



1500 WATT BIDIRECTIONAL TRANSIENT VOLTAGE SUPPRESSOR

Qualified per MIL-PRF-19500/507

*Qualified Levels:
JAN, JANTX, and
JANTXV*

DESCRIPTION

This popular Transient Voltage Suppressor (TVS) series for 1N6036 thru 1N6072A are JEDEC registered selections for bidirectional 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 latest information, visit our website <http://www.microsemi.com>.

FEATURES

- Bidirectional TVS series in axial packages for thru-hole mounting.
- Suppresses transients up to 1500 watts @ 10/1000 μ s (see [Figure 1](#)).
- Clamps transients in less than 100 pico seconds.
- Working voltage (V_{WM}) range 5.5 V to 185 V.
- Hermetically sealed DO-13 metal package.
- JAN, JANTX, JANTXV military qualifications also available per MIL-PRF-19500/507 for the tighter tolerance "A" suffix types by adding the JAN, JANTX, or JANTXV prefix, e.g. JANTXV1N6036A, etc.
- RoHS compliant versions available (commercial grade only).

APPLICATIONS / BENEFITS


- Protection from switching transients and induced RF.
- Protection from ESD & EFT per IEC 61000-4-2 and IEC 61000-4-4.
- Secondary lightning protection per IEC61000-4-5 with 42 Ohms source impedance:
 - Class 1: 1N6036 to 1N6072A
 - Class 2: 1N6036 to 1N6067A
 - Class 3: 1N6036 to 1N6061A
 - Class 4: 1N6036 to 1N6054A
- Secondary lightning protection per IEC61000-4-5 with 12 Ohms source impedance:
 - Class 1: 1N6036 to 1N6064A
 - Class 2: 1N6036 to 1N6057A
 - Class 3: 1N6036 to 1N6049A
 - Class 4: 1N6036 to 1N6042A
- Secondary lightning protection per IEC61000-4-5 with 2 Ohms source impedance:
 - Class 2: 1N6036 to 1N6048A
 - Class 3: 1N6036 to 1N6041A
- Inherently radiation hard as described in Microsemi "[MicroNote 050](#)".




**DO-13 (DO-202AA)
Package**

Also available in:


DO-13 package
(unidirectional)

 [1N5629 – 1N5665A](#)


Case 1 package
(plastic equivalent)

 [1.5KE6.8C – 1.5KE220CA](#)

DO-215AB package
(Gull-wing)

 [SMCG5.0 – SMCJ170A](#)

DO-214AB package
(J-bend)

 [SMCJ5.0 – SMCJ170A](#)

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MAXIMUM RATINGS

| Parameters/Test Conditions | Symbol | Value | Unit |
|---|---------------------|-------------|------|
| Junction and Storage Temperature | T_J and T_{STG} | -55 to +175 | °C |
| Peak Pulse Power @ $T_L = +25$ °C ⁽¹⁾ | P_{PP} | 1500 | W |
| Rated Average Power Dissipation @ $T_L \leq +125$ °C ⁽²⁾ | $P_{M(AV)}$ | 1 | W |
| Solder Temperature @ 10 s | T_{SP} | 260 | °C |

- Notes:**
- At 10/1000 us with repetition rate of 0.01% or less (see [Figures 1, 2, & 4](#)).
 - At 10 mm from body (see derating in [Figure 3](#) and note below).

MECHANICAL and PACKAGING

- CASE: DO-13 (DO-202AA), welded, hermetically sealed metal and glass.
- TERMINALS: All external metal surfaces are tin-lead plated and solderable per MIL-STD-750 method 2026.
- MARKING: Part number.
- POLARITY: Not applicable for bidirectional TVS.
- TAPE & REEL option: Standard per EIA-296 (add "TR" suffix to part number). Consult factory for quantities.
- WEIGHT: Approx 1.4 grams.
- See [Package Dimensions](#) on last page.

