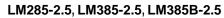


Sample &

Buy





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LMx85-2.5, LM385B-2.5 Micropower Voltage References

Technical

Documents

1 Features

- Operating Current Range 20 µA to 20 mA
- 1.5% and 3% Initial Voltage Tolerance
- Reference Impedance
 - LM385 1 Ω Maximum at 25°C
 - All Devices 1.5 Ω Maximum Over Full Temperature Range
- Very Low Power Consumption

2 Applications

- Portable Meter References
- Portable Test Instruments
- Battery-Operated Systems
- Current-Loop Instrumentation
- Panel Meters

3 Description

Tools &

Software

The LMx85-2.5 and LM385B are micropower, twoterminal, band-gap voltage references that operate over a 20- μ A to 20-mA current range and feature exceptionally low dynamic impedance and good temperature stability. On-chip trimming provides tight voltage tolerance. The band-gap reference for these devices has low noise and long-term stability.

Support &

Community

<u>...</u>

The design makes these devices exceptionally tolerant of capacitive loading and, thus, easier to use in most reference applications. The wide dynamic operating temperature range accommodates varying current supplies, with excellent regulation.

The extremely low power drain of this series makes these devices useful for micropower circuitry. These voltage references can be used to make portable meters, regulators, or general-purpose analog circuitry, with battery life approaching shelf life. The wide operating current range of these voltage references allows them to replace older references with tighter-tolerance parts.

Device Information⁽¹⁾

PART NUMBER	PACKAGE	BODY SIZE (NOM)
LMx85D-2-5, LM385BD-2-5	SOIC (8)	4.90 mm × 3.90 mm
LMx85LP-2-5, LM385BLP-2-5	TO-92 (3)	4.30 mm × 4.30 mm
LM385PW-2-5, LM385BPW-2-5	TSSOP (8)	3.00 mm × 4.40 mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.

Simplified Schematic

ANODE CATHODE

An IMPORTANT NOTICE at the end of this data sheet addresses availability, warranty, changes, use in safety-critical applications, intellectual property matters and other important disclaimers. PRODUCTION DATA.

2

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4 Revision History

Changes from Revision J (March 2005) to Revision K

Page

Added Features section, Device Information table, Table of Contents, Revision History section, Pin Configuration and Functions section, Specifications section, Absolute Maximum Ratings table, ESD Ratings table, Thermal Information table, Detailed Description section, Application and Implementation section, Power Supply Recommendations section, Layout section, Device and Documentation Support section, and Mechanical, Packaging, and Orderable Information section 1

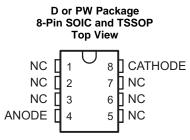
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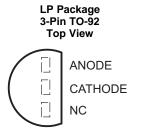
8



5 Pin Configuration and Functions



NC – No internal connection



NC - No internal connection

Pin Functions

		PIN					
		NO.		TYPE DESCRIPTION			
NAME	SOIC	TSSOP	TO-92				
ANODE		4	1	I	Shunt Current/Voltage Input		
CATHODE	8 2		0	Common pin, typically connected to ground			
NC	1, 2, 3, 5, 6, 7 3 — No Internal Connection				No Internal Connection		

6 Specifications

6.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)⁽¹⁾

		MIN	MAX	UNIT
I _R	Reverse current		30	mA
I _F	Forward current		10	mA
	Lead temperature 1.6 mm (1/16 inch) from case for 10 seconds		260	°C
TJ	Junction temperature		150	°C
T _{stg}	Storage temperature	-65	150	°C

(1) Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

6.2 ESD Ratings

				VALUE	UNIT
,		Electrostatio discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 ⁽¹⁾	±2000	V
	V _(ESD)	Electrostatic discharge	Charged-device model (CDM), per JEDEC specification JESD22-C101 ⁽²⁾	±1000	v

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.

(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process

6.3 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)

			MIN	MAX	UNIT
IZ	Reference current		0.02	20	mA
Ŧ	Operating free air temperature	LM285-2.5	-40	85	°C
IA	Operating free-air temperature	LM385-2.5, LM385B-2.5	0	70	

6.4 Thermal Information

		LN	Ix85-2.5, LM385B-	2.5	
	THERMAL METRIC ⁽¹⁾	D (SOIC)	LP (T0-92)	PW (TSSOP)	UNIT
		8 PINS	3 PINS	8 PINS	
R _{θJA}	Junction-to-ambient thermal resistance	112	157	168.3	°C/W
R _{0JC(top)}	Junction-to-case (top) thermal resistance	58.5	80.3	53.7	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	52.1	N/A	96.4	°C/W
Ψ_{JT}	Junction-to-top characterization parameter	15.8	24.6	4.5	°C/W
Ψ_{JB}	Junction-to-board characterization parameter	51.7	136.2	94.7	°C/W

(1) For more information about traditional and new thermal metrics, see the IC Package Thermal Metrics application report, SPRA953.



