



## LM358

## LINEAR INTEGRATED CIRCUIT

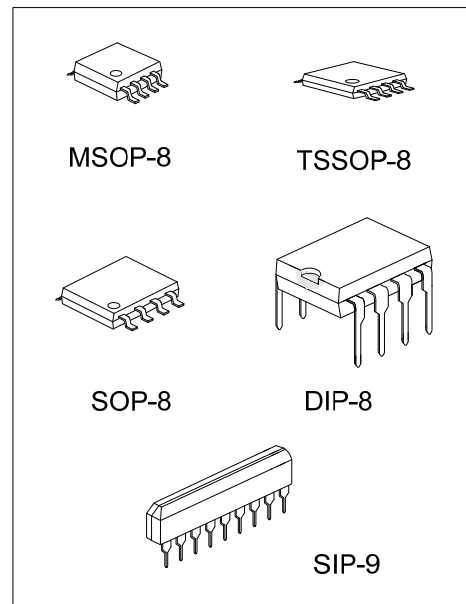
### DUAL OPERATIONAL AMPLIFIER

#### DESCRIPTION

The UTC **LM358** consists of two independent high gain, internally frequency compensated operational amplifier. It can be operated from a single power supply and also split power supplies.

#### FEATURES

- \*Internally frequency compensated for unity gain.
- \*Wide power supply range 3V - 32V.
- \*Input common-mode voltage range include ground.
- \*Large DC voltage gain.



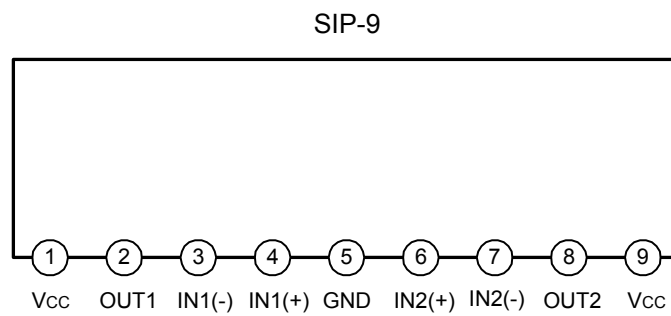
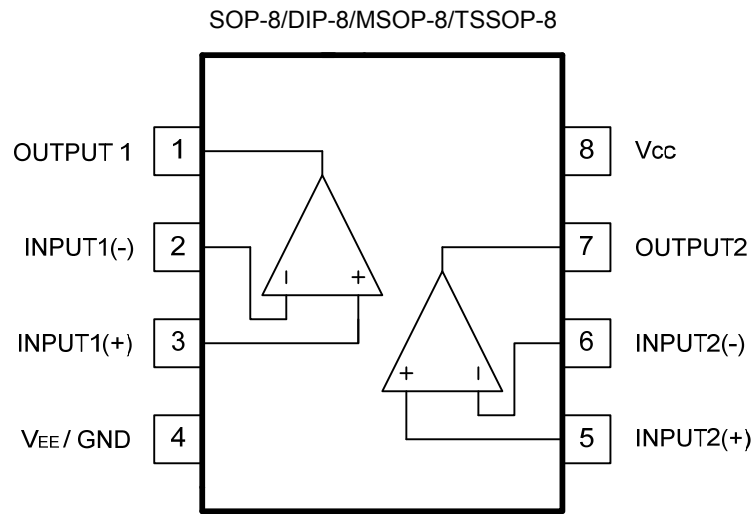
Lead-free: LM358L  
Halogen-free: LM358G

