LM1558QML Dual Operational Amplifier

Check for Samples: LM1558QML

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**

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.

Connection Diagram

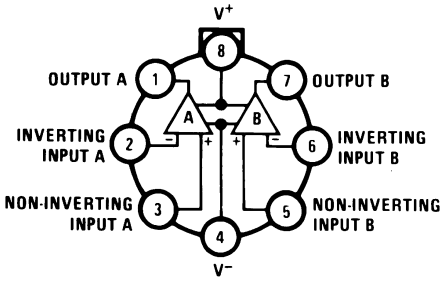


Figure 1. TO-99 Package
Top View
See Package Number LMC

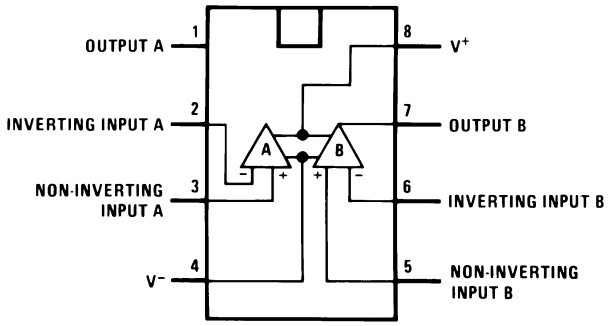
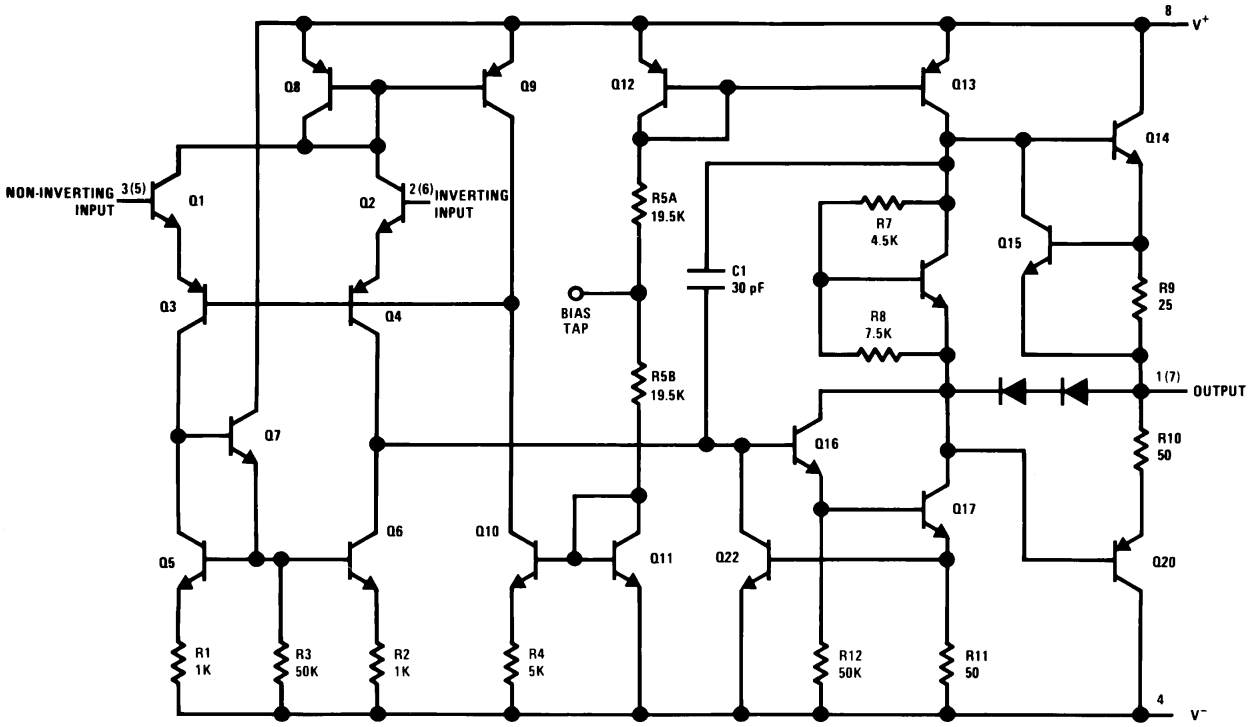


Figure 2. CDIP Package
Top View
See Package Number NAB0008A

Schematic Diagram



Numbers in parentheses are pin numbers for amplifier B.

