TVS2200 22V 平缓钳位浪涌保护器件

1 特性

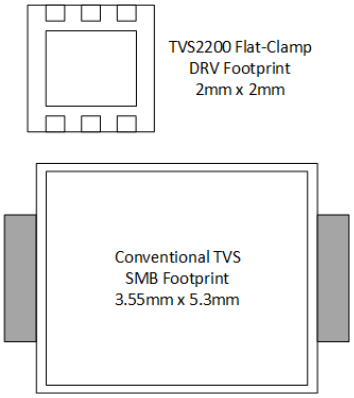
- 保护特性符合针对工业信号线路的 1kV、42Ω IEC 61000-4-5 浪涌测试要求
- 40A 8/20μs 浪涌电流下的最大钳位电压为 28.4V
- 关断电压：22 V
- 4mm^2 微型封装尺寸
- 在 125°C 时，可耐受超过 5,000 次的 35 A 8/20μs 浪涌电流的重复冲击
- 强大的浪涌保护：
  - IEC 61000-4-5 (8/20μs)：40A
  - IEC 61643-321 (10/1000μs)：5A
- 低漏电流：
  - 27°C 下为 3.5nA（典型值）
  - 85°C 下为 25nA（典型值）
- 低电容：105pF
- 集成 4 级 IEC 61000-4-2 ESD 保护

2 应用

- 工业传感器 I/O
- 医疗设备
- USB Type-C™ V_{bus}
- PLC I/O 模块
- 电器

3 说明

TVS2200 可将高达 40A 的 IEC 61000-4-5 故障电流进行可靠分流，以保护系统免受高功率瞬态冲击或雷击。该器件为满足常见的工业信号线路 EMC 要求提供了解决方案，可通过 42Ω 阻抗进行耦合的方式承受高达 ±1kV 的 IEC 61000-4-5 开路电压。



封装比较

TVS2200 使用独特的反馈机制确保在故障期间发挥精确的平缓钳位能力，从而使系统接触电压低于 30V。精确的电压调节允许设计人员放心地选择具有较低电压容差的系统组件，从而能够在不影响可靠性的情况下降低系统成本和复杂度。

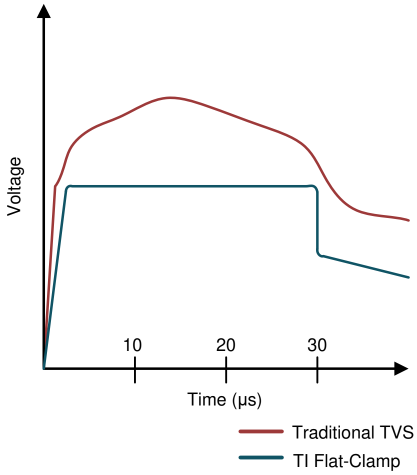
此外，TVS2200 采用小型 2mm × 2mm SON 封装，专为空间受限的应用而设计，与业界通用 SMA 和 SMB 封装相比，其尺寸可减小 70%。极低的器件漏电流和电容可尽可能降低对受保护线路的影响。为了确保在产品的整个寿命期间提供可靠保护，TI 在高温环境下对 TVS2200 进行了 5,000 次重复浪涌冲击测试，但器件性能未发生任何变化。

TVS2200 是 TI 的平缓钳位系列浪涌器件中的一款产品。有关该系列其他器件的更多信息，请参阅*器件比较表*。

封装信息

器件型号(1)	封装(2)	封装尺寸(3)
TVS2200	DRV（SON，6）	2mm × 2mm

(1) 请参阅*器件比较表*。
(2) 如需了解所有可用封装，请参阅数据表末尾的可订购产品附录。
(3) 封装尺寸（长 x 宽）为标称值，并包括引脚（如适用）。



对 8μs 至 20μs 浪涌事件的电压钳位响应

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4 Revision History

注：以前版本的页码可能与当前版本的页码不同

Changes from Revision B (July 2023) to Revision C (August 2023)	Page
• Updated the *Pin Configuration and Functions* section	3

Changes from Revision A (March 2018) to Revision B (July 2023)	Page
• 更新了整个文档中的表格、图和交叉参考的编号格式	1
• 将 TVS2200DRCR 的湿敏等级从 2 更改为 1	1
• 更新了*封装信息* 表	1

Changes from Revision * (December 2017) to Revision A (March 2018)	Page
• 将产品状态从“预告信息”更改为“量产数据”	1
• Updated the *DRV Package, 6-Pin SON (Top View)* figure	3

5 Device Comparison Table

Device	V_{rwm}	V_{clamp} at I_{pp}	I_{pp} (8/20 µs)	V_{rwm} leakage (nA)	Package Options	Polarity
TVS0500	5	9.2	43	0.07	SON	Unidirectional
TVS1400	14	18.4	43	2	SON	Unidirectional
TVS1800	18	22.8	40	0.5	SON	Unidirectional
TVS2200	22	27.7	40	3.2	SON	Unidirectional
TVS2700	27	32.5	40	1.7	SON	Unidirectional
TVS3300	33	38	35	19	WCSP, SON	Unidirectional

6 Pin Configuration and Functions

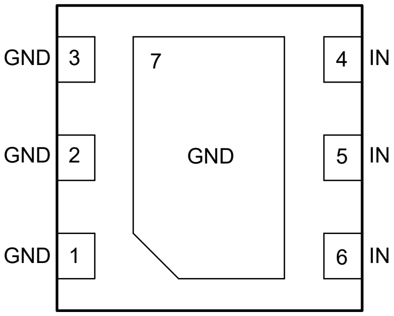


图 6-1. DRV Package, 6-Pin SON (Bottom View)

