# UNISONIC TECHNOLOGIES CO., LTD

LM358

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.

MSOP-8   TSSOP-8

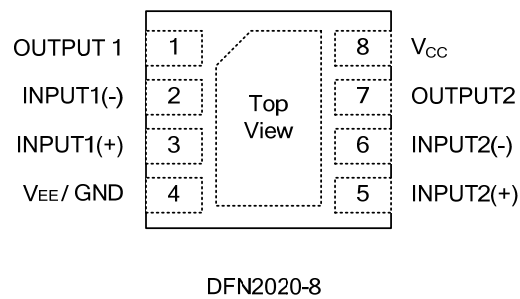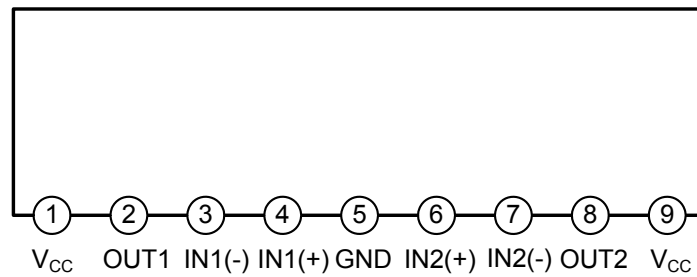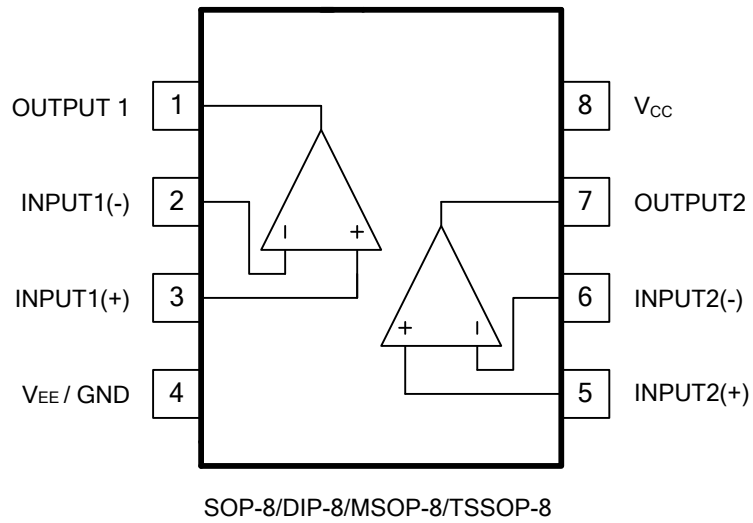SOP-8   DIP-8

SIP-9   DFN2020-8
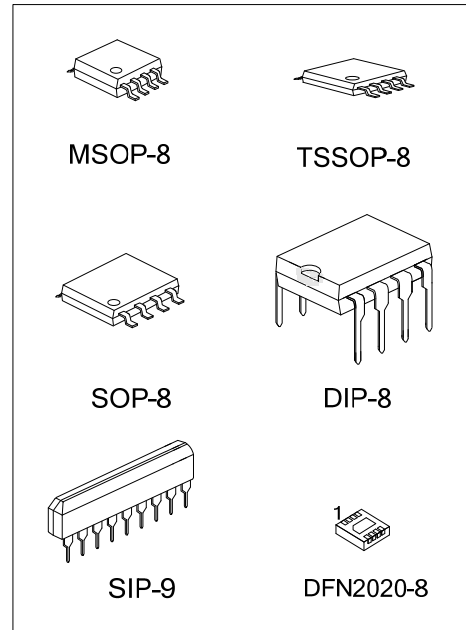
■ **ORDERING INFORMATION**

Ordering Number		Package	Packing
Lead Free	Halogen-Free		
LM358L-D08-T	LM358G-D08-T	DIP-8	Tube
LM358L-L09-T	LM358G-G09-T	SIP-9	Tube
LM358L-P08-R	LM358G-P08-R	TSSOP-8	Tape Reel
LM358L-S08-R	LM358G-S08-R	SOP-8	Tape Reel
LM358L-SM1-R	LM358G-SM1-R	MSOP-8	Tape Reel
LM358L-K08-2020-R	LM358G-K08-2020-R	DFN2020-8	Tape Reel

