

MicroNote 107

Cross Referencing TVS Devices

By Mel Clark and Kent Walters

This note is intended to clarify the confusion that exists in silicon transient voltage suppressor (TVS) nomenclature and to provide guidance for cross-referencing. Examples will illustrate the selection process for choosing equivalent or near equivalent parts.

Some series have their part numbers based on the nominal breakdown voltage ($V_{(BR)}$) of the device while others are based on the rated working voltage (V_{WM}). Examples of both numbering systems include the P6SMB6.8 Motorola series, based on a nominal ($V_{(BR)}$), and the Microsemi SMBJ5.0 series, which is based on V_{WM} . Both of these devices are surface mount types rated for 600 W of peak pulse power (P_{PP}). cross-referencing is normally applicable only for devices of the same (P_{PP}) rating for equivalent TVS performance levels.

Initially, TVS device offerings were identified by part numbers based on breakdown voltage ($V_{(BR)}$). Subsequent product introductions were then labeled with the more practical working/operating voltage (V_{WM}) base. With the V_{WM} value integrated into the part number, a design engineer could more easily identify and select the part best suited for his/her application. A major advantage to using the V_{WM} based nomenclature is that the minimum V_{BR} and V_{WM} are identical for $\pm 5\%$ and $\pm 10\%$ tolerance parts. Hence, the $\pm 10\%$ part becomes a candidate for substitution as a $\pm 5\%$ device if required and may even provide a more permanent, cost-effective solution.

The first parameter to match in selecting an equivalent is the minimum breakdown voltage ($V_{(BR)}$), since most other ratings correlate well with this characteristic. Then check the fit of V_{WM} , peak pulse current (I_{PP}), and maximum clamping voltage (V_C). For example, selecting a replacement for the Motorola P6SMB10A, 10 V nominal $V_{(BR)}$, 600 W surface mount package part with a Microsemi equivalent is shown below:

Part Number	Min ($V_{(BR)}$)	(V_{WM})	(V_C) @ (I_{PP})	(I_{PP})
Motorola P6SMB10A	9.5 V	8.55 V	14.5 V	41 A
Microsemi Equivalent SMBJ8.5A	9.44 V	8.5 V	14.4 V	41.7 A

Note that the electrical parameters of the Microsemi part match very closely and are well within the needs for circuit performance and protection requirements. Both parts share essentially the same electrical characteristics and DO-214AA package outline although they are marked with different labels. This exercise in equivalent selection provides guidance to the user in choosing alternative sources and also allows for a broader supplier base.

cross-referencing is also required in converting from thru-hole to surface mount technology since most axial leaded part numbers are based on $V_{(BR)}$, while most surface mounts are based on V_{WM} . Illustrated below is an example cross-referencing an axial lead 1.5 kW device for operating in a 36 V circuit to an electrically equivalent surface mount chosen from the Microsemi Product Data Book.

Part Number	Min ($V_{(BR)}$)	(V_{WM})	(V_C) @ (I_{PP})	(I_{PP})
1.5KE43A	40.9 V	36.8 V	59.3 V	25.3 A
SMCJ36A	40.0 V	36.0 V	58.1 V	25.8 A

Here we show that the SMCJ36A surface mount is an acceptable electrical replacement for the axial leaded 1.5KE43A. In this example, the minimum $V_{(BR)}$ of the SMCJ36A compared favorably with that of the 1.5KE43A for matching. Subsequently, the remaining parameters were also a close match for the same 1.5 kW device rating.

Some parameters match more closely than others. In most cases, especially for ESD protection, the V_{WM} can be as high as 15 V for a 5 V operating circuit and still provide good performance. This has been proven in volume production.

In the event that a perfect match cannot be made, integrated circuits are normally quite forgiving for very short duration pulses, even though a substitute TVS may clamp a few volts higher. If you need additional guidance in cross-referencing devices or in selecting a TVS for your application, please contact your Microsemi sales representative.

Support

For additional technical information, please contact Design Support at:
<http://www.microsemi.com/designsupport>
 or
 Kent Walters (kwalters@microsemi.com) at 480-302-1144



Microsemi Corporate Headquarters

One Enterprise, Aliso Viejo,
 CA 92656 USA
 Within the USA: +1 (800) 713-4113
 Outside the USA: +1 (949) 380-6100
 Fax: +1 (949) 215-4996
 Email: sales.support@microsemi.com
www.microsemi.com

© 2018 Microsemi Corporation. All rights reserved. Microsemi and the Microsemi logo are trademarks of Microsemi Corporation. All other trademarks and service marks are the property of their respective owners.

Microsemi makes no warranty, representation, or guarantee regarding the information contained herein or the suitability of its products and service for any particular purpose, nor does Microsemi assume any liability whatsoever arising out of the application or use of any product or circuit. The products sold hereunder and any other products sold by Microsemi have been subject to limited testing and should not be used in conjunction with mission-critical equipment or applications. Any performance specifications are believed to be reliable but are not verified, and Buyer must conduct an complete all performance and other testing of the products, alone and together with, or installed in, any end-products. Buyer shall not rely on any data and performance specifications or parameters provided by Microsemi. It is the Buyer's responsibility to independently determine suitability of any products and to test and verify the same. The information provided by Microsemi hereunder is provided "as is, where is" and with all faults, and the entire risk associated with such information is entirely with the Buyer. Microsemi does not grant, explicitly or implicitly, to any party any patent rights licenses, or any other IP rights, whether with regard to such information itself or anything described by such information. Information provided in this document is proprietary to Microsemi, and Microsemi reserves the right to make any changes to the information in this document or to any product and services at any time without notice.

Microsemi Corporation (Nasdaq: MSCC) offers a comprehensive portfolio of semiconductor and system solutions for aerospace & defense, communications, data center and industrial markets. Products include high-performance and radiation-hardened analog mixed-signal integrated circuits, FPGAs, SoCs and ASICs; power management products; timing and synchronization devices and precise time solutions, setting the world standard for time; voice processing devices; RF solutions; discrete components; enterprise storage and communication solutions; security technologies and scalable anti-tamper products; Ethernet solutions; Power-over-Ethernet ICs and midspans; as well as custom design capabilities and services. Microsemi is headquartered in Aliso Viejo, California, and has approximately 4,800 employees globally. Learn more at www.microsemi.com.