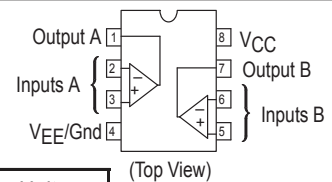
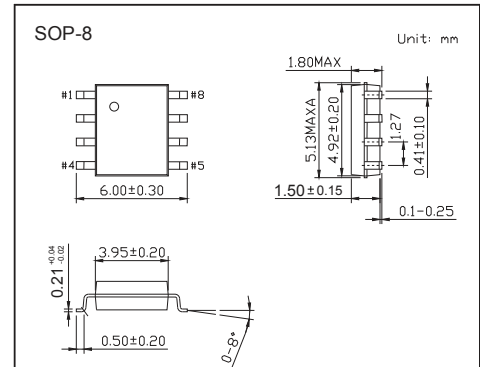


# Single Supply Dual Operational Amplifiers

## LM358 (KM358)

### ■ Features

- Short Circuit Protected Outputs
- True Differential Input Stage
- Single Supply Operation: 3.0 V to 32 V
- Low Input Bias Currents
- Internally Compensated
- Common Mode Range Extends to Negative Supply
- Single and Split Supply Operation



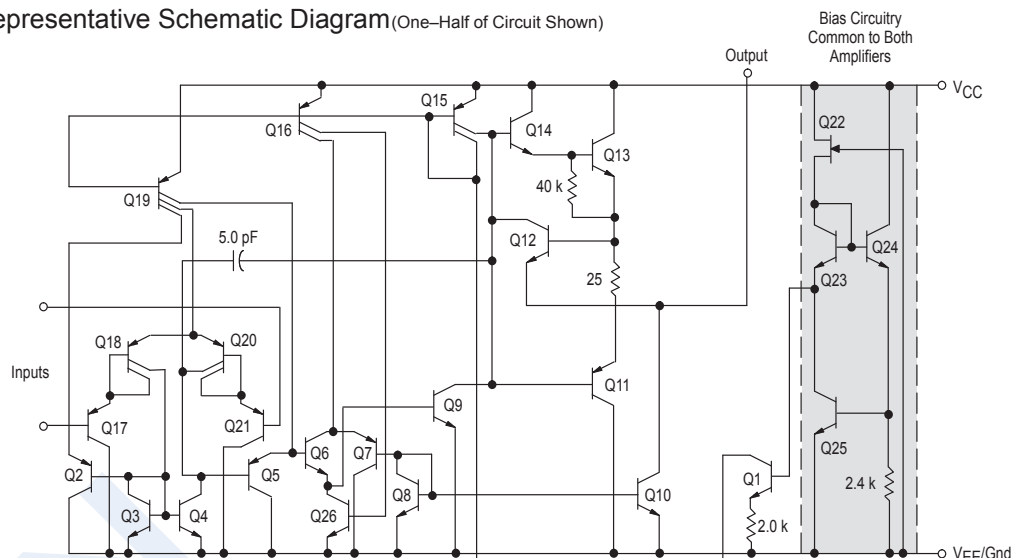
### ■ Absolute Maximum Ratings $T_a = 25^\circ\text{C}$

Parameter	Symbol	Rating	Unit
Power Supply Voltages			
Single Supply	$V_{CC}$	32	Vdc
Split Supplies	$V_{CC}, V_{EE}$	$\pm 16$	
Input Differential Voltage Range *1	$V_{IDR}$	$\pm 32$	Vdc
Input Common Mode Voltage Range *2	$V_{ICR}$	-0.3 to 32	Vdc
Output Short Circuit Duration	tsc	Continuous	
Junction Temperature	$T_J$	150	$^\circ\text{C}$
Thermal Resistance, Junction-to-Air	$R_{\theta JA}$	238	$^\circ\text{C/W}$
Storage Temperature Range	$T_{stg}$	-55 to +125	$^\circ\text{C}$
Operating Ambient Temperature Range	$T_A$	0 to +70	$^\circ\text{C}$

\*1 Split Power Supplies.

\*2 For supply voltages less than 32 V the absolute maximum input voltage is equal to the supply voltage.

### ■ Representative Schematic Diagram (One-Half of Circuit Shown)



## LM358 (KM358)

■ Electrical Characteristics  $T_A = 25^\circ\text{C}$  ( $V_{CC} = 5.0\text{ V}$ ,  $V_{EE} = \text{Gnd}$ ,  $T_A = 25^\circ\text{C}$ , unless otherwise noted.)

