

# 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.

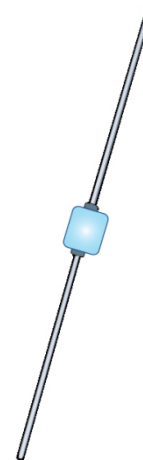
### Features

- 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 <sup>1</sup> (Figure 3-4)	$P_D$	3.0	W
Solder temperature at 10 s	$T_{SP}$	260	°C

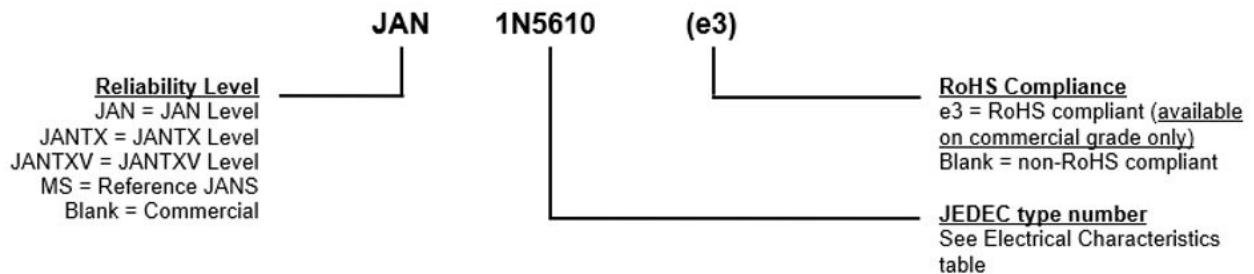
### Note:

- 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

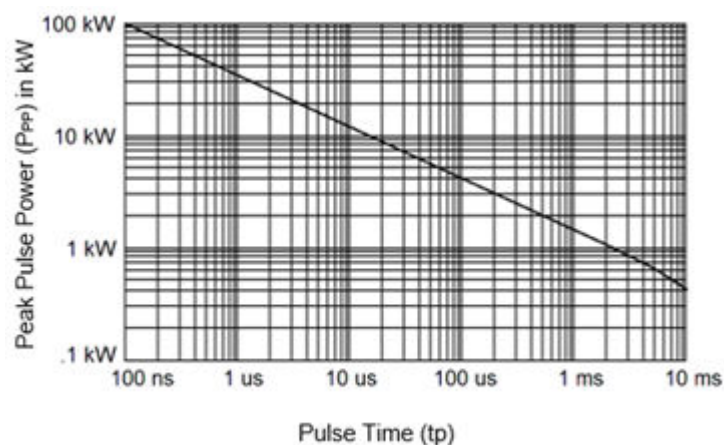
Symbol	Definition
$I_{(BR)}$	Breakdown current: The current used for measuring breakdown voltage $V_{(BR)}$ .
$I_D$	Maximum standby current: The maximum current that will flow at the specified voltage and temperature.
$I_{PP}$	Peak pulse current: The peak current during the impulse.
$P_{PP}$	Peak pulse 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 $\mu\text{s}$	Maximum Peak Pulse Current $I_{PP}$		Maximum Temp. Coef. of $V_{(BR)}$ $\alpha_{V(BR)}$
						at 8/20 $\mu\text{s}$	at 10/1000 $\mu\text{s}$	
	V	mA	V (pk)	$\mu\text{A}$	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

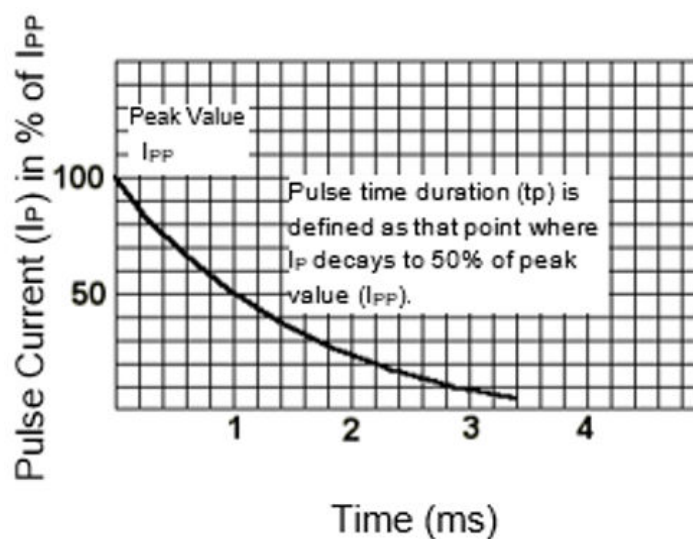
Figure 3-1. Non-repetitive Peak Pulse Power Rating Curve<sup>1</sup>



