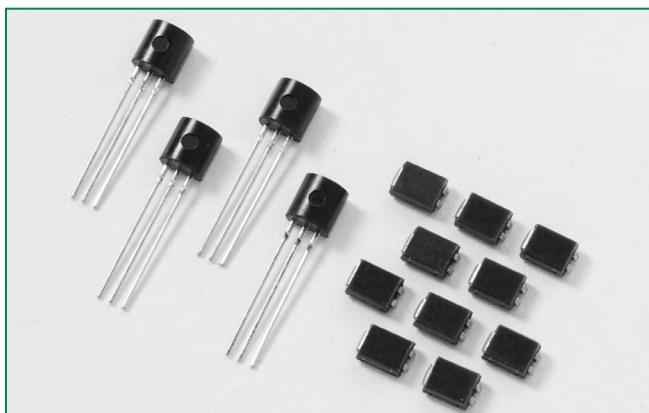


## Sx01E & SxN1 Series

RoHS



### Description

Excellent for lower current heat, lamp, and audible alarm controls for home goods.

Standard phase control SCRs are triggered with few milliamperes of current at less than 1.5V potential.

### Features & Benefits

- RoHS compliant
- Glass – passivated junctions
- Voltage capability up to 600 V
- Surge capability up to 30 A

### Applications

Typical applications are AC solid-state switches, fluidlevel sensors, strobes, and capacitive-discharge ignition systems.

### Additional Information


[Datasheet](#)

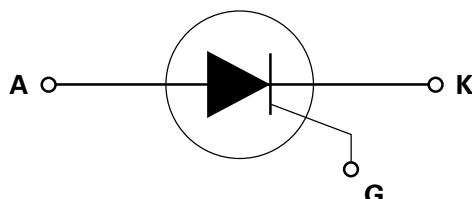
[Resources](#)

[Samples](#)

### Main Features

Symbol	Value	Unit
$I_{T(RMS)}$	1	A
$V_{DRM}/V_{RRM}$	400 to 600	V
$I_{GT}$	10	mA

### Schematic Symbol



### Absolute Maximum Ratings – Standard SCRs

Symbol	Parameter	Test Conditions	Value	Unit
$I_{T(RMS)}$	RMS on-state current	$T_c = 90^\circ\text{C}$	1	A
$I_{T(AV)}$	Average on-state current	$T_c = 90^\circ\text{C}$	0.64	A
$I_{TSM}$	Peak non-repetitive surge current	single half cycle; $f = 50\text{Hz}$ ; $T_j$ (initial) = $25^\circ\text{C}$	25	A
		single half cycle; $f = 60\text{Hz}$ ; $T_j$ (initial) = $25^\circ\text{C}$	30	
$I^2t$	$I_2t$ Value for fusing	$t_p = 8.3 \text{ ms}$	3.7	$\text{A}^2\text{s}$
$di/dt$	Critical rate of rise of on-state current	$f = 60\text{Hz}; T_j = 125^\circ\text{C}$	50	$\text{A}/\mu\text{s}$
$I_{GM}$	Peak gate current	$T_j = 125^\circ\text{C}$	1.5	A
$P_{G(AV)}$	Average gate power dissipation	$T_j = 125^\circ\text{C}$	0.3	W
$T_{stg}$	Storage temperature range		-40 to 150	$^\circ\text{C}$
$T_j$	Operating junction temperature range		-40 to 125	$^\circ\text{C}$

**Electrical Characteristics ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)**

Symbol	Test Conditions	Value	Unit
$I_{GT}$	$V_D = 12\text{V}; R_L = 60 \Omega$	MAX.	10
		MIN.	1
$V_{GT}$	$V_D = 12\text{V}; R_L = 60 \Omega$	MAX.	1.5
dv/dt	$V_D = V_{DRM}$ ; gate open; $T_J = 100^\circ\text{C}$	MIN.	20
	$V_D = V_{DRM}$ ; gate open; $T_J = 125^\circ\text{C}$		40
$V_{GD}$	$V_D = V_{DRM}; R_L = 3.3 \text{k}\Omega; T_J = 125^\circ\text{C}$	MIN.	0.2
$I_H$	$I_T = 200\text{mA}$ (initial)	MAX.	30
$t_q$	(1)	MAX.	35
$t_{gt}$	$I_G = 2 \times I_{GT}$ ; PW = 15μs; $I_T = 2\text{A}$	TYP.	2

