LM748QML Operational Amplifier

Check for Samples: LM748QML

FEATURES

- **Frequency Compensation with a Single 30 pF Capacitor**
- **Operation from ±5V to Operation from ±20V**
- **Continuous Short-Circuit Protection**
- **Operation as a Comparator with Differential Inputs as High as ±30V**
- **No Latch-Up when Common Mode Range is Exceeded**
- **Same Pin Configuration as the LM101**

DESCRIPTION

The LM748 is a general purpose operational amplifier with external frequency compensation.

The unity-gain compensation specified makes the circuit stable for all feedback configurations, even with capacitive loads. It is possible to optimize compensation for best high frequency performance at any gain. As a comparator, the output can be clamped at any desired level to make it compatible with logic circuits.

The LM748 is specified for operation over the −55°C to +125°C military temperature range.

Connection Diagram

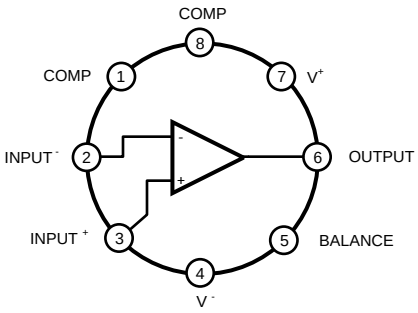


Figure 1. 8LD Metal Can Package (Top View)
See Package Number LMC0008C

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)	500mW
Differential Input Voltage	±30V
Input Voltage(3)	±15V
Output Short-Circuit Duration(4)	Indefinite
Operating Temperature Range	$-55°C \le T_A \le 125°C$
Storage Temperature Range	$-65°C \le T_A \le 150°C$
Maximum Junction Temperature	150°C
Lead Temperature (Soldering, 10 seconds)	300°C

(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 ensure specific performance limits. For ensured specifications and test conditions, see the Electrical Characteristics. The ensured specifications apply only for the test conditions listed. Some performance characteristics may degrade when the device is not operated under the listed test conditions.
(2) For operating at elevated temperatures, the device must be derated based on a maximum junction to case thermal resistance of 45°C/W, or 150°C/W
(3) For supply voltages less than ±15V, the absolute maximum input voltage is equal to the supply voltage.
(4) Continuous short circuit is allowed for case temperatures to +125°C.

Quality Conformance Inspection

Table 1. 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
12	Settling time at	+25
13	Settling time at	+125
14	Settling time at	-55

LM748 Electrical Characteristics DC Parameters

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

Symbol	Parameter	Conditions	Notes	Min	Max	Units	Sub-groups
V_{IO}	Input Offset Voltage	V_{CM} = 12V			3.0	mV	1
					4.0	mV	2, 3
		V_{CM} = -12V			3.0	mV	1
					4.0	mV	2, 3
					3.0	mV	1
					4.0	mV	2, 3
		V_{CC} = ±5V			3.0	mV	1
					4.0	mV	2, 3
I_{IO}	Input Offset Current	V_{CM} = 12V			200	nA	1
					500	nA	2, 3
		V_{CM} = -12V			200	nA	1
					500	nA	2, 3
					200	nA	1
					500	nA	2, 3
		V_{CC} = ±5V			200	nA	1
					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
					500	nA	1
					1500	nA	2, 3
		V_{CC} = ±5V			500	nA	1
					1500	nA	2, 3
PSRR+	Power Supply Rejection Ratio	+V_{CC} = 15V to 5V, -V_{CC} = -15V		77		dB	1, 2, 3
PSRR-	Power Supply Rejection Ratio	-V_{CC} = -15V to -5V, +V_{CC} = +15V		77		dB	1, 2, 3
CMRR	Common Mode Rejection Ratio	-12V ≤ V_{CM} ≤ +12V		70		dB	1, 2, 3
$-A_{VS}$	Large Signal Voltage Gain	R_L = 2KΩ, V_O = -10V	See (1)	50		V/mV	1
				25		V/mV	2, 3
$+A_{VS}$	Large Signal Voltage Gain	R_L = 2KΩ, V_O = +10V	See (1)	50		V/mV	1
				25		V/mV	2, 3
$+V_{IO\ Adj}$	Offset Null	V_{CC} = ±20V		4.0		mV	1
$-V_{IO\ Adj}$	Offset Null	V_{CC} = ±20V			-4.0	mV	1

(1) Datalog reading in K = V/mV.