PART NOMENCLATURE

SYMBOLS & DEFINITIONS

| Symbol | Definition |
|------------|--|
| V_{WM} | Standoff Voltage: Applied Reverse Voltage to assure a nonconductive condition. |
| $V_{(BR)}$ | Breakdown Voltage: This is the Breakdown Voltage the device will exhibit at 25 °C. |
| V_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}). |
| $I_{(BR)}$ | Breakdown Current: The current used for measuring Breakdown Voltage ($V_{(BR)}$). |

ELECTRICAL CHARACTERISTICS @ 25 °C (Test Both Polarities)

| JEDEC Type No. | Rated Standoff Voltage V_{WM} | Breakdown Voltage $V_{(BR)}$ | | | Maximum Clamping Voltage $V_C @ I_{PP}$ | Maximum Standby Current $I_D @ V_{WM}$ | Maximum Peak Pulse Current I_{PP} (See Fig. 2) | Maximum Temperature Coefficient of $V_{(BR)}$ |
|----------------|---------------------------------|------------------------------|---------------|--------------|---|--|--|---|
| | Volts | $V_{(BR)min}$ | $V_{(BR)max}$ | @ $I_{(BR)}$ | Volts | μA | Amps | $\alpha_{V(BR)} \%$ / $^{\circ}C$ |
| 1N6036 | 5.5 | 6.75 | 8.25 | 10 | 11.7 | 1000 | 128 | .061 |
| *1N6036A | 6.0 | 7.13 | 7.88 | 10 | 11.3 | 1000 | 132 | .061 |
| 1N6037 | 6.5 | 7.38 | 9.02 | 10 | 12.5 | 500 | 120 | .065 |
| *1N6037A | 7.0 | 7.79 | 8.61 | 10 | 12.1 | 500 | 124 | .065 |
| 1N6038 | 7.0 | 8.19 | 10.00 | 10 | 13.8 | 200 | 109 | .068 |
| *1N6038A | 7.5 | 8.65 | 9.55 | 10 | 13.4 | 200 | 112 | .068 |
| 1N6039 | 8.0 | 9.0 | 11.0 | 1 | 15.0 | 50 | 100 | .073 |
| *1N6039A | 8.5 | 9.5 | 10.5 | 1 | 14.5 | 50 | 103 | .073 |
| 1N6040 | 8.5 | 9.9 | 12.1 | 1 | 16.2 | 10 | 93 | .075 |
| *1N6040A | 9.0 | 10.5 | 11.6 | 1 | 15.6 | 10 | 96 | .075 |
| 1N6041 | 9.0 | 10.8 | 13.2 | 1 | 17.3 | 5 | 87 | .078 |
| *1N6041A | 10.0 | 11.4 | 12.6 | 1 | 16.7 | 5 | 90 | .078 |
| 1N6042 | 10.0 | 11.7 | 14.3 | 1 | 19.0 | 5 | 79 | .081 |
| *1N6042A | 11.0 | 12.4 | 13.7 | 1 | 18.2 | 5 | 82 | .081 |
| 1N6043 | 11.0 | 13.5 | 16.5 | 1 | 22.0 | 5 | 68 | .084 |
| *1N6043A | 12.0 | 14.3 | 15.8 | 1 | 21.2 | 5 | 71 | .084 |
| 1N6044 | 12.0 | 14.4 | 17.5 | 1 | 23.5 | 5 | 64 | .086 |
| *1N6044A | 13.0 | 15.2 | 16.8 | 1 | 22.5 | 5 | 67 | .086 |
