TVS2210 22V Flat-Clamp Surge Protection Device

1 Features

- Protection against ±1kV, 42Ω IEC 61000-4-5 surge test for industrial signal lines
- Maximum clamping voltage of 28V at 25A of 8/20µs surge current
- Robust surge protection:
  - IEC 61000-4-5 (8/20µs): 25A
- Integrated IEC 61000-4-2 ESD protection
- Tiny 1.0mm x 0.6mm footprint

2 Applications

- Mobile Phones
- Tablets
- PC & Notebooks
- USB Type-C™ V_{bus}

3 Description

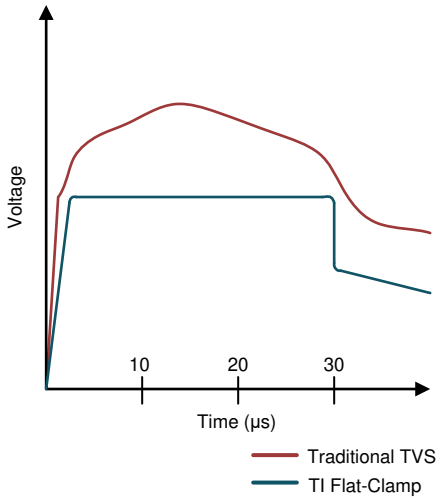
The TVS2210 robustly shunts up to 25A of IEC 61000-4-5 fault current to protect systems from high power transients or lightning strikes. The device is designed for the common industrial signal line EMC requirement to survive up to ±1kV IEC 61000-4-5 open circuit voltage coupled through a 42Ω impedance.

The TVS2210 uses a unique feedback mechanism for precise flat clamping during a fault, allowing system exposure below 30V. The tight voltage regulation allows designers to confidently select system components with a lower voltage tolerance, lowering system costs and complexity without sacrificing robustness.

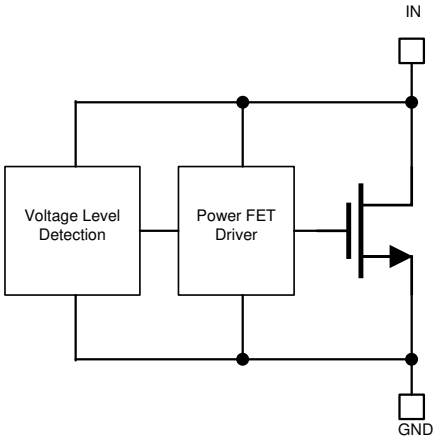
Package Information

PART NUMBER	PACKAGE (1)	PACKAGE SIZE (2)
TVS2210	YMZ (0402, 2)	1.0mm × 0.6mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.
(2) The package size (length × width) is a nominal value and includes pins, where applicable.



Voltage Clamp Response to 8µs to 20µs Surge Event



Functional Block Diagram

An IMPORTANT NOTICE at the end of this data sheet addresses availability, warranty, changes, use in safety-critical applications, intellectual property matters and other important disclaimers. PRODUCTION DATA.

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4 Pin Configuration and Functions

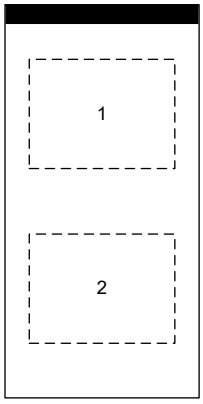

Figure 4-1. YMZ Package, 2-Pin 0402 (Bottom View)

Table 4-1. Pin Functions

PIN		TYPE	DESCRIPTION
NAME	NO.		
IN	1	IO	ESD and surge protected channel
GND	2	GND	Ground

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5 Specifications

5.1 Absolute Maximum Ratings

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

		MIN	MAX	UNIT
Maximum Surge	IEC 61000-4-5 Current (8/20µs)		25	A
	IEC 61000-4-5 Power (8/20µs)		700	W
T_A	Ambient Operating Temperature	-40	125	°C
T_{stg}	Storage Temperature	-65	150	°C

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

5.2 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 500V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250V CDM allows safe manufacturing with a standard ESD control process.

