

Description

The LM358 contains two independent high gain operational amplifiers with internal compensation.

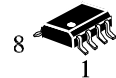
The two op-amps operate over a wide voltage range from a single power supply. Also use a split power supply. The device has low power supply voltage. The low power drain also makes the LM358 a good choice for battery operation.

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

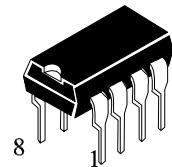
The LM358 is a versatile, rugged workhorse with a thousand-and-one use, from amplifying signals from a variety of transducers to dc gain blocks, or any op-amp function. The attached pages offer some recipes that will have your project cooking in no time.

Features

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



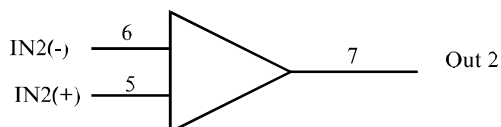
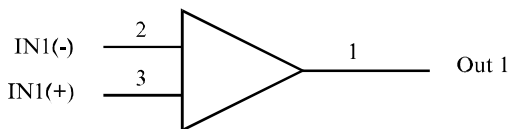
SOP - 8



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Package

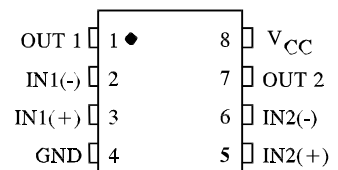
Internal Block Diagram

Logic Diagram



PIN 4 = GND
PIN 8 = V_{CC}

Pin Assignment



Electrical Characteristics

at specified free-air temperature, $V_{CC} = 5\text{ V}$ (unless otherwise noted)

Symbol	Parameter	Test conditions*		LM358			Units
				Min	Typ	Max	
V_{IO}	Input offset voltage	$V_{CC} = 5\text{ V to MAX,}$ $V_{IC} = V_{ICR\text{ min,}}$ $V_O = 1.4\text{ V}$	25 °C		3	7	mV
			Full range			9	
αV_{IO}	Average temperature coefficient of input offset voltage		Full range		7		$\mu\text{V}/^\circ\text{C}$
I_{IO}	Input offset current	$V_O = 1.4\text{ V}$	25 °C		2	50	nA
			Full range			150	
αI_{IO}	Average temperature coefficient of input offset current		Full range		10		$\text{pA}/^\circ\text{C}$
I_{IB}	Input bias current	$V_O = 1.4\text{ V}$	25 °C		-20	-250	nA
			Full range			-500	
V_{ICR}	Common-mode input voltage range	$V_{CC} = 5\text{ V to MAX}$	25 °C	0 to $V_{CC} - 1.5$			V
			Full range	0 to $V_{CC} - 2$			
V_{OH}	High-level output voltage	$R_L \geq 2\text{ k}\Omega$	25 °C	$V_{CC} - 1.5$			V
		$V_{CC} = \text{MAX, } R_L = 2\text{ k}\Omega$	Full range	26			
		$V_{CC} = \text{MAX, } R_L \geq 10\text{ k}\Omega$	Full range	27	28		
	V_{OL} Low-level output voltage	$R_L \geq 10\text{ k}\Omega$	Full range		5	20	mV
A_{VD}	Large-signal differential voltage amplification	$V_{CC} = 15\text{ V,}$ $V_O = 1\text{ V to } 11\text{ V,}$ $R_L \geq 2\text{ k}\Omega$	25 °C	25	100		V/mV
			Full range	15			
CMRR	Common-mode rejection ratio	$V_{CC} = 5\text{ V to MAX,}$ $V_{IC} = V_{ICR\text{ min}}$	25 °C	65	80		dB
k_{SVR}	Supply voltage rejection ratio ($\Delta V_{CC}/\Delta V_{IO}$)	$V_{CC} = 5\text{ V to MAX}$	25 °C	65	100		dB
V_{O1}/V_{O2}	Crosstalk attenuation	$f = 1\text{ kHz to } 20\text{ kHz}$	25 °C		120		dB
I_O	Output current	$V_{CC} = 15\text{ V,}$ $V_{ID} = 1\text{ V, } V_O = 0$	25 °C	-20	-30		mA
			Full range	-10			
		$V_{CC} = 15\text{ V,}$ $V_{ID} = -1\text{ V, } V_O = 15\text{ V}$	25 °C	10	20		μA
			Full range	5			
		$V_{ID} = -1\text{ V,}$ $V_O = 200\text{ mV}$	25 °C	12	30		
I_{OS}	Short-circuit output current	V_{CC} at 5 V, GND at -5 V, $V_O = 0$	25 °C		± 40	± 60	mA
I_{CC}	Supply current (two amplifiers)	$V_O = 2.5\text{ V, No load}$	Full range		0.7	1.2	mA
		$V_{CC} = \text{MAX,}$ $V_O = 0.5V_{CC}, \text{ No load}$	Full range		1	2	

- All characteristics are measured under open-loop conditions with zero common-mode input voltage unless otherwise specified. "MAX" V_{CC} for testing purposes is 30 V. Full range is 0 °C to 70 °C.

Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V_{CC}	Power Supply Voltages Single Supply Split Supplies	32 ± 16	V
V_{IDR}	Input Differential Voltage Range (1)	± 32	V
V_{ICR}	Input Common Mode Voltage Range	-0.3 to 32	V
t_s	Short-Circuit duration of Output	100	ms
I_{IN}	Input Current, per pin (2)	50	mA
T_J	Junction Temperature Plastic Packages	150	$^{\circ}\text{C}$
T_{stg}	Storage Temperature ($T_A = +25^{\circ}\text{C}$) Plastic Packages	-55 to +125	$^{\circ}\text{C}$
T_L	Lead Temperature, 1mm from Case for 10 Seconds	260	$^{\circ}\text{C}$

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

Functional operation should be restricted to the Recommended Operating Conditions.

Notes:

1. Split Power Supplies.
2. $V_{IN} < -0.3\text{V}$. This input current will only exist when voltage at any of the input leads is driven negative.

Typical Performance Characteristics

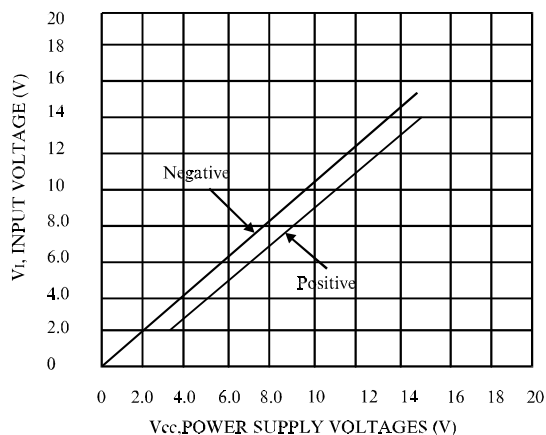


Figure 1. Input Voltage Range

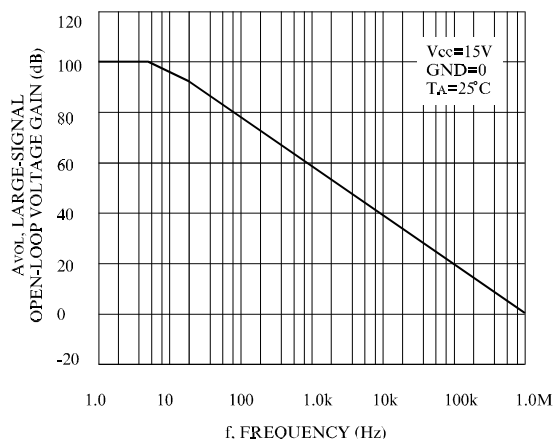
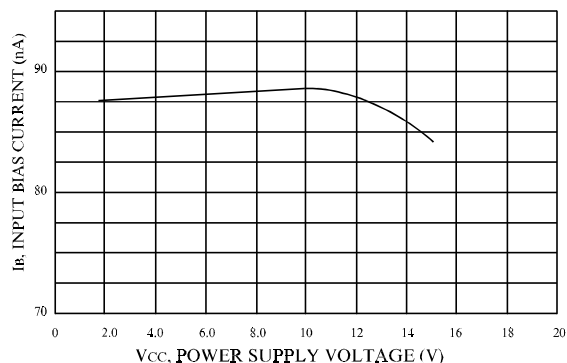
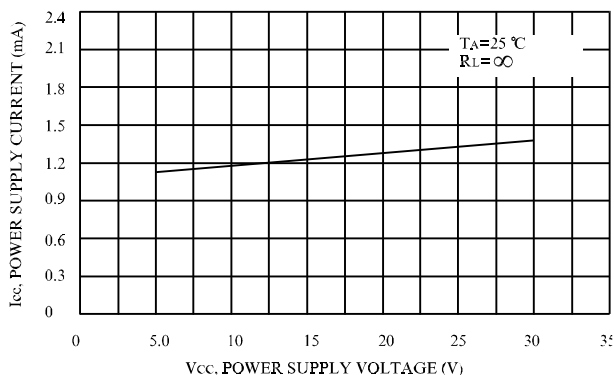
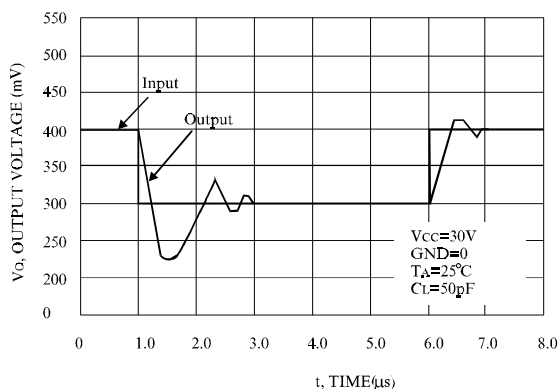
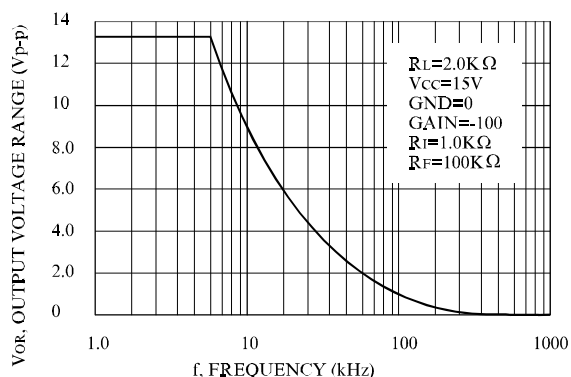


Figure 2. Open-Loop Frequency



Ordering Information

ORDERING NUMB	PACKAGE	MARKING
LM358	DIP - 8 / SOP - 8	LM358

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