| 1N6045 | 14.0 | 16.2 | 19.8 | 1 | 26.5 | 5 | 56.5 | .088 |
| *1N6045A | 15.0 | 17.1 | 18.9 | 1 | 25.2 | 5 | 59.5 | .088 |
| 1N6046 | 16.0 | 18.0 | 22.0 | 1 | 29.1 | 5 | 51.5 | .090 |
| *1N6046A | 17.0 | 19.0 | 21.0 | 1 | 27.7 | 5 | 54 | .090 |
| 1N6047 | 17.0 | 19.8 | 24.2 | 1 | 31.9 | 5 | 47 | .092 |
| *1N6047A | 18.0 | 20.9 | 23.1 | 1 | 30.6 | 5 | 49 | .092 |
| 1N6048 | 19.0 | 21.6 | 26.4 | 1 | 34.7 | 5 | 43 | .094 |
| *1N6048A | 20.0 | 22.8 | 25.2 | 1 | 33.2 | 5 | 45 | .094 |
| 1N6049 | 21.0 | 24.3 | 29.7 | 1 | 39.1 | 5 | 38.5 | .095 |
| *1N6049A | 22.0 | 25.7 | 28.4 | 1 | 37.5 | 5 | 40 | .096 |
| 1N6050 | 24.0 | 27.0 | 33.0 | 1 | 43.5 | 5 | 34.5 | .097 |
| *1N6050A | 25.0 | 28.5 | 31.5 | 1 | 41.4 | 5 | 36 | .097 |
| 1N6051 | 26.0 | 29.7 | 36.3 | 1 | 47.7 | 5 | 31.5 | .098 |
| *1N6051A | 28.0 | 31.4 | 34.7 | 1 | 45.7 | 5 | 33 | .098 |
| 1N6052 | 29.0 | 32.4 | 39.6 | 1 | 52.0 | 5 | 29 | .099 |
| *1N6052A | 30.0 | 34.2 | 37.8 | 1 | 49.9 | 5 | 30 | .099 |
| 1N6053 | 31.0 | 35.1 | 42.9 | 1 | 56.4 | 5 | 26.5 | .100 |
| *1N6053A | 33.0 | 37.1 | 41.0 | 1 | 53.9 | 5 | 28 | .100 |
| 1N6054 | 34.0 | 38.7 | 47.3 | 1 | 61.9 | 5 | 24 | .101 |
| *1N6054A | 36.0 | 40.9 | 45.2 | 1 | 59.3 | 5 | 25.3 | .101 |
| 1N6055 | 38.0 | 42.3 | 51.7 | 1 | 67.8 | 5 | 22.2 | .101 |
| *1N6055A | 40.0 | 44.7 | 49.4 | 1 | 64.8 | 5 | 23.2 | .101 |
| 1N6056 | 41.0 | 45.9 | 56.1 | 1 | 73.5 | 5 | 20.4 | .102 |
| *1N6056A | 43.0 | 48.5 | 53.6 | 1 | 70.1 | 5 | 21.4 | .102 |
| 1N6057 | 45.0 | 50.4 | 61.6 | 1 | 80.5 | 5 | 18.6 | .103 |
| *1N6057A | 47.0 | 53.2 | 58.8 | 1 | 77.0 | 5 | 19.5 | .103 |
| 1N6058 | 48.0 | 55.8 | 68.2 | 1 | 89.0 | 5 | 16.9 | .104 |
| *1N6058A | 53.0 | 58.9 | 65.1 | 1 | 85.0 | 5 | 17.7 | .104 |
| 1N6059 | 55.0 | 61.2 | 74.8 | 1 | 98.0 | 5 | 15.3 | .104 |
| *1N6059A | 58.0 | 64.6 | 71.4 | 1 | 92.0 | 5 | 16.3 | .104 |
| 1N6060 | 60.0 | 67.5 | 82.5 | 1 | 108.0 | 5 | 13.9 | .105 |
| *1N6060A | 64.0 | 71.3 | 78.8 | 1 | 103.0 | 5 | 14.6 | .105 |
| 1N6061 | 66.0 | 73.8 | 90.2 | 1 | 118.0 | 5 | 12.7 | .105 |
| *1N6061A | 70.0 | 77.9 | 86.1 | 1 | 113.0 | 5 | 13.3 | .105 |

