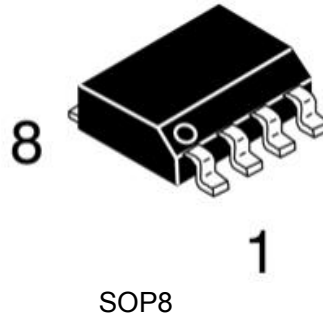


## General Description

The LM358 series consists of two independent, high gain, internally frequency compensated operational amplifiers which were designed specifically to operate from a single power supply over a wide range of voltages. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage.

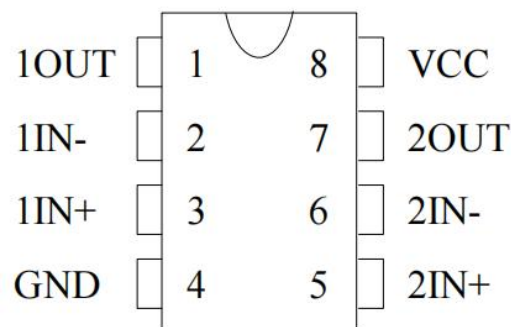
Application areas include transducer amplifiers, dc gain blocks and all the conventional op amp circuits which now can be more easily implemented in single power supply systems. For example, the LM358 series can be directly operated off of the standard +5V power supply voltage which is used in digital systems and will easily provide the required interface electronics without requiring the additional  $\pm 15V$  power supplies.



## Features

- Wide power supply range:
  - Single supply: 4V to 32V
  - or dual supplies:  $\pm 2V$  to  $\pm 16V$
- Very low supply current drain (500  $\mu A$ )—essentially independent of supply voltage
- Wide bandwidth (unity gain): 1 MHz
- Low Input Bias Currents
- Common Mode Range Extends to Negative Supply