(1)  $I_T=1\text{A}$ ;  $t_p=50\mu\text{s}$ ; dv/dt=20V/μs; di/dt=-10A/μs

**Static Characteristics**

Symbol	Test Conditions	Value	Unit
$V_{TM}$	$I_T = 2\text{A}; t_p = 380 \mu\text{s}$	1.6	V
$I_{DRM} / I_{RRM}$	$V_{DRM} = V_{RRM}$	MAX.	10
			200
			500

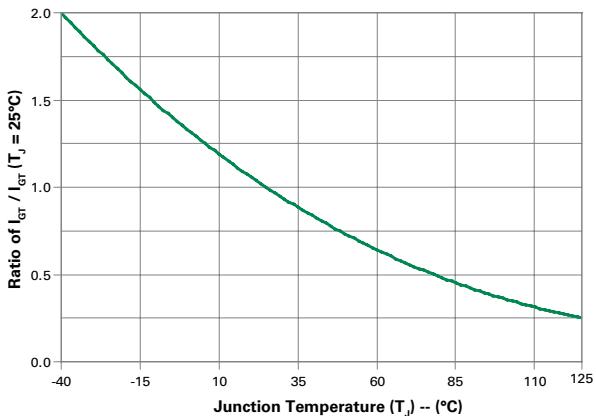
**Thermal Resistances**

Symbol	Parameter	Value	Unit
$R_{\theta(J-C)}$	Junction to case (AC)	Sx01E	50
		SxN1	35*
$R_{\theta(J-A)}$	Junction to ambient	145	°C/W

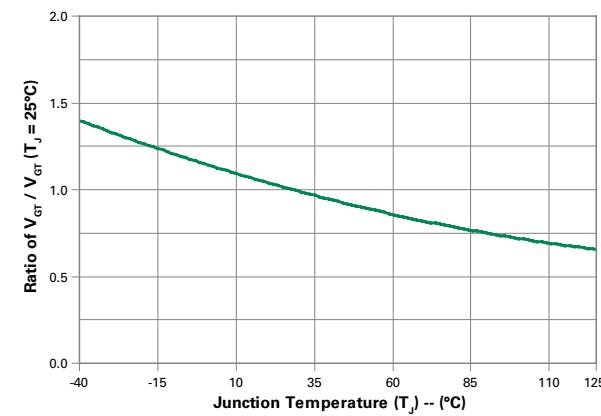
Notes : x = voltage

\* = Mounted on 1 cm<sup>2</sup> copper (two-ounce) foil surface

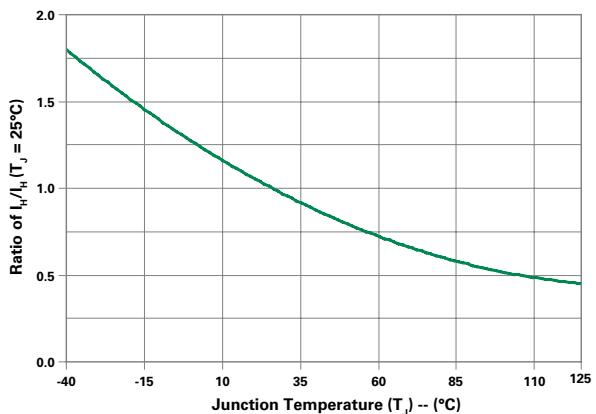
**Figure 1: Normalized DC Gate Trigger Current vs. Junction Temperature**



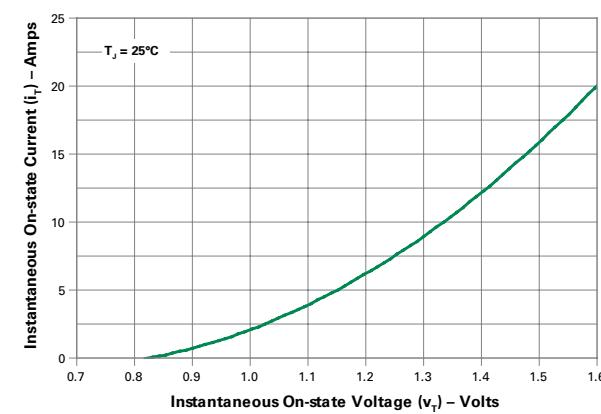
**Figure 2: Normalized DC Gate Trigger Voltage vs. Junction Temperature**



