TRANSIENT VOLTAGE SUPPRESSORS

TVS305-TVS430
TVS505-TVS528

4

FEATURES

- Up to 500W for 1mS Pulse Power Capability
- Clamping Time in Picoseconds
- Direct Applicability for all popular Microprocessors and IC families
- Metallurgically bonded assembly system to assure long term reliability
- Miniature glass encased hermetically sealed package

DESCRIPTION

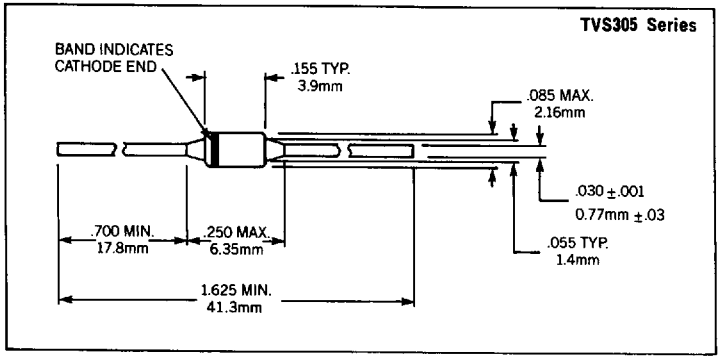
Microsemi's TVS series of transient voltage suppressors feature oxide passivated zener type chips with full-faced metallurgical bonds on both sides to achieve high surge capability and negligible electrical degradation under repeated surge conditions. The series is especially useful in protecting microprocessor, MOS, CMOS, TTL, ECL,I²L and linear integrated circuits from spurious transient disturbances.

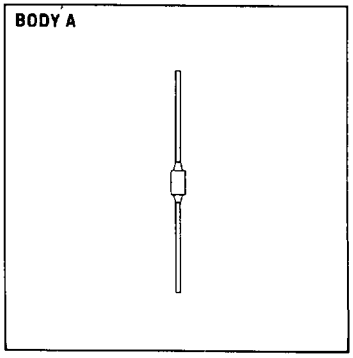
ABSOLUTE MAXIMUM RATINGS @ 25°C

	TVS305-TVS430	TVS505-TVS528
Stand-off Voltage, V_R	5 to 300V	5.0V to 28.0V
Peak Pulse Power (1mS)*	150W	500W
Forward Surge Current (8.3mS half sinewave)	15A	50A
Peak Pulse Current	See Table	See Table
Breakdown Voltage	See Table	See Table
Power, Continuous	3W	5W
Storage and Operating Temperature	−65 to +175°C	−65 to +175°C

*See Figures 3 and 4 for Peak Pulse Power vs Pulse Duration.

