Microsemi
SCOTTSDALE DIVISION

RT130KP275CV, RT130KP275CA, RT130KP295CV, RT130KP295CA, e3

AIRCRAFT AC POWER BUS PROTECTION

DESCRIPTION

Microsemi's **RT130KP275 and RT130KP295** bidirectional 130 kW Transient Voltage Suppressors (TVSs) protects 120 volt ac airborne electronic equipment from harsh lightning per **RTCA/DO-160E** Section 22 and is compatible with Section 16 for 180 volt ac 100 ms highline surges (paragraph 16.5.2.3.1b). Microsemi also offers a broad spectrum of other TVS products to meet your needs.

APPEARANCE

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

FEATURES

- Symmetrical bidirectional TVS construction
- Two Working Standoff Voltages of 275 V and 295 V
- Available as either low clamp with "CV" suffix or normal clamping features with "CA" suffix.
- Suppresses transients up to **130 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_Z and I_R)
- 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 Table 22-2 up to Level 5 for Waveform 4 (6.4/69 µs) and Level 3 for Waveform 5A (40/120 µs) at 70°C
- Compatible with "abnormal surge voltage" as described in 16.5.2.3.1b of RTCA/DO-160E
- The very low clamping with "CV" suffix is designed for low clamping protection of 400V transistors, IGBTs and MOSFETs in off-line switching power supplies.
- The normal clamp device with "CA" suffix is for use in less-sensitive applications including RFI/EMI filters and general across-the-line protection.
- Consult Factory for other voltages with similar Peak Pulse Power capabilities.
- Secondary lightning protection per IEC61000-4-5 with 12 Ohms source impedance for Class 1,2, 3 and 4
- Secondary lightning protection per IEC61000-4-5 with 2 Ohms source impedance for Class 2 and 3
- Consult Factory for other voltages with similar Peak Pulse Power capabilities

MAXIMUM RATINGS

- Steady-state power dissipation: 7 W @ T_A = 25°C
- Peak Pulse Power (P_{PP}) at 25°C: 130 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 UL 94V-0 requirements)
- FINISH: Tin-Lead or RoHS Compliant annealed matte-Tin plating solderable per MIL-STD-750, method 2026
- Polarity: No band required for bidirectional
- 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 Bi-directional

MICROSEMI PART NUMBER	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	Volts	mA	Volts	Amps
RT130KP275CV	275	5	300	5	**400**	292
RT130KP275CA	275	5	300	5	**445**	292
RT130KP295CV	295	5	300	5	**410**	282
RT130KP295CA	295	5	300	5	**460**	282

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

NOTE 2: Also equivalent to 90 and 87 Amps (40 kW) respectively at a longer impulse of 10/1000 µs (see Figure 1) with clamping voltages shown. Also see other equivalent peak pulse power performance levels for aircraft waveforms on page 3 for this device.

Microsemi
Scottsdale Division
8700 E. Thomas Rd. PO Box 1390, Scottsdale, AZ 85252 USA, (480) 941-6300, Fax: (480) 947-1503

GRAPHS

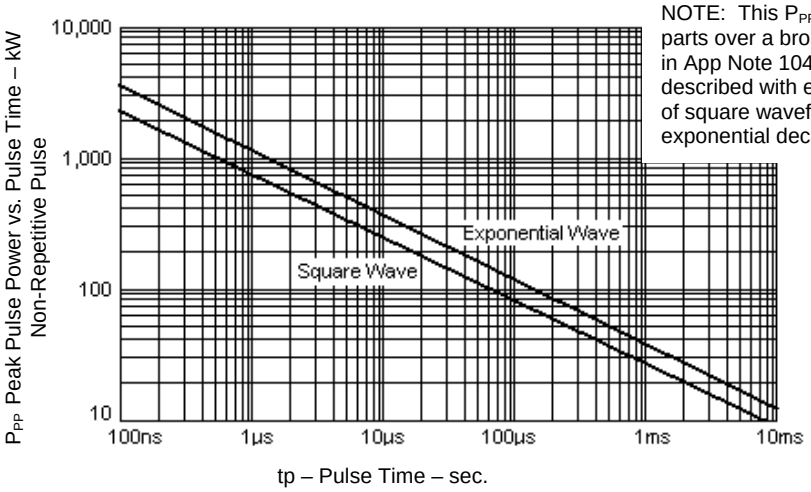


FIGURE 1
Peak Pulse Power vs. Pulse Time
To 50% of Exponentially Decaying Pulse

NOTE: This P_{PP} vs. 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 waveforms, derate power and current to 66% of that for exponential decay.

