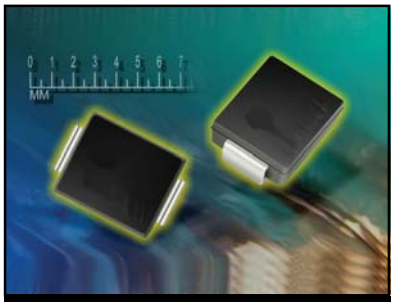
PROTEK DEVICES

# PP0640SA thru PP3500SC

## THYRISTOR SURGE SUPPRESSOR

## APPLICATIONS



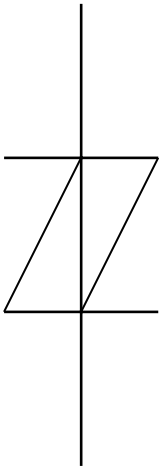
DO-214AA

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

## IEC COMPATIBILITY (EN61000-4)

- ✔ 61000-4-2 (ESD): Air - 15kV, Contact - 8kV
- ✔ 61000-4-4 (EFT): 40A - 5/50ns
- ✔ 61000-4-5 (Surge): 8/20µs - 95A, L4(Line-Gnd), 48A, L4(Line-Line) & 83A, L2(Power)

**DEVICE SYMBOL (BIDIRECTIONAL)**



## FEATURES

- ✔ Complies with: FCC Part 68, UL 1459, Bellcore 1089, ITU-K.20 & K.21
- ✔ UL File Recognition # E208219
- ✔ Peak Off-State Voltage from 25 to 300 Volts
- ✔ Surge Current Capability (See Table 1)
- ✔ ESD Protection > 40 kilovolts
- ✔ Low Capacitance for T1/E1 Trunk & Line Card Applications
- ✔ Bidirectional Configurations
- ✔ RoHS Compliant

## MECHANICAL CHARACTERISTICS

- ✔ Molded Plastic DO-214AA Package
- ✔ Weight 2.5 grams (Approximate)
- ✔ Available in Lead-Free Pure-Tin Plating(Annealed)
- ✔ Solder Reflow Temperature:
  Pure-Tin - Sn, 100: 260-270°C
- ✔ Leaded Device Availability
- ✔ Flammability Rating UL 94V-0
- ✔ 12mm Tape and Reel Per EIA Standard 481
- ✔ Marking: Logo & Marking Code

TABLE 1 - SURGE RATINGS

| SERIES | $I_{PP}$ 2 X 10µs AMPS | $I_{PP}$ 8 X 20µs AMPS | $I_{PP}$ 10 X 160µs AMPS | $I_{PP}$ 10 X 560µs AMPS | $I_{PP}$ 10 X 1000µs AMPS | $I_{TSM}$ 60 Hz AMPS | di/dt AMPS/µs (See Note 1) | dv/dt V/µs (See Note 1) |
|---|---|---|---|---|---|---|---|---|
| SA | 150 | 150 | 100 | 50 | 50 | 20 | 500 | 2000 |
| SB | 300 | 300 | 150 | 100 | 80 | 32 | 500 | 2000 |
| SC | 500 | 400 | 200 | 200 | 100 | 60 | 500 | 2000 |

**Note 1**: Critital Rate of Rise for On-State Current (di/dt) and Off-State Voltage (dv/dt).

## DEVICE CHARACTERISTICS

| MAXIMUM RATINGS @ 25°C Unless Otherwise Specified | | | |
|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **VALUE** | **UNITS** |
| Surge Current - 50/60 Hz | $I_{TSM}$ | 60 | Watts |
| Junction Temperature | $T_A$ | -40 to 150 | ℃ |
| Storage Temperature | $T_{STG}$ | -55 to 150 | ℃ |
| Thermal Resistance (Junction) - SA & SB Series | $R_{QJC}$ | 28 | °C/Watt |
| Thermal Resistance (Junction) - SC Series | $R_{QJC}$ | 26 | °C/Watt |
| Thermal Resistance (Ambient) - SA & SB Series | $R_{QJA}$ | 90 | °C/Watt |
| Thermal Resistance (Ambient) - SC Series | $R_{QJA}$ | 85 | °C/Watt |

