

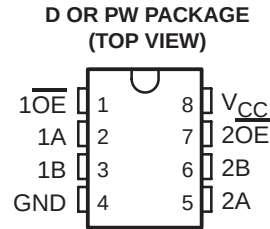
SN74CBTS3306 DUAL FET BUS SWITCH WITH SCHOTTKY DIODE CLAMPING

SCDS029I – JANUARY 1996 – REVISED JANUARY 2004

- 5-Ω Switch Connection Between Two Ports
- TTL-Compatible Input Levels

description/ordering information

The SN74CBTS3306 features independent line switches with Schottky diodes on the I/Os to clamp undershoot. Each switch is disabled when the associated output-enable ($\overline{\text{OE}}$) input is high.



ORDERING INFORMATION

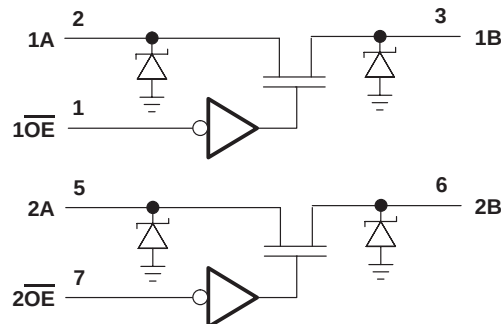
T _A	PACKAGE [†]		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	SOIC – D	Tube	SN74CBTS3306D	CR306
		Tape and reel	SN74CBTS3306DR	
	TSSOP – PW	Tube	SN74CBTS3306PW	CR306
		Tape and reel	SN74CBTS3306PWR	

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

FUNCTION TABLE
(each bus switch)

INPUT $\overline{\text{OE}}$	FUNCTION
L	A port = B port
H	Disconnect

logic diagram (positive logic)



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**TEXAS
INSTRUMENTS**

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SN74CBTS3306

DUAL FET BUS SWITCH

WITH SCHOTTKY DIODE CLAMPING

SCDS0291 – JANUARY 1996 – REVISED JANUARY 2004

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

Supply voltage range, V_{CC}	–0.5 V to 7 V
Input voltage range, V_I (see Note 1)	–0.5 V to 7 V
Continuous channel current	128 mA
Input clamp current, I_{IK} ($V_{I/O} < 0$)	–50 mA
Package thermal impedance, θ_{JA} (see Note 2): D package	97°C/W
PW package	149°C/W
Storage temperature range, T_{stg}	–65°C to 150°C

[†] 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.

recommended operating conditions (see Note 3)

	MIN	MAX	UNIT
V_{CC} 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
T_A Operating free-air temperature	–40	85	°C

NOTE 3: All unused control inputs of the device must be held at V_{CC} 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)

PARAMETER		TEST CONDITIONS		MIN	TYP [‡]	MAX	UNIT
V_{IK}	A or B inputs	$V_{CC} = 4.5$ V,	$I_I = -18$ mA			–0.7	V
	Control inputs					–1.2	
I_I	I_{IL}	$V_{CC} = 5.5$ V,	$V_I = \text{GND}$			–1	μA
	I_{IH}	$V_{CC} = 5.5$ V,	$V_I = 5.5$ V			150	
I_{CC}		$V_{CC} = 5.5$ V,	$I_O = 0$, $V_I = V_{CC}$ or GND			3	μA
ΔI_{CC} [§]	Control inputs	$V_{CC} = 5.5$ V,	One input at 3.4 V, Other inputs at V_{CC} or GND			2.5	mA
C_i	Control inputs	$V_I = 3$ V or 0				5	pF
$C_{io}(\text{OFF})$		$V_O = 3$ V or 0, $\overline{OE} = V_{CC}$				6	pF
r_{on} [¶]	$V_{CC} = 4$ V, TYP at $V_{CC} = 4$ V	$V_I = 2.4$ V,	$I_I = 15$ mA		14	20	Ω
		$V_I = 0$	$I_I = 64$ mA		5	7	
	$V_{CC} = 4.5$ V	$V_I = 0$	$I_I = 30$ mA		5	7	
		$V_I = 2.4$ V,	$I_I = 15$ mA		10	15	

[‡] All typical values are at $V_{CC} = 5$ V (unless otherwise noted), $T_A = 25^\circ\text{C}$.

