片间 USB 电压电平转换器

查询样品：TXS0202

特性

- 无需方向控制信号
- V_{CCA}，V_{CCB} 电源电源：**1.65V** 至 **3.6V**
- 满足 **IC-USB** 标准的所有要求
- 小外形封装：**WCSP**
- 锁断性能超过 **100mA** （符合 **JESD 78 Class II** 规范的要求）
- I_{off} 支持部分断电模式工作
- **ESD** 性能
  - **A** 端口（主机端）
    - **2000V** 人体模型
    - **100V** 机器模型
    - **500V** 充电器件模型
  - **B** 端口 （外设端）
    - **>4kV HBM**

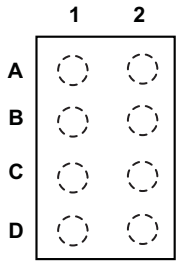


表 **1. YZP** 终端分配
（顶视图）

	1	2
A	D+(B)	D–(B)
B	GND	V_{CCB}
C	V_{CCA}	OE
D	D+(A)	D–(A)

说明

TXS0202 是 2 位电压电平转换器，针对在片间 USB (IC-USB) 应用的使用进行了优化。 V_{CCA} 和 V_{CCB} 均可跨 1.65V 至 3.6V 的整个范围运行。 该器件的设计将交叉歪斜限制在 1ns 以内。 该器件采用集成上拉和下拉电阻，可帮助主机和外设之间的协议通信。 该转换器是一款自动方向感应型缓冲转换器。 当输出使能 (OE) 输入为低时，所有输出均处于高阻抗状态。

该器件的技术规格针对采用 I_{off} 的部分断电应用而全面拟订。 I_{off} 电路负责停用输出，从而可防止破坏性的电流在其断电时通过器件回流。 为了确保上电或断电期间的高阻抗状态，OE 应通过一个下拉电阻器连接至 GND；该电阻器的最小值由驱动器的电流源能力来决定。

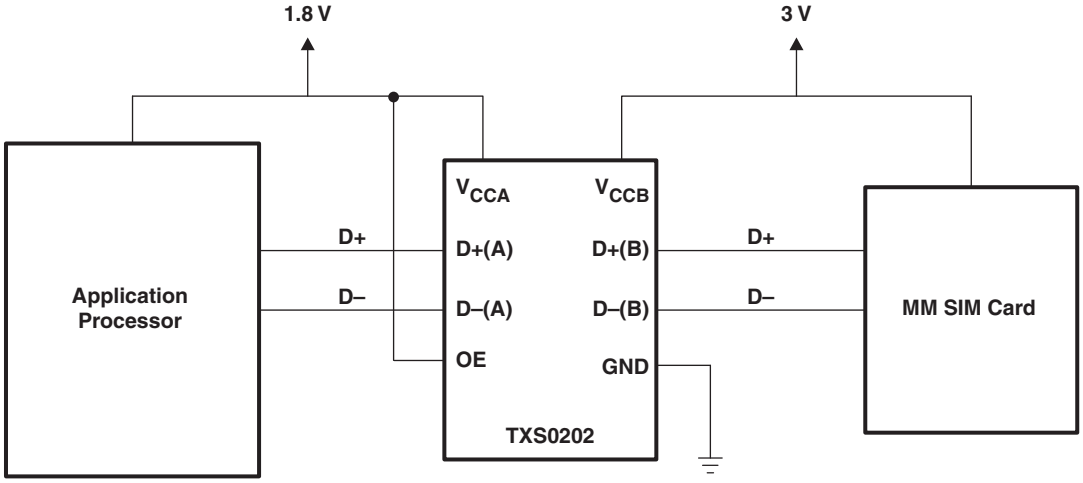
ORDERING INFORMATION(1)

T_A	PACKAGE(2)		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	WSCP – YZP	Tape and reel	TXS0202YZPR	_ _ _ 7PS _(3)

(1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI website at www.ti.com.
(2) Package drawings, thermal data, and symbolization are available at www.ti.com/packaging.
(3) 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.

