

**DESCRIPTION**

The “FemtoFarad” product family is specifically designed to protect sensitive electronic circuits from the threat of electrostatic discharge (ESD). “FemtoFarad” products react almost instantly to the transient voltage and effectively clamp it below 60 V, meaning less voltage stress during the clamp period and greater IC protection. The design of “FemtoFarad” products inherently produces a low capacitance part. In the off-state “FemtoFarad” is virtually invisible to the circuit. Installed from signal line to ground, the “FemtoFarad” device exhibits a high impedance and low capacitance that makes it transparent to high-speed digital circuits. Signals are not distorted or disrupted.

With “FemtoFarad” devices, waveform definition stays true and high-speed signals do not suffer. “FemtoFarad” products utilize a unique polymer-based material. The nature of the material creates a bi-directional part, which means that only one device is required to provide complete ESD protection regardless of the surge polarity. The combination of this material with proven thick film on ceramic technology produces a reliable, surface mount product that will help protect mobile communications, computers, data processing, test equipment, and many other electronic applications from EDS.

**KEY FEATURES**

- Exceeds testing requirements outlined in IEC 61000-4-2
- Extremely low capacitance
- Very low leakage current
- Fast response time
- Bi-directional
- Surface mount
- Nickel & Tin/Lead plated

**APPLICATIONS/BENEFITS**

- GaAs & InGaAs Photodetector protection
- InGaP HBT Power Amplifier Protection
- High Speed Data Line Protection
- Mobile Phone ESD protection

**IMPORTANT:** For the most current data, consult MICROSEMI's website: <http://www.microsemi.com>

**Part Ratings and Characteristics**

Performance Characteristics	Min	Typ	Max	Units
Continuous operating voltage	-	-	6	VDC
Clamping voltage <sup>1</sup>	-	35	60	V
Trigger voltage <sup>2</sup>	-	150	300	V
ESD voltage capability <sup>4</sup>	-	8	15	kV
Capacitance (@ 1 MHz)	-	0.25	1	pF
Leakage current (@ 6 VDC)	-	<10	<100	nA
Peak current <sup>1,4</sup>	-	30	45	A
Operating temperature	-40	+25	+85	°C
ESD pulse withstand <sup>1,3</sup>	20	-	-	# pulses

**Notes:**

1. Per IEC 1000-4-2, 30A @ 8kV, level 4, clamping measurements made 30 ns after initiation of pulse, all tests in contact discharge mode.
2. Trigger measurement made using TLP method (see page5).
3. Parts will remain within the specifications listed in the above table after a minimum of 20 ESD pulses.
4. TVSF1206 devices are capable of with-standing up to a 15 kV, 45 A ESD pulse. Device ratings are given at 8 kV per Note 1 unless otherwise specified.

**Environmental Specifications;**

- Humidity, steady state: MIL-STD-202F, Method 103B, 90-95% RH, 40°C, 96 hrs.
- Thermal shock: MIL-STD-202, Method 107G, -65°C to 125°C, 30 min. cycle 5 cycles
- Vibration: MIL-STD-202F, Method 201A, (10 to 55 to 10 Hz, 1 min. cycle, 2 hrs each in X-Y-Z)
- Chemical resistance: ASTM D-543, 24 hrs @ 50°C, 3 solutions (H<sub>2</sub>O, detergent solution, defluxer)
- Full Load voltage: 24 VDC, 1000 hrs, 25°C
- Solder leach resistance and terminal adhesion: Per EIA-576
- Solderability: MIL-STD-202, Method 208 (95% coverage)





TRANSIENT PROTECTION PRODUCTS

TVSF1206

“FemtoFarad Polymer ESD Suppressor

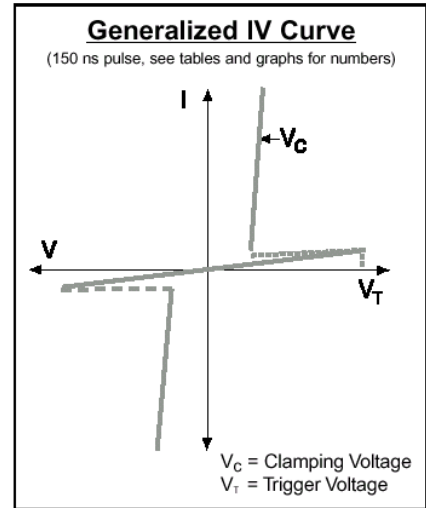
PRODUCT PREVIEW

**Definition of Terms:**

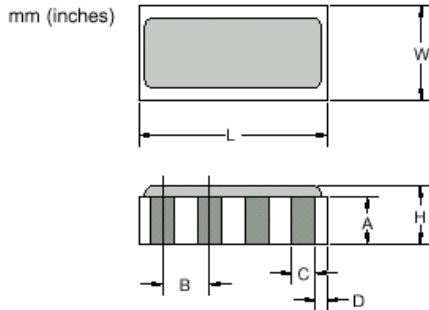
**Clamping Voltage** – The voltage at which the “FemtoFarad” device stabilizes during the transition from high to low impedance. This is the voltage experienced by the circuit, after stabilizing, for the duration of the ESD transient.