[§] This is the increase in supply current for each input that is at the specified TTL voltage level, rather than V_{CC} or GND.

[¶] Measured by the voltage drop between the A and B pin at the indicated current through the switch. On-state resistance is determined by the lower of the voltages of the two (A or B) pins.



SN74CBTS3306 DUAL FET BUS SWITCH WITH SCHOTTKY DIODE CLAMPING

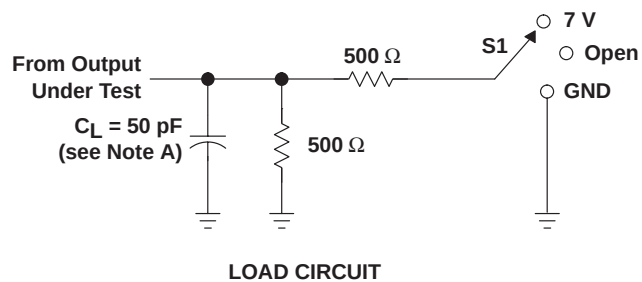
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switching characteristics over recommended operating free-air temperature range, $C_L = 50$ pF (unless otherwise noted) (see Figure 1)

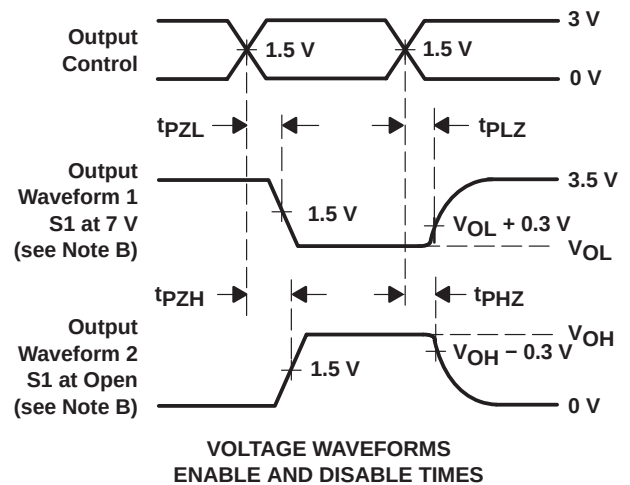
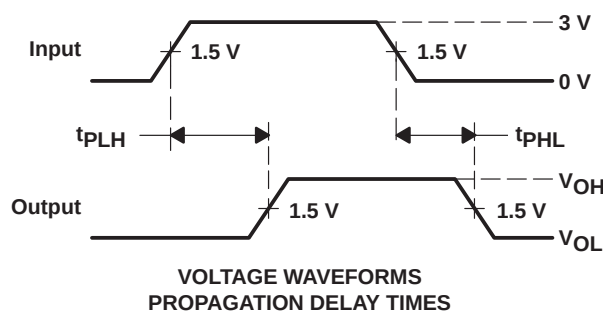
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4$ V		$V_{CC} = 5$ V ± 0.5 V		UNIT
			MIN	MAX	MIN	MAX	
$t_{pd}^\dagger$	A or B	B or A	0.35		0.25		ns
t_{en}	$\overline{OE}$	A or B	5.6		1.8	5	ns
t_{dis}	$\overline{OE}$	A or B	4.6		1	4.3	ns

[†] 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).

PARAMETER MEASUREMENT INFORMATION



TEST	S1
t_{pd}	Open
t_{PLZ}/t_{PZL}	7 V
t_{PHZ}/t_{PZH}	Open



- NOTES:
- A. C_L 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, $Z_O = 50 \Omega$, $t_r \leq 2.5$ ns, $t_f \leq 2.5$ 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. t_{PZL} and t_{PZH} are the same as t_{en} .
 - G. t_{PHL} and t_{PLH} are the same as t_{pd} .

