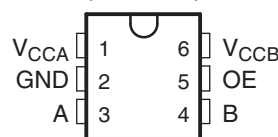


## 1-BIT BIDIRECTIONAL VOLTAGE-LEVEL TRANSLATOR FOR OPEN-DRAIN AND PUSH-PULL APPLICATIONS

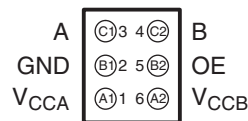
### FEATURES

- No Direction-Control Signal Needed
- Maximum Data Rates
  - 24 Mbps (Push Pull)
  - 2 Mbps (Open Drain)
- Available in the Texas Instruments NanoFree™ Package
- 1.65 V to 3.6 V on A port and 2.3 V to 5.5 V on B port ( $V_{CCA} \leq V_{CCB}$ )
- $V_{CC}$  Isolation Feature – If Either  $V_{CC}$  Input Is at GND, Both Ports Are in the High-Impedance State
- No Power-Supply Sequencing Required – Either  $V_{CCA}$  or  $V_{CCB}$  Can be Ramped First
- $I_{off}$  Supports Partial-Power-Down Mode Operation
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Protection Exceeds JESD 22
  - A Port
    - 2500-V Human-Body Model (A114-B)
    - 200-V Machine Model (A115-A)
    - 1500-V Charged-Device Model (C101)
  - B Port
    - 8-kV Human-Body Model (A114-B)
    - 200-V Machine Model (A115-A)
    - 1500-V Charged-Device Model (C101)

DBV, DCK, OR DRL PACKAGE  
(TOP VIEW)



YZP PACKAGE  
(BOTTOM VIEW)



### DESCRIPTION/ORDERING INFORMATION

This one-bit noninverting translator uses two separate configurable power-supply rails. The A port is designed to track  $V_{CCA}$ .  $V_{CCA}$  accepts any supply voltage from 1.65 V to 3.6 V. The B port is designed to track  $V_{CCB}$ .  $V_{CCA}$  must be less than or equal to  $V_{CCB}$ .  $V_{CCB}$  accepts any supply voltage from 2.3 V to 5.5 V. This allows for low-voltage bidirectional translation between any of the 1.8-V, 2.5-V, 3.3-V, and 5-V voltage nodes.

When the output-enable (OE) input is low, all outputs are placed in the high-impedance state.

To ensure the high-impedance state during power up or power down, OE should be tied to GND through a pulldown resistor; the minimum value of the resistor is determined by the current-sourcing capability of the driver.



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.

NanoFree is a trademark of Texas Instruments.

**ORDERING INFORMATION**

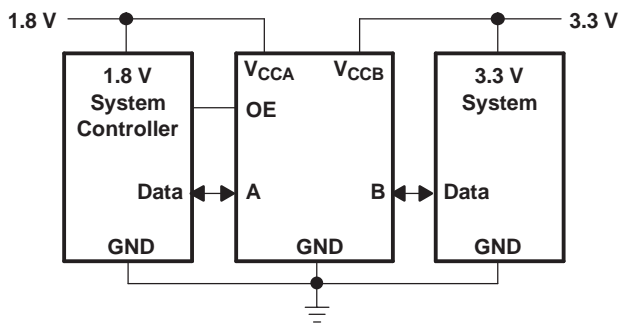
T <sub>A</sub>	PACKAGE <sup>(1)(2)</sup>		ORDERABLE PART NUMBER	TOP-SIDE MARKING <sup>(3)</sup>
-40°C to 85°C	NanoFree™ – WCSP (DSBGA) 0.23-mm Large Bump – YZP (Pb-free)	Reel of 3000	TXS0101YZPR	_ _ _2G_
		Reel of 3000	TXS0101DBVR	NFF_
	SOT (SOT-23) – DBV	Reel of 250	TXS0101DBVT	
		SOT (SC-70) – DCK	Reel of 3000	TXS0101DCKR
	Reel of 250		TXS0101DCKT	
	SOT (SOT-563) – DRL	Reel of 3000	TXS0101DRLR	2G_
		Reel of 250	TXS0101DRLT	

- (1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at [www.ti.com](http://www.ti.com).
- (2) Package drawings, thermal data, and symbolization are available at [www.ti.com/packaging](http://www.ti.com/packaging).
- (3) DBV/DCK/DRL: The actual top-side marking has one additional character that designates the wafer fab/assembly site.  
YZP: The actual top-side marking has three preceding characters to denote year, month, and sequence code, and one following character to designate the wafer fab/assembly site. Pin 1 identifier indicates solder-bump composition (1 = SnPb, • = Pb-free).

**PIN DESCRIPTION**

NO.	NAME	FUNCTION
1	V <sub>CCA</sub>	A-port supply voltage. $1.65\text{ V} \leq V_{CCA} \leq 3.6\text{ V}$ and $V_{CCA} \leq V_{CCB}$
2	GND	Ground
3	A	Input/output A. Referenced to V <sub>CCA</sub> .
4	B	Input/output B. Referenced to V <sub>CCB</sub> .
5	OE	Output enable. Pull OE low to place all outputs in 3-state mode. Referenced to V <sub>CCA</sub> .
6	V <sub>CCB</sub>	B-port supply voltage. $2.3\text{ V} \leq V_{CCB} \leq 5.5\text{ V}$

**TYPICAL OPERATING CIRCUIT**



## ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>

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

			MIN	MAX	UNIT
V <sub>CCA</sub>	Supply voltage range		-0.5	4.6	V
V <sub>CCB</sub>	Supply voltage range		-0.5	6.5	V
V <sub>I</sub>	Input voltage range <sup>(2)</sup>	A port	-0.5	4.6	V
		B port, OE	-0.5	6.5	
V <sub>O</sub>	Voltage range applied to any output in the high-impedance or power-off state <sup>(2)</sup>	A port	-0.5	4.6	V
		B port	-0.5	6.5	
V <sub>O</sub>	Voltage range applied to any output in the high or low state <sup>(2)(3)</sup>	A port	-0.5	V <sub>CCA</sub> + 0.5	V
		B port	-0.5	V <sub>CCB</sub> + 0.5	
I <sub>IK</sub>	Input clamp current	V <sub>I</sub> < 0		-50	mA
I <sub>OK</sub>	Output clamp current	V <sub>O</sub> < 0		-50	mA
I <sub>O</sub>	Continuous output current			±50	mA
	Continuous current through V <sub>CCA</sub> , V <sub>CCB</sub> , or GND			±100	mA
T <sub>stg</sub>	Storage temperature range		-65	150	°C

- (1) 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.
- (2) The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) The value of V<sub>CCA</sub> and V<sub>CCB</sub> are provided in the recommended operating conditions table.

## THERMAL IMPEDANCE RATINGS

			UNIT
θ <sub>JA</sub>	Package thermal impedance <sup>(1)</sup>	DBV package	165
		DCK package	259
		DRL package	142
		YZP package	123

- (1) The package thermal impedance is calculated in accordance with JESD 51-7.