| ELECTRICAL CHARACTERISTICS PER LINE @ 25°C Unless Otherwise Specified | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| PART NUMBER | DEVICE MARKING CODE | REPETITIVE PEAK OFF-STATE VOLTAGE<br>$V_{DRM}$<br>VOLTS | SWITCHING VOLTAGE<br>@100V/µs<br>$V_S$<br>VOLTS | MINIMUM HOLDING CURRENT (See Fig. 7)<br>di/dt = 1A/ms<br>$I_H$<br>mA | SWITCHING CURRENT<br>$I_S$<br>mA | MAXIMUM OFF-STATE CURRENT (See Fig. 4)<br>@$V_{DRM}$<br>$I_{DRM}$<br>µA | MAXIMUM ON-STATE VOLTAGE (See Fig. 5)<br>@$I_T$<br>$V_T$<br>VOLTS | ON-STATE CURRENT<br>$I_T$<br>AMPS | TYPICAL CAPACITANCE (See Note 1)<br>@2V, 1 MHz<br>C<br>pF |
| PP0640SA | GC | 58 | 77 | 150 | 800 | 5 | 4 | 2.2 | 60 |
| PP0720SA | GD | 65 | 88 | 150 | 800 | 5 | 4 | 2.2 | 60 |
| PP0800SA | GE | 75 | 98 | 150 | 800 | 5 | 4 | 2.2 | 60 |
| PP1100SA | GF | 90 | 130 | 150 | 800 | 5 | 4 | 2.2 | 60 |
| PP1300SA | GG | 120 | 160 | 150 | 800 | 5 | 4 | 2.2 | 40 |
| PP1500SA | GH | 140 | 180 | 150 | 800 | 5 | 4 | 2.2 | 40 |
| PP1800SA | GI | 160 | 220 | 150 | 800 | 5 | 4 | 2.2 | 40 |
| PP2300SA | GJ | 190 | 260 | 150 | 800 | 5 | 4 | 2.2 | 30 |
| PP2600SA | GK | 220 | 300 | 150 | 800 | 5 | 4 | 2.2 | 30 |
| PP3100SA | GL | 275 | 350 | 150 | 800 | 5 | 4 | 2.2 | 30 |
| PP3500SA | GM | 300 | 400 | 150 | 800 | 5 | 4 | 2.2 | 30 |
| PP0300SB | GN | 25 | 40 | 50 | 800 | 5 | 4 | 2.2 | 110 |
| PP0640SB | GP | 58 | 77 | 150 | 800 | 5 | 4 | 2.2 | 60 |
| PP0720SB | GQ | 65 | 88 | 150 | 800 | 5 | 4 | 2.2 | 60 |
| PP0800SB | GR | 75 | 98 | 150 | 800 | 5 | 4 | 2.2 | 60 |
| PP1100SB | GS | 90 | 130 | 150 | 800 | 5 | 4 | 2.2 | 60 |
| PP1300SB | GT | 120 | 160 | 150 | 800 | 5 | 4 | 2.2 | 40 |
| PP1500SB | GU | 140 | 180 | 150 | 800 | 5 | 4 | 2.2 | 40 |
| PP1800SB | GV | 160 | 220 | 150 | 800 | 5 | 4 | 2.2 | 40 |
| PP2300SB | GW | 190 | 260 | 150 | 800 | 5 | 4 | 2.2 | 30 |
| PP2600SB | GX | 220 | 300 | 150 | 800 | 5 | 4 | 2.2 | 30 |
| PP3100SB | GY | 275 | 350 | 150 | 800 | 5 | 4 | 2.2 | 30 |
| PP3500SB | GZ | 300 | 400 | 150 | 800 | 5 | 4 | 2.2 | 30 |
| PP0640SC | HC | 58 | 77 | 150 | 800 | 5 | 4 | 2.2 | 120 |
| PP0720SC | HD | 65 | 88 | 150 | 800 | 5 | 4 | 2.2 | 120 |
| PP0800SC | HE | 75 | 98 | 150 | 800 | 5 | 4 | 2.2 | 120 |
| PP1100SC | HF | 90 | 130 | 150 | 800 | 5 | 4 | 2.2 | 120 |
| PP1300SC | HG | 120 | 160 | 150 | 800 | 5 | 4 | 2.2 | 80 |
| PP1500SC | HH | 140 | 180 | 150 | 800 | 5 | 4 | 2.2 | 80 |
| PP1800SC | HI | 160 | 220 | 150 | 800 | 5 | 4 | 2.2 | 80 |
| PP2300SC | HJ | 190 | 260 | 150 | 800 | 5 | 4 | 2.2 | 60 |
| PP2600SC | HK | 220 | 300 | 150 | 800 | 5 | 4 | 2.2 | 60 |
| PP3100SC | HL | 275 | 350 | 150 | 800 | 5 | 4 | 2.2 | 60 |
| PP3500SC | HM | 300 | 400 | 150 | 800 | 5 | 4 | 2.2 | 60 |