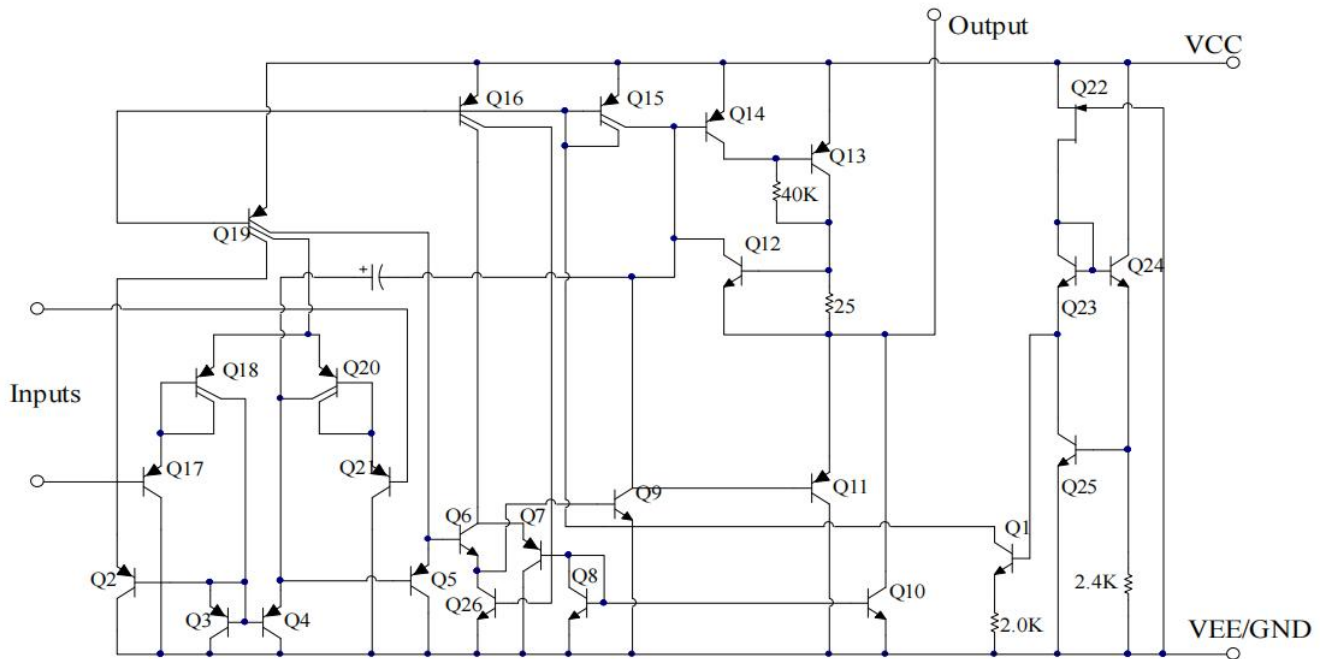
## PIN CONNECTIONS



## Ordering Information

Product Model	Package Type	Marking	Packing	Packing Qty
XBLW LM358DR2G	SOP-8	LM358	Tape	2500Pcs/Reel

**Schematic Diagram (One-Half of Circuit Shown)**



**MAXIMUM RATINGS(TA = +25°C, unless otherwise noted.)**

Rating		Value	Unit
Power Supply Voltages		32 or $\pm 16$	V
Input Differential Voltage Range		32	V
Input Common Mode Voltage Range		-0.3 ~ VCC	V
Power Dissipation (Note1)	DIP8	830	mW
	SOP8	530	
Output Short Circuit Duration ( One Amplifier ) ( $V \leq 15V, T_a = 25^\circ C$ )		Continuous	
Input Current ( $V_{IN} < -0.3V$ )		50	mA
Junction Temperature		150	$^\circ C$
Operating Temperature Range		0 ~ 70	$^\circ C$
Storage Temperature Range		-65 ~ 150	$^\circ C$

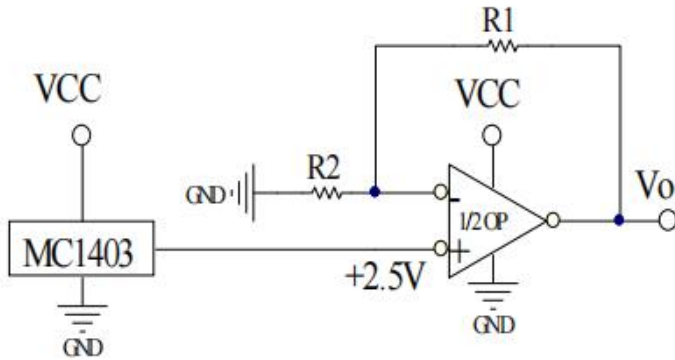
Note1 : LM358 must be derated based on a +150°C maximum junction temperature.

## ELECTRICAL CHARACTERISTICS

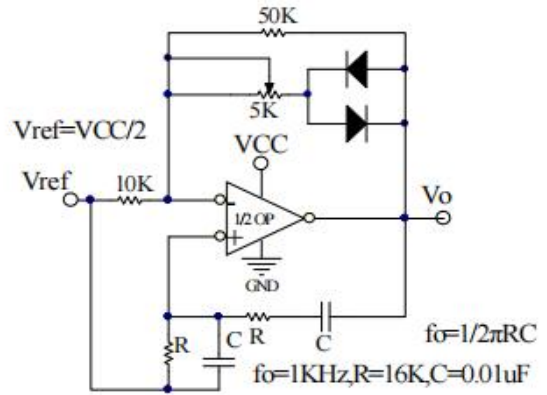
(V<sub>CC</sub>=5.0V, T<sub>A</sub> = +25 °C, unless otherwise noted.)