**RECOMMENDED OPERATING CONDITIONS<sup>(1)(2)</sup>**

		$V_{CCA}$	$V_{CCB}$	MIN	MAX	UNIT	
$V_{CCA}$	Supply voltage <sup>(3)</sup>			1.65	3.6	V	
$V_{CCB}$				2.3	5.5		
$V_{IH}$	High-level input voltage	A-port I/Os	1.65 V to 1.95 V 2.3 V to 3.6 V	2.3 V to 5.5 V	$V_{CCI} - 0.2$	$V_{CCI}$	V
					$V_{CCI} - 0.4$	$V_{CCI}$	
		B-port I/Os	1.65 V to 3.6 V	2.3 V to 5.5 V	$V_{CCI} - 0.4$	$V_{CCI}$	
OE input	$V_{CCA} \times 0.65$	5.5					
$V_{IL}$	Low-level input voltage	A-port I/Os	1.65 V to 3.6 V	2.3 V to 5.5 V	0	0.15	V
		B-port I/Os			0	0.15	
		OE input			0	$V_{CCA} \times 0.35$	
$\Delta t/\Delta v$	Input transition rise or fall rate	A-port I/Os, push-pull driving	1.65 V to 3.6 V	2.3 V to 5.5 V		10	ns/V
		B-port I/Os, push-pull driving				10	
		Control Input				10	
$T_A$	Operating free-air temperature			-40	85	°C	

- (1)  $V_{CCI}$  is the supply associated with the input port.
- (2)  $V_{CCO}$  is the supply associated with the output port.
- (3)  $V_{CCA}$  must be less than or equal to  $V_{CCB}$ , and  $V_{CCA}$  must not exceed 3.6 V.

**ELECTRICAL CHARACTERISTICS<sup>(1)(2)(3)</sup>**

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

PARAMETER	TEST CONDITIONS	$V_{CCA}$	$V_{CCB}$	$T_A = 25^\circ\text{C}$			$-40^\circ\text{C to } 85^\circ\text{C}$		UNIT
				MIN	TYP	MAX	MIN	MAX	
$V_{OHA}$	$I_{OH} = -20 \mu\text{A}$ , $V_{IB} \geq V_{CCB} - 0.4 \text{ V}$	1.65 V to 3.6 V	2.3 V to 5.5 V				$V_{CCA} \times 0.67$		V
$V_{OLA}$	$I_{OL} = 1 \text{ mA}$ , $V_{IB} \leq 0.15 \text{ V}$	1.65 V to 3.6 V	2.3 V to 5.5 V				0.4		V
$V_{OHB}$	$I_{OH} = -20 \mu\text{A}$ , $V_{IA} \geq V_{CCA} - 0.2 \text{ V}$	1.65 V to 3.6 V	2.3 V to 5.5 V				$V_{CCB} \times 0.67$		V
$V_{OLB}$	$I_{OL} = 1 \text{ mA}$ , $V_{IA} \leq 0.15 \text{ V}$	1.65 V to 3.6 V	2.3 V to 5.5 V				0.4		V
$I_I$	OE	1.65 V to 3.6 V	1.65 V to 5.5 V			$\pm 1$		$\pm 2$	$\mu\text{A}$
$I_{off}$	A port	0 V	0 to 5.5 V			$\pm 1$		$\pm 2$	$\mu\text{A}$
	B port	0 to 3.6 V	0 V			$\pm 1$		$\pm 2$	$\mu\text{A}$
$I_{OZ}$	A or B port	1.65 V to 3.6 V	2.3 V to 5.5 V			$\pm 1$		$\pm 2$	$\mu\text{A}$
$I_{CCA}$	$V_I = V_O = \text{open}$ , $I_O = 0$	1.65 V to $V_{CCB}$	2.3 V to 5.5 V				2.4		$\mu\text{A}$
		3.6 V	0 V				2.2		
		0 V	5.5 V				-1		
$I_{CCB}$	$V_I = V_O = \text{open}$ , $I_O = 0$	1.65 V to $V_{CCB}$	2.3 V to 5.5 V				12		$\mu\text{A}$
		3.6 V	0 V				-1		
		0 V	5.5 V				1		
$I_{CCA} + I_{CCB}$	$V_I = V_{CCI}$ , $I_O = 0$	1.65 V to $V_{CCB}$	2.3 V to 5.5 V				14.4		$\mu\text{A}$
$C_I$	OE	3.3 V	3.3 V			2.5		3.5	pF
$C_{io}$	A port	3.3 V	3.3 V			5		6	pF
	B port					6		7.5	

- (1)  $V_{CCI}$  is the  $V_{CC}$  associated with the input port.
- (2)  $V_{CCO}$  is the  $V_{CC}$  associated with the output port.
- (3)  $V_{CCA}$  must be less than or equal to  $V_{CCB}$ , and  $V_{CCA}$  must not exceed 3.6 V.

### TIMING REQUIREMENTS

 over recommended operating free-air temperature range,  $V_{CCA} = 1.8\text{ V} \pm 0.15\text{ V}$  (unless otherwise noted)

			$V_{CCB} = 2.5\text{ V} \pm 0.2\text{ V}$		$V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$		$V_{CCB} = 5\text{ V} \pm 0.5\text{ V}$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
Data rate	Push-pull driving		21		22		24		Mbps
	Open-drain driving		2		2		2		
$t_w$	Pulse duration	Push-pull driving	47		45		41		ns
		Open-drain driving	500		500		500		

### TIMING REQUIREMENTS

 over recommended operating free-air temperature range,  $V_{CCA} = 2.5\text{ V} \pm 0.2\text{ V}$  (unless otherwise noted)

			$V_{CCB} = 2.5\text{ V} \pm 0.2\text{ V}$		$V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$		$V_{CCB} = 5\text{ V} \pm 0.5\text{ V}$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
Data rate	Push-pull driving		20		22		24		Mbps
	Open-drain driving		2		2		1		
$t_w$	Pulse duration	Push-pull driving	50		45		41		ns
		Open-drain driving	500		500		500		

### TIMING REQUIREMENTS

 over recommended operating free-air temperature range,  $V_{CCA} = 3.3\text{ V} \pm 0.3\text{ V}$  (unless otherwise noted)

			$V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$		$V_{CCB} = 5\text{ V} \pm 0.5\text{ V}$		UNIT
			MIN	MAX	MIN	MAX	
Data rate	Push-pull driving		23		24		Mbps
	Open-drain driving		2		2		
$t_w$	Pulse duration	Push-pull driving	43		41		ns
		Open-drain driving	500		500		

### SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range,  $V_{CCA} = 1.8\text{ V} \pm 0.15\text{ V}$  (unless otherwise noted)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	$V_{CCB} = 2.5\text{ V} \pm 0.2\text{ V}$		$V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$		$V_{CCB} = 5\text{ V} \pm 0.5\text{ V}$		UNIT
				MIN	MAX	MIN	MAX	MIN	MAX	
$t_{PHL}$	A	B	Push-pull driving	5.3		5.4		6.8		ns
			Open-drain driving	2.3	8.8	2.4	9.6	2.6	10	
$t_{PLH}$			Push-pull driving	6.8		7.1		7.5		
			Open-drain driving	45	260	36	208	27	198	
$t_{PHL}$	B	A	Push-pull driving	4.4		4.5		4.7		ns
			Open-drain driving	1.9	5.3	1.1	4.4	1.2	4	
$t_{PLH}$			Push-pull driving	5.3		4.5		0.5		
			Open-drain driving	45	175	36	140	27	102	
$t_{en}$	OE	A or B		200		200		200		ns
$t_{dis}$	OE	A or B		50		40		35		ns
$t_{rA}$	A-port rise time		Push-pull driving	3.2	9.5	2.3	9.3	2	7.6	ns
			Open-drain driving	38	165	30	132	22	95	
$t_{rB}$	B-port rise time		Push-pull driving	1.1	10.8	1	9.1	1	7.6	ns
			Open-drain driving	34	145	23	106	10	76	
$t_{fA}$	A-port fall time		Push-pull driving	1.9	5.9	1.9	6	1.4	13.3	ns
			Open-drain driving	4.4	6.9	4.3	6.4	4.2	6.1	
$t_{fB}$	B-port fall time		Push-pull driving	2.2	13.8	2.2	16.2	2.6	16.2	ns
			Open-drain driving	6.9	13.8	7.5	16.2	7	16.2	
Max data rate			Push-pull driving	21		22		24		Mbps
			Open-drain driving	2		2		2		

