

6 Lake Street, Lawrence, MA 01841 1-800-446-1158 / (978) 620-2600 / Fax: (978) 689-0803 Website: http://www.microchip.com Gort Road Business Park, Ennis, Co. Clare, Ireland Tel: +353 (0) 65 6840044 Fax: +353 (0) 65 6822298

DEVICES

* 1N5629 thru 1N5665 1N5629A thru 1N5665A

JAN
JANTX
JANTXV

* Commercial only

DESCRIPTION

This popular Transient Voltage Suppressor (TVS) series for 1N5629 thru 1N5665A are JEDEC registered selections for unidirectional devices. All have the same high Peak Pulse Power rating of 1500 W with extremely fast response times. They are also available in military qualified selections as described in the Features section herein. They are most often used for protecting against transients from inductive switching environments, induced RF effects, or induced secondary lightning effects as found in lower surge levels of IEC61000-4-5. They are also very successful in protecting airborne avionics and electrical systems. Since their response time is virtually instantaneous, they can also protect from ESD and EFT per IEC61000-4-2 and IEC61000-4-4.

IMPORTANT: For the most current data, consult *MICROSEMI's* website:

http://www.microsemi.com

FEATURES

- Unidirectional TVS series for thru-hole mounting
- > Suppresses transients up to 1500 watts @ 10/1000 μs (see Figure 1)
- ➤ Clamps transient in less than 100 pico seconds
- ➤ Working voltage (V_{WM}) range 5 V to 171 V
- ➤ Hermetic sealed DO-13 metal package
- ➤ JAN/TX/TXV military qualifications also available for the tighter tolerance "A" suffix devices per MIL-PRF-19500/500 by adding the JAN, JANTX, or JANTXV prefix, e.g. JANTXV1N5629A, etc.
- ➤ For bidirectional TVS in the same DO-13 package, see separate data sheet for the 1N6036 1N6072A series (also military qualified)
- ➤ Surface mount equivalent packages also available as SMCJ5.0 SMCJ170CA or SMCG5.0 SMCG170CA in separate data sheet (consult factory for other surface mount options)
- ➤ Plastic axial-leaded equivalents available in the 1N6267 1N6303A series in separate data sheet



DO-13 (DO-202AA)

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APPLICATIONS / BENEFITS

- Protection from switching transients and induced RF
- ➤ ESD & EFT protection per IEC 61000-4-2 and -4-4
- > Secondary lightning protection per IEC61000-4-5 with 42 Ohms source impedance:

Class 1: 1N5629 to 1N5665A

Class 2: 1N5629 to 1N5663A

Class 3: 1N5629 to 1N5655A

Class 4: 1N5629 to 1N5648A

Secondary lightning protection per IEC61000-4-5 with 12 Ohms source impedance:

Class 1: 1N5629 to 1N5658A

Class 2: 1N5629 to 1N5651A

Class 3: 1N5629 to 1N5643A

Class 4: 1N5629 to 1N5636A

➤ Secondary lightning protection per IEC61000-4-5 with 2 Ohms source impedance:

Class 2: 1N5629 to 1N5642A

Class 3: 1N5629 to 1N5635A

➤ Inherently radiation hard per Microsemi MicroNote 050

MAXIMUM RATINGS

- > 1500 Watts for 10/1000 μs with repetition rate of 0.01% or less* at lead temperature (T_L) 25°C (see Figs 1, 2, & 4)
- ➤ Operating & Storage Temperatures: -55° to +175°C
- ➤ THERMAL RESISTANCE: 50°C/W junction to lead at 0.375 inches (10 mm) from body or 110°C/W junction to ambient when mounted on FR4 PC board with 4 mm² copper pads (1oz) and track width 1 mm, length 25 mm
- ▶ DC Power Dissipation*: 1 Watt at $T_L \le +125^{\circ}\text{C}$ 3/8" (10 mm) from body (see derating in Fig 3 and note below)
- Forward surge current: 200 Amps for 8.3ms half-sine wave at $T_A = +25^{\circ}C$
- Solder Temperatures: 260 ° C for 10 s (maximum)

