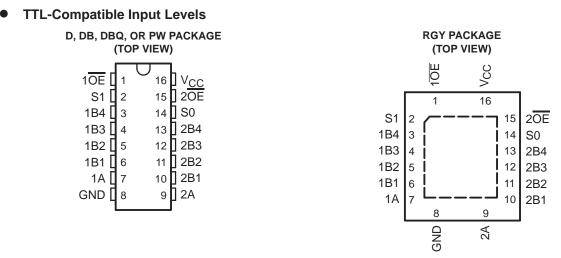
SCDS018O - MAY 1995 - REVISED JANUARY 2004



#### description/ordering information

The SN74CBT3253 is a dual 1-of-4 high-speed TTL-compatible FET multiplexer/demultiplexer. The low on-state resistance of the switch allows connections to be made with minimal propagation delay.

10E, 20E, S0, and S1 select the appropriate B output for the A-input data.

TA	PACKAGI	Eţ	ORDERABLE PART NUMBER	TOP-SIDE MARKING						
	QFN – RGY	Tape and reel	SN74CBT3253RGYR	CU253						
		Tube	SN74CBT3253D	ODTOOLO						
	SOIC – D	Tape and reel	SN74CBT3253DR	CBT3253						
-40°C to 85°C	SSOP – DB	Tape and reel	SN74CBT3253DBR	CU253						
	SSOP (QSOP) – DBQ	Tape and reel	SN74CBT3253DBQR	CU253						
		Tube	SN74CBT3253PW	011050						
	TSSOP – PW	Tape and reel	SN74CBT3253PWR	CU253						

#### **ORDERING INFORMATION**

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

#### FUNCTION TABLE

	INPU	JTS	FUNCTION	
1OE	2 <mark>0E</mark>	<b>S</b> 1	S0	FUNCTION
Х	Н	Х	Х	Disconnect 1A and 2A
н	Х	Х	Х	Disconnect 1A and 2A
L	L	L	L	1A to 1B1 and 2A to 2B1
L	L	L	Н	1A to 1B2 and 2A to 2B2
L	L	Н	L	1A to 1B3 and 2A to 2B3
L	L	Н	Н	1A to 1B4 and 2A to 2B4



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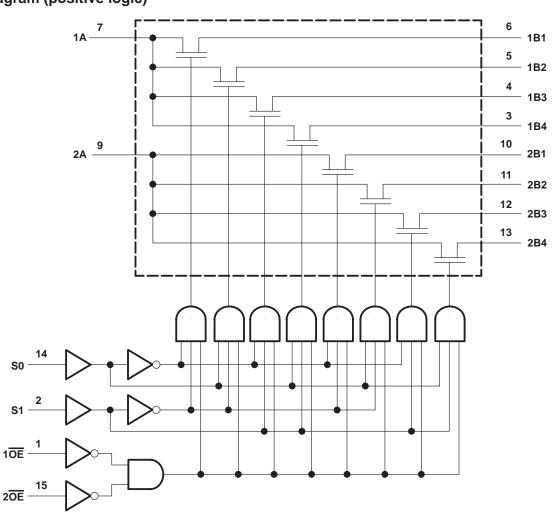
PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.



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## logic diagram (positive logic)



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

Supply voltage range, V <sub>CC</sub>	7 V
nput clamp current, I <sub>K</sub> (V <sub>I/O</sub> < 0)–50 r	mΑ
Package thermal impedance, θ <sub>JA</sub> (see Note 2): D package	;/W
(see Note 2): DB package	;/W
(see Note 2): DBQ package	;/W
(see Note 2): PW package	;/W
(see Note 3): RGY package	:/W
Storage temperature range, T <sub>stg</sub>	)°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.

NOTES: 1. The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.

- 2. The package thermal impedance is calculated in accordance with JESD 51-7.
- 3. The package thermal impedance is calculated in accordance with JESD 51-5.



