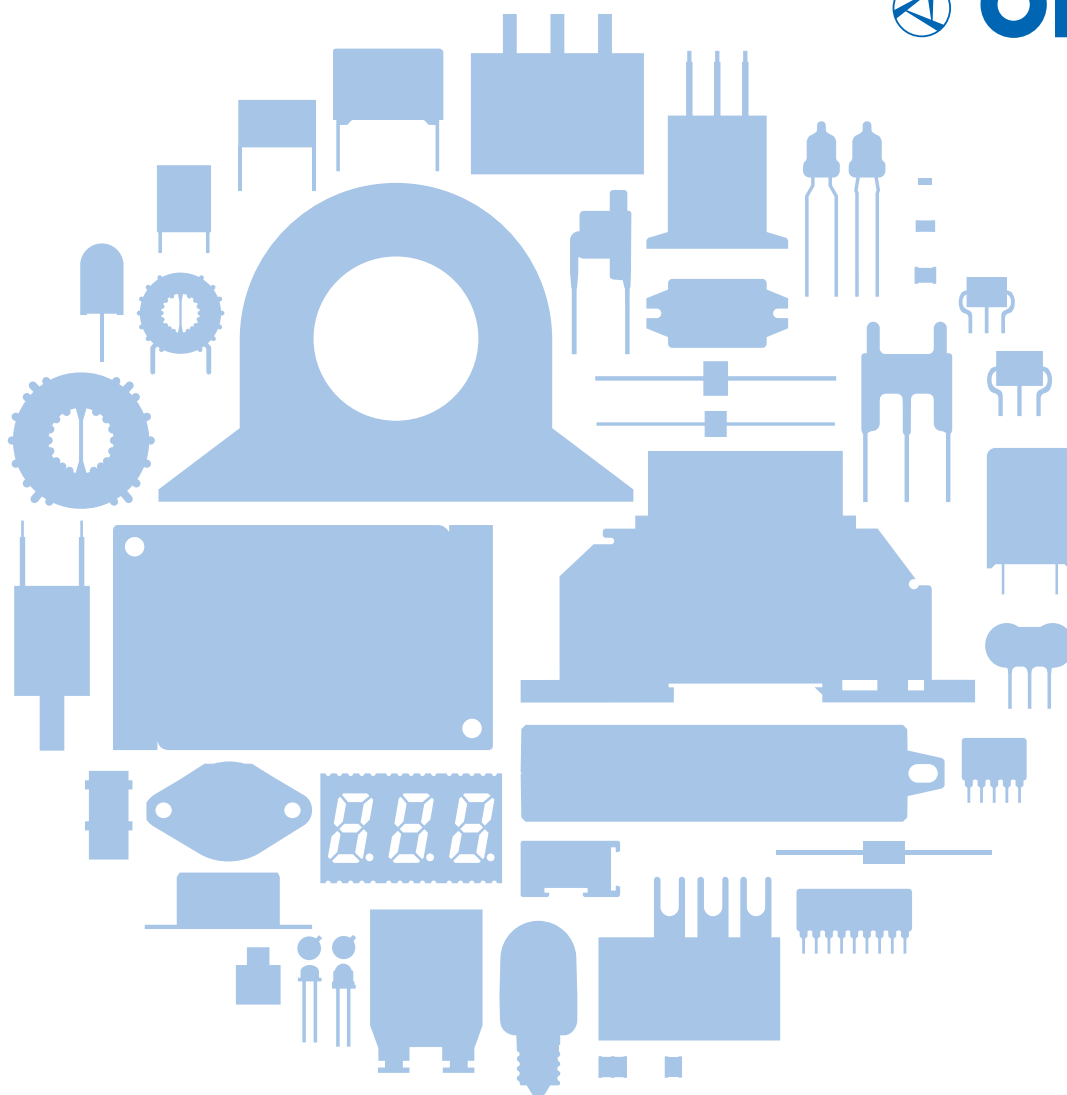




NOISE SUPPRESSING COMPONENTS

Proven Reliable Since 1946



<http://www.okayaelec.co.jp>

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NOISE SUPPRESSION CAPACITORS



NOISE SUPPRESSION CAPACITORS



The information provided in this catalog, as well as any additional data supplied by Okaya or Okaya representatives, is for general use only to assist the buyer in making its own independent decision as to the suitability of the products for the buyer's intended use and application.

Except for any limited warranties contained in Okaya Terms and Conditions, OKAYA DISCLAIMS WITH RESPECT TO THEIR GOODS AND DATA AND INFORMATION RELATED TO THEM, ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND ALL IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE.

The specifications contained in this catalog are subject to change without notice.

For improvement, specifications are subject to change without prior notice.

When components are used for special applications requiring high reliability (life maintenance equipment, atomic energy, airplanes, artificial satellites, etc.), contact us beforehand. Also make sure to evaluate and verify the components in a state that they are mounted on actual equipment.

SAFETY STANDARDS

Okaya noise suppression capacitors have been recognized by the following safety standards organizations:

Organization (Country)	Applicable Standard	
	Household Appliances	Office Appliances and others
IEC	PUB 65	PUB 950
UL (U.S.A)	UL60384-14 (capacitor)	UL1283 (filter)
cUL (C.S.A)	CSA E60384-14	C22.2 No.8
CSA (Canada)	CSA E60384-14	C22.2 No.8
VDE (Germany)	IEC/EN 60384-14	IEC/EN 60384-14
ENEC ALL EUROPIAN COUNTRIES	IEC/EN 60384-14	IEC/EN 60384-14
SEV (Switzerland)	IEC/EN 60384-14	IEC/EN 60384-14
BS (Great Britain)	IEC/EN 60384-14	IEC/EN 60384-14
SEMKO (Sweden)	IEC/EN 60384-14	IEC/EN 60384-14
DEMKO (Denmark)	IEC/EN 60384-14	IEC/EN 60384-14
NEMKO (Norway)	IEC/EN 60384-14	IEC/EN 60384-14
FIMKO (Finland)	IEC/EN 60384-14	IEC/EN 60384-14
ÖVE (Austria)	-----	IEC/EN 60384-14
IMQ (Italy)	-----	IEC/EN 60384-14

- Electrical apparatus are classified roughly into two categories, i.e., (a) household appliances and (b) office appliances including office automation (OA) and others.
- The standards for noise suppression capacitors to be used in the household appliances are more strict than those in the office appliances and others.
- The products enumerated in the following pages (with a few exceptions) have been approved under standards applicable to the household appliances, so that you may use them for almost all applications.
In order to avoid any accidents in machine applications which may experience unexpected abnormal surge voltage, or which are subjected to continuous 24-hour use, it is necessary to build in an extra measure of reliability. Here, the strict test conditions conducted by the above-mentioned safety standards organizations can be considered as one of the criteria from a reliability point of view.
- The product should be selected on the basis of a thorough consideration of such safety standards according to its application.



OUTLINE OF CAPACITOR CLASS RATINGS

Noise suppression capacitors are classified by the IEC into two categories (these designations are used by most European countries).

Class Y: Capacitors used in applications where damage to the capacitor may involve danger of electrical shock.

Class X: Capacitors used in applications where damage to the capacitor will not lead to the danger of electrical shock.

These X and Y Classifications are further divided into subcategories as shown in the tables.

Subclass	Peak Voltage	IEC 60664 Category	Application
X1	>2,500V <4,000V	III	Hi-pulse
X2	<2,500V	II	General
X3	<1,200V	I	General

Subclass	Type Insulation	Voltage Range	Peak Voltage
Y1	Double	<500V	8,000V
Y2	Basic	>150V <300V	5,000V
Y3	Basic	>150V <150V	None
Y4	Basic	<250V	2,500V

Okaya characterizes all capacitors using the standard test procedures outlined in JIS C 5101. These test parameters are confirmed by a Q.A. audit and are published as guaranteed specifications shown as "dielectric withstanding voltage".

Okaya performs 100% screen testing of all capacitors during the production process. These tests are subject to changes due to improvements in test equipment and procedures and are published for reference only.



NOISE SUPPRESSION CAPACITORS



FEATURES

The design and manufacture of OKAYA AC capacitors incorporates many features which make them superior in noise suppression applications.

Both single and double wound construction of the metallized polyester and polypropylene films insure long term reliability.

The electrical connection to the metallized film is made via a special multi-element solder which provides excellent surge current withstand capability and a decrease in Dissipation Factor.

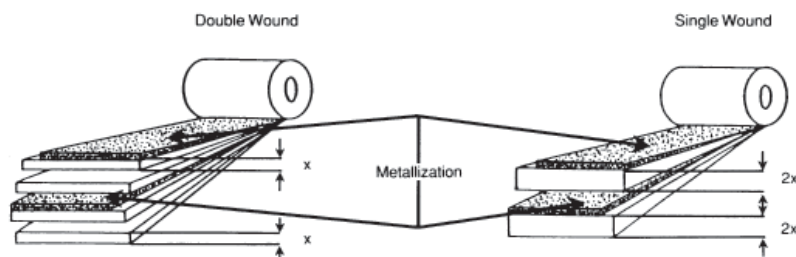
The special metallizing method is effective in lowering the level of dv/dt at the boundary between the margin section and the active section, thus improving voltage characteristics and Corona characteristics.

OKAYA's proprietary potting process prevents the outer case of the capacitor from exploding when exposed to "killer surges". Some competitive devices are designated "suitable for use with special enclosure only" by certain safety approval agencies.

OKAYA's AC capacitors employ a case made of FR-PBT (Polybutylene Terephthalate) which is impervious to most cleaning processes. The case and potting material are both rated UL94 Flame Class V-0.

The capacitors in general purpose series have been improved specially in AC voltage withstand characteristics by the Okaya's proprietary process for metallizing dielectric, resulting in smaller size and enhanced safety.

WINDING MELTED



Part No.	dv/dt at 390Vdc (V/ μ sec)
RE103	400
RE153	400
RE223	400
RE333	400
RE473	200
RE683	200
RE104	200
RE154	200
RE224	200
RE334	100
RE474	100
RE684	100
RE105	100
RE155	100
RE225	100

Part No.	dv/dt at 390Vdc (V/ μ sec)
LE103	400
LE153	400
LE223	400
LE333	400
LE473	150
LE683	150
LE104	150
LE154	150
LE224	150
LE334	150
LE474	100
LE684	100
LE105	100
LE155	100
LE225	100
LE335	70

Part No.	dv/dt at 390Vdc (V/ μ sec)
LE104-MX	150
LE154-MX	150
LE224-MX	150
LE334-MX	150
LE474-MX	100
LE684-MX	100
LE105-MX	100
LE155-MX	70
LE225-MX	70

Part No.	dv/dt at 390Vdc (V/ μ sec)
LE155-K	100
LE225-K	100
LE335-K	100
LE475-K	100
LE685-K	70
LE106-K	70

Part No.	dv/dt at 390Vdc (V/ μ sec)
LE155-K-M	100
LE225-K-M	100
LE335-K-M	70
LE475-K-M	70
LE685-K-M	70
LE106-K-M	70

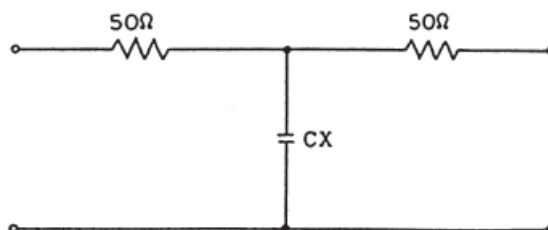
INSERTION LOSS

The insertion loss of a capacitor is measured in a 50Ω system.

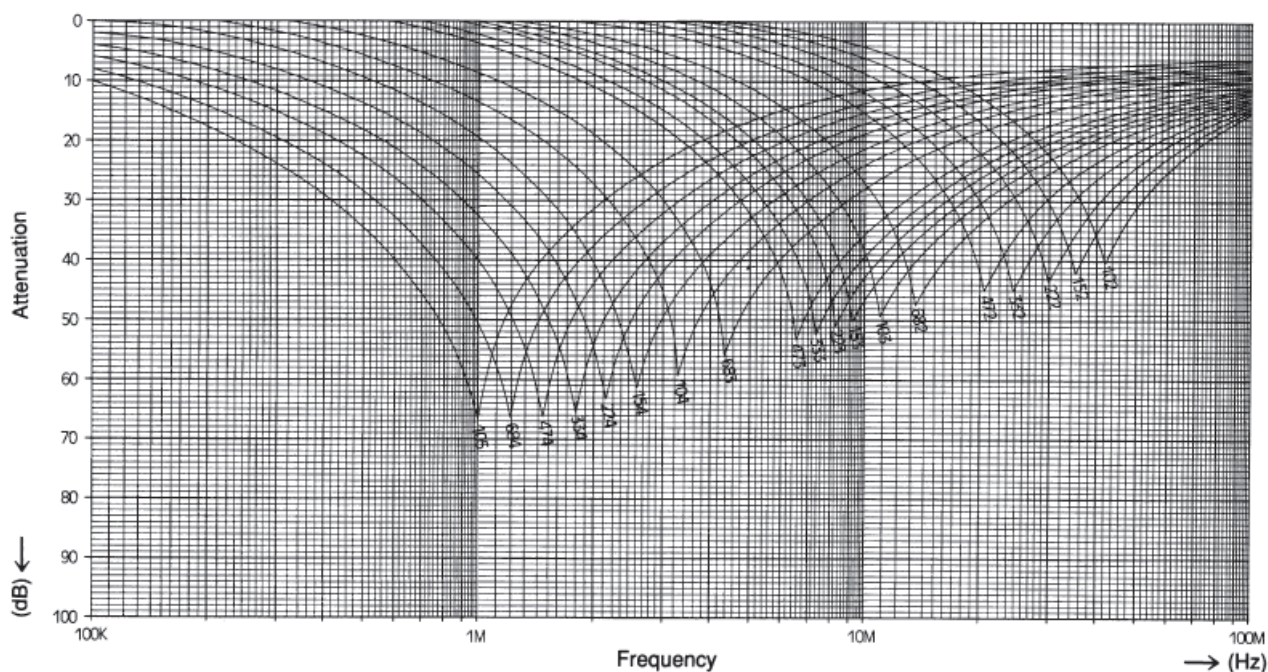
$$\text{Insertion Loss} = 20 \log_{10} (V_2 / V_1) \text{ [dB]}$$

V1 Level without test sample

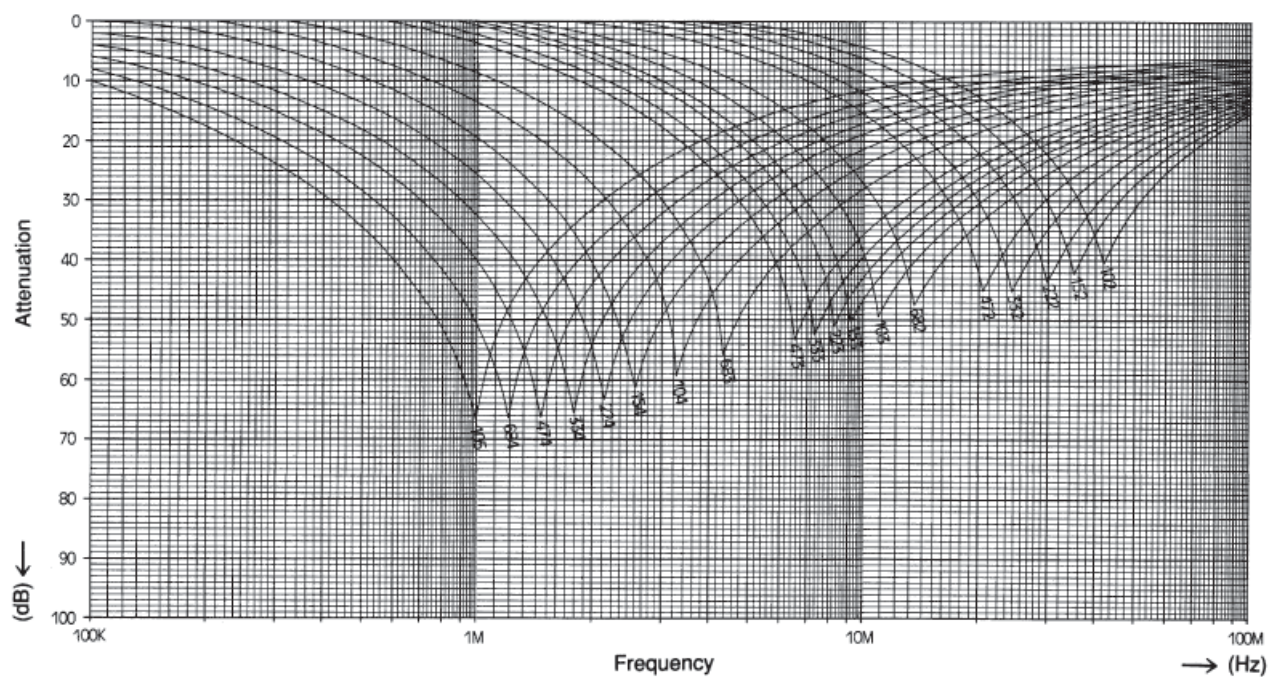
V2 Level with test sample



INSERTION LOSS (LE Series)



INSERTION LOSS (XE-Z Series)





NOISE SUPPRESSION CAPACITORS

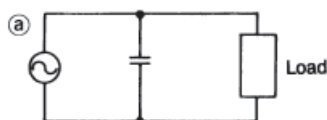


APPLICATION EXAMPLES

Electrical noise, which effects the correct operation of electrical equipment, can originate from sources both external and internal to the product. For example, high frequency noise can be generated by the rotation of a brush motor. As a counter measure to such noise, a capacitor can be introduced into the noise prevention circuitry to lower the circuit impedance. It is necessary to use a capacitor with excellent, high-frequency characteristics. This is why metallized polyester film is used by OKAYA as the capacitor dielectric in all AC noise suppression capacitors.

Examples of Uses:

- a) Effective as countermeasure for low-energy noise produced by high frequencies in DC motor brushes. Applications include power tools using multi-pole brush motors, vacuum cleaners, mixers, etc.



- b) Here, a common coil is used to compose a filter circuit as a means of improving attenuation and expanding band range.

Applications include a wide variety of office appliances, switching power units, etc.



- c) This shows countermeasures against common mode noise taken in addition to the measures shown in b).



*NOTE: For applications of the type shown in b) and c), see the Noise Filter section.

RATED CURRENT

The following is used to calculate the current for a supply voltage. Values for 250Vac, 50/60Hz are shown in the table (Precautions should be taken with regard to voltage fluctuation and permissible deviation of electrostatic capacitance when calculating maximum values).

$$I = 2 \pi f C E \text{ (A)}$$

I : Current Amps (A)

f : Operating frequency (Hz)

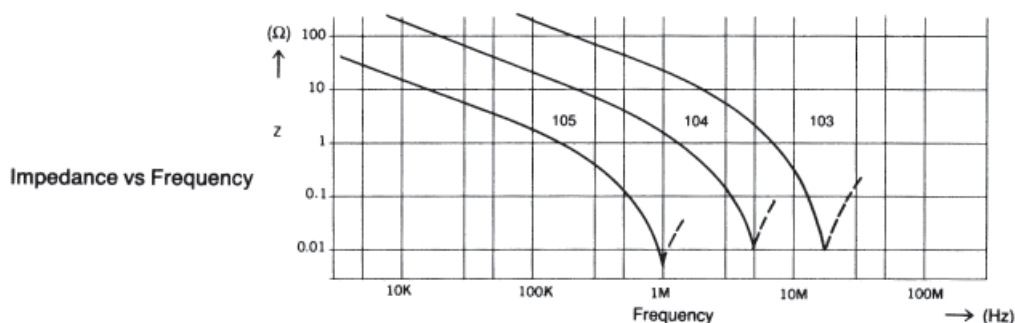
C : Electrostatic capacitance Farads (F)

E : Supply voltage AC (V)

Unit: mA

Frequency	Capacitance μF	0.001	0.0015	0.0022	0.0033	0.0047	0.0068	0.01	0.015	0.022	0.033
50Hz		0.1	0.1	0.2	0.3	0.4	0.5	0.8	1.18	1.73	2.59
60Hz		0.1	0.1	0.2	0.3	0.4	0.6	0.9	1.41	2.07	3.11

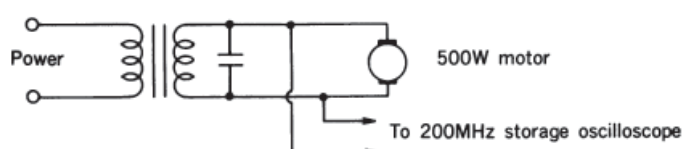
Frequency	Capacitance μF	0.047	0.068	0.1	0.15	0.22	0.33	0.47	0.68	1.0
50Hz		3.69	5.34	7.85	11.8	17.3	25.9	36.9	53.4	78.5
60Hz		4.43	6.41	9.42	14.1	20.7	31.1	44.3	64.1	94.2



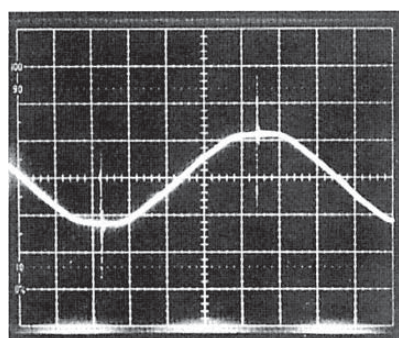


EXAMPLES OF NOISE SUPPRESSION EFFECTS

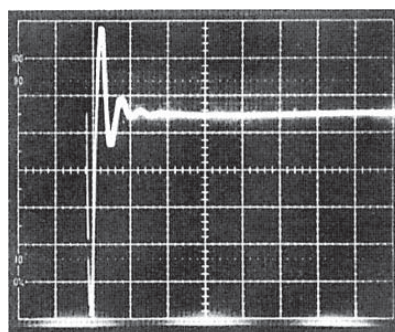
Noise suppression capacitors are most widely applied as countermeasures to noise occurring in inverters, switching power units, brush motors, and to the full range of Office Automation equipment.



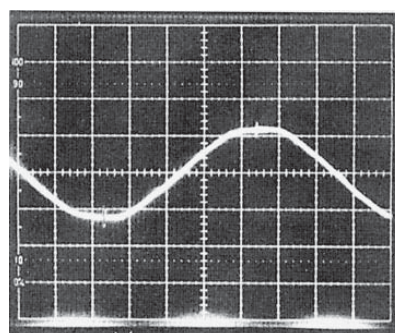
These illustrations show examples of the noise suppression effects produced with a 500W class brush motor used on a commercial 120V line. The load is driven through an isolation transformer.



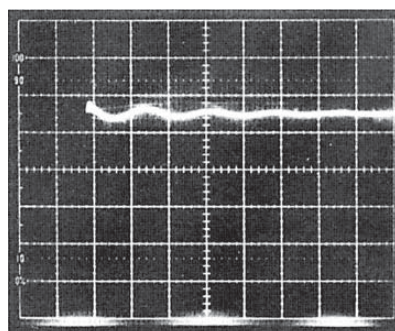
A) This illustration shows the line waveform without any noise countermeasures. A damped oscillation wave of about 800Vp-p is visible at the instant of positive and negative peak.



B) This illustration shows an observation of the noise component alone. (Time axis 10µsec/div.)



C) This illustration shows the results of noise countermeasures taken by inserting an XE474 (0.47µF) capacitor in the line. A minute amount of noise appears to remain in the sine curve, but it is not considered significant.



D) This illustration shows the same isolation of the noise at a time axis of 10µsec/div. By the insertion of the electrostatic capacitance of 0.47µF, the period of damping oscillation has become longer, but the peak voltage is well damped, thus producing excellent results.

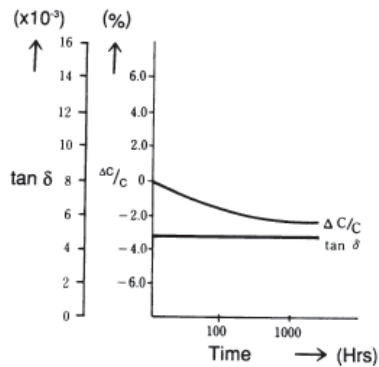


NOISE SUPPRESSION CAPACITORS

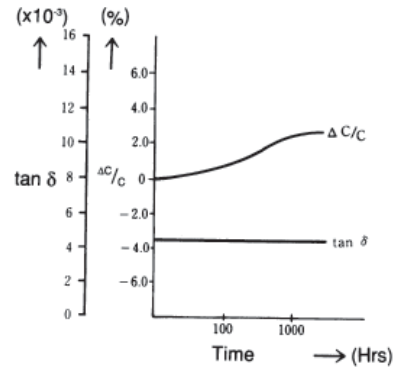


PERFORMANCE CHARACTERISTICS

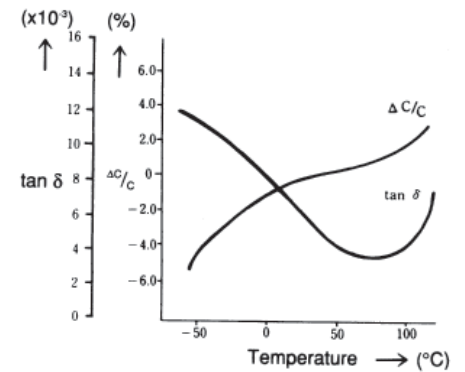
Endurance (XE-Z type)



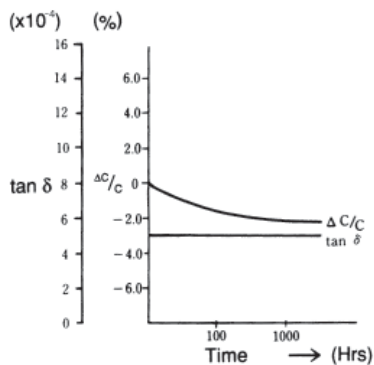
Damp Heat Endurance (XE-Z type)



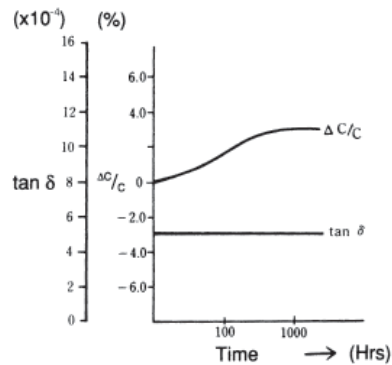
Temperature Characteristics (XE-Z type)



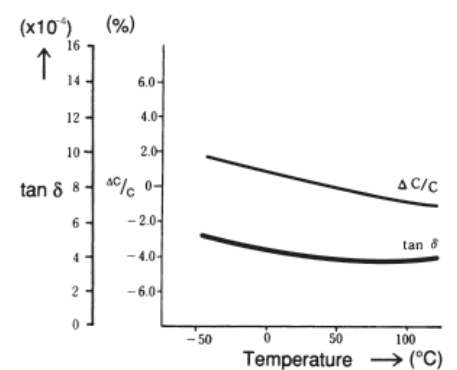
Endurance (LE type)



Damp Heat Endurance (LE type)



Temperature Characteristics (LE type)



TEST CONDITIONS

Temperature Endurance:
At maximum rated temperature and
at 125% of rated voltage.
The voltage is increased to
1,000Vac for 0.1 second.

Damp Heat Endurance:
 $\sqrt{2} \times WV$

Temperature Characteristics:
-50°C to +100°C
100% Rated Voltage



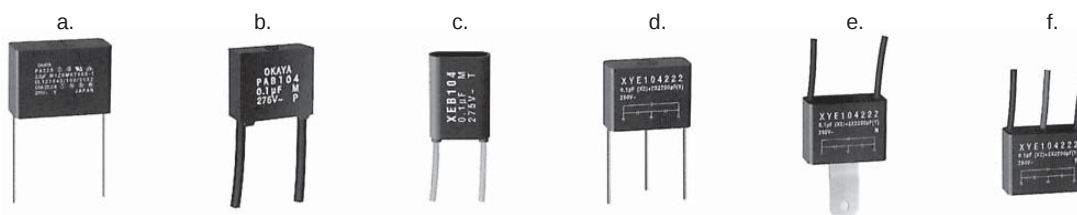
NOISE SUPPRESSION CAPACITORS



FORM

Rated Voltage	Safety Standard	Lead Type	Forms	Model	Page
310Vac*	cUL US	Bare Wire	a	LE-FX Series	12
310Vac*	cUL US	Bare Wire	a	LE-MX Series	13
275Vac*	cUL US	Bare Wire	a	LE Series	14
300Vac*	cUL US	Bare Wire	a	LE-K, LE-K-M Series	15
275Vac*	cUL US	Bare Wire	a	RE-L Series	16
275Vac*	cUL US	Bare Wire	a	PA-L Series	17
300Vac	cUL US	Bare Wire	a	VEA Series	18
500Vac	cUL US	Bare Wire	a	XH Series	19
275Vac*	cUL US	Flex Wire	b	REB Series	20
250Vac*	UL	Flex Wire	c	XEB Series	21
275Vac*	cUL US	Bare Wire	a	XE-Z Series	22
300Vac*	cUL US	Bare Wire	a	YF Series	23
250Vac	cUL US	Bare Wire	a	YE Series	24
250Vac	cUL US	Bare Wire	d	XYE-AN Series	25-26
250Vac	cUL US	Flex Wire, Earth Terminal	e	XYE-BE Series	
250Vac	cUL US	Flex Wire	f	XYE-BN Series	
440Vac	-	Flex Wire	-	3XYG Series	27
310Vac	-	Bare Wire	a	EPC Series	28

* UL and cUL, CSA = 250Vac



APPLICATIONS

AC Motors
DC Motors
Brush Motors
Grinders
Motor Controls
Mixers
Dryers

Machine Tools
Washers
Power Supplies
Lighting
Frequency Controls

Contact Protection
Industrial Controls
Robotics
NC Controls
CNC Controls
Antenna Coupling

AC Line Suppression
Vacuum Cleaners
Tumblers
Electric Switching
Power Snubbers
Mechanical Switching

DESIGN CAUTIONS

- 1) When protecting switching contacts, always include a resistor in series with the noise suppression capacitors. See Spark Quencher section for products specifically designed for such applications.
- 2) In high speed circuits, the addition of a noise suppression capacitor may slow the response time of the circuit. For best response characteristics, do not use a larger capacitor than is absolutely necessary to suppress the noise level.
- 3) Noise suppression capacitors are most effective when located close to the offending noise source. Excessive lead length may cause abnormal oscillation and decrease the energy absorption capability of the capacitor.
- 4) When noise suppression capacitors are connected across power lines, care must be taken that the resulting in-rush current does not cause the fuse or circuit breaker to open. Special consideration must be given to both the capacitor value and the breaker ratings.
- 5) OKAYA noise suppression capacitors are specifically designed for standard line frequencies and should not be used in circuits where normal operation will exceed 70Hz.
- 6) To prevent permanent damage to noise suppression capacitors, they should not be allowed to self-heat more than 5 degrees centigrade above ambient.
- 7) These products do absorb normal line surges. However they are not intended to absorb high-energy surges such as induced lightning. See Transient Voltage Suppressor section for products specifically designed for such applications.



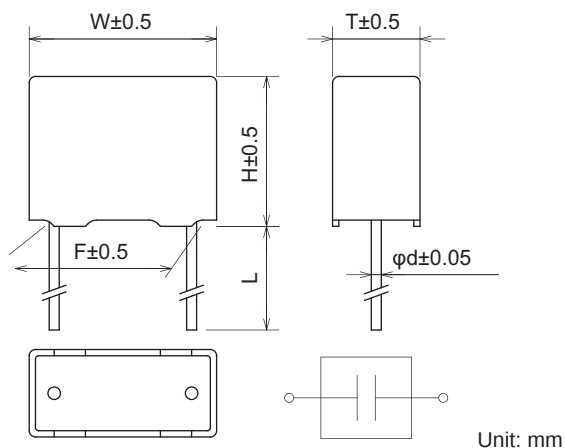
Features

- Rated 310Vac, Class X2 series
- Variable lead spacing and lead diameter with same capacitance
- Operating temperature up to 110°C°
- Lineup for Halogen (Chlorine, Bromine) Free compliant

Applications

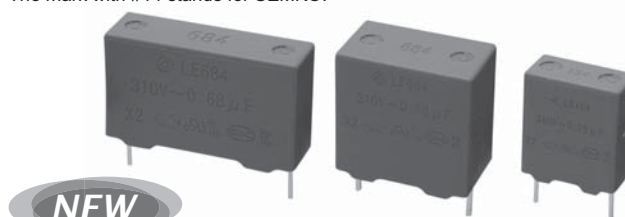
- Designed mainly for suppressing noise occurring in power line of electrical appliances.

Dimensions & Circuit



Safety Standard	File No.
UL : UL60384-14	E47474
cUL : CSA E60384-14	E47474
ENEC : IEC/EN60384-14:2005	SE/0142-1
CQC : GB/T14472-1998	CQC14001110427
KC : K60384-14	HU03005-**** HU03019-****

The "ENEC" mark is a common European product certification mark based on testing to harmonized European safety standard. The mark with #14 stands for SEMKO.



Model numbering system

L	E				-	F	X	①	②	③	④
Series name	Capacitance					Supported mark		Identifying Code*			

*Identifying Code

Code	①Lead spacing	②Lead diameter	③Lead length	④Halogen-free
1	10.0mm	φ0.6mm	10mm min.	Non compliant
2	12.5mm	φ0.8mm	4.5±0.5mm	Compliant
3	15.0mm		3.5±0.5mm	
4	22.5mm		30mm min.	
5	27.5mm		3.2±0.3mm	

Electrical Specifications

Rated Voltage **310Vac**

Safety Standard	Class	Model Number	Identifying Code	Capacitance μF±10%	Dimensions(mm)					Dissipation Factor	Test Voltage	Insulation Resistance
					W	H	T	F	d			
	X2	LE473-FX	11**	0.047	13.0	11.5	5.5	10.0	0.6	C≤1μF 0.005max. (at 10kHz) C>1μF 0.002max. (at 1kHz)	Line to Line 1,000Vac 50/60Hz 60sec. Line to Case 2,100Vac 50/60Hz 60sec.	C≤0.33μF 15,000MΩmin. (at 100Vdc) C>0.33μF 5,000ΩFmin. (at 100Vdc) Line to Case 100,000MΩmin. (at 100Vdc)
		LE683-FX	11**	0.068	13.0	12.0	6.0	10.0	0.6			
		LE104-FX	11**	0.1	13.0	12.5	5.5	10.0	0.6			
			31**		18.0	11.0	5.0	15.0	0.6			
		LE154-FX	11**	0.15	13.0	15.0	6.5	10.0	0.6			
			31**		18.0	11.5	6.0	15.0	0.6			
		LE224-FX	11**	0.22	13.0	16.5	7.5	10.0	0.6			
			31**		18.0	13.0	6.5	15.0	0.6			
		LE334-FX	21**	0.33	15.5	16.0	9.0	12.5	0.6			
			31**		18.0	15.0	7.5	15.0	0.6			
			32**		18.0	15.0	7.5	15.0	0.8			
		LE474-FX	32**	0.47	18.0	16.5	8.0	15.0	0.8			
			41**		26.0	13.5	7.0	22.5	0.6			
			42**		26.0	13.5	7.0	22.5	0.8			
		LE684-FX	32**	0.68	18.0	17.5	10.5	15.0	0.8			
			41**		26.0	15.5	8.0	22.5	0.6			
			42**		26.0	15.5	8.0	22.5	0.8			
		LE105-FX	41**	1.0	26.0	17.0	10.0	22.5	0.6			
			42**		26.0	17.0	10.0	22.5	0.8			
			52**		31.5	17.0	8.5	27.5	0.8			
		LE155-FX	42**	1.5	26.0	21.5	13.0	22.5	0.8			
			52**		31.5	18.5	13.0	27.5	0.8			
		LE225-FX	42**	2.2	26.0	23.0	15.0	22.5	0.8			
			52**		31.5	21.0	15.5	27.5	0.8			

Operating Temperature: -55~+110°C

Features

- Rated voltage 310Vac.
- Class X2 series.
- Operating temperature up to 110°C.
- Smallest size of LE series.

Applications

- Designed mainly for suppressing noise occurring in power line of electrical appliances.

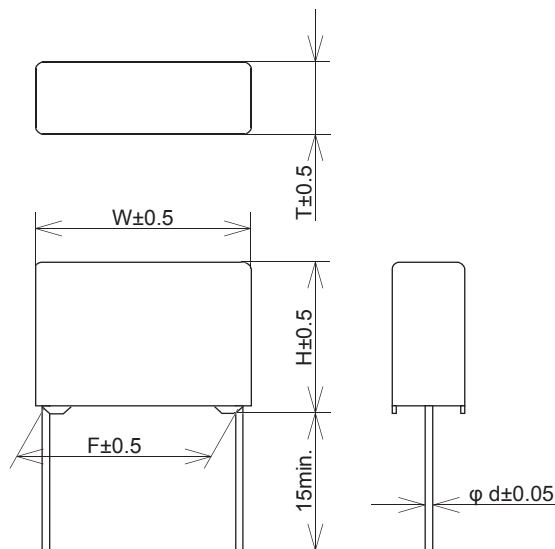


Safety Standard	File No.
UL :UL60384-14	E47474
cUL :CSA E60384-14	E47474
ENEC :IEC/EN 60384-14	SE/0142-1
CQC :GB/T14472-1998	CQC07001020113
KC :K60384-14	HU03005-**** HU03019-****

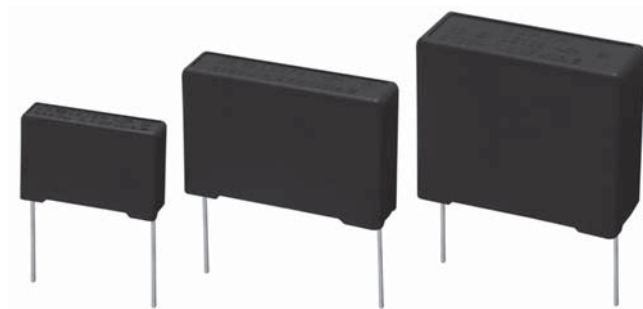
The "ENEC" mark is a common European product certification mark based on testing to harmonized European safety standard. The mark with #14 stands for SEMKO.



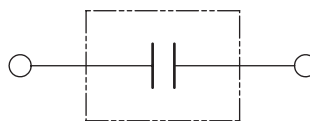
Dimensions



Unit: mm



Circuit



Model numbering system

L	E				-	M	X
Series name	Capacitance					Supported mark	

Electrical Specifications

Rated Voltage **310Vac**

Safety Standard	Class	Model Number	Capacitance μF±10%	Dimensions					Dissipation Factor	Test Voltage	Insulation Resistance
				W	H	T	F	d			
    	X2	LE104-MX	0.1	17.0	11.0	5.0	15.0	0.6	C≤1μF 0.003max. (f=10kHz) C≥1.5μF 0.002max. (f=1kHz)	Line to Line 1,000Vac 50/60Hz 60sec or 1,870Vdc 60sec Line to Case 2,100Vac 50/60Hz 60sec	Line to Line C≤0.33μF 15,000MΩmin. C≥0.47μF 5,000Ω•Fmin. Line to Case 100,000MΩmin. (at 100Vdc)
		LE154-MX	0.15		12.0	6.0					
		LE224-MX	0.22		14.0	6.5					
		LE334-MX	0.33	17.5	16.5	7.5	22.5				
		LE474-MX	0.47	7.0							
		LE684-MX	0.68	25.5	18.0	8.5					
		LE105-MX	1.0		21.0	10.0					
		LE155-MX	1.5		30.5	22.5	13.0	27.5			
		LE225-MX	2.2	25.5		15.5					

Operating Temperature: -55~+110°C



Features

- Metalized polypropylene film capacitor.
- Rated voltage 275Vac.
- Compact size.
- IEC/EN 60384-14 class X2.

Applications

- Designed mainly for suppressing noise occurring in power line of electrical appliances.

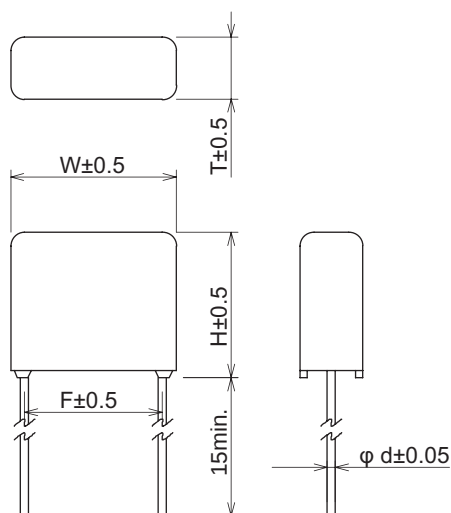


Safety Standard	File No.
UL :UL60384-14	E47474
cUL :CSA E60384-14	E47474
ENEC :IEC/EN60384-14	SE/0142-1
CQC :GB/T14472-1998	CQC03001006331
KC :K60384-14	HU03005-**** HU03019-****

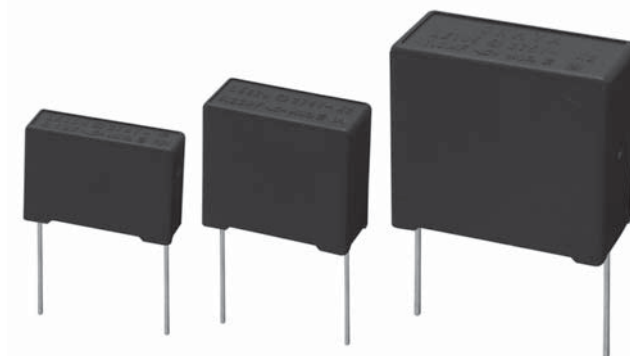
The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard. The mark with #14 stands for SEMKO.



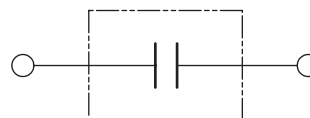
Dimensions



Unit: mm



Circuit



Model numbering system

L	E			
Series name	Capacitance			

Electrical Specifications

Rated Voltage **275Vac**

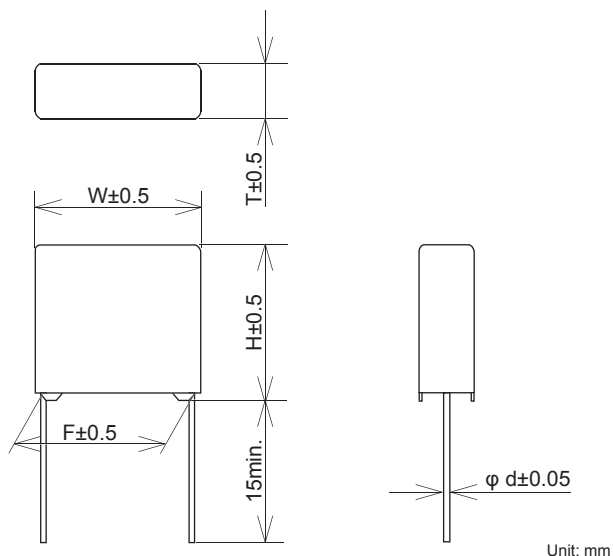
Safety Standard	Class	Model Number	Capacitance μF±10%	Dimensions					Dissipation Factor	Test Voltage	Insulation Resistance		
				W	H	T	F	d					
UL SEMI 14 S CQC KC	X2	LE103	0.01	12.0	10.5	4.5	10.0	0.6	C≤1μF 0.003max. (f=10kHz) C>1μF 0.002max. (f=1kHz)	Line to Line C≤2.2μF 1,250Vac 50/60Hz 60sec C=3.3μF 1,000Vac 50/60Hz 60sec	Line to Line 103~334 15,000MΩmin. 474~225 5,000Ω•Fmin.		
		LE153	0.015			11.5						5.5	
		LE223	0.022		17.0							11.0	5.0
		LE333	0.033			11.5							
		LE473	0.047	14.0			6.5						
		LE683	0.068			15.0						8.0	
		LE104	0.1	17.5	17.5		9.5						0.8
		LE154	0.15			25.5						19.5	
		LE224	0.22	22.0	12.0		22.5						
		LE334	0.33			30.5						24.5	
		LE474	0.47	28.0	18.0								
		LE684	0.68			30.0	27.5						
		LE105	1.0	27.5	18.0								
		LE155	1.5			27.5	18.0						
		LE225	2.2	27.5	18.0								
		LE335	3.3			27.5	18.0						

Operating Temperature: -55~+100°C

- Rated voltage 300Vac, Class X2 series.
- Tolerance of Capacitance $\pm 10\%$ (LE-K), $\pm 20\%$ (LE-K-M).
- High Capacitance 1.5 ~ 10 μ F.

- Designed mainly for suppressing noise occurring in power line of electrical appliances.

- *Dimensions*

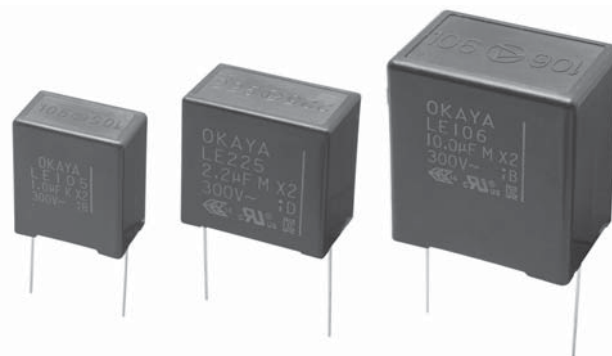


Unit: mm

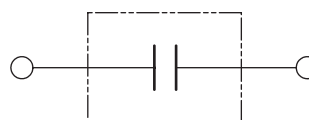


Safety Standard	File No.
UL :UL60384-14	E47474
cUL :CSA E60384-14	E47474
ENEC :IEC/EN60384-14	SE/0142-1

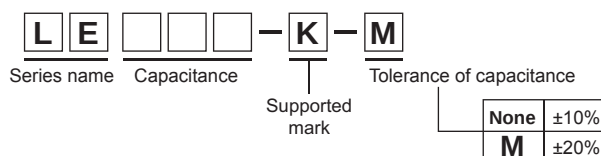
The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard. The mark with #14 stands for SEMKO.



- *Circuit*



- Model numbering system



Electrical Specifications

Rated Voltage **300Vac**

Safety Standard	Class	Model Number	Capacitance μF±10%	Dimensions					Dissipation Factor	Test Voltage	Insulation Resistance
				W	H	T	F	d			
  	X2	LE155-K	1.5	25.5	28.0	16.0	22.5	0.8	0.002max. (f=1kHz)	Line to Line C≤3.3μF 1,250Vac 50/60Hz 60sec C≥4.7μF 1,770Vdc 60sec Line to Case 2,100Vac 50/60Hz 60sec	Line to Line 5,000Ω•Fmin. (at 100Vdc) Line to Case 100,000MΩmin (at 100Vdc)
		LE225-K	2.2		32.0	20.5					
		LE335-K	3.3	31.0	35.5	21.5	27.5				
		LE475-K	4.7		26.0						
		LE685-K	6.8	39.0	40.0	27.0	35.0	1.0			
		LE106-K	10.0	46.5	43.5	31.0	42.5				

Safety Standard	Class	Model Number	Capacitance μF±20%	Dimensions					Dissipation Factor	Test Voltage	Insulation Resistance
				W	H	T	F	d			
  	X2	LE155-K-M	1.5	30.5	24.5	15.0	27.5	0.8	0.002max. (f=1kHz)	Line to Line Cs≤3.3μF 1,250Vac 50/60Hz 60sec Cs≥4.7μF 1,770Vdc 60sec Line to Case 2,100Vac 50/60Hz 60sec	Line to Line 5,000Ω•Fmin.
		LE225-K-M	2.2		28.0	18.0					
		LE335-K-M	3.3	38.0		18.5	35.0				
		LE475-K-M	4.7	41.0	31.0	21.0	37.5				
		LE685-K-M	6.8		38.0	23.0					
		LE106-K-M	10.0		43.0	28.0					

Operating Temperature: -55~+100°C



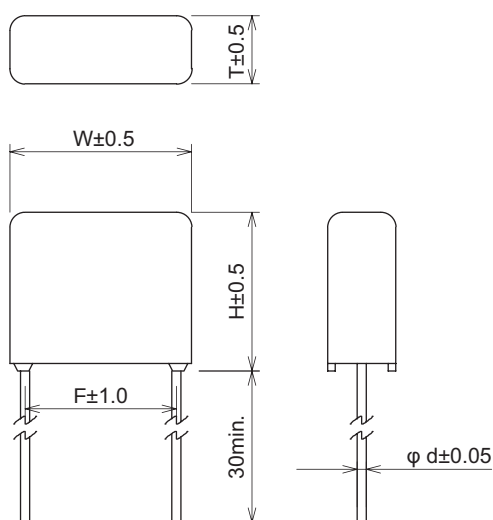
Features

- Rated voltage 275Vac.
- IEC/EN 60384-14 class X2.

Applications

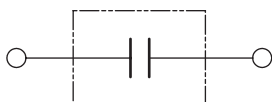
- Designed mainly for suppressing noise occurring in power line of electrical appliances.

Dimensions



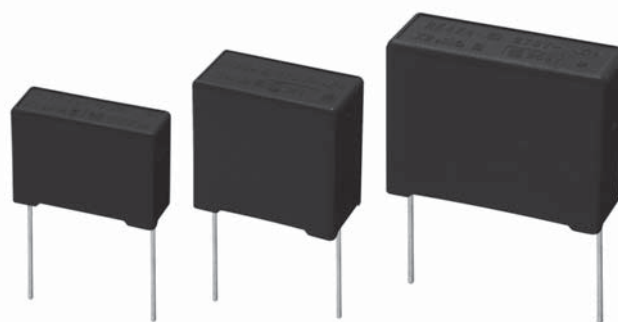
Unit: mm

Circuit

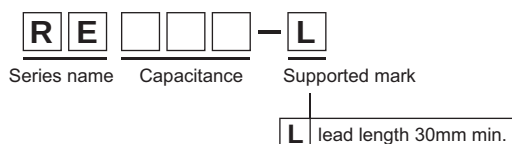


Safety Standard	File No.
UL :UL-60384-14	E47474
cUL :CSA E60384-14	E47474
CSA :CSA E60384-14, C22.2 No.8	LR37404, LR104926
VDE :IEC/EN 60384-14	094750X
SEMKO :IEC/EN 60384-14	1303400, 916932
NEMKO :IEC/EN 60384-14	P08208949, P10211810
DEMKO :IEC/EN 60384-14	144191-01, 315279-01
FIMKO :IEC/EN 60384-14	FI 24150A2, FI 25644
Electrosuisse:IEC/EN 60384-14	13.0339, 13.0068
ENEC :IEC/EN 60384-14	40028657
KC :K60384-14	SU03007-2001C

The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard. The mark with #10 stands for VDE.



Model numbering system



Electrical Specifications

Rated Voltage **275Vac (CSA: 250Vac)**

Safety Standard	Class	Model Number	Capacitance μF±10%	Dimensions					Dissipation Factor	Test Voltage	Insulation Resistance				
				W	H	T	F	d							
         	X2	RE103-L	0.01	12.0	10.5	4.5	10.0	0.6	C≤1μF 0.003max. (f=10kHz)	Line to Line 1,250Vac 50/60Hz 60sec	Line to Line 103~334 15,000MΩmin. 474~225 5,000Ω·Fmin.				
		RE153-L	0.015												
		RE223-L	0.022												
		RE333-L	0.033	17.0	11.0	5.0	15.0					0.6	C>1μF 0.002max. (f=1kHz)	Line to Case 2,000Vac 50/60Hz 60sec	Line to Case 100,000MΩmin. (at 100Vdc)
		RE473-L	0.047												
		RE683-L	0.068												
		RE104-L	0.1												
		RE154-L	0.15												
		RE224-L	0.22												
		RE334-L	0.33	25.5	17.5	8.0	22.5	0.8	C>1μF 0.002max. (f=1kHz)	Line to Case 2,000Vac 50/60Hz 60sec	Line to Case 100,000MΩmin. (at 100Vdc)				
		RE474-L	0.47												
		RE684-L	0.68	30.5	21.0	10.5	27.5					0.8	C>1μF 0.002max. (f=1kHz)	Line to Case 2,000Vac 50/60Hz 60sec	Line to Case 100,000MΩmin. (at 100Vdc)
		RE105-L	1.0												
		RE155-L	1.5												
		RE225-L	2.2												

Operating Temperature: -55~+100°C

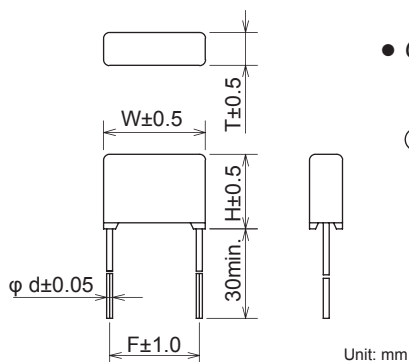
Features

- Rated voltage 275Vac.
- IEC/EN 60384-14 class X2.

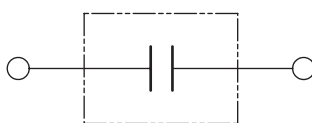
Applications

- Designed mainly for suppressing noise occurring in power line of electrical appliances.

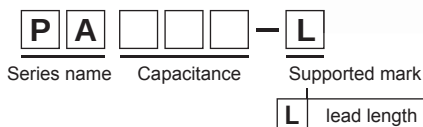
• Dimensions



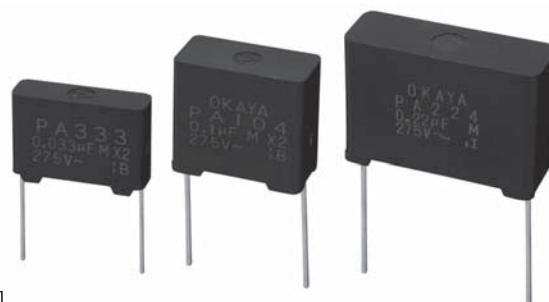
• Circuit



• Model numbering system



Safety Standard	File No.
UL	:UL-60384-14 E47474
cUL	:CSA E60384-14 E47474
CSA	:CSA E60384-14, C22.2 No.8 LR37404, LR104926
VDE	:IEC/EN 60384-14 40018318, 40017808
SEMKO	:IEC/EN 60384-14 917611, 1111621
NEMKO	:IEC/EN 60384-14 P08209479, P06206040
DEMKO	:IEC/EN 60384-14 315316-01, D-00242
FIMKO	:IEC/EN 60384-14 FI25733, FI27268
Electrosuisse	:IEC/EN 60384-14 12.0939, 12.0937



Electrical Specifications

Rated Voltage **275Vac**

Safety Standard	Class	Model Number	Capacitance μF±20%	Dimensions					Dissipation Factor	Test Voltage	Insulation Resistance
				W	H	T	F	d			
UL[®] US SP[®] VDE S N D FI S	X2	PA103-L	0.01	17.0	12.0	5.0	15.0	0.6	0.01max. (at 1kHz)	Line to Line 1,250Vac 50/60Hz 60sec	Line to Line 103~334 15,000MΩmin. 474~225 5,000Ω•Fmin
		PA123-L	0.012								
		PA153-L	0.015								
		PA183-L	0.018								
		PA223-L	0.022								
		PA273-L	0.027								
		PA333-L	0.033								
		PA393-L	0.039								
		PA473-L	0.047								
		PA563-L	0.056								
		PA683-L	0.068								
		PA823-L	0.082								
		PA104-L	0.1								
		PA124-L	0.12								
		PA154-L	0.15								
		PA184-L	0.18								
		PA224-L	0.22								
		PA274-L	0.27	30.0	17.0	8.5	27.5	0.8			
		PA334-L	0.33	25.0	19.5	10.0	22.5				
		PA394-L	0.39	30.0	22.0	11.0	27.5				
		PA474-L	0.47		24.5	13.5					
		PA564-L	0.56								
		PA684-L	0.68								
		PA824-L	0.82	30.5	28.0	16.0	37.5				
		PA105-L	1.0								
PA125-L	1.2	41.0	15.5								
PA155-L	1.5										
PA185-L	1.8		32.5	17.5							
PA225-L	2.2										

Operating Temperature: -40~+100°C

Features

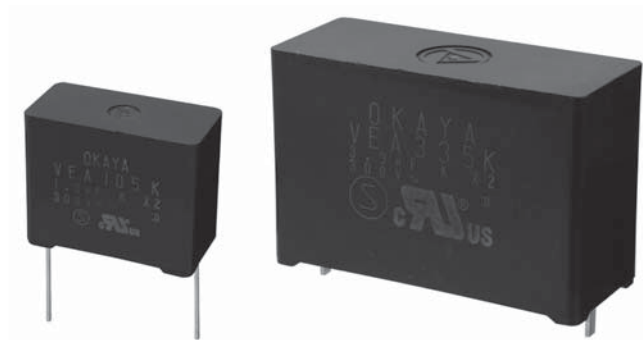
- Single and three phase application.
- High Capacitance 1.0 ~ 10 μ F.

Applications

- Suppressing noise occurring in large power systems, such as 3 phase 500Vac inverters, and welding machines.

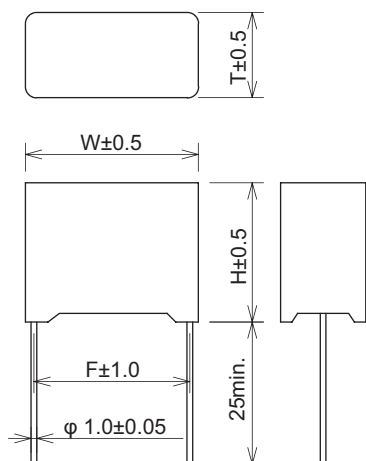


Safety Standard		File No.
UL	:UL1283	E78644
cUL	:C22.2 No.8	
SEMKO	:IEC/EN 60384-14	712459

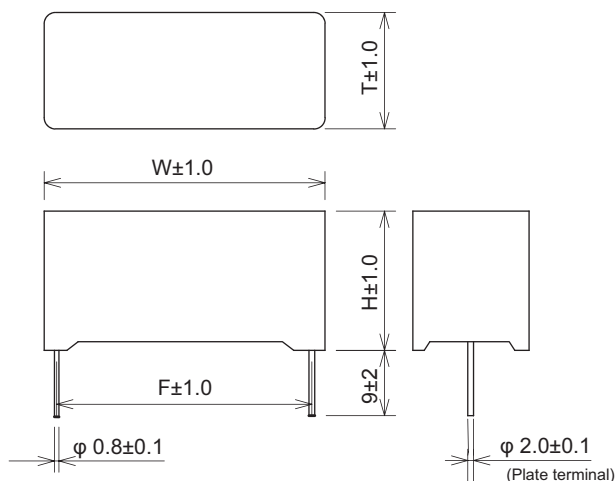


Dimensions

Type: a

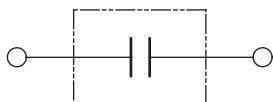


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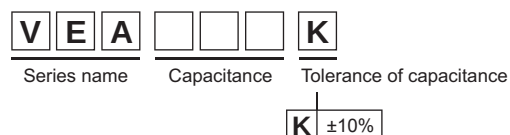


Unit: mm

Circuit



Model numbering system



Electrical Specifications

Rated Voltage **300Vac**

Safety Standard	Class	Model Number	Capacitance μF±10%	Dimensions				Type	Dissipation Factor	Test Voltage	Insulation Resistance					
				W	H	T	F									
	X2	VEA105K	1.0	30.5	24.5	15.0	27.5	a	0.001max. (at 1kHz)	Line to Line 1,450Vdc 60sec. or 1,000Vac 60sec.	Line to Line 5,000Ω•Fmin.					
		VEA155K	1.5	41.0	28.0	15.5	37.5									
		VEA225K	2.2		32.5	17.5										
		VEA305K	3.0	49.5	33.0	20.5	45.0	b	0.002max. (at 1kHz)	Line to Case 2,100Vac 50/60Hz 60sec.	Line to Case 30,000MΩmin. (at 500Vdc)					
		VEA335K	3.3													
		VEA475K	4.7	59.5	35.5	21.5	55.0									
		VEA685K	6.8		43.5											
		VEA106K	10.0													

Operating Temperature: -40~+100°C

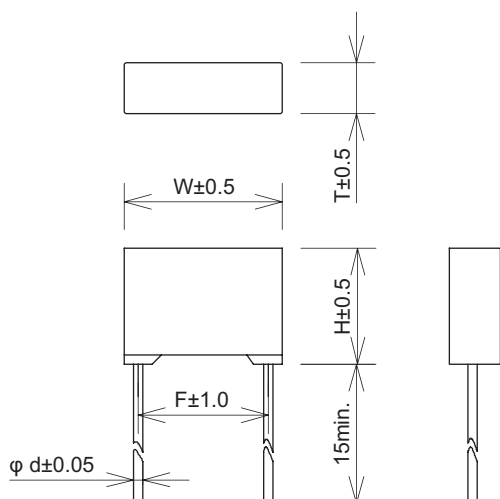
Features

- 500Vac rated capacitor designed for use in high voltage system.

Applications

- Suppressing noise occurring in large power systems, such as 3 phase 500Vac inverters, and welding machines.

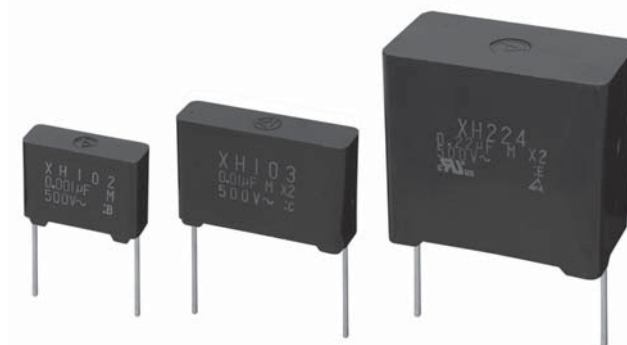
Dimensions



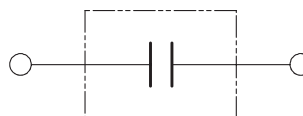
Unit: mm



	Safety Standard	File No.
UL	:UL60384-14	E47474
cUL	:CSA E60384-14	E47474
TÜV	:IEC/EN 60384-14	J9650619



Circuit



Model numbering system

X	H			
Series name	Capacitance			

Electrical Specifications

Rated Voltage **500Vac**

Safety Standard	Class	Model Number	Capacitance μF±20%	Dimensions					Dissipation Factor	Test Voltage		Insulation Resistance					
				W	H	T	F	d									
		XH102	0.001	17.0	12.5	5.5	15.0	0.8	0.01max. (at 1kHz)	Line to Line 2,200Vac 50/60Hz 60sec	Line to Case 2,200Vac 50/60Hz 60sec	Line to Line 15,000MΩmin. (at 500Vdc)	Line to Case 100,000MΩmin (at 500Vdc)				
		XH152	0.0015														
		XH222	0.0022														
		XH332	0.0033														
		XH472	0.0047														
		XH682	0.0068														
c  US 	X2	XH103	0.01	25.0	16.0	6.5	22.5			1.0				Line to Line 2,000Vac 50/60Hz 60sec	Line to Case 2,200Vac 50/60Hz 60sec	Line to Line 15,000MΩmin. (at 500Vdc)	Line to Case 100,000MΩmin (at 500Vdc)
		XH153	0.015														
		XH223	0.022														
		XH333	0.033														
		XH473	0.047														
		XH683	0.068														
		XH104	0.1	30.0	24.5	13.5	27.5										
		XH154	0.15														
		XH224	0.22														
		XH334	0.33	31.0	28.0	16.0											
		XH474	0.47				36.0	33.5	22.0		32.5						

Operating Temperature: -40~+100°C



Features

- X2 class capacitor RE series with insulated flexible wire leads.
- Two types of wire (single wire type & multiple wire type).
- UL, CSA (cUL), IEC/EN 60384-14 (class X2).



Safety Standard		File No.
UL	:UL60384-14	E236227
cUL	:CSA E60384-14	
ENEC	:IEC/EN 60384-14	SE/0142-28

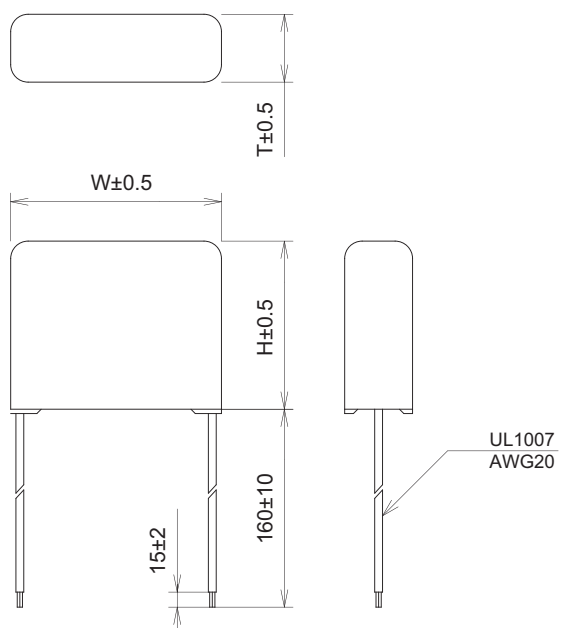
The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard. The mark with #14 stands for SEMKO.



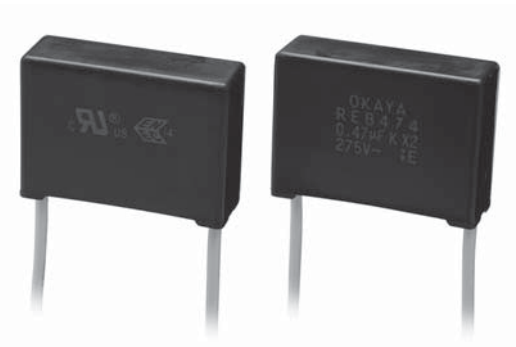
Applications

- Industrial machinery, Electric appliances and Lighting.

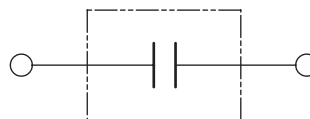
Dimensions



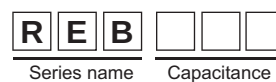
Unit: mm



Circuit



Model numbering system



Electrical Specifications

Rated Voltage **275Vac**

Safety Standard	Class	Model Number	Capacitance μF±10%	Dimensions			Dissipation Factor	Test Voltage	Insulation Resistance
				W	H	T			
	X2	REB473	0.047	17.0	12.5	5.5	0.003max. (at 10kHz)	Line to Line 1,250Vac 50/60Hz 60sec	Line to Line C≤0.33μF 15,000MΩmin. (at 100Vdc)
		REB683	0.068		13.5	6.5			
		REB104	0.1		15.0	8.0			
		REB154	0.15	20.0	17.5	8.5			
		REB224	0.22						
		REB334	0.33	27.0	18.0	8.0			
		REB474	0.47		19.5	9.5			
		REB684	0.68	32.0	21.5	10.5			
		REB105	1.0		23.5	12.5			

Operating Temperature: -40~+100°C

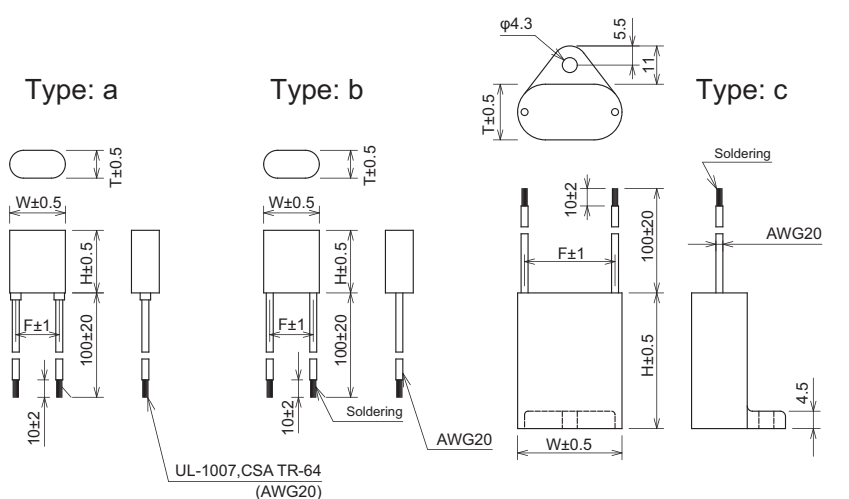
Features

- Long insulated flexible wire leads.
- Large devices have isolated external mounting tab.
- Electrical capabilities equivalent to XE series.

Applications

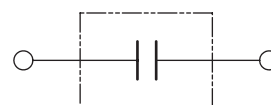
- Designed mainly for suppressing noise occurring in power line of electrical appliances.

Dimensions

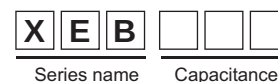


Unit: mm

Circuit



Model numbering system



Electrical Specifications

Rated Voltage **250Vac**

Safety Standard	Class	Model Number	Capacitance $\mu\text{F}\pm 20\%$	Type	Dimensions				Dissipation Factor	Test Voltage		Insulation Resistance	
					W	H	T	F					
UL[®] US CSA[®] S	Y2	XEB102	0.001	a	16.0	18.0	8.0	12.5	0.01max. (at 1kHz)	Line to Line 2,000Vac 50/60Hz 60sec	Line to Case 2,000Vac 50/60Hz 60sec	Line to Line 15,000M Ω min. (at 500Vdc)	Line to Case 100,000M Ω min (at 500Vdc)
		XEB152	0.0015										
		XEB222	0.0022										
		XEB332	0.0033										
		XEB472	0.0047										
		XEB682	0.0068										
	X2	XEB103	0.01	a	16.0	18.0	8.0	12.5		Line to Line 1,250Vac 50/60Hz 60sec			
		XEB153	0.015										
		XEB223	0.022										
		XEB333	0.033										
		XEB473	0.047										
		XEB683	0.068										
		XEB104	0.1	b	21.5	28.0	11.0	17.5					
		XEB154	0.15										
		XEB224	0.22										
		XEB334	0.33	c	30.0	39.0	16.0	26.0					
		XEB474	0.47										
		XEB684	0.68										
		XEB105	1.0										

Operating Temperature: -40~+85°C



Features

- Best performance series in most popular configurations.
- Dielectric withstand voltage twice safety agency requirement.
- High dv/dt, surge resistance and I/R ratings.
- IEC/EN 60384-14 class X1.

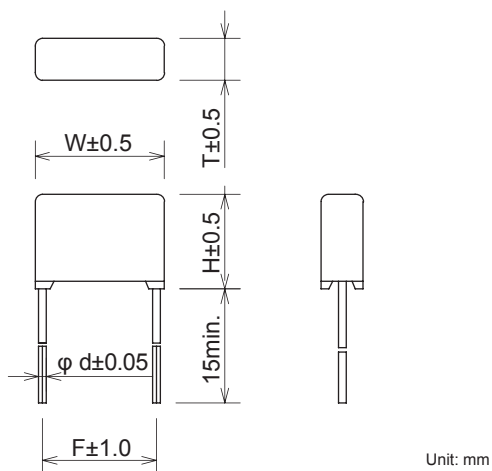
Applications

- Designed mainly for suppressing noise occurring in power line of electrical appliances.

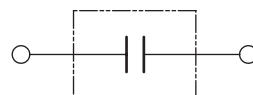


Safety Standard	File No.
UL :UL60384-14	E47474
cUL :CSA E60384-14	E47474
CSA :CSA E60384-14	LR37404, LR104926
VDE :IEC/EN 60384-14	40021020
SEMKO :IEC/EN 60384-14	1021983
NEMKO :IEC/EN 60384-14	P10213515
DEMKO :IEC/EN 60384-14	315532-01
FIMKO :IEC/EN 60384-14	FI 26476
Electrosuisse :IEC/EN 60384-14	12.0477
ÖVE :IEC/EN 60384-14	20938-003-03
IMQ :IEC/EN 60384-14	102~682 V4048
	102~105 V4047

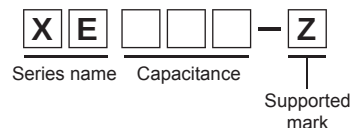
Dimensions



Circuit



Model numbering system



Electrical Specifications

X1 (102~105) : 275Vac

Rated Voltage Y1 (102~682) : 250Vac

Safety Standard	Class	Model Number	Capacitance μF±20%	Dimensions					Dissipation Factor	Test Voltage		Insulation Resistance																		
				W	H	T	F	d																						
          	X1 and Y2*	XE102-Z	0.001	17.0	12.5	5.5	15.0	0.8	0.01max. (at 1kHz)	Line to Line 2,000Vac 50/60Hz 60sec	Line to Case 2,000Vac 50/60Hz 60sec	Line to Line 15,000MΩmin. (at 500Vdc)	Line to Case 100,000MΩmin. (at 500Vdc)																	
		XE152-Z	0.0015																											
		XE222-Z	0.0022																											
		XE332-Z	0.0033																											
		XE472-Z	0.0047																											
		XE682-Z	0.0068																											
	X1	XE103-Z	0.01	17.0	12.0	5.0	15.0	0.6		0.01max. (at 1kHz)				Line to Line 1,250Vac 50/60Hz 60sec	Line to Case 2,000Vac 50/60Hz 60sec	Line to Line 15,000MΩmin. (at 500Vdc)	Line to Case 100,000MΩmin. (at 500Vdc)													
		XE153-Z	0.015																											
		XE223-Z	0.022																											
		XE333-Z	0.033																											
		XE473-Z	0.047																											
		XE683-Z	0.068																											
		XE104-Z	0.1	25.0	16.0	6.5	22.5	0.8						0.01max. (at 1kHz)				Line to Line 1,250Vac 50/60Hz 60sec	Line to Case 2,000Vac 50/60Hz 60sec	Line to Line 15,000MΩmin. (at 500Vdc)	Line to Case 100,000MΩmin. (at 500Vdc)									
		XE154-Z	0.15																											
		XE224-Z	0.22																											
		XE334-Z	0.33	30.0	22.0	11.0	27.5					1.0										0.01max. (at 1kHz)	Line to Line 1,250Vac 50/60Hz 60sec	Line to Case 2,000Vac 50/60Hz 60sec	Line to Line 15,000MΩmin. (at 500Vdc)	Line to Case 100,000MΩmin. (at 500Vdc)				
		XE474-Z	0.47																											
		XE684-Z	0.68	30.5	28.0	16.5	32.5																				1.0	0.01max. (at 1kHz)	Line to Line 1,250Vac 50/60Hz 60sec	Line to Case 2,000Vac 50/60Hz 60sec
		XE105-Z	1.0	36.0	30.5	20.0																								

Operating Temperature: -40~+100°C

*Rated voltage of Y2 is 250Vac.

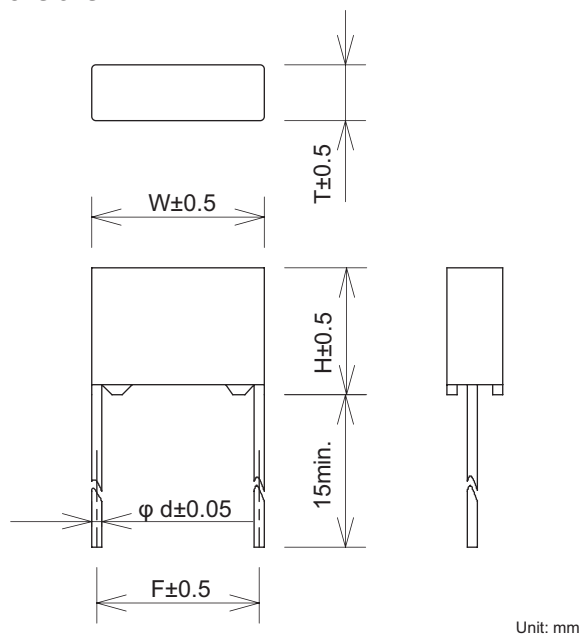
Features

- 30% smaller size of YE series.
- UL, cUL, IEC/EN 60384-14 class Y2.
- Good temperature characteristic compared to ceramic capacitor.

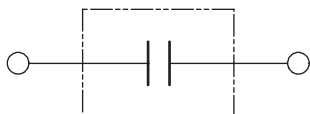
Applications

- Designed mainly for suppressing noise occurring in electric appliances and medical equipment.

Dimensions

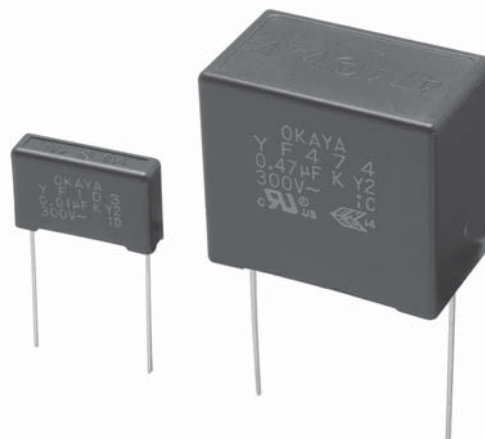


Circuit

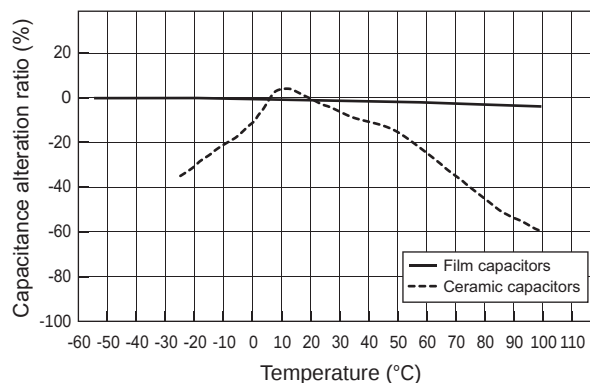


	Safety Standard	File No.
UL	:UL60384-14	E47474
cUL	:CSA E60384-14	E47474
ENEC	:IEC/EN60384-14	SE/0142-11

The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard. The mark with #14 stands for SEMKO.



Temperature Characteristic



Model numbering system



Electrical Specifications

Rated Voltage **300Vac**

Safety Standard	Class	Model Number	Capacitance μF±10%	Dimensions					Dissipation Factor	Test Voltage	Insulation Resistance	
				W	H	T	F	d				
cUL [®] US	Y2	YF103	0.01	18.0	11.0	5.0	15.0	0.6	0.003max. (at 10kHz)	Line to Line 2,000Vac 50/60Hz 60sec	Line to Line C≤0.33μF 15,000MΩmin.	
		YF153	0.015		11.5	6.0						
		YF223	0.022		12.5	7.0						
		YF333	0.033		14.0	8.0						
		YF473	0.047		15.0	9.0						
E14		YF683	0.068	26.0	15.5	7.5	22.5	0.8				
		YF104	0.1		17.5	11.0						
		YF154	0.15		19.5	12.5						
		S	YF224	0.22	31.0	20.5	13.5					27.5
			YF334	0.33		24.0	16.0					
YF474	0.47		27.0	18.5								

Operating Temperature: -55~+110°C



Features

- Y class rating up to 0.1 μ F not readily available elsewhere.
- IEC65 withstand voltage of 2,000Vac for severe applications.

Applications

- Designed mainly for suppressing noise occurring in applications.

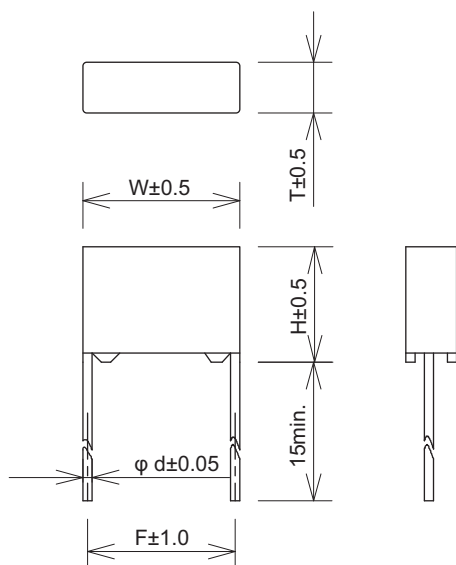


	Safety Standard	File No.
UL	:UL60384-14	E47474
cUL	:CSA E60384-14	E47474
CSA	:CSA E60384-14	LR37404
ENEC	:IEC/EN 60384-14	40003928

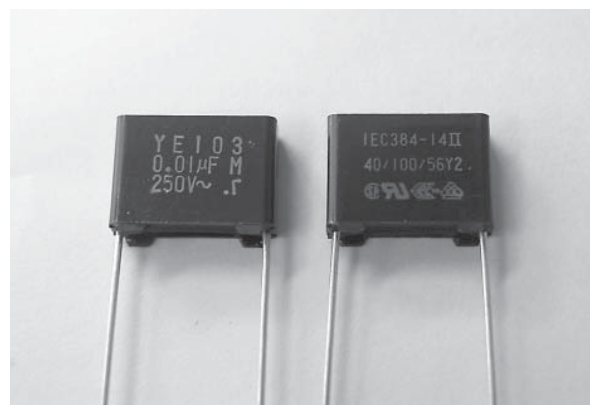
The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard. The mark with #10 stands for VDE.



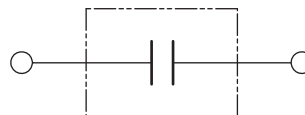
Dimensions



Unit: mm



Circuit



Model numbering system

Y	E			
Series name	Capacitance			

Electrical Specifications

Rated Voltage **250Vac**

Safety Standard	Class	Model Number	Capacitance μF±20%	Dimensions					Dissipation Factor	Test Voltage	Insulation Resistance					
				W	H	T	F	d								
   	Y2	YE102	0.001	13.0	10.0	4.0	11.0	0.6	0.01max. (at 1kHz)	Line to Line 2,000Vac 50/60Hz 60sec Line to Case 2,000Vac 50/60Hz 60sec	Line to Line 30,000MΩmin Line to Case 100,000MΩmin (at 500Vdc)					
		YE152	0.0015		12.0	5.0										
		YE222	0.0022													
		YE332	0.0033													
		YE472	0.0047	17.0	12.5	5.5	15.0	0.8								
		YE682	0.0068													
		YE103	0.01													
		YE153	0.015													
		YE223	0.022		16.0	6.5	22.5	0.8								
		YE333	0.033													
		YE473	0.047													
		YE683	0.068													
		YE104	0.1	30.0	22.0	11.0	27.5									

Operating Temperature: -40~+100°C

Features

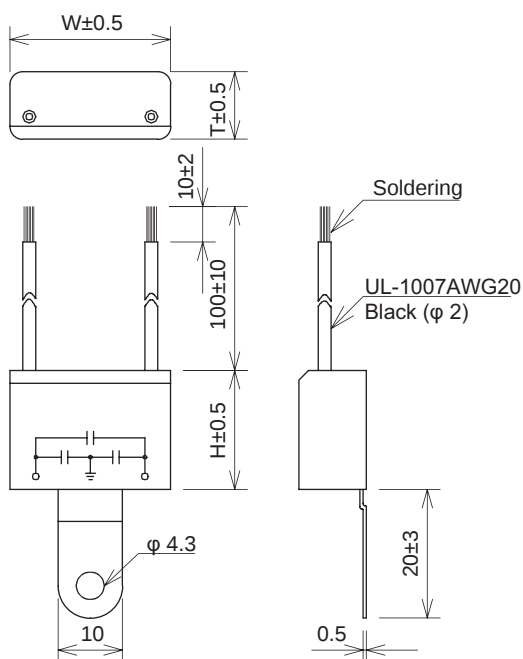
- Space saving PWB capacitor network has one X and two Y caps.
- Excellent common and normal mode capability in a wide capacitance selection.
- Flexible wire leads available with optional length.

Applications

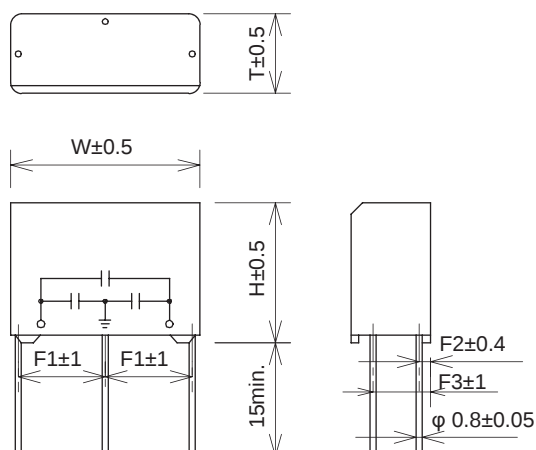
- Designed mainly for suppressing noise occurring in applications.

Dimensions

XYE-BE series

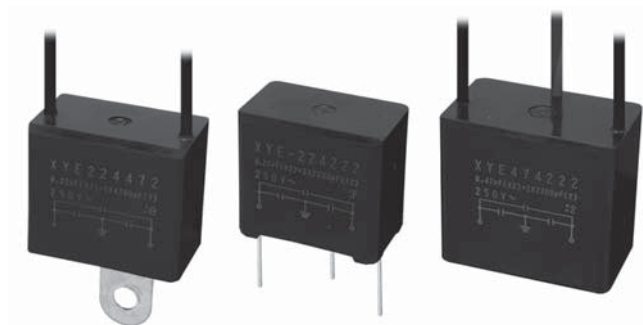


XYE-AN series

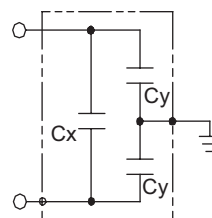


	Safety Standard	File No.
UL	:UL60384-14	E47474
cUL	:CSA E60384-14	E47474
CSA	:CSA E60384-14	LR37404
ENEC	:IEC/EN60384-14	SE/0142-15

The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard. The mark with #14 stands for SEMKO.



