National Semiconductor

April 1998

LM1558/LM1458
Dual Operational Amplifier

General Description

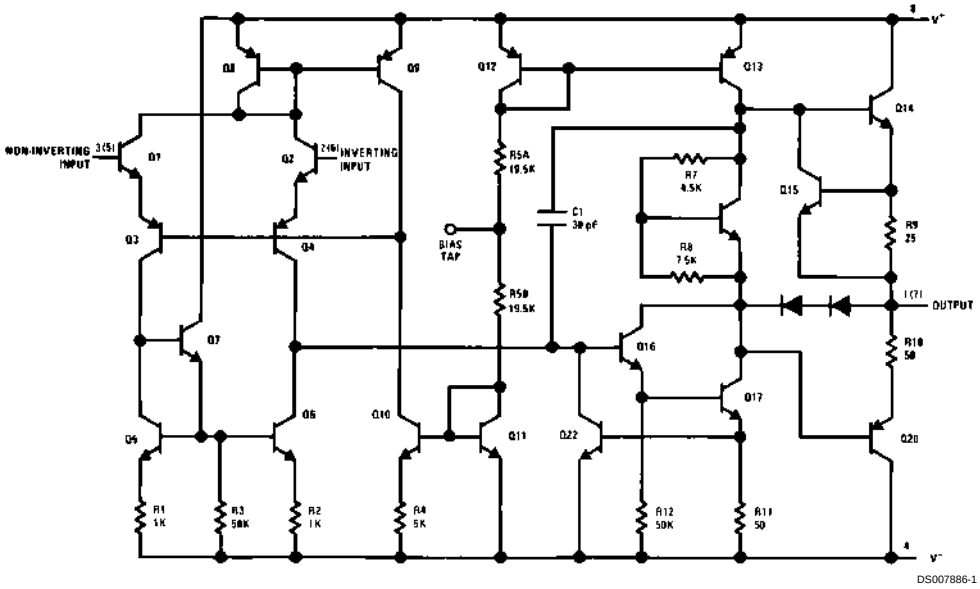
The LM1558 and the LM1458 are general purpose dual operational amplifiers. The two amplifiers share a common bias network and power supply leads. Otherwise, their operation is completely independent.

The LM1458 is identical to the LM1558 except that the LM1458 has its specifications guaranteed over the temperature range from 0˚C to +70˚C instead of −55˚C to +125˚C.

Features

- No frequency compensation required
- Short-circuit protection
- Wide common-mode and differential voltage ranges
- Low-power consumption
- 8-lead can and 8-lead mini DIP
- No latch up when input common mode range is exceeded

Schematic and Connection Diagrams



DS007886-1

Numbers in parentheses are pin numbers for amplifier B.

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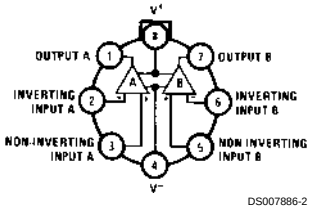
Schematic and Connection Diagrams (Continued)

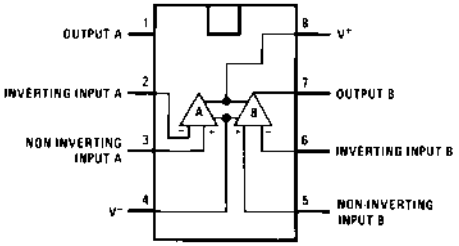
Metal Can Package



DS007886-2

Top View
Order Number LM1558H, LM1558H/883 or LM1458H
See NS Package Number H08C

Dual-In-Line Package



DS007886-3

Top View
Order Number LM1558J, LM1558J/883, LM1458J, LM1458M or LM1458N
See NS Package Number J08A, M08A or N08E

Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/ Distributors for availability and specifications.

