Microsemi
SCOTTSDALE DIVISION

# HSMBJSAC5.0 thru HSMBJSAC75, e3

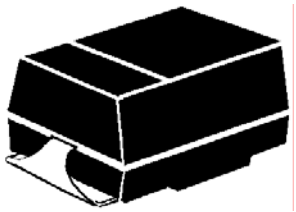
## 500 WATT LOW CAPACITANCE TRANSIENT VOLTAGE SUPPRESSOR



## DESCRIPTION

The HSMBJSAC transient voltage suppressor (TVS) series rated at 500 Watts provides an added rectifier element as shown in Figure 4 to achieve low capacitance in applications for data or signal lines. The low capacitance rating of less than 30 pF may be used for protecting higher frequency applications in inductive switching environments or electrical systems involving secondary lightning effects per IEC61000-4-5 as well as RTCA/DO-160D or ARINC 429 for airborne avionics. If bidirectional protection is needed, two HSMBJSAC devices in anti-parallel configuration are required as shown in Figure 6. With their very fast response time, they also provide ESD and EFT protection per IEC61000-4-2 and IEC61000-4-4 respectively.

## APPEARANCE



**DO-214AA**
**See package notes**

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

## FEATURES

- Unidirectional low-capacitance TVS series (for bidirectional see Figure 6)
- Suppresses transient up to 500 Watts Peak Pulse Power @ 10/1000 µs
- Improved performance in low capacitance of 30 pF
- Economical small plastic surface mount with robust axial subassembly package
- Optional 100% **screening for avionics grade** is available by adding MA prefix to part number for added 100% temperature cycle -55°C to +125°C (10X) as well as surge (3X) and 24 hours HTRB with post test $V_Z$ & $I_R$
- Options for screening in accordance with MIL-PRF-19500 for JAN, JANTX, JANTXV, and JANS are also available by adding MQ, MX, MV, or MSP prefixes respectively to part number, e.g. MXHSMBJSAC5.0, MVHSMBJSAC18, etc.
- Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020B
- Also available in axial-leaded packages with part numbers (SAC5.0 thru SAC50)
- RoHS Compliant devices available by adding "e3" suffix

## APPLICATIONS / BENEFITS

- Low Capacitance for data-line protection to 10 MHz
- Protection for aircraft fast data rate lines per select waveforms in RTCA/DO-160D (see MicroNote 130 for Waveform 4 and 5A capability) & ARINC 429 with bit rates of 100 kb/s (per ARINC 429, Part 1, par. 2.4.1.1)
- ESD and EFT protection per IEC61000-4-2 and IEC61000-4-4 respectively
- Secondary lightning protection per IEC61000-4-5 with 42 Ohms source impedance:
  - Class 1: HSMBJSAC5.0 to HSMBJSAC75
  - Class 2: HSMBJSAC5.0 to HSMBJSAC45
  - Class 3: HSMBJSAC5.0 to HSMBJSAC22
  - Class 4: HSMBJSAC5.0 to HSMBJSAC10
- Secondary lightning protection per IEC61000-4-5 with 12 Ohms source impedance
  - Class 1: HSMBJSAC5.0 to HSMBJSAC26
  - Class 2: HSMBJSAC5.0 to HSMBJSAC15
  - Class 3: HSMBJSAC5.0 to HSMBJSAC7.0

## MAXIMUM RATINGS

- Peak Pulse Power Dissipation at 25°C: 500 Watts @ 10/1000 µs with repetition rate of 0.01% or less*
- Steady State Power Dissipation*: 2.5 Watts @ $T_L$ =+75°C
- Clamping Speed (0 volts to $V_{(BR)}$ Min.) less than 5 nanoseconds.
- Operating and Storage Temperature: -65°C to +150°C
- Solder temperatures: 260°C for 10 s maximum

## MECHANICAL AND PACKAGING

- CASE: Void Free Transfer Molded Thermosetting Plastic package meeting UL94V-0
- FINISH: Tin-Lead or RoHS Compliant matte-Tin plating solderable per MIL-STD-750, method 2026
- POLARITY: Cathode (TVS) Marked with Band
- MARKING: Part number without HSMBJ prefix (ie. SAC5.0, SAC5.0e3, etc)
- WEIGHT: 0.1 Grams (Approx.)
- See package dimensions on last page

* TVS devices are not typically used for dc power dissipation and are instead operated $\leq V_{WM}$ (rated standoff voltage) except for transients that briefly drive the device into avalanche breakdown ($V_{BR}$ to $V_C$ region) of the TVS element. Also see Figures 5 and 6 for further protection details in rated peak pulse power for unidirectional and bidirectional configurations respectively.