LM358G-D08-T

— (1) Packing Type

— (2) Package Type

— (3) Green Package

(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
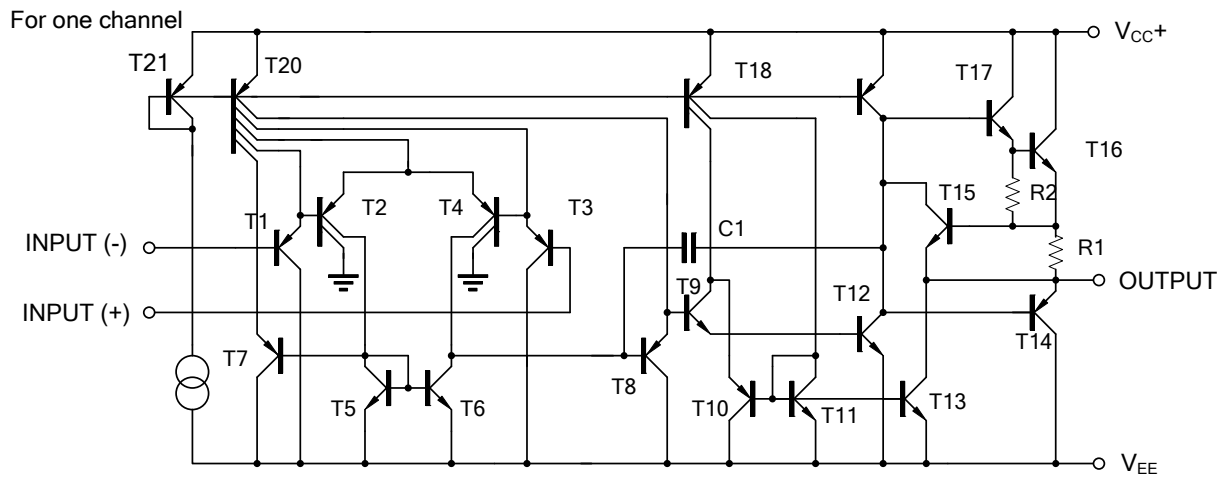
(3) G: Halogen Free and Lead Free, L: Lead Free