**Note 1:** Capacitance imbalance between positive and negative polarities is typically < 15pF.

## GRAPHS

**FIGURE 1**
**PULSE WAVE FORM**

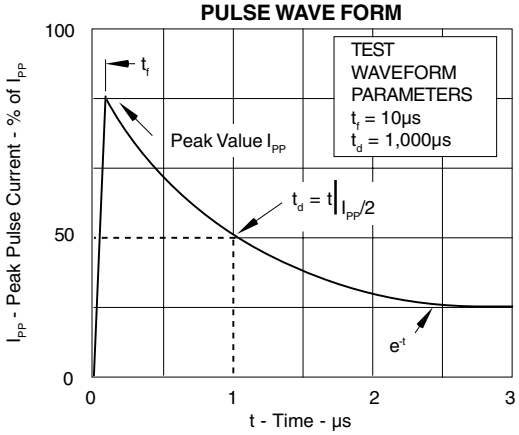



**FIGURE 2**
**V-I CHARACTERISTIC CURVE**

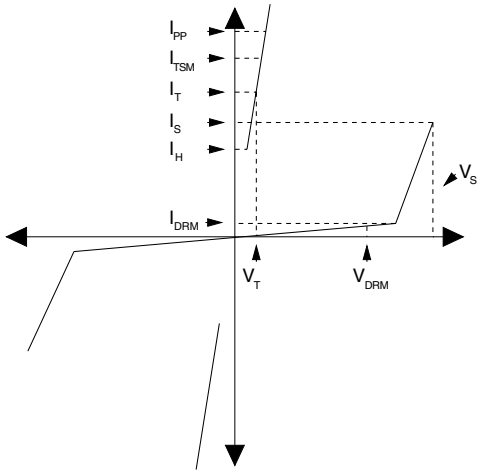
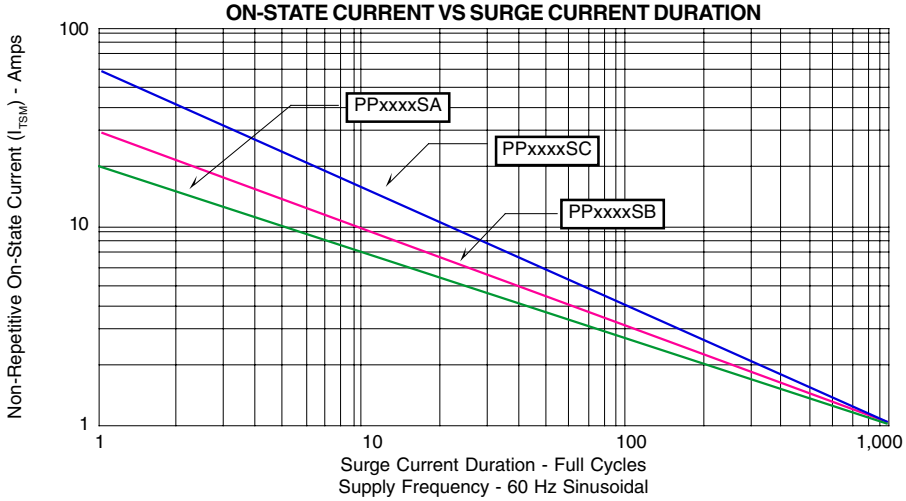