Figure 1. Load Circuit and Voltage Waveforms

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
SN74CBTS3306D	Active	Production	SOIC (D) 8	75 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CR306
SN74CBTS3306D.A	Active	Production	SOIC (D) 8	75 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CR306
SN74CBTS3306DR	Active	Production	SOIC (D) 8	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CR306
SN74CBTS3306DR.A	Active	Production	SOIC (D) 8	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CR306
SN74CBTS3306PW	Active	Production	TSSOP (PW) 8	150 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CR306
SN74CBTS3306PW.A	Active	Production	TSSOP (PW) 8	150 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CR306
SN74CBTS3306PWR	Active	Production	TSSOP (PW) 8	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CR306
SN74CBTS3306PWR.A	Active	Production	TSSOP (PW) 8	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CR306

⁽¹⁾ **Status:** For more details on status, see our [product life cycle](#).

⁽²⁾ **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

⁽³⁾ **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

⁽⁴⁾ **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

⁽⁵⁾ **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

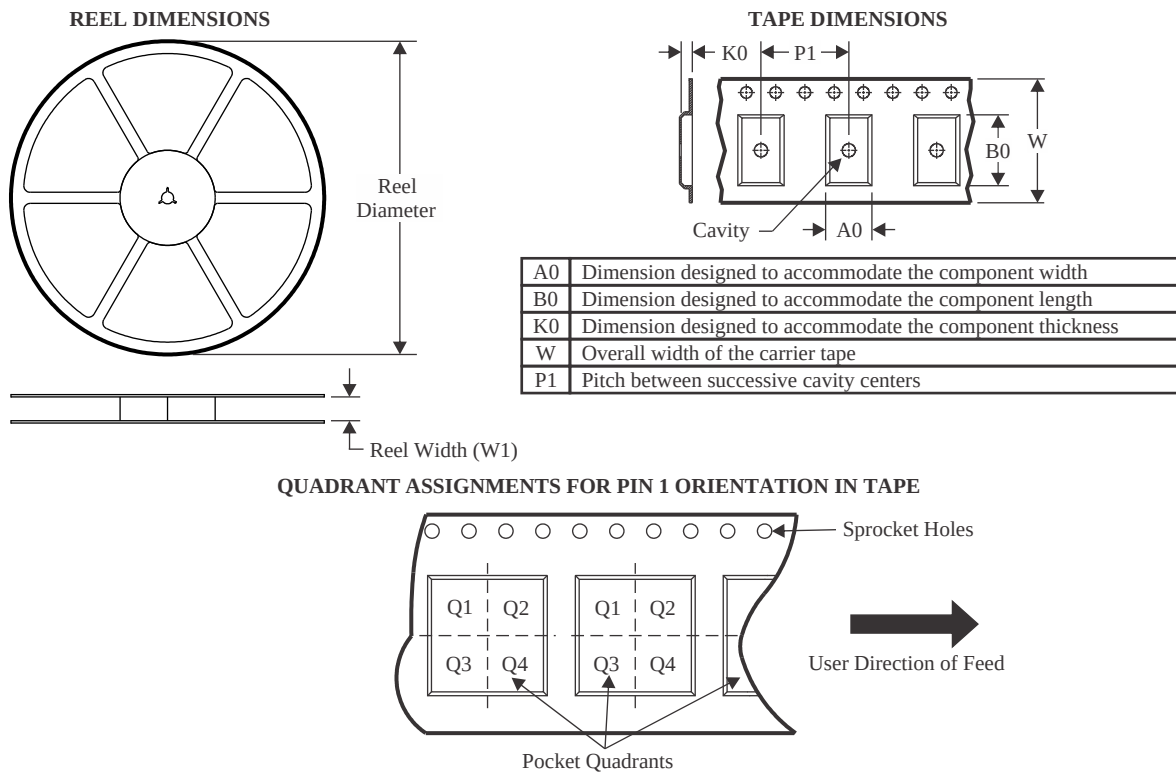
⁽⁶⁾ **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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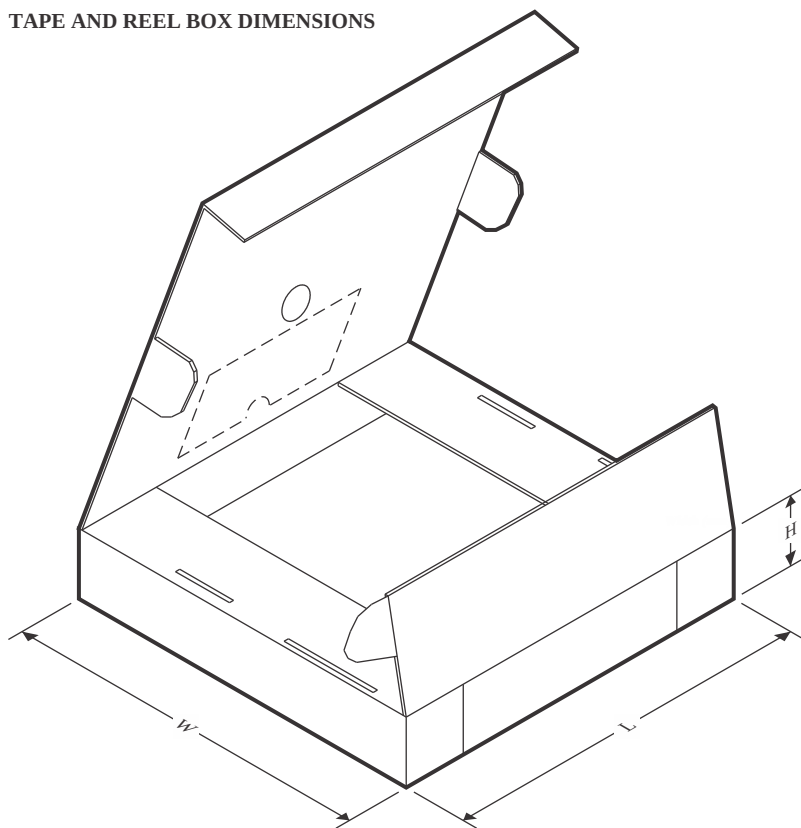
TAPE AND REEL INFORMATION



