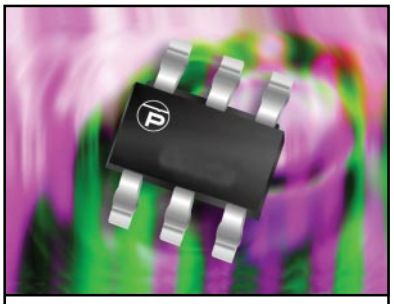
PROTEK DEVICES
Only One Name Means ProTek'Tion™

CP05 thru CP24C

STANDARD CAPACITANCE TVS ARRAY

APPLICATIONS

✔ Ethernet - 10 Base T
✔ Cellular Phones
✔ Handheld Electronics
✔ FireWire & USB Interfaces
✔ Multiple I/O Ports or Power Supplies



SOT-23-6

IEC COMPATIBILITY (EN61000-4)

✔ 61000-4-2 (ESD): Air - 15kV, Contact - 8kV
✔ 61000-4-4 (EFT): 40A - 5/50ns
✔ 61000-4-5 (Surge): 12A, 8/20µs - Level 1(Line-Gnd) & Level 2(Line-Line)

FEATURES

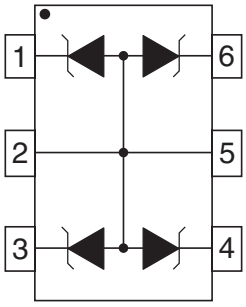
✔ 200 Watts Peak Pulse Power per Line (tp=8/20µs)
✔ Monolithic Design
✔ Available in Multiple Voltage Types Ranging From 5V to 24V
✔ Protect 4 Bidirectional Lines & 5 Unidirectional Lines
✔ ESD Protection > 25 kilovolts
✔ Low Clamping Voltage
✔ Unidirectional & Bidirectional Configurations
✔ Low Leakage Current
✔ RoHS Compliant in Lead-Free Versions

MECHANICAL CHARACTERISTICS

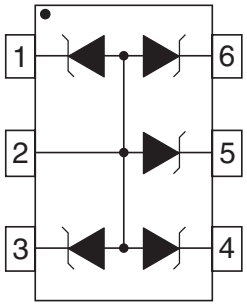
✔ Molded JEDEC SOT-23-6 Package
✔ Weight 16 milligrams (Approximate)
✔ Available in Tin-Lead or Lead-Free Pure-Tin Plating(Annealed)
✔ Solder Reflow Temperature:
  Tin-Lead - Sn/Pb, 85/15: 240-245°C
  Pure-Tin - Sn, 100: 260-270°C
✔ Flammability rating UL 94V-0
✔ 8mm Tape and Reel Per EIA Standard 481
✔ Marking: Marking Code & Pin One Defined By DOT on Package

PIN CONFIGURATIONS

UNIDIRECTIONAL



BIDIRECTIONAL



DEVICE CHARACTERISTICS

MAXIMUM RATINGS @ 25°C Unless Otherwise Specified			
PARAMETER	SYMBOL	VALUE	UNITS
Peak Pulse Power (t_p = 8/20µs) - See Figure 1	P_{PP}	200	Watts
Operating Temperature	T_J	-55°C to 150°C	°C
Storage Temperature	T_{STG}	-55°C to 150°C	°C

ELECTRICAL CHARACTERISTICS PER LINE @ 25°C Unless Otherwise Specified

PART NUMBER (See Notes 1-3)	DEVICE MARKING	RATED STAND-OFF VOLTAGE V_{WM} VOLTS	MINIMUM BREAKDOWN VOLTAGE @ 1mA $V_{(BR)}$ VOLTS	MAXIMUM CLAMPING VOLTAGE (See Fig. 2) @ I_P = 1A V_C VOLTS	MAXIMUM CLAMPING VOLTAGE (See Fig. 2) @8/20µs V_C @ I_{PP}	MAXIMUM LEAKAGE CURRENT @V_{WM} I_D µA	TYPICAL CAPACITANCE @0V, 1 MHz C_j pF
CP05	QRH	5.0	6.0	9.8	11.8V @ 17.0A	20	70
CP05C	QRL	5.0	6.0	9.8	11.8V @ 17.0A	20	70
CP12	QRI	12.0	13.3	19	28.3V @ 7.0A	1	50
CP12C	QRM	12.0	13.3	19	28.3V @ 7.0A	1	50
CP15	QRJ	15.0	16.7	24	45.0V @ 5.0A	1	30
CP15C	QRN	15.0	16.7	24	45.0V @ 5.0A	1	30
CP24	QRK	24.0	26.7	43	65.0V @ 3.0A	1	25
CP24C	QRO	24.0	26.7	43	65.0V @ 3.0A	1	25

Note 1: Part numbers with an additional "C" suffix are bidirectional devices, i.e., CP05C.
Note 2: *Unidirectional Only:* Test between pin 1, 3, 4 and 6 to pin 2 or 5.
Note 3: *Bidirectional Only:* Test between pin 5 to 1 or 3 or 4 or 6. Electrical characteristics apply in both directions.

