



# LM358B

## LINEAR INTEGRATED CIRCUIT

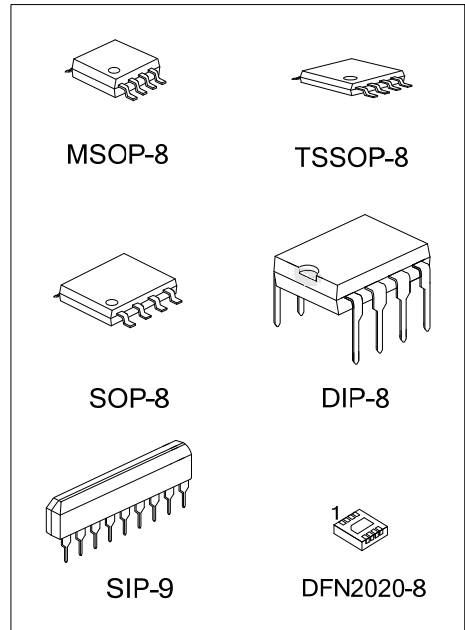
### DUAL OPERATIONAL AMPLIFIER

#### DESCRIPTION

The UTC **LM358B** 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 - 36V.
- \*Input common-mode voltage range include ground.
- \*Large DC voltage gain.
- \*High ESD (2kV, HBM)



#### ORDERING INFORMATION

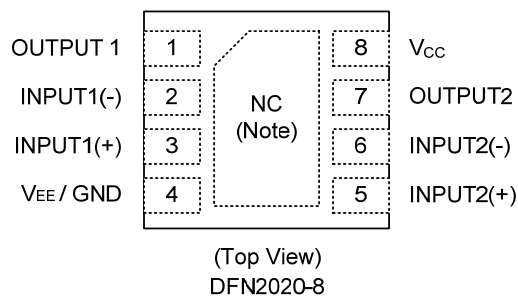
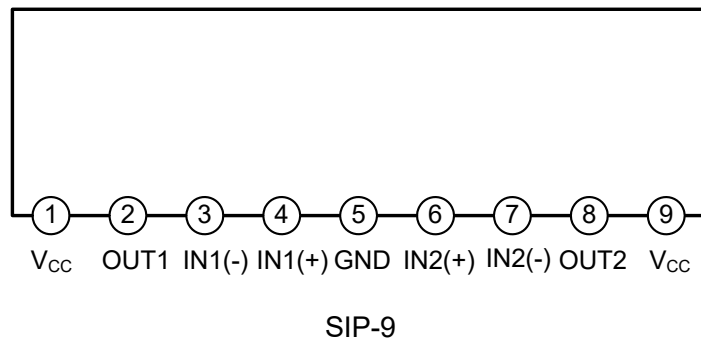
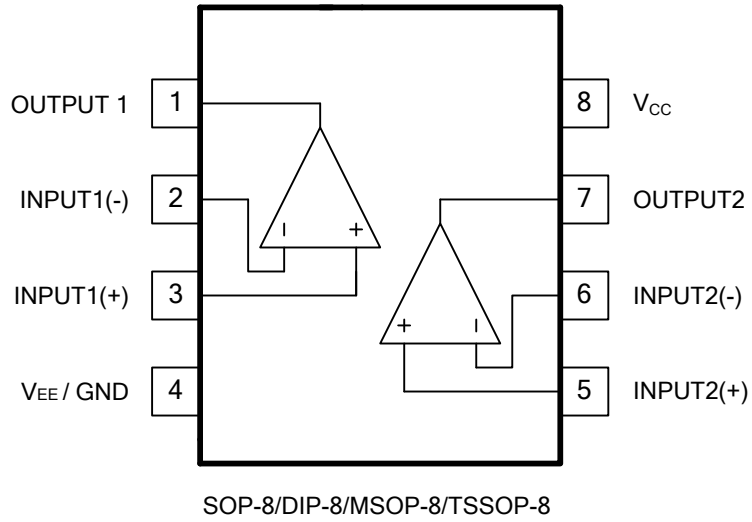
Ordering Number		Package	Packing
Lead Free	Halogen-Free		
LM358BL-D08-T	LM358BG-D08-T	DIP-8	Tube
LM358BL-L09-T	LM358BG-G09-T	SIP-9	Tube
LM358BL-P08-R	LM358BG-P08-R	TSSOP-8	Tape Reel
LM358BL-S08-R	LM358BG-S08-R	SOP-8	Tape Reel
LM358BL-SM1-R	LM358BG-SM1-R	MSOP-8	Tape Reel
LM358BL-K08-2020-R	LM358BG-K08-2020-R	DFN2020-8	Tape Reel