*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
SN74CBTS3306DR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
SN74CBTS3306PWR	TSSOP	PW	8	2000	330.0	12.4	7.0	3.6	1.6	8.0	12.0	Q1

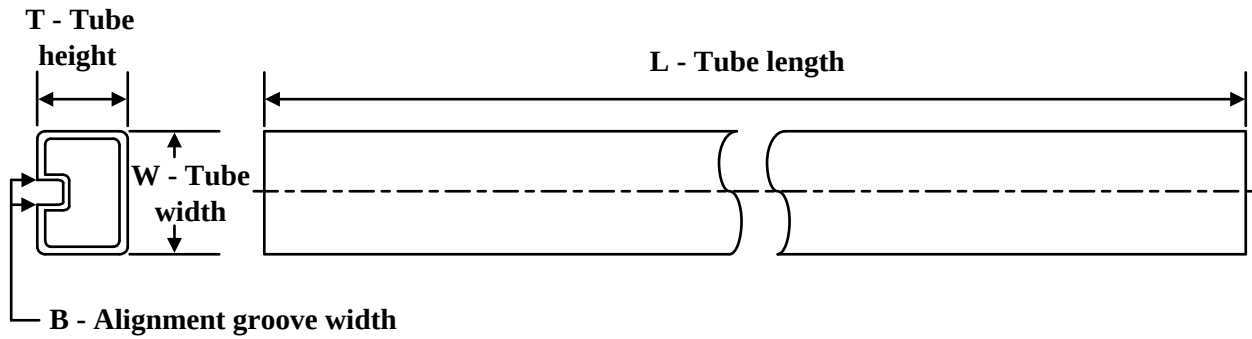
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74CBTS3306DR	SOIC	D	8	2500	340.5	336.1	25.0
SN74CBTS3306PWR	TSSOP	PW	8	2000	353.0	353.0	32.0

