

# NP Series

Preferred Devices

## Thyristor Surge Protectors High Voltage Bidirectional

NP Series Thyristor Surge Protector Devices (TSPD) protect telecommunication circuits such as central office, access, and customer premises equipment from overvoltage conditions. These are bidirectional devices so they are able to have functionality of 2 devices in one package, saving valuable space on board layout.

These devices will act as a crowbar when overvoltage occurs and will divert the energy away from circuit or device that is being protected.

Use of the NP Series in equipment will help meet various regulatory requirements including: GR-1089-CORE, IEC 61000-4-5, ITU K.20/21/45, IEC 60950, TIA-968-A, FCC Part 68, EN 60950, UL 1950.

### ELECTRICAL PARAMETERS

| Device      | V <sub>DRM</sub> | V <sub>(BO)</sub> | V <sub>T</sub> | I <sub>DRM</sub> | I <sub>(BO)</sub> | I <sub>T</sub> | I <sub>H</sub> |
|-------------|------------------|-------------------|----------------|------------------|-------------------|----------------|----------------|
|             | V                | V                 | V              | μA               | mA                | A              | mA             |
| NP0640SxT3G | 58               | 77                | 4              | 5                | 800               | 2.2            | 150            |
| NP0720SxT3G | 65               | 88                | 4              | 5                | 800               | 2.2            | 150            |
| NP0900SxT3G | 75               | 98                | 4              | 5                | 800               | 2.2            | 150            |
| NP1100SxT3G | 90               | 130               | 4              | 5                | 800               | 2.2            | 150            |
| NP1300SxT3G | 120              | 160               | 4              | 5                | 800               | 2.2            | 150            |
| NP1500SxT3G | 140              | 180               | 4              | 5                | 800               | 2.2            | 150            |
| NP1800SxT3G | 170              | 220               | 4              | 5                | 800               | 2.2            | 150            |
| NP2100SxT3G | 180              | 240               | 4              | 5                | 800               | 2.2            | 150            |
| NP2300SxT3G | 190              | 260               | 4              | 5                | 800               | 2.2            | 150            |
| NP2600SxT3G | 220              | 300               | 4              | 5                | 800               | 2.2            | 150            |
| NP3100SxT3G | 275              | 350               | 4              | 5                | 800               | 2.2            | 150            |
| NP3500SxT3G | 320              | 400               | 4              | 5                | 800               | 2.2            | 150            |

G = indicates leadfree, RoHS compliant

### SURGE DATA RATINGS

| Specification | Waveform      |               | x = series ratings |     |     | Unit  |
|---------------|---------------|---------------|--------------------|-----|-----|-------|
|               | Voltage<br>μs | Current<br>μs | A                  | B   | C   |       |
| GR-1089-CORE  | 2x10          | 2x10          | 150                | 250 | 500 | A(pk) |
| TIA-968-A     | 10x160        | 10x160        | 90                 | 150 | 200 |       |
| GR-1089-CORE  | 10x360        | 10x360        | 75                 | 125 | 175 |       |
| TIA-968-A     | 10x560        | 10x560        | 50                 | 100 | 150 |       |
| ITU-T K.20/21 | 10x700        | 5x310         | 75                 | 100 | 200 |       |
| GR-1089-CORE  | 10x1000       | 10x1000       | 50                 | 80  | 100 |       |

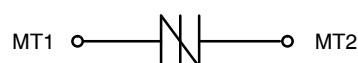
\* Recognized Components



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## BIDIRECTIONAL SURFACE MOUNT THYRISTOR 64 – 350 VOLTS



**SMB**  
JEDEC DO-214AA  
CASE 403C

### MARKING DIAGRAM



xxxx = Specific Device Code  
Y = Year  
WW = Work Week  
▪ = Pb-Free Package  
(Note: Microdot may be in either location)

### ORDERING INFORMATION

See detailed ordering and shipping information on page 4 of this data sheet.

