

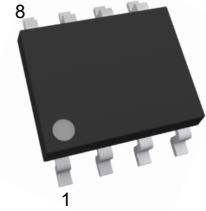
## Low Power Double Operational Amplifier

### Description

The LM358 consists of two independent and high-gain operational amplifier . It can work under single power supply or dual power supply, and the magnitude of current is not affected by the magnitude of the power supply voltage. Its applications include audio amplifiers, industrial controls, DC gain and all conventional operational amplifier circuit.

The LM358 available in SOP-8 package.

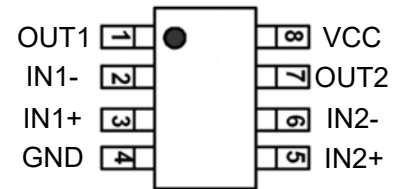
SOP-8



### Feature

- Can work under single supply or dual supply
- Including two operational amplifiers
- Logical circuit matching
- Low power dissipation
- Wide frequency range

### Pin Assignment

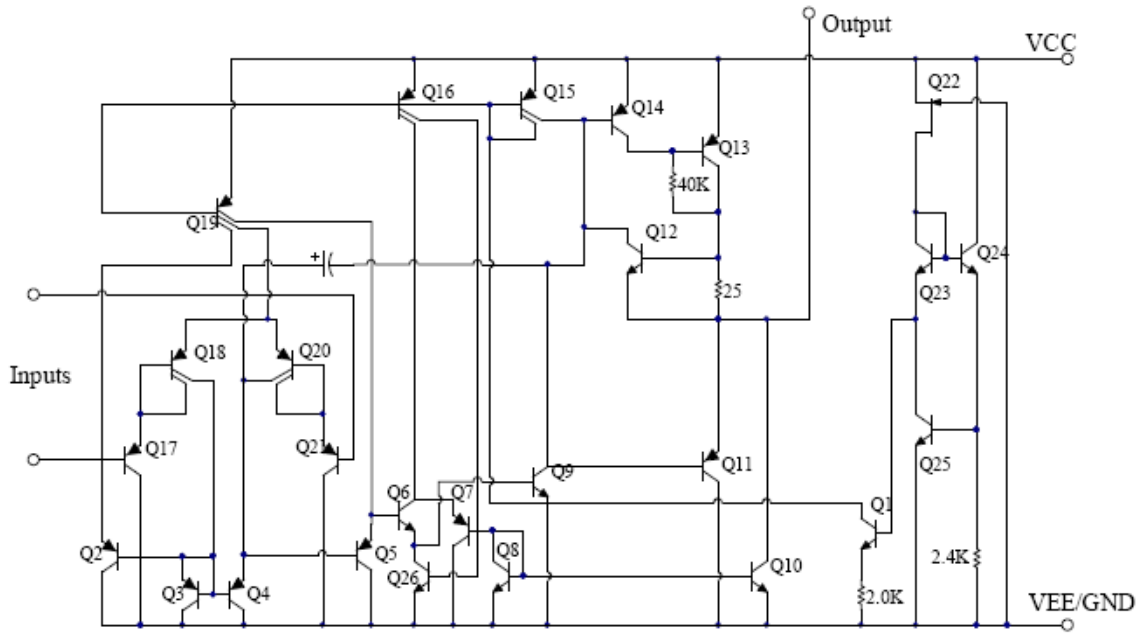


### Pin Function

Pin No.	Symbol	Function	Pin No.	Symbol	Function
1	OUT1	The output of the first operational amplifier	5	IN2+	The non-inverting input of the second operational amplifier
2	IN1-	The inverting input of the first operational amplifier	6	IN2-	The inverting input of the second operational amplifier
3	IN1+	The non-inverting input of the first operational amplifier	7	OUT2	The output of the second operational amplifier
4	GND	ground	8	VCC	the power supply



Block Diagram



Absolute Maximum Ratings (at  $T_A = 25^\circ\text{C}$ )