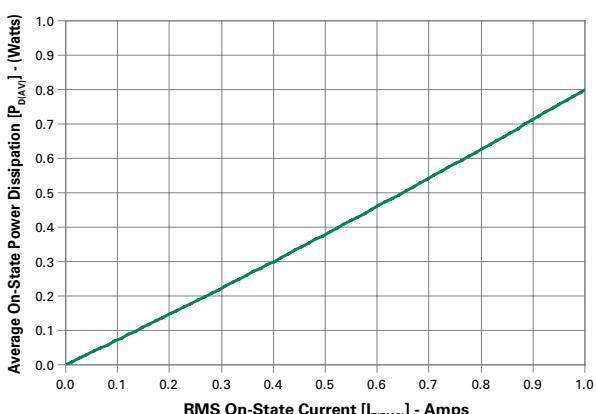
**Figure 3: Normalized DC Holding Current vs. Junction Temperature**



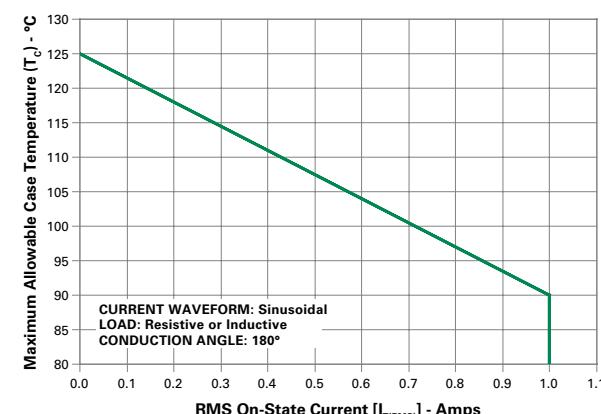
**Figure 4: On-State Current vs. On-State Voltage (Typical)**



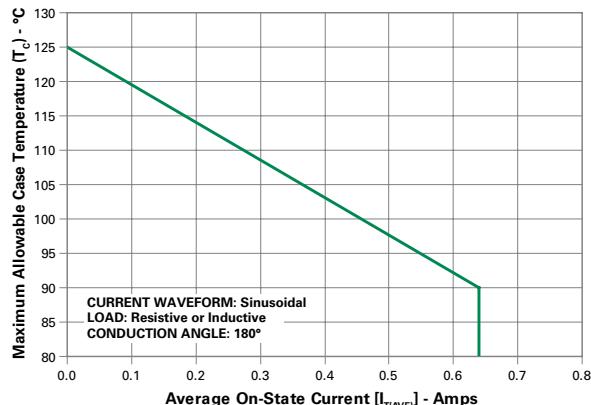
**Figure 5: Power Dissipation (Typical) vs. RMS On-State Current**



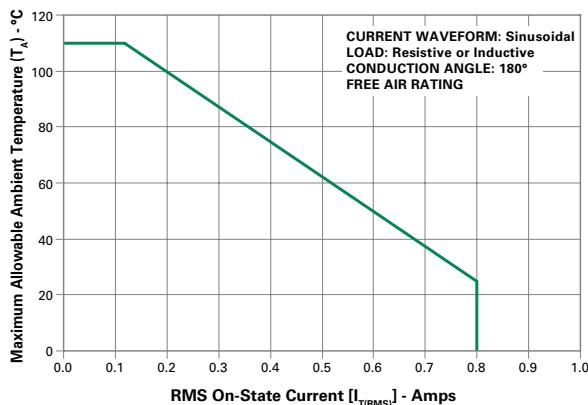
**Figure 6: Maximum Allowable Case Temperature vs. RMS On-State Current**



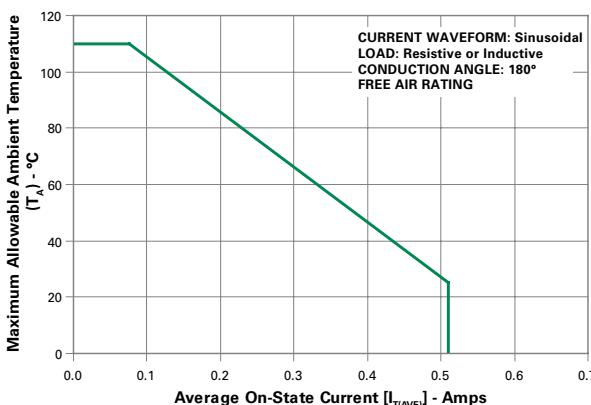
**Figure 7: Maximum Allowable Case Temperature vs. Average On-State Current**



