

## THYRISTOR SURGE SUPPRESSOR

### APPLICATIONS

- T1/E1 Trunk & Line Card
- SLIC Line Card
- DBX Branch Exchange Switches
- FCC Part 68 Customer Premise Equipment
- Line Interface Modem
- ADSL Architecture Interface
- ISDN Architecture Interface

### FEATURES

- Meets IEC 1000-4-4 & -5 Industry Requirements
- Provides Protection in Accordance with FCC Part 68, UL 1459, Bellcore 1089, ITU-TK.20 & K.21
- Peak Off-State Voltage from 58 to 300 Volts
- Surge Current Capability (See Surge Ratings Table)
- ESD Protection > 40 kilovolts
- Low Capacitance for T1/E1 Trunk & Line Card Applications
- UL 94V-0 Flammability Classification

### MAXIMUM RATINGS

- Surge Current: 60A Max. (50/60 Hz) ( $I_{TSM}$ )
- Storage Temperatures: -55° to + 150°C
- Junction Temperatures:  $T_j$  = -40° to 150°C
- Thermal Resistance for PPxxxxEA or EB in a TO-92 Package is  $R_{\theta JC}$  = 28°C/Watt &  $R_{\theta JA}$  = 90°C/Watt
- Thermal Resistance for PPxxxxEC in a TO-92 Package is  $R_{\theta JC}$  = 26°C/Watt &  $R_{\theta JA}$  = 85°C/Watt
- Critical Rate of Rise of Maximum On-State Current:  $di/dt$  = 500A/ $\mu$ s
- Critical Rate of Rise of Maximum Off-State Voltage:  $dv/dt$  > 2kv/ $\mu$ s

### MECHANICAL CHARACTERISTICS

- Package: Molded TO-92 (JEDEC)
- Approximate Weight: 0.18 grams
- Body Marked with Logo and Marking Code

SURGE RATINGS						
SERIES	$I_{PP}$ 2 X 10 $\mu$ s AMPS	$I_{PP}$ 10 X 160 $\mu$ s AMPS	$I_{PP}$ 10 X 560 $\mu$ s AMPS	$I_{PP}$ 10 X 1000 $\mu$ s AMPS	$I_{TSM}$ 60 Hz AMPS	$di/dt$ AMPS/ $\mu$ s
EA	N/A	100	50	N/A	20	500
EB	N/A	150	100	N/A	30	500
EC	500	200	N/A	100	60	500

### IEC 1000-4 COMPATIBLE



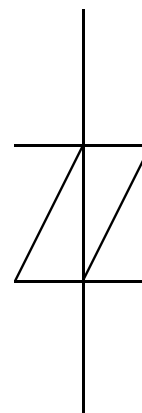
### TO-92 PACKAGE

### DESCRIPTION

The PPxxxxEA, EB and EC families are a series of Thyristor surge suppression (TSS) devices designed to protect telecommunication equipment against lightning and transients induced by AC power lines. These devices can be used on central office equipment, PBX, DSU, OCU, digital telephones, fax machines, modems and radio controlled equipment. The bidirectional configuration provides protection for both positive and negative transients and the discrete surface mount package allows individual placement of the device on line cards or other locations where multiple component devices do not offer the versatile in board trace layout.

The ProTek TSS device can be used to provide protection in accordance with industry standard requirements, such as FCC Part 68, ANSI C62.41, UL 1459 and GR-1089-CORE. Their low capacitance is ideal for T1/E1 trunk or line card applications.