表 6-1. Pin Functions

PIN		TYPE[1]	DESCRIPTION
NAME	NO.		
GND	1	G	Ground
	2		
	3		
IN	4	I	ESD and surge protected channel
	5		
	6		
Exposed thermal pad		GND	Ground

(1) I = input, GND = ground

7 Specifications

7.1 Absolute Maximum Ratings

T_A = 27°C (unless otherwise noted)(1)

		MIN	MAX	UNIT
Maximum Surge	IEC 61000-4-5 Current (8/20 µs)		40	A
	IEC 61000-4-5 Power (8/20 µs)		1120	W
	IEC 61643-321 Current (10/1000 µs)		5	A
	IEC 61643-321 Power (10/1000 µs)		145	W
Maximum Forward Surge	IEC 61000-4-5 Current (8/20 µs)		50	A
	IEC 61000-4-5 Power (8/20 µs)		80	W
	IEC 61643-321 Current (10/1000 µs)		23	A
	IEC 61643-321 Power (10/1000 µs)		60	W
EFT	IEC 61000-4-4 EFT Protection		80	A
I_{BR}	DC Breakdown current		18	mA
I_F	DC Forward Current		500	mA
T_A	Ambient Operating Temperature	-40	125	°C
T_{stg}	Storage Temperature	-65	150	°C

(1) Operation outside the *Absolute Maximum Rating* may cause permanent device damage. *Absolute Maximum Rating* do not imply functional operation of the device at these or any other conditions beyond those listed under *Recommended Operating Condition*. If used outside the *Recommended Operating Condition* but within the *Absolute Maximum Rating*, the device may not be fully functional, and this may affect device reliability, functionality, performance, and shorten the device lifetime.

7.2 ESD Ratings - JEDEC

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001, all pins(1)	±2000	V
		Charged device model (CDM), per JEDEC specification JESD22-C101, all pins(2)	±500	

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

7.3 ESD Ratings - IEC

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	IEC 61000-4-2 contact discharge	±17	kV
		IEC 61000-4-2 air-gap discharge	±30	

7.4 Recommended Operating Conditions

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

PARAMETER		MIN	NOM	MAX	UNIT
V_{RWM}	Reverse Stand-off Voltage			22	V

7.5 Thermal Information

THERMAL METRIC[1]		TVS2200 DRV (SON) 6 PINS	UNIT
R_{qJA}	Junction-to-ambient thermal resistance	70.4	°C/W
$R_{qJC(top)}$	Junction-to-case (top) thermal resistance	73.7	°C/W
R_{qJB}	Junction-to-board thermal resistance	40	°C/W
Y_{JT}	Junction-to-top characterization parameter	2.2	°C/W
Y_{JB}	Junction-to-board characterization parameter	40.3	°C/W
$R_{qJC(bot)}$	Junction-to-case (bottom) thermal resistance	11	°C/W

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

7.6 Electrical Characteristics

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

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{RWM}	Reverse Stand-off Voltage		-0.5		22	V
I_{LEAK}	Leakage Current	Measured at $V_{IN} = V_{RWM}$ T_A = 27°C		3.5	62	nA
		Measured at $V_{IN} = V_{RWM}$ T_A = 85°C		25	400	nA
		Measured at $V_{IN} = V_{RWM}$ T_A = 105°C		80	1300	nA
V_F	Forward Voltage	I_{IN} = 1 mA from GND to IO	0.25	0.5	0.65	V
V_{BR}	Break-down Voltage	I_{IN} = 1 mA from IO to GND	24.6	25.9	27.6	V
V_{FCLAMP}	Forward Clamp Voltage	40 A IEC 61000-4-5 Surge (8/20 µs) from GND to IO, 27°C	1	2	5	V
V_{CLAMP}	Clamp Voltage	24 A IEC 61000-4-5 Surge (8/20 µs) from IO to GND, V_{IN} = 0 V before surge, 27°C		27.2	27.7	V
		40 A IEC 61000-4-5 Surge (8/20 µs) from IO to GND, V_{IN} = 0 V before surge, 27°C		27.6	28	V
		35 A IEC 61000-4-5 Surge (8/20 µs) from IO to GND, $V_{IN} = V_{RWM}$ before surge, T_A = 125°C		27.8	28.35	V
R_{DYN}	8/20 µs surge dynamic resistance	Calculated from V_{CLAMP} at .5*I_{pp} and I_{pp} surge current levels, 27°C		30		mΩ
C_{IN}	Input pin capacitance	$V_{IN} = V_{RWM}$, f = 1 MHz, 30 mV_{pp}, IO to GND		105		pF
SR	Maximum Slew Rate	0-V_{RWM} rising edge, sweep rise time and measure slew rate when I_{PK} = 1 mA, 27°C		2.5		V/µs
		0-V_{RWM} rising edge, sweep rise time and measure slew rate when I_{PK} = 1 mA, 105°C		0.7		V/µs