5.3 ESD Ratings - IEC

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	IEC 61000-4-2 contact discharge	±8	kV

5.4 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

5.5 Electrical Characteristics

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

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{RWM}	Reverse Stand-off Voltage				22	V
I_{LEAK}	Leakage Current	Measured at V_{IN} = V_{RWM} T_A = 25°C		6	70	nA
		Measured at V_{IN} = V_{RWM} T_A = 85°C		25	500	nA
V_{BR}	Break-down Voltage	I_{IN} = 1mA from IO to GND	24.6	25.9	27.6	V
V_F	Forward Voltage	I_{IN} = 1mA from GND to IO	0.25	0.5	0.65	V
V_{CLAMP}	Clamp Voltage	1A IEC 61000-4-5 Surge (8/20µs) from IO to GND, V_{IN} = 0V before surge, 25°C		27.2	27.7	V
V_{CLAMP}	Clamp Voltage	25A IEC 61000-4-5 Surge (8/20µs) from IO to GND, V_{IN} = 0V before surge, 25°C		27.6	28	V
R_{DYN}	8/20 µs surge dynamic resistance	Calculated from V_{CLAMP} at .5*I_{pp} and I_{pp} surge current levels, 25°C		30		mΩ
C_{IN}	Input pin capacitance	V_{IN} = V_{RWM}, f = 1MHz, IO to GND		59		pF