MECHANICAL AND PACKAGING

- CASE: DO-13 (DO-202AA), welded, hermetically sealed metal and glass
- FINISH: All external metal surfaces are Tin-Lead plated and solderable per MIL-STD-750 method 2026
- ➤ POLARITY: Cathode connected to case and polarity indicated by diode symbol
- MARKING: Part number and polarity diode symbol
- ➤ WEIGHT: 1.4 grams. (Approx)
- TAPE & REEL option: Standard per EIA-296 (add "TR" suffix to part number)
- See package dimension on last page
- * TVS devices are not typically used for dc power dissipation and are instead operated at or less than their rated standoff voltage

(V_{WM}) except for transients that briefly drive the device into avalanche breakdown (V_{BR} to V_C region).

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ELECTRICAL CHARACTERISTICS (a) $T_A = 25^{\circ}$ C											
JEDEC Type No.*	Breakdown Voltage V _(BR) @ I _(BR)		Breakdown Current I _(BR)	Rated Standoff Voltage Vwm	Maximum Standby Current I _D @ Vwm	Maximum Clamping Voltage V _C @ I _{PP}	Maximum Peak Pulse Current IPP	Maximum Temperature Coefficient of V(BR) ΦV(BR)			
No."	Min.	Max.			0	Ü		` , ` , ` ,			
	\mathbf{V}	V	mA	V	μA	V	A	%/°C			
1N5629	6.12	7.48	10	5.50	1000	10.8	139	.057			
1N5629A	6.45	7.14	10	5.80	1000	10.5	143	.057			
1N5630	6.75	8.25	10	6.05	500	11.7	128	.061			
1N5630A	7.13	7.88	10	6.40	500	11.3	132	.061			
1N5631	7.38	9.02	10	6.63	200	12.5	120	.065			
1N5631A 1N5632	7.79 8.19	8.61 10.0	10 1	7.02 7.37	200 50	12.1 13.8	124 109	.065 .068			
1N5632A	8.65	9.55	1	7.78	50	13.4	112	.068			
1N5633	9.00	11.0	1	8.10	10	15.0	100	.073			
1N5633A	9.5	10.5	1	8.55	10	14.5	103	.073			
1N5634	9.9	12.1	1	8.92	5	16.2	93	.075			
1N5634A	10.5	11.6	1	9.40	5	15.6	96	.075			
1N5635	10.8	13.2	1	9.72	5	17.3	87	.078			
1N5635A	11.4	12.6	1	10.2	5	16.7	90	.078			
1N5636	11.7	14.3	1	10.5	5	19.0	79	.081			
1N5636A	12.4	13.7	1	11.1	5	18.2	82	.081			
1N5637 1N5637A	13.5 14.3	16.5 15.8	1 1	12.1 12.8	5 5	22.0 21.2	68 71	.084 .084			
1N5637A 1N5638	14.3	17.6	1	12.8	5	23.5	64	.084			
1N5638A	15.2	16.8	1 1	13.6	5	22.5	67	.086			
1N5639	16.2	19.8	1	14.5	5	26.5	56.5	.088			
1N5639A	17.1	18.9	1	15.3	5	25.2	59.5	.088			
1N5640	18.0	22.0	1	16.2	5	29.1	51.5	.090			
1N5640A	19.0	21.0	1	17.1	5	27.7	54	.090			
1N5641	19.8	24.2	1	17.8	5	31.9	47	.092			
1N5641A	20.9	23.1	1	18.8	5	30.6	49	.092			
1N5642	21.6	26.4	1	19.4	5 5	34.7	43	.094			
1N5642A 1N5643	22.8	25.2 29.7	1	20.5 21.8	5	33.2 39.1	45 38.5	.094 .096			
1N5643A	25.7	28.4	1	23.1	5	37.5	40	.096			
1N5644	27.0	33.0	1	24.3	5	43.5	34.5	.097			
1N5644A	28.5	31.5	1	25.6	5	41.4	36	.097			
1N5645	29.7	36.3	1	26.8	5	47.7	31.5	.098			
1N5645A	31.4	34.7	1	28.2	5	45.7	33	.098			
1N5646	32.4	39.6	1	29.1	5	52.0	29	.099			
1N5646A	34.2	37.8	1	30.8	5	49.9	30	.099			
1N5647 1N5647A	35.1	42.9	1 1	31.6	5 5	56.4	26.5	.100			
1N5647A 1N5648	37.1 38.7	41.0 47.3	1	33.3 34.8	5	53.9 61.9	28 24	.100 .101			
1N5648A	40.9	45.2	1	36.8	5	59.3	25.3	.101			
1N5649	42.3	51.7	1	38.1	5	67.8	22.2	.101			
1N5649A	44.7	49.4	1	40.2	5	64.8	23.2	.101			
1N5650	45.9	56.1	1	41.3	5	73.5	20.4	.102			
1N5650A	48.5	53.6	1	43.6	5	70.1	21.4	.102			
1N5651	50.4	61.6	1	45.4	5	80.5	18.6	.103			
1N5651A	53.2	58.8	1	47.8	5	77.0	19.5	.103			
1N5652	55.8 58.0	68.2	1	50.2	5 5	89.0 85.0	16.9	.104			
1N5652A 1N5653	58.9 61.2	65.1 74.8	1	53.0 55.1	5	85.0 98.0	17.7 15.3	.104 .104			
1N5653A	64.6	71.4	1	58.1	5	92.0	16.3	.104			
1N5654	67.5	82.5	1	60.7	5	108	13.9	.105			
1N5654A	71.3	78.8	1	64.1	5	103	14.6	.105			
1N5655	73.8	90.2	1	66.4	5	118	12.7	.105			
1N5655A	77.9	86.1	1	70.1	5	113	13.3	.105			
1N5656	81.9	100.0	1	73.7	5	131	11.4	.106			
1N5656A	86.5	95.5	1	77.8	5	125	12.0	.106			
1N5657 1N5657A	90 95	110	1	81.0	5 5	144	10.4 11.0	.106			
1N5657A 1N5658	95	105 121	1 1	85.5 89.2	5	137 158	9.5	.106 .107			
1N5658A	105	116	1	94.0	5	152	9.9	.107			
1N5659	108	132	1	97.2	5	173	8.7	.107			
1N5659A	114	126	1	102	5	165	9.1	.107			
1N5660	117	143	1	105	5	187	8.0	.107			
1N5660A	124	137	1	111	5	179	8.4	.107			