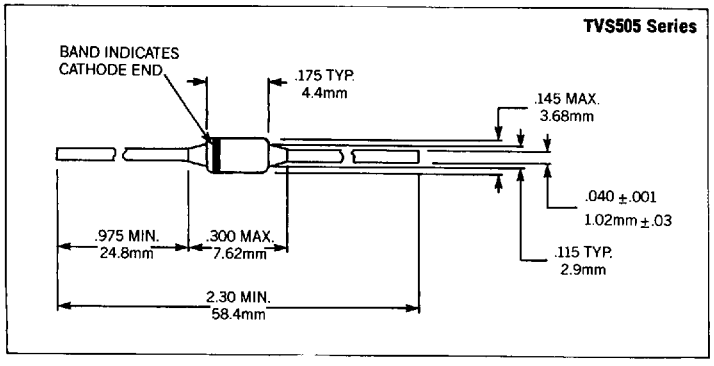
MECHANICAL SPECIFICATIONS

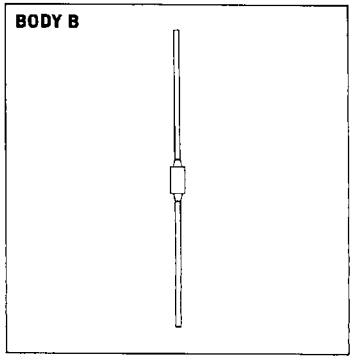




THESE DEVICES ALSO AVAILABLE IN SURFACE MOUNT PACKAGE. SEE SECTION 10

MECHANICAL SPECIFICATIONS





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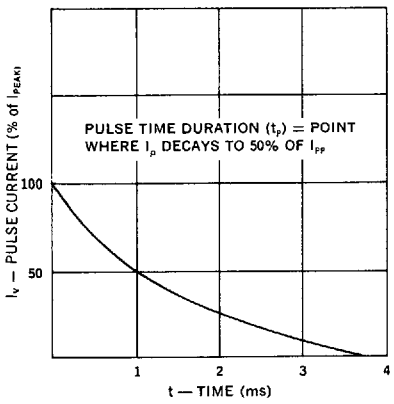
Microsemi Corp.
Watertown
The diode experts

ELECTRICAL SPECIFICATIONS @ 25°C

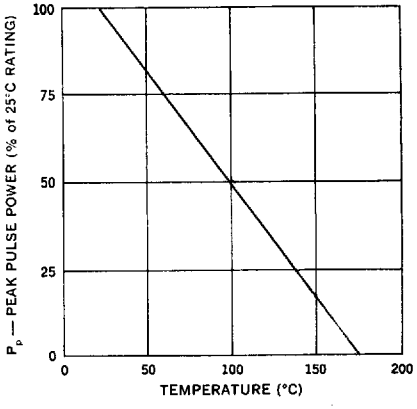
TVS Part No.	Stand -Off Voltage V_R	Min. Breakdown Voltage $BV_{(min)}$ @ 1mA	Max. Leakage Current I_R @ V_R	Max. Peak Pulse Current* I_{PP}	Max. Clamping Voltage* V_C @ I_{PP}	Max. Clamping Voltage* V_C @ 1A	Max. Clamping Voltage* V_C @ 5A	Max. Clamping Voltage* V_C @ 10A
	V	V	μA	A	V	V	V	
TVS305	5.0	6.0	50	17	8.7	—	—	—
TVS310	10.0	11.1	2	8.9	16.8	—	—	—
TVS312	12	13.8	1	7.1	21.0	—	—	—
TVS315	15	16.7	1	5.9	25	—	—	—
TVS318	18	20.4	1	4.9	31	—	—	—
TVS324	24	28.4	1	3.6	42	—	—	—
TVS328	28	30.7	1	3.2	46	—	—	—
TVS348	48	54	1	1.7	82	—	—	—
TVS360	60	67	1	1.4	105	—	—	—
TVS410	100	111	1	.91	160	—	—	—
TVS420	200	234	1	.42	360	—	—	—
TVS430	300	342	1	.28	520	—	—	—
TVS505	5.0	6.0	300	53.7	9.3	7.4	—	7.9
TVS510	10.0	11.1	5	30.3	16.5	13.2	—	14.4
TVS512	12.0	13.8	5	23.8	21.0	16.5	—	18.5
TVS515	15.0	16.7	5	19.8	25.2	19.7	—	22.2
TVS518	18.0	20.4	5	16.3	30.5	23.8	26.0	—
TVS524	24.0	28.4	5	11.9	42.0	32.4	37.0	—
TVS528	28.0	30.7	5	10.7	46.5	35.9	41.0	—

*For 1mS pulse: see Figure 1.