#### ORDERING INFORMATION

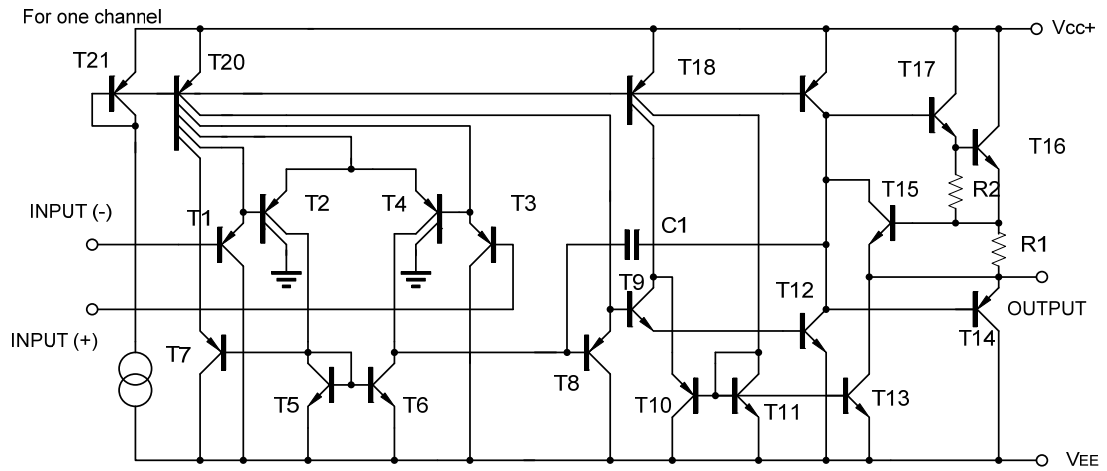
Normal	Ordering Number		Package	Packing
	Lead Free Plating	Halogen-Free		
LM358-D08-T	LM358L-D08-T	LM358G-D08-T	DIP-8	Tube
LM358-G09-T	LM358L-G09-T	LM358G-G09-T	SIP-9	Tube
LM358-P08-R	LM358L-P08-R	LM358G-P08-R	TSSOP-8	Tape Reel
LM358-P08-T	LM358L-P08-T	LM358G-P08-T	TSSOP-8	Tube
LM358-S08-R	LM358L-S08-R	LM358G-S08-R	SOP-8	Tape Reel
LM358-S08-T	LM358L-S08-T	LM358G-S08-T	SOP-8	Tube
LM358-SM1-R	LM358L-SM1-R	LM358G-SM1-R	MSOP-8	Tape Reel
LM358-SM1-T	LM358L-SM1-T	LM358G-SM1-T	MSOP-8	Tube

<p>LM358L-D08-T</p> <p>(1)Packing Type (2)Package Type (3)Lead Plating</p>	<p>(1) R: Tape Reel, T: Tube (2) D08: DIP-8, G09: SIP-9, S08: SOP-8, SM1: MSOP-8, P08: TSSOP-8 (3) G: Halogen Free, L: Lead Free Plating, Blank: Pb/Sn</p>
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## ■ PIN DESCRIPTION