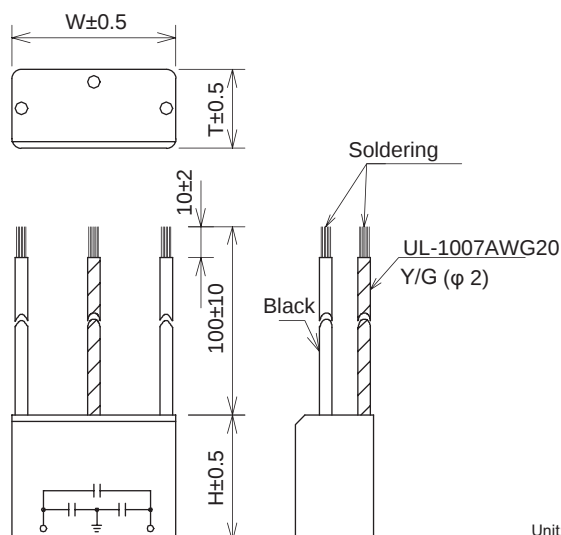
Circuit



Cx: Line to Line (X capacitor)

Cy: Line to Ground (Y capacitor)

XYE-BN series



Unit: mm

- Model numbering system

X Y E —

Series name Capacitance Capacitance Lead type
(line to line) (line to ground)

AN	Bare wire
BN	Flex PVC wire
BE	Flex PVC wire & metal terminal

Electrical Specifications

Rated Voltage **250Vac**

Safety Standard	Class	Model Number	Capacitance		Dimensions						Dissipation Factor	Test Voltage	Insulation Resistance		
			Cx(μF±20%)	Cy(pF±20%)	W	H	T	F1	F2	F3					
   	X2 Y2	XYE-473472AN	0.047	4,700	25.0	18.5	10.5	11.5	1.5	6.1	0.01max at 1k ±100Hz	Line to Line 1,250Vac 50/60Hz 60sec	Line to Line Cx ≤0.33μF 15,000MΩmin. Cx =0.47μF 5,000Ω•Fmin. Line to Ground 2,000Vac 50/60Hz 60sec Line to Ground 30,000MΩmin. Terminal to Case 2,000Vac 50/60Hz 60sec Terminal to Case 100,000MΩmin. (at 500Vdc)		
		XYE-104102AN	0.1	1,000		20.0	12.0			7.1					
		XYE-104222AN		2,200											
		XYE-104332AN		3,300											
		XYE-104472AN		4,700											
		XYE-224102AN	0.22	1,000	22.5	14.5	8.6								
		XYE-224222AN		2,200											
		XYE-224332AN		3,300											
		XYE-224472AN		4,700											
		XYE-334222AN	0.33	2,200	30.0	26.0	19.0	13.5	1.8	9.7					
		XYE-334332AN		3,300											
		XYE-334472AN		4,700											
		XYE-474222AN		2,200											
		XYE-474332AN	0.47	3,300	26.0	20.0	12.5	-	-	-					
		XYE-474472AN		4,700											
		XYE-104102BN		0.1								1,000		23.0	15.0
		XYE-104222BN										2,200			
		XYE-104332BN	3,300												
		XYE-104472BN	4,700												
		XYE-224102BN	0.22	1,000	31.0	27.5	18.5								
		XYE-224222BN		2,200											
		XYE-224332BN		3,300											
		XYE-224472BN		4,700											
		XYE-334222BN	0.33	2,200	26.0	20.0	12.5	-	-	-					
		XYE-334332BN		3,300											
		XYE-334472BN		4,700											
		XYE-474222BN		2,200											
		XYE-474332BN	0.47	3,300	31.0	27.5	18.5								
		XYE-474472BN		4,700											
		XYE-104102BE		0.1				1,000	23.0	15.0					
		XYE-104222BE						2,200							
		XYE-104332BE	3,300												
		XYE-104472BE	4,700												
		XYE-224102BE	0.22	1,000	31.0	27.5	18.5								
		XYE-224222BE		2,200											
		XYE-224332BE		3,300											
XYE-224472BE	4,700														
XYE-334222BE	0.33	2,200	26.0	20.0	12.5	-	-	-							
XYE-334332BE		3,300													
XYE-334472BE		4,700													
XYE-474222BE		2,200													
XYE-474332BE	0.47	3,300	31.0	27.5	18.5										
XYE-474472BE		4,700													
XYE-104102BN		0.1				1,000	23.0	15.0							
XYE-104222BN						2,200									
XYE-104332BN	3,300														
XYE-104472BN	4,700														
XYE-224102BN	0.22	1,000	31.0	27.5	18.5										
XYE-224222BN		2,200													
XYE-224332BN		3,300													
XYE-224472BN		4,700													
XYE-334222BN	0.33	2,200	26.0	20.0	12.5	-	-	-							
XYE-334332BN		3,300													
XYE-334472BN		4,700													
XYE-474222BN		2,200													
XYE-474332BN	0.47	3,300	31.0	27.5	18.5										
XYE-474472BN		4,700													
XYE-104102BE		0.1				1,000	23.0	15.0							
XYE-104222BE						2,200									
XYE-104332BE	3,300														
XYE-104472BE	4,700														
XYE-224102BE	0.22	1,000	31.0	27.5	18.5										
XYE-224222BE		2,200													
XYE-224332BE		3,300													
XYE-224472BE		4,700													
XYE-334222BE	0.33	2,200	26.0	20.0	12.5	-	-	-							
XYE-334332BE		3,300													
XYE-334472BE		4,700													
XYE-474222BE		2,200													
XYE-474332BE	0.47	3,300	31.0	27.5	18.5										
XYE-474472BE		4,700													
XYE-104102BN		0.1				1,000	23.0	15.0							
XYE-104222BN						2,200									
XYE-104332BN	3,300														
XYE-104472BN	4,700														
XYE-224102BN	0.22	1,000	31.0	27.5	18.5										
XYE-224222BN		2,200													
XYE-224332BN		3,300													
XYE-224472BN		4,700													
XYE-334222BN	0.33	2,200	26.0	20.0	12.5	-	-	-							
XYE-334332BN		3,300													
XYE-334472BN		4,700													
XYE-474222BN		2,200													
XYE-474332BN	0.47	3,300	31.0	27.5	18.5										
XYE-474472BN		4,700													
XYE-104102BE		0.1				1,000	23.0	15.0							
XYE-104222BE						2,200									
XYE-104332BE	3,300														
XYE-104472BE	4,700														
XYE-224102BE	0.22	1,000	31.0	27.5	18.5										
XYE-224222BE		2,200													
XYE-224332BE		3,300													
XYE-224472BE		4,700													
XYE-334222BE	0.33	2,200	26.0	20.0	12.5	-	-	-							
XYE-334332BE		3,300													
XYE-334472BE		4,700													
XYE-474222BE		2,200													
XYE-474332BE	0.47	3,300	31.0	27.5	18.5										
XYE-474472BE		4,700													
XYE-104102BN		0.1				1,000	23.0	15.0							
XYE-104222BN						2,200									
XYE-104332BN	3,300														
XYE-104472BN	4,700														
XYE-224102BN	0.22	1,000	31.0	27.5	18.5										
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XYE-224332BN		3,300													
XYE-224472BN		4,700													
XYE-334222BN	0.33	2,200	26.0	20.0	12.5	-	-	-							
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XYE-															

Operating temperature: -40~85°C

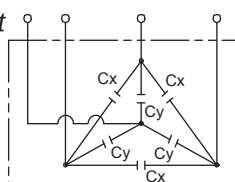
Features

- Three phase capacitor network.
- Two terminal style (bare wire or Insulated lead).

Applications

- Suppressing noise occurring in large power systems, such as 3 phase inverters.

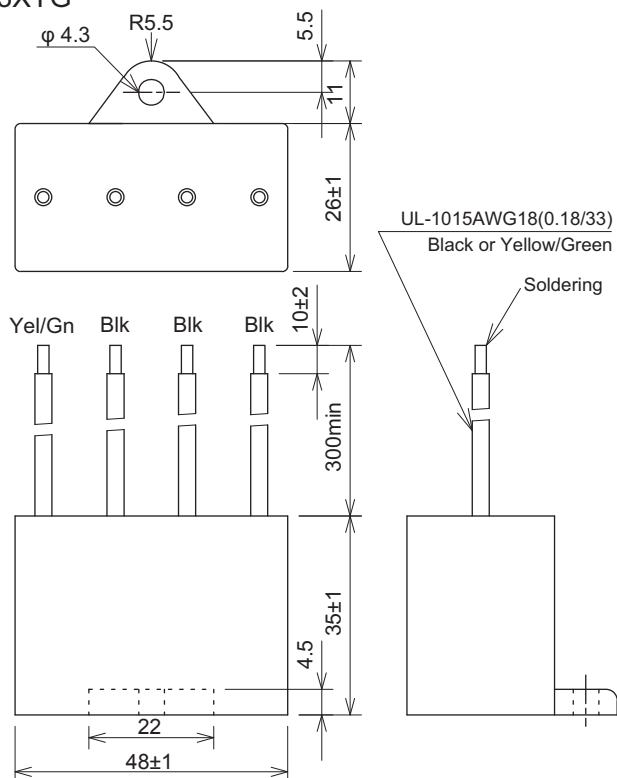
Circuit



Cx: Line to Line (X capacitor)
Cy: Line to Ground (Y capacitor)

Dimensions

3XYG

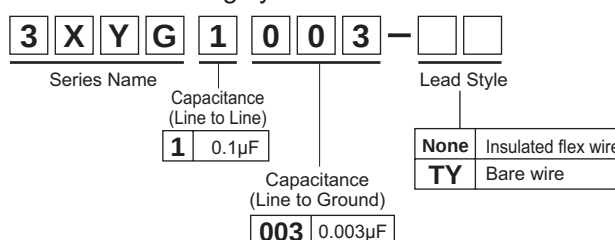


3XYG

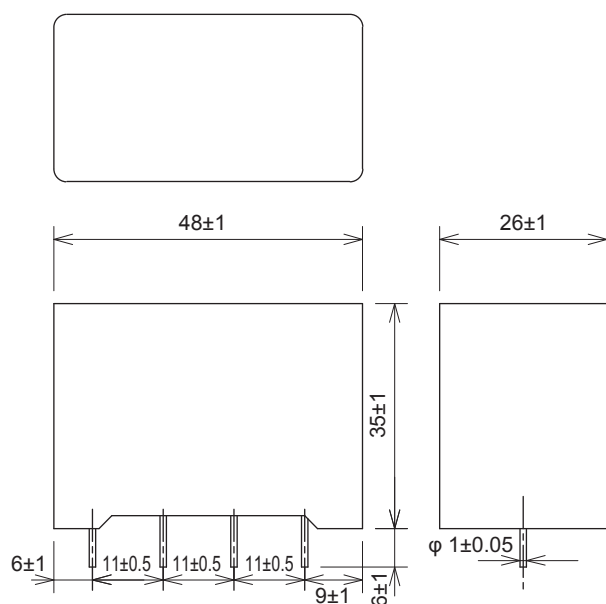


3XYG-TY

Model numbering system



3XYG-TY



Unit: mm

Electrical Specifications

Rated Voltage **440Vac**

Model Number	Capacitance μF±20%	Dissipation Factor	Test Voltage	Insulation Resistance
3XYG1003 (Insulated lead)	X : 0.1μF Y : 0.003μF	X: 0.001 max. Y: 0.01 max. (at 1kHz)	Line to Line 2,000Vac 50/60Hz 60sec	Line to Line X: 10,000MΩ Y: 15,000MΩ (at 100Vdc)
3XYG1003-TY (Bare wire)			Terminal to Case 2,000Vac 50/60Hz 60sec	Terminal to Case 100,000MΩmin. (at 500Vdc)

Operating Temperature: -40~+85°C

Features

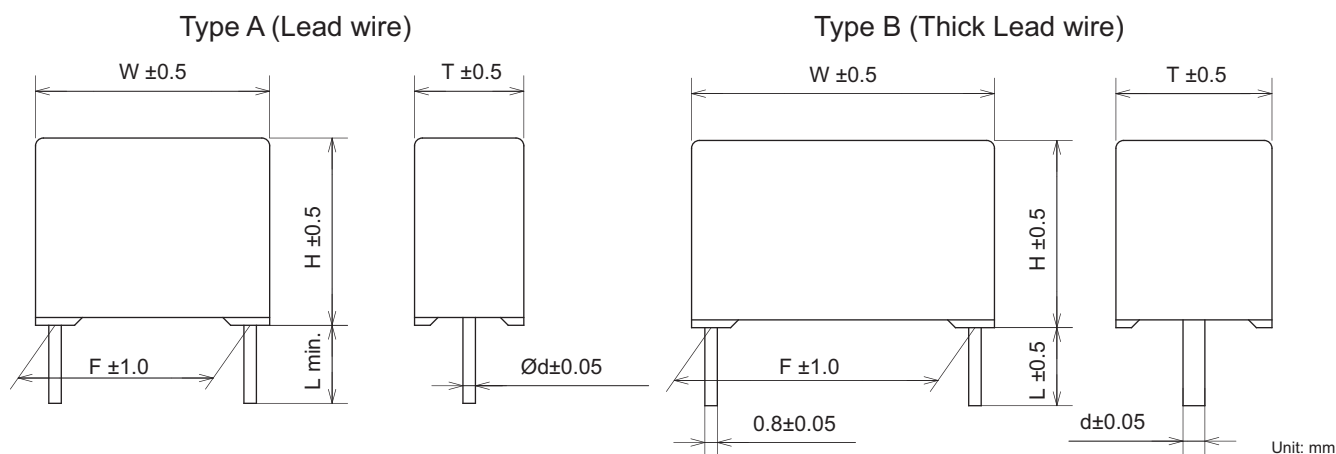
- Small-footprint
- Safety mechanism with segmented pattern
- JIS C 4908 compliance
- Metalized polypropylene film
- Non combustible plastic case

Applications

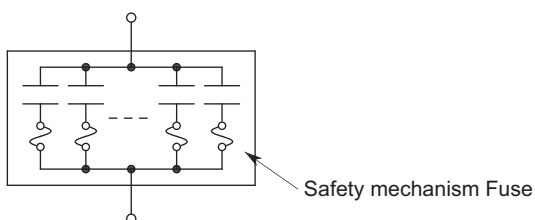
- Power conditioner, UPS, and waveform shaping circuit



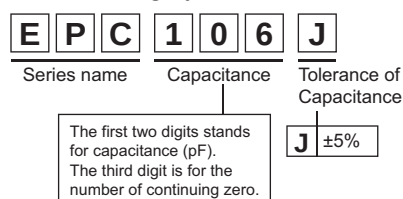
Dimensions



Circuit



Model numbering system



Electrical Specifications

Rated Voltage **310Vac**

Rated Voltage	Model Number	Capacitance $\mu F \pm 5\%$	Dimensions (mm)							Dissipation Factor	Test Voltage	Insulation Resistance
			W	H	T	F	d	L	Type			
310Vac 450Vdc	EPC105J	1.0	30.0	22.0	11.0	27.5	$\varnothing 1.0$	15	A	0.003max. (at 1kHz)	Line to Line 545Vac 50/60Hz 60sec.	Line to Line 7,500 ΩF (100Vdc)
	EPC155J	1.5	30.0	22.0	11.0	27.5	$\varnothing 1.0$	15	A			
	EPC225J	2.2	30.0	22.0	11.0	27.5	$\varnothing 1.0$	15	A			
	EPC335J	3.3	30.0	24.5	13.5	27.5	$\varnothing 1.0$	15	A			
	EPC475J	4.7	31.0	26.0	18.0	27.5	$\varnothing 1.0$	15	A			
	EPC685J	6.8	36.0	29.0	17.0	32.5	$\varnothing 1.0$	15	A			
	EPC106J	10.0	36.0	34.0	21.5	32.5	$\varnothing 1.0$	15	A		Terminal to Case 1,620Vac 50/60Hz 60sec.	Terminal to Case 30,000 $M\Omega$ min. (500Vdc)
	EPC156J	15.0	60.5	33.0	20.0	55.0	2*0.8	9	B			
	EPC226J	22.0	60.5	36.5	22.5	55.0	2*0.8	9	B			
	EPC336J	33.0	60.5	41.5	28.0	55.0	2*0.8	9	B			
	EPC476J	47.0	60.5	49.0	33.0	55.0	3*0.8	9	B			

Operating Temperature: -25~+85°C

PFC CAPACITORS

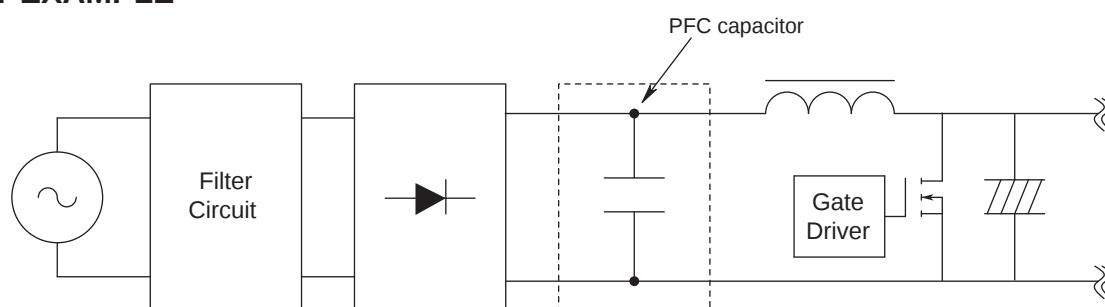


Recently, electric equipment and household electrical appliances have begun to utilize inverter technology to improve power efficiency. Therefore, many products generate a harmonic current. For suppressing the harmonic current, these products have an “Active filter circuit (*PFC circuit)”. Capacitors that are used in these circuits are called “Active-filter capacitors” or “PFC capacitors”.

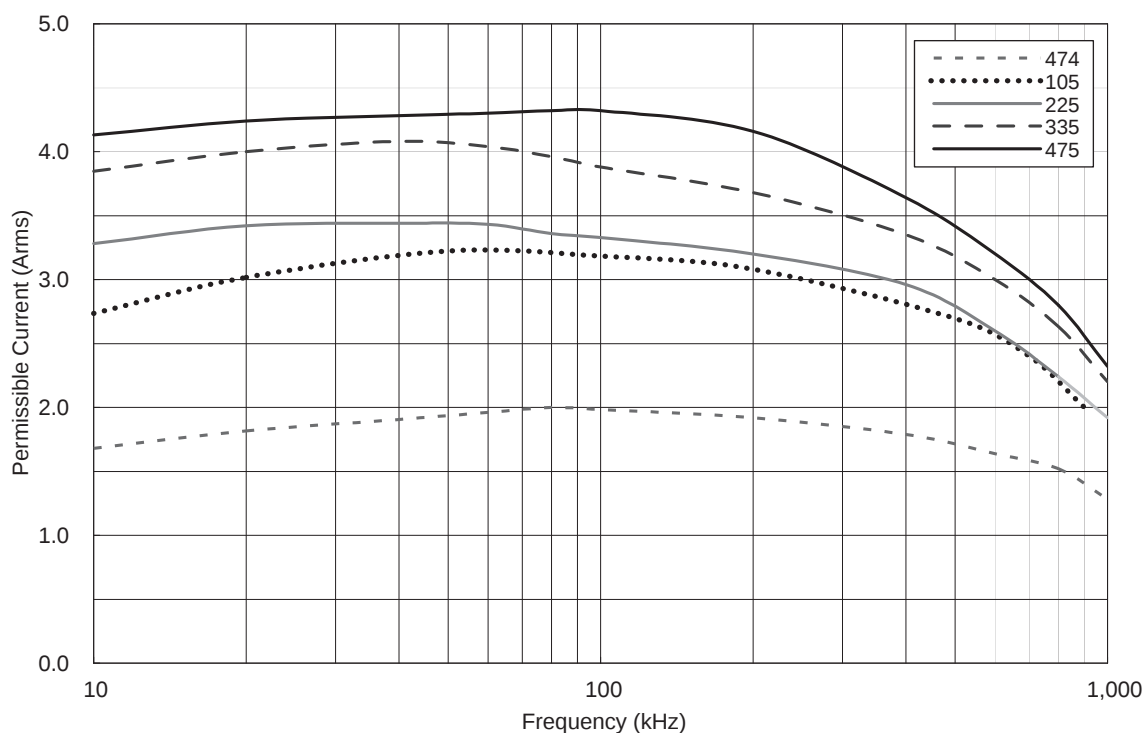
Resin-coated film capacitors are generally used for these circuits. Our film capacitors use a flame-retardant resin plastic case. Therefore, withstand voltage between line and ground is very high and safe. Also, the printed-wiring board mounting is stable.

*PFC: Power Factor Correction.

CIRCUIT EXAMPLE



PERMISSIBLE CURRENT (type; AFC450V series)

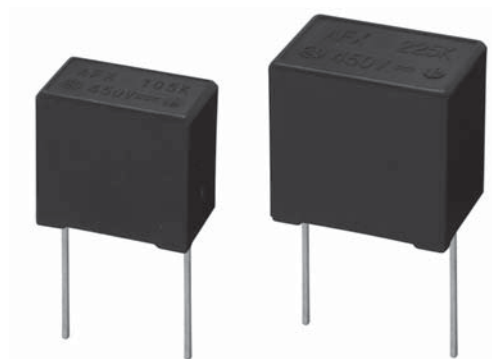


Features

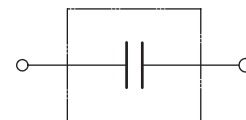
- Space-saving, high permissible current, low buzzing
- High reliability for proprietary-structure
- Correspondence of passive flammability (Flame-resistant category B)
Volume: $\geq 1750\text{mm}^3$ [Capacitance: $\geq 1.0\mu\text{F}$]
- Adopting for box type of casing,
 - High withstand voltage between line and case (2500Vac /1min.)
 - Stable design for mounting on a board

Applications

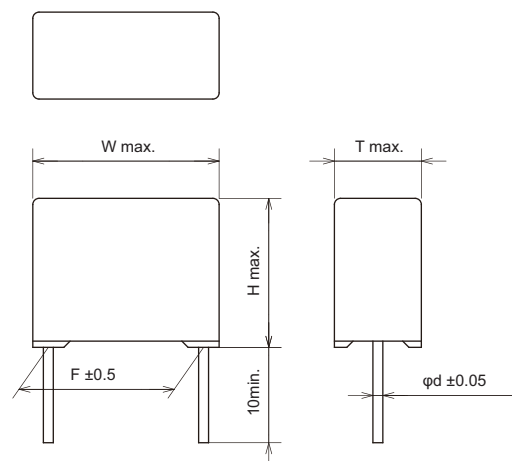
- PFC circuit of electrical equipment
- Flat-TV, PC, LED lighting etc.



• Circuit

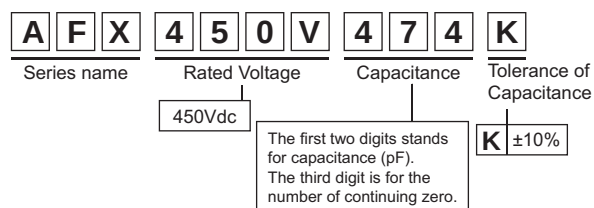


• Dimensions

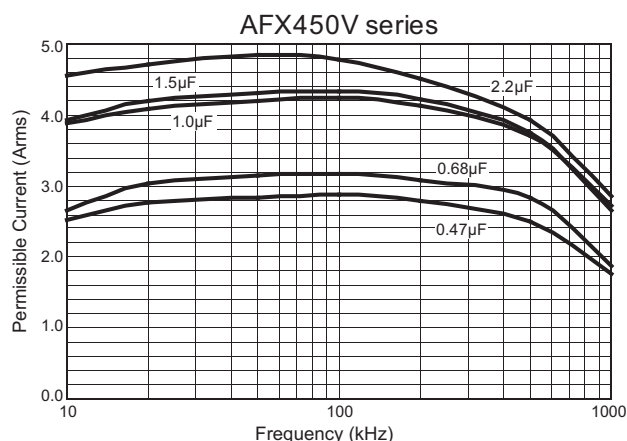


Unit: mm

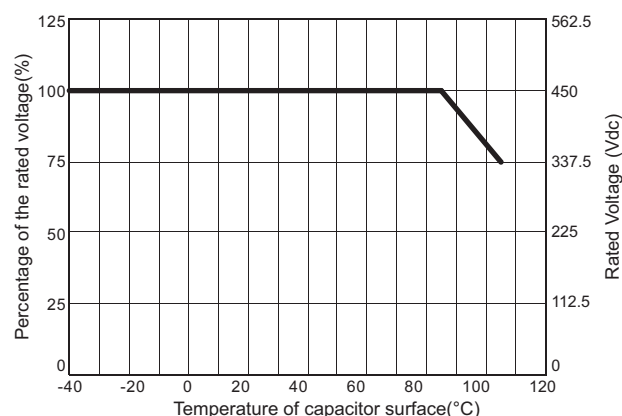
• Model numbering system



• Permissible current data



• Voltage derating by temperature



Electrical Specifications

Rated Voltage	Model Number	Capacitance $\mu\text{F} \pm 10\%$	Dimensions (mm)					Dissipation Factor (at 1kHz)	Test Voltage $\times 1.5\text{Vdc}$ (60sec)	Insulation Resistance (at 20°C, 100Vdc)
			W	H	T	F	ϕd			
450Vdc	AFX450V474K	0.47	15.0	12.0	7.0	12.5	0.6	0.002max.	Rated Voltage $\times 1.5\text{Vdc}$ (60sec)	7,500 $\Omega \cdot \text{Fmin.}$ (at 20°C, 100Vdc)
	AFX450V684K	0.68	15.0	13.5	8.5	12.5	0.6			
	AFX450V105K	1.0	15.5	14.5	9.5	12.5	0.8			
	AFX450V155K	1.5	17.5	15.5	10.5	15.0	0.8			
	AFX450V225K	2.2	17.5	17.0	12.5	15.0	0.8			

It is possible to use from more than 85°C to 105°C by derating of rated voltage.

Operating Temperature: -40~+105°C

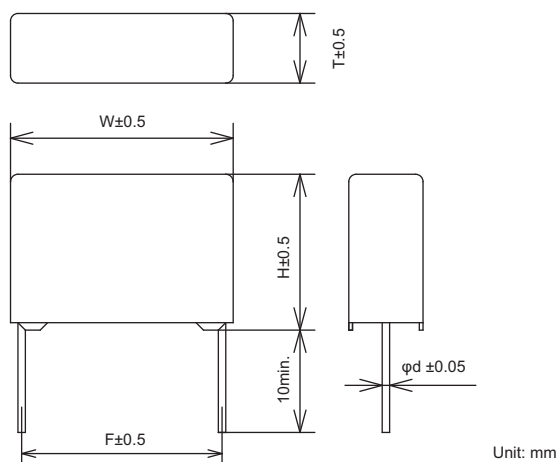
Features

- Smaller than AFC series.
- High withstand voltage (between line and case, 2500Vac - 60sec.)

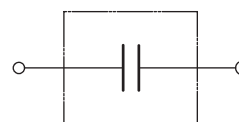
Applications

- Active filter circuit for electrical appliances. (PFC circuit)
- PFC circuit of electrical equipment
- Flat-TV, PC, LED lighting etc.

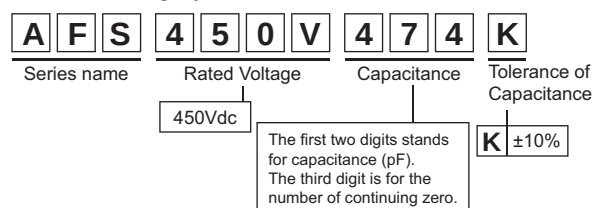
Dimensions



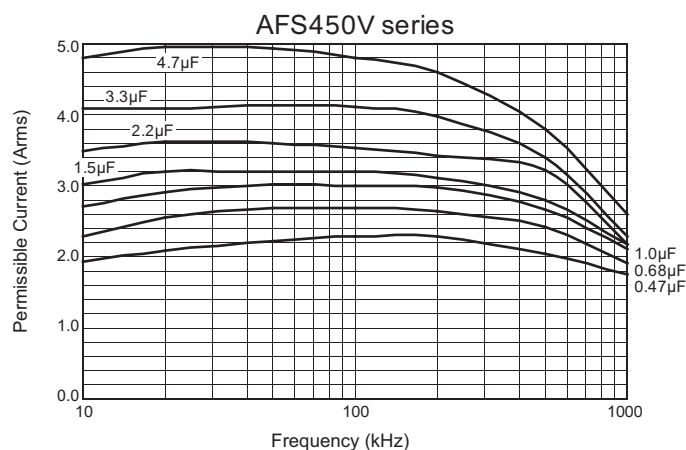
Circuit



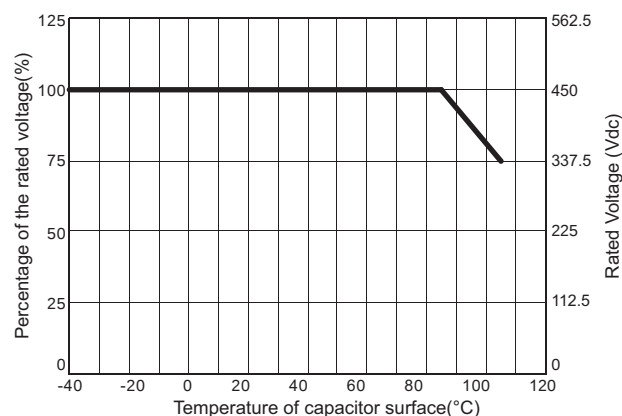
Model numbering system



Permissible current data



Voltage derating by temperature



Electrical Specifications

Rated Voltage	Model Number	Capacitance $\mu\text{F} \pm 10\%$	Dimensions (mm)					Dissipation Factor (at 1kHz)	Test Voltage ×1.5Vdc (2~5sec)	Insulation Resistance 7,500Ω•Fmin. (at 20°C 100Vdc)
			W	H	T	F	φ d			
450Vdc	AFS450V474K	0.47	17.5	13.5	5.5	15.0	0.8	0.002max. (at 1kHz)		
	AFS450V684K	0.68	17.5	14.5	6.5	15.0	0.8			
	AFS450V105K	1.0	17.5	16.0	7.5	15.0	0.8			
	AFS450V155K	1.5	17.5	17.5	9.5	15.0	0.8			
	AFS450V225K	2.2	25.5	17.5	9.5	22.5	0.8			
	AFS450V335K	3.3	25.5	20.5	11.0	22.5	0.8			
	AFS450V475K	4.7	25.5	22.5	13.5	22.5	0.8			

It is possible to use from more than 85°C to 105°C by derating of rated voltage.

Operating Temperature: -40~+105°C

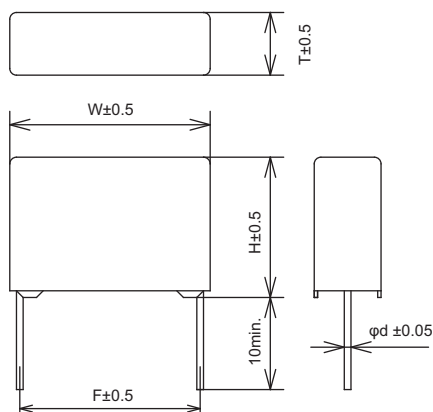
Features

- Low self-heating and low loss by using thin polypropylene film.
- High withstand voltage (between line and case) by the design of resin outer case.
- Stable design for mounting on a board.
- No derating voltage to maximum temperature.

Applications

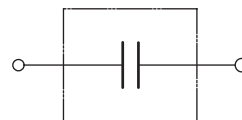
- Active filter circuit for electrical appliances. (PFC circuit)
- Flat screen television, PC display monitor, Audio-video equipment and home appliance.

Dimensions

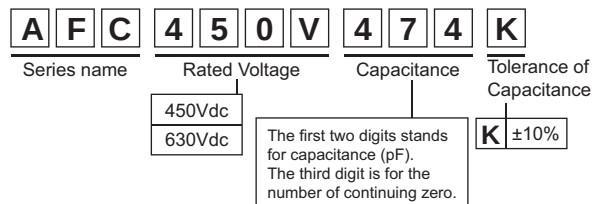


Unit: mm

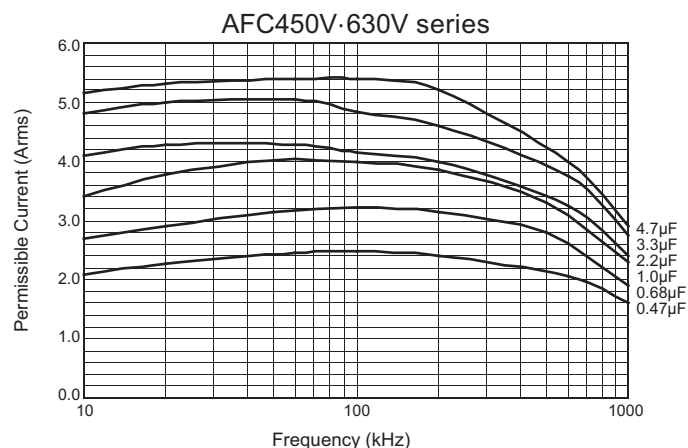
Circuit



Model numbering system



Permissible current data



Electrical Specifications

Rated Voltage	Model Number	Capacitance μF±10%	Dimensions (mm)					Dissipation Factor	Test Voltage	Insulation Resistance
			W	H	T	F	φd			
450Vdc 630Vdc	AFC□□□V474K	0.47	17.0	14.5	6.5	15.0	0.6	0.002max. (at 1kHz)	Rated Voltage ×1.75Vdc (2~5sec)	7,500Ω•Fmin. (at 20°C, 100Vdc)
	AFC□□□V684K	0.68	17.5	15.0	7.5	15.0	0.8			
	AFC□□□V105K	1.0	17.5	18.0	9.5	15.0	0.8			
	AFC□□□V225K	2.2	25.5	19.5	10.5	22.5	0.8			
	AFC□□□V335K	3.3	25.5	22.0	13.5	22.5	0.8			
	AFC□□□V475K	4.7	25.5	25.5	16.5	22.5	0.8			

□□□: Rated Voltage 450(Vdc), 630(Vdc)

Operating Temperature: -40~+105°C

Features

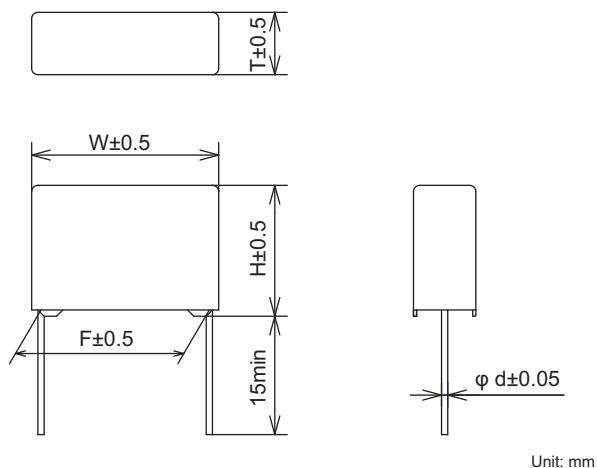
- 30% smaller size of HCE series.
- High withstand voltage (line to case) by resin case.

Applications

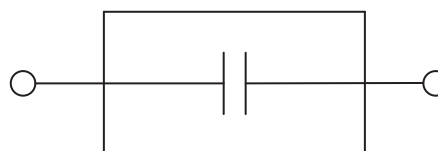
- Active filter circuit for electrical appliances. (PFC circuit)



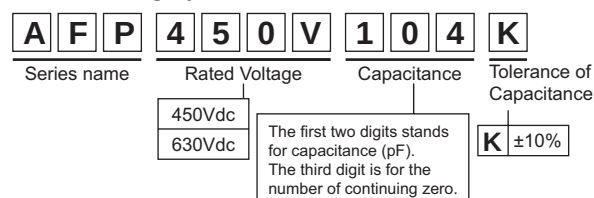
Dimensions



Circuit



Model numbering system



Electrical Specifications

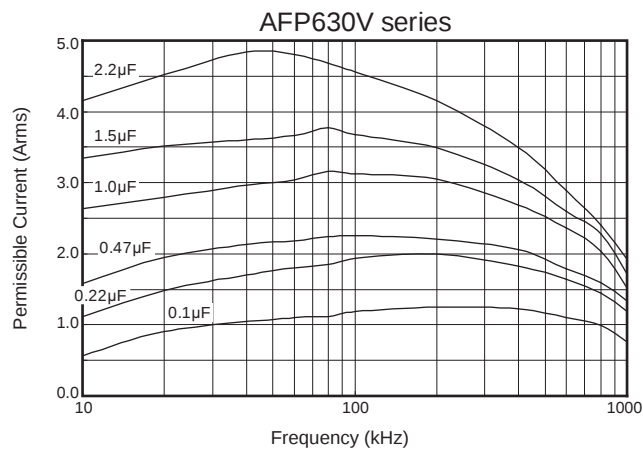
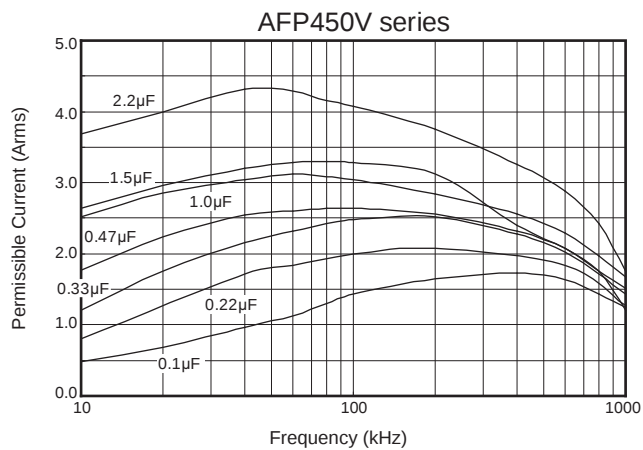
Rated Voltage	Model Number	Capacitance $\mu\text{F} \pm 10\%$	Dimensions (mm)					Dissipation Factor	Test Voltage	Insulation Resistance
			W	H	T	F	ϕd			
450Vdc	AFP450V104K	0.1	12.0	11.5	6.5	10.0	0.6	$C \leq 1.0\mu\text{F}$ 0.001max. $C > 1.0\mu\text{F}$ 0.002max. (at 1kHz)	Rated Voltage $\times 1.75\text{Vdc}$ (2~5sec)	$C \leq 0.33\mu\text{F}$ 50,000M Ω min. $C > 0.33\mu\text{F}$ 20,000 $\Omega \cdot \text{Fmin.}$ (at 20°C, 100Vdc)
	AFP450V154K	0.15	14.0	11.5	7.0	12.5	0.6			
	AFP450V224K	0.22	14.0	13.5	8.5	12.5	0.6			
	AFP450V334K	0.33	14.0	15.5	10.0	12.5	0.6			
	AFP450V474K	0.47	17.0	16.5	11.5	15.0	0.6			
	AFP450V684K	0.68	22.5	17.0	10.0	20.0	0.6			
	AFP450V105K	1.0	22.5	20.5	12.0	20.0	0.6			
	AFP450V155K	1.5	26.0	22.0	13.5	22.5	0.8			
	AFP450V225K	2.2	26.0	25.0	17.0	22.5	0.8			
630Vdc	AFP630V104K	0.1	17.0	12.0	6.0	15.0	0.6			
	AFP630V154K	0.15	17.0	15.0	8.0	15.0	0.6			
	AFP630V224K	0.22	17.0	16.0	9.0	15.0	0.6			
	AFP630V334K	0.33	25.5	17.5	8.0	22.5	0.8			
	AFP630V474K	0.47	25.5	19.0	9.5	22.5	0.8			
	AFP630V684K	0.68	30.5	21.0	10.5	27.5	0.8			
	AFP630V105K	1.0	30.5	23.0	12.5	27.5	0.8			
	AFP630V155K	1.5	30.5	27.5	17.0	27.5	0.8			
	AFP630V225K	2.2	30.5	30.5	20.5	27.5	0.8			

Operating Temperature: -55~+100°C



● *Permissible current data*

The representative capacity value's permissible current characteristics per rated voltage is shown below.
Please ask a sales representative for capacitance data not shown below.



MEMO



HIGH PULSE CAPACITORS



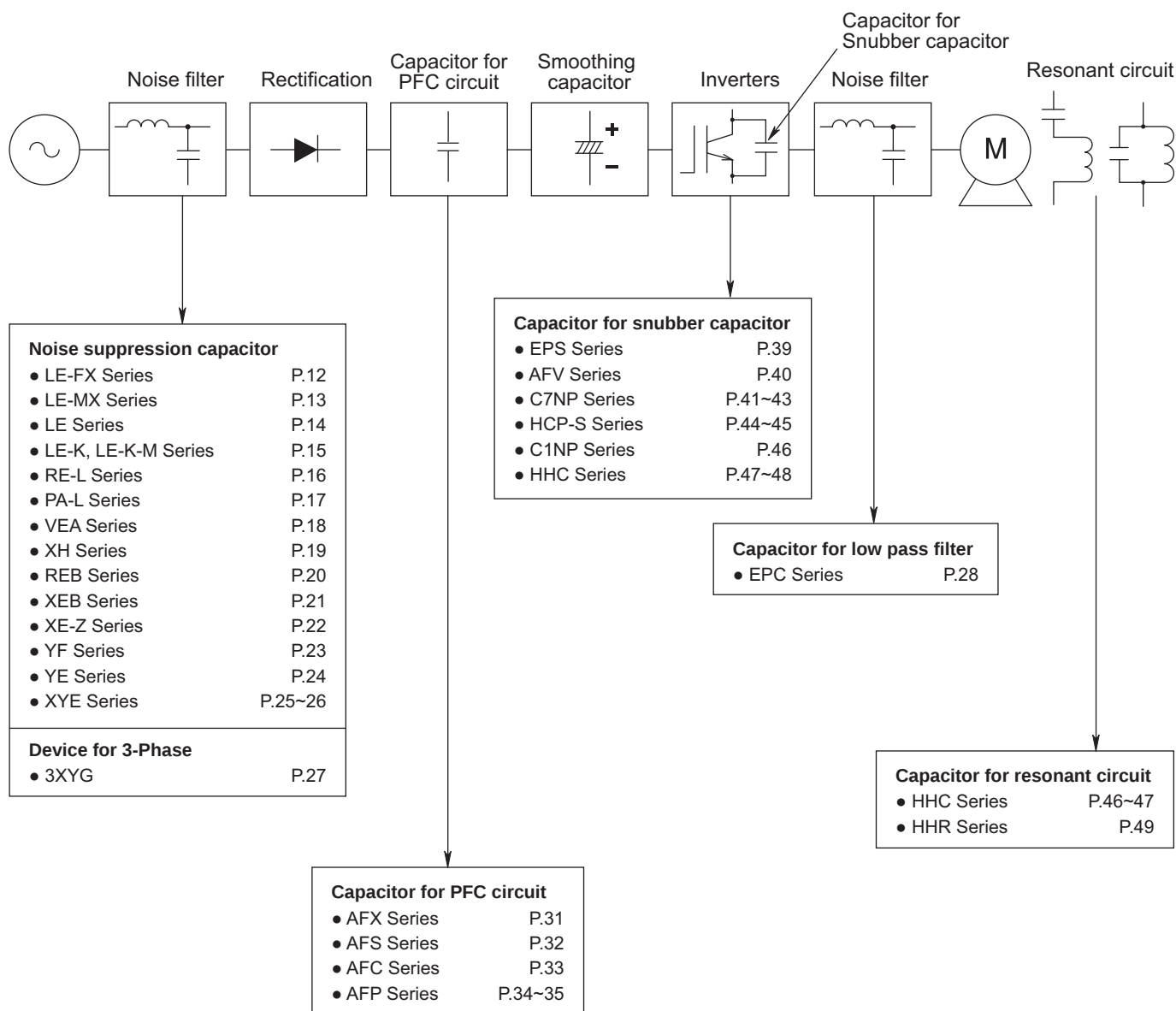
HIGH PULSE CAPACITORS



WHAT IS HIGH PULSE CAPACITOR?

- Designed for power semiconductor.
- Reduces the excessive voltage caused by the turning on time and off of power semiconductor and lowers the value of dv/dt .
- Made up of non-inductive Metallized Polypropylene Film that provides excellent anti-pulse characteristics and low insertion loss, which are generally regarded as important features necessary for the capacitor. The metallized polypropylene capacitor is specially characterized by its high insulation resistance and low dissipation that permit low insertion loss from low frequency to high frequency, low heating and better endurance to surges, providing excellent electrical characteristics required for high frequency circuit and high voltage circuit.

POWER ELECTRONICS APPLICATIONS



Features

- Safety design (Using metalized film with fail safe function)
- Maintenance free
- High permissible current (High ripple current)
- Possibility direct-mounted to IGB
- Non combustible plastic case

Applications

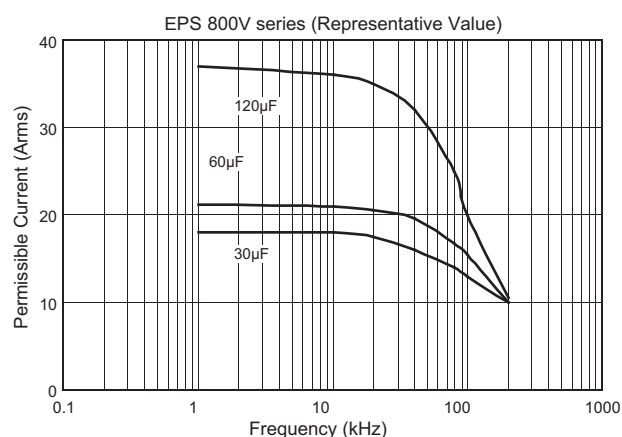
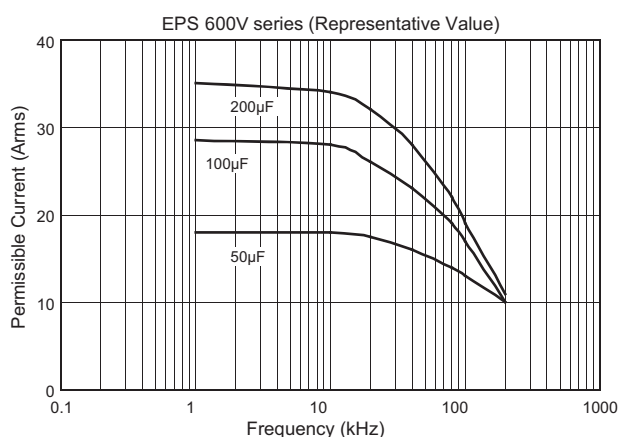
- For Smoothing circuit of inverter



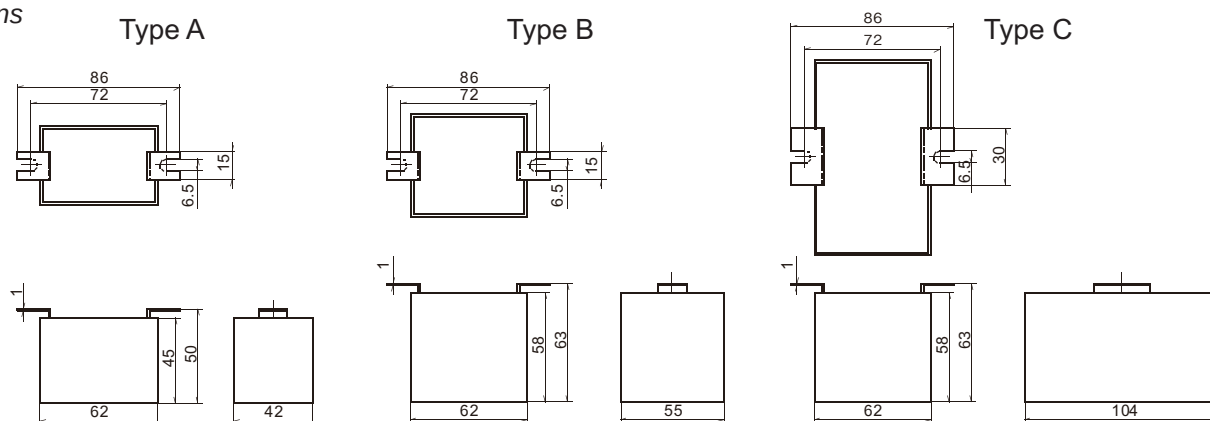
Model numbering system

E	P	S	6	0	0	V	5	0	6	K
Series name			Rated Voltage				Capacitance			Tolerance of Capacitance
							The first two digits stands for capacitance (pF). The third digit is for the number of continuing zero.			K ±10%

Permissible current data



Dimensions



Unit: mm

Electrical Specifications

Rated Voltage	Model Number	Capacitance $\mu\text{F} \pm 10\%$	Dimensions	Dissipation Factor	Insulation Resistance
600Vdc	EPS600V506K	50	Type: A	0.002max. (at 1kHz)	Line to Line 7,500 ΩF (100Vdc)
	EPS600V107K	100	Type: B		
	EPS600V207K	200	Type: C		
800Vdc	EPS800V306K	30	Type: A		
	EPS800V606K	60	Type: B		
	EPS800V127K	120	Type: C		

Please inquire other capacitance.

Operating Temperature: -40~+85°C



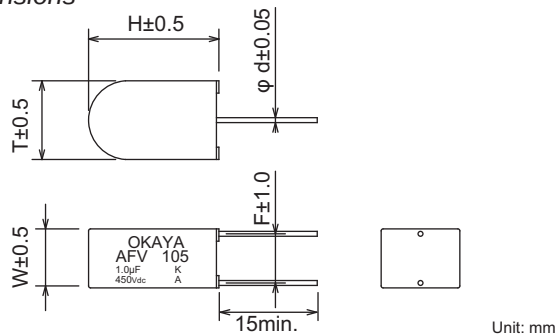
Features

- For use in active filters and snubbers for electronic circuit.
- Featured metallized polypropylene films to increase electric current withstand capability.
- 50% better dielectric withstand than the HCP series and 3~5 times better than the HCE series.
- The resin case is designed to consume a smaller footprint due to the reduced length and width.
- The case top features a radius which allows for ventilated effects.

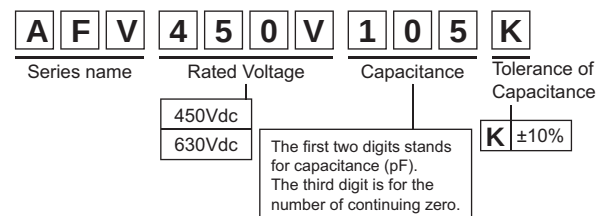
Applications

- TV, PC Display monitor, Electric Appliances (75~500W) and All electric equipment using switching power supplies or semiconductors requiring snubber circuit.

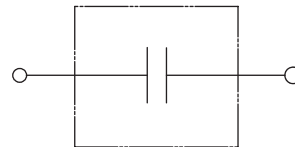
Dimensions



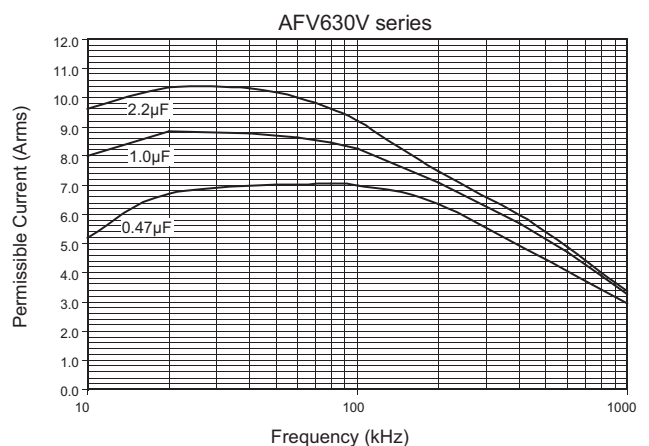
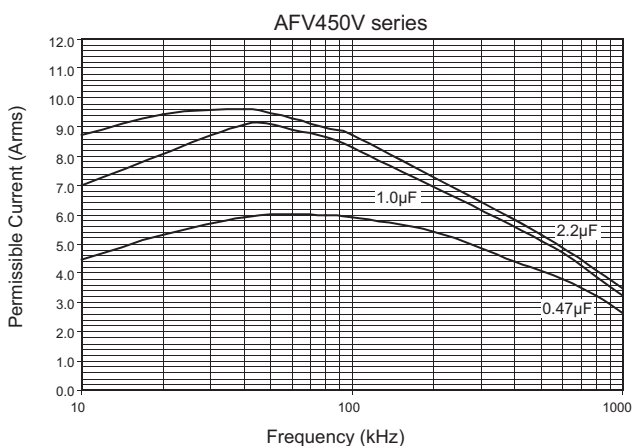
Model numbering system



Circuit



Permissible current data



Electrical Specifications

Rated Voltage	Model Number	Capacitance μF±10%	Dimensions (mm)					Dissipation Factor	Test Voltage	Insulation Resistance
			W	H	T	F	d			
450Vdc	AFV450V474K	0.47	12.0	21.0	10.5	10.0	0.8	0.001max. (at 1kHz)	Rated Voltage ×1.75Vdc (2~5sec)	20,000MΩ min. (at 20°C, 100Vdc)
	AFV450V105K	1.0	12.0	26.5	16.0	10.0	1.0			
	AFV450V225K	2.2	17.0	27.5	17.0	15.0	1.0			
630Vdc	AFV630V474K	0.47	12.0	26.5	16.0	10.0	1.0			
	AFV630V105K	1.0	17.0	27.5	17.0	15.0	1.0			
	AFV630V225K	2.2	20.0	36.0	26.0	17.5	1.0			

It is possible to use from more than 85°C to 105°C by derating of rated voltage.

Operating Temperature: -40~+85°C

**Features**

- High insulation resistance (more than 50,000MΩ at less than 0.33μF).
- Low dissipation factor (less than 0.001 at 1kHz).
- High surge withstand voltage and high current withstand capability.

Applications

- High frequent circuit, Resonant circuit in high voltage, Snubber circuit, Protection of semiconductors, Ultra-high impedance circuit and Long time constant circuit.

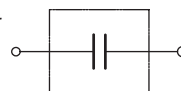


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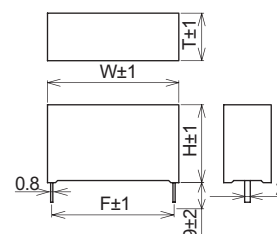
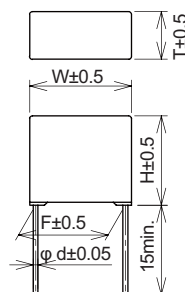
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• Circuit



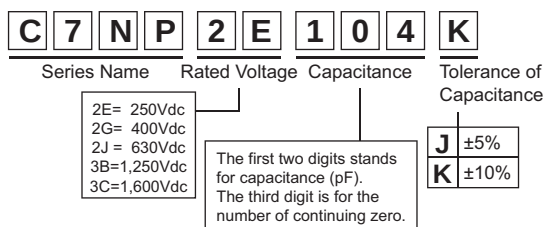
• Dimensions

type: b



Unit: mm

• Model numbering system

**Electrical Specifications**

Rated Voltage	Model Number	Capacitance μF	Dimensions (mm)						Dissipation factor	Test voltage	Insulation resistance
			W	H	T	F	φ d	Type			
2E (250Vdc)	C7NP2E104□	0.1	17.0	13.5	6.5	15.0	0.8	a	0.001max. (at 1kHz)	Rated Voltage x 1.75Vdc (2~5sec)	C≤0.33μF 50,000MΩmin. (at 20°C, 100Vdc) C>0.33μF 20,000Ω•Fmin. (at 20°C, 100Vdc)
	C7NP2E154□	0.15	17.0	13.5	6.5	15.0	0.8	a			
	C7NP2E224□	0.22	17.0	15.0	8.0	15.0	0.8	a			
	C7NP2E334□	0.33	25.0	16.0	6.5	22.5	0.8	a			
	C7NP2E474□	0.47	25.0	17.5	8.0	22.5	0.8	a			
	C7NP2E684□	0.68	25.0	19.5	10.0	22.5	0.8	a			
	C7NP2E105□	1.0	30.0	22.0	11.0	27.5	0.8	a			
	C7NP2E155□	1.5	30.0	24.5	13.5	27.5	0.8	a			
	C7NP2E225□	2.2	30.5	28.0	16.0	27.5	1.0	a			
	C7NP2E335□	3.3	41.0	28.0	15.5	37.5	1.0	a			
	C7NP2E475□	4.7	41.0	28.0	15.5	37.5	1.0	a			
	C7NP2E685□	6.8	41.0	32.5	17.5	37.5	1.0	a			
	C7NP2E106□	10	59.5	35.0	21.5	55.0	-	b			
	C7NP2E156□	15	59.5	43.5	30.5	55.0	-	b			
	C7NP2E226□	22	59.5	43.5	30.5	55.0	-	b			
2G (400Vdc)	C7NP2G473□	0.047	17.0	13.5	6.5	15.0	0.8	a			
	C7NP2G683□	0.068	17.0	13.5	6.5	15.0	0.8	a			
	C7NP2G104□	0.1	17.0	15.0	8.0	15.0	0.8	a			
	C7NP2G154□	0.15	25.0	16.0	6.5	22.5	0.8	a			
	C7NP2G224□	0.22	25.0	17.5	8.0	22.5	0.8	a			
	C7NP2G334□	0.33	25.0	19.5	10.0	22.5	0.8	a			
	C7NP2G474□	0.47	30.0	22.0	11.0	27.5	0.8	a			
	C7NP2G684□	0.68	30.0	24.5	13.5	27.5	0.8	a			
	C7NP2G105□	1.0	30.0	24.5	13.5	27.5	0.8	a			
	C7NP2G155□	1.5	41.0	28.0	15.5	37.5	1.0	a			
	C7NP2G225□	2.2	41.0	28.0	17.5	37.5	1.0	a			
	C7NP2G335□	3.3	49.5	33.0	20.5	45.0	-	b			
	C7NP2G475□	4.7	59.5	35.5	21.5	55.0	-	b			
	C7NP2G685□	6.8	59.5	43.5	30.5	55.0	-	b			
	C7NP2G106□	10	59.5	43.5	30.5	55.0	-	b			

□:J=Tolerance of Capacitance ±5%, K=Tolerance of Capacitance ±10%

Operating Temperature: -40~+85°C

Electrical Specifications

Rated Voltage	Model Number	Capacitance μF	Dimensions (mm)						Dissipation factor	Test voltage	Insulation resistance
			W	H	T	F	φ d	Type			
2J (630Vdc)	C7NP2J103□	0.01	17.0	13.5	6.5	15.0	0.8	a	0.001max. (at 1kHz)	Rated Voltage ×1.75Vdc (2~5sec)	C≤0.33μF 50,000MΩmin. (at 20°C, 100Vdc) C>0.33μF 20,000Ω•Fmin. (at 20°C, 100Vdc)
	C7NP2J153□	0.015	17.0	13.5	6.5	15.0	0.8	a			
	C7NP2J223□	0.022	17.0	13.5	6.5	15.0	0.8	a			
	C7NP2J333□	0.033	17.0	13.5	6.5	15.0	0.8	a			
	C7NP2J473□	0.047	17.0	13.5	6.5	15.0	0.8	a			
	C7NP2J683□	0.068	17.0	15.0	8.0	15.0	0.8	a			
	C7NP2J104□	0.1	25.0	16.0	6.5	22.5	0.8	a			
	C7NP2J154□	0.15	25.0	17.5	8.0	22.5	0.8	a			
	C7NP2J224□	0.22	25.0	19.5	10.0	22.5	0.8	a			
	C7NP2J334□	0.33	30.0	22.0	11.0	27.5	0.8	a			
	C7NP2J474□	0.47	30.0	22.0	11.0	27.5	0.8	a			
	C7NP2J684□	0.68	30.0	24.5	13.5	27.5	0.8	a			
	C7NP2J105□	1.0	30.5	28.0	16.0	27.5	1.0	a			
	C7NP2J155□	1.5	41.0	28.0	15.5	37.5	1.0	a			
	C7NP2J225□	2.2	49.5	33.0	20.5	45.0	-	b			
	C7NP2J335□	3.3	59.5	35.5	21.5	55.0	-	b			
3B (1250Vdc)	C7NP3B472□	0.0047	17.0	13.5	6.5	15.0	0.8	a			
	C7NP3B682□	0.0068	17.0	15.0	8.0	15.0	0.8	a			
	C7NP3B103□	0.01	25.0	16.0	6.5	22.5	0.8	a			
	C7NP3B153□	0.015	25.0	16.0	6.5	22.5	0.8	a			
	C7NP3B223□	0.022	25.0	17.5	8.0	22.5	0.8	a			
	C7NP3B333□	0.033	25.0	19.5	10.0	22.5	0.8	a			
	C7NP3B473□	0.047	25.0	19.5	10.0	22.5	0.8	a			
	C7NP3B683□	0.068	30.0	22.0	11.0	27.5	0.8	a			
	C7NP3B104□	0.1	30.0	24.5	13.5	27.5	0.8	a			
	C7NP3B154□	0.15	30.5	28.0	16.0	27.5	1.0	a			
	C7NP3B224□	0.22	41.0	28.0	15.5	37.5	1.0	a			
	C7NP3B334□	0.33	41.0	28.0	15.5	37.5	1.0	a			
	C7NP3B474□	0.47	41.0	32.5	17.5	37.5	1.0	a			
	C7NP3B684□	0.68	59.5	35.5	21.5	55.0	-	b			
	C7NP3B105□	1.0	59.5	43.5	30.5	55.0	-	b			
3C (1600Vdc)	C7NP3C102□	0.001	17.0	13.5	6.5	15.0	0.8	a			
	C7NP3C152□	0.0015	17.0	13.5	6.5	15.0	0.8	a			
	C7NP3C222□	0.0022	17.0	15.0	8.0	15.0	0.8	a			
	C7NP3C332□	0.0033	25.0	16.0	6.5	22.5	0.8	a			
	C7NP3C472□	0.0047	25.0	16.0	6.5	22.5	0.8	a			
	C7NP3C682□	0.0068	25.0	17.5	8.0	22.5	0.8	a			
	C7NP3C103□	0.01	25.0	17.5	8.0	22.5	0.8	a			
	C7NP3C153□	0.015	25.0	19.5	10.0	22.5	0.8	a			
	C7NP3C223□	0.022	30.0	22.5	11.0	27.5	0.8	a			
	C7NP3C333□	0.033	30.0	24.5	13.5	27.5	0.8	a			
	C7NP3C473□	0.047	30.0	24.5	13.5	27.5	0.8	a			

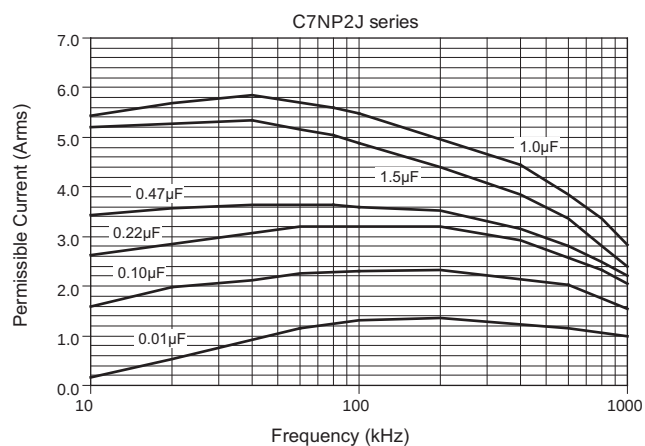
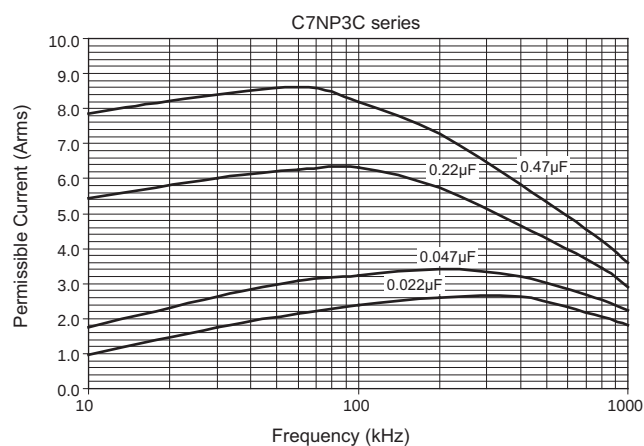
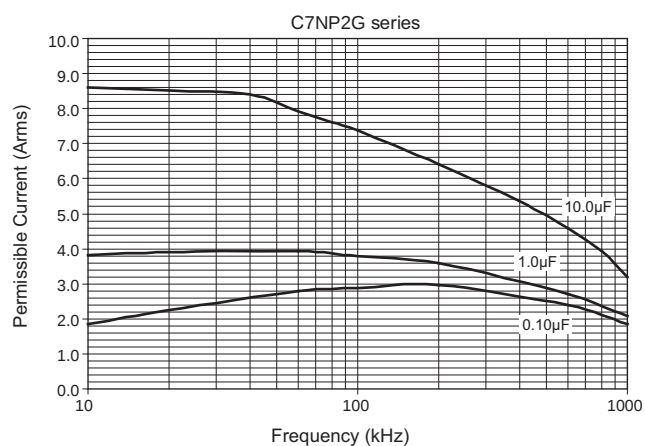
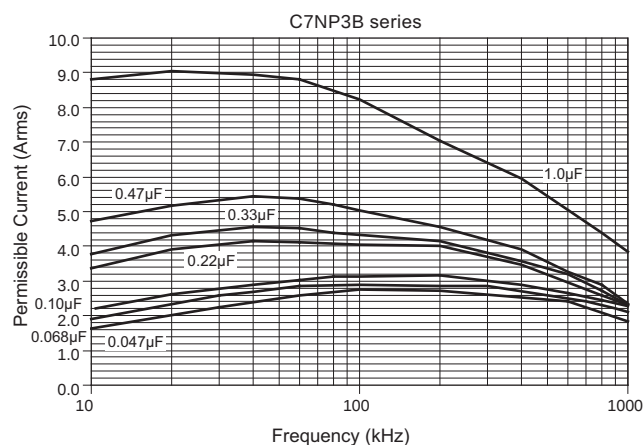
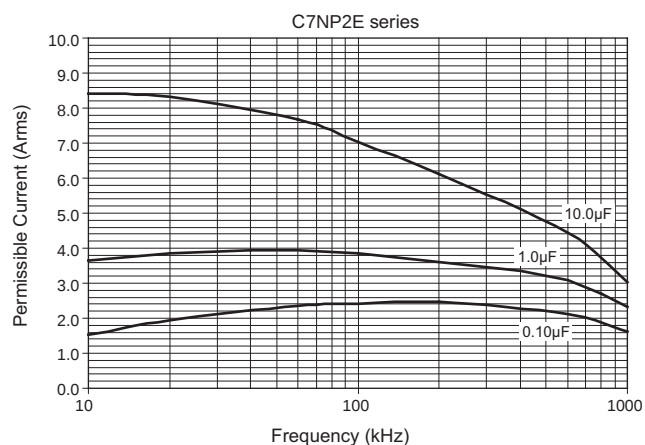
□:J=Tolerance of Capacitance ±5%, K=Tolerance of Capacitance ±10%

Operating Temperature: -40~+85°C



● Permissible current data

The representative capacity value's permissible current characteristics per rated voltage is shown below.
Please ask a sales representative for capacitance data not shown below.

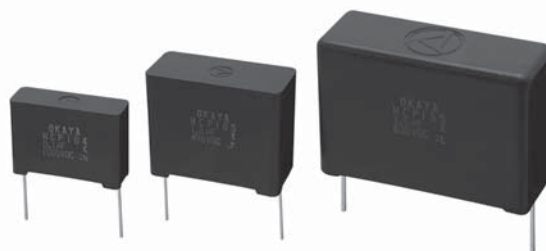
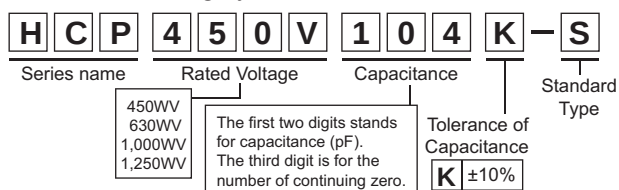


**Features**

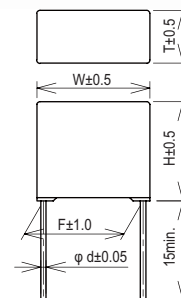
- Compact size and resin case.
- Improved safety and suppressing self-heating.

Applications

- High frequency circuit, High voltage resonant circuit, Snubber circuit and Protection of semiconductors such as IGBT, IPM and MOSFET.
- Model numbering system

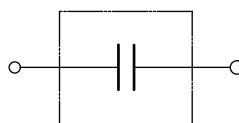


• Dimensions



Unit: mm

• Circuit

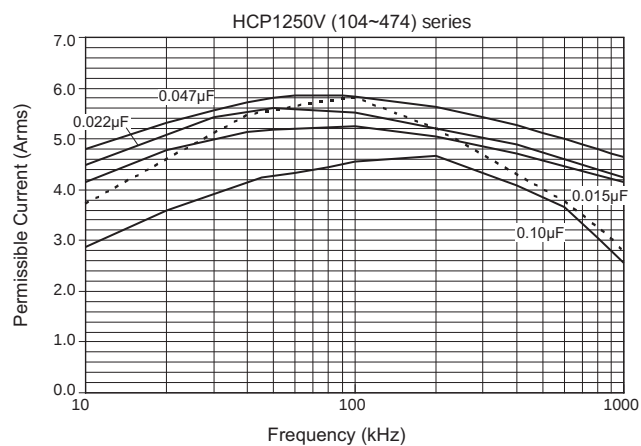
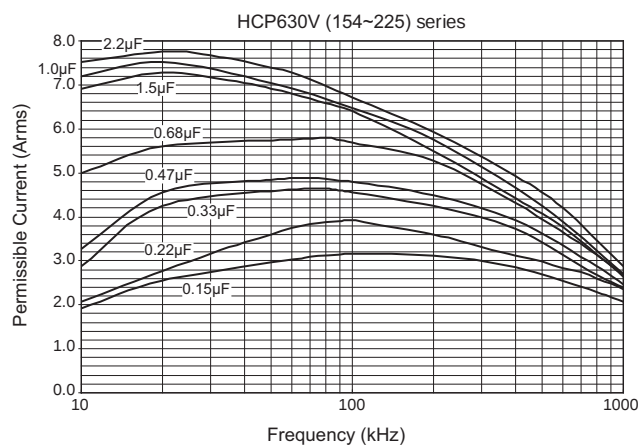
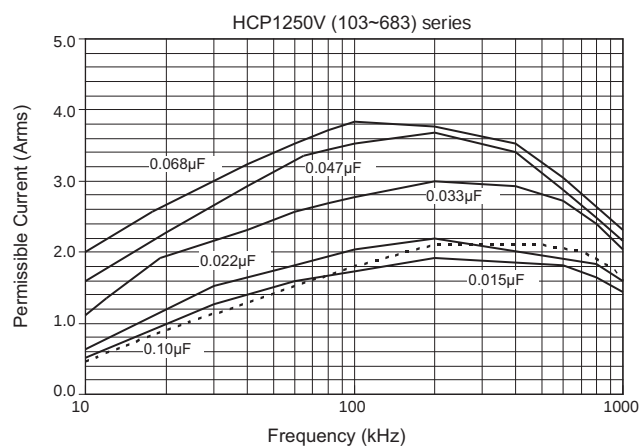
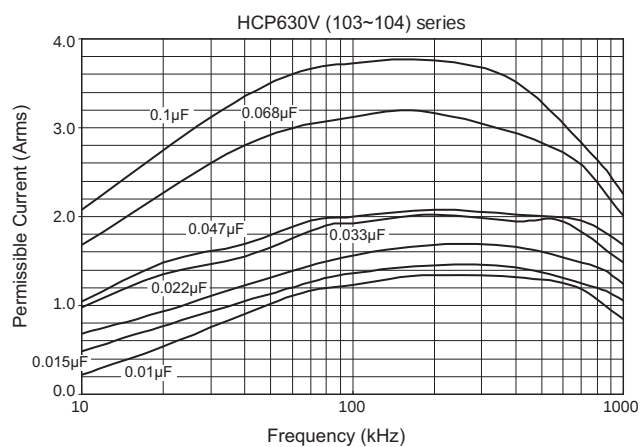
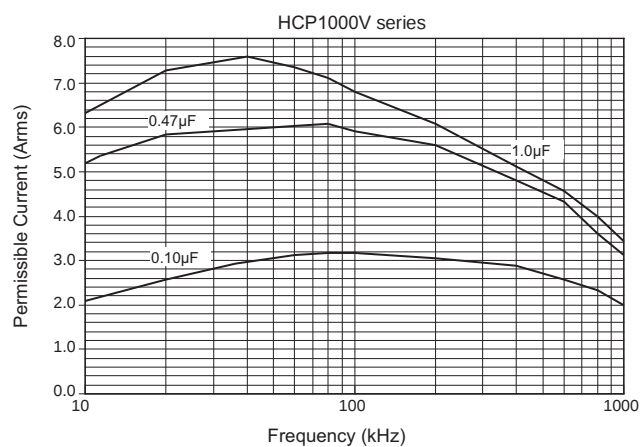
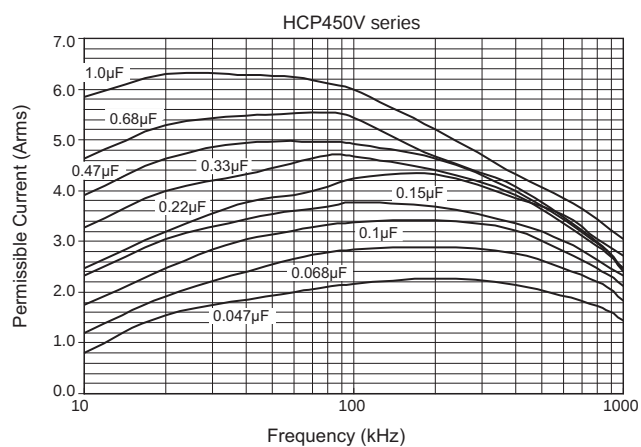
**Electrical Specifications**

Rated Voltage	Model Number	Capacitance μF±10%	Dimensions (mm)					Dissipation Factor	Test Voltage	Insulation Resistance
			W	H	T	F	φ d			
450Vdc	HCP450V473K-S	0.047	17.0	12.0	5.0	15.0	0.6	0.001max. (at 1k±100Hz)	Rated Voltage ×1.75Vdc (2~5sec)	C≤0.33μF 50,000MΩmin. (at 20°C, 100Vdc) C>0.33μF 20,000Ω·Fmin. (at 20°C, 100Vdc)
	HCP450V683K-S	0.068	17.0	12.5	5.5	15.0	0.8			
	HCP450V104K-S	0.1	17.0	13.5	6.5	15.0	0.8			
	HCP450V154K-S	0.15	17.0	15.0	8.0	15.0	0.8			
	HCP450V224K-S	0.22	25.0	16.0	6.5	22.5	0.8			
	HCP450V334K-S	0.33	25.0	17.5	8.0	22.5	0.8			
	HCP450V474K-S	0.47	30.0	22.0	11.0	27.5	0.8			
	HCP450V684K-S	0.68	30.0	22.0	11.0	27.5	0.8			
	HCP450V105K-S	1.0	30.0	24.5	13.5	27.5	0.8			
630Vdc	HCP630V103K-S	0.01	17.0	12.0	5.0	15.0	0.6			
	HCP630V153K-S	0.015	17.0	12.0	5.0	15.0	0.6			
	HCP630V223K-S	0.022	17.0	12.0	5.0	15.0	0.6			
	HCP630V333K-S	0.033	17.0	12.0	5.0	15.0	0.6			
	HCP630V473K-S	0.047	17.0	12.5	5.5	15.0	0.8			
	HCP630V683K-S	0.068	17.0	13.5	6.5	15.0	0.8			
	HCP630V104K-S	0.1	17.0	15.0	8.0	15.0	0.8			
	HCP630V154K-S	0.15	25.0	17.5	8.0	22.5	0.8			
	HCP630V224K-S	0.22	25.0	17.5	8.0	22.5	0.8			
	HCP630V334K-S	0.33	25.0	19.5	10.0	22.5	0.8			
	HCP630V474K-S	0.47	30.0	22.0	11.0	27.5	0.8			
	HCP630V684K-S	0.68	30.0	24.5	13.5	27.5	0.8			
	HCP630V105K-S	1.0	30.5	28.0	16.0	27.5	1.0			
	HCP630V155K-S	1.5	41.0	28.0	15.5	37.5	1.0			
1000Vdc	HCP1000V104K-S	0.1	25.0	17.5	8.0	22.5	0.8			
	HCP1000V474K-S	0.47	30.5	28.0	16.0	27.5	1.0			
	HCP1000V105K-S	1.0	41.0	32.5	17.5	37.5	1.0			
1250Vdc	HCP1250V103K-S	0.01	17.0	15.0	8.0	15.0	0.8			
	HCP1250V153K-S	0.015	25.0	16.0	6.5	22.5	0.8			
	HCP1250V223K-S	0.022	25.0	16.0	6.5	22.5	0.8			
	HCP1250V333K-S	0.033	25.0	17.5	8.0	22.5	0.8			
	HCP1250V473K-S	0.047	25.0	19.5	10.0	22.5	0.8			
	HCP1250V683K-S	0.068	30.0	22.0	11.0	27.5	0.8			
	HCP1250V104K-S	0.1	30.0	24.5	13.5	27.5	0.8			
	HCP1250V154K-S	0.15	30.5	28.0	16.0	27.5	1.0			
	HCP1250V224K-S	0.22	41.0	28.0	15.5	37.5	1.0			
	HCP1250V334K-S	0.33	41.0	28.0	15.5	37.5	1.0			
	HCP1250V474K-S	0.47	41.0	32.5	17.5	37.5	1.0			

It is possible to use from more than 85°C to 105°C by derating of rated voltage.

Operating Temperature: -40~+85°C

● Permissible current data





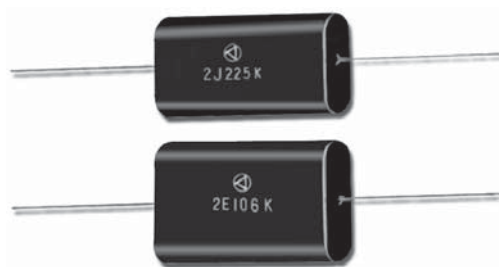
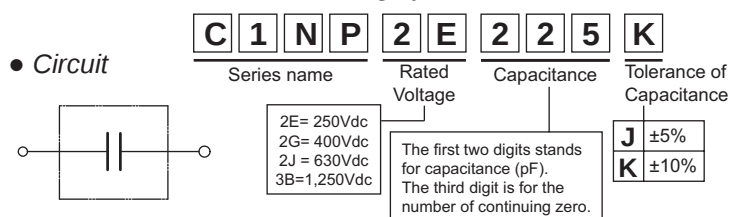
Features

- High performance.
- High capacitance.
- High surge withstand voltage and high current withstand capability.

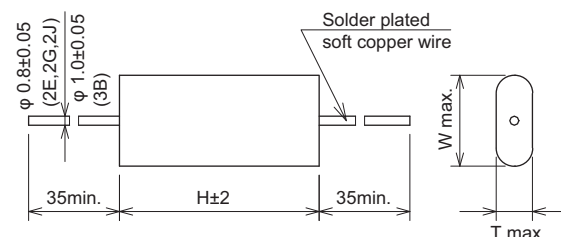
Applications

- High frequency circuit, High voltage resonant circuit, Snubber circuit and Protection of semiconductors.

• Model numbering system



• Dimensions



Unit: mm

Electrical Specifications

Rated Voltage	Model Number	Capacitance μF	Dimensions (mm)				Dissipation Factor	Test Voltage	Insulation Resistance
			W	H	T	ϕd			
2E (250Vdc)	C1NP2E225□	2.2	20.0	44.0	8.0	0.8	0.001max. (at 1kHz)	Rated Voltage $\times 1.75Vdc$ (2~5sec)	20,000 $\Omega \cdot Fmin.$ (at 20°C, 100Vdc)
	C1NP2E275□	2.7	21.5	44.0	9.0	0.8			
	C1NP2E335□	3.3	22.0	44.0	10.5	0.8			
	C1NP2E395□	3.9	23.5	44.0	11.5	0.8			
	C1NP2E475□	4.7	25.0	44.0	13.0	0.8			
	C1NP2E565□	5.6	27.0	44.0	14.5	0.8			
	C1NP2E685□	6.8	28.5	44.0	16.5	0.8			
	C1NP2E825□	8.2	33.5	44.0	17.5	0.8			
	C1NP2E106□	10	34.5	44.0	19.5	0.8			
	C1NP2E126□	12	37.0	44.0	22.0	0.8			
2G (400Vdc)	C1NP2G125□	1.2	20.5	44.0	9.0	0.8			
	C1NP2G155□	1.5	22.0	44.0	10.5	0.8			
	C1NP2G185□	1.8	23.5	44.0	11.5	0.8			
	C1NP2G225□	2.2	25.0	44.0	13.0	0.8			
	C1NP2G275□	2.7	26.5	44.0	14.5	0.8			
	C1NP2G335□	3.3	28.5	44.0	16.5	0.8			
	C1NP2G395□	3.9	32.0	44.0	17.5	0.8			
	C1NP2G475□	4.7	34.5	44.0	19.0	0.8			
2J (630Vdc)	C1NP2J824□	0.82	20.5	44.0	9.5	0.8			
	C1NP2J105□	1.0	21.5	44.0	10.0	0.8			
	C1NP2J125□	1.2	23.0	44.0	11.5	0.8			
	C1NP2J155□	1.5	24.5	44.0	13.0	0.8			
	C1NP2J185□	1.8	26.5	44.0	14.5	0.8			
	C1NP2J225□	2.2	28.0	44.0	16.0	0.8			
	C1NP2J275□	2.7	30.5	44.0	17.5	0.8			
	C1NP2J335□	3.3	35.0	44.0	20.0	0.8			
3B (1250Vdc)	C1NP3B105□	1.0	30.0	60.0	20.5	1.0			
	C1NP3B125□	1.2	32.5	60.0	23.0	1.0			
	C1NP3B155□	1.5	35.5	60.0	26.0	1.0			
	C1NP3B185□	1.8	38.5	60.0	29.0	1.0			
	C1NP3B225□	2.2	38.0	70.0	28.5	1.0			
	C1NP3B275□	2.7	41.5	70.0	32.0	1.0			
	C1NP3B335□	3.3	45.5	70.0	36.0	1.0			
	C1NP3B395□	3.9	49.0	70.0	39.5	1.0			
	C1NP3B475□	4.7	53.0	70.0	44.0	1.0			

□: J=Tolerance of Capacitance $\pm 5\%$, K=Tolerance of Capacitance $\pm 10\%$

Operating Temperature: -40~+85°C



Features

- Compact size and resin case.
- Best for high frequency and high current.

Applications

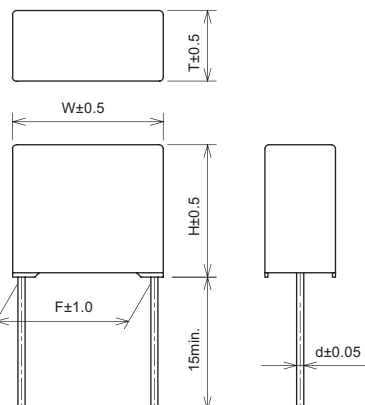
- High frequency circuit, High voltage resonant circuit, Snubber circuit and Protection of semiconductors such as IGBT, IPM and MOSFET.

- Model numbering system

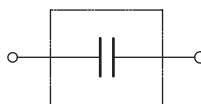
H	H	C	4	0	0	V	1	0	2	J
Series Name										
			400V			400Vdc				J ±5%
			630V			630Vdc				K ±10%
			1250V			1,250Vdc				

The first two digits stands for capacitance (pF).
The third digit is for the number of continuing zero.

Dimensions



Circuit



Unit: mm

Electrical Specifications

Rated Voltage	Model Number	Capacitance μF	Dimensions (mm)					Dissipation Factor	Test Voltage	Insulation Resistance
			W	H	T	F	φ d			
400Vdc	HHC400V333□	0.033	17.0	12.0	5.0	15.0	0.8	0.001max. (at 1kHz)	Rated Voltage ×1.75Vdc (2~5sec)	50,000MΩmin. (at 20°C, 100Vdc)
	HHC400V393□	0.039	17.0	13.5	6.5	15.0	0.8			
	HHC400V473□	0.047	17.0	13.5	6.5	15.0	0.8			
	HHC400V563□	0.056	17.0	15.0	8.0	15.0	0.8			
	HHC400V683□	0.068	17.0	15.0	8.0	15.0	0.8			
	HHC400V823□	0.082	25.0	16.0	6.5	22.5	0.8			
	HHC400V104□	0.1	25.0	16.0	6.5	22.5	0.8			
	HHC400V124□	0.12	25.0	17.5	8.0	22.5	0.8			
	HHC400V154□	0.15	25.0	17.5	8.0	22.5	0.8			
	HHC400V184□	0.18	25.0	19.5	10.0	22.5	0.8			
630Vdc	HHC630V103□	0.01	17.0	12.0	5.0	15.0	0.8			
	HHC630V123□	0.012	17.0	12.5	5.5	15.0	0.8			
	HHC630V153□	0.015	17.0	12.5	5.5	15.0	0.8			
	HHC630V183□	0.018	17.0	12.5	5.5	15.0	0.8			
	HHC630V223□	0.022	17.0	12.5	5.5	15.0	0.8			
	HHC630V273□	0.027	17.0	13.5	6.5	15.0	0.8			
	HHC630V333□	0.033	17.0	15.0	8.0	15.0	0.8			
	HHC630V393□	0.039	17.0	15.0	8.0	15.0	0.8			
	HHC630V473□	0.047	17.0	15.0	8.0	15.0	0.8			
	HHC630V563□	0.056	25.0	16.0	6.5	22.5	0.8			
	HHC630V683□	0.068	25.0	16.0	6.5	22.5	0.8			
	HHC630V823□	0.082	25.0	17.5	8.0	22.5	0.8			
	HHC630V104□	0.1	25.0	17.5	8.0	22.5	0.8			
	HHC630V124□	0.12	25.0	19.5	10.0	22.5	0.8			
	HHC630V154□	0.15	25.0	19.5	10.0	22.5	0.8			
	HHC630V184□	0.18	25.0	19.5	10.0	22.5	0.8			
1250Vdc	HHC1250V102□	0.001	17.0	12.0	5.0	15.0	0.8			
	HHC1250V122□	0.0012	17.0	12.0	5.0	15.0	0.8			
	HHC1250V152□	0.0015	17.0	12.0	5.0	15.0	0.8			
	HHC1250V182□	0.0018	17.0	12.0	5.0	15.0	0.8			
	HHC1250V222□	0.0022	17.0	12.0	5.0	15.0	0.8			
	HHC1250V272□	0.0027	17.0	12.5	5.5	15.0	0.8			
	HHC1250V332□	0.0033	17.0	12.5	5.5	15.0	0.8			

□:J=Tolerance of Capacitance ±5%, K=Tolerance of Capacitance ±10%

Operating Temperature: -40~+105°C



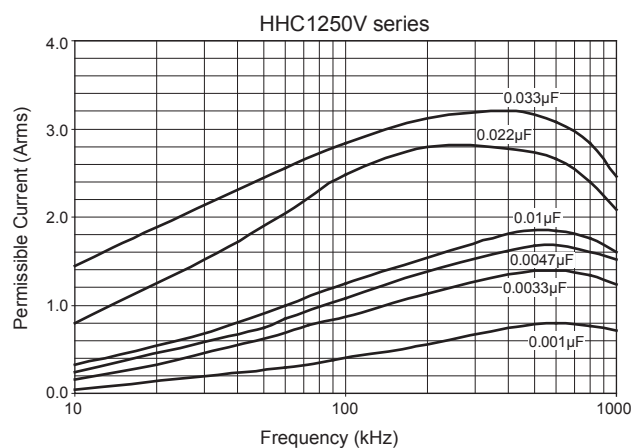
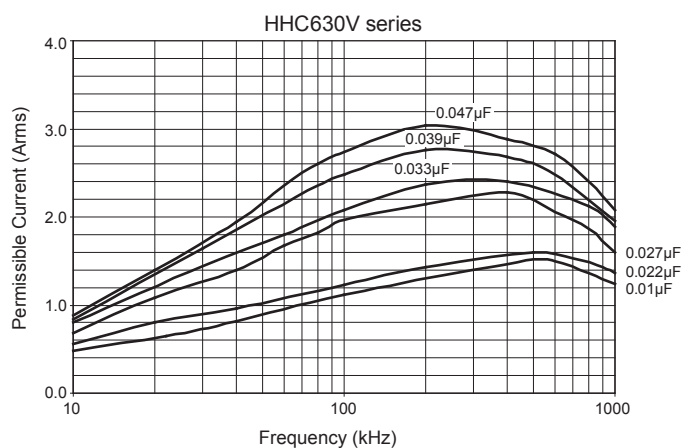
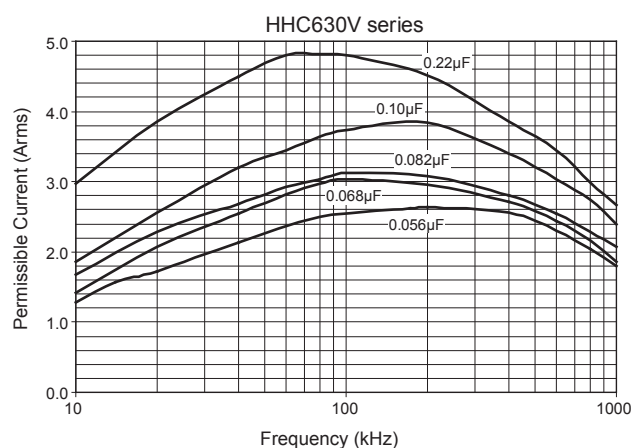
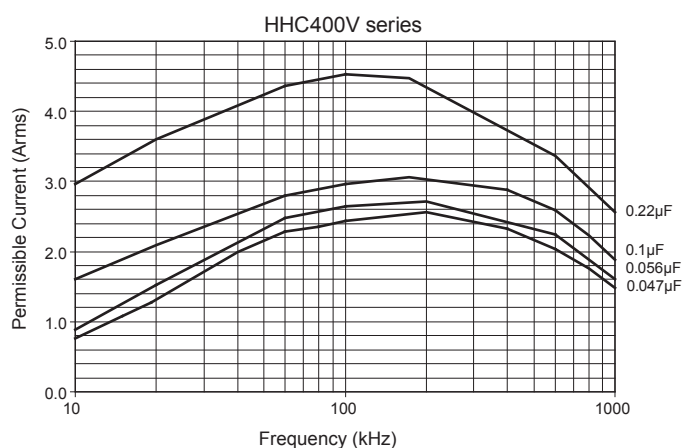
Electrical Specifications

Rated Voltage	Model Number	Capacitance μF	Dimensions (mm)					Dissipation Factor	Test Voltage	Insulation Resistance
			W	H	T	F	ϕ d			
1250Vdc	HHC1250V392□	0.0039	17.0	12.5	5.5	15.0	0.8	0.001max. (at 1kHz)	Rated Voltage $\times 1.75\text{Vdc}$ (2~5sec)	50,000M Ω min. (at 20°C, 100Vdc)
	HHC1250V472□	0.0047	17.0	12.5	5.5	15.0	0.8			
	HHC1250V562□	0.0056	17.0	13.5	6.5	15.0	0.8			
	HHC1250V682□	0.0068	17.0	13.5	6.5	15.0	0.8			
	HHC1250V822□	0.0082	17.0	15.0	8.0	15.0	0.8			
	HHC1250V103□	0.01	17.0	15.0	8.0	15.0	0.8			
	HHC1250V123□	0.012	25.0	16.0	6.5	22.5	0.8			
	HHC1250V153□	0.015	25.0	16.0	6.5	22.5	0.8			
	HHC1250V183□	0.018	25.0	17.5	8.0	22.5	0.8			
	HHC1250V223□	0.022	25.0	17.5	8.0	22.5	0.8			
	HHC1250V273□	0.027	25.0	19.5	10.0	22.5	0.8			
	HHC1250V333□	0.033	25.0	19.5	10.0	22.5	0.8			

□:J=Tolerance of Capacitance $\pm 5\%$, K=Tolerance of Capacitance $\pm 10\%$ Operating Temperature: $-40\sim+105^{\circ}\text{C}$

● Permissible current data

The representative capacity value's permissible current characteristics per rated voltage is shown below.
Please ask a sales representative for capacitance data not shown below.