Parameter	Conditions		LM358			Units
			Min	Typ	Max	
Input Offset Voltage	T <sub>a</sub> =25°C, V <sub>CC</sub> = 5.0 V to 30 V, V <sub>O</sub> =1.4 V,			2	5	mV
Input Bias Current	T <sub>a</sub> =25°C I <sub>IN</sub> (+)或 I <sub>IN</sub> (-), V <sub>CM</sub> =0V			45	250	nA
Input Offset Current	T <sub>a</sub> =25°C I <sub>IN</sub> (+) - I <sub>IN</sub> (-), V <sub>CM</sub> =0V			3	50	nA
Input Common Mode Voltage Range	T <sub>a</sub> =25°C V <sup>+</sup> =30V		0		V <sub>CC</sub> -1.5	V
Power Supply Current	R <sub>L</sub> =∞, Total Device	V <sub>CC</sub> =30V		1	2	mA
		V <sub>CC</sub> =5V		0.5	1.2	mA
Large Signal Open Loop Voltage Gain	V <sub>CC</sub> =15V, T <sub>a</sub> =25°C, R <sub>L</sub> ≥2kΩ (for V <sub>O</sub> =1~11V)		25	100		V/mV
Common Mode Rejection	DC, T <sub>a</sub> =25°C, V <sub>CM</sub> =0~V <sub>CC</sub> -1.5V		65	90		dB
Power Supply Rejection	DC, T <sub>a</sub> =25°C, V <sub>CC</sub> =5~30V		65	100		dB
Output Source Current	V <sub>IN</sub> (+)=1V, V <sub>IN</sub> (-)=0V, V <sub>CC</sub> =15V, V <sub>O</sub> =2V, T <sub>a</sub> =25°C		20	40		mA
Output Sink Current	V <sub>IN</sub> (-)=1V, V <sub>IN</sub> (+)=0V, V <sub>CC</sub> =15V, V <sub>O</sub> =2V, T <sub>a</sub> =25°C		10	15		mA
	V <sub>IN</sub> (-)=1V, V <sub>IN</sub> (+)=0V, V <sub>CC</sub> =15V, V <sub>O</sub> =200mV, T <sub>a</sub> =25°C		12	50		μA
Output Short Circuit to Ground	V <sub>CC</sub> =15V, T <sub>a</sub> =25°C			40	60	mA
Output Voltage Swing	V <sub>OH</sub>	V <sub>CC</sub> =30V, R <sub>L</sub> =2kΩ	26			V
		V <sub>CC</sub> =30V, R <sub>L</sub> =10kΩ	27	28		V
	V <sub>OL</sub>	V <sub>CC</sub> =5V, R <sub>L</sub> =10kΩ		5	20	mV

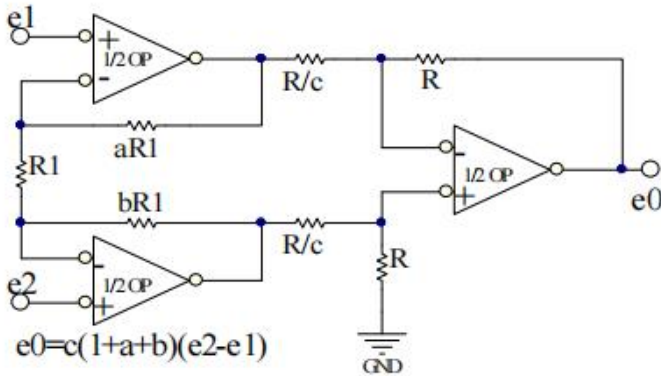
**Typical Applications**



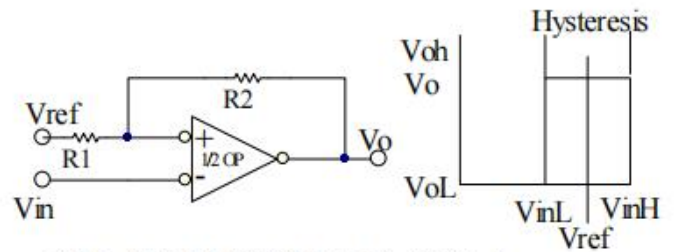
Voltage Reference,  $V_o = 2.5V (1 + R1/R2)$