TUBE



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
SN74CBTS3306D	D	SOIC	8	75	507	8	3940	4.32
SN74CBTS3306D.A	D	SOIC	8	75	507	8	3940	4.32
SN74CBTS3306PW	PW	TSSOP	8	150	530	10.2	3600	3.5
SN74CBTS3306PW.A	PW	TSSOP	8	150	530	10.2	3600	3.5

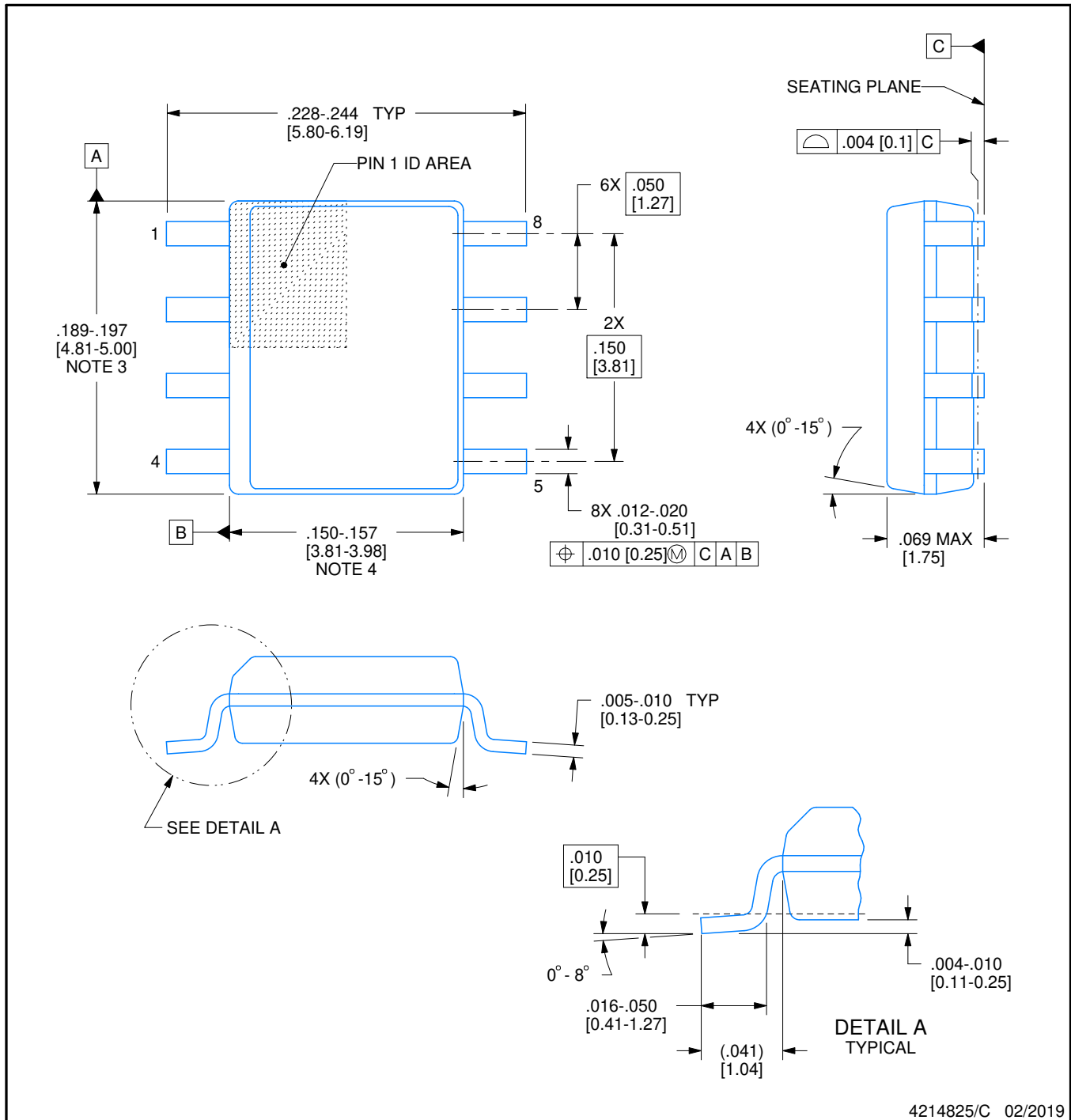


D0008A

PACKAGE OUTLINE

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



4214825/C 02/2019

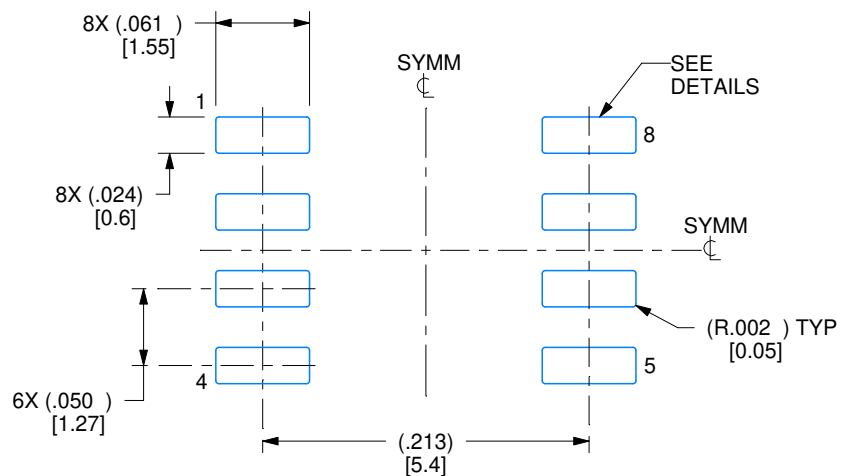
NOTES:

1. Linear dimensions are in inches [millimeters]. Dimensions in parenthesis are for reference only. Controlling dimensions are in inches. 