**Preferred** devices are recommended choices for future use and best overall value.

# NP Series

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted)

| Characteristics (Note 1)  | Symbol                                 | Min  | Typ | Max   | Unit     |
|---|--|--|-----|---|----------|
| Breakover Voltage (Both Polarities)<br>NP0640SxT3G<br>NP0720SxT3G<br>NP0900SxT3G<br>NP1100SxT3G<br>NP1300SxT3G<br>NP1500SxT3G<br>NP1800SxT3G<br>NP2100SxT3G<br>NP2300SxT3G<br>NP2600SxT3G<br>NP3100SxT3G<br>NP3500SxT3G | V <sub>(BO)</sub>                      |  |     | 77<br>88<br>98<br>130<br>160<br>180<br>220<br>240<br>260<br>300<br>350<br>400 | V        |
| Off-State Voltage (Both Polarities)<br>NP0640SxT3G<br>NP0720SxT3G<br>NP0900SxT3G<br>NP1100SxT3G<br>NP1300SxT3G<br>NP1500SxT3G<br>NP1800SxT3G<br>NP2100SxT3G<br>NP2300SxT3G<br>NP2600SxT3G<br>NP3100SxT3G<br>NP3500SxT3G | V <sub>DRM</sub>                       | 58<br>65<br>75<br>90<br>120<br>140<br>170<br>180<br>190<br>220<br>275<br>320 |     |   | V        |
| Off State Current<br>(V <sub>D1</sub> = 50 V) Both Polarities<br>(V <sub>D2</sub> = V <sub>DRM</sub> ) Both Polarities  | I <sub>DRM1</sub><br>I <sub>DRM2</sub> |  |     | 2.0<br>5.0  | μA<br>μA |
| Holding Current (Both Polarities) (Note 4) V <sub>S</sub> = 500 V; I <sub>T</sub> = 2.2 A   | I <sub>H</sub>                         | 150  | 250 | –   | mA       |
| On-State Voltage I <sub>T</sub> = 1.0 A(pk) (PW = 300 μSec, DC = 2%)  | V <sub>T</sub>                         | –  | –   | 4.0   | V        |
| Maximum Non-Repetitive Rate of Change of On-State Current (Note 1)<br>(Haefely test method, 1.0 pk < 100 A)   | di/dt                                  | –  | –   | 500   | A/μSec   |
| Critical Rate of Rise of Off-State Voltage<br>(Linear Waveform, V <sub>D</sub> = 0.8 V <sub>DRM</sub> , T <sub>J</sub> = 25°C)  | dv/dt                                  | 5.0  | –   | –   | kV/μSec  |

## CAPACITANCE

| Characteristics  | Symbol         | Typ  |   |  | Unit |
|--|----------------|--|---|--|------|
|  |                | A  | B   | C  |      |
| (f=1.0 MHz, 1.0 V <sub>rms</sub> , 2 Vdc bias)<br>NP0640SxT3G<br>NP0720SxT3G<br>NP0900SxT3G<br>NP1100SxT3G<br>NP1300SxT3G<br>NP1500SxT3G<br>NP1800SxT3G<br>NP2100SxT3G<br>NP2300SxT3G<br>NP2600SxT3G<br>NP3100SxT3G<br>NP3500SxT3G | C <sub>o</sub> | 84<br>79<br>65<br>58<br>46<br>44<br>39<br>37<br>36<br>33<br>31<br>28 | 129<br>123<br>122<br>95<br>75<br>70<br>59<br>59<br>56<br>52<br>47<br>44 | 222<br>198<br>122<br>154<br>120<br>113<br>99<br>97<br>56<br>81<br>76<br>71 | pF   |

1. Electrical parameters are based on pulsed test methods.
2. di/dt must not be exceeded of a maximum of 100 A/μSec in this application.
3. Measured under pulsed conditions to reduce heating
4. Allow cooling before testing second polarity.

# NP Series

## SURGE RATINGS

| Characteristics                                      | Symbol            | A   | B   | C   | Unit  |
|--|-------------------|-----|-----|-----|-------|
| Nominal Pulse  |                   |     |     |     | A(pk) |
| Surge Short Circuit Current Non – Repetitive         |                   |     |     |     |       |
| Double Exponential Decay Waveform (Notes 5, 6 and 7) |                   |     |     |     |       |
| 2 x 10 $\mu$ Sec                                     | I <sub>PPS1</sub> | 150 | 250 | 500 |       |
| 10 x 160 $\mu$ Sec                                   | I <sub>PPS3</sub> | 90  | 150 | 200 |       |
| 10 x 360 $\mu$ Sec                                   | I <sub>PPS4</sub> | 75  | 125 | 150 |       |
| 10 x 560 $\mu$ Sec                                   | I <sub>PPS5</sub> | 50  | 100 | 150 |       |
| 10 x 700 $\mu$ Sec                                   | I <sub>PPS6</sub> | 75  | 100 | 200 |       |
| 10 x 1000 $\mu$ Sec                                  | I <sub>PPS7</sub> | 50  | 80  | 100 |       |