ELECTRICAL CHARACTERISTICS @ 25 °C (Test Both Polarities)

| JEDEC Type No. | Rated Standoff Voltage V_{WM} | Breakdown Voltage $V_{(BR)}$ | | | Maximum Clamping Voltage $V_C @ I_{PP}$ | Maximum Standby Current $I_D @ V_{WM}$ | Maximum Peak Pulse Current I_{PP} (See Fig. 2) | Maximum Temperature Coefficient of $V_{(BR)}$ |
|----------------|---------------------------------|------------------------------|---------------|--------------|---|--|---|---|
| | | $V_{(BR)min}$ | $V_{(BR)max}$ | @ $I_{(BR)}$ | | | | |
| | Volts | Volts | Volts | mA | Volts | μA | Amps | |
| 1N6062 | 73.0 | 81.9 | 100.0 | 1 | 131.0 | 5 | 11.4 | .106 |
| *1N6062A | 75.0 | 86.5 | 95.5 | 1 | 125.0 | 5 | 12.0 | .106 |
| 1N6063 | 81.0 | 90.0 | 110.0 | 1 | 144.0 | 5 | 10.4 | .106 |
| *1N6063A | 82.0 | 95.0 | 105.0 | 1 | 137.0 | 5 | 11.0 | .106 |
| 1N6064 | 90.0 | 99.0 | 121.0 | 1 | 158.0 | 5 | 9.5 | .107 |
| *1N6064A | 94.0 | 105.0 | 116.0 | 1 | 152.0 | 5 | 9.9 | .107 |
| 1N6065 | 95.0 | 108.0 | 132.0 | 1 | 176.0 | 5 | 8.5 | .107 |
| *1N6065A | 100.0 | 114.0 | 126.0 | 1 | 168.0 | 5 | 8.9 | .107 |
| 1N6066 | 105.0 | 117.0 | 143.0 | 1 | 191.0 | 5 | 7.8 | .107 |
| *1N6066A | 110.0 | 124.0 | 137.0 | 1 | 182.0 | 5 | 8.2 | .107 |
| 1N6067 | 121.0 | 135.0 | 165.0 | 1 | 223.0 | 5 | 6.7 | .108 |
| *1N6067A | 128.0 | 143.0 | 158.0 | 1 | 213.0 | 5 | 7.0 | .108 |
| 1N6068 | 137.0 | 153.0 | 187.0 | 1 | 258.0 | 5 | 5.8 | .108 |
| *1N6068A | 145.0 | 162.0 | 179.0 | 1 | 245.0 | 5 | 6.1 | .108 |
| 1N6069 | 145.0 | 162.0 | 198.0 | 1 | 274.0 | 5 | 5.5 | .108 |
| *1N6069A | 150.0 | 171.0 | 189.0 | 1 | 261.0 | 5 | 5.7 | .108 |
| 1N6070 | 155.0 | 171.0 | 210.0 | 1 | 292.0 | 5 | 5.1 | .108 |
| *1N6070A | 160.0 | 181.0 | 200.0 | 1 | 278.0 | 5 | 5.4 | .108 |
| 1N6071 | 165.0 | 180.0 | 220.0 | 1 | 308.0 | 5 | 4.9 | .108 |
| *1N6071A | 170.0 | 190.0 | 210.0 | 1 | 294.0 | 5 | 5.1 | .108 |
| 1N6072 | 175.0 | 198.0 | 242.0 | 1 | 344.0 | 5 | 4.3 | .108 |
| *1N6072A | 185.0 | 209.0 | 231.0 | 1 | 328.0 | 5 | 4.6 | .108 |

* Also available in military qualified types by adding the prefix JAN, JANTX or JANTXV per MIL-PRF-19500/507.

