Low Power Dual Operational Amplifier

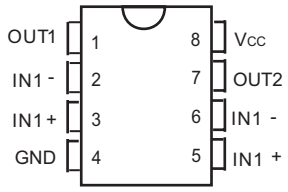
DESCRIPTION

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 practice any digital system or personal computer application, without requiring an extra 15V power supply just to have the interface electronics you need.

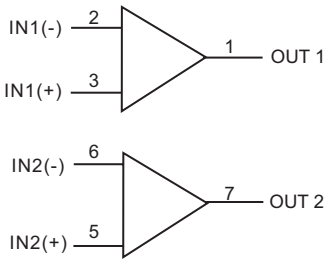
The LM358 is a versatile, rugged workhorse with a thousand-and-one uses, from amplifying signals from a variety of transducers to DC gain blocks, or any op-amp function. The attached pages offer some recipes that will have your project cooking in no time.

PIN CONFIGURATION



(Top View)

LOGIC SYMBOL



FEATURES

- Internally frequency compensated for unity gain
- Large DC voltage gain: 100dB
- Wide bandwidth (unity gain): 1 MHz (temperature-compensated)
- Wide power supply range:
  Single supply:3VDC to 32 VDC
  Dual supplies:+1.5VDC to +16VDC
- 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

APPLICATION

- Transducer Amplifiers
- DC Gain-blocks
- All The Conventional Op Amp Circuits

ORDERING INFORMATION

Temperature Range	Package		Orderable Device	Package Qty
-40°C to +85°C	SOP-8L	Pb-Free	LM358D	100Units/Tube
			LM358DR	3000Units/R&T
	DIP-8L		LM358P	50Units/Tube

SCHEMATIC DIAGRAM

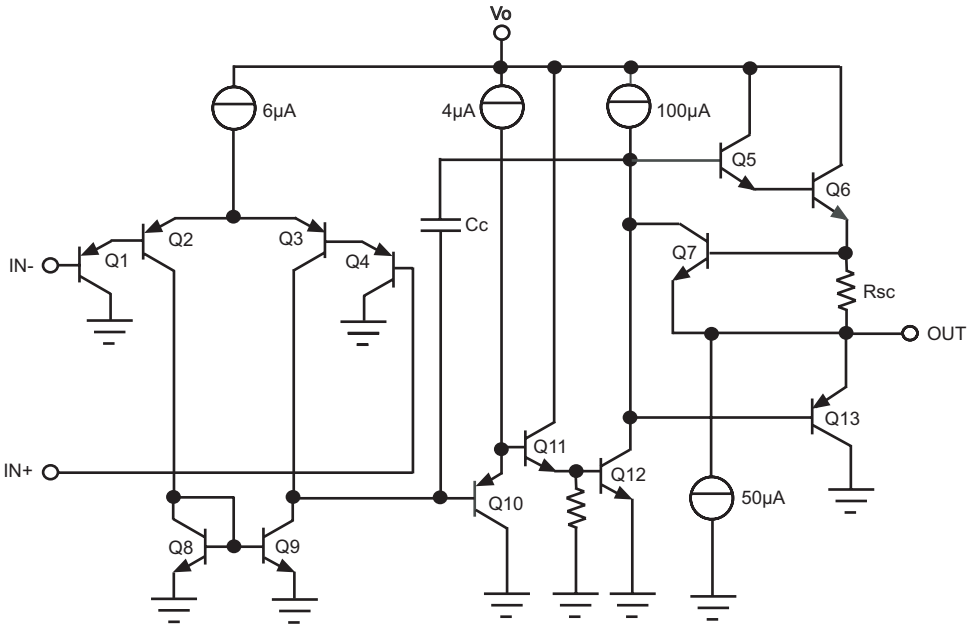


Figure 1. Schematic

ABSOLUTE MAXIMUM RATINGS(NOTE1)

Parameter		Symbol	Value	Unit
Power Supply Voltages	Single Supply	V_{CC}	32	V
	Split Supplies		± 16	
Input Differential Voltage Range(Note 2)		V_{IDR}	±32	V
Input Common Mode Voltage Range		V_{ICR}	-0.3 to 32	V
Output Short Circuit Duration		I_{SC}	Continuous	
Junction Temperature		T_J	150	°C
Storage Temperature		T_{Stg}	-55 to +125	°C
Input Current,per pin(Note 3)		I_{IN}	50	mA
Lead Temperature,1mm from Case for 10 Seconds		T_L	260	°C

Note 1:Maximum Ratings are those values beyond which damage to the device may occur. Functional operation should be restricted to the Recommended Operating Conditons.
Power Derating:
DIP Package:-10mW/°C from 65 to 125°C
SOP Package:-7mW/°C from 65 to 125°C

Note 2:Split Power Supplies.

Note 3:V_{IN}<-0.3V.This input current will only exist when voltage at any of the input leads is driven negative.

RECOMMENDED OPERATING CONDITIONS

Parameter		Symbol	Min	Max	Unit
DC Supply Voltage	Single Supply	V_{CC}	5.0	30	V
	Split Supplies		±2.5	±15	
Operating Temperature, All Package Types		T_A	-40	+85	°C

Note: 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≤(V_{IN} or V_{OUT})≤V_{CC}.

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

Unused outputs must be left open.

ELECTRICAL CHARACTERISTICS(T_A=-40 to +85°C)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Maximum Input Offset Voltage	V_{IO}	V_O=1.4V,V_{CC}=5.0-30V R_S=0,V_{ICM}=0V to V_{CC}-1.7V			9.0 5.0 *	mV
Input Offset Voltage Drift	$\Delta V_{IO}/\Delta T$	R_S=0Ω,V_{CC}=30V		7.0		μV/°C
Maximum Input Offset Current	I_{IO}	V_{CC}=5.0V			150 50*	nA
Input Offset Current Drift	$\Delta I_{IO}/\Delta T$	R_S=0Ω,V_{CC}=30V		10		pA/°C
Maximum Input Bias Current	I_{IB}	V_{CC}=5.0V			500 250*	nA
Input Common Mode Voltage Range	V_{ICR}	V_{CC}=30V	0		28	V
Maximum Power Supply Current	I_{CC}	R_L= ∞,V_{CC}=30V,V_O=0V			3	mA
		R_L= ∞,V_{CC}=5V,V_O=0V			1.2	
Minimum Large Signal Open-Loop Voltage Gain	A_{VOL}	V_{CC}=15V R_L≥2kΩ	15 25*			V/mV
Minimum Output Low-Level Voltage Swing	V_{OH}	V_{CC}=30V,R_L=2kΩ	26			V
		V_{CC}=30V,R_L=10kΩ	27			
Maximum Output Low-Level Voltage Swing	V_{OL}	V_{CC}=5V,R_L=10kΩ			20	mV
Common Mode Rejection	CMR	V_{CC}=30V,R_L=10kΩ	65*			dB

ELECTRICAL CHARACTERISTICS(CONTINUED)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Power Supply Rejection	PSR	V_{CC}=30V	65*			dB
Channel Separation	CS	f=1kHz to 20kHz, V_{CC}=30V	-120*			dB
Maximum Output Short Circuit to GND	I_{SC}	V_{CC}=5.0V			60*	mA
Minimun Output Source Current	I_{SOURCE}	V_{IN+}=1V,V_{IN-}=0V, V_{CC}=15V,V_O=0V	-10			mA
Minimum Output Sink Current	I_{SINK}	V_{IN+}=0V,V_{IN-}=1V, V_{CC}=15V,V_O=15V	5 10*			mA
		V_{IN+}=0V,V_{IN-}=1, V_{CC}=15V,V_O=0.2V	12*			μA
Differential Input Voltage Range	V_{IOR}	ALL V_{IN}>GND or V-Supply(ifused)			V_{CC}*	V

*at T_A=25°C

TYPICAL PERFORMANCE CHARACTERISTICS

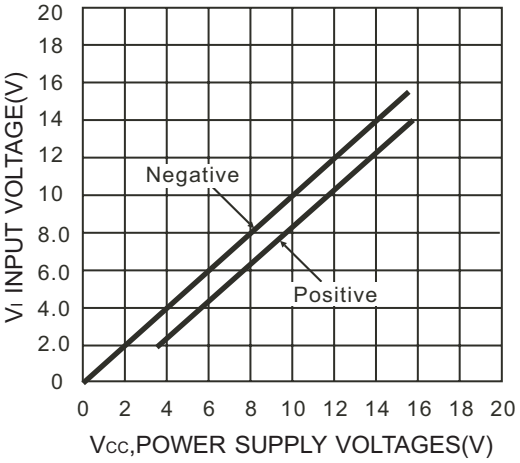


Figure 2. Input Voltage Range

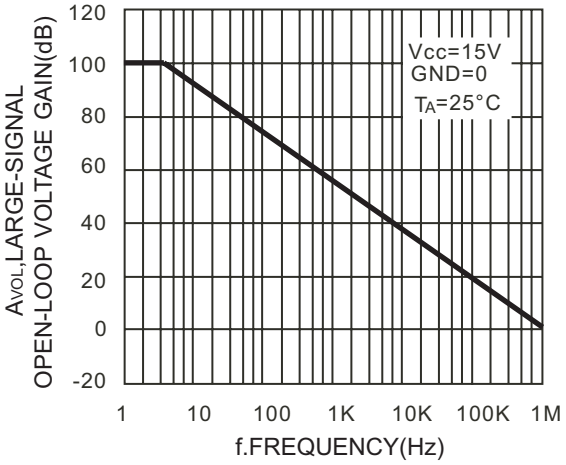


Figure 3. Open-Loop Frequency

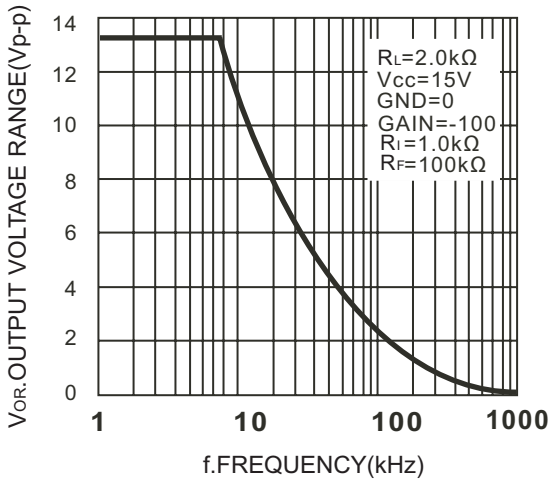


Figure 4. Large-signal Frequency Response

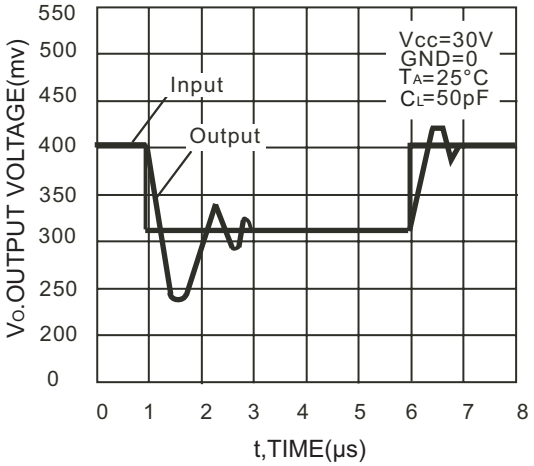


Figure 5. Small-Signsl Voltage Follower Pulse Response(Non-inverting)

