

5 通道节省空间静电放电 (ESD) 保护器件

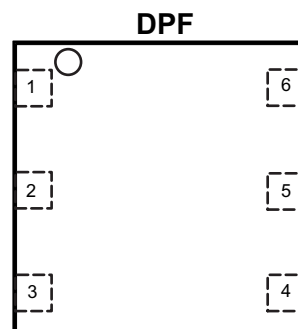
查询样品: **TPD5E003**

特性

- 为低压输入输出 (IO) 接口提供系统级的 ESD 保护
- **IEC 61000-4-2 级别 4**
 - **±15kV** (接触放电)
 - **±15kV** (空气间隙放电)
- 典型 IO 电容 **7pF** ($V_{IO}=2.5V$)
- 直流 (DC) 击穿电压 **6V** (最小值)
- 低泄漏电流 **100nA** (最大值)
- 低 ESD 钳位电压
- 工业温度范围: **-40°C 至 125°C**
- **IEC 61000-4-5** (浪涌): **40W** (8/20µs 脉冲)
- 小型、易于走线的 **DPF** 封装

应用范围

- **SIM** 卡
- 侧键
- 音频接口
- 存储卡



1 mm x 1 mm x 0.4mm
(0.35-mm pitch)

说明

TPD5E003 是一款 5 通道 ESD 保护器件。它提供 ±15KV IEC 接触和 ±15KV 空气间隙 ESD 保护。它特有 5 个完全一样的 ESD 钳位二极管，这些二极管可被用于 5 个单向 (0V 至 5V) I/O 线路或 4 个双向 (-5V 至 5V) I/O 线路。较低的 IO 电容适合于广泛的应用。典型应用领域包括音频线路 (麦克风、耳机和免提电话)，SD 接口和袖珍键盘以及其他按钮。

订购信息

T _A	封装 ⁽¹⁾⁽²⁾		可订购部件号	正面标记
-40°C 至 125°C	5000	卷带	TPD5E003DPFR	9Q

(1) 封装图样、热数据和符号可从网站www.ti.com/packaging中获取。

(2) 要获得最新的封装和订购信息，请见本文档末尾的封装选项附录，或者浏览 TI 网站www.ti.com。



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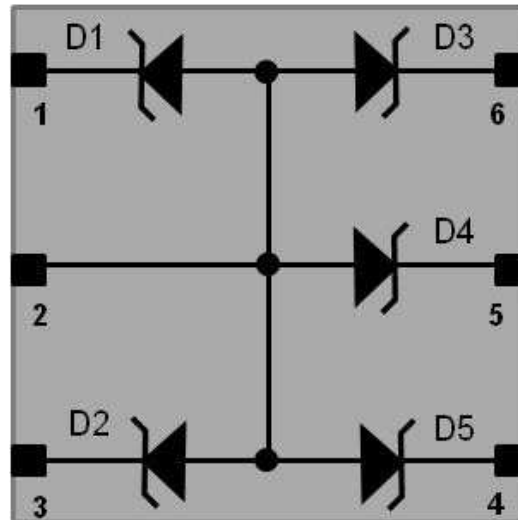
PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of the Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

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English Data Sheet: [SLVSBQ6](#)



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.

APPLICATION/FUNCTIONAL BLOCK DIAGRAM



PIN FUNCTIONS

PIN NAME	DPF	PIN TYPE	DESCRIPTION
I/O	1, 3, 4, 5, 6	I/O	ESD Protected channel
GND	2	GND	Ground

ABSOLUTE MAXIMUM RATINGS

	MIN	MAX	UNIT
IO voltage tolerance		5.5	V
Operating temperature range	-40	125	°C
Storage temperature	-55	150	°C
IEC 61000-4-2 contact ESD		±15	kV
IEC 61000-4-2 air-gap ESD		±15	kV
I_{PP} , peak pulse current ($t_p = 8/20\mu s$)		3	A
P_{PP} , peak pulse power ($t_p = 8/20\mu s$)		40	W