LM748 Electrical Characteristics DC Parameters (continued)

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

Symbol	Parameter	Conditions	Notes	Min	Max	Units	Sub-groups
$+I_{OS}$	Short Circuit Current			-45	-7.0	mA	1
				-45	-5.0	mA	2
				-55	-7.0	mA	3
$-I_{OS}$	Short Circuit Current			7.0	45	mA	1
				5.0	45	mA	2
				7.0	55	mA	3
V_O+	Output Voltage Swing	R_L = 10KΩ		12		V	1, 2, 3
		R_L = 2KΩ		10		V	1, 2, 3
V_O-	Output Voltage Swing	R_L = 2KΩ			-10	V	1, 2, 3
		R_L = 10KΩ			-12	V	1, 2, 3
I_{CC}	Supply Current				2.8	mA	1
					2.25	mA	2
					3.3	mA	3

REVISION HISTORY

Released	Revision	Section	Changes
12/16/2010	A	New Release, Corporate format	1 MDS data sheet converted into one Corp. data sheet format. The drift table was eliminated from the 883 section since it did not apply; MNLM748-X Rev 0BL will be archived.
03/26/13	A	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
LM748H/883	ACTIVE	TO-99	LMC	8	20	RoHS & Green	Call TI	Level-1-NA-UNLIM	-55 to 125	LM748H/883 Q ACO LM748H/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.

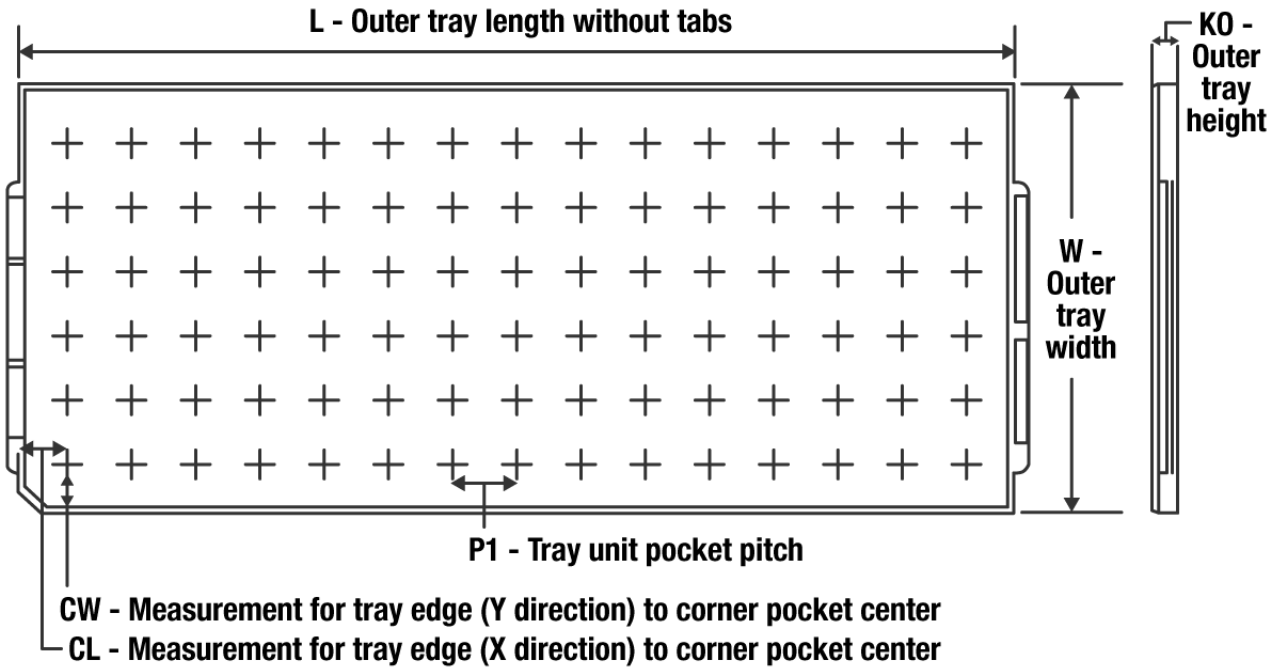
(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(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.