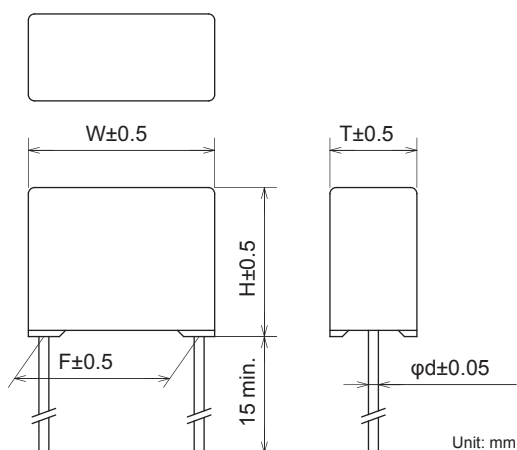
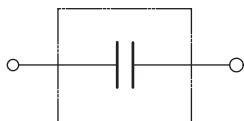


**Features**

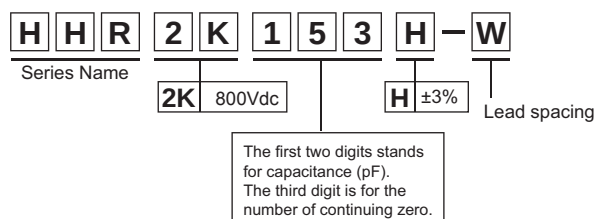
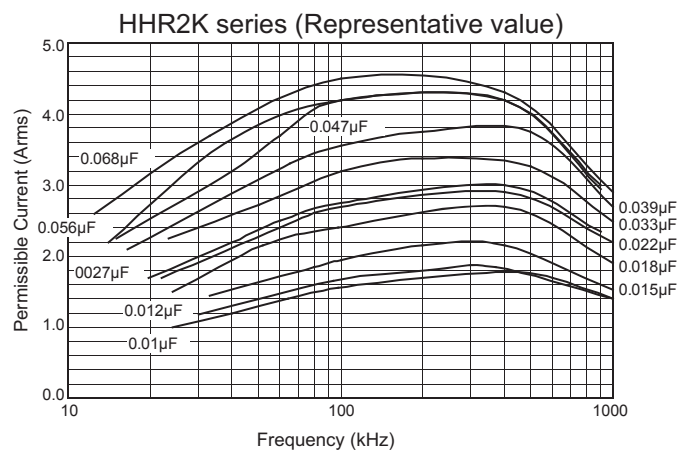
- Space-saving
- High permissible current
- Low buzzing
- High reliability for proprietary-structure
- 2 kinds of lead pitch (10mm pitch•12.5mm pitch)
*0.01 μ F to 0.033 μ F
- Adopting for box type of casing,
 - High withstand voltage between line and case
(2500Vac / 1min)
 - Stabile design for mounting on a board

Applications

- Resonance circuit in power supply for a Flat panel TV and a Printer etc.

• *Dimensions*• *Circuit*

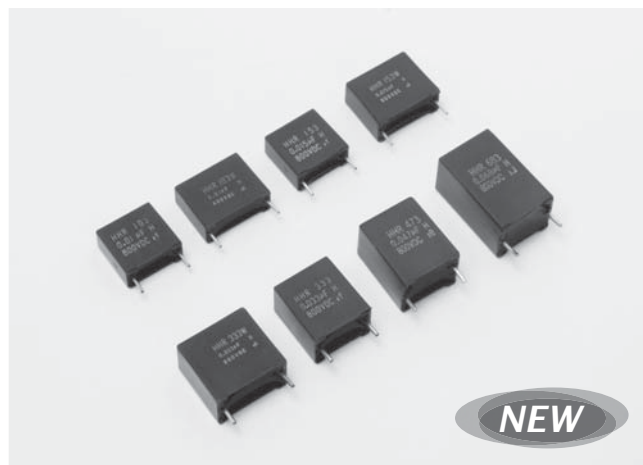
• Model numbering system

• *Permissible current data***Electrical Specifications**

Rated Voltage	Model Number	Capacitance μF±3%	Dimensions (mm)					Dissipation Factor	Test Voltage	Insulation Resistance
			W	H	T	F	φ d			
800Vdc	HHR2K103H (-W)	0.010	12.0 (14.5)*	11.5	5.5	10.0 (12.5)*	0.6	0.001max. (at 10kHz)	Line to Line 1,400Vdc 2~5sec. Terminal to Case 2,400Vdc 60sec.	Line to Line 50,000MΩ (100Vdc) Terminal to Case 100,000MΩ (100Vdc)
	HHR2K123H (-W)	0.012		12.0	6.5					
	HHR2K153H (-W)	0.015		12.0	6.5					
	HHR2K183H (-W)	0.018	12.5 (15.0)*	13.0	7.5	0.8				
	HHR2K223H (-W)	0.022		13.0	7.5					
	HHR2K273H (-W)	0.027		14.0	8.5					
	HHR2K333H (-W)	0.033	12.5	15.5	10.0	10.0				
	HHR2K393H	0.039		15.5	10.0					
	HHR2K473H	0.047		15.5	10.0					
	HHR2K563H	0.056		19.5	10.5					
HHR2K683H	0.068									

(W) means the lead wire pitch is 12.5mm or the lead spacing is 12.5mm

Operating Temperature: -40~+105°C



MEMO



SPARK QUENCHING R-C NETWORKS



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For improvement, specifications are subject to change without prior notice.

When components are used for special applications requiring high reliability (life maintenance equipment, atomic energy, airplanes, artificial satellites, etc.) , contact us beforehand. Also make sure to evaluate and verify the components in a state that they are mounted on actual equipment.

SAFETY STANDARDS

Okaya spark quenchers have been recognized by the following safety standards organizations:

Organization (Country)	Applicable Standard	
	Household Appliances	Office Appliances and others
IEC	PUB 65	PUB 950
UL (U.S.A)	UL60384-14 (capacitor)	UL1283 (filter)
cUL (C.S.A)	CSA E60384-14	CSA E60384-14
CSA (Canada)	CSA E60384-14	CSA E60384-14
VDE (Germany)	IEC/EN 60384-14	IEC/EN 60384-14
ENEC ALL EUROPIAN COUNTRIES	IEC/EN 60384-14	IEC/EN 60384-14
SEV (Switzerland)	IEC/EN 60384-14	IEC/EN 60384-14
BS (Great Britain)	IEC/EN 60384-14	IEC/EN 60384-14
SEMKO (Sweden)	IEC/EN 60384-14	IEC/EN 60384-14
DEMKO (Denmark)	IEC/EN 60384-14	IEC/EN 60384-14
NEMKO (Norway)	IEC/EN 60384-14	IEC/EN 60384-14
FIMKO (Finland)	IEC/EN 60384-14	IEC/EN 60384-14
ÖVE (Austria)	-----	IEC/EN 60384-14
IMQ (Italy)	-----	IEC/EN 60384-14

- Electrical apparatus are classified roughly into two categories, i.e., (a)household appliances and (b) office appliances including office automation (OA) and others.
- The standards for noise suppression capacitors to be used in the household appliances are more strict than those in the office appliances and others.
- The products enumerated in the following pages (with a few exceptions) have been approved under standards applicable to the household appliances, so that you may use them for almost all applications.
- In order to avoid any accidents in machine applications which may experience unexpected abnormal surge voltage, or which are subjected to continuous 24-hour use, it is necessary to build in an extra measure of reliability. Here, the strict test conditions conducted by the above-mentioned safety standards organizations can be considered as one of the criteria from a reliability point of view.



SPARK QUENCHERS INTRODUCTION RC NETWORKS

Recent developments in electronic equipment have shown the following trends:

- Increasing demands for numerical control machines, robotics and technically advanced appliances are requiring progressive electronic technologies.
- When employing integrated circuit and microcomputer technology, today's equipment is required to perform multifunction in limited size.
- The denser the installation of components, the more the components must be miniaturized and of lighter weight.
- As a result, the following problems arise:
 - 1) Functional limits of magnetic relays and switches have narrowed due to increasing contact amperage.
 - 2) Miniaturization of electronic components has reduced their dielectric strength.
 - 3) Circuit noise has increased as a result of the coexistence of signal and power lines.
 - 4) Safety standards for electronic equipment and components have become increasingly restrictive.

Some key factors affecting circuit performance are:

- 1) Arcing between relay and switch contacts result in wear and binding.
- 2) Contact arcing, results in high frequency noise and abnormal high voltages.
- 3) The generation of back electromotive force (EMF) is due to the self-inductance of inductive loads.
- 4) The occurrence of high frequency noise is the result of contact chatter in magnetic relays and switches.

Back EMF, due to self-inductance, affects Silicon Control Rectifiers (SCRs) and Solid-state Relays (SSRs) and can result in the breakdown of other semi-conductor devices. Power line surges must also be carefully considered. Either may be a contributing factor in equipment malfunctions, failures and in extreme cases fire and/or electrical shock.

To illustrate these factors, consider that relay contact chatter is capable of inducing oscillations of several Kilohertz, contact arcing frequencies of several Megahertz and amplitudes 10 to 20 times normal circuit voltages. Voltage surges from external sources may approach thousands of volts.

To protect electronic equipment against costly failures or malfunctions, Okaya has developed advanced components to suppress contact arcing and filter unwanted electrical noise.

DETERMINING RC VALUE

In general, the RC determining formula is regarded as quite complex, but since the RC combination has the decisive effect of integrating the rapid changes of the waveform to a smoothed average, the determination of RC values by complex formulas becomes unnecessary.

It is possible to select a suitable OKAYA Spark Quencher using the chart or the formulas shown below. Keep in mind that there is no one exact value of Spark Quencher which will satisfy all applications. The chart and formula are guide-lines to give the user a starting point from which to work. The final selection must be evaluated in the application to determine its acceptability.

		LOAD CURRENT - AMPERES										
		0.05	0.1	0.2	0.3	0.5	1.0	2.0	3.0	5.0		
Source Voltage	125Vac or 125Vdc	0.01 +	0.01 +	0.01 +	0.01 +	0.022 +	0.1 +	0.3 +	0.5 +	1.0 +	MFD +	R+C Values
	250Vac or 250Vdc	470 +	470 +	220 +	120 +	120 +	47 +	47 +	47 +	10 +	OHMS +	

$$C = \frac{I^2}{10}$$

$$R = \frac{V}{10 (1 + \frac{50}{V}) I}$$

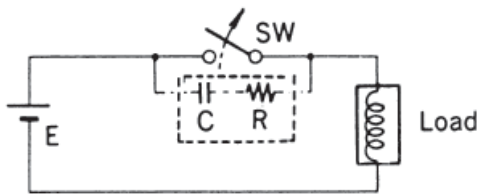
C = Capacitance in MFD
I = Load Current in Amps
R = Resistance in Ohms
V = Source Voltage



Spark Quenchers are easily selectable electronic components designed to prevent or substantially minimize the occurrence of arcing and noise generation in relay and switch contacts.

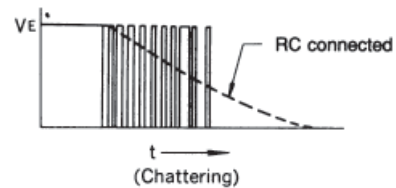
EFFECT OF SPARK QUENCHER

Arc suppression



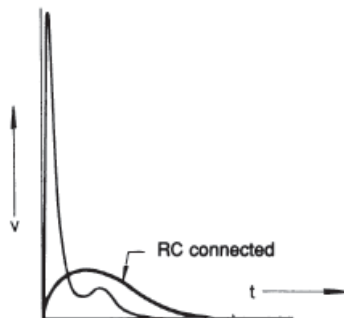
At the moment of switch opening, the RC combination absorbs and suppresses the energy of the arc by letting it bypass the switch.

Damping oscillation



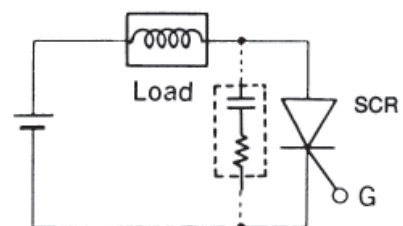
The RC combination absorbs the high frequency oscillations caused by mechanical vibrations such as relay contact chattering. Similarly the oscillations created by arcing are also averaged and suppressed by the RC combination regardless of their origin.

Back electromotive force suppression



With back electromotive force due to self-inductance, the surge voltage peak is suppressed by conducting it through the RC circuit on the low impedance side. The peak is absorbed by the capacitance of RC. The wave-form is averaged and smoothed by the time constant of the RC; thus generated noise is eliminated or substantially minimized.

Dv/dt suppression



The RC combination allows the dv/dt of the "on" and "off" operation of thyristors or similar devices to decrease; thus surge voltages are suppressed and semi-conductor elements are protected.

Even in the case of zero crossing circuits, such as AC circuits, protection is necessary since harmonic noise occurs when there is a gap between phases or current and voltage of the load circuit.



OKAYA Spark Quenchers have the following characteristics which make it possible to easily use them in a wide range of applications.

- 1) The Overload capacity is large.
- 2) They are not polarized; thus can be used in both AC and DC circuits.
- 3) They have a favorable effect on surge voltage and accompanying oscillations caused by contact chatter.
- 4) They are effective against spurious potentials having magnitudes below circuit voltage.
- 5) They offer a high degree of protection for semiconductor devices, and as thyristors and SCRs.
- 6) They improve the dv/dt ratio.

OUTLINE OF CAPACITOR CLASS RATINGS

Spark Quenchers are classified by following categories :

Class X: Capacitors used in applications where damage to the capacitor will not lead to the danger of electrical shock.

Safety Agencies subdivide Class X into X1, X2 and X3 classifications. The test criteria for these subclasses is shown in the table.

Subclass	Peak Voltage on Service	Peak Voltage Test 1.2/50 sec.
X1	>2,500V ≤4,000V	4,000V
X2	≤2,500V	2,500V
X3	≤1,200V	None

RC COMBINATION TABLE

μF	10	27	33	47	50	68	100	120	150	160	200	220	470	500
0.01	XE XEB			XE XEB				XE XEB RE				XE XEB	XE XEB	
0.033	XE XEB AU			XE XEB AU				XE XEB AU RE				XE XEB	XE XEB	
0.1	XE XEB AU			XE XEB AU		CRH		XE XEB AU RE			CRE	XE XEB	XE XEB	
0.2	XE XEB							XE XEB RE				XE XEB		
0.22				XE XEB										
0.3	XE XEB					CRE 3CRE		XE XEB	CRE			XE XEB		
0.33			CRH 3CRH	CRH XE XEB										
0.47		CRH 3CRH												
0.5	XE XEB			XE	CRE 3CRE 6CRE									
1.0	XE XEB													



GENERAL CONSTRUCTION

Spark Quenchers must have the capacity to store surge voltages and current energy, and afford protection against inductively induced potentials. The dielectric material of the OKAYA capacitors, used in Spark Quenchers, affords a very high degree of voltage withstand strength. All resistors are non-inductive solid slug type to insure a high degree of protection against pulse potentials. To provide additional protection for equipment and users, especially when these components are used in AC applications, all OKAYA Spark Quenchers are packaged in cases which meet UL-94 Flame Class V-O.

SAFETY STANDARDS

Safety standards for capacitors used in conjunction with AC power sources have recently been adopted by many world wide standards agencies.

OKAYA Spark Quenchers are fully tested to these standards (see Chart). As well, Okaya is able to offer some products with 500 Vac ratings.

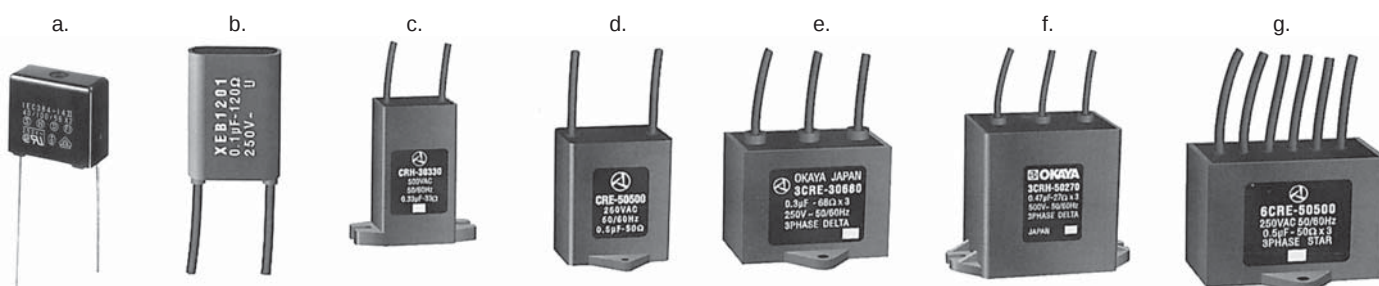
APPLICATIONS

- A) Protection for contacts and from noise during switching operations of equipment such as radio, TV, copiers, mixers, coffee grinders, dryers, tool machine equipment, etc.
- B) Protection of electronic instruments during operation of relays, solenoids, motors, etc.
- C) Electrical noise protection of semiconductor devices during control of triacs, thyristors, motors, welders, illumination equipment, etc.

FORM

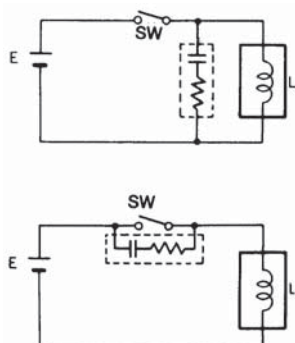
Line Voltage	Safety Standard	Lead Type	Forms	Model	Page
250Vac		Bare wire	a	AU series	62
250Vac		Bare wire	a	TA series	62
275Vac*		Bare wire	a	RE series	63
250Vac		Bare wire	a	XE series	64
250Vac		Flex PVC wire	b	XEB series	65
250Vac		Flex PVC wire	d	CRE series	66
250Vac		Flex PVC wire	e	3CRE series (3 phase delta connection)	66
250Vac		Flex PVC wire	g	6CRE series (3 individual circuits)	66
500Vac		Flex PVC wire	c	CRH series	67
500Vac		Flex PVC wire	f	3CRH series (3 phase delta connection)	67

* UL and CSA = 250Vac

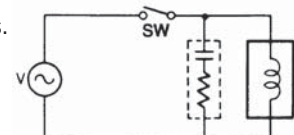


APPLICATIONS

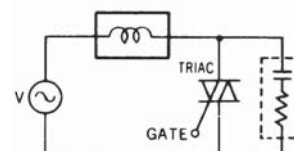
Standard example in DC circuits.



Standard example in AC circuits.



For phase control circuits employing SCR or TRIAC, etc.





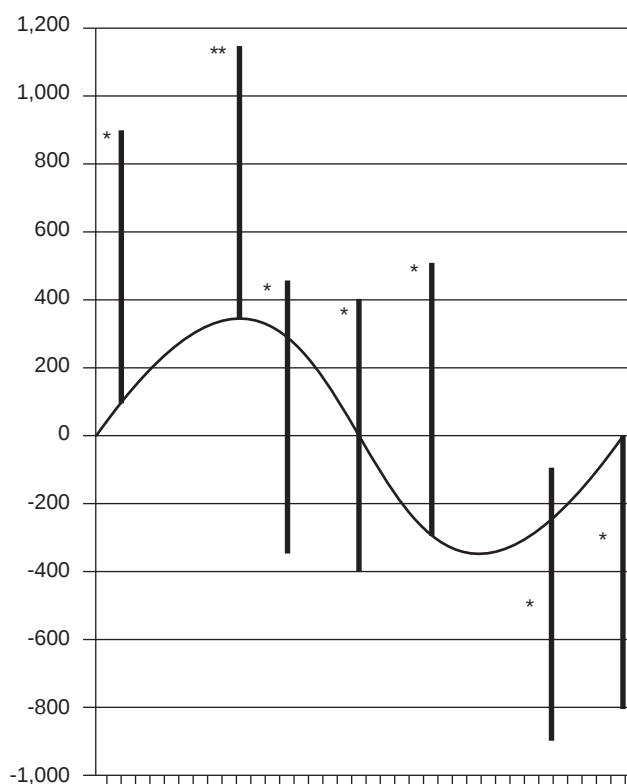
DESIGN CAUTIONS

- 1) Using OKAYA Spark Quenchers will help prevent abnormal operation due to electrical noise and/or surge pulses. It is not recommended that these devices be used in circuits with frequencies greater than 70 Hz. When used in 3-phase, full wave rectified applications, care must be taken to insure that the Spark Quencher does not self heat by more than 5 degrees centigrade or permanent damage to the Spark Quencher may occur.
- 2) When protecting contacts feeding small circuit loads, it is recommended that the Spark Quencher be placed in parallel with the load, rather than the contacts, for the most effective application.
- 3) In high speed circuits, the addition of a Spark Quencher may slow the response time of the circuit. For best response characteristics, do not use a larger Spark Quencher than is absolutely necessary to suppress the noise level.
- 4) Spark Quenchers should be connected as close as possible to the noise source. Excessive lead length may allow abnormal oscillation and/or decrease energy absorption capacity.
- 5) When a thyristor, triac or inverter circuit is to be protected by a Spark Quencher, care must be taken that high harmonic currents do not cause over heating of the Spark Quencher resistor. If heating occurs, we suggest the employment of a Spark Quencher with a lower resistance. The Spark Quencher must not self heat by more than 5 degrees centigrade. In inverter applications, it is recommended that an OKAYA noise suppression capacitor be used across the power lines, instead of the Spark Quencher.
- 6) While it may appear effective to protect contacts with a capacitor only, the capacitor discharge current will cause accumulative damage to the contacts when they close. The proper technique is to apply a Spark Quencher across either the contacts or the load.
- 7) Regarding the pulse condition (superimposed pulse condition), value of () shows the condition of rated voltage. Please careful not to raise the temperature rise when use in the phase control circuit.
- 8) Peak to peak value of pulse condition shows the maximum pulse voltage that is able to apply between terminals of spark quencher with superimposed line voltage. It must not exceed the peak pulse voltage when add the line voltage.

EXPRESSION OF RATED VOLTAGE

The rated voltage of OKAYA Spark Quenchers is expressed by the steady-state (line) voltage rating. They can, however, withstand much higher voltages from power surges. In this catalog, the maximum voltage (including the line voltage) that the Spark Quenchers can withstand is expressed as the "Peak Pulse Voltage". For example, the XE series is rated 250Vac RMS (350Vac Peak) maximum line voltage, but can withstand surge voltages up to 1,200Vac (including Peak line voltage). "Pulse Condition" means the maximum voltage that can be input between terminals of the Spark Quencher (excluding line voltage) during operation. For example, when the XE series is used in a 250Vac RMS (350Vac Peak) line voltage application, it can withstand surge voltages up to 800Vac (P-P) above the Peak line voltage. The following drawing shows examples of both "Peak Pulse Voltage" and "Pulse Condition" for clarification.

"Pulse Condition"



* Pulse Condition (Surge pulse p.p.)

** Peak Pulse Voltage (Peak line voltage plus surge pulse)

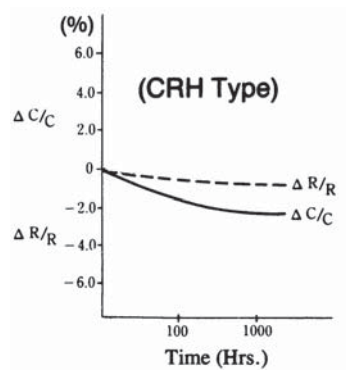
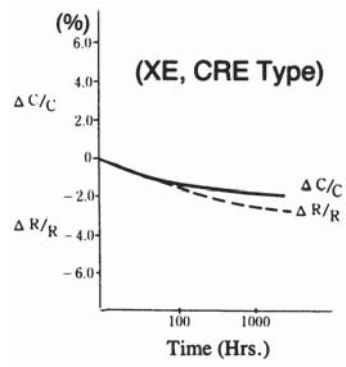
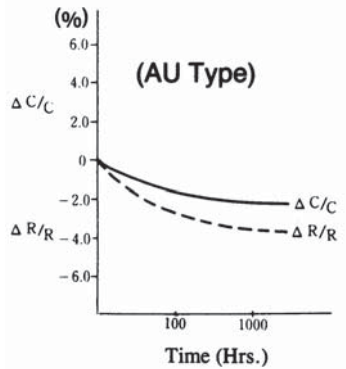


SPARK QUENCHERS

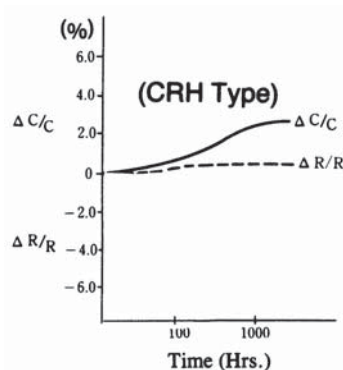
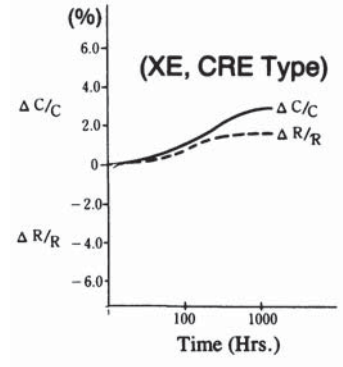
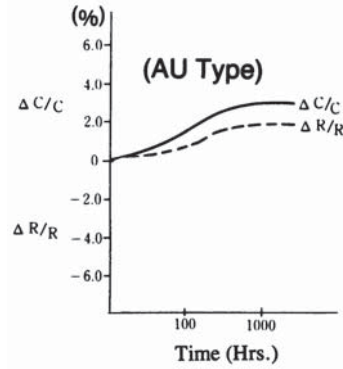


PERFORMANCE CHARACTERISTICS

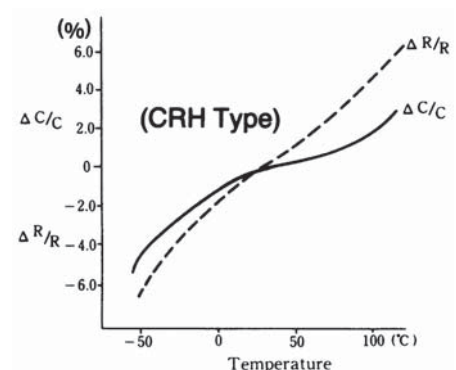
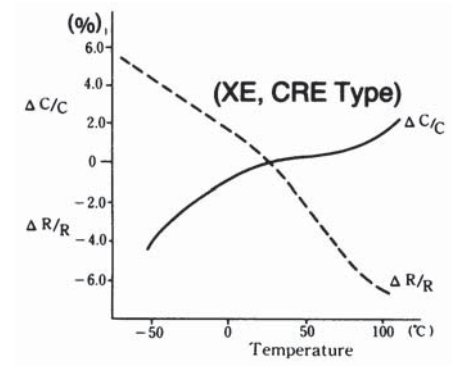
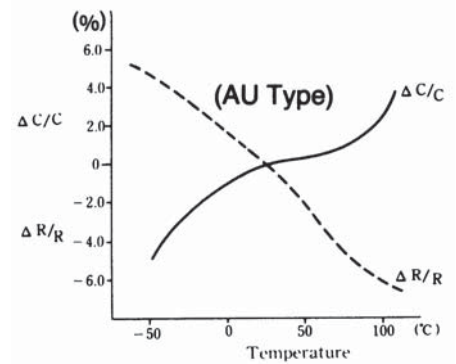
Temperature Endurance



Damp Heat Endurance



Temperature Characteristics



TEST CONDITIONS

Temperature Endurance:

While operating at maximum rated temperature and at 125% of rated voltage, input the table voltages four times per hour for 0.1 second.

Model	Applied voltage
AU, CRE	880 Vac
XE	1,000 Vac
CRH	1,500 Vac

Damp Heat Endurance:

60°C, 90~95% RH
100% Rated Voltage

Temperature Characteristics:

-50°C to ~100°C
100% Rated Voltage



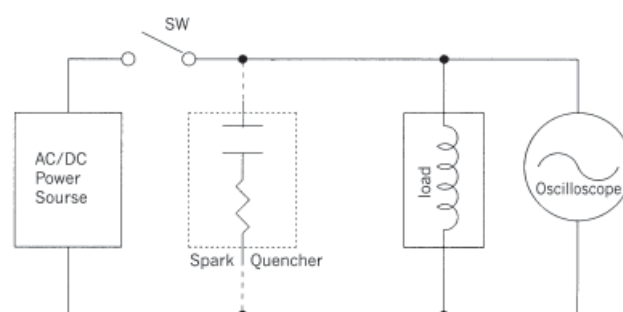
EXAMPLES OF ABSORPTION OF NOISE

The following illustrations show examples of the operation of a variety of commonly used magnetic relays and contactors with and without a Spark Quencher. The ability of the Spark Quencher to integrate peak power surges and suppress high frequency oscillations is visibly demonstrated.

Without a Spark Quencher in the circuit, surge voltage becomes 10 to 30 times larger than the normal circuit voltage and the noise frequency approaches 10 MHz. Spark Quenchers effectively absorb high frequency oscillations induced by contact chattering and attenuate peak surge voltages.

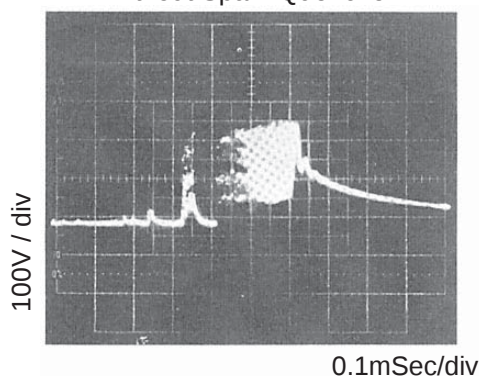
In general, inductive load circuit malfunctions occur as a result of component dielectric breakdown induced by excessive peak potential, or unnecessary radiation accompanied by occurrences of high frequency oscillations due to rapid changes of voltage. Spark Quenchers are effective in preventing both types of electrical noise.

In the following illustrations of noise waves, note that the time base is quite small compared with the normal 50/60 Hz line (16-20 msec).

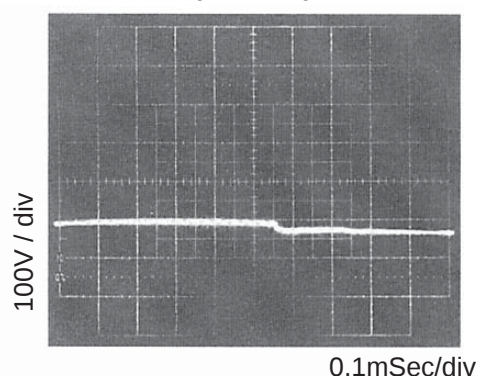


Example 1. Magnetic relay closed in 12Vdc circuit.

Without Spark Quencher

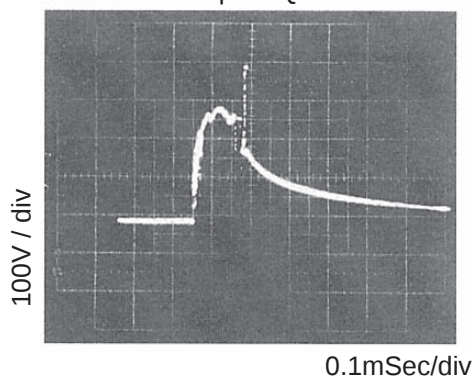


With XE-1201

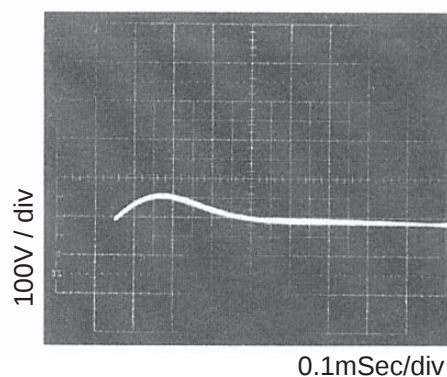


Example 2. Magnetic relay opened in 12Vdc circuit.

Without Spark Quencher



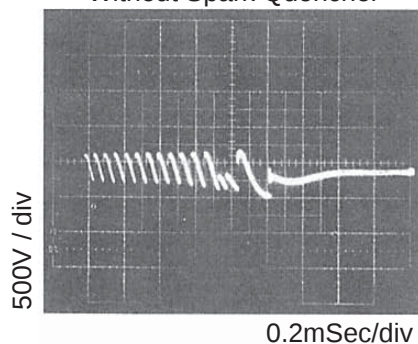
With XE-1201



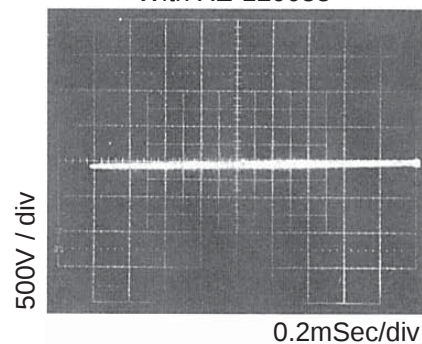


Example 3. Magnetic relay opened in 120Vac circuit.

Without Spark Quencher

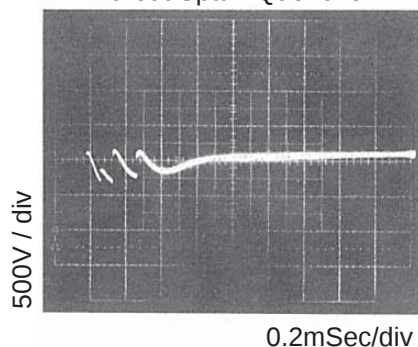


With XE-120033

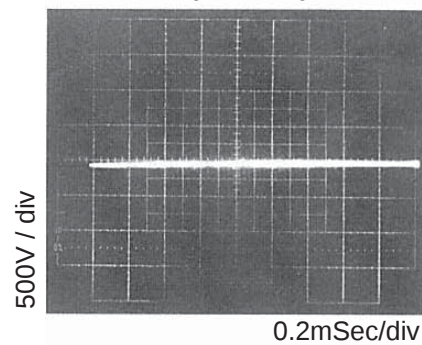


Example 4. Large magnetic relay opened in 120Vac circuit.

Without Spark Quencher

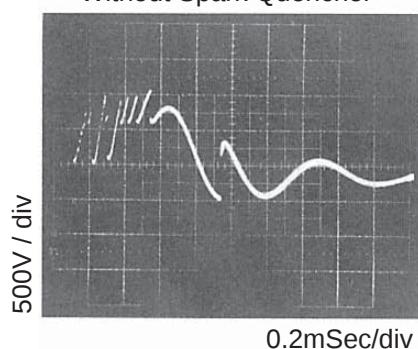


With XE-1202

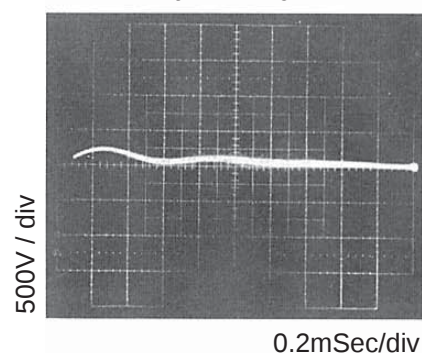


Example 5. Magnetic contactor opened in 240Vac circuit.

Without Spark Quencher

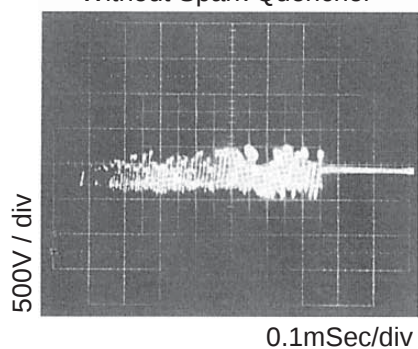


With XE-1202

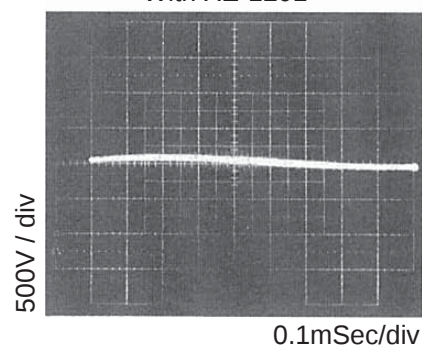


Example 6. Rotary solenoid opened in 120Vac circuit.

Without Spark Quencher



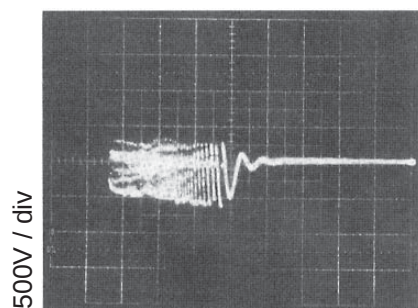
With XE-1201





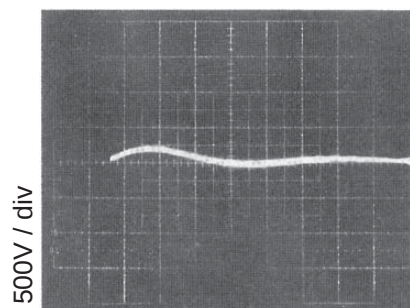
Example 7. Motor timer opened in 120Vac circuit.

Without Spark Quencher



0.2mSec/div

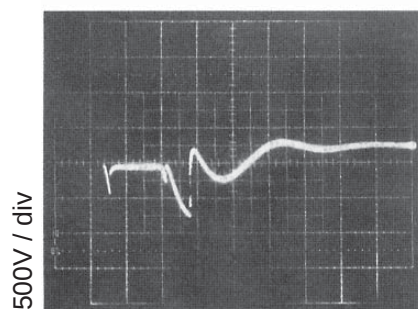
With AU-1201



0.2mSec/div

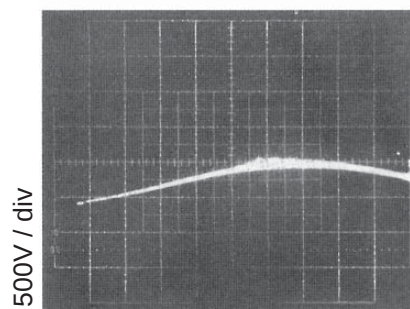
Example 8. Induction motor opened in 240Vac circuit.

Without Spark Quencher



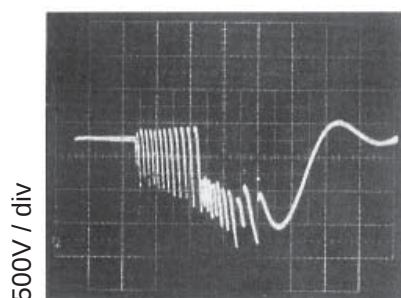
0.2mSec/div

With XE-1201



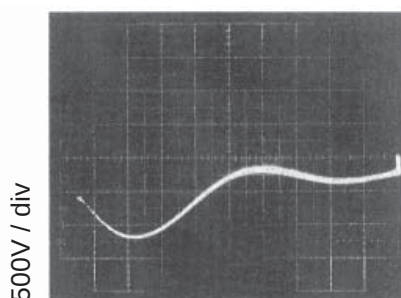
0.2mSec/div

Without Spark Quencher



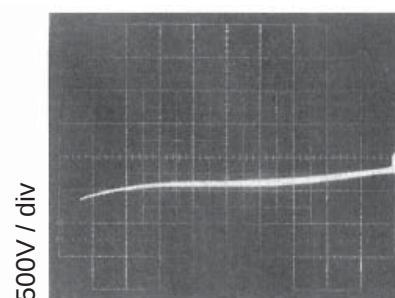
0.2mSec/div

With XE-120033



0.2mSec/div

With XE-1202



0.2mSec/div

Two of the illustrations in example 8 are the result of the switch opening without Spark Quencher protection. The variation in the wave forms is due to the difference in the AC voltage at the instant of circuit opening.

Three of the noise-graph illustrations are the result of the switch opening with Spark Quencher protection. Noise that occurs at the time of load disconnect is absorbed by the LRC loop. Proportionally as the capacitor becomes larger, the noise prevention becomes more effective.



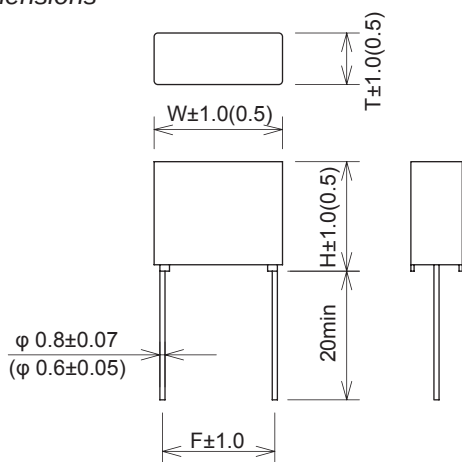
Features

- Compact size.
- AC or DC applications.

Applications

- Suppressing mechanical switching surge occurring Automatic machines and Office appliances.

Dimensions



Unit: mm

Model numbering system

Series Name	Resistance	Capacitance
AU	010 10 Ω	033 0.033 μ F
TA	047 47 Ω	1 0.1 μ F
	120 120 Ω	

- AU Series

Safety Standard	File No.
UL :UL60384-14	E47474
cUL :CSA E60384-14	E47474
CSA :CSA E60384-14	LR37404, LR104926
ENEC-VDE :IEC/EN 60384-14	40007824

The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard. The mark with #10 stands for VDE.



- TA Series

Safety Standard	File No.
UL :UL60384-14	E47474
cUL :CSA E60384-14	E47474
CSA :CSA E60384-14	LR37404
VDE :IEC/EN 60384-1	126004

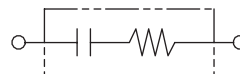
AU Series



TA Series



Circuit



Electrical Specifications

Rated Voltage **250Vac**

Safety Standard	Class	Model Number	Capacitance μF±20%	Resistance Ω±30%	Dimensions				Pulse condition (max.)				Peak Pulse Voltage	Test Voltage	Insulation Resistance
					W	H	T	F	Peak to peak	Pulse width	Repetitive frequency	Pulse width (sec) x Frequency(Hz)			
  	X2	AU120033	0.033	120(1/2W)	20.0	17.0	8.0	17.5	700V	20msec.	120(60)Hz	3(0.8)	700V	Line to Line 1,250Vac 50/60Hz 2~5sec	Line to Line 15,000MΩ min.
		AU1201	0.1							50msec.		6(1.5)			
		AU047033	0.033	47(1/2W)						20msec.				10(2.5)	
		AU0471	0.1							50msec.					
		AU010033	0.033	10(1/2W)						20msec.					
		AU0101	0.1							50msec.					
  	X2	TA120033	0.033	120(1/4W)	18.0	12.0	5.0	16.0		20msec.		3(0.8)	800V	Line to Line 2,000Vdc or 1,080Vac Line to Case 2,000Vac	Line to Case 100,000MΩ min. (at 100Vdc)

Operating Temperature: -40~+100°C
(TA Series= -40~+85°C)

- Various safety approval.
- Compact size.
- AC or DC applications.
- Good peak pulse withstand capability.

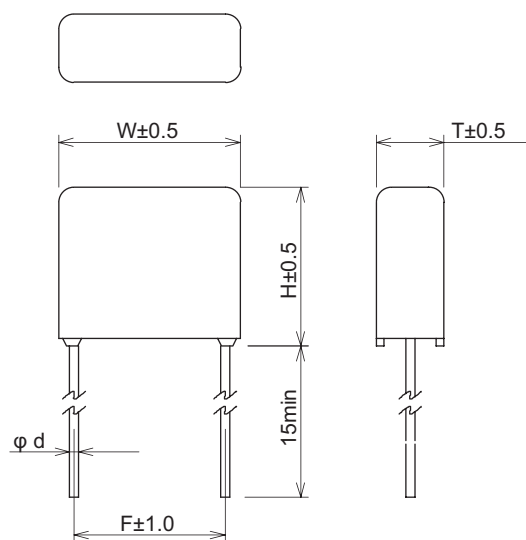
Applications

- Suppressing mechanical switching surge occurring Automatic machines and Office appliances.



Safety Standard	File No.
UL :UL60384-14	E47474
cUL :CSA E60384-14	E47474
CSA :CSA E60384-14	LR37404, LR104926
VDE :IEC/EN 60384-14	40024027
SEMKO :IEC/EN 60384-14	1218214
NEMKO :IEC/EN 60384-14	P07208382
DEMKO :IEC/EN 60384-14	D-02403
FIMKO :IEC/EN 60384-14	FI 27865
Electrosuisse:IEC/EN 60384-14	13.0823

- *Dimensions*



Unit: mm



- *Circuit*



- Model numbering system

Series Name	Resistance	Capacitance
R	120	01 0.01μF
E	120	033 0.033μF
1	120	1 0.1μF
2	120	2 0.2μF
0	120	

Electrical Specifications

Rated Voltage **275Vac**

Safety Standard	Class	Model Number	Capacitance μF±20%	Resistance Ω±30%	Dimensions					Pulse condition (max.)				Peak Pulse Voltage	Test Voltage	Insulation Resistance
					W	H	T	F	d	Peak to peak	Pulse width	Repetitive frequency	Pulse width (sec) x Frequency(Hz)			
	X2	RE12001	0.01	120(1/4W)	16.0	13.5	6.0	14.0	0.6±0.05	800V	50msec	120Hz	1.5	1,200V max.	Line to Line 1,000Vac 50/60Hz 60sec Line to Case 2,000Vac 50/60Hz 60sec	Line to Line 15,000MΩmin (at 100Vdc) Line to Case 100,000MΩmin (at 100Vdc)
		RE120033	0.033										1.0			
		RE1201	0.1	17.0	15.5	8.0	15.0	0.45								
		RE1202	0.2	120(1/2W)	24.5	17.0	8.5	22.5	0.8±0.07				0.15			

Operating Temperature: -40~+100°C

Features

- Wide variations of constant.

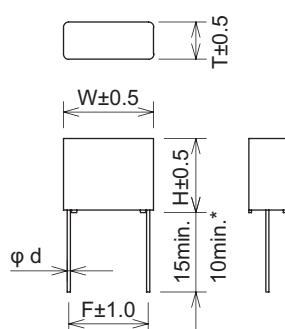
Applications

- Suppressing mechanical switching surge occurring Automatic machines and Office appliances.



Safety Standard	File No.
UL :UL60384-14	E47474
cUL :CSA E60384-14	E47474
CSA :CSA E60384-14	LR37404
VDE :IEC/EN 60384-14	40021694
Electrosuisse :IEC/EN 60384-14	13.0340
SEMKO :IEC/EN 60384-14	1214750
NEMKO :IEC/EN 60384-14	P07207757
FIMKO :IEC/EN 60384-14	FI 27517
DEMKO :IEC/EN 60384-14	D-01387

• Dimensions



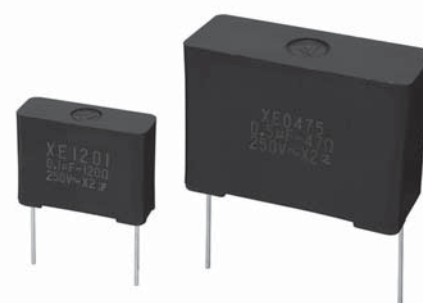
*XE0103~XE01010

Unit: mm

• Model numbering system

Series Name	Resistance	Capacitance
X E 		
010	10Ω	01 0.01μF
047	47Ω	033 0.033μF
120	120Ω	1 0.1μF
220	220Ω	2 0.2μF
470	470Ω	3 0.3μF
		5 0.5μF
		10 1.0μF

The combination of Resistance and Capacitance is shown in following chart.



• Circuit



Electrical Specifications

Rated Voltage **250Vac**

Safety Standard	Class	Model Number	Capacitance μF±20%	Resistance Ω±30%	Dimensions					Pulse condition (max.)				Peak Pulse Voltage	Test Voltage	Insulation Resistance
					W	H	T	F	d	Peak to peak	Pulse width	Repetitive frequency	Pulse width (sec) x Frequency(Hz)			
UL CSA VDE SEMI NEMKO FM +	X2	XE01001	0.01	10 (1/4W)	17.0	14.0	7.0	15.0	0.6±0.05	800V	50 msec	120Hz	4.5	1,200V max.	Line to Line 1,250Vac 50/60Hz 60sec	Line to Line 15,000MΩ min. (500Vdc) except XE0105 0475, 01010 5,000MΩ min. (500Vdc)
		XE04701		47 (1/4W)									3.0			
		XE12001		120 (1/4W)									1.5			
		XE22001		220 (1/4W)									0.8			
		XE47001		470 (1/4W)									0.45			
		XE010033	0.033	10 (1/4W)	17.5	15.0	8.0	3.0								
		XE047033		47 (1/4W)				2.0								
		XE120033		120 (1/4W)				1.0								
		XE220033		220 (1/4W)				0.5								
		XE470033		470 (1/4W)				0.25								
		XE0101	0.1	10 (1/2W)	23.5	17.5	8.5	20.0	1.5				Line to Case 2,000Vac 50/60Hz 60sec			
		XE0471		47 (1/2W)					1.0							
		XE1201		120 (1/2W)					0.45							
		XE2201		220 (1/2W)					0.2							
		XE4701		470 (1/2W)					0.1							
		XE0102	0.2	10 (1/2W)	30.0	20.0	11.0	27.5	0.5							
		XE0472		47 (1/2W)					0.3							
		XE1202		120 (1/2W)					0.15							
		XE2202		220 (1/2W)					0.08							
		XE0103	0.3	10 (1W)	40.0	28.0	16.0	36.5	0.2							
		XE0473		47 (1W)					0.1							
		XE1203		120 (1W)					0.05							
		XE2203		220 (1W)					0.02							
		XE0105	0.5	10 (1W)					0.18							
		XE0475		47 (1W)					0.05							
		XE01010	1.0	10 (1W)	47.0	33.5	22.0	43.5					0.15			

Operating Temperature: -40~+100°C



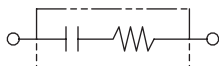
Features

- Rated voltage 250Vac, compact size.

Applications

- Suppressing mechanical occurring switching surge Automatic machines and Office appliances.

Circuit

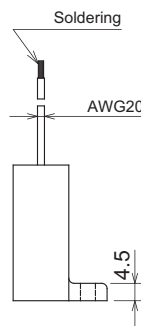
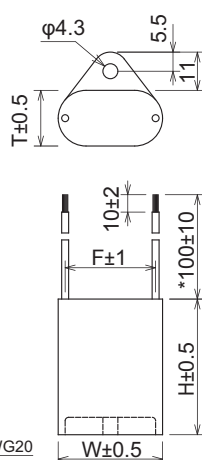
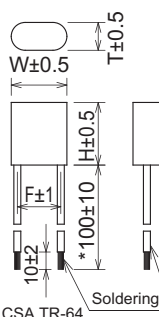
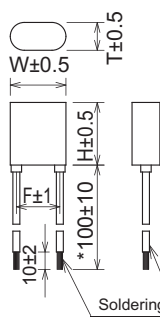


Dimensions

Type: a

Type: b

Type: c



*200±20, 300±30 available

Unit: mm



Model numbering system

Series Name	Resistance	Capacitance
X E B		
	010 10Ω	01 0.01μF
	047 47Ω	033 0.033μF
	120 120Ω	1 0.1μF
	220 220Ω	2 0.2μF
	470 470Ω	3 0.3μF
		5 0.5μF
		10 1.0μF

The combination of Resistance and Capacitance is shown in following chart.

Electrical Specifications

Rated Voltage **250Vac**

Safety Standard	Class	Model Number	Capacitance μF±20%	Resistance Ω±30%	Type	Dimensions				Pulse condition (max.)				Peak Pulse Voltage	Test Voltage	Insulation Resistance			
						W	H	T	F	Peak to peak	Pulse width	Repetitive frequency	Pulse width (sec) x Frequency(Hz)						
       	X2	XEB01001	0.01	10(1/4W)	a	16.0	18.0	8.0	12.5	800V	50msec	120Hz	4.5	1,200V max.	Line to Line 1,250Vac 50/60Hz 60sec	Line to Line 15×10³MΩ min. except: XEB0105 0475,01010 5,000MΩ min. (500Vdc)			
		XEB04701		47(1/4W)									3.0						
		XEB12001		120(1/4W)									1.5						
		XEB22001		220(1/4W)									0.8						
		XEB47001		470(1/4W)									0.45						
		XEB010033	0.033	10(1/4W)									3.0						
		XEB047033		47(1/4W)									2.0						
		XEB120033		120(1/4W)									1.0						
		XEB220033		220(1/4W)									0.5						
		XEB470033		470(1/4W)									0.25						
		XEB0101	0.1	10(1/2W)	b	19.0	25.0	8.5	15.0	800V	50msec	120Hz	1.5	1,200V max.	Line to Case 2,000Vac 50/60Hz 60sec	Line to Case 1×10⁵MΩ min. (500Vdc)			
		XEB0471		47(1/2W)									1.0						
		XEB1201		120(1/2W)									0.45						
		XEB2201		220(1/2W)									0.2						
		XEB4701		470(1/2W)									0.1						
		XEB0102	0.2	10(1/2W)		21.5	28.0	11.0	17.0				0.5						
		XEB0472		47(1/2W)									0.3						
		XEB1202		120(1/2W)									0.15						
		XEB2202		220(1/2W)									0.08						
		XEB0103		0.3	10(1 W)	c	30.0	39.0	16.0				26.0				0.2		
		XEB0473	47(1 W)		0.1														
		XEB1203	120(1 W)		0.05														
		XEB2203	220(1 W)		0.02														
		XEB0105	10(1 W)	0.18															
		XEB0475	0.5	47(1 W)	0.05														
		XEB01010		10(1 W)	0.15														

Operating Temperature: -40~+100°C



CRE, 3CRE, 6CRE SERIES

SPARK QUENCHER



Features

- Broad use in industrial applications.
- External mounting tab.
- 1/2 watt non-inductive, high pulse resistor.
- Three phase delta connection (3 CRE).
- Three phase three line (6 CRE).

Applications

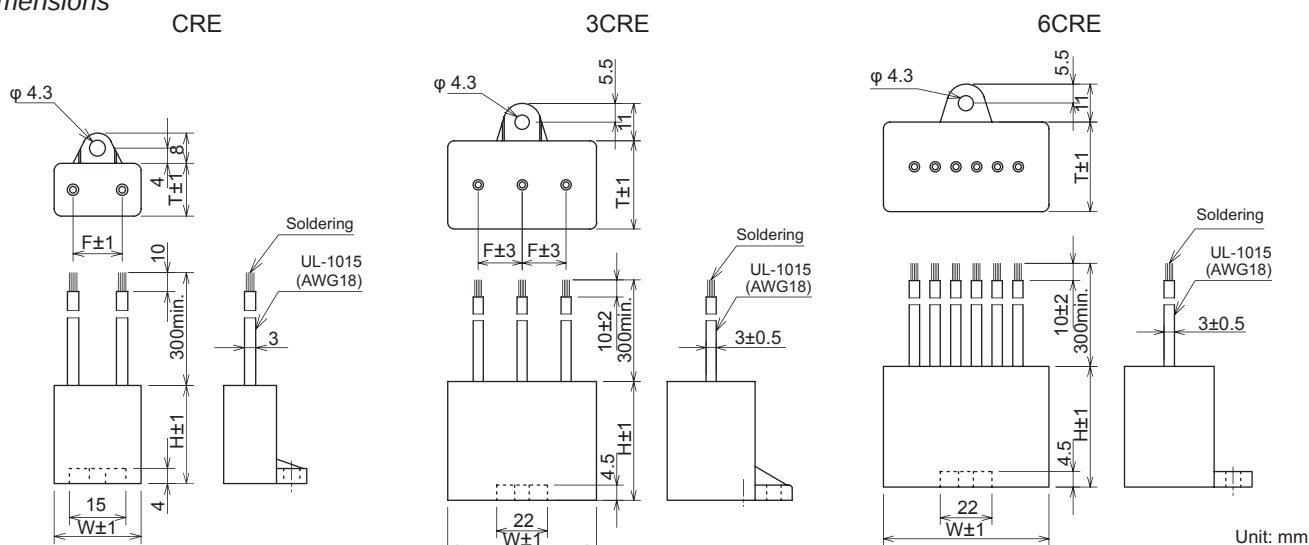
- Automatic machines and industrial machinery.

Model numbering system

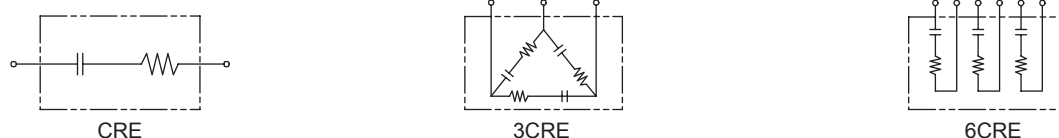
Supported number	Series name	Capacitance	Resistance
None	1 Phase	10 0.1μF	201 200Ω
3	3 Phase	20 0.2μF	151 150Ω
6	3 Phase 3 Line	30 0.3μF	680 68Ω
		50 0.5μF	500 50Ω

The combination of Resistance and Capacitance is shown in following chart.

Dimensions



Circuit



Electrical Specifications

Rated Voltage **250Vac**

Safety Standard	Class	Model Number	Capacitance μF±20%	Resistance Ω±30%	Dimensions				Pulse condition (max.)				Peak Pulse Voltage	Test Voltage	Insulation Resistance
					W	H	T	F	Peak to peak	Pulse width	Repetitive frequency	Pulse width (sec) x Frequency(Hz)			
 	X2	CRE-10201	0.1	200(1/2W)	23	26	14	13	700V	50msec.	360Hz.	0.45	800V max.	Line to Line 625Vac 50/60Hz 60sec	Line to Line 10,000MΩ min.
		CRE-20151	0.2	150(1/2W)								0.15			
		CRE-30680	0.3	68(1/2W)	0.1										
		CRE-50500	0.5	50(1/2W)		0.07									
		3CRE-30680*	0.3/1 phase	68 (1/2W) /1 phase	44	35	26	70msec.		0.1					
		3CRE-50500	0.5	50(1/2W)						0.07					
		6CRE-50500	/1 phase	/1 phase						48		-			

* 3CRE-30680 is not UL approved.

Operating Temperature: -40~+85°C



Features

- 500Vac rating for application in high voltage phase control.
- Flexible wire leads with external mounting tab.
- 6 and 10 watt non-inductive, high pulse resistor.

Applications

- 500Vac line Automatic machines and Office appliances.



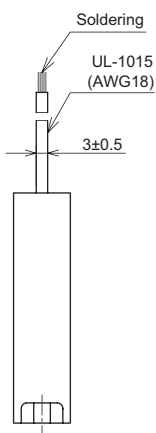
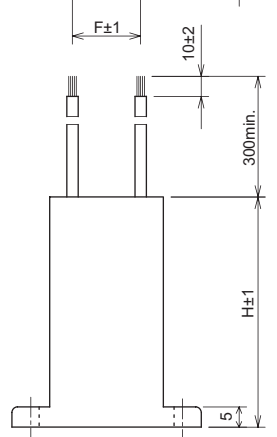
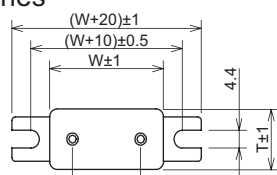
• CRH Series

• Circuit



Dimensions

CRH Series



Safety Standard	File No.
UL :UL60384-14	E47474

Model numbering system

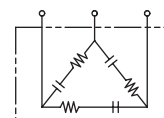
Supported number	Series Name	Capacitance	Resistance
None	1 Phase	10 0.1μF	270 27Ω
3	3 Phase	20 0.22μF	330 33Ω
		30 0.33μF	470 47Ω
		50 0.47μF	680 68Ω

The combination of Resistance and Capacitance is shown in following chart.

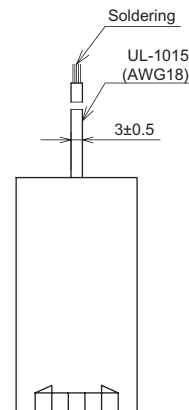
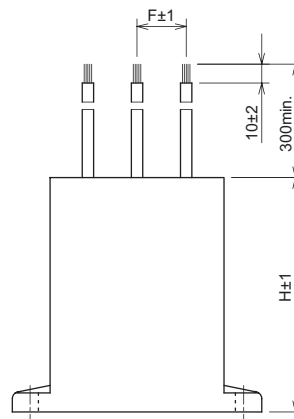
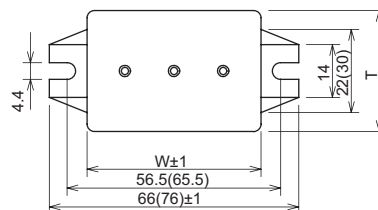


• 3CRH Series (3 Phase)

• Circuit



3CRH Series (3 Phase)



()=3CRH-50270

Unit: mm

Electrical Specifications

Rated Voltage **500Vac**

Safety Standard	Model Number	Capacitance μF±20%	Resistance Ω±30%	Dimensions				Pulse condition (max.)				Peak Pulse Voltage	Test Voltage	Insulation Resistance						
				W	H	T	F	Peak to peak	Pulse width	Repetitive frequency	Pulse width (sec) x Frequency (Hz)									
	CRH-10680	0.1	68(6W)	30	57	15	18	1,000V	50msec.	720Hz	1.0	1,500V	Line to Line 1,250Vac 50/60Hz 60sec Line to Case 2,000Vac 50/60Hz 60sec	Line to Line 10,000MΩmin. Line to Case 100,000MΩmin (at 500Vdc)						
	CRH-20470	0.22	47(6W)			20	28		70msec.		0.3									
	CRH-30330	0.33	33(6W)						100msec.						0.2					
	CRH-50270	0.47	27(10W)	40	62	32	13													
	3CRH-30330	0.33/1 phase	33 (6W)/1 phase	46		40	18													
	3CRH-50270	0.47/1 phase	27(10W)/1 phase	56		40	18													

Operating Temperature: -40~+70°C

MEMO



AC POWER LINE NOISE FILTERS



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For improvement, specifications are subject to change without prior notice.

When components are used for special applications requiring high reliability (life maintenance equipment, atomic energy, airplanes, artificial satellites, etc.), contact us beforehand. Also make sure to evaluate and verify the components in a state that they are mounted on actual equipment.

Model Number	Rated Voltage (Vac)	Rated Current																												Safety Standard	Terminal*	Case	Page			
		1	2	3	4	5	6	8	10	15	20	25	30	40	50	60	75	80	100	150	200	250	300	400												
SUP□-EX□	250					○			○	○	○		○																			UL,cUL,SEMKO	SWB	Resin	74~75	
SUP□-EY□	250					○			○	○	○		○																			UL,cUL,SEMKO	SWB	Resin	76~77	
SUP-ET□-ER-0	250					○		○	○	○																						UL,cUL,SEMKO	F	Metal	78~79	
SUP-E□H	250	○	○	○																												CSA,SEMKO	PVC	Metal	80	
	250					○			○	○	○																					UL,CSA,SEMKO	F, SW, SR	Metal	80	
SUP-E□H-EP	250	○	○	○																												CSA,SEMKO	PVC	Metal	81	
	250					○			○	○	○																					UL,CSA,SEMKO	SW	Metal	81	
SUP-G□H-EPR	250					○			○	○	○																					UL,CSA,SEMKO	F, SW, SR	Metal	82	
SUP-P□H-EPR	250					○		○	○	○	○		○																			UL,CSA,SEMKO	F, SW, SR	Metal	83	
SUP-P□H-E1PR /-R	250					○		○	○	○	○		○																			UL,CSA,SEMKO	F, SW, SR	Metal	84	
SUP-EP□-ER-6	250					○			○	○	○		○																			UL,cUL,TÜV	SWB	Metal	85	
SUP-EQ□-ER-6	250					○			○	○	○		○																			UL,cUL,TÜV	SWB	Metal	86	
SUP-EK□-ER-6	250					○			○	○	○		○																			UL,cUL,TÜV	SWB	Metal	87	
SUP-EL□-ER-6	250					○			○	○	○		○																			UL,cUL,TÜV	SWB	Metal	88	
SUP-EV□-ER-6	250					○			○	○	○		○																			UL,cUL,SEMKO	SWB	Metal	89	
SUP-EW□-ER-6	250					○			○	○	○		○																			UL,cUL,SEMKO	SWB	Metal	90	
SUP-J□H-ER	250					○			○	○	○		○																			CSA,SEMKO	SW	Metal	91	
SUP-MH-ER-4	250													○		○		○	○		○		○									UL	SW	Metal	92	
SUP-EB50-E-4	250														○																		TÜV	SW	Metal	93
3SUP□-BE-6~30	250					○			○	○	○		○																			UL,cUL,SEMKO	SWB	Resin	94~95	
3SUP□-BH-6~30	500					○			○	○	○		○																			UL,cUL,SEMKO	SWB	Resin	96~97	
3SUP□-BE-50, 60	250															○	○															UL,cUL,SEMKO	SWB	Resin	98	
3SUP□-BH-50, 60	500															○	○															UL,cUL,SEMKO	SWB	Resin	99	
3SUPF-DE-80~300	250																		○	○	○	○	○	○								UL,cUL,SEMKO	SWB	Metal	100	
3SUPF-DH-80~300	500																		○	○	○	○	○	○								UL,cUL,SEMKO	SWB	Metal	101	
3SUP□-DE-400	250																								○							UL,cUL,SEMKO	SWB	Metal	102	
3SUP□-DH-400	500																								○							UL,cUL,SEMKO	SWB	Metal	103	
3SUP□-CE-6~60	250					○			○	○	○		○	○	○	○																UL,cUL,SEMKO	SWB	Metal	104	
3SUP□-CH-6~60	500					○			○	○	○		○	○	○	○																UL,cUL,SEMKO	SWB	Metal	105	
3SUP□-CE-80~300	250																		○	○	○	○	○	○								UL,cUL,SEMKO	SWB	Metal	106	
3SUP□-CH-80~300	500																		○	○	○	○	○	○								UL,cUL,SEMKO	SWB	Metal	107	
3SUP□-CE-400	250																								○							UL,cUL,SEMKO	SWB	Metal	108	
3SUP□-CH-400	500																								○							UL,cUL,SEMKO	SWB	Metal	109	
3SUP□-AE□	250														○		○		○	○	○	○	○									UL,cUL,SEMKO	SWB	Metal	110	
3SUP□-AH□	500														○		○		○	○	○	○	○									UL,cUL,SEMKO	SWB	Metal	111	
3SUP-HL□-ER-6	500					○			○	○			○		○		○		○	○	○	○											UL,TÜV	SWB	Metal	112
SUP-B□R-E	250		○		○		○																									-	Lead	Plastic	113	
SUP-C□G-E	250			○			○																										-	Lead	Plastic	113
RZR-N	-																															-	-	-	114	
RCV, RCH	-			○		○			○	○	○	○	○	○																		-	-	-	115	
SUP-K□H-ERB	125/250								○	○	○		○																			-	SW	Metal	116	

*Terminal: PVC=Flex PVC Terminal, F=Faston® Terminal, SW=Screw Terminal, SR=Solder Terminal, SWB= Screw Terminal Block



INTRODUCTION

Recent years have witnessed tremendous advances in electronics. In the field of computers related equipment, legal restrictions regarding safety and noise generation have grown more strict with each passing year. In most cases, electronic devices exported must now conform to the noise regulations of the target country in order for them to be given market approval.

The following is an introductory description of the ways in which noise is generated and the various noise regulations currently enforced throughout the world.

NOISE GENERATION AND TRANSMISSION

The noise generated by electronic devices consists of two kinds. **Radiated noise** is transmitted directly into the air from an electronic device, taking the form of an electric wave that interferes with other electronic devices. In contrast **Conductive noise** interferes with other components and devices by being transmitted along power lines and the wiring of electronic circuits. These two kinds of noise can be briefly explained in the context of an electronic device by means of the following diagram (Figure 1).

A) Electronic device

1. Conductive noise from electric power line.
2. Conductive noise along the signal lines connecting electronic devices.
3. Radiated noise transmitted from an electronic device which interferes with another device.
4. Radiated noise picked up and generated by the power line which acts as an antenna.
5. Radiated noise picked up and generated by the signal lines which act as an antenna.
6. Noise produced from a source within the electronic device.
7. Noise entering from the ground line..

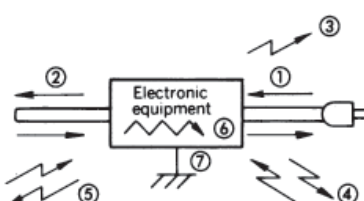


Figure 1

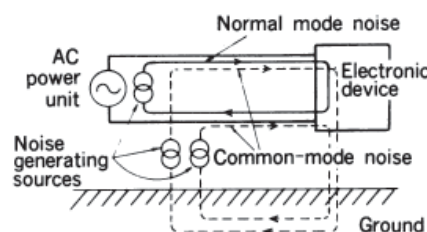


Figure 2

As shown in Figure 2, conductive noise can also be divided into two types, normal mode noise involving symmetrical noise components oscillating between lines (L1-L2) and common mode noise involving asymmetrical noise components transmitted between a line and ground (L1-E, L2- E).

OPERATING PRINCIPLES OF NOISE FILTERS

A key counter measure taken against noise is the use of noise filters. The operating principles of these devices are described in the following:

Viewed from the perspective of the circuit network, the noise filter is a kind of low range or low pass filter. It is designed to pass only frequencies lower than the cut off frequency of the filter, while attenuating or blocking all ranges higher than the cut off frequency.

As shown in Figure 3, the filter operates according to a principle whereby inductance connected directly in series with the line has virtually no affect on the noise current at low frequencies, but at high frequencies it demonstrates a high interruptive effect with respect to the noise current.

Also, a capacitor connected in parallel with the line is used as a side path to return high frequency back to the power line. The result is that normal mode noise passes through the capacitor and is shunted back to the other line. In the case of common mode noise, the result is that the noise passes through the midpoint of the two capacitors to ground.

The use of special materials such as amorphous alloys and toroidal cores gives the Okaya noise filters excellent insertion loss characteristics and high voltage pulse attenuation capability.

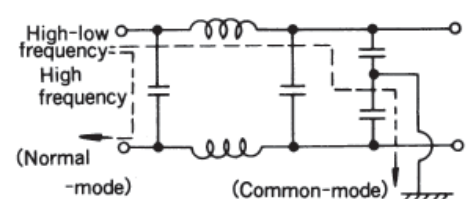


Figure 3

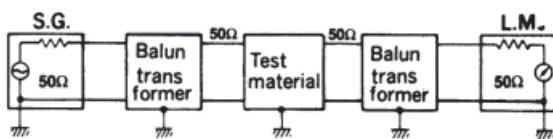


EVALUATION METHODS OF NOISE FILTER CHARACTERISTICS

1. Static Characteristics

With a measuring impedance of 50 ohms, the amount of attenuation (insertion loss) is determined by using a level meter to measure the voltage before and after insertion of a noise filter into the test circuit. Using this method, both normal mode and common mode attenuation can be measured.

Measuring Circuit

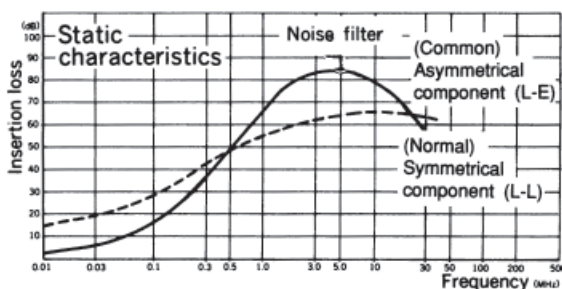


$$\text{Attenuation} = 20 \log_{10} (V_2 / V_1) \text{ [dB]}$$

V1 Level when test material is inserted

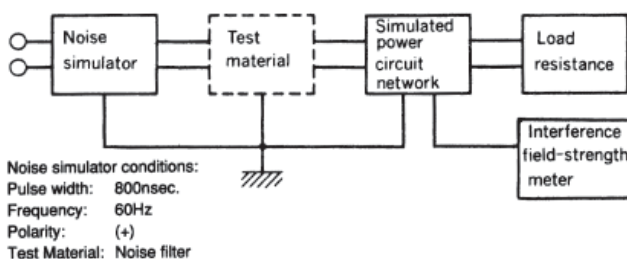
V2 Level when test material is not inserted

Test material: Noise filter.



2. Dynamic Characteristics

In order to achieve measurement results as near as possible to actual application conditions, the following method is used: With a noise simulator as the noise generating source, a rated current is allowed to flow through the test device and a simulated power circuit network. The amount of normal mode and common mode attenuation is measured.

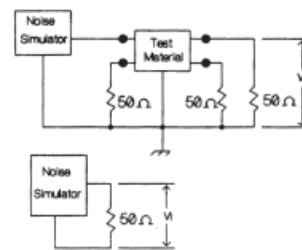


3. Pulse Attenuation Characteristics

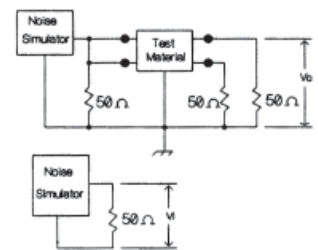
The following method is used to measure the noise margin for the external noise in an electronic device: a noise simulator is connected and the input/output voltages are measured. The formula noted below is then used to calculate the amount of attenuation in the form of the pulse absorption effect produced. In general, the noise condition used to test malfunctions is a high voltage pulse of 50nsec. to 1μsec at 1,000V to 2,000V in amplitude.

$$\text{Attenuation} = 20 \log_{10} (V_o / V_i) \text{ [dB]}$$

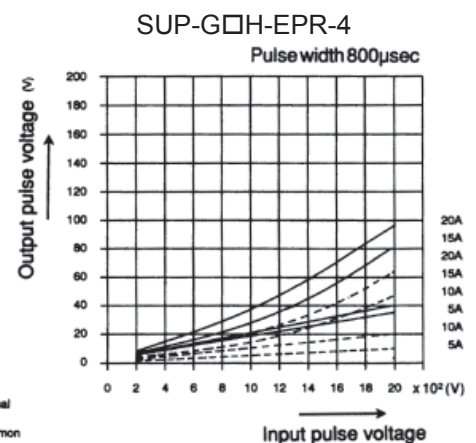
Normal Mode



Common Mode



TVSS characteristics





APPLICATION PRECAUTIONS

The following points should be kept in mind with regard to the installation of noise filters.

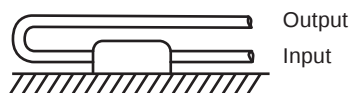
1. When mounting on the noise producing side, they should be mounted as close as possible to the source of the noise with noise electrical or mechanical contact between the input and output side of the filter.

(Example) When the input/output lines are bundled together or arranged parallel with each other, high frequency noise components induced on the input side, results in the production of noise current on the output side.

Separation of input/output lines (good example)



Bundling or parallel arrangement of input/output lines (poor example)



2. When the device is directly installed on the equipment exposed to interference, it is important to mount the noise filter as close as possible to the machines power unit or input wiring. If a power line is allowed to enter the case of the equipment without passing through the noise filter, noise current can be radiated throughout the inside of the equipment enclosure, affecting the internal electronics.
3. Precautions should be taken to insure that the ground line for the noise filter has a lower impedance than that of the noise current. If this is not done, the noise prevention effect will be lost. Also, ground lines should be as short as possible. The use of long ground lines will result in substantial reduction of the noise prevention effects (particularly in the high frequency ranges above several MHz.).
4. Whenever possible, the outer case of the noise filter should be mounted directly to the outer case of the electronic equipment. When this is not possible, a short grounding line should be used to link the outer case of the filter and the equipment.



Features

- Terminal preventing loosening screw
- Two type of inductance coil is available: F means Ferrite H means High-μ
- The capacitance of Y cap is selectable
- DIN rail type is option

Applications

- Medical devices, Information processing devices, Office appliances, and Various control systems



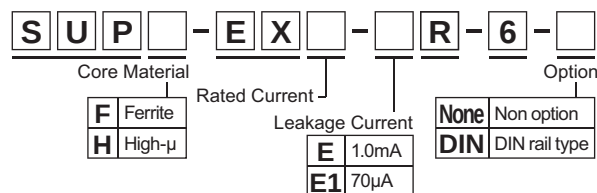
- DIN rail type (option)



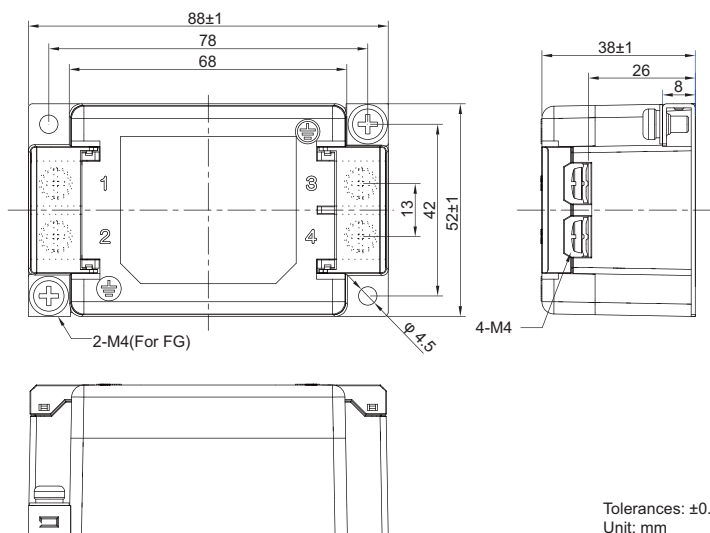
Safety Standard		File No.
UL	:UL1283	E78644
cUL	:C22.2, No.8-M1986	
SEMKO	:EN60939	SE/0142-31

The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard.

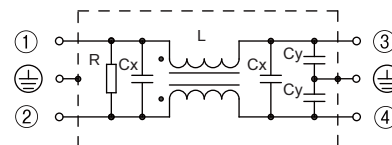
- Model numbering system



- Dimensions



- Circuit



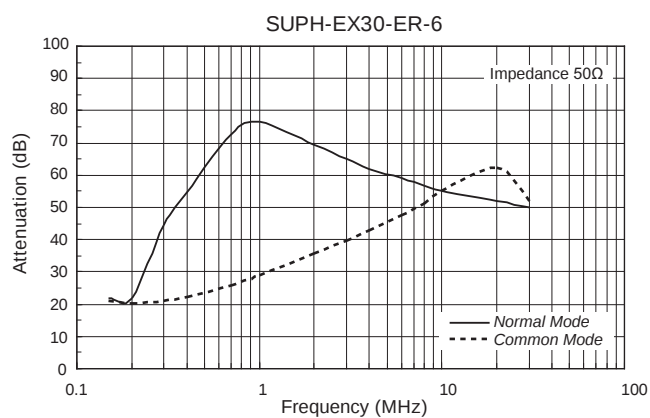
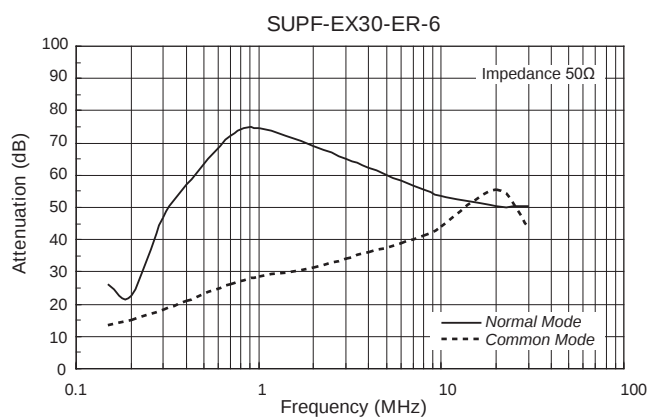
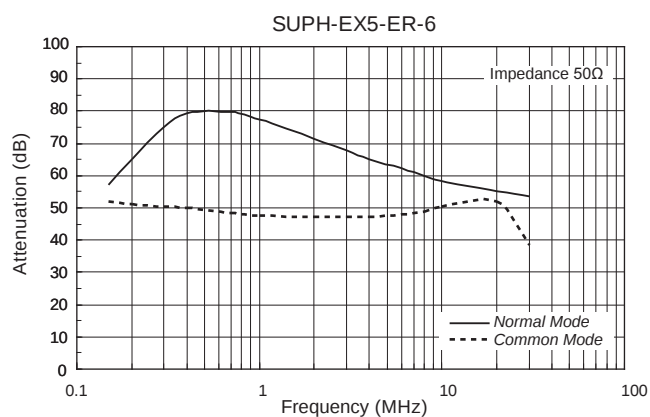
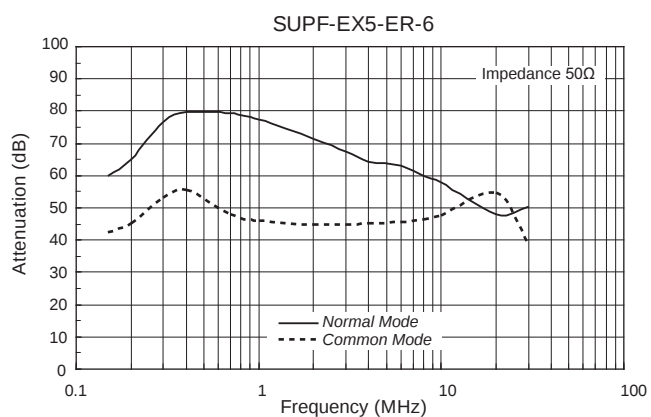
Electrical Specifications

Rated Voltage **250Vac**

Safety Standard	Model Number	Rated Current (A)	Test Voltage	Insulation Resistance	Leakage Current max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Weight typ.(g)	
cUL [®] US  	SUP□-EX5-ER-6	5	Line to Line 1,000Vac 50/60Hz 60sec	Line to Ground 300MΩmin (at 500Vdc)	1.0mA (at 250Vac, 60Hz)	1.0Vac	45K	-25 ~ +55 (100°C with Temp. rise)	210	
	SUP□-EX10-ER-6	10								
	SUP□-EX15-ER-6	15								
	SUP□-EX20-ER-6	20								
	 ¹⁴	SUP□-EX30-ER-6	30		Line to Ground 3,000Vac 50/60Hz 60sec					70μA (at 250Vac, 60Hz)
	SUP□-EX5-E1R-6	5								
	SUP□-EX10-E1R-6	10								
	SUP□-EX15-E1R-6	15								
	SUP□-EX20-E1R-6	20								
	SUP□-EX30-E1R-6	30								

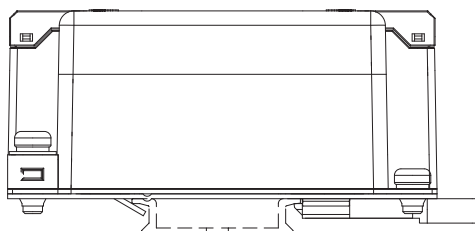
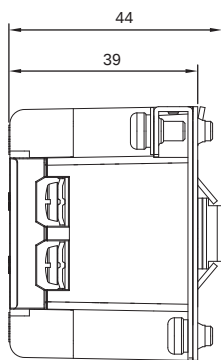
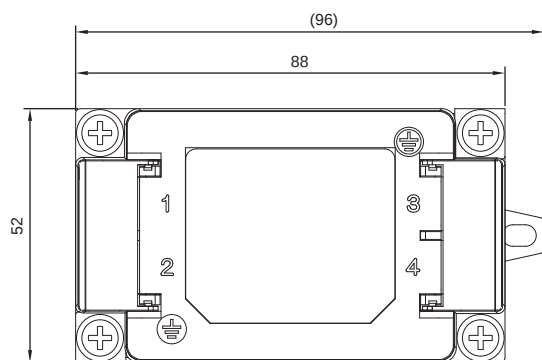
□= F: Ferrite, H: High-μ

• Static characteristics (Representative example)



• Dimensions

DIN rail type (option)



Tolerances: ± 0.5
Unit: mm

• Note when installing EMI filter on DIN rail

Even though the ground connects correctly through the DIN rail, may not get noise attenuation. Be sure to connect the FG ground of EMI filter to the ground directory.

Features

- IEC60601 compliance (250Vac Line)
- Terminal preventing losing screw
- Two type of inductance coil is available: F means Ferrite H means High-μ
- The capacitance of Y cap is selectable
- DIN rail type is option

Applications

- Medical devices, Information processing devices, Office appliances, and Various control systems



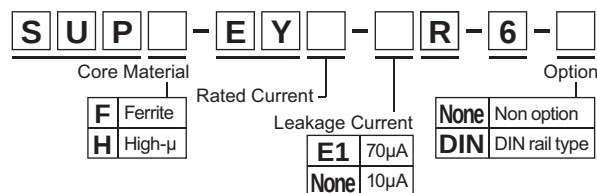
- DIN rail type (option)



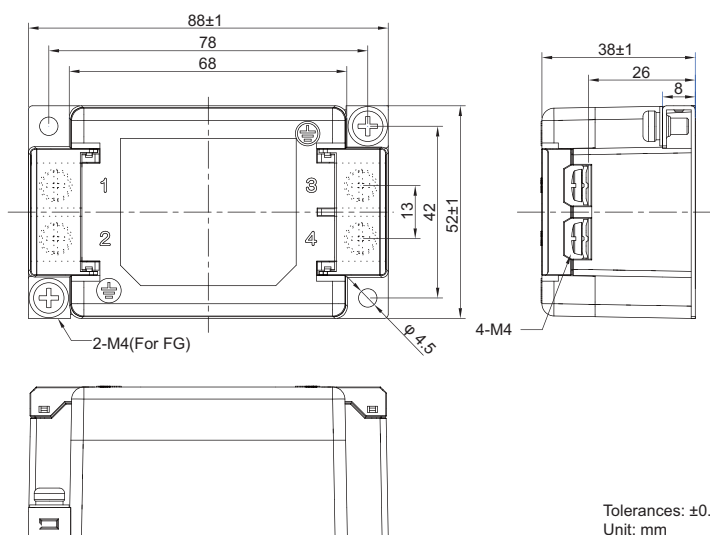
Safety Standard		File No.
UL	:UL1283	E78644
cUL	:C22.2, No.8-M1986	
SEMKO	:EN60939	SE/0142-31

The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard.