These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

Absolute Maximum Ratings(1)

Supply Voltage				±22V
Power Dissipation(2)			8LD TO-99	500 mW
			8LD CERDIP	TBD
Differential Input Voltage				±30V
Input Voltage(3)				±15V
Output Short-Circuit Duration				Continuous
Operating Temperature Range				$-55°C \le T_A \le +125°C$
Maximum Junction Temperature				150°C
Storage Temperature Range				$-65°C \le T_A \le +150°C$
Lead Temperature (Soldering, 10 sec.)				260°C
Thermal Resistance	θ_{JA}	TO-99 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}		TO-99 8LD	30°C/W
			CERDIP 8LD	22°C/W
ESD tolerance(4)				300V

(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 ensure specific performance limits. For ensured specifications and test conditions, see the Electrical Characteristics. The ensured specifications apply only for the test conditions listed.
(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.
(3) For supply Voltages less than ±15V, the absolute maximum input Voltage is equal to the supply Voltage.
(4) Human body model, 1.5 KΩ in series with 100 pF.

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		See (1)	-12	12	V	1, 2, 3
R_I	Input Resistance	R_I = 5(KT/q I_{IB})	See (2)	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

(1) Specified by the CMRR test.
(2) Specified parameter not tested.

LM1558 Electrical Characteristics 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

LM1558 Electrical Characteristics 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	See (1)	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	See (1)	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	See (1)		1	µS	9
OS	Overshoot	R_L = 2KΩ, C_L = 100pF	See (1)		30	%	9

(1) Specified 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.
03/20/13	B	All		Changed layout of National Data Sheet to TI format

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
LM1558H/883	ACTIVE	TO-99	LMC	8	20	Non-RoHS & Non-Green	Call TI	Call TI	-55 to 125	LM1558H/883 Q ACO LM1558H/883 Q >T	Samples
LM1558J/883	ACTIVE	CDIP	NAB	8	40	Non-RoHS & Green	Call TI	Level-1-NA-UNLIM	-55 to 125	LM1558J /883 Q ACO /883 Q >T	Samples

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".
RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

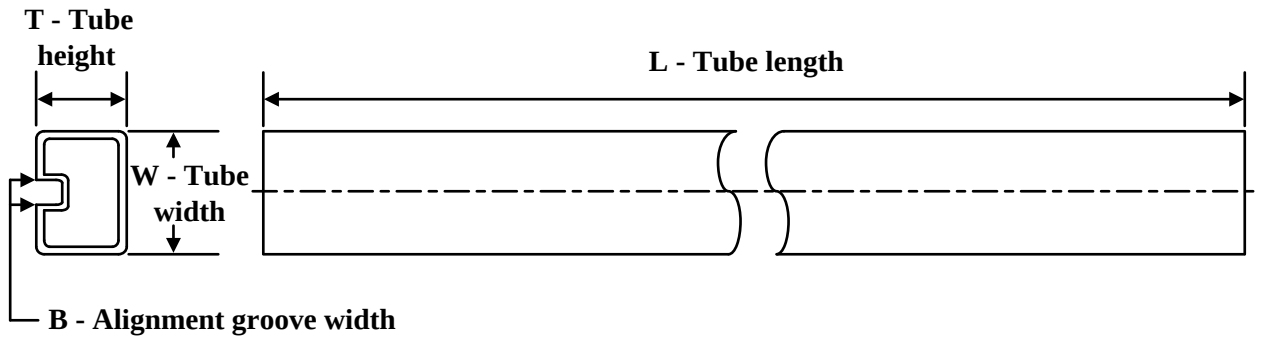
(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

