Voidless Hermetically Sealed Bidirectional Transient Voltage Suppressors Data Sheet

1N6138A-1N6173A

Product Overview

This series of industry-recognized voidless, hermetically sealed bidirectional Transient Voltage Suppressors (TVS) are military qualified per MIL-PRF-19500/516 and are ideal for high-reliability applications where a failure cannot be tolerated. They provide a working peak "standoff" voltage selection from 5.2 V to 152 V with a 1500 W rating for a 10/1000 µs pulse. They are very robust in hard-glass construction and use internal "Category 1" metallurgical bonds for high reliability. These devices are available as both a non-suffix part and an "A" version part involving different voltage tolerances as described in the Part Nomenclature section. These devices are also available in a surface-mount MELF package configuration.

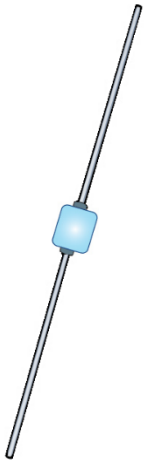
Features

- 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, JANTXV and JANS qualified versions are available per MIL-PRF-19500/516. (See Part Nomenclature for all available options).
- RoHS compliant versions available (commercial grade only)

Applications

- Military and other high-reliability applications
- Extremely robust construction
- Extensive range in working peak "standoff" voltage (V_{WM}) from 5.2 V to 152 V
- 1500 W peak pulse power (P_{PP}) for a 10/1000 µs test pulse
- ESD and EFT protection per IEC6100-4-2 and IEC61000-4-4 respectively
- Protection from the secondary effects of lightning 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

Maximum ratings taken at T_A = 25 °C unless otherwise noted.

Parameters/Test Conditions	Symbol	Value	Unit
Junction and storage temperature	T_J and T_{STG}	–55 to +175	°C
Thermal resistance junction-to-lead[1]	$R_{\Theta JL}$	20	°C/W
Peak pulse power at 25 °C	P_{PP}	1500	W
Off-state power at T_L = 75 °C[1]	P_D	5.0	W
Off-state power at T_A = 25 °C[2]	P_D	3.0	W
Impulse repetition rate	df	0.01	%
Solder temperature at 10 seconds	T_{SP}	260	°C

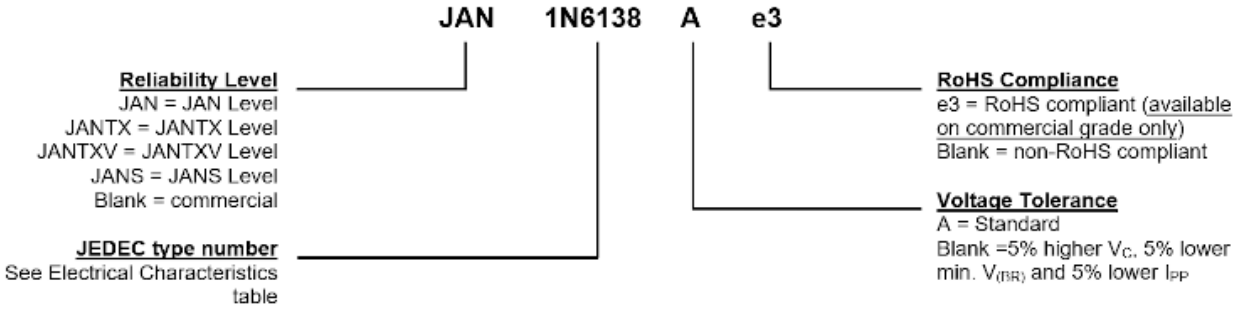
Notes:

1. At 3/8 inch lead length from body (see Figure 3-4).
2. 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 (also see Figure 3-5).

1.1 Mechanical and Packaging

- Case: Hermetically sealed voidless hard glass with tungsten slugs
- Terminals: Axial-leads are tin/lead over copper. RoHS compliant matte-tin is available on commercial grade only.
- Marking: Body paint and part number
- Polarity: No polarity marking for these bidirectional TVSs
- Tape and reel option: Standard per EIA-296. Consult factory for quantities.
- Weight: Approximately 1270 mg
- See Package Dimensions.

1.2 Part Nomenclature



2. Symbols and Definitions

Symbol	Definition
$\alpha_{V(BR)}$	Temperature coefficient of minimum breakdown voltage: The change in breakdown voltage divided by the change in temperature that caused it expressed in %/°C or mV/°C.
$V_{(BR)}$	Breakdown voltage: The voltage across the device at a specified current $I_{(BR)}$ in the breakdown region.
V_{WM}	Working standoff voltage: The maximum-rated value of dc or repetitive peak positive cathode-to-anode voltage that may be continuously applied over the standard operating temperature.
I_D	Standby current: The current through the device at rated stand-off voltage.
V_C	Clamping voltage: The voltage across the device in a region of low differential resistance during the application of an impulse current (I_{PP}) for a specified waveform.
P_{PP}	Peak pulse power: The rated random recurring peak impulse power or rated nonrepetitive peak impulse power. The impulse power is the maximum-rated value of the product of I_{PP} and V_C.