■ **MARKING**

DIP-8	SOP-8/MSOP-8	TSSOP-8

SIP-9	DFN2020-8

■ **PIN DESCRIPTION**

SOP-8/DIP-8/MSOP-8/TSSOP-8

1	2	3	4	5	6	7	8	9
V_{CC}	OUT1	IN1(-)	IN1(+)	GND	IN2(+)	IN2(-)	OUT2	V_{CC}

SIP-9

DFN2020-8

■ **BLOCK DIAGRAM**

For one channel

■ **ABSOLUTE MAXIMUM RATINGS**

PARAMETER		SYMBOL	RATINGS	UNIT
Supply Voltage		V_{CC}	±16 or 32	V
Differential Input Voltage		$V_{I(DIFF)}$	±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	
	DFN2020-8		830	
Junction Temperature		T_J	+125	°C
Operating Temperature (Note 2)		T_{OPR}	-40 ~ +105	°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.
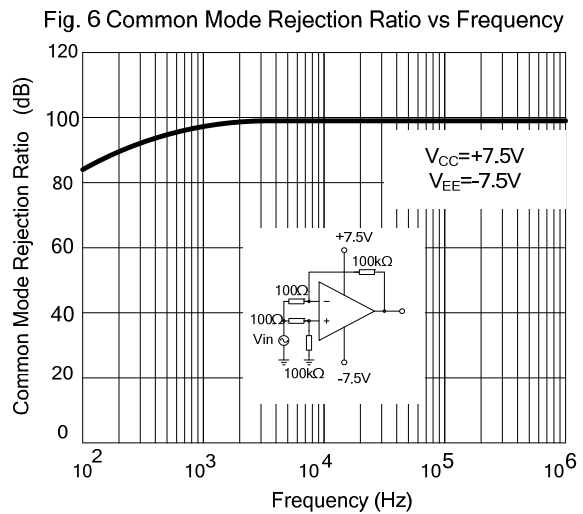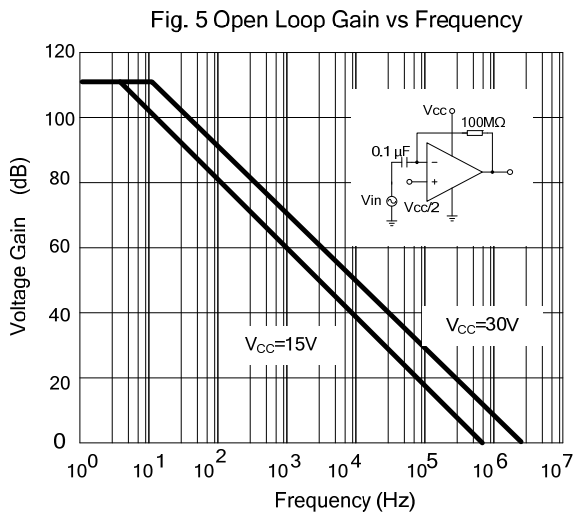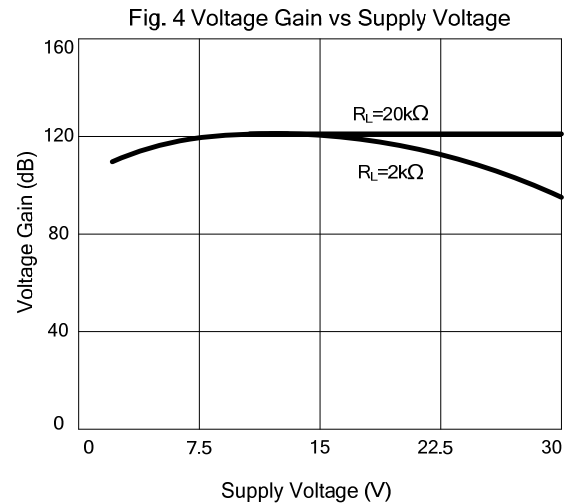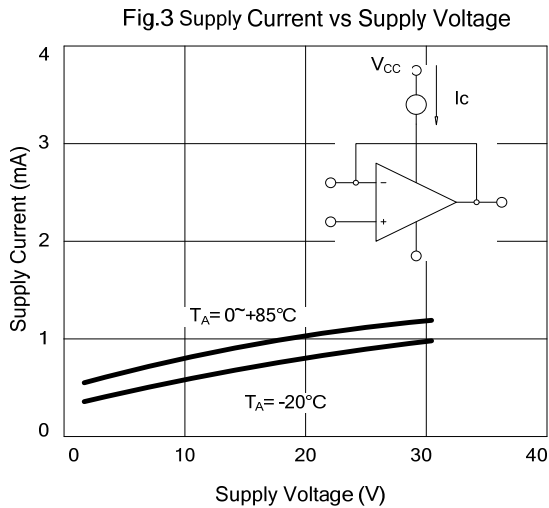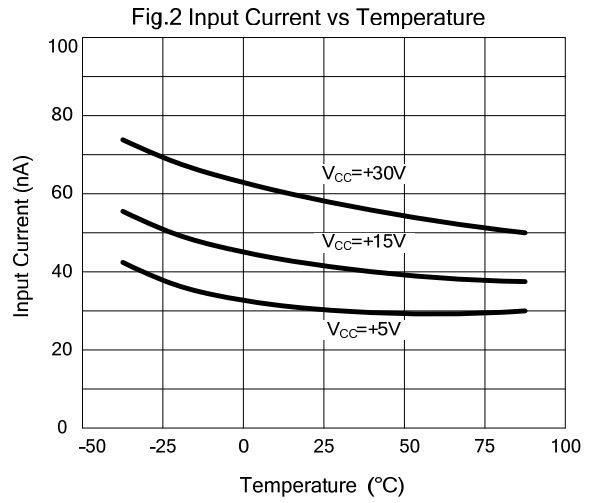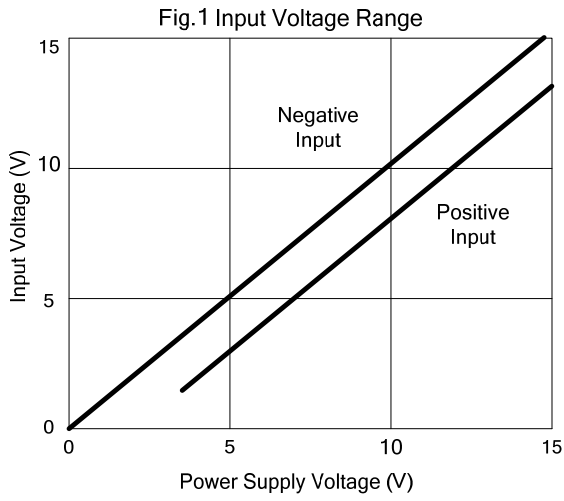
2. It is guarantee by design, not 100% be tested.