### DEVICE SYMBOL

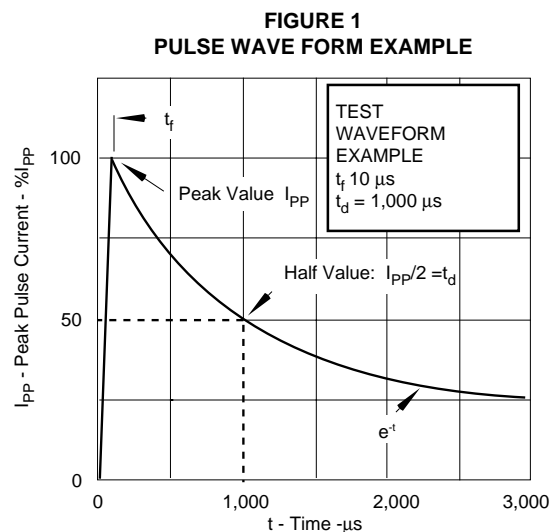
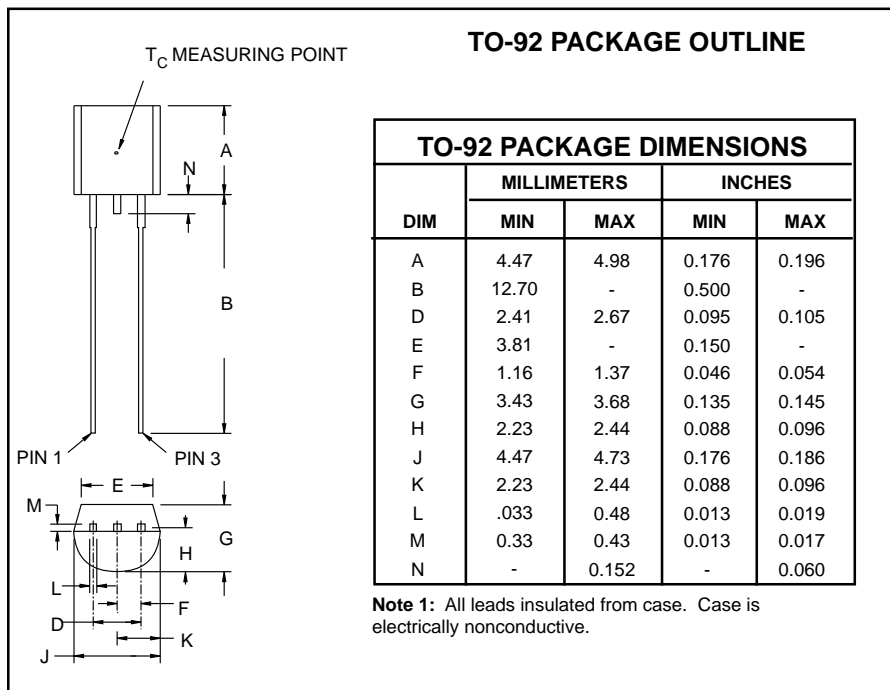


# ELECTRICAL CHARACTERISTICS @ 25°C Ambient Temperature

PROTEK PART NUMBER (NOTE 1)		DEVICE MARKING CODE	REPETITIVE PEAK OFF-STATE VOLTAGE	SWITCHING VOLTAGE	MINIMUM HOLDING CURRENT (Figure 4)	SWITCHING CURRENT	MAXIMUM OFF-STATE CURRENT (Figure 2)	MAXIMUM ON-STATE VOLTAGE (Figure 3)	ON-STATE CURRENT	TYPICAL CAPACITANCE  (See Note 2)
			$V_{DRM}$ VOLTS	@ 100V/ $\mu$ s $V_S$ VOLTS	di/dt = 1A/ms $I_H$ mA	$I_S$ mA	@ $V_{DRM}$ $I_{DRM}$ $\mu$ A	@ $I_T$ $V_T$ VOLTS	$I_T$ A	@ 2V, 1 MHz C pF
P	PP0640EA	GC	58	77	150	800	5	5	1.0	60
	PP0720EA	GD	65	88	150	800	5	5	1.0	60
	PP0800EA	GE	75	98	150	800	5	5	1.0	60
	PP1100EA	GF	90	130	150	800	5	5	1.0	60
	PP1300EA	GG	120	160	150	800	5	5	1.0	40
P	PP1500EA	GH	140	180	150	800	5	5	1.0	40
	PP1800EA	GI	160	220	150	800	5	5	1.0	40
	PP2300EA	GJ	190	260	150	800	5	5	1.0	30
P	PP2600EA	GK	220	300	150	800	5	5	1.0	30
	PP3100EA	GL	275	350	150	800	5	5	1.0	30
	PP3500EA	GM	300	400	150	800	5	5	1.0	30
P	PP0640EB	GP	58	77	150	800	5	5	1.0	60
	PP0720EB	GQ	65	88	150	800	5	5	1.0	60
	PP0800EB	GR	75	98	150	800	5	5	1.0	60
	PP1100EB	GS	90	130	150	800	5	5	1.0	60
	PP1300EB	GT	120	160	150	800	5	5	1.0	40
P	PP1500EB	GU	140	180	150	800	5	5	1.0	40
	PP1800EB	GV	160	220	150	800	5	5	1.0	40
	PP2300EB	GW	190	260	150	800	5	5	1.0	30
	PP2600EB	GX	220	300	150	800	5	5	1.0	30
	PP3100EB	GY	275	350	150	800	5	5	1.0	30
P	PP3500EB	GZ	300	400	150	800	5	5	1.0	30
P	PP0640EC	HC	58	77	150	800	5	5	1.0	120
	PP0720EC	HD	65	88	150	800	5	5	1.0	120
	PP0800EC	HE	75	98	150	800	5	5	1.0	120
	PP1100EC	HF	90	130	150	800	5	5	1.0	120
	PP1300EC	HG	120	160	150	800	5	5	1.0	80
P	PP1500EC	HH	140	180	150	800	5	5	1.0	80
	PP1800EC	HI	160	220	150	800	5	5	1.0	80
P	PP2300EC	HJ	190	260	150	800	5	5	1.0	60
	PP2600EC	HK	220	300	150	800	5	5	1.0	60
P	PP3100EC	HL	275	350	150	800	5	5	1.0	60
P	PP3500EC	HM	300	400	150	800	5	5	1.0	60