5. Allow cooling before testing second polarity.
6. Measured under pulse conditions to reduce heating.
7. Nominal values may not represent the maximum capability of a device.

## THERMAL CHARACTERISTICS

| Symbol           | Rating   | Value       | Unit |
|------------------|--|-------------|------|
| T <sub>STG</sub> | Storage Temperature Range  | -65 to +150 | °C   |
| T <sub>J</sub>   | Operating Temperature Range  | -40 to +150 | °C   |
| R <sub>ΘJA</sub> | Thermal Resistance: Junction-to-Ambient Per EIA/JESD51-3, PCB = FR4 3"x4.5"x0.06"<br>Fan out in a 3x3 inch pattern, 2 oz copper track. | 90          | °C/W |

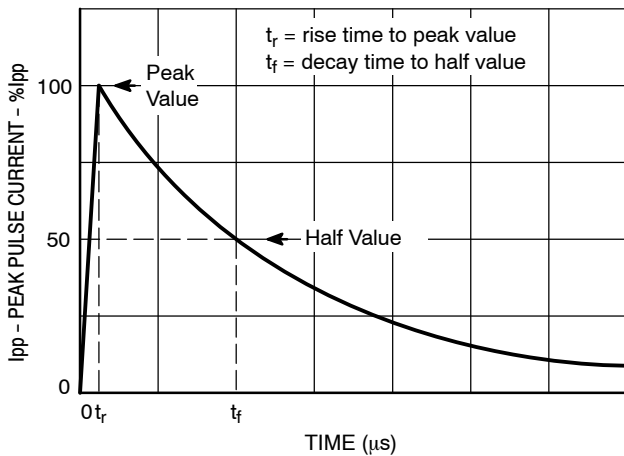


Figure 1. Exponential Decay Pulse Waveform

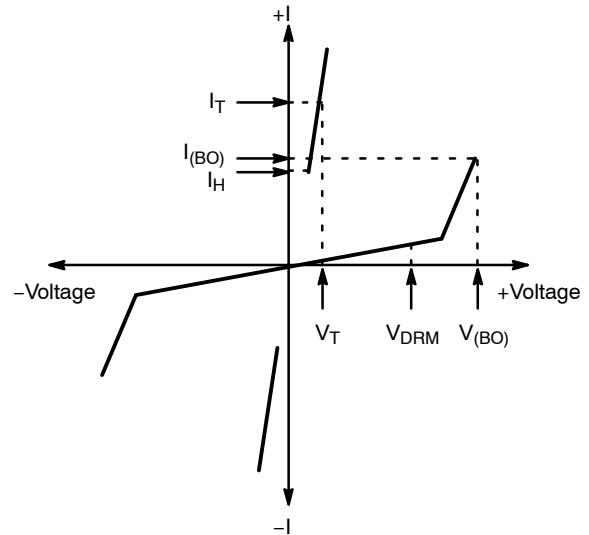


Figure 2. Voltage Current Characteristics of TSPD

| Symbol            | Parameter              |
|-------------------|------------------------|
| V <sub>DRM</sub>  | Peak Off State Voltage |
| V <sub>(BO)</sub> | Breakover Voltage      |
| I <sub>(BO)</sub> | Breakover Current      |
| I <sub>H</sub>    | Holding Current        |
| V <sub>T</sub>    | On State Voltage       |
| I <sub>T</sub>    | On State Current       |

