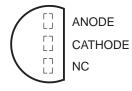
# LM285-1.2, LM385-1.2, LM385B-1.2 MICROPOWER VOLTAGE REFERENCES

SLVS075I - APRIL 1989 - REVISED DECEMBER 2005

- Operating Current Range
  - LM285 . . . 10 μA to 20 mA
  - LM385 . . . 15  $\mu$ A to 20 mA
  - LM385B . . . 15  $\mu$ A to 20 mA
- 1% and 2% 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 LM285-1.2 and LM385-1.2

NC - No internal connection

LM285-1.2, LM385-1.2, LM385B-1.2...LP PACKAGE (TOP VIEW)



NC - No internal connection

# description/ordering information

These micropower, two-terminal, band-gap voltage references operate over a 10-μA 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	PACKAG	iņ	ORDERABLE PART NUMBER	TOP-SIDE MARKING	
		COIC (D)	Tube of 75	LM385D-1-2	205.40	
		SOIC (D)	Reel of 2000	LM385DR-1-2	385-12	
		SOP (PS)	Reel of 2000	LM385PSR-1-2	L385-12	
	2%	TO 200 / TO 20 // D)	Tube of 1000	LM385LP-1-2	205.40	
		TO-226 / TO-92 (LP)	Reel of 2000	LM385LPR-1-2	385-12	
		TOCOD (DIA)	Tube of 150	LM385PW-1-2	205 42	
0°C to 70°C		TSSOP (PW)	Reel of 2000	LM385PWR-1-2	385-12	
		SOIC (D)	Tube of 75	LM385BD-1-2	385B12	
		SOIC (D)	Reel of 2000	LM385BDR-1-2		
	40/	TO 200 / TO 20 // D)	Tube of 1000	LM385BLP-1-2	205042	
	1%	TO-226 / TO-92 (LP)	Reel of 2000	LM385BLPR-1-2	385B12	
		TOCOD (DIA)	Tube of 150	LM385BPW-1-2	205042	
		TSSOP (PW)	Reel of 2000	LM385BPWR-1-2	385B12	
		SOIC (D)	Tube of 75	LM285D-1-2	205 42	
-40°C to 85°C	1%	SOIC (D)	Reel of 2000	LM285DR-1-2	285-12	
		TO-226 / TO-92 (LP)	Tube of 1000	LM285LP-1-2	285-12	

<sup>†</sup> Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at 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.



SLVS075I - APRIL 1989 - REVISED DECEMBER 2005

#### description/ordering information (continued)

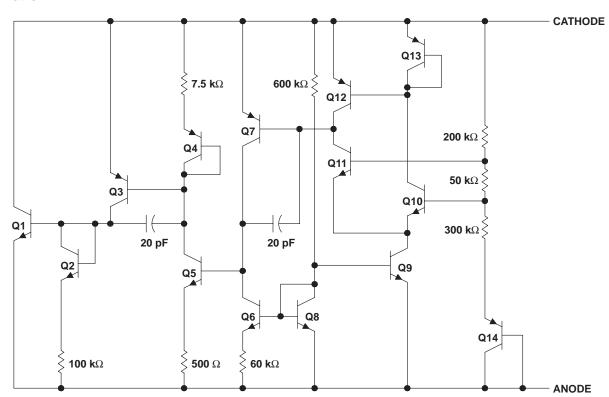
The design makes these devices exceptionally tolerant of capacitive loading and, thus, easier to use in most reference applications. The wide dynamic operating temperature range accommodates varying current supplies, with excellent regulation.

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: Component values shown are nominal.



# LM285-1.2, LM385-1.2, LM385B-1.2 MICROPOWER VOLTAGE REFERENCES

SLVS075I - APRIL 1989 - REVISED DECEMBER 2005

# absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Reverse current, I <sub>R</sub>		
Package thermal impedance, $\theta_{JA}$ (see Notes 1 and 2):	D package	97°C/W
- · · · · · · · · · · · · · · · · · · ·	LP package	140°C/W
	PS package	95°C/W
	PW package	149°C/W
Operating virtual junction temperature, T <sub>J</sub>		150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10	seconds	260°C
Storage temperature range, T <sub>stg</sub>		_65°C to 150°C

<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.