■ **ELECTRICAL CHARACTERISTICS** (V_{CC}=5.0V, V_{EE}=GND, T_A=25°C, unless otherwise specified）

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Offset Voltage	$V_{I(OFF)}$	V_{CM}=0V toV_{CC}-1.5V $V_{O(P)}$=1.4V, R_S=0Ω		2.0	5.0	mV
Input Common Mode Voltage	$V_{I(CM)}$	V_{CC}=30V	0		V_{CC}-1.5	V
Differential Input Voltage	$V_{I(DIFF)}$				V_{CC}	V
Output Voltage Swing	V_{OH}	V_{CC}=30V, R_L=2KΩ	26			V
		V_{CC}=30V, R_L=10KΩ	27	28		V
	V_{OL}	V_{CC}=5V, R_L≧10KΩ		5	20	mV
Large Signal Voltage Gain	G_V	V_{CC}=15V, R_L≧2KΩ $V_{O(P)}$=1V ~ 11V	25	100		V/mV
Power Supply Current	I_{CC}	R_L=∝, V_{CC}=30V		0.8	2.0	mA
		R_L=∝, 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(+)=1V, V_I(-)=0V V_{CC}=15V, $V_{O(P)}$=2V	10	30		mA
	I_{SINK}	V_I(+)=0V, V_I(-)=1V V_{CC}=15V, $V_{O(P)}$=2V	10	15		mA
		V_I(+)=0V, V_I(-)=1V V_{CC}=15V, $V_{O(P)}$=200mV	12	100		μA
Common Mode Rejection Ratio	CMRR		65	80		dB
Power Supply Rejection Ratio	PSRR		65	100		dB
Channel Separation	CS	f=1KHZ ~ 20KHZ		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
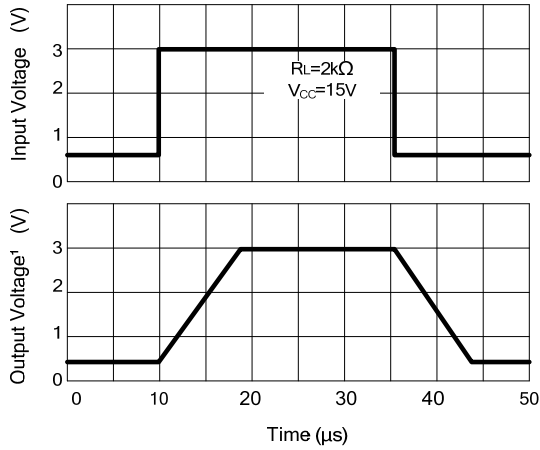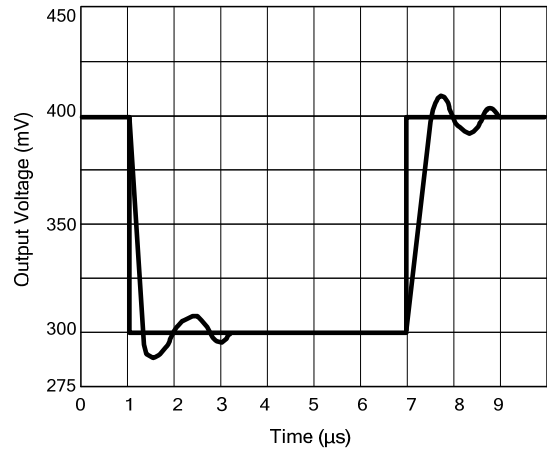
Fig. 8 Voltage Follower Response (Small Signal)
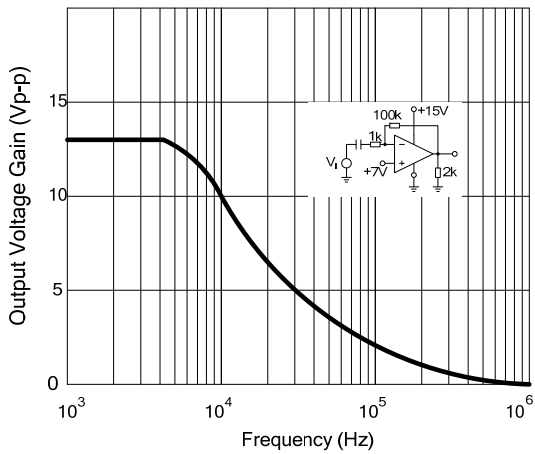
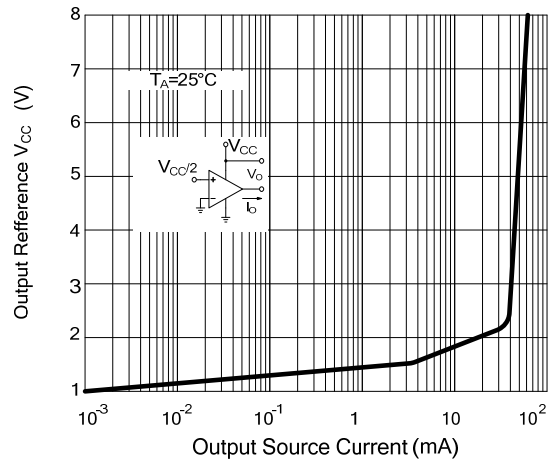Fig. 9 Gain vs. Large Signal Frequency

