

# 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 μs	Current 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	

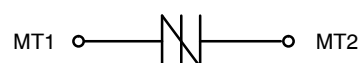
\* Recognized Components



ON Semiconductor®

<http://onsemi.com>

## 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) NP0640SxT3G NP0720SxT3G NP0900SxT3G NP1100SxT3G NP1300SxT3G NP1500SxT3G NP1800SxT3G NP2100SxT3G NP2300SxT3G NP2600SxT3G NP3100SxT3G NP3500SxT3G	V <sub>(BO)</sub>			77 88 98 130 160 180 220 240 260 300 350 400	V
Off-State Voltage (Both Polarities) NP0640SxT3G NP0720SxT3G NP0900SxT3G NP1100SxT3G NP1300SxT3G NP1500SxT3G NP1800SxT3G NP2100SxT3G NP2300SxT3G NP2600SxT3G NP3100SxT3G NP3500SxT3G	V <sub>DRM</sub>	58 65 75 90 120 140 170 180 190 220 275 320			V
Off State Current (V <sub>D1</sub> = 50 V) Both Polarities (V <sub>D2</sub> = V <sub>DRM</sub> ) Both Polarities	I <sub>DRM1</sub> I <sub>DRM2</sub>			2.0 5.0	μA 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) (Haefely test method, 1.0 pk < 100 A)	di/dt	–	–	500	A/μSec
Critical Rate of Rise of Off-State Voltage (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) NP0640SxT3G NP0720SxT3G NP0900SxT3G NP1100SxT3G NP1300SxT3G NP1500SxT3G NP1800SxT3G NP2100SxT3G NP2300SxT3G NP2600SxT3G NP3100SxT3G NP3500SxT3G	C <sub>o</sub>	84 79 65 58 46 44 39 37 36 33 31 28	129 123 122 95 75 70 59 59 56 52 47 44	222 198 122 154 120 113 99 97 56 81 76 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" Fan out in a 3x3 inch pattern, 2 oz copper track.	90	°C/W

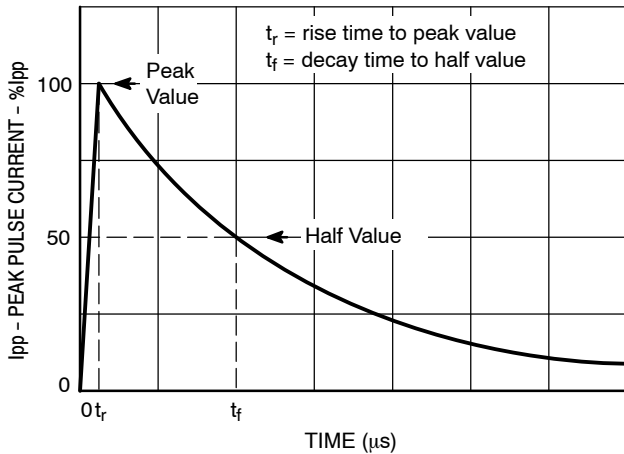


Figure 1. Exponential Decay Pulse Waveform

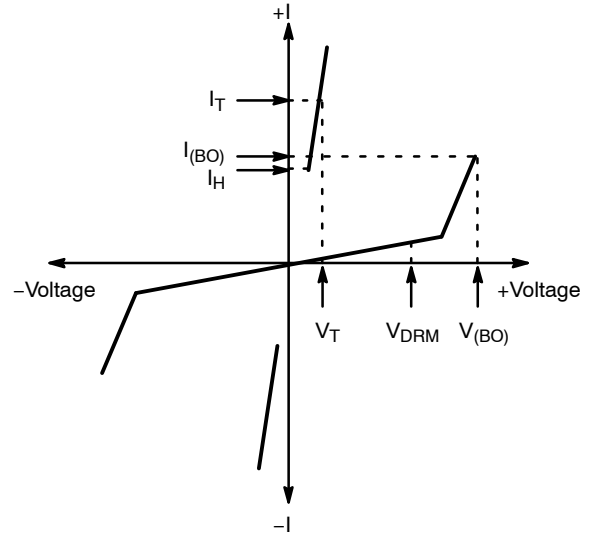


Figure 2. Voltage Current Characteristics of TSPD

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

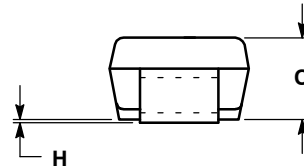
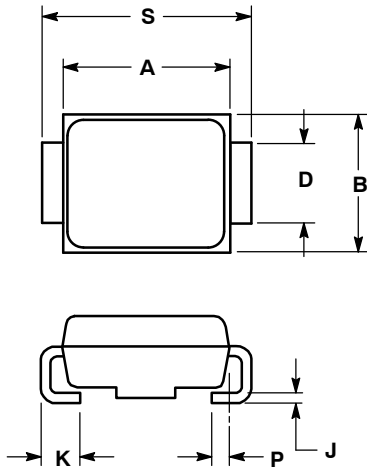
Part Number	Marking	Case	Shipping†
NP0640SAT3G	064A	SMB (Pb-Free)	2500 / Tape and Reel
NP0640SBT3G	064B		
NP0640SCT3G	064C		
NP0720SAT3G	072A		
NP0720SBT3G	072B		
NP0720SCT3G	072C		
NP0900SAT3G	090A		
NP0900SBT3G	090B		
NP0900SCT3G	090C		
NP1100SAT3G	110A		
NP1100SBT3G	110B		
NP1100SCT3G	110C		
NP1300SAT3G	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

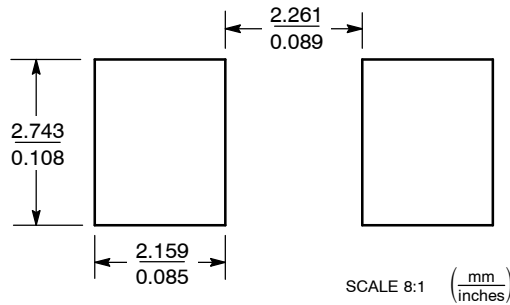


#### NOTES:

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.

ON Semiconductor and are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

### PUBLICATION ORDERING INFORMATION

**LITERATURE FULFILLMENT:**  
 Literature Distribution Center for ON Semiconductor  
 P.O. Box 5163, Denver, Colorado 80217 USA  
**Phone:** 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
**Fax:** 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
**Email:** orderlit@onsemi.com

**N. American Technical Support:** 800-282-9855 Toll Free  
 USA/Canada  
**Europe, Middle East and Africa Technical Support:**  
 Phone: 421 33 790 2910  
**Japan Customer Focus Center**  
 Phone: 81-3-5773-3850

**ON Semiconductor Website:** [www.onsemi.com](http://www.onsemi.com)  
**Order Literature:** <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative