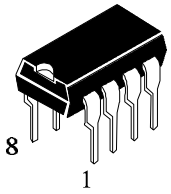
Low Power Dual Operational Amplifier

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 IL358 a good choice for battery operation.

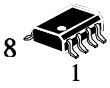
When your project calls for a traditional op-amp function, now you can streamline your design with a simple single power supply. Use ordinary +5V$_{DC}$ common to practically any digital system or personal computer application, without requiring an extra 15V power supply just to have the interface electronics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

The IL358 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.

- Internally frequency compensated for unity gain
- Large DC voltage gain: 100dB
- Wide power supply range:
  3V ~ 32V (or ±1.5V ~ ±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
- Low input offset voltage and offset current
- Differential input voltage range equal to the power supply voltage



CD suffix

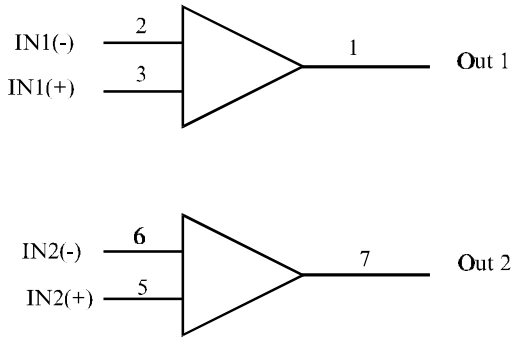


CS suffix

ORDERING INFORMATION

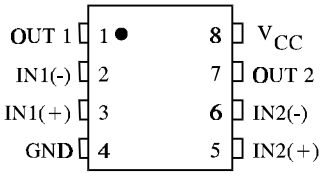
LM358CD DIP-8
LM358CS SOP-8
T$_A$ = 0° to 70° C
for all packages.

LOGIC DIAGRAM



PIN 4 = GND
PIN 8 = V$_{CC}$

PIN ASSIGNMENT



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
I_{SC}	Output Short Circuit Duration	Continuous	
T_J	Junction Temperature Plastic Packages	 150	°C
Tstg	Storage Temperature Plastic Packages	 -55 to +125	°C
I_{IN}	Input Current, per pin (2)	50	mA
T_L	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
SOIC Package: : - 7 mW/°C from 65° to 125°C
Notes:
1. Split Power Supplies.
2. V_{IN} < -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
V_{CC}	DC Supply Voltage	±2.5 or 5.0	±15 or 30	V
T_A	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≤(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.

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

Symbol	Parameter	Test Conditions	Guaranteed Limit			Unit
			Min	Typ	Max	
V_{IO}	Maximum Input Offset Voltage	V_O = 1.4V V_{CC} = 5.0-30V; R_S = 0Ω V_{ICM} = 0V to V_{CC}-1.7V			9.0	mV
$\Delta V_{IO}/\Delta T$	Input Offset Voltage Drift	R_S = 0Ω, V_{CC} = 30V		7.0		µV/°C
I_{IO}	Maximum Input Offset Current	V_{CC} = 5.0V			150	nA
$\Delta I_{IO}/\Delta T$	Input Offset Current Drift	R_S = 0Ω, V_{CC} = 30V		10		pA/°C
I_{IB}	Maximum Input Bias Current	V_{CC} = 5.0V			-500	nA
V_{ICR}	Input Common Mode Voltage Range	V_{CC} = 30V	0		28	V
I_{CC}	Maximum Power Supply Current	R_L = ∞, V_{CC} = 30V, V_0 = 0V R_L = ∞, V_{CC} = 5V, V_0 = 0V			3 1.2	mA
A_{VOL}	Minimum Large Signal Open-Loop Voltage Gain	V_{CC} = 15V, R_L≥2KΩ	15			V/mV
V_{OH}	Minimum Output High-Level Voltage Swing	V_{CC} = 30V, R_L = 2KΩ V_{CC} = 30V, R_L = 10KΩ	26 27			V
V_{OL}	Maximum Output Low-Level Voltage Swing	V_{CC} = 5V, R_L = 10KΩ			20	mV
CMR	Common Mode Rejection	V_{CC} = 30V, R_S = 10KΩ	65*			dB
PSR	Power Supply Rejection	V_{CC} = 30V	65			dB
CS	Channel Separation	f = 1KHz to 20KHz, V_{CC} = 30V	-120*			dB
I_{SC}	Maximum Output Short Circuit to GND	V_{CC} = 5.0V			60*	mA
I_{source}	Minimum Source Output Current	V_{IN+} = 1V, V_{IN-} = 0V, V_{CC} = 15V, V_0 = 0V	10			mA
I_{sink}	Minimum Output Sink Current	V_{IN+} = 0V, V_{IN-} = 1V, V_{CC} = 15V, V_0 = 15V V_{IN+} = 0V, V_{IN-} = 1V, V_{CC} = 15V, V_0 = 0.2V	5 12*			mA µA
V_{IDR}	Differential Input Voltage Range	All V_{IN}≥GND or V-Supply (if used)			V_{CC}*	V

* = @25°C

TYPICAL PERFORMANCE CHARACTERISTICS

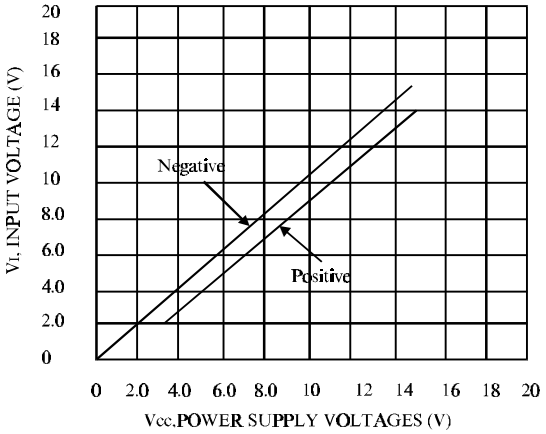


Figure 1.Input Voltage Range

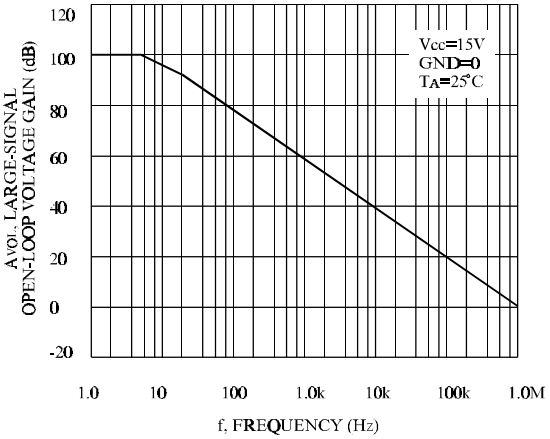


Figure 2. Open-Loop Frequency

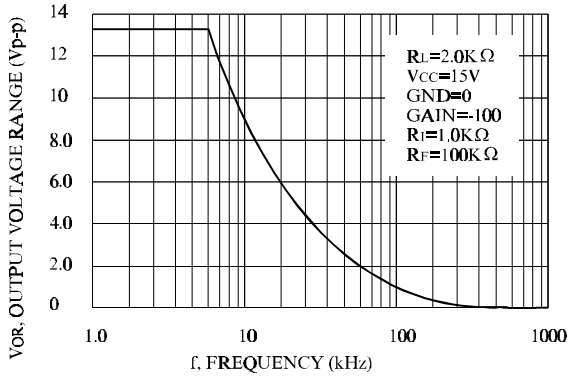


Figure 3. Large-Signal Frequency Response

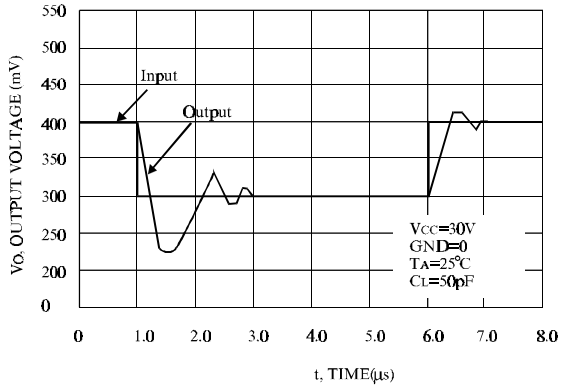


Figure 4. Small-Signal Voltage Follower Pulse Response (Noninverting)

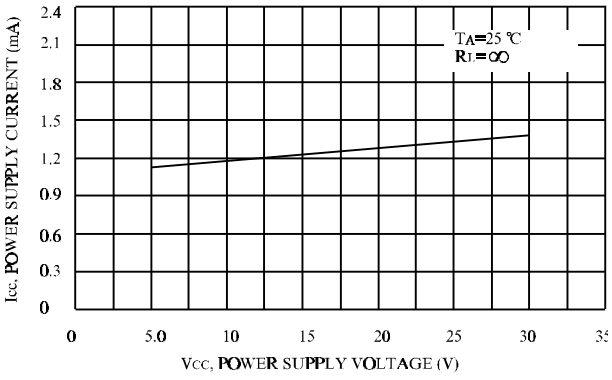


Figure 5. Power Supply Current versus Power Supply Voltage

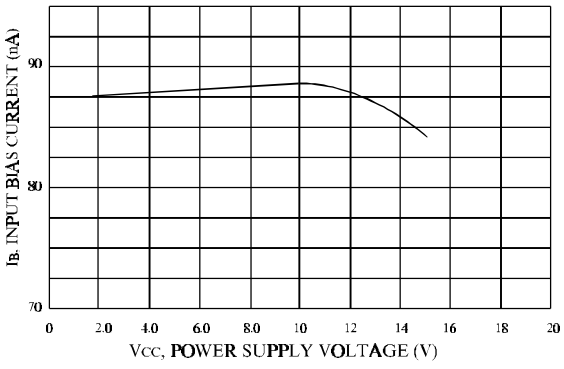
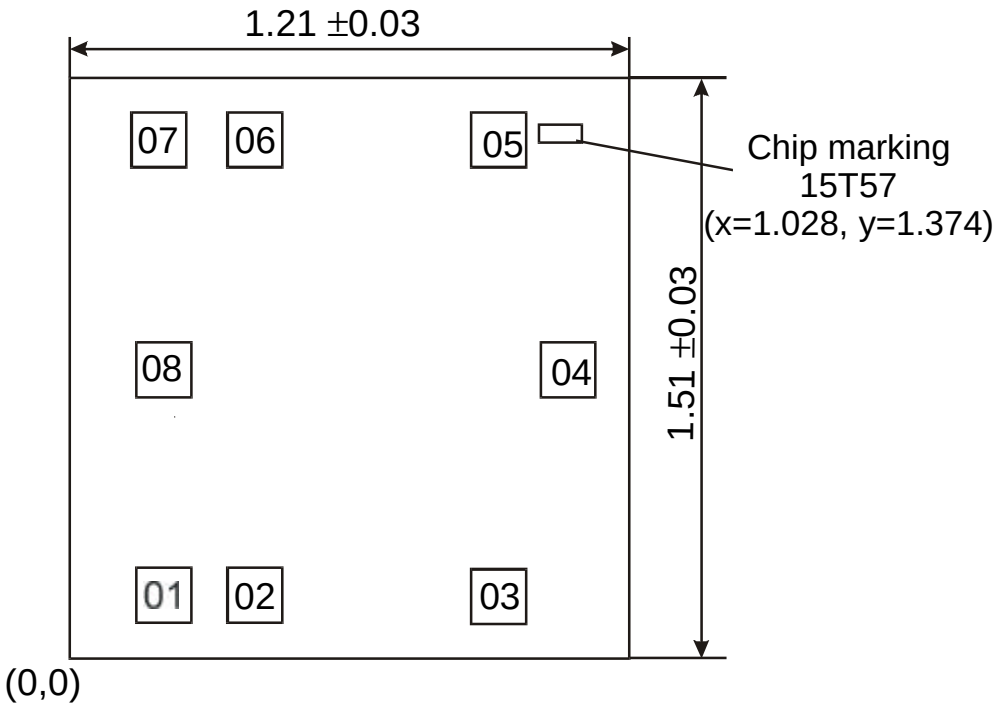


Figure 6. Input Bias Current versus Power Supply Voltage

CHIP DIAGRAM



Pad size 0.11 x 0.11 mm (Pad size is given as per passivation layer)
Thickness of chip 0.35 ± 0.02 mm

PAD LOCATION

Pad No	Symbol	X	Y
01	OUT1	0.087	0.085
02	IN1(-)	0.267	0.085
03	IN1(+0	0.852	0.085
04	GND	1.003	0.695
05	IN2(+)	0.852	1.305
06	IN2(-)	0.267	1.305
07	OUT2	0.087	1.305
08	V_{CC}	0.087	0.695