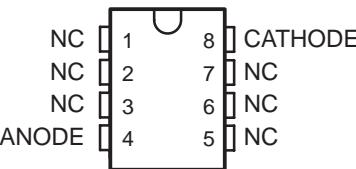


# LM285-2.5, LM385-2.5, LM385B-2.5 MICROPOWER VOLTAGE REFERENCES

SLVS023J – JANUARY 1989 – REVISED MARCH 2005

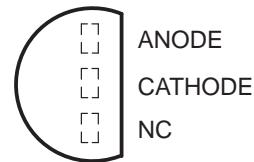
- Operating Current Range . . . 20  $\mu$ A to 20 mA
- 1.5% and 3% Initial Voltage Tolerance
- Reference Impedance
  - LM385 . . . 1  $\Omega$  Max at 25°C
  - All Devices . . . 1.5  $\Omega$  Max Over Full Temperature Range
- Very Low Power Consumption
- Applications
  - Portable Meter References
  - Portable Test Instruments
  - Battery-Operated Systems
  - Current-Loop Instrumentation
  - Panel Meters
- Interchangeable With Industry-Standard LM285-2.5 and LM385-2.5

LM285-2.5 . . . D PACKAGE  
LM385-2.5, LM385B-2.5 . . . D OR PW PACKAGE  
(TOP VIEW)



NC – No internal connection

LM285-2.5, LM385-2.5, LM385B-2.5 . . . LP PACKAGE  
(TOP VIEW)



NC – No internal connection

## description/ordering information

These micropower two-terminal band-gap voltage references operate over a 20- $\mu$ 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.

## ORDERING INFORMATION

TA	V <sub>Z</sub> TOLERANCE	PACKAGE <sup>†</sup>	ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	3%	SOIC (D)	Tube of 75	LM385D-2-5
			Reel of 2000	LM385DR-2-5
		TO226/TO-92 (LP)	Tube of 1000	LM385LP-2-5
			Reel of 2000	LM385LPR-2-5
		TSSOP (PW)	Tube of 150	LM385PW-2-5
			Reel of 2000	LM385PWR-2-5
	1.5%	SOIC (D)	Tube of 75	LM385BD-2-5
			Reel of 2000	LM385BDR-2-5
		TO226/TO-92 (LP)	Tube of 1000	LM385BLP-2-5
			Reel of 2000	LM385BLPR-2-5
		TSSOP (PW)	Tube of 150	LM385BPW-2-5
			Reel of 2000	LM385BPWR-2-5
-40°C to 85°C	1.5%	SOIC (D)	Tube of 75	LM285D-2-5
			Reel of 2000	LM285DR-2-5
		TO226/TO-92 (LP)	Tube of 1000	LM285LP-2-5
			Reel of 2000	LM285LPR-2-5

<sup>†</sup> Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

Copyright © 2005, Texas Instruments Incorporated

**TEXAS  
INSTRUMENTS**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

# LM285-2.5, LM385-2.5, LM385B-2.5 MICROPOWER VOLTAGE REFERENCES

SLVS023J – JANUARY 1989 – REVISED MARCH 2005

## description/ordering information (continued)

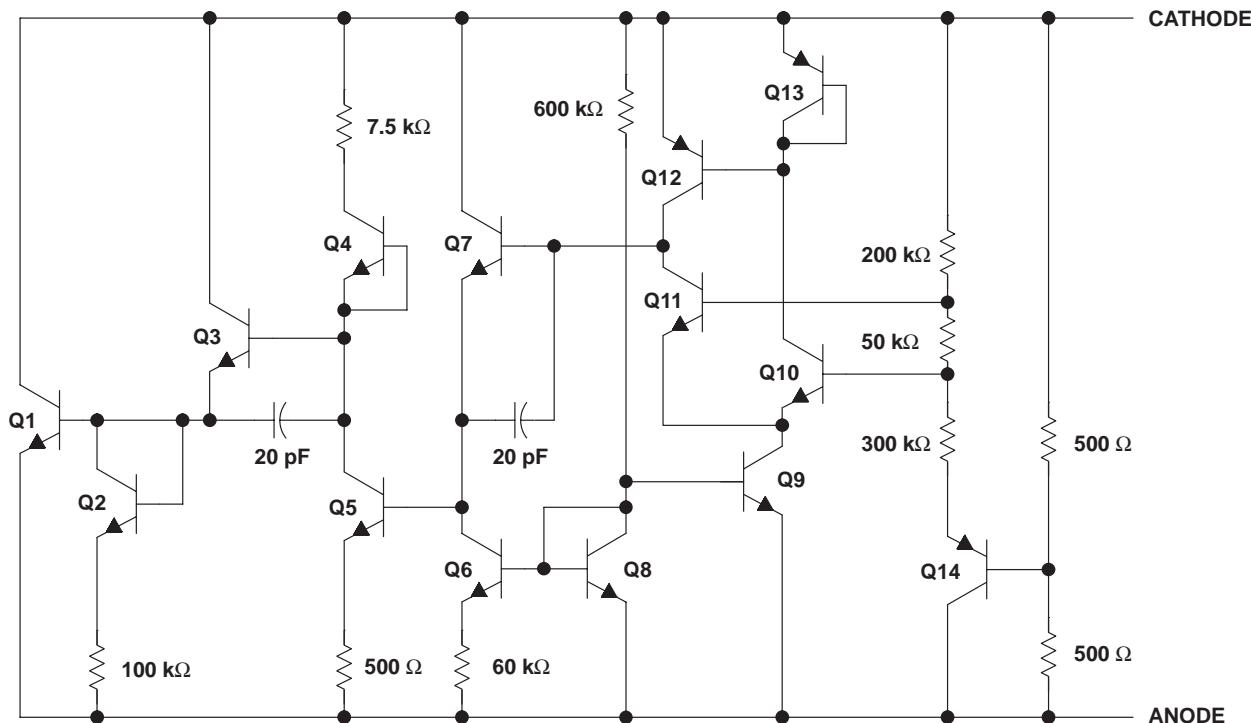
The design makes these devices exceptionally tolerant of capacitive loading and, thus, easier to use in most reference applications. The wide dynamic operating temperature range accommodates varying current supplies, with excellent regulation.