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5.6 Typical Characteristics

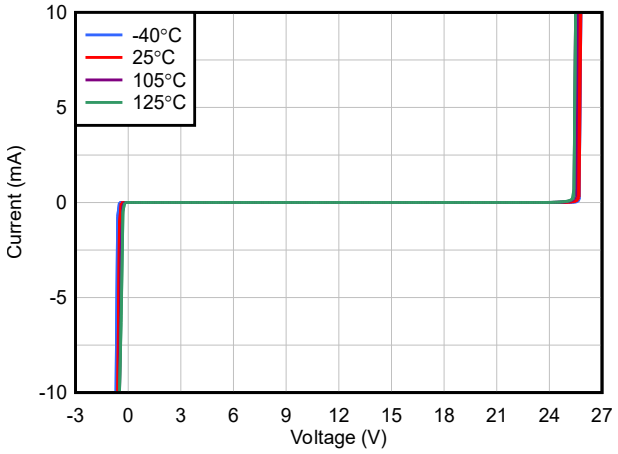

Figure 5-1. IV Across Temperature

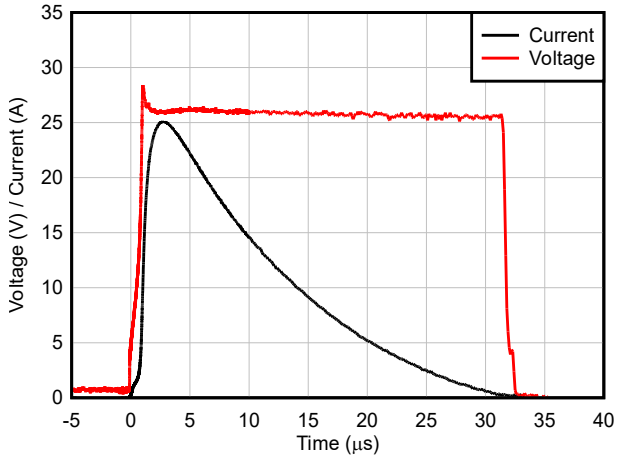

Figure 5-2. Surge Response at 25A

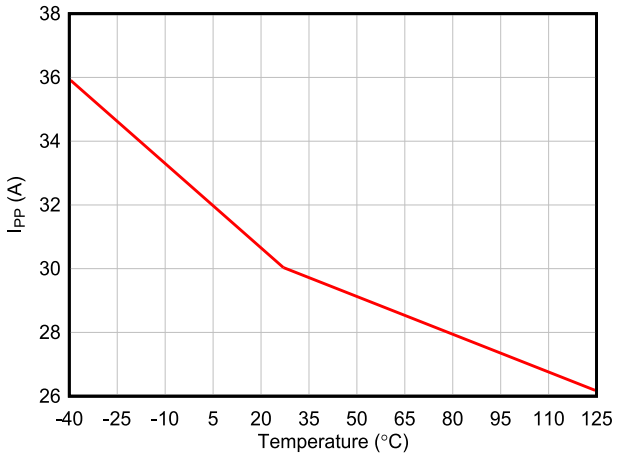

Figure 5-3. Maximum Surge Current (8/20µs) vs Temperature

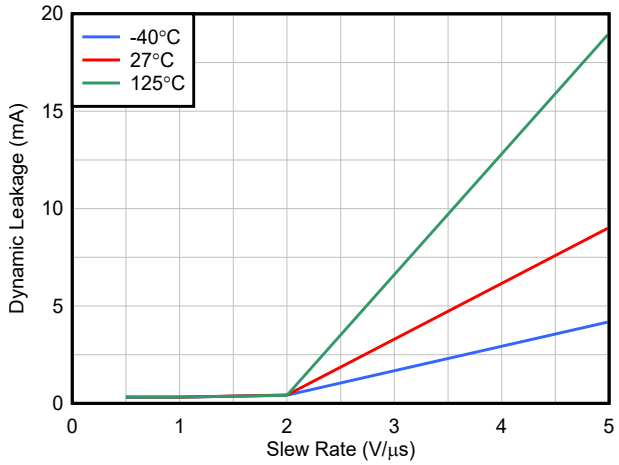

Figure 5-4. Maximum Leakage vs Signal Slew Rate Across Temperature

6 Application and Implementation

Note

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes, as well as validating and testing their design implementation to confirm system functionality.

6.1 Power Supply Recommendations

The TVS2210 is a clamping device so there is no need to power it. To ensure the device functions properly, do not violate the recommended V_{IN} voltage range (0V to 22V).

6.2 Layout

6.2.1 Layout Guidelines

The optimum placement is close to the connector. 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 straight. Eliminate any sharp corners on the protected traces between the TVS2210 and the connector by using rounded corners with the largest radii possible. Electric fields tend to build up on corners, increasing EMI coupling.

6.2.2 Layout Example

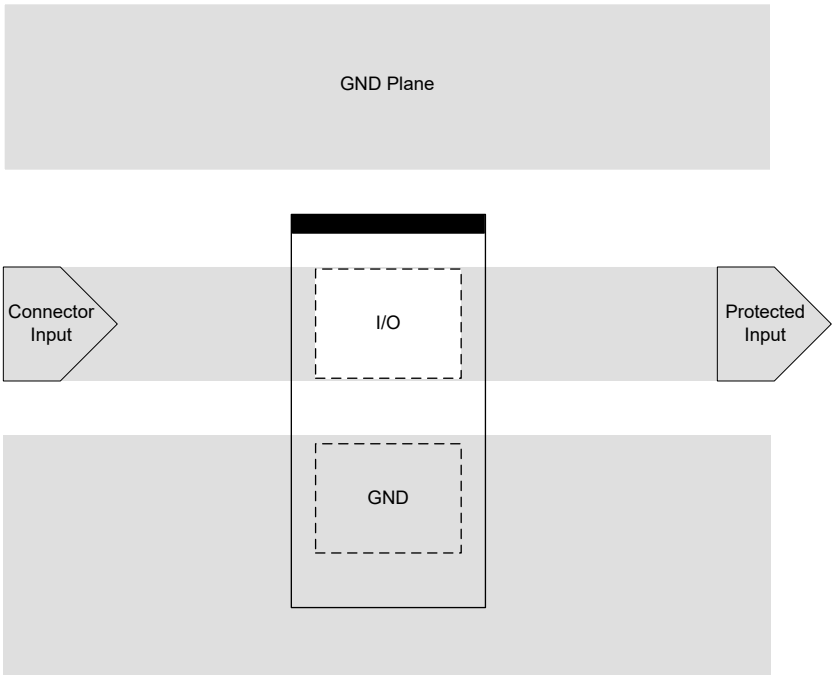

Figure 6-1. TVS2210 Layout

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7 Device and Documentation Support

7.1 Documentation Support

7.1.1 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*

7.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. Click on *Notifications* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

7.3 Support Resources

TI E2E™ support forums are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

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7.4 Trademarks

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7.5 Electrostatic Discharge Caution

This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

7.6 Glossary

TI Glossary	This glossary lists and explains terms, acronyms, and definitions.

8 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision * (December 2025) to Revision A (June 2026)	Page
• Updated *Mechanical, Packaging, and Orderable Information*	7

DATE	REVISION	NOTES
December 2025	*	Initial Release

9 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.

