

说明

针对低钳位电压的需求，无锡明芯微采用特殊工艺，开发了垂直钳位电压的功率 TVS，钳位电压更加接近工作电压的 Flat clamping 的 TVS MX2200TVS 系列。MX2200TVS 可将高达 55A 的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。MX2200TVS 使用独特的反馈机制确保在故障期间发挥精确的垂直钳位能力，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，MX2200TVS 采用小型 DFN2*2-6 封装，专为空间受限的应用而设计。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。

特性

- ◆55A 8/20 μ s 浪涌电流下的最大钳位电压为 28.0V
- 关断电压：22V
- ◆DFN2*2-6
- 浪涌电流的重复冲击
- ◆低漏电流：
25° C 下为 5nA（典型值）
- ◆低电容：105pF
- 集成 4 级 IEC 61000-4-2 ESD 保护，ESDHBM 30kV+

应用

- 工业传感器 I/O
- 医疗设备
- USB Type-C™ Vbus
- PLC I/O 模块
- 电器

基本信息

订购信息

Part Number	Description
MX2200TVS	DFN2*2-6
MPQ	3000pcs

封装损耗额定值

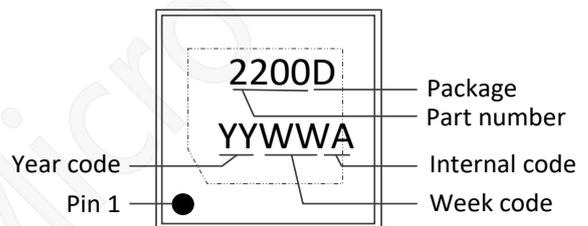
Package	R θ JA (°C/W)
DFN2*2-6	120

绝对最大额定值

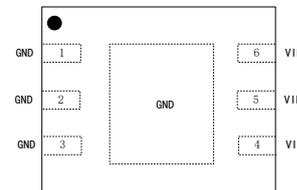
Parameter	Value
Maximum Surge (8/20 μ s)	60A
	1620W
Maximum Forward Surge (8/20 μ s)	55A
	80W
IBR (DC Breakdown current)	30mA
EFT	80A
IF (DC Forward Current)	500mA
Junction temperature	150°C
Storage temperature, Tstg	-55 to 150°C
Leading temperature (soldering, 10secs)	260°C

超过绝对最大额定值中列出的应力可能会对设备造成永久性损坏。长时间暴露在绝对最大额定值条件下可能会影响可靠性。不暗示设备在超出推荐作条件部分所示的任何条件下的功能运行。

印章信息



引脚定义

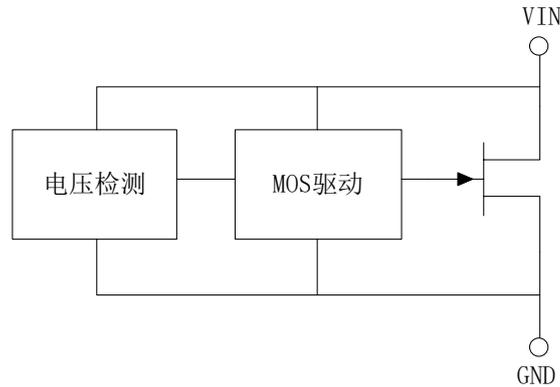


PIN NO.	PIN name	Description
1~3	GND	GND
4~6	VIN	ESD and surge protected channel
Exposed thermal pad	GND	GND

推荐使用条件

Symbol	Range
VRWM (Reverse Stand-off Voltage)	22V(TYP)
Ambient temperature	-40~85°C
Operating temperature	-40~125°C
ESD (contact discharge)	\pm 30KV
ESD (air-gap discharge)	\pm 30KV