The extremely low power drain of this series makes them 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 allows them to replace older references with tighter-tolerance parts.

## symbol



## schematic



NOTE A: All component values shown are nominal.

## LM285-2.5, LM385-2.5, LM385B-2.5 MICROPOWER VOLTAGE REFERENCES

SLVS023J – JANUARY 1989 – REVISED MARCH 2005

**absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>**

<sup>†</sup> Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. Maximum power dissipation is a function of  $T_J(\max)$ ,  $\theta_{JA}$ , and  $T_A$ . The maximum allowable power dissipation at any allowable ambient temperature is  $P_D = (T_J(\max) - T_A)/\theta_{JA}$ . Operation at the absolute maximum  $T_J$  of 150°C can affect reliability.  
 2. The package thermal impedance is calculated in accordance with JEDEC 51-7.

### **recommended operating conditions**

		MIN	MAX	UNIT
I <sub>Z</sub>	Reference current	0.02	20	mA
T <sub>A</sub>	Operating free-air temperature range	LM285-2.5	-40	85
		LM385-2.5, LM385B-2.5	0	70 °C

## electrical characteristics at specified free-air temperature

PARAMETER	TEST CONDITIONS	TA <sup>‡</sup>	LM285-2.5			LM385-2.5			LM385B-2.5			UNIT	
			MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX		
V <sub>Z</sub>	Reference voltage	I <sub>Z</sub> = 20 µA to 20 mA	25°C	2.462	2.5	2.538	2.425	2.5	2.575	2.462	2.5	2.538	V
αV <sub>Z</sub>	Average temperature coefficient of reference voltage <sup>§</sup>	I <sub>Z</sub> = 20 µA to 20 mA	Full range	±20			±20			±20			ppm/°C
ΔV <sub>Z</sub>	Change in reference voltage with current	I <sub>Z</sub> = 20 µA to 1 mA	25°C	1			2			2			mV
			Full range	1.5			2			2			
	I <sub>Z</sub> = 1 mA to 20 mA	25°C	10			20			20				
			Full range	30			30			30			
ΔV <sub>Z</sub> /Δt	Long-term change in reference voltage	I <sub>Z</sub> = 100 µA	25°C	±20			±20			±20			ppm/khr
I <sub>Z(min)</sub>	Minimum reference current		Full range	8		20	8		20	8		20	µA
z <sub>Z</sub>	Reference impedance	I <sub>Z</sub> = 100 µA	25°C	0.2		0.6	0.4		1	0.4		1	Ω
			Full range	1.5			1.5			1.5			
V <sub>n</sub>	Broadband noise voltage	I <sub>Z</sub> = 100 µA, f = 10 Hz to 10 kHz	25°C	120			120			120			µV

‡ 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.