1. Pulse Waveform



2. Derating Curve



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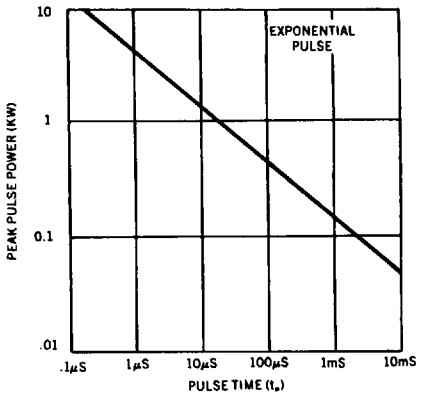
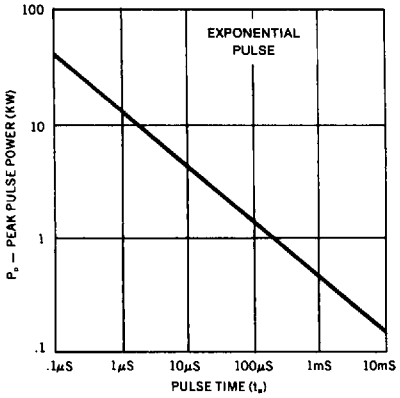
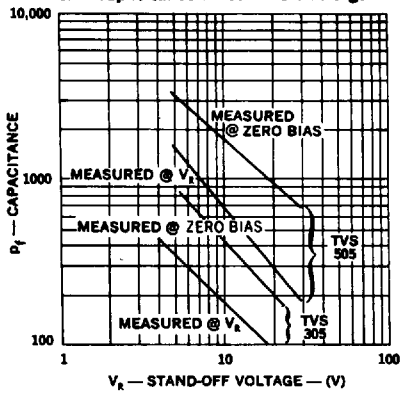
3. Peak Pulse Power vs. Pulse Duration



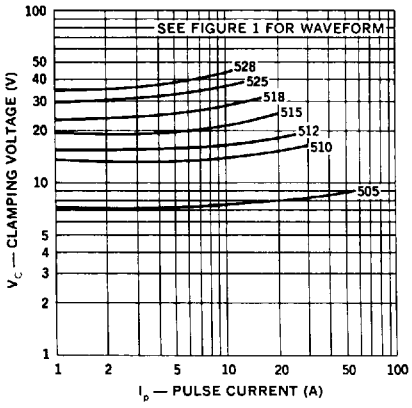
4. Peak Pulse Power vs. Pulse Duration



5. Capacitance vs. Stand-Off Voltage



6. Clamping Voltage vs. Pulse Current



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CHOOSING AND SPECIFYING THE PROPER TVS

The following terms are generally used in specifying Transient Voltage Suppressors (TVS):

1. Stand-off Voltage (V_R) is the highest reverse voltage at which the TVS will be non-conducting.
2. Minimum Breakdown Voltage (BV min) is the reverse voltage at which the TVS conducts 1 milli-amp. This is the point where the TVS begins to limit the transient.
3. Maximum Clamping Voltage (V_C max) is the maximum voltage the TVS will allow during a transient "spike."

Figure 7 graphically shows all three terms.

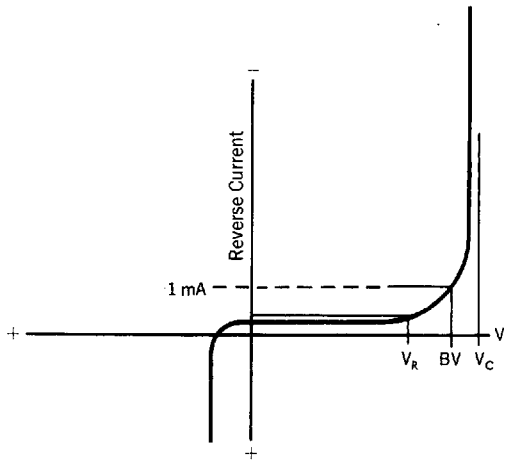

Figure 7

The three most important factors in choosing the appropriate TVS for an application in their order of importance are:

1. Pulse power (P_P) — Choose the TVS series that will handle the Transient Pulse Power. Transient Pulse Power is equal to the clamping voltage (V_C) times the peak pulse current (i_{PP}). The pulse duration vs. pulse power graph on the TVS data sheet can then be used to determine the maximum allowable pulse duration. (Figure 3 or 4).
2. Standoff voltage (V_R) — From the TVS series selected, choose the device with the stand-off voltage equal to or greater than the normal circuit operating voltage.
3. Maximum Clamping Voltage (V_{CMAX}) — Determine the clamping voltage of the device chosen for the transient given and be sure it is below the voltage that might damage any components.