7.7 Typical Characteristics

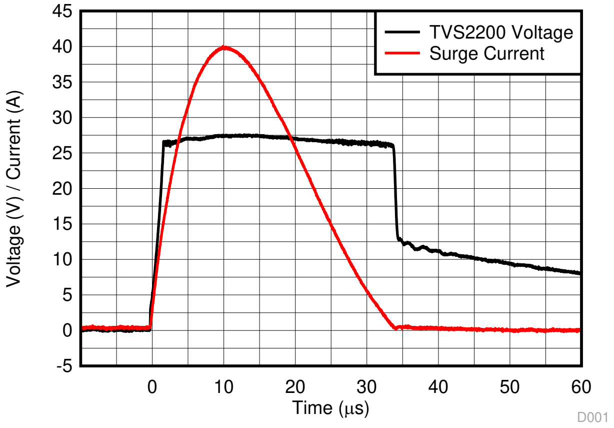


图 7-1. Surge Response at 40 A

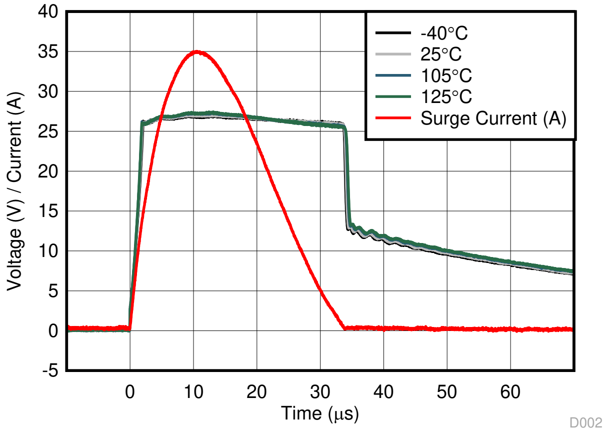
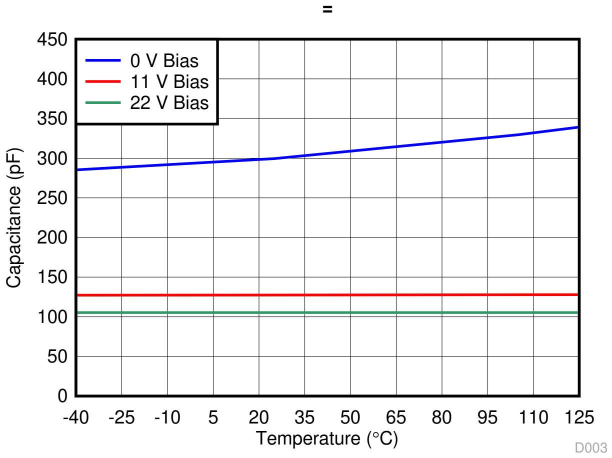