**Trigger Voltage** – The voltage at which the “FemtoFarad” device begins to function. When the ESD threat voltage reaches this level, the “FemtoFarad” device begins the transition from high impedance to low impedance, shunting the ESD energy to ground.

**Threat Voltage** – The voltage that the test equipment is set to operate (i.e. the voltage across the discharge capacitor).



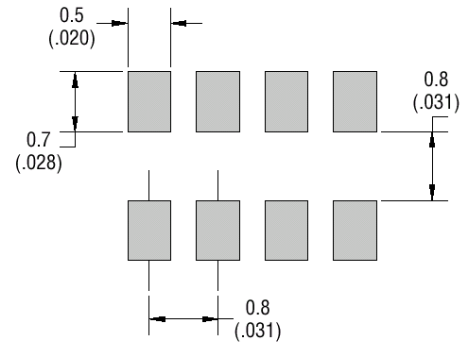
**Product Dimension**



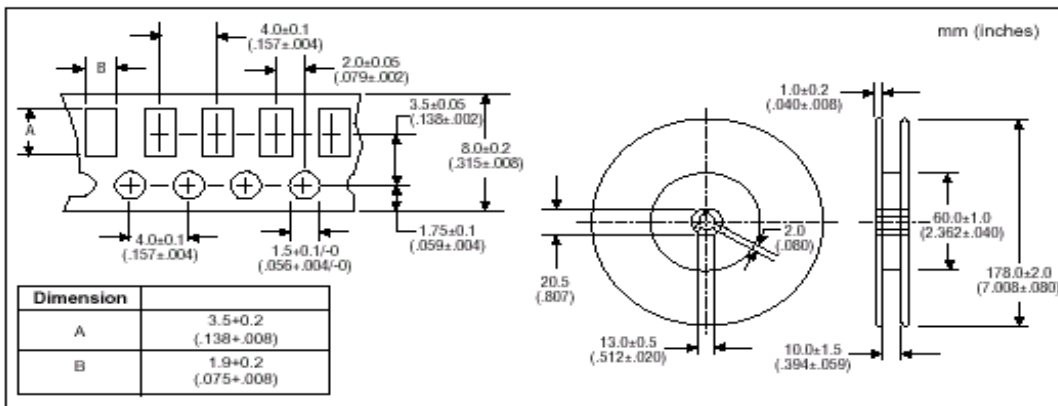
L	W	H	A	B	C	D
3.2±0.2 (.126±.008)	1.6±0.2 (.063±.008)	0.8 max (.032 max)	0.4±0.05 (.016±.002)	0.8 Typ. (.031 Typ.)	0.4 Typ. (.016 Typ.)	0.2±0.1 (.008±.004)

**Recommended Solder Pad Outline**

(per IPC-SM-782)