(Note 5)

Supply Voltage
- LM1558 ±22V
- LM1458 ±18V

Power Dissipation (Note 2)
- LM1558H/LM1458H 500 mW
- LM1458N 400 mW

Differential Input Voltage ±30V

Input Voltage (Note 3) ±15V

Output Short-Circuit Duration Continuous

Operating Temperature Range
- LM1558 −55˚C to +125˚C
- LM1458 0˚C to +70˚C

Storage Temperature Range −65˚C to +150˚C

Lead Temperature (Soldering, 10 sec.) 260˚C

Soldering Information
- Dual-In-Line Package
  - Soldering (10 seconds) 260˚C
- Small Outline Package
  - Vapor Phase (60 seconds) 215˚C
  - Infrared (15 seconds) 220˚C

See AN-450 “Surface Mounting Methods and Their Effect on Product Reliability” for other methods of soldering surface mount devices.

ESD tolerance (Note 6) 300V

Electrical Characteristics (Note 4)

Parameter	Conditions	LM1558			LM1458			Units
		Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage	T_A = 25˚C, $R_S \le 10$ kΩ		1.0	5.0		1.0	6.0	mV
Input Offset Current	T_A = 25˚C		80	200		80	200	nA
Input Bias Current	T_A = 25˚C		200	500		200	500	nA
Input Resistance	T_A = 25˚C	0.3	1.0		0.3	1.0		MΩ
Supply Current Both Amplifiers	T_A = 25˚C, V_S = ±15V		3.0	5.0		3.0	5.6	mA
Large Signal Voltage Gain	T_A = 25˚C, V_S = ±15V V_{OUT} = ±10V, $R_L \ge 2$ kΩ	50	160		20	160		V/mV
Input Offset Voltage	$R_S \le 10$ kΩ			6.0			7.5	mV
Input Offset Current				500			300	nA
Input Bias Current				1.5			0.8	µA
Large Signal Voltage Gain	V_S = ±15V, V_{OUT} = ±10V $R_L \ge$ kΩ	25			15			V/mV
Output Voltage Swing	V_S = ±15V, R_L = 10 kΩ	±12	±14		±12	±14		V
	R_L = 2 kΩ	±10	±13		±10	±13		V
Input Voltage Range	V_S = ±15V	±12			±12			V
Common Mode Rejection Ratio	$R_S \le 10$ kΩ	70	90		70	90		dB
Supply Voltage Rejection Ratio	$R_S \le 10$ kΩ	77	96		77	96		dB

Note 1: “Absolute Maximum Ratings” indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not guarantee specific performance limits.

Note 2: The maximum junction temperature of the LM1558 is 150˚C, while that of the LM1458 is 100˚C. For operating at elevated temperatures, devices in the H08 package must be derated based on a thermal resistance of 150˚C/W, junction to ambient or 20˚C/W, junction to case. For the DIP the device must be derated based on a thermal resistance of 187˚C/W, junction to ambient.

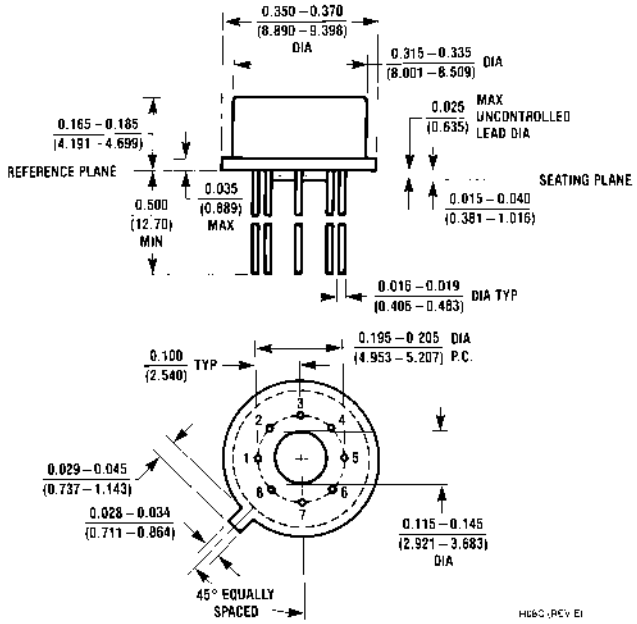
Note 3: For supply voltages less than ±15V, the absolute maximum input voltage is equal to the supply voltage.