功能框图



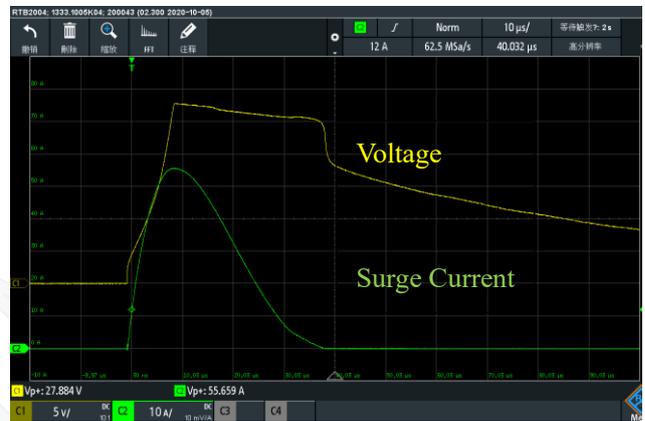
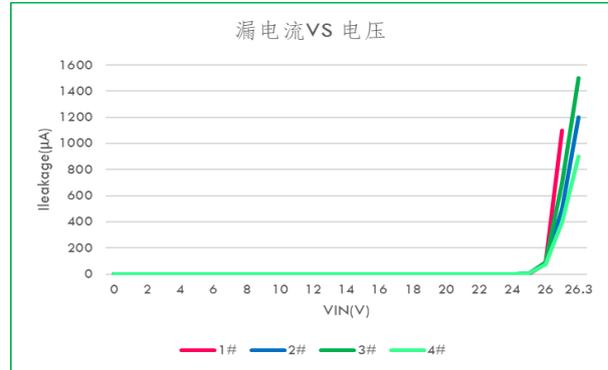
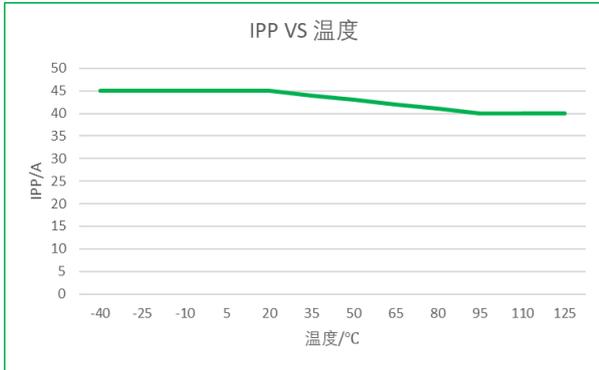
电气特性

(VIN = EN = 3V , TA = 25°C, unless otherwise noted)

Symbol	Parameter	Test condition	Min	Typ.	Max	Unit
V _{RWM}	Reverse Stand-off Voltage		-0.5		22	V
I _{LEAK}	Leakage Current	Measured at VIN = VRWM		10	60	nA
VF	Forward Voltage	I _{IN} = 1 mA from GND to IO	0.25		0.65	V
VBR	Break-down Voltage	I _{IN} = 1 mA from IO to GND	24.6		27.6	V
V _{FCLAMP} P	Forward Clamp Voltage	VINx = 5V, I _{OUT} = 200mA	1	2	5	V
VCLAMP	Clamp Voltage	25A Surge (8/20 μs) from IO to GND, VIN = 0 V before surge		26	27	V
		35A Surge (8/20 μs) from IO to GND, VIN = 0 V before surge		27	28	V
		45A Surge (8/20 μs) from IO to GND, VIN = 0 V before surge		28	29	V
RDYN	8/20 μs surge dynamic resistance	Calculated from VCLAMP at .5*I _{pp} and I _{pp} surge current levels		30		mΩ
CIN	Input pin capacitance	VIN = VRWM, f = 1 MHz, 30 mVpp, IO to GND		105		pF
SR	Maximum Slew Rate	0-VRWM rising edge, sweep rise time and measure slew rate when I _{PK} = 1 mA		2.5		V/μs

Characteristic plots

($T_A = 25^\circ\text{C}$, unless otherwise noted)



Operation description

Overview

The MX2200TVS is a precision clamp with a low, flat clamping voltage during transient overvoltage events like surge and protecting the system with zero voltage overshoot.