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

# LM285-2.5, LM385-2.5, LM385B-2.5 MICROPOWER VOLTAGE REFERENCES

SLVS023J – JANUARY 1989 – REVISED MARCH 2005

## TYPICAL CHARACTERISTICS<sup>†</sup>

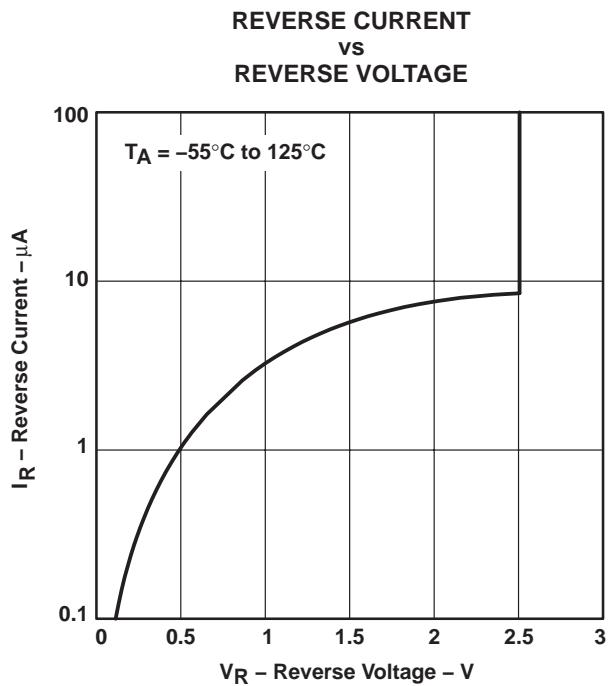


Figure 1

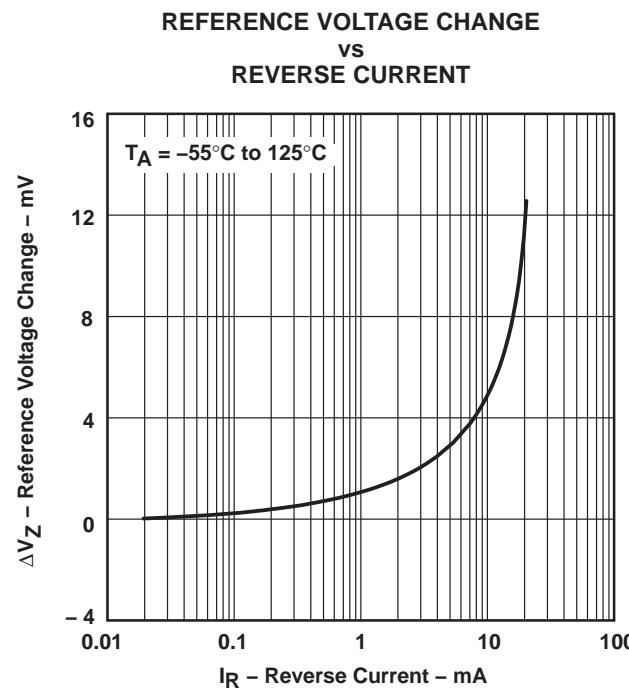


Figure 2

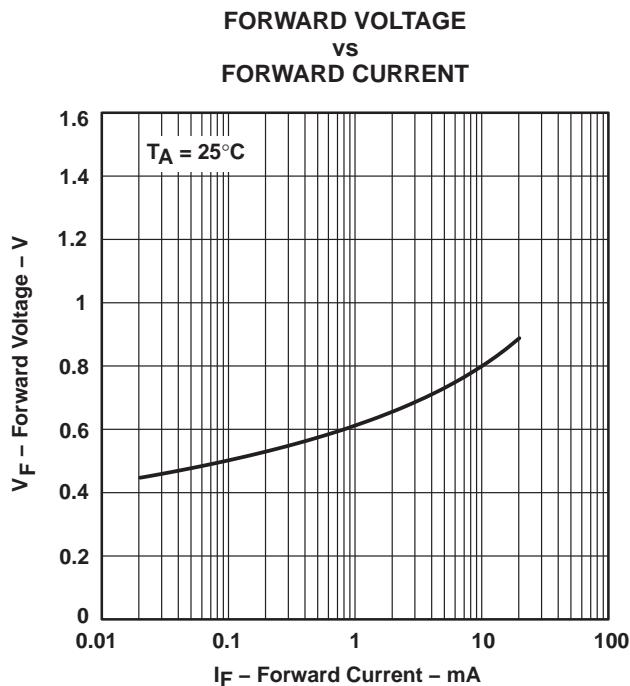


Figure 3