2.1 Electrical Characteristics

Industry Type Number[1]	Minimum Breakdown Voltage[1] $V_{(BR)}$ at $I_{(BR)}$		Rated Standoff Voltage V_{WM}	Maximum Standby Current I_D at V_{WM}	Maximum Clamping Voltage[1] V_C at I_{PP}	Maximum Peak Pulse Current[1] I_{PP}	Maximum Temp. Coef. of $V_{(BR)}$ $\alpha_{V(BR)}$
	V	mA	V	µA	V	A	%/°C
1N6138A	6.46	175	5.2	500	10.5	142.8	0.05
1N6139A	7.13	175	5.7	300	11.2	133.9	0.06
1N6140A	7.79	150	6.2	100	12.1	124.0	0.06
1N6141A	8.65	150	6.9	100	13.4	111.9	0.06
1N6142A	9.50	125	7.6	100	14.5	103.4	0.07
1N6143A	10.45	125	8.4	20	15.6	96.2	0.07
1N6144A	11.40	100	9.1	20	16.9	88.8	0.07
1N6145A	12.35	100	9.9	20	18.2	82.4	0.08
1N6146A	14.25	75	11.4	20	21.0	71.4	0.08
1N6147A	15.20	75	12.2	20	22.3	67.3	0.08
1N6148A	17.10	65	13.7	10	25.1	59.8	0.085
1N6149A	19.0	65	15.2	5	27.7	54.2	0.085
1N6150A	20.9	50	16.7	5	30.5	49.2	0.085
1N6151A	22.8	50	18.2	5	33.3	45.0	0.09
1N6152A	25.7	50	20.6	5	37.4	40.1	0.09
1N6153A	28.5	40	22.8	5	41.6	36.0	0.09
1N6154A	31.4	40	25.1	5	45.7	32.8	0.095
1N6155A	34.2	30	27.4	5	49.9	30.1	0.095
1N6156A	37.1	30	29.7	5	53.6	28.0	0.095
1N6157A	40.9	30	32.7	5	59.1	25.4	0.095
1N6158A	44.7	25	35.8	5	64.6	23.2	0.095
1N6159A	48.5	25	38.8	5	70.1	21.4	0.095

.....continued

Industry Type Number[1]	Minimum Breakdown Voltage[1] $V_{(BR)}$ at $I_{(BR)}$		Rated Standoff Voltage V_{WM}	Maximum Standby Current I_D at V_{WM}	Maximum Clamping Voltage[1] V_C at I_{PP}	Maximum Peak Pulse Current[1] I_{PP}	Maximum Temp. Coef. of $V_{(BR)}$ $\alpha_{V(BR)}$
	V	mA	V	µA	V	A	%/°C
1N6160A	53.2	20	42.6	5	77.0	19.5	0.095
1N6161A	58.9	20	47.1	5	85.3	17.6	0.100
1N6162A	64.6	20	51.7	5	97.1	15.4	0.100
1N6163A	71.3	20	56.0	5	103.1	14.5	0.100
1N6164A	77.9	15	62.2	5	112.8	13.3	0.100
1N6165A	86.5	15	69.2	5	125.1	12.0	0.100
1N6166A	95.0	12	76.0	5	137.6	10.9	0.100
1N6167A	104.5	12	86.6	5	151.3	9.9	0.100
1N6168A	114.0	10	91.2	5	165.1	9.1	0.100
1N6169A	123.5	10	98.8	5	178.8	8.4	0.105
1N6170A	142.5	8	114.0	5	206.3	7.3	0.105
1N6171A	152.0	8	121.6	5	218.4	6.9	0.105
1N6172A	171.0	5	136.8	5	245.7	6.1	0.110
1N6173A	190.0	5	152.0	5	273.0	5.5	0.110

Note:

1. Part number without the A suffix has 5% higher V_C, 5% lower minimum $V_{(BR)}$, and 5% lower I_{PP}.

3. Performance Curves

Figure 3-1. Peak Pulse Power vs. Pulse Time

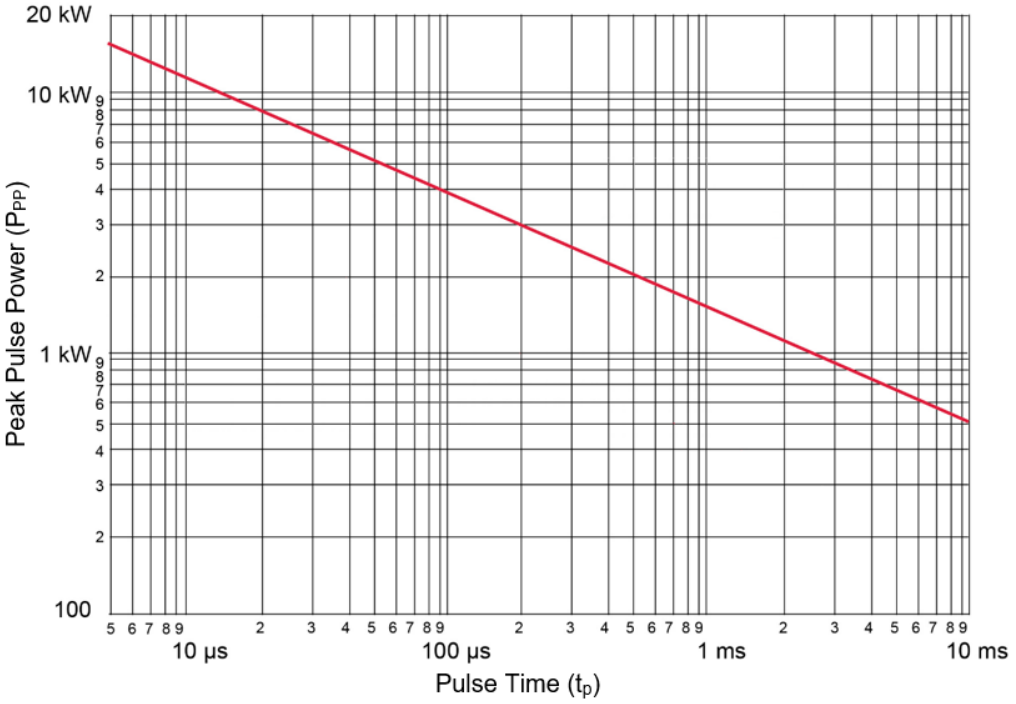


Figure 3-2. Pulse Derating Curve (Not Applicable to JANHC/JANKC Die)