6.5 Electrical Characteristics

 $T_A = 25^{\circ}C$ unless otherwise noted.

	PARAMETER	TEST COND	ITIONS	MIN	TYP	MAX	UNIT	
LM285-2	2.5							
VZ	Reference voltage	$I_{Z} = 20 \ \mu A \text{ to } 20 \text{ mA}$		2.462	2.5	2.538	V	
αVZ	Average temperature coefficient of reference voltage ⁽¹⁾	$I_{Z} = 20 \ \mu A \text{ to } 20 \ m A$	Full range ⁽²⁾		±20		ppm/°C	
			$T_A = 25^{\circ}C$			1		
A) /		$I_Z = 20 \ \mu A \text{ to } 1 \ \text{mA}$	Full range			1.5	mV	
ΔV_Z	Change in reference voltage with current	$L = 1 \text{ m} \Lambda \text{ to } 20 \text{ m} \Lambda$	$T_A = 25^{\circ}C$			10		
		$I_Z = 1 \text{ mA to } 20 \text{ mA}$	Full range			30		
$\Delta V_Z / \Delta t$	Long-term change in reference voltage	I _Z = 100 μA			±20		ppm/khr	
I _{Z(MIN)}	Minimum reference current	Full range			8	20	μΑ	
7	Reference impedance	I _Z = 100 μA	$T_A = 25^{\circ}C$		0.2	0.6	Ω	
ZZ		12 = 100 μΑ	Full range			1.5	32	
V _n	Broadband noise voltage	I _Z = 100 μA, f = 10 Hz	to 10 kHz		120		μV	
LM385-2	2.5							
Vz	Reference voltage	$I_Z = 20 \ \mu A \text{ to } 20 \ m A$		2.425	2.5	2.575	V	
αVZ	Average temperature coefficient of reference voltage ⁽¹⁾	$I_Z = 20 \ \mu A \text{ to } 20 \ \text{mA}$	Full range ⁽²⁾		±20		ppm/°C	
		L = 20 uA to 1 mA	$T_A = 25^{\circ}C$			2		
ΔV_Z	Change in reference voltage with current	$I_Z = 20 \ \mu A \text{ to } 1 \ \text{mA}$	Full range			2	mV	
ΔvZ		$I_7 = 1 \text{ mA to } 20 \text{ mA}$	$T_A = 25^{\circ}C$			20		
		Full range				30		
$\Delta V_Z / \Delta t$	Long-term change in reference voltage	I _Z = 100 μA			±20		ppm/khr	
I _{Z(MIN)}	Minimum reference current	Full range			8	20	μA	
Zz	Reference impedance	I _Z = 100 μA	$T_A = 25^{\circ}C$		0.4	1	Ω	
			Full range			1.5		
V _n	Broadband noise voltage	I _Z = 100 μA, f = 10 Hz	to 10 kHz		120		μV	
LM385B	-2.5							
Vz	Reference voltage	$I_Z = 20 \ \mu A \text{ to } 20 \ m A$		2.462	2.5	2.538	V	
αVZ	Average temperature coefficient of reference voltage ⁽¹⁾	$I_Z = 20 \ \mu A$ to 20 mA	Full range ⁽²⁾		±20		ppm/°C	
		$L = 20 \mu \Lambda \text{ to } 1 \text{ m} \Lambda$	$T_A = 25^{\circ}C$			2		
۸\/_	Change in reference voltage with current	$I_Z = 20 \ \mu A \text{ to } 1 \ \text{mA}$	Full range			2	mV	
ΔV_Z	Change in reference voltage with current	$I_7 = 1 \text{ mA to } 20 \text{ mA}$	$T_A = 25^{\circ}C$			20		
		$I_Z = 1$ IIIA to 20 IIIA	Full range			30		
$\Delta V_Z / \Delta t$	Long-term change in reference voltage	I _Z = 100 μA			±20		ppm/khr	
I _{Z(MIN)}	Minimum reference current	Full range			8	20	μA	
7	Reference impedance	I= = 100^	$T_A = 25^{\circ}C$		0.4	1	0	
Zz	Reference impedance	I _Z = 100 μA	Full range			1.5	Ω	
Vn	Broadband noise voltage	I _Z = 100 μA, f = 10 Hz	to 10 kHz		120		μV	

(1) The average temperature coefficient of reference voltage is defined as the total change in reference voltage divided by the specified temperature range.