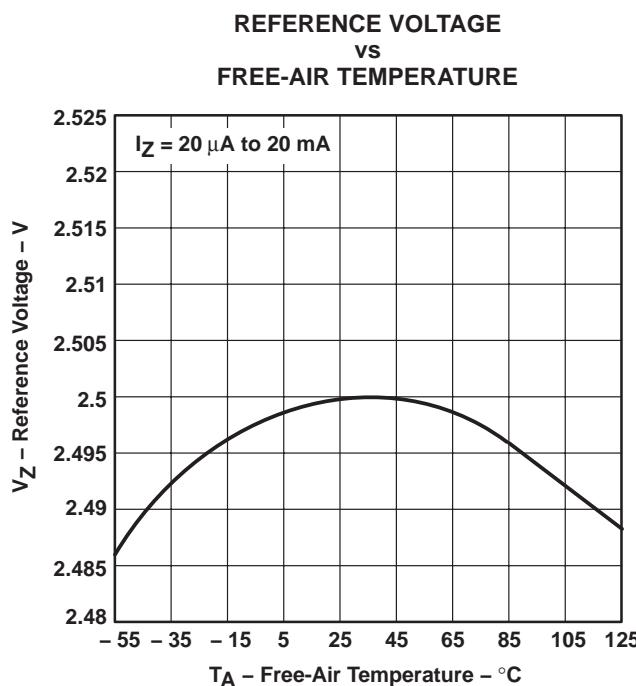


Figure 4

<sup>†</sup> Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS†

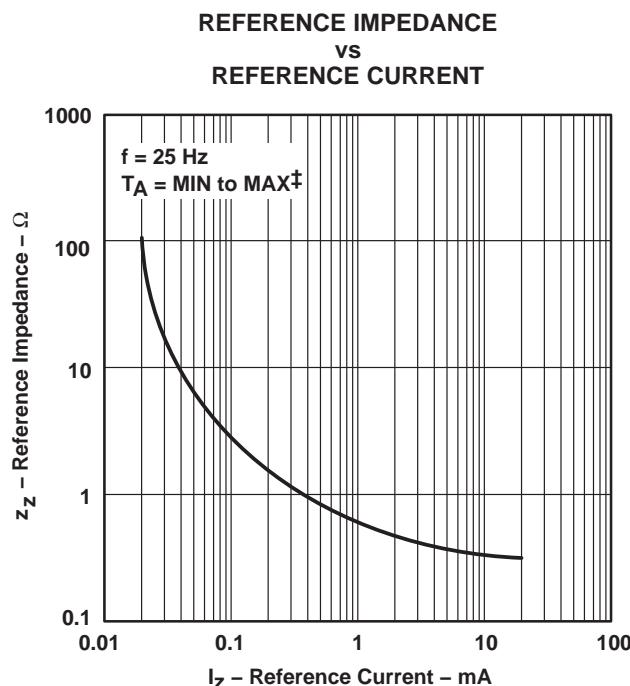


Figure 5

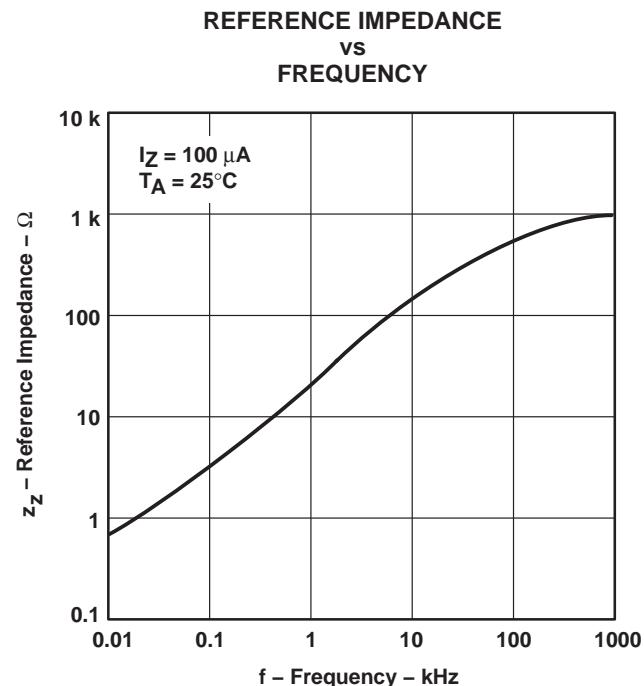


Figure 6

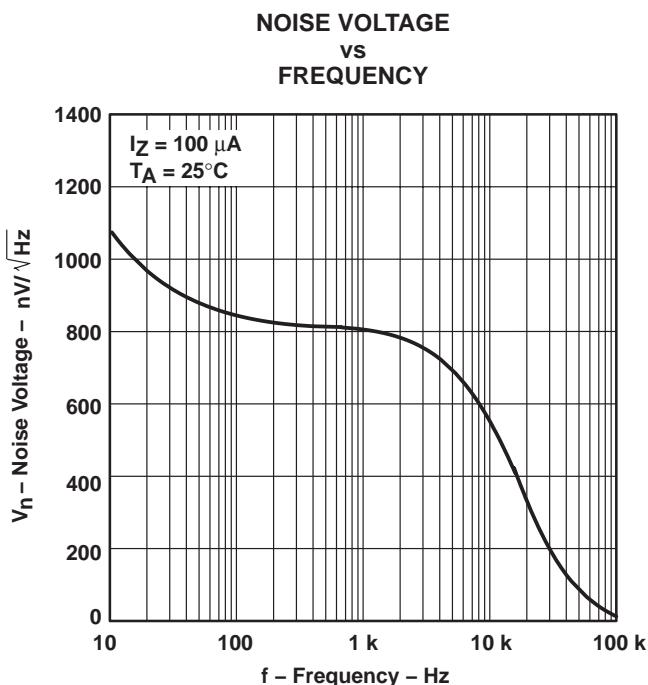


Figure 7

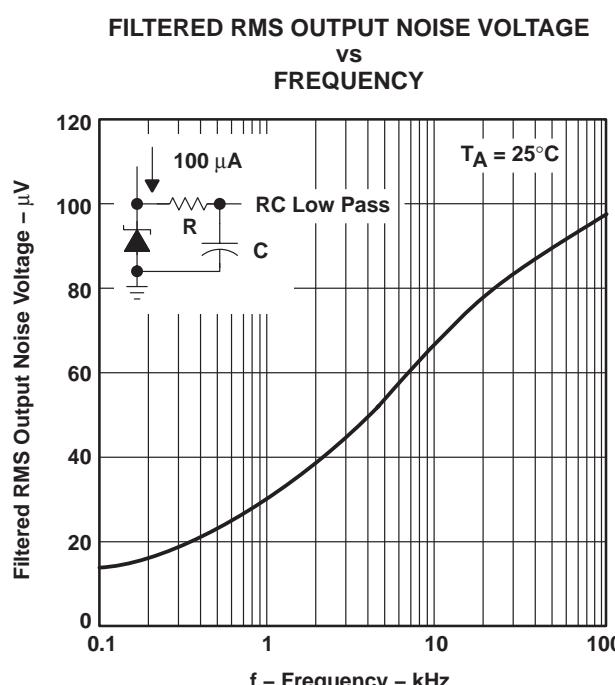


Figure 8

† 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.