These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

TYPICAL APPLICATION BLOCK DIAGRAM



PIN FUNCTIONS

PIN		DESCRIPTION
WSCP (YFP) BALL NO.	NAME	
A1	D+(B)	USB data signal connected to peripheral
A2	D–(B)	USB data signal connected to peripheral
B1	GND	Ground
B2	V_{CCB}	B-side supply voltage (1.65 V to 3.6 V)
C1	V_{CCA}	A-side supply voltage (1.65 V to 3.6 V)
C2	OE	Output enable input control
D1	D+(A)	USB data signal connected to host
D2	D–(A)	USB data signal connected to host

FUNCTIONAL TABLE

CONTROL INPUT	OUTPUT CIRCUIT	OPERATION
OE	B PORT	
L	Hi-Z	Isolation
H	Enabled	Bi-directional communications between host and peripheral

ABSOLUTE MAXIMUM RATINGS(1)

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

			MIN	MAX	UNIT
V_{CCA} V_{CCB}	Supply voltage rang		–0.5	4.6	V
V_I	Input voltage range	A port, B port, control inputs	–0.5	V_{CCx} + 0.5	V
V_O	Voltage range applied to any output in the high-impedance or power-off state	A port, B port	–0.5	V_{CCx} + 0.5	V
I_{IK}	Input clamp current	V_I < 0		–50	mA
I_{OK}	Output clamp current	V_O < 0		–50	mA
I_{CC} I_{GND}	Continuous current through V_{CCA}, V_{CCB}, or GND			±100	mA
T_{stg}	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.

THERMAL INFORMATION

THERMAL METRIC(1)		TXS0202 YZP 8 PINS	UNITS
θ_{JA}	Junction-to-ambient thermal resistance	102	°C/W

(1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics* application report, SPRA953.

RECOMMENDED OPERATING CONDITIONS

			MIN	MAX	UNIT
V_{CCA}, V_{CCB}	Supply voltage		1.65	3.6	V
V_{IH}	High-level input voltage	A port I/Os	V_{CCA} – 0.2	V_{CCA}	V
		B port I/Os	V_{CCB} – 0.2	V_{CCB}	
		OE	V_{CCA} × 0.65	3.6	
V_{IL}	Low-level input voltage	A port I/Os	0	0.15	V
		B port I/Os	0	0.15	
		OE	0	V_{CCA} × 0.35	
Δt/Δv	Input transition rise or fall rate			10	ns/V
T_A	Operating free-air temperature		–40	85	°C