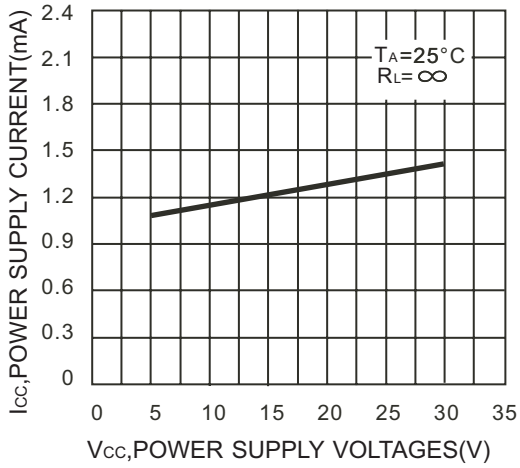


Figure 6. Power Supply Current VS. Power Supply Voltage

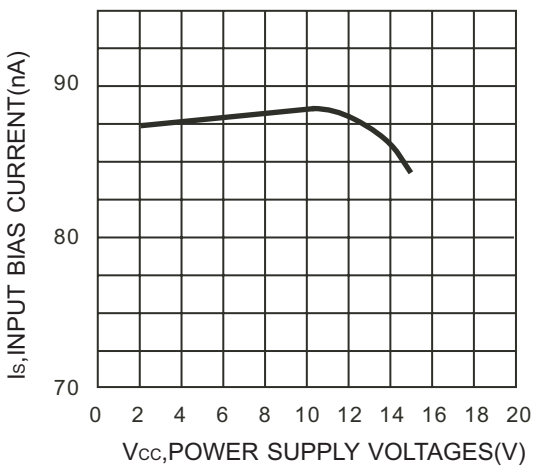


Figure 7. Input Bias Current VS. Power Supply Voltage

TYPICAL APPLICATION

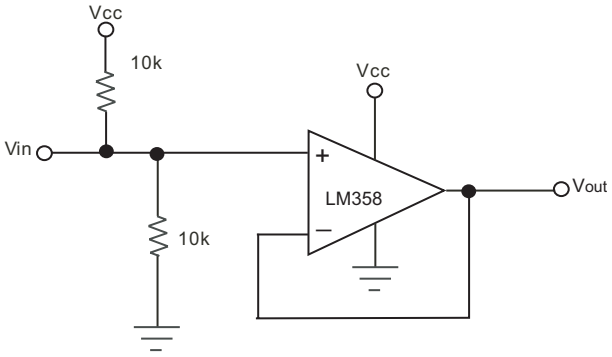