#### recommended operating conditions

			MIN	MAX	UNIT
ΙZ	Reference current		0.01	20	mA
Τ.	Operating free air temperature range	LM285-1.2	-40	85	°C
۱A	Operating free-air temperature range	LM385-1.2, LM385B-1.2	0	70	-0

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.

<sup>2.</sup> The package thermal impedance is calculated in accordance with JESD 51-7.

# LM285-1.2, LM385-1.2, LM385B-1.2 MICROPOWER VOLTAGE REFERENCES

SLVS075I - APRIL 1989 - REVISED DECEMBER 2005

# electrical characteristics at specified free-air temperature

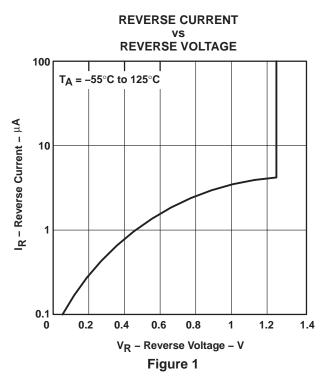
-		TEST	_ +	L	M285-1.2	2	L	M385-1.2	2	LN	/I385B-1	.2		
PAR	RAMETER	CONDITIONS	T <sub>A</sub> †	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	UNIT	
٧z	Reference voltage	I <sub>Z</sub> = I(min) to 20 mA <sup>‡</sup>	25°C	1.223	1.235	1.247	1.21	1.235	1.26	1.223	1.235	1.247	V	
αΛΣ	Average temperature coefficient of reference voltage§	I <sub>Z</sub> = I(min) to 20 mA <sup>‡</sup>	Full range		±20			±20			±20		ppm/°C	
	Change in IZ = I(min)		25°C			1			1			1		
	reference to 1 mA <sup>‡</sup>		Full range			1.5			1.5			1.5	\/	
$\Delta V_Z$	voltage with		25°C			12			20			20	mV	
	current	to 20 mA	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</sub> (min)	Minimum reference current		Full range		8	10		8	15		8	15	μА	
	Reference	$I_Z = 100 \mu A$ ,	25°C		0.2	0.6		0.4	1		0.4	1	0	
$z_Z$	impedance	f = 25 Hz	Full range			1.5			1.5			1.5	Ω	
Vn	Broadband noise voltage	$I_Z = 100 \mu A$ , f = 10 Hz to 10 kHz	25°C		60			60			60		μV	

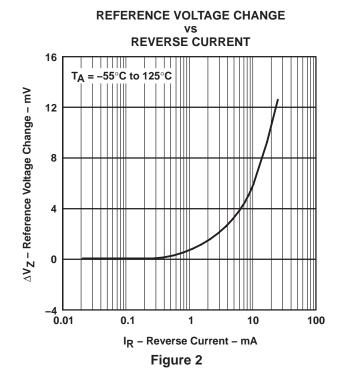
<sup>†</sup> Full range is –40°C to 85°C for the LM285-1.2 and 0°C to 70°C for the LM385-1.2 and LM385B-1.2.