Note 4: These specifications apply for V_S = ±15V and −55˚C ≤ T_A ≤ 125˚C, unless otherwise specified. With the LM1458, however, all specifications are limited to 0˚C ≤ T_A ≤ 70˚C and V_S = ±15V.

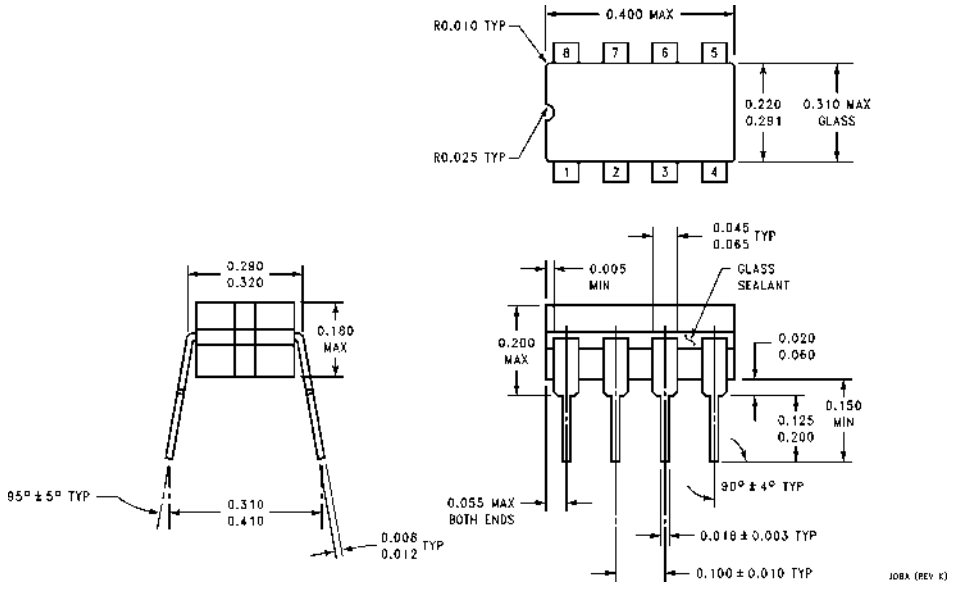
Note 5: Refer to RETS 1558V for LM1558J and LM1558H military specifications.

Note 6: Human body model, 1.5 kΩ in series with 100 pF.

Physical Dimensions inches (millimeters) unless otherwise noted

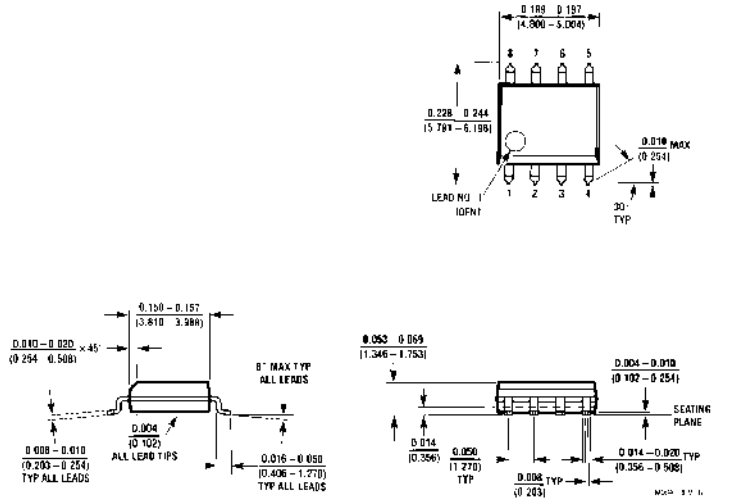


Metal Can Package (H)
Order Number LM1558H, LM1558H/883 or LM1458H
NS Package Number H08C