Figure 8. Input Biasing Voltage-Follower

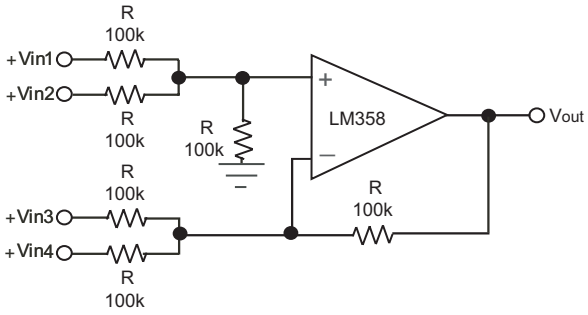


Figure 9. DC Summing Amplifier

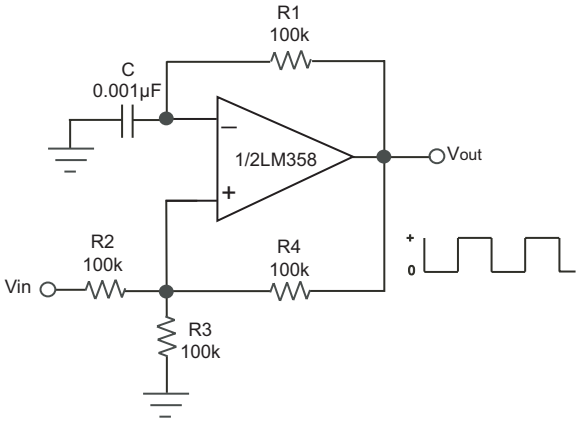


Figure 10. Square wave Oscillator

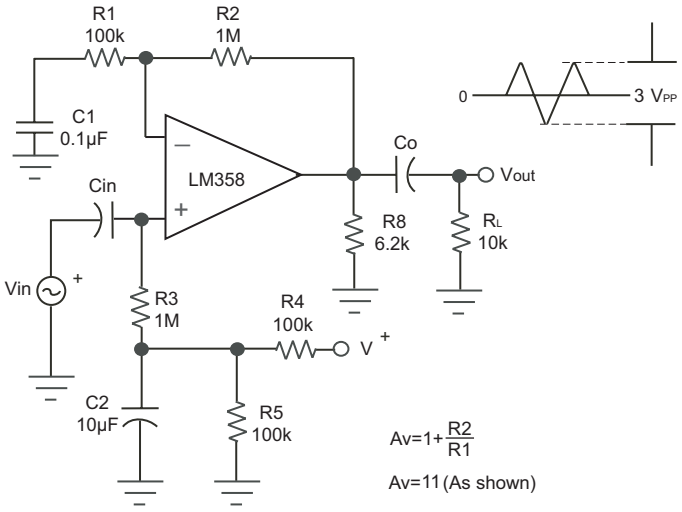
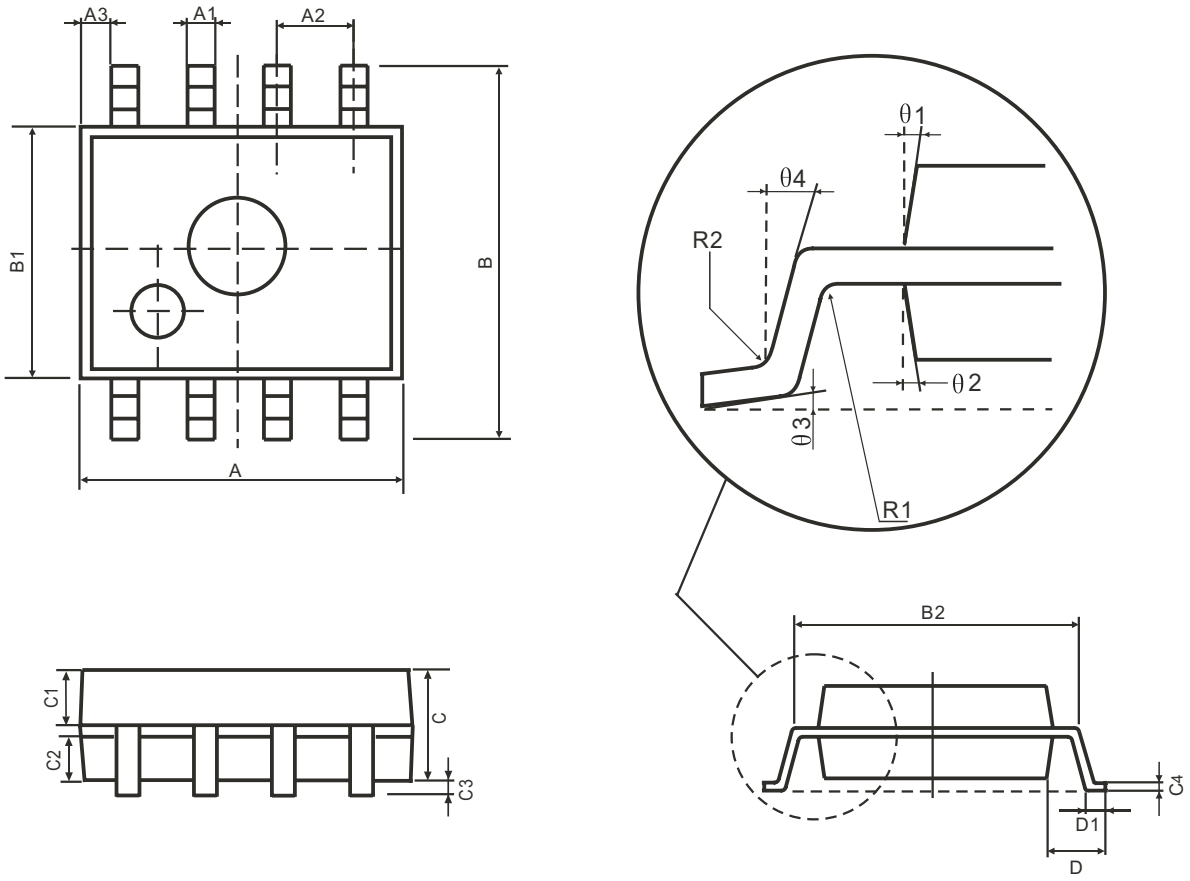