(2) Full range is 0° C to 70° C for the LM385-2.5 and LM385B-2.5, and -40° C to 85° C for the LM285-2.5.

LM285-2.5, LM385-2.5, LM385B-2.5

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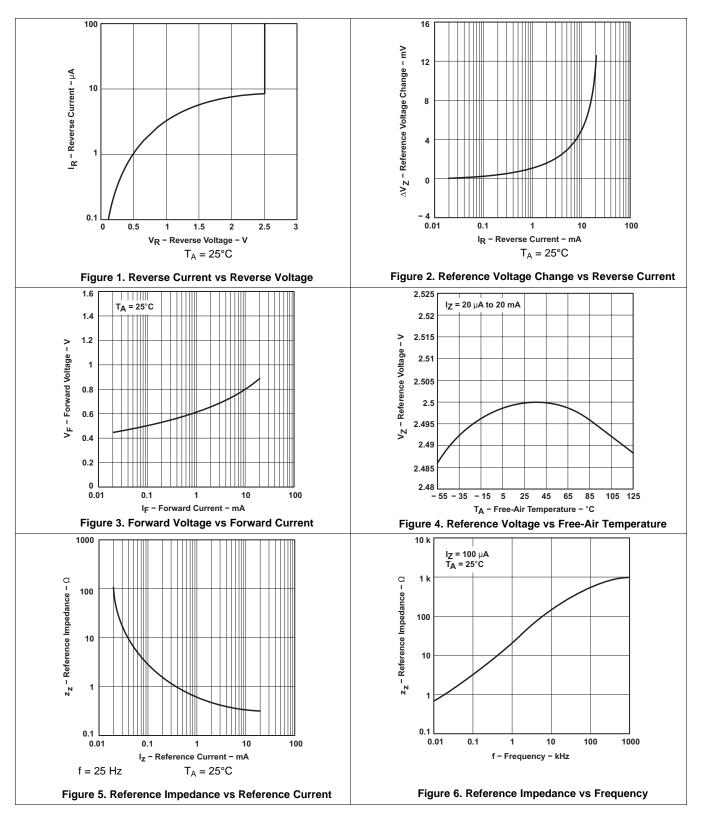
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STRUMENTS

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6.6 Typical Characteristics

Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices. For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

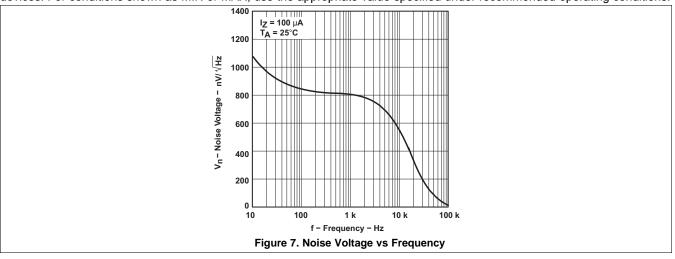


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Typical Characteristics (continued)

Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices. For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.



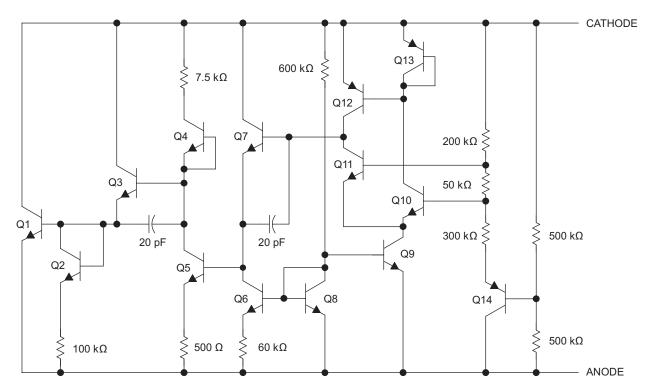
8

7 Detailed Description

7.1 Overview

The LMx85-2.5 and LM385B-2.5 devices maintain a nearly constant voltage between the cathode and anode of 2.5 V when the minimum cathode current up to the recommended maximum is provided. See *Recommended Operating Conditions* for recommended minimum cathode current.