## ■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

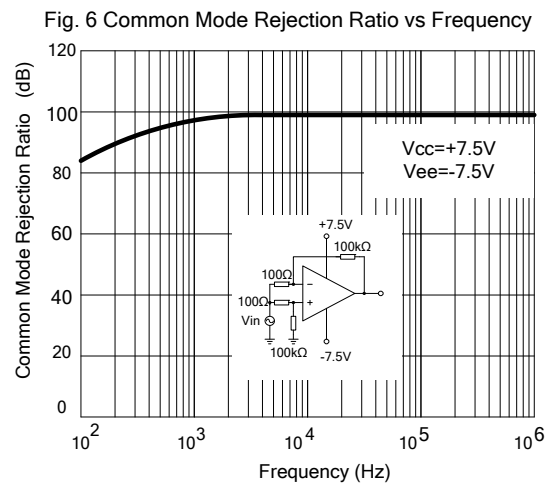
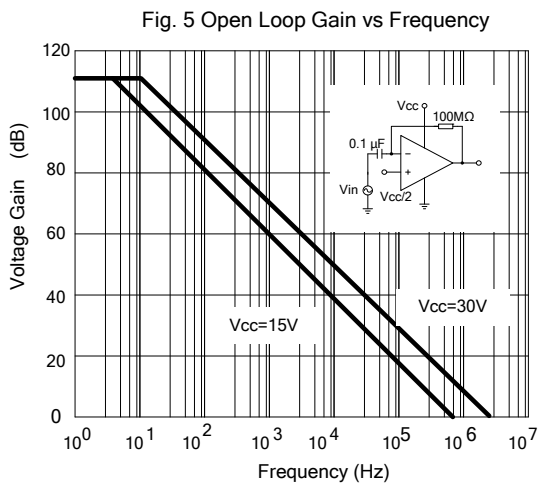
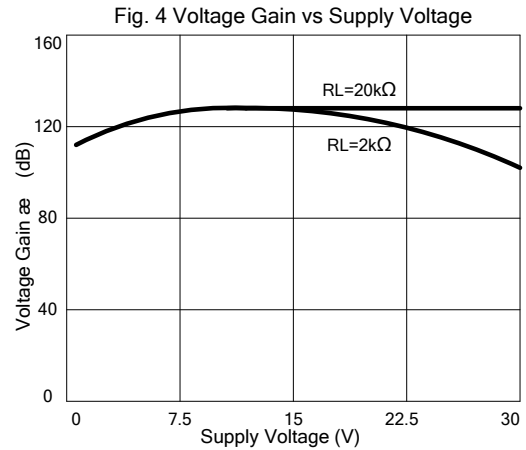
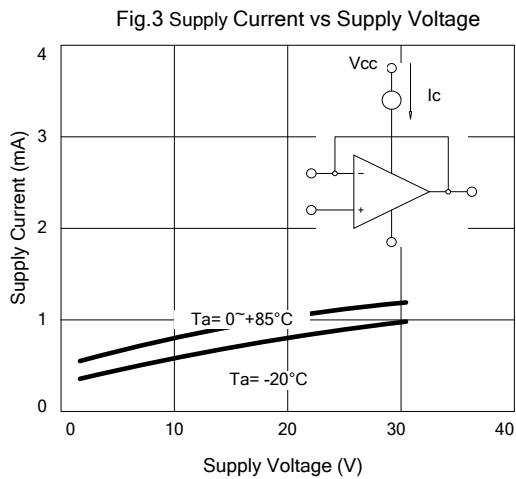
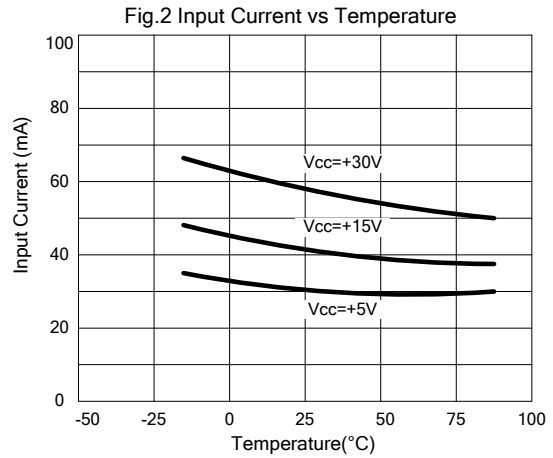
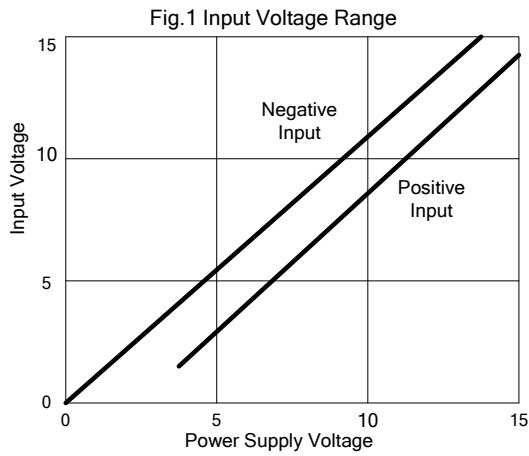
PARAMETER		SYMBOL	RATINGS	UNIT
Supply Voltage		$V_{CC}$	$\pm 16$ or 32	V
Differential Input Voltage		$V_{I(DIFF)}$	$\pm 32$	V
Input Voltage		$V_I$	-0.3 ~ +32	V
Output Short to Ground			Continuous	
Power Dissipation	SIP-9	$P_D$	750	mW
	DIP-8		625	
	SOP-8		440	
	TSSOP-8		360	
	MSOP-8		300	
Junction Temperature		$T_J$	+125	$^{\circ}\text{C}$
Operating Temperature		$T_{OPR}$	-40 ~ +85	$^{\circ}\text{C}$
Storage Temperature		$T_{STG}$	-65 ~ +150	$^{\circ}\text{C}$