图 7-2. Surge Response at 35 A Across Temperature



f = 1 MHz, 30 mVpp, IO to GND

图 7-3. Capacitance vs Temperature Across Bias

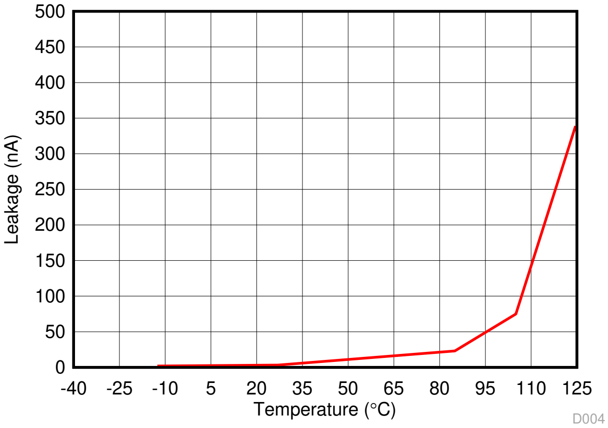


图 7-4. Leakage Current vs Temperature at 22 V

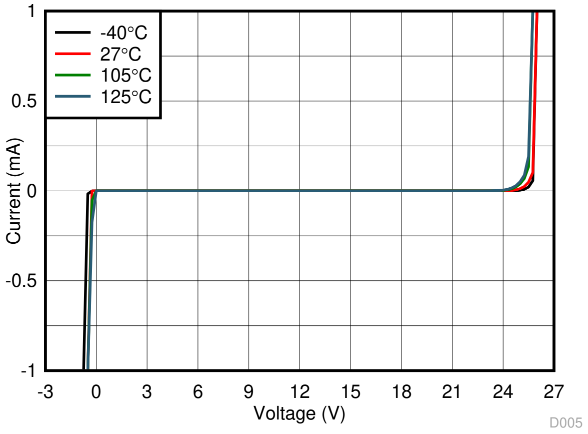


图 7-5. IV Across Temperature

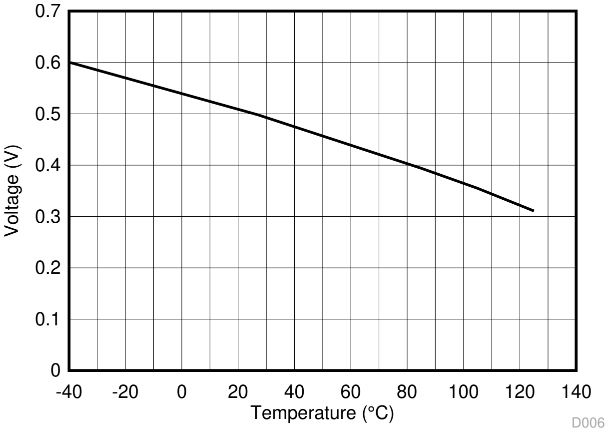


图 7-6. Forward Voltage vs Temperature Across Current

7.7 Typical Characteristics (continued)

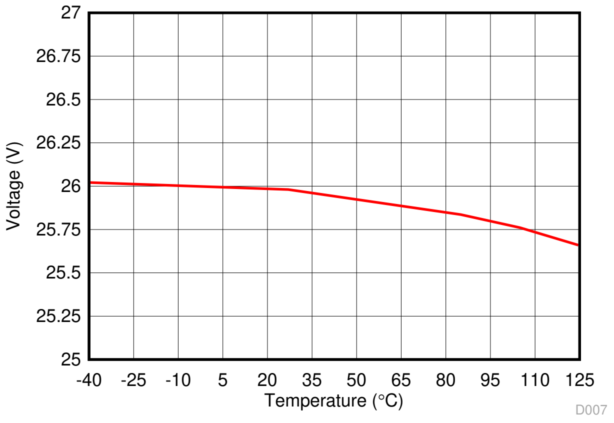


图 7-7. Breakdown Voltage at 1 mA vs Temperature

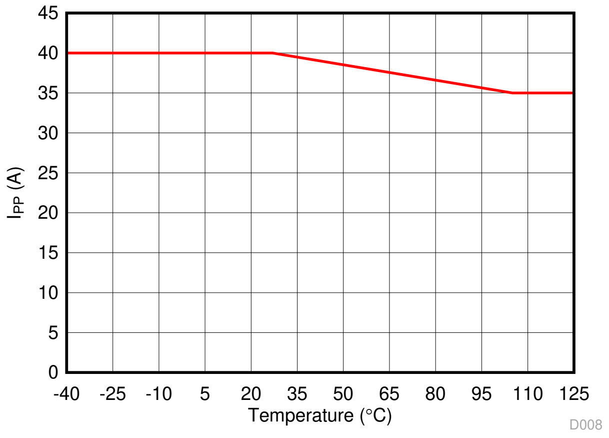


图 7-8. Maximum Surge Current (8/20 µs) vs Temperature

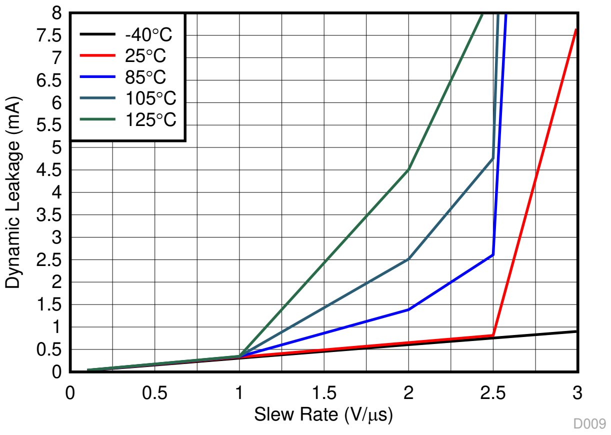


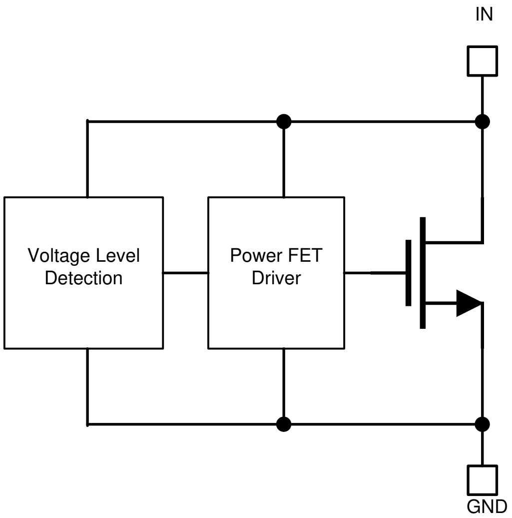
图 7-9. Maximum Leakage vs Signal Slew Rate Across Temperature

8 Detailed Description

8.1 Overview

The TVS2200 is a precision clamp with a low, flat clamping voltage during transient overvoltage events like surge and protecting the system with zero voltage overshoot. For a detailed overview of the Flat-Clamp family of devices, please reference TI's *Flat-Clamp surge protection technology for efficient system protection* white paper. This document explains in detail the functional operation of the devices and how they impact and improve system design.

8.2 Functional Block Diagram



8.3 Feature Description

The TVS2200 is a precision clamp that handles 40 A of IEC 61000-4-5 8/20 µs surge pulse. The flat clamping feature helps keep the clamping voltage very low to keep the downstream circuits from being stressed. The flat clamping feature can also help end-equipment designers save cost by opening up the possibility to use lower-cost lower voltage tolerant downstream ICs. The TVS2200 has minimal leakage under the standoff voltage of 22 V, making it a good candidate for applications where low leakage and power dissipation is a necessity. IEC 61000-4-2 and IEC 61000-4-4 ratings make it a robust protection solution for ESD and EFT events. Wide ambient temperature range of –40°C to +125°C makes it a good candidate for most applications. Compact packages enable it to be used in small devices and save board area.

8.4 Reliability Testing

For device reliability, the TVS2200 is characterized against 5000 repetitive pulses of 35 A IEC 61000-4-5 8/20 µs surge pulses at 125°C. The test is performed with less than 10 seconds between each pulse at high temperature to simulate worst case scenarios for fault regulation. After each surge pulse, the TVS2200 clamping voltage, breakdown voltage, and leakage are recorded so that there is no variation or performance degradation. By design, the robust, reliable, high temperature protection of the TVS2200 enables fault protection in applications that must withstand years of continuous operation with no performance change.

8.5 Device Functional Modes

8.5.1 Protection Specifications

The TVS2200 is specified according to both the IEC 61000-4-5 and IEC 61643-321 standards. This enables usage in systems regardless of which standard is required in relevant product standards or best matches measured fault conditions. The IEC 61000-4-5 standard requires protection against a pulse with a rise time of 8 μs and a half length of 20 μs while the IEC 61643-321 standard requires protection against a much longer pulse with a rise time of 10 μs and a half length of 1000 μs.

The positive and negative surges are imposed to the TVS2200 by a combinational waveform generator (CWG) with a 2-Ω coupling resistor at different peak voltage levels. For powered on transient tests that need power supply bias, inductance's are usually used to decouple the transient stress and protect the power supply. By design, the TVS2200 is post tested so that there is no shift in device breakdown or leakage at V_{rwm}.

