

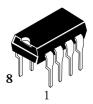
Low Power Dual Operational Amplifier

The LM358 contains two independent high gain operational amplifiers with internal frequency compensation. The two op-amps operate over a wide voltage range from a single power supply. Also use a split power supply. The device has low power supply current drain, regardless of the power supply voltage. The low power drain also makes the LM358 a good choice for battery operation.

When your project calls for a traditional op-amp function, now you can streamline your design with a simple single power supply. Use ordinary + 5VDC common to practically any digital system or personal computer application, without requiring an extra 15V power supply just to have the interface electronics you need.

The LM358 is a versatile, rugged workhorse with thousand-andone uses, from amplifying signals from a variety of transducers to dc gain blocks, or any op-amp function. The attached pages offer some recipes that will have your project cooking in no time.

- Internally frequency compensated for unity gain
- Large DC voltage gain: 100dB
- Wide power supply range:
- $3V \sim 32V$ (or $\pm 1.5V \sim \pm 16V$)
- Input common-mode voltage range includes ground
- Large output voltage swing: 0V DC to Vcc-1.5V DC
- Power drain suitable for battery operation
- Low input offset voltage and offset current
- Differential input voltage range equal to the power supply voltage



LM358D DIP-8

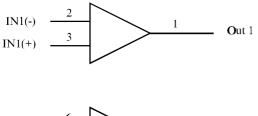


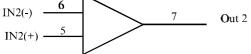
LM358S SOP-8

PIN ASSIGNMENT

OUT 1	1 •	8	v _{cc}
IN1(-)	2	7	OUT 2
IN1(+)	3	6	IN2(-)
GND	4	5	IN2(+)

LOGIC DIAGRAM





 $PIN \ 4 = \ GND$ $PIN \ 8 = Vcc$



MAXIMUM RATINGS*

Symbol	Parameter	Value	Unit
Vcc	Power Supply Voltages		
	Single Supply32Split Supplies±16		V
Vidr	Input Differential Voltage Range (1)	± 32	V
Vicr	Input Common Mode Voltage Range	ode Voltage Range -0.3 to 32	
Isc	Output Short Circuit Duration Continuo		
TJ	Junction Temperature		
	Plastic Packages	150	°C
Tstg	Storage Temperature		°C
	Plastic Packages	-55 to +125	
Iin	Input Current, per pin (2)	50	mA
TL	Lead Temperature, 1mm from Case for 10 Seconds	260	°C

*Maximum Ratings are those values beyond which damage to the device may occur.

Functional operation should be restricted to the Recommended Operating Conditions.

- + Derating Plastic DIP: 10 mW/°C from 65° to 125°C
 - SOP Package : : 7 mW/°C from 65° to 125°C

Notes:

1. Split Power Supplies.

2. $V_{\mathbb{N}}$ -0.3V. This input current will only exist when voltage at any of the input leads is driven negative.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
Vcc	DC Supply Voltage	±2.5 or 5.0	±15 or 30	V
TA	Operating Temperature, All Package Types	0	+ 70	°C

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation, V_{IN} and V_{OUT} should be constrained to the range $GND \leq (V_{IN} \text{ or } V_{OUT}) \leq V_{CC}$.

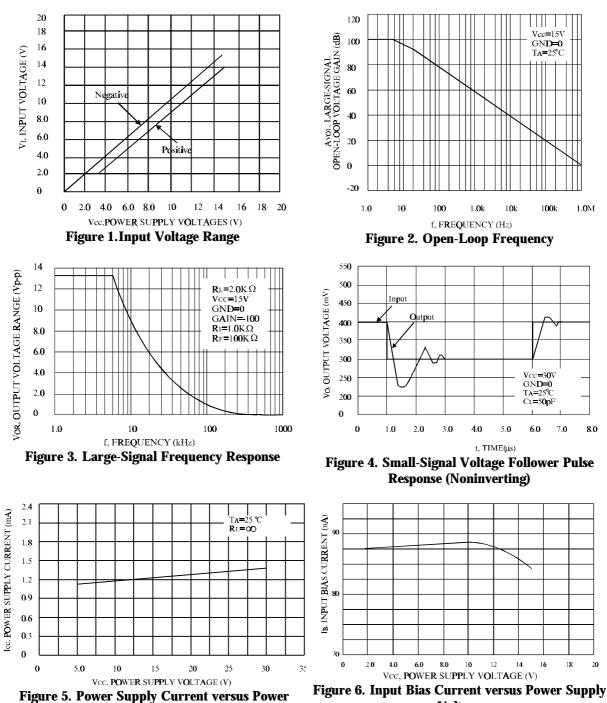
Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or $V_{\rm CC}$). Unused outputs must be left open.

			Gua			
Symbol	Parameter	Test Conditions	Min	Тур	Max	Unit
Vio	Maximum Input Offset Voltage	$V_{0}=1.4V V_{CC}=5.0-$ 30V;Rs= 0 Ω VICM= 0V to VCC-1.7V			9.0	mV
$\Delta V_{IO}/\Delta T$	Input Offset Voltage Drift	$R_s = 0\Omega$, $V_{cc} = 30V$		7.0		μV/°C
Ιю	Maximum Input Offset Current	Vcc=5.0V			150	nA
$\Delta I_{10}/\Delta T$	Input Offset Current Drift	$R_s = 0\Omega$, $V_{cc} = 30V$		10		pA/°C
Ів	Maximum Input Bias Current	$V_{cc} = 5.0 V$			-500	nA
Vicr	Input Common Mode Voltage Range	$V_{cc}=30V$	0		28	V
Icc	Maximum Power Supply Current	$R_{\text{L}} = \infty, V_{\text{CC}} = 30V, V_0 = 0V$			3	mA
		$R_{\rm L}{=}\infty, V{\rm cc}{=}~5V, V{\rm o}{=}~0V$			1.2	
Avol	Minimum Large Signal Open-Loop Voltage Gain	$V_{CC}=15V, R_L \ge 2K\Omega$	15			V/mV
Vон	Minimum Output High- Level Voltage Swing	$\label{eq:Vcc} \begin{split} V_{\text{CC}} &= 30 V, R_{\text{L}} = 2 K \Omega \\ V_{\text{CC}} &= 30 V, R_{\text{L}} = 10 K \Omega \end{split}$	26 27			V
Vol	Maximum Output Low- Level Voltage Swing	$V_{\rm CC}{=}~5V, R_{\rm L}{=}~10K\Omega$			20	mV
CMR	Common Mode Rejection	$V_{cc}=30V, R_{s}=10K\Omega$	65*			dB
PSR	Power Supply Rejection	Vcc= 30V	65			dB
CS	Channel Separation	f= 1KHz to 20KHz, Vcc= 30V	-120*			dB
Isc	Maximum Output Short Circuit to GND	$V_{CC} = 5.0 V$			60*	mA
Isource	Minimum Source Output Current		10			mA
Isink	Minimum Output Sink Current	$\label{eq:VIN+} \begin{split} V_{\rm IN+} &= 0V, \ V_{\rm IN-} = 1V, \\ V_{\rm CC} &= 15V, \ V_0 &= 15V \end{split}$	5			mA
			12*			μΑ
Vidr	Differential Input Voltage Range	All V _{IN} ≥GND or V-Supply (if used)			Vcc*	V

DC ELECTRICAL CHARACTERISTICS(T_A= 0 to + 70°C)

*=@25°C





TYPICAL PERFORMANCE CHARACTERISTICS

Voltage

Supply Voltage