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#### recommended operating conditions (see Note 4)

		MIN	MAX	UNIT
VCC	Supply voltage	4	5.5	V
$V_{IH}$	High-level control input voltage	2		V
$V_{IL}$	Low-level control input voltage		0.8	V
Τ <sub>Α</sub>	Operating free-air temperature	-40	85	°C

NOTE 4: All unused control inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, Implications of Slow or Floating CMOS Inputs, literature number SCBA004.

# electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PAF	PARAMETER TEST CONDITIONS				MIN	TYP†	MAX	UNIT
VIK		$V_{CC} = 4.5 V,$	l <sub>l</sub> = –18 mA				-1.2	V
Ц		$V_{CC} = 5 V,$	$V_I = 5.5 V \text{ or GND}$				±1	μΑ
ICC	-	V <sub>CC</sub> = 5.5 V,	$I_{O} = 0,$	$V_I = V_{CC}$ or GND			3	μΑ
∆ICC <sup>‡</sup>	Control inputs	V <sub>CC</sub> = 5.5 V,	One input at 3.4 V,	Other inputs at $V_{CC}$ or GND			2.5	mA
Ci	Control inputs	$V_{I} = 3 V \text{ or } 0$				3.5		pF
0	A port					10		- <b>F</b>
C <sub>io(OFF)</sub>	B port	V <sub>O</sub> = 3 V or 0,	$\overline{OE} = V_{CC}$			4		pF
			N/ 0	lj = 64 mA		5	7	
ron§		$V_{CC} = 4.5 V$	$V_{I} = 0$	l <sub>l</sub> = 30 mA		5	7	Ω
			V <sub>I</sub> = 2.4 V,	lı = 15 mA		10	15	

<sup>†</sup> All typical values are at  $V_{CC} = 5 V$  (unless otherwise noted),  $T_A = 25^{\circ}C$ .

<sup>‡</sup>This is the increase in supply current for each input that is at the specified TTL voltage level, rather than V<sub>CC</sub> or GND.

§ Measured by the voltage drop between the A and the B terminals at the indicated current through the switch. On-state resistance is determined by the lower voltage of the two (A or B) terminals.

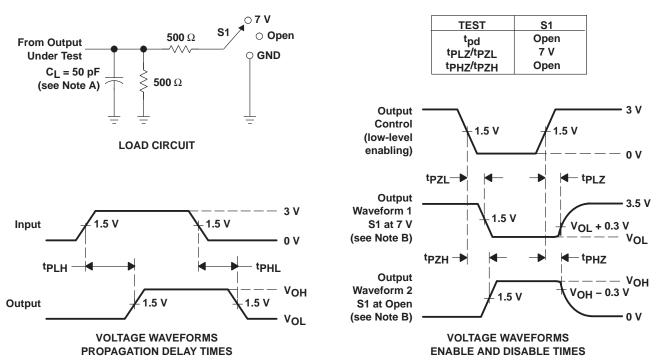
# switching characteristics over recommended operating free-air temperature range, $C_L = 50 \text{ pF}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM	TO	V <sub>CC</sub> = 4 V		V <sub>CC</sub> = 5 V ± 0.5 V		UNIT
	(INPUT)	(OUTPUT)	MIN	MAX	MIN	MAX	
t <sub>pd</sub> ¶	A or B	B or A		0.35		0.25	ns
<sup>t</sup> pd	S	A or B		6.6	1.6	6.2	ns
	S	1 D		7.1	1.3	6.3	
ten	OE	A or B		7.3	1.4	6.4	ns
1	S	A or D		7.9	1.1	7.4	
<sup>t</sup> dis	OE	A or B		7.3	2.3	7	ns

The propagation delay is the calculated RC time constant of the typical on-state resistance of the switch and the specified load capacitance, when driven by an ideal voltage source (zero output impedance).



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#### PARAMETER MEASUREMENT INFORMATION

NOTES: A.  $\ensuremath{\mathsf{CL}}$  includes probe and jig capacitance.