# LM285-2.5, LM385-2.5, LM385B-2.5 MICROPOWER VOLTAGE REFERENCES

SLVS023J – JANUARY 1989 – REVISED MARCH 2005

## TYPICAL CHARACTERISTICS†

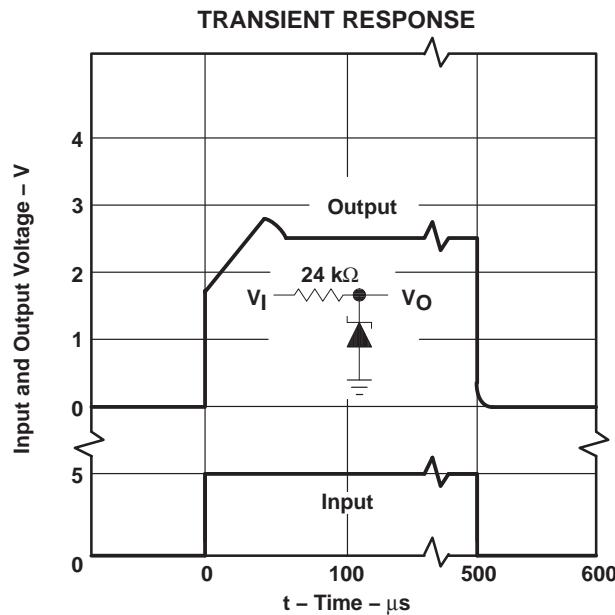


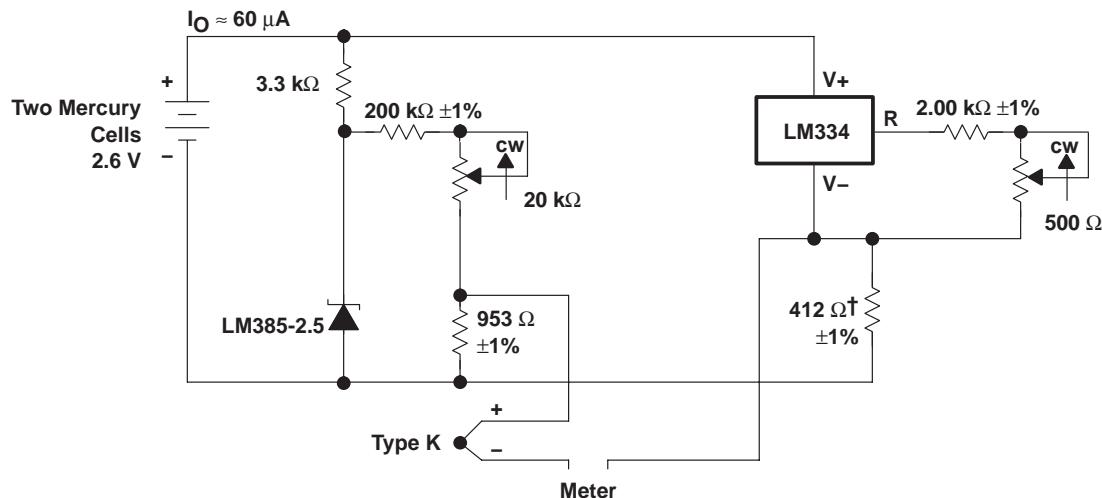
Figure 9

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

## APPLICATION INFORMATION



† Adjust for 12.17 mV at 25°C across 412  $\Omega$

Figure 10. Thermocouple Cold-Junction Compensator

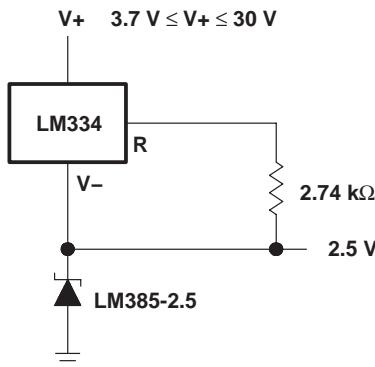


Figure 11. Operation Over a Wide Supply Range

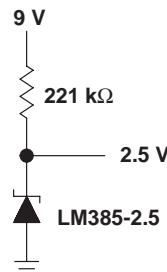


Figure 12. Reference From a 9-V Battery

**PACKAGING INFORMATION**

Orderable Device	Status (1)	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
LM285D-2-5	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	285-25	<a href="#">Samples</a>
LM285DG4-2-5	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	285-25	<a href="#">Samples</a>
LM285DR-2-5	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	285-25	<a href="#">Samples</a>
LM285DRG4-2-5	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	285-25	<a href="#">Samples</a>
LM285LP-2-5	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	285-25	<a href="#">Samples</a>
LM285LPE3-2-5	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	285-25	<a href="#">Samples</a>
LM285LPR-2-5	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	285-25	<a href="#">Samples</a>
LM285LPRE3-2-5	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	285-25	<a href="#">Samples</a>
LM385BD-2-5	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	385B25	<a href="#">Samples</a>
LM385BDE4-2-5	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	385B25	<a href="#">Samples</a>
LM385BDR-2-5	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	385B25	<a href="#">Samples</a>
LM385BDRE4-2-5	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	385B25	<a href="#">Samples</a>
LM385BLP-2-5	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	385B25	<a href="#">Samples</a>
LM385BLPE3-2-5	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	385B25	<a href="#">Samples</a>
LM385BLPR-2-5	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	385B25	<a href="#">Samples</a>
LM385BPWR-2-5	ACTIVE	TSSOP	PW	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	385B25	<a href="#">Samples</a>
LM385D-2-5	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	385-25	<a href="#">Samples</a>

Orderable Device	Status (1)	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	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
LM385DRG4-2-5	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	385-25	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
LM385LP-2-5	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	385-25	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
LM385LPE3-2-5	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	385-25	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
LM385LPR-2-5	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	385-25	<span style="background-color: red; color: white; padding: 2px;">Samples</span>
LM385PWR-2-5	ACTIVE	TSSOP	PW	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	385-25	<span style="background-color: red; color: white; padding: 2px;">Samples</span>

(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.

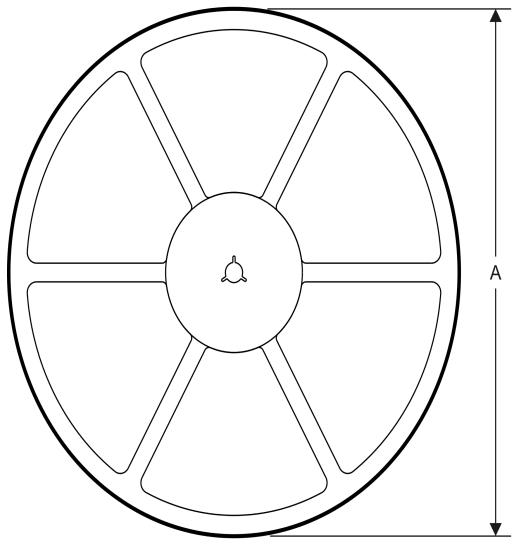
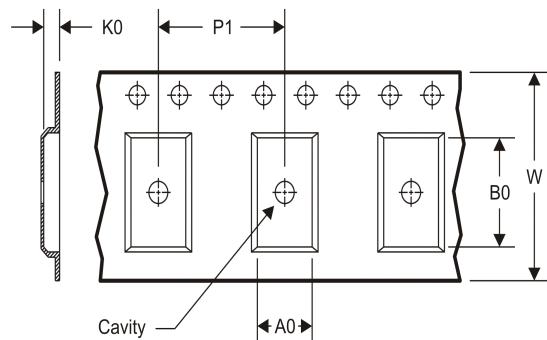
(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

---

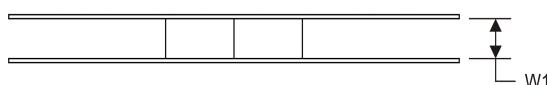
(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

**Important Information and Disclaimer:** The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

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.

**TAPE AND REEL INFORMATION**
**REEL DIMENSIONS**

**TAPE DIMENSIONS**


A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers


**TAPE AND REEL INFORMATION**

\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	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