**SWITCHING CHARACTERISTICS**

 over recommended operating free-air temperature range,  $V_{CCA} = 2.5 \text{ V} \pm 0.2 \text{ V}$  (unless otherwise noted)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	$V_{CCB} = 2.5 \text{ V} \pm 0.2 \text{ V}$		$V_{CCB} = 3.3 \text{ V} \pm 0.3 \text{ V}$		$V_{CCB} = 5 \text{ V} \pm 0.5 \text{ V}$		UNIT
				MIN	MAX	MIN	MAX	MIN	MAX	
$t_{PHL}$	A	B	Push-pull driving	3.2		3.7		3.8		ns
			Open-drain driving	1.7	6.3	2	6	2.1	5.8	
$t_{PLH}$			Push-pull driving	3.5		4.1		4.4		
			Open-drain driving	43	250	36	206	27	190	
$t_{PHL}$	B	A	Push-pull driving	3		3.6		4.3		ns
			Open-drain driving	1.8	4.7	1.6	4.2	1.2	4	
$t_{PLH}$			Push-pull driving	2.5		1.6		1		
			Open-drain driving	44	170	37	140	27	103	
$t_{en}$	OE	A or B		200		200		200		ns
$t_{dis}$	OE	A or B		50		40		35		ns
$t_{rA}$	A-port rise time		Push-pull driving	2.8	7.4	2.1	6.6	0.9	5.6	ns
			Open-drain driving	34	149	28	121	24	89	
$t_{rB}$	B-port rise time		Push-pull driving	1.3	8.3	0.9	7.2	0.4	6.1	ns
			Open-drain driving	35	151	24	112	12	81	
$t_{fA}$	A-port fall time		Push-pull driving	1.9	5.7	1.4	5.5	0.8	5.3	ns
			Open-drain driving	4.4	6.9	4.3	6.2	4.2	5.8	
$t_{fB}$	B-port fall time		Push-pull driving	2.2	7.8	2.4	6.7	2.6	6.6	ns
			Open-drain driving	5.1	8.8	5.4	9.4	5.4	10.4	
Max data rate			Push-pull driving	20		22		24		Mbps
			Open-drain driving	2		2		2		

## SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range,  $V_{CCA} = 3.3 \text{ V} \pm 0.3 \text{ V}$  (unless otherwise noted)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	$V_{CCB} = 3.3 \text{ V} \pm 0.3 \text{ V}$		$V_{CCB} = 5 \text{ V} \pm 0.5 \text{ V}$		UNIT
				MIN	MAX	MIN	MAX	
$t_{PHL}$	A	B	Push-pull driving	2.4		3.1		ns
$t_{PLH}$			Open-drain driving	1.3	4.2	1.4	4.6	
			Push-pull driving	4.2		4.4		
$t_{PHL}$			B	A	Open-drain driving	36	204	
	Push-pull driving	2.5			3.3			
$t_{PLH}$	Open-drain driving	1			124	1	97	
	Push-pull driving	2.5			2.6			
$t_{en}$	OE	A or B		200		200		ns
$t_{dis}$	OE	A or B		40		35		ns
$t_{rA}$	A-port rise time		Push-pull driving	2.3	5.6	1.9	4.8	ns
			Open-drain driving	25	116	19	85	
$t_{rB}$	B-port rise time		Push-pull driving	1.6	6.4	0.6	7.4	ns
			Open-drain driving	26	116	14	72	
$t_{fA}$	A-port fall time		Push-pull driving	1.4	5.4	1	5	ns
			Open-drain driving	4.3	6.1	4.2	5.7	
$t_{fB}$	B-port fall time		Push-pull driving	2.3	7.4	2.4	7.6	ns
			Open-drain driving	5	7.6	4.8	8.3	
Max data rate			Push-pull driving	23		24		Mbps
			Open-drain driving	2		2		

## PRINCIPLES OF OPERATION

### Applications

The TXS0101 can be used in level-translation applications for interfacing devices or systems operating at different interface voltages with one another. The TXS0101 is ideal for use in applications where an open-drain driver is connected to the data I/Os. The TXB0101 can also be used in applications where a push-pull driver is connected to the data I/Os, but the TXB0102 might be a better option for such push-pull applications.

### Architecture

The TXS0101 architecture (see [Figure 1](#)) does not require a direction-control signal to control the direction of data flow from A to B or from B to A.

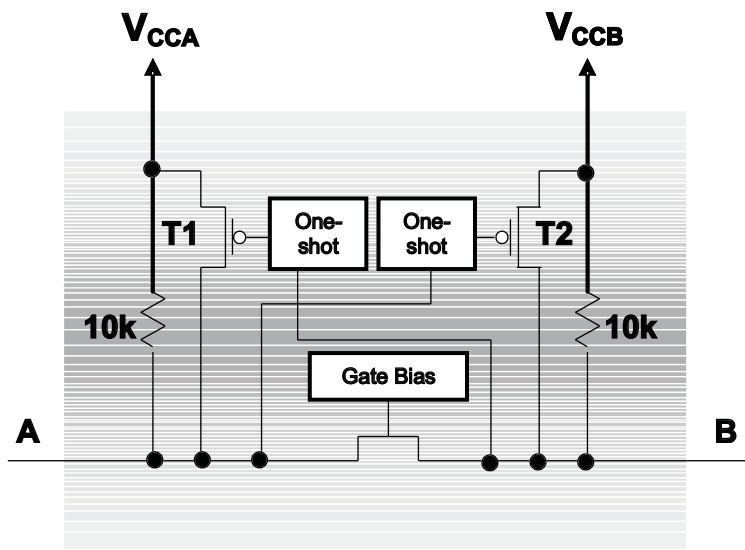


Figure 1. Architecture of a TXS01xx Cell

Each A-port I/O has an internal 10-kΩ pullup resistor to  $V_{CCA}$ , and each B-port I/O has an internal 10-kΩ pullup resistor to  $V_{CCB}$ . The output one-shots detect rising edges on the A or B ports. During a rising edge, the one-shot turns on the PMOS transistors (T1,T2) for a short duration, which speeds up the low-to-high transition.

### Input Driver Requirements

The fall time ( $t_{fA}$ ,  $t_{fB}$ ) of a signal depends on the output impedance of the external device driving the data I/Os of the TXS0101. Similarly, the  $t_{pHL}$  and max data rates also depend on the output impedance of the external driver. The values for  $t_{fA}$ ,  $t_{fB}$ ,  $t_{pHL}$ , and maximum data rates in the data sheet assume that the output impedance of the external driver is less than 50 Ω.

### Power Up

During operation, ensure that  $V_{CCA} \leq V_{CCB}$  at all times. During power-up sequencing,  $V_{CCA} \geq V_{CCB}$  does not damage the device, so any power supply can be ramped up first.