## NP Series

### ORDERING INFORMATION

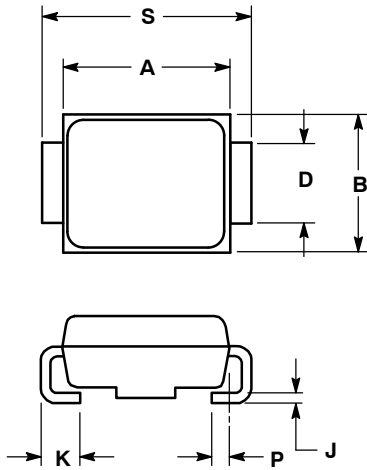
| Part Number | Marking | Case             | Shipping†            |
|-------------|---------|------------------|----------------------|
| NP0640SAT3G | 064A    | SMB<br>(Pb-Free) | 2500 / Tape and Reel |
| NP0640SBT3G | 064B    |                  |                      |
| NP0640SCT3G | 064C    |                  |                      |
| NP0720SAT3G | 072A    |                  |                      |
| NP0720SBT3G | 072B    |                  |                      |
| NP0720SCT3G | 072C    |                  |                      |
| NP0900SAT3G | 090A    |                  |                      |
| NP0900SBT3G | 090B    |                  |                      |
| NP0900SCT3G | 090C    |                  |                      |
| NP1100SAT3G | 110A    |                  |                      |
| NP1100SBT3G | 110B    |                  |                      |
| NP1100SCT3G | 110C    |                  |                      |
| NP1300SAT3G | 130A    |                  |                      |
| NP1300SBT3G | 130B    |                  |                      |
| NP1300SCT3G | 130C    |                  |                      |
| NP1500SAT3G | 150A    |                  |                      |
| NP1500SBT3G | 150B    |                  |                      |
| NP1500SCT3G | 150C    |                  |                      |
| NP1800SAT3G | 180A    |                  |                      |
| NP1800SBT3G | 180B    |                  |                      |
| NP1800SCT3G | 180C    |                  |                      |
| NP2100SAT3G | 210A    |                  |                      |
| NP2100SBT3G | 210B    |                  |                      |
| NP2100SCT3G | 210C    |                  |                      |
| NP2300SAT3G | 230A    |                  |                      |
| NP2300SBT3G | 230B    |                  |                      |
| NP2300SCT3G | 230C    |                  |                      |
| NP2600SAT3G | 260A    |                  |                      |
| NP2600SBT3G | 260B    |                  |                      |
| NP2600SCT3G | 260C    |                  |                      |
| NP3100SAT3G | 310A    |                  |                      |
| NP3100SBT3G | 310B    |                  |                      |
| NP3100SCT3G | 310C    |                  |                      |
| NP3500SAT3G | 350A    |                  |                      |
| NP3500SBT3G | 350B    |                  |                      |
| NP3500SCT3G | 350C    |                  |                      |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

# NP Series

## PACKAGE DIMENSIONS

### SMB CASE 403C-01 ISSUE A

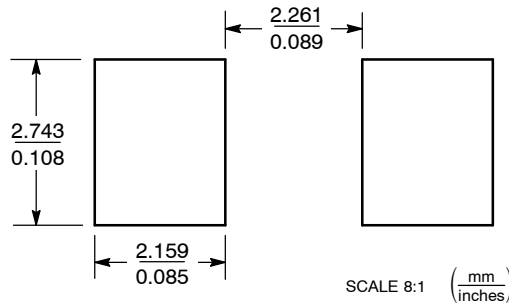


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. D DIMENSION SHALL BE MEASURED WITHIN DIMENSION P.

| DIM | INCHES |        | MILLIMETERS |       |
|-----|--------|--------|-------------|-------|
|     | MIN    | MAX    | MIN         | MAX   |
| A   | 0.160  | 0.180  | 4.06        | 4.57  |
| B   | 0.130  | 0.150  | 3.30        | 3.81  |
| C   | 0.075  | 0.095  | 1.90        | 2.41  |
| D   | 0.077  | 0.083  | 1.96        | 2.11  |
| H   | 0.0020 | 0.0060 | 0.051       | 0.152 |
| J   | 0.006  | 0.012  | 0.15        | 0.30  |
| K   | 0.030  | 0.050  | 0.76        | 1.27  |
| P   | 0.020  | REF    | 0.51        | REF   |
| S   | 0.205  | 0.220  | 5.21        | 5.59  |

### SOLDERING FOOTPRINT\*



\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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