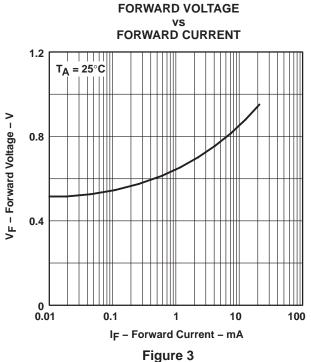
 $<sup>\</sup>ddagger$  I(min) = 10  $\mu$ A for the LM285-1.2 and 15  $\mu$ A for the LM385-1.2 and LM385B-1.2

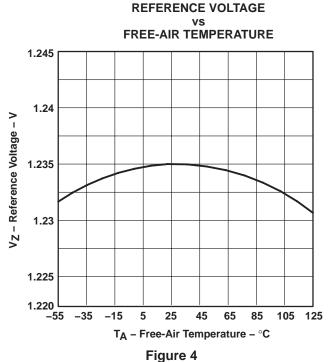
<sup>§</sup> The average temperature coefficient of reference voltage is defined as the total change in reference voltage divided by the specified temperature range.

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





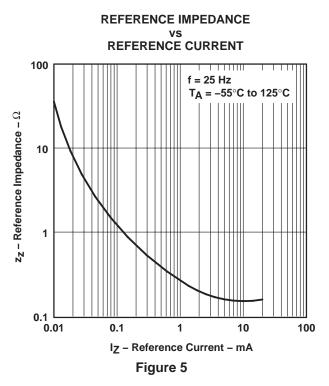


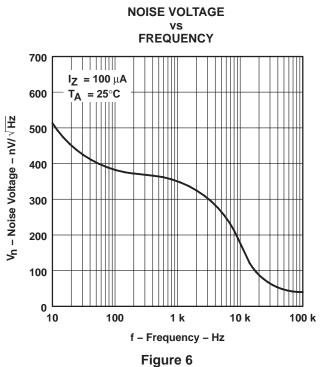


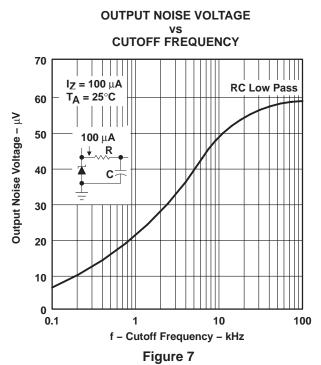
† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

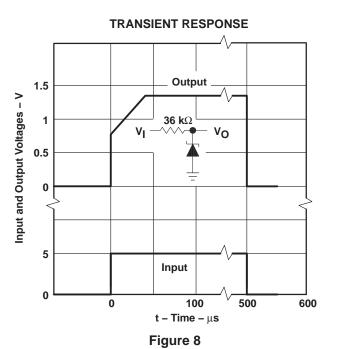


#### TYPICAL CHARACTERISTICS<sup>†</sup>





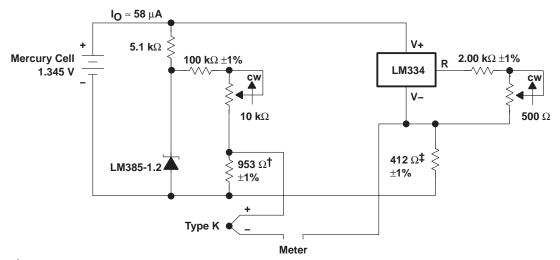




† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.