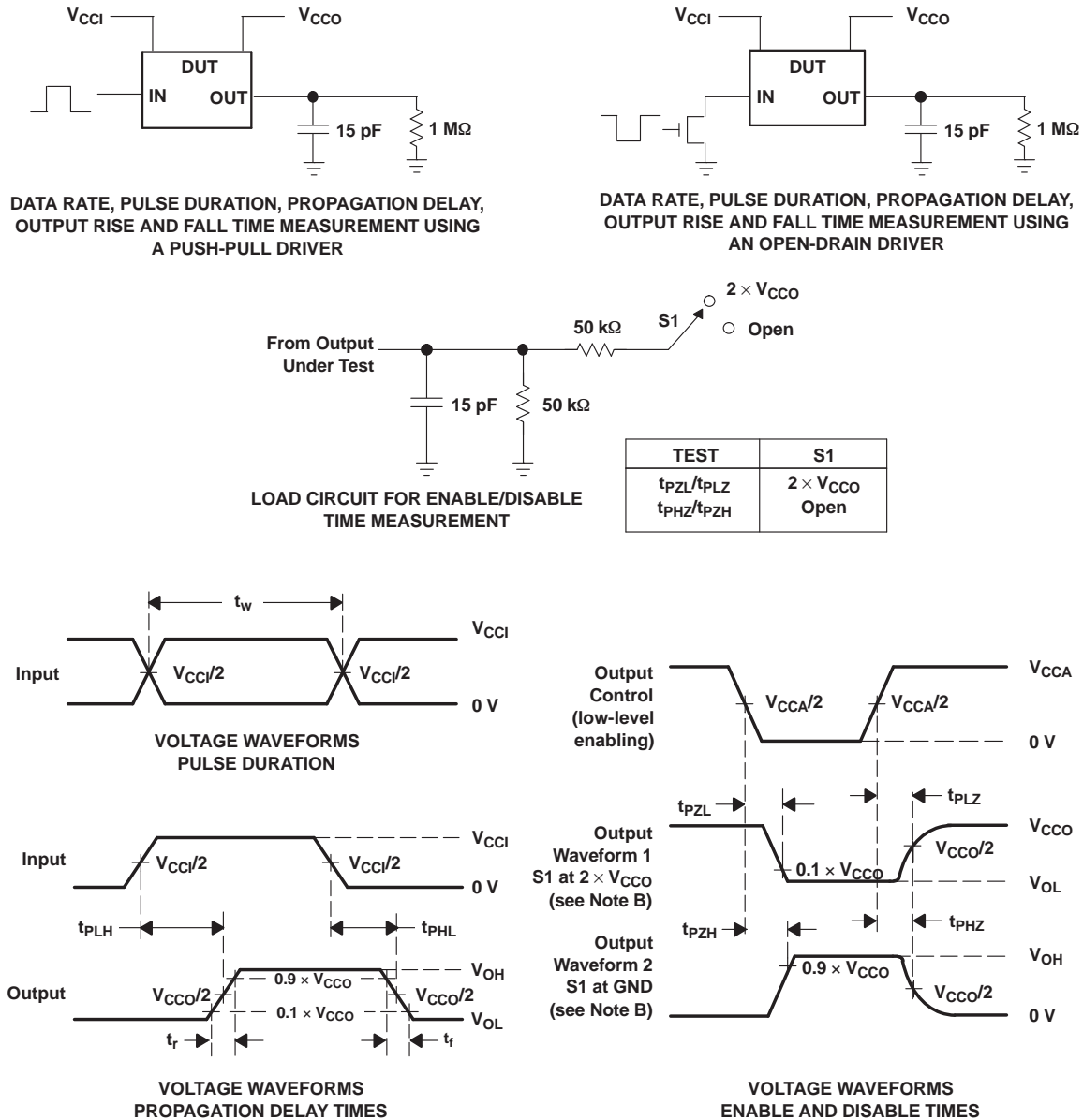
### Enable and Disable

The TXS0101 has an OE input that is used to disable the device by setting OE low, which places all I/Os in the Hi-Z state. The disable time ( $t_{dis}$ ) indicates the delay between the time when OE goes low and when the outputs actually get disabled (Hi-Z). The enable time ( $t_{en}$ ) indicates the amount of time the user must allow for the one-shot circuitry to become operational after OE is taken high.

### Pullup or Pulldown Resistors on I/O Lines

Each A-port I/O has an internal 10-kΩ pullup resistor to  $V_{CCA}$ , and each B-port I/O has an internal 10-kΩ pullup resistor to  $V_{CCB}$ . If a smaller value of pullup resistor is required, an external resistor must be added from the I/O to  $V_{CCA}$  or  $V_{CCB}$  (in parallel with the internal 10-kΩ resistors).

**PARAMETER MEASUREMENT INFORMATION**



- 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,  $Z_O = 50 \Omega$ ,  $dv/dt \geq 1$  V/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.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .
- H.  $V_{CCI}$  is the  $V_{CC}$  associated with the input port.
- I.  $V_{CCO}$  is the  $V_{CC}$  associated with the output port.
- J. All parameters and waveforms are not applicable to all devices.

**Figure 2. Load Circuit and Voltage Waveforms**

**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
TXS0101DBVR	ACTIVE	SOT-23	DBV	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(NFFF ~ NFFR)	<a href="#">Samples</a>
TXS0101DBVRG4	ACTIVE	SOT-23	DBV	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(NFFF ~ NFFR)	<a href="#">Samples</a>
TXS0101DBVT	ACTIVE	SOT-23	DBV	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-55 to 125	NFFR	<a href="#">Samples</a>
TXS0101DBVTG4	ACTIVE	SOT-23	DBV	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	NFFR	<a href="#">Samples</a>
TXS0101DCKR	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	2GO	<a href="#">Samples</a>
TXS0101DCKRG4	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	2GO	<a href="#">Samples</a>
TXS0101DCKT	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	2GO	<a href="#">Samples</a>
TXS0101DRLR	ACTIVE	SOT	DRL	6	4000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	2GR	<a href="#">Samples</a>
TXS0101DRLRG4	ACTIVE	SOT	DRL	6	4000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	2GR	<a href="#">Samples</a>
TXS0101YZPR	ACTIVE	DSBGA	YZP	6	3000	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM	-40 to 85	(2G7 ~ 2GN)	<a href="#">Samples</a>

(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.

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**TAPE AND REEL INFORMATION**

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


\*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
TXS0101DBVR	SOT-23	DBV	6	3000	180.0	8.4	3.23	3.17	1.37	4.0	8.0	Q3
TXS0101DBVT	SOT-23	DBV	6	250	180.0	8.4	3.23	3.17	1.37	4.0	8.0	Q3
TXS0101DCKR	SC70	DCK	6	3000	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
TXS0101DCKT	SC70	DCK	6	250	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
TXS0101DRLR	SOT	DRL	6	4000	180.0	8.4	1.98	1.78	0.69	4.0	8.0	Q3
TXS0101YZPR	DSBGA	YZP	6	3000	178.0	9.2	1.02	1.52	0.63	4.0	8.0	Q1