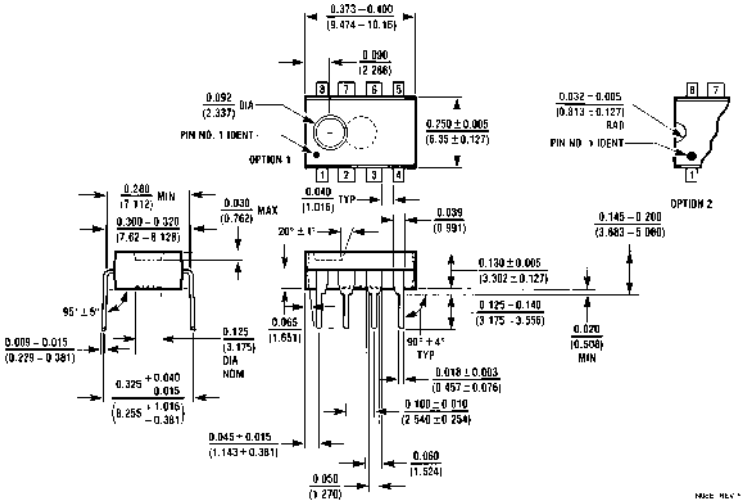


Small Outline Package (M)
Order Number LM1458M
NS Package Number M08A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



Small Outline Package (M)
Order Number LM1458M
NS Package Number M08A



Molded Dual-In-Line Package (N)
Order Number LM1458N
NS Package Number N08E

Notes

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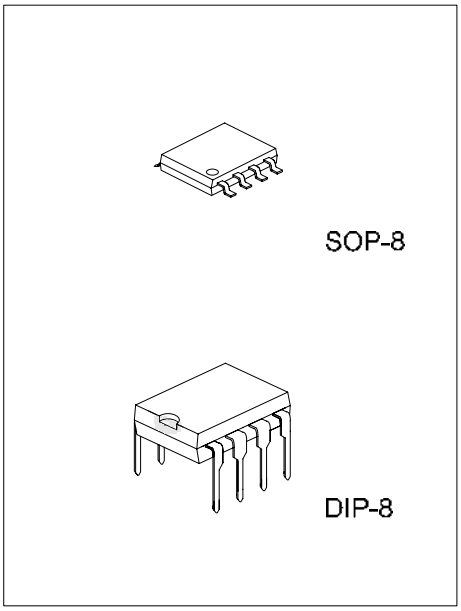
MC1458

LINEAR INTEGRATED CIRCUIT

DUAL OPERATIONAL AMPLIFIER



*Pb-free plating product number: MC1458L

■ DESCRIPTION

The UTC **MC1458** is a high performance dual operational amplifier. It is designed for a wide range of analog applications. The high gain and wide range of operating voltages provide superior performance in summing amplifier, voltage follower, integrator, active filter, function generator and general feed back applications.

■ FEATURES

* Low power consumption
* Wide input voltage range
* No latch-up
* High gain
* Short-circuit protection
* Frequency compensation is unnecessary

■ ORDERING INFORMATION

Order Number		Package	Packing
Normal	Lead Free Plating		
MC1458-D08-T	MC1458L-D08-T	DIP-8	Tube
MC1458-S08-R	MC1458L-S08-R	SOP-8	Tape Reel
MC1458-S08-T	MC1458L-S08-T	SOP-8	Tube

MC1458L-D08-T (1)Packing Type (2)Package Type (3)Lead Plating	(1) R: Tape Reel, T: Tube (2) D08: DIP-8, S08: SOP-8 (3) L: Lead Free Plating, Blank: Pb/Sn