GRAPHS



FIGURE 1
Derating Curve

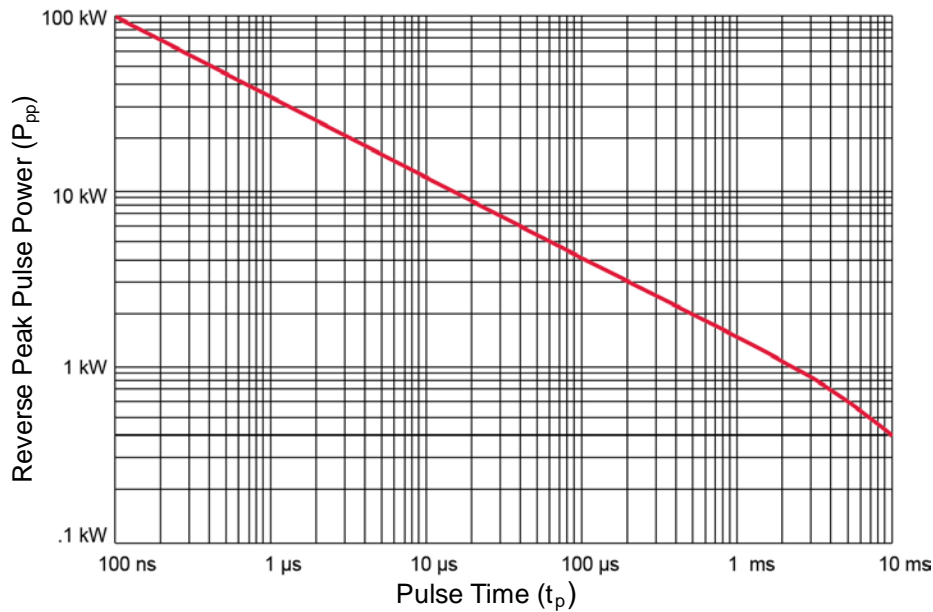


FIGURE 2
Peak Pulse Power versus Pulse Time

GRAPHS

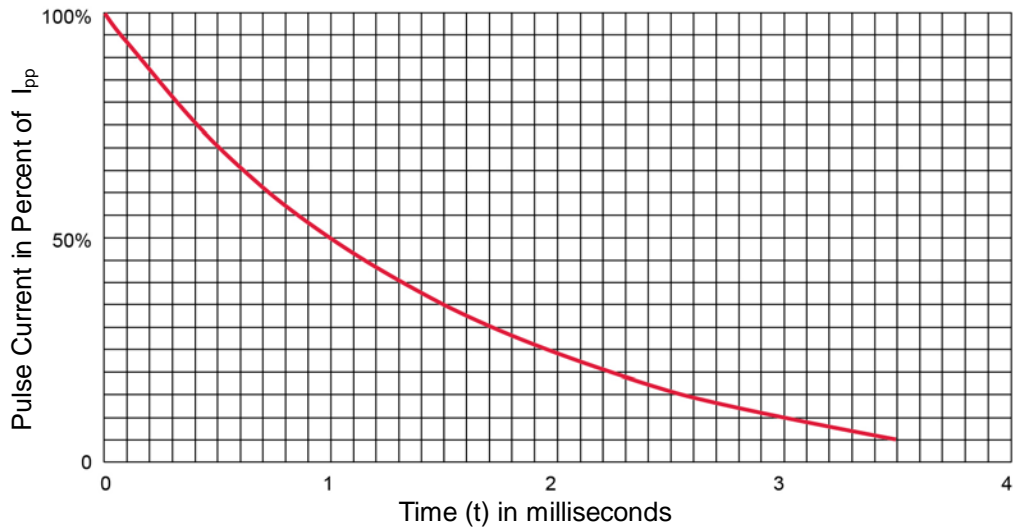


FIGURE 3
Current impulse waveform ($I_{PP} = 10 \mu s$)



FIGURE 4
Current impulse waveform ($I_{PP} = 8 \mu s$)

PACKAGE DIMENSIONS

NOTES:

- 1 Dimensions are in inches.
- 2 Millimeter equivalents 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 Symbol for bidirectional transient suppressor.
- 7 Lead 1 shall be electrically connected to the case.
- 8 In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

| Symbol | Dimensions | | | | Notes |
|------------|------------|-------|-------------|-------|-------|
| | Inches | | Millimeters | | |
| | 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 | |
| LU | | .188 | | 4.78 | 4 |