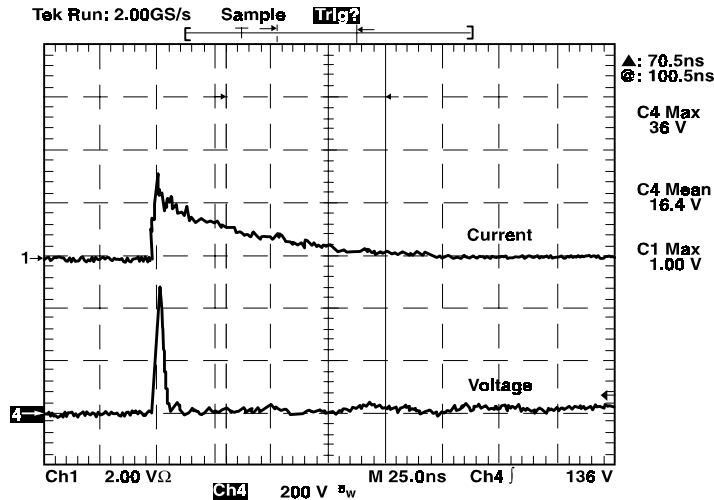


**Tape-and-Reel Specification**

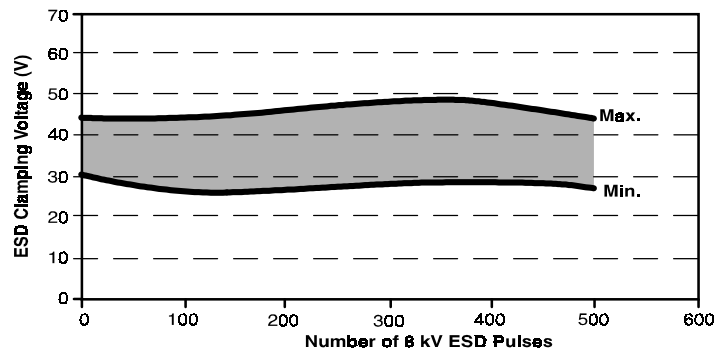


**"FemtoFarad" TVSF1206 Device Performance**

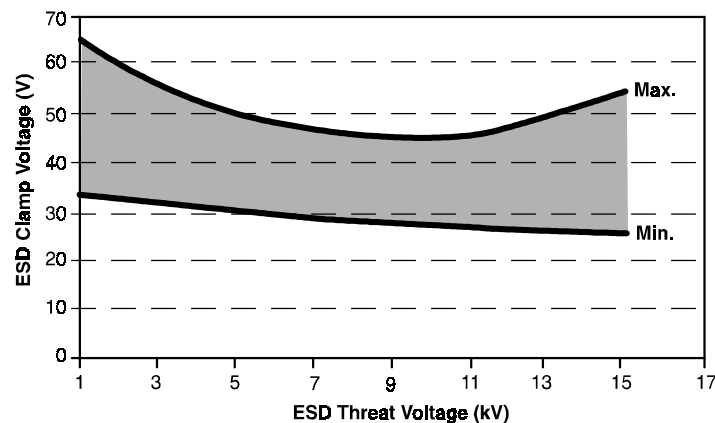
**Typical Device Response to 8kV ESD**

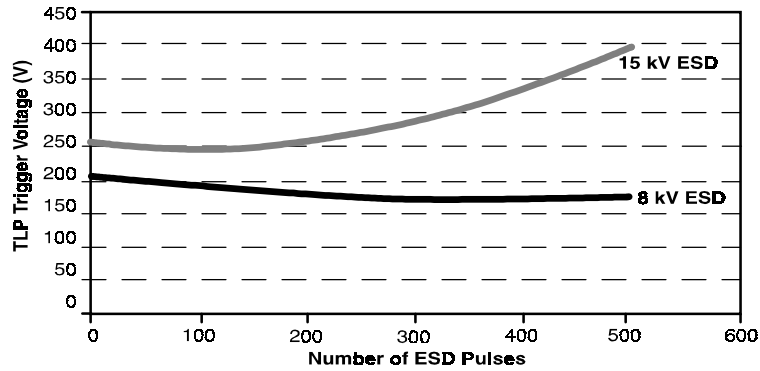
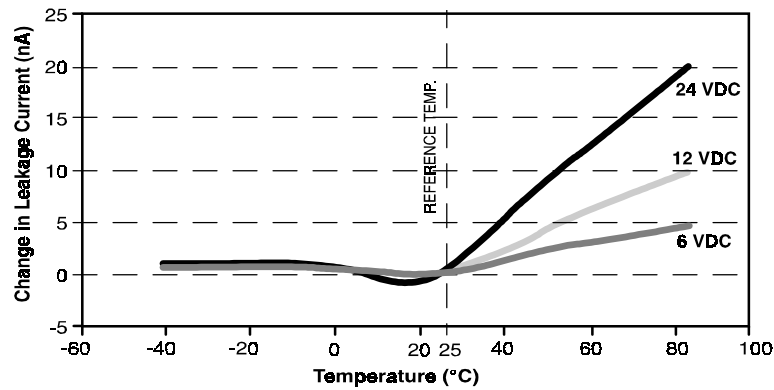
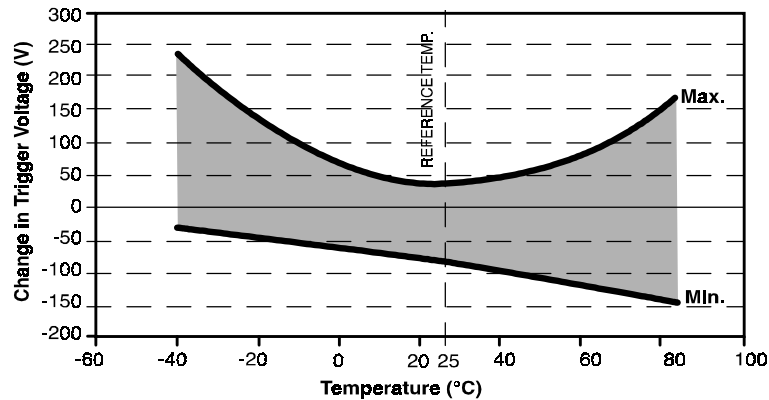