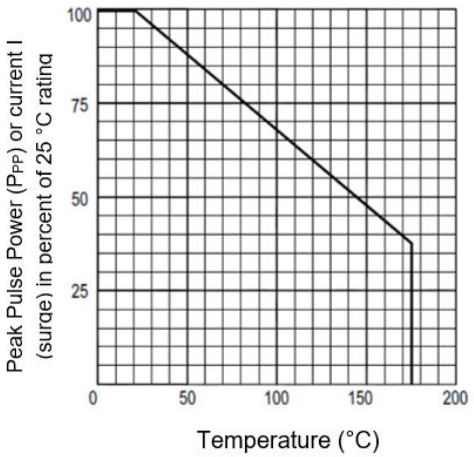


Figure 3-3. Pulse Waveform

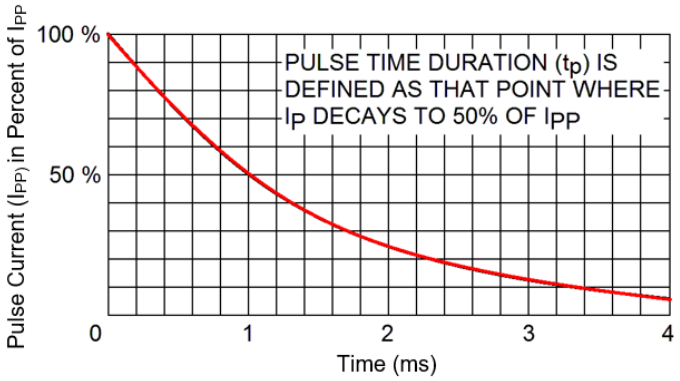


Figure 3-4. Temperature-Power Derating Curve

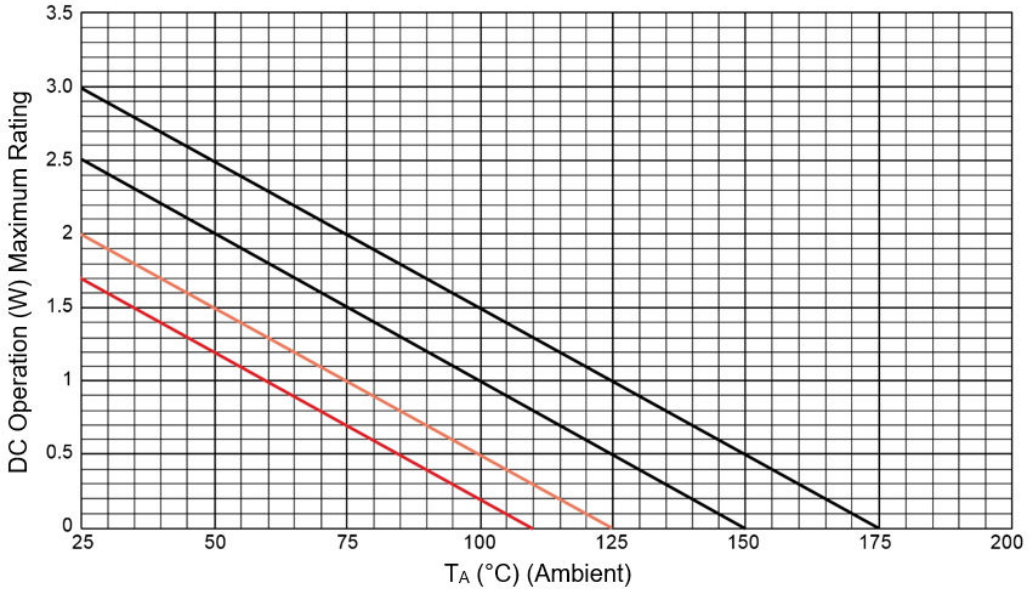
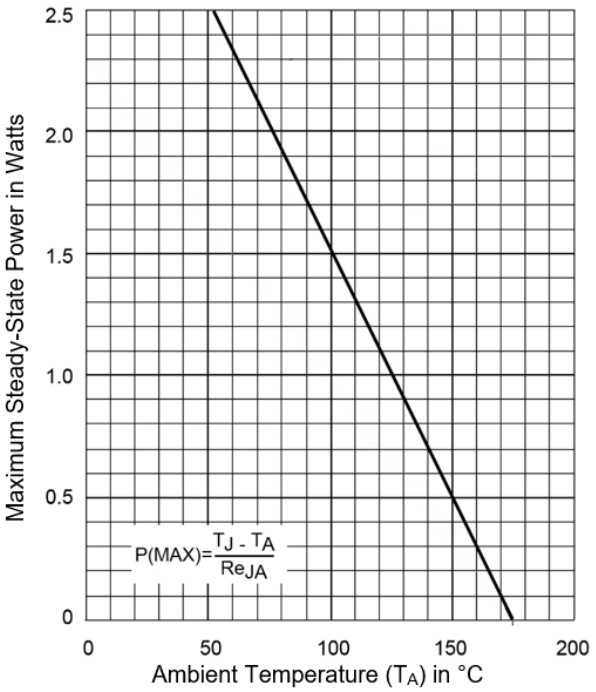
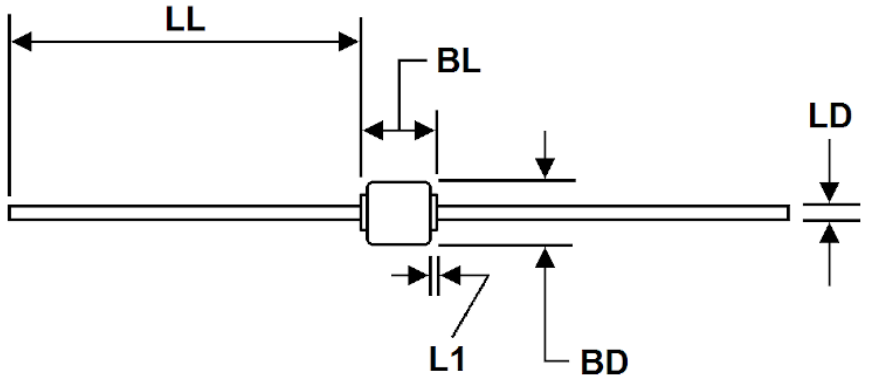


Figure 3-5. Steady-State Derating Curve for Free-Air Mounting ($R_{\Theta JA}$ = 50 °C/W)



4. Package Dimensions

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



Schematic Symbol

Ltr	Inches		Millimeters		Notes
	Min	Max	Min	Max	
BD	0.135	0.185	3.43	4.70	1
BL	0.140	0.195	3.56	4.95	
LD	0.036	0.042	0.91	1.07	
LL	1.00	1.30	25.4	33.02	
L1	-	0.030	-	0.76	2

Notes:

1. Dimension BD shall be measured at the largest diameter.
2. Dimension L1 lead diameter uncontrolled in this area.

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	06/2023	Converted document to Microchip template.

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