



# LM358

## LINEAR INTEGRATED CIRCUIT

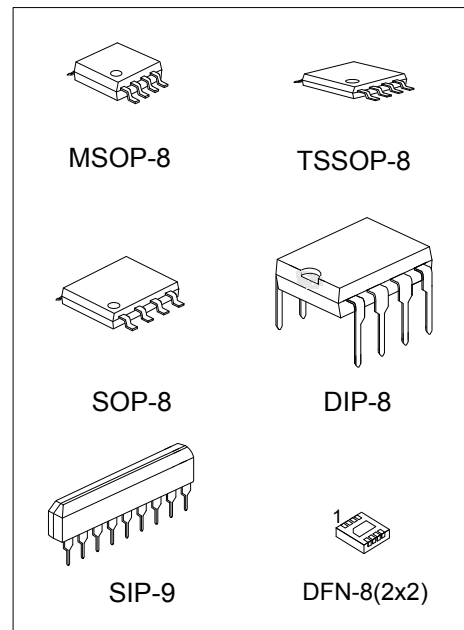
### DUAL OPERATIONAL AMPLIFIER

#### 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.



#### ORDERING INFORMATION

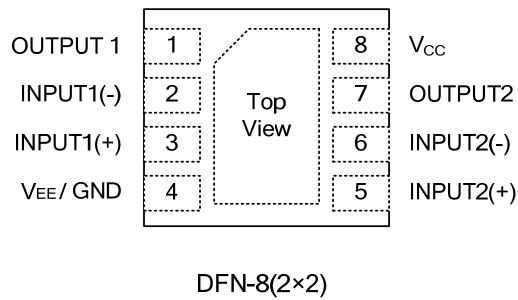
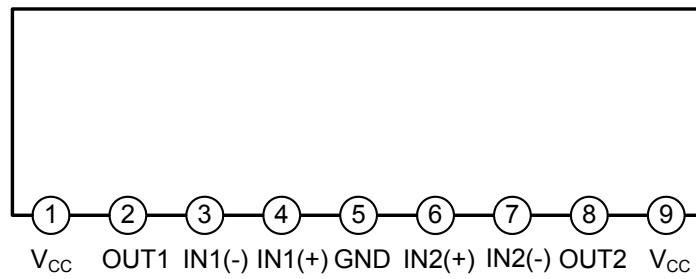
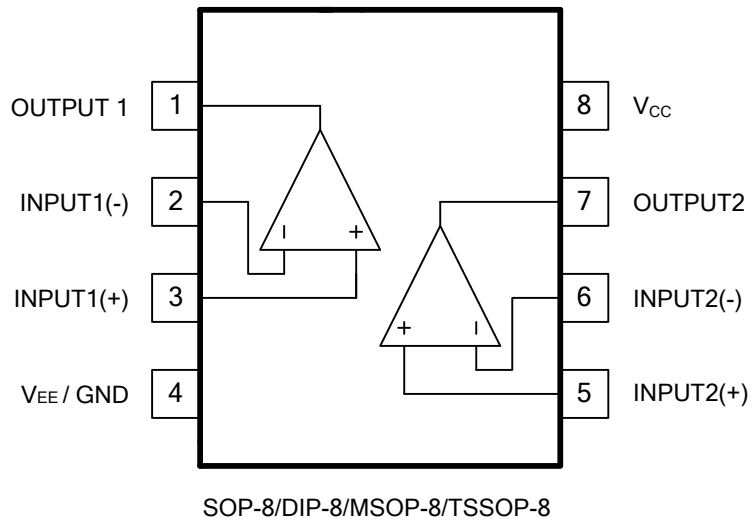
Ordering Number		Package	Packing
Lead Free	Halogen-Free		
LM358L-D08-T	LM358G-D08-T	DIP-8	Tube
-	LM358G-G09-T	SIP-9	Tube
-	LM358G-P08-R	TSSOP-8	Tape Reel
-	LM358G-S08-R	SOP-8	Tape Reel
-	LM358G-SM1-R	MSOP-8	Tape Reel
-	LM393G-K08-2020-R	DFN-8(2x2)	Tape Reel

