LM1558QML

LM1558QML Dual Operational Amplifier

Literature Number: SNOSAN1A

National Semiconductor

August 2005

LM1558QML
Dual Operational Amplifier

General Description

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

Features

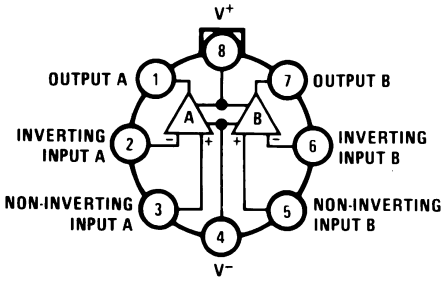
- No frequency compensation required
- Short-circuit protection
- Wide common-mode and differential voltage ranges
- Low-power consumption
- 8-lead can and 8-lead mini DIP
- No latch up when input common mode range is exceeded

Ordering Information

NS PART NUMBER	SMD PART NUMBER	NS PACKAGE NUMBER	PACKAGE DISCRIPTION
LM1558H/883		H08C	8LD Metal Can
LM1558J/883		J08A	8LD Cerdip

Connection Diagrams

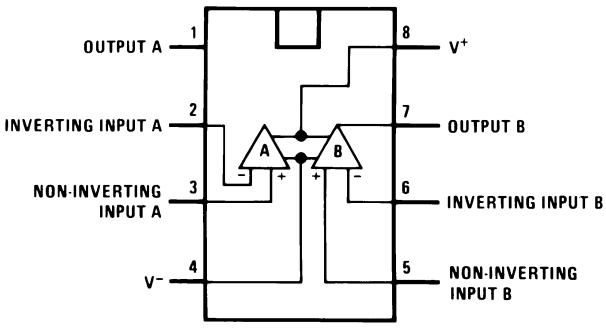
Metal Can Package



20142602

Top View
See NS Package Number H08C

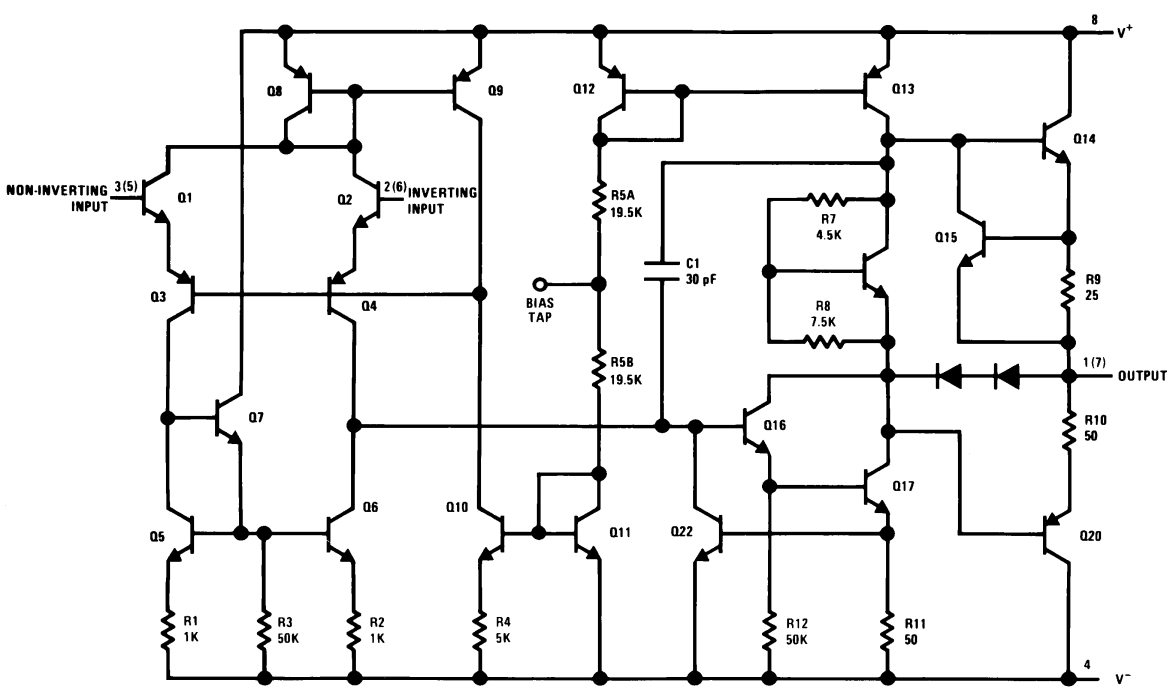
Dual-In-Line Package



20142603

Top View
See NS Package Number J08A

Schematic Diagram



20142601

Numbers in parentheses are pin numbers for amplifier B.