In addition, the TVS2200 has been tested according to IEC 61000-4-5 to pass a ±1 kV surge test through a 42-Ω coupling resistor and a 0.5 μF capacitor. This test is a common test requirement for industrial signal I/O lines and the TVS2200 will serve as a good protection solution for applications with that requirement.

The TVS2200 also integrates IEC 61000-4-2 Level 4 ESD Protection and 80 A of IEC 61000-4-4 EFT Protection. These combine so that the device can be protected against all transient conditions regardless of length or type.

For more information on TI's test methods for Surge, ESD, and EFT testing, reference *TI's IEC 61000-4-x Testing Application Note*.

8.5.2 Minimal Derating

Unlike traditional diodes the TVS2200 has very little derating of maximum power dissipation and allows for robust performance up to 125°C shown in 图 7-8. Traditional TVS diodes lose up to 50% of their current carrying capability when at high temperatures, so a surge pulse above 85°C ambient can cause failures that are not seen at room temperature. The TVS2200 prevents this and allows for the same level of protection regardless of temperature.

8.5.3 Transient Performance

During large transient swings, the TVS2200 will begin clamping the input signal to protect downstream conditions. While this prevents damage during fault conditions, it can cause leakage when the intended input signal has a fast slew rate. In order to keep power dissipation low and remove the chance of signal distortion, it is recommended to keep the slew rate of any input signal on the TVS2200 below 2.5 V/μs at room temperature and below 0.7 V/μs at 125°C shown in 图 7-9. Faster slew rates will cause the device to clamp the input signal and draw current through the device for a few microseconds, increasing the rise time of the signal. This will not cause any harm to the system or to the device, however if the fast input voltage swings occur regularly it can cause device overheating.

9 Application and Implementation

备注

以下应用部分中的信息不属于 TI 器件规格的范围，TI 不担保其准确性和完整性。TI 的客 户应负责确定器件是否适用于其应用。客户应验证并测试其设计，以确保系统功能。

9.1 Application Information

The TVS2200 can be used to protect any power, analog, or digital signal from transient fault conditions caused by the environment or other electrical components.

9.2 Typical Application

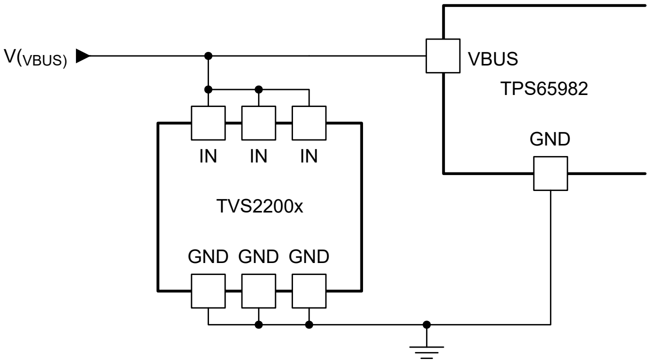


图 9-1. TVS2200 Application

9.2.1 Design Requirements

A typical operation for the TVS2200 would be protecting a USB Type-C V_{bus} input, with a nominal input voltage of 20 V and a required withstand of 22 V, shown in 图 9-1. In this example, a TVS2200 is protecting the input to a TPS65982 Type-C Port Controller. Without any input protection, if a surge event is caused by lightning, coupling, hot-swap ringing, or any other fault condition this input voltage will rise to hundreds of volts for multiple microseconds, violating the absolute maximum input voltage and harming the device.

9.2.2 Detailed Design Procedure

If the TVS2200 is in place to protect the device, during a surge event the voltage will rise to the breakdown of the diode at 25.9 V, and then the TVS2200 will turn on, shunting the surge current to ground. With the low dynamic resistance of the TVS2200, even large amounts of surge current will have minimal impact on the clamping voltage. The dynamic resistance of the TVS2200 is around 30 mΩ, which means 40 A of surge current will cause a voltage raise of 40 A × 30 mΩ = 1.2 V. Because the device turns on at 25.9 V, this means the input will be exposed to a maximum of 25.9 V + 1.2 V = 27.1 V during surge pulses, robustly protecting the USB Type-C port. This pulse is shown in 图 9-2 and allows for robust protection of the circuit.

Finally, the small size of the device also improves fault protection by lowering the effect of fault current coupling onto neighboring traces. The small form factor of the TVS2200 allows the device to be placed extremely close to the input connector, lowering the length of the path fault current will take through the system compared to larger protection solutions.

9.2.3 Application Curves

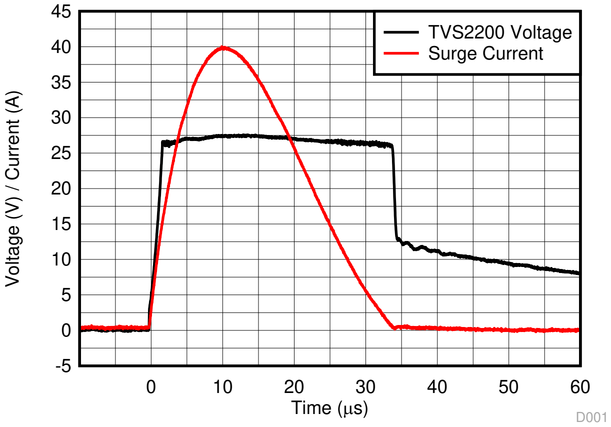


图 9-2. TVS2200 Surge Response at 40 A

9.2.4 Configuration Options

The TVS2200 can be used in either unidirectional or bidirectional configuration. The TVS2200 shows unidirectional usage to protect an input. By placing two TVS2200's in series with reverse orientation, bidirectional operation can be used which will allow a working voltage of ±22 V. TVS2200 operation in bidirectional will be similar to unidirectional operation, with a minor increase in breakdown voltage and clamping voltage. The TVS3300 bidirectional performance has been characterized in the *TVS3300 Configurations Characterization*. While the TVS2200 in bidirectional configuration has not specifically been characterized, it will have similar relative changes to the TVS3300 in bidirectional configuration.