7.2 Functional Block Diagram



7.3 Feature Description

A band-gap voltage reference controls a high-gain amplifier and shunt pass element to maintain a nearly constant voltage between the cathode and anode of 2.5 V. Regulation occurs after a minimum current is provided to power the voltage divider and amplifier. Internal frequency compensation provides a stable loop for all capacitive loads. Floating shunt design is useful for both positive and negative regulation applications.

7.4 Device Functional Modes

The LMx85-2.5 and LM385B-2.5 devices have a single functional mode. These devices can be used as 2.5-V fixed voltage references. The reference voltage cannot be adjusted for these devices.

In order for a proper Reverse Voltage to be developed, current must be sourced into the cathode of LM285. The minimum current needed for proper regulation is denoted in *Electrical Characteristics* as I_{Z(MIN)}.

ISTRUMENTS

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8 Application and Implementation

NOTE

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

8.1 Application Information

The LMx85-2.5 and LM385B-2.5 devices create a voltage reference for use in a variety of applications including amplifiers, power supplies, and current-sensing circuits.

8.2 Typical Application

Figure 8 shows how to use these devices to establish a 2.5-V source from a 9-V battery.

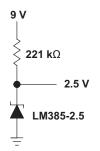


Figure 8. Reference From a 9-V Battery

8.2.1 Design Requirements

The key design requirement when using this device as a voltage reference is to supply the LM385 with a minimum Cathode Current (I_7), as indicated in *Electrical Characteristics*.

8.2.2 Detailed Design Procedure

To generate a constant and stable reference voltage, a current greater than $I_{Z(MIN)}$ must be sourced into the cathode of this device. This can be accomplished using a current regulating device such as LM334 or a simple resistor. For a resistor, its value should be equal to or greater than $(V_{supply} - V_{reference}) \div I_{Z(MIN)}$.

8.2.3 Application Curve

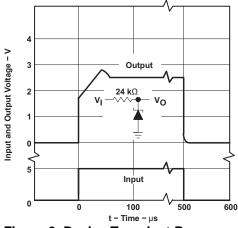
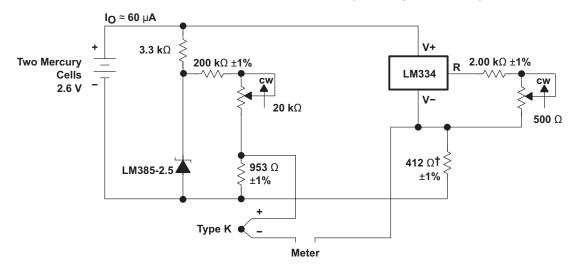


Figure 9. Device Transient Response

8.3 System Examples

8.3.1 Thermocouple Cold-Junction Compensator

Figure 10 shows how to use the LM385-2.5 in a circuit for thermocouple cold-junction compensation.

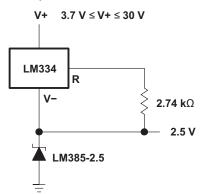


 † Adjust for 12.17 mV at 25°C across 412 Ω

Figure 10. Thermocouple Cold-Junction Compensator

8.3.2 Generating Reference Voltage with a Constant Current Source

The LM334 device can be used to set the cathode current of the LM385-2.5 device over a wide range of input voltages to ensure proper voltage regulation by the LM385-2.5 device.







9 Power Supply Recommendations

The supply voltage should be current limited to ensure that the maximum cathode current is not exceeded.

For applications shunting high currents (30 mA maximum), pay attention to the cathode and anode trace lengths, and adjust the width of the traces to have the proper current density.

10 Layout

10.1 Layout Guidelines

Figure 12 shows an example of a PCB layout of LMx85x-2.5. Some key V_{ref} noise considerations are:

- It is optional to connect a low-ESR, $0.1-\mu F$ (C_L) ceramic bypass capacitor on the cathode pin node.
- Decouple other active devices in the system per the device specifications.
- Using a solid ground plane helps distribute heat and reduces electromagnetic interference (EMI) noise pickup.
- Place the external components as close to the device as possible. This configuration prevents parasitic errors (such as the Seebeck effect) from occurring.
- Do not run sensitive analog traces in parallel with digital traces. Avoid crossing digital and analog traces if possible and only make perpendicular crossings when absolutely necessary.