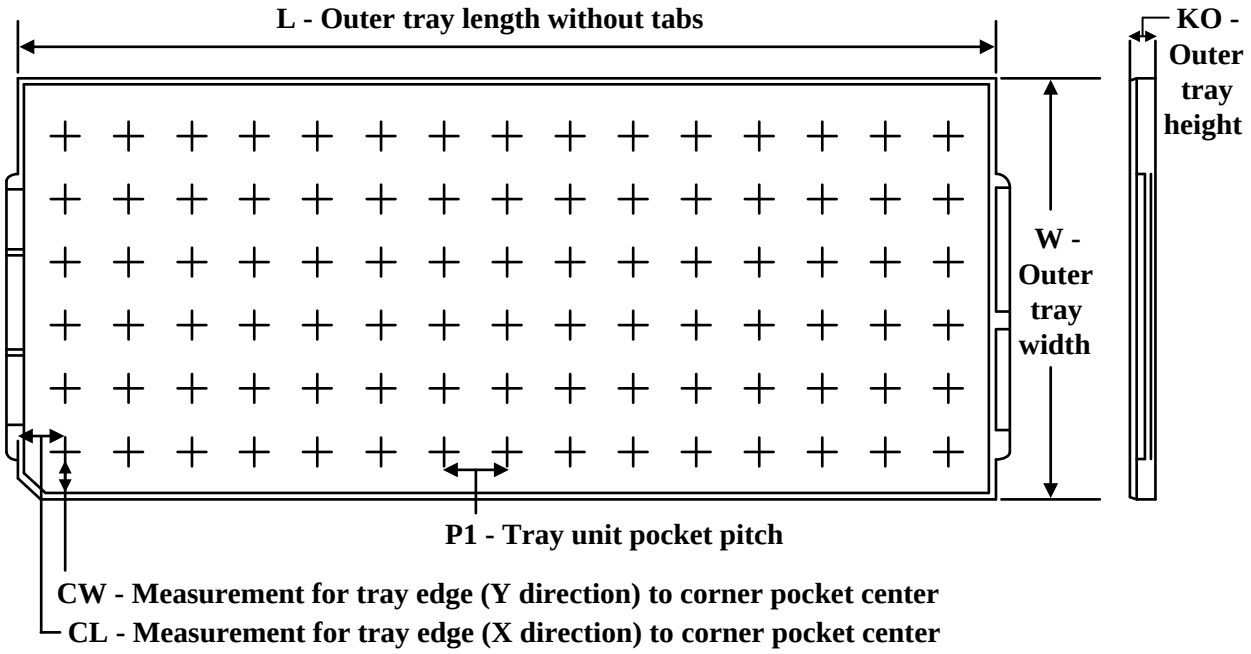
TUBE



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
LM1558J/883	NAB	CDIP	8	40	506.98	15.24	13440	NA