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 .006 [0.15] per side.
4. This dimension does not include interlead flash.
5. Reference JEDEC registration MS-012, variation AA.

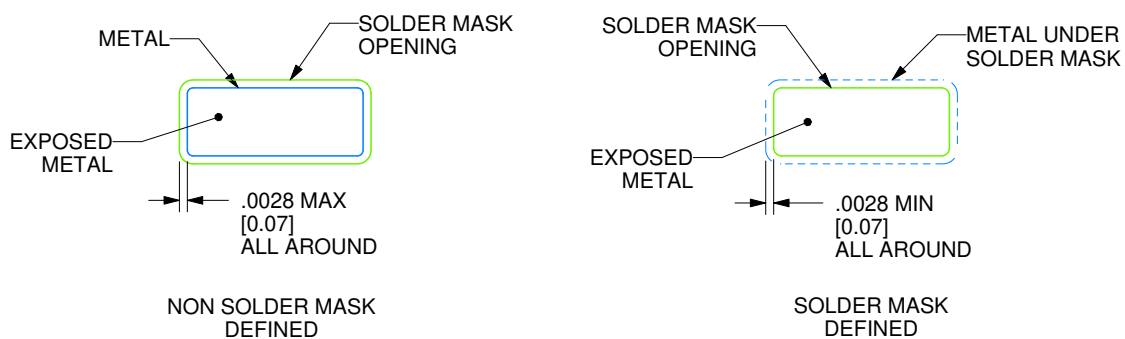
D0008A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:8X



SOLDER MASK DETAILS

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NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

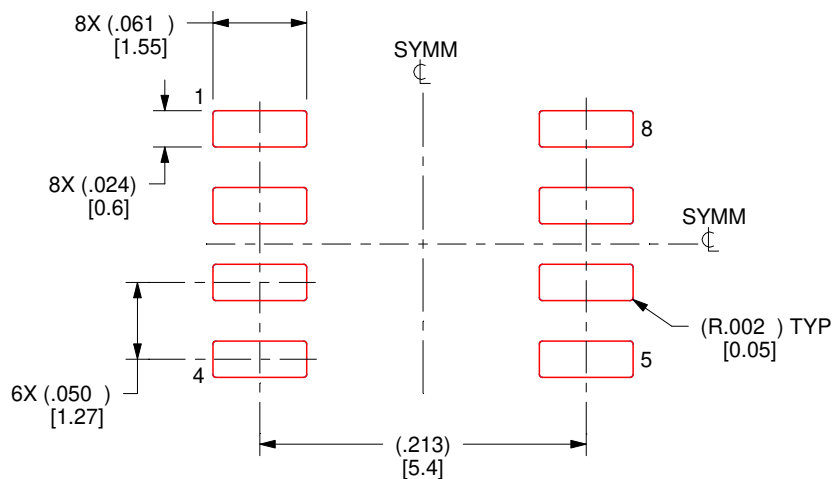
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