ELECTRICAL CHARACTERISTICS

PARAMETER	TEST CONDITION	MIN	TYP	MAX	UNIT
V_{RWM} Reverse stand-off voltage	$I_l = 0.1 \mu A$			5.0	V
I_{LEAK} Leakage Current	Pin 1, 3, 4, 5, or 6 = 5V, Pin 2 = 0V		10	100	nA
V_{Clamp} Clamp voltage with ESD strike	$I_{PP} = 6A$, TLP, Dx pin to GND, $T_A = 25^\circ C$		13	15.6	V
	$I_{PP} = 10A$, TLP, Dx pin to GND, $T_A = 25^\circ C$		16.3	19.5	V
R_{DYN} Dynamic resistance	$I_{TLP} = 6A$ to 10 A, Dx pin to GND, $T_A = 25^\circ C$		0.8	1	Ω
	$I_{TLP} = 6A$ to 10 A, GND to Dx pin, $T_A = 25^\circ C$		0.3	0.4	Ω
C_{IO} IO capacitance	$V_{IO} = 2.5V$, 1 MHz, $T_A = 25^\circ C$	5.6	7	8.4	pF
	$V_{IO} = 0V$, 1 MHz, $T_A = 25^\circ C$	8	10	12	pF
V_{BR} Break-down voltage	$I_{IO} = 1 mA$	6.0	7	8.5	V

APPLICATION INFORMATION

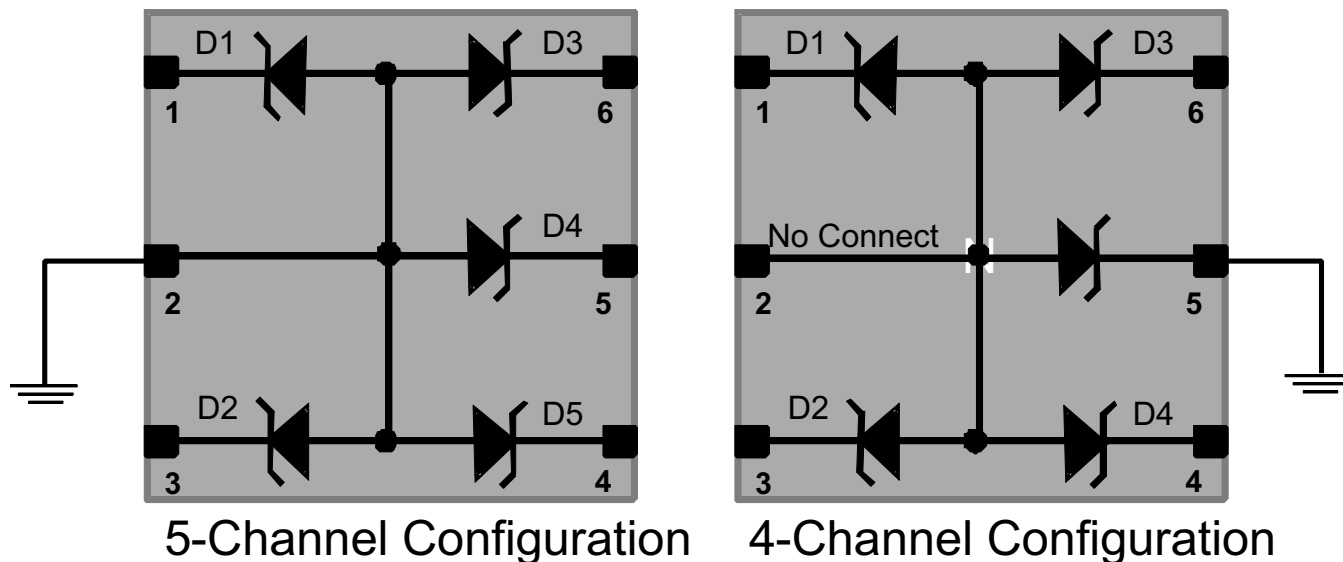


Figure 1. Application Diagram

The TPD5E003 offers 5 identical unidirectional ESD protection channels. To use all 5 channels, the recommended configuration is shown in [Figure 1](#). The TPD5E003 can also be used as 4 identical bidirectional ESD protection channels. To do so, pin 5 would be connected to ground, with pin 1, 3, 4, and 6 connected to the I/O to be protected. In the bidirectional configuration, IO capacitance is reduced by half and the breakdown voltage is doubled.