<p>LM358L-D08-T</p>	<p>(1) T: Tube, R: Tape Reel                  (2) D08: DIP-8, G09: SIP-9, S08: SOP-8,                  P08: TSSOP-8, SM1: MSOP-8,                  K08-2020: DFN-8(2x2)                  (3) L: Lead Free, G: Halogen Free and Lead Free</p>
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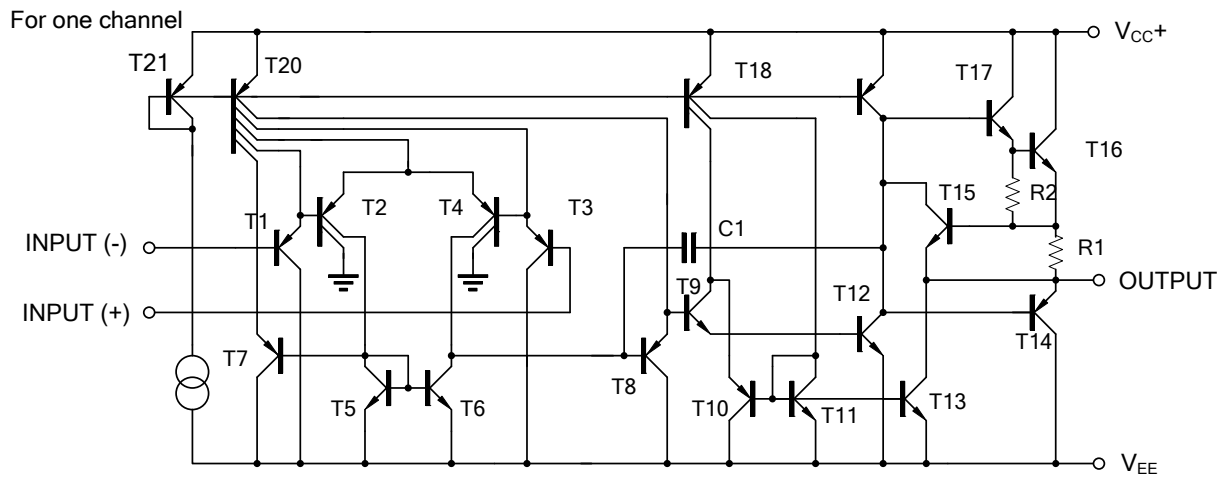
#### MARKING

DIP-8	SOP-8/MSOP-8	TSSOP-8
<p>UTC □□□□ LM358 □ □□</p> <p>8 7 6 5 → Date Code                  L: Lead Free                  G: Halogen Free                  □□ → Lot Code                  1 2 3 4</p>	<p>UTC □□□□ LM358G □ □□</p> <p>8 7 6 5 → Date Code                  □□ → Lot Code                  1 2 3 4</p>	<p>UTC □□□□ LM358G □ □□</p> <p>8 7 → Date Code                  6 5 → Lot Code                  1 2 3 4</p>
SIP-9	DFN-8(2x2)	
<p>UTC □□□□ LM358G □ □□</p> <p>→ Date Code                  □□ → Lot Code                  1 2 3 4 5 6 7 8 9</p>	<p>M58C □□□□ □□□□ → Date Code</p>	

■ 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	
	DFN-8(2x2)		830	
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	$V_{I(OFF)}$	$V_{CM}=0\text{V to }V_{CC}-1.5\text{V}$ $V_{O(P)}=1.4\text{V}$ , $R_S=0\Omega$		2.0	5.0	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	70	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