**FIGURE 3**
**ON-STATE CURRENT VS SURGE CURRENT DURATION**



## GRAPHS

**FIGURE 4**
**TYPICAL PEAK OFF-STATE CURRENT VS JUNCTION TEMPERATURE**

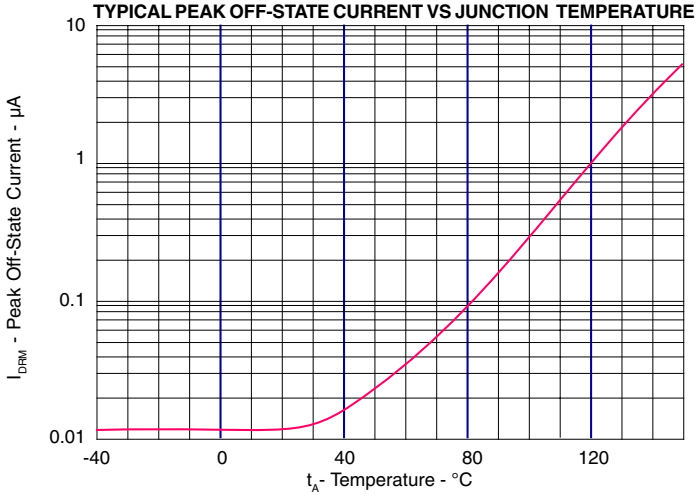



**FIGURE 5**
**TYPICAL ON-STATE CURRENT VS ON-STATE VOLTAGE**

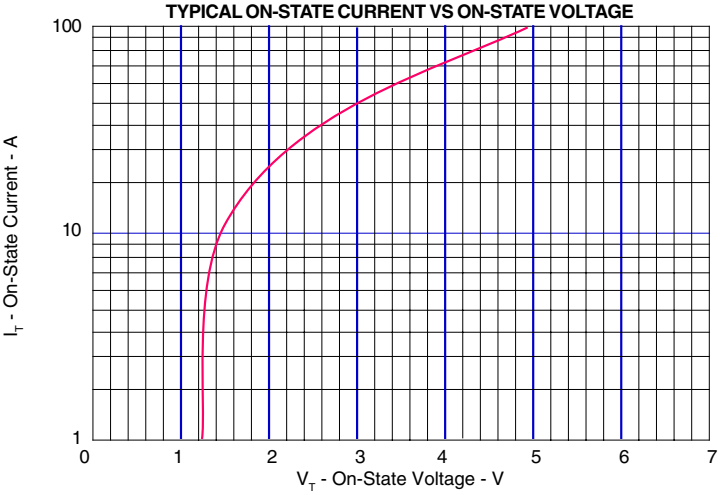



**FIGURE 6**
**TYPICAL NORMALIZED SWITCHING VOLTAGE VS JUNCTION TEMPERATURE**

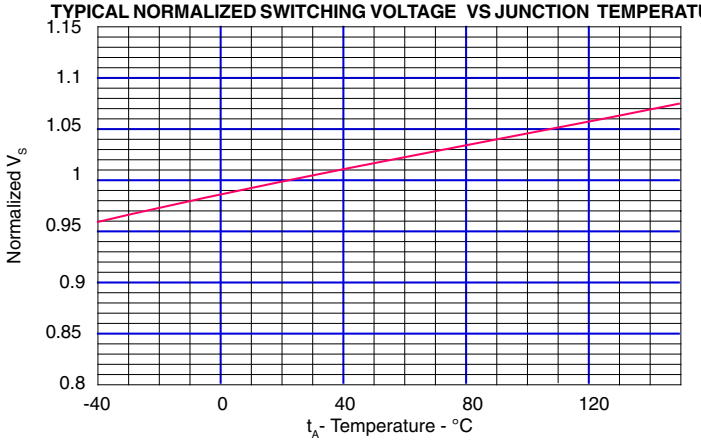
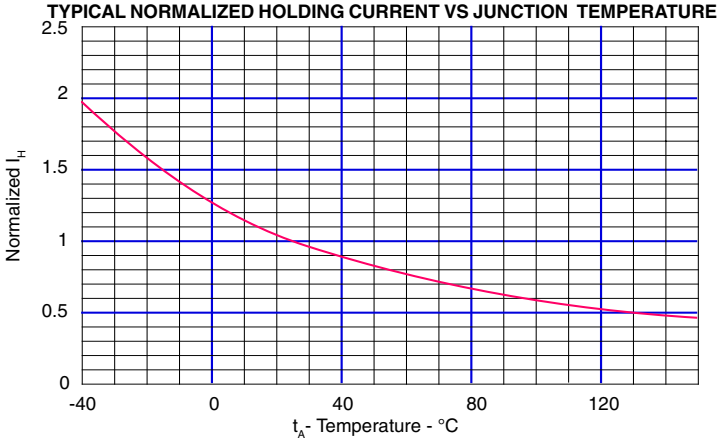



**FIGURE 7**
**TYPICAL NORMALIZED HOLDING CURRENT VS JUNCTION TEMPERATURE**



## APPLICATION NOTE

**FIGURE 1: UL 1459 & FCC Part 68 - Metallic Protection**

The TSS (Thyristor Surge Suppressor) device is located across the tip-to-ring 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 PP3100SB/SC is recommended. However, with a resistance value of 7.5 Ohms for tip and ring, the PP3100SA 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 PPxxxxSA or SB/SC is based upon the value of the tip and ring resistors. For the National Electric 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.

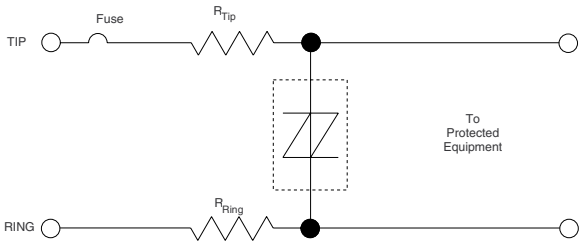



**FIGURE 1 - Metallic Protection**

**FIGURE 2 - 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 PP3100SA is recommended with a typical resistor value for tip and ring of 15 Ohms. The PP3100SB/SC 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.

