

# MSKSEMI

SEMICONDUCTOR



ESD



TVS



TSS



MOV



GDT



PLED

Product data sheet

## GENERAL DESCRIPTION

LM358 是一款双路低功耗的差分式运算放大器。具有单、双电源供电的特点。具有较高的开环增益、内部补偿、高共模范围和良好的温度稳定性，以及具有输出短路保护的特点。可应用于传感器的放大电路、直流放大模块，音频放大电路和传统的运算放大电路中。

## FEATURES

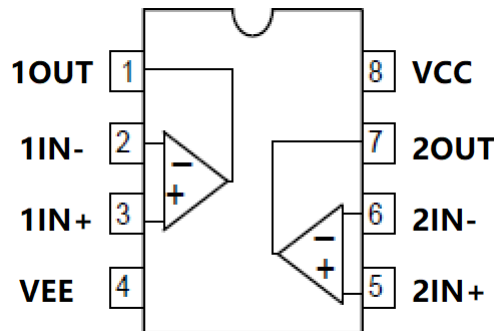
- 内部频率补偿
- 短路保护
- 低功耗：单路典型值 300uA
- 封装形式：DIP8、SOP8
- 高输入单电源电压范围：3V~36V
- 高输入双电源电压范围：±18V
- 单位增益带宽：大于 1.2MHZ

## APPLICATION

- 传感器信号放大器
- 直流增益
- 音频放大器
- 其它应用领域

## PIN CONFIGURATION

DIP8/SOP8 管脚序号	管脚定义	功能说明
1	1OUT1	运放输出端
2	1IN-	运放输入负端
3	1IN+	运放输入正端
4	VEE	负电源端
5	2IN+	运放输入正端
6	2IN-	运放输入负端
7	2OUT	运放输出端
8	VCC	正电源端