B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.

- C. All input pulses are supplied by generators having the following characteristics: PRR  $\leq$  10 MHz, Z<sub>O</sub> = 50  $\Omega$ , t<sub>r</sub>  $\leq$  2.5 ns, t<sub>f</sub>  $\leq$  2.5 ns.
- D. The outputs are measured one at a time with one transition per measurement.
- E.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
- F. tpzL and tpzH are the same as ten.
- G.  $t_{PHL}$  and  $t_{PLH}$  are the same as  $t_{pd}$ .
- H. All parameters and waveforms are not applicable to all devices.

#### Figure 1. Load Circuit and Voltage Waveforms



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28-May-2007

#### **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>
SN74CBT3253D	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CBT3253DBLE	OBSOLETE	SSOP	DB	16		TBD	Call TI	Call TI
SN74CBT3253DBQR	ACTIVE	SSOP/ QSOP	DBQ	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
SN74CBT3253DBQRE4	ACTIVE	SSOP/ QSOP	DBQ	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
SN74CBT3253DBQRG4	ACTIVE	SSOP/ QSOP	DBQ	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
SN74CBT3253DBR	ACTIVE	SSOP	DB	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CBT3253DBRE4	ACTIVE	SSOP	DB	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CBT3253DBRG4	ACTIVE	SSOP	DB	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CBT3253DE4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CBT3253DG4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CBT3253DR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CBT3253DRE4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CBT3253DRG4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CBT3253PW	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CBT3253PWE4	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CBT3253PWG4	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CBT3253PWLE	OBSOLETE	TSSOP	PW	16		TBD	Call TI	Call TI
SN74CBT3253PWR	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CBT3253PWRE4	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CBT3253PWRG4	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CBT3253RGYR	ACTIVE	QFN	RGY	16	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
SN74CBT3253RGYRG4	ACTIVE	QFN	RGY	16	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR

<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.





<sup>(2)</sup> 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)

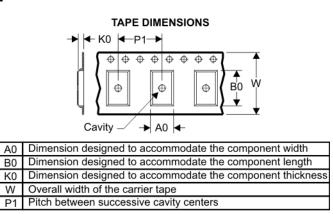
<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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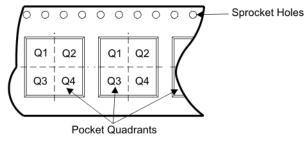
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#### TAPE AND REEL BOX INFORMATION





#### QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE

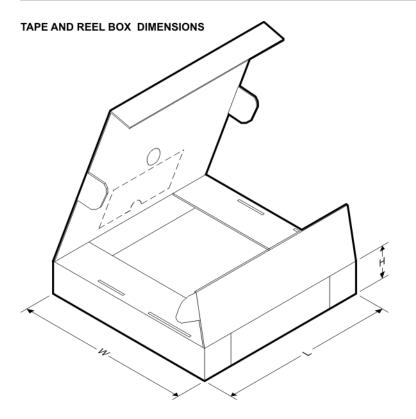


Device	Package	Pins	Site	Reel Diameter (mm)	Reel Width (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74CBT3253DBQR	DBQ	16	SITE 27	330	0	6.4	5.2	2.1	8	12	Q1
SN74CBT3253DBR	DB	16	SITE 41	330	16	8.2	6.6	2.5	12	16	Q1
SN74CBT3253DR	D	16	SITE 27	330	16	6.5	10.3	2.1	8	16	Q1
SN74CBT3253PWR	PW	16	SITE 41	330	12	7.0	5.6	1.6	8	12	Q1
SN74CBT3253RGYR	RGY	16	SITE 41	180	12	3.8	4.3	1.5	8	12	Q1