Wien Bridge Oscillator



High Impedance Differential Amplifier

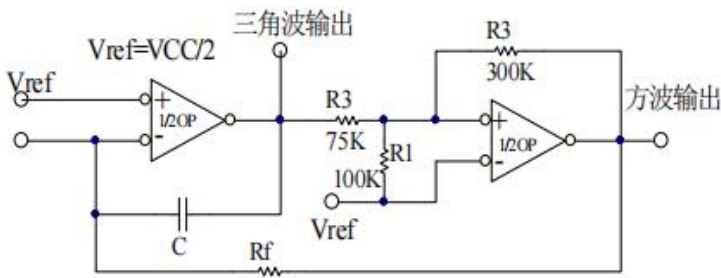


$$V_{inL} = (R1/(R1+R2)) * (VoL - Vref) + Vref$$

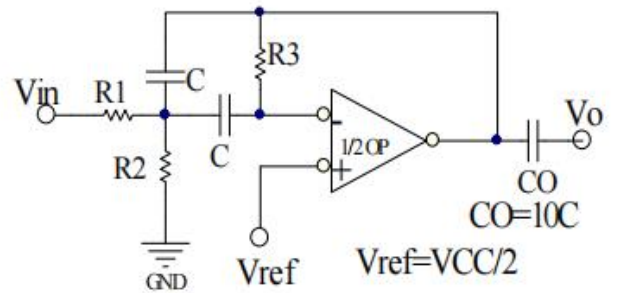
$$V_{inH} = (R1/(R1+R2)) * (VoH - Vref) + Vref$$

