1500 Watt Low Voltage Transient Voltage Suppressor Data Sheet

1N5907

Product Overview

This unidirectional low voltage Transient Voltage Suppressor (TVS) device for the 1N5907 JEDEC registration has a high peak pulse power rating of 1500 W with extremely fast response times. The 1N5907 is available in a military qualified version per MIL-PRF-19500/500 as described in Figure 1. It's most often used for protecting against transients from inductive switching environments, induced RF effects, or induced secondary lightning effects as found in surge levels of IEC61000-4-5 described herein. It's also very successful in protecting airborne avionics and electrical systems when low voltage is required. Since their response time is virtually instantaneous, they can also protect from ESD and EFT per IEC61000-4-2 and IEC61000-4-4.

Features

- Unidirectional TVS for though-hole mounting
- Suppresses transients up to 1500 W at 10/1000 µs in less than 100 ps.
- Low working voltage (V_{WM}) of 5 V
- Hermetic sealed DO-13 metal package for 1N5907
- JAN/TX/TXV military qualification available for 1N5907 per MIL-PRF-19500/500 by adding JAN, JANTX, or JANTXV prefix. For example, JANTXV1N5907.
- Further options for screening in accordance with MIL-PRF-19500 for JANS equivalent level by using a "MS" prefix.
- Surface-mount equivalent packages also available as SMCJ5.0 or SMCG5.0 in separate data sheet (consult factory for other surface-mount options).

Applications

- Protection from switching transients and induced RF
- Protects TTL, ECL, DTL, MOS, MSI, and other integrated circuits requiring 5.0V or lower power supplies.
- Protection from ESD and 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 through 4
- Secondary lightning protection per IEC61000-4-5 with 12 Ohms source impedance: Class 1 through 4
- Secondary lightning protection per IEC61000-4-5 with 2 Ohms source impedance: Class 2 and 3
- 1N5907 inherently radiation hard as described in MicroNote 050

Figure 1. DO-13 (DO-202A)

1. Maximum Ratings

- 1500 W for 10/1000 µs at lead temperature (T_L) 25 °C (See Figure 3-1, Figure 3-2, and Figure 3-4) with repetition rate of 0.01% or less
  - 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).
- Operating and storage temperatures: -55 °C to +175 °C for 1N5907
- Thermal resistance (junction to lead): 50 °C/W for 1N5907
- Thermal resistance (junction to ambient): 110 °C/W for 1N5907
- DC Power Dissipation (1N5907): 1 W at $T_L \leq$125 °C 3/8" (10 mm) from body, or 1 W at $T_A \leq$+65 °C when mounted on FR4 PC board as described for thermal resistance junction to ambient
  - 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).
- Forward surge current: 200 A for 8.3 ms half-sine wave at T_A = +25 °C
- Solder temperatures: 260 °C for 10 s (maximum)

1.1 Mechanical and Packaging

- Case (1N5907): DO-13 (DO-202AA) welded hermetically sealed metal and glass
- Finish: External metal surfaces are tin/lead (Sn/Pb) plated and solderable per MIL-STD-750 method 2026.
- Polarity: Polarity indicated by diode symbol or cathode band (cathode connected to case for 1N5907)
- Marking: Part number and polarity symbol
- Weight: Approximately 1.4 grams
- Tape and reel option: Standard per EIA-296 (add "TR" suffix to part number)
- See Package Dimensions.

2. Symbols and 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 3-2)
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 ($V_{(BR)}$)

2.1 Electrical Characteristics

JEDEC Type No.	Reverse Standoff Voltage V_{WM}[1]	Minimum Breakdown Voltage $V_{(BR)}$ at 1 mA	Maximum Standby Current I_D at V_{WM}	Maximum Clamping Voltage V_C at I_{PP1} (Figure 3-3)	Peak Pulse Current I_{PP1} (Figure 3-3)	Maximum Clamping Voltage V_C at I_{PP2} (Figure 3-3)	Peak Pulse Current I_{PP2} (Figure 3-3)	Maximum Clamping Voltage V_C at I_{PP3} (Figure 3-3)	Peak Pulse Current I_{PP3} (Figure 3-3)
	V	V	µA	V	A	V	A	V	A
1N5907[2]	5.0	6.0	300	7.6	30	8.0	60	8.5	120

Notes:

1. A TVS is normally selected according to the reverse "Standoff Voltage" V_{WM} which should be equal to or greater than the dc or continuous peak operating voltage level.
2. Also available in military qualified types with a JAN, JANTX, or JANTXV prefix per MIL-PRF-19500/500.