**TAPE AND REEL BOX DIMENSIONS**

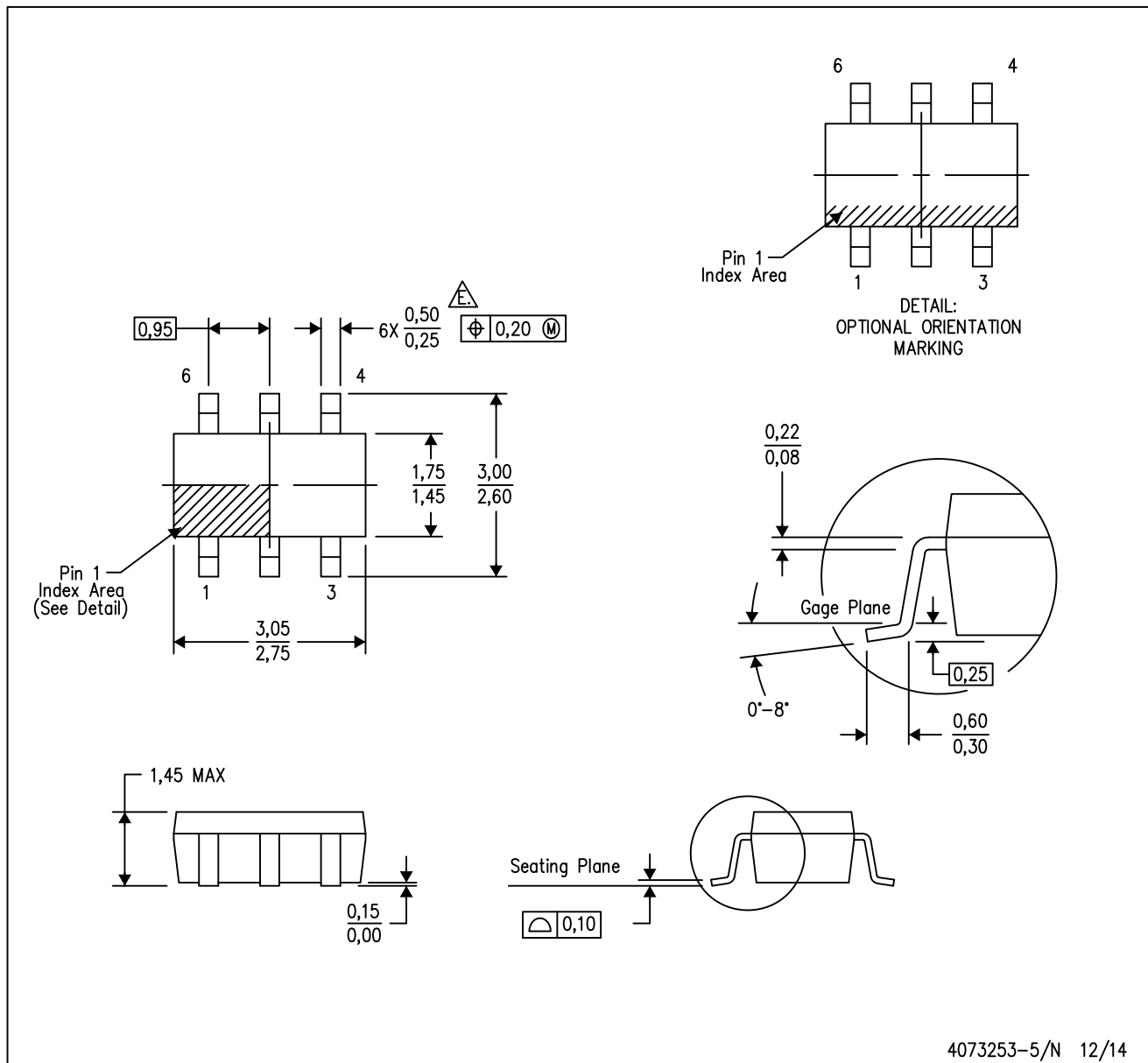

\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TXS0101DBVR	SOT-23	DBV	6	3000	202.0	201.0	28.0
TXS0101DBVT	SOT-23	DBV	6	250	202.0	201.0	28.0
TXS0101DCKR	SC70	DCK	6	3000	203.0	203.0	35.0
TXS0101DCKT	SC70	DCK	6	250	203.0	203.0	35.0
TXS0101DRLR	SOT	DRL	6	4000	202.0	201.0	28.0
TXS0101YZPR	DSBGA	YZP	6	3000	220.0	220.0	35.0

# MECHANICAL DATA

DBV (R-PDSO-G6)

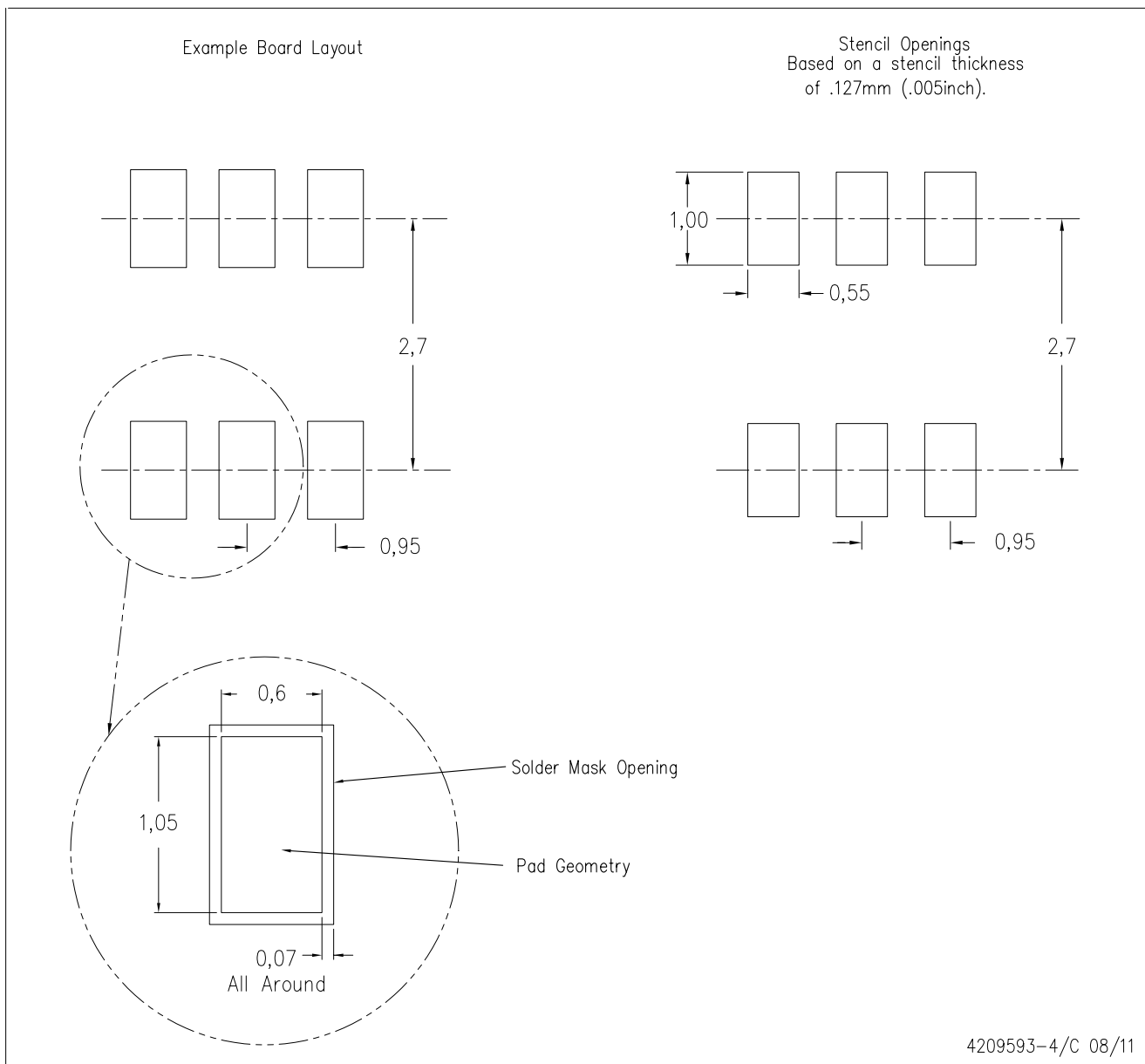
PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
  - Leads 1,2,3 may be wider than leads 4,5,6 for package orientation.
- ⚠ Falls within JEDEC MO-178 Variation AB, except minimum lead width.