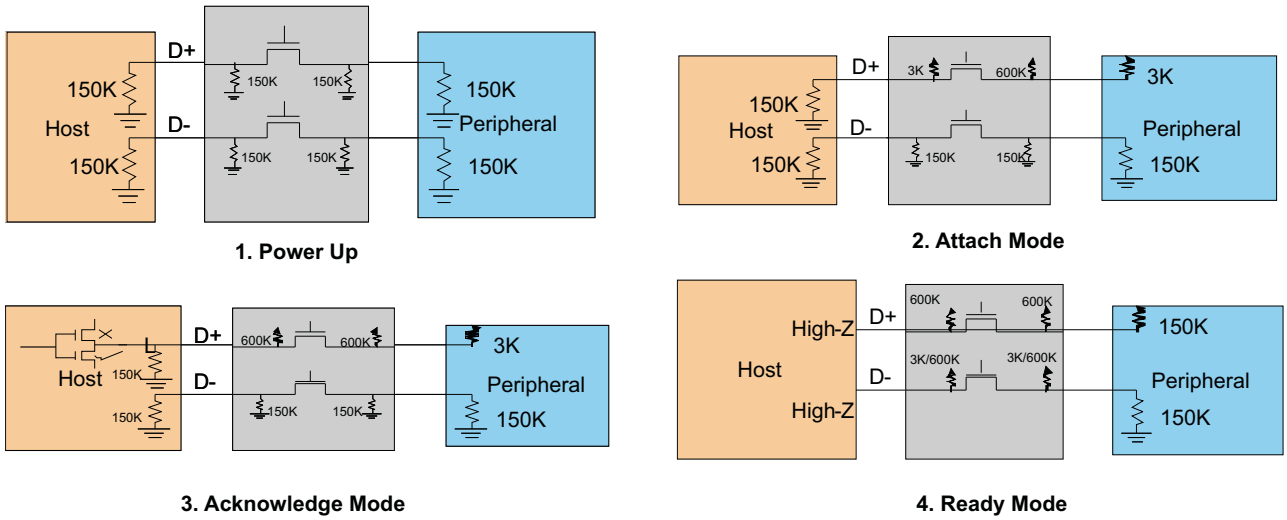


Figure 1. Block Diagram Showing Different Modes in the TXS0202

ELECTRICAL CHARACTERISTICS

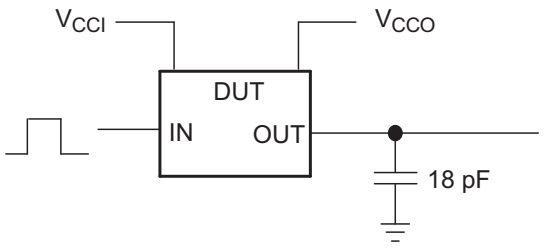
PARAMETER	TEST CONDITIONS	V_{CCA}	V_{CCBx}	T_A = 25°C	T_A = –40°C to 85°C		UNIT
				TYP	MIN	MAX	
$V_{OH(D–)}$ (D– A or B port)	I_{OH} = –20 µA, V_{Ix} ≥ V_{CCx} – 0.2 V	1.65 V	1.65 V		V_{CCO} × 0.67		V
		2.3 V	2.3 V		V_{CCO} × 0.67		
		3.3 V	3.3 V		V_{CCO} × 0.67		
$V_{OL(D–)}$ (D– A or B port)	I_{OL} = 220 µA, V_{Ix} ≤ 0.15 V	1.65 V	1.65 V			0.45	V
	I_{OL} = 180 µA, V_{Ix} ≤ 0.15 V	2.3 V	2.3 V			0.55	
	I_{OL} = 220 µA, V_{Ix} ≤ 0.15 V	3.3 V	3.3 V			0.7	
$V_{OH(D+)}$ (D+ A or B port)	I_{OH} = –20 µA, V_{Ix} ≥ V_{CCx} – 0.2 V	1.65 V	1.65 V		V_{CCO} × 0.67		V
		2.3 V	2.3 V		V_{CCO} × 0.67		
		3.3 V	3.3 V		V_{CCO} × 0.67		
$V_{OL(D+)}$ (D– A or B port)	I_{OL} = 220 µA, V_{Ix} ≤ 0.15 V	1.65 V	1.65 V			0.45	V
	I_{OL} = 300 µA, V_{Ix} ≤ 0.15 V	2.3 V	2.3 V			0.55	
	I_{OL} = 620 µA, V_{Ix} ≤ 0.15 V	3.3 V	3.3 V			0.7	
I_I	OE	1.65 V to 3.6 V	1.65 V to 3.6 V	±2		±2	µA
	D–/D+ A or B port, OE = OPEN			±2		±2	
	I_{BOFF}, D+, D– B port	1.65 V to 3.6 V	0 V			±2	
	I_{AOFF}, D+, D– A port	0 V	1.65 V to 3.6 V			±2	
I_{CCA}	V_I = V_O = Open, OE = High	1.65 V to 3.6 V	1.65 V to 3.6 V	2.2		12	µA
		3.6 V	0 V	2.3		12	
		0 V	3.6 V	0.026		–1	
I_{CCB}	V_I = V_O = Open, OE = High	1.65 V to 3.6 V	1.65 V to 3.6 V	2.7		24	µA
		3.6 V	0 V	0.031		–12	
		0 V	3.6 V	2.7		24	
C_i	OE	3.6 V	3.6 V	2.5		3.5	pF
C_{io}	A port	3.6 V	3.6 V	7		7.5	pF
	B port			9.5		10	