<p>LM358BG-D08-T</p> <p>(1) Packing Type (2) Package Type (3) Green Package</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: DFN2020-8 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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#### MARKING

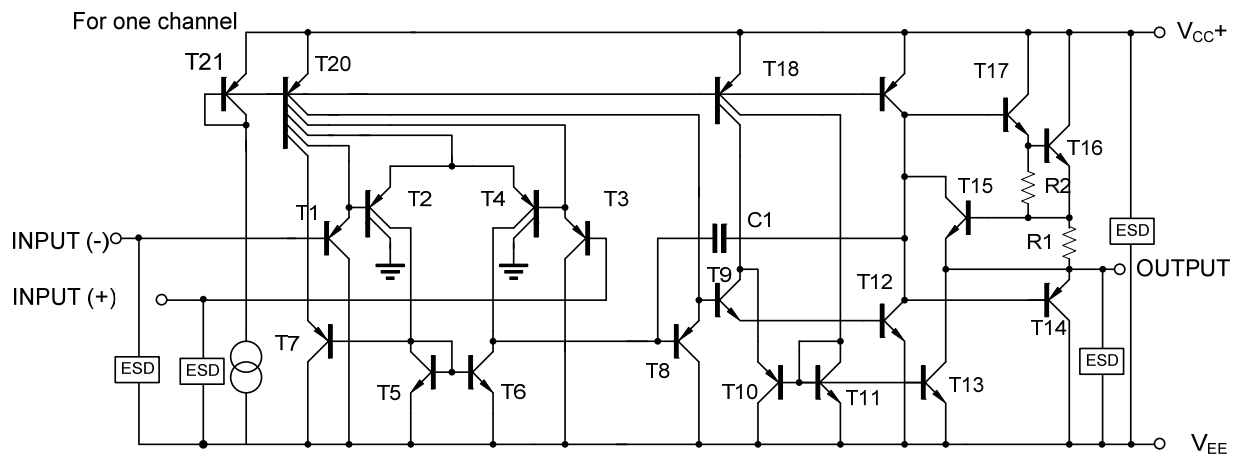
<p><b>DIP-8</b></p> <p>UTC □□□□ → Date Code L: Lead Free G: Halogen Free □□ → Lot Code</p>	<p><b>SOP-8/MSOP-8</b></p> <p>UTC □□□□ → Date Code L: Lead Free G: Halogen Free □□ → Lot Code</p>	<p><b>TSSOP-8</b></p> <p>UTC □□□□ → Date Code L: Lead Free G: Halogen Free □□ → Lot Code</p>
<p><b>SIP-9</b></p> <p>UTC □□□□ → Date Code L: Lead Free G: Halogen Free □□ → Lot Code</p>	<p><b>DFN2020-8</b></p> <p>M58B □□□□ → Date Code</p>	

### ■ PIN DESCRIPTION



Note: No connect.

