Voidless Hermetically Sealed Surface Mount Bidirectional Transient Voltage Suppressors Data Sheet

1N6138AUS-1N6173AUS

Product Overview

This surface-mount series of industry-recognized voidless, hermetically sealed, bidirectional Transient Voltage Suppressor (TVS) designs 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 are also available as both a non-suffix part and an "A" version part involving different voltage tolerances as further described in the Part Nomenclature section. These devices are also available in axial-leaded packages for through-hole mounting.

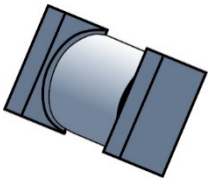
Features

- High surge current and peak pulse power provide 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 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
- Square-end-cap terminals for easy placement
- Non-sensitive to ESD per MIL-STD-750 method 1020
- Inherently radiation hard as described in MicroNote 050.

Figure 1. "C" or SQ-MELF



1. Maximum Ratings

Maximum ratings are 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-end cap	$R_{\Theta JEC}$	5.0	°C/W
Peak pulse power at 25 °C (10/1000 µs)	P_{PP}	1500	W
Off-state power up to T_{EC} = 150 °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

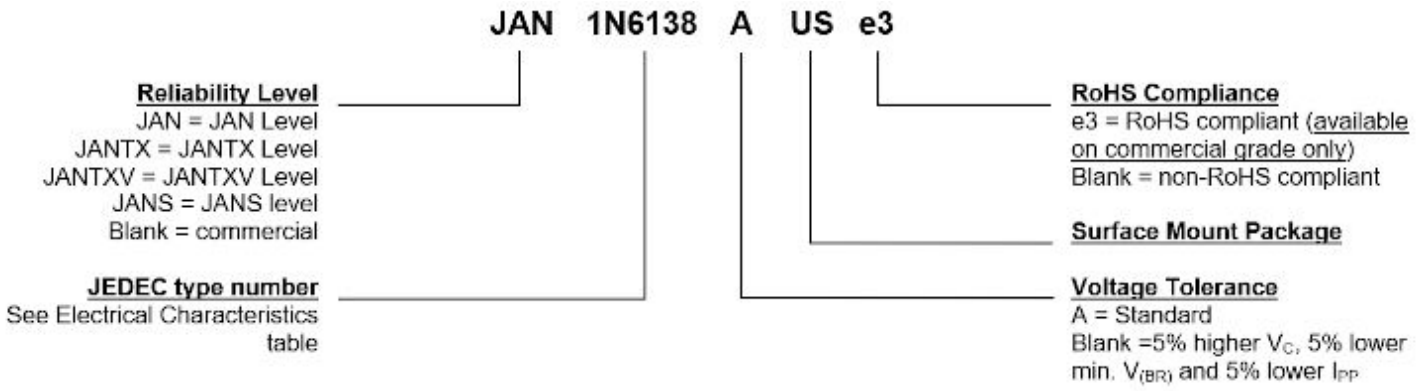
Notes:

1. Linearly derate above T_{EC} =150 °C to zero at T_{EC} =175 °C.
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_{OP} or $T_{J(MAX)}$ is not exceeded (also see Figure 3-5).