TYPICAL CHARACTERISTICS

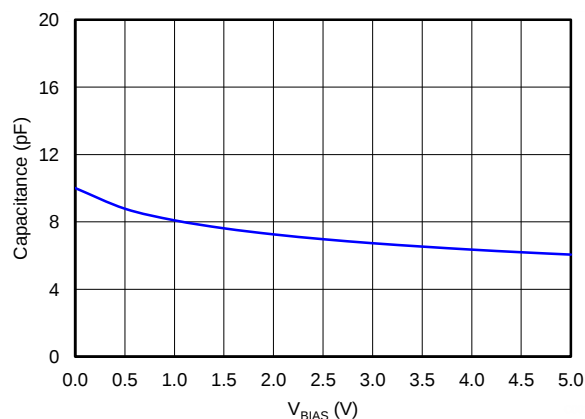


Figure 2. Capacitance vs DC Bias Voltage

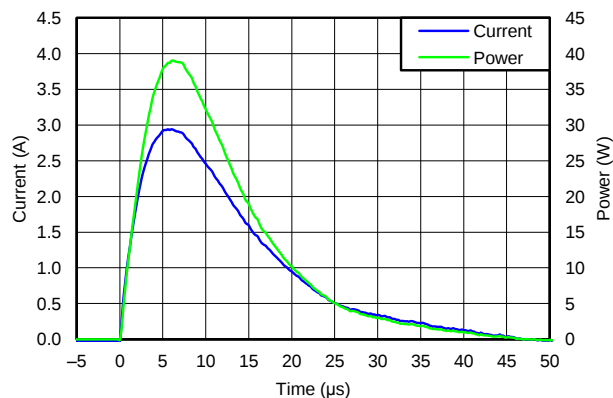


Figure 3. Surge Plot ($t_p = 8/20\mu s$), Pin Dx to GND

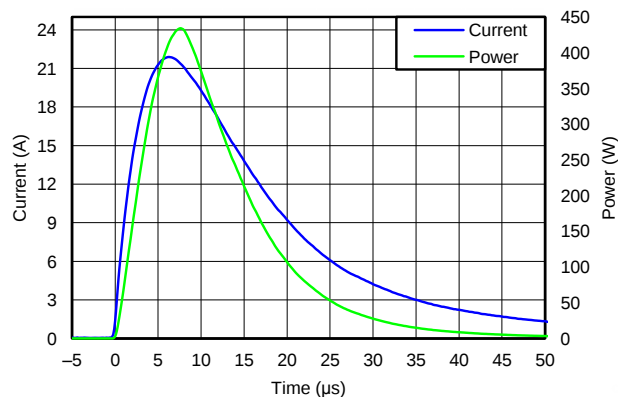


Figure 4. Surge Plot ($t_p = 8/20\mu s$), Pin GND to Dx

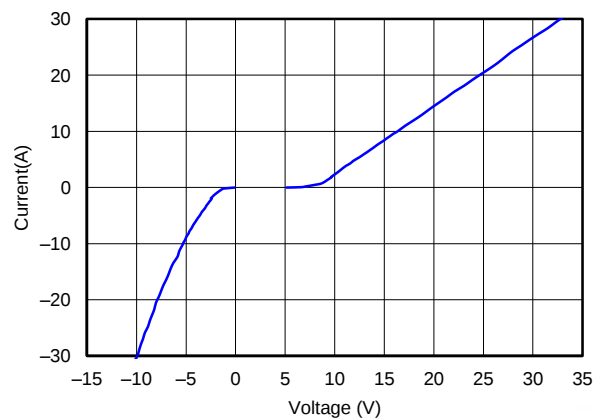


Figure 5. 30 Amps TLP Plot

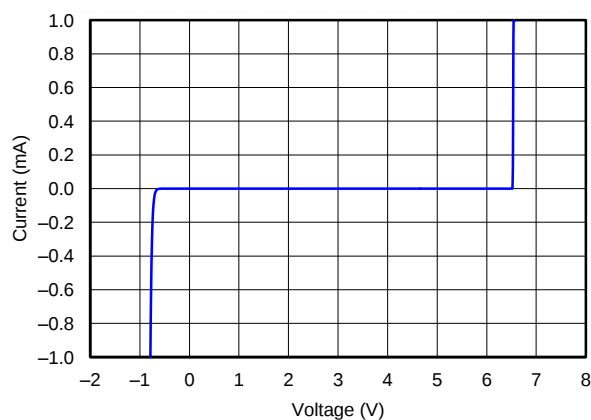


Figure 6. DC SWEEP V-I Curve

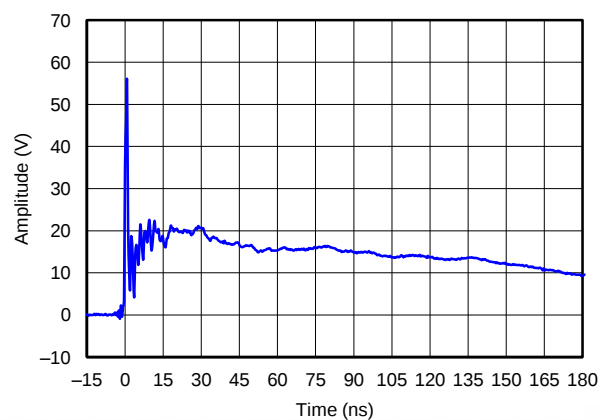


Figure 7. IEC 61000-4-2 Clamping Voltage, +8kV Contact

TYPICAL CHARACTERISTICS (continued)

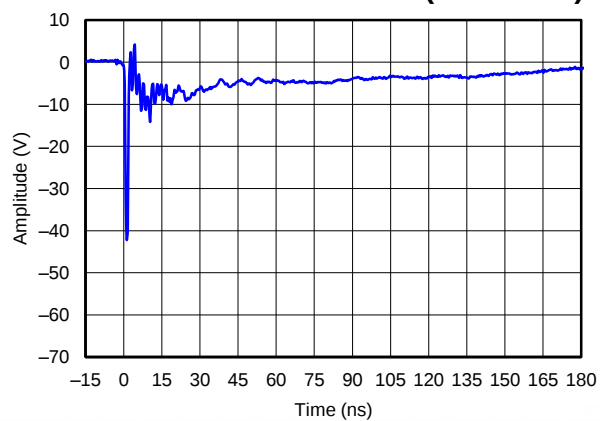


Figure 8. IEC 61000-4-2 Clamping Voltage, -8kV Contact

REVISION HISTORY

Changes from Original (December 2012) to Revision A	Page
• Added IO voltage tolerance to the ABSOLUTE MAXIMUM RATINGS table.	2
• Added MAX values to parameters in the ELECTRICAL CHARACTERISTICS table.	2

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)
TPD5E003DPFR	Active	Production	X2SON (DPF) 6	5000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	9Q
TPD5E003DPFR.A	Active	Production	X2SON (DPF) 6	5000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	9Q
TPD5E003DPFR.B	Active	Production	X2SON (DPF) 6	5000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	9Q

⁽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
TPD5E003DPFR	X2SON	DPF	6	5000	180.0	9.5	1.16	1.16	0.63	4.0	8.0	Q2

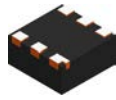
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPD5E003DPFR	X2SON	DPF	6	5000	184.0	184.0	19.0