## ■ BLOCK DIAGRAM



### ■ ABSOLUTE MAXIMUM RATINGS

PARAMETER		SYMBOL	RATINGS	UNIT
Supply Voltage		$V_{CC}$	$\pm 20$ or 40	V
Differential Input Voltage		$V_{I(DIFF)}$	$\pm 32$	V
Input Voltage		$V_I$	-0.3 ~ +40	V
Output Short to Ground			Continuous	
Power Dissipation	SIP-9	$P_D$	750	mW
	DIP-8		625	mW
	SOP-8		440	mW
	TSSOP-8		360	mW
	MSOP-8		300	mW
	DFN2020-8		830	mW
Electrostatic Discharge	Human-Body Model (HBM) Per JESD22-A114/115	$V_{(ESD)}$	2000	V
Junction Temperature		$T_J$	+150	$^{\circ}\text{C}$
Operating Temperature (Note 2)		$T_{OPR}$	-20 ~ +85	$^{\circ}\text{C}$
Storage Temperature		$T_{STG}$	-65 ~ +150	$^{\circ}\text{C}$

Notes: 1. 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.  
2. It is guarantee by design, not 100% be tested.

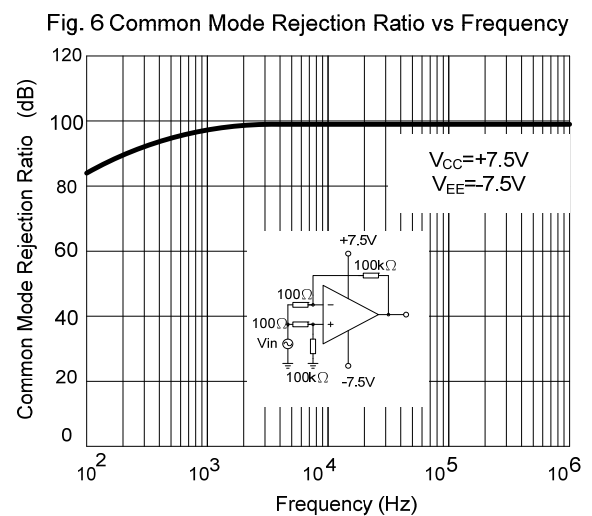
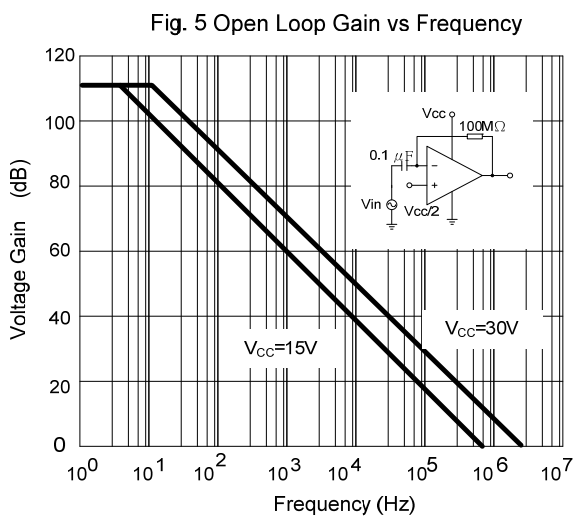
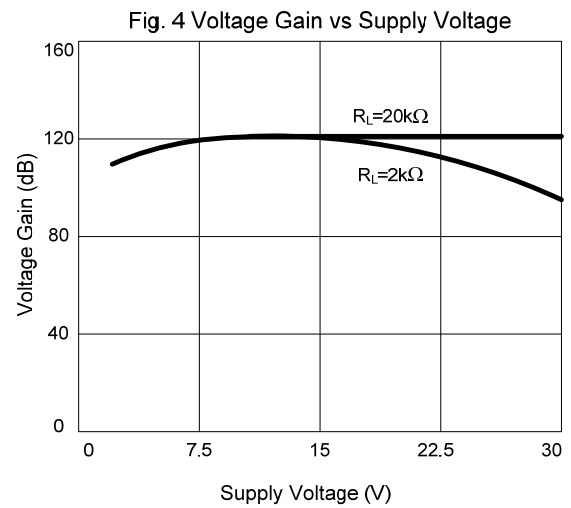
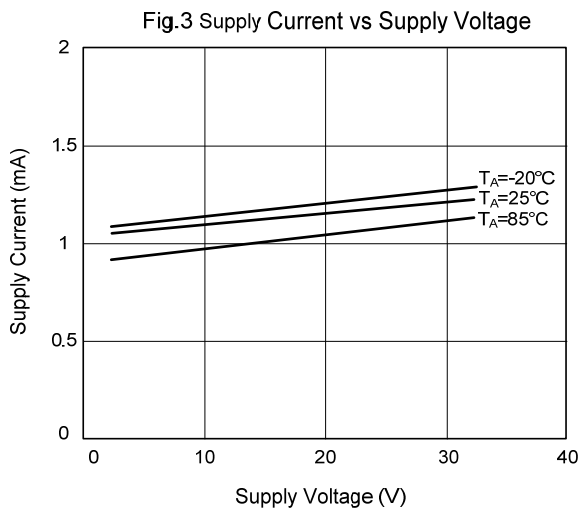
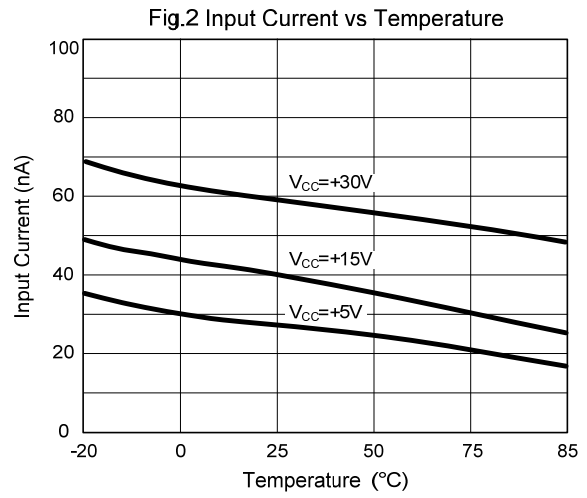
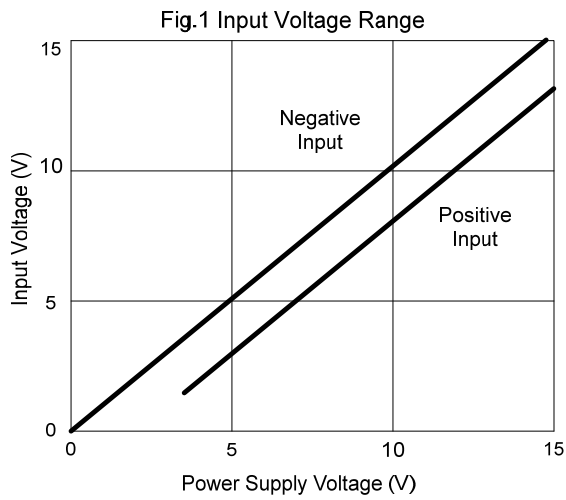
### ■ ELECTRICAL CHARACTERISTICS ( $V_{CC} - V_{EE} = 5\sim 36\text{V}$ , $T_A = 25^{\circ}\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
Input Offset Voltage	$V_{OS}$			1.0	3.0	mV	
		$T_{MIN} < T_A < T_{MAX}$			4.0	mV	
Input Offset Voltage Drift	$\Delta V_{OS}/\Delta T$			8		$\mu\text{V}/^{\circ}\text{C}$	