1.1 Mechanical and Packaging

- Case: Hermetically sealed, voidless hard glass with tungsten slugs
- Terminals: Tin/lead plate over copper. RoHS compliant matte-tin is available on commercial grade only.
- Marking: None
- Polarity: No polarity marking for these bidirectional TVSs
- Tape and reel option: Standard per EIA-481-B. Consult factory for quantities.
- Weight: Approximately 1100 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
1N6138AUS	6.46	175	5.2	500	10.5	142.8	0.05
1N6139AUS	7.13	175	5.7	300	11.2	133.9	0.06
1N6140AUS	7.79	150	6.2	100	12.1	124.0	0.06
1N6141AUS	8.65	150	6.9	100	13.4	111.9	0.06
1N6142AUS	9.50	125	7.6	100	14.5	103.4	0.07
1N6143AUS	10.45	125	8.4	20	15.6	96.2	0.07
1N6144AUS	11.40	100	9.1	20	16.9	88.8	0.07
1N6145AUS	12.35	100	9.9	20	18.2	82.4	0.08
1N6146AUS	14.25	75	11.4	20	21.0	71.4	0.08
1N6147AUS	15.20	75	12.2	20	22.3	67.3	0.08
1N6148AUS	17.10	65	13.7	10	25.1	59.8	0.085
1N6149AUS	19.0	65	15.2	5	27.7	54.2	0.085
1N6150AUS	20.9	50	16.7	5	30.5	49.2	0.085
1N6151AUS	22.8	50	18.2	5	33.3	45.0	0.09
1N6152AUS	25.7	50	20.6	5	37.4	40.1	0.09
1N6153AUS	28.5	40	22.8	5	41.6	36.0	0.09
1N6154AUS	31.4	40	25.1	5	45.7	32.8	0.095
1N6155AUS	34.2	30	27.4	5	49.9	30.1	0.095
1N6156AUS	37.1	30	29.7	5	53.6	28.0	0.095
1N6157AUS	40.9	30	32.7	5	59.1	25.4	0.095
1N6158AUS	44.7	25	35.8	5	64.6	23.2	0.095
1N6159AUS	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
1N6160AUS	53.2	20	42.6	5	77.0	19.5	0.095
1N6161AUS	58.9	20	47.1	5	85.3	17.6	0.100
1N6162AUS	64.6	20	51.7	5	97.1	15.4	0.100
1N6163AUS	71.3	20	56.0	5	103.1	14.5	0.100
1N6164AUS	77.9	15	62.2	5	112.8	13.3	0.100
1N6165AUS	86.5	15	69.2	5	125.1	12.0	0.100
1N6166AUS	95.0	12	76.0	5	137.6	10.9	0.100
1N6167AUS	104.5	12	86.6	5	151.3	9.9	0.100
1N6168AUS	114.0	10	91.2	5	165.1	9.1	0.100
1N6169AUS	123.5	10	98.8	5	178.8	8.4	0.105
1N6170AUS	142.5	8	114.0	5	206.3	7.3	0.105
1N6171AUS	152.0	8	121.6	5	218.4	6.9	0.105
1N6172AUS	171.0	5	136.8	5	245.7	6.1	0.110
1N6173AUS	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