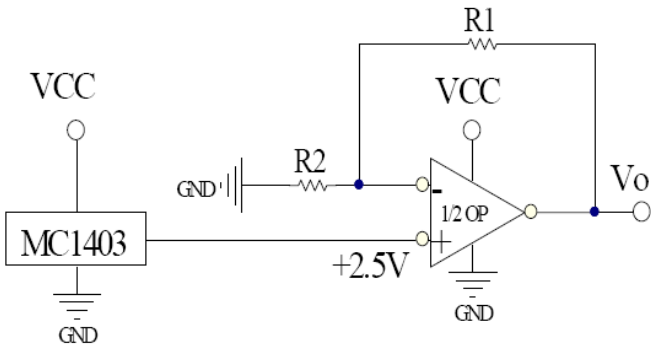
Parameter	Symbol	Value	Unit
Supply Voltage	$V_{CC}$	$\pm 16$	V
		32	
Differential Input Voltage	$V_{I(DIFF)}$	32	V
Common-mode Input Voltage	$V_{ICR}$	-0.3~32	V
Short-circuit Output Current to Ground (Each channel amplifier, $V \leq 15V$ )	$I_{OG}$	Continuous	--
Input Current ( $V_{IN} \leq 0.3V$ )	$I_{IN}$	50	mA
Junction Temperature	$T_J$	150	$^\circ\text{C}$
Maximum Power Dissipation	$P_D$	530	mW
Operating Temperature Range	$T_{OPR}$	0~70	$^\circ\text{C}$
Storage Temperature Range	$T_{STG}$	-65~150	$^\circ\text{C}$

**Electrical Characteristics**
 $T_a = 25^\circ\text{C}$ ,  $V_{CC}=5\text{V}$ , unless otherwise noted

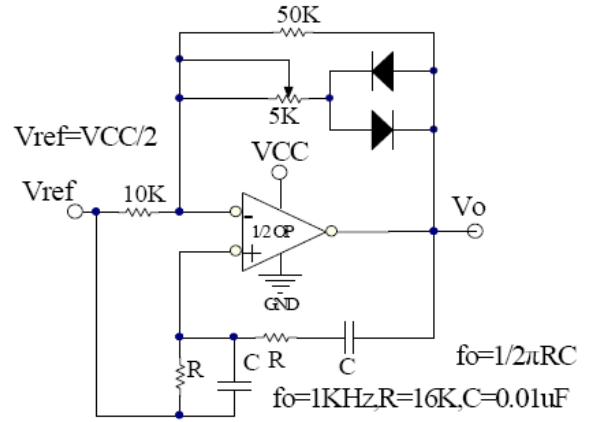
Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Input offset voltage	$V_{OS}$	$T_a=25^\circ\text{C}$	--	$\pm 2$	$\pm 5$	mV
Input offset current	$I_{OS}$	$T_a=25^\circ\text{C}$ , $I_{IN(-)} \text{ or } I_{IN(+)}$ , $V_{CM}=0\text{V}$	--	$\pm 3$	$\pm 50$	nA
Low input bias current	$I_B$	$T_a=25^\circ\text{C}$ , $I_{IN(-)} - I_{IN(+)}$ , $V_{CM}=0\text{V}$	--	$\pm 45$	$\pm 250$	nA
Common-mode input voltage rang	$V_{CM}$	$T_a=25^\circ\text{C}$ , $V^+=30\text{V}$	0	--	$V_{CC}-1.5$	V
Large-signal differential voltage amplification	$A_{VD}$	$R_L \geq 2\text{K}\Omega$ , $V_{CC}=15\text{V}$ , ( $V_O=1\sim 11\text{V}$ )	25	100	--	V/mV
Common mode rejection	CMRR	DC, $V_{CM}=0\sim V_{CC}-1.5\text{V}$	65	90	--	dB
Power supply rejection	PSRR	DC, $V_{CC}=5\sim 30\text{V}$	65	100	--	dB
Output sink current	$I_{SINK}$	$V_{IN(-)} = 1\text{V}$ , $V_{IN(+)} = 0\text{V}$ , $V_{CC}=15\text{V}$ , $V_O=2\text{V}$	10	15	--	mA
		$V_{IN(-)} = 1\text{V}$ , $V_{IN(+)} = 0\text{V}$ , $V_{CC}=15\text{V}$ , $V_O=0.2\text{V}$	12	20	--	$\mu\text{A}$
Output Current Sourcing	$I_{SOURCE}$	$V_{IN(-)} = 1\text{V}$ , $V_{IN(+)} = 0\text{V}$ , $V_{CC}=15\text{V}$ , $V_O=2\text{V}$	20	40	--	mA
Short-circuit current to ground	$I_G$	$V_{CC}=15\text{V}$	--	40	60	mA
Supply current	$I_{CC}$	$R_L = \infty$ , $V_{CC}=5\text{V}$	--	0.5	1.2	mA
		$R_L = \infty$ , $V_{CC}=30\text{V}$	--	1	2	
Output voltage swing	$V_{OH}$	$V_{CC}=30\text{V}$ , $R_L=2\text{K}\Omega$	26	--	--	V
		$V_{CC}=30\text{V}$ , $R_L=10\text{K}\Omega$	27	28	--	V
	$V_{OL}$	$V_{CC}=5\text{V}$ , $R_L=10\text{K}\Omega$	--	5	20	mV