TRAY



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

*All dimensions are nominal

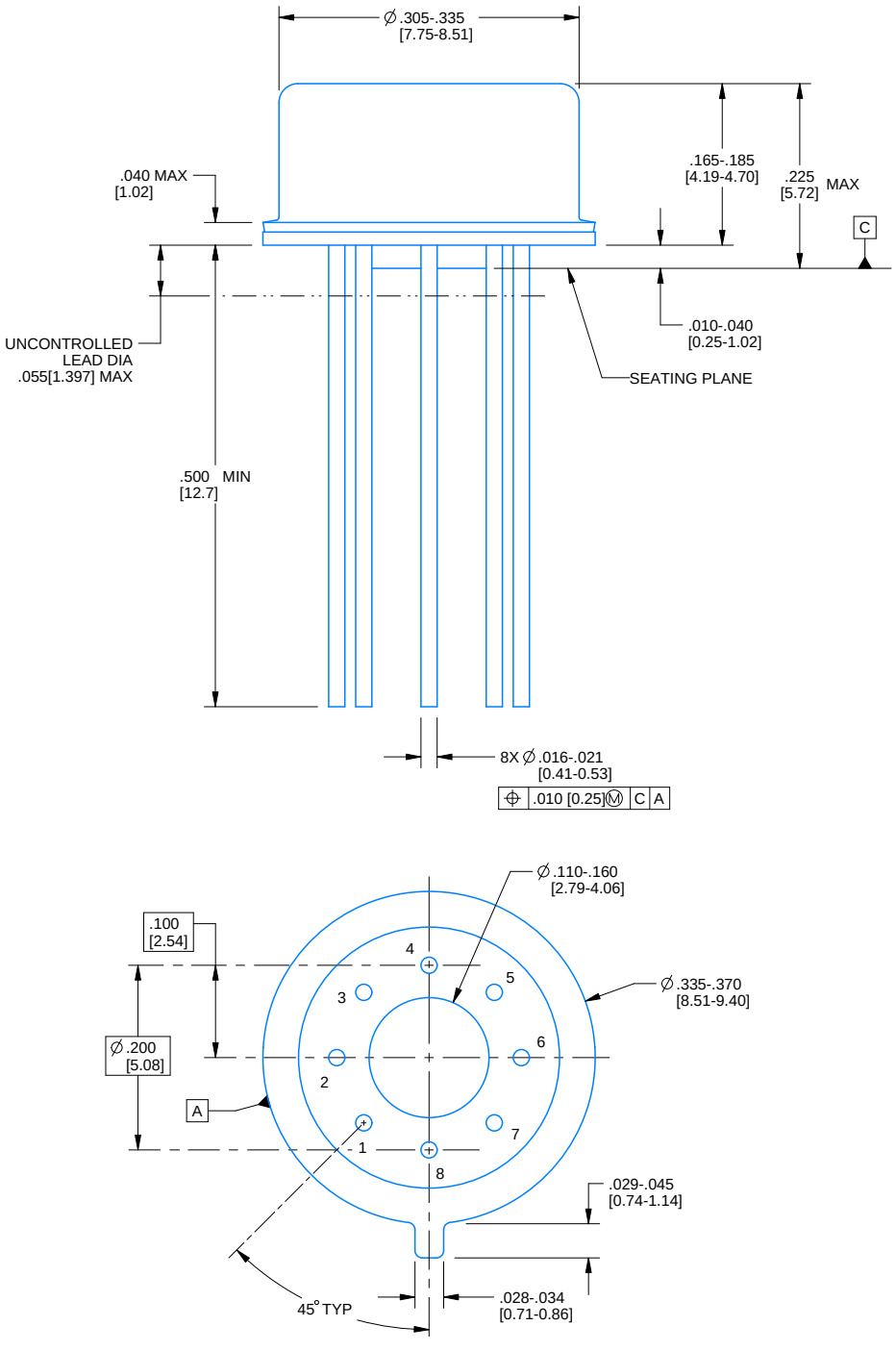
Device	Package Name	Package Type	Pins	SPQ	Unit array matrix	Max temperature (°C)	L (mm)	W (mm)	K0 (µm)	P1 (mm)	CL (mm)	CW (mm)
LM748H/883	LMC	TO-CAN	8	20	2 X 10	150	126.49	61.98	8890	11.18	12.95	18.54