SWITCHING CHARACTERISTICS

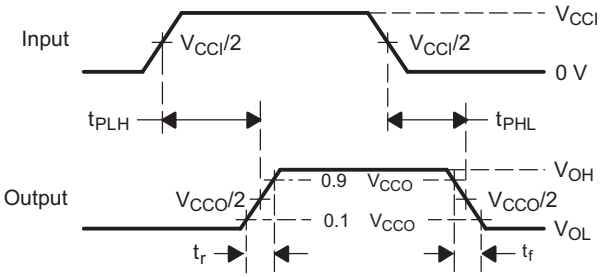
over recommended operating free-air temperature range, V_{CCA} = 1.8 V ± 0.15 V (unless otherwise noted)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CCB} = 1.8 V ± 0.15 V	V_{CCB} = 3.3 V ± 0.3 V	UNIT
			TYP	TYP	
t_{pd}	A	B	5	5	ns
	B	A	5	5	
t_{rA}	A port rise times		2	2	ns
t_{fA}	A port fall times		2	2	ns
t_{rB}	B port rise times		2	2	ns
t_{fB}	B port fall times		2	2	ns
$t_{sk(o)}$	Channel-to-channel		0.5	0.5	ns
Max data rate			15	15	Mbps

PARAMETER MEASUREMENT INFORMATION



DATA RATE, SKEW, PROPAGATION DELAY,
OUTPUT RISE AND FALL TIME MEASUREMENT



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES

A. C_L includes probe and jig capacitance.
B. The outputs are measured one at a time, with one transition per measurement.
C. t_{PLH} and t_{PHL} are the same as t_{pd}.

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)
TXS0202YZPR	Active	Production	DSBGA (YZP) | 8	3000 | LARGE T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-40 to 85	7P
TXS0202YZPR.B	Active	Production	DSBGA (YZP) | 8	3000 | LARGE T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-40 to 85	7P

(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.

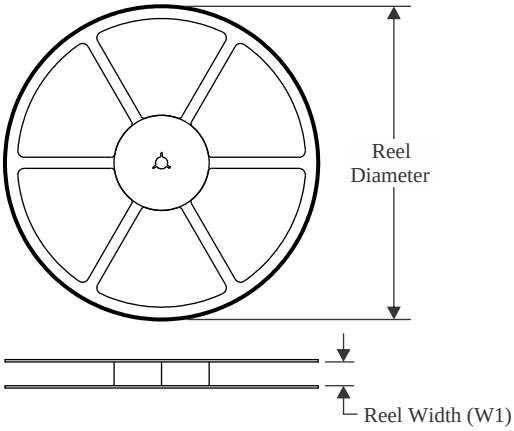
(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will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

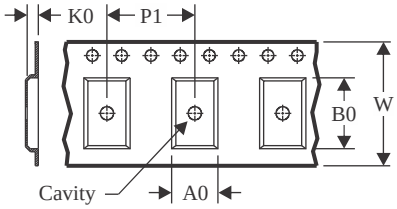
Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