10.2 Layout Example

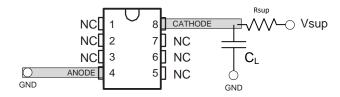


Figure 12. Layout Diagram

TEXAS INSTRUMENTS

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11 Device and Documentation Support

11.1 Related Links

The table below lists quick access links. Categories include technical documents, support and community resources, tools and software, and quick access to sample or buy.

PARTS	PRODUCT FOLDER	SAMPLE & BUY	TECHNICAL DOCUMENTS	TOOLS & SOFTWARE	SUPPORT & COMMUNITY
LM285-2.5	Click here	Click here	Click here	Click here	Click here
LM385-2.5	Click here	Click here	Click here	Click here	Click here
LM385B-2.5	Click here	Click here	Click here	Click here	Click here

Table 1. Related Links

11.2 Community Resources

The following links connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's Terms of Use.

TI E2E[™] Online Community *TI's Engineer-to-Engineer (E2E) Community.* Created to foster collaboration among engineers. At e2e.ti.com, you can ask questions, share knowledge, explore ideas and help solve problems with fellow engineers.

Design Support TI's Design Support Quickly find helpful E2E forums along with design support tools and contact information for technical support.

11.3 Trademarks

E2E is a trademark of Texas Instruments. All other trademarks are the property of their respective owners.

11.4 Electrostatic Discharge Caution



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.

11.5 Glossary

SLYZ022 — TI Glossary.

This glossary lists and explains terms, acronyms, and definitions.

12 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.



15-Jan-2016

PACKAGING INFORMATION

Orderable Device		Package Type	Package Drawing	Pins	•		Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	Device Marking	Samples
	(1)				Qty	(2)	(6)	(3)		(4/5)	
LM285D-2-5	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	285-25	Samples
LM285DG4-2-5	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	285-25	Samples
LM285DR-2-5	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	285-25	Samples
LM285DRG4-2-5	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	285-25	Samples
LM285LP-2-5	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	285-25	Samples
LM285LPE3-2-5	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	285-25	Samples
LM285LPR-2-5	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	285-25	Samples
LM285LPRE3-2-5	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	285-25	Samples
LM385BD-2-5	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	385B25	Samples
LM385BDE4-2-5	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	385B25	Samples
LM385BDR-2-5	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	385B25	Samples
LM385BDRE4-2-5	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	385B25	Samples
LM385BLP-2-5	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	385B25	Samples
LM385BLPE3-2-5	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	385B25	Samples
LM385BLPR-2-5	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	385B25	Samples
LM385BPWR-2-5	ACTIVE	TSSOP	PW	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	385B25	Samples
LM385D-2-5	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	385-25	Samples



15-Jan-2016

Orderable Device	Status	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
LM385DR-2-5	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	385-25	Samples
LM385DRG4-2-5	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	385-25	Samples
LM385LP-2-5	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	385-25	Samples
LM385LPE3-2-5	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	385-25	Samples
LM385LPR-2-5	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	385-25	Samples
LM385PWR-2-5	ACTIVE	TSSOP	PW	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	385-25	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) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

⁽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.



PACKAGE OPTION ADDENDUM

15-Jan-2016

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

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PACKAGE MATERIALS INFORMATION

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TAPE AND REEL INFORMATION





QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



Device	Package Type	Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
LM285DR-2-5	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
LM385BDR-2-5	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
LM385BPWR-2-5	TSSOP	PW	8	2000	330.0	12.4	7.0	3.6	1.6	8.0	12.0	Q1
LM385DR-2-5	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
LM385PWR-2-5	TSSOP	PW	8	2000	330.0	12.4	7.0	3.6	1.6	8.0	12.0	Q1

TEXAS INSTRUMENTS

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PACKAGE MATERIALS INFORMATION

15-Feb-2016



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
LM285DR-2-5	SOIC	D	8	2500	340.5	338.1	20.6
LM385BDR-2-5	SOIC	D	8	2500	340.5	338.1	20.6
LM385BPWR-2-5	TSSOP	PW	8	2000	367.0	367.0	35.0
LM385DR-2-5	SOIC	D	8	2500	340.5	338.1	20.6
LM385PWR-2-5	TSSOP	PW	8	2000	367.0	367.0	35.0

PW0008A



PACKAGE OUTLINE

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



NOTES:

- 1. All linear dimensions are in 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. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not
- exceed 0.15 mm per side.
- 4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
- 5. Reference JEDEC registration MO-153, variation AA.