PACKAGE OUTLINE

LMC0008A

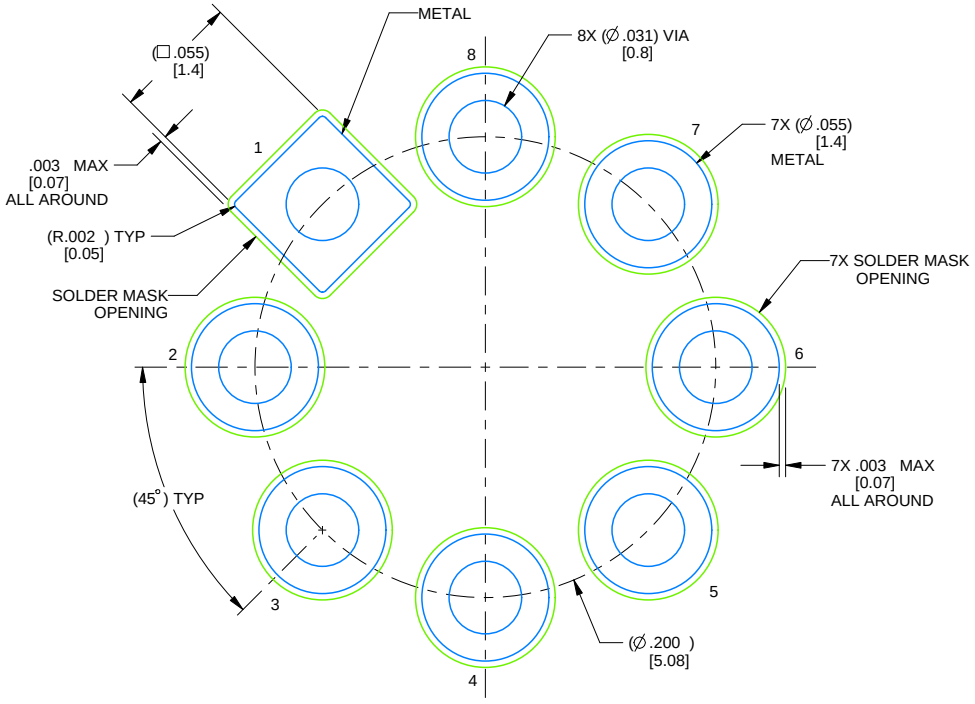
TO-CAN - 5.72 mm max height

TRANSISTOR OUTLINE



NOTES:

1. All linear dimensions are in inches [millimeters]. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Pin numbers shown for reference only. Numbers may not be marked on package.
4. Reference JEDEC registration MO-002/TO-99.



LAND PATTERN EXAMPLE
NON-SOLDER MASK DEFINED
SCALE: 12X

4220610/B 09/2024

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