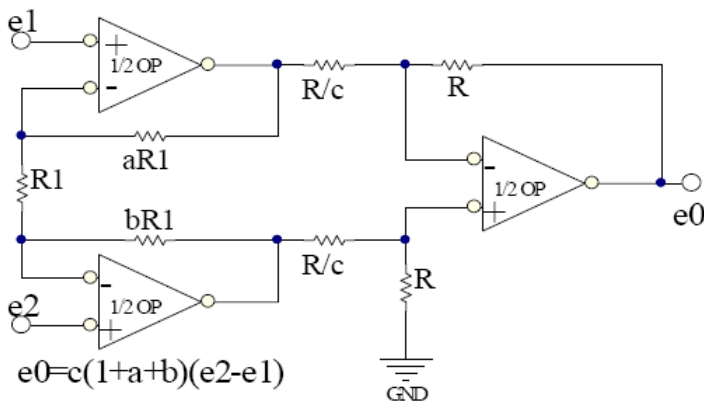
Typical Application Circuit



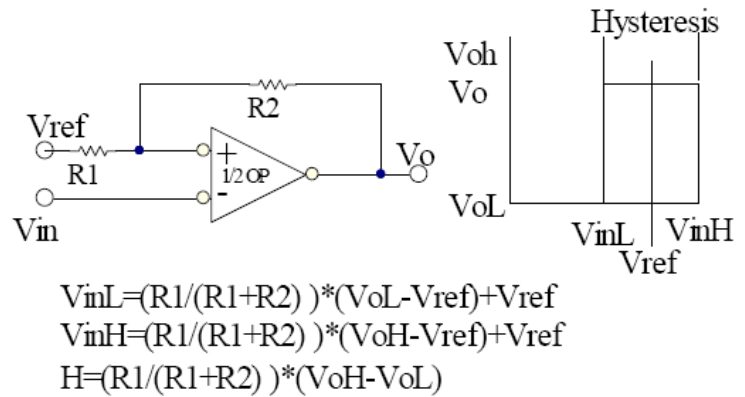
Voltage reference,  $V_o=2.5V(1+R1/R2)$



Wien bridge oscillator circuit



High impedance differential amplifier

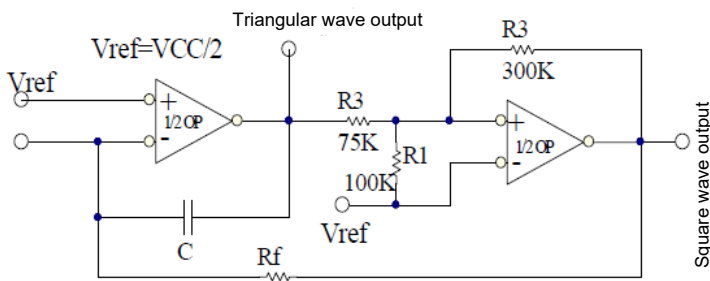


$$V_{inL}=(R1/(R1+R2))\cdot(VoL-V_{ref})+V_{ref}$$

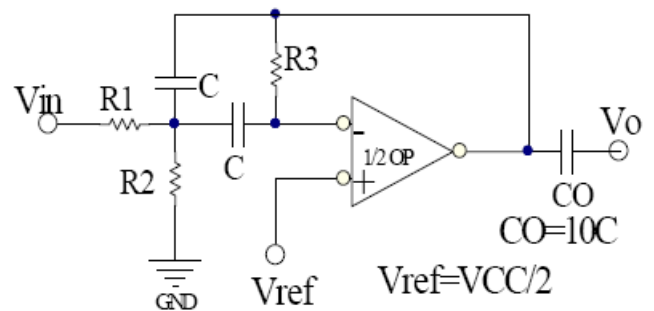
$$V_{inH}=(R1/(R1+R2))\cdot(VoH-V_{ref})+V_{ref}$$