RoHS / Pb-free Strategy - Lawrence

In the challenge to meet the RoHS guidelines and to understand the impact while simultaneously assuring our Military and Aerospace customers that reliability will not compromised, it is necessary to first separate the Military Products lines from the Commercial Products lines and from the Industrial Products lines which are derived from Military Products.

The Military Products Lines

Military Products, Tin-Lead Terminal Finish
Semiconductor products manufactured for the US Government and its various defense contractors have specific guidelines pertaining to terminal and case finish. The use of pure tin is forbidden at this time for Military products and we currently supply a Sn10Pb finish. Therefore, it is not yet possible to buy Military Products from Microsemi Lawrence that are RoHS compliant if that finish currently calls for the use of tin-lead alloy. Typically, the JAN, JANTX, JANTXV, and JANS prefix identifies these.

Customers that require RoHS commercial versions of product from these lines employing Sn10Pb finish can specify such product by amending the part number by adding the suffix “e3” on the purchase order. For example, 1N5819 becomes 1N5819e3. This JESD97 code signifies a pure tin finish which, in this case, will be matte tin electroplate. Due to package size restrictions, the “e3” may be missing from the package itself but it will be documented in the paperwork.

Microsemi will continue to support all our Military customers and supply tin-lead surface finish on these products until the Military

requests and authorizes a change.

Military Products, Gold Terminal Finish
Military components with gold plated finishes are already RoHS compliant. Since many customers request having these lead finishes hot solder dipped, it may be necessary to assure RoHS compliance by specifically asking that no hot solder that no hot solder dip be used. This would address previous inventory that may already have a tin-lead solder dip. This is the only flexibility afforded to us by the Defense Supply Center in Columbus, Ohio (DSCC). No product can be shipped with any JAN or DSCC designation unless complaint fully to government specifications.

Customers that require RoHS commercial versions of products from these lines employing a gold finish can specify such a product by amending the part number by adding the suffix “e4” on the purchase order. For example, 2N2222A becomes 2N2222Ae4. This JESD97 code signifies a noble metal finish which, in this case, would be gold electroplate. Due to package size restrictions, the “e4” may be missing from the package itself but it will be documented in the paperwork.

Microsemi will continue to support all our Military customers and supply hot solder dip surface finish on these products until the Military requests and authorizes a change.

Commercial and Industrial Product Lines

Commercial Products
Pure tin is allowed and is, in fact, being embraced by most commercial suppliers. To this end, Microsemi will be supplying 100% pure matte tin plate including a 150°C 1hr anneal to fully stabilize the finish. Most of our true commercial products are already converted or are being quickly converted to matte tin finish at our other divisions. Lawrence has very little product in this commercial category at the moment but that will change as our commercial lines expand. These parts would be designated with the “e3” suffix using the same restrictions previously mentioned.

Industrial Products
This category applies to commercial product that are derived from or otherwise take from Military Product lines. These may already have been plated to comply with Military Product requirements and, thus, contain some lead in the finish. For these products, Microsemi is free from any Military restrictions to strip the old lead-bearing finish and replace it with the 100% matte tin finish. A minimum order would be required due to capacity requirements of the various plating and stripping equipment. These parts would be designated with the “e3” suffix using the same restrictions previously mentioned.

Chip-Only Products

Chip Products

All chip sales, whether Military, Commercial, or Industrial are naturally RoHS compliant. Typically backside metallization is either silver or gold and the front metallization is either silver or aluminum. The chips are made of silicon. This description covers virtually all the chips made in the Microsemi Lawrence Division. There are no part number changes required nor provided.