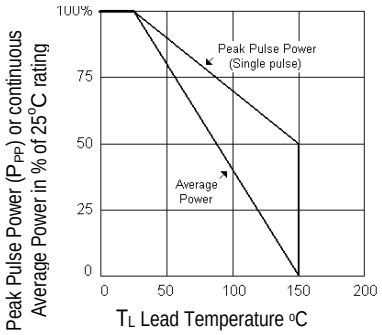


FIGURE 2
POWER DERATING

Correct

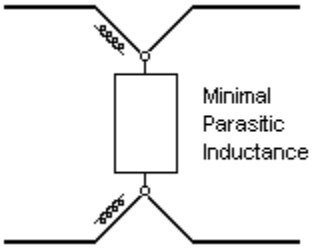


FIGURE 3

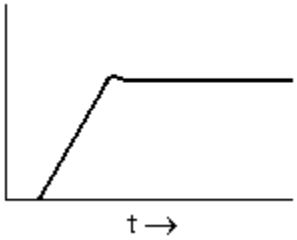


FIGURE 4

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

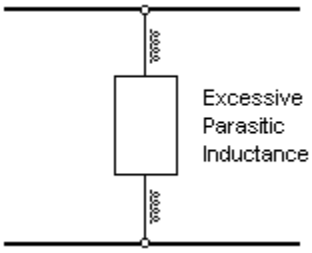


FIGURE 5

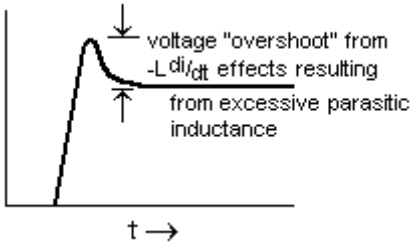
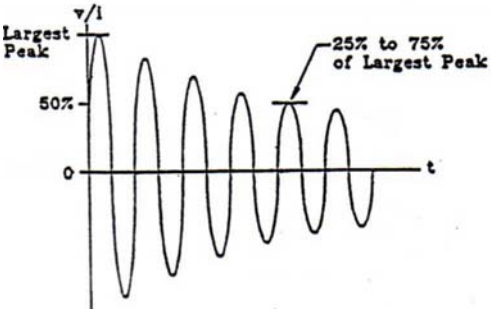
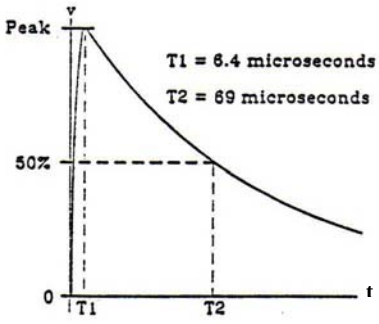


FIGURE 6



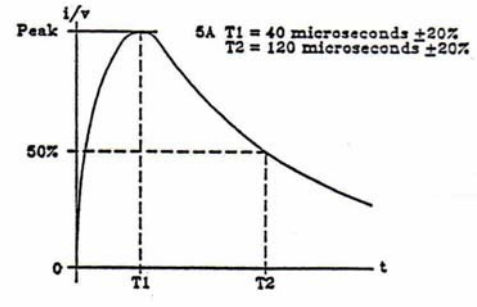
t – time
Note: frequency is 1MHz

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 for the RT130KP275CA and RT130KP295CA at each of the pulse widths represented in RTCA/DO-160E for wave forms 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	580
4	6.4/69	130
5A	40/120	98

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