Fig. 10 Output Source Current vs Output Voltage
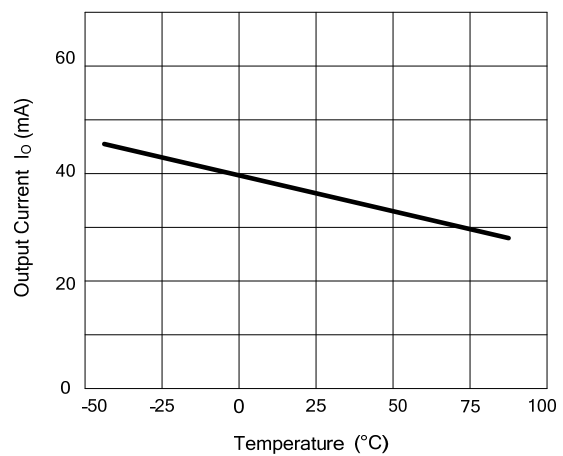
Fig. 11 Output Sink Current vs Output Voltage
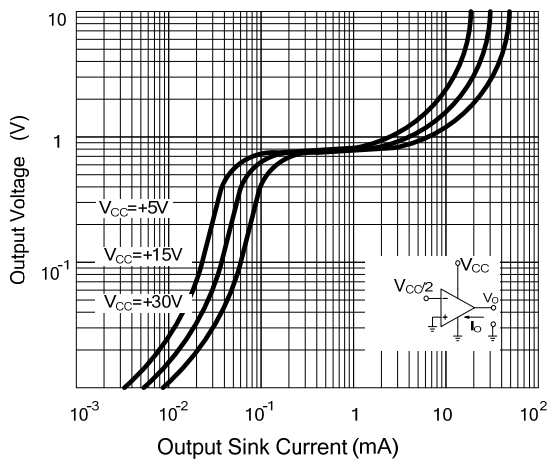
Fig.12 Current Limiting vs Temperature

UTC **UNISONIC TECHNOLOGIES CO., LTD**
www.unisonic.com.tw