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## ELECTRICAL CHARACTERISTICS @ 25°C

| MICROSEMI PART NUMBER | REVERSE STAND-OFF VOLTAGE (Note 1) $V_{WM}$ Volts | BREAKDOWN VOLTAGE @ $I_{(BR)}$ 1.0mA $V_{(BR)}$ Volts Min. | MAXIMUM STANDBY CURRENT @$V_{WM}$ $I_D$ µA | MAXIMUM CLAMPING VOLTAGE $I_P$ = 5.0A* $V_C$ Volts | MAXIMUM PEAK PULSE CURRENT* RATING $I_{PP}$ Amps | MAXIMUM CAPACITANCE @ O Volts, f=1 MHz pF | WORKING INVERSE BLOCKING VOLTAGE $V_{WIB}$ Volts | INVERSE BLOCKING LEAKAGE CURRENT $I_{IB}$ @ $V_{WIB}$ µA | PEAK INVERSE BLOCKING VOLTAGE $V_{PIB}$ Volts |
|---|---|---|---|---|---|---|---|---|---|
| HSMBJSAC5.0 | 5.0 | 7.60 | 300 | 10.0 | 44 | 30 | 75 | 10 | 100 |
| HSMBJSAC6.0 | 6.0 | 7.90 | 300 | 11.2 | 41 | 30 | 75 | 10 | 100 |
| HSMBJSAC7.0 | 7.0 | 8.33 | 300 | 12.6 | 38 | 30 | 75 | 10 | 100 |
| HSMBJSAC8.0 | 8.0 | 8.89 | 100 | 13.4 | 36 | 30 | 75 | 10 | 100 |
| HSMBJSAC8.5 | 8.5 | 9.44 | 50 | 14.0 | 34 | 30 | 75 | 10 | 100 |
| HSMBJSAC10 | 10 | 11.10 | 5.0 | 16.3 | 29 | 30 | 75 | 10 | 100 |
| HSMBJSAC12 | 12 | 13.30 | 5.0 | 19.0 | 25 | 30 | 75 | 10 | 100 |
| HSMBJSAC15 | 15 | 16.70 | 5.0 | 23.6 | 20 | 30 | 75 | 10 | 100 |
| HSMBJSAC18 | 18 | 20.00 | 5.0 | 28.8 | 15 | 30 | 75 | 10 | 100 |
| HSMBJSAC22 | 22 | 24.40 | 5.0 | 35.4 | 14 | 30 | 75 | 10 | 100 |
| HSMBJSAC26 | 26 | 28.90 | 5.0 | 42.3 | 11.1 | 30 | 75 | 10 | 100 |
| HSMBJSAC36 | 36 | 40.0 | 5.0 | 60.0 | 8.6 | 30 | 75 | 10 | 100 |
| HSMBJSAC45 | 45 | 50.00 | 5.0 | 77.0 | 6.8 | 30 | 150 | 10 | 200 |
| HSMBJSAC50 | 50 | 55.50 | 5.0 | 88.0 | 5.8 | 30 | 150 | 10 | 200 |
| HSMBJSAC75 | 75 | 83.3 | 5.0 | 121 | 4.1 | 30 | 150 | 10 | 200 |

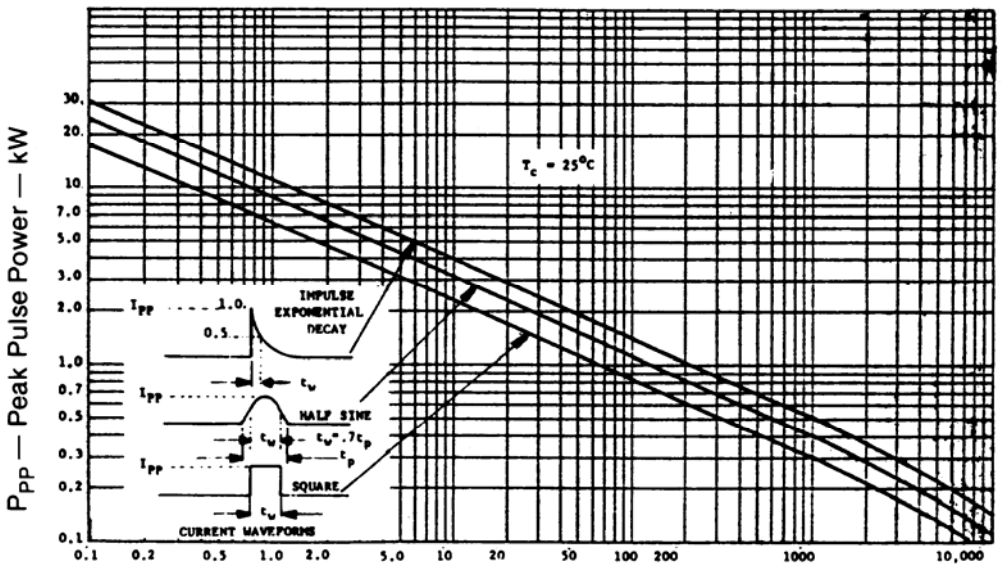
*See Figure 3. For the HSMBJSAC75, the maximum clamping voltage $V_C$ is at the maximum rated Peak Pulse Current ($I_{PP}$) of 4.1 Amps.