#### **APPLICATION INFORMATION**



 $<sup>^{\</sup>dagger}$  Adjust for 11.15 mV at 25°C across 953  $\Omega$ 

Figure 9. Thermocouple Cold-Junction Compensator

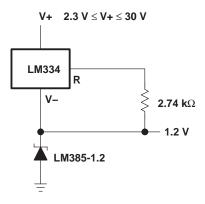


Figure 10. Operation Over a Wide Supply Range

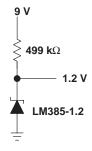


Figure 11. Reference From a 9-V Battery

 $<sup>\</sup>ddagger$  Adjust for 12.17 mV at 25°C across 412  $\Omega$ 



www.ti.com 11-Nov-2009

## **PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	e Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
LM285D-1-2	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM285DE4-1-2	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM285DG4-1-2	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM285DR-1-2	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM285DRE4-1-2	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM285DRG4-1-2	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM285LP-1-2	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type
LM285LPE3-1-2	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type
LM285LPRE3-1-2	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type
LM385BD-1-2	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM385BDE4-1-2	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM385BDG4-1-2	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM385BDR-1-2	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM385BDRE4-1-2	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM385BDRG4-1-2	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM385BLP-1-2	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type
LM385BLPE3-1-2	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type
LM385BLPR-1-2	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type
LM385BLPRE3-1-2	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type
LM385BPW-1-2	ACTIVE	TSSOP	PW	8	150	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM385BPWE4-1-2	ACTIVE	TSSOP	PW	8	150	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM385BPWG4-1-2	ACTIVE	TSSOP	PW	8	150	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM385BPWR-1-2	ACTIVE	TSSOP	PW	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM385BPWRE4-1-2	ACTIVE	TSSOP	PW	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM385BPWRG4-1-2	ACTIVE	TSSOP	PW	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM



#### PACKAGE OPTION ADDENDUM

www.ti.com 11-Nov-2009

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	e Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
LM385D-1-2	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM385DE4-1-2	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM385DG4-1-2	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM385DR-1-2	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM385DRE4-1-2	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM385DRG4-1-2	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM385LP-1-2	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type
LM385LPE3-1-2	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type
LM385LPR-1-2	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type
LM385LPRE3-1-2	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type
LM385PW-1-2	ACTIVE	TSSOP	PW	8	150	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM385PWE4-1-2	ACTIVE	TSSOP	PW	8	150	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM385PWG4-1-2	ACTIVE	TSSOP	PW	8	150	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM385PWR-1-2	ACTIVE	TSSOP	PW	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM385PWRE4-1-2	ACTIVE	TSSOP	PW	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM385PWRG4-1-2	ACTIVE	TSSOP	PW	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

<sup>(1)</sup> 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.



#### PACKAGE OPTION ADDENDUM

www.ti.com 11-Nov-2009

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.

# PACKAGE MATERIALS INFORMATION

www.ti.com 29-Jul-2009

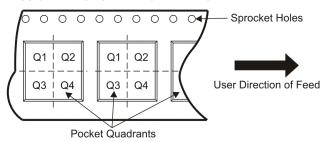
## TAPE AND REEL INFORMATION





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

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



#### \*All dimensions are nominal

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-1-2	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
LM385BDR-1-2	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
LM385BPWR-1-2	TSSOP	PW	8	2000	330.0	12.4	7.0	3.6	1.6	8.0	12.0	Q1
LM385DR-1-2	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
LM385PWR-1-2	TSSOP	PW	8	2000	330.0	12.4	7.0	3.6	1.6	8.0	12.0	Q1

www.ti.com 29-Jul-2009



\*All dimensions are nominal

7 til diffictiolorio are florilifia							
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
LM285DR-1-2	SOIC	D	8	2500	340.5	338.1	20.6
LM385BDR-1-2	SOIC	D	8	2500	340.5	338.1	20.6
LM385BPWR-1-2	TSSOP	PW	8	2000	346.0	346.0	29.0
LM385DR-1-2	SOIC	D	8	2500	340.5	338.1	20.6
LM385PWR-1-2	TSSOP	PW	8	2000	346.0	346.0	29.0

# 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.
- 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.



# D (R-PDSO-G8)

# PLASTIC SMALL OUTLINE



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.



#### LP (O-PBCY-W3)

#### PLASTIC CYLINDRICAL PACKAGE



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

B. This drawing is subject to change without notice.  $\hfill \hfill \$ 

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.



#### LP (O-PBCY-W3)

#### PLASTIC CYLINDRICAL PACKAGE



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 Format Lead Option package.

PW (R-PDSO-G8)

# PLASTIC SMALL OUTLINE



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.
- Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
- 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, 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	Wireless	www.ti.com/wireless-apps
RF/IF and ZigBee® Solutions	www.ti.com/lprf		

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265 Copyright © 2011, Texas Instruments Incorporated

e2e.ti.com

**TI E2E Community Home Page**