Absolute Maximum Ratings (Note 1)

Supply Voltage	±22V
Power Dissipation (Note 2)	
8LD Metal Can	500 mW
8LD CERDIP	TBD
Differential Input Voltage	±30V
Input Voltage (Note 3)	±15V
Output Short-Circuit Duration	Continuous
Operating Temperature Range	$-55^{\circ}C \leq T_A \leq +125^{\circ}C$
Maximum Junction Temperature	150˚C
Storage Temperature Range	$-65^{\circ}C \leq T_A \leq +150^{\circ}C$
Lead Temperature (Soldering, 10 sec.)	260˚C
Thermal Resistance	
θ_{JA}	
Metal Can 8LD	
Still Air	150˚C/W
500LF/Min Air flow	85˚C/W
CERDIP 8LD	
Still Air	125˚C/W
500LF/Min Air flow	70˚C/W
θ_{JC}	
Metal Can 8LD	30˚C/W
CERDIP 8LD	22˚C/W
ESD tolerance (Note 4)	300V

Quality Conformance Inspection

MIL-STD-883, Method 5005 - Group A

Subgroup	Description	Temp (C)
1	Static tests at	+25
2	Static tests at	+125
3	Static tests at	-55
4	Dynamic tests at	+25
5	Dynamic tests at	+125
6	Dynamic tests at	-55
7	Functional tests at	+25
8A	Functional tests at	+125
8B	Functional tests at	-55
9	Switching tests at	+25
10	Switching tests at	+125
11	Switching tests at	-55

LM1558 Electrical Characteristics

DC Parameters

The following conditions apply, unless otherwise specified. V_{CC} = ±15V, V_{CM} = 0V, R_S = 10KΩ

Symbol	Parameter	Conditions	Note	Min	Max	Unit	Sub-group
V_{IO}	Input Offset Voltage	V_{CM} = -12V		-5.0	5.0	mV	1
				-6.0	6.0	mV	2, 3
		V_{CM} = +12V		-5.0	5.0	mV	1
				-6.0	6.0	mV	2, 3
		V_{CM} = 0V		-5.0	5.0	mV	1
				-6.0	6.0	mV	2, 3
		V_{CC} = 0V, R_S = 50Ω		-5.0	5.0	mV	1
				-6.0	6.0	mV	2, 3
		V_{CC} = ±5V, V_{CM} = 0V		-5.0	5.0	mV	1
				-6.0	6.0	mV	2, 3
I_{IO}	Input Offset Current	V_{CM} = -12V		-200	200	nA	1
				-500	500	nA	2, 3
		V_{CM} = +12V		-200	200	nA	1
				-500	500	nA	2, 3
		V_{CM} = 0V		-200	200	nA	1
				-500	500	nA	2, 3
		V_{CC} = ±5V, V_{CM} = 0V		-200	200	nA	1
				-500	500	nA	2, 3
I_{IB}	Input Bias Current	V_{CM} = -12V			500	nA	1
					1500	nA	2, 3
		V_{CM} = +12V			500	nA	1
					1500	nA	2, 3
		V_{CM} = 0V			500	nA	1
					1500	nA	2, 3
		V_{CC} = ±5V, V_{CM} = 0V			500	nA	1
					1500	nA	2, 3
PSRR	Power Supply Rejection Ratio	±5V ≤ V_{CC} ≤ ±15V		77		dB	1, 2, 3
CMRR	Common Mode Rejection Ratio	-12V ≤ V_{CM} ≤ 12V		70		dB	1, 2, 3
I_{CC}	Power Supply Current	R_S = 50Ω (both amplifiers measured together)			5.0	mA	1, 2,
					7.0	mA	3
$+I_{OS}$	Short Circuit Current	R_S = 50Ω, V_O = 0V		-45	-14	mA	1
				-45	-9	mA	2
				-50	-9	mA	3
$-I_{OS}$	Short Circuit Current	R_S = 50Ω, V_O = 0V		14	45	mA	1
				9.0	45	mA	2
				9.0	50	mA	3
V_I	Input Voltage Range		(Note 5)	-12	12	V	1, 2, 3
R_I	Input Resistance	R_I = 5(KT/q I_{IB})	(Note 6)	0.3		MΩ	1
$+V_{OP}$	Output Voltage Swing	R_S = 50Ω, R_L = 10KΩ, V_{CC} = ±20V		16		V	4, 5, 6
		R_S = 50Ω, R_L = 2KΩ, V_{CC} = ±20V		15		V	4, 5, 6
		R_S = 50Ω, R_L = 10KΩ		12		V	4, 5, 6
		R_S = 50Ω, R_L = 2KΩ		10		V	4, 5, 6

