

Voidless Hermetically Sealed Unidirectional Transient Voltage Suppressors Data Sheet

1N5610-1N5613



Product Overview

This series of industry-recognized voidless hermetically sealed unidirectional Transient Voltage Suppressor (TVS) designs is military qualified per MIL-PRF-19500/434 and are ideal for high-reliability applications where a failure cannot be tolerated. They provide a working peak "standoff" voltage selection from 30.5V to 175V with 1500W ratings. They are very robust in hard-glass construction and also use an internal metallurgical bond identified as "Category 1" for high reliability applications. These devices are also available in a surface-mount MELF package configuration as a special order. Microchip also offers numerous other TVS products to meet higher and lower peak pulse power and voltage ratings in both through-hole and surface-mount packages.

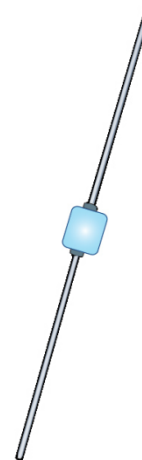
Features

- High surge current and peak pulse power provides transient voltage protection for sensitive circuits.
- Double-layer passivation.
- Internal "Category 1" metallurgical bonds.
- Voidless hermetically sealed glass package.
- JAN, JANTX, and JANTXV military qualifications available per MIL-PRF-19500/434.
- Further options for screening in accordance with MIL-PRF-19500 for JANS equivalent level by using a "MS" prefix.
- RoHS compliant versions available (commercial grade only).

Applications

- Military and other high reliability transient protection.
- Extremely robust construction.
- Working peak "standoff" voltage (V_{WM}) from 30.5V to 175V.
- Available as 1500W peak pulse power (P_{PP}).
- ESD and EFT protection per IEC61000-4-2 and IEC61000-4-4 respectively.
- Secondary lightning protection per select levels in IEC61000-4-5.
- Flexible axial-leaded mounting terminals.
- Non-sensitive to ESD per MIL-STD-750 method 1020.
- Inherently radiation hard as described in [MicroNote 050](#).

Figure 1. "C" Package



1. Maximum Ratings

Parameters/Test Conditions	Symbol	Value	Unit
Junction and storage temperature	T_J and T_{STG}	-55 to +175	°C
Peak pulse power at $t_p = 1.0$ ms	P_{PP}	1500	W
Rated forward surge current at $t_p = 8.33$ ms	I_{FSM}	150	A (pk)
Impulse repetition rate (duty factor)	I_{PP}	0.01	%
Steady-state power ¹ (Figure 3-4)	P_D	3.0	W
Solder temperature at 10 s	T_{SP}	260	°C

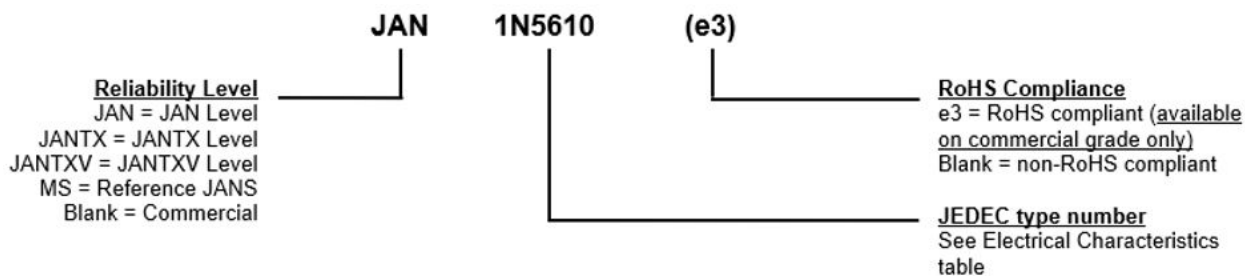
Note:

- Derate at 20 mW/°C above $T_A = +25$ °C. Steady-state power ratings with reference to ambient are for PC boards where thermal resistance from mounting point to ambient is sufficiently controlled where $T_{J(MAX)}$ is not exceeded.

1.1 Mechanical and Packaging

- Case: Hermetically sealed voidless hard glass with tungsten slugs.
- Terminations: Axial-leads are tin/lead (Sn/Pb) over copper. RoHS compliant mattetin available for commercial only.
- Marking: Body painted and part number.
- Polarity: Cathode band.
- Tape and reel option: Standard per EIA-296. Consult factory for quantities.
- Weight: 1270 mg.
- See [Package Dimensions](#).