9.3 Power Supply Recommendations

The TVS2200 is a clamping device so there is no need to power it. Take care to not violate the recommended V_{IN} voltage range (0 V to 22 V) so that the device functions properly.

9.4 Layout

9.4.1 Layout Guidelines

The optimum placement is as close to the connector as possible. EMI during an ESD event can couple from the trace being struck to other nearby unprotected traces, resulting in early system failures. The PCB designer must minimize the possibility of EMI coupling by keeping any unprotected traces away from the protected traces which are between the TVS and the connector.

Route the protected traces as straight as possible.

Eliminate any sharp corners on the protected traces between the TVS2200 and the connector by using rounded corners with the largest radii possible. Electric fields tend to build up on corners, increasing EMI coupling.

9.4.2 Layout Example

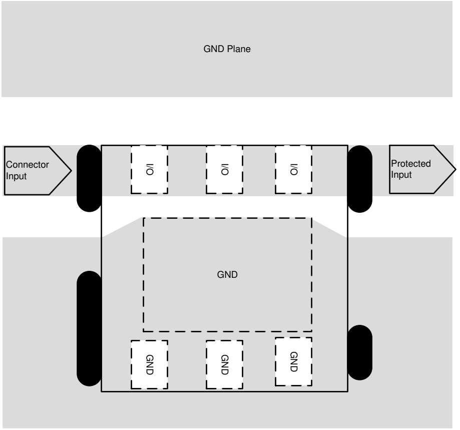


图 9-3. TVS2200 Layout

10 Device and Documentation Support

10.1 Documentation Support

10.1.1 Related Documentation

For related documentation, see the following:

- Texas Instruments, *Flat-Clamp surge protection technology for efficient system protection*
- Texas Instruments, *TI's IEC 61000-4-x Testing Application Note.*
- Texas Instruments, *TVS3300 Configurations Characterization*

10.2 接收文档更新通知

要接收文档更新通知，请导航至 ti.com 上的器件产品文件夹。点击*订阅更新* 进行注册，即可每周接收产品信息更改摘要。有关更改的详细信息，请查看任何已修订文档中包含的修订历史记录。

10.3 支持资源

TI E2E™ 支持论坛是工程师的重要参考资料，可直接从专家获得快速、经过验证的解答和设计帮助。搜索现有解答或提出自己的问题可获得所需的快速设计帮助。

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10.4 Trademarks

Type-C™ is a trademark of USB Implementers Forum, Inc..
TI E2E™ is a trademark of Texas Instruments.
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10.5 静电放电警告

静电放电 (ESD) 会损坏这个集成电路。德州仪器 (TI) 建议通过适当的预防措施处理所有集成电路。如果不遵守正确的处理和安装程序，可能会损坏集成电路。

ESD 的损坏小至导致微小的性能降级，大至整个器件故障。精密的集成电路可能更容易受到损坏，这是因为非常细微的参数更改都可能会导致器件与其发布的规格不相符。

10.6 术语表

TI 术语表	本术语表列出并解释了术语、首字母缩略词和定义。

11 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
TVS2200DRVR	ACTIVE	WSON	DRV	6	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	1HVH	Samples

[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] **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".
RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

[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.

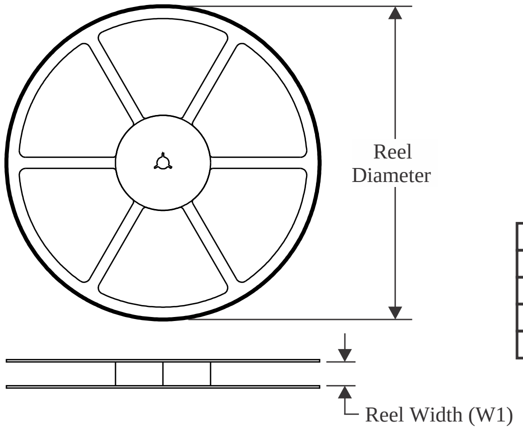
[6] Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

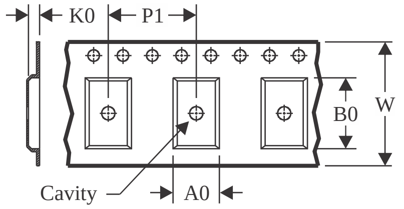
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