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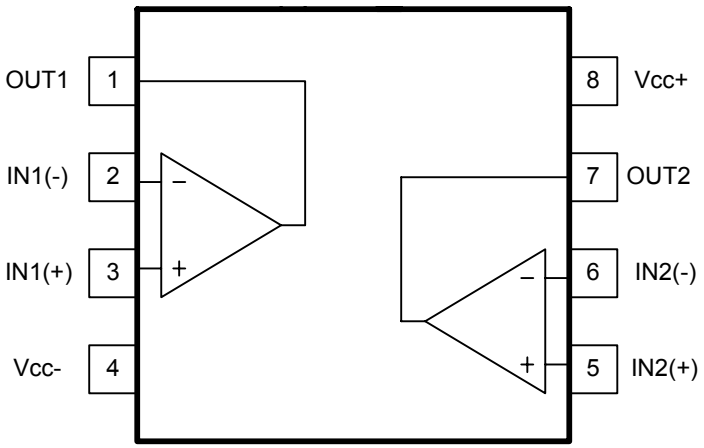
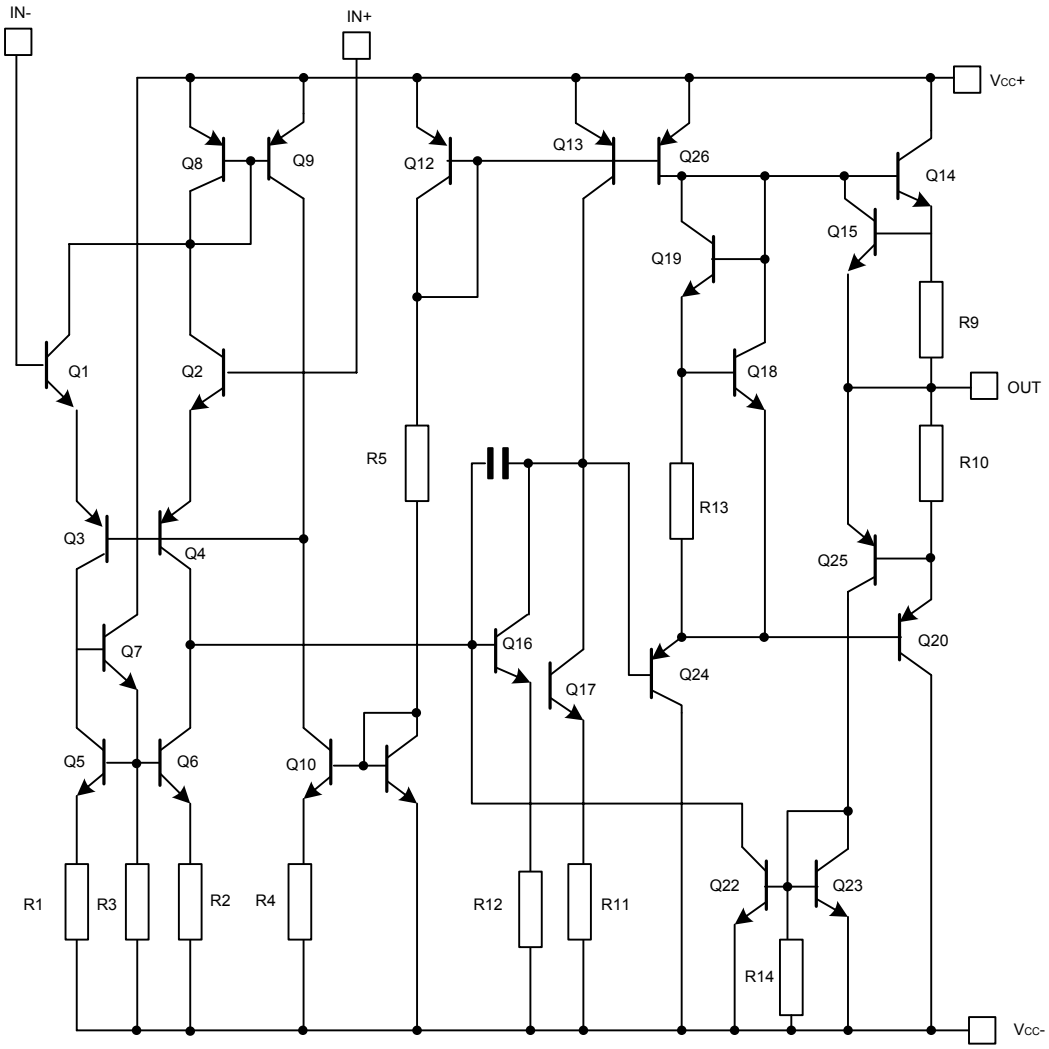
■ PIN CONFIGURATIONS