PW0008A

EXAMPLE BOARD LAYOUT

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



PW0008A

EXAMPLE STENCIL DESIGN

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



NOTES: (continued)

9. Board assembly site may have different recommendations for stencil design.



^{8.} Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

D (R-PDSO-G8)

PLASTIC SMALL OUTLINE



NOTES: A. All linear dimensions are in inches (millimeters).

- B. This drawing is subject to change without notice.
- Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
- Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
- E. Reference JEDEC MS-012 variation AA.

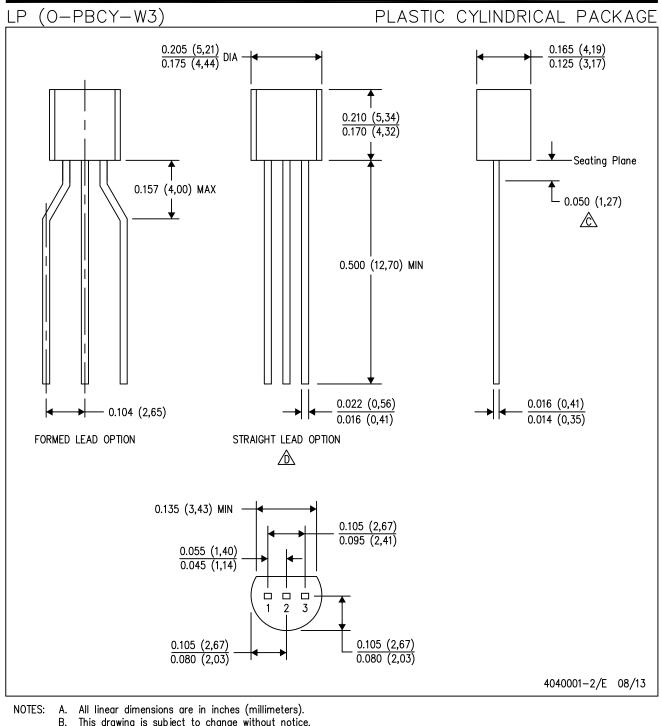




NOTES: A. All linear dimensions are in millimeters.

- B. This drawing is subject to change without notice.
- C. Publication IPC-7351 is recommended for alternate designs.
- D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

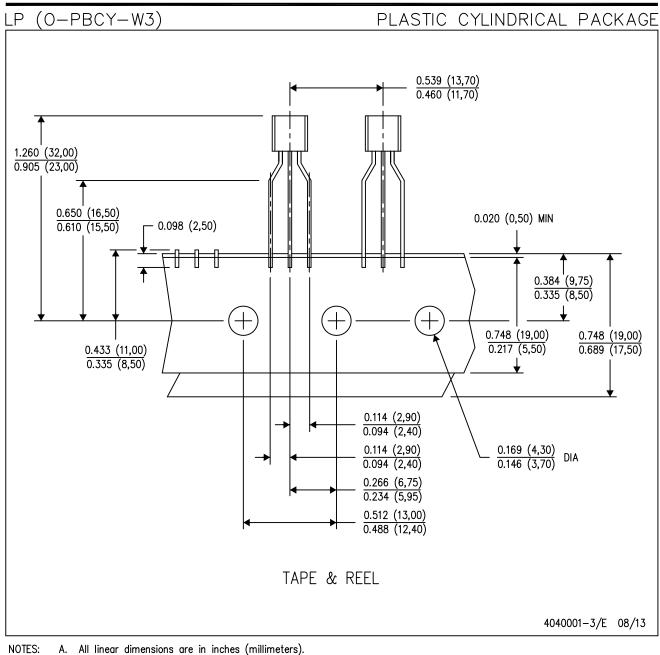




- B. This drawing is subject to change without notice.
- Lead dimensions are not controlled within this area.
- ⚠ Falls within JEDEC TO-226 Variation AA (TO-226 replaces TO-92).
- Shipping Method: E. Straight lead option available in bulk pack only. Formed lead option available in tape & reel or ammo pack. Specific products can be offered in limited combinations of shipping mediums and lead options. Consult product folder for more information on available options.



MECHANICAL DATA



- B. This drawing is subject to change without notice.
- C. Tape and Reel information for the Formed Lead Option package.



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