FIGURE 1
PEAK PULSE POWER VS PULSE TIME

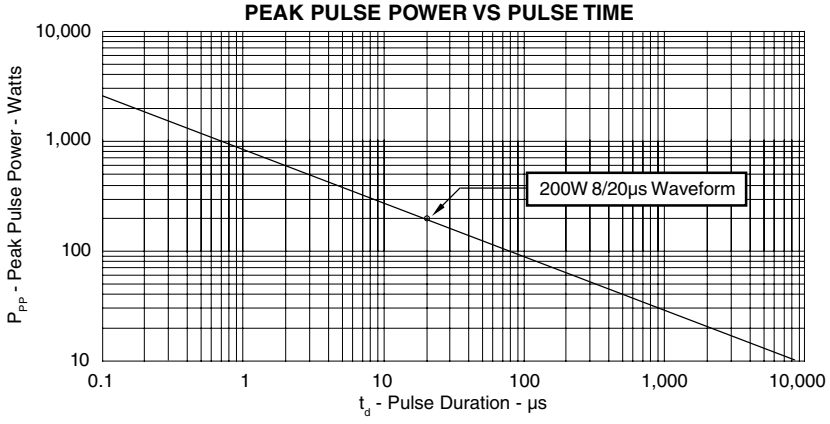
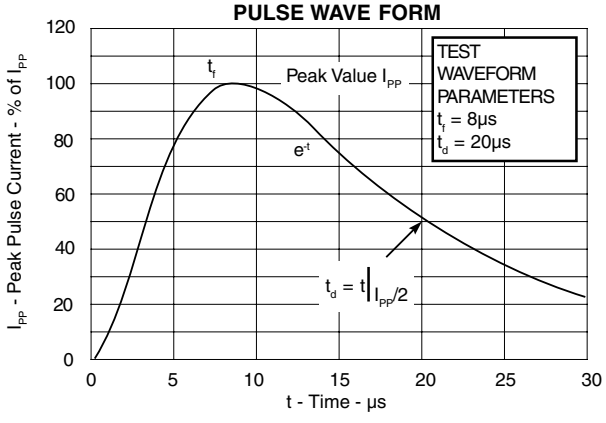


FIGURE 2
PULSE WAVE FORM



GRAPHS

FIGURE 3
POWER DERATING CURVE

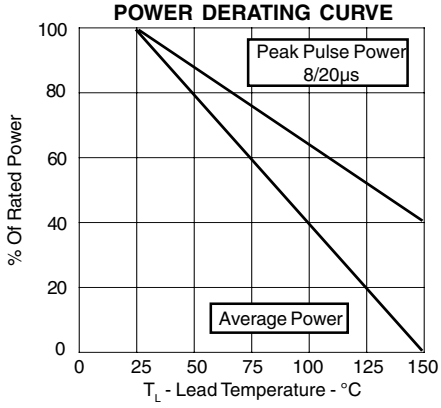
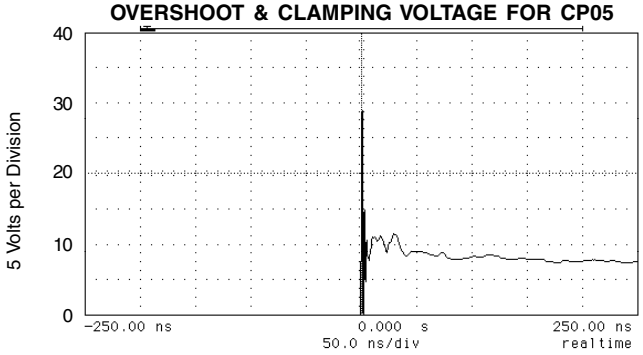


FIGURE 4
OVERSHOOT & CLAMPING VOLTAGE FOR CP05



ESD Test Pulse: 25 kilovolt, 1/30ns (waveshape)