DBV (R-PDSO-G6)

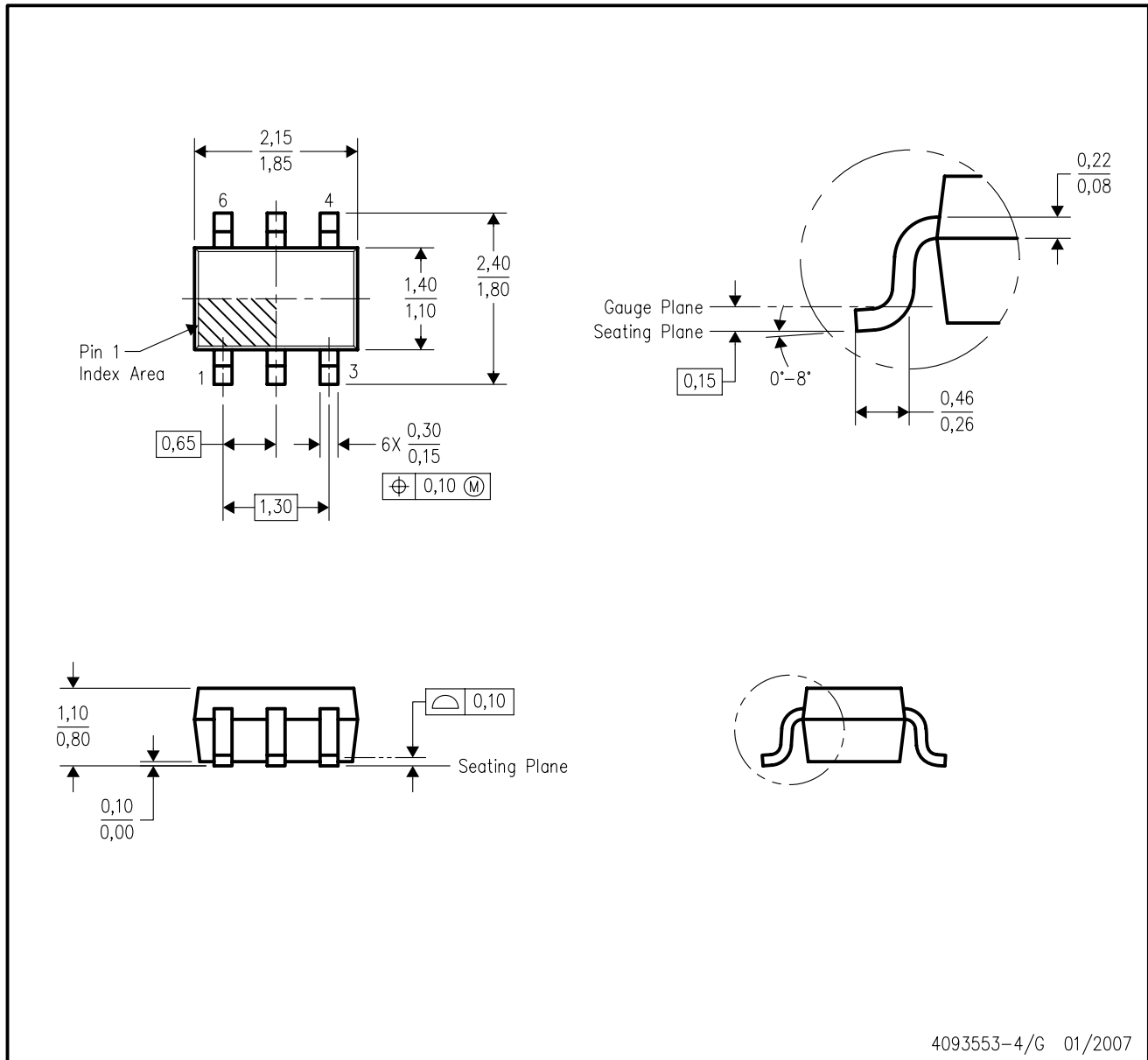
PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
  - D. Publication IPC-7351 is recommended for alternate designs.
  - 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. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC-7525 for other stencil recommendations.

DCK (R-PDSO-G6)

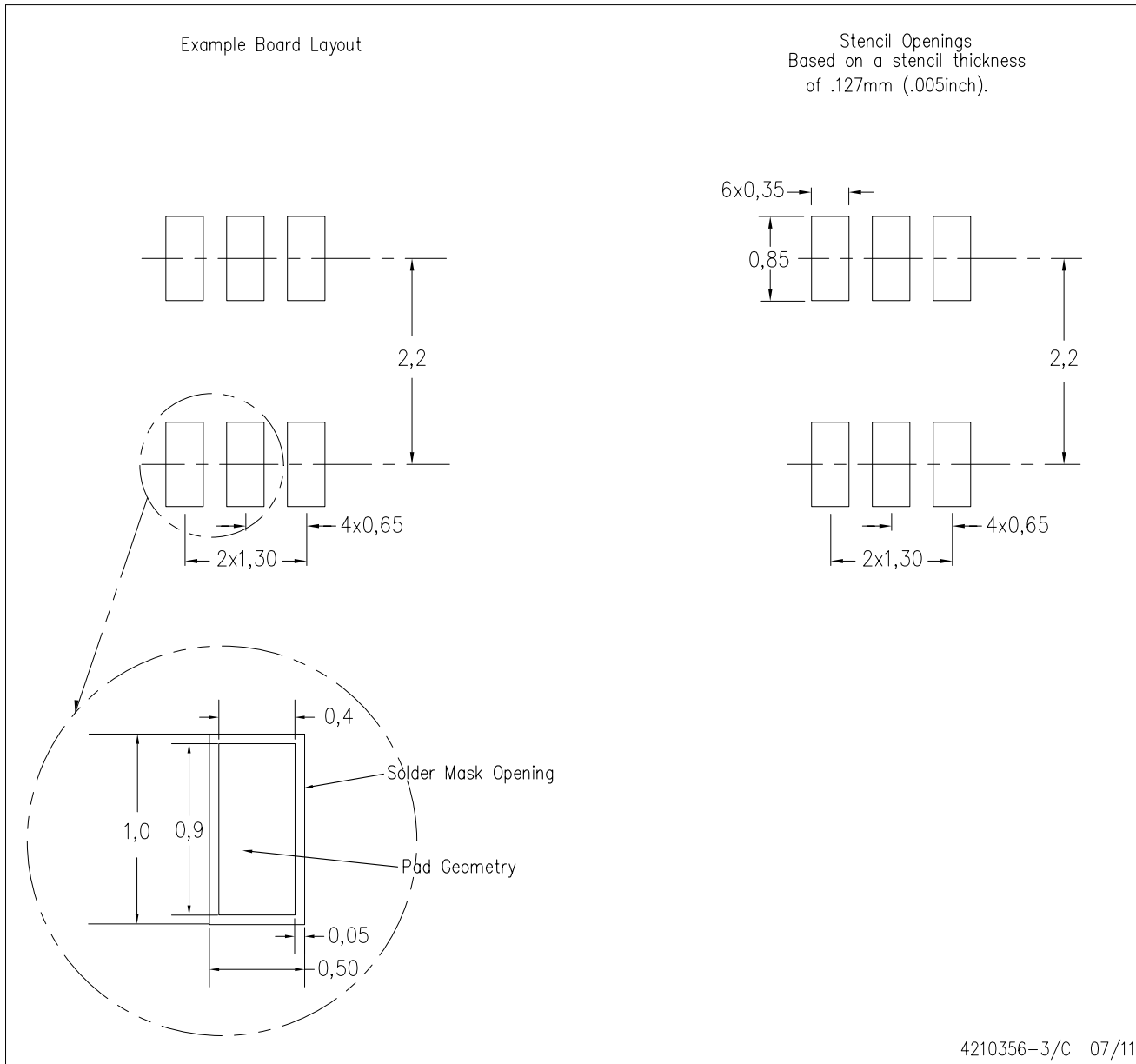
PLASTIC SMALL-OUTLINE PACKAGE



- 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. Mold flash and protrusion shall not exceed 0.15 per side.
  - D. Falls within JEDEC MO-203 variation AB.