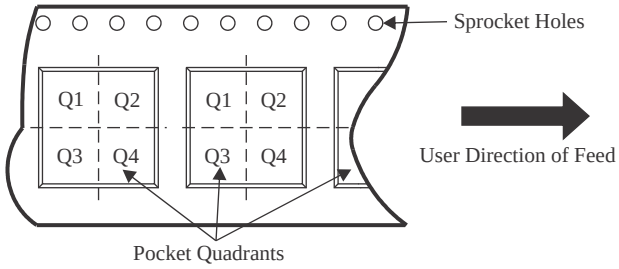


TAPE DIMENSIONS



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

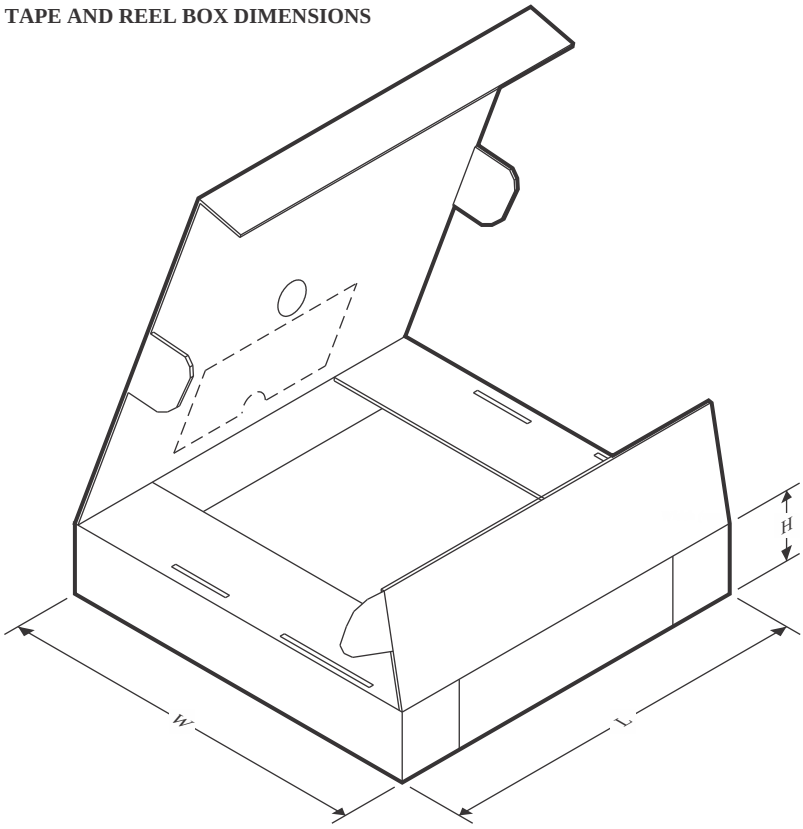
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
TXS0202YZPR	DSBGA	YZP	8	3000	180.0	8.4	1.02	2.02	0.63	4.0	8.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

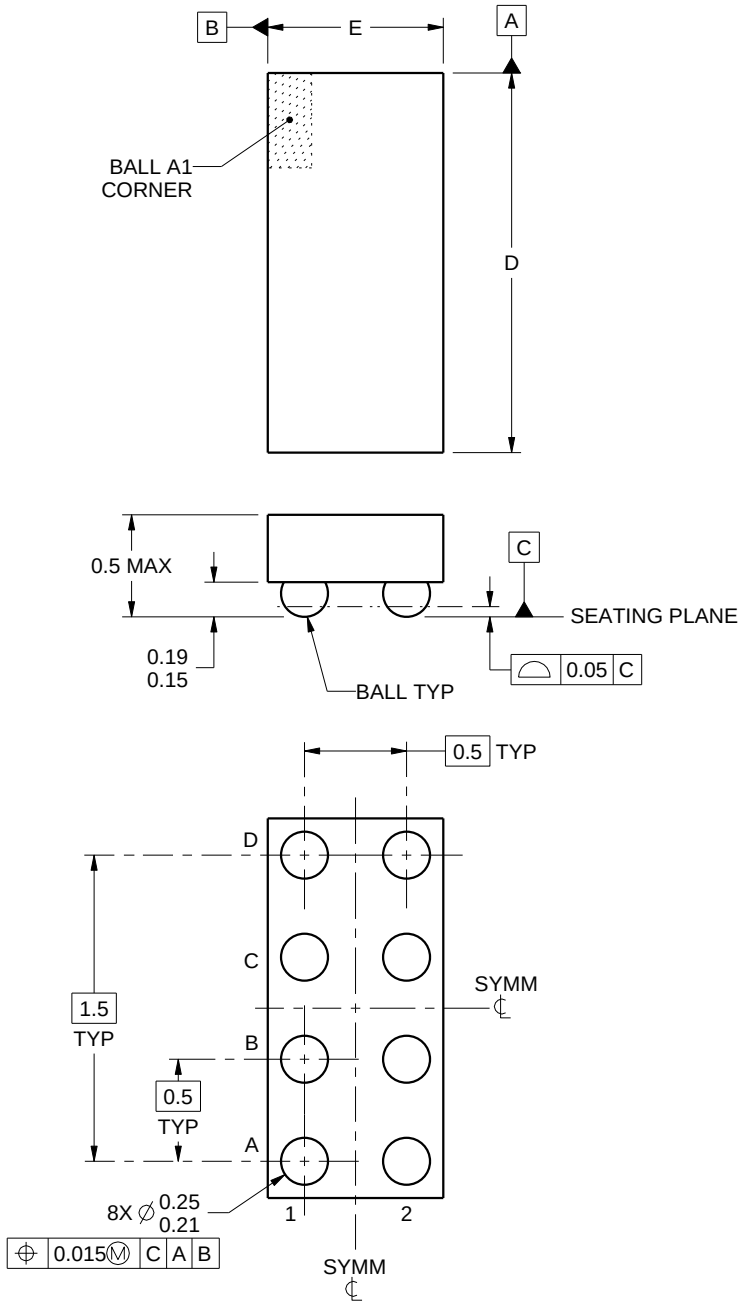
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TXS0202YZPR	DSBGA	YZP	8	3000	182.0	182.0	20.0