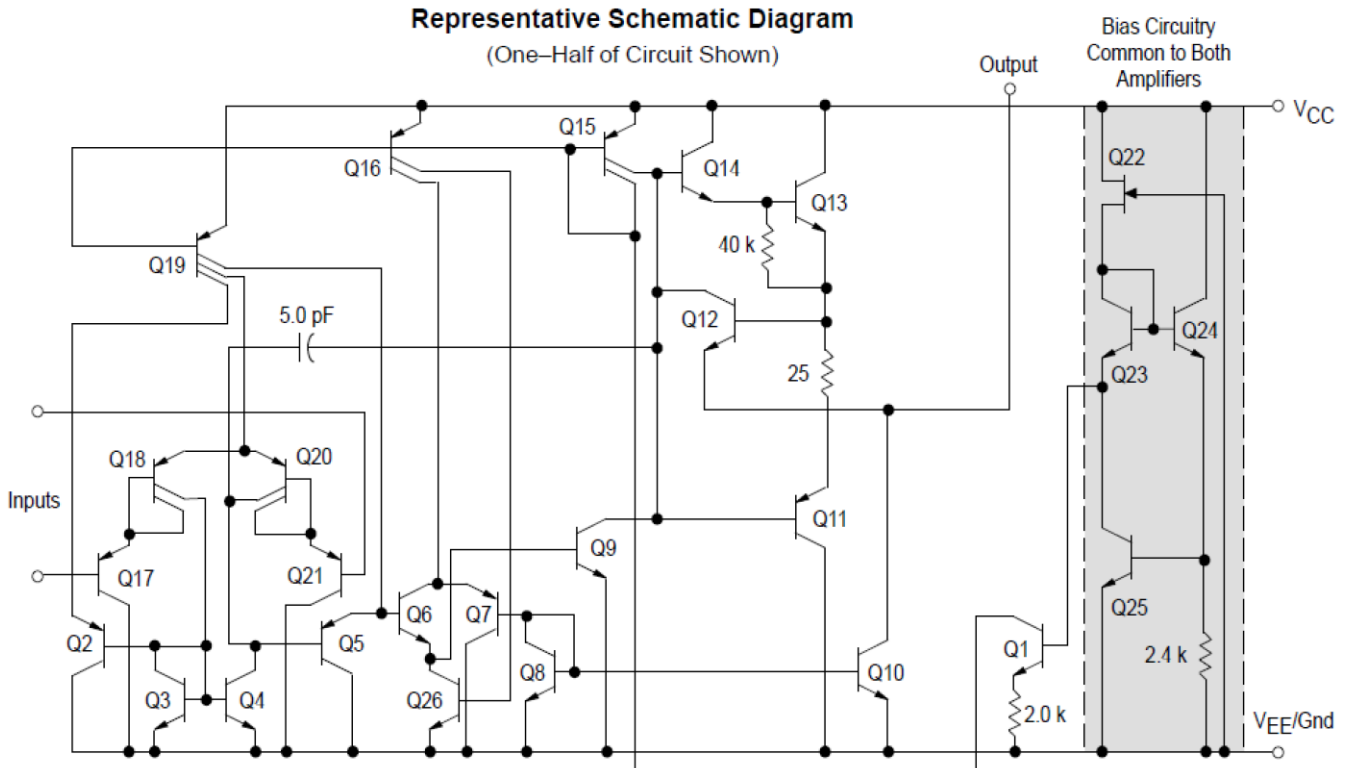
## 极限参数

参数	符号	极限值 <sup>(2)</sup>	单位
单电源供电电压	$V_{CC}$	40	V
双电源供电电压	$V_S$	$\pm 20$	V
差分输入电压 <sup>(1)</sup>	$V_{IDR}$	$\pm 32$	V
输入电压	$V_I$	0.3~40V	V
输出短路时间	$t_{SC}$	连续	
耗散功率	$P_D$	400	mW
工作温度	$T_A$	0~70	$^{\circ}C$
储存温度	$T_S$	-65~150	$^{\circ}C$
焊接温度	$T_W$	260, 10s	$^{\circ}C$

注：（1）输入端NI+相对于IN-之间的最大电压差。

（2）极限参数是指无论在任何条件下都不能超过的极限值。如果超过此极限值，将有可能造成产品劣化等物理性损伤；同时在接近极限参数下，不能保证芯片可以正常工作。

## 逻辑框图

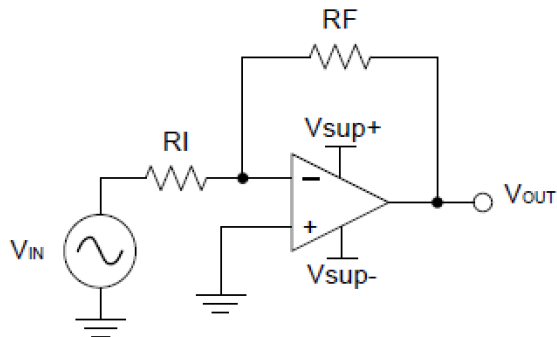


**直流电学特性** ( $T_A=25^\circ\text{C}$ ,  $V_{CC}=5\text{V}$ ,  $V_{EE}=\text{GND}$  除非特别指定)

项目	符号	测试条件	最小值	典型值	最大值	单位
输入失调电压	$V_{IO}$	$V_{CC}=5\text{V to MAX}$ , $V_{IC}=V_{ICR}(\text{min})$ , $V_O=1.4\text{V}$	-	5	-	mV
输入失调电流	$I_{IO}$	$V_O = 1.4\text{V}$	-	10	50	nA
偏置电流	$I_{BIAS}$	$V_O = 1.4\text{V}$	-	50	250	nA
输入共模电压	$V_{ICR}$	$V_{CC}=5\text{V to }36\text{V}$	$V_{EE}$	-	$V_{CC}-1.5\text{V}$	V
输出高电压	$V_{OH}$	$V_{CC}=28\text{V}$ , $R_L=2\text{k}$		26	-	V
输出低电压	$V_{OL}$	$V_{CC}=28\text{V}$ , $R_L=2\text{k}$	-	0.85	-	V
开环电压增益	$A_{OL}$	$V_{CC}=15\text{V}$ , $V_O=1\text{V to }11\text{V}$ , $R_L \geq 2\text{k}\Omega$	70	100	-	V/mV
共模抑制比	CMRR	$V_{CC}=5\text{V to MAX}$ , $V_{IC}=V_{ICR}(\text{min})$	65	80	-	dB
单位增益带宽	GBWP	--	-	1.2	-	MHZ
电源电压抑制比 PSRR	$\Delta V_{VDD}/\Delta V_{IO}$	$V_{CC}=5\text{V to MAX}$ , $f=20\text{kHz}$	-	90	-	dB
串扰衰减抑制比 CS	$V_{O1}/V_{O2}$	$f=1\text{MHz}$ / $f=1\text{kHz to }20\text{kHz}$	-	120	-	dB
电压输出幅值	$V_{O+}$	$V_{CC}=15\text{V}$ , $I_{out} = 50\mu\text{A}$	-	13.7	13.5	V
		$V_{CC}=15\text{V}$ , $I_{out} = 1\text{mA}$	-	13.6	13.3	V
		$V_{CC}=15\text{V}$ , $I_{out} = 5\text{mA}$	-	13.4	13	V
	$V_{O-}$	$V_{CC}=15\text{V}$ , $I_{out} = 50\mu\text{A}$	-	0.1	0.15	V
		$V_{CC}=15\text{V}$ , $I_{out} = 1\text{mA}$	-	0.75	1	V
		$V_{CC}=15\text{V}$ , $I_{out} = 5\text{mA}$	-	1	1.5	V
输出短路电流	$I_{OS}$	$V_{CC}=5\text{V}$ , $V_{EE}=-5\text{V}$ , $V_O=0\text{V}$	-	$\pm 24$	-	mA
电源工作电流	$I_{CC}$	$V_{CC}=5\text{V}$ , $V_O=1/2V_{CC}$ , <b>No load</b>	-	0.5	-	mA
		$V_{CC}=36$ , $V_O=1/2V_{CC}$ , <b>No load</b>	-	0.8	-	mA
双电源电压	$V_S$	$V_{CC}$ , $V_{EE}$	-18	-	+18	V

