



# LM358B

## LINEAR INTEGRATED CIRCUIT

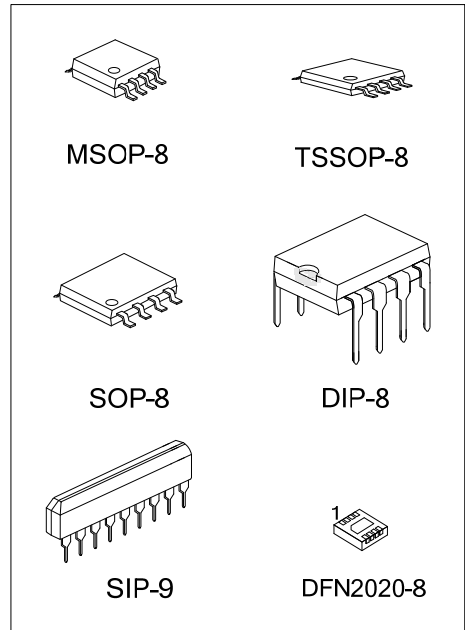
### DUAL OPERATIONAL AMPLIFIER

#### 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

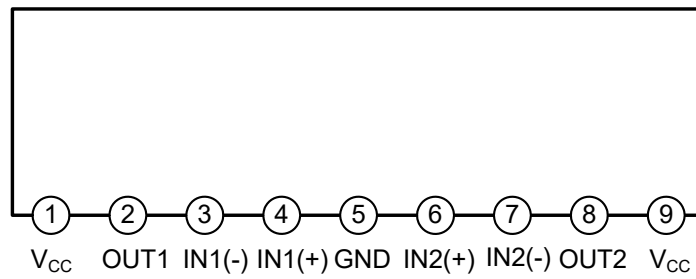
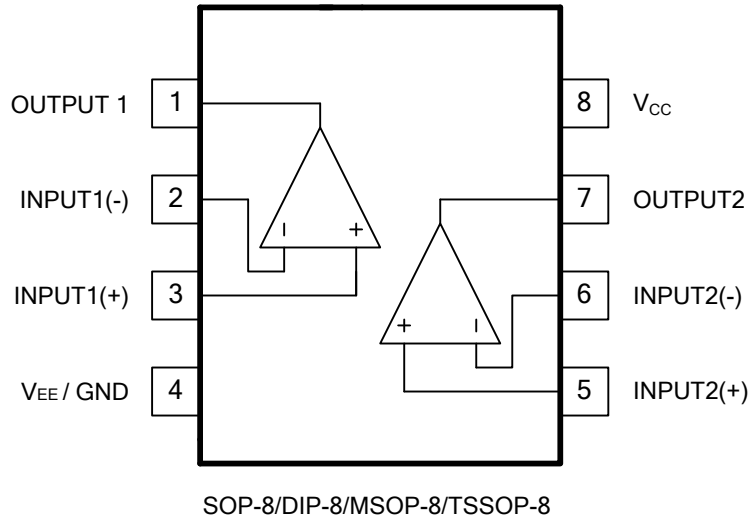
Ordering Number		Package	Packing
Lead Free	Halogen-Free		
LM358BL-D08-T	LM358BG-D08-T	DIP-8	Tube
LM358BL-L09-T	LM358BG-G09-T	SIP-9	Tube
LM358BL-P08-R	LM358BG-P08-R	TSSOP-8	Tape Reel
LM358BL-S08-R	LM358BG-S08-R	SOP-8	Tape Reel
LM358BL-SM1-R	LM358BG-SM1-R	MSOP-8	Tape Reel
LM358BL-K08-2020-R	LM358BG-K08-2020-R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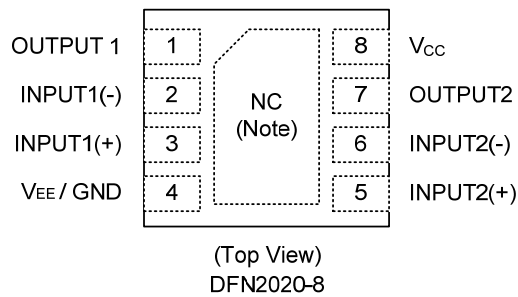
#### MARKING

<p><b>DIP-8</b></p>	<p><b>SOP-8/MSOP-8</b></p>	<p><b>TSSOP-8</b></p>
<p><b>SIP-9</b></p>		<p><b>DFN2020-8</b></p>