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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)
TVS2210YMZR	Active	Production	DSLGA (YMZ) | 2	3000 | LARGE T&R	Yes	Call TI	Level-1-260C-UNLIM	-40 to 125	TN

(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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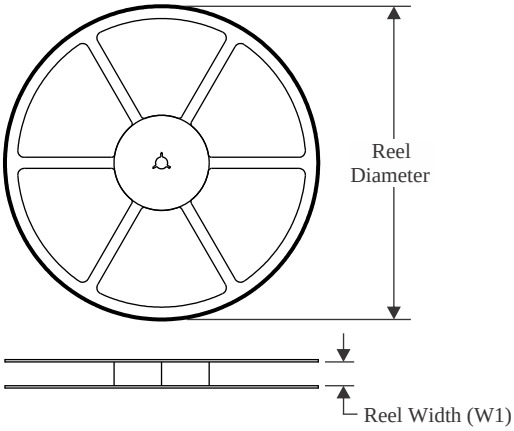
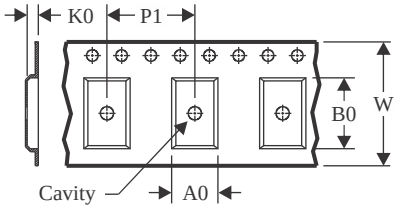
TAPE AND REEL INFORMATION

REEL DIMENSIONS

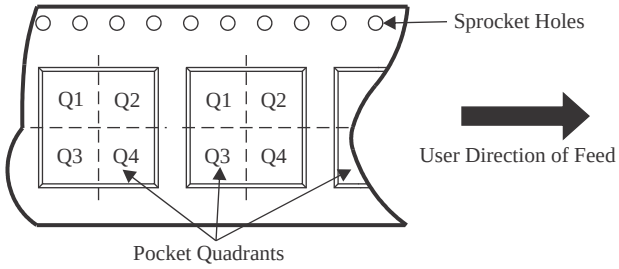


TAPE DIMENSIONS



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

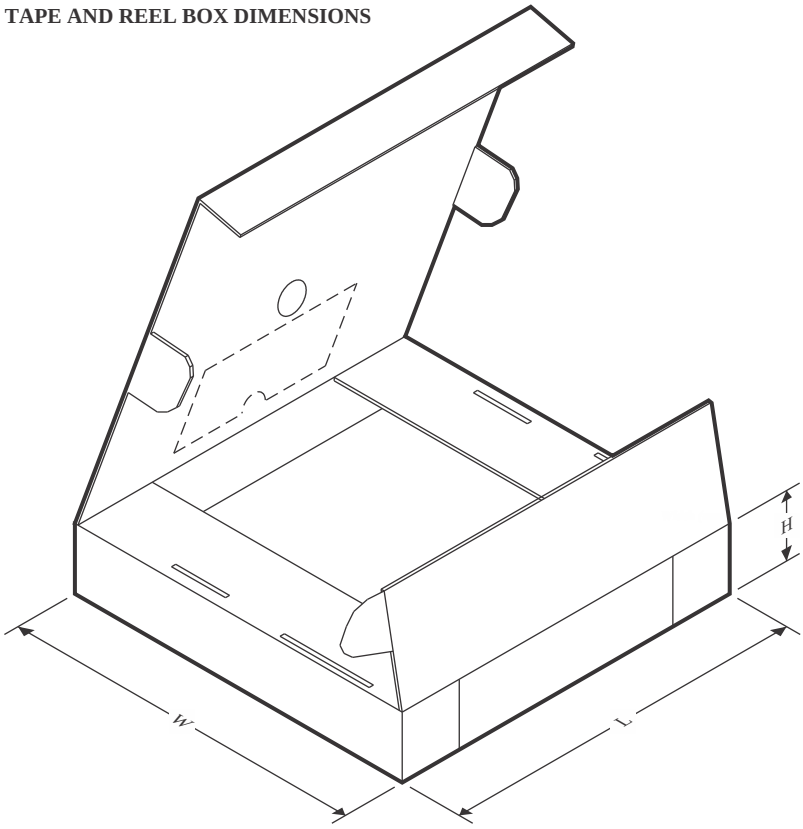
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
TVS2210YMZR	DSLGA	YMZ	2	3000	180.0	8.4	0.7	1.1	0.43	2.0	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)
TVS2210YMZR	DSLGA	YMZ	2	3000	182.0	182.0	20.0

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