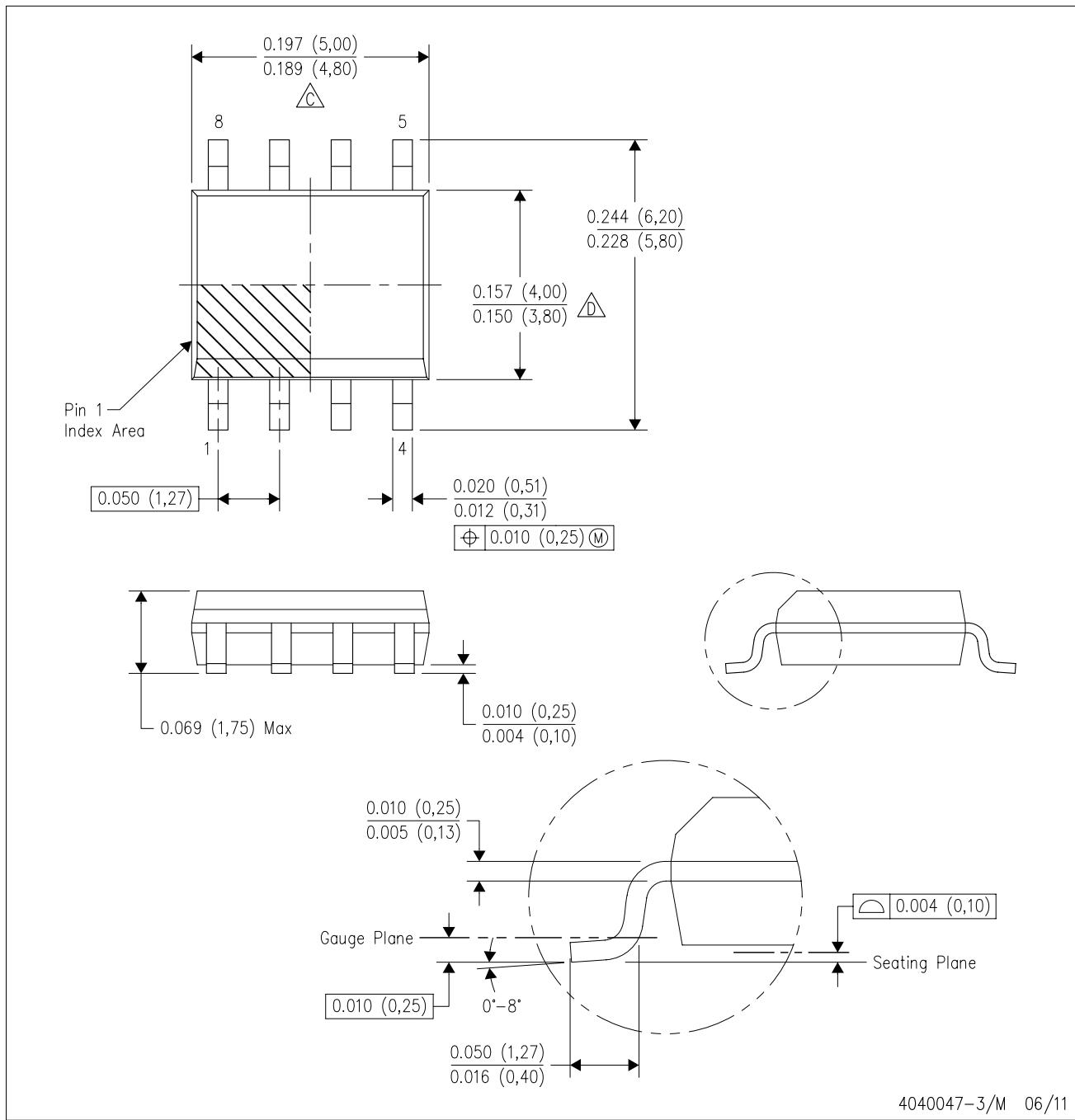
**TAPE AND REEL BOX DIMENSIONS**


\*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

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.

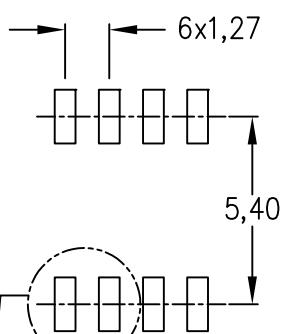
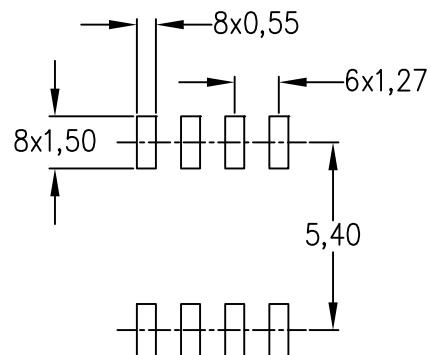
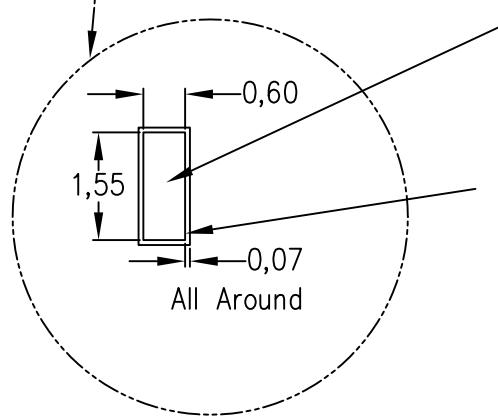
△C Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0.15) each side.

△D 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.

D (R-PDSO-G8)

PLASTIC SMALL OUTLINE

Example Board Layout  
(Note C)Stencil Openings  
(Note D)Example  
Non Soldermask Defined PadExample  
Pad Geometry  
(See Note C)Example  
Solder Mask Opening  
(See Note E)