### ■ PIN DESCRIPTION

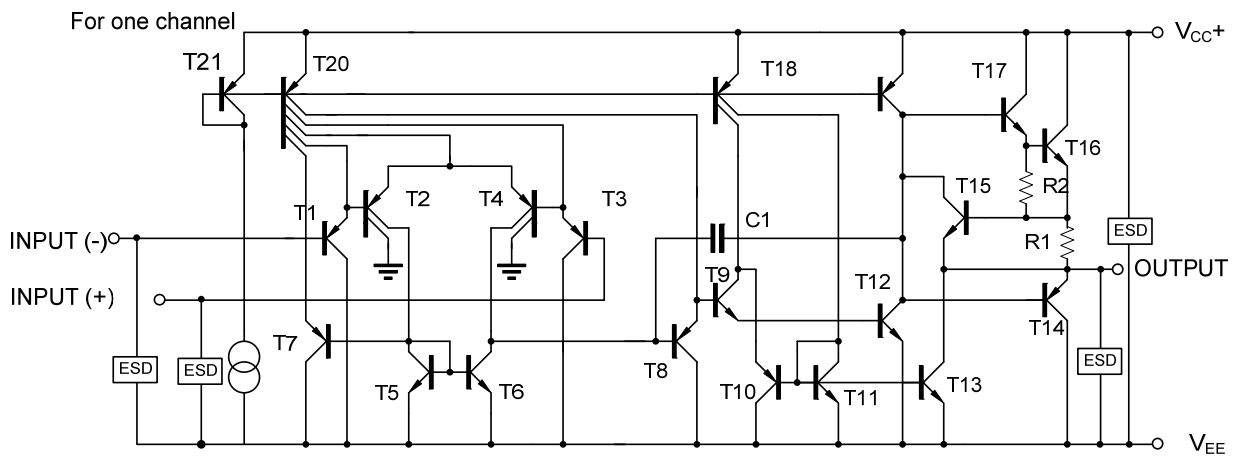


SIP-9



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	°C
Operating Temperature (Note 2)		$T_{OPR}$	-40 ~ +85	°C
Storage Temperature		$T_{STG}$	-65 ~ +150	°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 ( $V_{CC} - V_{EE} = 5 \sim 36V$ , $T_A = 25^\circ C$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Current/Amplifier	$I_Q$	$R_L = \infty$ , $V_{CC} = 5V$ $T_A = \text{Full Range}$		320	460	$\mu A$
		$R_L = \infty$ , $V_{CC} = 36V$ $T_A = \text{Full Range}$			800	$\mu A$
Power Supply Rejection Ratio	PSRR		95	100		dB
Input Offset Voltage	$V_{OS}$			1.0	3.0	mV
		$T_A = \text{Full Range}$			4.0	mV
Input Offset Voltage Drift	$\Delta V_{OS} / \Delta T$			8		$\mu V / ^\circ C$
Input Offset Current	$I_{OS}$			5	20	nA
		$T_A = \text{Full Range}$			30	nA
Input Offset Current Drift	$\Delta I_{OS} / \Delta T$			25		$pA / ^\circ C$
Input Bias Current	$I_B$			15	40	nA
		$T_A = \text{Full Range}$			60	nA
Input Common Mode Voltage	$V_{I(CM)}$	$V_{CC} = 3V \sim 36V$	0		$V_{CC} - 1.5$	V
		$V_{CC} = 5V \sim 36V$ , $T_A = \text{Full Range}$	0		$V_{CC} - 2.0$	V
Common Mode Rejection Ratio	CMRR		80	100		dB
		$T_A = \text{Full Range}$	70			dB
Large Signal Voltage Gain	$A_V$	$V_{CC} = 15V$ , $R_L \geq 10K\Omega$ $V_{O(P)} = 1V \sim 11V$	90	96		dB
		$T_A = \text{Full Range}$	86			dB
Output Voltage Swing	$V_{OH}$	$I_O = 50\mu A$	$V_{CC} - 1.5$	$V_{CC} - 1.4$		V
		$I_O = 1mA$	$V_{CC} - 1.6$	$V_{CC} - 1.5$		V
		$I_O = 5mA$	$V_{CC} - 1.7$	$V_{CC} - 1.6$		V
	$V_{OL}$	$I_O = 50\mu A$			150	mV
$I_O = 1mA$			0.75	1	V	
Short Circuit Current	$I_{SC}$	$V_{CC} = \pm 10V$ , $V_O = 0V$		50	70	mA