■ TEST CIRCUIT



■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER		SYMBOL	RATINGS	UNIT
Supply Voltage		V_{CC}	-22 ~ +22	V
Differential Input Voltage		$V_{I(DIFF)}$	-30 ~ +30	V
Input Voltage		V_{IN}	-15 ~ +15	V
Power Dissipation	SOP-8	P_D	300	mW
	DIP-8		500	
Output Short Circuit Duration			Infinite	
Operating Ambient Temperature Range		T_{OPR}	0 ~ 70	°C
Storage Temperature Range		T_{STG}	-65~ +150	°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}=±15V,Ta=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Input Offset Voltage (R_S≤10kΩ)	$V_{I(OFF)}$	Ta=+25°C			1	5	mV
		0°C ≤Ta ≤ 70°C				6	mV
Input Offset Current	$I_{I(OFF)}$	Ta=+25°C			2	200	nA
		0°C ≤ Ta ≤ 70°C				300	nA
Input Bias Current	$I_{I(BIAS)}$	Ta=+25°C			30	500	nA
		0°C ≤Ta ≤ 70°C				800	nA
Large Signal Voltage Gain (Vo=+-10V,RL=2kΩ)	G_V	Ta=+25°C		50	200		V/mV
		0°C ≤Ta ≤ 70°C		25			V/mV
Supply Voltage Rejection Ratio (Rs≤10kΩ)	SVR	Ta=+25°C		77	90		dB
		0°C ≤Ta≤70°C		77			dB
Supply Current(all Amp, no Load)	I_{CC}	Ta=+25°C			2.3	5	mA
		0°C ≤Ta ≤ 70°C				6	mA
Input Common Mode Voltage Range	$V_{IN(CM)}$	Ta=+25°C		±12			V
		0°C ≤Ta ≤ 70°C		±12			V
Common-Mode Rejection Ratio (R_S≤10kΩ)	CMR	Ta=+25°C		70	90		dB
		0°C ≤ Ta ≤ 70°C		70			dB
Output Short-Circuit Current	Ios	Ta=+25°C		10	20	35	mA
Output Voltage Swing	±Vopp	Ta=+25°C	R_L=10kΩ	12	14		V
			R_L=2kΩ	10	13		V
		0°C ≤Ta ≤70°C	R_L=10kΩ	12			V
			R_L=2kΩ	10			V
Slew Rate	SR	V_{IN}=±10V, R_L=2kΩ, C_L=100pF, Ta=+25°C, unity gain		0.2	0.8		V/μs
Rise Time	tr	V_{IN}=20mV, R_L=2kΩ, C_L=100pF, Ta=+25°C, unity gain			0.3		μs
Over-Shoot	Kos	V_{IN}=20mV, R_L=2kΩ,C_L=100pF, Ta=+25°C, unity gain			5		%
Input Resistance	R_{IN}			0.3	2		MΩ
Common-Mode Input Impedance	Z_{IN}				200		MΩ
Input Capacitance	C_{IN}				1.4		pF
Output Resistance	R_{OUT}				75		Ω
Full Power Bandwidth	FB_W	R_L=2kΩ,V_{OUT} ≥ ±10V, G_V=1,THD ≤ 5%			14		KHz
Unity Gain Bandwidth	GB_W	V_{IN}=10mV, R_L=2kΩ, C_L=100pF, Ta=+25°C			1		MHz
Gain Bandwidth Product	GBP	V_{IN}=10mV,R_L=2kΩ, C_L=100pF, t=100kHz,Ta=+25°C		0.4	1		MHz

■ ELECTRICAL CHARACTERISTICS(Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Total Harmonic Distortion	THD	F=1kHz, Av=20dB, R_L=2kΩ, V_{OUT}=2Vpp,C_L=100pF,Ta=25°C		0.02		%
Equivalent Input Noise Voltage	eN	F=kHz, Rs=100Ω		45		$\frac{nV}{\sqrt{Hz}}$
Phase Margin	ϕm			65		Deg.
Gain Margin	Am			11		dB
Channel Separation	Vo1/Vo2			120		dB

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