Input Common Mode Voltage	$V_{I(CM)}$	$V_{CC} = 3\text{V} \sim 36\text{V}$	0		$V_{CC} - 1.5$	V	
Input Offset Current	$I_{OS}$			5	20	nA	
		$T_{MIN} < T_A < T_{MAX}$			30	nA	
Input Offset Current Drift	$\Delta I_{OS}/\Delta T$			25		$\text{pA}/^{\circ}\text{C}$	
Input Bias Current	$I_B$			15	40	nA	
		$T_{MIN} < T_A < T_{MAX}$			60	nA	
Output Voltage Swing	$V_{OH}$	$I_O = 50\mu\text{A}$	$V_{CC} - 1.5$	$V_{CC} - 1.4$		V	
		$I_O = 1\text{mA}$	$V_{CC} - 1.6$	$V_{CC} - 1.5$		V	
		$I_O = 5\text{mA}$	$V_{CC} - 1.7$	$V_{CC} - 1.6$		V	
	$V_{OL}$	$I_O = 50\mu\text{A}$			20		mV
		$I_O = 1\text{mA}$			0.75	1	V
Large Signal Voltage Gain	$A_V$	$V_{CC} = 15\text{V}$ , $R_L \geq 10\text{K}\Omega$ $V_{O(P)} = 1\text{V} \sim 11\text{V}$	90	96		dB	
		$T_{MIN} < T_A < T_{MAX}$	20	95		V/mV	
Supply Current/Amplifier	$I_Q$	$R_L = \infty$ , $V_{CC} = 36\text{V}$			800	$\mu\text{A}$	
		$R_L = \infty$ , $V_{CC} = 5\text{V}$		320	460	$\mu\text{A}$	
Short Circuit Current to Ground	$I_{SC}$	$V_{CC} = \pm 10\text{V}$ , $V_O = 0\text{V}$		50	70	mA	
Output Current	$I_{SOURCE}$	$V_I(+)=1\text{V}$ , $V_I(-)=0\text{V}$ $V_{CC}=15\text{V}$ , $V_O=V_{EE}$	20	50		mA	
		$V_I(+)=0\text{V}$ , $V_I(-)=1\text{V}$ $V_{CC}=15\text{V}$ , $V_O=V_{CC}$	10	40		mA	
	$I_{SINK}$	$V_I(+)=0\text{V}$ , $V_I(-)=1\text{V}$ $V_{CC}=15\text{V}$ , $V_{O(P)}=200\text{mV}$	60	135		$\mu\text{A}$	