■ ELECTRICAL CHARACTERISTICS (Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Current	I <sub>SOURCE</sub>	V <sub>CC</sub> =15V, V <sub>O</sub> =V <sub>EE</sub> , V <sub>I</sub> (+)=1V, V <sub>I</sub> (-)=0V	20	50		mA
		T <sub>A</sub> = Full Range	10			mA
	I <sub>SINK</sub>	V <sub>CC</sub> =15V, V <sub>O</sub> =V <sub>CC</sub> , V <sub>I</sub> (+)=0V, V <sub>I</sub> (-)=1V	10	40		mA
		T <sub>A</sub> = Full Range	5			mA
		V <sub>CC</sub> =15V, V <sub>O(P)</sub> =200mV, V <sub>I</sub> (+)=0V, V <sub>I</sub> (-)=1V	60	135		μA
Slew Rate	SR		0.6		V/μs	
Gain Bandwidth Product	GBW		1.1		MHz	
Channel Separation	CS	f=1KHZ ~ 20KHZ		120		dB

## TYPICAL CHARACTERISTICS

Fig.1 Input Voltage Range

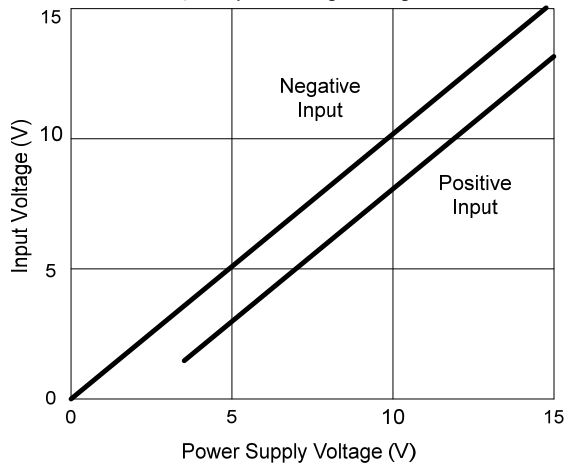


Fig. 2 Voltage Gain vs Supply Voltage

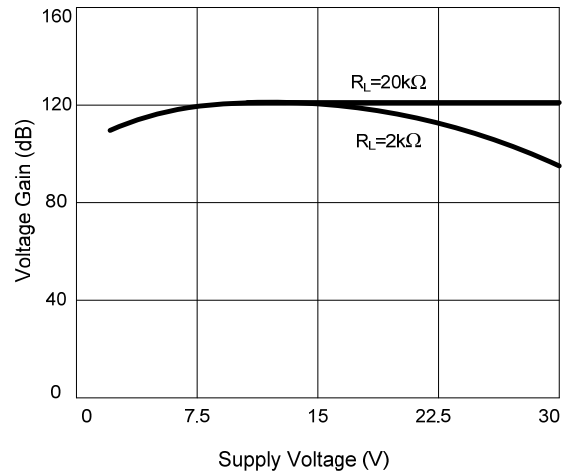


Fig. 3 Open Loop Gain vs Frequency

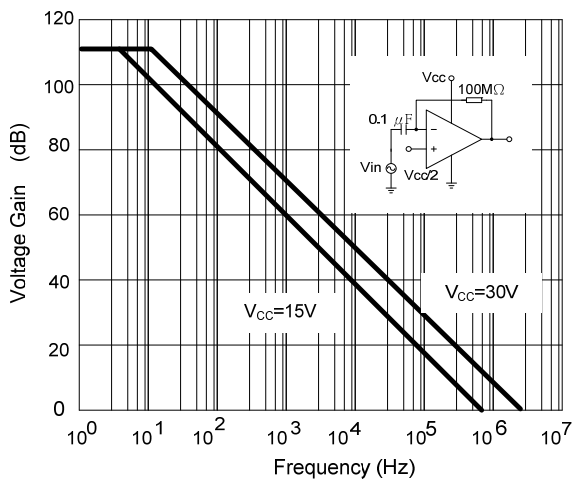


Fig. 4 Common Mode Rejection Ratio vs Frequency

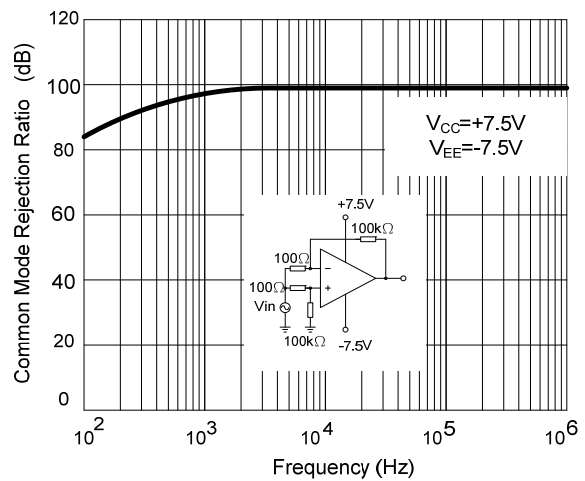


Fig. 5 Voltage Follower Response (Small Signal)

