RT65KP48A thru RT65KP75CA, e3

AIRCRAFT DC POWER BUS PROTECTION

Microsemi
SCOTTSDALE DIVISION

DESCRIPTION

Microsemi's **65 kW** bidirectional Transient Voltage Suppressors (TVSs) protects 28 volt dc airborne electronic equipment from harsh lightning environments per **RTCA/DO-160E** Section 22 and is compatible with Section 16, paragraph 16.6.2.4 Category A for 46.3 V, Category B for 60 V, and Category Z for 80 V high-line surges. It is also optionally available with screening in accordance with MIL-PRF-19500 or avionics screening as described in the Features section. It is also available as RoHS Compliant (annealed matte-Tin finish) with an e3 suffix added to the part number. Microsemi also offers a broad spectrum of other TVSs to meet your needs.

APPEARANCE

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

FEATURES

- Unidirectional TVS construction with A suffix or bidirectional with a CA suffix
- Suppresses transients up to **65 kW @ 6.4/69 µs**
- Fast response with less than 5 ns turn-on time.
- 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), surge (3X) in each direction, 24 hours HTRB in each direction, and post test (V_{BR} and I_D)
- Options for **screening** in accordance with MIL-PRF-19500 **for JAN, JANTX,** and **JANTXV** are also available by adding MQ, MX, or MV prefixes respectively to part numbers.
- Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020B.
- RoHS Compliant devices available by adding "e3" suffix

APPLICATIONS / BENEFITS

- Pin injection protection per RTCA/DO-160E up to Level 5 for Waveform 4 (6.4/69 µs) and up to Level 3 for Waveform 5A (40/120 µs) at 70°C
- Compatible with "abnormal surge voltage (dc)" in 16.6.2.4 (Category A, B, and Z) of RTCA/DO-160E
- The RT65KP48A is designed for Category A in protecting 80V components**
- The RT65KP54A or 60A is designed for Category B in protecting 90V or 100 V components**
- The RT65KP75A is designed for Category Z in protecting 125 V components**
- Consult Factory for other voltages with similar Peak Pulse Power capabilities.

**includes switching transistors, MOSFETs & IGBTs in off-line switching power supplies

MAXIMUM RATINGS

- Steady-state power dissipation: 7 W @ T_L = 25°C
- Peak Pulse Power (P_{PP}) at 25°C: 65 kW at 6.4/69 µs per waveform in Figure 8 (derate per Figure 2)
- Repetition rate: 0.01% max.
- Operating & storage temperatures: -55°C to +150°C
- Temperature coefficient of voltage: +0.100%/°C max
- Solder Temperatures: 260°C for 10 s maximum

MECHANICAL & PACKAGING

- CASE: Molded Epoxy (meets UL94V-O requirements)
- FINISH: Tin-Lead or RoHS Compliant matte-Tin plating solderable per MIL-STD-750, method 2026
- Polarity: Cathode marked with band for unidirectional (no band required for bi-directional)
- MARKING: Manufacturers logo and part number. Add prefix MA, MQ, MX, etc., for screened parts.
- Package dimensions: See last page

ELECTRICAL PARAMETERS @ 25°C Devices are Bidirectional

MICROSEMI PART NUMBER (replace A suffix with CA for bidirectional)	Working Standoff Voltage V_{WM}	Maximum Standby Current I_D @ V_{WM}	Minimum Breakdown Voltage V_{BR} @ $I_{(BR)}$	Breakdown Current $I_{(BR)}$	Maximum Clamping Voltage V_C @ I_{PP} (Note 1)	Peak Pulse Current I_{PP} @ 6.4/69 µs (Note 2)
	V max	µA	V	mA	V	A
RT65KP48A	48	5	53.3	5	77.7	836
RT65KP54A	54	5	60.0	5	87.5	742
RT65KP60A	60	5	66.7	5	97.3	668
RT65KP75A	75	5	83.3	5	122	533

NOTE 1: See MicroNote 108 for lower Clamping Voltage performance at lower I_P values relative to I_{PP} and P_{PP} ratings and Figure 1.

NOTE 2: Equivalent to ratings of 257, 228, 205, and 164 Amps of 20 kW at a longer 10/1000 µs impulse (see Figure 1) with clamping voltages shown for the RT65KP48A, 54A, 60A, and 75A part numbers respectively. Also see Peak Pulse Power (P_{PP}) performance levels for other aircraft waveforms on page 3 for this device series.

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GRAPHS

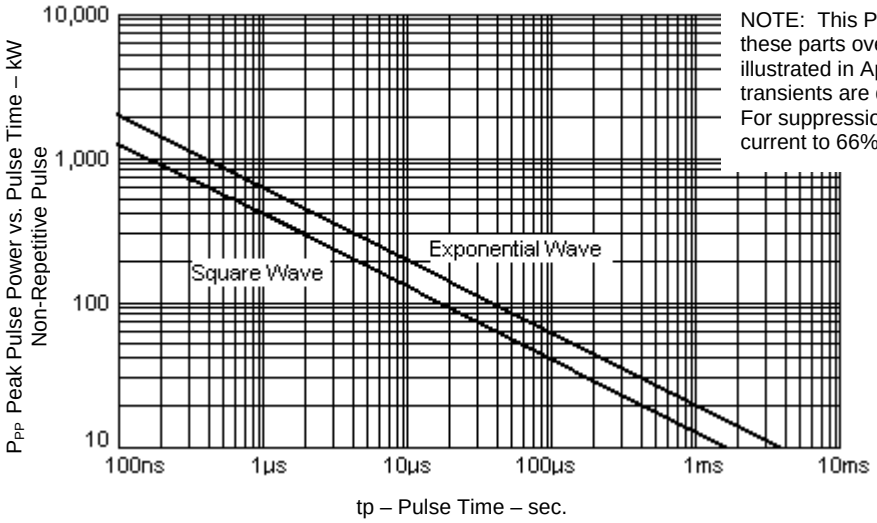


FIGURE 1
Peak Pulse Power vs. Pulse Time
To 50% of Exponentially Decaying Pulse

NOTE: This P_{PP} versus time graph allows the designer to use these parts over a broad power spectrum using the guidelines illustrated in App Note 104 on Microsemi's website. Aircraft transients are described with exponential decaying waveforms. For suppression of square-wave impulses, derate power and current to 66% of that for exponential decay as shown in Figure 1.

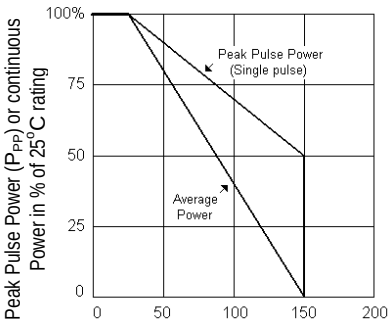


FIGURE 2
POWER DERATING

Correct

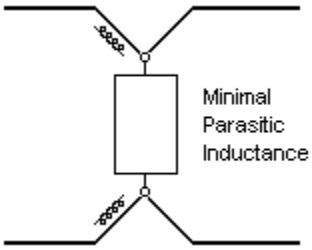


FIGURE 3

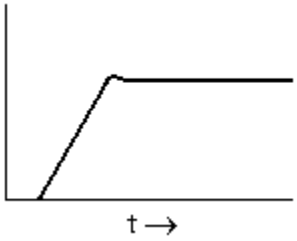


FIGURE 4

INSTALLATION

TVS devices used across power lines are subject to relatively high magnitude surge currents and are more prone to adverse parasitic inductance effects in the mounting leads. Minimizing the shunt path of the lead inductance and their V= -Ldi/dt effects will optimize the TVS effectiveness. Examples of optimum installation and poor installation are illustrated in figures 3 through figure 6. Figure 3 illustrates minimal parasitic inductance with attachment at end of device. Inductive voltage drop is across input leads. Virtually no "overshoot" voltage results as illustrated with figure 4. The loss of effectiveness in protection caused by excessive parasitic inductance is illustrated in figures 5 and 6. Also see MicroNote 111 for further information on "Parasitic Lead Inductance in TVS".

Wrong

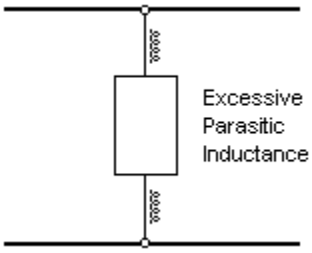


FIGURE 5

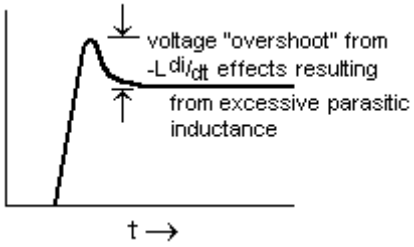
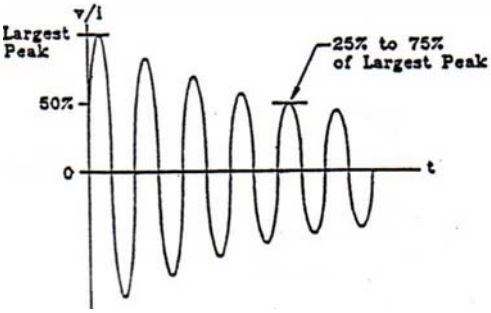
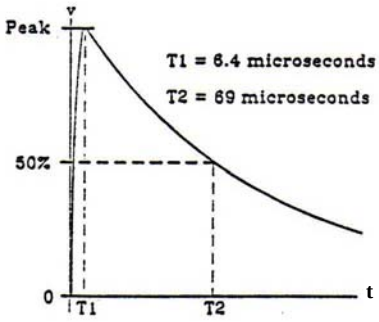


FIGURE 6



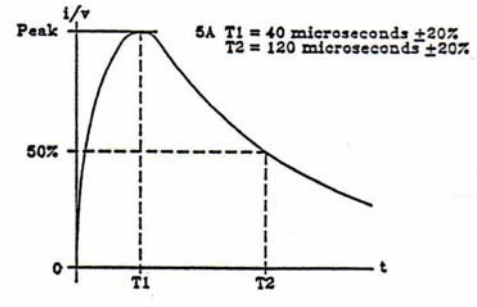
t – time
Note: frequency is 1MHz

FIGURE 7 – Waveform 3



t – time

FIGURE 8 – Waveform 4



t - Time

FIGURE 9 – Waveform 5A

NOTE: The 1MHz damped oscillatory waveform (3) has an effective pulse width of 4 μs. Equivalent peak pulse power at each of the pulse widths represented in RTCA/DO-160E for waveforms 3, 4 and 5A (above) have been determined referencing Figure 1 herein as well as Application Notes 104 and 120 (found on Microsemi's website) and are listed below.

WAVEFORM NUMBER	PULSE WIDTH μs	PEAK PULSE POWER kW
3	4	290
4	6.4/69	65
5A	40/120	49

Note: High current fast rise-time transients of 250 ns or less can more than triple the V_C from parasitic inductance effects (V= -Ldi/dt) compared to the clamping voltage shown in the initial Electrical Characteristics on page 1 as also described in Figures 5 and 6 herein.

DIMENSIONS