Note 1: "P" indicates preferred part number.

Note 2: Capacitance imbalance between positive and negative polarities is typically < 15pF.



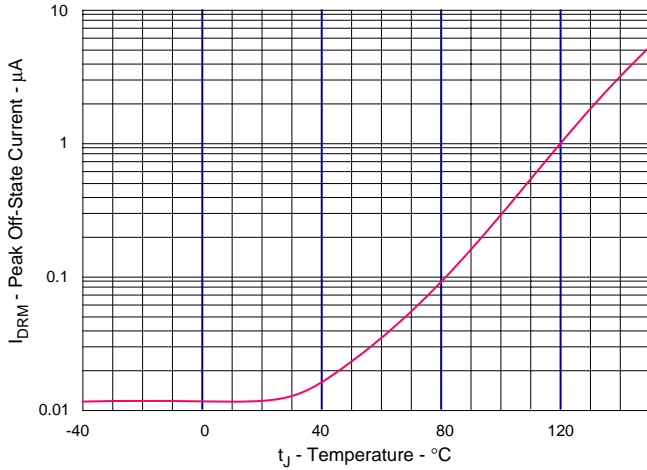
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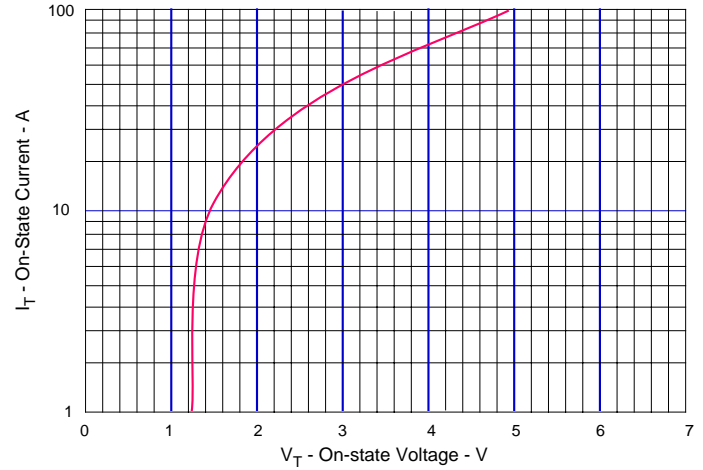
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## THYRISTOR SURGE SUPPRESSOR