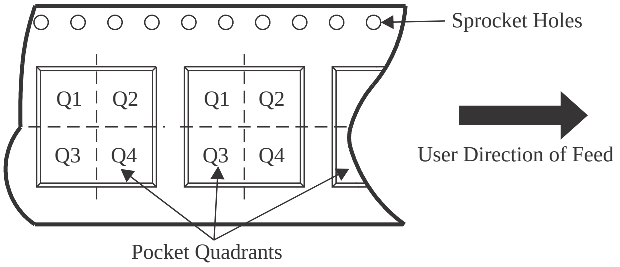


TAPE DIMENSIONS



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

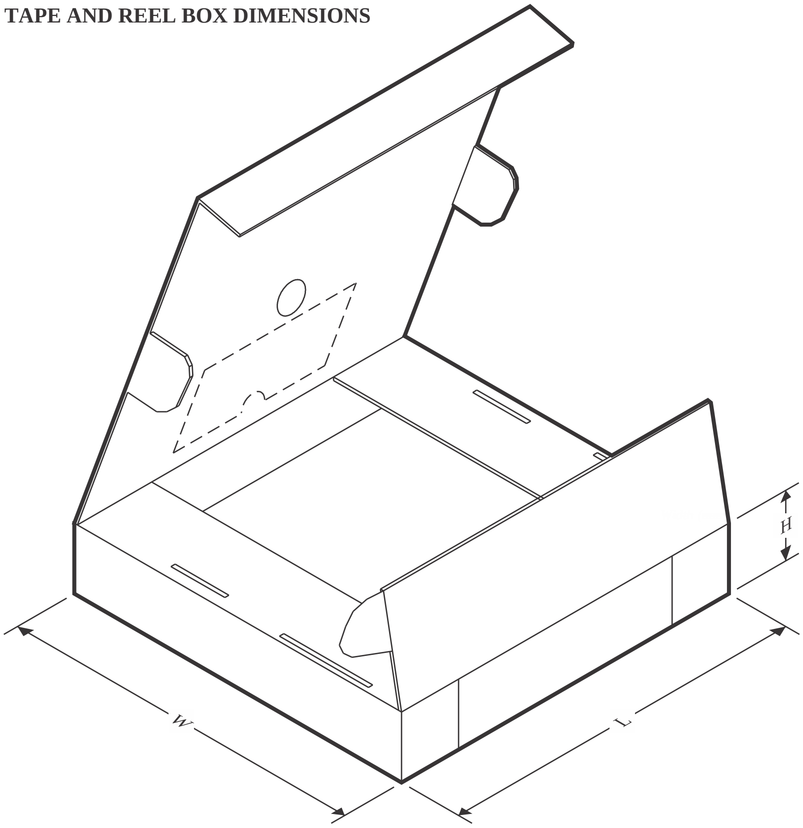
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
TVS2200DRVR	WSON	DRV	6	3000	180.0	8.4	2.3	2.3	1.15	4.0	8.0	Q2

TAPE AND REEL BOX DIMENSIONS



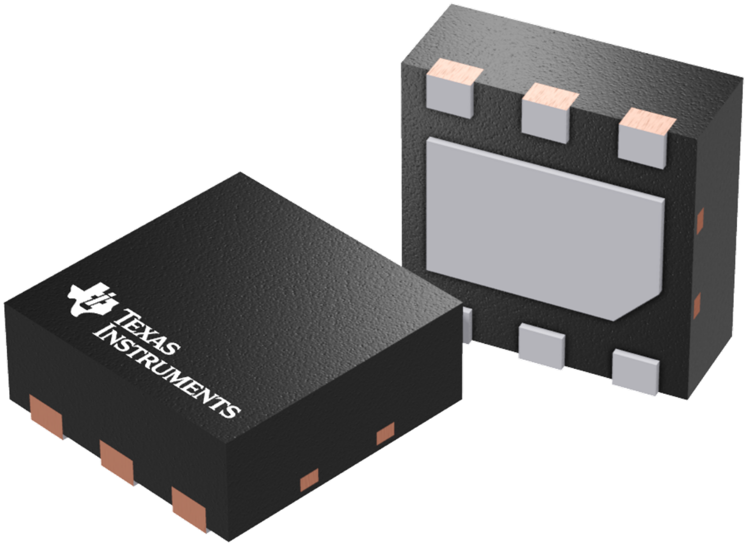
*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TVS2200DRVR	WSON	DRV	6	3000	210.0	185.0	35.0

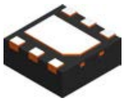
DRV 6

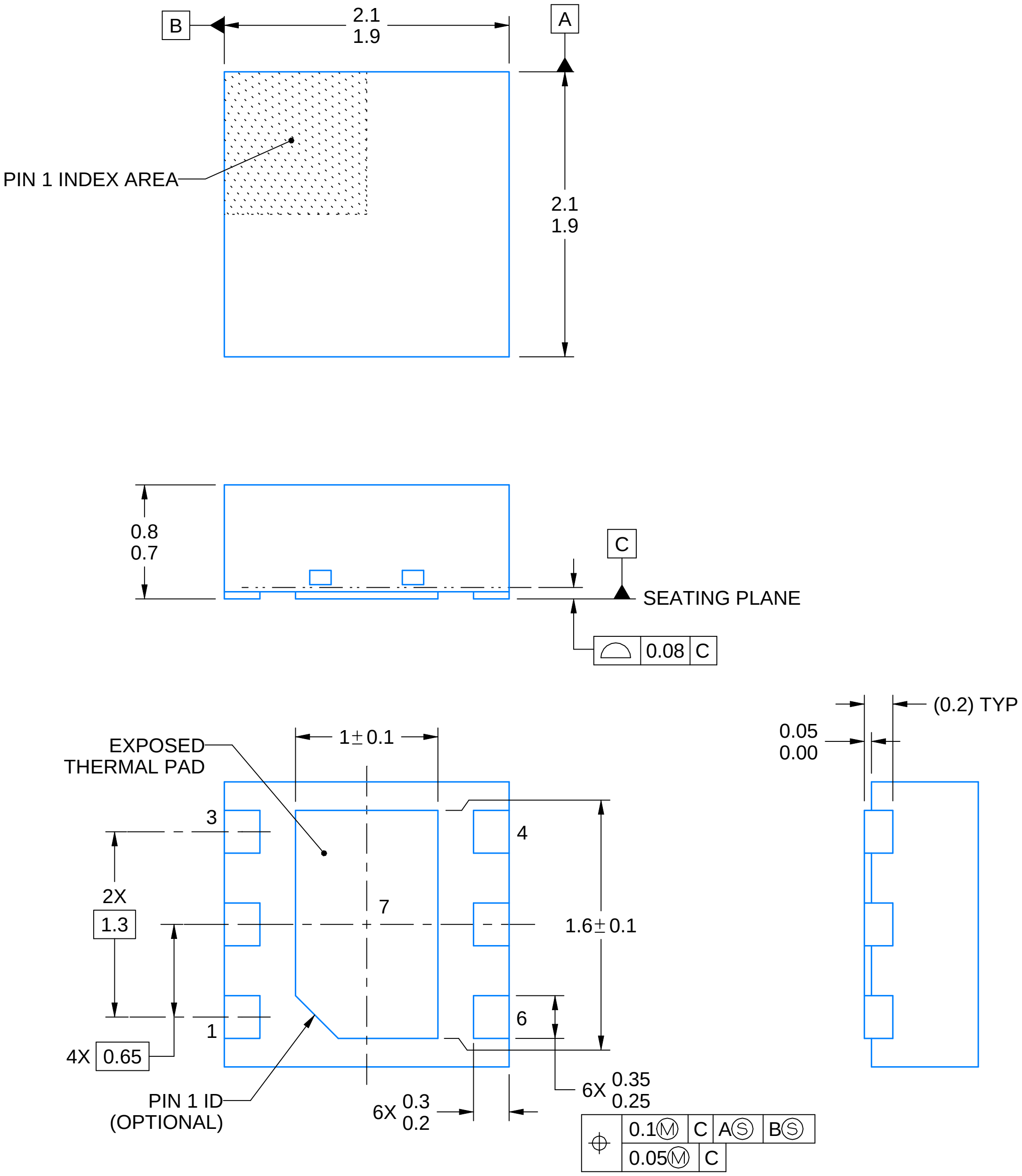
WSON - 0.8 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