PACKAGE OUTLINE

YZP0008

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY



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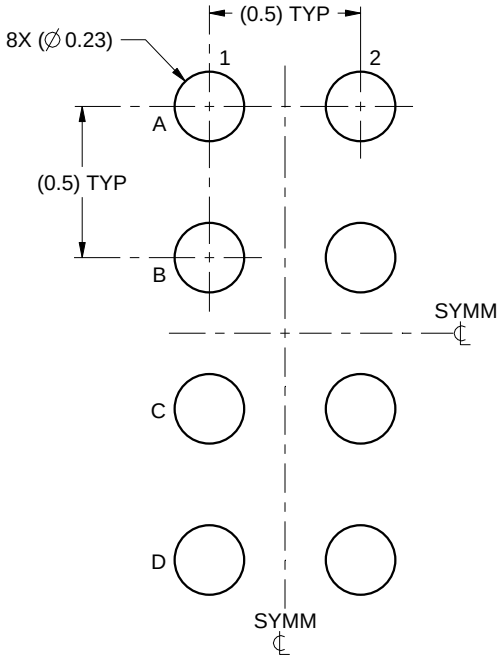
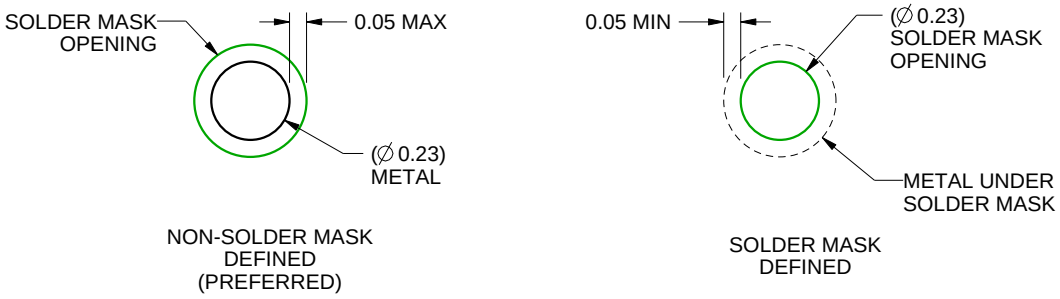
NOTES:

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.



LAND PATTERN EXAMPLE
SCALE:40X



SOLDER MASK DETAILS
NOT TO SCALE

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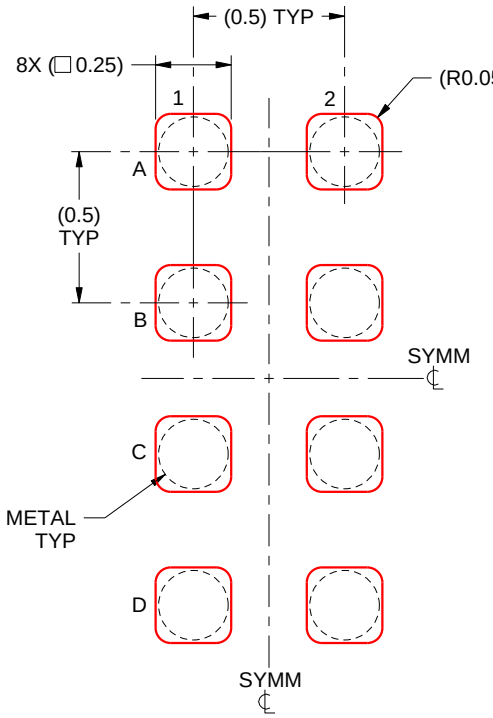
NOTES: (continued)

3. Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints. For more information, see Texas Instruments literature number SNVA009 (www.ti.com/lit/snva009).



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

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NOTES: (continued)

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

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最后更新日期：2025 年 10 月