Note Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ ELECTRICAL CHARACTERISTICS ( $V_{CC}=5.0\text{V}$ ,  $V_{EE}=\text{GND}$ ,  $T_a=25^{\circ}\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Offset Voltage	$V_{I(OFF)}$	$V_{CM}=0\text{V to }V_{CC}-1.5\text{V}$ $V_{O(P)}=1.4\text{V}$ , $R_S=0\Omega$		2.9	7.0	mV
Input Common Mode Voltage	$V_{I(CM)}$	$V_{CC}=30\text{V}$	0		$V_{CC}-1.5$	V
Differential Input Voltage	$V_{I(DIFF)}$				$V_{CC}$	V
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
	$V_{OL}$	$V_{CC}=5\text{V}$ , $R_L \geq 10\text{K}\Omega$		5	20	mV
Large Signal Voltage Gain	$G_v$	$V_{CC}=15\text{V}$ , $R_L \geq 2\text{K}\Omega$ $V_{O(P)}=1\text{V} \sim 11\text{V}$	25	100		V/mV
Power Supply Current	$I_{CC}$	$R_L=\infty$ , $V_{CC}=30\text{V}$		0.8	2.0	mA
		$R_L=\infty$ , Full Temperature Range		0.5	1.2	mA
Input Offset Current	$I_{I(OFF)}$			5	50	nA
Input Bias Current	$I_{I(BIAS)}$			45	250	nA
Short Circuit Current to Ground	$I_{SC}$			40	60	mA
Output Current	$I_{SOURCE}$	$V_I(+)=1\text{V}$ , $V_I(-)=0\text{V}$ $V_{CC}=15\text{V}$ , $V_{O(P)}=2\text{V}$	10	30		mA
		$V_I(+)=0\text{V}$ , $V_I(-)=1\text{V}$ $V_{CC}=15\text{V}$ , $V_{O(P)}=2\text{V}$	10	15		mA
	$I_{SINK}$	$V_I(+)=0\text{V}$ , $V_I(-)=1\text{V}$ $V_{CC}=15\text{V}$ , $V_{O(P)}=200\text{mV}$	12	100		$\mu\text{A}$
Common Mode Rejection Ratio	CMRR		65	80		dB
Power Supply Rejection Ratio	PSRR		65	100		dB
Channel Separation	CS	$f=1\text{KHZ} \sim 20\text{KHZ}$		120		dB

## TYPICAL CHARACTERISTICS



## TYPICAL CHARACTERISTICS(Cont.)

Fig. 7 Voltage Follower Pulse Response

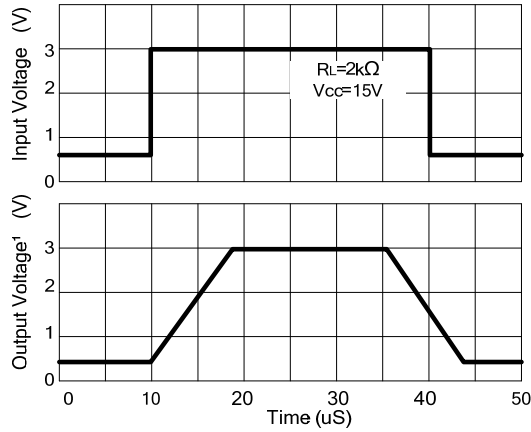


Fig. 8 Voltage Follower Response (Small Signal)