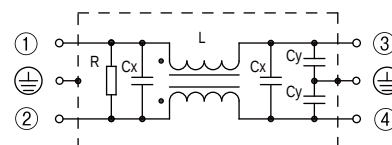
- Model numbering system



- Dimensions



- Circuit



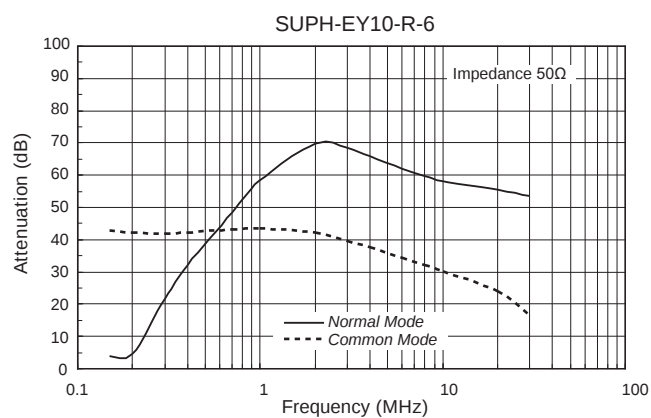
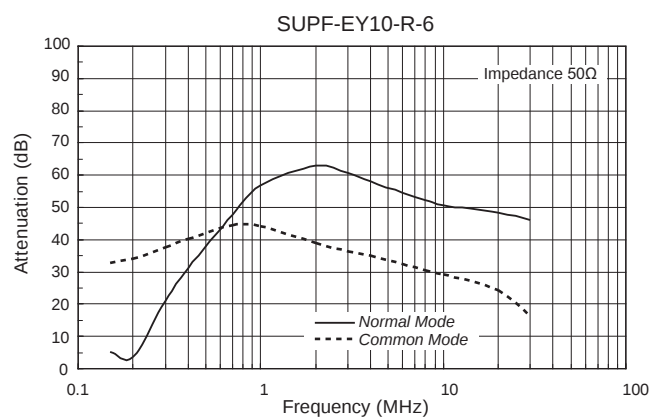
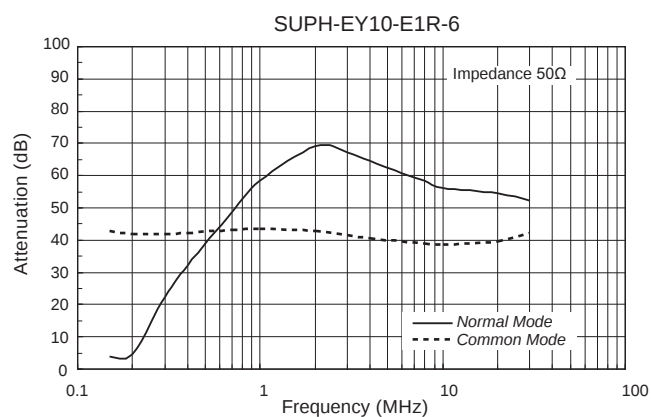
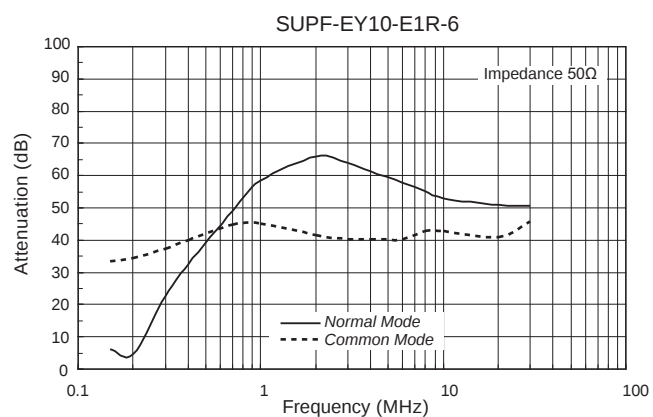
Electrical Specifications

Rated Voltage **250Vac**

Safety Standard	Model Number	Rated Current (A)	Test Voltage	Insulation Resistance	Leakage Current max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Weight typ.(g)
cUL [®] US  	SUP□-EY5-E1R-6	5	Line to Line 1,500Vac 50/60Hz 60sec	Line to Ground 300MΩmin (at 500Vdc)	70μA (at 250Vac, 60Hz)	1.0Vac	45K	-25 ~ +55 (100°C with Temp. rise)	210
	SUP□-EY10-E1R-6	10							
	SUP□-EY15-E1R-6	15							
	SUP□-EY20-E1R-6	20							
	SUP□-EY30-E1R-6	30	Line to Ground 4,000Vac 50/60Hz 60sec		10μA (at 250Vac, 60Hz)				
	SUP□-EY5-R-6	5							
	SUP□-EY10-R-6	10							
	SUP□-EY15-R-6	15							
	SUP□-EY20-R-6	20							
	SUP□-EY30-R-6	30							

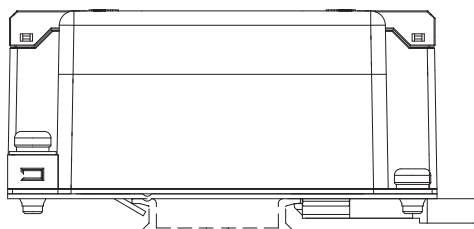
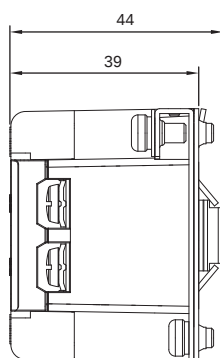
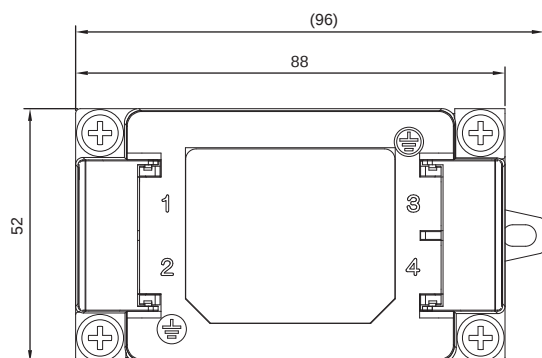
□= F: Ferrite, H: High-μ

• Static characteristics (Representative example)



• Dimensions

DIN rail type (option)



Tolerances: ± 0.5
Unit: mm

- Note when installing EMI filter on DIN rail
Even though the ground connects correctly through the DIN rail, may not get noise attenuation. Be sure to connect the FG ground of EMI filter to the ground directory.

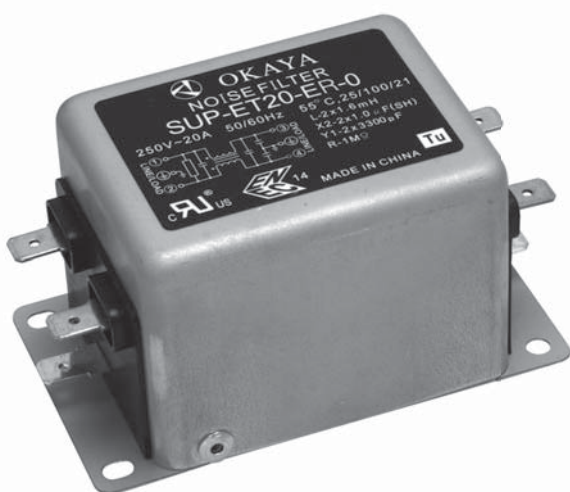


Features

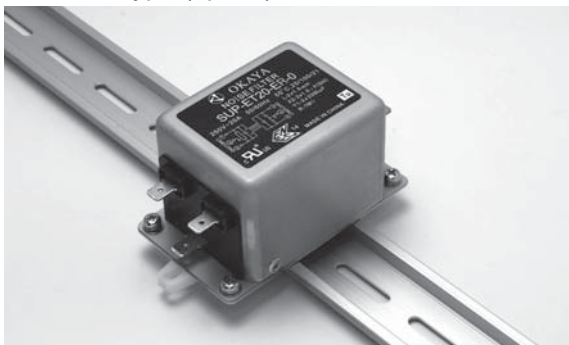
- Wiring with Faston terminal
- High attenuation by using a ferrite core with broad frequency characteristic
- Wide rating up (5, 8, 10, 15, 20 Ampere)
- Bleeder resistor for electric shock protection
- DIN rail type is option

Applications

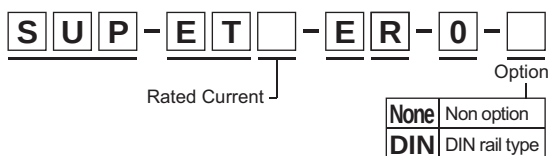
- Information processing machines, Copiers, Fax machines, and Various control systems



- DIN rail type (option)



- Model numbering system



Electrical Specifications

Rated Voltage **250Vac**

Safety Standard	Model Number	Rated Current (A)	Test Voltage	Insulation Resistance	Leakage Current max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Insertion losses		Weight typ.(g)
									Normal Mode (MHz)	Common Mode (MHz)	
	SUP-ET5-ER-0	5	Line to Case 1,500Vac 50/60Hz 60sec	Line to Case 100MΩmin (at 500Vdc)	0.6mA (at 250Vac 60Hz)	1.0Vac	45K	-25 ~ +55 (100°C with Temp. rise)	0.2 ~ 20	0.15 ~ 20	250
	SUP-ET8-ER-0	8								0.2 ~ 20	
	SUP-ET10-ER-0	10								0.5 ~ 20	
	SUP-ET15-ER-0	15								2.0 ~ 20	
	SUP-ET20-ER-0	20								2.0 ~ 20	

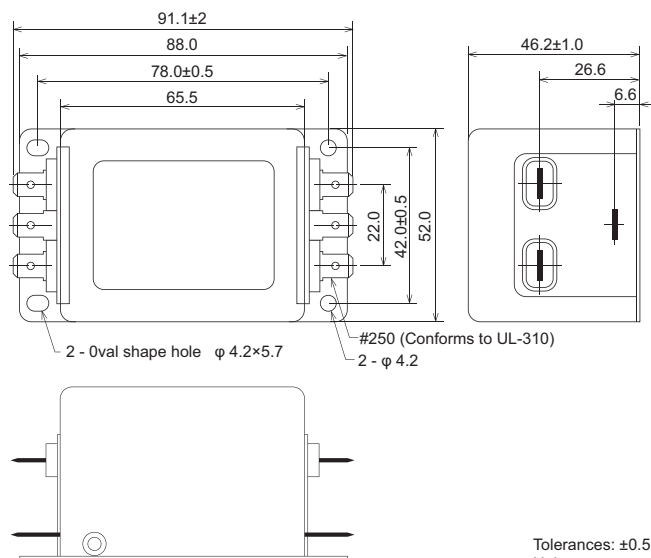
Guaranteed attenuation is more than 40dB in normal mode and more than 30dB in common mode.



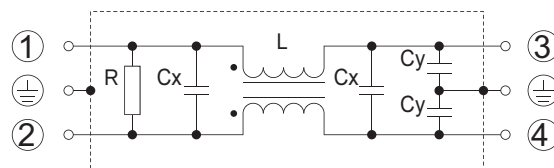
Safety Standard		File No.
UL	:UL1283	E78644
cUL	:C22.2, No.8-M1986	
SEMKO	:EN60939	SE/0142-2

The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard.

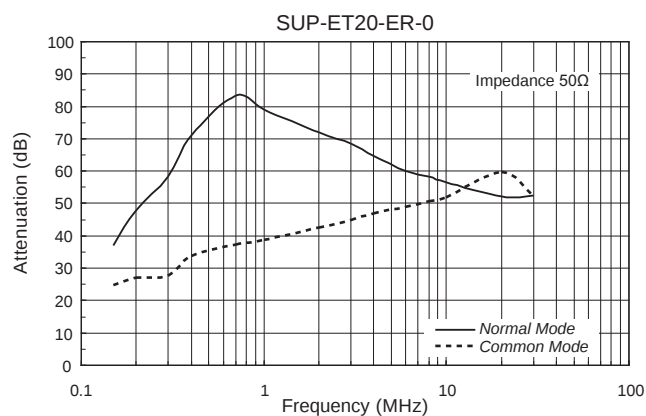
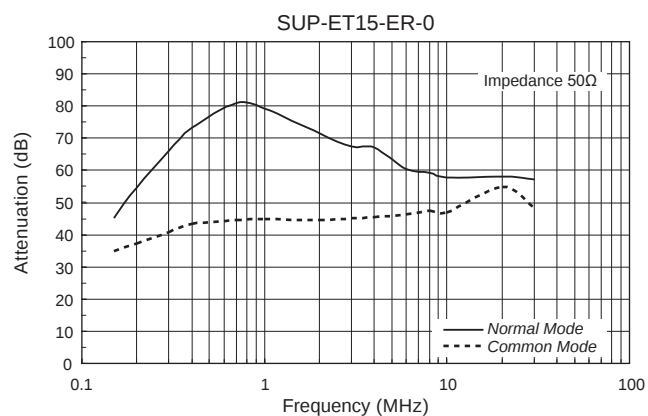
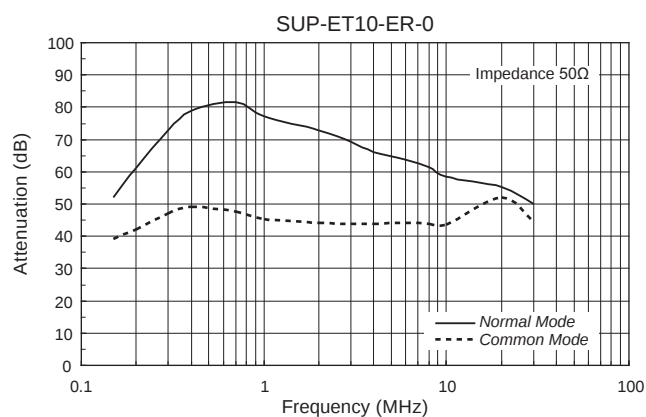
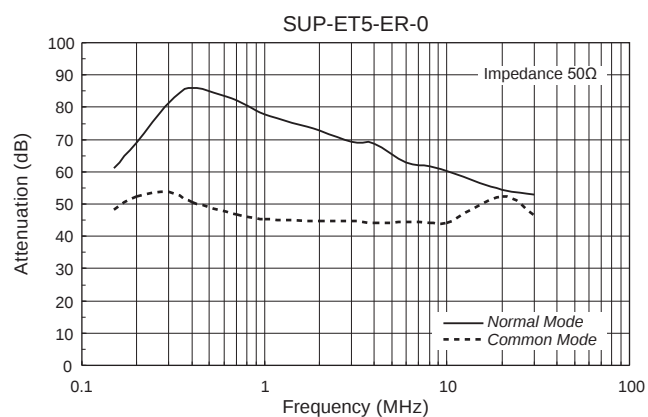
Dimensions (5 ~ 20A)



Circuit

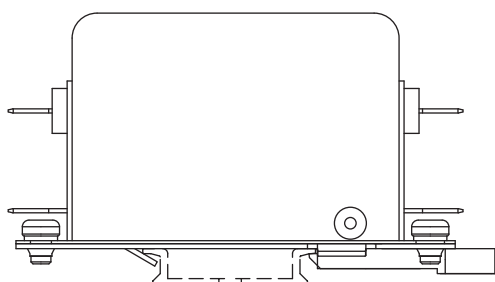
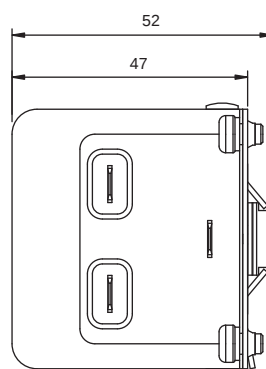
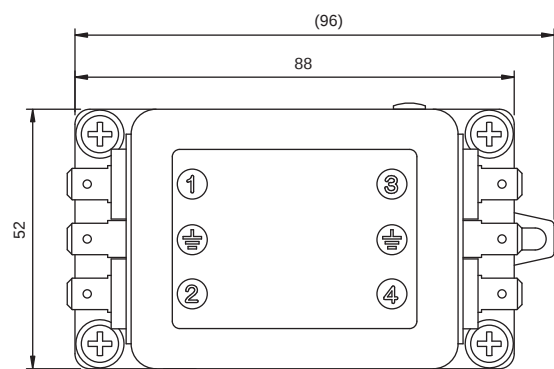


• Static characteristics (Representative example)



• Dimensions

DIN rail type (option)



Tolerances: ± 0.5
Unit: mm

- Note when installing EMI filter on DIN rail
Even though the ground connects correctly through the DIN rail, may not get noise attenuation. Be sure to connect the FG ground of EMI filter to the ground directory.



Features

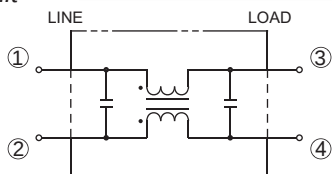
- Leak current lower than $10\mu\text{A}$ (250Vac, 60Hz),
The best for medical equipment.
- High performance magnetics for pulse absorption.
- High insertion loss characteristics.

Applications

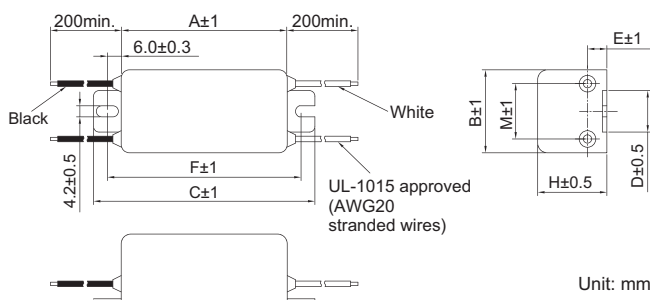
- Medical equipments, Printers, Copiers, Office appliances, Measuring devices and Control systems.

SUP-E□H Series (PVC wire)
(1~3A)

Circuit



Dimensions



Model Number	A	B	C	D	E	F	H	M
SUP-E1H	60	30	80	15	7.0	70	25	20
SUP-E2H		40		20				
SUP-E3H								

Electrical Specifications

Safety Standard	Model Number	Rated Current (A)	Test Voltage	Insulation Resistance	Leakage Current max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Insertion losses		Weight typ.(g)
									Normal Mode (MHz)	Common Mode (MHz)	
	SUP-E1H	1	Line to Line 1,100Vac 50/60Hz 60sec	Line to Line 3,000MΩmin	10μA (at 250Vac 60Hz)	1.0Vac	30K	-25 ~ +55 (85°C with Temp.rise)	0.7 ~ 30	-	100
	SUP-E2H	2								-	
	SUP-E3H	3								-	
	SUP-E5H(1/2)	5	Line to Case 2,240Vac 50/60Hz 60sec	Line to Case 6,000MΩmin (at 500Vdc)			35K	-25 ~ +50 (85°C with Temp. rise)	0.8 ~ 20	-	270
	SUP-E10H(1/2)	10							1.0 ~ 30	-	
	SUP-E15H(1/2)	15							1.5 ~ 30	-	
	SUP-E20H(1/2)	20								-	

Guaranteed attenuation is more than 40dB.



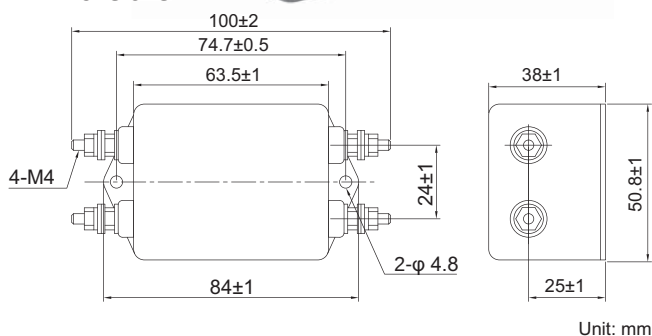
Safety Standard		File No.
UL	:UL1283 / UL544	E78644
CSA	:C22.2, No.8-M1986	LR60681
SEMKO	:EN60939	SE/0142-13 SE/0142-14

UL-544 is the standard of medical equipments.
The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard.

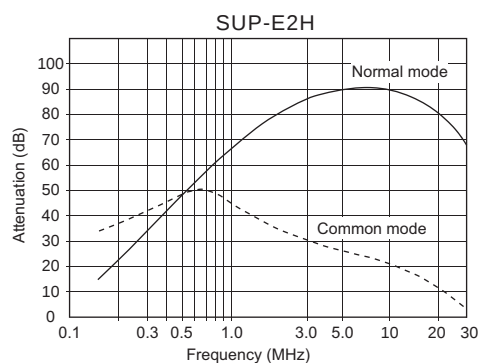
SUP-E□H Series (Screw) - 0 (Faston® terminal)
(5~15A, 20A) - 2 (Solder terminal)



Dimensions



Static characteristics (Representative example)

Rated Voltage **250Vac**



Features

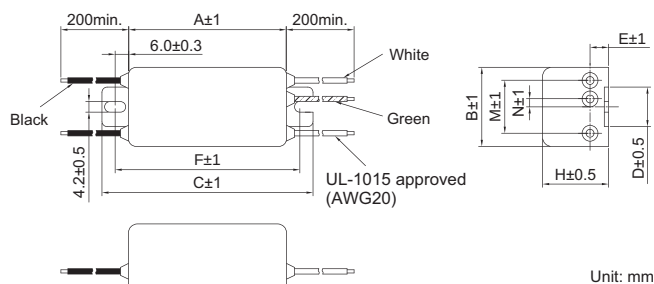
- High performance magnetics for pulse absorption (20dB attenuation at 1,000V pulse).
- High insertion loss characteristics.

Applications

- PCs, Copiers, Printers, Office appliances, Measuring devices and Control systems.

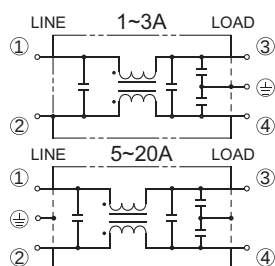
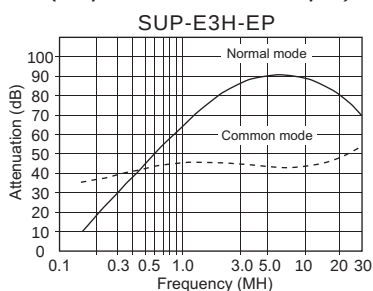
SUP-E□H-EP Series (PVC wire)
(1~3A)

• Dimensions



Model Number	A	B	C	D	E	F	H	M	N
SUP-E1H-EP	60	30	80	15	7.0	70	25	20	3
SUP-E2H-EP		40		20				25	4
SUP-E3H-EP									

• Circuit

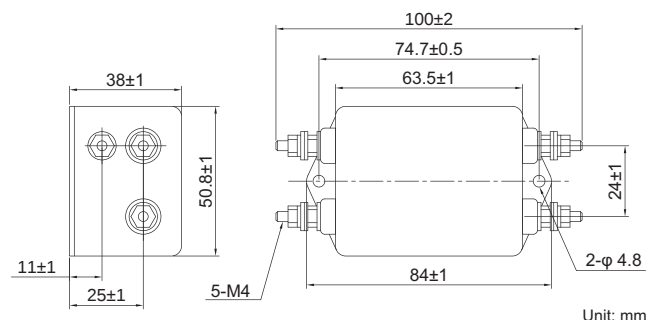
• Static characteristics
(Representative example)

Safety Standard	File No.
UL :UL1283	E78644
CSA :C22.2, No.8-M1986	LR60681
SEMKO :EN60939	SE/0142-13 SE/0142-14

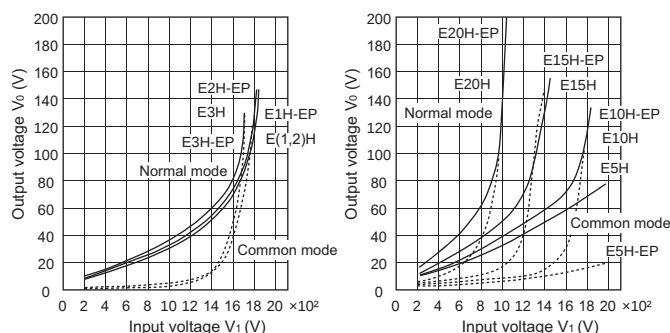
The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard.

SUP-E□H-EP Series (Screw terminal)
(5~15A, 20A)

• Dimensions



• TVSS Characteristics Pulse width 800nsec



Electrical Specifications

Safety Standard	Model Number	Rated Current (A)	Test Voltage	Insulation Resistance	Leakage Current max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Insertion losses		Weight typ.(g)
									Normal Mode (MHz)	Common Mode (MHz)	
	SUP-E1H-EP	1	Line to Line 1,100Vac 50/60Hz 60sec	Line to Line 3,000MΩmin	0.6mA (at 250Vac 60Hz)	1.0Vac	30K	-25 ~ +55 (85°C with Temp. rise)	0.7 ~ 30	0.7 ~ 30	105
	SUP-E2H-EP	2									
	SUP-E3H-EP	3									135
	SUP-E5H-EP	5	Line to Case 2,240Vac 50/60Hz 60sec	Line to Case 6,000MΩmin (at 500Vdc)			35K	-25 ~ +50 (85°C with Temp. rise)	0.8 ~ 30	1.5 ~ 30	270
	SUP-E10H-EP	10							1.0 ~ 30	2.0 ~ 30	
	SUP-E15H-EP	15							1.5 ~ 30	6.0 ~ 30	
	SUP-E20H-EP	20									

Guaranteed attenuation is more than 40dB in normal mode, more than 40dB at 1~3A and more than 35dB at 5~20A in common mode.

Features

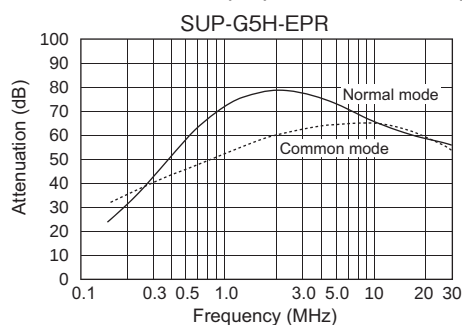
- Amorphous alloy core material (20dB attenuation of 2,000V).
- Three terminal styles (Faston®, solder and screw).
- Bleeder resistor for electric shock protection.

Applications

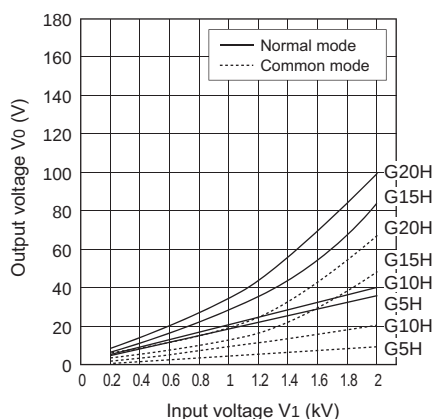
- PCs, Copiers, Office appliances, Measuring devices and Control systems.



- *Static characteristics (Representative example)*



- *TVSS characteristics*



Electrical Specifications

Safety Standard	Model Number	Rated Current (A)	Test Voltage	Insulation Resistance	Leakage Current max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Insertion losses		Weight typ.(g)	
									Normal Mode (MHz)	Common Mode (MHz)		
   	SUP-G5H-EPR(- ² / ₄)	5	L to L 1,000Vac	Line to Case 6,000MΩmin (at 500Vdc)	0.6mA (at 250Vac 60Hz)	1.0Vac	30K	-25 ~ +55*	0.4 ~ 30	0.7 ~ 30	270	
	SUP-G10H-EPR(- ² / ₄)	10	50/60Hz 60sec									
	SUP-G15H-EPR(- ² / ₄)	15	Line to Case 2,000Vac							0.5 ~ 30	0.8 ~ 30	640
	SUP-G20H-EPR(- ² / ₄)	20	50/60Hz 60sec							0.6 ~ 30	0.7 ~ 30	

Guaranteed attenuation is more than 30dB.
*85°C with Temp. rise.



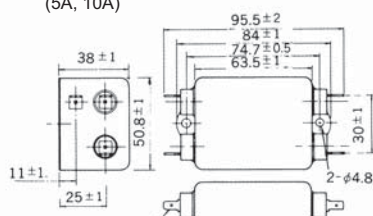
Safety Standard	File No.
UL :UL1283	E78644
CSA :C22.2, No.8-M1986	LR60681
SEMKO :EN60939	SE/0142-23

The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard.

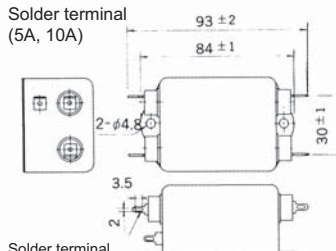
- SUP-G□H-EPR Series (Faston® terminal)
- SUP-G□H-EPR-2 Series (Solder terminal)
- SUP-G□H-EPR-4 Series (Screw terminal)

- *Dimensions*

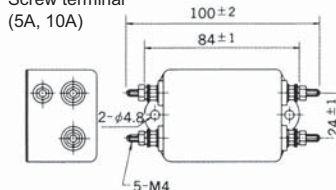
Faston® terminal
(5A, 10A)

Faston
(#250)

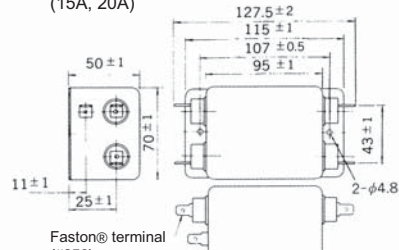
Solder terminal
(5A, 10A)



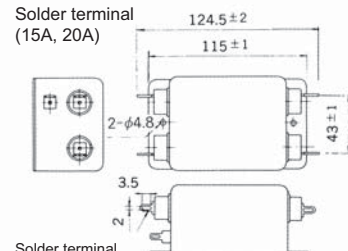
Screw terminal
(5A, 10A)



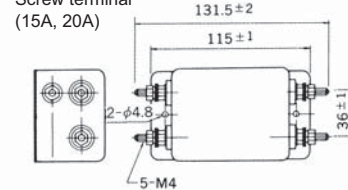
Faston® terminal
(15A, 20A)

Fastor
(#250)

Solder terminal
(15A, 20A)

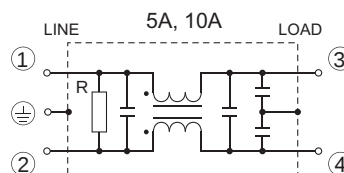


Screw terminal
(15A, 20A)

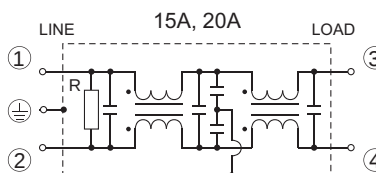


Unit: mm

- *Circuit*



Bleeder resistor R: 470k Ω



Bleeder resistor R: 470kΩ

Features

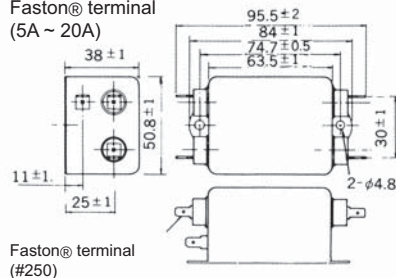
- Low range high attenuation effects by super high μ material (20~30dB at 10,000Hz). Excellent pulse absorption (more than 25dB attenuation with 1,500V pulse).
- Three terminal styles (Faston®, solder and screw).
- Bleeder resistor for electric shock protection.

Applications

- Information processing devices (for Europe), Office appliances and Various control systems.
- SUP-PH-EPR-0 Series (Faston® terminal)
- SUP-PH-EPR-2 Series (Solder terminal)
- SUP-PH-EPR-4 Series (Screw terminal)

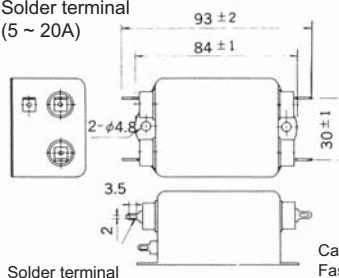
Dimensions

Faston® terminal
(5A ~ 20A)



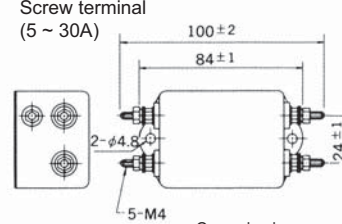
Faston® terminal
(#250)

Solder terminal
(5 ~ 20A)



Solder terminal

Screw terminal
(5 ~ 30A)

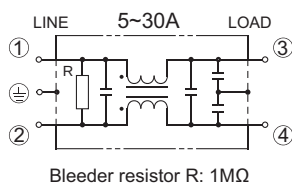


Case size is same size of
Faston® terminal type

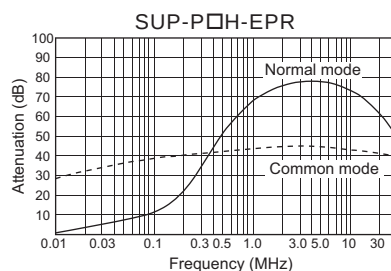
Unit: mm

Static characteristics (Representative example)

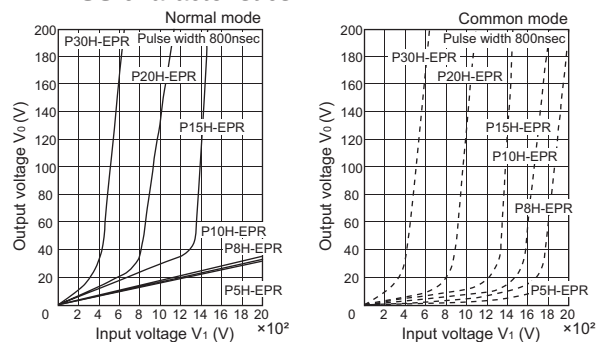
Circuit



Bleeder resistor R: 1MΩ



TVSS characteristics



Electrical Specifications

Safety Standard	Model Number	Rated Current (A)	Test Voltage	Insulation Resistance	Leakage Current max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Insertion losses		Weight typ.(g)
									Normal Mode (MHz)	Common Mode (MHz)	
 	SUP-P5H-EPR ^(-0/-2/-4)	5	Line to Line 1,000Vac 50/60Hz 60sec Line to Case 2,000Vac 50/60Hz 60sec	Line to Case 6,000MΩmin (at 500Vdc)	0.6mA (at 250Vac 60Hz)	1.0Vac	35K	-25~ +50 (85°C with Temp. rise)	0.5 ~ 30	0.2 ~ 30	275
	SUP-P8H-EPR ^(-0/-2/-4)	8							0.6 ~ 30	0.3 ~ 30	
	SUP-P10H-EPR ^(-0/-2/-4)	10							0.7 ~ 30	0.4 ~ 20	
	SUP-P15H-EPR ^(-0/-2/-4)	15							0.9 ~ 30	0.7 ~ 30	
	SUP-P20H-EPR ^(-0/-2/-4)	20							1.5 ~ 30	3.0 ~ 30	
	*SUP-P30H-EPR-4	30							3.0 ~ 30	5.0 ~ 30	

Guaranteed attenuation is more than 40dB in normal mode and more than 35dB in common mode.

*only screw terminal type



SUP-PH-E1PR / -R SERIES

NOISE FILTERS



Features

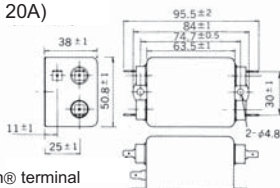
- Low range high attenuation effects by super high μ material (20~30dB at 10,000Hz). Excellent pulse absorption (more than 25dB attenuation with 1,500V pulse).
- Two types of leakage current
 - less than 70 μ A
 - less than 10 μ A (applies to medical equipment)
- Three terminal styles (Faston®, solder and screw).
- Bleeder resistor for electric shock protection.

Applications

- Information processing devices (for Europe), Medical equipments, Office appliances and Various control systems.

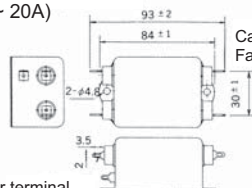
• Dimensions

Faston® terminal
(5A ~ 20A)



Faston® terminal
(#250)

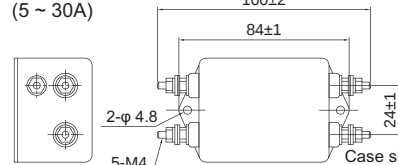
Solder terminal
(5A ~ 20A)



Solder terminal

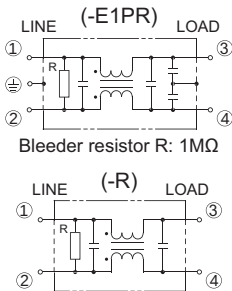
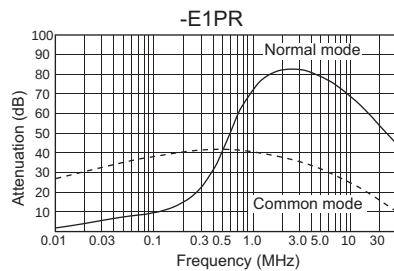
Case size is the same as Faston® terminal type

Screw terminal
(5 ~ 30A)

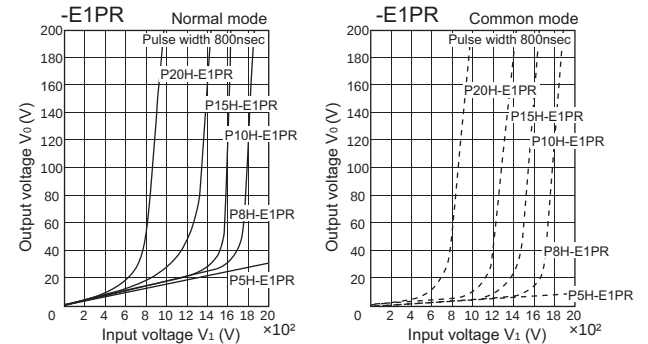


Case size is the same as Faston® terminal type

• Circuit

• Static characteristics
(Representative example)

• TVSS characteristics



Unit: mm

Electrical Specifications

Rated Voltage **250Vac**

Safety Standard	Model Number	Rated Current (A)	Test Voltage	Insulation Resistance	Leakage Current max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Insertion losses		Weight typ.(g)
									Normal Mode (MHz)	Common Mode (MHz)	
UL®	SUP-P5H-E1PR($\frac{5}{3}$)	5	Line to Line 1,000Vac 50/60Hz 60sec	Line to Case 6,000MΩmin (at 500Vdc)	70μA (at 250Vac 60Hz)	1.0Vac	35K	-25~ +50 (85°C with Temp. rise)	0.5 ~ 20	0.05 ~ 20	275
	SUP-P8H-E1PR($\frac{8}{3}$)	8							0.6 ~ 30	0.09 ~ 30	
	SUP-P10H-E1PR($\frac{10}{3}$)	10							0.7 ~ 30	0.1 ~ 30	
CSA®	SUP-P15H-E1PR($\frac{15}{3}$)	15			1.0 ~ 30				3.0 ~ 30		
	SUP-P20H-E1PR($\frac{20}{3}$)	20			1.5 ~ 30						
	*SUP-P30H-E1PR-4	30			3.0 ~ 30					4.0 ~ 30	
SEMCO®	SUP-P5H-R($\frac{5}{3}$)	5	Line to Case 2,000Vac 50/60Hz 60sec	10μA (at 250Vac 60Hz)	0.5 ~ 20	-					
	SUP-P8H-R($\frac{8}{3}$)	8			0.6 ~ 30	-					
	SUP-P10H-R($\frac{10}{3}$)	10			0.7 ~ 30	-					
S	SUP-P15H-R($\frac{15}{3}$)	15			1.0 ~ 30	-					
	SUP-P20H-R($\frac{20}{3}$)	20			1.5 ~ 30	-					
	*SUP-P30H-R-4	30			3.0 ~ 30	-					
E44											

Guaranteed attenuation is more than 40dB in normal mode and more than 35dB in common mode for SUP-PH-E1PR series.
(more than 25dB at 15A and more than 20dB at 20A, 30A)
*only screw terminal type

Features

- Uses wiring-easy terminal block.
- General purpose model made with ferrite core.
- Bleeder resistor for electric shock protection.

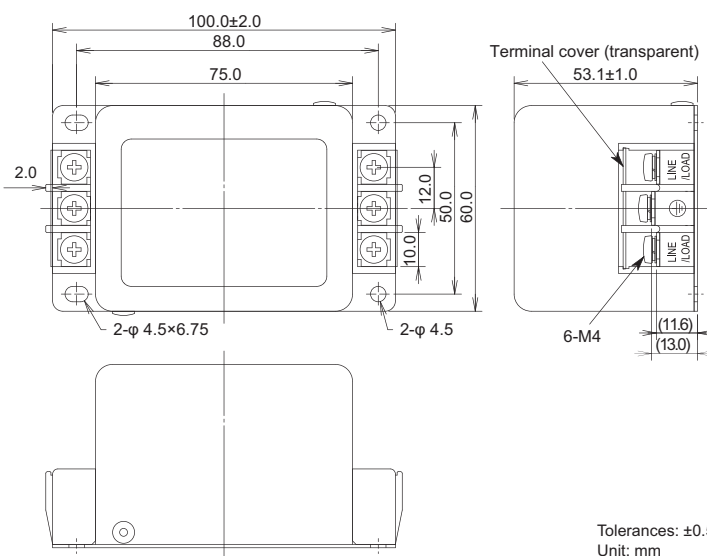
Applications

- Thyristor-applied systems, Fax machines, Game machines, Various control systems and etc.

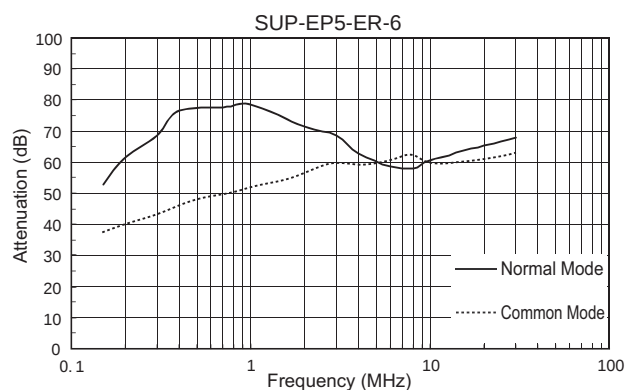


Safety Standard		File No.
UL	:UL1283	E78644
cUL	:C22.2, No.8-M1986	
TÜV	:EN60939	R2-50006831

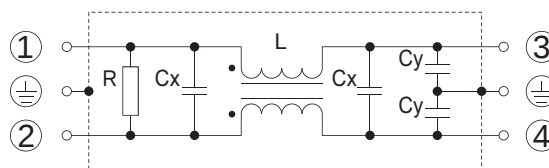
Dimensions (5~30A)



Static characteristics (Representative example)



Circuit (5 ~ 30A)



Electrical Specifications

Rated Voltage **250Vac**

Safety Standard	Model Number	Rated Current (A)	Test Voltage	Insulation Resistance	Leakage Current (max.)	Voltage Drop (max.)	Temperature Rise (max.)	Operating Temperature (°C)	Insertion losses		Weight typ.(g)
									Normal Mode (MHz)	Common Mode (MHz)	
	SUP-EP5-ER-6	5	Line to Case 2,500Vac 50/60Hz 60sec	Line to Case 100MΩmin (at 500Vdc)	1mA (at 250Vac 60Hz)	1.0Vac	45K	-25 ~ +50 (100°C with Temp. rise)	0.15 ~ 30	0.3 ~ 20	450
	SUP-EP10-ER-6	10							0.2 ~ 30	0.4 ~ 20	
	SUP-EP15-ER-6	15							0.3 ~ 30	0.7 ~ 20	
	SUP-EP20-ER-6	20							0.4 ~ 30	2.0 ~ 30	
	SUP-EP30-ER-6	30							0.4 ~ 30	6.0 ~ 30	

Guaranteed attenuation is more than 35dB in normal mode and more than 30dB in common mode.
Available leakage current 70μA max.(250Vac, 60Hz) type for medical equipments and low leakage current equipments.

Features

- Uses wiring-easy terminal block.
- The super high μ core allows high attenuation.
- Bleeder resistor for electric shock protection.

Applications

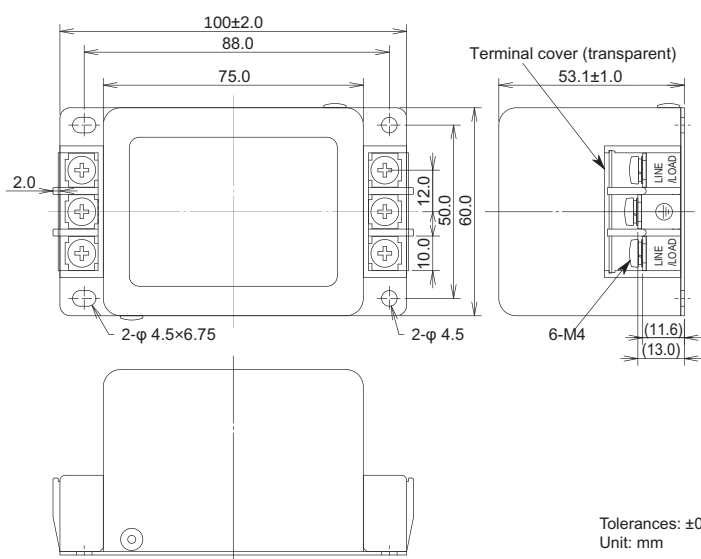
- Information processing devices, Office appliances, Various control systems and etc.



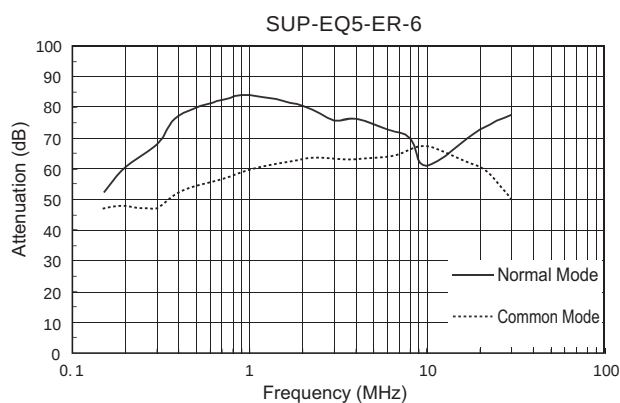
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TÜV	:EN60939	R2-50006839



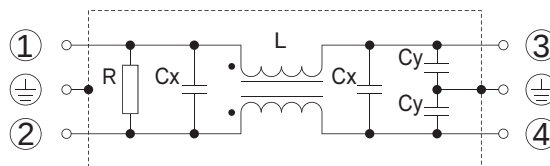
• Dimensions (5~30A)



• Static characteristics (Representative example)



• Circuit (5~30A)



Electrical Specifications

Rated Voltage **250Vac**

Safety Standard	Model Number	Rated Current (A)	Test Voltage	Insulation Resistance	Leakage Current max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Insertion losses		Weight typ.(g)
									Normal Mode (MHz)	Common Mode (MHz)	
	SUP-EQ5-ER-6	5	Line to Case 2,500Vac 50/60Hz 60sec	Line to Case 100MΩmin (at 500Vdc)	1mA (at 250Vac 60Hz)	1.0Vac	45K	-25 ~ +55 (100°C with Temp. rise)	0.15 ~ 30	0.15 ~ 20	450
	SUP-EQ10-ER-6	10							0.2 ~ 30	0.6 ~ 20	
	SUP-EQ15-ER-6	15							0.4 ~ 30	1.0 ~ 30	
	SUP-EQ20-ER-6	20									
	SUP-EQ30-ER-6	30									

Guaranteed attenuation is more than 30dB in normal mode and common mode.
Available leakage current 70 μ A max.(250Vac, 60Hz) type for medical equipments and low leakage current equipments.

Features

- Uses wiring-easy terminal block.
- High attenuation over a broad band range by two-stage ferrite core circuit construction.
- Wide range lineup (5 to 30A).
- Bleeder resistor for electric shock protection.

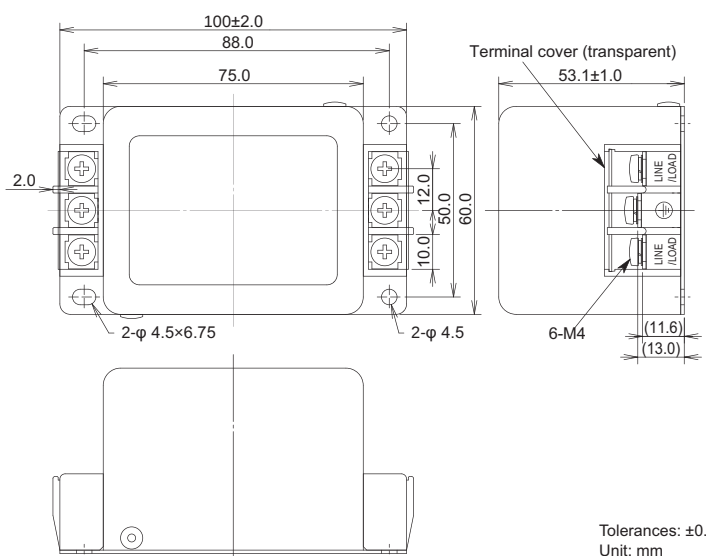
Applications

- Information processing devices, Office appliances, Various control systems and etc.

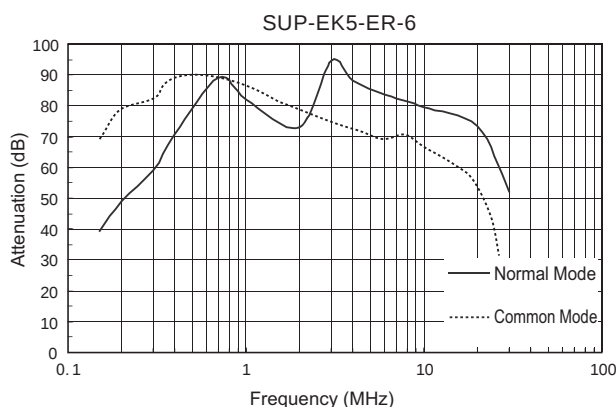


Safety Standard		File No.
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cUL	:C22.2, No.8-M1986	
TÜV	:EN60939	R2-50006837

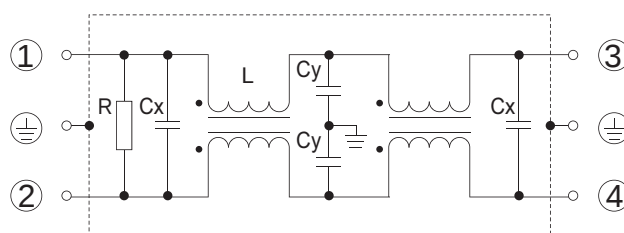
• Dimensions (5~30A)



• Static characteristics (Representative example)



• Circuit (5 ~ 30A)



Electrical Specifications

Rated Voltage **250Vac**

Safety Standard	Model Number	Rated Current (A)	Test Voltage	Insulation Resistance	Leakage Current max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Insertion losses		Weight typ.(g)
									Normal Mode (MHz)	Common Mode (MHz)	
	SUP-EK5-ER-6	5	Line to Case 2,500Vac 50/60Hz 60sec	Line to Case 100MΩmin (at 500Vdc)	1mA (at 250Vac 60Hz)	1.0Vac	45K	-25 ~ +50 (100°C with Temp. rise)	0.4 ~ 20	0.15 ~ 10	500
	SUP-EK10-ER-6	10							0.5 ~ 30	0.2 ~ 10	
	SUP-EK15-ER-6	15							0.6 ~ 30	0.4 ~ 10	
	SUP-EK20-ER-6	20							*0.6 ~ 30	*2.0 ~ 30	
	SUP-EK30-ER-6	30									

Guaranteed attenuation is more than 40dB in normal and common mode. (*more than 35dB)
Available leakage current 70μA max.(250Vac, 60Hz) type for medical equipments and low leakage current equipments.

Features

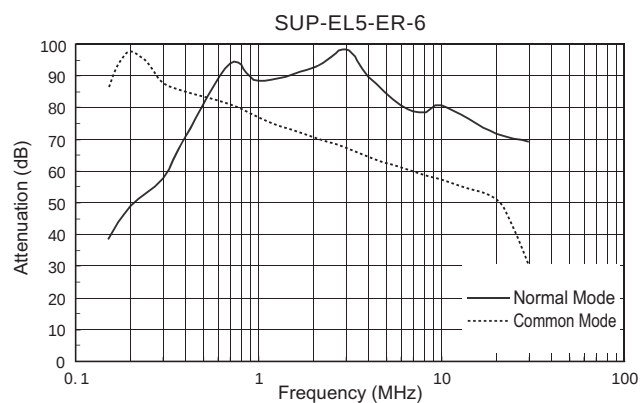
- Uses wiring-easy terminal block.
- The two stage super high μ core allows high attenuation over a broad band range.
- Wide range lineup (5 to 30A).
- Bleeder resistor for electric shock protection.

Applications

- Information processing devices, Office appliances, Various control systems and etc.

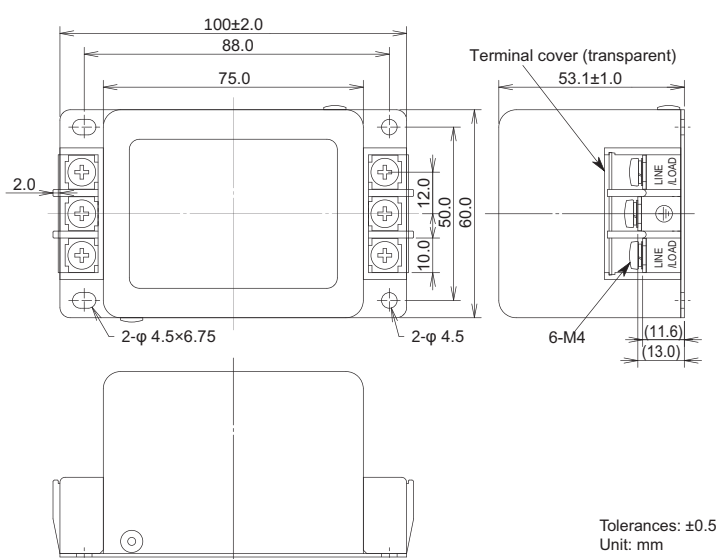


- Static characteristics (Representative example)

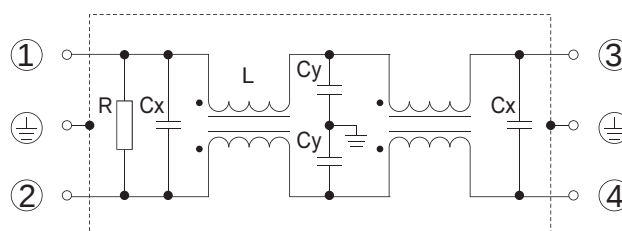


Safety Standard		File No.
UL	:UL1283	E78644
cUL	:C22.2, No.8-M1986	
TÜV	:EN60939	R2-50006835

- Dimensions (5~30A)



- Circuit (5~30A)



Electrical Specifications

Rated Voltage **250Vac**

Safety Standard	Model Number	Rated Current (A)	Test Voltage	Insulation Resistance	Leakage Current max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Insertion losses		Weight typ.(g)
									Normal Mode (MHz)	Common Mode (MHz)	
 	SUP-EL5-ER-6	5	Line to Case 2,500Vac 50/60Hz 60sec	Line to Case 100MΩmin (at 500Vdc)	1mA (at 250Vac 60Hz)	1.0Vac	45K	-25 ~ +55 (100°C with Temp. rise)	0.4 ~ 30	0.15 ~ 10	500
	SUP-EL10-ER-6	10							0.6 ~ 30	0.3 ~ 10	
	SUP-EL15-ER-6	15							0.7 ~ 30	0.4 ~ 10	
	SUP-EL20-ER-6	20							*1.0 ~ 30	*1.0 ~ 20	
	SUP-EL30-ER-6	30									

Guaranteed attenuation is more than 40dB in normal mode and common mode. (*more than 35dB)
Available leakage current 70μA max.(250Vac, 60Hz) type for medical equipments and low leakage current equipments.

Features

- Uses wiring-easy terminal block.
- General purpose model made with ferrite core.
- Wide range lineup (5 to 30A).
- Bleeder resistor for electric shock protection.

Applications

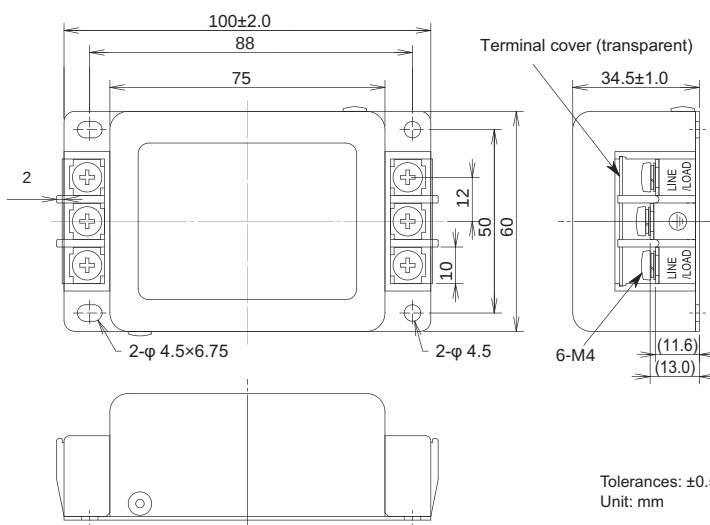
- Information processing devices, Office appliances, and Various control systems (elevators).



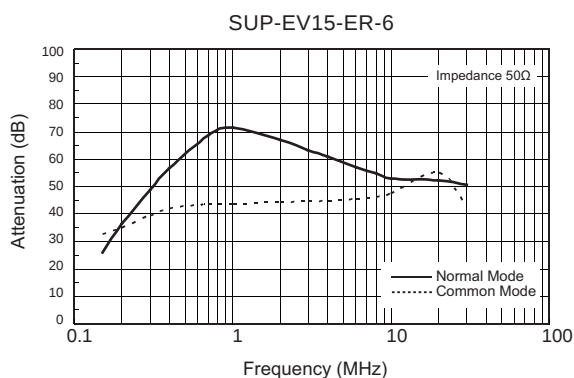
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cUL	:C22.2, No.8-M1986	
SEMKO	:EN60939	SE/0142-12

The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard.

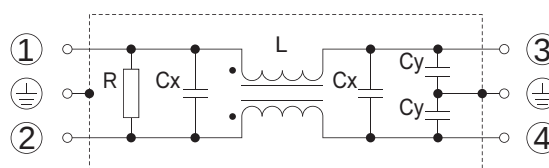
• Dimensions (5~30A)



• Static characteristics (Representative example)



• Circuit (5 ~ 30A)



Electrical Specifications

Rated Voltage **250Vac**

Safety Standard	Model Number	Rated Current (A)	Test Voltage	Insulation Resistance	Leakage Current max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Insertion losses		Weight typ.(g)
									Normal Mode (MHz)	Common Mode (MHz)	
	SUP-EV5-ER-6	5	Line to Case 2,500Vac 50/60Hz 60sec	Line to Case 100MΩmin (at 500Vdc)	1mA (at 250Vac 60Hz)	1.0Vac	45K	-25 ~ +50 (100°C with Temp. rise)	0.3 ~ 20	0.15 ~ 20	300
	SUP-EV10-ER-6	10							0.3 ~ 20	0.2 ~ 20	
	SUP-EV15-ER-6	15							0.5 ~ 20	0.5 ~ 20	
	SUP-EV20-ER-6	20							0.6 ~ 20	*1.0 ~ 20	
	SUP-EV30-ER-6	30							0.6 ~ 20	*1.0 ~ 20	

Guaranteed attenuation is more than 35dB in normal and 25dB (*more than 20dB) in common mode.
Available leakage current 70μA max.(250Vac, 60Hz) type for medical equipments and low leakage current equipments.

Features

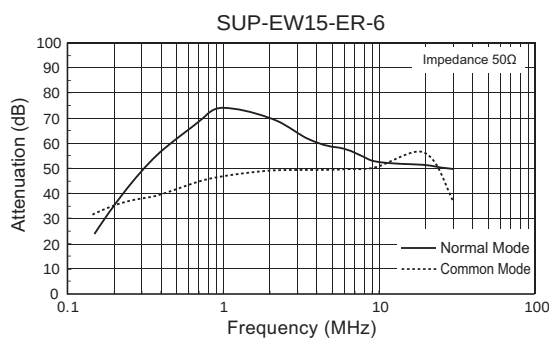
- Uses wiring-easy terminal block.
- The super high μ core allows high attenuation.
- Wide range lineup (5 to 30A).
- Bleeder resistor for electric shock protection.

Applications

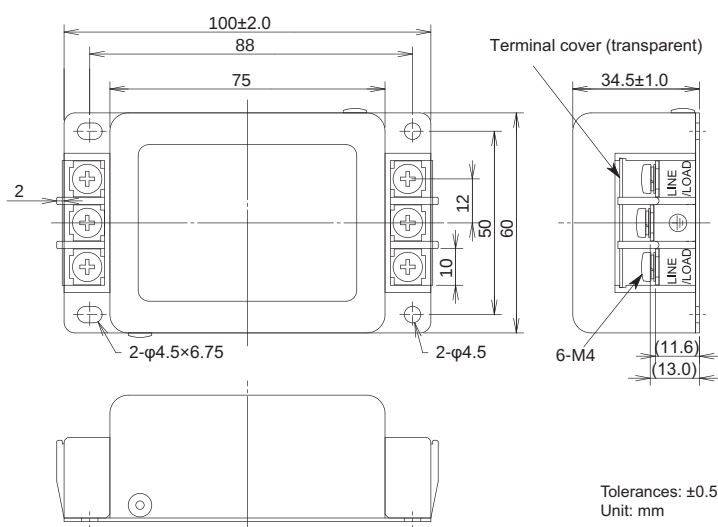
- Information processing devices, Office appliances, and Various control systems (elevators).



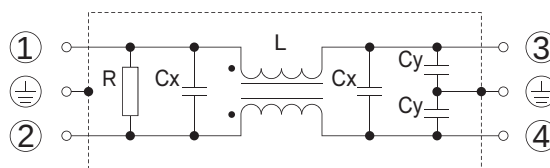
- *Static characteristics (Representative example)*



- *Dimensions (5~30A)*



- *Circuit (5~30A)*



Electrical Specifications

Rated Voltage **250Vac**

Safety Standard	Model Number	Rated Current (A)	Test Voltage	Insulation Resistance	Leakage Current max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Insertion losses		Weight typ.(g)
									Normal Mode (MHz)	Common Mode (MHz)	
  	SUP-EW5-ER-6	5	Line to Case 2,500Vac 50/60Hz 60sec	Line to Case 100MΩmin (at 500Vdc)	1mA (at 250Vac 60Hz)	1.0Vac	45K	-25 ~ +55 (100°C with Temp. rise)	0.3 ~ 20	0.15 ~ 20	300
	SUP-EW10-ER-6	10							0.5 ~ 20	*0.15 ~ 20	
	SUP-EW15-ER-6	15								*0.7 ~ 20	
	SUP-EW20-ER-6	20								*2.0 ~ 20	
	SUP-EW30-ER-6	30									

Guaranteed attenuation is more than 35dB in normal and 25dB in common mode.(*more than 20dB)
Available leakage current 70uA max.(250Vac, 60Hz) type for medical equipments and low leakage current equipments.

Features

- Common and normal mode attenuation to 30MHz.
- Leak current lower than 1.0mA (250Vac, 60Hz).
- Bleeder resistor for electric shock protection.

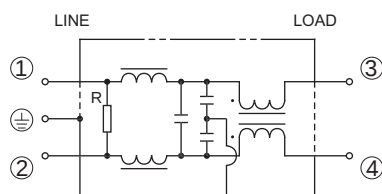
Applications

- Copiers, Fax machines, Office appliances, Measuring devices, Control systems.

- SUP-J□H-ER-4 Series (Screw terminal)

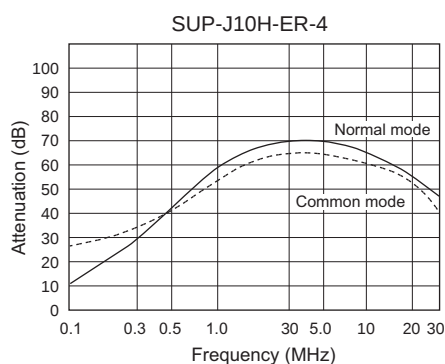


Circuit



Bleeder resistor R: 1MΩ (J5H, J10H, J15H)
470kΩ (J20H, J30H)

Static characteristics (Representative example)

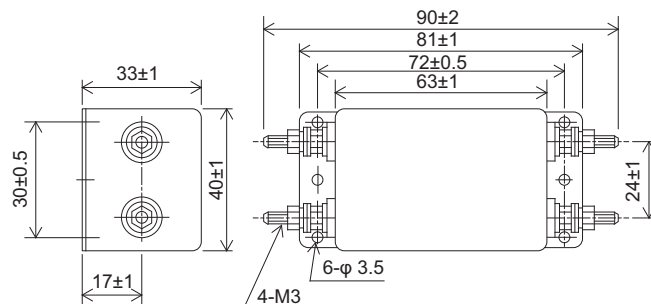


Safety Standard		File No.
CSA	:C22.2, No.8-M1986	LR60681
SEMKO	:EN60939	SE/014-18

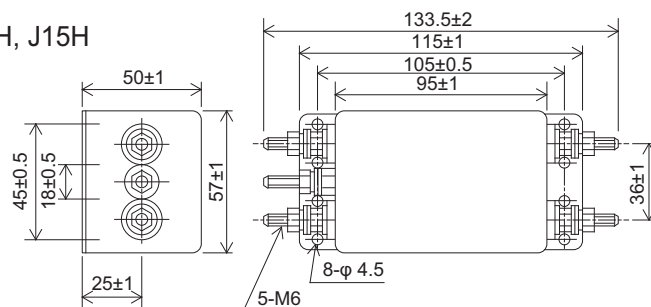
The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard.

Dimensions

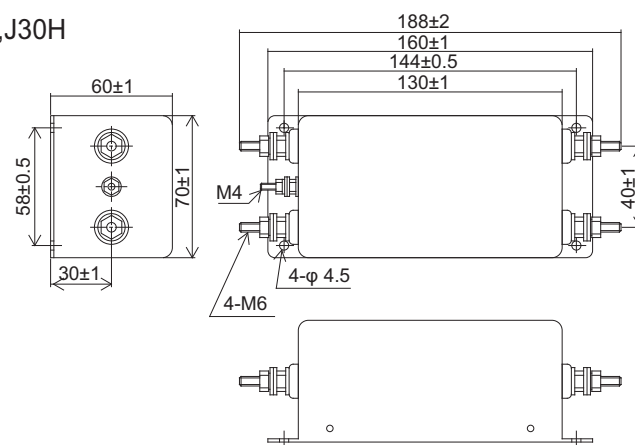
J5H



J10H, J15H



J20H, J30H



Unit: mm

Electrical Specifications

Rated Voltage **250Vac**

Safety Standard	Model Number	Rated Current (A)	Test Voltage	Insulation Resistance	Leakage Current max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Insertion losses		Weight typ.(g)
									Normal Mode (MHz)	Common Mode (MHz)	
	SUP-J5H-ER-4	5	Line to Line 1,000Vac 50/60Hz 60sec Line to Case 2,000Vac 50/60Hz 60sec	Line to Case 6,000MΩmin. (at 500Vdc)	1.0mA (at 250Vac 60Hz)	1.5Vac	30K	-25 ~ +55 (85°C with Temp. rise)	0.5 ~ 30	0.5 ~ 20	230
	SUP-J10H-ER-4	10							0.6 ~ 30		600
	SUP-J15H-ER-4	15							1.0 ~ 30	1.0 ~ 20	620
	SUP-J20H-ER-4	20							0.5 ~ 30	0.9 ~ 20	1,270
	SUP-J30H-ER-4	30							0.7 ~ 30	2.0 ~ 20	

Guaranteed attenuation is more than 30dB.

Features

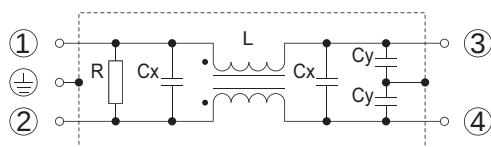
- Single phase filter.
- The adoption of super high m core material ensures high attenuation.
- Leak current lower than 0.6mA (250Vac, 60Hz).

Applications

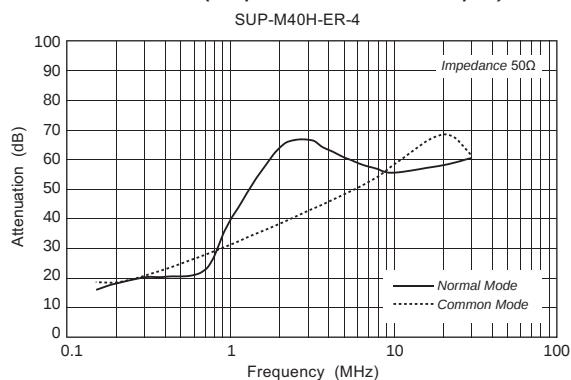
- PCs, Printers, UPS, Office appliances, Measuring devices, and Control systems.



Circuit

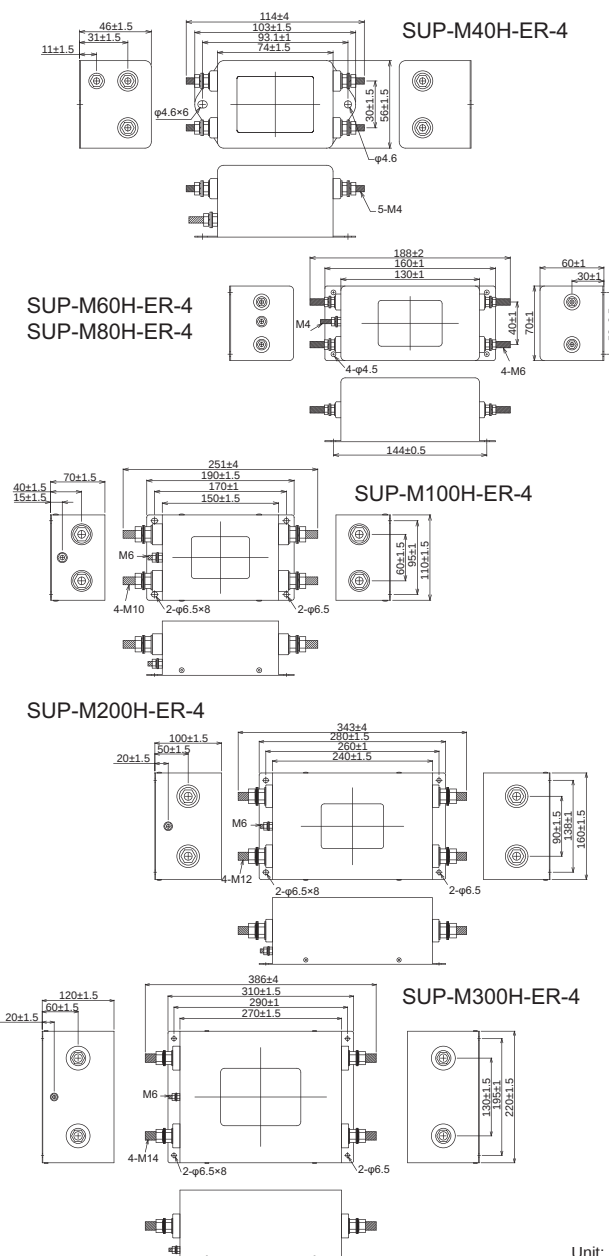


Static characteristics (Representative example)



Safety Standard	File No.
UL : UL1283	E78644

Dimensions



Unit: mm

Electrical Specifications

Safety Agency	Model Number	Rated Current (A)	Test Voltage	Insulation Resistance	Leakage Current max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Insertion losses		Weight typ.(kg)
									Normal Mode (MHz)	Common Mode (MHz)	
	SUP-M40H-ER-4	40	Line to Line 1,000Vac 50/60Hz 60sec Line to Ground 2,000Vac 50/60Hz 60sec	Line to Ground 6,000MΩmin (at 500Vdc)	0.6mA (at 250Vac 60Hz)	Less than 1.0Vac	35K	-25 ~ +50	*1 1.0 ~ 30	*4 2.0 ~ 30	0.4
	SUP-M60H-ER-4	60							*2 0.6 ~ 30	*5 2.0 ~ 30	0.9
	SUP-M80H-ER-4	80							*2 0.6 ~ 30	*5 2.0 ~ 30	1.0
	SUP-M100H-ER-4	100							*3 0.4 ~ 30	*5 2.0 ~ 30	2.0
	SUP-M200H-ER-4	200							*3 0.4 ~ 30	*5 2.0 ~ 30	7.2
	SUP-M300H-ER-4	300							*3 0.4 ~ 30	*5 2.0 ~ 30	12.0

Guaranteed attenuation of *1 is 30dB, *2 is 35dB, *3 is 40dB, *4 is 25dB and *5 is more than 20dB.

Features

- Single phase filter, high attenuation.
- Applies to CE marking (EN60939 approval by TÜV)
- Leak current lower than 1.0mA (250Vac, 60Hz).

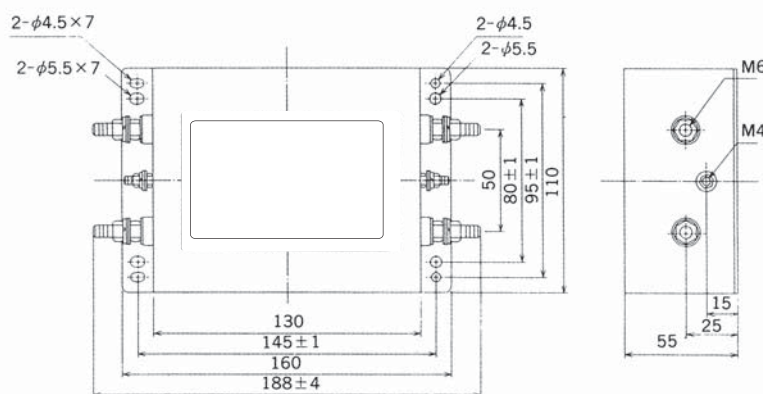
Applications

- Large electronic power supply, Printers, UPS, Information processing machines.



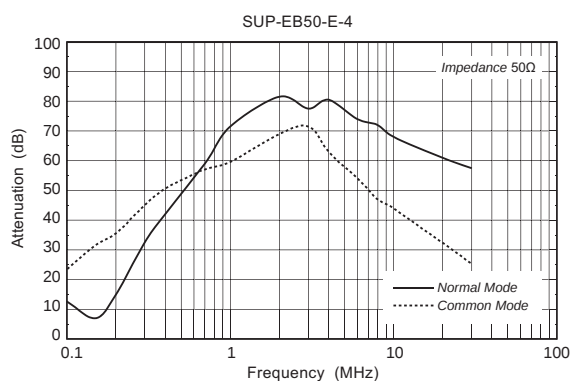
Safety Standard		File No.
UL	: EN60939	R50056162

Dimensions

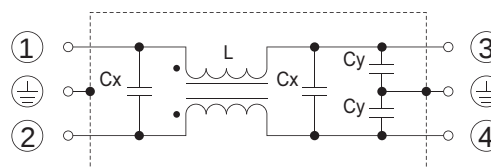


Unit: mm

Static characteristics (Representative example)



Circuit



Electrical Specifications

Rated Voltage **250Vac**

Safety Agency	Model Number	Rated Current (A)	Test Voltage	Insulation Resistance	Leakage Current max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Insertion losses		Weight typ.(kg)
									Normal Mode (MHz)	Common Mode (MHz)	
	SUP-EB50-E-4	50	Line to Line 1,000Vac 50/60Hz 60sec Line to Ground 2,000Vac 50/60Hz 60sec	Line to Ground 6,000MΩmin (at 500Vdc)	0.6mA (at 250Vac 60Hz)	Less than 1.0Vac	35K	-25 ~ +50 (85°C with Temp. rise)	0.5 ~ 30	0.5 ~ 30	1.5

Guaranteed attenuation is more than 35dB.



3SUP□-BE(6~30) SERIES

NOISE FILTERS



Features

- Terminal preventing loosening screw
- Two type of inductance coil is available: F means Ferrite, H means High μ
- DIN rail type is option

Applications

- Inverter power supplies, UPS, NC controlled machineries



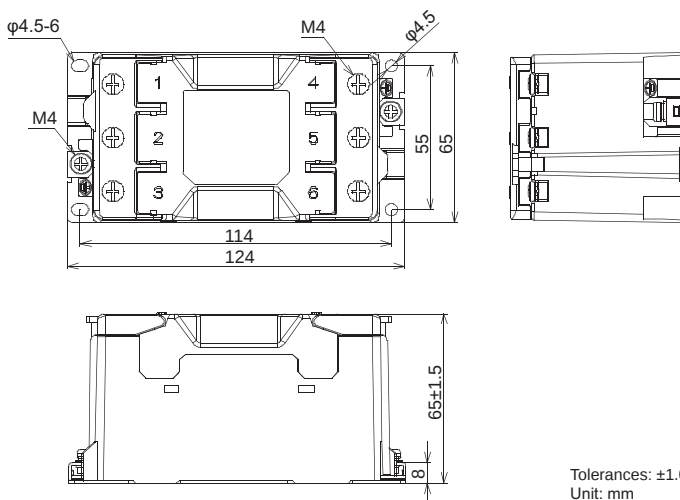
Safety Standard	File No.
UL :UL1283	E78644
cUL :C22.2, No.8-M1986	
SEMKO :EN60939	SE/0142-32

The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard.

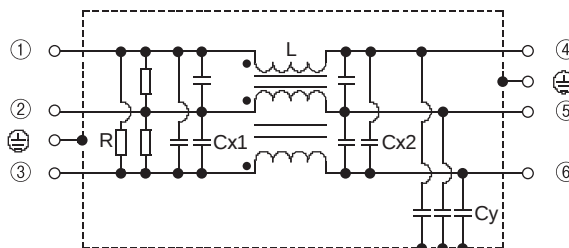
Model numbering system

3	S	U	P	□	-	B	E	□	-	E	R	-	6	-	□	-	□
Three-phase Three-wire System	Core Material	Rated Current	Leakage Current	Option													
	F Ferrite H High- μ	A 2.4mA(Standard Type) *8 varieties (0.8~54mA)	None Non option DIN DIN rail type														

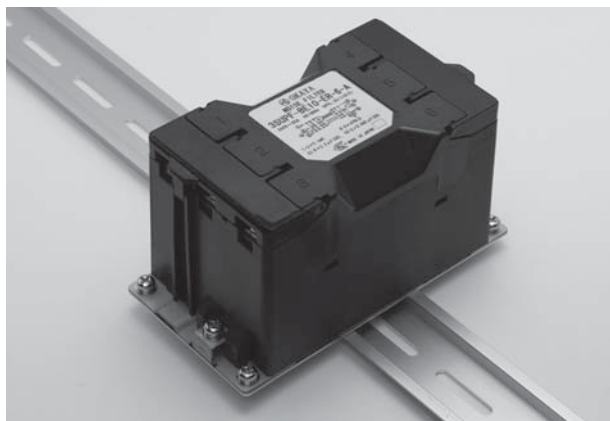
Dimensions



Circuit



DIN rail type (option)



Electrical Specifications

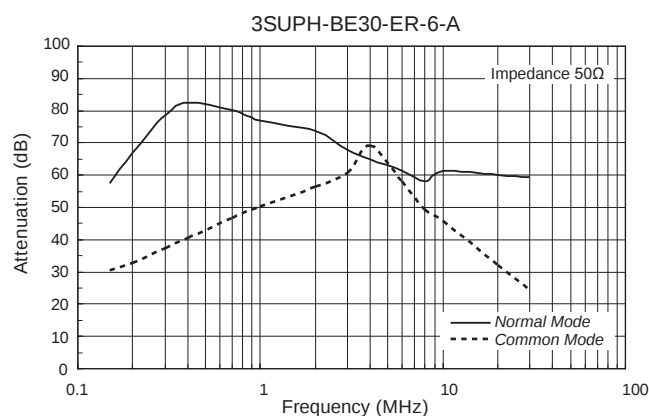
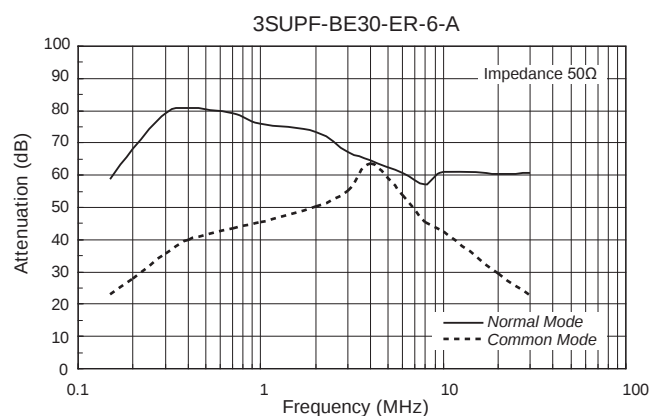
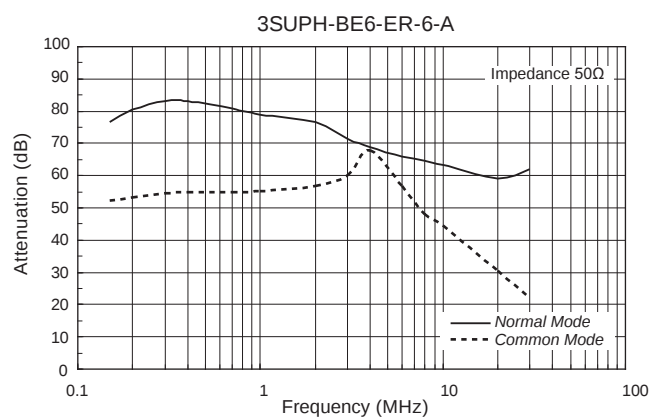
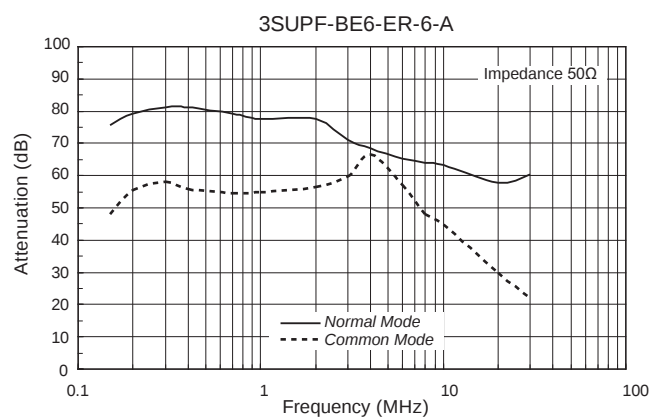
Rated Voltage **250Vac**

Safety Standard	Model Number*1	Rated Current (A)	Test Voltage	Insulation Resistance	Leakage Current *2 max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Weight typ.(g)
	3SUP□-BE6-ER-6-A	6	Line to Case 2,000Vac 50/60Hz 60sec	Line to case 6,000M Ω min (at 500Vdc)	2.4mA (at 250Vac 60Hz)	1.0Vac	60K	-25 ~ +50 (Derating of current from 50 to 85°C)	490
	3SUP□-BE10-ER-6-A	10							510
	3SUP□-BE20-ER-6-A	20							530
	3SUP□-BE30-ER-6-A	30							540

□= F: Ferrite, H: High- μ

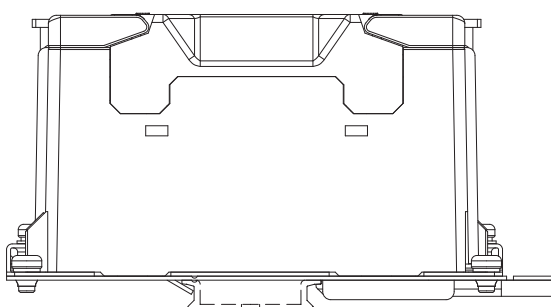
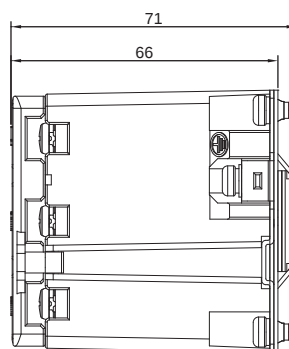
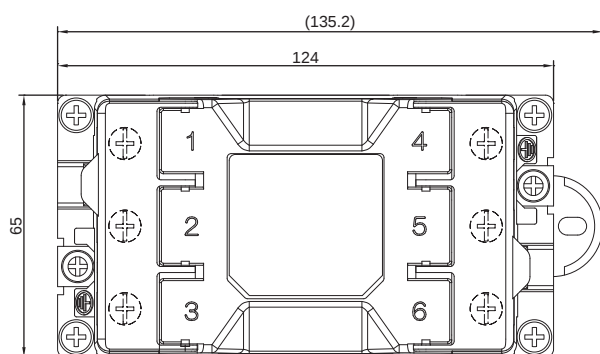
*1 Standard type *2 Leakage current of Standard type

● Static characteristics (Representative example)



● Dimensions

DIN rail type (option)



Tolerances: ±0.5
Unit: mm

● Note when installing EMI filter on DIN rail

Even though the ground connects correctly through the DIN rail, may not get noise attenuation. Be sure to connect the FG ground of EMI filter to the ground directory.

3SUP□-BH(6~30) SERIES

NOISE FILTERS



Features

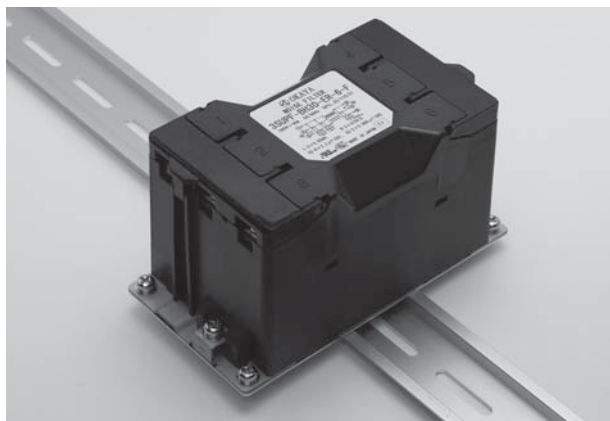
- Terminal preventing loosening screw
- Three-phase three-wire system (Rated Voltage 500Vac)
- Two type of inductance coil is available: F means Ferrite, H means High μ
- DIN rail type is option

Applications

- Inverter power supplies, UPS, NC controlled machineries



- DIN rail type (option)



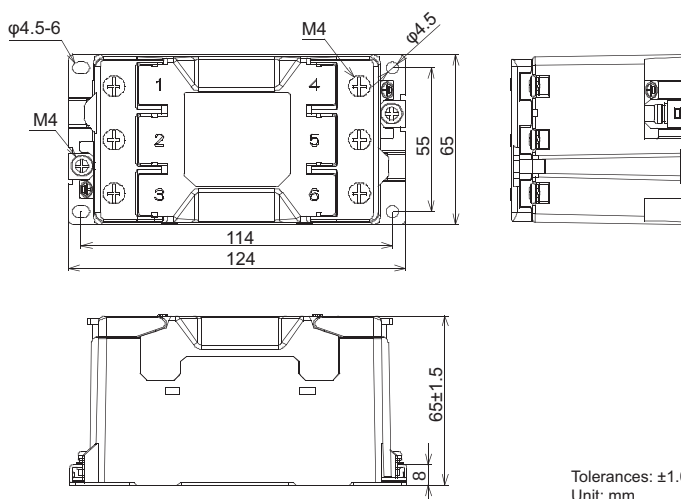
Safety Standard		File No.
UL	:UL1283	E78644
cUL	:C22.2, No.8-M1986	
SEMKO	:EN60939	SE/0142-32

The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard.