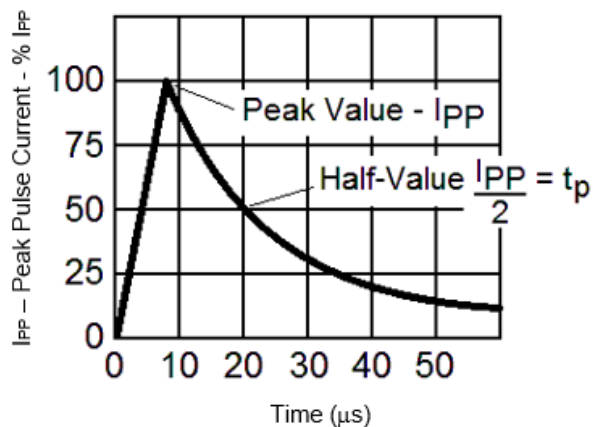
**Note:**

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

Figure 3-2. Pulse Wave Form for Exponential Surge for 10/1000  $\mu$ s



**Figure 3-3.** 8/20  $\mu$ s Current Impulse Waveform<sup>1</sup>



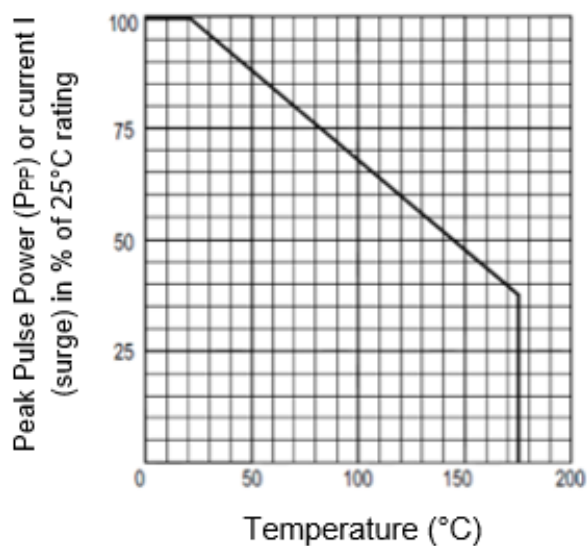
**Note:**

1. Test waveform parameters:

$$t_r = 8 \mu\text{s}$$

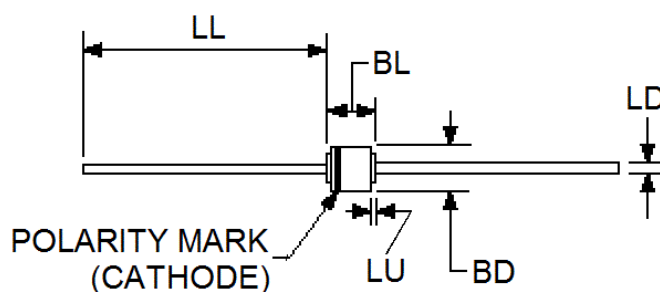
$$t_p = 20 \mu\text{s}$$

**Figure 3-4.** Derating Curve

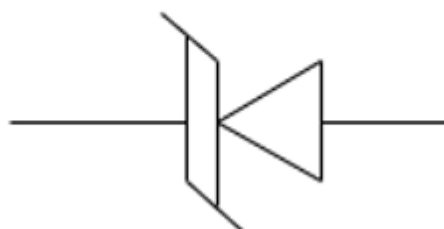


## 4. Package Dimensions

Dimensions are in inches. Millimeters are given for general information only. In accordance with ASME Y14.5M, diameters are equivalent to  $\Phi$ 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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