DCK (R-PDSO-G6)

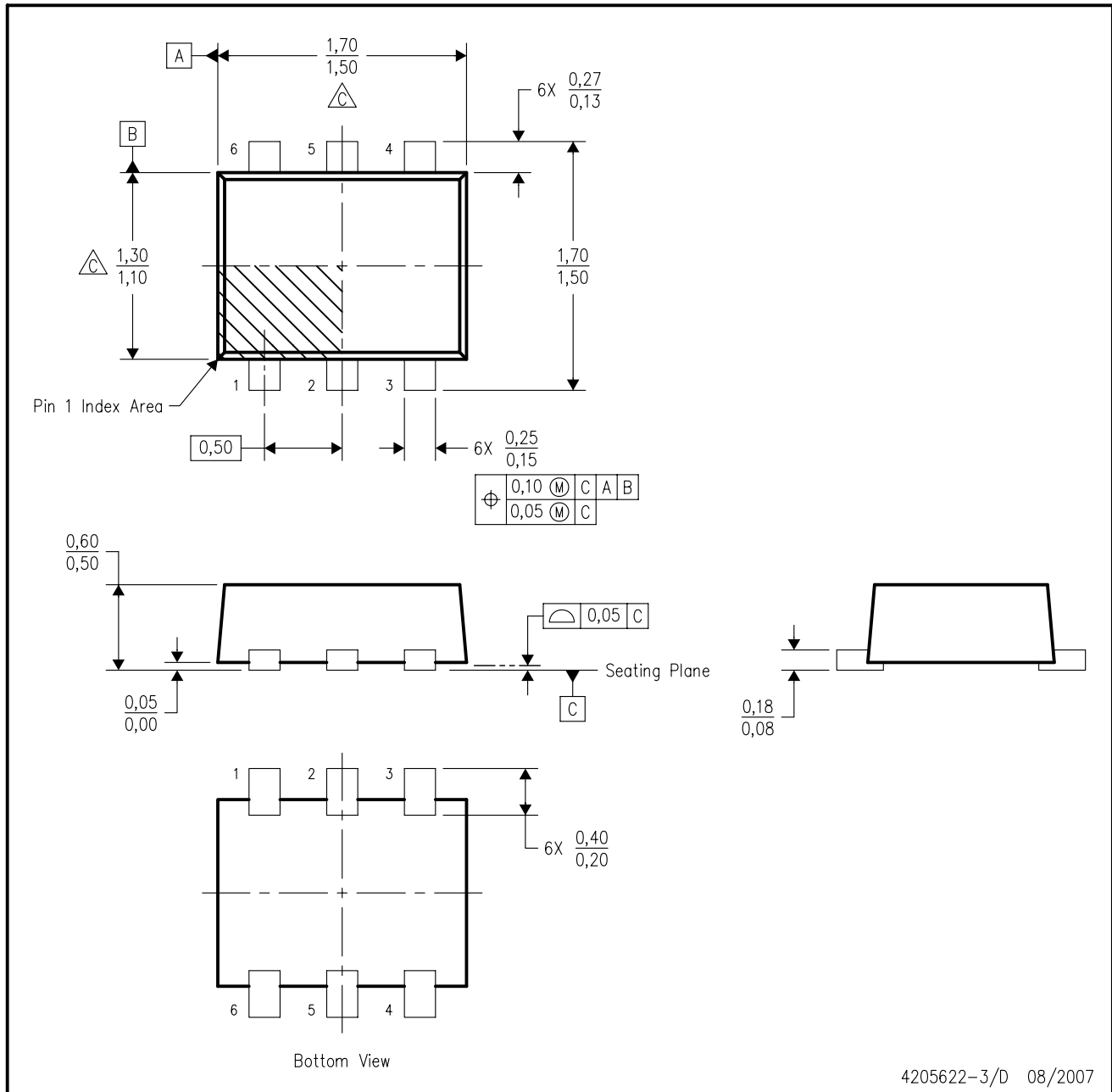
PLASTIC SMALL OUTLINE

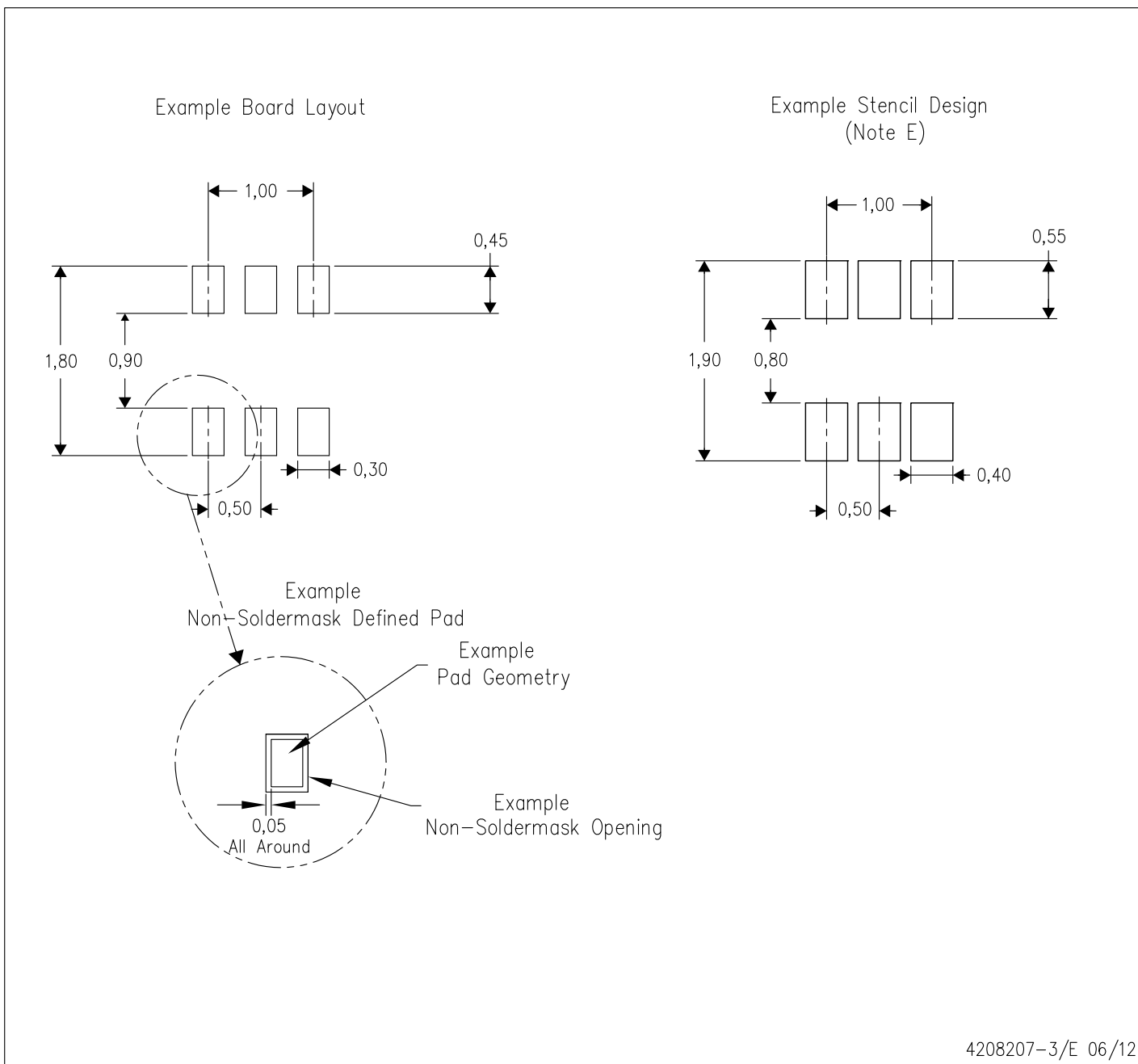


- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
  - D. Publication IPC-7351 is recommended for alternate designs.
  - 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. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC-7525 for other stencil recommendations.