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

Hysteresis comparator



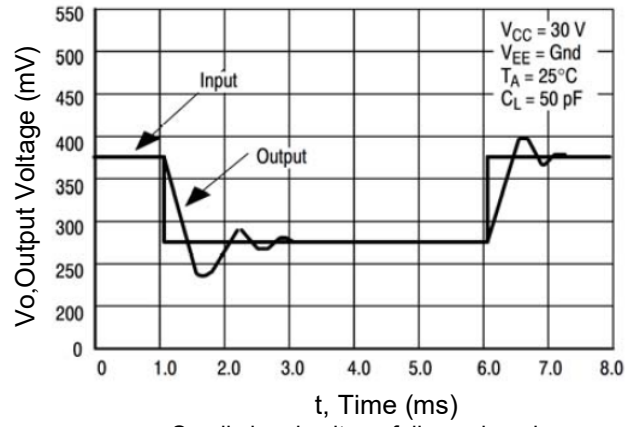
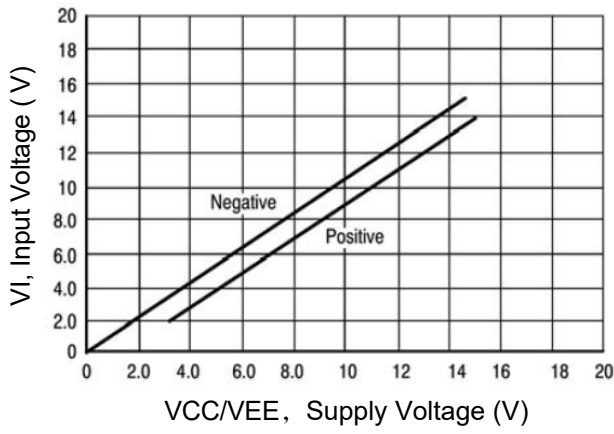
Function Generator



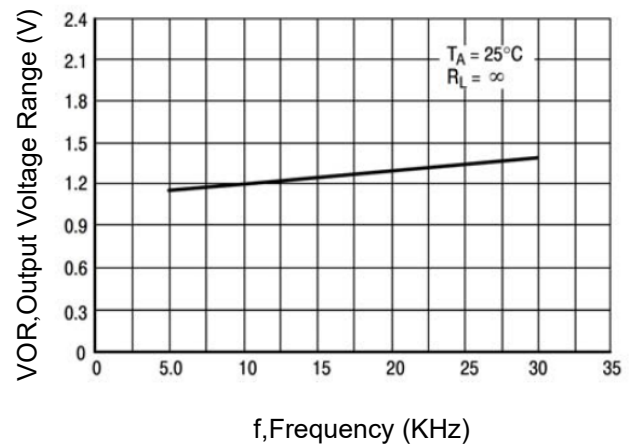
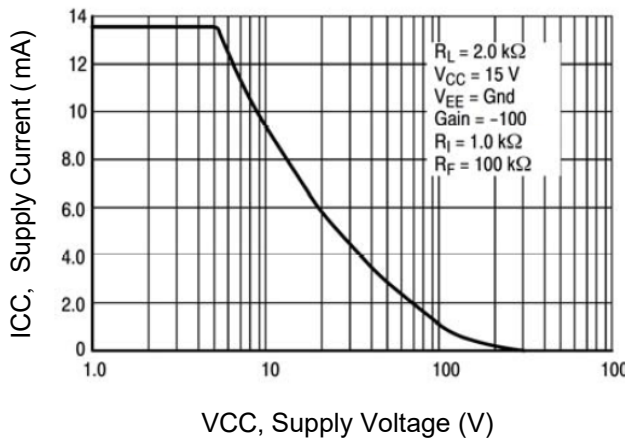
fo=center frequency  
Multiple-feedback bandpass filter