Feature Description

The MX2200TVS's 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 the possibility to use lower cost lower voltage tolerant downstream ICs. The MX2200TVS has minimal leakage under the standoff voltage of 22V, making it a good candidate for applications where low leakage and power dissipation is a necessity.

Wide ambient temperature range of -40°C to $+125^{\circ}\text{C}$ makes it a good candidate for most applications. Compact packages enable it to be used in small devices and save board area.

Protection Specifications

- The MX2200TVS also integrates IEC 61000-4-2 Level 4 ESD Protection.
- These combine so that the device can be protected against all transient conditions regardless of length or type.

Minimal Derating

Unlike traditional diodes the MX2200TVS has very little derating of maximum power dissipation and allows for robust performance up to 125°C . 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 MX2200TVS prevents this and allows for the same level of protection regardless of temperature.

During large transient swings, the MX2200TVS 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. 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 MX2200TVS below $2.5\text{ V}/\mu\text{s}$ at room temperature and below $0.7\text{ V}/\mu\text{s}$ at 125°C . 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.

Application and Implementation

Application Information

A typical operation for the MX2200TVS would be protecting a USB Type-C Vbus input, with a nominal input voltage of 20 V and a required withstand of 22V. 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.

Configuration Options

The MX2200TVS can be used in either unidirectional or bidirectional configuration. The MX2200TVS shows unidirectional usage to protect an input. By placing two MX2200TVS's in series with reverse orientation, bidirectional operation can be used which will allow a working voltage of $\pm 22\text{V}$. MX2200TVS operation in bidirectional will be like unidirectional operation, with a minor increase in breakdown voltage and clamping voltage.

Power Supply Recommendations

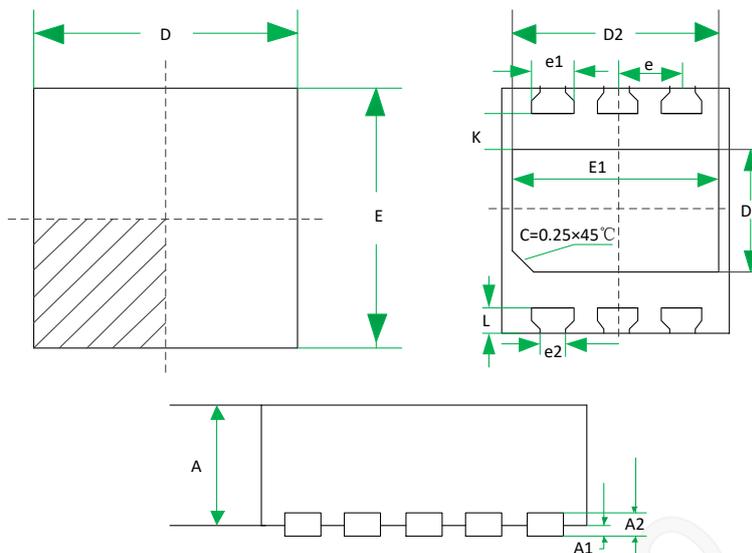
The MX2200TVS is a clamping device so there is no need to power it. Take care not to violate the recommended VIN voltage range (0V to 22V) so that the device functions properly.

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 MX2200TVS and the connector by using rounded corners with the largest raid possible. Electric fields tend to build up on corners, increasing EMI coupling.

Package information DFN2*2-6L



SYMBOL	MILLIMETERS		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	0.025	0.05
A2	0.203REF		
D	1.95	2.00	2.05
D1	0.85	0.9	0.95
E	1.95	2.00	2.05
E1	1.65	1.70	1.75
e	0.65BSC		
e1	0.45BSC		
e2	0.33BSC		
L	0.20	0.25	0.30
K	0.3BSC		

Restrictions on Product Use

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- ◆ In developing your designs, please ensure that MAXIN products are used within specified operating ranges as set forth in the most recent MAXIN products specifications.
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Version update record:

V1.0 The original version

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