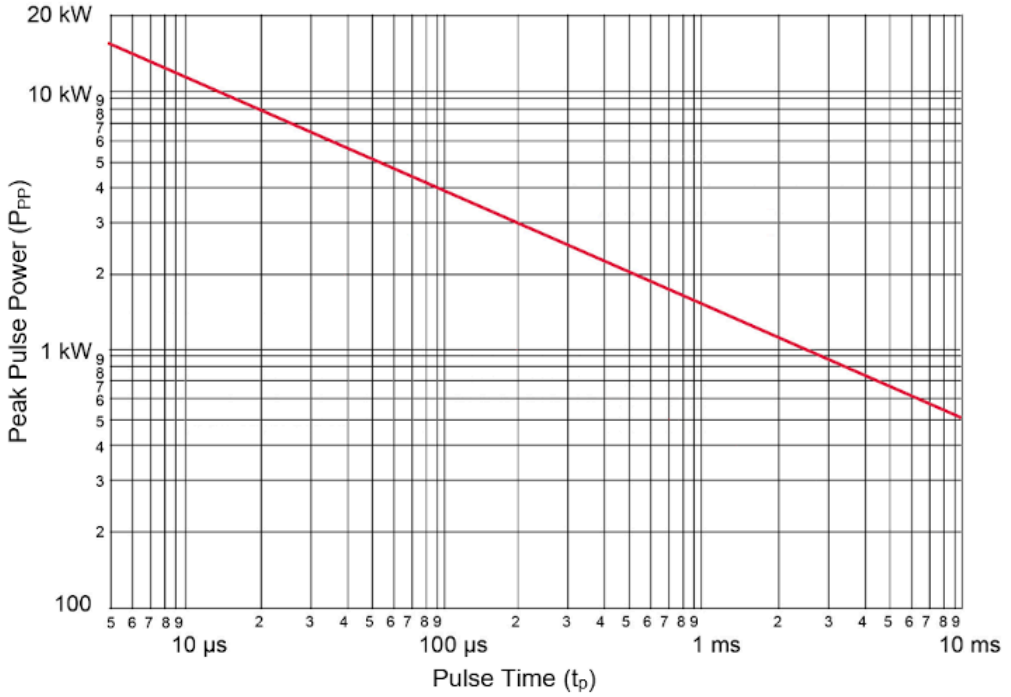


Figure 3-2. Pulse Derating Curve (Not Applicable to JANHC/JANKC Die)