FIGURE 5
TYPICAL CLAMPING VOLTAGE VS PEAK PULSE CURRENT FOR CP05C

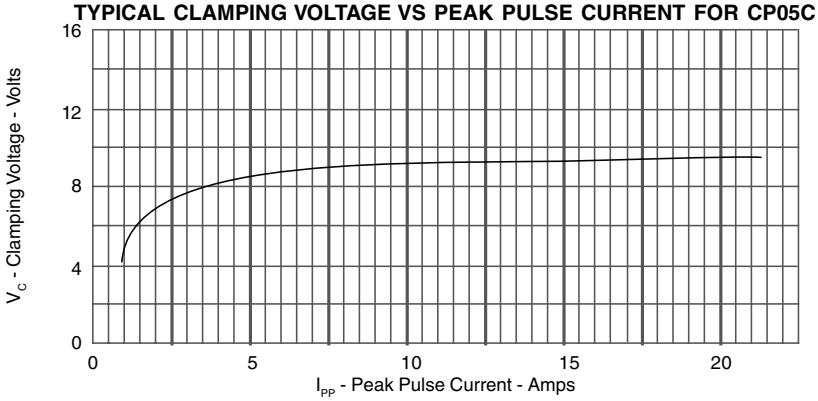
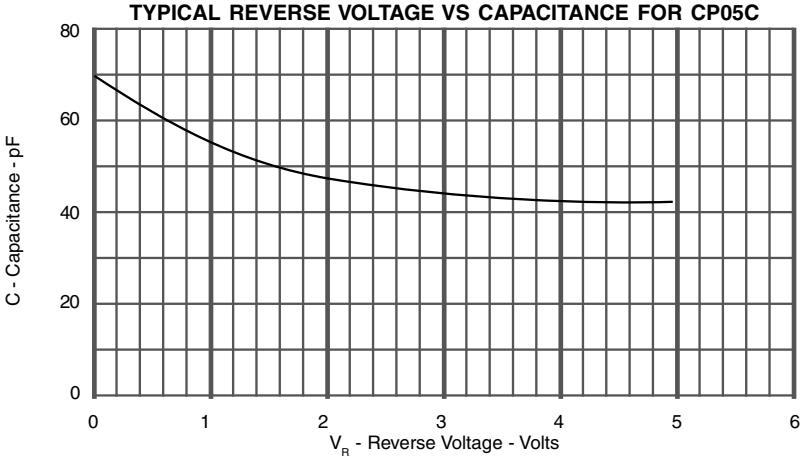


FIGURE 6
TYPICAL REVERSE VOLTAGE VS CAPACITANCE FOR CP05C



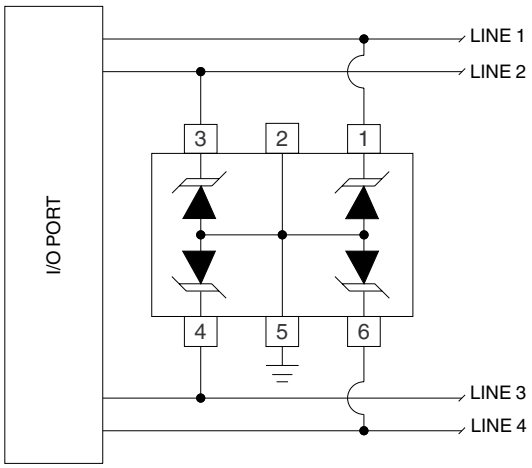
APPLICATION NOTE

The CP Series are TVS arrays designed to protect I/O or data lines from the damaging effects of ESD or EFT. This product series provides both unidirectional and bidirectional protection, with a surge capability of 200 Watts P_{PP} per line for an 8/20µs waveform and ESD protection > 25 kilovolts.

UNIDIRECTIONAL COMMON-MODE CONFIGURATION (Figure 1)

The CP Series provides up to four (4) lines of protection in a common-mode configuration as depicted in Figure 1.

Figure 1 - Unidirectional Configuration
Common-Mode I/O Port Protection



Circuit connectivity is as follows:
- ✔ Line 1 is connected to Pin 1.
- ✔ Line 2 is connected to Pin 3.
- ✔ Line 3 is connected to Pin 4.
- ✔ Line 4 is connected to Pin 6.
- ✔ Pin 5 is connected to ground.
- ✔ Pin 2 is not connected.

BIDIRECTIONAL COMMON-MODE CONFIGURATION (Figure 2)

The CPxxC Series provides up to four (4) lines of protection in a common-mode configuration as depicted in Figure 2.

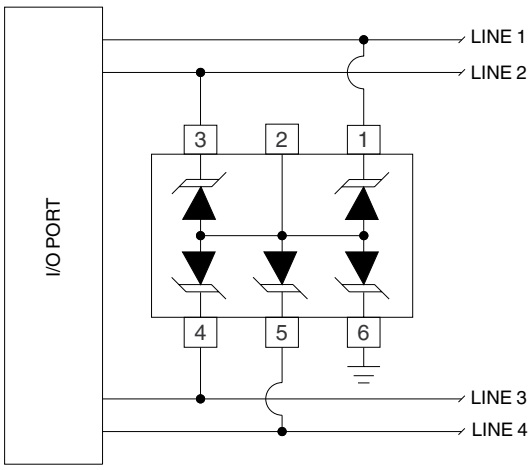
Circuit connectivity is as follows:
- ✔ Line 1 is connected to Pin 1.
- ✔ Line 2 is connected to Pin 3.
- ✔ Line 3 is connected to Pin 4.
- ✔ Line 4 is connected to Pin 5.
- ✔ Pin 6 is connected to ground.
- ✔ Pin 2 is not connected.