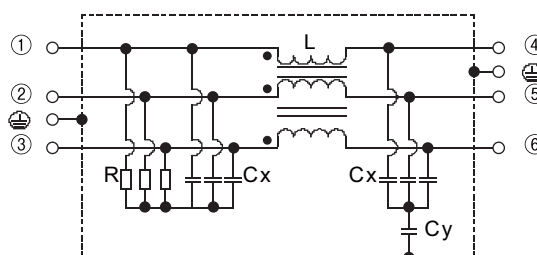
- Model numbering system

3	S	U	P		-	B	H		-	E	R	-	6	-		-	
				Core Material		Rated Current			Leakage Current			Option					
Three-phase Three-wire System				F Ferrite H High-μ		F 5.5mA(Standard Type) *7 varieties (0.8~37mA)			None Non option DIN DIN rail type								

- Dimensions



- Circuit



Electrical Specifications

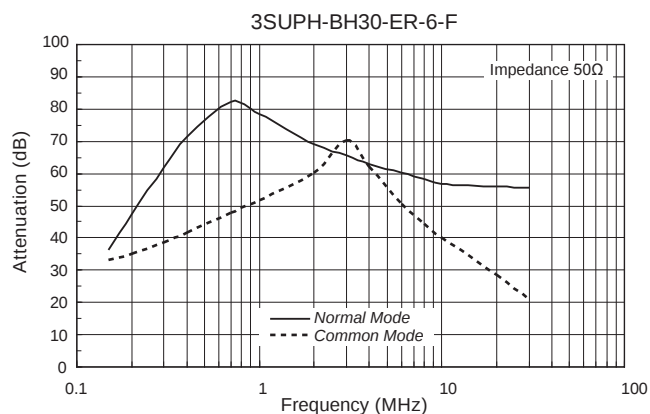
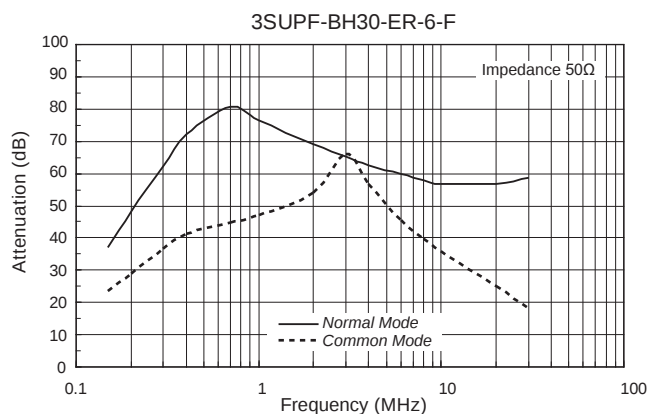
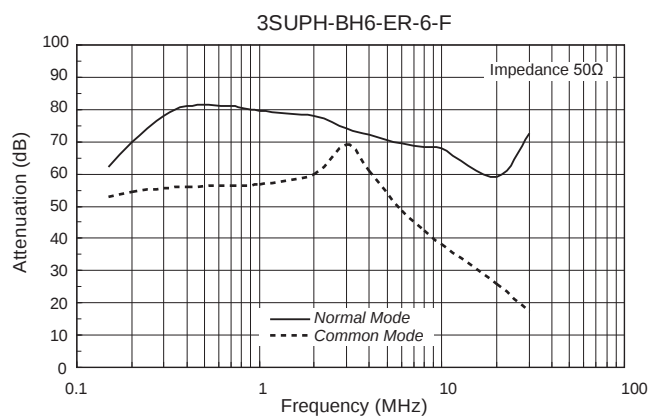
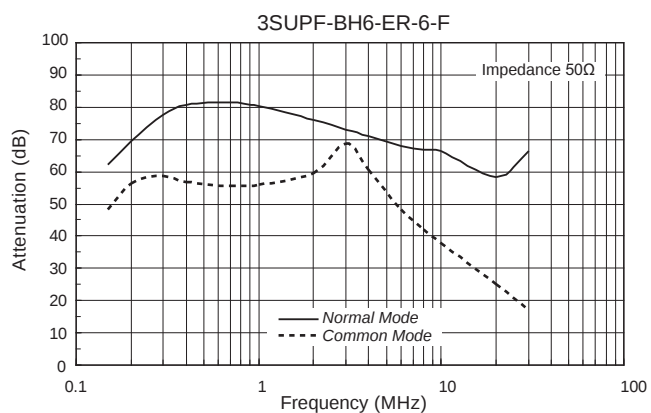
Rated Voltage **500Vac**

Safety Standard	Model Number*1	Rated Current (A)	Test Voltage	Insulation Resistance	Leakage Current *2 max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Weight typ.(g)
	3SUP□-BH6-ER-6-F	6	Line to Case 2,000Vac 50/60Hz 60sec	Line to case 6,000MΩmin (at 500Vdc)	5.5mA (at 500Vac 60Hz)	1.0Vac	60K	-25 ~ +50 (Derating of current from 50 to 85°C)	490
	3SUP□-BH10-ER-6-F	10							510
	3SUP□-BH20-ER-6-F	20							530
	3SUP□-BH30-ER-6-F	30							540

□= F: Ferrite, H: High- μ

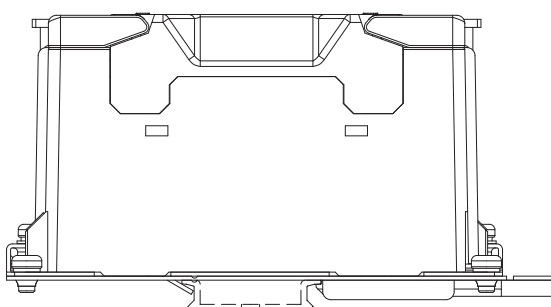
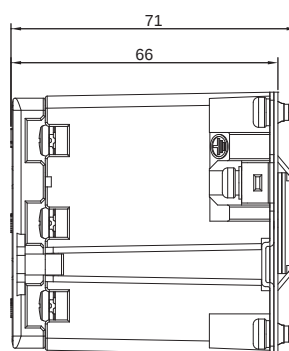
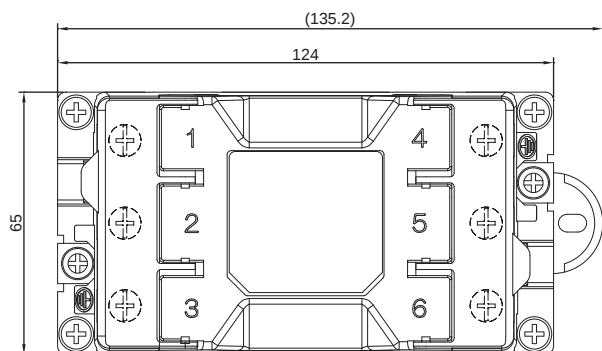
*1 Standard type *2 Leakage current of Standard type

● Static characteristics (Representative example)



● Dimensions

DIN rail type (option)



Tolerances: ±0.5
Unit: mm

● Note when installing EMI filter on DIN rail

Even though the ground connects correctly through the DIN rail, may not get noise attenuation. Be sure to connect the FG ground of EMI filter to the ground directory.

Features

- Three phase filter delta (250Vac).
- The capacitance of Y capacitor is selectable.

Applications

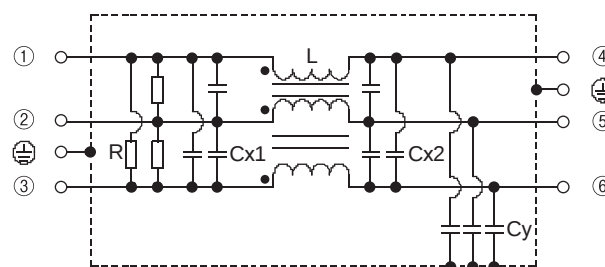
- Inverter power supplies, UPS, NC controlled machineries.



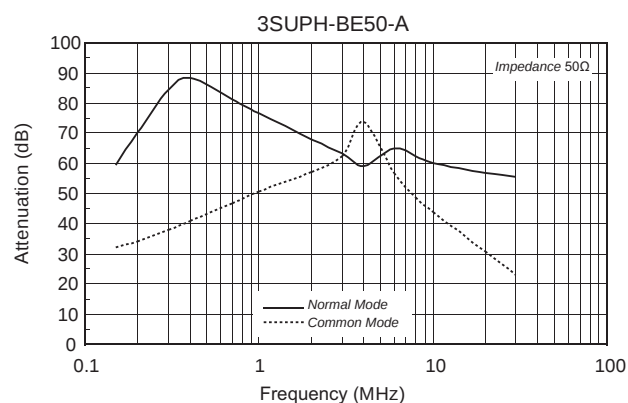
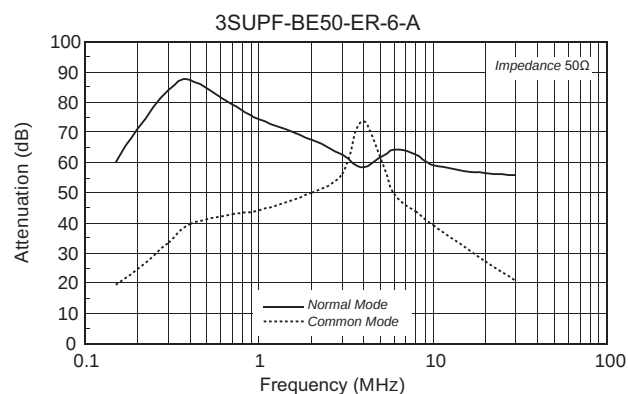
Safety Standard	File No.
UL :UL1283	E78644
cUL :C22.2, No.8-M1986	
SEMKO :EN60939	SE/0142-33

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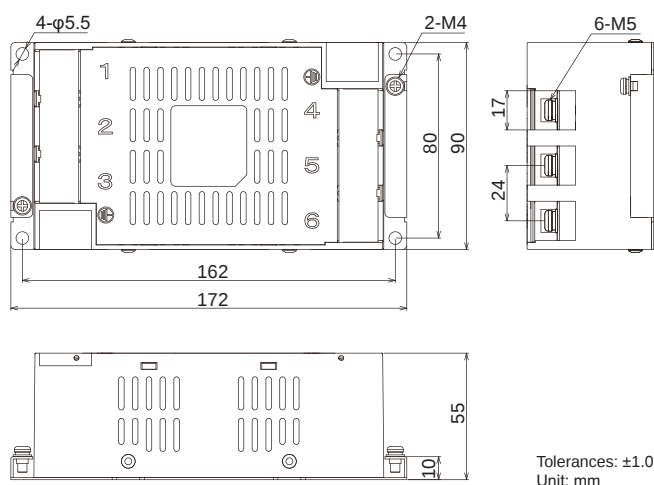
Circuit



Static characteristics (Representative example)



Dimensions



Tolerances: ±1.0
Unit: mm

Electrical Specifications

Rated Voltage **250Vac**

Safety Standard	Model Number*1	Rated Current (A)	Test Voltage *2	Insulation Resistance	Leakage Current *3 max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Weight typ.(g)
	3SUP□-BE50-ER-6-A	50	Line to Case 2,000Vac 50/60Hz 60sec	Line to case 6,000MΩmin (at 500Vdc)	2.5mA (at 250Vac 60Hz)	1.0Vac	60K	-25 ~ +50 (Derating of current from 50 to 85°C)	1,000
	3SUP□-BE60-ER-6-A	60							

□= F: Ferrite, H: High-μ

*1 Standard type *2 Leakage current of Standard type *3 Leakage current of standard type

Features

- Three phase filter delta (500Vac).
- The capacitance of Y capacitor is selectable.

Applications

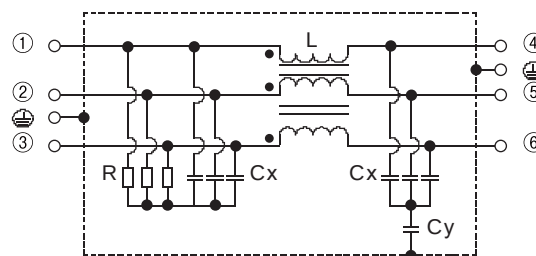
- Inverter power supplies, UPS, NC controlled machineries.



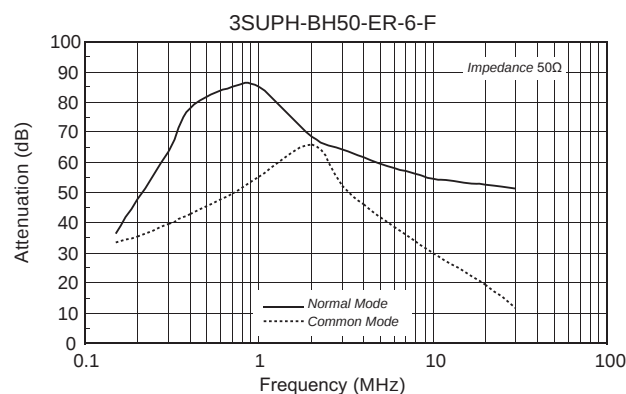
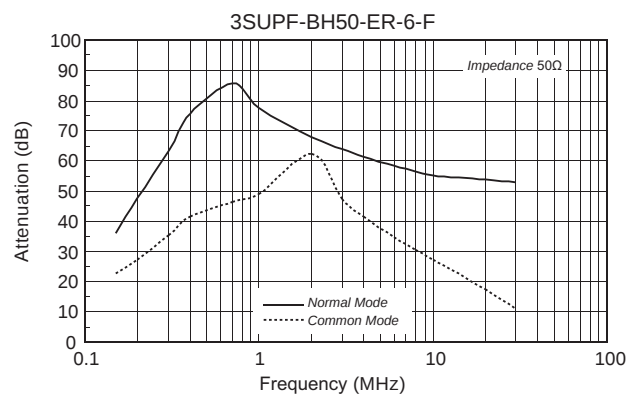
Safety Standard		File No.
UL	:UL1283	E78644
cUL	:C22.2, No.8-M1986	
SEMKO	:EN60939	SE/0142-33

The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard.

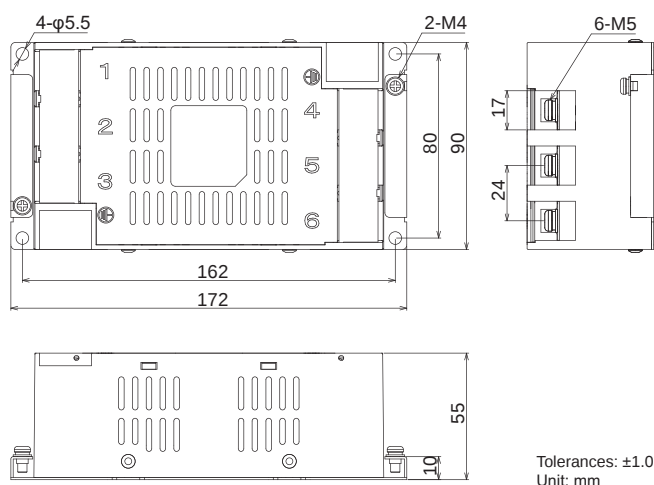
• Circuit



• Static characteristics (Representative example)



• Dimensions



Electrical Specifications

Rated Voltage **500Vac**

Safety Standard	Model Number*1	Rated Current (A)	Test Voltage *2	Insulation Resistance	Leakage Current *3 max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Weight typ.(g)
	3SUP□-BH50-ER-6-F	50	Line to Case 3,000Vac 50/60Hz 60sec	Line to case 6,000MΩmin (at 500Vdc)	5.5mA (at 500Vac 60Hz)	1.0Vac	60K (Part of coil)	-25 ~ +50 (Derating of current from 50 to 85°C)	1,000
	3SUP□-BH60-ER-6-F	60							

□= F: Ferrite, H: High-μ

*1 Standard type *1 Withstand voltage of standard type *3 Leakage current of standard type



3SUPF-DE (80~300) SERIES

NOISE FILTERS



Features

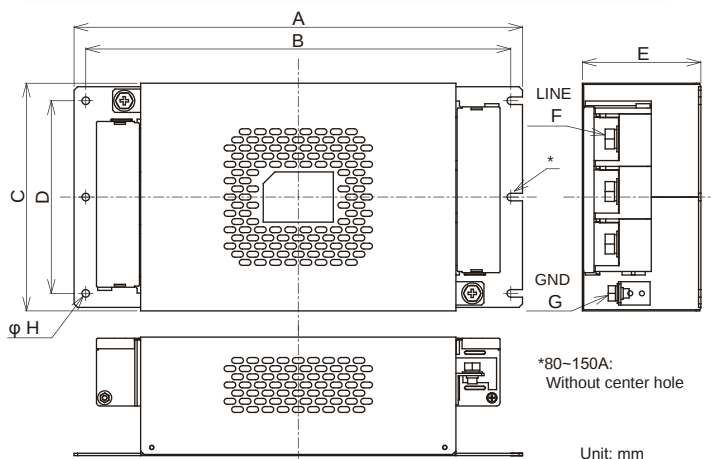
- Low Profile
- Three phase filter delta (250Vac)
- The capacitance of Y cap is selectable

Applications

- Inverter power supplies, UPS, NC controlled machineries.



Dimensions



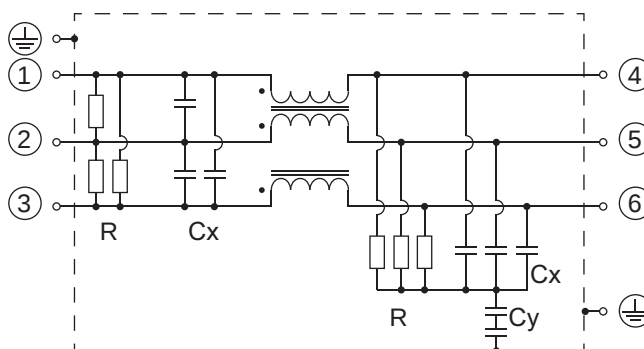
Model Number	Dimensions (mm)							
	A	B	C	D	E	F	G	H
3SUPF-DE80-F	273	257	160	135	85	M8	M6	6.5
3SUPF-DE100-F								
3SUPF-DE150-F	287	269	190		86			
3SUPF-DE200-F				165				
3SUPF-DE250-F	384	364	195		102	M10	M8	
3SUPF-DE300-F								



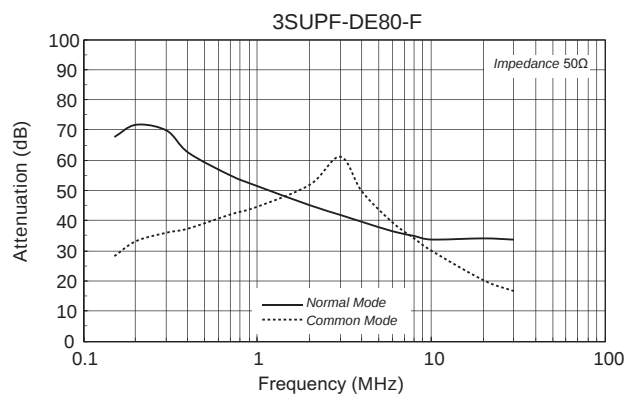
Safety Standard		File No.
UL	:UL1283	E78644
cUL	:C22.2, No.8-M1986	
SEMKO	:EN60939	SE/0142-35

The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard.

Circuit



Static characteristics (Representative example)



Electrical Specifications

Rated Voltage **250Vac**

Safety Standard	Model Number*1	Rated Current (A)	Test Voltage *2	Insulation Resistance	Leakage Current *3 max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Weight typ.(kg)
	3SUPF-DE80-F	80	Line to Case 2,500Vac 50/60Hz 60sec	Line to case 100MΩmin (at 500Vdc)	2.8mA (at 250Vac 60Hz)	1.0Vac	60K	-25 ~ +50 (Derating of current from 50 to 85°C)	4.2
	3SUPF-DE100-F	100							4.2
	3SUPF-DE150-F	150							6.0
	3SUPF-DE200-F	200							8.0
	3SUPF-DE250-F	250							8.0
	3SUPF-DE300-F	300							7.8

*1 Standard type *2 Leakage current of Standard type *3 Leakage current of standard type

Features

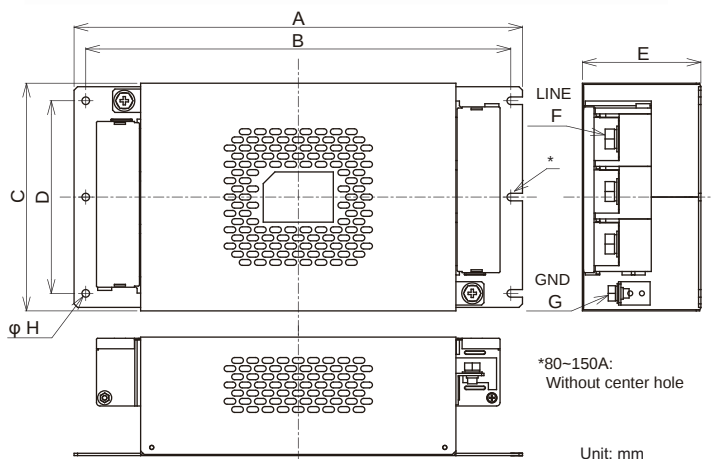
- Low Profile
- Three phase filter delta (500Vac)
- The capacitance of Y cap is selectable

Applications

- Inverter power supplies, UPS, NC controlled machineries.



Dimensions



Model Number	Dimensions (mm)							
	A	B	C	D	E	F	G	H
3SUPF-DH80-F	273	257	160	135	85	M8	M6	6.5
3SUPF-DH100-F								
3SUPF-DH150-F	287	269	190		86			
3SUPF-DH200-F				165				
3SUPF-DH250-F	384	364	195		102	M10	M8	
3SUPF-DH300-F								

Electrical Specifications

Rated Voltage **500Vac**

Safety Standard	Model Number*1	Rated Current (A)	Test Voltage *2	Insulation Resistance	Leakage Current *3 max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Weight typ.(kg)
	3SUPF-DE80-F	80	Line to Case 2,500Vac 50/60Hz 60sec	Line to case 100MΩmin (at 500Vdc)	5.5mA (at 500Vac 60Hz)	1.0Vac	60K	-25 ~ +50 (Derating of current from 50 to 85°C)	4.2
	3SUPF-DE100-F	100							4.2
	3SUPF-DE150-F	150							6.0
	3SUPF-DE200-F	200							8.0
	3SUPF-DE250-F	250							8.0
	3SUPF-DE300-F	300							7.8

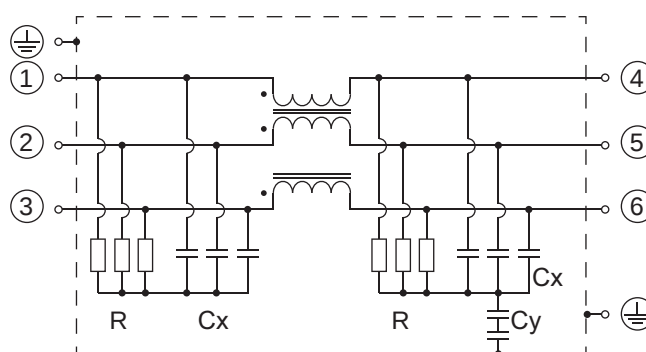
*1 Standard type *2 Leakage current of Standard type *3 Leakage current of standard type



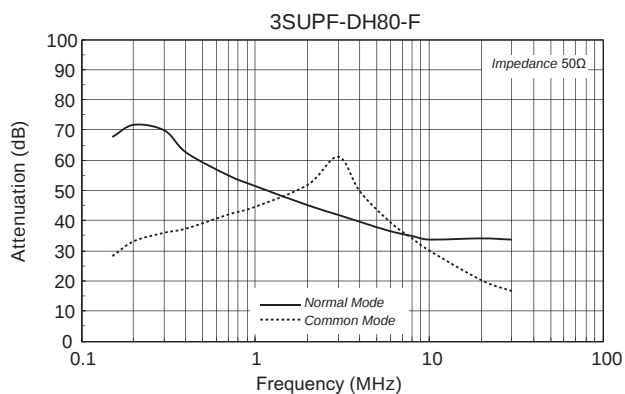
Safety Standard		File No.
UL	:UL1283	E78644
cUL	:C22.2, No.8-M1986	
SEMKO	:EN60939	SE/0142-35

The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard.

Circuit



Static characteristics (Representative example)





3SUP□-DE (400) SERIES

NOISE FILTERS



Features

- Three phase filter delta (250Vac)
- The capacitance of Y cap is selectable

Applications

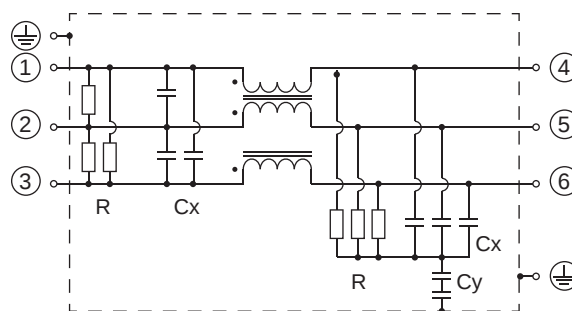
- Inverter power supplies, UPS, NC controlled machineries.



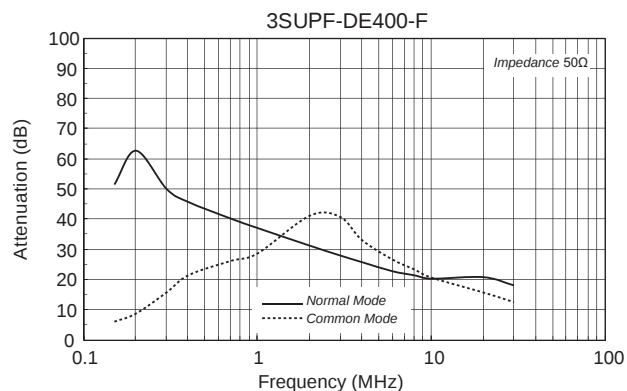
Safety Standard		File No.
UL	:UL1283	E78644
cUL	:C22.2, No.8-M1986	
SEMKO	:EN60939	SE/0142-35

The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard.

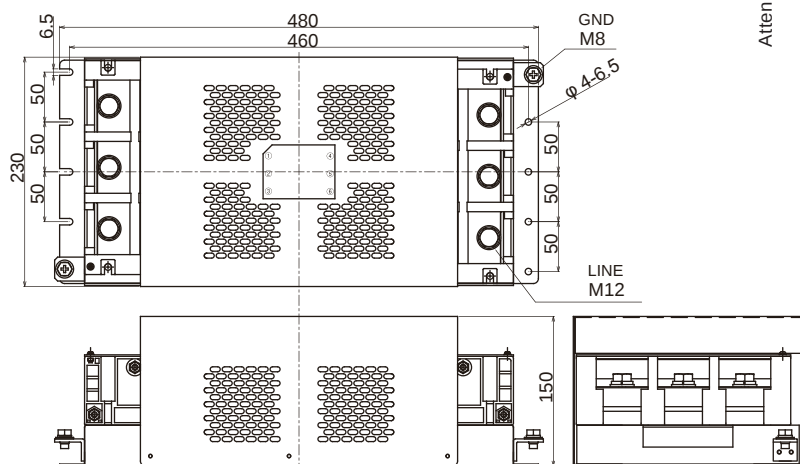
• Circuit



• Static characteristics (Representative example)



• Dimensions



Unit: mm

Electrical Specifications

Rated Voltage **250Vac**

Safety Standard	Model Number*1	Rated Current (A)	Test Voltage *2	Insulation Resistance	Leakage Current *3 max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Weight typ.(kg)
cUL US 14 S	3SUP□-DE400-F	400	Line to Case 2,500Vac 50/60Hz 60sec	Line to case 100MΩmin (at 500Vdc)	2.8mA (at 250Vac 60Hz)	1.0Vac	50K	-25 ~ +50 (Derating of current from 50 to 85°C)	10.5

□= F: Ferrite, H: High-μ

*1 Standard type *2 Leakage current of Standard type *3 Leakage current of standard type

Features

- Three phase filter delta (500Vac)
- The capacitance of Y cap is selectable

Applications

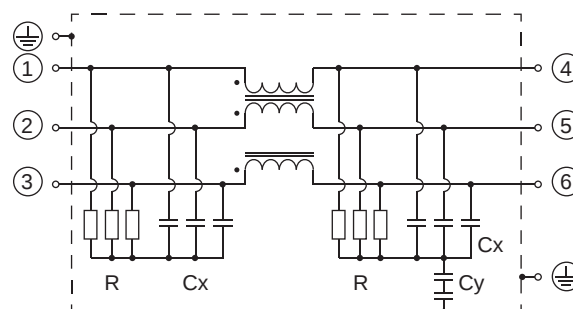
- Inverter power supplies, UPS, NC controlled machineries.



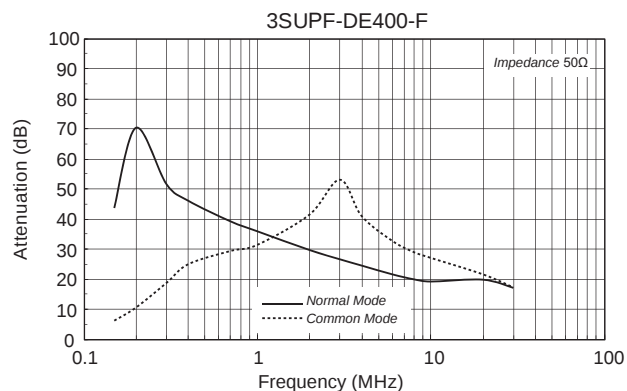
Safety Standard		File No.
UL	:UL1283	E78644
cUL	:C22.2, No.8-M1986	
SEMKO	:EN60939	SE/0142-35

The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard.

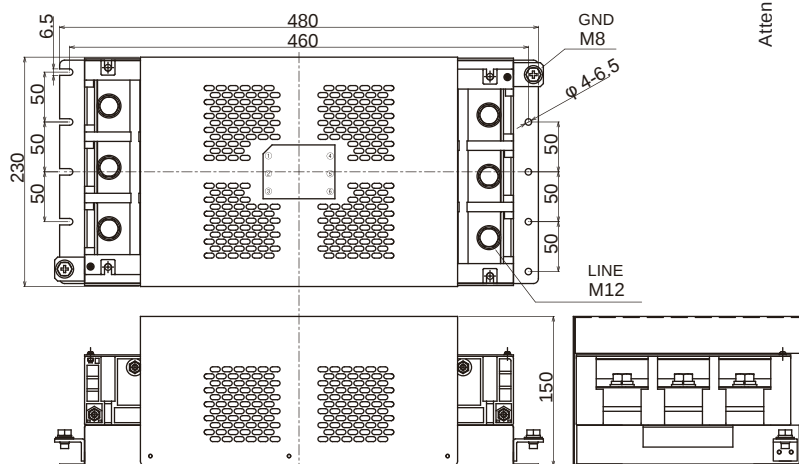
• Circuit



• Static characteristics (Representative example)



• Dimensions



Unit: mm

Electrical Specifications

Rated Voltage **500Vac**

Safety Standard	Model Number*1	Rated Current (A)	Test Voltage *2	Insulation Resistance	Leakage Current *3 max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Weight typ.(kg)
	3SUP□-DH400-F	400	Line to Case 2,500Vac 50/60Hz 60sec	Line to case 100MΩmin (at 500Vdc)	5.5mA (at 500Vac 60Hz)	1.0Vac	50K	-25 ~ +50 (Derating of current from 50 to 85°C)	10.5

□= F: Ferrite, H: High-μ

*1 Standard type *2 Leakage current of Standard type *3 Leakage current of standard type

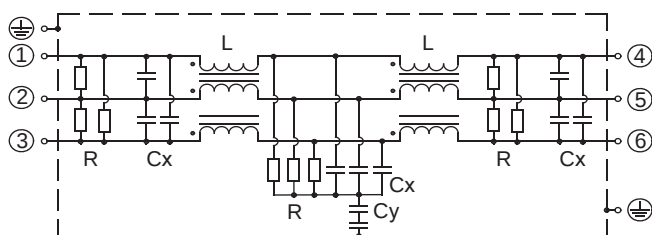
Features

- Low Profile
- Three phase filter delta (250Vac)
- The capacitance of Y cap is selectable

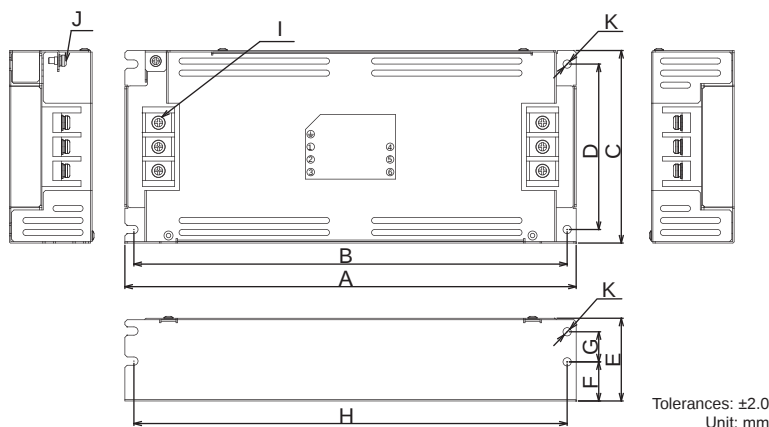
Applications

- Inverter power supplies, UPS, NC controlled machineries.

Circuit



Dimensions

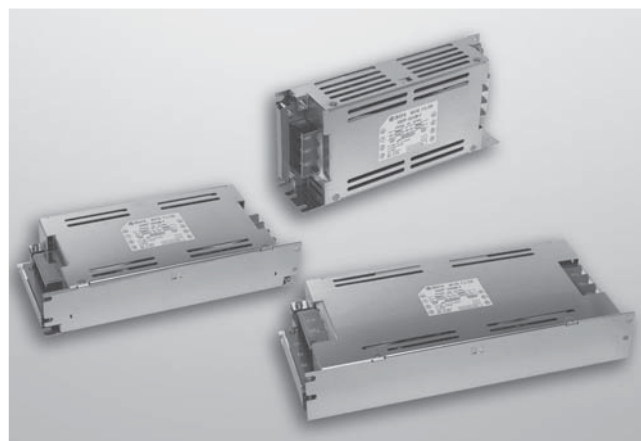


Model Number	Dimensions (mm)										
	A	B	C	D	E	F	G	H	I	J	K
3SUP□-CE6M-F	210	200	95	83	45	19	18	200	M4	M4	φ4.5
3SUP□-CE10M-F											
3SUP□-CE20M-F	240	230	105	90	50	19	23	230			
3SUP□-CE30M-F											
3SUP□-CE40M-F	300	288	128	110	55	26	20	288	M5	M4	φ5.5
3SUP□-CE50M-F											
3SUP□-CE60M-F											

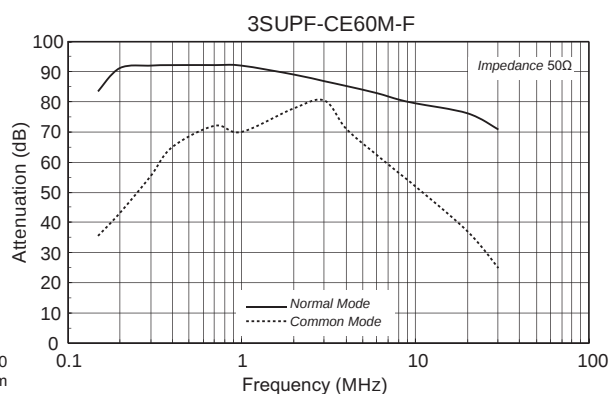


Safety Standard		File No.
UL	:UL1283	E78644
ENEC	:EN60939	SE/0142-35

The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard.



Static characteristics (Representative example)



Electrical Specifications

Rated Voltage **250Vac**

Safety Standard	Model Number*1	Rated Current (A)	Test Voltage *2	Insulation Resistance	Leakage Current *3 max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Weight typ.(kg)
	3SUP□-CE6M-F	6	Line to Case 2,000Vac 50/60Hz 60sec	Line to case 100MΩmin (at 500Vdc)	2.8mA (at 250Vac 60Hz)	1.0Vac	55K	-25 ~ +50 (Derating of current from 50 to 85°C)	0.8
	3SUP□-CE10M-F	10							0.8
	3SUP□-CE20M-F	20							1.1
	3SUP□-CE30M-F	30							1.1
	3SUP□-CE40M-F	40							2.1
	3SUP□-CE50M-F	50							2.1
	3SUP□-CE60M-F	60							2.1

□= F: Ferrite, H: High-μ

*1 Standard type *2 Leakage current of Standard type *3 Leakage current of standard type

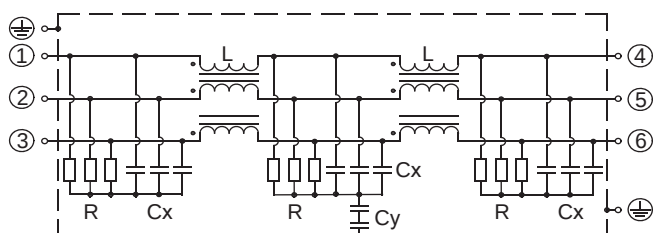
Features

- Low Profile
- Three phase filter delta (500Vac)
- The capacitance of Y cap is selectable

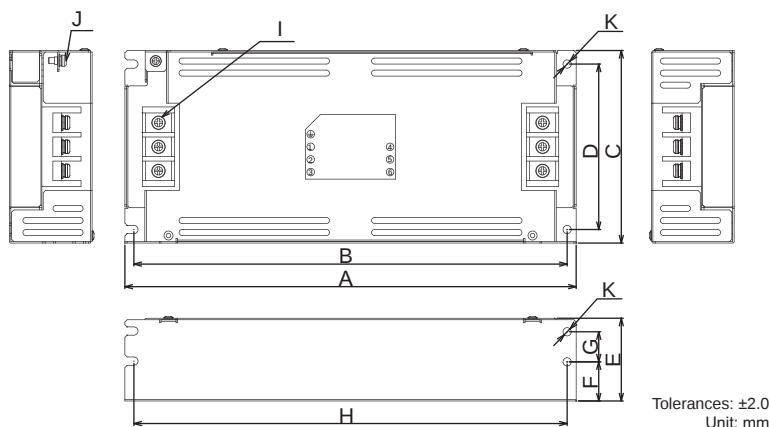
Applications

- Inverter power supplies, UPS, NC controlled machineries.

Circuit



Dimensions



Model Number	Dimensions (mm)									
	A	B	C	D	E	F	G	H	I	J
3SUP□-CH6M-F	210	200	95	83	45	19	18	200	M4	M4
3SUP□-CH10M-F										
3SUP□-CH20M-F	240	230	105	90	50	19	23	230		
3SUP□-CH30M-F										
3SUP□-CH40M-F	300	288	128	110	55	26	20	288	M5	M4
3SUP□-CH50M-F										
3SUP□-CH60M-F										

Electrical Specifications

Rated Voltage **500Vac**

Safety Standard	Model Number*1	Rated Current (A)	Test Voltage *2	Insulation Resistance	Leakage Current *3 max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Weight typ.(kg)
	3SUP□-CH6M-F	6	Line to Case 2,000Vac 50/60Hz 60sec	Line to case 100MΩmin (at 500Vdc)	5.5mA (at 500Vac 60Hz)	1.0Vac	55K	-25 ~ +50 (Derating of current from 50 to 85°C)	0.8
	3SUP□-CH10M-F	10							0.8
	3SUP□-CH20M-F	20							1.1
	3SUP□-CH30M-F	30							1.1
	3SUP□-CH40M-F	40							2.1
	3SUP□-CH50M-F	50							2.1
	3SUP□-CH60M-F	60							2.1

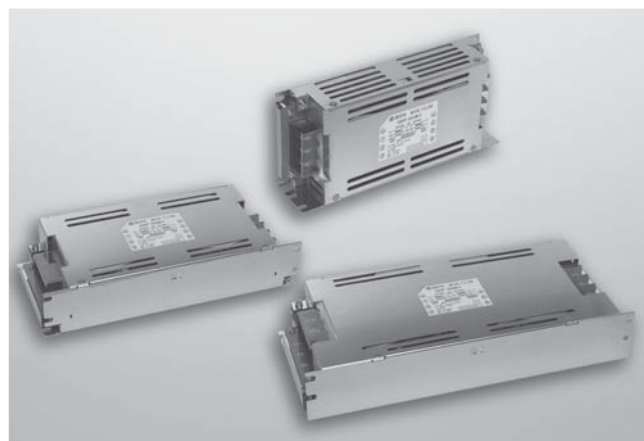
□= F: Ferrite, H: High-μ

*1 Standard type *2 Leakage current of Standard type *3 Leakage current of standard type

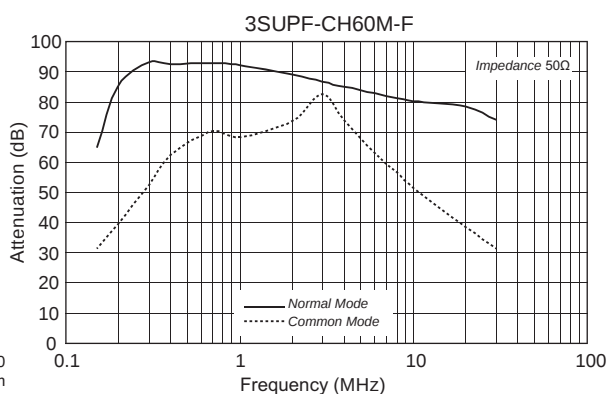


Safety Standard		File No.
UL	:UL1283	E78644
ENEC	:EN60939	SE/0142-35

The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard.



Static characteristics (Representative example)





3SUPF-CE (80~300) SERIES

NOISE FILTERS



Features

- Low Profile
- Three phase filter delta (250Vac)
- Type of inductance coil is Ferrite
- The capacitance of Y cap is selectable

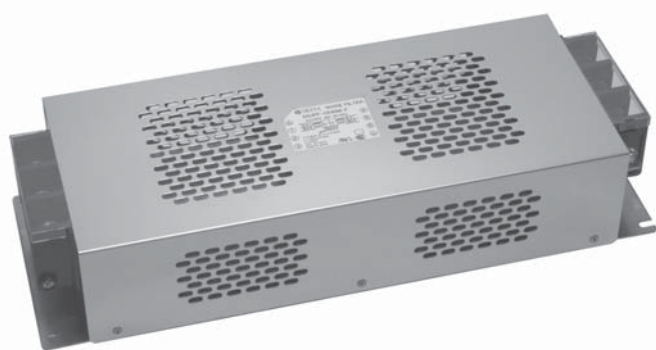
Applications

- Inverter power supplies, UPS, NC controlled machineries.

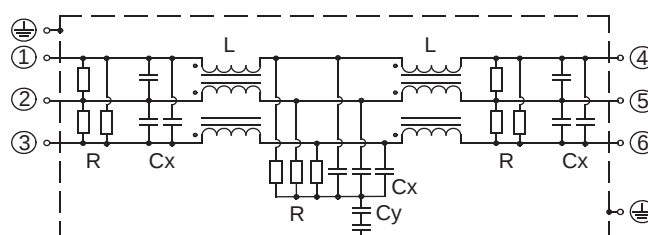


Safety Standard		File No.
UL	:UL1283	E78644
cUL	:C22.2, No.8-M1986	
SEMKO	:EN60939	SE/0142-35A

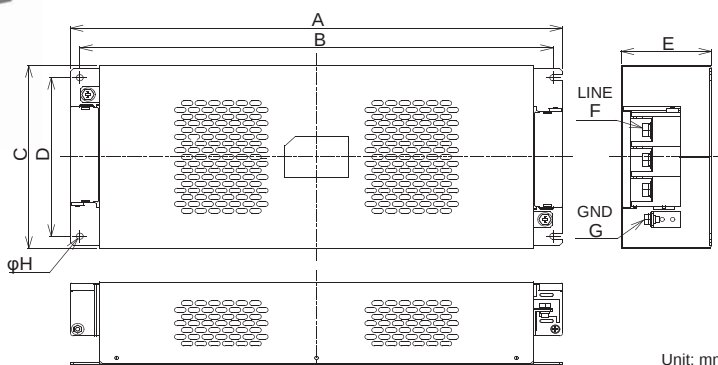
The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard.



• Circuit

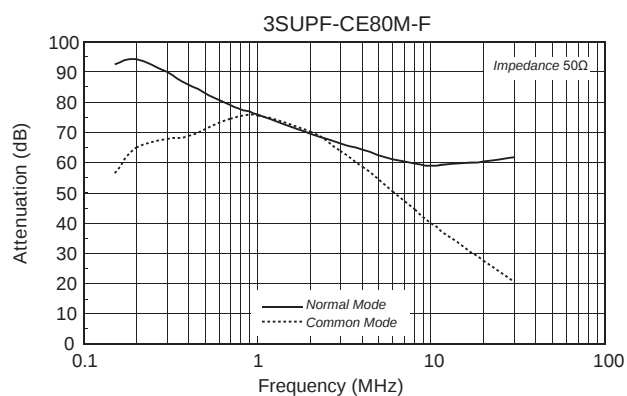


• Dimensions



Unit: mm

• Static characteristics (Representative example)



Model Number	Dimensions (mm)							
	A	B	C	D	E	F	G	H
3SUPF-CE80M-F	435	419	160	135	85	M8	M6	6.5
3SUPF-CE100M-F								
3SUPF-CE150M-F	468	450	190		86			
3SUPF-CE200M-F				165				
3SUPF-CE250M-F	583	563	195		102	M10	M8	
3SUPF-CE300M-F								

Electrical Specifications

Rated Voltage **250Vac**

Safety Standard	Model Number*1	Rated Current (A)	Test Voltage *2	Insulation Resistance	Leakage Current *3 max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Weight typ.(kg)
	3SUPF-CE80M-F	80	Line to Case 2,500Vac 50/60Hz 60sec	Line to case 100MΩmin (at 500Vdc)	2.8mA (at 250Vac 60Hz)	1.0Vac	60K	-25 ~ +50 (Derating of current from 50 to 85°C)	8.0
	3SUPF-CE100M-F	100							7.7
	3SUPF-CE150M-F	150							11.5
	3SUPF-CE200M-F	200							15.0
	3SUPF-CE250M-F	250							15.2
	3SUPF-CE300M-F	300							14.2

*1 Standard type *2 Leakage current of Standard type *3 Leakage current of standard type

Features

- Low Profile
- Three phase filter delta (500Vac)
- Type of inductance coil is Ferrite
- The capacitance of Y cap is selectable

Applications

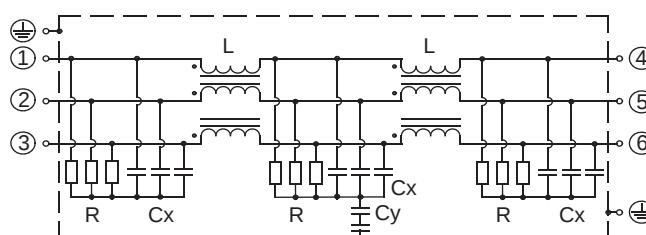
- Inverter power supplies, UPS, NC controlled machineries.



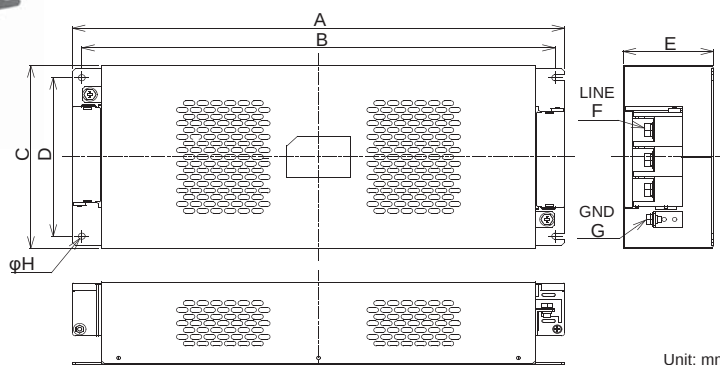
Safety Standard		File No.
UL	:UL1283	E78644
cUL	:C22.2, No.8-M1986	
SEMKO	:EN60939	SE/0142-35A

The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard.

• Circuit

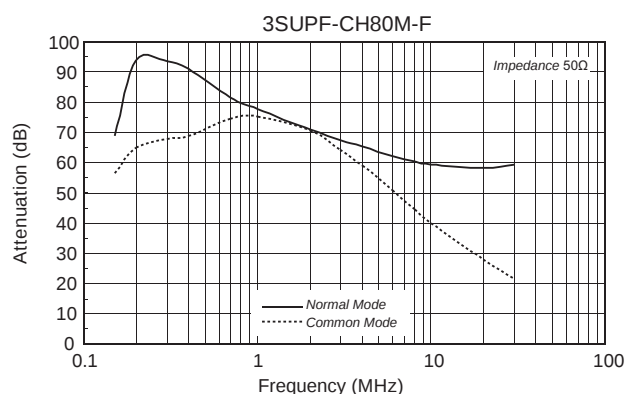


• Dimensions



Unit: mm

• Static characteristics (Representative example)



Model Number	Dimensions (mm)							
	A	B	C	D	E	F	G	H
3SUPF-CH80M-F	435	419	160	135	85	M8	M6	6.5
3SUPF-CH100M-F								
3SUPF-CH150M-F	468	450	190	165	86			
3SUPF-CH200M-F								
3SUPF-CH250M-F	583	563	195		102	M10	M8	
3SUPF-CH300M-F								

Electrical Specifications

Rated Voltage **500Vac**

Safety Standard	Model Number*1	Rated Current (A)	Test Voltage *2	Insulation Resistance	Leakage Current *3 max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Weight typ.(kg)
	3SUPF-CH80M-F	80	Line to Case 2,500Vac 50/60Hz 60sec	Line to case 100MΩmin (at 500Vdc)	5.5mA (at 500Vac 60Hz)	1.0Vac	60K	-25 ~ +50 (Derating of current from 50 to 85°C)	8.0
	3SUPF-CH100M-F	100							7.7
	3SUPF-CH150M-F	150							11.5
	3SUPF-CH200M-F	200							15.0
	3SUPF-CH250M-F	250							15.2
	3SUPF-CH300M-F	300							14.2

*1 Standard type *2 Leakage current of Standard type *3 Leakage current of standard type

Features

- Low Profile
- Three phase filter delta (250Vac)
- Two type of inductance coil is available: F means Ferrite H means High μ
- The capacitance of Y cap is selectable

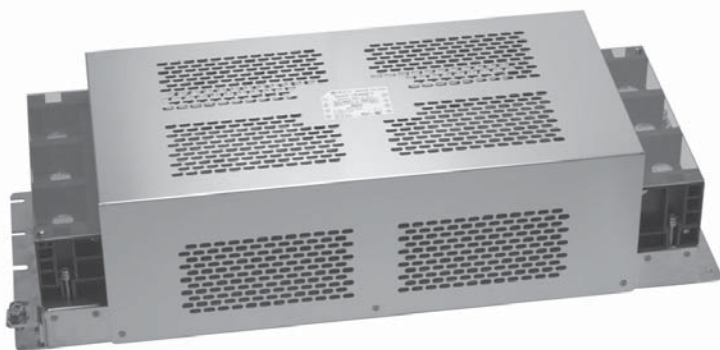
Applications

- Inverter power supplies, UPS, NC controlled machineries.

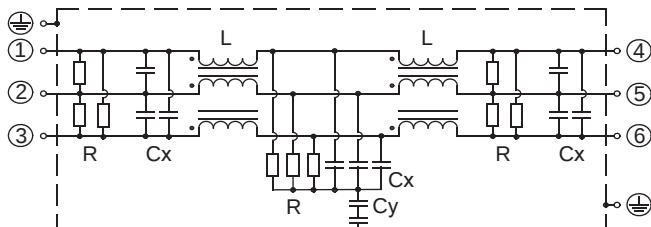


Safety Standard		File No.
UL	:UL1283	E78644
cUL	:C22.2, No.8-M1986	
SEMKO	:EN60939	SE/0142-35A

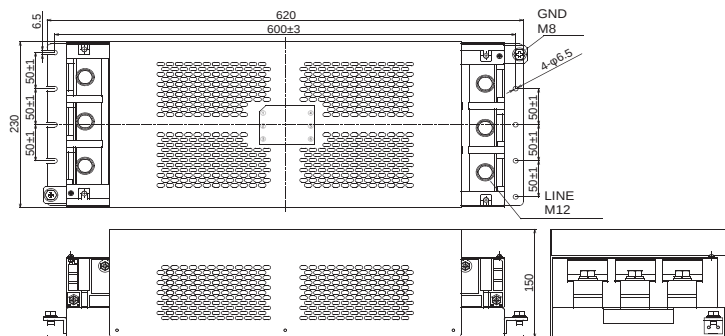
The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard.



Circuit

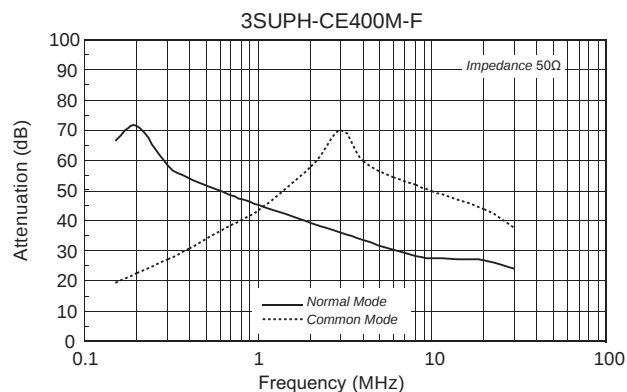
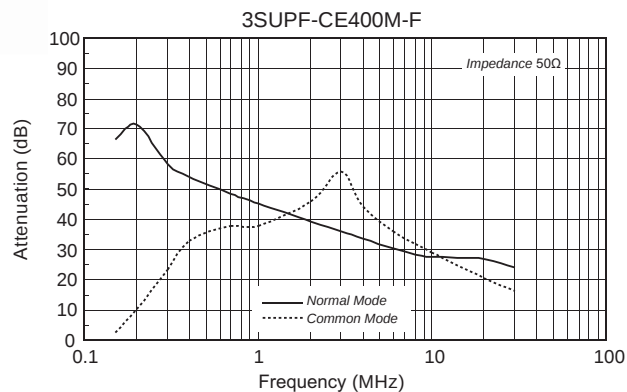


Dimensions



Unit: mm

Static characteristics (Representative example)



Electrical Specifications

Rated Voltage **250Vac**

Safety Standard	Model Number*1	Rated Current (A)	Test Voltage *2	Insulation Resistance	Leakage Current *3 max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Weight typ.(kg)
	3SUP□-CE400M-F	400	Line to Case 2,500Vac 50/60Hz 60sec	Line to case 100MΩmin (at 500Vdc)	2.8mA (at 250Vac 60Hz)	1.0Vac	50K	-25 ~ +50 (Derating of current from 50 to 85°C)	16.5

□= F: Ferrite, H: High- μ

*1 Standard type *1 Withstand voltage of standard type *3 Leakage current of standard type

Features

- Low Profile
- Three phase filter delta (500Vac)
- Two type of inductance coil is available: F means Ferrite H means High μ
- The capacitance of Y cap is selectable

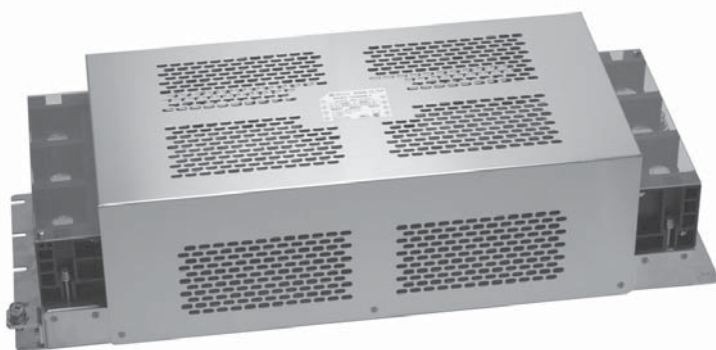
Applications

- Inverter power supplies, UPS, NC controlled machineries.

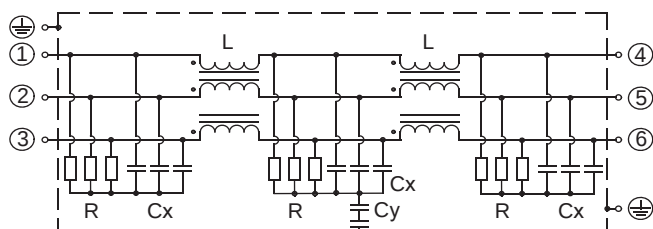


Safety Standard		File No.
UL	:UL1283	E78644
cUL	:C22.2, No.8-M1986	
SEMKO	:EN60939	SE/0142-35A

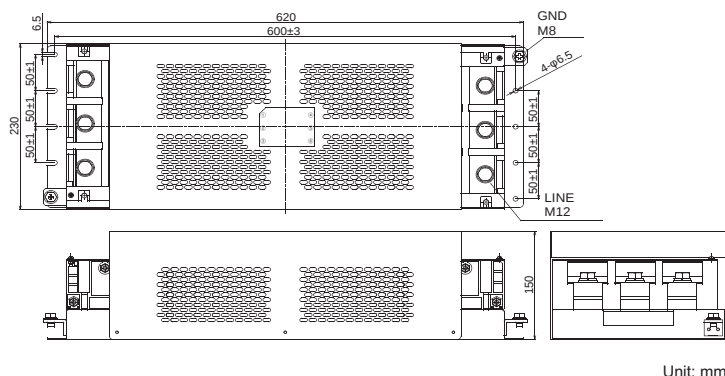
The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard.



Circuit

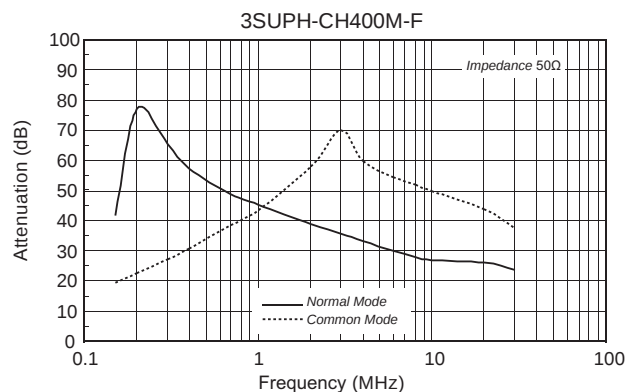
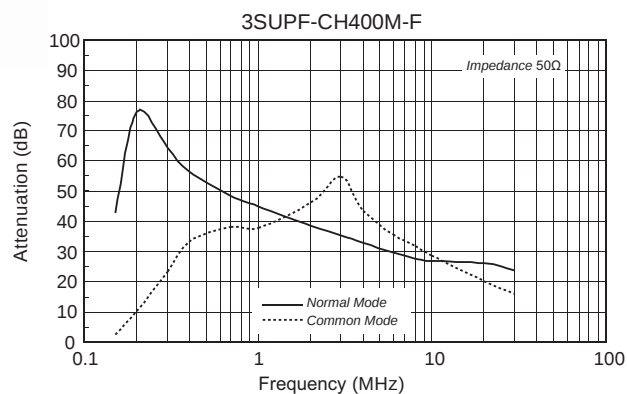


Dimensions



Unit: mm

Static characteristics (Representative example)



Electrical Specifications

Rated Voltage **500Vac**

Safety Standard	Model Number*1	Rated Current (A)	Test Voltage *2	Insulation Resistance	Leakage Current *3 max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Weight typ.(kg)
	3SUP□-CH400M-F	400	Line to Case 2,500Vac 50/60Hz 60sec	Line to case 100MΩmin (at 500Vdc)	5.5mA (at 500Vac 60Hz)	1.0Vac	50K	-25 ~ +50 (Derating of current from 50 to 85°C)	16.5

□= F: Ferrite, H: High- μ

*1 Standard type *1 Withstand voltage of standard type *3 Leakage current of standard type



3SUP□-AE SERIES

NOISE FILTERS



Features

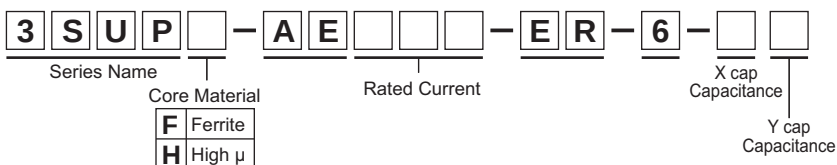
- Three phase filter delta (250Vac).
- 30% smaller size of former model.
- The capacitance of X and Y capacitor is selectable.

Applications

- Inverter power supplies, UPS, NC controlled machineries.

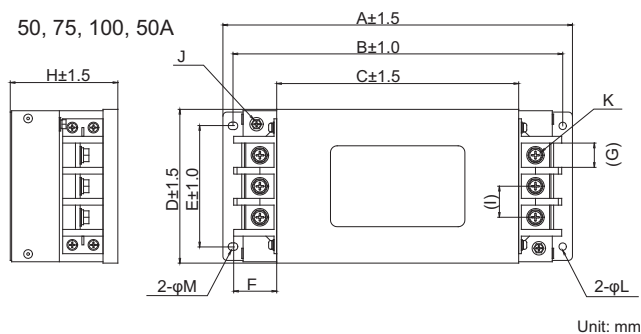


Model numbering system



Dimensions

50, 75, 100, 50A



Unit: mm

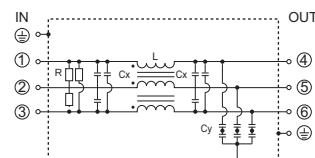
Model Number	Dimensions (mm)												
	A	B	C	D	E	F	G	H	I	J	K	L	M
3SUP□-AE50	185	170	120	110	85	23	13	80	18	M4	M6	5.5	5.5x7
3SUP□-AE75	260	245	182	116	90	33	18	80	23	M4	M6	5.5	5.5x7
3SUP□-AE100	260	245	182	116	90	33	18	80	23	M4	M6	5.5	5.5x7
3SUP□-AE150	310	290	220	163	133	42	25	100	30	M6	M8	6.5	6.5x8



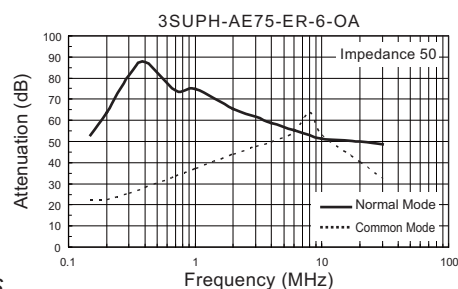
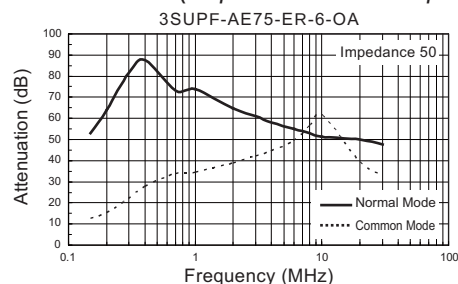
Safety Standard		File No.
UL	:UL1283	E78644
cUL	:C22.2, No.8-M1986	
SEMKO	:EN60939	SE/0142-7

The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard.

Circuit

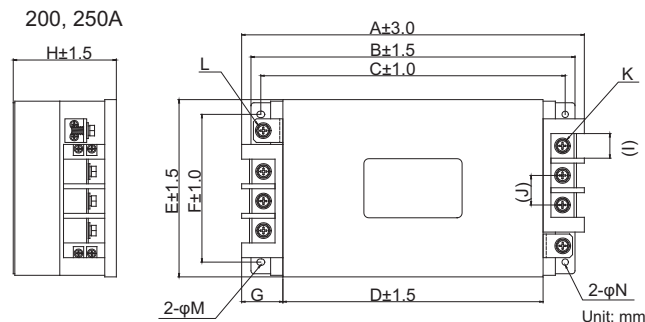


Static characteristics (Representative example)



Dimensions

200, 250A



Unit: mm

Model Number	Dimensions (mm)													
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
3SUP□-AE200	349	330	310	265	180	150	42	105	25	30	30	M8	6.5x8	6.5
3SUP□-AE250	364	345	325	280	180	150	42	120	25	30	30	M8	6.5x8	6.5

Electrical Specifications

Rated Voltage **250Vac**

Safety Standard	Model Number *1	Rated Current (A)	Test Voltage	Insulation Resistance	Leakage Current max. *2	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Weight typ.(kg)
	3SUP□-AE50-ER-6-OA	50	Line-Case 2,000Vac 50/60Hz 60sec	Line-Case 6,000MΩmin (at 500Vdc)	1.1mA (at 250Vac 60Hz)	1.0Vac	50K	-25 ~ +50 (100°C with Temp. rise)	2.0
	3SUP□-AE75-ER-6-OA	75							3.2
	3SUP□-AE100-ER-6-OA	100							7.0
	3SUP□-AE150-ER-6-OA	150							8.5
	3SUP□-AE200-ER-6-OA	200							10.0
	3SUP□-AE250-ER-6-OA	250							

*1 Standard type

*2 Leakage current of Standard type

Features

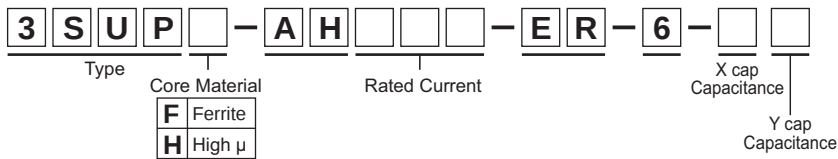
- Three phase filter delta (500Vac).
- 30% smaller size of former model.
- The capacitance of X and Y capacitor is selectable.

Applications

- Inverter power supplies, UPS, NC controlled machineries.

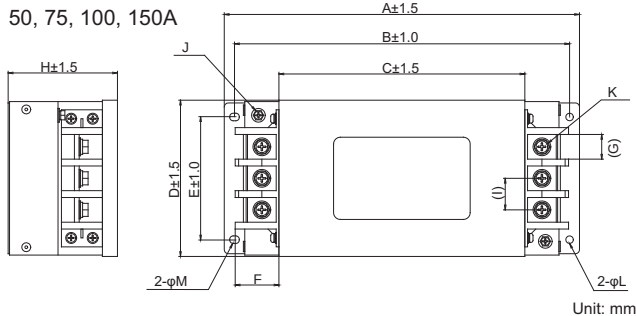


- Model numbering system



- Dimensions

50, 75, 100, 150A



Model Number	Dimensions(mm)												
	A	B	C	D	E	F	G	H	I	J	K	L	M
3SUP□-AH50	185	170	120	110	85	23	13	80	18	M4	M6	5.5	5.5x7
3SUP□-AH75	260	245	182	116	90	33	18	80	23	M4	M6	5.5	5.5x7
3SUP□-AH100	260	245	182	116	90	33	18	80	23	M4	M6	5.5	5.5x7
3SUP□-AH150	310	290	220	163	133	42	25	100	30	M6	M8	6.5	6.5x8

Electrical Specifications

Safety Standard	Model Number *1	Rated Current (A)	Test Voltage	Insulation Resistance	Leakage Current max. *2	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Weight typ.(kg)
	3SUP□-AH50-ER-6-OC	50	Line-Case 2,000Vac 50/60Hz 60sec	Line-Case 6,000M Ω min (at 500Vdc)	4.7mA (at 500Vac 60Hz)	1.0Vac	50K	-25 ~ +50 (100°C with Temp. rise)	2.0
	3SUP□-AH75-ER-6-OC	75							3.2
	3SUP□-AH100-ER-6-OC	100							7.0
	3SUP□-AH150-ER-6-OC	150							8.5
	3SUP□-AH200-ER-6-OC	200							10.0
	3SUP□-AH250-ER-6-OC	250							

*1 Standard type

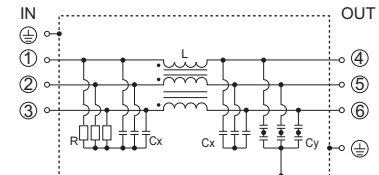
*2 Leakage current of Standard type



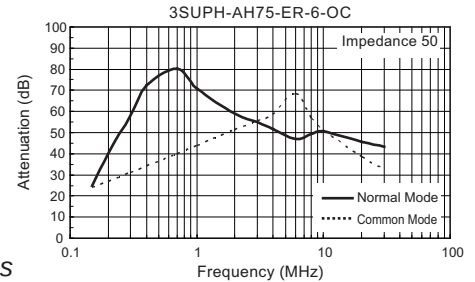
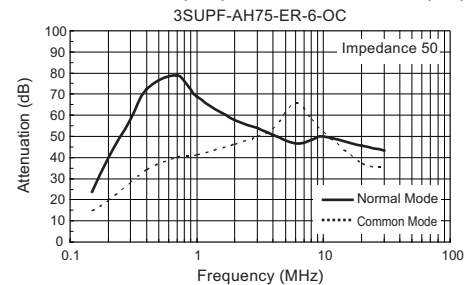
Safety Standard		File No.
UL	:UL1283	E78644
cUL	:C22.2, No.8-M1986	
SEMKO	:EN60939	SE/0142-7

The "ENEC" mark is a common European product certification mark based on testing to harmonised European safety standard.

- Circuit

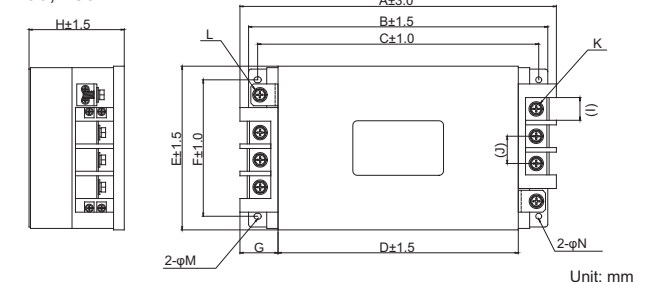


- Static characteristics (Representative example)



- Dimensions

200, 250A



Model Number	Dimensions(mm)													
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
3SUP□-AH200	349	330	310	265	180	150	42	105	25	30	M8	M8	6.5x8	6.5
3SUP□-AH250	364	345	325	280	180	150	42	120	25	30	M8	M8	6.5x8	6.5

Rated Voltage **500Vac**

Features

- Three phase filter delta, high attenuation.
- EN55011 class A & B.
- Applies to CE marking (EN60939 approval by TÜV).

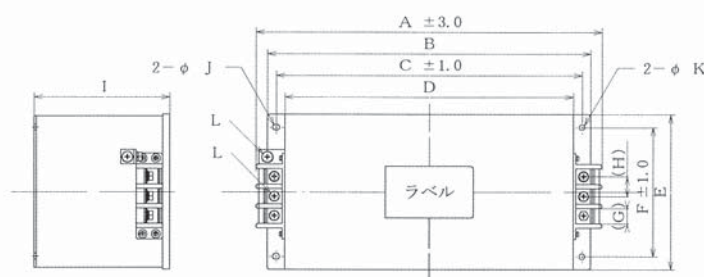
Applications

- Inverter power supplies, UPS, Servo-operated machinery.



Safety Standard		File No.
UL	:UL1283	E78644
TÜV	:EN60939	R50056176

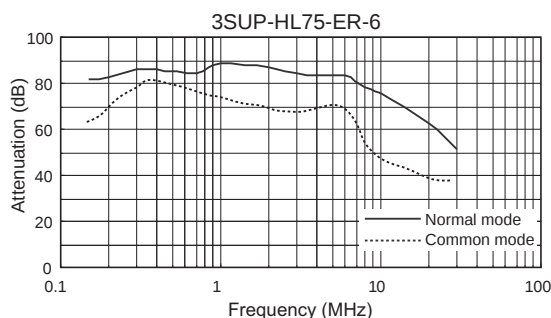
Dimensions



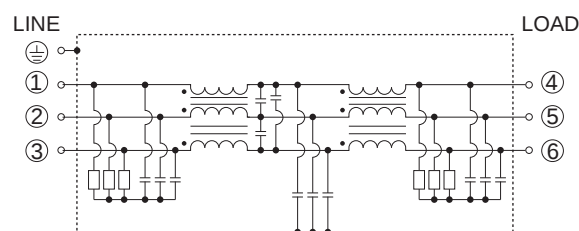
Unit: mm

Model Number	Dimensions(mm)											
	A	B	C	D	E	F	G	H	I	J	K	L
3SUP-HL5-ER-6	226	220	195	180	100	85	13	18	120	5.5×7	5.5	M4
3SUP-HL10-ER-6	226	220	195	180	100	85	13	18	120	5.5×7	5.5	M4
3SUP-HL15-ER-6	226	220	195	180	100	85	13	18	130	5.5×7	5.5	M4
3SUP-HL30-ER-6	246	230	215	200	100	85	13	18	140	5.5×7	5.5	M4
3SUP-HL50-ER-6	286	270	255	240	120	90	13	18	150	5.5×7	5.5	M6
3SUP-HL75-ER-6	396	370	350	330	170	140	18	23	155	6.5×8	6.5	M6
3SUP-HL100-ER-6	396	370	350	330	170	140	18	23	155	6.5×8	6.5	M6
3SUP-HL150-ER-6	484	440	420	400	200	170	25	30	200	6.5×8	6.5	M8
3SUP-HL200-ER-6	484	440	420	400	200	170	25	30	200	6.5×8	6.5	M8

Static characteristics (Representative example)



Circuit



Electrical Specifications

Rated Voltage **500Vac**

Safety Standard	Model Number	Rated Current (A)	Test Voltage	Insulation Resistance	Leakage Current max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Insertion losses		Weight typ.(kg)
									Normal Mode (MHz)	Common Mode (MHz)	
	3SUP-HL5-ER-6	5	Line-Case 2,000Vac 50/60Hz 60sec	Line-Case 6,000MΩmin (at 500Vdc)	8.0mA (at 500Vac 60Hz)	1.5Vac	35K	-25 ~ +50 (85°C with Temp. rise)	*0.15 ~ 30	0.15 ~ 10	3.0
	3SUP-HL10-ER-6	10									3.3
	3SUP-HL15-ER-6	15									4.0
	3SUP-HL30-ER-6	30							0.15 ~ 30	*0.15 ~ 10	5.2
	3SUP-HL50-ER-6	50									6.5
	3SUP-HL75-ER-6	75									12.0
	3SUP-HL100-ER-6	100									12.5
	3SUP-HL150-ER-6	150									23.5
	3SUP-HL200-ER-6	200									24.5

Guaranteed attenuation is more than 30dB (*more than 40dB) in normal mode and more than 25dB (*more than 20dB) in common mode.



Features

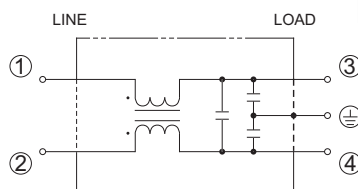
- High attenuation in MF and HF bands.
- PCB mounting with wire leads.
- Compact size.
- Case material rated UL94-VO.

Applications

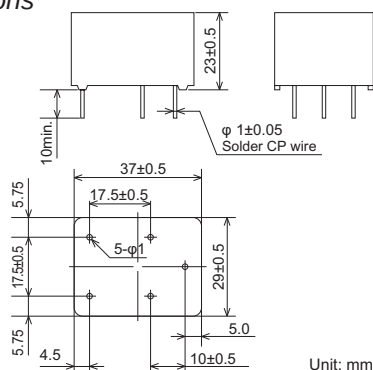
- Game machines and Control systems.

• SUP-B□R-E Series

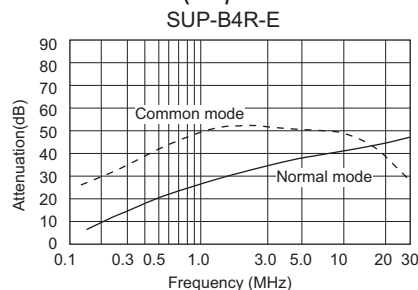
• Circuit



• Dimensions



• Static characteristics (Representative example)



Features

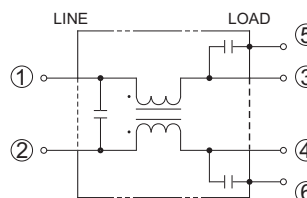
- High attenuation in MF and HF bands.
- PCB mounting with wire leads.
- Compact size.
- Case material rated UL94-VO.

Applications

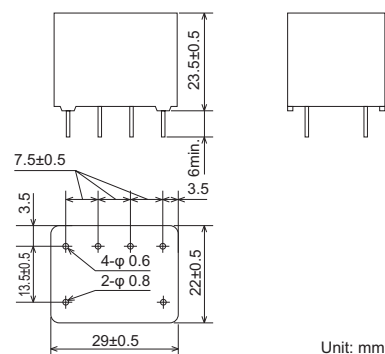
- Game machines and Control systems.

• SUP-C□G-E Series

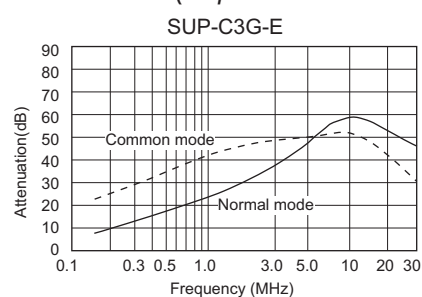
• Circuit



• Dimensions



• Static characteristics (Representative example)



Electrical Specifications

Rated Voltage **250Vac**

Model Number	Rated Current (A)	Test Voltage	Insulation Resistance	Leakage Current max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Insertion losses		Weight typ.(g)
								Normal Mode (MHz)	Common Mode (MHz)	
SUP-B2R-E	2	Line to Line 1,000Vac 50/60Hz 60sec Line to Ground 1,500Vac 50/60Hz 60sec	Line to Line 1,000MΩmin Line to Ground 1,000MΩmin (at 500Vdc)	1.0mA (at 250Vac 60Hz)	1.0Vac	20K	-20 ~ +65 (85°C with Temp. rise)	0.9 ~ 10	0.4 ~ 10	41
SUP-B4R-E	4							1.5 ~ 10	0.7 ~ 10	
SUP-B6R-E	6							2.0 ~ 10	2.0 ~ 10	
SUP-C3G-E	3	Line to Line 1,000Vac 50/60Hz 60sec Line to Ground 1,500Vac 50/60Hz 60sec	Line to Line 1,000MΩmin Line to Ground 1,000MΩmin (at 500Vdc)	1.0mA (at 250Vac 60Hz)	0.6Vac	30K	-20 ~ +55 (85°C with Temp. rise)	2.0 ~ 30	1.0 ~ 10	23
SUP-C6G-E	6							4.0 ~ 30	*1.5 ~ 20	

Guaranteed attenuation is more than 25dB in normal mode and more than 30dB in common mode. (*more than 25dB)

Features

Easy installation

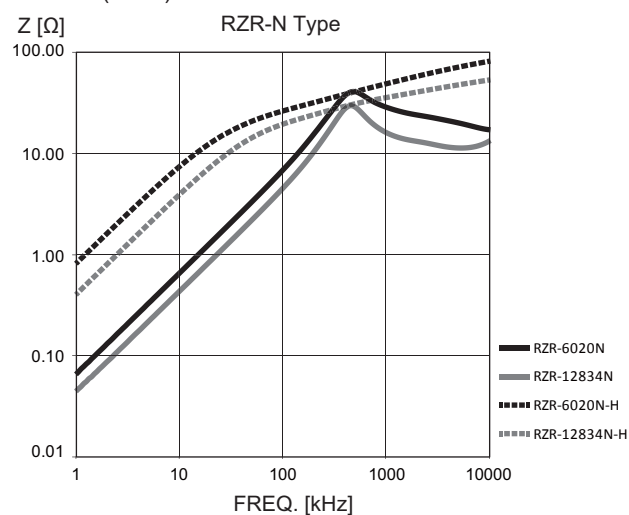
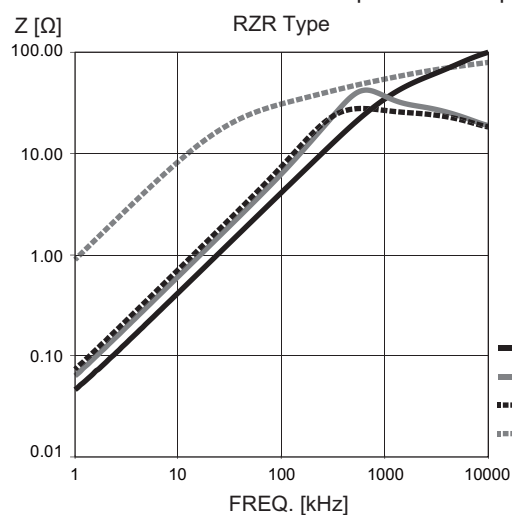
- Multiple usage by parallel installation
- Low conducted radiation noise by winding the primary or secondary power of leads
- RZR-N (magnetic material) : Ferrite, RZR-N-H (magnetic material) : Nanocrystal

Applications

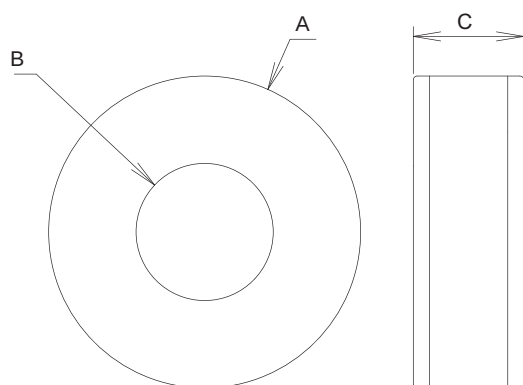
- NC machines, General inverters, UPS, and Industrial equipments.

Characteristic Features

Impedance Frequency Characteristic (1turn)

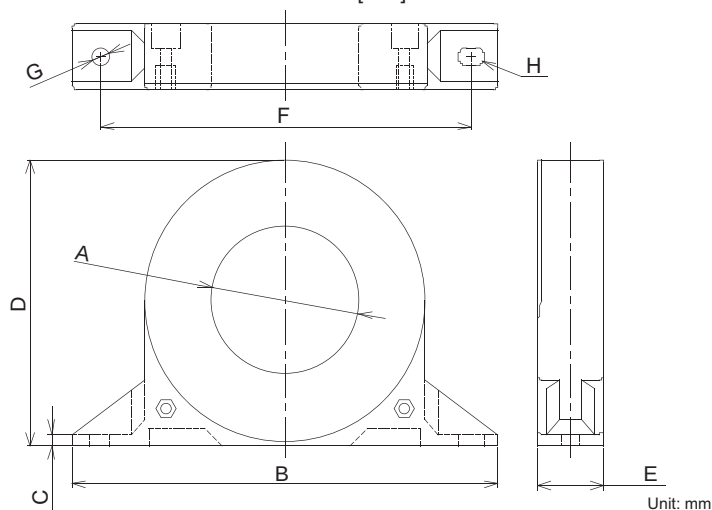


Dimensions



Unit: mm

Model Number	Dimensions(mm)			Weight typ.(g)
	A	B	C	
RZR38-3800	φ39.3	φ17.3	13.8	60
RZR38-5500				
RZR38-7000				
RZR38-H	φ50.0	φ24.2	17.5	100
RZR47-3800				
RZR47-5500				
RZR47-7000				
RZR47-H				



Unit: mm

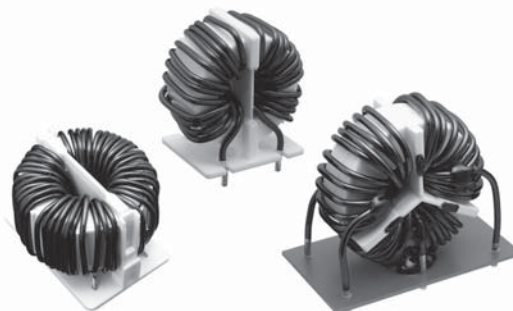
Model Number	Dimensions(mm)								Weight typ.(g)
	A	B	C	D	E	F	G	H	
RZR-6020N	φ31.4	110.0	4.5	65.5	25.0	95.0	φ5.5	φ5.5	250
RZR-6020N-H									
RZR-6815N	φ40.0	130.0	4.5	74.0	20.0	110.0	φ6.0	φ6×9	220
RZR-6815N-H									
RZR-9920N	φ56.0	160.0	4.5	108.0	25.0	140.0	φ7.0	φ7×10	570
RZR-9920N-H									
RZR-12834N	φ95.5	190.0	5.0	139.0	39.0	160.0	φ7.0	φ7×10	1,010
RZR-12834N-H									

Features

- Uses ferrite core with small size and high performance
- Wide range Lineup (3 to 30A)

Applications

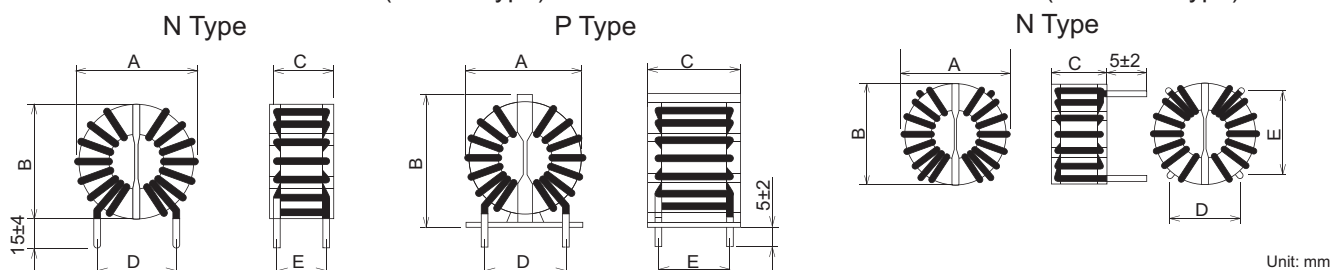
- Suppressing conduction noise of power line and signal line
- Office automation equipment, inverter
- For CISPR, VCCI standards



Dimensions

RCV SERIES (Vertical type)

RCH SERIES (Horizontal type)



Electrical Specifications

Rated Voltage **250Vac**

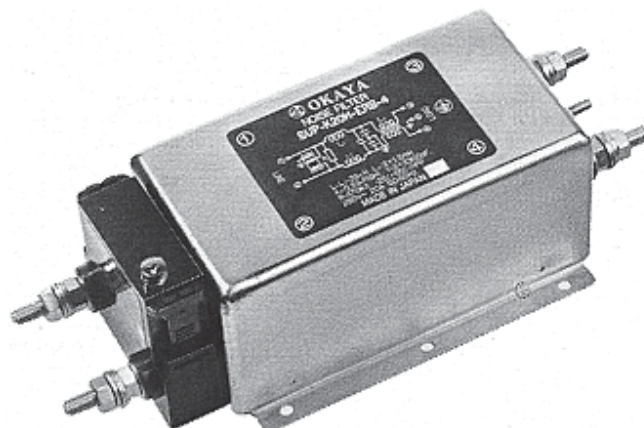
Model Number	Rated Current (A)	Inductance Value min. (mH)	DC Resistance (mΩ)	Dimensions (mm)					Wire dia. (φ mm)	Temperature Rise max.	Operating Temperature (°C)	Weight typ.(g)
				A max.	B max.	C max.	D	E				
RCV103-10N	3	1.0	70	17	17	15	7	11	0.6	40K	-25~+65 105°C with Temp.rise	6
RCV105-10N	5		2.0	55	25	24	19	10	16	0.8	50K	-25~+55 105°C with Temp. rise
RCV105-20N												
RCV110-10N	10	1.0	25	34	34	23	16	20	1.3	55K	-25~+75 130°C with Temp. rise	42
RCV110-10P	15	0.7	9		35		18	16				1.5
RCV115-07N					37	34	16	20	1.7			
RCV115-07P						35	18	16				
RCV115-16N				1.6		15	37	23	25			
RCV115-16P	38	20	22									
RCV120-12N	20	1.2	14	39	39	29	23	25	2.0	60K	-25~+70 130°C with Temp. rise	70
RCV120-12P					40		20	22				
RCV125-07N	25	0.7	7	41	41	30	23	25	2.3	55K	-25~+75 130°C with Temp. rise	72
RCV125-07P					42		12	22				
RCV130-06N	30	0.6	5	65	65	40	25	35	3.2	40K	-25~+90 130°C with Temp. rise	210
RCH203-10N	3	1.0	70	17	17	15	11	12	0.6		-25~+65 105°C with Temp. rise	6
RCH205-10N	5		2.0	55	25	24	19	12	18	0.8	50K	-25~+55 105°C with Temp. rise
RCH205-20N												
RCH210-10N	10	1.0	25	34	34	23	21	22	1.3	55K	-25~+75 130°C with Temp. rise	41
RCH215-07N	15	0.7	10						1.5			38
RCH215-16N		1.6	15	37	37	27	1.7	61				
RCH220-12N	20	1.2	14	39	39	29	23	25	2.0	60K	-25~+70	70
RCH225-07N	25	0.7	7	41	41	30			2.3		72	
RCH230-06N	30	0.6	5	65	65	40	18	28	3.2	40K	-25~+90 130°C with Temp. rise	205

Features

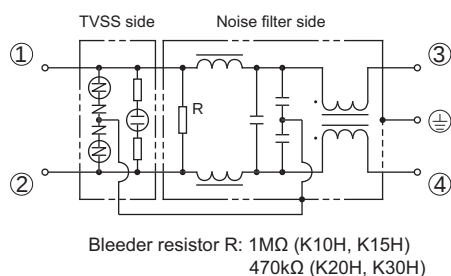
- Normal and common attenuation to 30MHz.
- VCCI, FCC, Part15.
- EMI/ RFI filter with transient voltage protection.
- TVS protection monitoring indicator.
- TVS protector is replaceable.