Fig.1 Input Voltage Range

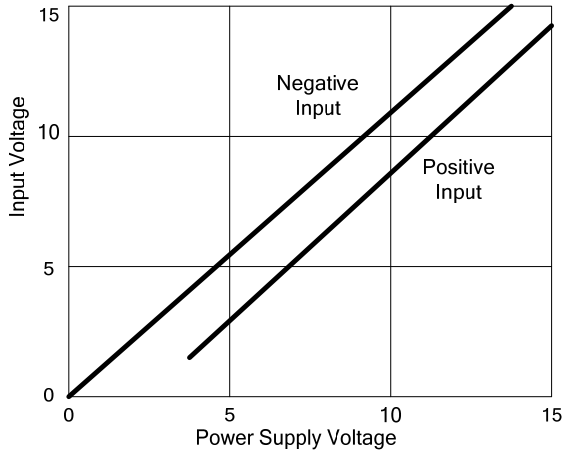


Fig.2 Input Current vs Temperature

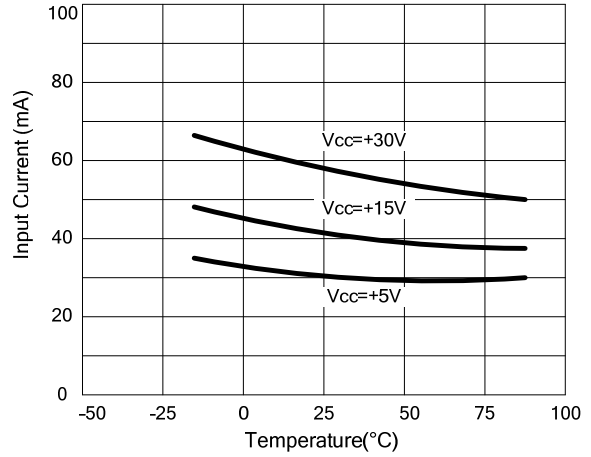


Fig.3 Supply Current vs Supply Voltage

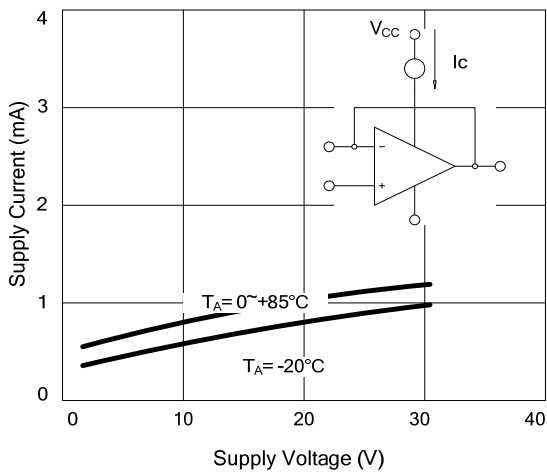


Fig. 4 Voltage Gain vs Supply Voltage

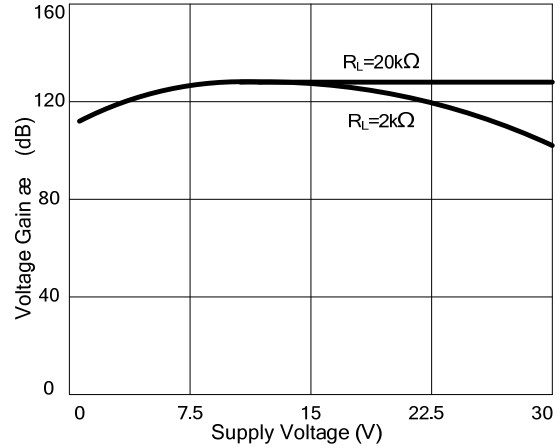


Fig. 5 Open Loop Gain vs Frequency

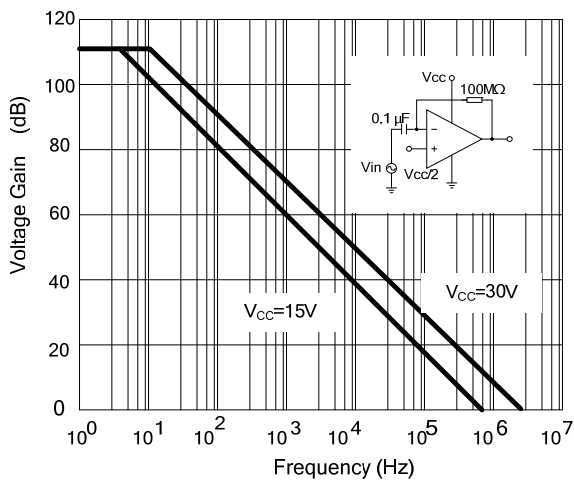
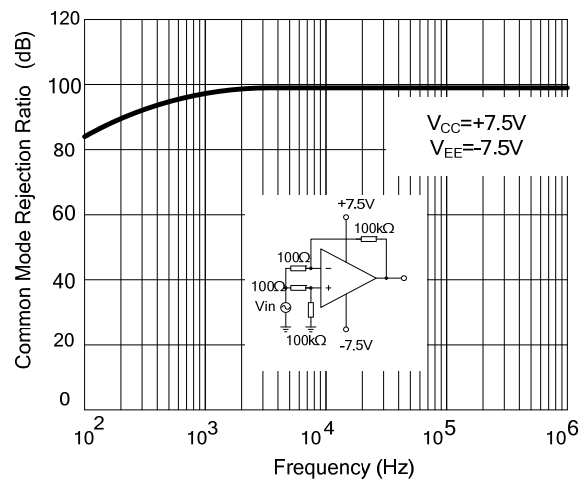


Fig. 6 Common Mode Rejection Ratio vs Frequency



## TYPICAL CHARACTERISTICS(Cont.)

Fig. 7 Voltage Follower Pulse Response

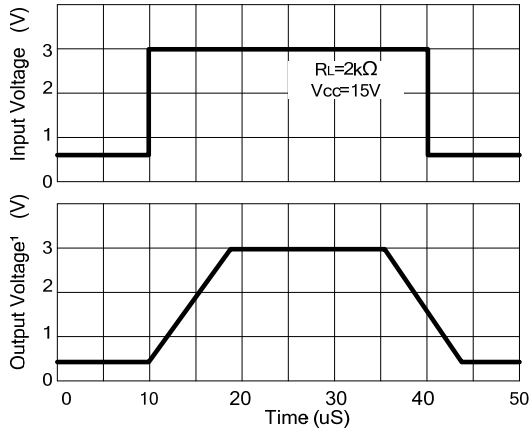


Fig. 8 Voltage Follower Response (Small Signal)