**典型应用**

1、线路图



运算放大器在反相放大器中的典型应用图

2、设计要求

必须选择大于输入电压范围和输出范围的电源电压。

例如，将信号源 VIN 从±0.5 V 放大到±1.8V。将电源设置为±5 V 足以适应此应用要求。

3、设计过程

根据公式(1)计算放大倍数(增益) AV

$$A_V = -V_O/V_{IN} \quad \text{----- (1)}$$

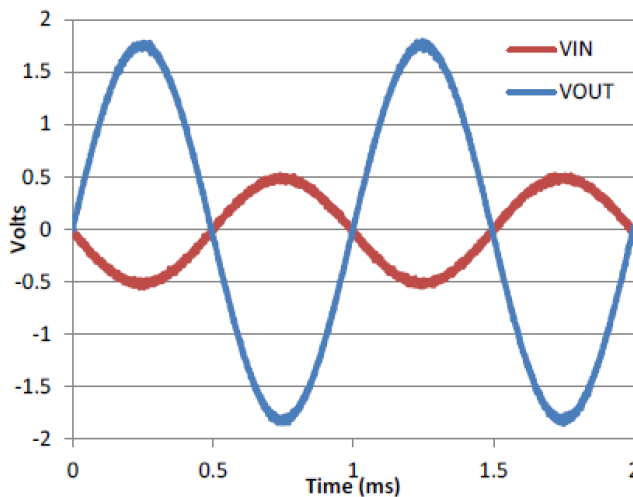
$$A_V = -V_O/V_{IN} = -1.8/0.5 = -3.6$$

一旦确定了所需的增益 AV，就要为 RI 或 RF 电阻选择一个值。根据运放的电特性及功耗的需要，可选择 1kΩ-100kΩ 范围内的值。本例将选择 RI=10 kΩ，则 RF=36kΩ。这由方程式 2 确定。

$$A_V = -R_F/R_I \quad \text{----- (2)}$$

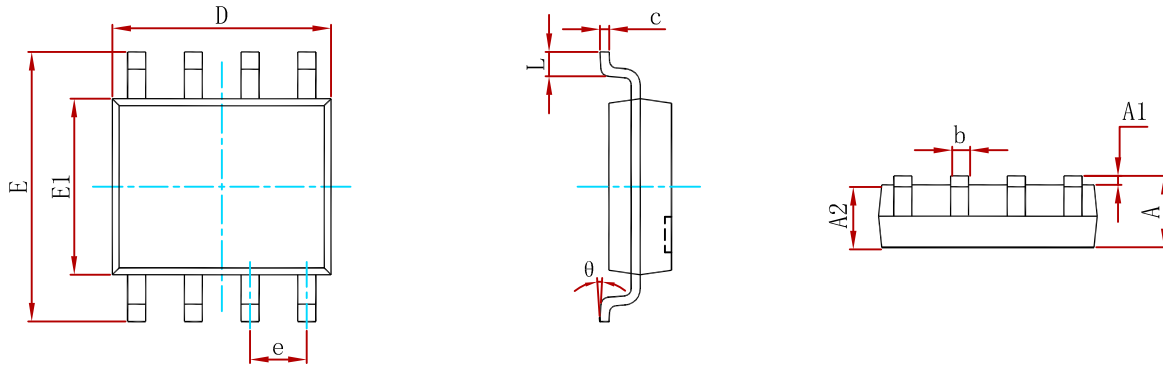
$$R_F = -A_V * R_I = 3.6 * 10 = 36 \text{ k}\Omega$$