**Clamping Factor:** The ratio of the numerical value of $V_C$ to $V_{(BR)}$ is typically 1.4 @ full rated power, 1.20 @ 50% rated power. Also see MicroNote 108.

**Note 1:** A transient voltage suppressor is normally selected according to voltage ($V_{WM}$), that should be equal to or greater than the dc or continuous peak operating voltage level.

**Note 2:** When pulse testing, test in TVS avalanche direction. Do not pulse in "forward" direction. See section for "Schematic Applications" herein.

## GRAPHS




**$t_w$ – Pulse Width µs**

**FIGURE 1**

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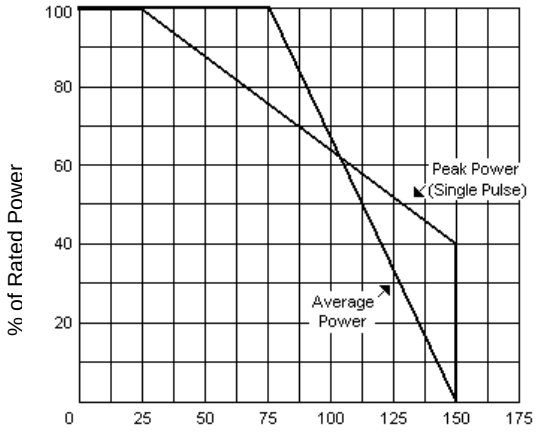
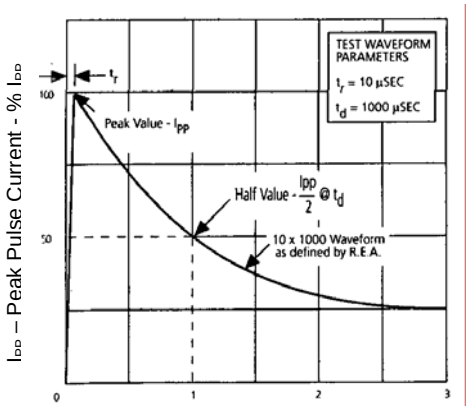



$T_L$ – Lead Temperature – °C

**FIGURE 2**

Lead Length = 3/8"




t – Time – msec

**FIGURE 3**

## SCHEMATIC APPLICATIONS

The TVS low capacitance device configuration is shown in Figure 4. As a further option for unidirectional applications, an additional low capacitance rectifier diode may be used in parallel in the same polarity direction as the TVS as shown in Figure 5. In applications where random high voltage transients occur, this will prevent reverse transients from damaging the internal low capacitance rectifier diode and also provide a low voltage conducting direction. The added rectifier diode should be of similar low capacitance and also have a higher reverse voltage rating than the TVS clamping voltage $V_C$. The Microsemi recommended rectifier part number is the "HSMBJLCR60" for the application in Figure 5. If using two (2) low capacitance TVS devices in anti-parallel for bidirectional applications, this added protective feature for both directions (including the reverse of each rectifier diode) is inherently provided in Figure 6. The unidirectional and bidirectional configurations in Figure 5 and 6 will both result in twice the capacitance of Figure 4.

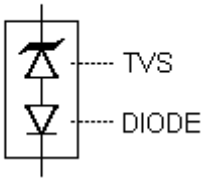



**FIGURE 4**
TVS with internal Low Capacitance Diode

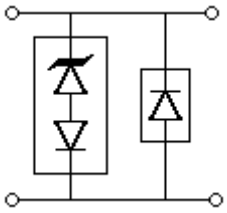


**FIGURE 5**
Optional Unidirectional configuration (TVS and separate rectifier diode) in parallel)

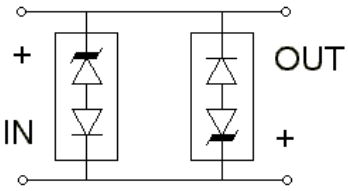
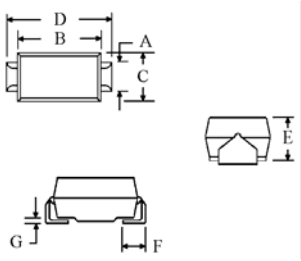



**FIGURE 6** Optional Bidirectional configuration (two TVS devices in anti-parallel)

## PACKAGE DIMENSIONS




| DIM | DIMENSIONS | | | |
|---|---|---|---|---|
| | INCHES | | MILLIMETERS | |
| | MIN | MAX | MIN | MAX |
| A | .073 | .087 | 1.85 | 2.21 |
| B | .160 | .180 | 4.06 | 4.57 |
| C | .130 | .155 | 3.30 | 3.94 |
| D | .205 | .220 | 5.21 | 5.59 |
| E | .075 | .130 | 1.91 | 3.30 |
| F | .030 | .060 | .76 | 1.52 |
| G | .006 | .016 | .15 | .41 |

NOTE: Dimension E exceeds the JEDEC outline in height as shown



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