

MicroNote 123

Effective Use of Space Saving TVSArrays

By Mel Clark

With the continual downsizing of electronic apparatus for improving and expanding performance, Microsemi has kept pace by expanding its offering of surface mount TVSArray transient voltage suppressor (TVS) devices. Twenty separate families of TVSArrays are available in three package types, including the SOT-143, SO-8, and SO-16. These include TVSs for unidirectional and bidirectional protection, which are intended for protecting from electrostatic discharge and low levels of induced lightning.

Device Description

Most TVSArrays are rated for 300 W and 8/20 μ s with a maximum pulse repetition rate of 0.01%. Operating voltages are available for 3.3 V, 5 V, 12 V, 15 V, and 24 V, which are most in demand. With a few exceptions, low-capacitance devices are designated with an "LC" in the part number, and bidirectional devices are identified with a "C" suffix.

Summarizing the significant electrical and mechanical characteristics, [Table 1 \(see page 2\)](#) has been compiled for quick identification and selection of TVSArrays for your application. For complete data on each part, plug into our website at <https://www.microsemi.com/>.

Electrical Performance

A large selection of TVSArray products is available to the user; they can choose from a variety of circuit protection options. Up to seven lines can be protected from ESD inductive load switching, or low levels of induced lightning, with a single SO-8 package. The SO-8 protects two high-speed data lines or up to seven lines for bidirectional signals. The USB04XXC in the SOT-143 is ideal for protection across a high data rate single wire, such as a coax cable. The SO-16 packages will protect up to eight lines offering unidirectional or bidirectional protection. For protection across fast data rate lines, LoCap TVSArrays in the SO-16 accommodate up to four wires.

SO-8 and SO-16 TVSArrays are intended for high density packaging in present and future designs. This series has been built to withstand transient surges as defined in IEC 1000-4-2 for ESD and electrical fast transients per IEC 1000-4-4. Electronic apparatus must meet the surge requirements of these specs to be certified for the European Community market. The SMDB series is rated for 10 A of induced lightning at 8/20 μ s, and the SMDA series is rated for 5 A, 8/20 μ s. An exception to the power rating is the SMP6LC6.5, rated for 600 W at 10/1000 μ s, which is designed for use in more severe telecom environments.

Applications

In addition to general use in meeting the IEC specifications listed above, Microsemi's TVSArrays protect from transient voltages encountered in all hand held equipment including data logging systems, palm top and laptop computers, computer peripherals, modems, and RF amplifiers. One use is protecting CATV line extenders with USB50805C TVSArrays.

Unidirectional TVSs are designed to operate with positive going signals and voltages only. Bidirectional devices, on the other hand, have a "C" suffix and are bilaterally symmetrical for positive and negative voltage excursions.

A word of caution: ESD can easily radiate through unshielded or poorly shielded enclosures, and interconnecting wiring often causes upset, like data corruption. A TVS cannot provide protection from radiated ESD that can bypass the protector element. Relatively low voltages (between 1 kV and 3 kV) are the most troublesome, because their rise-times are exceedingly fast—as low as 100 ps. The writer has had many experiences in which radiation of low-level ESD was ultimately found to be responsible for system upset. Adequate shielding restored normal performance.

For dimensions, lead configurations, mechanical outlines, and specific electrical parameters, please refer to the individual datasheets on our website at <https://www.microsemi.com/>. To convert the generic types listed in the table below to a specific part, substitute the device operating voltage (e.g. SMDA05 for the "XX", to designate a component having a 5 V operating voltage, or SMDA12 for 12 V operating, etc.)

Table 1: TVSArrays Selection Guide

Device Family	Package	Power (W)	Lines Protected	Unidirectional	Bidirectional	Capacitance (pF)
SMDAXX	SO-8	300	4	X		
SMDBXX	SO-8	500	4	X		
SMDAXXC	SO-8	300	4		X	
SMDBXXC	SO-8	500	4		X	
SMDAXXC-4	SO-8	300	4		X	
SMDAXXC-4-2	SO-8	300	4		X	
SMDAXXC-5	SO-8	300	5		X	
SMDAXX-6	SO-8	300	6	X		
SMDAXXC-7	SO-8	300	7		X	
SM8LCXX	SO-8	500	2		X	25
USB504XXC	SOT-143	300	1		X	5
USB508XXC	SO-8	300	2		X	5
SMDAXXC-8	SO-14	300	8		X	
SM16XX	SO-16	300	8	X		
SM16XXC	SO-16	300	8		X	
SM16LCXXC	SO-16	300	8		X	25
SM16LCXXC-6	SO-16	300	6		X	25
SM16LCXX	SO-16	300	6	X		
SMP6LC6.5	SO-16	600	2		X	30

Support

For additional technical information, please contact Design Support at:

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