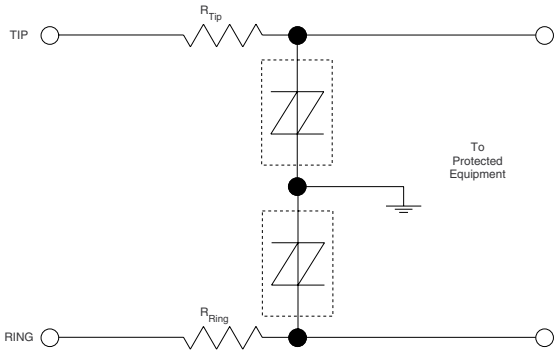



**FIGURE 2 - Longitudinal Protection**

**FIGURE 3 - UL 1459 & FCC Part 68 - Metallic & 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 PP3100SB/SC is recommended. With a resistance value of 15 Ohms for the tip and ring resistors, the PP3100SA 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 circuit is recommended for protection against the Bellcore requirement: First Level Lightning Surge Tests (Telecommunications Port), document # GR-1089-CORE.

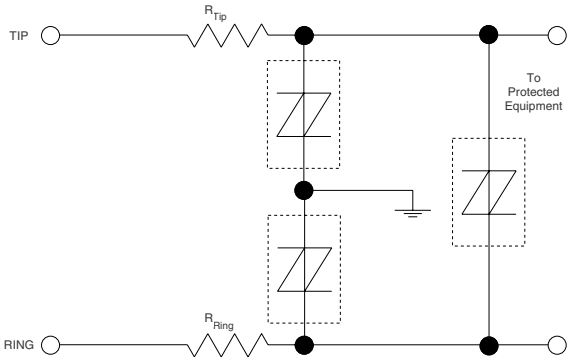
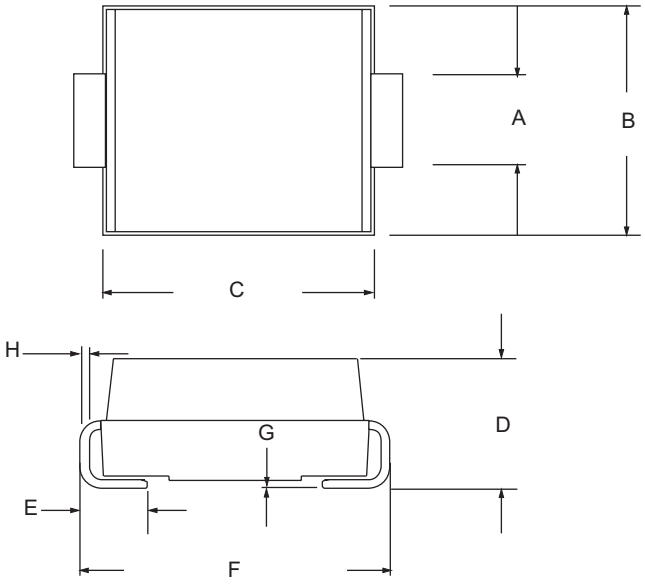


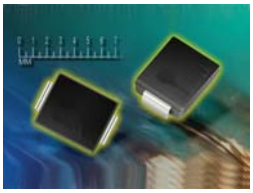

**FIGURE 3 - Metallic & Longitudinal Protection**

# DO-214AA PACKAGE OUTLINE & DIMENSIONS

**PACKAGE OUTLINE**




**DO-214AA (SMB)**



**DIMENSIONS**

| DIM | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 1.96 | 2.21 | 0.077 | 0.087 |
| B | 3.30 | 3.94 | 0.130 | 0.155 |
| C | 4.06 | 4.57 | 0.160 | 0.180 |
| D | 2.00 | 2.50 | 0.079 | 0.098 |
| E | 0.76 | 1.52 | 0.030 | 0.060 |
| F | 5.21 | 5.59 | 0.205 | 0.220 |
| G | 0.10 | 0.20 | 0.004 | 0.008 |
| H | 0.15 | 0.31 | 0.006 | 0.012 |

**NOTES**

1. 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-T = 13 Inch Reel - 3,000 pieces per 12mm tape, i.e., *PP0640SA-T.*
3. Suffix - LF = Lead-Free, Pure-Tin Plating, .e., *PP0640SA-LF-T.*

**Outline & Dimensions: Rev 0 - 4/02, 06030**

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