Applications

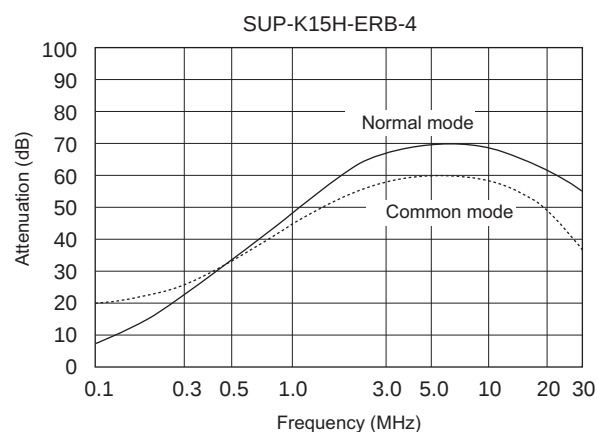
- Information processing systems, Control systems and NC machinery.



Circuit

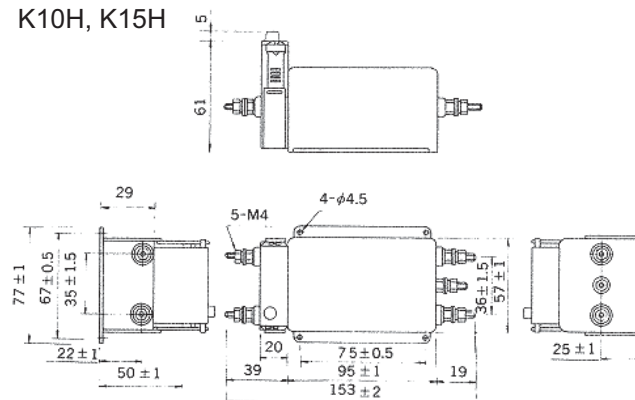


Static characteristics (Representative example)

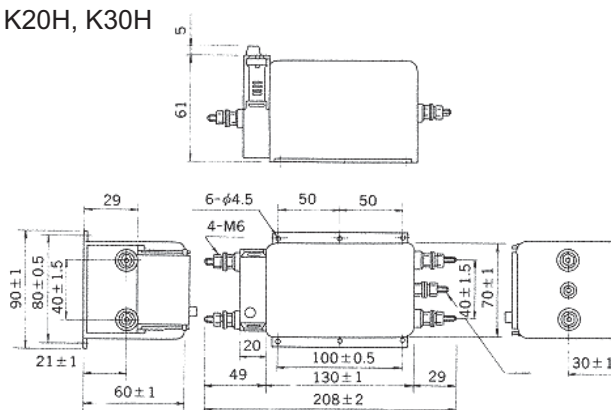


Dimensions

K10H, K15H



K20H, K30H



Unit: mm

Electrical Specifications

Model Number	Rated Voltage (Vac)	Rated Current (A)	Surge Voltage Withstand	Insulation Resistance	Leakage Current max.	Voltage Drop max.	Temperature Rise max.	Operating Temperature (°C)	Insertion losses		Weight typ.(g)			
									Normal Mode (MHz)	Common Mode (MHz)				
SUP-K10H-ERB-4P1	125	10	Line to Case 1.2/50μS 12kV	Line to Case 100MΩmin. (at 100Vdc)	0.5 mA (at 125Vac 60Hz)	1.5Vac	30K	-25 ~ +55 (85°C with Temp. rise)	0.6 ~ 30	0.5 ~ 20	660			
SUP-K15H-ERB-4P1		15							1.0~30	1.0~30	680			
SUP-K20H-ERB-4P1		20							0.5~30	0.9~30	1,500			
SUP-K30H-ERB-4P1		30							0.7~30	2.0~30				
SUP-K10H-ERB-4P2	250	10			1.0 mA (at 250Vac 60Hz)				0.6~30	0.5~30	660			
SUP-K15H-ERB-4P2		15							1.0~30	1.0~30	680			
SUP-K20H-ERB-4P2		20							0.5~30	0.9~30	1,500			
SUP-K30H-ERB-4P2		30							0.7~30	2.0~30				

Test Voltage: (Line to Line) 1,000Vac 50/60Hz 60sec
(Line to Ground) 2,000Vac 50/60Hz 60sec

Guaranteed attenuation is more than 30dB.

TRANSIENT VOLTAGE SURGE ABSORBERS (SURGE PROTECTIVE DEVICES)



SURGE PROTECTIVE DEVICES



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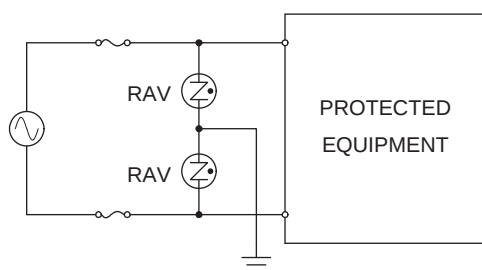
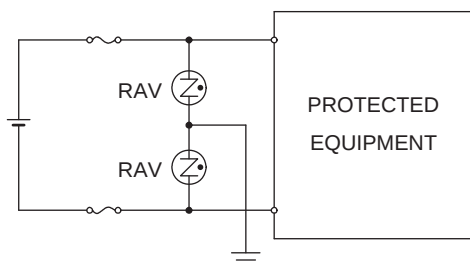
For improvement, specifications are subject to change without prior notice.

When components are used for special applications requiring high reliability (life maintenance equipment, atomic energy, airplanes, artificial satellites, etc.), contact us beforehand. Also make sure to evaluate and verify the components in a state that they are mounted on actual equipment.

Application	Model Series	Features	Impulse Discharge Current 8/20μs (A)	Page
AC Power Line Lightning Surge Single Phase	LV-Q	IEC61643-1 approval	5,000	120~121
	RSPD-Q	IEC61643-1 approval	5,000	122~123
	SV-Q	IEC61643-1 approval	5,000	124~125
	LVF-Q	IEC61643-1 approval	10,000	126~127
	R·C·M-BQZ-4, -5	Lightning surge	5,000	128~129
	R·A·V-BWZ-4, -5	Lightning surge	2,500	130~131
	R·A·V-BWZ-2A	Lightning surge	2,500	132~133
	R·A·M-BWZ,BXZ(LED)	Lightning surge	2,000	134
	R·A·M-152BQZ(LED)	Lightning surge	2,000	135
	RGF-Q4, RGF10-Q4	Lightning surge	5,000	136
	R·A·M-LAS	Lightning surge	2,000	137
	R·A·V-LDEZ, BWZ-3C	Micro gap Gas discharge	1,000	138
	GFA-300-Q4	IEC61643-1 approval	5,000	139
	R28-S	Ceramic gas arrester	20,000	142
	R28, R38	Ceramic gas arrester	10,000	143, 145
	R26, R36	Ceramic gas arrester	5,000	144, 146
	RHCA5039	SMD Gas discharge tube	2,000	147~149
	RA-MX-V7-Y/ Y(5)	Fast response Gas discharge tube w/taping	3,500	158~159
	RA-MX-V7-Y/ Y(SJQ)	Fast response Gas discharge tube w/taping	3,500	160~161
	RA-V7	Fast response Gas discharge tube	3,500	162~163
	RA-C6	Fast response Gas discharge tube	2,000	164~165
	LV-U	IEC61643-1 approval	5,000	120~121
	RSPD-U	IEC61643-1 approval	5,000	122~123
	SV-U	IEC61643-1 approval	10,000	124~125
	LVF-U	IEC61643-1 approval	5,000	126~127
	R·C·M-BUZ-4, -5	Lightning surge	5,000	128~129
	R·A·V-BXZ-4, -5	Lightning surge	2,500	130~131
	R·A·V-BXZ-2A, BYZ-2	Lightning surge	1,000~	132~133
	R·A·M-BUN-Z(LED)	Lightning surge	2,000	134
	R·A·V-BWZ-3C	Lightning surge	2,400	138
Surge Protection for Network Line	R28-S	Ceramic gas arrester	20,000	142
	R28, R38	Ceramic gas arrester	10,000	143, 145
	R26, R36	Ceramic gas arrester	5,000	144, 146
	R5K, R5K3	SMD Gas discharge tube	5,000	150~153
	RHCA4532, 3216	SMD Gas discharge tube	500~	154~157
	RA-C6	Fast response Gas discharge tube	2,000	164~165
	R·A·V-L-A	Fast response, high capacity surge protection	2,400	167~168
	R·A·V-LD	Fast response, high capacity surge protection	2,400	178
	ZP, CP, U, B, SA	Fast response Gas discharge tube w/taping	25.5~	169~172
	RLAN	Surge protector for Cat8e PoE1000BASE	5,000	182
	RLAN2, 3	Surge protector for Cat8e PoE PLUS1000BASE	5,000	183
	RSP-LAN-B	Surge protector for LAN10/100BASE -T	-	174
	RSP-232	Surge protector for RS232, 9 pin	2,000	176
	RSP-TEL	Lightning surge protector for phone line	-	176
	RSP-485	Lightning surge protector for RS485/422	2,000	177
	RSD5-485	Lightning surge protector for RS485/422	5,000	158
	R·S·M-GL	Lightning surge protector for data line	1,000	179
	R·S·M-GL-PT	Lightning surge protector for data line	1,000	180
	R·S·M-GL-DIN	Lightning surge protector for data line	5,000	181
DC Power Line On-Off Surge	R·A·V-L-A	Fast response, high capacity surge protection	2,400	160
	R·A·V-LD	Fast response, high capacity surge protection	2,400	162, 163
	ZP, CP, U, B, SA	Fast response Gas discharge tube w/taping	25.5~	148~151
	RSP-DC	Lightning surge protector for DC power circuit	128~	161
Electrostatic Surge	R·A·V-L-A	response, high capacity surge protection	2,400	167~168
	R·A·V-LD	Fast response, high capacity surge protection	2,400	178
	RHCA3216	SMD Gas discharge tube	500	156~157
	RA-C6	Fast response Gas discharge tube	2,000	164
	ZP, CP, U, B, SA	Fast response Gas discharge tube w/taping	25.5~	169~172
	RSP-232	Surge protector for RS(EIA)232	2,000	176

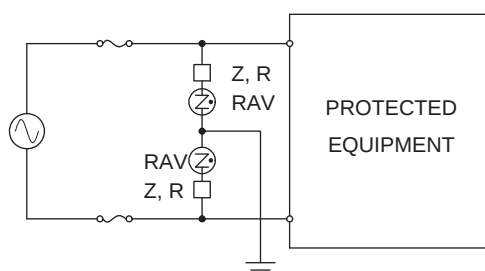
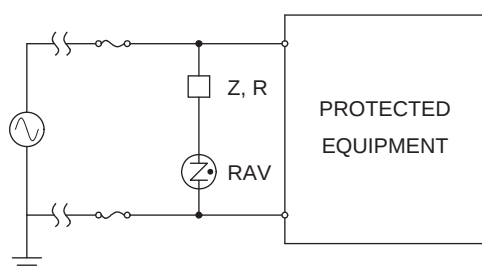
BASIC CIRCUIT TO PROTECT EQUIPMENT

- Input impedance is high



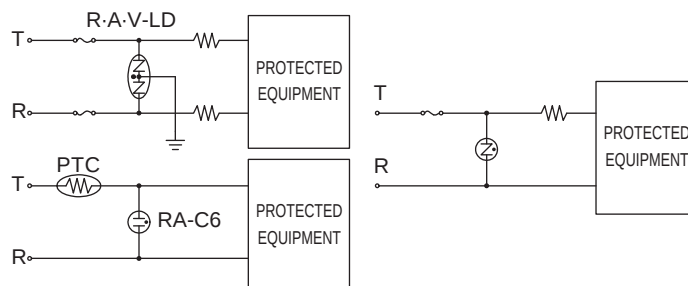
- Input impedance is low

The resistors (R) or MOV (Z) control continuous flow discharge and low value ones should be selected so as not to reduce the capacity of the surge protection device.

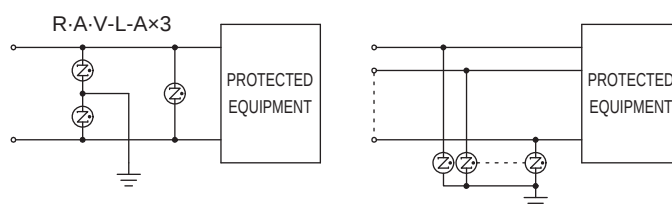


APPLICATION

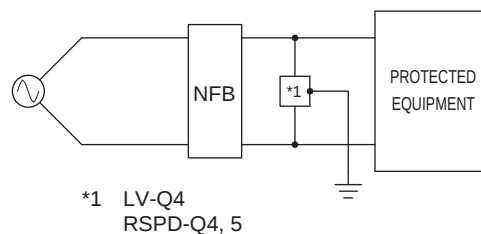
- Protecting telephone lines



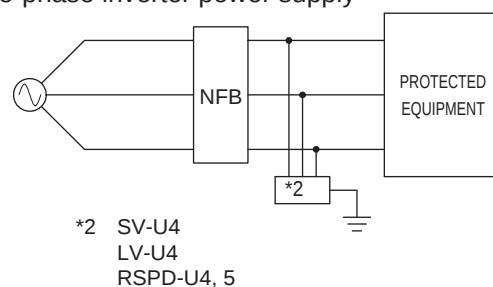
- Protecting telecommunications and signal lines



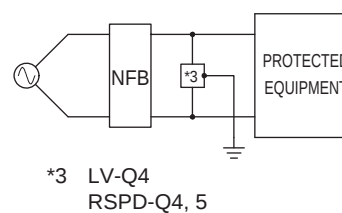
- Single phase power supply



- Three-phase inverter power supply



- Protecting power supply for vending machine



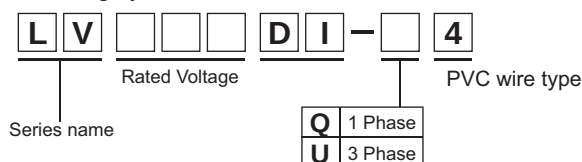
Features

- SPD with a fail safe function to prevent short-circuit (separation of circuit and element is visually confirmable)
- Compliance with IEC 61643-1 that meets the new JIS standards
- Against indirect lightning surge for single phase / three phase power supplies
- Quick response for surge
- Impulse current capacity 8/20 μ s-5,000A
- Impulse test category: Class II (Type II)
- Every pathway consists of same elements. Between line and line/between lines and ground can protect as the same level.

Applications

- Tapping machine, NC machine, other machine tools
- Lithography equipment, Washing device, IC tester
- Injection molding machine, Winding machine, Surface mounter
- Vehicle air conditioner
- Servo amplifier
- Electric facility, Industrial equipment

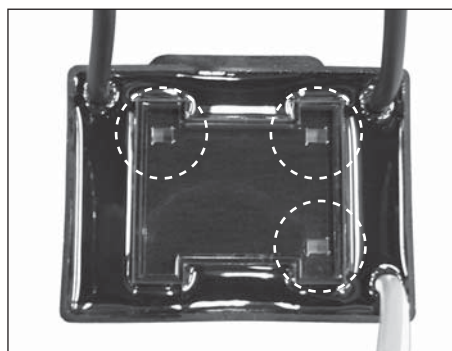
- Model numbering system



Safety Standard		File No.
UL	:UL1449 4th.	E322107
cUL	:C22.2 No.8-13	
SEMKO	:IEC61643-1:2005 2nd	SE-57200
	:EN61643-11:2002 +A11	1400254



- Indicator of disconnecter status



Status

Green: Normal
No Green: Abnormal

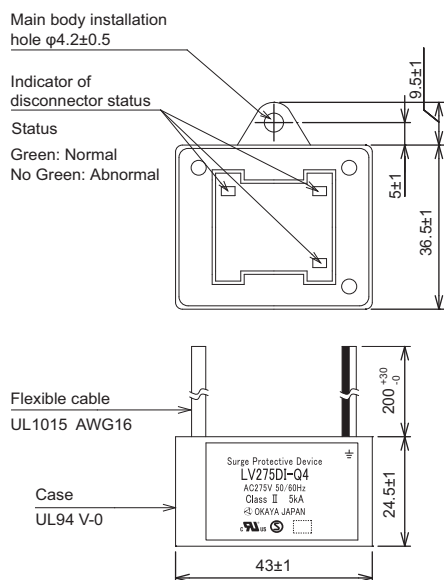
Electrical Specifications

Safety Standard	Model Number	Rated Voltage 50/60Hz		DC Operating Voltage (V) ±25%	Voltage Protection Level (V)	Nominal Discharge Current 8/20µs (A)	Max. Discharge Current 8/20µs (A)	Impulse Life Test 8/20µs-1,000A
 	LV150DI-Q4	Single Phase	AC150V	450	1,200	2,500	5,000	Approx. 500 times
	LV275DI-Q4	Single Phase	AC275V	800	1,500			
	LV275DI-U4	Three Phase						
	LV480DI-Q4	Single Phase	AC480V	1,400	2,000			
	LV480DI-U4	Three Phase						
	LV550DI-U4	Three Phase	AC550V	1,600	2,500			

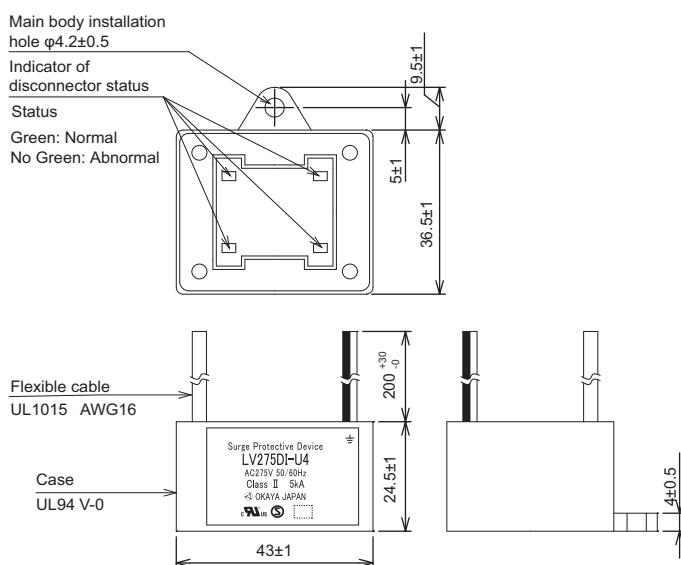
Operating Temperature: -40~+70°C

• Dimensions

LV-□□□DI-Q4 series (Single-Phase)



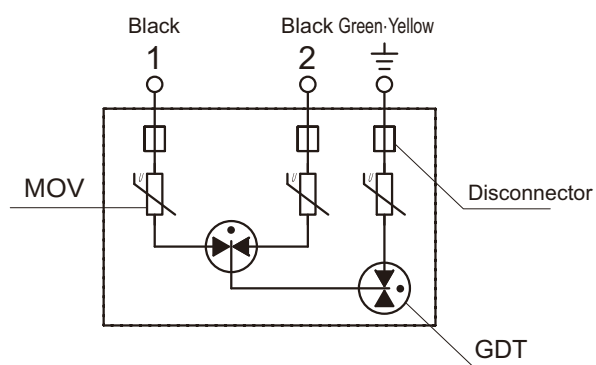
LV-□□□DI-U4 series (Three-Phase)



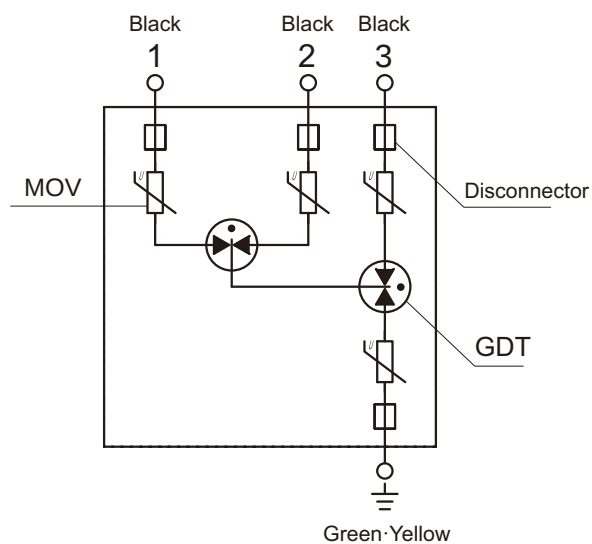
Unit: mm

• Circuit

LV□□□DI-Q4 series



LV□□□DI-U4 series



Flexible wires in black color can connect to each phase without any specific control.



Features

- Continual rated voltage AC150V-AC600V.
- Lightning surge protection for both single and three phase application.
- Fast response.
- Maximum peak surge current 8/20 μ s-5,000A.
- Every pathway consists of same elements.
Between line and line/between lines and ground can protect as the same level.
- Business equipment Compliant to IEC60950

Applications

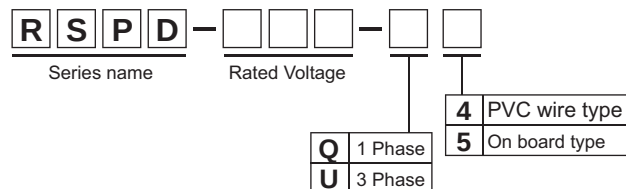
- Tapping machine, CNC turning machine, general machinery.



Safety Standard		File No.
UL	:UL1449 4th.	E322107
cUL	:C22.2 No.8-13	
TÜV	:EN60950-1:2006+A11+A1+A12+A2	J50354669



- Model numbering system



Electrical Specifications

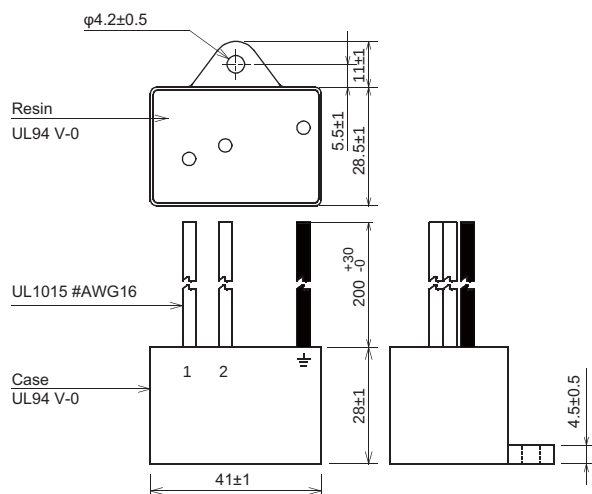
Safety Standard	Model Number*	Rated Voltage 50/60Hz		DC Operating Voltage (V)±25%	Voltage Protection Level (V)	Normalinal Discharge Current 8/20μs (A)	Max. Discharge Current 8/20μs (A)	Impulse life test 8/20μs-1,000A
 	RSPD-150-Q□	Single Phase	AC150V	400	800	2,500	5,000	Approx. 300times
	RSPD-250-Q□	Single Phase	AC250V	700	1,300			
	RSPD-250-U□	Three Phase						
	RSPD-420-Q□	Single Phase	AC420V	1,100	1,500			
	RSPD-420-U□	Three Phase						
	RSPD-500-Q□	Single Phase	AC500V	1,300	2,000			
	RSPD-500-U□	Three Phase						
	RSPD-600-Q□	Single Phase	AC600V	1,500	2,500			
	RSPD-600-U□	Three Phase						

* □: PVC wire type=4, on board type=5
Operating Temperature: -40~+70°C

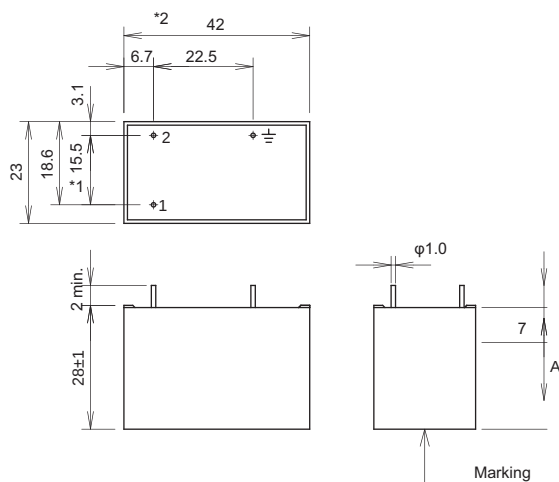
• Dimensions

RSPD-□□□-Q series (Single-Phase)

Wire terminal type (-4)

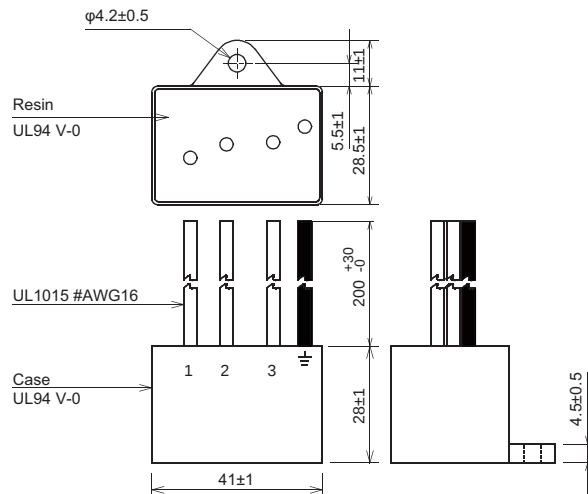


Solder lead type (-5)

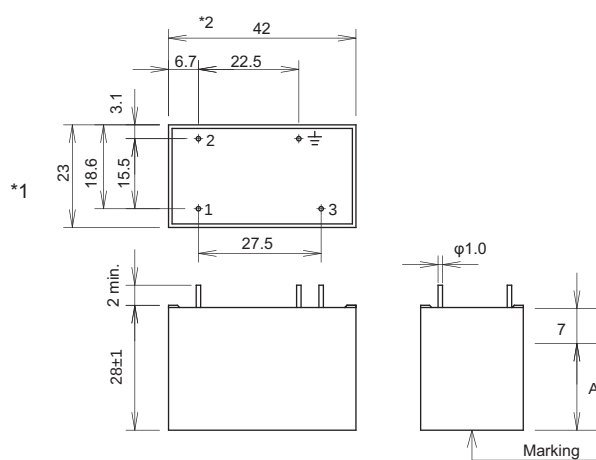


RSPD-□□□-U series (Three-Phase)

Wire terminal type (-4)



Solder lead type (-5)

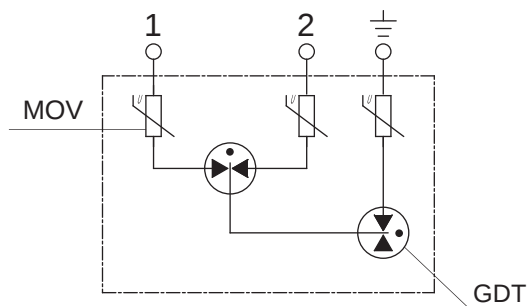


(A, *1, *2 Tolerance: ±0.5)

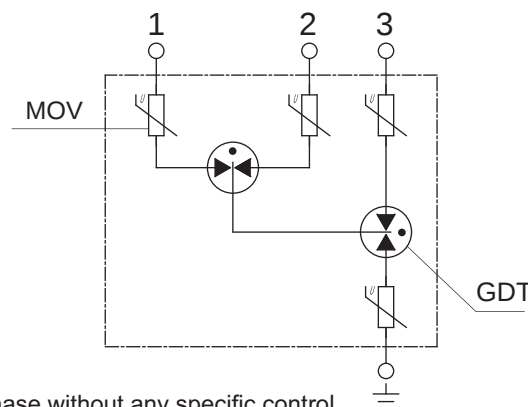
Unit: mm
Tolerance: ±1.0

• Circuit

RSPD-□□□-Q series



RSPD-□□□-U series



Flexible wires in black color can connect to each phase without any specific control.



Features

- SPD with a fail safe function to prevent short-circuit (separation of circuit and alarm contact that is easily to found the timing of changing the products)
- Compliance with IEC 61643-1 that meets the new JIS standards
- Against indirect lightning surge for three phase power supplies
- Quick response for surge
- Impulse current capacity: 8/20 μ s-5,000A
- Impulse test category: Class II (Type II)
- Every pathway consists of same elements. Between line and line/between lines and ground can protect as the same level.

Applications

- Power conditioner for solar photovoltaic system
- Electrical vehicle charger
- LED exterior illumination
- Tapping machine, NC machine, other machine tools
- Lithography equipment, Washing device, IC tester
- Injection molding machine, Winding machine, Surface mounter
- Vehicle air conditioner
- Servo amplifier
- Electric facility, Industrial equipment

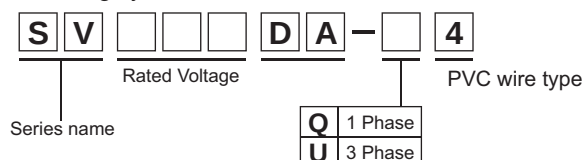


Safety Standard		File No.
UL	:UL1449 * 3rd.	E322107
cUL	:C22.2 No.8	
SEMKO	:IEC61643-1:2005 2nd :EN61643-11:2002 +A11	SE-65070 1400256

* SCCR=5kA



Model numbering system



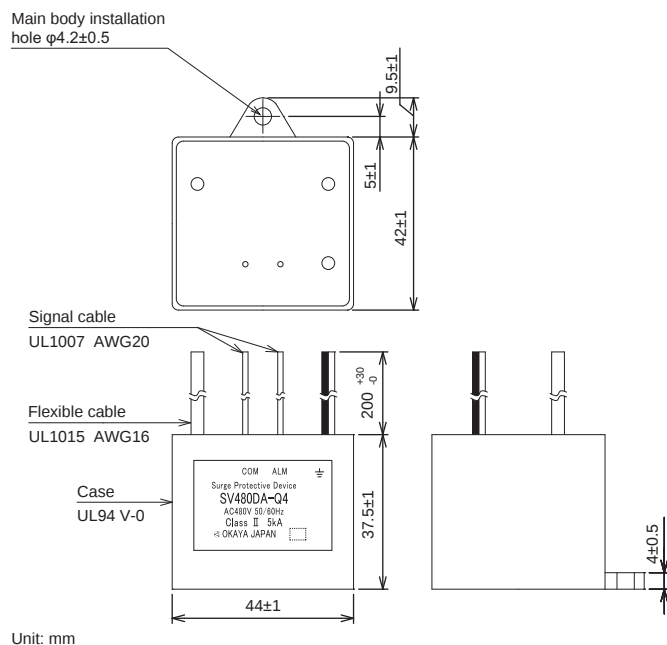
Electrical Specifications

Safety Standard	Model Number	Rated Voltage 50/60Hz		DC Operating Voltage (V)±25%	Voltage Protection Level (V)	Nominal Discharge Current 8/20μs (A)	Max. Discharge Current 8/20μs (A)	Impulse Life Test 8/20μs, 1,000A
—	SV150DA-Q4	Single Phase	AC150V	450	1,200	2,500	5,000	Approx. 500 times
	SV275DA-Q4	Single Phase	AC275V	800	1,500			
	SV275DA-U4	Three Phase						
—	SV480DA-Q4	Single Phase	AC480V	1,400	2,000			
	SV480DA-U4	Three Phase						
	SV550DA-U4	Three Phase	AC550V	1,600	2,500			

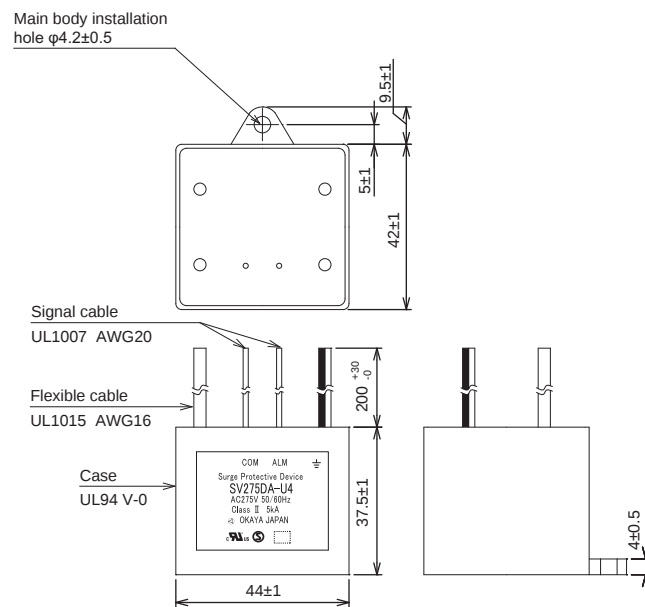
Operating Temperature: -40~+70°C

• Dimensions

SV-□□□DI-Q4 series (Single-Phase)

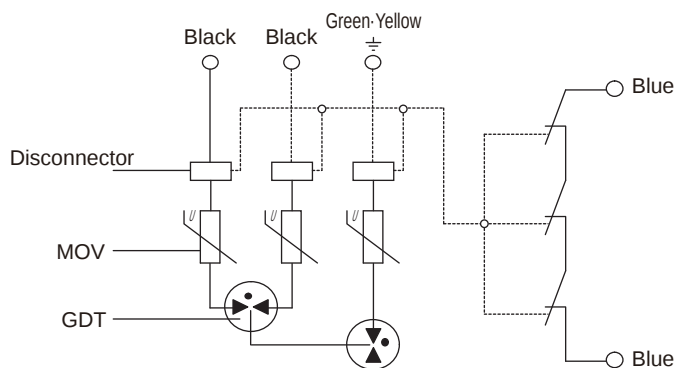


SV-□□□DI-U4 series (Three-Phase)

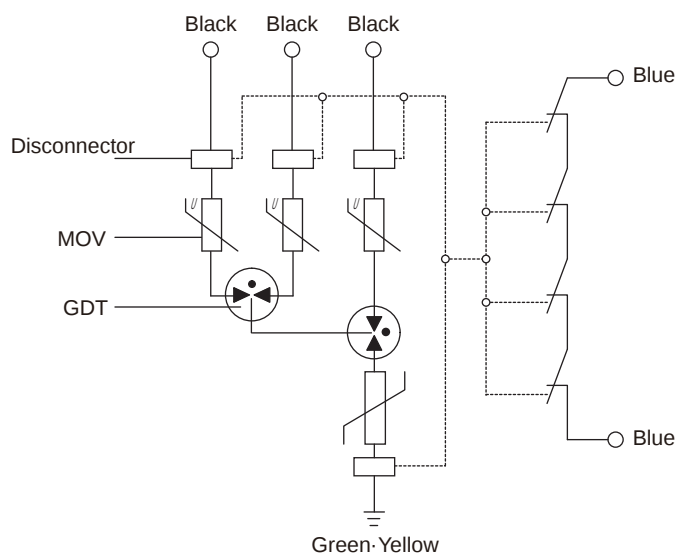


• Circuit

SV-□□□DI-Q4 series



SV-□□□DI-U4 series



Contact : Mechanical type

Maximum rating for contact circuit : DC26.4V, 200mA

Contact switching condition : Normal (Close)

Abnormal (Open)

Flexible wires in black color can connect to each phase without any specific control.

Features

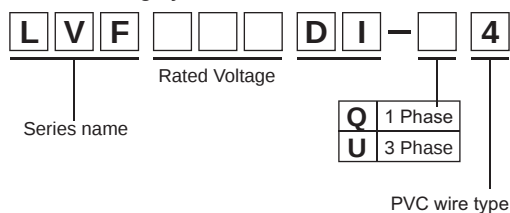
- Compliant to the standard specification of the Ministry of Land, Infrastructure, Transport and Tourism
- SPD with a fail safe function to prevent short-circuit (separation of circuit and element is visually confirmable)
- Quick response for surge
- JIS5381-I : Nominal 8/20 μ s-5,000A
Max. 8/20 μ s-10,000A
- Impulse test category: Class II (Type II)
- Every pathway consists of same elements.
Between line and line/between lines and ground can protect as the same level.



Applications

- Road traffic and related equipment
- Power conditioner for solar photovoltaic system etc.

- Model numbering system



- Indicator of disconnecter status



Status

Green: Normal
No Green: Abnormal

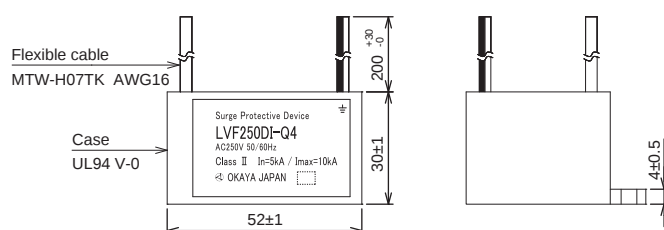
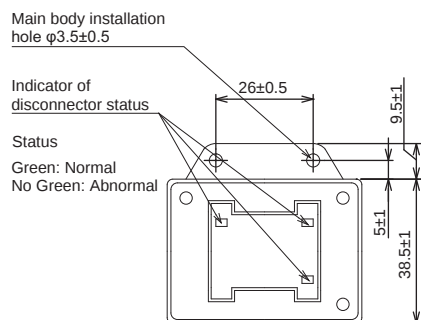
Electrical Specifications

Model Number	Rated Voltage 50/60Hz		DC Operating Voltage (V) ±25%	Voltage Protection Level (V)	Nominal Discharge Current 8/20μs (A)	Max. Discharge Current 8/20μs (A)	Impulse Life Test 8/20μs-1,000A
LVF150DI-Q4	SinglePhase	AC150V	450	1,200	5,000	10,000	Approx. 500 times
LVF250DI-Q4	SinglePhase	AC250V	700	1,500			
LVF250DI-U4	ThreePhase						
LVF300DI-Q4	SinglePhase	AC300V	1,000	2,000			
LVF300DI-U4	ThreePhase						
LVF480DI-Q4	SinglePhase	AC480V	1,400	2,500			
LVF480DI-U4	ThreePhase						

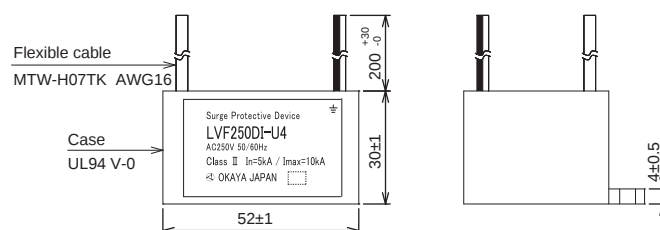
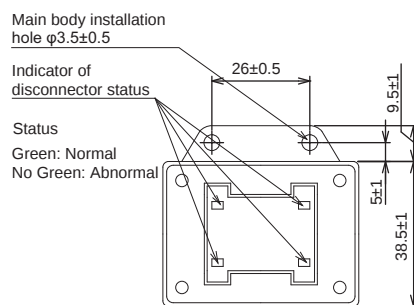
Operating Temperature: -40~+70°C

• Dimensions

LVF-□□□DI-Q4 series (Single-Phase)



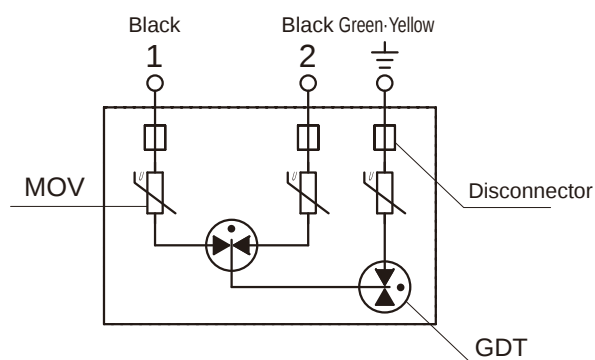
LVF-□□□DI-U4 series (Three-Phase)



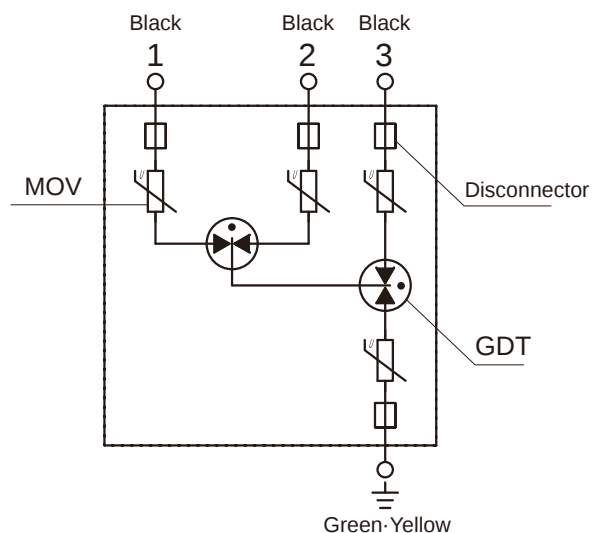
Unit: mm

• Circuit

LVF-□□□DI-Q4 series



LVF-□□□DI-U4 series



Flexible wires in black color can connect to each phase without any specific control.



R·C·M- BQZ-4, BQZ-5 BUZ-4, BUZ-5 SERIES SURGE PROTECTIVE DEVICES



Features

- Line to Line and Line to Ground combined protection.
- UL, CSA and CE safety approvals.
- Surge protection for both Single and Three-Phase applications.
- Compact size

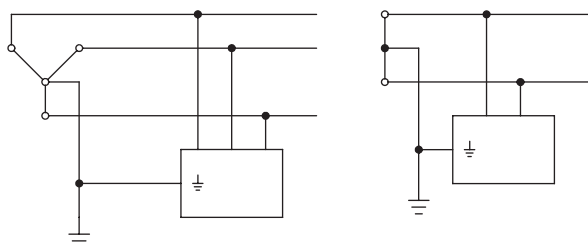
Applications

- Tapping machine, CNC turning machine, general machinery.

Rated Voltage

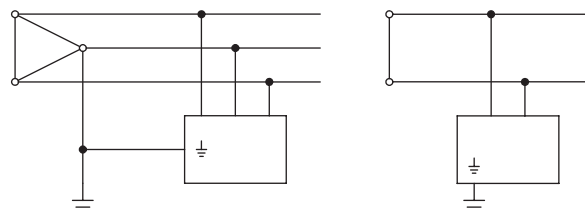
- Specification is different by delta connection and Y connection in Japan and overseas.
- Please use the RCM-BQZ and RCM-BUZ series at the rated voltage below.

- Y connection



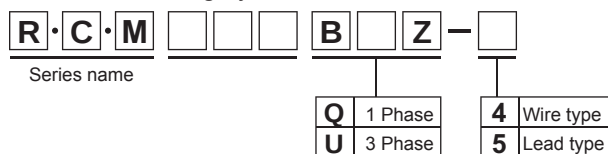
Y connection - 1 φ ~ AC430V(Line-Line) : R·C·M-781BQZ-4
 3 φ ~ AC430V(Line-Line) : R·C·M-781BUZ-4
 3 φ ~ AC500V : R·C·M-801BUZ-4

- Δ connection



Δ connection - 1 φ ~ AC250V : R·C·M-601BQZ-4
 3 φ ~ AC250V : R·C·M-601BUZ-4
 3 φ ~ AC250V : R·C·M-781BUZ-4
 3 φ ~ AC290V : R·C·M-801BUZ-4

- Model numbering system



Electrical Specifications

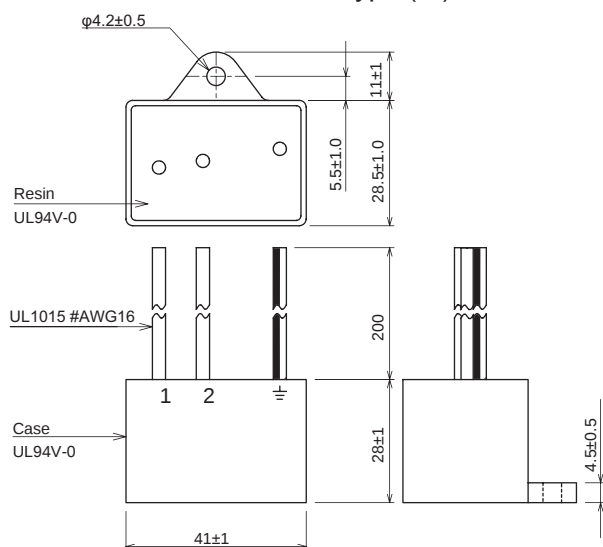
Safety Standard	Model Number*	Rated Voltage		Power Frequency Sparkover Voltage U_a (V) $\pm 20\%$	Nominal Discharge Current ins 8/20 μ s (A)	Max. Standard lightning Impulse Sparkover Voltage u_s 1.2/50 μ s (V)	Max. Sparkover Voltage at front of wave lighting Impulse u_{as} 10,000V/ μ s (V)	Max. Residual Voltage u_r 8/20/ μ s-2,500A (V)	Impulse Life Test 8/20 μ s 1,000A (times)	Max. Impulse Discharge Current I_s 8/20 μ s (A)
 UL cULus  TUV Rheinland	R·C·M-601BQZ-□	1 Phase	AC250V	AC560	2,500	2,000	3,000	2,000	300	5,000
	R·C·M-601BUZ-□	3 Phase								
	R·C·M-781BQZ-□	3 Phase	AC430V	AC700						
	R·C·M-781BUZ-□	3 Phase	AC250/430V							
	R·C·M-801BUZ-□	3 Phase	AC290/500V	AC800		2,320	3,480	2,320		

*□: Wire type=4, Lead type=5
 Operating Temperature: -40~+70°C

• Dimensions

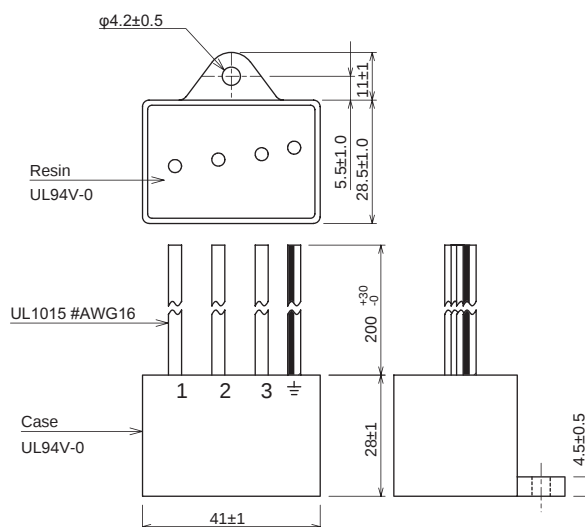
BQZ Series (Single-Phase)

Wire terminal type (-4)

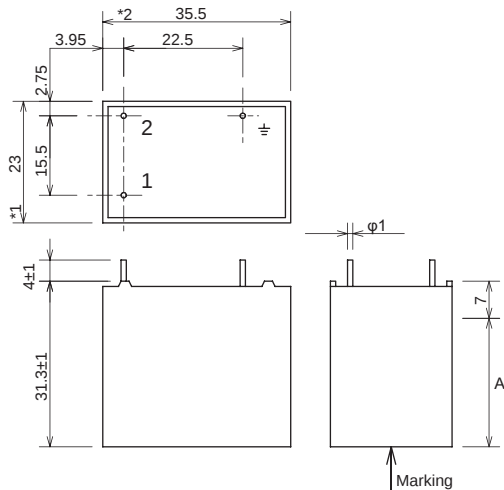


BUZ Series (Three-Phase)

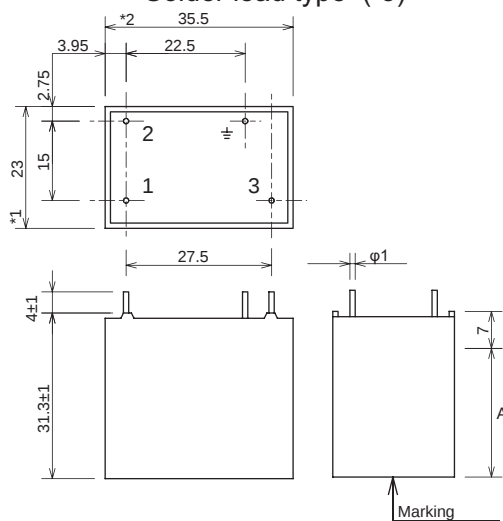
Wire terminal type (-4)



Solder lead type (-5)



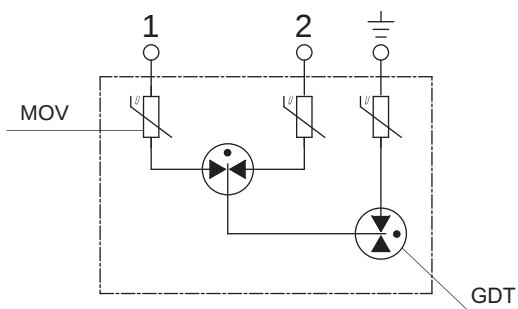
Solder lead type (-5)



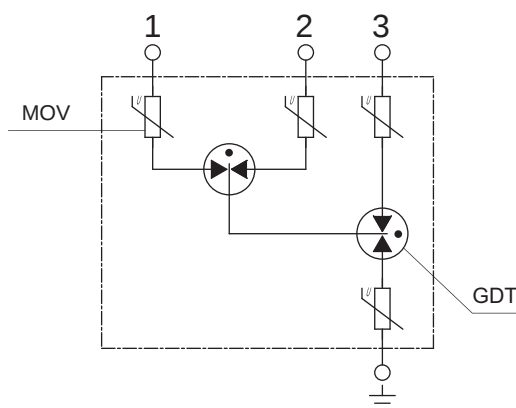
Unit: mm
(A, *1, *2 Tolerance: ±0.5) Tolerance: ±1.0

• Circuit

BQZ series



BUZ series



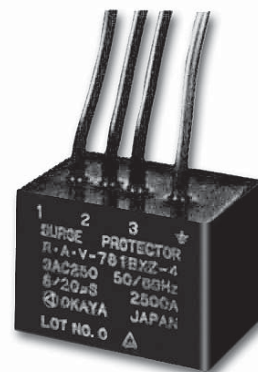


Features

- These models are specifically designed for use in AC power line applications which may require European (CE) mark.
- They are designed for use in Single and Three-Phase applications for protection against “Common mode” noise transient surges.
- Three-Phase application include Delta and Y connections to AC500V.

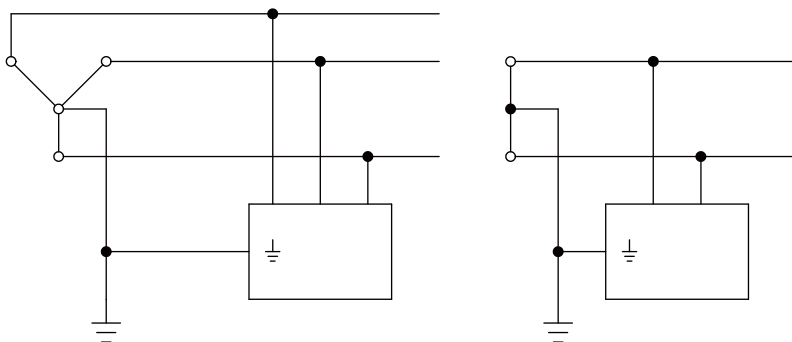


Safety Standard		File No.
UL	:UL1449 4th.	E322107
CSA	:C22.2 No.8	LR105073
TÜV	:EN60099-1	J9551051



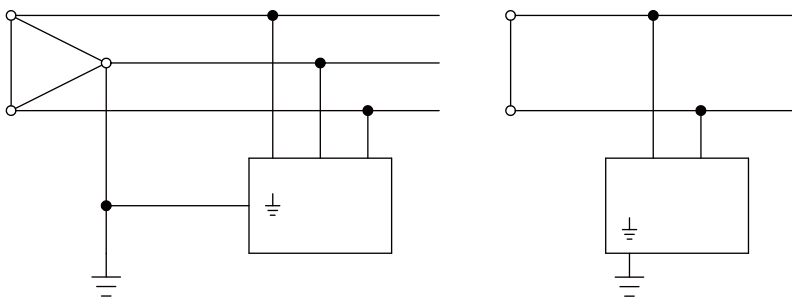
Circuit

- Y connection



Y connection - 1 ϕ ~ AC500V : R·A·V-781BWZ-4
 3 ϕ ~ AC430V : R·A·V-781BXZ-4
 3 ϕ ~ AC500V : R·A·V-801BXZ-4

- Δ connection



Δ connection - 1 ϕ ~ AC250V : R·A·V-781BWZ-4
 3 ϕ ~ AC250V : R·A·V-781BXZ-4
 3 ϕ ~ AC250V : R·A·V-801BXZ-4

Electrical Specifications

Safety Standard	Model Number	Rated Voltage		Power Frequency Sparkover Voltage U_a (V) $\pm 20\%$	Nominal Discharge Current ins 8/20 μ s (A)	Max. Standard lightning Impulse Sparkover Voltage u_s 1.2/50 μ s (V)	Max. Sparkover Voltage at front of wave lighting Impulse u_{sa} 10,000V/ μ s (V)	Max. Residual Voltage u_r 8/20/ μ s-2,500A (V)	
		Δ connection L-L, L- $\perp$	Y connection L-L, L- $\perp$						
  	R·A·V-781BWZ-4	AC250V	AC250/500V	700	2,500	2,000	3,000	2,000	
	R·A·V-781BWZ-5		AC250/500V						
	R·A·V-781BXZ-4		AC250/430V	800		2,320	3,480	2,320	
	R·A·V-781BXZ-5		AC250/430V						
	R·A·V-801BXZ-4		AC290/500V						
	R·A·V-801BXZ-5		AC290/500V						

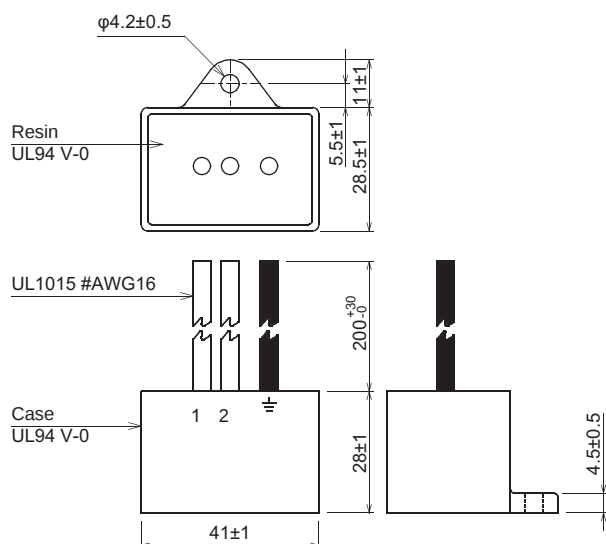
* R·A·V-□□□-4: Wire type, R·A·V-□□□-5: Lead type
 Operating Temperature: -40~+70°C



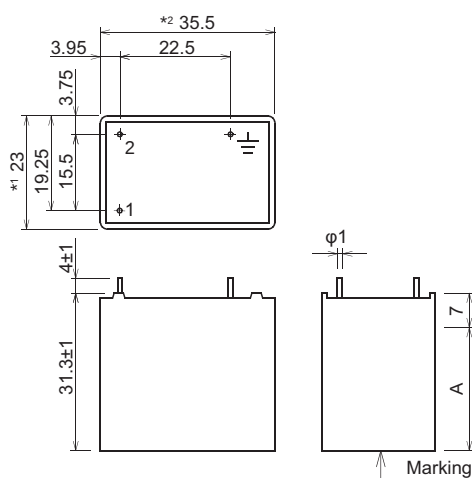
• Dimensions

BWZ Series (Single-Phase)

Wire terminal type (-4)

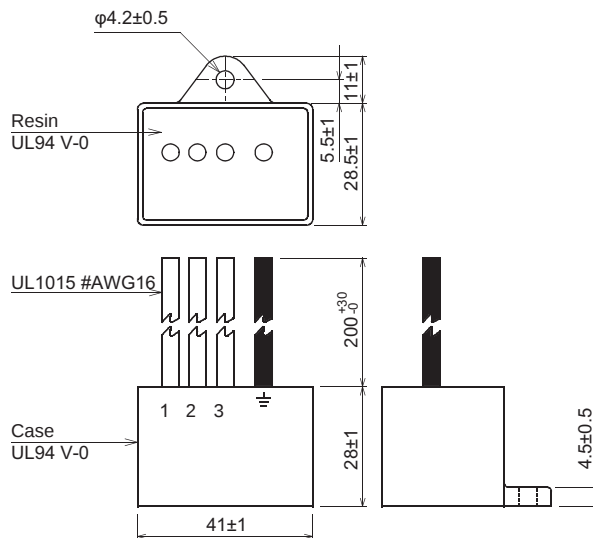


Solder lead type (-5)

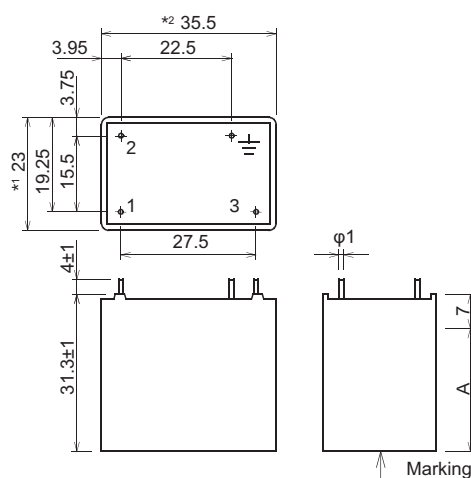


BXZ Series (Three-Phase)

Wire terminal type (-4)



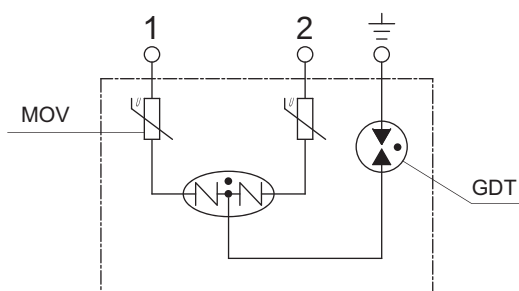
Solder lead type (-5)



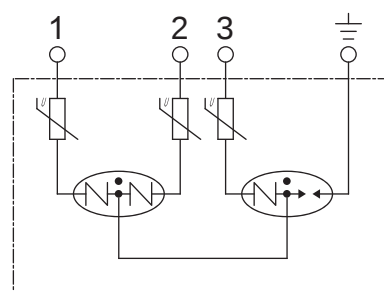
Unit: mm
(A, *1, *2: Tolerances ± 0.5)
Tolerances: ± 1.0

• Circuit

BWZ series



BXZ series





R·A·V-BWZ-2A

This model is designed specifically for use in AC power line applications. This model uses specially treated discharge electrodes for greatly enhanced noise immunity test and surge life making it optimum for the protection of single-phase power supply circuits.

R·A·V-BXZ-2A

This model is designed specifically for use in three-phase power circuit applications. Combining multiple PAVs with specially treated electrodes for greatly enhanced noise immunity test and surge life, this model is constructed in a unit-molded body.

R·A·V-BYZ-2

This model is designed specifically for use in three-phase power circuit applications. It is designed to protect against "normal mode" noise transient surges.

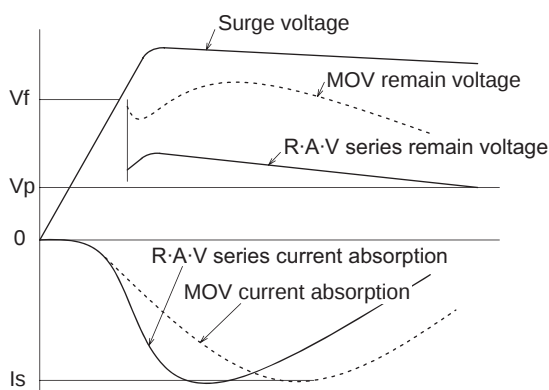
When used in conjunction with the RAV-BXZ-2A, it will furnish complete protection of equipment from both Normal and Common mode transient voltage surges.



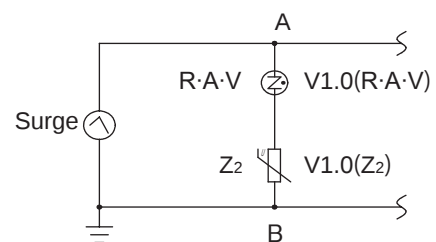
Safety Standard		File No.
UL	:UL1449 4th.	E322107
CSA	:C22.2 No.8	LR105073



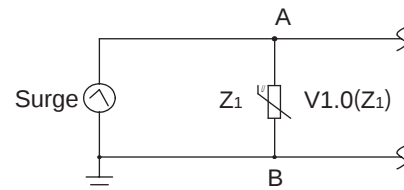
● Surge Absorption Capacitance Remain Voltage Comparison Chart



Surge Absorber

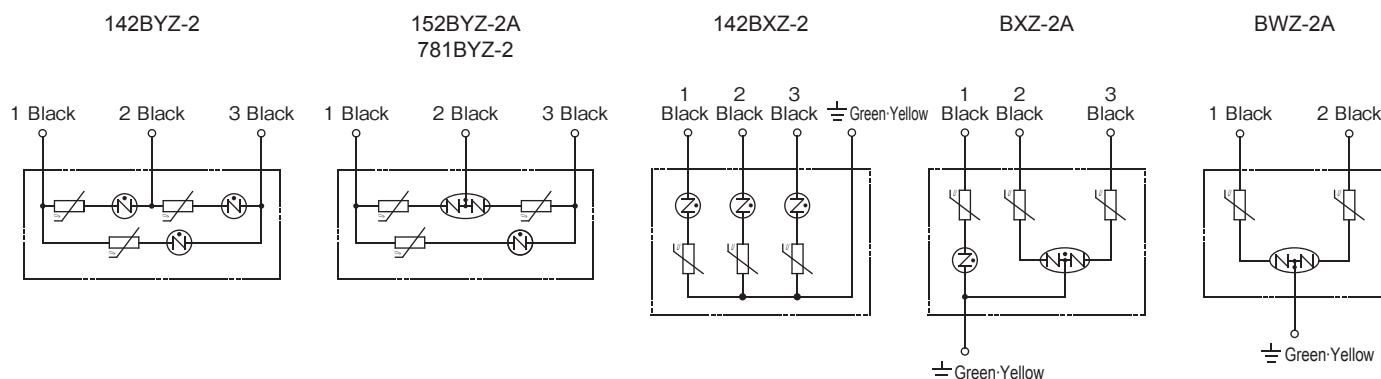


MOV

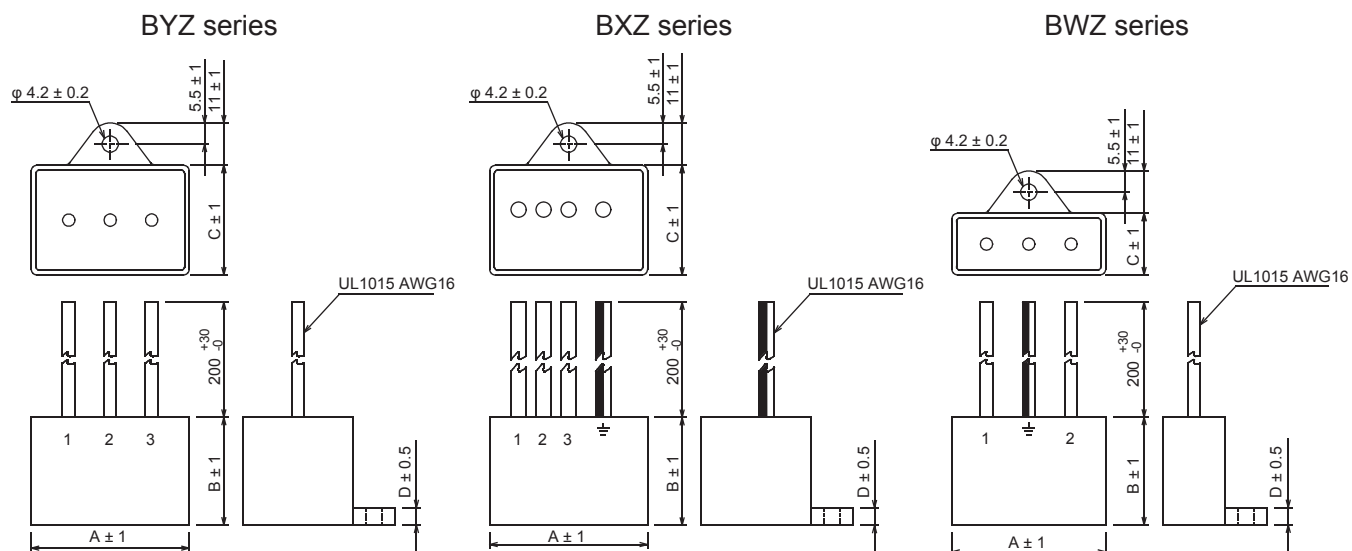


Vf: Breakdown voltage
Vp: Peak circuit voltage
 $V_p = V_{ac} \times \sqrt{2}$
Max. surge current
 $I_s: V1.0(R \cdot A \cdot V) + V1.0(Z_2) = V1.0(Z_1)$

● Circuit



● Dimensions



Unit: mm

Electrical Specifications

Safety Standard	Model Number	Line Voltage 50/60Hz		Max. Line Voltage (V)	Clamping Voltage (V) ±10%	Impulse Discharge Current 8/20μs (A)	Withstanding Impulse Voltage 1.2/50μs (V)	Capacitance (pF) *	Weight (g) Approx.	Dimensions (mm)			
										A	B	C	D
	R·A·V-401BWZ-2A	Single Phase	AC125V	145	403	2,500	20,000	100	50	40	28	16	4.5
	R·A·V-781BWZ-2A	Single Phase	AC250V	300	783			50	60				
	R·A·V-781BXZ-2A	Three Phase	AC250V					75	100	41	28.5		
	R·A·V-781BYZ-2												
—	R·A·V-142BXZ-2	Three Phase	AC400V	450	1,385	1,000	12,000	40	140	59.9	43.5	30.6	5
	R·A·V-142BYZ-2												
	R·A·V-152BXZ-2A	Three Phase	AC460V	500	1,470	2,500	20,000	35	100	41	28	28.5	4.5
 R·A·V-152BYZ-2A													

* Reference Value

Operating Temperature: -20~+70°C



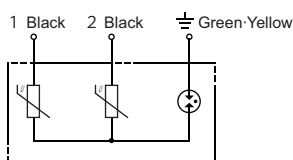
Features

- Compact size SPD
- Compliant to AC withstand voltage test
- Impulse discharge current 8/20 μ s-2kA
Common mode (1.2/50 μ s(R=12 Ω)-15kV)
available.
- Compliance with safety standard (TÜV)
- External setting available for LED security light
and LED street light.

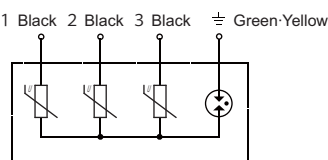
Applications

- LED security light, LED street light
- Industrial equipment required AC withstand
voltage test
- Circuit

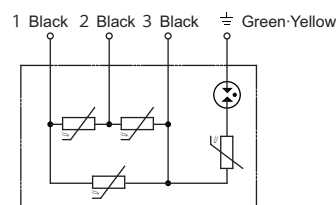
R·A·M-BWZ(LED)



R·A·M-BXZ(LED)

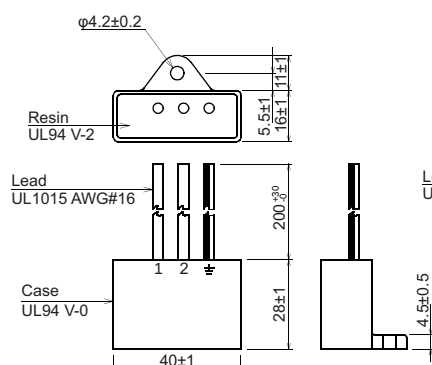


R·A·M-BUZ-N(LED)

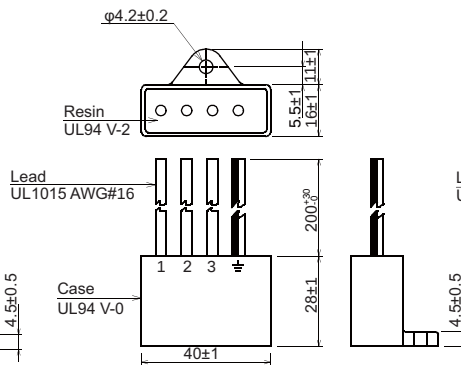


Dimensions

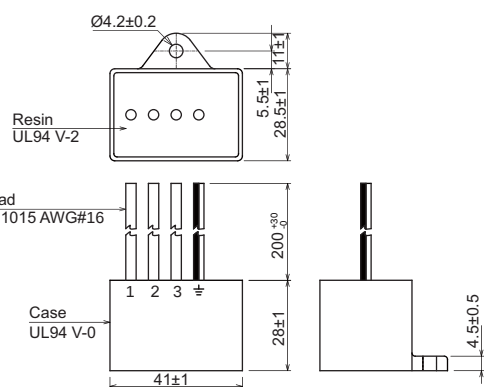
R·A·M-BWZ(LED)



R·A·M-BXZ(LED)



R·A·M-BUZ-N(LED)



Unit: mm

Electrical Specifications

Safety Standard	Model Number		Rated Voltage 50/60Hz (Vac)	Max. Line Voltage (Vac)	Varistor Voltage (V) $\pm 10\%$	DC Breakdown Voltage Ez +30, -20% (V)	Impulse Discharge Current 8/20 μ s (A)	Insulation Resistance IR DC500V	Withstanding Voltage (Vac)	Weight (g) Approx.
	R·A·M-242BWZ(LED)	1-2	125	140	540	-	2,000	>1,000	-	40
		1,2- $\frac{1}{2}$	-	-	-	2,400			AC1,000V 60s AC1,250V 3s	
	R·A·M-302BWZ(LED)	1-2	250	300	940	-			-	
		1,2- $\frac{1}{2}$	-	-	-	3,000			AC1,500V 60s	
	R·A·M-362BWZ(LED)	1-2	250	300	940	-			-	50
		1,2- $\frac{1}{2}$	-	-	-	3,600			AC1,500V 60s AC1,800V 3s	
	R·A·M-362BXZ(LED)	1-2-3-1	250	300	940	-			-	62
		1,2,3 $\frac{1}{2}$	-	-	-	3,600			AC1,500V 60s AC1,800V 3s	
	R·A·M-302BUZ-N(LED)	1-2-3-1	250	300	470	-			-	
		1,2,3- $\frac{1}{2}$	-	-	-	3,000			AC1,500V 60s	

Operating Temperature: -20~+70°C

Features

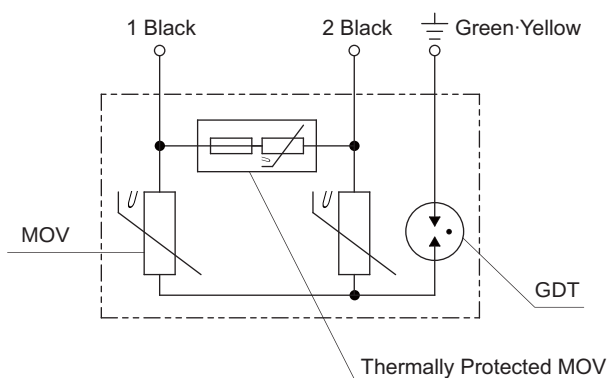
- Compact size SPD of rated AC250V available
- No use the fuse to between lines circuit because of SPD has a built-in separation mechanism
- Impulse discharge current 8/20 μ s-2kA
Common mode (1.2/50 μ s(R=12 Ω)-15kV) available.
- Compliance with safety standard (TÜV)
- External setting available for LED security light and LED street light.

Applications

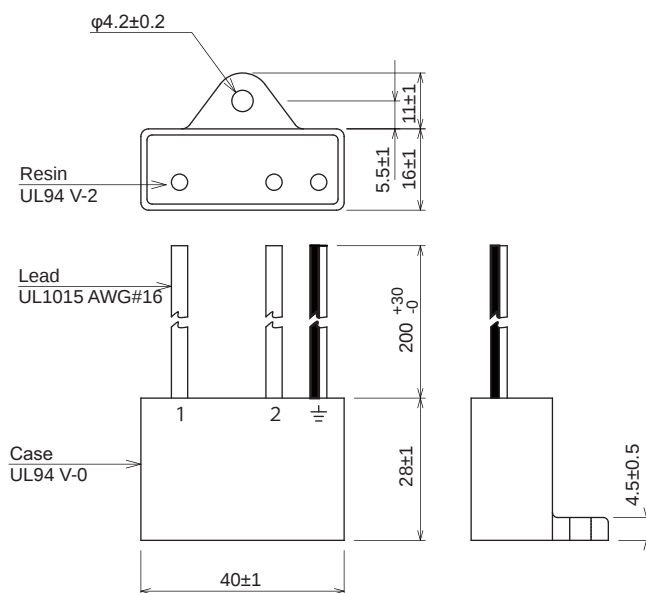
- LED security light, LED street light



Circuit



Dimensions



Unit: mm

Electrical Specifications

Safety Standard	Model Number		Rated Voltage 50/60Hz (Vac)	Max. Line Voltage (Vac)	Varistor Voltage (V) ±10%	DC Breakdown Voltage Ez +30	Impulse Discharge Current 8/20µs (A)	Insulation Resistance IR DC500V	Withstand Voltage Test (Vac)	Weight (g) Approx.
-	R·A·M-152BQZ (LED)	1-2	250	300	470	-	2,000	>1,000	-	40
		1 2- ½	-	-	-	1,200				

Operating Temperature: -40~+70°C



Features

- SPD of rated AC250V available
- No use the fuse to between lines circuit because of SPD has a built-in separation mechanism
- Impulse discharge current
 - 8/20 μ s-5kA (RGF-152-Q4)
 - 8/20 μ s-10kA (RGF10-152-Q4)
- Common mode 1.2/50 μ s-15kV available.

Applications

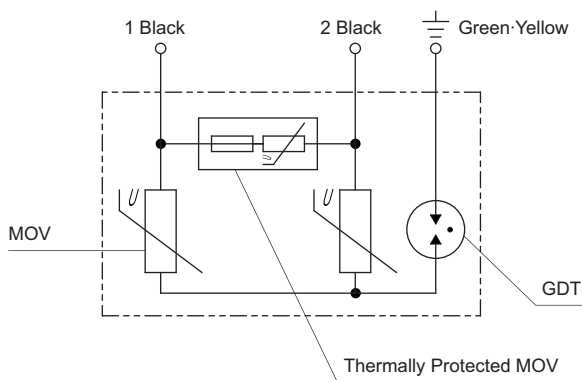
- LED security light, LED street light



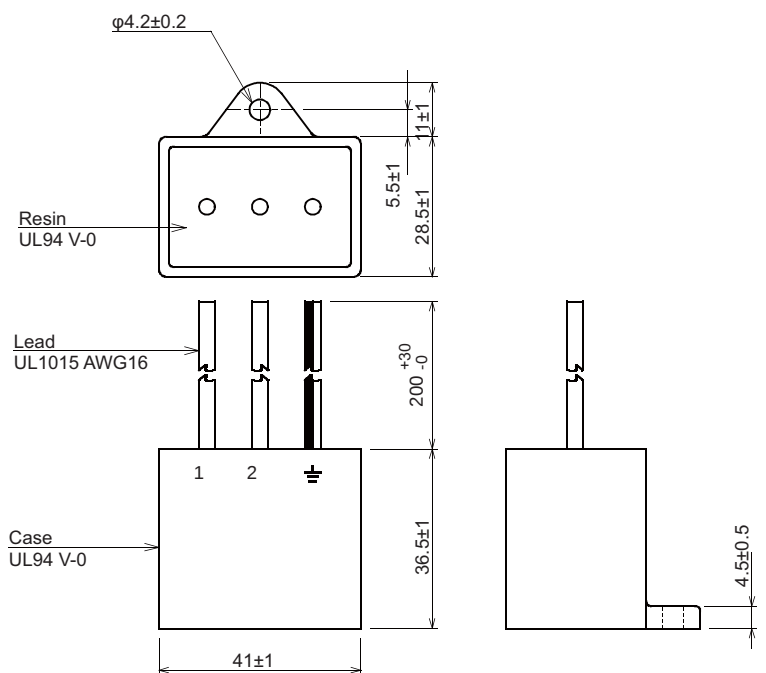
Safety Standard		File No.
UL	:UL1449 4th.	E322107
cUL	:C22.2 No.269.5	



Circuit



Dimensions



Unit: mm

Electrical Specifications

Safety Standard	Model Number		Rated Voltage 50/60Hz (Vac)	Max. Continuous Operating Voltage (Vac)	Varistor Voltage (V) $\pm 10\%$	DC Breakdown Voltage Ez +30	Impulse Discharge Current 8/20 μ s (A)	Impulse Life Test 8/20 μ s 1,000A (times)	Nominal Discharge Current 8/20 μ s (A)	Max. Discharge Current 8/20 μ s (A)	Voltage Protection Level (V)
-	RGF-152-Q4	1-2	250	300	470	-	5,000	Aprox.300	-	-	-
		1,2- $\frac{1}{2}$	-	-	-	1,200					
cUL	RGF10-152-Q4	1-2	250	300	470	-	-	Aprox.500	5,000	10,000	1,500
		1,2- $\frac{1}{2}$	-	-	-	1,200					

Operating Temperature: -40~+70°C

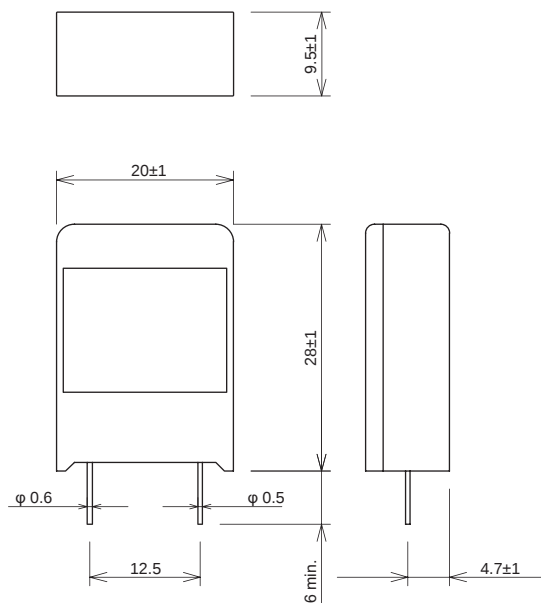
Features

- Fast response time.
- Bi-polar and it will fail open if surge withstand capability is exceeded.
- Small inter-terminal capacitance.
- High insulation resistance ($10^9\Omega$ min.).

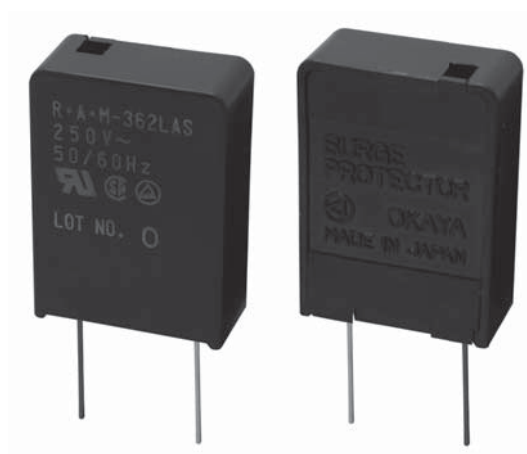


Safety Standard		File No.
UL	:UL1449 4th.	E332107
CSA	:C22.2 No.8	LR105073
TÜV	:IEC60384-14	J9650111

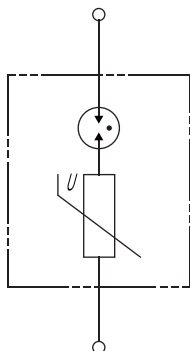
Dimensions



Unit: mm



Circuit



Electrical Specifications

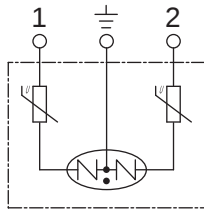
Safety Standard			Model Number	Rated Voltage 50/60Hz (Vac)	Max. Line Voltage (Vac)	DC Breakdown Voltage Ez +30, -20%	Impulse Current Capacity 8/20μs(A)	Insulation Resistance IR (MΩmin.)	Withstanding Voltage	Capacitance 1MHz (pF)max.
UL	CSA	TÜV								
○	○	-	R·A·M-242LAS	125	140	2,400V	2,000	10,000 (DC500V)	1,000V/60s, 1,250V/3s	2.0
○	○	○	R·A·M-302LAS	250	300	3,000V			1,500V/60s	
○	○	○	R·A·M-362LAS			3,600V			1,500V/60s, 1,800V/3s	

Operating Temperature: -20~+80°C

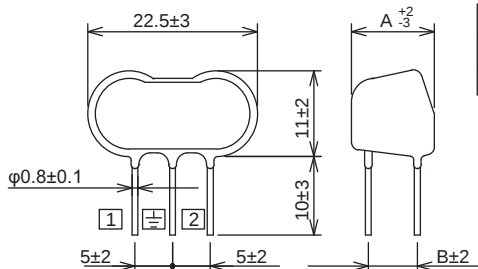
R·A·V-LDEZ

Designed specifically for use in AC power line applications. This model uses specially treated discharge electrodes for greatly enhanced noise immunity test and surge life making it optimum for the protection of single-phase power supply circuits.

• Circuit



• Dimensions



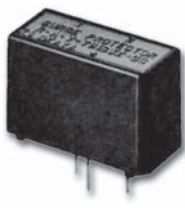
Model	A	B
401LDBZ	11	6.5
781LDBZ	12	7.5

Unit: mm

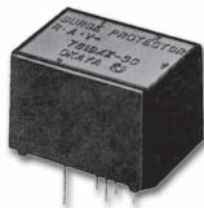
R·A·V-BWZ-3C, BXZ-3C

Use of surge protectors: Inverter, NC control systems, Welding machines and etc.

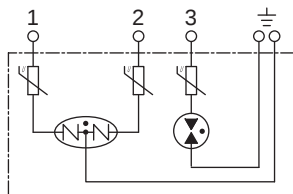
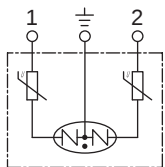
BWZ-3C series



BXZ-3C series



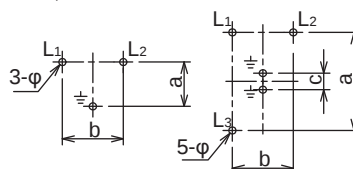
• Circuit



• Print circuit board hole dimensions

LDEZ, BWZ-3C

BXZ-3C



Unit: mm

Model Number	Dimensions (mm)			
	a	b	c	φ
401LDEZ	6.5	10	-	1.2*
781LDEZ	7.5			
401BWZ-3C	6			
78BWZ-3C	6.9			
781BXZ-3C	16.6	2.8	2.8	1.2*

* Reference Value

Electrical Specifications

Safety Standard	Model Number	Line Voltage 50/60Hz		Max. Line Voltage (V)	Clamping Voltage (V) ±10%	Impulse Discharge Current 8/20μs (A)	Withstanding Impulse Voltage 1.2/50μs (V)	Capacitance (pF)*	Weight (g)*
	R·A·V-401LDEZ	Single Phase	AC125V	145	403	1,000	12,000	100	10
	R·A·V-781LDEZ	Single Phase	AC250V	300	783			50	
	R·A·V-401BWZ-3C	Single Phase	AC125V	145	403	2,500	20,000	100	20
	R·A·V-781BWZ-3C	Single Phase	AC250V	300	783			50	
	R·A·V-781BXZ-3C	Three Phase	AC250V						30

* Reference Value

Operating Temperature: -20~+70°C



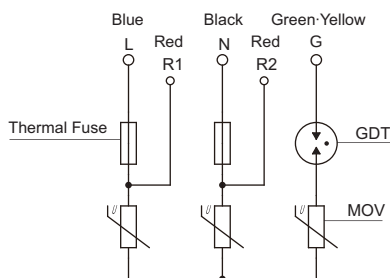
Features

- SPD with a fail safe function to prevent short-circuit (separation of circuit and alarm contact that is easily to found the timing of changing the products)
- Compliance with IEC 61643-1 that meets the new JIS standards
- Nominal discharge current (In) 8/20 μ s-2.5kA
Max. discharge current (Imax) 8/20 μ s-5kA
- Voltage protection level
- Common mode 1.2/50 μ s-15kV available.
- Impulse test category: Class II (Type II)
- Quick response for surge

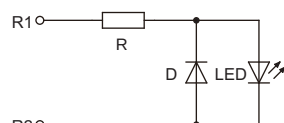
Applications

- Power conditioner for solar photovoltaic system
- Electrical vehicle charger
- LED exterior illumination
- Tapping machine, NC machine, other machine tools
- Lithography equipment, Washing device, IC tester
- Injection molding machine, Winding machine, Surface mounter
- Vehicle air conditioner
- Servo amplifier
- Electric facility, Industrial equipment

Circuit



Circuit example of LED warning light



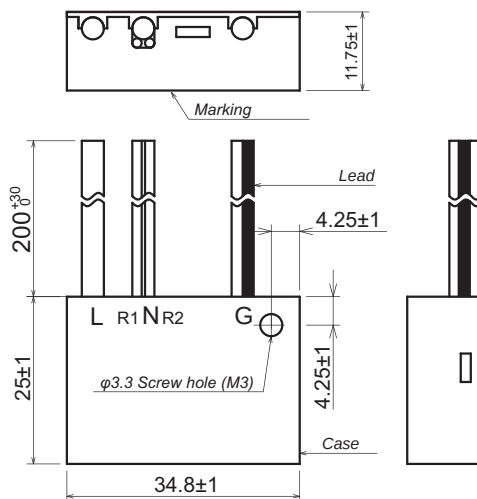
*LED warning light is not supplied with the product.



Safety Standard		File No.
UL	:UL1449 4th.	E322107
cUL	:C22.2 No.269.5	
UL-EU	:IEC61643-11:2011 :EN61643-11:2012	



Dimensions



Unit: mm

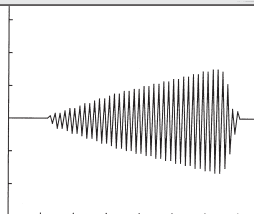
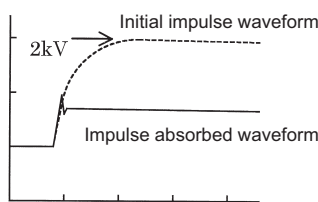
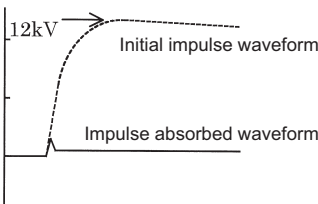
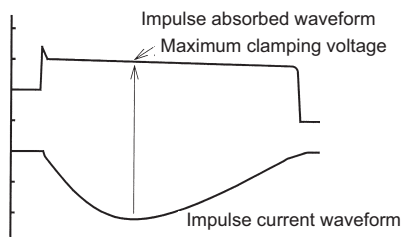
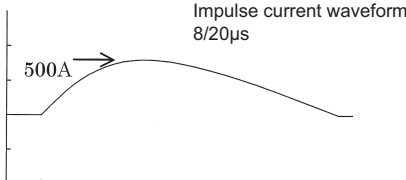
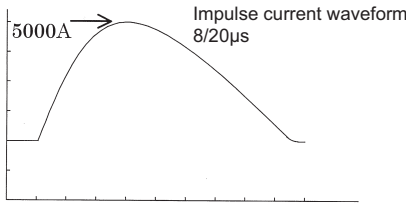
Electrical Specifications

Safety Standard	Model Number		Rated Voltage 50/60Hz (Vac)	Max. Continuous Operating Voltage (Vac)	Varistor Voltage (V) $\pm 10\%$	DC Breakdown Voltage Ez +30	Impulse Life Test 8/20 μ s 1,000A (times)	Nominal Discharge Current 8/20 μ s (A)	Max. Discharge Current 8/20 μ s (A)	Voltage Protection Level (V)
	GFA-300-Q4	L-N	250	300	480	-	Aprox.300	2,500	5,000	1,400
		L, N-G	-	-	-	1,200				

Operating Temperature: -40~+90°C



• Description of characteristic terms

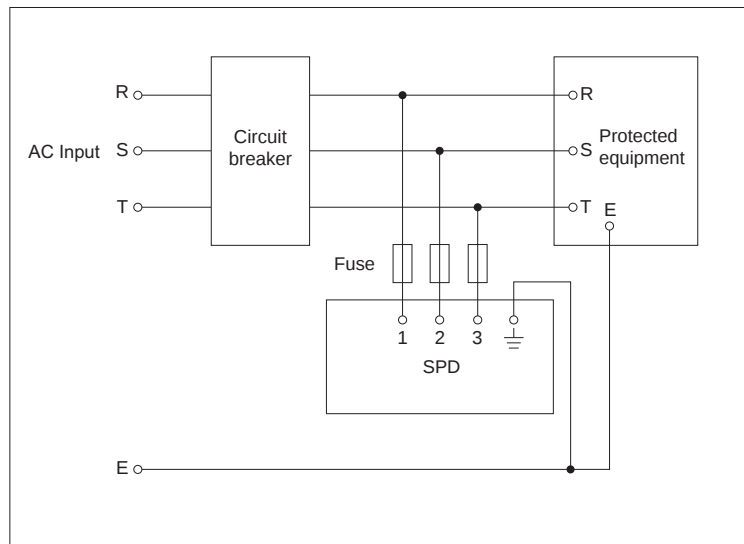
No.	Characteristic terms	Contents of the test
1	Power Frequency Sparkover Voltage (U_a)	Voltage that the SPD worked when AC voltage of gentle slope ($du/dt=AC100V/s$ to $AC500V/s$) is applied between terminals 
2	Nominal Discharge Current (i_{sn})	This defines the classification of arrester by impulse current waveform and current value of $8/20\mu s$. This is defined by IEC/EN 60099-1 "Surge arresters Parts1: Non-linear resistor type gapped surge arresters for a.c. system".
3	Max. Standard lightning Impulse Sparkover Voltage (U_s)	Minimum voltage that the SPD works when impulse wave form of $1.2/50\mu s$ is applied between terminals 
4	Max. Sparkover Voltage at front of wave lighting Impulse (U_{as})	Maximum sparkover voltage that when $1.2/50\mu s-12,000V(10,000Vus)$ is applied between each terminal 
5	Max. Residual Voltage (U_r)	Maximum clamping voltage that when impulse voltage of $8/20\mu s-2,500A$ is applied between terminals 
6	Impulse Life Test	Minimum number of applying that can apply between terminals when impulse current of $8/20\mu s-500A$ is applied 60 seconds interval 
7	Max. Impulse Discharge Current (I_s)	Maximum impulse discharge current that can apply impulse current of $8/20\mu s$ between terminals 



[Basic circuit and caution notice about using the SPD]

1. Example of application for basic circuit diagram

• In case of AC Three-phase circuit



(Fig-1)

Please connect SPD to secondary side of the circuit braker with fuse (5A or less) such as Fig-1 at the supply input of proctcted equipment.