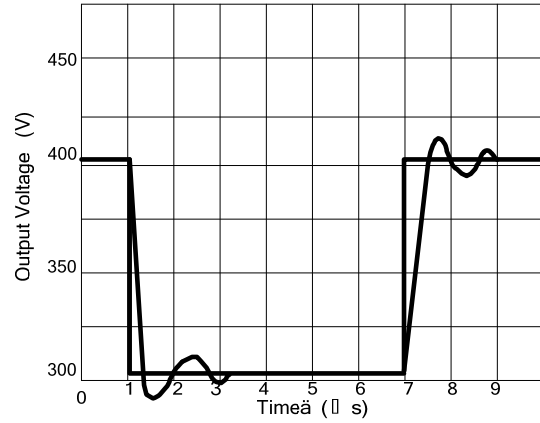


Fig. 9 Gain vs Large Signal Frequency

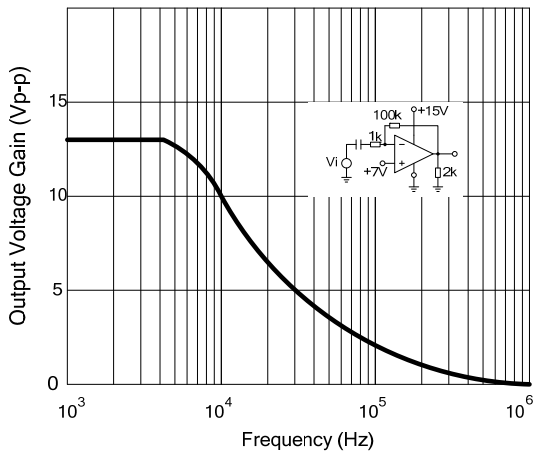


Fig. 10 Output Source Current vs Output Voltage

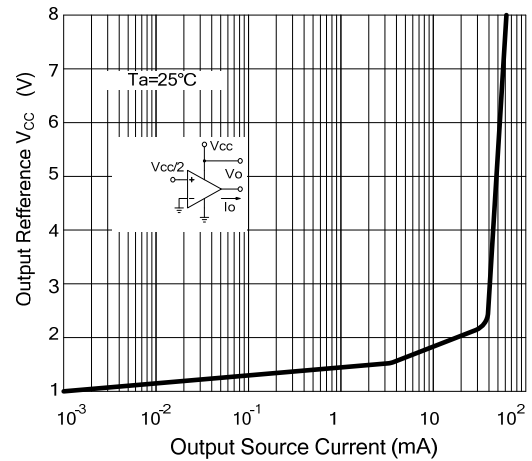


Fig. 11 Output Sink Current vs Output Voltage

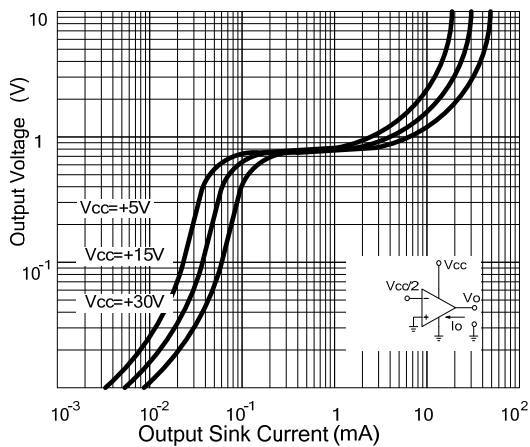
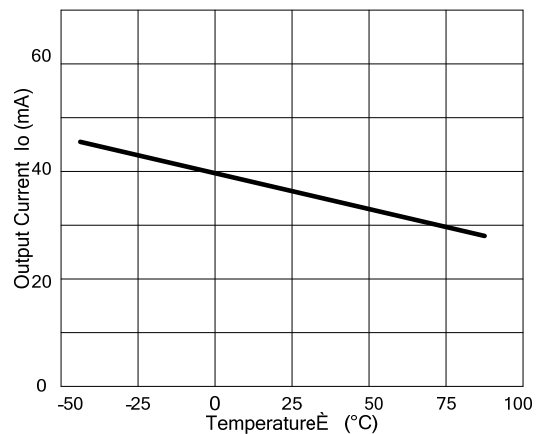


Fig.12 Current Limiting vs Temperature



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