CIRCUIT BOARD LAYOUT RECOMMENDATIONS

Circuit board layout is critical for Electromagnetic Compatibility (EMC) protection. The following guidelines are recommended:

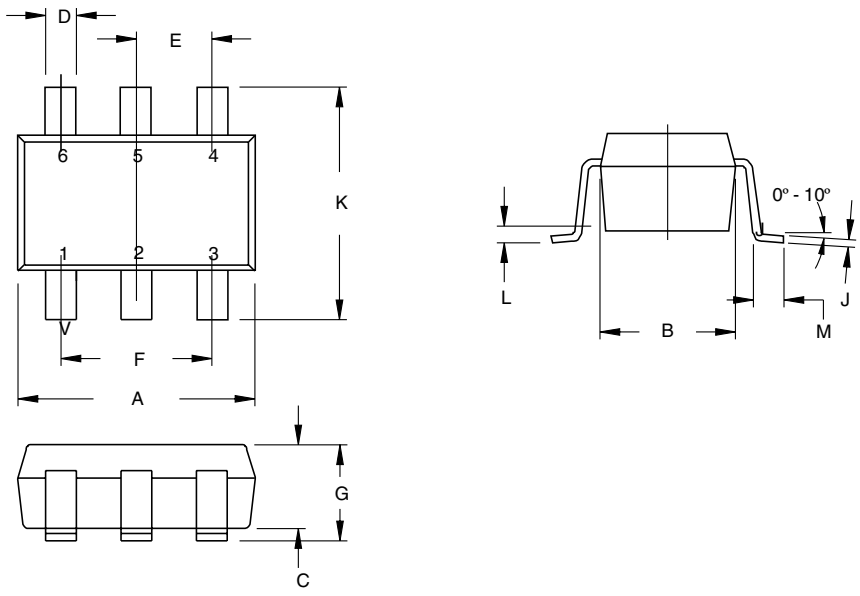
- ✔ The protection device should be placed near the input terminals or connectors, the device will divert the transient current immediately before it can be coupled into the nearby traces.
- ✔ The path length between the TVS device and the protected line should be minimized.
- ✔ All conductive loops including power and ground loops should be minimized.
- ✔ The transient current return path to ground should be kept as short as possible to reduce parasitic inductance.
- ✔ Ground planes should be used whenever possible. For multilayer PCBs, use ground vias.

Figure 2 - Bidirectional Configuration
Common-Mode I/O Port Protection

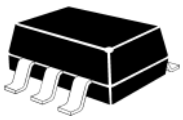


PACKAGE OUTLINE & DIMENSIONS

PACKAGE OUTLINE



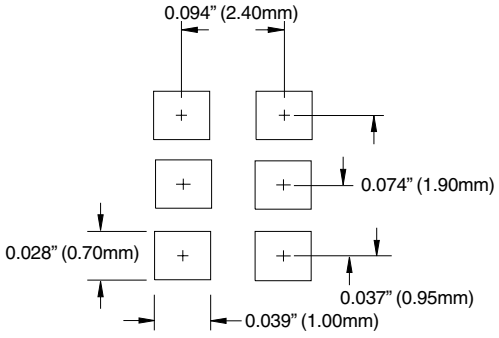
SOT-23-6



PACKAGE DIMENSIONS

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.80	3.05	0.110	0.120
B	1.50	1.75	0.059	0.070
C	0.90	1.30	0.036	0.051
D	0.35	0.50	0.014	0.020
E	0.85	1.05	0.033	0.040
F	1.70	2.10	0.067	0.083
G	0.90	1.45	0.036	0.057
J	0.090	0.20	0.0035	0.008
K	2.60	3.00	0.102	0.118
L	0.20 TYP	0.20 TYP	0.007 TYP	0.007 TYP
M	0.35	0.55	0.014	0.022

MOUNTING PAD



NOTES

1. Dimensioning and tolerances per ANSI Y14.5M, 1985.
2. Controlling Dimension: Inches
3. Dimensions are exclusive of mold flash and metal burrs.

TAPE & REEL ORDERING NOMENCLATURE

1. Surface mount product is taped and reeled in accordance with EIA-481.
2. Suffix-T7 = 7 Inch Reel - 3,000 pieces per 8mm tape, i.e., *CP05-T7*.
3. Suffix-T13 = 13 Inch Reel - 10,000 pieces per 8mm tape, i.e., *CP05-T13*.
4. Suffix - LF = Lead-Free, Pure-Tin Plating, i.e., *CP05-LF-T7*.

Outline & Dimensions: Rev 1 - 11/01, 06013

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