$$H = (R1/(R1+R2)) * (VoH - VoL)$$

Comparator with Hysteresis



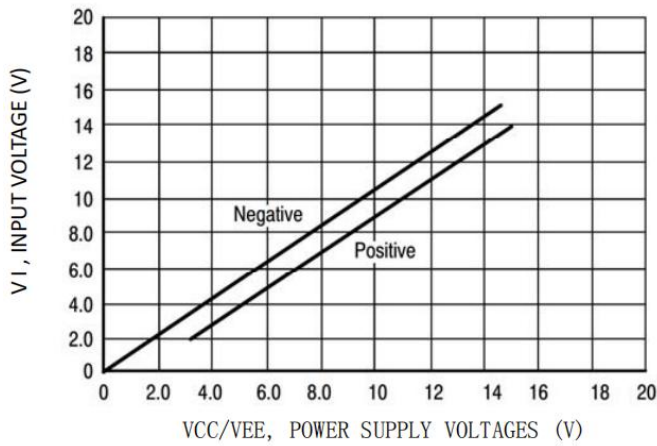
Function Generator



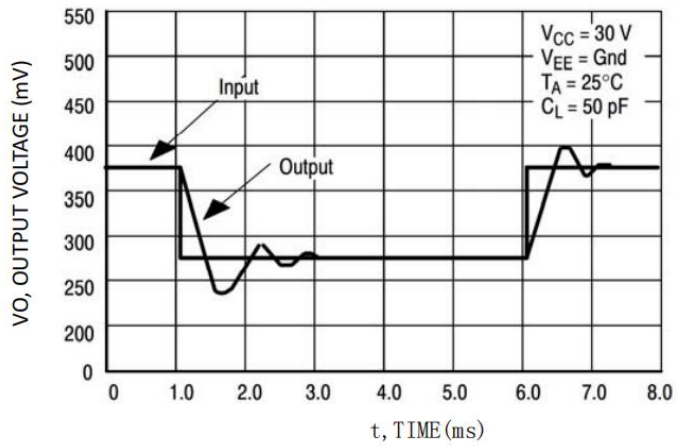
$f_o$  = center frequency

Multiple Feedback Bandpass Filter

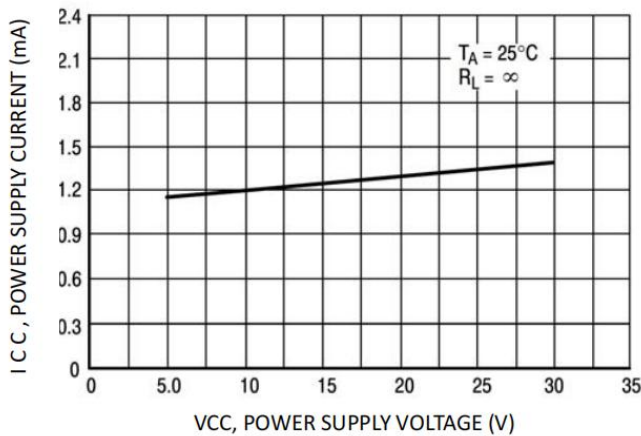
## Typical Performance Characteristics



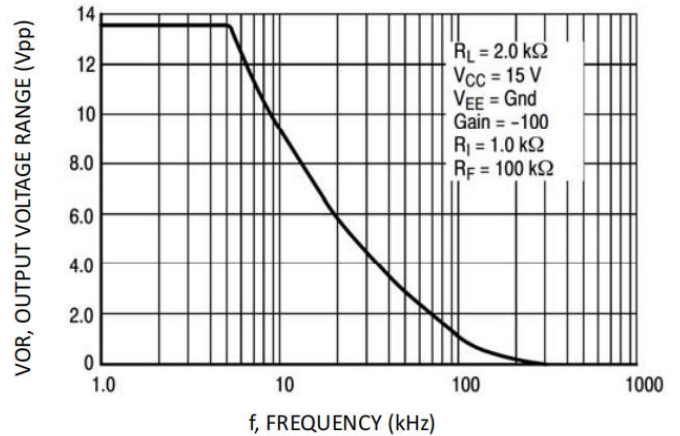
Input Voltage Range



Small Signal Voltage Follower Pulse Response  
(Noninverting)



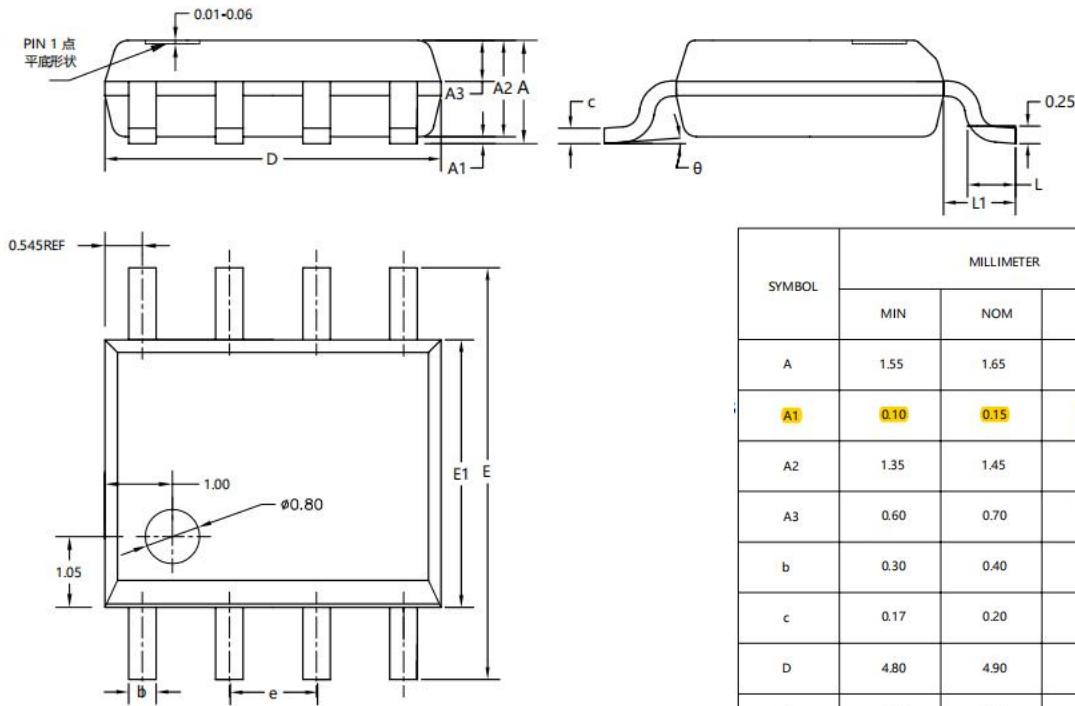
Power Supply Current versus Power Supply Voltage



Large-Signal Frequency Response

## Package Information

### SOP8



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	1.55	1.65	1.75
A1	0.10	0.15	0.20
A2	1.35	1.45	1.55
A3	0.60	0.70	0.80
b	0.30	0.40	0.50
c	0.17	0.20	0.25
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27BSC		
L	0.50	0.60	0.70
L1	1.05REF		
$\theta$	0°	4°	8°

#### Statement:

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