■ ELECTRICAL CHARACTERISTICS (Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Common Mode Rejection Ratio	CMRR		80	100		dB
		$T_{MIN} < T_A < T_{MAX}$	70			dB
Power Supply Rejection Ratio	PSRR		95	100		dB
Channel Separation	CS	$f=1\text{KHZ} \sim 20\text{KHZ}$		120		dB
Gain Bandwidth Product	GBW			1.1		MHz
Slew Rate	SR			0.6		V/ $\mu$ s

## TYPICAL CHARACTERISTICS



## TYPICAL CHARACTERISTICS (Cont.)

Fig. 7 Voltage Follower Pulse Response

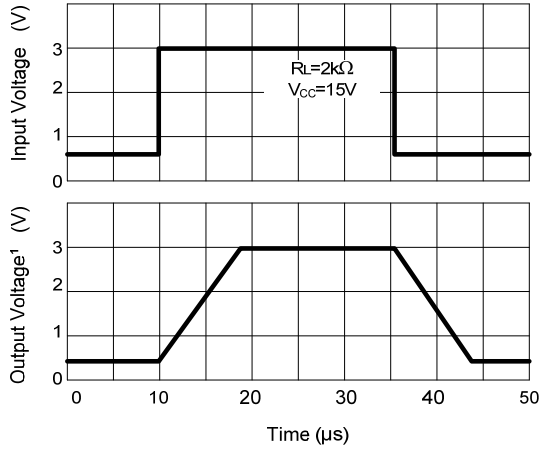


Fig. 8 Voltage Follower Response (Small Signal)