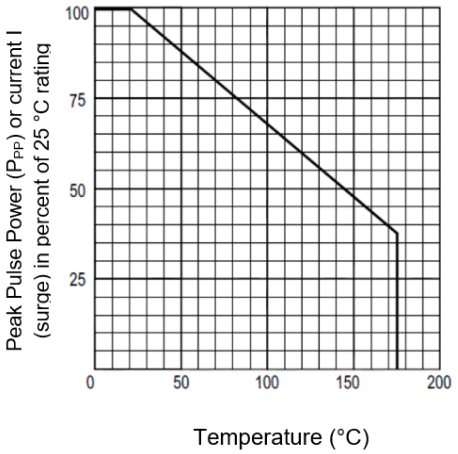


Figure 3-3. Pulse Waveform

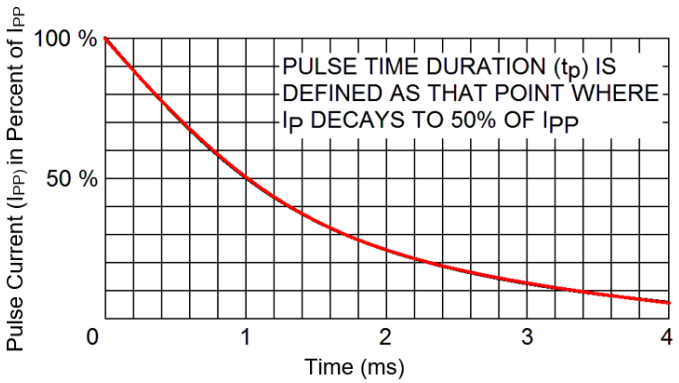


Figure 3-4. Temperature-Power Derating Curve

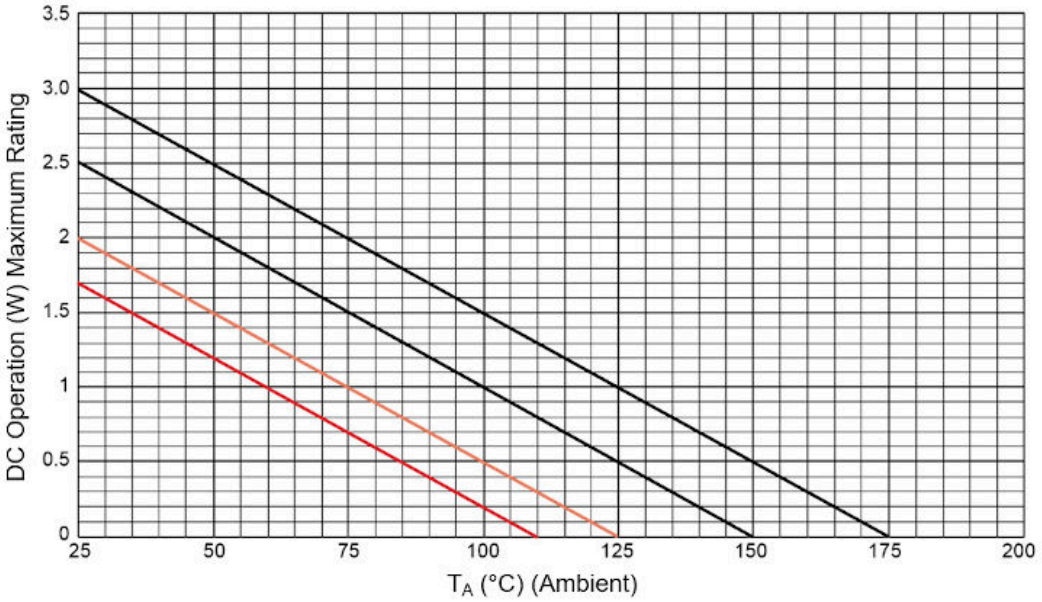
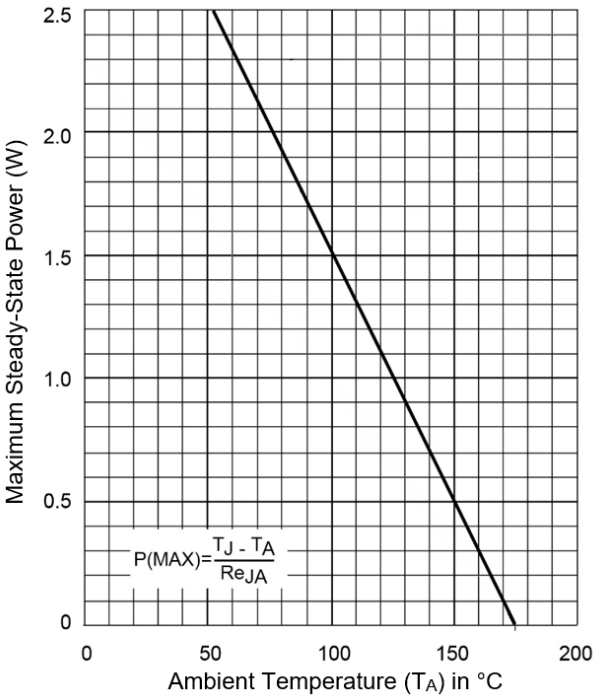
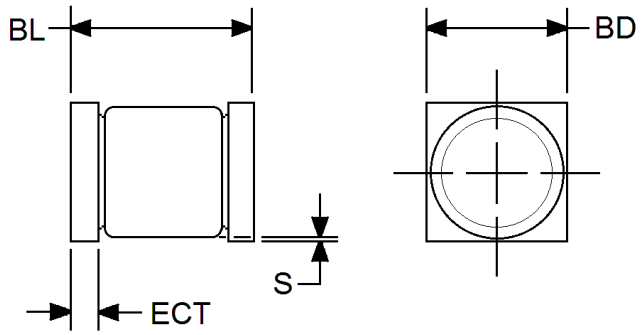


Figure 3-5. Steady-State Derating Curve for Free-Air Mounting ($R_{\Theta JA}$ = 50 °C/W)



4. Package Dimensions

Dimensions are in inches. Millimeters are given for general information only. Minimum clearance of glass body to mounting surface on all orientations.

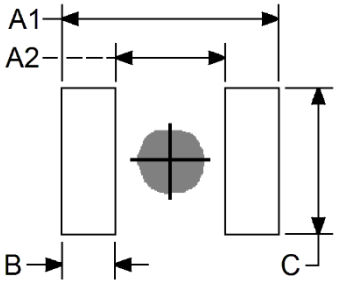


Ltr	Inch		Millimeters		Notes
	Min	Max	Min	Max	
BD	0.183	0.202	4.65	5.13	
BL	0.205	0.245	5.21	6.22	
ECT	0.019	0.028	0.48	0.71	
S	0.003	-	0.08	-	1

Note:

1. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

4.1 Pad Layout



Dim	Inch	Millimeters
A1	0.310	7.87
A2	0.170	4.32
B	0.070	1.78
C	0.205	5.21

If mounting requires adhesive separate from the solder, an additional 0.090 inch (2.29 mm) diameter contact may be placed in the center between the pads as an optional spot for cement.

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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