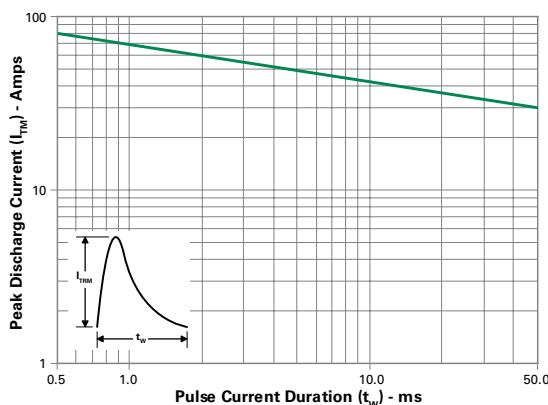
**Figure 8: Maximum Allowable Ambient Temperature vs. RMS On-State Current**



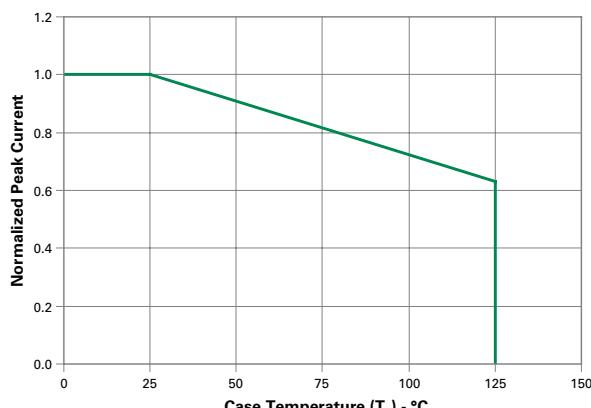
**Figure 9: Maximum Allowable Ambient Temperature vs. Average On-State Current**