Grounding to the SPD and grounding to the protected equipment are being common connection by the shortest distance, and connecting to earth by single point ground is recommended.

2. Caution notice

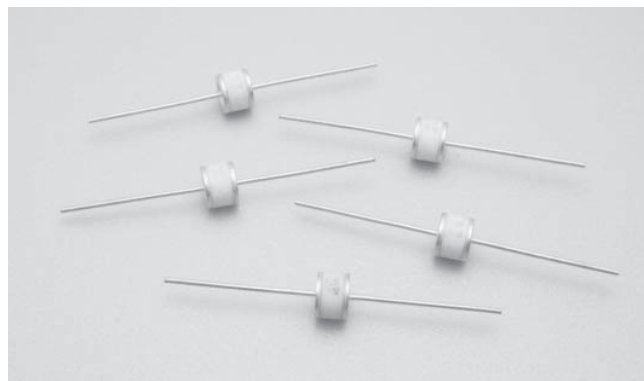
- Please connect the SPD as close as possible to the service entrance of equipment.
- Don't use by exceeding the maximum permissible circuit voltage because it might cause failure.
- When performing the withstand voltage test, please disconnect the ground ($\perp$) terminal.
- When select the fuse, please evaluate/verify fusing characteristic and inpulse withstand voltage.
- Please use the connecting conductor of SPD as short as possible.

Features

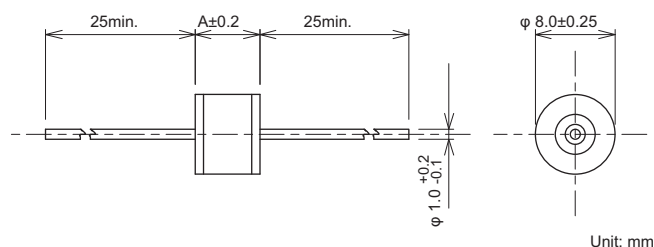
- Quick response for surge
- High impulse current capacity
- It can withstand alternating current

Applications

- Telephone, PBX, Wireless base station, Optical transmission equipments, CATV transmission equipments, Fire alarm systems and Home security systems.

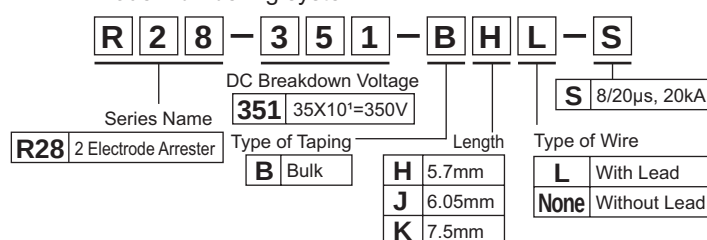


Dimensions

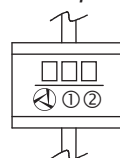


Model Number	A
R28-□□□-BHL	5.7
R28-□□□-BJL	6.05
R28-□□□-BKL	7.5

Model numbering system



Description of marking



□□□..... DC Breakdown Voltage
eg.) R28-351-BHL-S→351

[Lot No.] ①..... Identification of manufacture year
eg.) 2016→6

②..... Manufacture month (see below)

Month	1	2	3	4	5	6	7	8	9	10	11	12
Symbol	A	B	D	E	F	G	H	J	K	L	M	N

Electrical Specifications

Low Voltage Type

(Conforms to ITU-T)

Model Number	DC Breakdown Voltage 100V/s~2,000V/s (V) ±20	Impulse Sparkover Voltage 100V/μs (V) max	Insulation Resistance (MΩ) min.	Capacitance 1MHz (pF) max.	Impulse Life Test 10/1,000μs (A)300 times	Alternating Discharge Current 50Hz, 1s 10 times (A)	Impulse Discharge Current 8/20ms (A)
R28-900-BHL-S	90	450	10,000(DC50V)	1.5	100	10	20,000
R28-231-BHL-S	230	600	10,000 (DC100V)				
R28-251-BHL-S	250						
R28-301-BHL-S	300						
R28-351-BHL-S	350						
R28-401-BHL-S	400						
R28-471-BHL-S	470						
R28-601-BHL-S	600	1,300					

High Voltage Type

Model Number	DC Breakdown Voltage 500V/s (V)±20	Insulation Resistance (MΩ) min.	Capacitance 1MHz (pF) max.	Withstanding Voltage	Impulse Life Test 8/20μs (A)300A times	Impulse Discharge Current 8/20μs (A)
R28-801-BHL-S	800	10,000(DC250V)	1.5	-	1000	20,000
R28-102-BHL-S	1,000	10,000(DC500V)		-		
R28-152-BHL-S	1,500			-		
R28-242-BJL-S	2,400			AC1,250V 3s		
R28-302-BKL-S	3,000			AC1,500V 60s		
R28-362-BKL-S	3,600			AC1,800V 3s		
R28-402-BKL-S	4,000			AC2,000V 60s		
R28-452-BKL-S	4,500	10,000(DC1000V)				

Operating Temperature: -40~+90°C

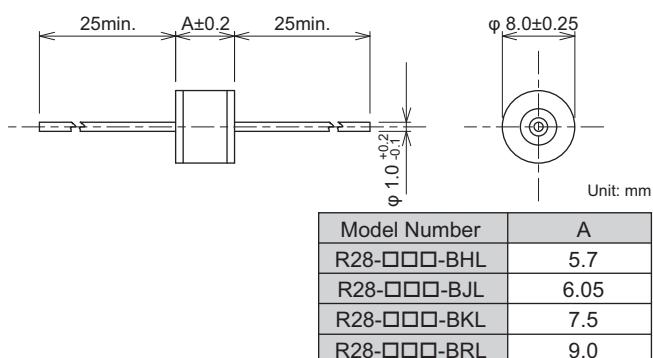
Features

- Quick response for surge.
- High impulse current capacity.
- It can withstand alternating current.
- Excellent insulation resistance and small capacitance.
- Recommendation of ITU-T conformity.

Applications

- Telephone, PBX, Wireless base station, Optical transmission equipments, CATV transmission equipments, Fire alarm systems and Home security systems.

Dimensions



Safety Standard		File No.
UL	:UL497B	E139599
	:UL1449 4th.	E332107



Model numbering system

R	2	8	-	3	5	1	-	B	H	L
Series Name			DC Breakdown Voltage			Type of wire		Type of taping		
R38 3 electrode arrester			351 35X10 ³ =350V			L With lead		B Bulk		
						None Without lead				
						Length				
						H 5.7mm				
						J 6.05mm				
						K 7.5mm				
						R 9.0mm				

Electrical Specifications

Low Voltage Type

(Conforms to ITU-T)

Safety Standard		Model Number	DC Breakdown Voltage	Impulse Sparkover Voltage	Insulation Resistance (MΩ) min.	Capacitance 1MHz (pF) max.	Impulse Life Test 10/1,000μs (A)300 times	Alternating Discharge Current 50Hz, 1s 10 times (A)	Impulse Discharge Current 8/20ms (A) 10times
UL 497B	UL 1449		100V/s~2,000V/s (V) ±20	100V/μs (V) max					
○	-	R28-900-BHL	90	450	10,000(DC50V)	1.5	100	10	10,000
○	-	R28-151-BHL	150	500					
○	-	R28-231-BHL	230	600	10,000(DC100V)				
○	-	R28-251-BHL	250						
○	○ ^{*1}	R28-301-BHL	300	650					
○	○ ^{*1}	R28-351-BHL	350	750					
○	○ ^{*1}	R28-401-BHL	400	800					
○	○ ^{*1}	R28-471-BHL	470	900					
○	○ ^{*1} ₋₂	R28-601-BHL	600	1,300					

High Voltage Type

Safety Standard	Model Number	DC Breakdown Voltage 500V/s (V)±20	Insulation Resistance (MΩ) min.	Capacitance 1MHz (pF) max.	Withstanding Voltage	Impulse Life Test 8/20μs (A)300A times	Impulse Discharge Current 8/20μs (A)
UL 1449							
○ ^{*1} ₋₂	R28-801-BHL	800	10,000(DC250V)	1.5	-	1000	10,000
○ ^{*1} ₋₂	R28-102-BHL	1,000	10,000(DC500V)		-		
○ ^{*1} ₋₂	R28-152-BHL	1,500			-		
○ ^{*1} ₋₂	R28-242-BJL	2,400			AC1,250V 3s		
○ ^{*1} ₋₂	R28-302-BKL	3,000			AC1,500V 60s		
○ ^{*1} ₋₂	R28-362-BKL	3,600			AC1,800V 3s		
○ ^{*1} ₋₂	R28-402-BKL	4,000	10,000(DC1000V)		AC2,000V 60s		
○ ^{*1} ₋₂	R28-452-BKL	4,500			AC3,000V 60s		
○ ^{*1} ₋₂	R28-602-BRL	6,000					

^{*1} Rated voltage AC125V: Approved if it is connected to UL approved varistor (V1.0mA≥270V, D≥φ 14mm).

^{*2} Rated voltage AC250V: Approved if it is connected to UL approved varistor (V1.0mA≥470V, D≥φ 14mm).

Operating Temperature: -40~+90°C

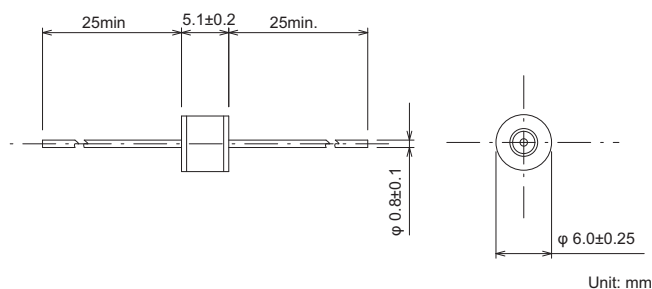
Features

- Quick response for surge.
- High impulse current capacity.
- It can withstand alternating current.
- Excellent insulation resistance and small capacitance.
- Recommendation of ITU-T conformity.

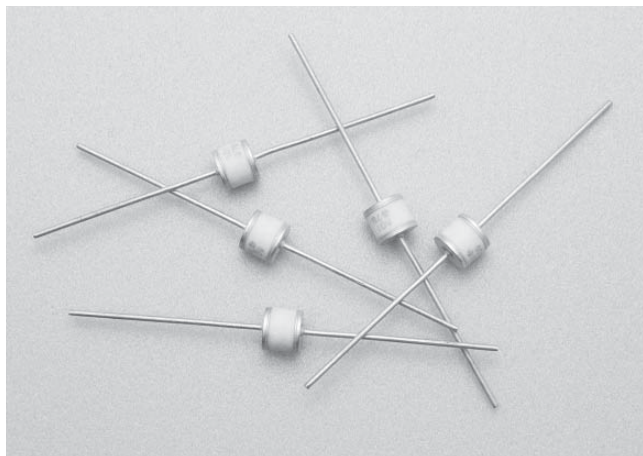
Applications

- Telephone, PBX, Wireless base station, Optical transmission equipments, CATV transmission equipments, Fire alarm systems and Home security systems. RoHS restriction complied.

Dimensions



Safety Standard		File No.
UL	:UL497B	E139599
	:UL1449 4th.	E332107



Model numbering system

R	2	6	-	3	5	1	-	B	G	L
Series Name			DC Breakdown Voltage			Type of taping		Type of wire		
R26 2 electrode arrester			351 35X10 ¹ =350V			B Bulk		L With lead		
								None Without lead		
								Length G 5.1mm		

Electrical Specifications

Low Voltage Type

(Conforms to ITU-T)

Safety Standard		Model Number	DC Breakdown Voltage	Impulse Sparkover Voltage	Insulation Resistance	Capacitance	Impulse Life Test	Alternating Discharge Current	Impulse Discharge Current
UL 497B	UL 1449		100V/s ~ 500V/s (V) ±20%	100V/μs (V)max.	(MΩ) min.	1MHz (pF) max.	10/1,000μs (A)300A times	50Hz, 1s 10 times (A)	8/20μs (A) 10 times
○	-	R26-900-BGL	90	450	10,000(DC50V)	1.0	50	5	5,000
○	-	R26-231-BGL	230	600	10,000(DC100V)				
○	-	R26-251-BGL	250						
○	○ ⁻¹	R26-301-BGL	300	650					
○	○ ⁻¹	R26-351-BGL	350	750					
○	○ ⁻¹	R26-401-BGL	400	800					
○	○ ⁻¹	R26-471-BGL	470	900					
○	○ ⁻¹	R26-601-BGL	600	1,300					

High Voltage Type

Safety Standard	Model Number	DC Breakdown Voltage 500V/s (V) ±20%	Insulation Resistance (MΩ) min.	Capacitance 1MHz (pF) max.	Withstanding Voltage test	Impulse Life Test 8/20μs (A)300 times	Impulse Discharge Current 8/20μs (A)
UL 1449							
○ ⁻¹ ₋₂	R26-801-BGL	800	10,000(DC250V)	1.0	-	500	5,000
○ ⁻¹ ₋₂	R26-102-BGL	1,000	10,000(DC500V)		-		
○ ⁻¹ ₋₂	R26-152-BGL	1,500			-		
○ ⁻¹ ₋₂	R26-242-BGL	2,400			AC1,250V 3s		
○ ⁻¹ ₋₂	R26-302-BGL	3,000			AC,1500V 60s		
○ ⁻¹ ₋₂	R26-362-BGL	3,600			AC1,800V 3s		

*1 Rated voltage AC125V: Approved if it is connected to UL approved varistor (V1.0mA≥270V, D≥φ 14mm).

*2 Rated voltage AC250V: Approved if it is connected to UL approved varistor (V1.0mA≥470V, D≥φ 14mm).

Operating Temperature: -40~+90°C

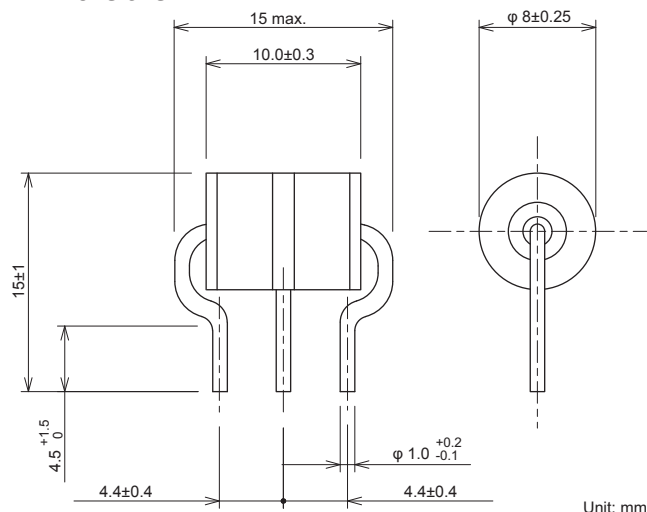
Features

- Quick response for surge.
- High impulse current capacity.
- It can withstand alternating current.
- Excellent insulation resistance and small capacitance.
- Recommendation of ITU-T conformity.

Applications

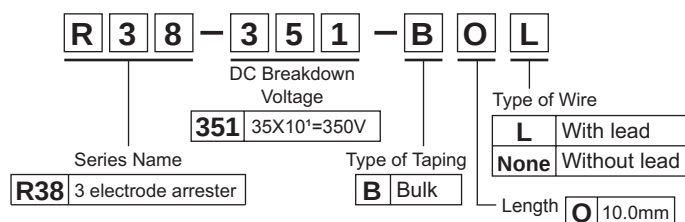
- Telephone, PBX, Wireless base station, Optical transmission equipments, CATV transmission equipments, Fire alarm systems and Home security systems. RoHS restriction complied.

- *Dimensions*



Unit: mm

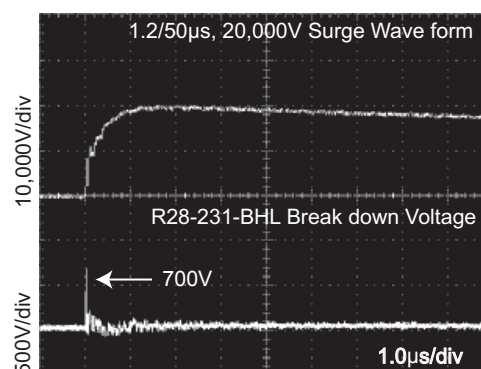
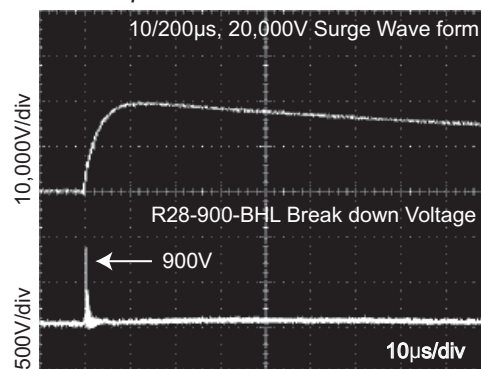
- Model numbering system



Safety Standard	File No.
UL :UL497B	E139599



- *Impulse Absorption Characteristics*



Electrical Specifications

(Conforms to ITU-T)

Safety Standard	Model Number	DC Breakdown Voltage 100V/s ~ 2,000V/s (V) ±20%	Impulse Sparkover Voltage 100V/μs (V) max.	Insulation Resistance (MΩ) min.	Capacitance 1MHz max. (pF)	Impulse Life Test 10/1,000μs (A) 300 times	Alternating Discharge Current 50Hz, 1s 10 times (A)	Impulse Discharge Current 8/20μs (A) 10 times
	R38-900-BOL	90	450	10,000(DC50V)	1.5	100	10	10,000
	R38-231-BOL	230	600	10,000(DC100V)				
	R38-251-BOL	250						
	R38-351-BOL	350	750					
	R38-421-BOL	420	900					
	R38-601-BOL	600	1,300					

Operating Temperature: -40~+90°C

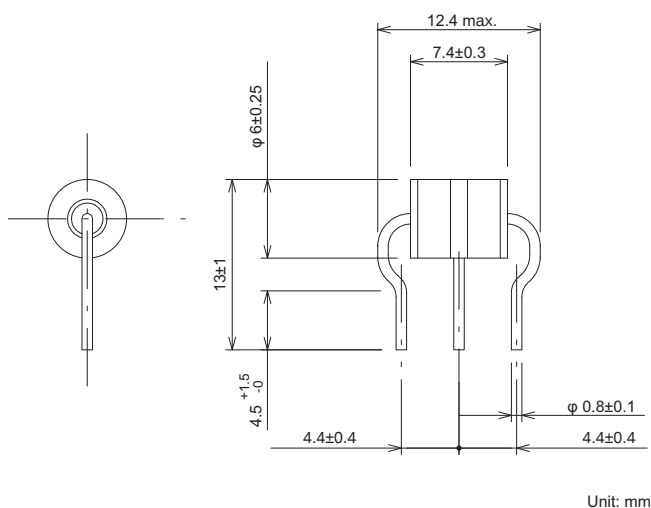
Features

- Quick response for surge.
- High impulse current capacity.
- It can withstand alternating current.
- Excellent insulation resistance and small capacitance.
- Recommendation of ITU-T conformity.

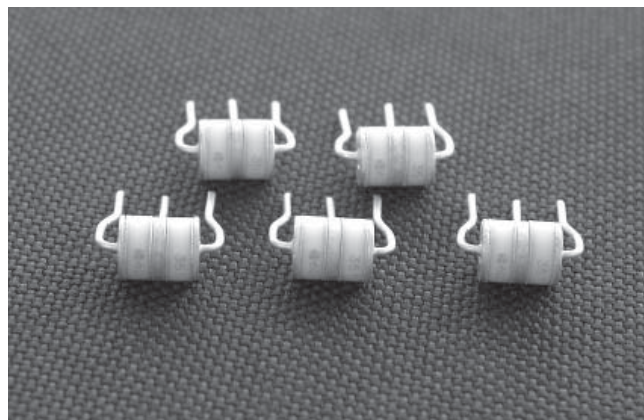
Applications

- Telephone, PBX, Wireless base station, Optical transmission equipments, CATV transmission equipments, Fire alarm systems and Home security systems. RoHS restriction complied.

Dimensions



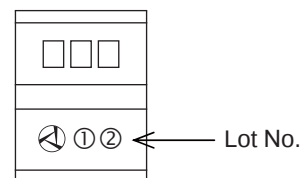
Safety Standard	File No.
UL :UL497B	E139599



Model numbering system

R	3	6	-	3	5	1	-	B	P	L
Series Name			DC Breakdown Voltage			Type of taping		Type of wire		
R36 3 electrode arrester			351 35X10 ¹ =350V			B Bulk		L With lead None With out lead		
						Length				
						P 7.4mm				

Description of marking



□□□..... DC Breakdown Voltage eg.) R36-351-BPL→351

[Lot No.] ①..... Identification of manufacture year eg.) 2016→6
②..... Manufacture month (see below)

Month	1	2	3	4	5	6	7	8	9	10	11	12
Symbol	A	B	D	E	F	G	H	J	K	L	M	N

Electrical Specifications

(Conforms to ITU-T)

Safety Standard	Model Number	DC Breakdown Voltage 100V/s ~ 2,000V/s (V) ±20%	Impulse Sparkover Voltage 100V/μs (V)max.	Insulation Resistance (MΩ)min.	Capacitance 1MHz (pF) max.	Impulse Life Test 10/1,000μs (A)300 times	Alternating Discharge Current 50Hz, 1s 10 times (A)	Impulse Discharge Current 8/20μs (A)
	R36-900-BPL	90	450	10,000(DC50V)	1.0	50	5	5,000
	R36-231-BPL	230	600	10,000(DC100V)				
	R36-251-BPL	250						
	R36-351-BPL	350	750					
	R36-421-BPL	420	900					
	R36-601-BPL	600	1,300					

Operating Temperature: -40~+90°C



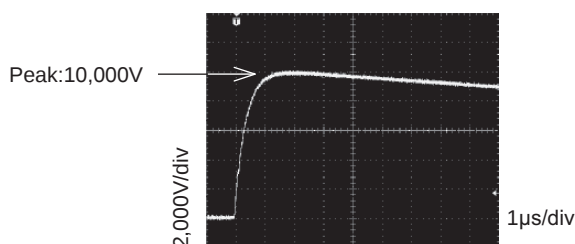
RHCA5039 series is suitable for products that need DC insulation resistance test on Line-FG, SG of a communications / signal line. Impulse current capacity is 2,000A 8/20 μ s.

Features

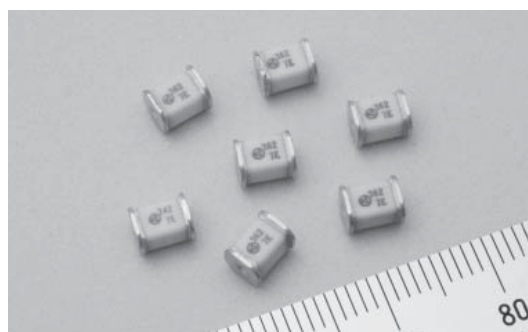
- Chip surge absorber for protection from indirect lighting surge, adaptable to high density surface mount technology
- Impulse current capacity 2,000A 8/20 μ s
- Small electrostatic capacity(Maximum 0.6pF)

Impulse Absorption Characteristics

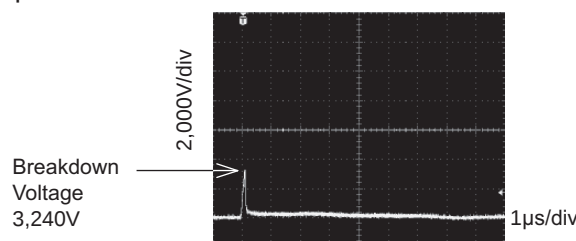
Impulse waveform 1.2/50 μ s-10,000V



Safety Standard		File No.
UL	:UL1449 4th.	E322107
cUL	:C22.2 No.8-13	
UL-EU	:EN61643-311 :IEC61643-311	



RHCA-242H53U
Impulse waveform



Electrical Specifications

•RHCA53 series

Safety Standard		Model Number	Impulse Sparkover Voltage 1.2/50 μ s (V) max.		Withstanding Voltage 50/60Hz	Insulation Resistance (M Ω) Min.	Capacitance 1MHz (pF) Max.	Impulse Life Test	Impulse Current Capacity	DC Breakdown Voltage (V)
UL1449 cUL	UL-EU		Applied Voltage	Specification						
○ ¹	○	RHCA-242H53U	5,000V	4,500V max.	AC1,000V-60sec AC1,200V-3sec AC1,500V-60sec AC1,800V-3sec	1,000(DC500V)	0.6	8/20 μ s 100A 300 times	8/20 μ s 2,000A	2,400 $\pm$ 20% *3
○ ¹ / ₂	○	RHCA-302H53U		4,700V max.						3,000 $\pm$ 20% *3
○ ¹ / ₂	○	RHCA-362H53U		4,950V max.						3,600 $\pm$ 20% *3

•RHCA53(335) series

Safety Standard		Model Number	Impulse Sparkover Voltage 1.2/50 μ s (V) max.		Withstanding Voltage 50/60Hz	Insulation Resistance (M Ω) Min.	Capacitance 1MHz (pF) Max.	Impulse Life Test	Impulse Current Capacity	DC Breakdown Voltage (V)
UL1449 cUL	UL-EU		Applied Voltage	Specification						
○ ¹ / ₂	○	RHCA-102P53U(335)	-	-	-	1,000(DC500V)	0.6	8/20 μ s 100A 300 times	8/20 μ s 3,500A	1,000 $\pm$ 20%
○ ¹ / ₂	○	RHCA-102Q53U(335)								1,000 $\pm$ 30%
○ ¹	○	RHCA-202H53U(335)								2,000 $\pm$ 20% *3
○ ¹	○	RHCA-242H53U(335)	5,000V	4,500V max.	AC1,000V 60s AC1,200V 3s AC1,200V 60s	1,000(DC500V)	0.6	8/20 μ s 100A 300 times	8/20 μ s 3,500A	2,400 $\pm$ 20% *3
○ ¹	○	RHCA-272H53U(335)								2,700 $\pm$ 20% *3
○ ¹ / ₂	○	RHCA-302H53U(335)		4,700V max.	AC1,500V 60s					3,000 $\pm$ 20% *3
○ ¹ / ₂	○	RHCA-362H53U(335)	7,500V	4,950V max.	AC1,500V 60s AC1,800V 3s	1,000(DC1,000V)	0.6	8/20 μ s 100A 300 times	8/20 μ s 3,500A	3,600 $\pm$ 20% *3
○ ¹ / ₂	○	RHCA-402H53U(335)		7,450V max.	AC2,000V 60s					4,000 $\pm$ 20% *3
○ ¹ / ₂	○	RHCA-452H53U(335)	8,000V	7,950V max.	AC2,000V 60s					4,500 $\pm$ 20% *3

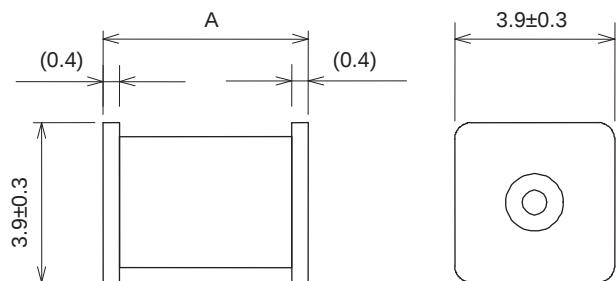
*1 Rated voltage AC125V: Approved if it is connected to UL approved varistor (V1.0mA $\geq$ 270V, D $\geq$ 7 mm).

*2 Rated voltage AC250V: Approved if it is connected to UL approved varistor (V1.0mA $\geq$ 470V, D $\geq$ 7 mm).

*3 Reference Value

Operating Temperature: -20~+80°C

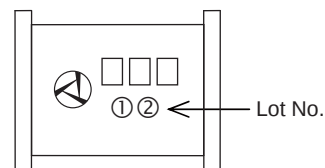
• Dimensions



Model Number	A
RHCA53	5.0±0.3
RHCA53(335)	5.6±0.3

Unit: mm

• Description of marking



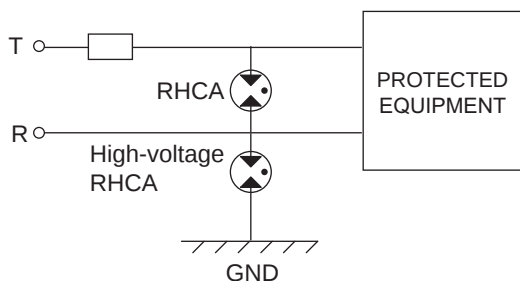
□□□..... DC Breakdown Voltage
eg.) RHCA-362H53U→362

[Lot No.] ①..... Identification of manufacture year
eg.) 2016→6

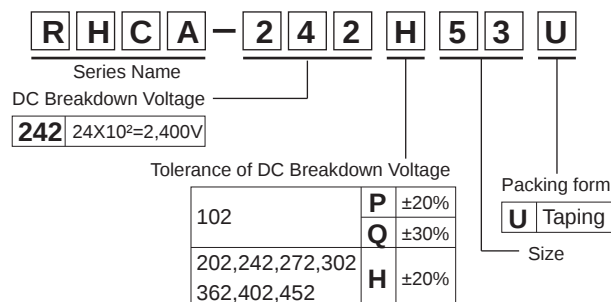
②..... Manufacture month (see below)

Month	1	2	3	4	5	6	7	8	9	10	11	12
Symbol	A	B	D	E	F	G	H	J	K	L	M	N

• Example (Communication Line)

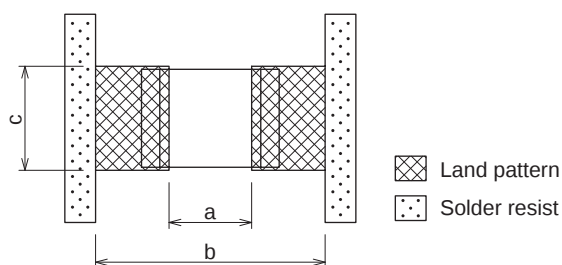


• Model numbering system



• Recommended Land Pattern (Typical value)

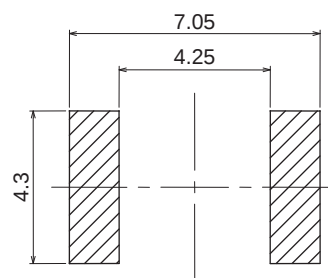
RHCA53 Series



Unit: mm

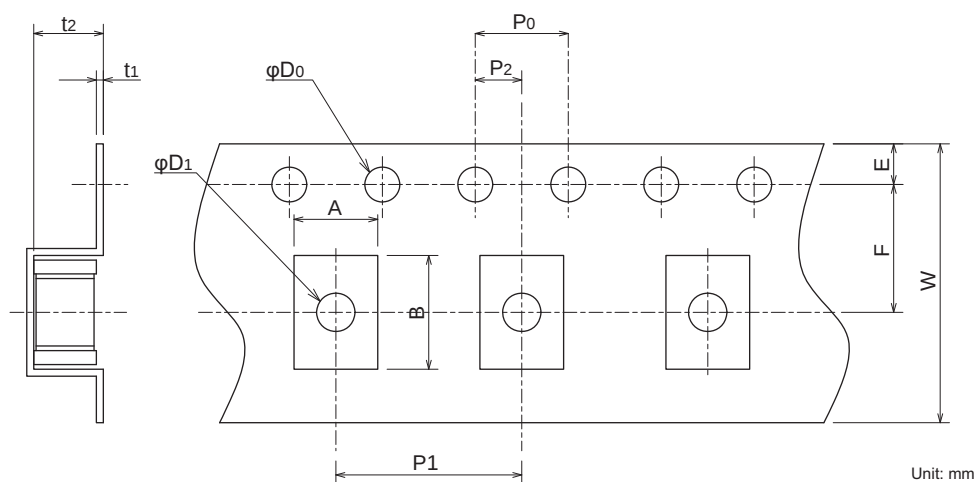
	Dimensions (mm)		
	a	b	c
Reflow Soldering	3.7	6.5	4.3

RHCA53(335) Series



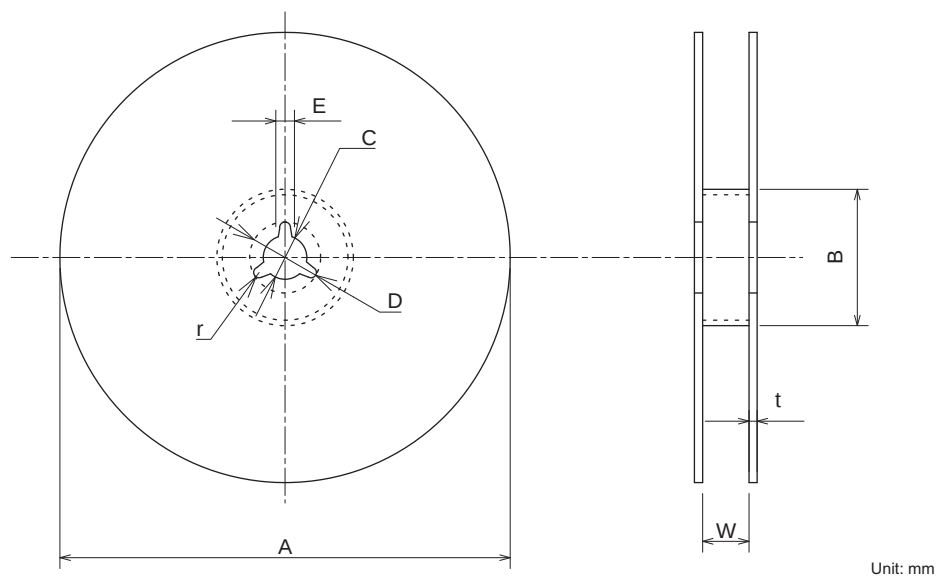


● Taping Dimensions



Dimensions (mm)	
A	4.5±0.3
B	5.6±0.3
W	12.0±0.3
F	5.5±0.1
E	1.75±0.1
P ₁	8.0±0.1
P ₂	2.0±0.1
P ₀	4.0±0.1
D ₀	φ 1.55±0.1
D ₁	φ 1.5 min.
t ₁	0.40±0.2
t ₂	4.3±0.2

● Reel Dimensions (2,500pcs per one reel)



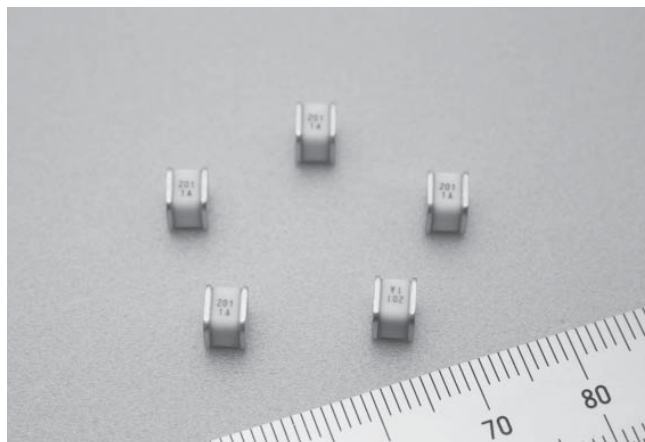
Dimensions (mm)	
A	φ 380±3
B	φ 80±2
C	φ 13.0±0.5
D	φ 21±1
E	2±1
W	13.5±2.0
t	2.0±0.5
r	1.0±0.2

Features

- Small surface mount type corresponding to reflow solder
- High impulse current capacity 8/20 μ s-5,000A
- Quick response for surge
- Excellent insulation resistance and small capacitance 1.0pF max.
- Recommendation of ITU-T conformity

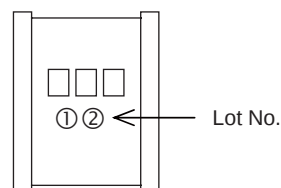
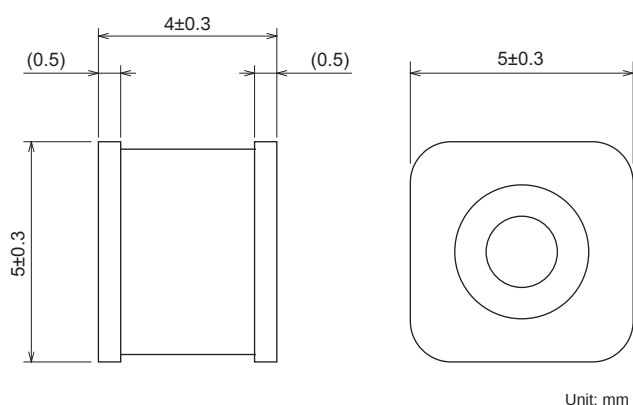
Applications

- Homegateway equipments
- Telephone, PBX, Wireless base station
- Optical transmission equipments
- CATV transmission equipments, BS / CS broadcasts equipments
- Fire alarm systems and Home security systems



Description of marking

Dimensions



□□□..... DC Breakdown Voltage
eg.) R5K-231P45U→231

[Lot No.] ①..... Identification of manufacture year
eg.) 2016→6

②..... Manufacture month (see below)

Month	1	2	3	4	5	6	7	8	9	10	11	12
Symbol	A	B	D	E	F	G	H	J	K	L	M	N

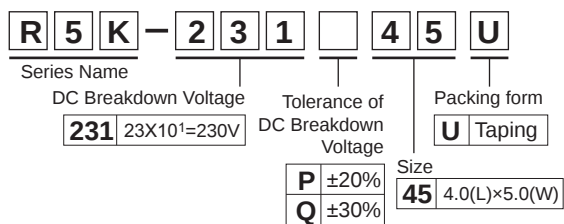
Electrical Specifications

Model Number*1	DC Breakdown Voltage (V)	Insulation Resistance (MΩ) min.	Capacitance 1MHz (pF) max.	Impulse Life Test	Impulse Current Capacity*2	Impulse Withstanding Voltage Capacity
R5K-750□45U	75	1,000(DC50V)	1.0	8/20μs, 100A 300 times	8/20μs, 5,000A (R=2Ω) Positive/Negative 5 times	10/700μs 15,000V (R=25Ω) Positive/Negative 5times
R5K-900□45U	90					
R5K-231□45U	230	1,000(DC100V)				
R5K-251□45U	250					
R5K-351□45U	350					
R5K-421□45U	420					
R5K-501□45U	500					
R5K-601□45U	600					

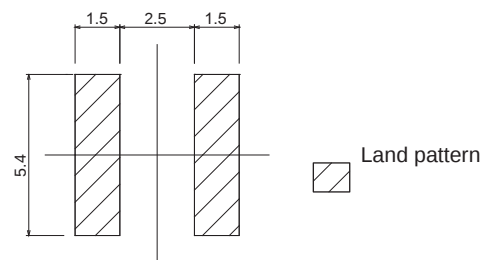
*1 □: Tolerance $\pm 20\%$ =P, Tolerance $\pm 30\%$ =Q

*2 Comforms to ITU-T K.20, K.21 Enhanced test
Operating Temperature: -20~+80°C

Model numbering system



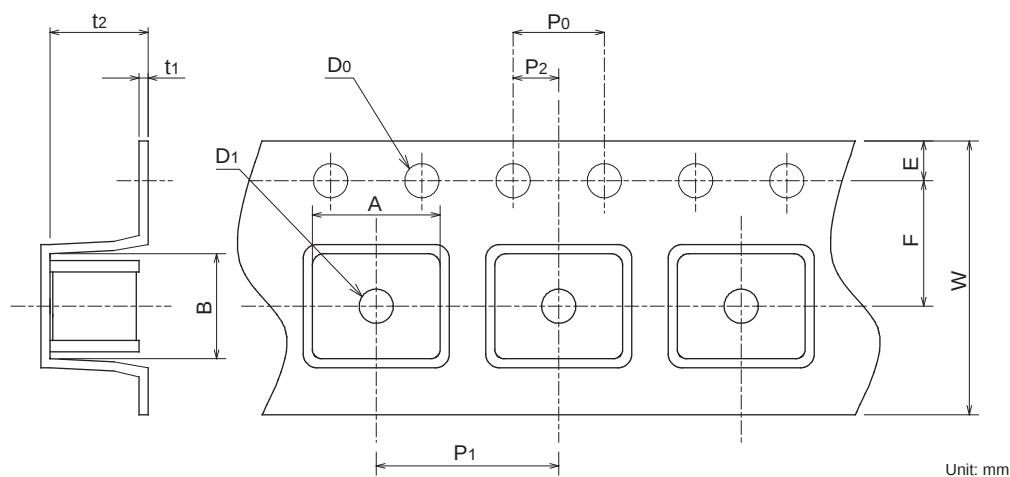
Recommended Land Pattern (Typical value)



Recommended thickness of copper foil is 70μm for upgrading of withstand surge current.

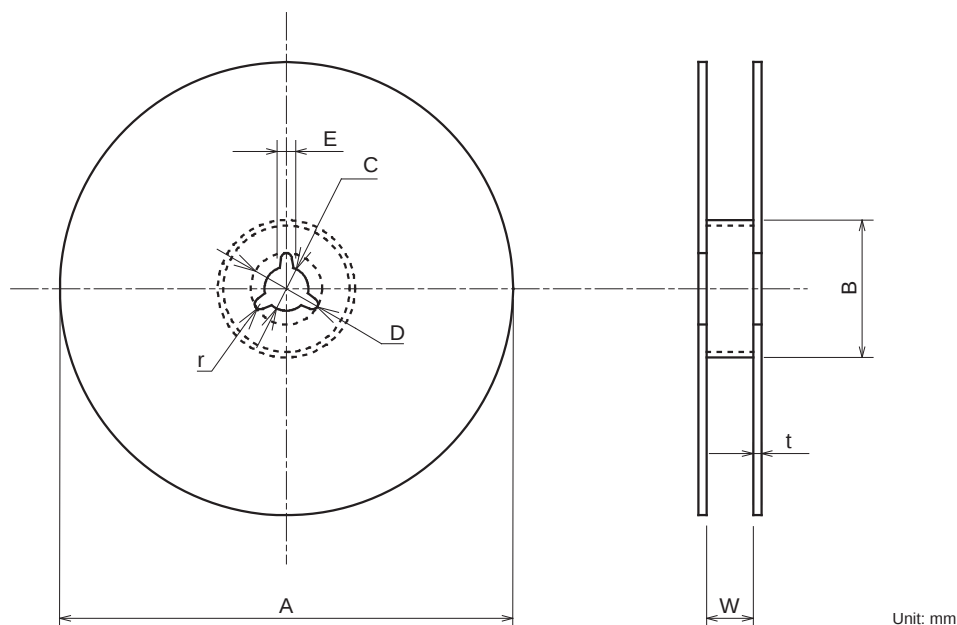
Unit: mm

Taping Dimensions



Dimensions (mm)	
A	5.6±0.3
B	4.6±0.3
W	12.0±0.4
F	5.5±0.2
E	1.75±0.2
P ₁	8.0±0.2
P ₂	2.0±0.2
P ₀	4.0±0.2
D ₀	φ 1.5±0.1
D ₁	φ 1.5 min.
t ₁	0.35±0.2
t ₂	5.35±0.2

Reel Dimensions (2,000pcs per one reel)



Dimensions (mm)	
A	φ 380±3
B	φ 80±2
C	φ 13.0±0.5
D	φ 21±1
E	2±1
W	13.5±2.0
t	2.0±0.5
r	1.0±0.2

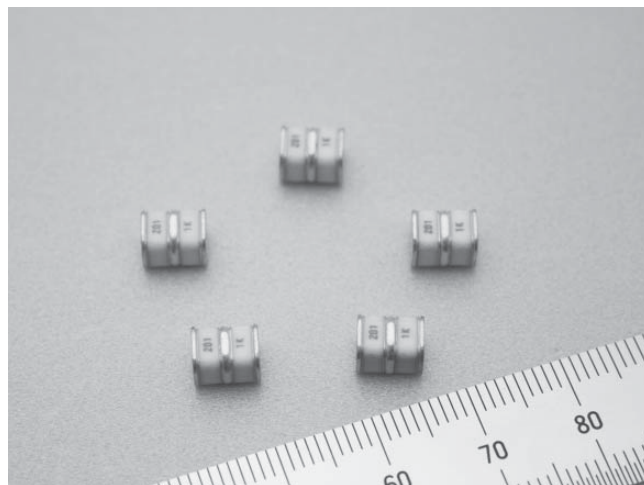
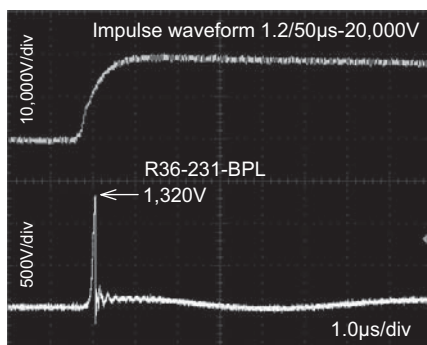
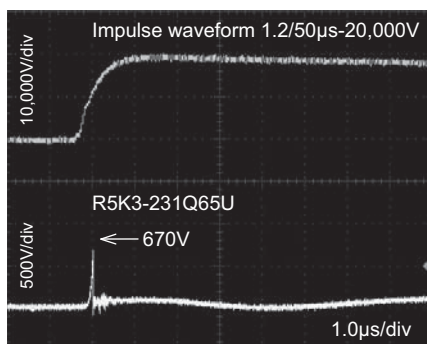
Features

- Small surface mount type corresponding to reflow solder
- High impulse current capacity 8/20 μ s-5,000A
- Quick response for surge
- Excellent insulation resistance and small capacitance (1.0pF max.)
- Recommendation of ITU-T conformity

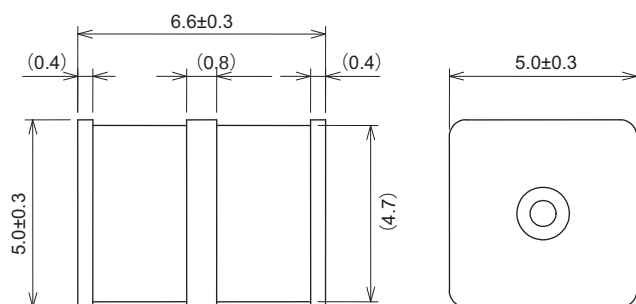
Applications

- Homegateway equipments
- Telephone, PBX, Wireless base station
- Optical transmission equipments
- CATV transmission equipments, BS / CS broadcasts equipments
- Fire alarm systems and Home security systems

Impulse Absorption Characteristics

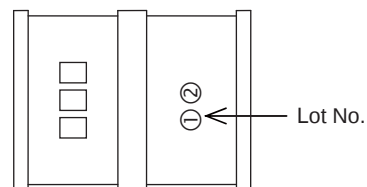


Dimensions



Unit: mm

Description of marking



□□□..... DC Breakdown Voltage
eg.) R5K3-231P65U→231

[Lot No.] ①..... Identification of manufacture year
eg.) 2016→6

②..... Manufacture month (see below)

Month	1	2	3	4	5	6	7	8	9	10	11	12
Symbol	A	B	D	E	F	G	H	J	K	L	M	N

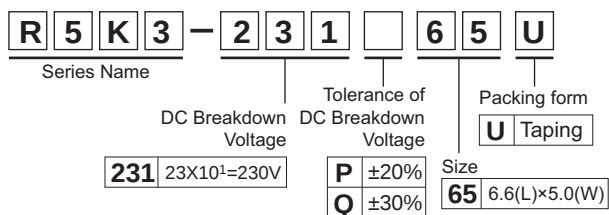
Electrical Specifications

Model Number*1	DC Breakdown Voltage (V)	Insulation Resistance (MΩ) min.	Capacitance 1MHz (pF)max.	Impulse Life Test	Impulse Current Capacity*2	Impulse Withstanding Voltage Capacity*2
R5K3-750□65U	75	1,000(DC50V)	1.0	8/20μs, 100A 300 times	8/20μs, 5,000A (R=Ω) Positive/Negative 5 times	10/700μs 15,000V (R=25Ω) Positive/Negative 5times
R5K3-900□65U	90					
R5K3-231□65U	230	1,000(DC100V)				
R5K3-251□65U	250					
R5K3-351□65U	350					
R5K3-421□65U	420					
R5K3-501□65U	500					
R5K3-601□65U	600					

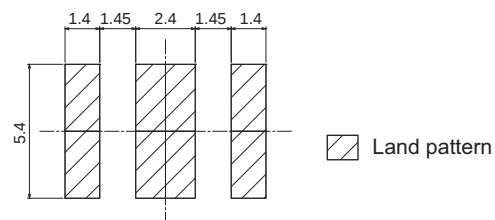
*1 □: Tolerance $\pm$ 20%=P, Tolerance $\pm$ 30%=Q

*2 Comforms to ITU-T K.20,K.21 Enhanced test
Operating Temperature: -20~+80°C

Model numbering system



Recommended Land Pattern (Typical value)

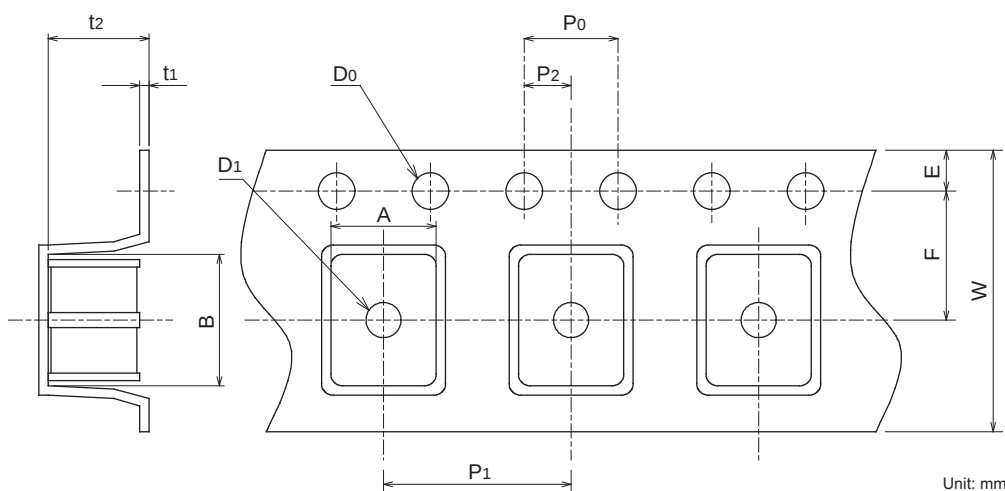


Recommended thickness of copper foil is
70μm for upgrading of withstand surge current.

Unit: mm

	Dimensions (mm)				
	a	b	c	d	e
Reflow Soldering	1.8	1.8	5.3	8.1	5.4

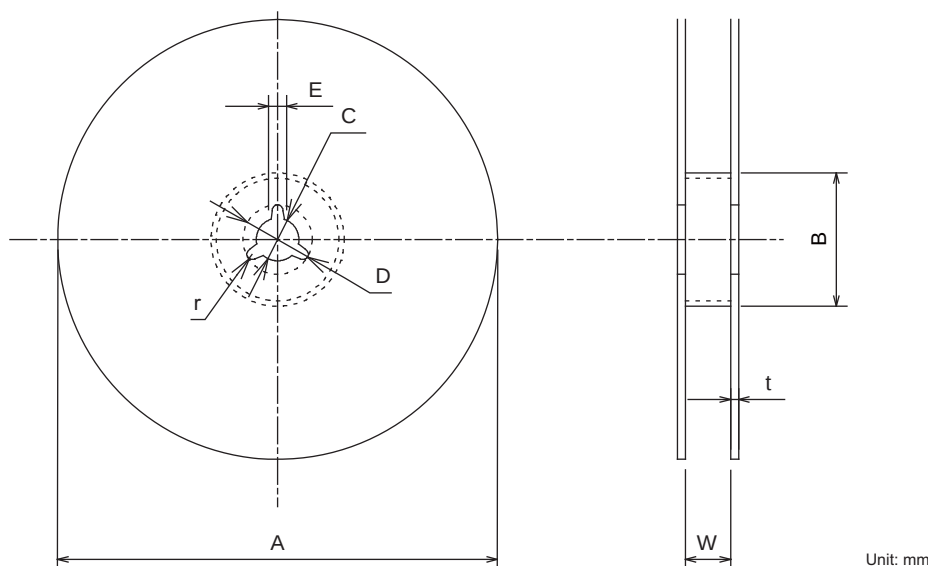
Taping Dimensions



Unit: mm

Dimensions (mm)	
A	5.6±0.3
B	7.3±0.3
W	16.0±0.4
F	7.5±0.2
E	1.75±0.2
P1	8.0±0.2
P2	2.0±0.2
P0	4.0±0.2
D0	φ 1.55±0.1
D1	φ 1.5 min.
t1	0.40±0.2
t2	5.35±0.2

Reel Dimensions (2,000pcs per one reel)



Unit: mm

Dimensions (mm)	
A	φ 380±3
B	φ 80±2
C	φ 13.0±0.5
D	φ 21±1
E	2±1
W	17.5±2.0
t	2.0±0.5
r	1.0±0.2

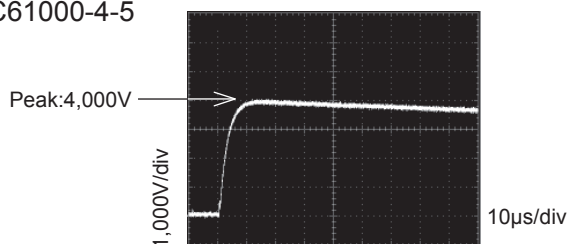
RHCA4532 series is chip surge absorber for protection from indirect lighting surge, smaller and thinner than ceramic tube lead type, adaptable to high density surface mount technology. Impulse current capacity is 2,000A 8/20 μ s.

Features

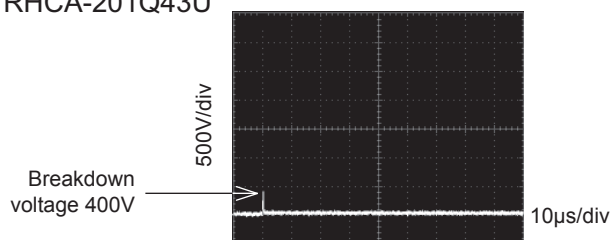
- Chip surge absorber for protection from indirect lighting surge, adaptable for high density surface mount technology
- Usable for reflow / flow soldering
- Compliance with IEC61000-4-5, ITU-T
 1. Impulse current capacity 2,000A 8/20 μ s
 2. 10/700 μ s-4,000V
- Good impulse absorbcency
- Small electrostatic capacity (Maximum 0.25pF)
- Embossed taping

• Impulse Absorption Characteristics

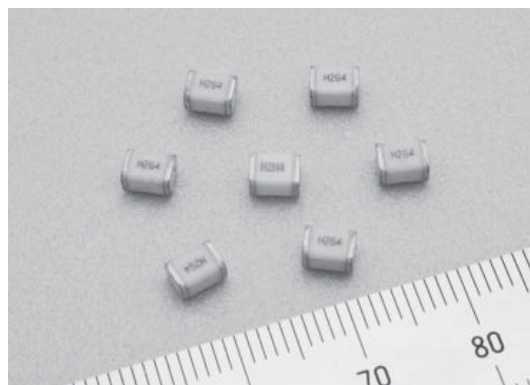
Impulse waveform 10/700 μ s-4,000V, IEC61000-4-5



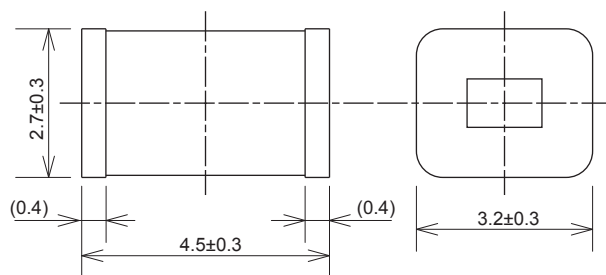
RHCA-201Q43U



Safety Standard	File No.
UL :UL497B	E139599

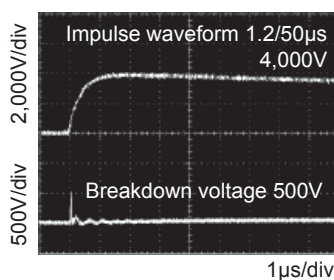


• Dimensions

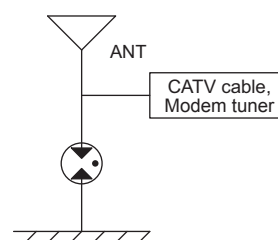


Unit: mm

Combination wave
1.2/50 μ s-8/20 μ s, 4,000V
IEC61000-4-5



• Example



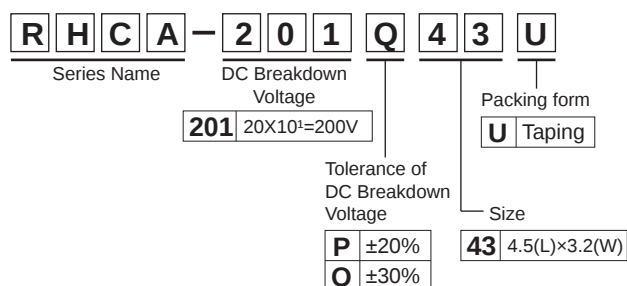
Electrical Specifications

Safety Standard	Model Number*1	DC Breakdown Voltage (V)	Insulation Resistance (MΩ) min.	Capacitance 1MHz (pF) max.	Impulse Life Test	Impulse Current Capacity *2	Impulse Withstanding Voltage Capacity *2
	RHCA-900□43U	90	1,000(DC50V)	0.25	8/20μs 100A 300 times	8/20μs, 2,000A (R=2Ω) Positive/Negative 5 times	10/700μs 4,000V (R=25Ω) Positive/Negative 5 times
	RHCA-201□43U	200	1,000(DC100V)				
	RHCA-301□43U	300					
	RHCA-351□43U	350					
	RHCA-401□43U	400					
	RHCA-401R43U*2	400 ⁺³⁰ ₋₁₇ %					
	RHCA-501□43U	500					
	RHCA-601□43U	600					

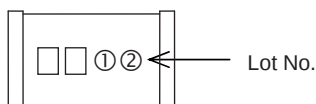
*1 □: Tolerance $\pm 20\%$ =P, Tolerance $\pm 30\%$ =Q

*2 Conforms to ITU-T K.20,K.21 Enhanced test
Operating Temperature: -20~+80°C

Model numbering system



Description of marking



□ □ DC Breakdown Voltage (see below)

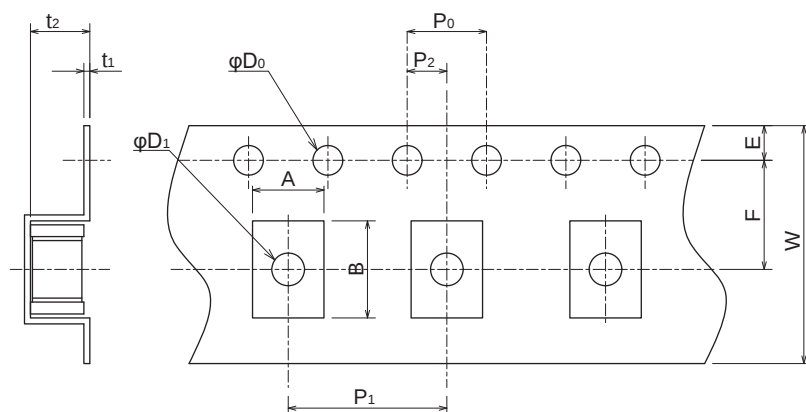
DC Breakdown Voltage Brevity Code	900	201	301	351	401	401(R)	501	601
Symbol	09	H2	H3	H3	H4	H4	H5	H6

[Lot No.] ① Identification of manufacture year
eg.) 2016→6

② Manufacture month (see below)

Month	1	2	3	4	5	6	7	8	9	10	11	12
Symbol	A	B	D	E	F	G	H	J	K	L	M	N

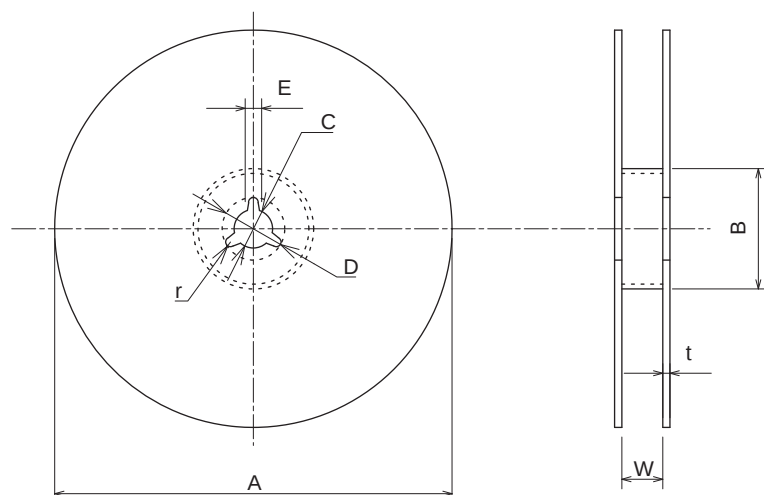
Taping Dimensions



Unit: mm

Dimensions (mm)	
A	3.6±0.2
B	4.9±0.2
W	12.0±0.3
F	5.5±0.05
E	1.75±0.1
P1	8.0±0.1
P2	2.0±0.05
P0	4.0±0.1
D0	φ 1.5 ^{+0.1} ₋₀
D1	φ1.65±0.15
t1	0.30±0.1
t2	3.0±0.2

Reel Dimensions (3,000pcs per one reel)



Unit: mm

Dimensions (mm)	
A	φ 330±2
B	φ 80±0.5
C	φ 13.0±0.5
D	φ 21±0.8
E	2.0±0.5
W	13.5 ^{+1.0} _{-0.5}
t	1.6±0.5
r	1.0

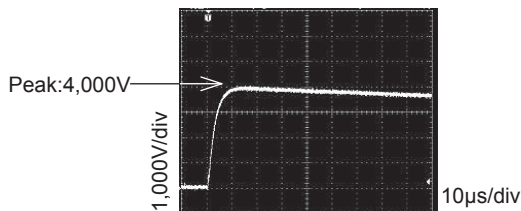
RHCA3216 series is chip surge absorber for protection from static electricity/indirect lighting surge, smaller and thinner than ceramic tube lead type, adaptable for high density surface mount technology. Impulse current capacity is 2,000A 8/20 μ s.

Features

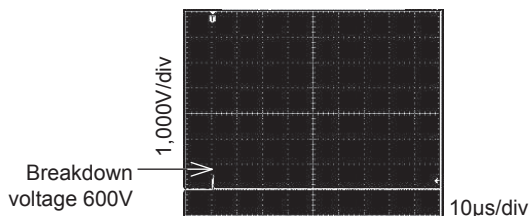
- Chip surge absorber for protection from static electricity/indirect lighting surge, adaptable to high density surface mount technology
- Usable for reflow / flow soldering
- Compliance with IEC61000-4-5
 1. Surge current capacity 8/20 μ s-500A $\pm$ 5times
 2. 10/700 μ s 4,000V (R=25 Ω) $\pm$ 5times
- Good impulse absorbency
- Electrostatic capacity (Maximum 0.15pF)
- Embossed tapping
- RoHS Directive-compliant components

• Impulse Absorption Characteristics

Impulse waveform 10/700 μ s-4,000V, IEC61000-4-5



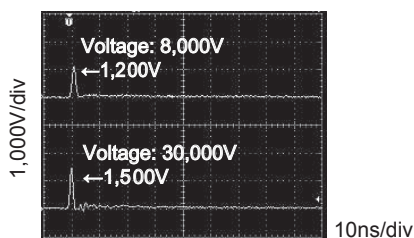
RHCA-201Q31U



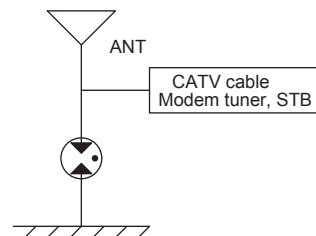
IEC61000-4-2 150pF-330 Ω -XkV

RHCA-201Q31U

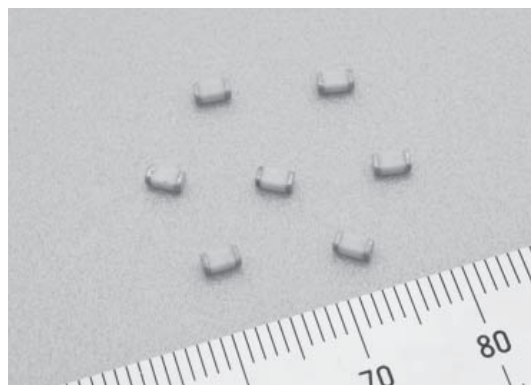
ESD impulse waveform



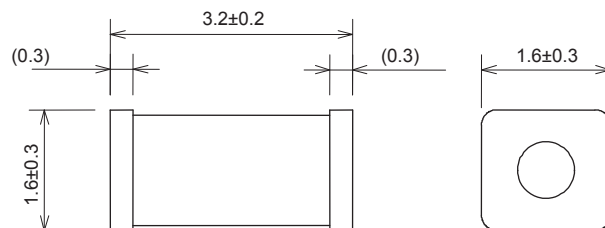
• Example



Safety Standard	File No.
UL :UL497B	E139599



• Dimensions



*Without marking

Unit: mm

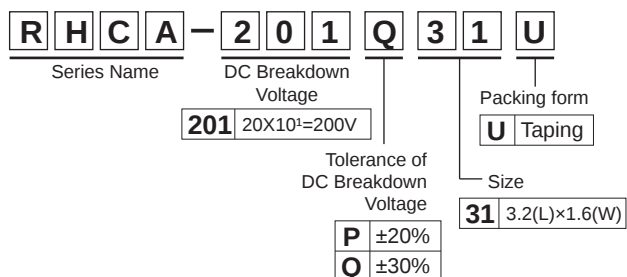
Electrical Specifications

Safety Standard	Model Number *1	DC Breakdown Voltage (V)	Insulation Resistance (MΩ) min.	Capacitance 1MHz (pF) max	Impulse Life Test	Impulse Current Capacity	Impulse Withstanding Voltage Capacity*2
	RHCA-900□31U	90	100(DC50V)	0.15	8/20μs, 50A 300 times	8/20μs, 500A (R=2Ω) Positive/Negative 5 times	10/700μs, 4,000V (R=25Ω) Positive/Negative 5 times
	RHCA-201□31U	200	100(DC100V)				
	RHCA-301□31U	300					
	RHCA-401□31U	400					
	RHCA-501□31U	500					

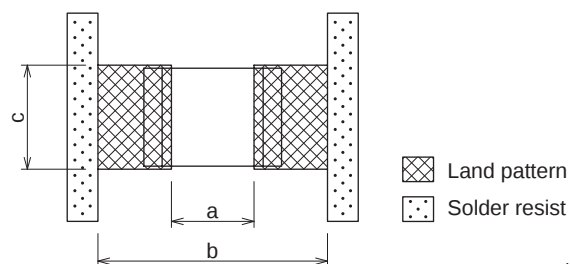
*1 □: Tolerance $\pm$ 20%=P, Tolerance $\pm$ 30%=Q

*2 Comforms to ITU-T K.20, K.21 Enhanced test
Operating Temperature: -20~+80°C

● Model numbering system

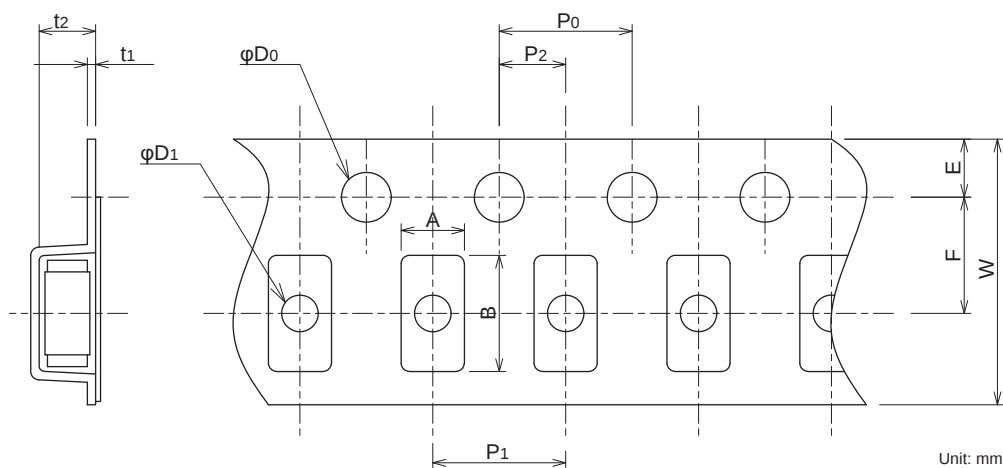


● Recommended Land Pattern (Typical value)



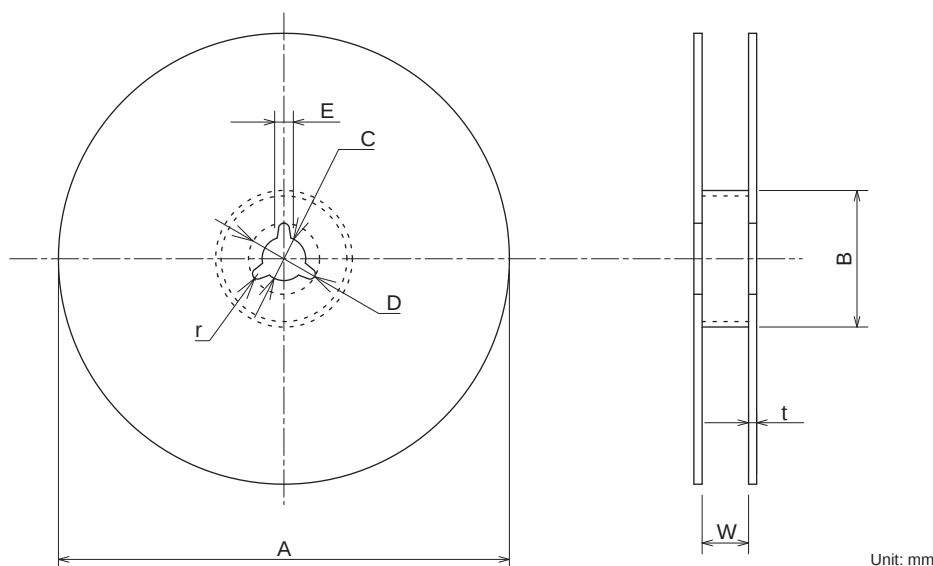
	Dimensions (mm)		
	a	b	c
Reflow Soldering	1.8 ~ 2.5	3.8 ~ 5.5	1.2 ~ 2.0
Flow Soldering		2.4 ~ 3.6	1.2 ~ 1.6

● Taping Dimensions



Dimensions (mm)	
A	1.9 ^{+0.2} _{-0.1}
B	3.5±0.1
W	8.0±0.3
F	3.5±0.05
E	1.75±0.1
P1	4.0±0.1
P2	2.0±0.05
P0	4.0±0.1
D0	φ 1.5 ^{+0.1} ₋₀
D1	φ 1.1±0.1
t1	0.3±0.1
t2	2.0 ^{+0.1} _{-0.4}

● Reel Dimensions (2,000pcs per one reel)



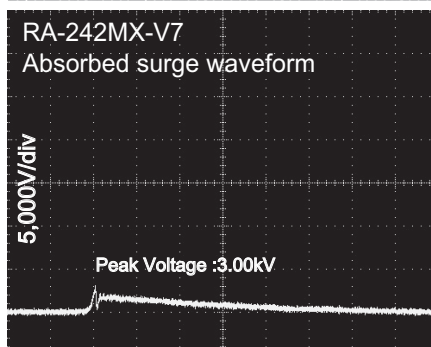
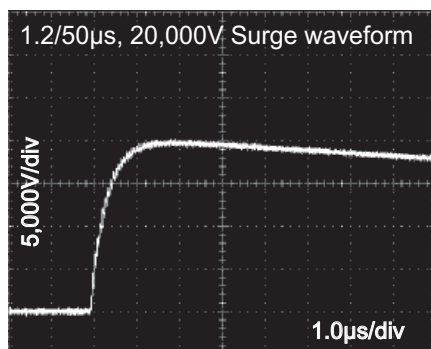
Dimensions (mm)	
A	φ 180.0 ⁺⁰ _{-1.5}
B	φ 60 ⁺¹ ₋₀
C	φ 13.0±0.2
D	φ 21.0±0.8
E	2.0±0.5
W	9.0 ^{+1.0} _{-0.5}
t	1.6±0.5
r	1.0

Features

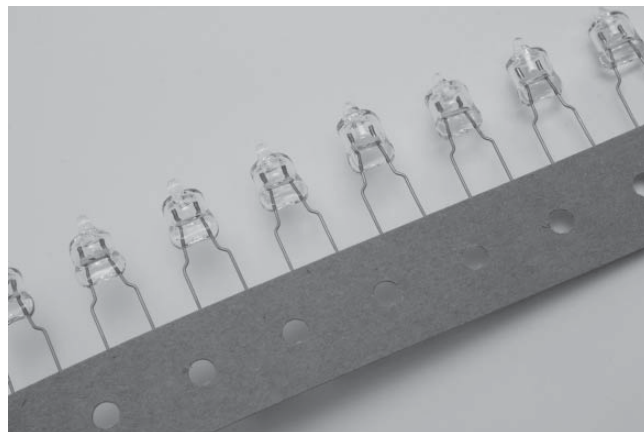
- Invented 3mm height smaller size of RA-MX-V7 Series compare with present productions
- Dielectric strength voltage test compliant
- High-speed response of surge
- Wide range of lineup from DC500V to DC4,500V
- Will be soon approved for UL, CSA, TÜV

Applications

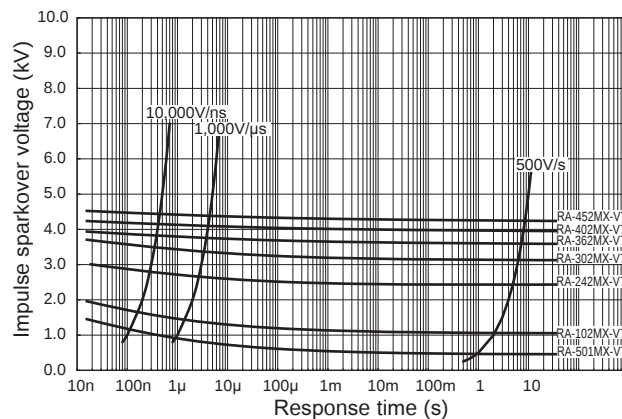
- Switching power supply, Inverter power supplies
- Refrigerator, Laundry machine, Air conditioner
- LED Lighting
- Copier, Telecommunication equipment
- *Impulse Absorption Characteristics*



	Safety Standard	File No.
UL	:UL1449 3rd.	E322107
CSA	:C22.2 No.60065	105073
TÜV	:EN60065 :EN60950-1	J50114145



V-t Characteristics



Electrical Specifications

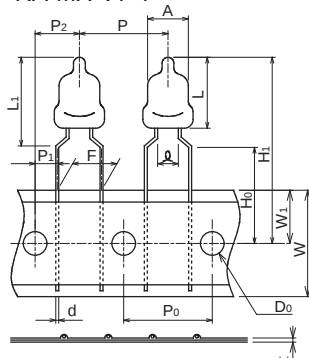
Model Number	DC Breakdown Voltage (V)	Impulse Sparkover Voltage 1.2/50μs (V) max.		Insulation Resistance (MΩ) min.	Capacitance 1MHz (pF) max.	Impulse Life test 8/20μs 100A	Impulse Current Capacity 8/20μs (A)	Withstanding Voltage
		Applied Voltage	Specification					
RA-501MX-V7-Y/Y(5)	500(400~600)	-	-	1000(DC100V)	1.0	300 times	3,500	—
RA-601MX-V7-Y/Y(5)	600(480~720)			1000(DC250V)				—
RA-102MX-V7-Y/Y(5)	1,000(800~1,200)			1000(DC500V)				—
RA-152MX-V7-Y/Y(5)	1,500(1,200~1,800)							—
RA-242MX-V7-Y/Y(5)	2,400(1,920~2,880) *	5,000V	5,000V max.					AC1,250V 3s
RA-302MX-V7-Y/Y(5)	3,000(2,400~3,600) *							AC1,500V 60s
RA-362MX-V7-Y/Y(5)	3,600(2,880~4,320) *							AC1,800V 3s
RA-402MX-V7-Y/Y(5)	4,000(3,200~4,800) *			AC2,000V 60s				
RA-452MX-V7-Y/Y(5)	4,500(3,600~5,400) *	8,000V	8,000V max.	1000(DC1000V)				AC2,000V 60s

* Reference Value

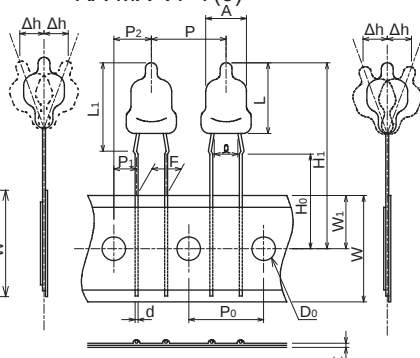
Operating Temperature: -20~+80°C

• Taping Dimensions

RA-MX-V7-Y



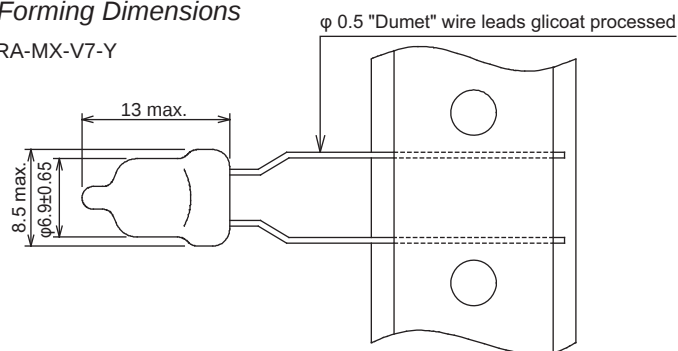
RA-MX-V7-Y(5)



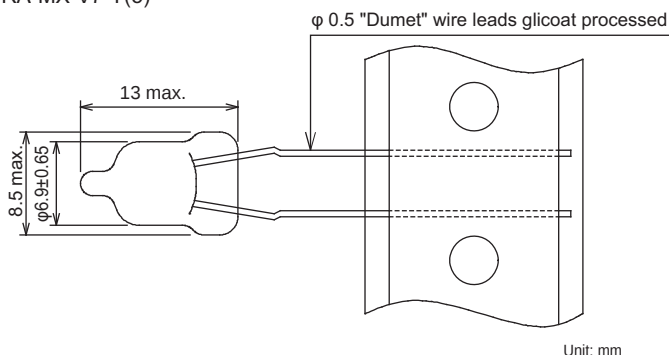
Unit: mm

• Forming Dimensions

RA-MX-V7-Y



RA-MX-V7-Y(5)



Unit: mm

Safety Standard

UL	CSA	TÜV	Model Number
○ ⁻¹ ₋₃	○ ⁺⁴ ₋₅	-	RA-501MX-V7-Y/Y(5)
○ ⁻¹ ₋₃	○ ⁺⁴ ₋₅	-	RA-601MX-V7-Y/Y(5)
○ ⁻² ₋₃	○ ⁺⁴ ₋₅	-	RA-102MX-V7-Y/Y(5)
○ ⁻² ₋₃	○ ⁺⁴ ₋₅	-	RA-152MX-V7-Y/Y(5)
○ ⁻² ₋₃	○ ⁺⁴ ₋₅	-	RA-242MX-V7-Y/Y(5)
○ ⁻¹ ₋₃	○ ⁺⁴ ₋₅	○ ⁻⁶	RA-302MX-V7-Y/Y(5)
○ ⁻¹ ₋₃	○ ⁺⁴ ₋₅	○ ⁻⁶	RA-362MX-V7-Y/Y(5)
○ ⁻¹ ₋₃	○ ⁺⁴ ₋₅	○ ⁻⁶	RA-402MX-V7-Y/Y(5)
○ ⁻¹ ₋₃	○ ⁺⁴ ₋₅	○ ⁻⁶	RA-452MX-V7-Y/Y(5)

Rated voltage <A>: Approved if it is connected to UL approved varistor .

	A	B
*1	AC125V	V1.0≥270V, D≥φ7mm
*2	AC125V	V1.0≥270V, D≥φ5mm
*3	AC250V	V1.0≥390V, D≥φ7mm
*4	AC125V	V1.0≥270V, D≥φ14mm
*5	AC250V	V1.0≥470V, D≥φ14mm
*6	AC125V / AC250V	V1.0≥470V, D≥φ5mm

Description	Symbol	Dimension (mm)	
		RA-MX-V7-Y	RA-MX-V7-Y(5)
High	L	13.0 max.	
Lamp Diameter	A	φ 6.9±0.65	
Lead Diameter	d	φ 0.5±0.05	
Leads clearance	Δh	4.0 min.	
Height from PCB top	L ₁	18.0 max.	
Lamp pitch	P	15.0±1.0	12.7±1.0
Hole pitch	P ₀	15.0±0.3	12.7±0.3
Hole position	P ₁	3.75±0.7	3.85±0.7
	P ₂	7.5±1.3	6.35±1.3
Lead pitch	F	7.5±0.5	5.0± ^{0.6} _{0.2}
Declining	Δh	±2.0	
Paper width	W	18.0±0.5	
Hole position	W ₁	9.0±0.5	
Lead clinch height	H ₀	16.0±0.5	
Product height*	H ₁	(34.5)	
Hole diameter	D ₀	φ 4.0±0.2	
Paper thickness	t	0.9 max.	