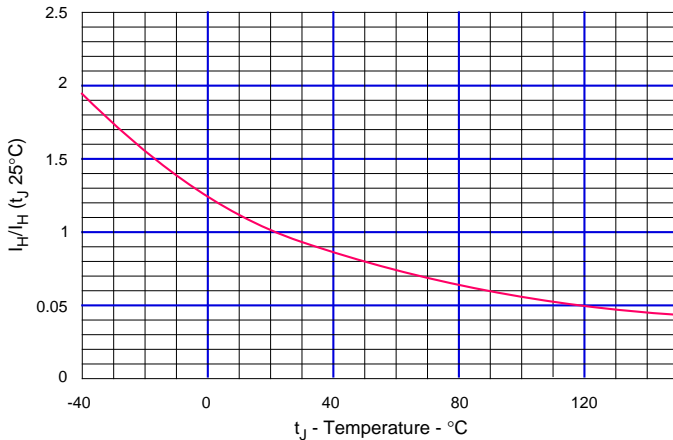
**FIGURE 2**  
**TYPICAL PEAK OFF-STATE CURRENT VS JUNCTION TEMPERATURE**



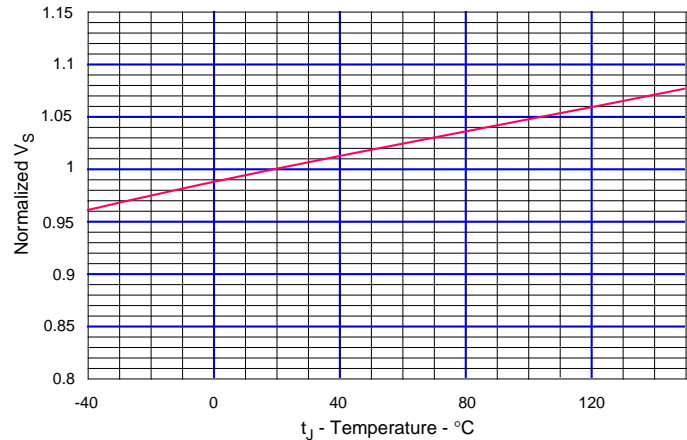
**FIGURE 3**  
**TYPICAL ON-STATE CURRENT VS ON-STATE VOLTAGE**



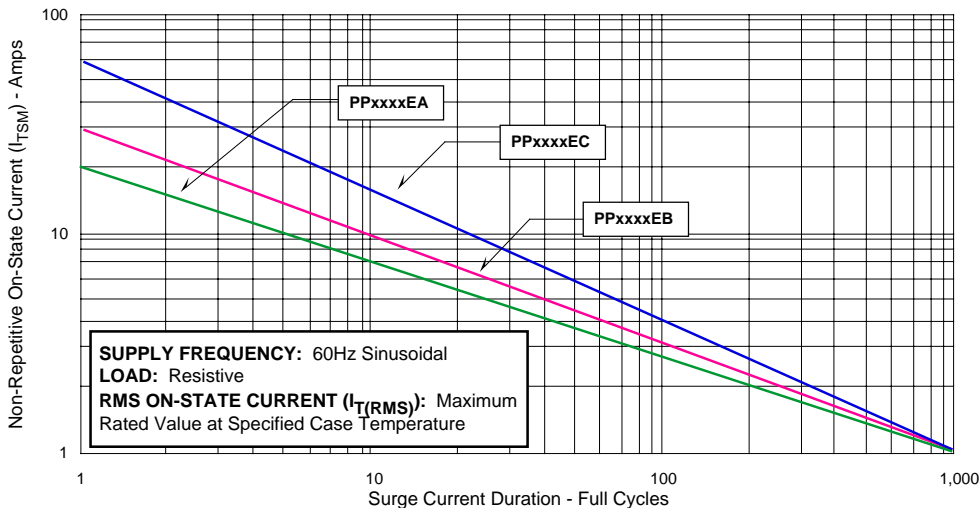
**FIGURE 4**  
**TYPICAL HOLDING CURRENT VS JUNCTION TEMPERATURE**



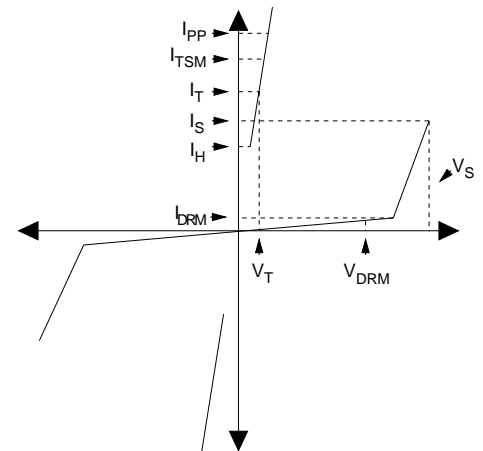
**FIGURE 5**  
**TYPICAL NORMALIZED V\_S VS JUNCTION TEMPERATURE**



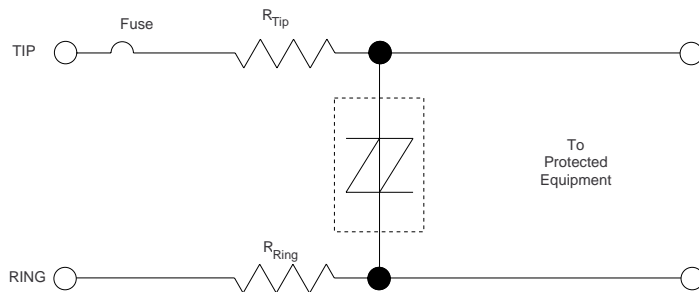
**FIGURE 6**  
**ON-STATE CURRENT VS SURGE CURRENT DURATION**