1.2 Part Nomenclature



2. Symbols and Definitions

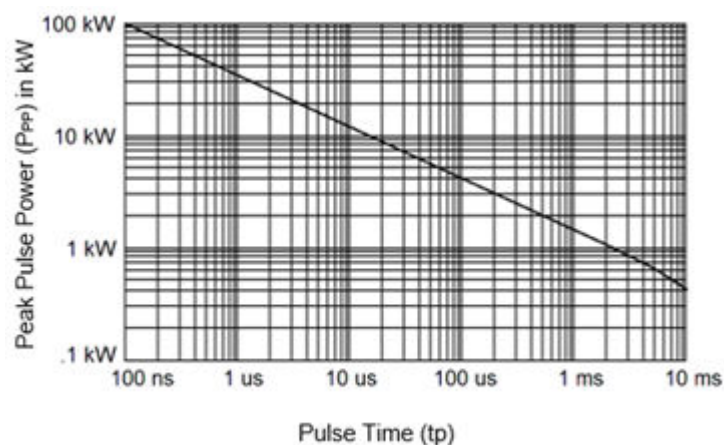
Symbol	Definition
$I_{(BR)}$	Breakdown current: The current used for measuring breakdown voltage $V_{(BR)}$.
I_D	Maximum standby current: The maximum current that will flow at the specified voltage and temperature.
I_{PP}	Peak pulse current: The peak current during the impulse.
P_{PP}	Peak pulse power: The peak power dissipation resulting from the peak impulse current I_{PP} .
T_{SP}	Temperature solder pad: The maximum solder temperature that can be safely applied to the terminal.
$\alpha_{V(BR)}$	Temperature coefficient of minimum breakdown voltage: The minimum voltage the device will exhibit at a specified current temperature.
$V_{(BR)}$	Minimum breakdown voltage: The minimum voltage the device will exhibit at a specified current.
V_C	Maximum clamping voltage at specified I_{PP} (peak pulse current) at the specified pulse conditions.
V_{WM}	Working peak voltage: The maximum peak voltage that can be applied over the operating temperature range. This is also referred to as standoff voltage.

2.1 Electrical Characteristics

Type	Minimum Breakdown Voltage $V_{(BR)}$ at 1.0 mA	Breakdown Current Maximum dc Current $T_A = +25\text{ }^{\circ}\text{C}$ $I_{(BR)}$	Working Peak Reverse Voltage V_{WM}	Maximum Standby Current I_D at V_{RWM}	Maximum Clamping Voltage V_C at 10/1000 μs	Maximum Peak Pulse Current I_{PP}		Maximum Temp. Coef. of $V_{(BR)}$ $\alpha_{V(BR)}$
						at 8/20 μs	at 10/1000 μs	
	V	mA	V (pk)	μA	V (pk)	A (pk)	A (pk)	%/ $^{\circ}\text{C}$
1N5610	33.0	75.0	30.5	5	47.6	193	32.0	0.093
1N5611	43.7	53.0	40.3	5	63.5	136	24.0	0.094
1N5612	54.0	43.0	49.0	5	78.5	116	19.0	0.096
1N5613	191	12.5	175	5	265	33	5.7	0.100

3. Performance Curves

Figure 3-1. Non-repetitive Peak Pulse Power Rating Curve¹



Note:

1. Peak power defined as peak voltage times peak current.

Figure 3-2. Pulse Wave Form for Exponential Surge for 10/1000 μ s

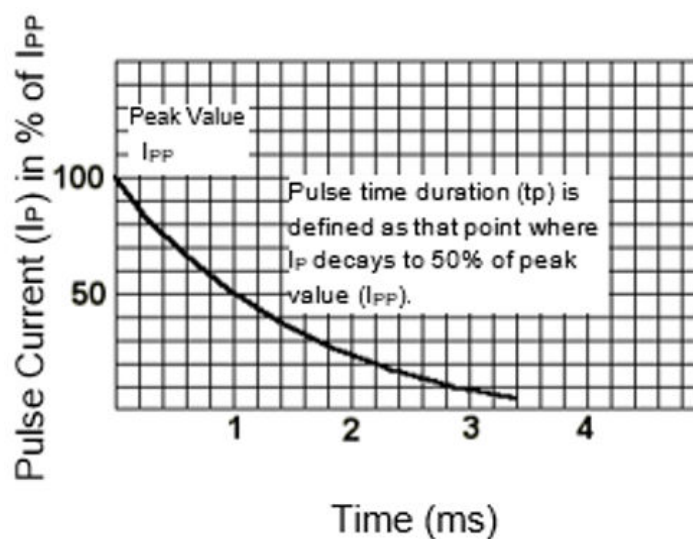
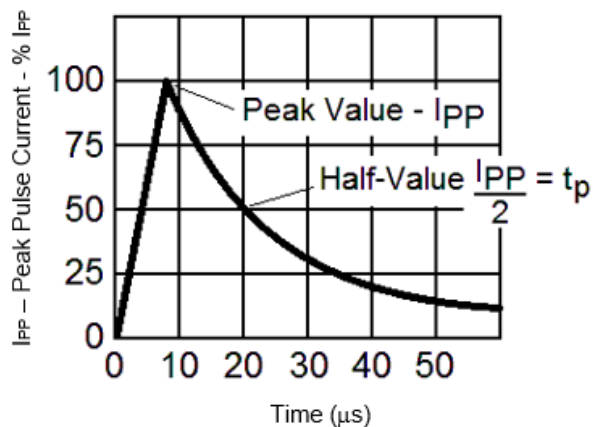


Figure 3-3. 8/20 μ s Current Impulse Waveform¹



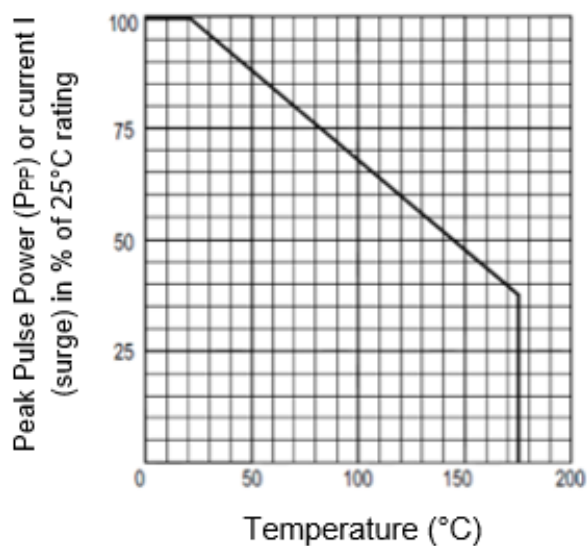
Note:

1. Test waveform parameters:

$$t_r = 8 \mu s$$

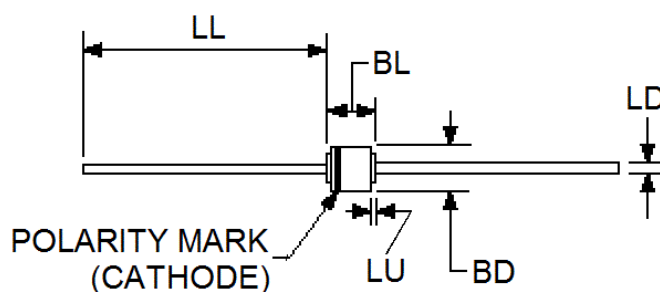
$$t_p = 20 \mu s$$

Figure 3-4. Derating Curve

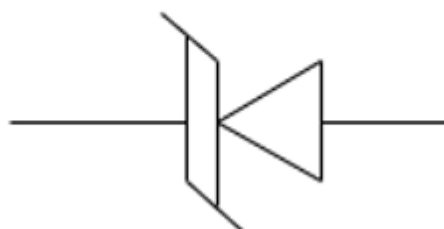


4. Package Dimensions

Dimensions are in inches. Millimeters are given for general information only. In accordance with ASME Y14.5M, diameters are equivalent to Φ x symbology.



Schematic Symbol



Ltr	Inch		Millimeters		Notes
	Min	Max	Min	Max	
BD	0.150	0.185	3.81	4.70	1
BL	0.160	0.375	4.06	9.53	1
LD	0.037	0.042	0.94	1.07	
LL	0.900	1.300	22.86	33.02	
LU		0.050		1.27	2

Notes:

1. Package contour optional within BD and length BL.
2. Within this zone lead diameter may vary to allow for lead finishes and irregularities other than heat slugs.

5. Revision History

The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

Revision	Date	Description
A	05/2023	Initial Revision

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