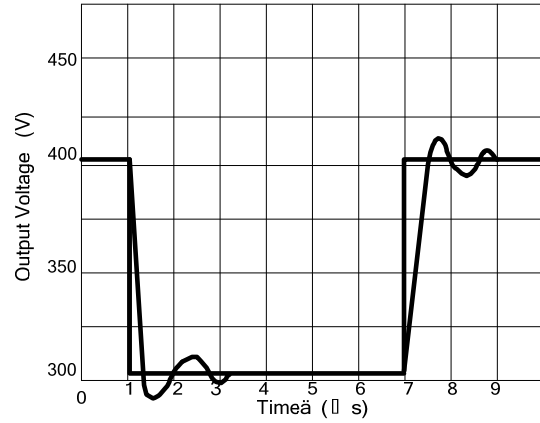


Fig. 9 Gain vs Large Signal Frequency

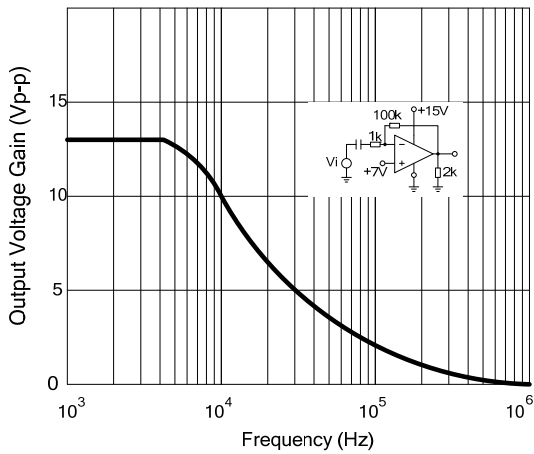


Fig. 10 Output Source Current vs Output Voltage

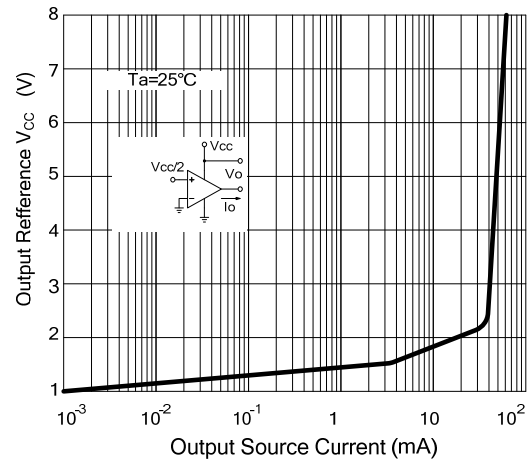


Fig. 11 Output Sink Current vs Output Voltage

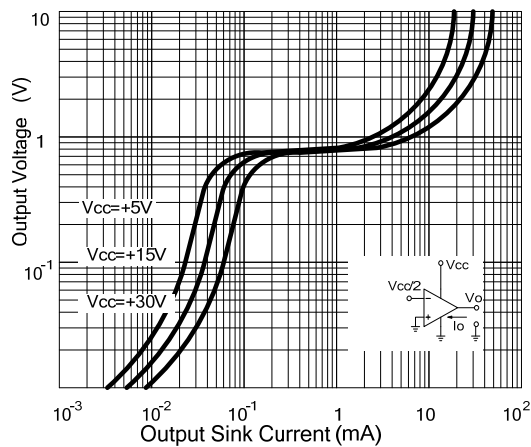
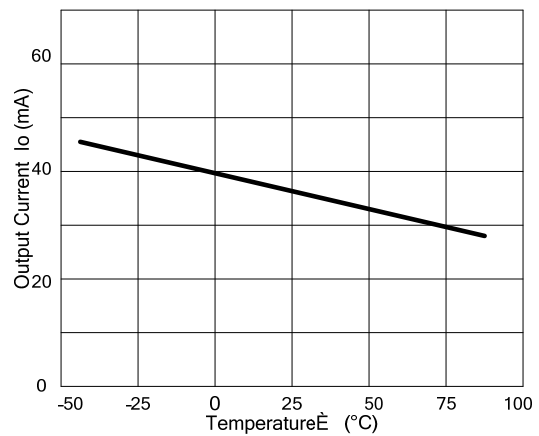


Fig.12 Current Limiting vs Temperature



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