Parameter	Symbol	Test conditions	Min	Typ	Max	Unit
Input Offset Voltage	$V_{IO}$	$V_{CC} = 5.0\text{ V}$ to $30\text{ V}$ , $V_{IC} = 0\text{ V}$ to $V_{CC} - 1.7\text{ V}$ $V_O \approx 1.4\text{ V}$ , $R_S = 0\Omega$ $T_A = 25^\circ\text{C}$		2.0	7.0	mV
		$T_A = T_{High} *5$			9.0	
		$T_A = T_{Low} *5$			9.0	
Average Temperature Coefficient of Input Offset Voltage	$\Delta V_{IO}/\Delta T$	$T_A = T_{High}$ to $T_{Low} *5$		7.0		$\mu\text{V}/^\circ\text{C}$
Input Offset Current	$I_{IO}$	$T_A = T_{High}$ to $T_{Low} *5$		5.0	50	nA
					150	
Input Bias Current	$I_{IB}$	$T_A = T_{High}$ to $T_{Low} *5$		-45	-250	nA
					-50	
Average Temperature Coefficient of Input Offset Current	$\Delta I_{IO}/\Delta T$	$T_A = T_{High}$ to $T_{Low} *5$		10		$\text{pA}/^\circ\text{C}$
Input Common Mode Voltage Range *6	$V_{ICR}$	$V_{CC} = 30\text{ V}$	0		28.3	V
		$V_{CC} = 30\text{ V}$ , $T_A = T_{High}$ to $T_{Low}$	0		28	
Differential Input Voltage Range	$V_{IDR}$				$V_{CC}$	V
Large Signal Open Loop Voltage Gain	$A_{VOL}$	$R_L = 2.0\text{ k}\Omega$ , $V_{CC} = 15\text{ V}$ , For Large $V_O$ Swing, $T_A = T_{High}$ to $T_{Low}$	25	100		V/mV
			15			
Channel Separation	$C_S$	$1.0\text{ kHz} \leq f \leq 20\text{ kHz}$ , Input Referenced		-120		dB
Common Mode Rejection	CMR	$R_S \leq 10\text{ k}\Omega$	65	70		dB
Power Supply Rejection	PSR		65	100		dB
Output Voltage-High Limit	$V_{OH}$	$T_A = T_{High}$ to $T_{Low} *5$ $V_{CC} = 5.0\text{ V}$ , $R_L = 2.0\text{ k}\Omega$ , $T_A = 25^\circ\text{C}$ $V_{CC} = 30\text{ V}$ , $R_L = 2.0\text{ k}\Omega$ $V_{CC} = 30\text{ V}$ , $R_L = 10\text{ k}\Omega$	3.3	3.5		V
			26			
			27	28		
Output Voltage-Low Limit	$V_{OL}$	$V_{CC} = 5.0\text{ V}$ , $R_L = 10\text{ k}\Omega$ $T_A = T_{High}$ to $T_{Low} *5$		5	20	mV
Output Source Current	$I_{O+}$	$V_{ID} = +1.0\text{ V}$ , $V_{CC} = 15\text{ V}$	20	40		mA
Output Sink Current	$I_{O-}$	$V_{ID} = -1.0\text{ V}$ , $V_{CC} = 15\text{ V}$	10	20		mA
		$V_{ID} = -1.0\text{ V}$ , $V_O = 200\text{ mV}$	12	50		$\mu\text{A}$
Output Short Circuit to Ground *7	$I_{SC}$			40	60	mA
Power Supply Current (Total Device)	$I_{CC}$	$T_A = T_{High}$ to $T_{Low} *5$ $V_{CC} = 30\text{ V}$ , $V_O = 0\text{ V}$ , $R_L = \infty$ $V_{CC} = 5\text{ V}$ , $V_O = 0\text{ V}$ , $R_L = \infty$		1.5	3.0	mA
				0.7	1.2	

\*5  $T_{Low} = 0^\circ\text{C}$ ,  $T_{High} = +70^\circ\text{C}$ \*6 The input common mode voltage or either input signal voltage should not be allowed to go negative by more than 0.3 V. The upper end of the common mode voltage range is  $V_{CC} - 1.7\text{ V}$ .

\*7 Short circuits from the output to VCC can cause excessive heating and eventual destruction. Destructive dissipation can result from simultaneous shorts on all amplifiers.