*Accumulated pitch error

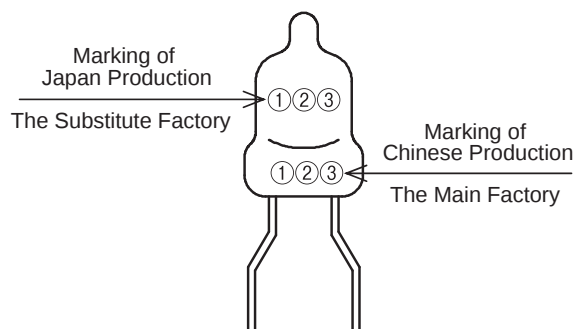
	4 pitch	20 pitch
RA-MX-V7-Y	60.0±0.6	300±1.5
RA-MX-V7-Y(5)	50.8±0.6	254±1.5

• Packing Quantity per Carton

RA-MX-V7-Y Series: 1,500 pcs

RA-MX-V7-Y(5) Series: 1,800 pcs

• Packing Description of Marking



①DC Breakdown Voltage

DC Sparkover voltage brevity code	501	601	102	152	242	302	362	402	452
Code	F	A	J	K	T	L	S	V	Y

②The year manufactured eg.) 2016→6

③The month manufactured (see below)

Month	1	2	3	4	5	6	7	8	9	10	11	12
Symbol	A	B	D	E	F	G	H	J	K	L	M	N

Features

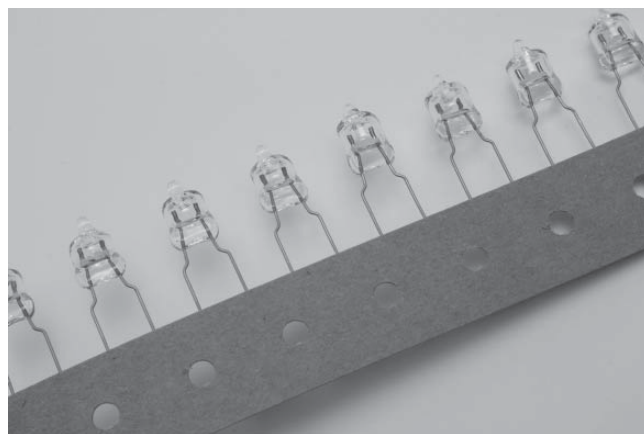
- Invented 3mm height smaller size of RA-MX-V7 (SJQ) Series compare with present productions
- Dielectric strength voltage test compliant
- High-speed response of surge
- Wide range of lineup DC4,000 and 4,500V
- Approved for UL, CSA, TÜV

Applications

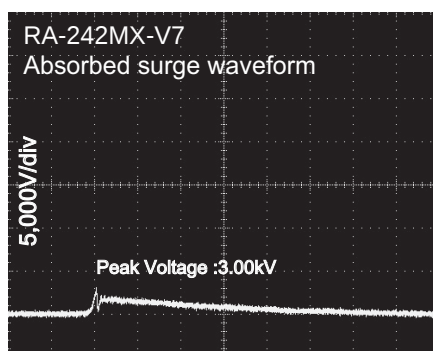
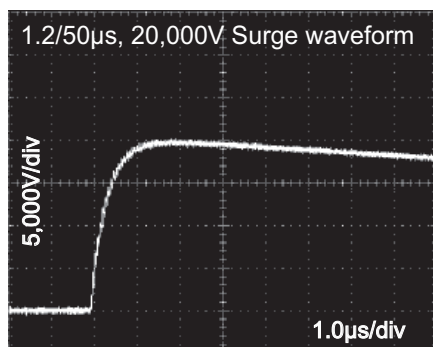
- LCD-TV, PDP-TV
- Blue-Ray recorder
- Antenna amplifier (Booster)
- Copier, Telecommunication equipment



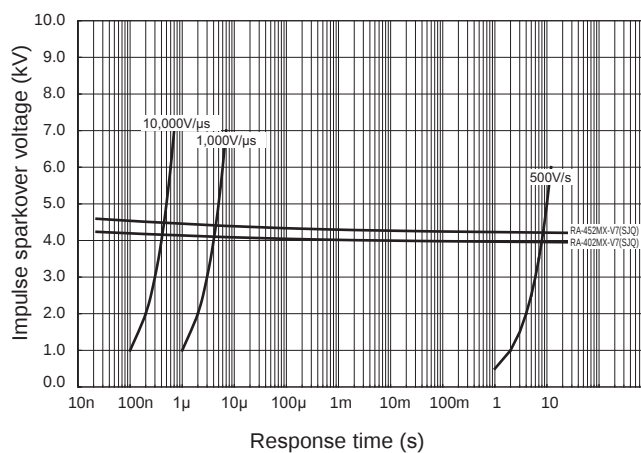
Safety Standard		File No.
UL	:UL1449 3rd.	E322107
CSA	:C22.2 No.60065	CA105073
TÜV	:EN60065 :EN60950-1	J50114145
JQA	:J60065(H26)	JQ10641-1



• Impulse Absorption Characteristics



• V-t Characteristics



Electrical Specifications

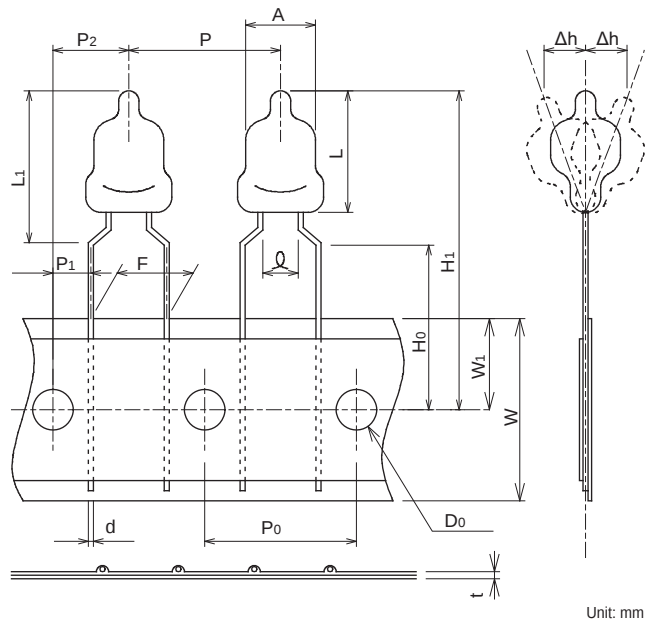
Model Number	DC Breakdown Voltage (V)	Impulse Sparkover Voltage 1.2/50 μ s (V) max.		Insulation Resistance (M Ω) min.	Capacitance 1MHz (pF) max.	Impulse Life test 8/20 μ s 100A	Impulse Current Capacity 8/20 μ s (A)	Withstanding Voltage
		Applied Voltage	Specification					
RA-402MX-V7-Y(SJQ)	4,000(3,200~4,800) *	7,500V	7,500V max.	1,000(DC500V)	1.0	300 times	3,500	AC2,000V 60s
RA-452MX-V7-Y(SJQ)	4,500(3,600~5,400) *	8,000V	8,000V max.	1,000(DC1kV)				AC2,000V 60s

* Reference Value

Operating Temperature: -20~+80°C

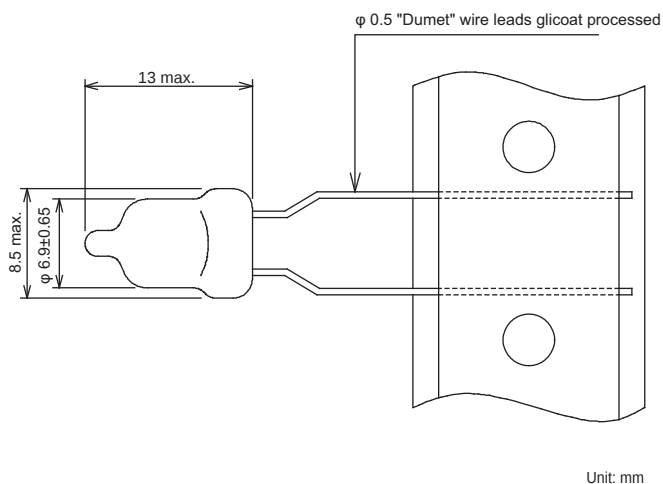
● Taping Dimensions

RA-MX-V7-Y(SJQ)



● Forming Dimensions

RA-MX-V7-Y(SJQ)



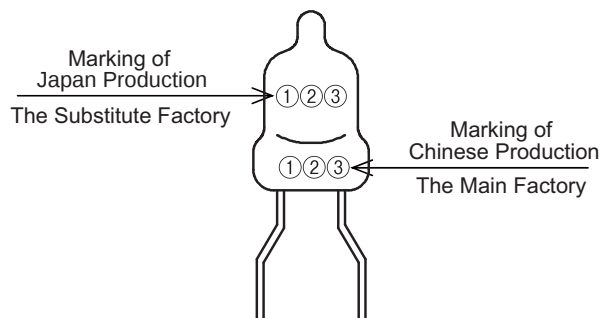
Description	Symbol	Dimension	
		RA-MX-V7-Y(SJQ)	
Height	L	13.0 max.	
Lamp Diameter	A	φ 6.9±0.65	
Lead Diameter	d	φ 0.5±0.05	
Width between leads	ℓ	4.0 min.	
Product height from board	L ₁	18.0 max.	
Lamp pitch	P	15.0±1.0	12.7±1.0
Hole pitch	P ₀	15.0±0.3	12.7±0.3
Hole position	P ₁	3.75±0.7	3.85±0.7
	P ₂	7.5±1.3	6.35±1.3
Pitch between leads	F	7.5±0.5	5.0 ^{+0.6} _{-0.2}
Declining	Δh	±2.0	
Paper width	W	18.0±0.5	
Hole position	W ₁	9.0±0.5	
Lead clinch height	H ₀	16.0±0.5	
Product height	H ₁	(34.5)	
Hole diameter	D ₀	φ 4.0±0.2	
Paper thickness	t	0.9 max.	

*Accumulated pitch error is 50.8±0.6 at 4 pitches and 254 ± 1.5 at 20pitches.

● Packing Quantity per Carton

RA-MX-V7-Y(SJQ) Series: 1,500 pcs/1 carton

● Packing Description of Marking



①.....DC Sparkover Voltage

DC Sparkover voltage brevity code	402(SJQ)	452(SJQ)
Code	X	Z

②.....The year manufactured eg.(2016→6

③.....The month manufactured (see below)

Month	1	2	3	4	5	6	7	8	9	10	11	12
Symbol	A	B	D	E	F	G	H	J	K	L	M	N

Safety Standard

UL	CSA	TÜV	JQA	Model Number
○ ⁻¹ ₋₂	○ ⁻³ ₋₄	○ ⁻⁵	○	RA-402MX-V7-Y(SJQ)
○ ⁻¹ ₋₂	○ ⁻³ ₋₄	○ ⁻⁵	○	RA-452MX-V7-Y(SJQ)

Rated voltage <A>: Approved if it is connected to UL approved varistor .

	A	B
*1	AC125V	V1.0≥270V, D≥φ7mm
*2	AC250V	V1.0≥390V, D≥φ7mm
*3	AC125V	V1.0≥270V, D≥φ14mm
*4	AC250V	V1.0≥470V, D≥φ14mm
*5	AC125V / AC250V	V1.0≥470V, D≥φ5mm

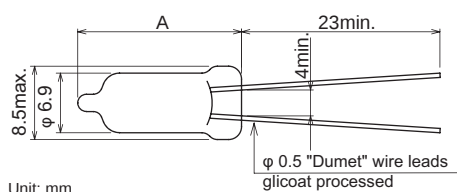
Features

- Fast response time.
- Bi-polar surge absorber, it will fail open if the surge withstand capacity is exceeded.
- Small inter-terminal capacitance.
- High insulation resistance ($10^9\Omega$. min).
- Excellent surge withstand capability (300 times at 100A, 8/20 μ s).
- Small size for compact circuit design.

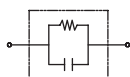
Applications

- Switching supply, Inverter power supplies, Refrigerator, Laundry machine, Air conditioner, DVD players, DVD recorders, Copiers, xDSL modems, Splitters, BS tuner, CRT, VCR, Telephone, Modems, Car audio and GPS.

Dimensions

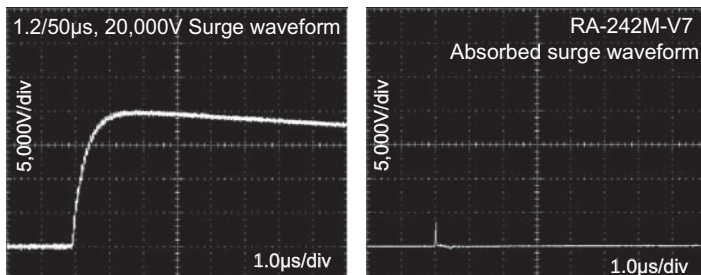


Circuit

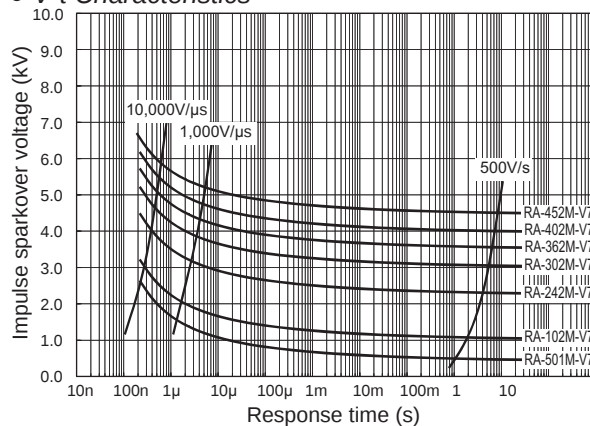


Dimensions max.(mm)	
A	
RA-M-V7	19
RA-MS-V7	16

Impulse Absorption Characteristics



V-t Characteristics



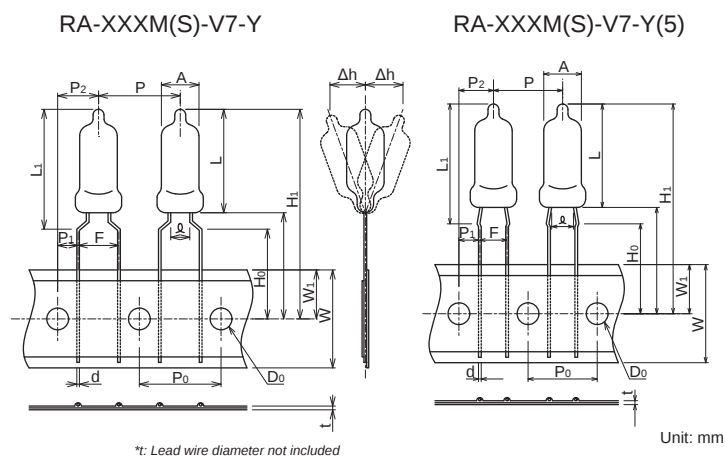
Electrical Specifications

Model Number	DC Breakdown Voltage (V)	Impulse Sparkover Voltage 1.2/50μs (V) max.		Insulation Resistance (MΩ) min.	Capacitance 1MHz (pF) max.	Impulse Life test 8/20μs 100A	Impulse Current Capacity 8/20μs (A)	Withstanding Voltage
		Applied Voltage	Specification					
RA-501M/MS-V7	500(400~600)	-	-	1000(DC100V)	2.0	300 times	3,500	—
RA-601M/MS-V7	600(480~720)			1000(DC250V)				—
RA-102M/MS-V7	1,000(800~1,200)			1000(DC500V)				—
RA-152M/MS-V7	1,500(1,200~1,800)							—
RA-242M-V7	2,400(1,920~2,880) *	5,000V	5,000V max.					AC1,250V 3s
RA-302M-V7	3,000(2,400~3,600) *							AC1,500V 60s
RA-362M-V7	3,600(2,880~4,320) *							AC1,800V 3s
RA-402M-V7	4,000(3,200~4,800) *							AC2,000V 60s
RA-452M-V7	4,500(3,600~5,400) *	8,000V	8,000V max.	1000(DC1000V)				AC2,000V 60s
RA-242MS-V7	2,400(1,920~2,880) *	5,000V	5,000V max.	1000(DC500V)				AC1,250V 3s
RA-302MS-V7	3,000(2,400~3,600) *							AC1,500V 60s
RA-362MS-V7	3,600(2,880~4,320) *							AC1,800V 3s
RA-402MS-V7	4,000(3,200~4,800) *							AC2,000V 60s
RA-452MS-V7	4,500(3,600~5,400) *	8,000V	8,000V max.	1000(DC1000V)				AC2,000V 60s

* Reference Value

Operating Temperature: -20~+80°C

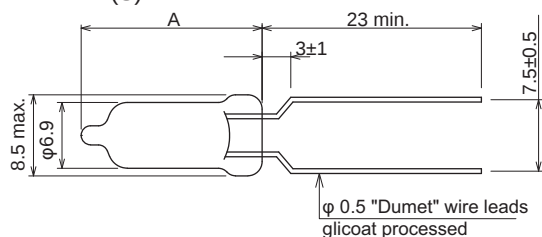
Taping Dimensions



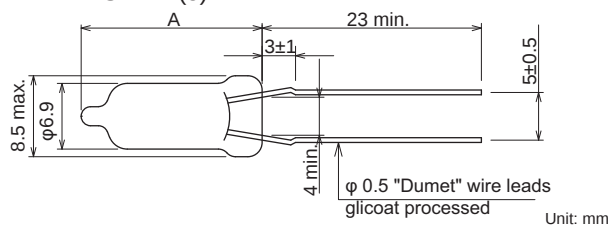
*t: Lead wire diameter not included

Forming Dimensions

RA-XXXM(S)-V7-F



RA-XXXMS-V7-F(5)



Safety Standard

UL	CSA	TÜV	Model Number
○ ⁻¹	-	-	RA-501M/MS-V7
○ ⁻¹ ₂	-	-	RA-601M/MS-V7
○ ⁻¹ ₂	-	-	RA-102M/MS-V7
○ ⁻¹ ₂	-	-	RA-152M/MS-V7
○ ⁻¹	○ ⁻¹	-	RA-242M-V7
○ ⁻¹ ₂	○ ⁻³	○ ⁻⁴	RA-302M-V7
○ ⁻¹ ₂	○ ⁻³	○ ⁻⁴	RA-362M-V7
○ ⁻²	○ ⁻³	○ ⁻⁴	RA-402M-V7
○ ⁻²	○ ⁻³	○ ⁻⁴	RA-452M-V7
○ ⁻¹	○ ⁻¹	-	RA-242MS-V7
○ ⁻¹ ₂	○ ⁻³	○ ⁻⁴	RA-302MS-V7
○ ⁻¹ ₂	○ ⁻³	○ ⁻⁴	RA-362MS-V7
○ ⁻²	○ ⁻³	○ ⁻⁴	RA-402MS-V7
○ ⁻²	○ ⁻³	○ ⁻⁴	RA-452MS-V7

Rated voltage <A>: Approved if it is connected to UL approved varistor .

	A	B
*1	AC125V	V1.0≥270V, D≥φ5mm
*2	AC250V	V1.0≥390V, D≥φ7mm
*3	AC250V	V1.0≥270V, D≥φ5mm
*4	AC125V / AC250V	V1.0≥470V, D≥φ5mm

Description	Symbol	Dimension (mm)	
		RA-M(S)-V7-Y	RA-M(S)-V7-Y(5)
High	L	19.0 max.	(16.0 max.)
Lamp Diameter	A	φ 6.9±0.65	
Lead Diameter	d	φ 0.5±0.05	
Lead clearance	∅	4.0 min.	
Height from PCB top	L1	22.0 max.	(19.0 max.)
Lamp pitch	P	15.0±1.0	12.7±1.0
Hole pitch	P0	15.3±0.3 *1	12.7±0.3 *1
Hole position	P1	3.75±0.7	3.85±0.7
	P2	7.5±1.3	6.35±1.3
Lead pitch	F	7.5±0.5	5.0± ^{0.6} _{0.2}
Declining	Δh	±2.0	
Paper width	W	18.0±0.5	
Hole position	W1	9.0±0.5	
Lead clinch height	H0	16.0±0.5	
Product height *2	H1	38.5 (35.5)	
Hole diameter	D0	φ 4.0±0.2	
Paper thickness	t	0.7±0.2	

*2 Nominal value

*1 Accumulative pitch error:

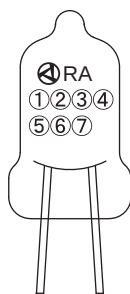
	4 pitch	20 pitch
RA-M(S)-V7-Y	60.0±0.6	300±1.5
RA-M(S)-V7-Y(5)	50.8±0.6	254±1.5

Packing Quantity per Carton

RA-XXXM(S)-V7-Y Series: 1,500 pcs

RA-XXXM(S)-V7-Y(5) Series: 1,800 pcs

Description of marking



eg)

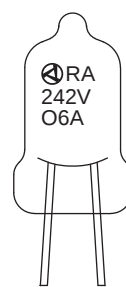
Model: RA-242M-V7

DC Breakdown voltage: 2,400V

Tolerance: ±20%→O

Calendar: 2016→6

Manufactured month: January→A

① ② ③ DC Breakdown Voltage ① ② ×10^③

④ V (Radial)

⑤ Tolerance

Tolerance	±20%	^{+30%} _{-10%}	Other
Symbol	O	R	-

⑥ Identification of manufacture year eg.) 2015→5

⑦ Manufacture month (see below)

Month	1	2	3	4	5	6	7	8	9	10	11	12
Symbol	A	B	D	E	F	G	H	J	K	L	M	N

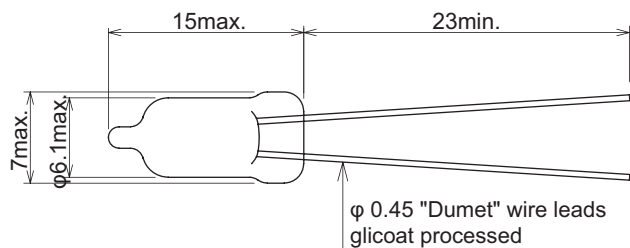
Features

- Fast response time.
- Large surge withstand capability 2,000A.
- Protects electronic components from impulse breakdown voltage.
- Small inter-terminal capacity.

Applications

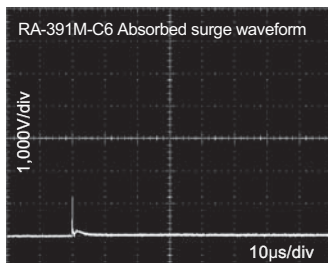
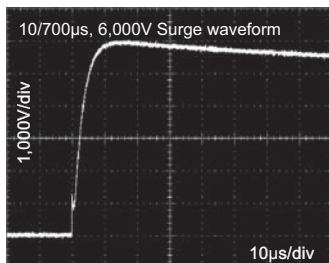
- xDSL modems, Splitters, BS tuner, CRT, VCR, Telephone, Modems, Car audio and GPS.

Dimensions

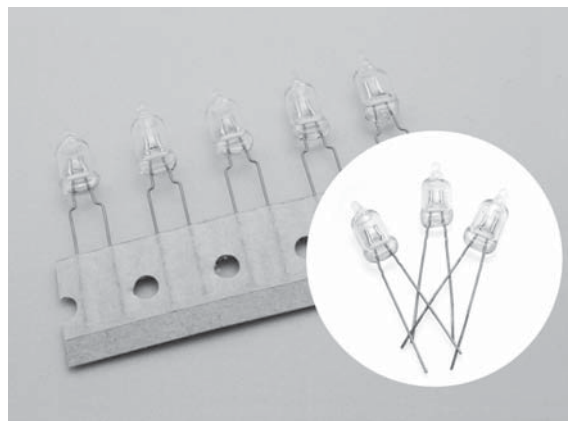


Unit: mm

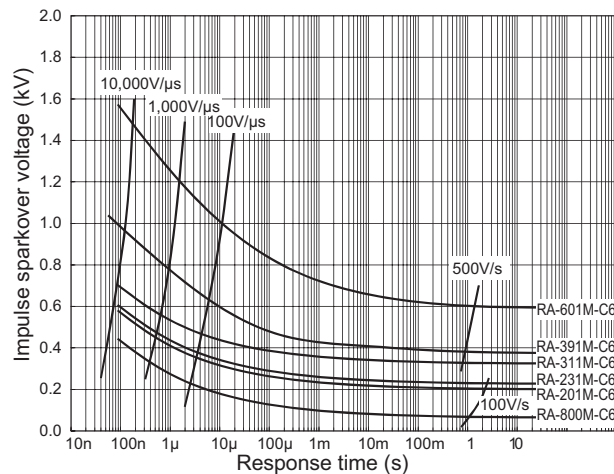
Impulse Absorption Characteristics



Safety Standard		File No.
UL	:UL497B	E139599
UL	:UL1449 4th.	E332107
cUL	:C22.2 No.8-13	
TÜV	:EN60065	J50114145
	:EN60950-1	



V-t Characteristics



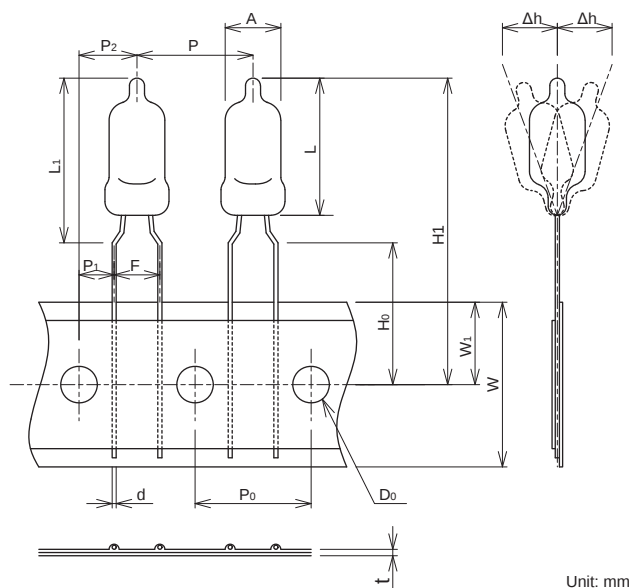
Electrical Specifications

Model Number P: Without Marking M: Marking	DC Breakdown Voltage (V)	Impulse Sparkover Voltage 1.2/50μs (V) max.		Insulation Resistance (MΩ) min.	Electrostatic Capacitance 1MHz (pF) max.	Impulse Life Test 8/20μs 100A	Impulse Current Capacity 8/20μs (A)	Withstanding Voltage		
		Applied Voltage	Specification							
RA-800P/M-C6	80 (64 ~ 96)	-	-	1,000 (DC50V)	1.0	300 times	2,000	-		
RA-151P/M-C6	150 (120 ~ 180)			1,000 (DC100V)						
RA-201P/M-C6	200 (160 ~ 240)									
RA-231P/M-C6	230 (184 ~ 276)									
RA-311P/M-C6	310 (264 ~ 356)	1kV/10μs	600V max.	1,000 (DC250V)						
RA-351P/M-C6	350 (280 ~ 420)	-	-							
RA-391P/M-C6	390 (312 ~ 468)									
RA-501P/M-C6	500 (400 ~ 600)									
RA-601P/M-C6	600 (480 ~ 720)									
RA-102P/M-C6	1,000 (800 ~ 1,200)		1,000 (DC500V)							
RA-152P/M-C6	1,500 (1,200 ~ 1,800)									
RA-272M-C6	2,700 (2,160 ~ 3,240) *	1.2/50μs 5kV	5kV max.					AC1,250V3s AC1,500V60s AC1,800V3s		
RA-302M-C6	3,000 (2,400 ~ 3,600) *									
RA-302M-C6(AC)	3,000 (2,700 ~ 3,900) *									

* Reference Value

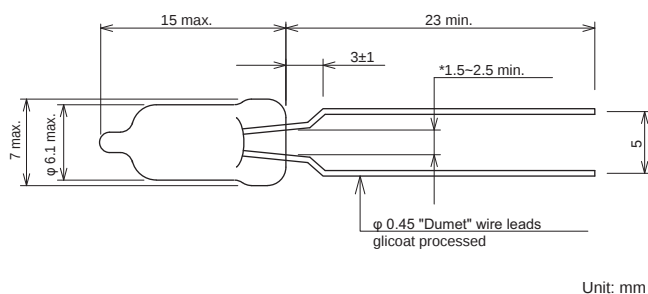
Operating Temperature: -20~+80°C

● Taping Dimensions (RA-XXXP/M-C6-Y)



Unit: mm

● Forming Dimensions (RA-XXXP/M-C6-F)



Unit: mm

Safety Standard

UL497B	UL1449	cUL	TÜV	Model Number
○	-	-	-	RA-800P/M-C6
○	-	-	-	RA-151P/M-C6
○	-	-	-	RA-201P/M-C6
○	-	-	-	RA-231P/M-C6
○	○ ^{*1}	-	-	RA-311P/M-C6
○	○ ^{*1}	-	-	RA-351P/M-C6
○	○ ^{*1}	-	-	RA-391P/M-C6
○	○ ^{*1}	-	-	RA-501P/M-C6
-	○ ^{*1} ₂	-	-	RA-601P/M-C6
-	○ ^{*1} ₂	-	-	RA-102P/M-C6
-	○ ^{*1} ₂	-	-	RA-152P/M-C6
-	○ ^{*1}	○ ^{*1}	○ ^{*3}	RA-272M-C6
-	○ ^{*1} ₂	○ ^{*1} ₂	○ ^{*4}	RA-302M-C6
-	○ ^{*1} ₂	○ ^{*1} ₂	○ ^{*4}	RA-302M-C6(AC)

Rated voltage <A>: Approved if it is connected to UL approved varistor .

	A	B
*1	AC125V	V1.0≥270V, D≥φ5mm
*2	AC250V	V1.0≥390V, D≥φ7mm
*3	AC125V	V1.0≥470V, D≥φ5mm
*4	AC125V / AC250V	V1.0≥470V, D≥φ5mm

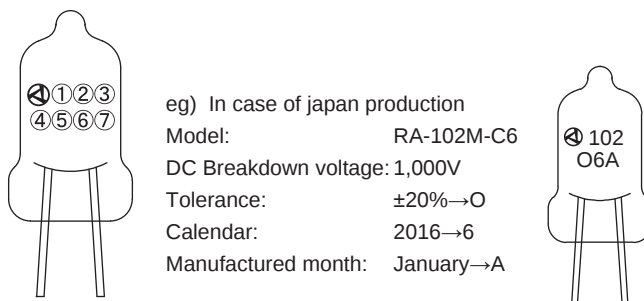
Description	Symbol	Dimension (mm)
RA	Height	L 15.0 max.
	Lamp Diameter	A φ 6.1 max.
	Lead Diameter	d φ 0.45±0.05
Height from PCB top		L1 17.0 max.
Lamp pitch		P 12.7±1.0
Hole pitch		P0 12.7±0.3*
Hole position	P1	3.85±0.7
	P2	6.35±1.3
Lead pitch		F 5.0 ^{+0.6} _{-0.2}
Declining		Δh ±2.0
Paper width		W 18.0±0.5
Hole position		W1 9.0±0.5
Lead clinch height		H0 16.0±0.5
Product height		H1 (33.5)
Hole diameter		D0 φ 4.0±0.2
Paper thickness		t 0.7±0.2

* Accumulative pitch error: 4 pitches 50.8±0.6mm,
20 pitches 254±1.5mm

● Packing Quantity per Carton

RA-C6-Y: 2,000 pcs

● Description of marking

①②③..... DC Breakdown Voltage ①②×10^③

④..... T : China production

None : Japan production

⑤..... Tolerance ±20% (Symbol O)*1

⑥..... Identification of manufacture year eg.) 2016→6

⑦..... Manufacture month (see below)

*1 Tolerance of 311 ±15% (Symbol M)

Month	1	2	3	4	5	6	7	8	9	10	11	12
Symbol	A	B	D	E	F	G	H	J	K	L	M	N

Rated Voltage	AC125V 50/60Hz	AC250V 50/60Hz	AC250V 50/60Hz
DC Breakdown Voltage	2,400V±20%	3,000V±20%	3,600V±20%
Withstand Voltage test	AC1,000V 50/60Hz 60s	AC1,500V 50/60Hz 60s	AC1,500V 50/60Hz 60s
	AC1,250V 50/60Hz 3s		AC1,800V 50/60Hz 3s
Example. 1 Single-phase	Module : RAM-242BWZ RA: RA-242MX-V7 Z1, Z2: MOVφ10Min, 270VMin Module : RAM-302BWZ RA: RA-302MX-V7 Z1, Z2: MOVφ10Min, 400VMin Module : RAM-362BWZ RA: RA-362MX-V7 Z1, Z2: MOVφ10Min, 400VMin		
Example. 2 Single-phase	Module : RAM-242LAS RA: RA-242MX-V7 Z1: MOVφ10Min, 220VMin Z2: MOVφ5Min, 270VMin Module : RAM-302LAS RA: RA-302MX-V7 Z1: MOVφ10Min, 400VMin Z2: MOVφ5Min, 400VMin Module : RAM-362LAS RA: RA-362MX-V7 Z1: MOVφ10Min, 400VMin Z2: MOVφ5Min, 400VMin		
Example. 3 Three-phase	Module : RAM-302BXZ RA : RA-302MX-V7 Z1 } Z2 } : MOVφ10Min, 400VMin Z3 } Module : RAM-362BXZ RA : RA-362MX-V7 Z1 } Z2 } : MOVφ10Min, 400VMin Z3 }		
Example. 4 Three-phase	RA : RA-302MX-V7 Z1 } Z2 } : MOVφ10Min, 400VMin Z3 } R1 } R2 } : RA-362MX-V7 R3 } Z1 } Z2 } : MOVφ10Min, 400VMin Z3 } Z4 } Z5 } : MOVφ5Min, 400VMin Z6 }		

Module : RA + MOV

R·A·V surge absorbers are designed to assist in dealing with the problem of power surges. The R·A·V series is a unique new approach which combines the features of two well known technologies. Combining the high speed capabilities of Metal Oxide Varistor (MOV) with the large power handling capability of Gas Arrester, OKAYA has developed a product which can clamp power surges faster than gas arrester alone and handle large power surges far beyond the capability of MOV.

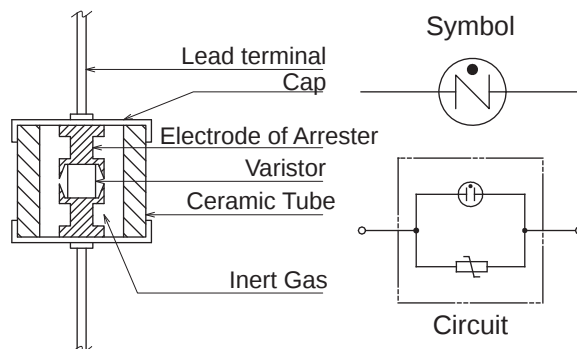
Features

The R·A·V Surge Absorber is applicable for the protection of many types of electrical equipment. The R·A·V has the following features:

- 1) Large capacity surge protection
- 2) Fast response time
- 3) Good endurance to repetitive lightning
- 4) High clipping performance
- 5) Low internal capacitance
- 6) No environmentally hazardous materials

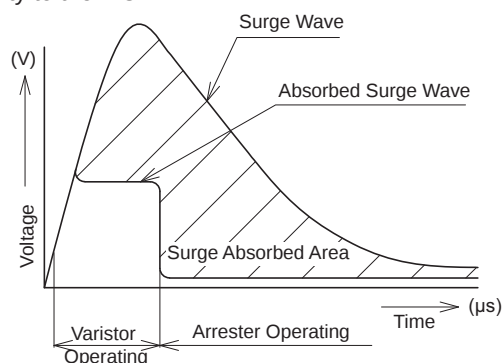
• Dynamic Characteristics

• Structure

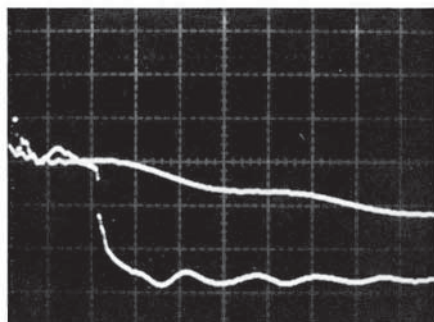


• Operating principal

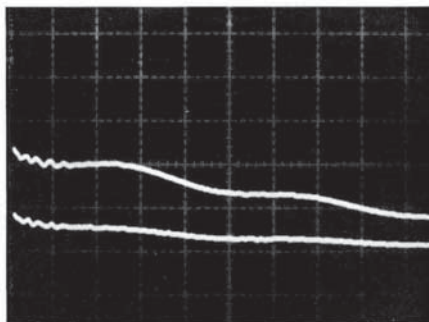
The R·A·V connected between lines will shunt the surge from one side of the line to the other. The high speed varistor quickly shunts the surge until the slower, but more powerful gas arrester takes over. This allows the gas arrester to handle the high energy portion of the surge and protect the MOV from damage. This interaction of the R·A·V assures safe handling of the power surge and long life stability to the MOV.



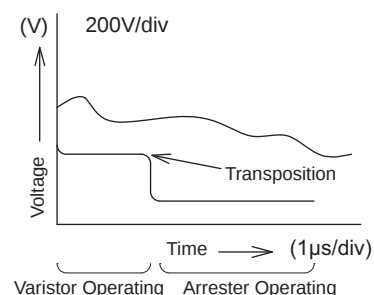
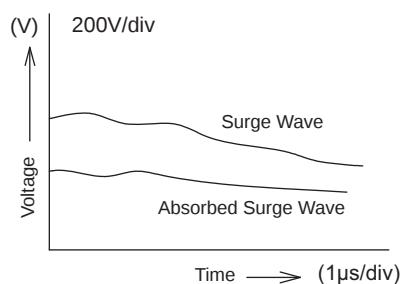
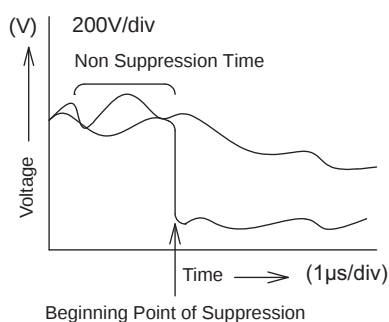
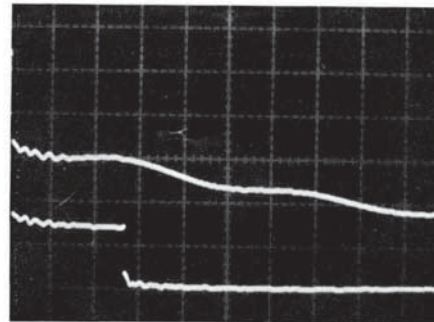
Gas Arrester



ZnO Varistor



R·A·V

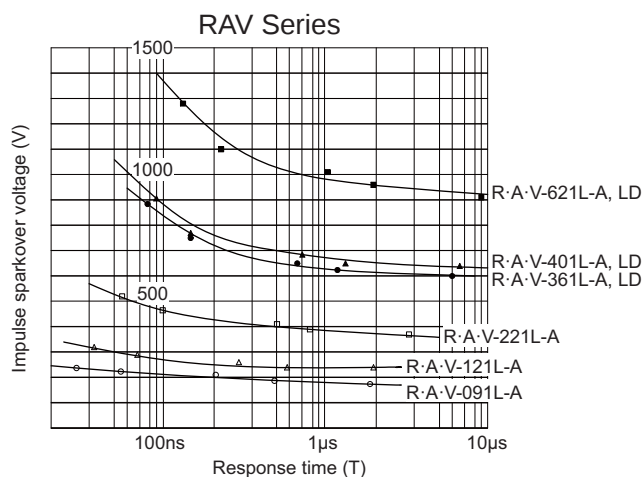


R·A·V·L-A (for protecting network line)

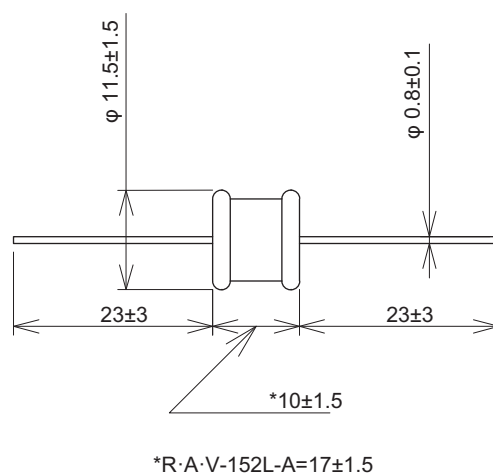
R·A·V was developed to absorb high current surge such as indirect lighting. specially, the R·A·V applied to communication circuits will protect it. The R·A·V is suitable for use with equipment which requires high reliability protection from external surges.

- Response time: 50ns max.
- Life: Possible to absorb 1,000A for 300 times repeatedly(surge wave form: 8/20μs).

• V-t Characteristics

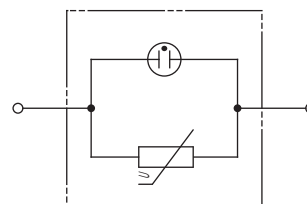


• Dimensions



Unit: mm

• Circuit



Electrical Specifications

Model Number	Clamping Voltage (V) ±10% *1	Impulse Discharge Current 8/20μs (A)	Withstanding Impulse Voltage 1.2/50μs (V)	Response Time (ns)	Capacitance (pF) *2
R·A·V-091L-A	90	2,400	20,000	50	150
R·A·V-121L-A	120				14
R·A·V-181L-A	180				100
R·A·V-221L-A	220				60
R·A·V-361L-A	360				30
R·A·V-401L-A	400				40
R·A·V-621L-A	620				30
R·A·V-901L-A	900				20
R·A·V-152L-A	1,500				

*1 Equivalent varistor voltage@1mA *2 Reference Value
Operating Temperature: -20~+70°C

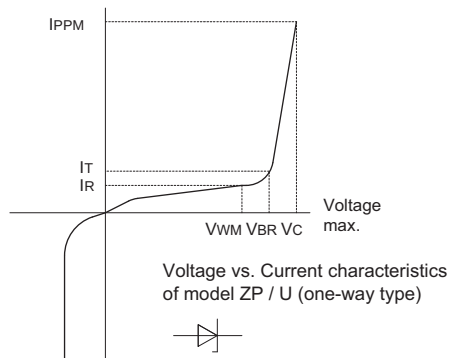
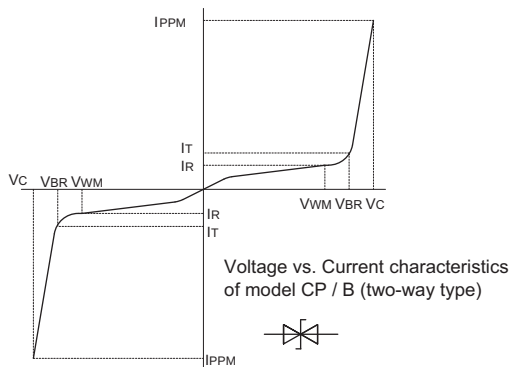
Features

- Fast response to rapid surge (10^{-12} sec).
- Almost no performance degradation against repetitive surge.
- Very low internal resistance during operation.
- Very small leak current.

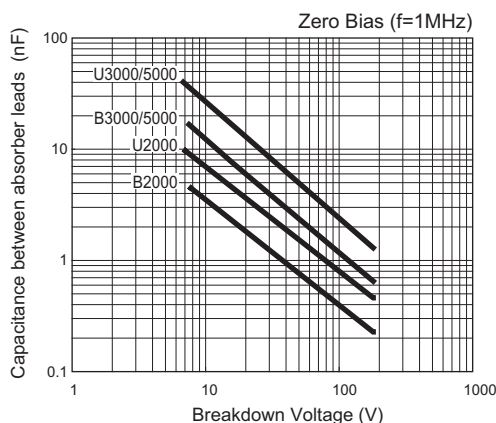
Applications

- Air conditioners, Amusement machines, Telecommunication equipments, Data transmitters.

Electrical Specifications



Typical capacitance between absorber's lead vs. Breakdown voltage



Nominal Breakdown Voltage (V_{BR})

Voltage at which avalanche current may begin to flow, normally the voltage between the surge absorber's leads when 1mA of current is applied.

Maximum Working Voltage (V_{WM})

A maximum voltage that can be applied to the surge absorber continuously.

Leakage Current (I_R)

A maximum current flowing through the surge absorber when the standoff voltage is applied to the surge absorber.

Rated Peak Impulse Current (I_{PPM})

A maximum surge current that can flow through the surge absorber, but not repetitively. The waveform in the table is 8/20 μ sec.

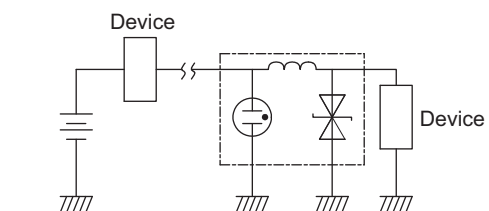
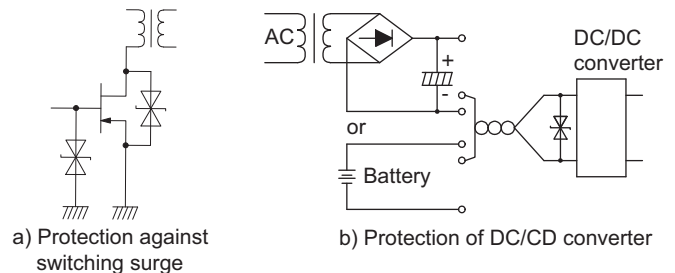
Clamping Voltage (V_C)

A maximum voltage that may be generated between the surge absorber's leads when the peak surge current is applied to the surge absorber.

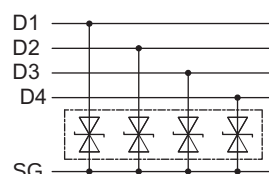
Rated Peak Impulse Power Dissipation (P_{PPM})

$$(P_{PPM}) = (V_{PPM}) \times (I_{PPM})$$

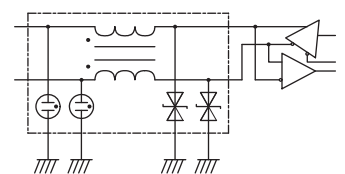
Applications



c) Protection of interface RS485A from lightning surge (surge absorber-component surge protection)



d) Protection of data line (arrayed surge absorbers)



e) Protection of RS-485-A lightning surge

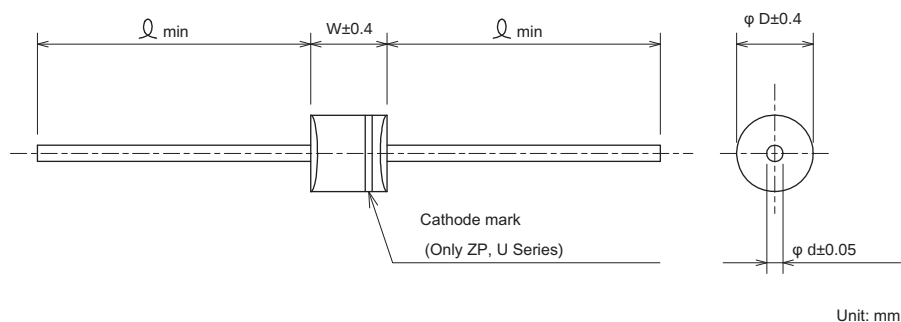


The Silicon Surge Absorber is available in five series that support the countermeasure against a wide range of surge from low to high, including electrostatic discharges and lightning surges. The device may also be used as a constant voltage device where high voltage or high power is required.

Series	Uni-Polar Type	Bi-Polar Type	Rated Peak Impulse Current Dissipation	
			8/20 μ s	10/100 μ s
1000	ZP	CP	6,000 W	500 W
2000	U	B	18,000W	1,500W
3000	U	B	34,000W	3,500W
5000	U	B	44,000W	5000W



• Dimensions



Dimensions (mm)				
Series	D	W	d	$\varnothing$
1000	2.8	5.0	0.6	20
1500	5.3	9.7	1.0	
2000				
3000	8.5	8.6		
5000	9.7	12.3	1.2	

Electrical Specifications

1000 Series

Rated Peak Impulse Power Dissipation 6,000W (8/20 μ sec)

Model Number*1	Nominal Breakdown Voltage		Maximum Working Voltage		Rated Peak Impulse Current	
	V _{BR} (V)	I _T (mA)	V _{WM} (V)	I _R (μ A)	I _{PPM} (A)	V _C (V)
ZP1010	10	1	8.10	5	311	19.5
□□1012	12		9.72		267	22.7
□□1016	16		12.9		213	28.4
□□1018	18		14.5		178	34.0
ZP1027	27		21.8		120	50.5
ZP1040	40		32.4		83	73.0
□□1050*2	50		40.5		68.9	88.0
ZP1060	60		48.6		52.6	114
ZP1075*2	75		60.7		42.2	142
ZP1120	120		97.0		27.3	222

*1 ZP: Uni-Polar Type, CP: Bi-Polar Type, □□: Both ZP and CP

*2 Requirements may vary depending on the quantity ordered.

Please ask for details.

Operating Temperature: -40~+125°C



2000 Series

Rated Peak Impulse Power Dissipation 18,000W (8/20μsec)

Model Number*	Nominal Breakdown Voltage		Maximum Working Voltage		Rated Peak Impulse Current 8/20μsec	
	VBR (V)	IT (mA)	VWM (V)	IR (μA)	IPPM (A)	VC (V)
U2007	7.5	10	6.05	1,000	1241.0	14.5
B2008	8.2		6.63	400	1161.0	15.5
B2010	10.0		8.10	20	968.0	18.6
B2012	12.0		9.72	5	829.0	21.7
□2018	18.0	1	14.50		554.0	32.5
□2022	22.0		17.80		458.0	39.3
B2027	27.0		21.80		373.0	48.3
□2033	33.0		26.80		305.0	59.0
□2039	39.0		31.60		258.0	69.7
□2047	47.0		38.10		214.0	84.0
B2056	56.0		45.50		180.0	100.0
B2068	68.0		55.10		148.0	121.0
B2082	82.0		66.40		123.0	146.0
B2100	100.0		81.00		101.0	178.0
B2150	150.0		121.00		68.0	265.0
□2180	180.0		146.00		57.0	317.0
B2220	220.0		175.00		46.5	388.0
B2250	250.0		202.00		40.7	442.0
B2300	300.0		243.00		34.0	529.0
B2400	400.0		324.00		25.5	706.0

* U: Uni-Polar type, B: Bi-Polar Type, □: Both U and B

Operating Temperature: -40~+125°C

3000 Series

Rated Peak Impulse Power Dissipation 34,000W (8/20μsec)

Model Number*	Nominal Breakdown Voltage		Maximum Working Voltage		Rated Peak Impulse Current 8/20μsec	
	VBR (V)	IT (mA)	VWM (V)	IR (μA)	IPPM (A)	VC (V)
B3008	8.2	10	6.63	2,000	2208	15.4
B3010	10.0	1	8.10	100	1717	19.8
□3015	15.0		12.10	10	1145	29.7
□3018	18.0		14.50		955	35.6
U3022	22.0		17.80		780	43.6
□3033	33.0		26.80		521	63.5
B3036	36.0		29.16		478	71.0
U3039	39.0		31.60		440	77.2
B3056	56.0		45.50		307	111.0
□3068	68.0		55.10		252	135.0
B3082	82.0		66.40		210	162.0
U3180	180.0		146.00		96	356.0

* U: Uni-Polar type, B: Bi-Polar Type, □: Both U and B

Operating Temperature: -40~+125°C

5000 Series

Rated Peak Impulse Power Dissipation 44,000W (8/20μsec)

Model Number*	Nominal Breakdown Voltage		Maximum Working Voltage		Rated Peak Impulse Current 8/20μsec	
	VBR (V)	IT (mA)	VWM (V)	IR (μA)	IPPM (A)	VC (V)
B5008	8.2	10	6.63	2,000	2819	15.9
B5010	10.0	1	8.10	100	2426	18.5
□5015	15.0		12.10	10	1621	27.6
□5018	18.0		14.50		1352	33.1
U5022	22.0		17.80		1104	40.5
□5033	33.0		26.80		737	60.7
B5036	36.0		29.16		679	64.8
U5039	39.0		31.60		622	71.9
B5056	56.0		45.50		434	103.0
□5068	68.0		55.10		358	126.0
B5082	82.0		66.40		298	150.0
U5180	180.0		146.00		135	331.0

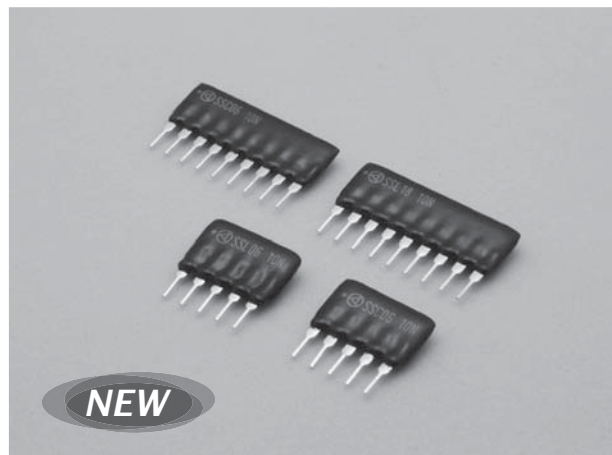
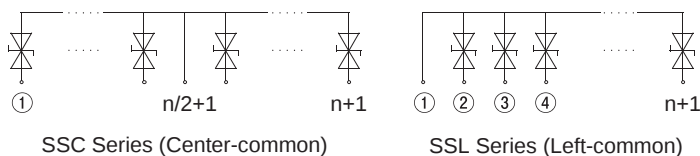
* U: Uni-Polar type, B: Bi-Polar Type, □: Both U and B

Operating Temperature: -40~+125°C



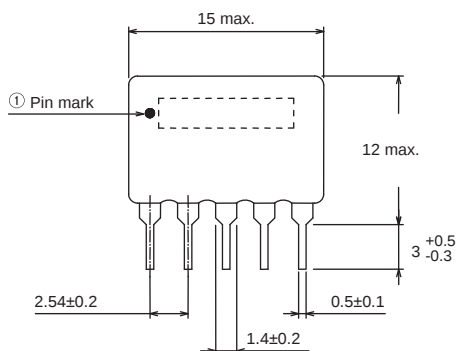
This array type of silicon surge absorber is designed for use in signal line applications. The element's integration is enhanced, so space factor and process times are much improved. You can choose 4 or 8 elements, and center-common or left-common.

● Circuit

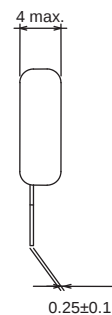
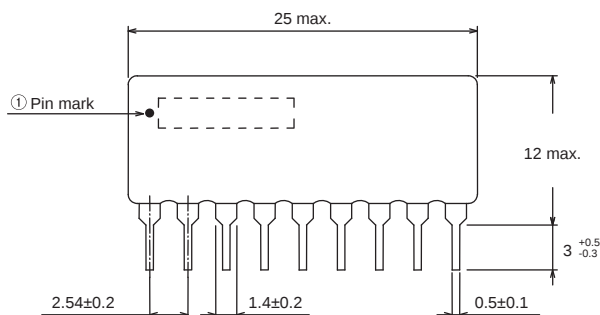


● Dimensions

4 elements



8 elements



Unit: mm

Electrical Specifications

Rated Peak Impulse Power Dissipation 4,200W (8/20μsec)

Model Number*	Nominal Breakdown Voltage		Maximum Working Voltage		Rated Peak Impulse Current 8/20μsec	
	V _{BR} (V)	I _T (mA)	V _{WM} (V)	I _R (μA)	I _{PPM} (A)	V _C (V)
SS□08-O	8.2	1	6.63	5	180.0	23.3
SS□18-O	18.0		14.5		128.0	32.7
SS□22-O	22.0		17.8		105.0	40.0
SS□33-O	33.0		26.8		70.1	59.9

*□: Circuit symbol: C= Center-common, L= left-common O: Number of element: 4 or 8
Operating Temperature: -40~+125°C

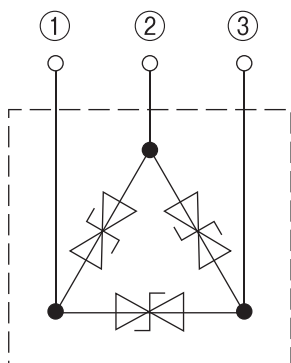
RSP-DC series is surge protective device for DC power circuit, protects line-in driver, receiver IC from indirect lightning surge, static electricity.

Features

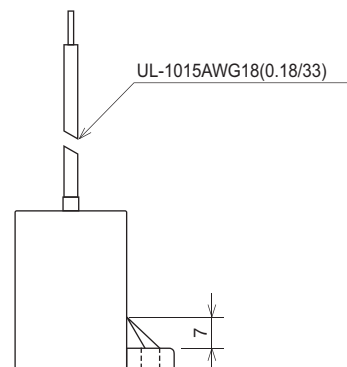
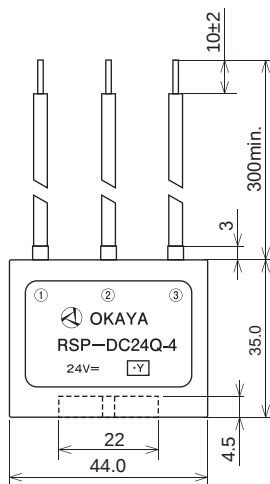
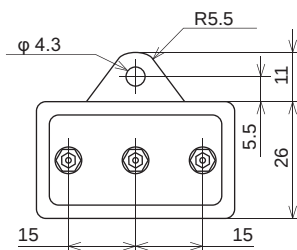
- Quick response for surge
- Internal resistance is very small at work
- Able to withstand impulse due to mesa-shaped chip
- Complex product of silicon surge absorber



Circuit

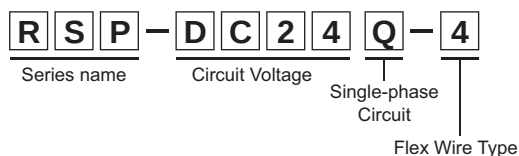


Dimensions



Tolerances: ±1.0
Unit: mm

Model Numbering System



Electrical Specifications

Model Number	DC Circuit Voltage (V)	Nominal Breakdown Voltage (±10%)		Standoff Voltage		Rated Peak Impulse Current 1.2/50μs-8/20μs	
		V _{BR} (V)	I _T (mA)	V _{WM} (V)	I _R (μA)	I _{PPM} (A)	V _C (V)*
RSP-DC05Q-4	5	7.5	1	6.63	10	1,161	180
RSP-DC12Q-4	12	18.0		14.50		554	110
RSP-DC24Q-4	24	33.0		26.80		305	90
RSP-DC48Q-4	48	68.0		55.10		148	130
RSP-DC60Q-4	60	82.0		66.40		128	150

*V_C of maximum impulse rating includes voltage rise of code impedance.

Please set shortest possible length when connect the cord to prevent voltage rise.

<Term meaning> Breakdown voltage (V_{BR}): Current that starts to flow the avalanche current. Between terminals voltage that flows current (I_T(mA)).

Stand voltage (V_{WM}): Maximum voltage capable to apply continuously between terminals.

Maximum impulse rating : Current value capable to flow the surge current (8/20μsec) between terminals.

Operating Temperature: -40~+85°C

Features

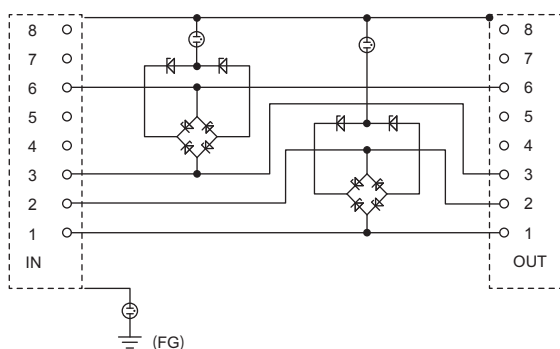
- RSP-LAN-B is a surge protector for Ethernet LAN10/100BASE-T that prevails in LAN network and it protects a network system from lightning surge by attaching this between the application and cables.

Applications

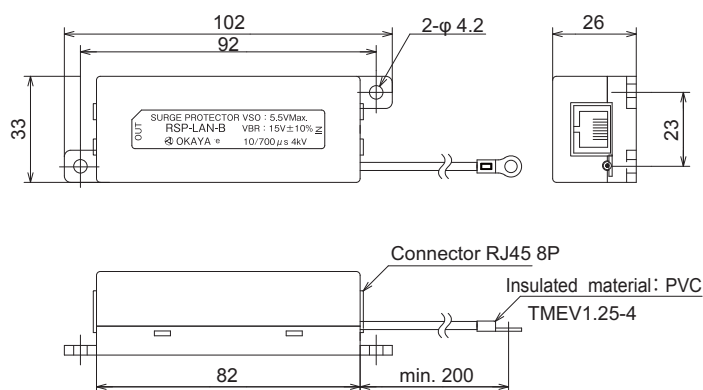
- Counter measure against surge can be taken easily just by attaching this between the application and cables due to hook-up box.
- With a complex circuit, electrostatic capacity got small and usable for high speed communication.



Circuit



Dimensions



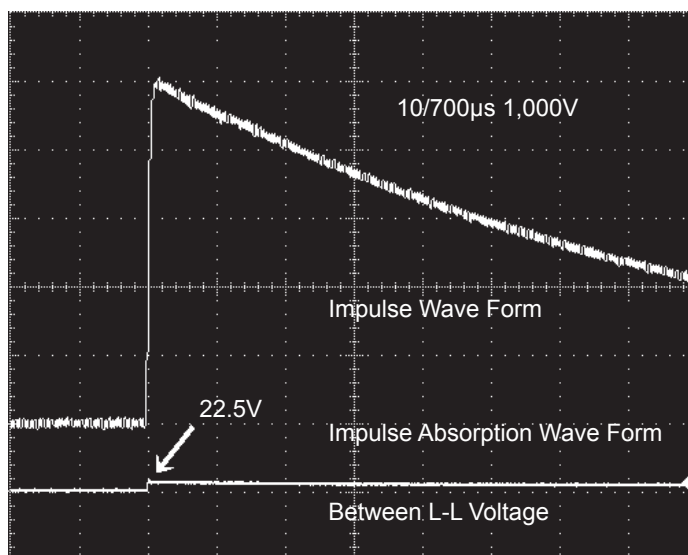
Tolerances: ± 1.0
Unit: mm

Electrical Specifications

Max. Line Voltage	12.1V (L-L)
Impulse Withstand Voltage Capacity	4,000V (10/700 μ s ITU-T K20 R=25)
Breakdown Voltage	15.0V $\pm 10\%$ (L-L) 635V $\pm 15\%$ (L-G)
Capacitance	20pF Max. (L-L) 1pF Max. (L-G)

Operating Temperature: -20~+60°C

Impulse Absorption Characteristics



RSP-232-9 series is designed for RS(EIA)-232 which is widely used as standard specifications for data input-output in serial data terminals. These protectors will be installed between equipment and cable to protect equipment from surge caused by electrostatic discharge and switching surge.

This will be installed in both end of the cable. Also 9 pin type is available for the use in IBM PC.

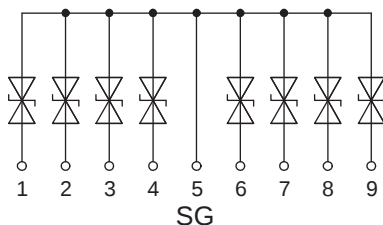
Electrical Specifications

- Breakdown voltage: 22V @1mA (L-SG)
- Impulse life: 25,000V 500pF 0Ω, more than 5,000 times

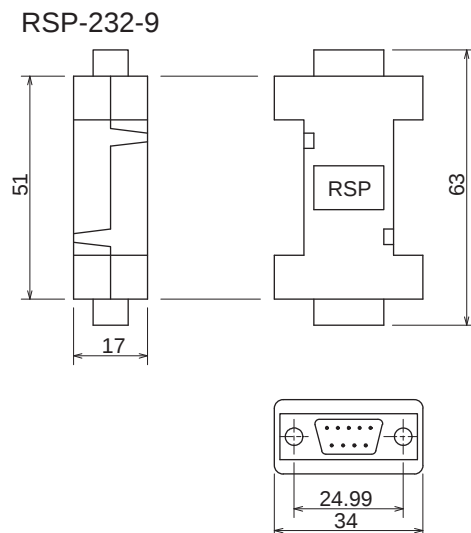


• RSP-232-9

• Circuit



• Dimensions



Unit: mm



Features

- For telephone line use.
- This protector consists of RSSA (silicon surge absorber) and R·A·V.
- Excellent response time and endurance.
- Available in PCB mounting type and box with modular jack type.

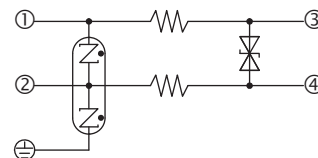


• RSP-TEL

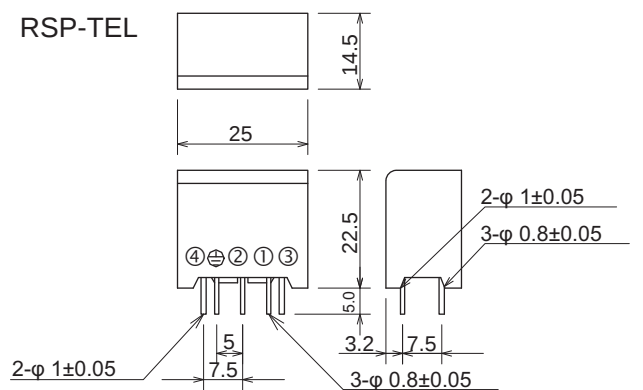


• RSP-TEL-B

• Circuit

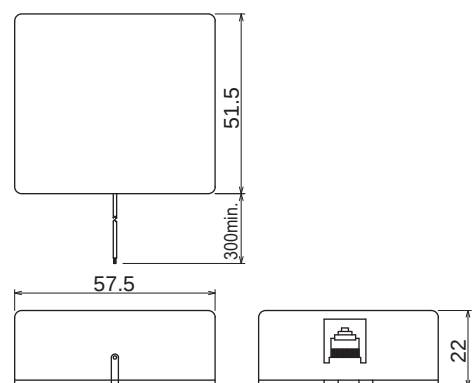


• Dimensions



Unit: mm
Tolerance: ±0.5

RSP-TEL-B



Unit: mm
Tolerance: ±1.0



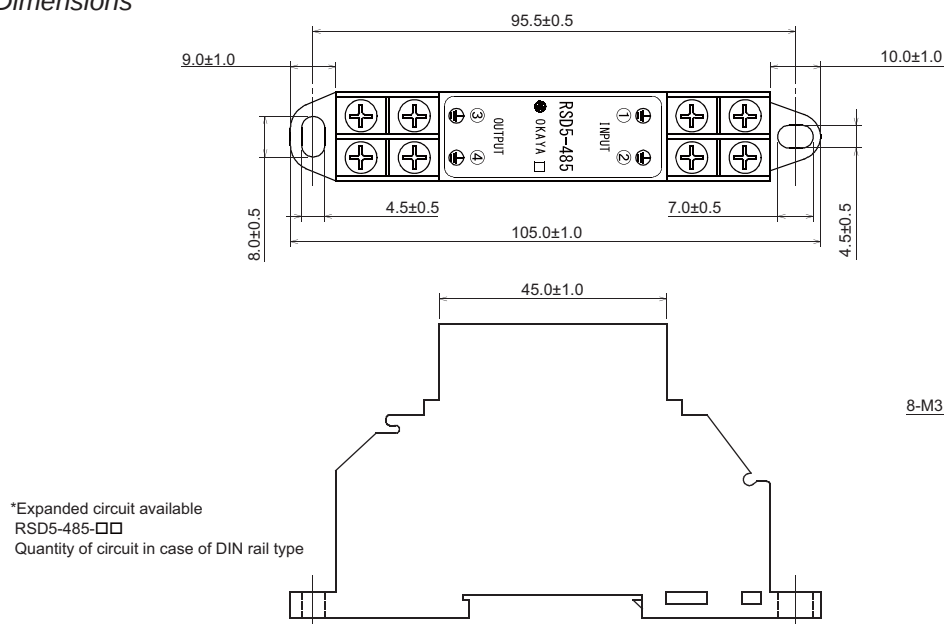
Features

- SPD for RS-485 and RS422 signal circuit
- Compliance to JIS C 5381-2 and category C2/D1
- Impulse withstand current C2: 8/20 μ s-5kA
D1: 10/350 μ s-2.5kA
- Available to DIN rail
- Longer impulse current life and higher impulse withstand current than old RSP-485M.

Applications

- Data processing machine and control machine with RS-485 line or RS-422 line
- Fire alarm apparatus system
- Security camera
- Coin-operated parking
- Outdoor display unit

Dimensions



Unit: mm

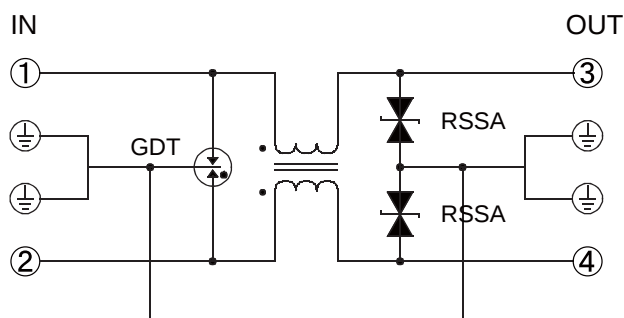
Electrical Specifications

Nominal Breakdown Voltage VBR ① ②- $\frac{+}{-}$, ③ ④- $\frac{+}{-}$	8.2V(at 10mA)
Breakdown Tolerance	$\pm$ 10%
Max. Operating Voltage VWM (①-②,③-④)	DC13.26V
Max. circuit current (①-②,③-④)	3A
Leakage of current I _r ① ②- $\frac{+}{-}$, ③ ④- $\frac{+}{-}$	2mA max.(at 6.63V)
Impulse Discharge Current ① ②- $\frac{+}{-}$, ③ ④- $\frac{+}{-}$	Category C2
	Category D1

8/20 μ s-5kA,
5 times for each positive and negative
10/350 μ s-2.5kA,
1 time for each positive and negative

Operating Temperature: -40~+85°C

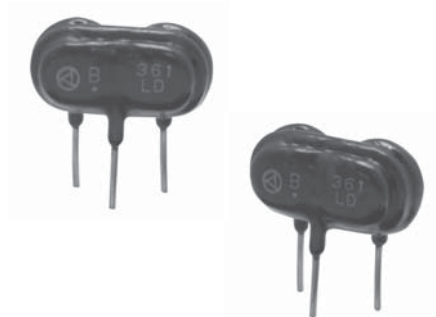
Circuit



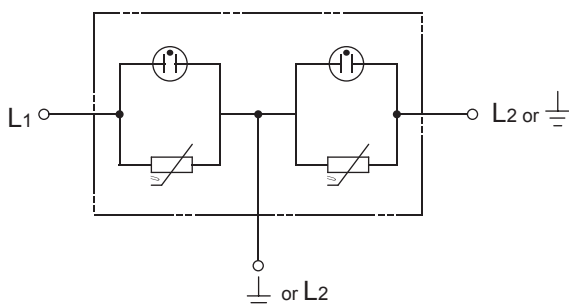
R·A·V-LD (for protecting network line)

RAV-LD series are designed as surge absorbers for protection of telecommunication lines from indirect lightning surges. They demonstrate extremely fast response time and positive surge absorption operation compared to gas arresters.

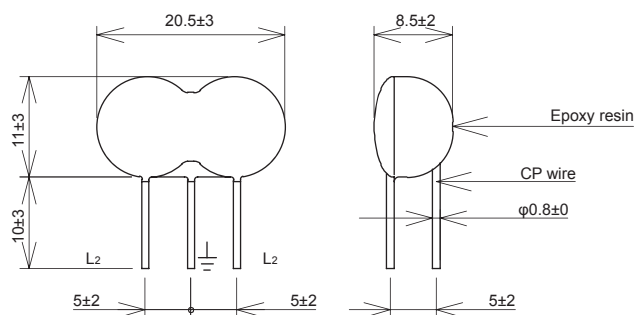
They contain two of RAV in one package with 3 leads.



• Circuit



• Dimensions



Unit: mm

Electrical Specifications

Model Number	Clamping Voltage (V) $\pm 10\%$ ^{*1}	Impulse Discharge Current 8/20 μ s (A)	Withstanding Impulse Voltage 1.2/50 μ s (V)	Response Time (ns)	Capacitance (pF) ^{*2}
R·A·V-221LD	220	2,400	12,000	50	90
R·A·V-361LD	360				50
R·A·V-401LD	400				55
R·A·V-621LD	620				40

^{*1} Equivalent varistor voltage@1mA ^{*2} Reference Value
Operating Temperature: -20~+70°C

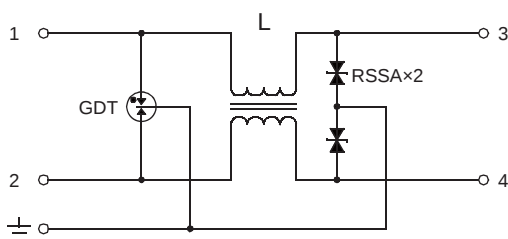
Features

- SPD for data signal line and control line
- Compliance to JIS C 5381-2 and category C2/D1
- Impulse withstand current C2: 8/20 μ s-5kA
D1: 10/350 μ s-2.5kA
- Longer impulse current life and higher impulse withstand current than old R·S·M-RL.

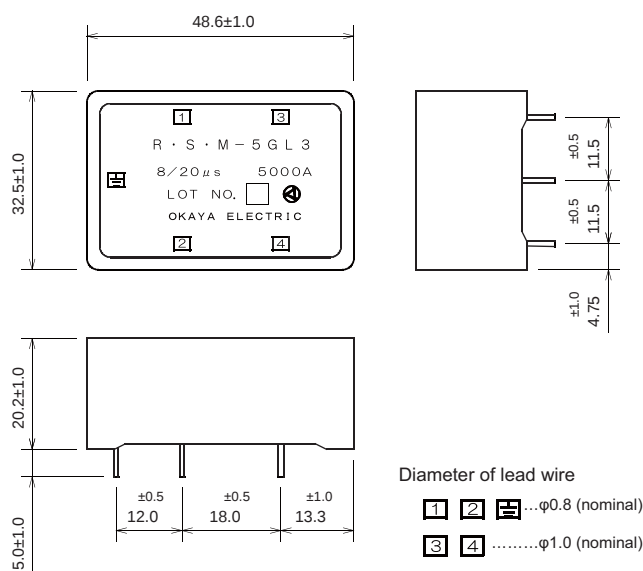
Applications

- Data processing machine and control machine with communication signal line
- LED light dimmer
- Fire alarm apparatus system
- Security camera
- Outdoor display unit

Circuit



Dimensions



Unit: mm

Electrical Specifications

Model Number			R·S·M-5GL3	R·S·M-12GL3	R·S·M-24GL3	R·S·M-48GL3
Rated Voltage	①, ②- $\frac{-}{+}$	-	DC5.0V	DC12.0V	DC24.0V	DC48.0V
Max. Continuous Operating Voltage	①, ②- $\frac{-}{+}$	-	DC6.63V	DC14.5V	DC26.8V	DC55.1V
Rated Current	①-③-④-②	-	3A			
Residual Voltage (Representative Value) 1.2/50 μ s-8/20 μ s, 10kV-5kA	③, ④- $\frac{-}{+}$	-	30V	60V	70V	100V
Impulse Discharge Current	①, ②- $\frac{-}{+}$	Category C2	8/20 μ s-5kA, 5 times for each positive and negative			
		Category D1	10/350 μ s-2.5kA, 1 time for each positive and negative			

Operating Temperature: -20~+60°C



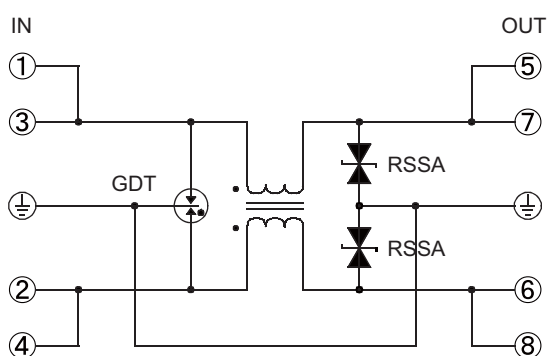
Features

- SPD for data signal line and control line
- Compliance to JIS C 5381-2 and category C2/D1
- Impulse withstand current C2: 8/20 μ s-5kA
D1: 10/350 μ s-2.5kA
- Longer impulse current life and higher impulse withstand current than old R·S·M-RL.

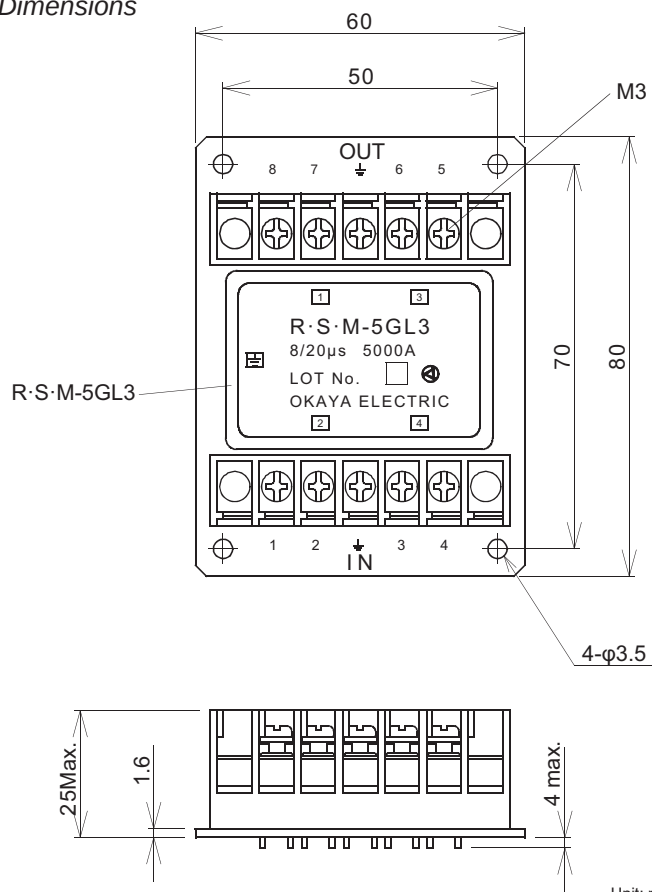
Applications

- Data processing machine and control machine with communication signal line
- LED light dimmer
- Fire alarm apparatus system
- Security camera
- Outdoor display unit

Circuit



Dimensions



Unit: mm

Electrical Specifications

	Model Number			R·S·M-5GL3-PT	R·S·M-12GL3-PT	R·S·M-24GL3-PT	R·S·M-48GL3-PT
	In	Out	Category				
Rated Voltage	①,③/②,④	⑤,⑦/⑥,⑧	-	DC5.0V	DC12.0V	DC24.0V	DC48.0V
Max. Continuous Operating Voltage	①,③/②,④	⑤,⑦/⑥,⑧	-	DC6.63V	DC14.5V	DC26.8V	DC55.1V
Rated Current	①,③/⑤,⑦/②,④/⑥,⑧			3A			
Residual Voltage (representative value) 1.2/50 μ s-8/20 μ s, 10kV-5kA	⑥,⑦- $\perp$	-	-	30V	60V	70V	100V
Impulse Discharge Current	①,②,③,④- $\perp$	-	Category C2	8/20 μ s-5kA, 5 times for each positive and negative			
	①,②,③,④- $\perp$	-	Category D1	10/350 μ s-2.5kA, 1 time for each positive and negative			

Operating Temperature: -20~+60°C

Features

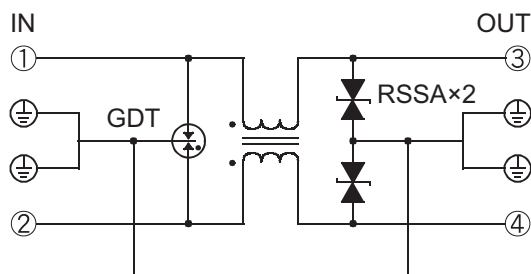
- SPD for data signal line and control line
- Compliance to JIS C 5381-2 and category C2/D1
- Impulse withstand current C2: 8/20 μ s-5kA
D1: 10/350 μ s-2.5kA
- Longer impulse current life and higher impulse withstand current than old R·S·M-RL
- Thin model for DIN rail type

Applications

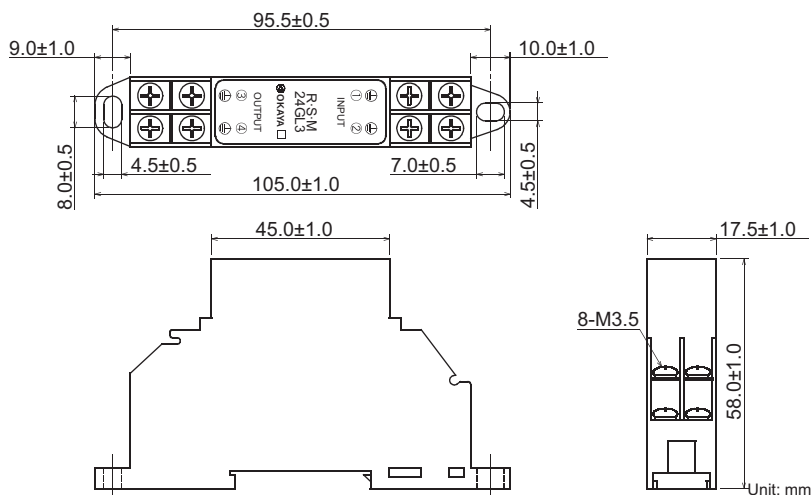
- Data processing machine and control machine with communication signal line
- LED light dimmer
- Fire alarm apparatus system
- Security camera
- Outdoor display unit



Circuit



Dimensions



Electrical Specifications

	Model Number			R·S·M-5GL3-DIN	R·S·M-12GL3-DIN	R·S·M-24GL3-DIN	R·S·M-48GL3-DIN
	In	Out	Class				
Rated Voltage	①,②	③,④		DC5.0V	DC12.0V	DC24.0V	DC48.0V
Max. Continuous Operating Voltage	①,②	③,④		DC6.63V	DC14.5V	DC26.8V	DC55.1V
Rated Current	①,②/③,④			3A			
	③,④- $\frac{1}{2}$	-	-	30V	60V	70V	100V
Impulse Discharge Current	①,②- $\frac{1}{2}$	-	Category C2	8/20 μ s-5kA, 5 times for each positive and negative			
			Category D1	10/350 μ s-2.5kA, 1 time for each positive and negative			
Impulse Life Test	①,②- $\frac{1}{2}$	-	Category C3(B1/B3)	10/1,000 μ s-100A, 300 times			
			Category B2	5/300 μ s(10/700 μ s)-100A, 300 times			
			Category C1	8/20 μ s-500A, 300 times			

Operating Temperature: -40~+85°C

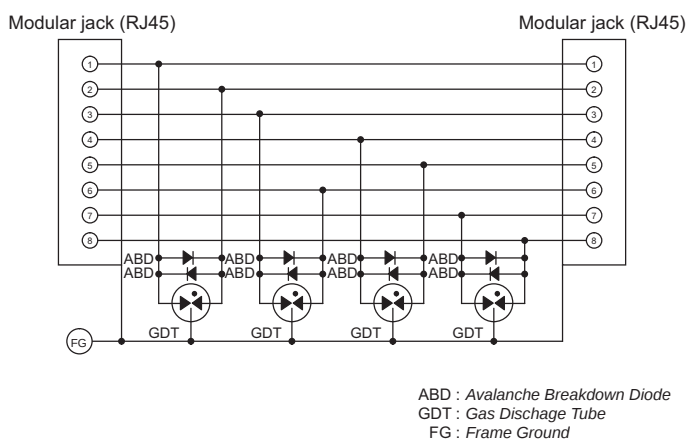
Features

- Recommendation of JISC5381-21
- Max. discharge current: 8/20 μ s-5,000A (Category C2)
10/350 μ s-1,000A (Category D1)
- Available for Hi-speed Lan (1000BASE-T) of Cat 5e
- Available for DIN rail installation
- Easy to connect to the earth with DIN rail

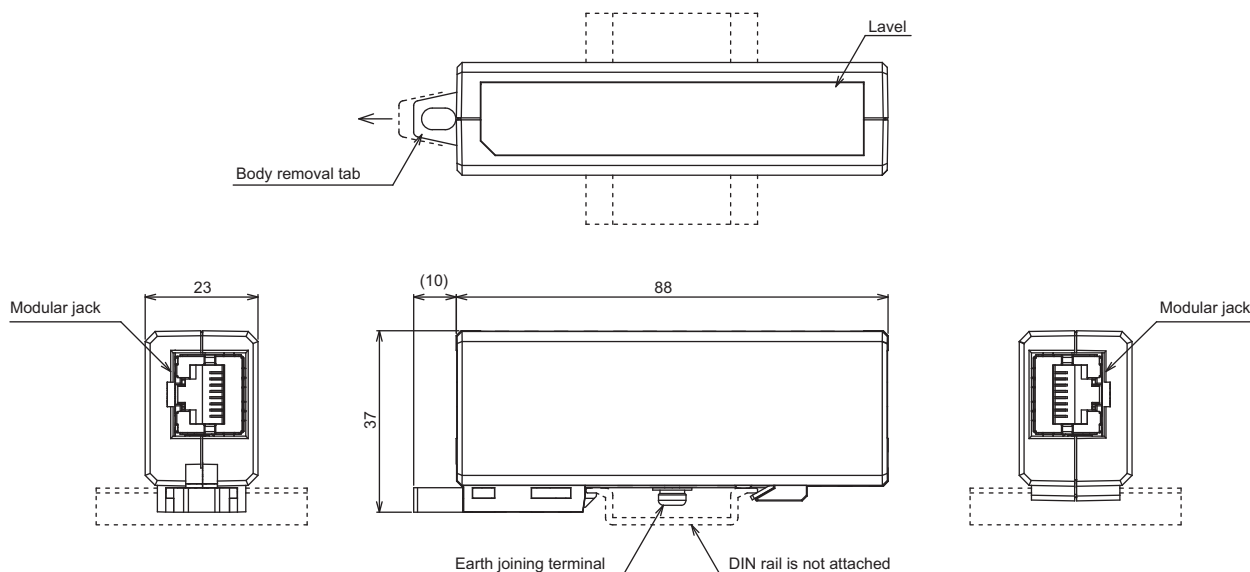
Applications

- Road traffic and related equipment
- Outdoor display
- Surveillance camera
- Office building etc. Protection of each LAN line

Circuit



Dimensions



Unit: mm



Electrical Specifications

Model Name	RLAN-1000POE5K-D
Application	10BASE-T/100BASE-Tx 1000BASE-T PoE (Power over Ethernet)
Max. Continuous Operating Voltage	DC60V
Rated Voltage	500mA
Impulse Durability	8/20 μ s-5,000A 10 times (category C2) 10/350 μ s-1,000A 2 times (category D1)
Voltage Protection Level	$\leq 500V$ (Line - Ground)
Insertion Loss	DC~100MHz $\geq 1.0dB$
Near-end Crosstalk	DC~100MHz $\leq 32.3dB$
Return Loss	DC~100MHz $\geq 12.1dB$



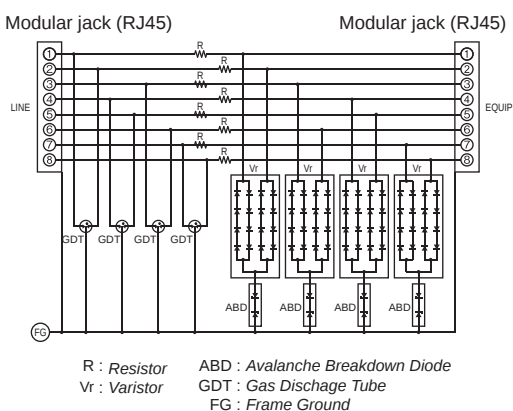
Features

- Recommendation of JISC5381-21
- Complying with land, Infrastructure and Transportation Ministry
- Max. discharge current:
8/20 μ s-5,000A (Category C2)
10/350 μ s-2,500A (Category D1)
- Available for Hi-speed Lan (1000BASE-T) of Cat 5e
- Available for DIN rail installation
- Easy to connect to the earth with DIN rail
- RLAN3 Available for DC60V(LINE-FG)
- Available for IEEE 802.3 at (POE) and IEEE 802.3 at (POE PLUS)

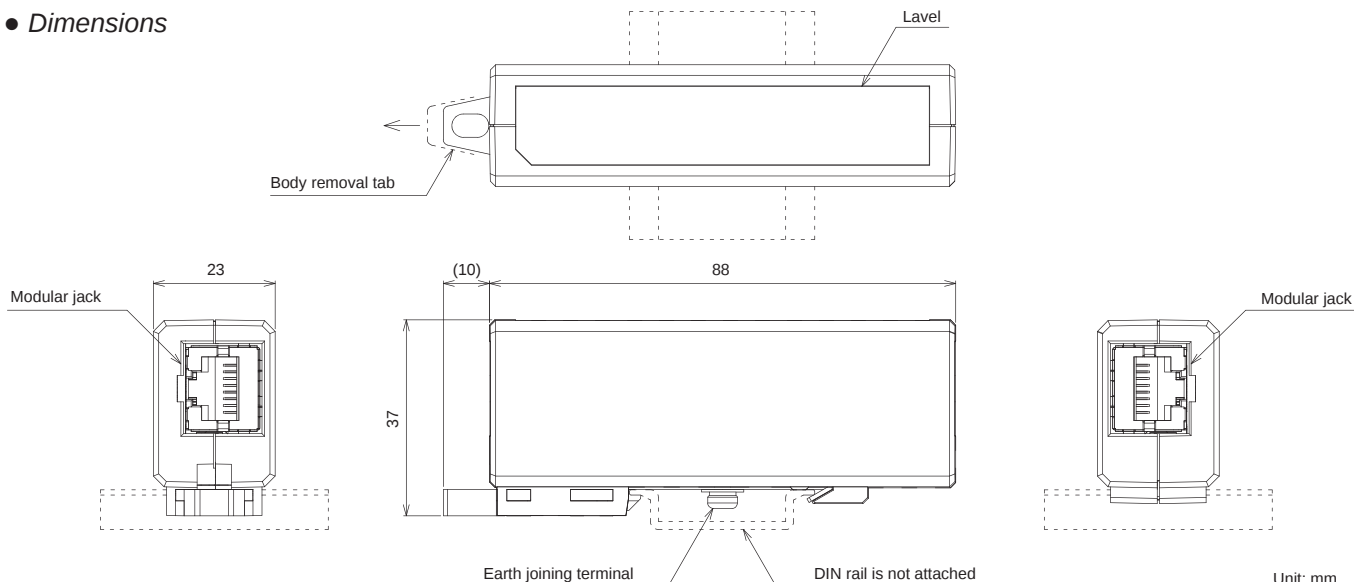
Applications

- Road traffic and related equipment
- Outdoor display
- Surveillance camera
- Office building etc. Protection of each LAN line

● Circuit



● Dimensions



Electrical Specifications

Model Name		RLAN2-1000POE5K-D RLAN3-1000POE5K-D
Application		10BASE-T 100BASE-Tx 1000BASE-T PoE (Power over Ethernet) / PoE Plus
Max. Continuous Operating Voltage	RLAN2	LINE-EQUIP: DC60V LINE-FG: DC30V
	RLAN3	LINE-EQUIP: DC60V LINE-FG: DC60V
Rated Current		600mA
Impulse Durability	Category C2	8/20 μ s-5,000A 10 times (category C2)
	Category D1	10/350 μ s-2,500A 2 times (category D1)
Voltage Protection Level		≥ 250 V (Line - Ground)
Insertion Loss		DC~100MHz ≥ 1.0 dB
Near-end Crosstalk		DC~100MHz ≤ 32.3 dB
Return Loss		DC~100MHz ≤ 12.1 dB

Operating Temperature: -25~+75°C



MAIN PRODUCTS



NOISE SUPPRESSION PRODUCTS



SURGE PROTECTIVE DEVICES



DISPLAY PRODUCTS



SENSOR PRODUCTS

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For improvement, specifications are subject to change without prior notice.



CAUTION FOR SAFETY

Please review individual technical data, specification, and manual before use.

- Please make inquiries for application of these products in final products such as aerospace equipment, undersea cable, nuclear reaction control system, life maintenance device, automobile, transportation equipment, and traffic control system.