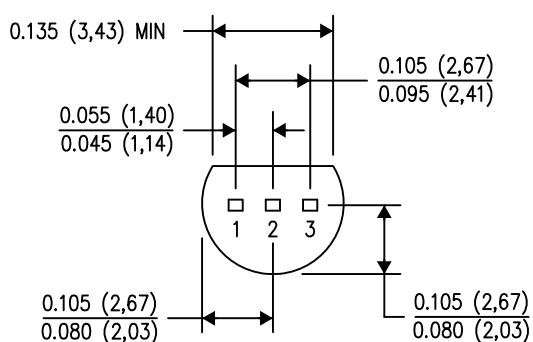
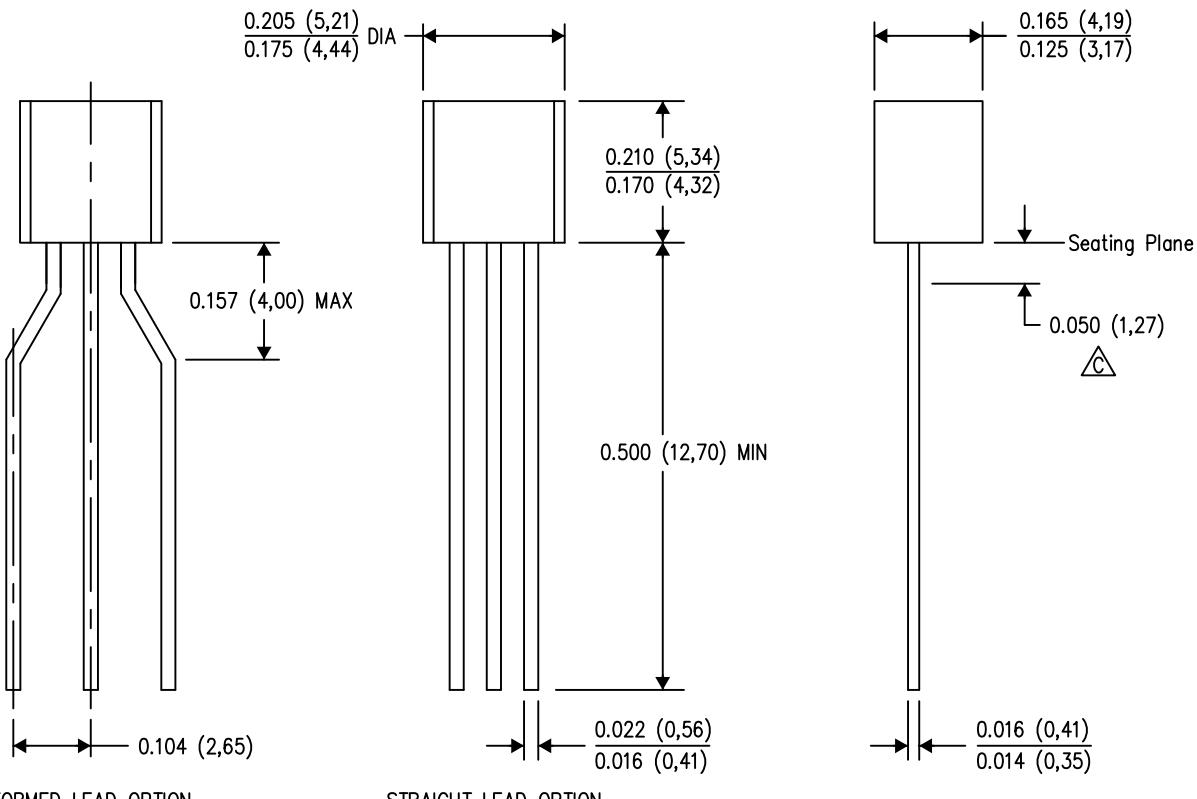
4211283-2/E 08/12

NOTES:

- All linear dimensions are in millimeters.
- This drawing is subject to change without notice.
- Publication IPC-7351 is recommended for alternate designs.
- 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.
- Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

LP (O-PBCY-W3)

PLASTIC CYLINDRICAL PACKAGE



4040001-2/E 08/13

NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.

△C Lead dimensions are not controlled within this area.

△D Falls within JEDEC TO-226 Variation AA (TO-226 replaces TO-92).

E. Shipping Method:

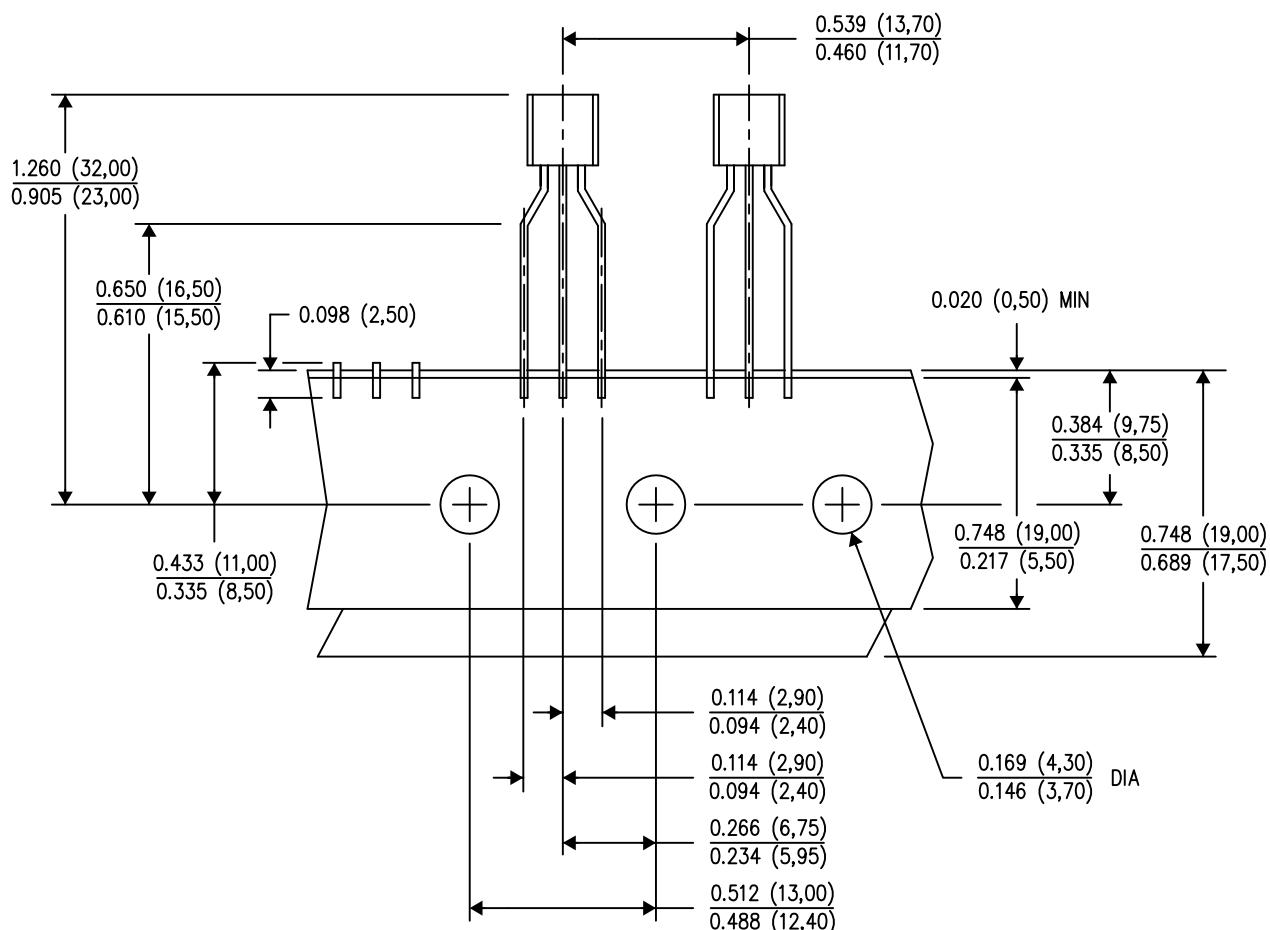
Straight lead option available in bulk pack only.