**ESD Clamping Voltage vs. Number of 8 kV ESD Pulses**



**ESD Clamp Voltage vs. ESD Threat Voltage**



**"FemtoFarad" TVSF1206 Device Performance**
**Average TLP Trigger Voltage vs. Number of ESD Pulses**

**Average Leakage Current vs. Temperature**

**Change in TLP Trigger vs. Temp.**


**Test Methodology**

Full product characterization requires testing in a variety of scenarios. Different test methods reveal unique information about the device response. Evaluating the results for all of the tests is crucial to fully understanding the device operation. Two different test methods have been employed to understand the “FemtoFarad” device response to an over voltage event.

**Electrostatic Discharge (ESD) pulse**

The ESD pulse is the defining test for an ESD protective device. The ESD pulse is an extremely fast rising transient event. The pulse is characterized in IEC 1000-4-2, has arise time of less than 1 ns, peak currents up to 45 A, and voltage levels to 15kV. Characteristics determined by this test are those such as voltage overshoot, peak voltage, clamping voltage, and peak current.

Due to the extremely fast rate of rise of the ESD pulse, the test setup can have a definite impact on the above factors. Variable such as wiring inductance and probe capacitance can produce inaccurate readings on an otherwise capable oscilloscope.

**Transmission Line Pulse (TLP)**

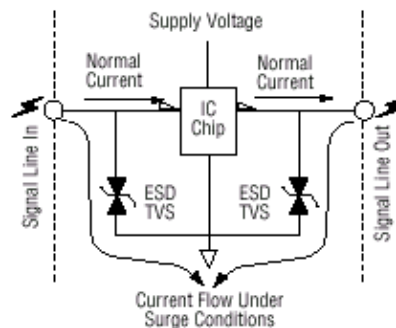
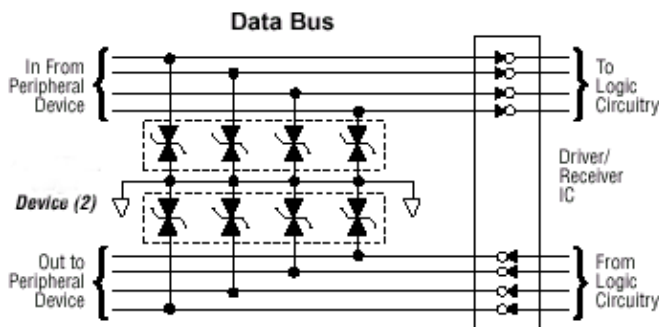
The transmission line tester implements a controlled impedance cable to deliver a square wave current pulse. The advantage of this technique is that the constant current of the square wave allows the behavior of the protection structure to be more studied.

The actual implementation of this technique produces a waveform that has a slightly slower rise time than the ESD pulse but can be correlated to deliver approximately the same surge current and energy. This controlled impedance pulse provides a more accurate depiction of the trigger voltage of the device because of the reduced voltage overshoot caused by a fast rising transient and the reactive components of the test fixture.

**Device Application**

TVSF1206 “FemtoFarad” devices are applicable to signal line circuits. It is applied in a shunt-connected manner. These devices are not applicable on line where lightning or load switching transients are present. The devices are ideal for use in computers and computer-related equipment, such as modems, keyboards, and printers. The TVSF devices are also well suited for portable electronic equipment such as mobile telephones, test equipment, and card scanners.

**Typical Applications**





TRANSIENT PROTECTION PRODUCTS

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PRODUCT PREVIEW

### Device Markings

TVSF1206 devices are not marked. There are no distinguishing characteristics within the product family, other than package sizes, that require differentiation at this time.

### Processing Recommendations

TVSF1206 devices currently have a convex profile on the top surface of the part. This profile is a result of the construction of the device. TVSF1206 devices can be processed using standard pick-and-place equipment. The placement and processing techniques for TVSF1206 devices are similar to those used for chip resistor or chip capacitors.