3. Performance Curves

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

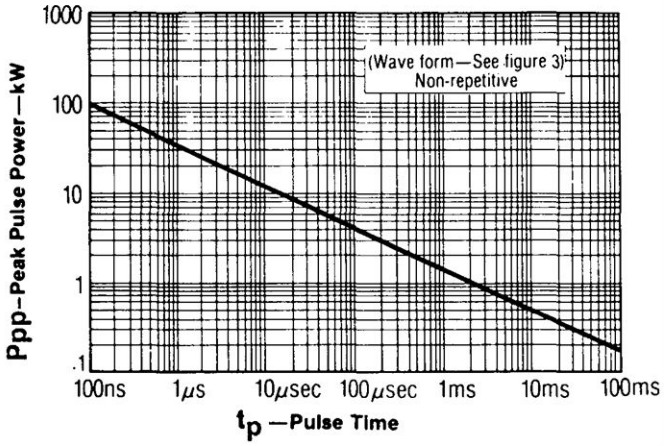


Figure 3-2. Derating Curve

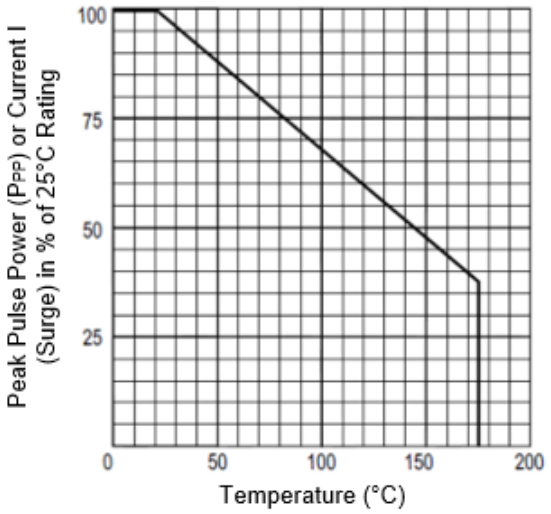


Figure 3-3. Pulse Waveform

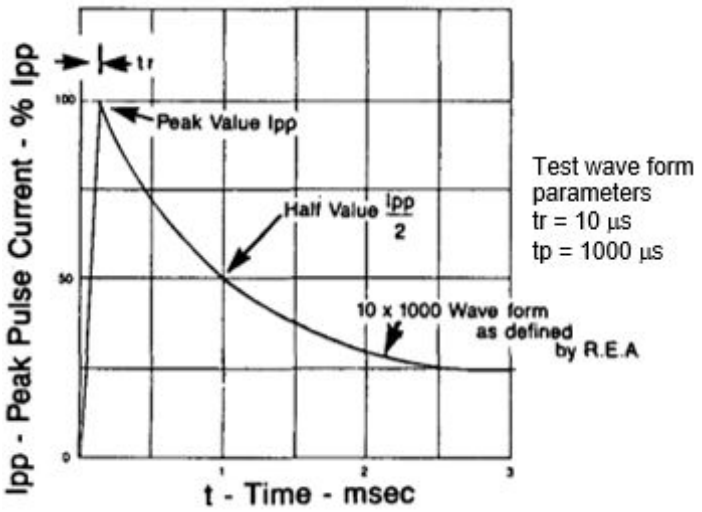
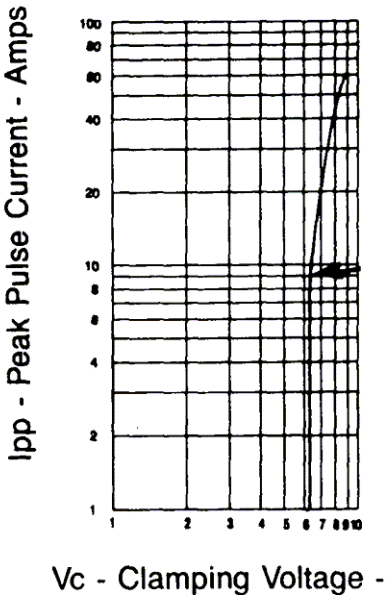


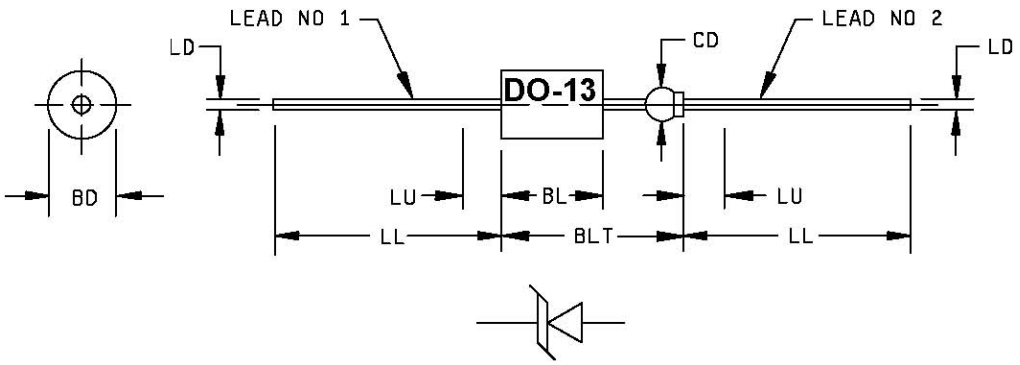
Figure 3-4. Typical Clamping Voltage ($V_{C)}$ vs. Peak Pulse Current (I_{PP})



4. Package Dimensions

Dimensions are in inches. Millimeters are given for general information only. Lead 1 (cathode) shall be electrically connected to the case. In accordance with ASME Y14.5M, diameters are equivalent to φx symbology.

Figure 4-1. Physical Dimensions (DO-13)



	Inch		Millimeters		Notes
	Min	Max	Min	Max	
BD	0.215	0.235	5.46	5.97	
BL	0.293	0.357	7.44	9.07	1
BLT		0.570		14.48	
CD	0.045	0.100	1.14	2.54	3
LD	0.025	0.035	0.64	0.89	
LL	1.000	1.625	25.40	41.28	2
LU		0.188		4.78	2

Notes:

1. The major diameter is essentially constant along its length.
2. Within this zone, diameter may vary to allow for lead finishes and irregularities.
3. Dimension to allow for pinch or seal deformation anywhere along tubulation.

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	Converted document to Microchip template.

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