D0008A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



SOLDER PASTE EXAMPLE
BASED ON .005 INCH [0.125 MM] THICK STENCIL
SCALE:8X

4214825/C 02/2019

NOTES: (continued)

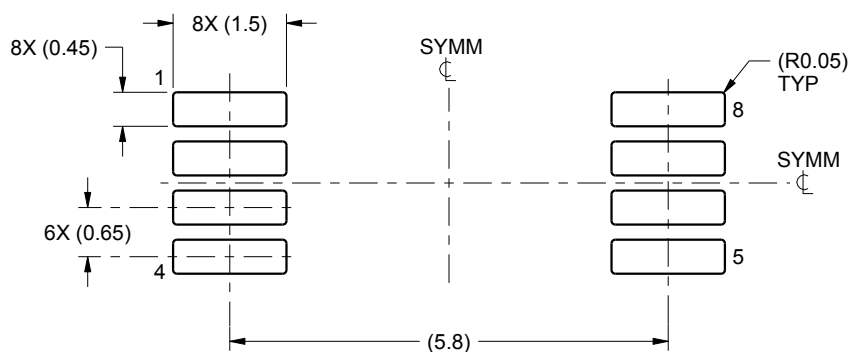
8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

EXAMPLE BOARD LAYOUT

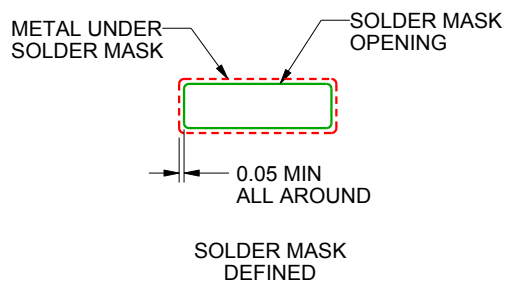
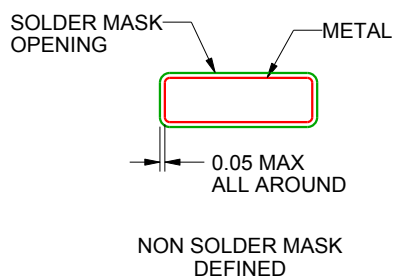
PW0008A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
SCALE:10X



SOLDER MASK DETAILS
NOT TO SCALE

4221848/A 02/2015

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

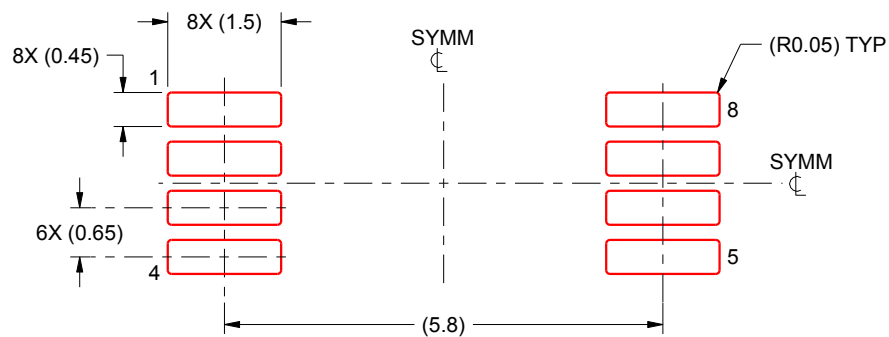
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

PW0008A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:10X

4221848/A 02/2015

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

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