## ■ Marking

Marking	LM358
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# LM358 (KM358)

## Typical Characteristics

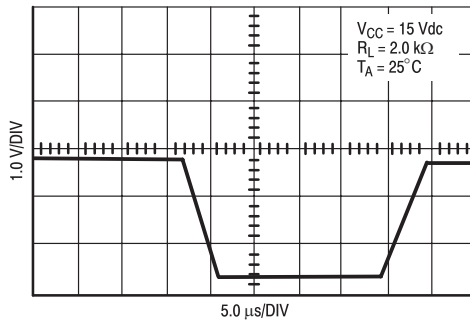


Figure 1. Large Signal Voltage Follower Response

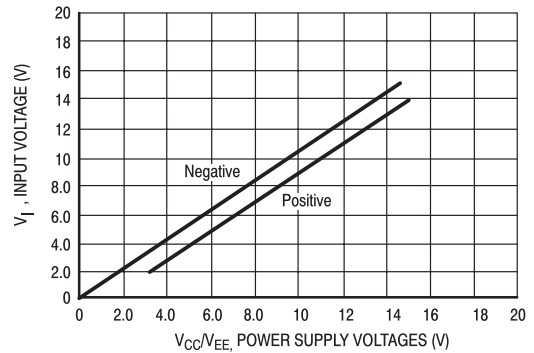


Figure 2. Input Voltage Range

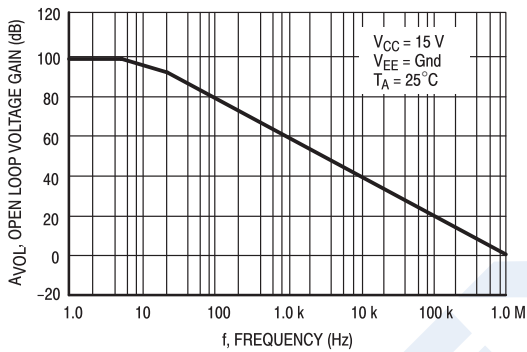


Figure 3. Large-Signal Open Loop Voltage Gain

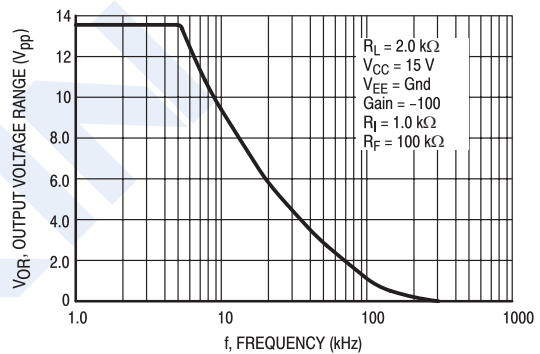


Figure 4. Large-Signal Frequency Response

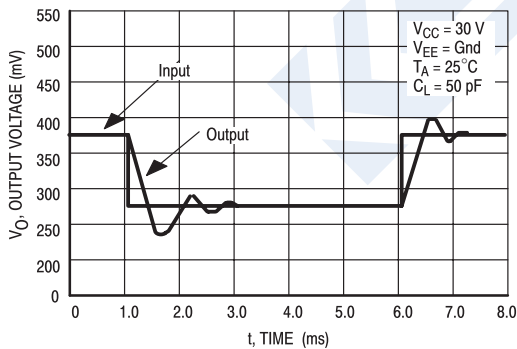


Figure 5. Small Signal Voltage Follower Pulse Response (Noninverting)

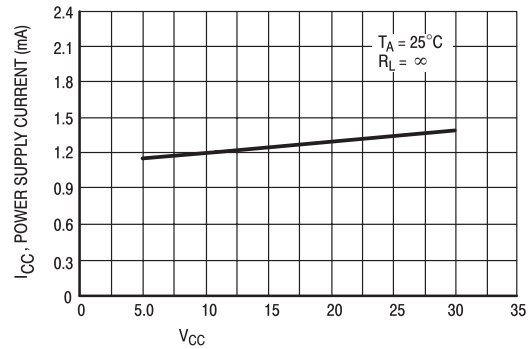


Figure 6. Power Supply Current versus Power Supply Voltage

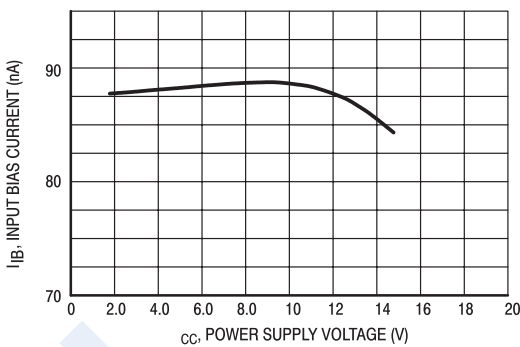


Figure 7. Input Bias Current versus Supply Voltage

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