Images above are just a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.





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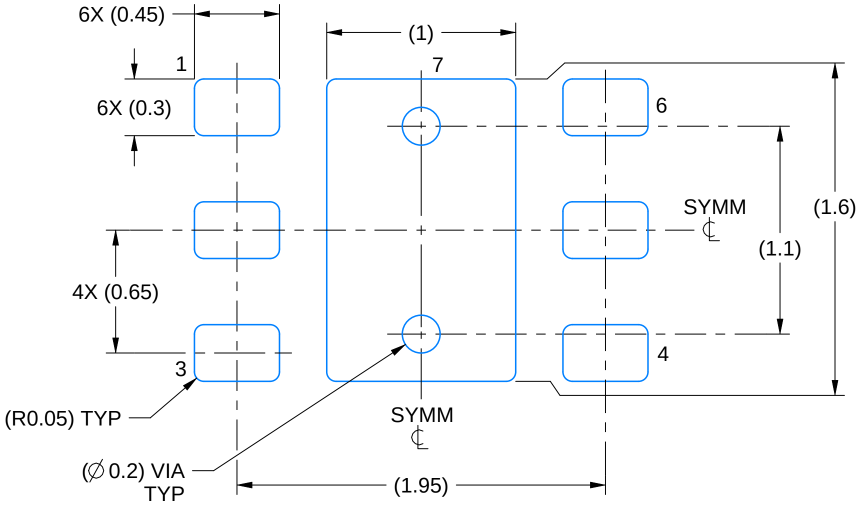
NOTES:

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.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.



LAND PATTERN EXAMPLE
SCALE:25X

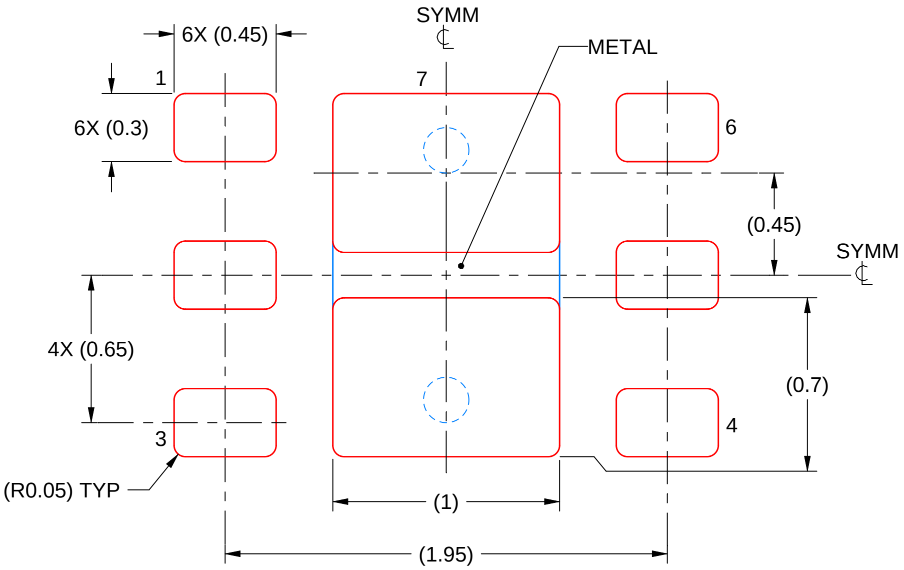
NON SOLDER MASK
DEFINED
(PREFERRED)

SOLDER MASK
DEFINED

SOLDER MASK DETAILS

NOTES: (continued)

4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slua271).
5. Vias are optional depending on application, refer to device data sheet. If some or all are implemented, recommended via locations are shown.



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL

EXPOSED PAD #7
88% PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE
SCALE:30X

NOTES: (continued)

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

重要声明和免责声明

邮寄地址：Texas Instruments, Post Office Box 655303, Dallas, Texas 75265