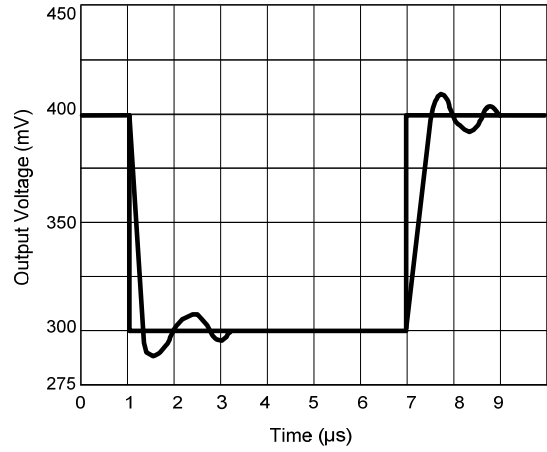


Fig. 9 Gain vs. Large Signal Frequency

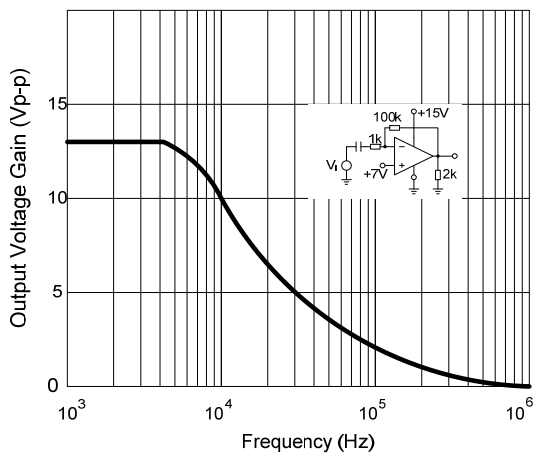


Fig. 10 Output Source Current vs Output Voltage

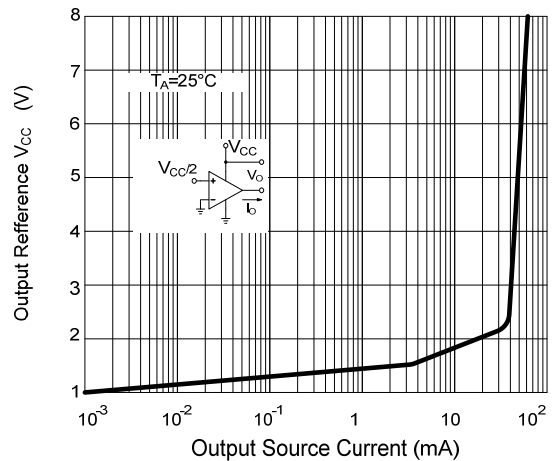


Fig. 11 Output Sink Current vs Output Voltage

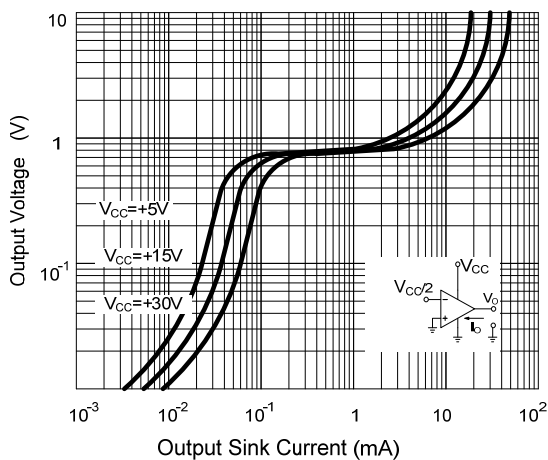
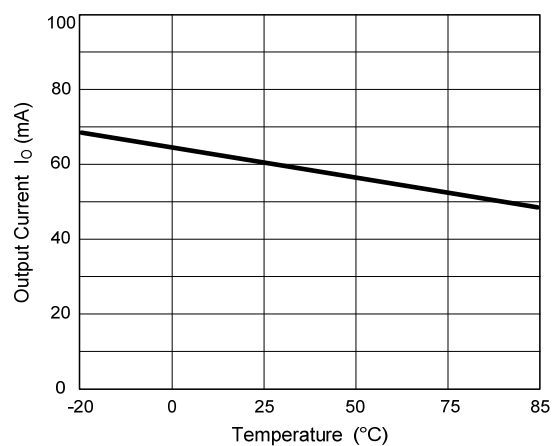


Fig. 12 Current Limiting vs Temperature



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