LM1558 Electrical Characteristics (Continued)

DC Parameters (Continued)

The following conditions apply, unless otherwise specified. V_{CC} = ±15V, V_{CM} = 0V, R_S = 10KΩ

Symbol	Parameter	Conditions	Note	Min	Max	Unit	Sub-group
$-V_{OP}$	Output Voltage Swing	R_S = 50Ω, R_L = 10KΩ, V_{CC} = ±20V			-16	V	4, 5, 6
		R_S = 50Ω, R_L = 2KΩ, V_{CC} = ±20V			-15	V	4, 5, 6
		R_S = 50Ω, R_L = 10KΩ			-12	V	4, 5, 6
		R_S = 50Ω, R_L = 2KΩ			-10	V	4, 5, 6
$+A_{VS}$	Large Signal Voltage Gain	R_S = 50Ω, R_L = 2KΩ, V_O = 10V		50		V/mV	4
				25		V/mV	5, 6
$-A_{VS}$	Large Signal Voltage Gain	R_S = 50Ω, R_L = 2KΩ, V_O = -10V		50		V/mV	4
				25		V/mV	5, 6

AC Parameters

The following conditions apply, unless otherwise specified. V_{CC} = ±15V, V_{CM} = 0V

Symbol	Parameter	Conditions	Note	Min	Max	Unit	Sub-group
+SR	Slew Rate	V_I = -5 to 5V		0.2		V/µS	9
		V_I = -5 to 5V, R_L = 2KΩ, C_L = 100pF	(Note 6)	0.2		V/µS	9
-SR	Slew Rate	V_I = 5 to -5V		0.2		V/µS	9
		V_I = 5 to -5V, R_L = 2KΩ, C_L = 100pF	(Note 6)	0.2		V/µS	9
GBW	Gain Bandwidth	V_I = 50mV_{RMS}, f = 20KHz, R_S = 50Ω, R_L = 2KΩ		250		KHz	9
t_R	Rise Time	R_L = 2KΩ, C_L = 100pF	(Note 6)		1	µS	9
OS	Overshoot	R_L = 2KΩ, C_L = 100pF	(Note 6)		30	%	9

Note 1: "Absolute Maximum Ratings" indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but do not guarantee specific performance limits. For guaranteed specifications and test conditions, see the Electrical Characteristics. The guaranteed specifications apply only for the test conditions listed.

Note 2: The maximum power dissipation must be derated at elevated temperatures and is dictated by T_{Jmax} (maximum junction temperature), θ_{JA} (package junction to ambient thermal resistance), and T_A (ambient temperature). The maximum allowable power dissipation at any temperature is $P_{Dmax} = (T_{Jmax} - T_A)/\theta_{JA}$ or the number given in the Absolute Maximum Ratings, whichever is lower.

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

Note 4: Human body model, 1.5 KΩ in series with 100 pF.

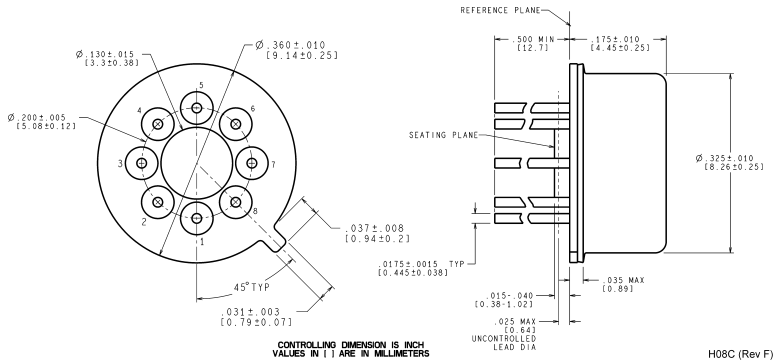
Note 5: Guaranteed by the CMRR test.

Note 6: Guaranteed parameter not tested.