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ELECTRICAL CHARACTERISTICS @ T_A = 25°C Breakdown Breakdown Rated Maximum Maximum Maximum Maximum Voltage Standoff **Peak Pulse** Current Standby Clamping Temperature **JEDEC** Voltage V(BR) @ I(BR) I_(BR) Current Voltage Current Coefficient of Type V_{WM} I_D @ V_{WM} V_C (a) I_{PP} IPP $V_{(BR)}$ $\alpha_{V(BR)}$ No.* Min. Max. V \mathbf{V} A %/°C mA μΑ 1N5661 135 165 1 121 5 215 7.0 .108 1N5661A 143 158 1 128 5 207 7.2 .108 1N5662 144 176 130 5 230 6.5 .108 1 1N5662A 5 219 .108 152 168 136 6.8 1 1N5663 153 187 1 138 5 244 6.2 .108 1N5663A 162 179 1 145 5 234 6.4 .108 1N5664 162 198 146 5 258 5.8 .108 1 1N5664A 5 171 189 1 154 246 6.1 .108 1N5665 180 220 1 162 5 287 5.2 .108 190 210 171 5 274 5.5 1N5665A 1 .108

NOTE 1: A TVS is normally selected according to the rated "Standoff Voltage" V_{WM} that should be equal to or greater than the dc or continuous peak operating voltage level.