**FIGURE 7**  
**V-I CHARACTERISTICS CURVE**



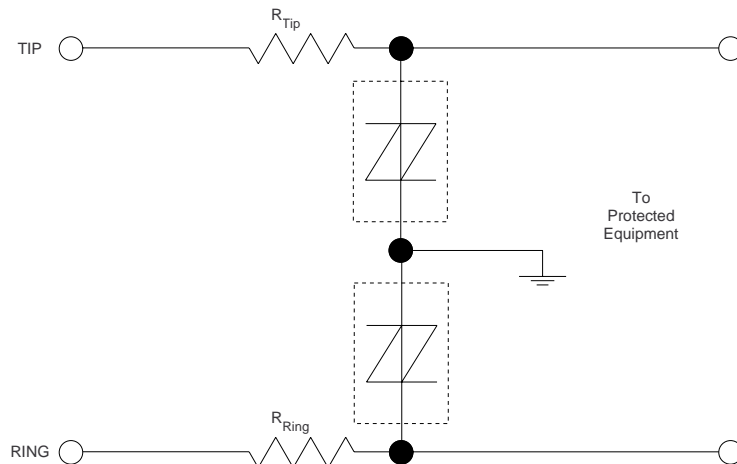
**FIGURE 8 - UL 1459 & FCC Part 68 Metallic Protection**



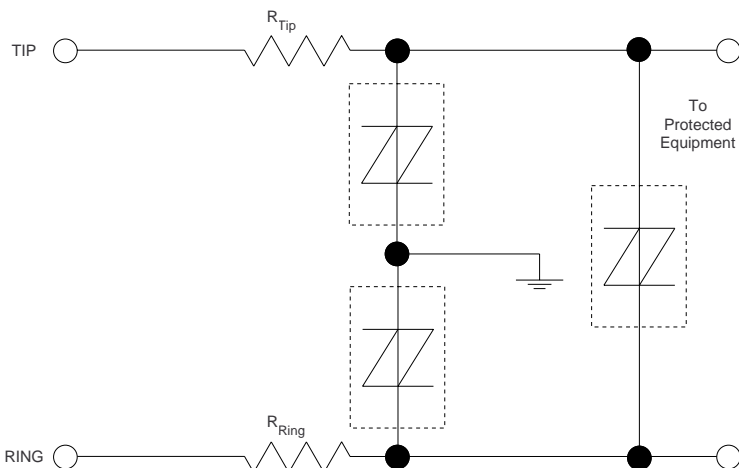
The TSS device is located across the tip-to-ring line after a limiting resistor and fuse combination.  $R_{TIP}$  and  $R_{RING}$  resistors are optional depending upon the TSS device selection. Without the resistors, the PP3100EB/EC is recommended. However, with a resistance value of 7.5 ohms for tip and ring, the PP3100EA is recommended. Digital signals may use a lower TSS device depending upon the total tip to ring voltage range. Selection of the TSS device, either PPxxxxEA or SB/SC is based upon the value of the tip and ring resistors. For the National Electronic Code (NEC) article 800, it is recommended that at least one fuse be used in the tip or ring line for metallic surges. Fuses may be replaced with a suitable Positive Temperature Coefficient (PTC) automatic resettable current limiting device.

**FIGURE 9 - UL 1459 & FCC Part 68 - Longitudinal Protection**

There are two TSS devices, one located from tip-to-ground and one ring-to-ground. For standard analog signals, the PP3100EA is recommended with a typical resistor value for tip and ring of 15 ohms. The PP3100EB/EC is recommended for resistor values of 7.5 ohms each. The National Electric Code (NEC) article 800 requires two fuse elements when connecting to ground. Fuses or a suitable Positive Temperature Coefficient (PTC) automatic resettable current limiting device may be used. The purpose of this circuit is to limit AC power current from getting on the ground line causing any safety hazard.



**FIGURE 10 - UL 1459 & FCC Part 68 - Metallic and Longitudinal Protection**



Three equal TSS devices are used in this application for metallic (tip-to-ring) and longitudinal (tip-to-ground and ring-to-ground) protection. For analog signals, the PP3100EB/EC is recommended. With a resistance value of 15 ohms for the tip and ring resistors, the PP3100EA may be used. The National Electric Code (NEC) article 800 requires two fuse elements when connecting to ground. Fuses or a suitable Positive Temperature Coefficient (PTC) automatic resettable current limiting device may be used. This is circuit is recommended for protection against the Bellcore requirement: First Level Lightning Surge Tests (Telecommunications Port), document # GR-1089-CORE.