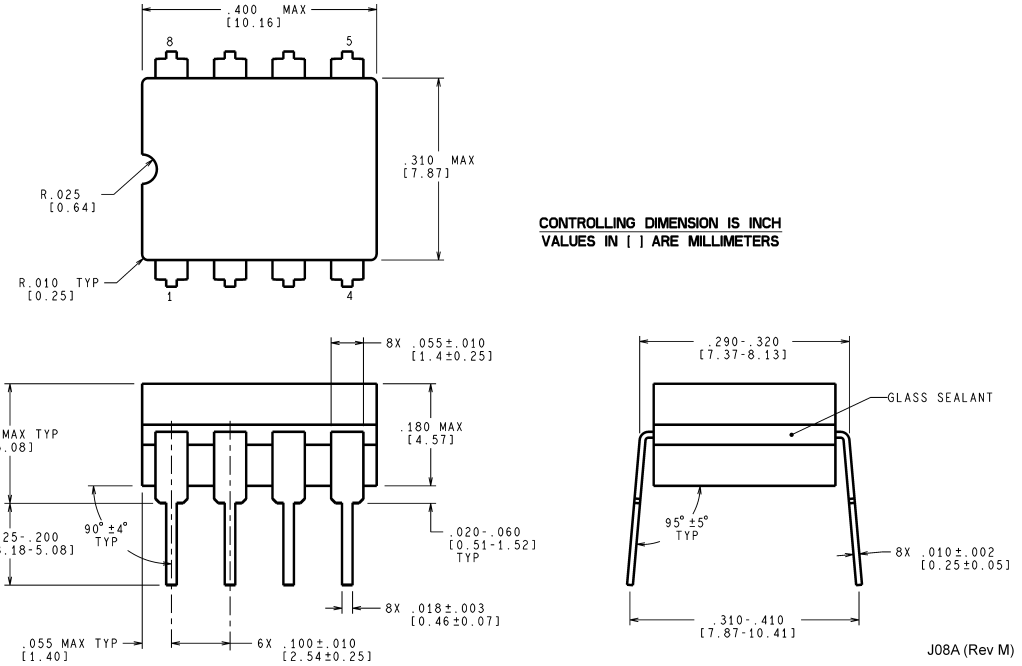
Revision History Section

Date Released	Revision	Section	Originator	Changes
05/24/05	A	New Released Corporate format. Electrical Section	R. Malone	1 MDS data sheet converted into one corp. data sheet format. MDS data MNLM1558–X, Rev. 0B0 will be achrived. Deleted Drift table from electrical section. Reason: Referenced products are 883 only.
08/04/05	B	Added Thermal Resistance limit in the Absolute Maximum Ratings Section	R. Malone	Added Thermal Resistance limit in the Absolute Maximum Ratings Section for all packages.

Physical Dimensions inches (millimeters) unless otherwise noted



Metal Can Package (H)
NS Package Number H08C



Ceramic Dual-In-Line Package (J)
NS Package Number J08A

Notes

National Semiconductor
Americas Customer
Support Center
Email: new.feedback@nsc.com
Tel: 1-800-272-9959

www.national.com

National Semiconductor
Europe Customer Support Center
Fax: +49 (0) 180-530 85 86
Email: europe.support@nsc.com
Deutsch Tel: +49 (0) 69 9508 6208
English Tel: +44 (0) 870 24 0 2171
Français Tel: +33 (0) 1 41 91 8790

National Semiconductor
Asia Pacific Customer
Support Center
Email: ap.support@nsc.com

National Semiconductor
Japan Customer Support Center
Fax: 81-3-5639-7507
Email: jpn.feedback@nsc.com
Tel: 81-3-5639-7560

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		**Applications**	
Audio	www.ti.com/audio	Communications and Telecom	www.ti.com/communications
Amplifiers	amplifier.ti.com	Computers and Peripherals	www.ti.com/computers
Data Converters	dataconverter.ti.com	Consumer Electronics	www.ti.com/consumer-apps
DLP® Products	www.dlp.com	Energy and Lighting	www.ti.com/energy
DSP	dsp.ti.com	Industrial	www.ti.com/industrial
Clocks and Timers	www.ti.com/clocks	Medical	www.ti.com/medical
Interface	interface.ti.com	Security	www.ti.com/security
Logic	logic.ti.com	Space, Avionics and Defense	www.ti.com/space-avionics-defense
Power Mgmt	power.ti.com	Transportation and Automotive	www.ti.com/automotive
Microcontrollers	microcontroller.ti.com	Video and Imaging	www.ti.com/video
RFID	www.ti-rfid.com		
OMAP Mobile Processors	www.ti.com/omap		
Wireless Connectivity	www.ti.com/wirelessconnectivity		
	TI E2E Community Home Page		e2e.ti.com

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265