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.

LP (0-PBCY-W3)

## PLASTIC CYLINDRICAL PACKAGE



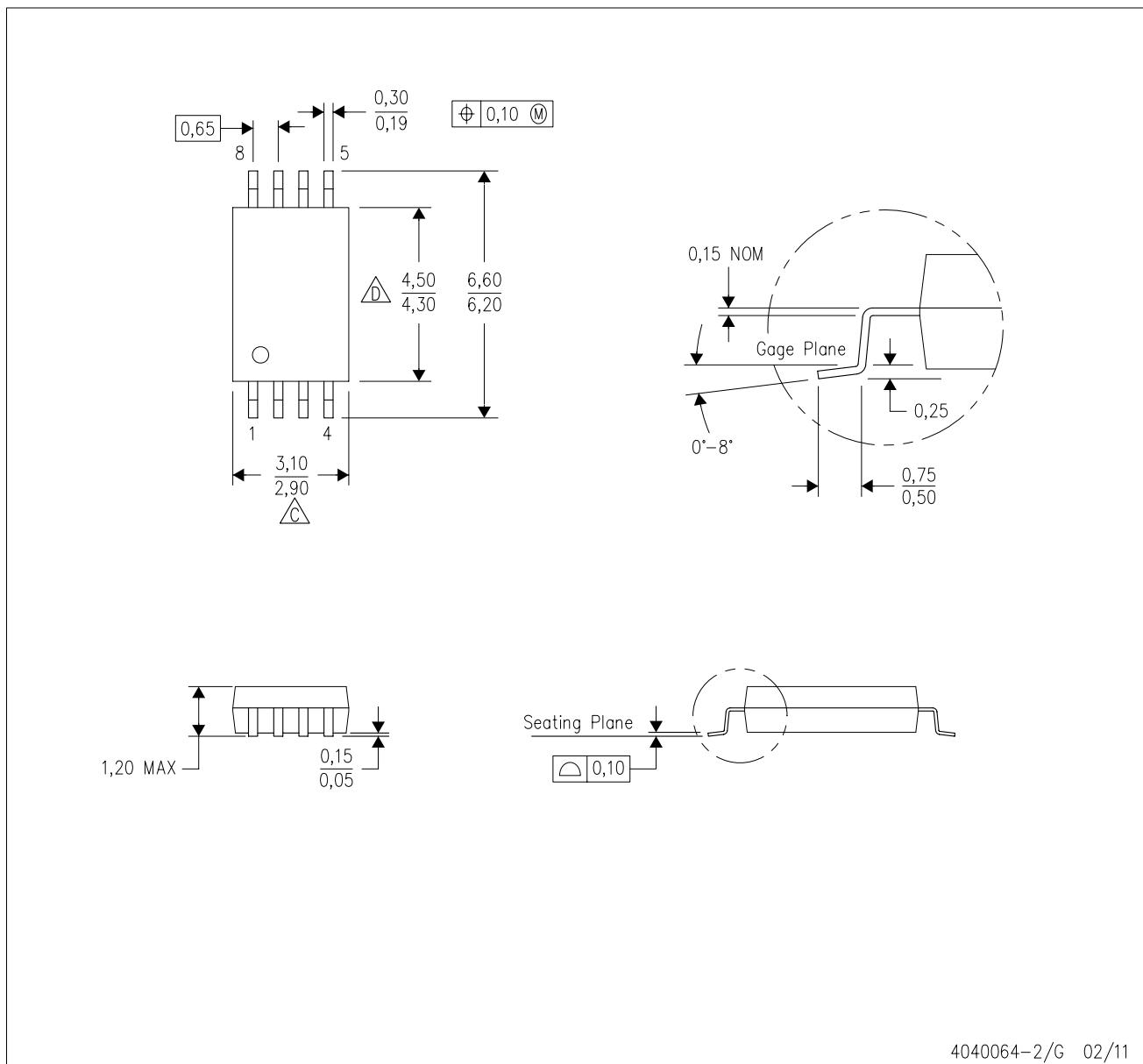
## TAPE & REEL

4040001-3/E 08/13

NOTES: A. All linear dimensions are in inches (millimeters).  
B. This drawing is subject to change without notice.  
C. Tape and Reel information for the Formed Lead Option package.

PW (R-PDSO-G8)

PLASTIC SMALL OUTLINE



4040064-2/G 02/11

NOTES: A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.

B. This drawing is subject to change without notice.

 C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.

 D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.

E. Falls within JEDEC MO-153

## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

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

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

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license 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 significant portions 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. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

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

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products	Applications
Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Amplifiers	<a href="http://amplifier.ti.com">amplifier.ti.com</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>
DLP® Products	<a href="http://www.dlp.com">www.dlp.com</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>
Clocks and Timers	<a href="http://www.ti.com/clocks">www.ti.com/clocks</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>
OMAP Applications Processors	<a href="http://www.ti.com/omap">www.ti.com/omap</a>
Wireless Connectivity	<a href="http://www.ti.com/wirelessconnectivity">www.ti.com/wirelessconnectivity</a>
	<b>TI E2E Community</b>
	<a href="http://e2e.ti.com">e2e.ti.com</a>