4、应用曲线图



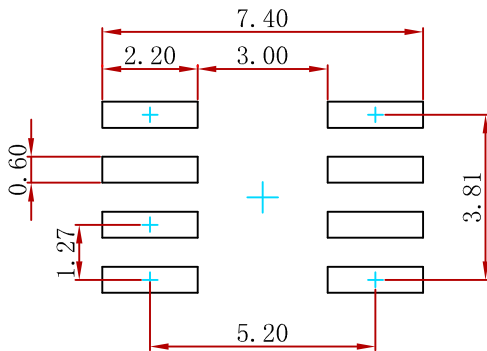
反相放大器的输入电压 VS 输出电压

**PACKAGE MECHANICAL DATA**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.800	5.000	0.189	0.197
e	1.270 (BSC)		0.050 (BSC)	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

**Suggested Pad Layout**

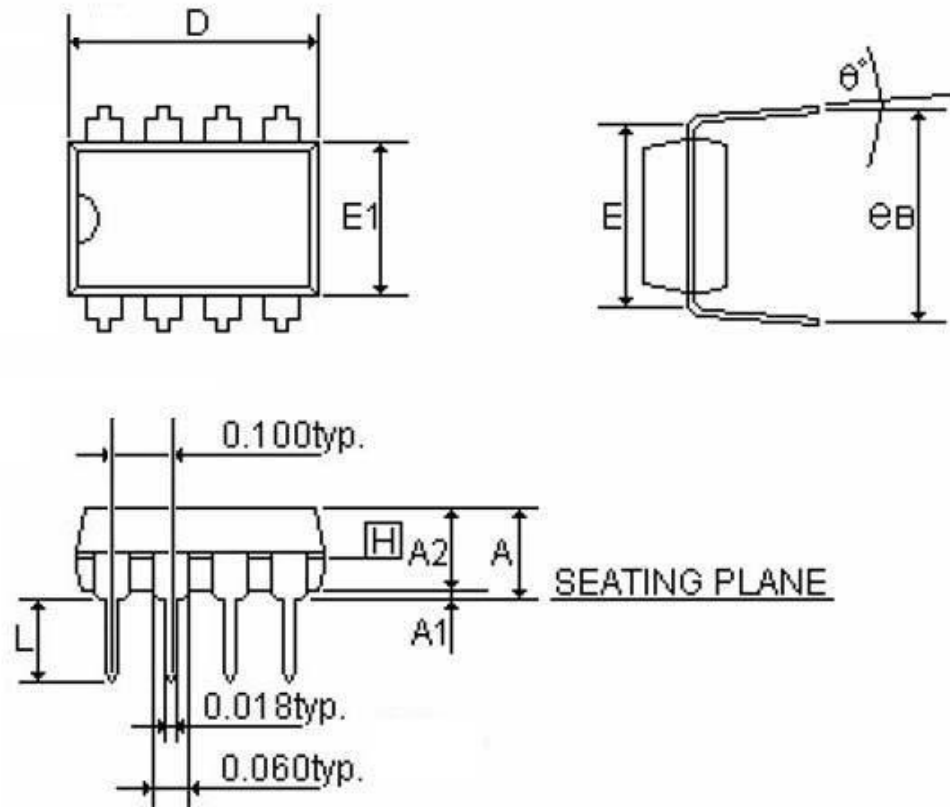


Note:  
 1. Controlling dimension: in millimeters.  
 2. General tolerance: ± 0.05mm.  
 3. The pad layout is for reference purposes only.

**REEL SPECIFICATION**

P/N	PKG	QTY
LM358	SOP-8	2500

**DIP 8**



SYMBOLS	MIN	NOR	MAX	MIN	NOR	MAX
	(inch)			(mm)		
A	-	-	0.210	-	-	5.334
A1	0.015	-	-	0.381	-	-
A2	0.125	0.130	0.135	3.175	3.302	3.429
D	0.435	0.455	0.475	15.669	16.050	16.685
E	0.300			7.62		
E1	0.245	0.250	0.255	6.223	6.35	6.477
L	0.115	0.130	0.150	2.921	3.302	3.810
e B	0.335	0.355	0.375	8.509	9.017	9.525
θ°	0°	7°	15°	0°	7°	15°

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