NOTE 2: Also available in military qualified types with a JAN, JANTX, or JANTXV prefix.

	SYMBOLS & DEFINITIONS							
Symbol	Definition							
V_{WM}	Standoff Voltage: Applied Reverse Voltage to assure a nonconductive condition. (See Note 1 above.)							
$V_{(BR)}$	Breakdown Voltage: This is the Breakdown Voltage the device will exhibit at 25°C							
$V_{\rm C}$	Maximum Clamping Voltage: The maximum peak voltage appearing across the TVS when subjected to the peak pulse current in a one millisecond time interval. The peak pulse voltage is the combination of voltage rise due to both the series resistance and thermal rise and positive temperature coefficient $(\alpha_{V(BR)})$							
I_{PP}	Peak Pulse Current: The peak current during the impulse (See Figure 2)							
P_{PP}	Peak Pulse Power: The pulse power as determined by the product of V_{C} and I_{PP}							
I_D	Standby Current: The current at the standoff voltage (V_{WM})							
$I_{\left(BR\right) }$	Breakdown Current: The current used for measuring Breakdown Voltage (V _(BR))							

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GRAPHS

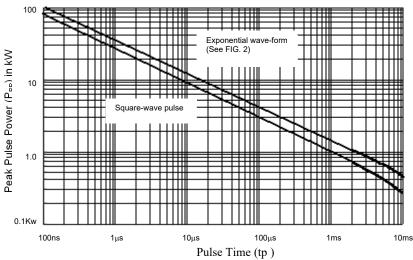
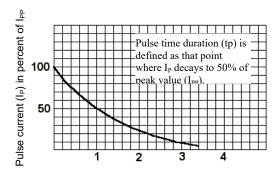


FIG. 1 – Non-repetitive peak pulse power rating curve NOTE: Peak power defined as peak voltage times peak current



Time (t) in milliseconds

FIG. 2 Pulse wave form for exponential surge

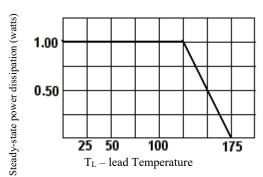
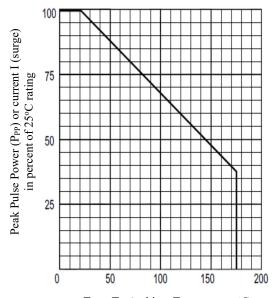


FIG. 3 Steady-state power derating curve



 T_L or T_A Ambient Temperature ${}^{\rm o}C$

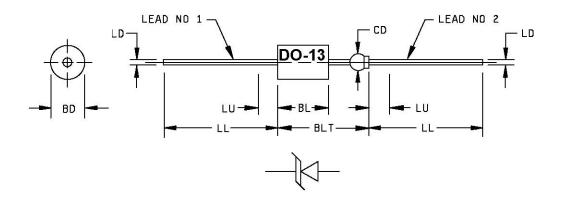
FIG. 4 Derating Curve

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PACKAGE DIMENSIONS



NOTES:

- 1. Dimensions are in inches.
- 2. Millimeters are given for general information only.
- 3. The major diameter is essentially constant along its length.
- 4. Within this zone, diameter may vary to allow for lead finishes and irregularities.
- 5. Dimension to allow for pinch or seal deformation anywhere along tubulation.
- 6. Lead 1 (cathode) shall be electrically connected to the case.
- 7. In accordance with ASME Y14.5M, diameters are equivalent to φx symbology.

Symbol	Inc	hes	Millir	Notes	
	Min	Max	Min	Max	
BD	.215	.235	5.46	5.97	
BL	.293	.357	7.44	9.07	3
BLT		.570		14.48	
CD	.045	.100	1.14	2.54	5
LD	.025	.035	0.64	0.89	
LL	1.000	1.625	25.40	41.28	4
LU		.188		4.78	4

FIGURE 1. Physical dimensions (DO-13).

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