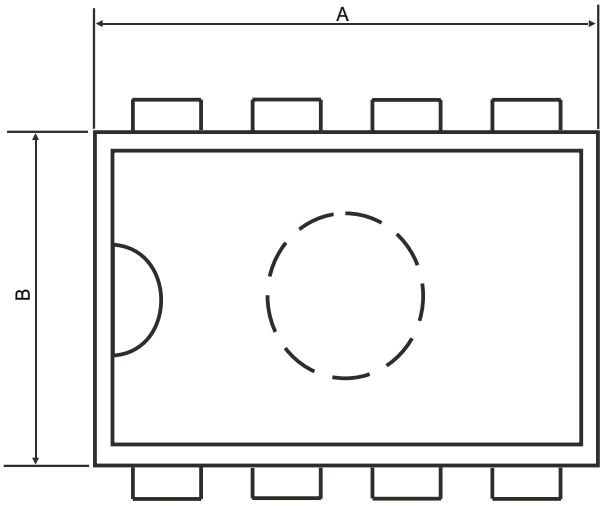
Figure 11. AC Coupled Non-Inverting Amplifier

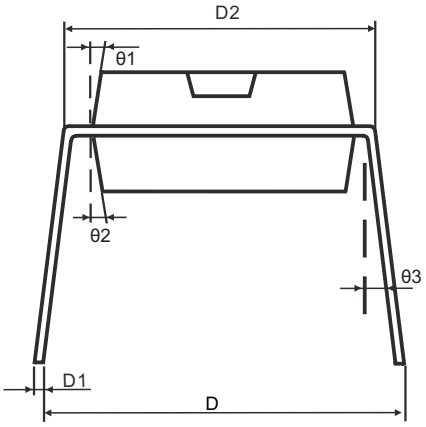
PHYSICAL DIMENSIONS
SOP8L

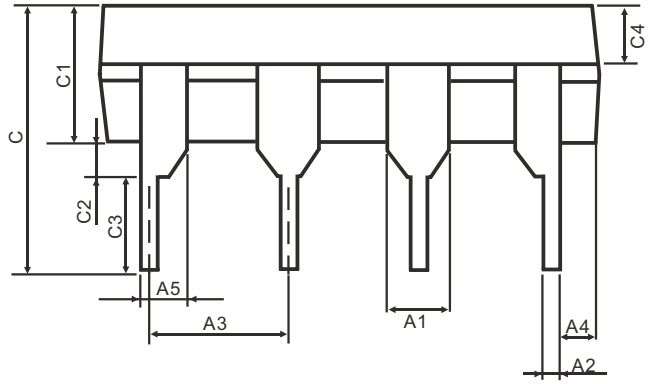


Symbol	Dimension(mm)		Symbol	Dimension(mm)	
	Min	Max		Min	Max
A	4.95	5.15	C3	0.05	0.20
A1	0.37	0.47	C4	0.20(TYP)	
A2	1.27(TYP)		D	1.05(TYP)	
A3	0.41(TYP)		D1	0.40	0.60
B	5.80	6.20	R1	0.07(TYP)	
B1	3.80	4.00	R2	0.07(TYP)	
B2	5.0(TYP)		θ1	17°(TYP)	
C	1.30	1.50	θ2	13°(TYP)	
C1	0.55	0.65	θ3	4°(TYP)	
C2	0.55	0.65	θ4	12°(TYP)	

DIP8L







Symbol	Dimension(mm)		Symbol	Dimension(mm)	
	Min	Max		Min	Max
A	9.30	9.50	C2	0.5(TYP)	
A1	1.524(TYP)		C3	3.3(TYP)	
A2	0.39	0.53	C4	1.57(TYP)	
A3	2.54(TYP)		D	8.20	8.80
A4	0.66(TYP)		D1	0.20	0.35
A5	0.99(TYP)		D2	7.62	7.87
B	6.3	6.5	θ1	8°(TYP)	
C	7.20(TYP)		θ2	8°(TYP)	
C1	3.30	3.50	θ3	5°(TYP)	