DRL (R-PDSO-N6)

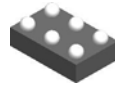
PLASTIC SMALL OUTLINE





- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Publication IPC-7351 is recommended for alternate designs.
  - Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads.
  - Maximum stencil thickness 0,127 mm (5 mils). All linear dimensions are in millimeters.
  - 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.
  - Side aperture dimensions over-print land for acceptable area ratio > 0.66. Customer may reduce side aperture dimensions if stencil manufacturing process allows for sufficient release at smaller opening.

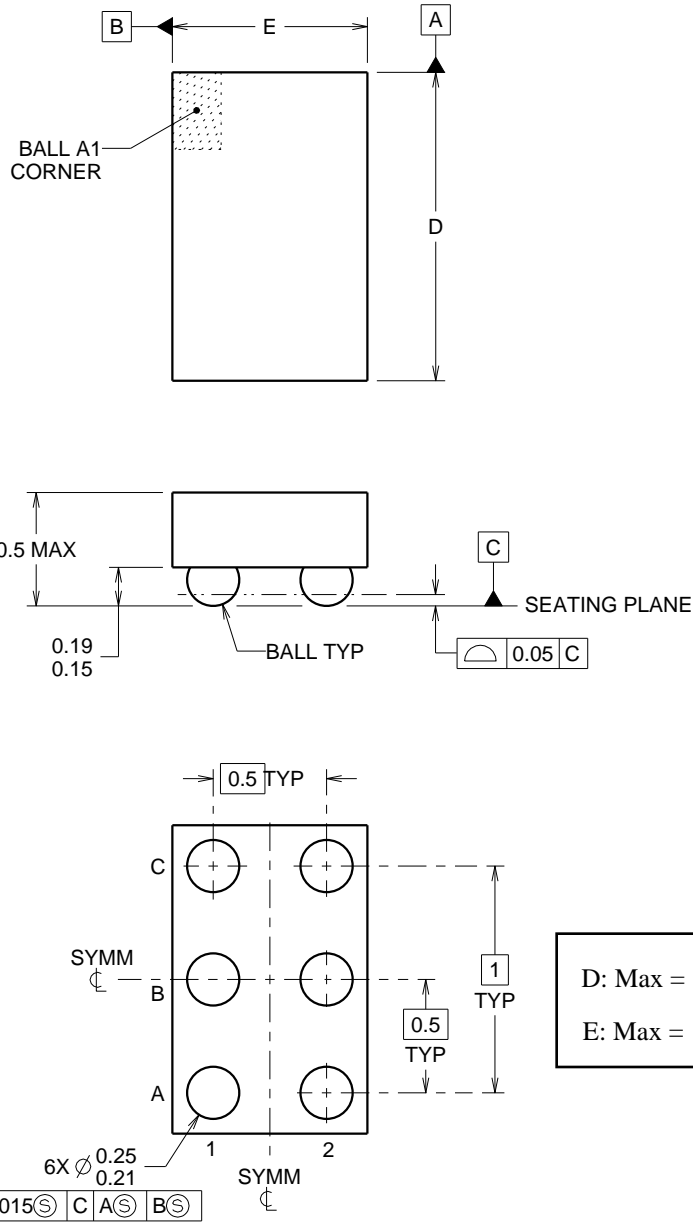
YZP0006



PACKAGE OUTLINE

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY



D: Max = 1.418 mm, Min = 1.358 mm  
 E: Max = 0.918 mm, Min = 0.858 mm

4219524/A 06/2014

NOTES:

NanoFree Is a trademark of Texas Instruments.

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. NanoFree™ package configuration.

# EXAMPLE BOARD LAYOUT

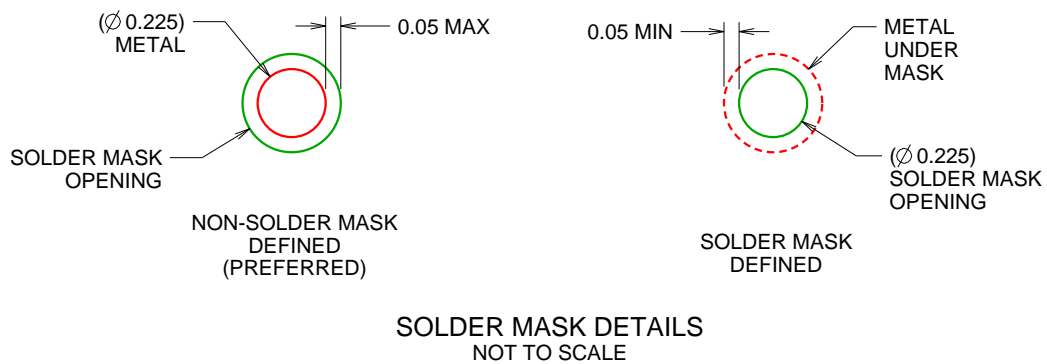
YZP0006

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY



LAND PATTERN EXAMPLE  
SCALE:40X



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NOTES: (continued)

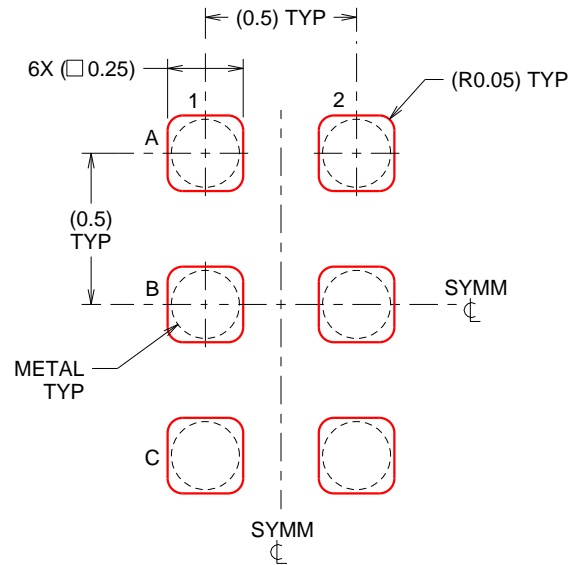
- Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints. For more information, see Texas Instruments literature number SBVA017 ([www.ti.com/lit/sbva017](http://www.ti.com/lit/sbva017)).

# EXAMPLE STENCIL DESIGN

YZP0006

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY



SOLDER PASTE EXAMPLE  
BASED ON 0.1 mm THICK STENCIL  
SCALE:40X

4219524/A 06/2014

NOTES: (continued)

5. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release.

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