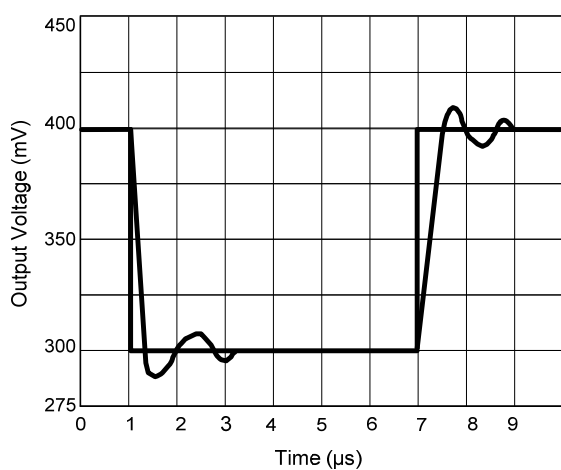
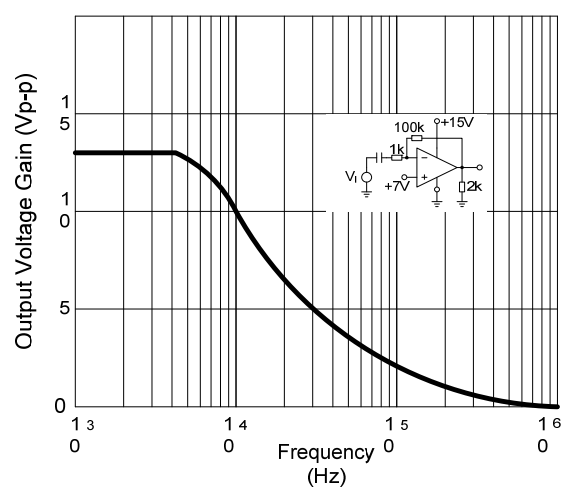


Fig. 6 Gain vs. Large Signal Frequency



## ■ TYPICAL CHARACTERISTICS (Cont.)

Fig. 7 Output Source Current vs Output Voltage

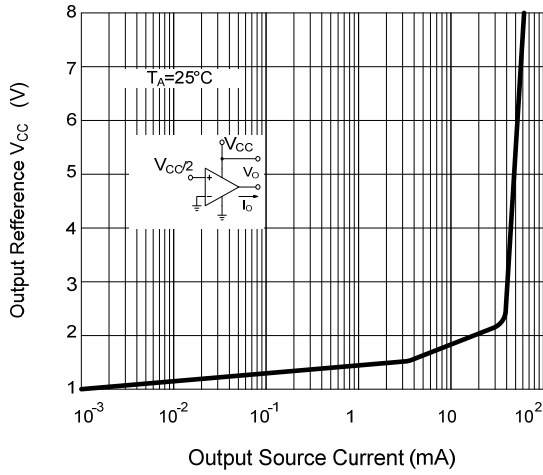
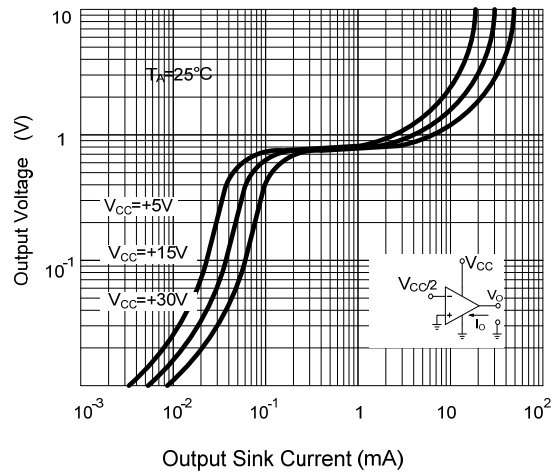


Fig. 8 Output Sink Current vs Output Voltage



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