TRAY

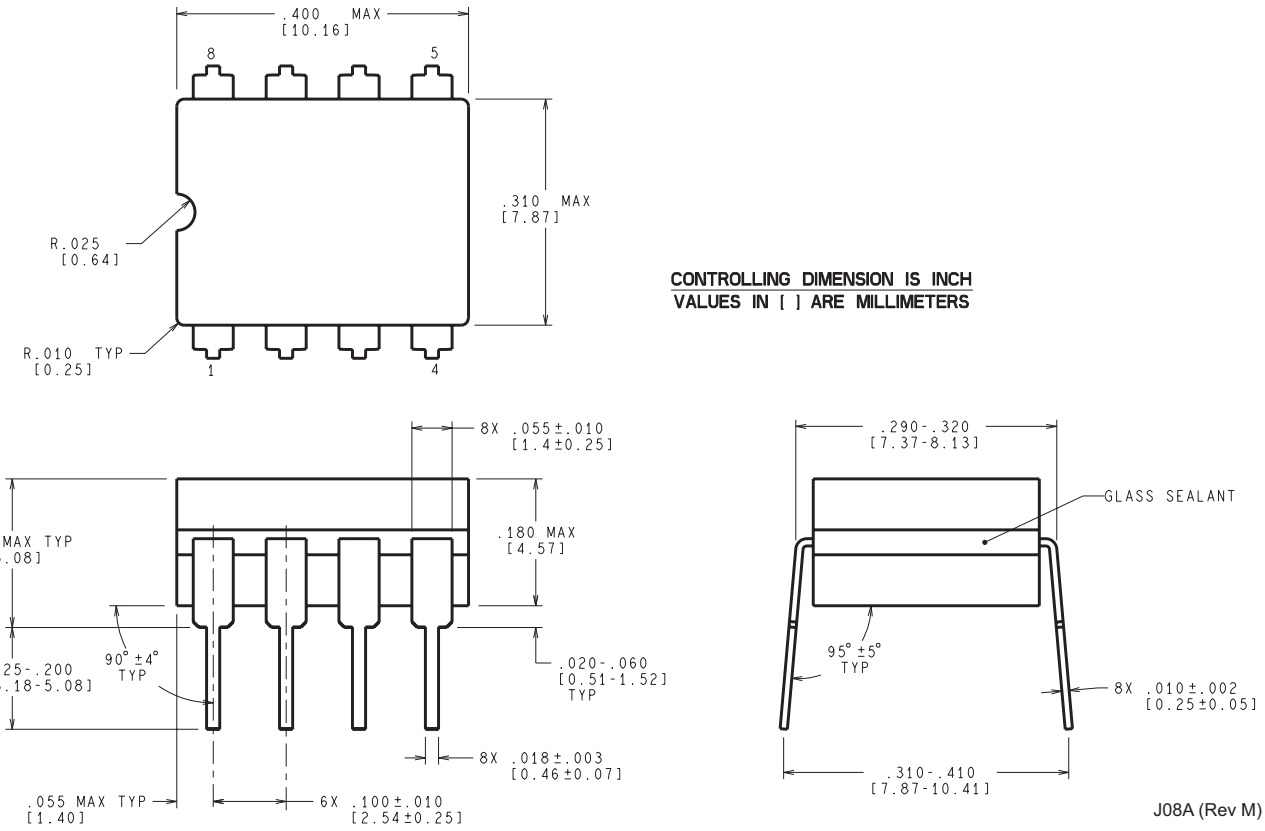


Chamfer on Tray corner indicates Pin 1 orientation of packed units.

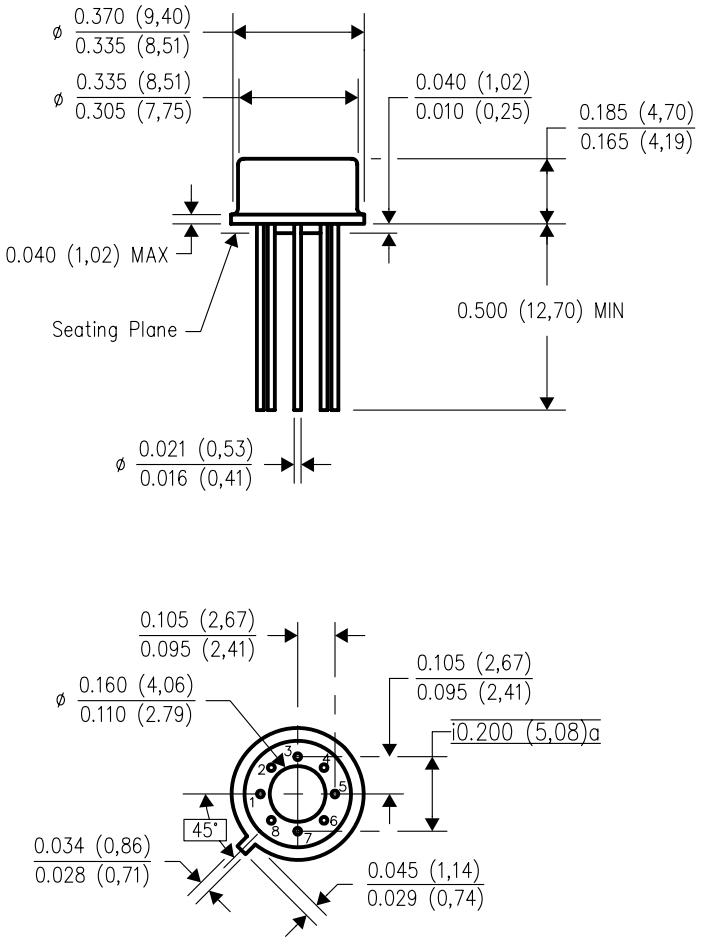
*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	Unit array matrix	Max temperature (°C)	L (mm)	W (mm)	K0 (µm)	P1 (mm)	CL (mm)	CW (mm)
LM1558H/883	LMC	TO-CAN	8	20	2 X 10	150	126.49	61.98	8890	11.18	12.95	18.54

NAB0008A


.400 MAX
[10.16]
8
5
.310 MAX
[7.87]
R.025
[0.64]
R.010 TYP
[0.25]
1
4
CONTROLLING DIMENSION IS INCH
VALUES IN [ ] ARE MILLIMETERS
8X .055±.010
[1.4±0.25]
.200 MAX TYP
[5.08]
.180 MAX
[4.57]
8X .125-.200
[3.18-5.08]
90° ±4°
TYP
.020-.060
[0.51-1.52]
TYP
8X .018±.003
[0.46±0.07]
.055 MAX TYP
[1.40]
6X .100±.010
[2.54±0.25]
.290-.320
[7.37-8.13]
GLASS SEALANT
95° ±5°
TYP
8X .010±.002
[0.25±0.05]
.310-.410
[7.87-10.41]
J08A (Rev M)

LMC (O–MBCY–W8) METAL CYLINDRICAL PACKAGE



4202483/B 09/07

NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Leads in true position within 0.010 (0,25) R @ MMC at seating plane.
D. Pin numbers shown for reference only. Numbers may not be marked on package.
E. Falls within JEDEC MO–002/TO–99.

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI’s products are provided subject to TI’s Terms of Sale or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI’s provision of these resources does not expand or otherwise alter TI’s applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

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