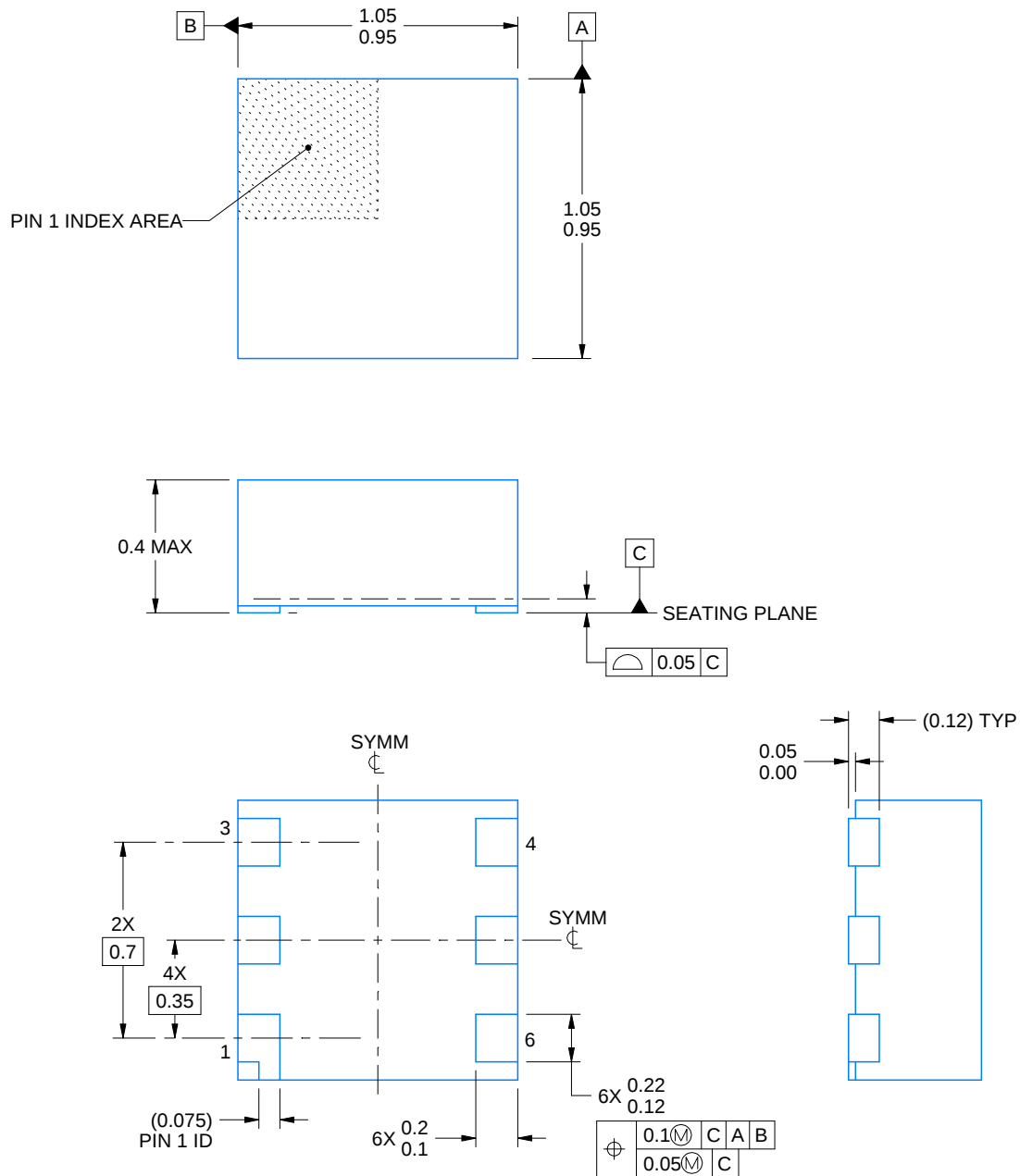
DPF0006A



PACKAGE OUTLINE

X2SON - 0.4 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



4220595/A 03/2020

NOTES:

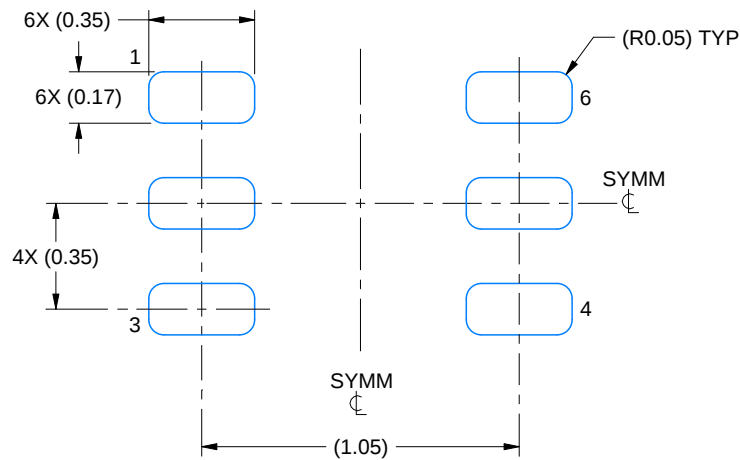
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Reference JEDEC registration MO-287, variation X2AAF.

EXAMPLE BOARD LAYOUT

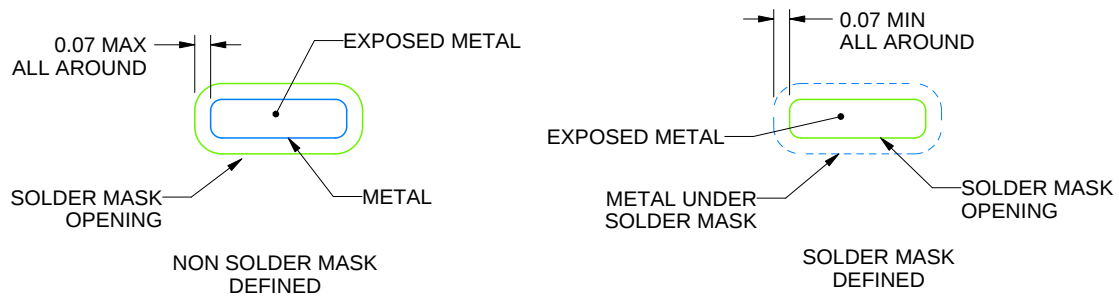
DPF0006A

X2SON - 0.4 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:40X



SOLDER MASK DETAILS

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NOTES: (continued)

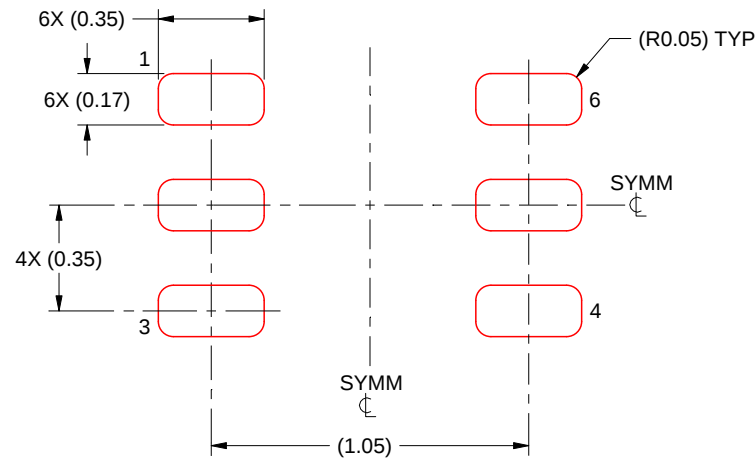
4. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/sluea271).

EXAMPLE STENCIL DESIGN

DPF0006A

X2SON - 0.4 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



SOLDER PASTE EXAMPLE
BASED ON 0.1 mm THICK STENCIL

SCALE:40X

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4. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

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