# PACKAGE MATERIALS INFORMATION

12-Feb-2008



Device	Package	Pins	Site	Length (mm)	Width (mm)	Height (mm)
SN74CBT3253DBQR	DBQ	16	SITE 27	342.9	338.1	20.64
SN74CBT3253DBR	DB	16	SITE 41	346.0	346.0	33.0
SN74CBT3253DR	D	16	SITE 27	342.9	345.9	28.58
SN74CBT3253PWR	PW	16	SITE 41	346.0	346.0	29.0
SN74CBT3253RGYR	RGY	16	SITE 41	190.5	212.7	31.75

D (R-PDSO-G16)

PLASTIC SMALL-OUTLINE PACKAGE

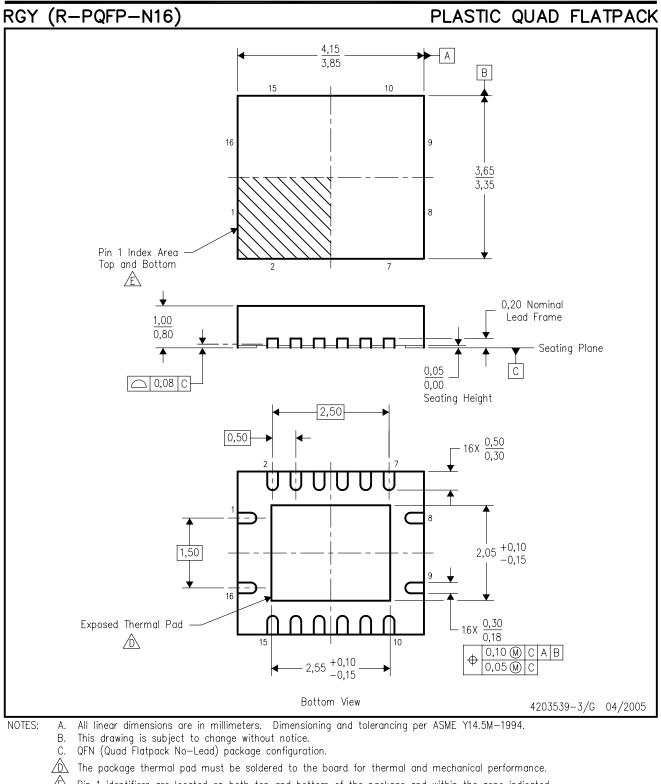


NOTES: A. All linear dimensions are in inches (millimeters).

- 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 .006 (0,15) per end.
- Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
- E. Reference JEDEC MS-012 variation AC.



# **MECHANICAL DATA**



Pin 1 identifiers are located on both top and bottom of the package and within the zone indicated. The Pin 1 identifiers are either a molded, marked, or metal feature.

F. Package complies to JEDEC MO-241 variation BB.





## THERMAL PAD MECHANICAL DATA

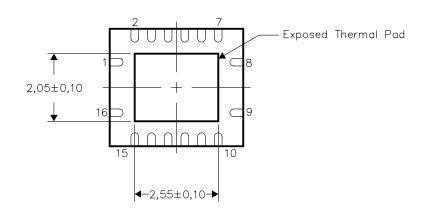
### RGY (R-PQFP-N16)

THERMAL INFORMATION

This package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB). After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For information on the Quad Flatpack No-Lead (QFN) package and its advantages, refer to Application Report, Quad Flatpack No-Lead Logic Packages, Texas Instruments Literature No. SCBA017. This document is available at www.ti.com.

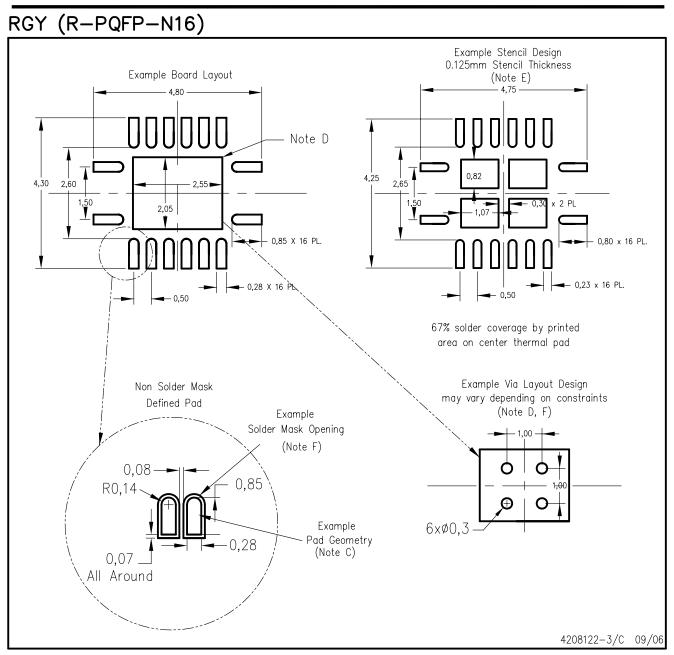
The exposed thermal pad dimensions for this package are shown in the following illustration.



#### Bottom View

NOTE: All linear dimensions are in millimeters

Exposed Thermal Pad Dimensions



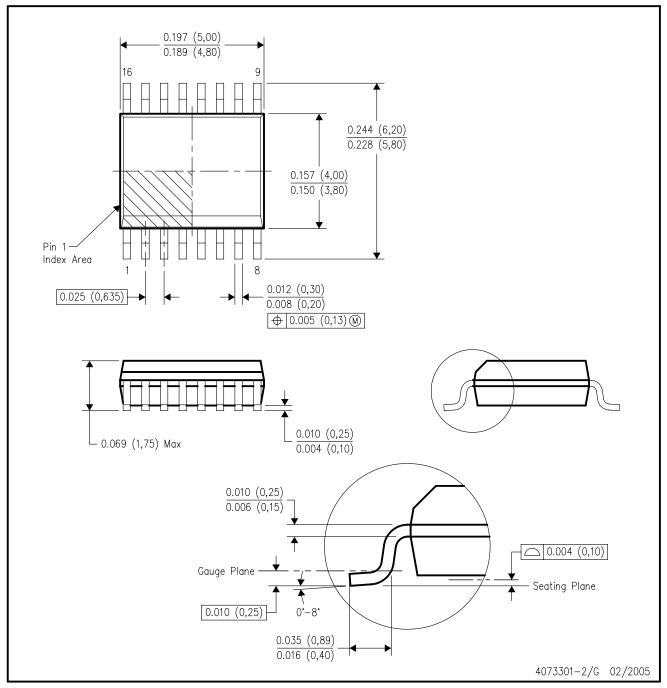
NOTES: A. All linear dimensions are in millimeters.

- B. This drawing is subject to change without notice.
- C. Publication IPC-7351 is recommended for alternate designs.
- D. This package is designed to be soldered to a thermal pad on the board. Refer to Application Note, Quad Flat-Pack Packages, Texas Instruments Literature No. SCBA017, SLUA271, and also the Product Data Sheets for specific thermal information, via requirements, and recommended board layout. These documents are available at www.ti.com <http://www.ti.com>.
- E. 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 stencil design considerations.
- F. Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads.



DBQ (R-PDSO-G16)

PLASTIC SMALL-OUTLINE PACKAGE



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

B. This drawing is subject to change without notice.

C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15) per side.

D. Falls within JEDEC MO-137 variation AB.



## **MECHANICAL DATA**

MSSO002E - JANUARY 1995 - REVISED DECEMBER 2001

### DB (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE

28 PINS SHOWN



NOTES: A. All linear dimensions are in millimeters.

- B. This drawing is subject to change without notice.
- C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.
- D. Falls within JEDEC MO-150



## **MECHANICAL DATA**

MTSS001C - JANUARY 1995 - REVISED FEBRUARY 1999

# PW (R-PDSO-G\*\*)

#### PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



NOTES: A. All linear dimensions are in millimeters.

- B. This drawing is subject to change without notice.
- C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.
- D. Falls within JEDEC MO-153