Typical characteristic curve



Small signal voltage follower impulse response (same direction)

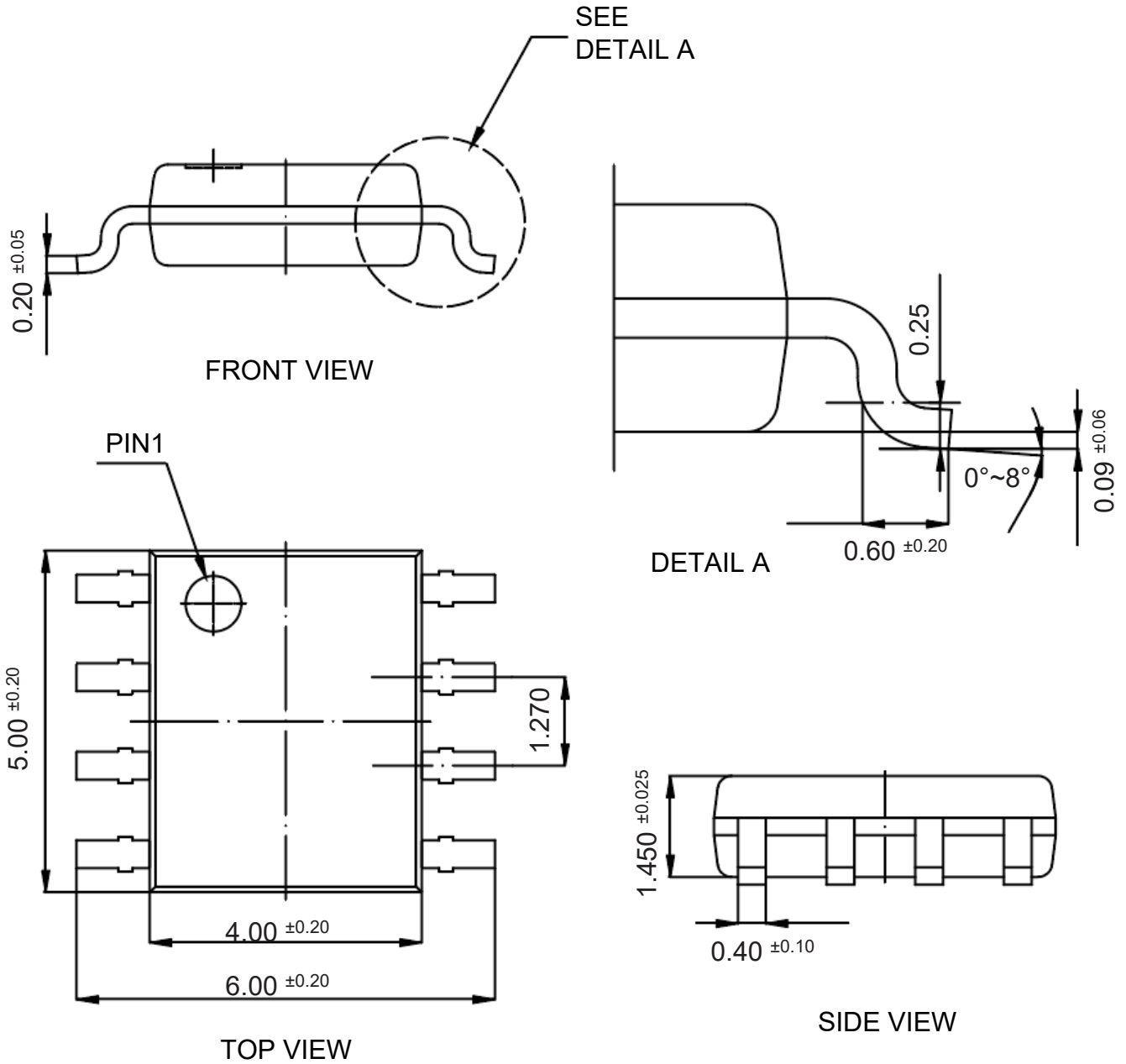




### Package Outline

SOP-8

Dimensions in mm



### Ordering Information

Device	Package	Shipping
LM358	SOP-8	4,000PCS/Reel&13inches