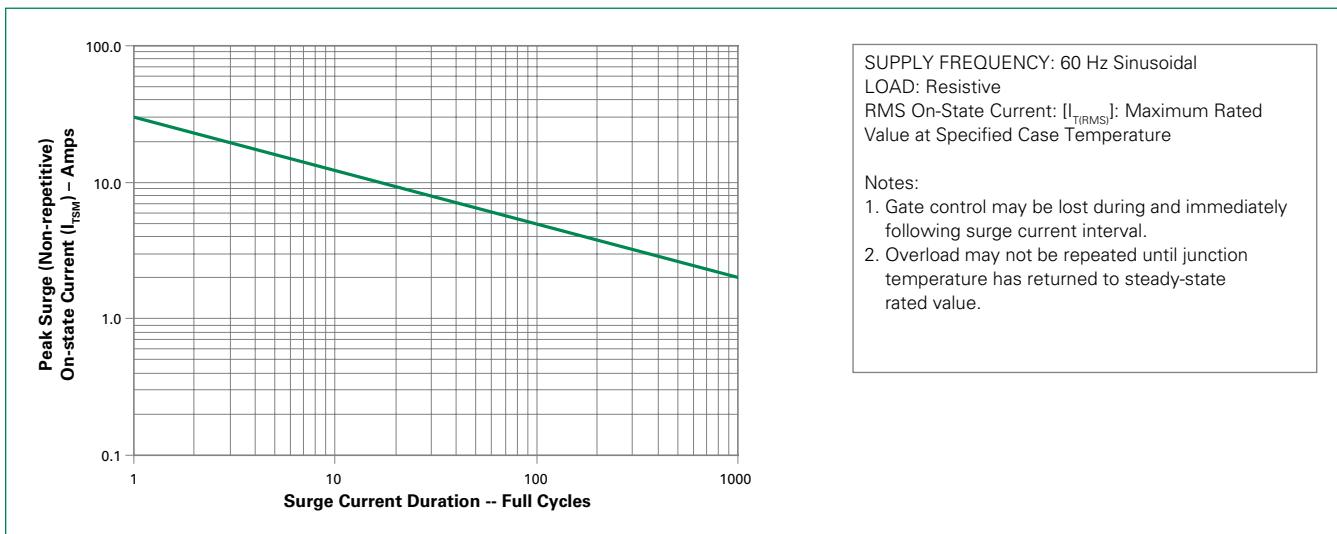


**Figure 10: Peak Capacitor Discharge Current**

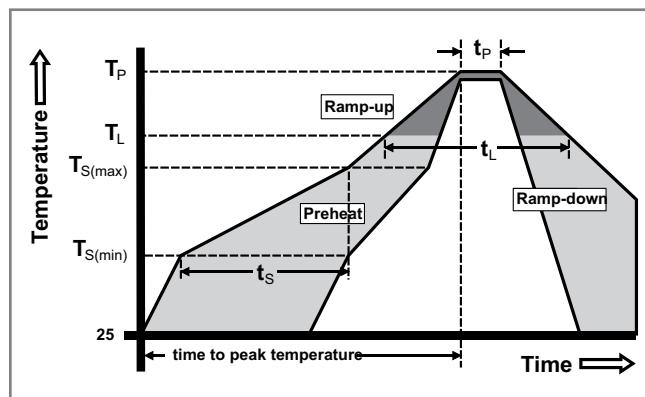


**Figure 11: Peak Capacitor Discharge Current Derating**



**Figure 12: Surge Peak On-State Current vs. Number of Cycles**

**Soldering Parameters**

Reflow Condition		Pb – Free assembly
Pre Heat	- Temperature Min ( $T_{s(min)}$ )	150°C
	- Temperature Max ( $T_{s(max)}$ )	200°C
	- Time (min to max) ( $t_s$ )	60 – 180 secs
Average ramp up rate (Liquidus Temp) ( $T_L$ ) to peak		5°C/second max
Reflow	$T_{S(max)}$ to $T_L$ - Ramp-up Rate	5°C/second max
	- Temperature ( $T_L$ ) (Liquidus)	217°C
Peak Temperature ( $T_p$ )		260 <sup>+0/-5</sup> °C
Time within 5°C of actual peak Temperature ( $t_p$ )		20 – 40 seconds
Ramp-down Rate		5°C/second max
Time 25°C to peak Temperature ( $T_p$ )		8 minutes Max.
Do not exceed		280°C



### Physical Specifications

<b>Terminal Finish</b>	100% Matte Tin-plated
<b>Body Material</b>	UL recognized epoxy meeting flammability classification 94V-0
<b>Lead Material</b>	Copper Alloy

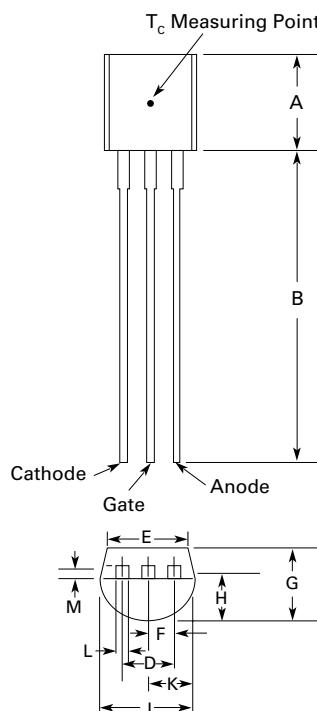
### Environmental Specifications

Test	Specifications and Conditions
<b>AC Blocking</b>	MIL-STD-750, M-1040, Cond A Applied Peak AC voltage @ 125°C for 1008 hours
<b>Temperature Cycling</b>	MIL-STD-750, M-1051, 100 cycles; -40°C to +150°C; 15-min dwell-time
<b>Temperature/Humidity</b>	EIA / JEDEC, JESD22-A101 1008 hours; 320V - DC: 85°C; 85% rel humidity
<b>High Temp Storage</b>	MIL-STD-750, M-1031, 1008 hours; 150°C
<b>Low-Temp Storage</b>	1008 hours; -40°C
<b>Resistance to Solder Heat</b>	MIL-STD-750 Method 2031
<b>Solderability</b>	ANSI/J-STD-002, category 3, Test A
<b>Lead Bend</b>	MIL-STD-750, M-2036 Cond E

### Design Considerations

Careful selection of the correct device for the application's operating parameters and environment will go a long way toward extending the operating life of the Thyristor. Good design practice should limit the maximum continuous current through the main terminals to 75% of the device rating. Other ways to ensure long life for a power discrete semiconductor are proper heat sinking and selection of voltage ratings for worst case conditions. Overheating, overvoltage (including dv/dt), and surge currents are the main killers of semiconductors. Correct mounting, soldering, and forming of the leads also help protect against component damage.

### Dimensions – TO-92 (E Package)

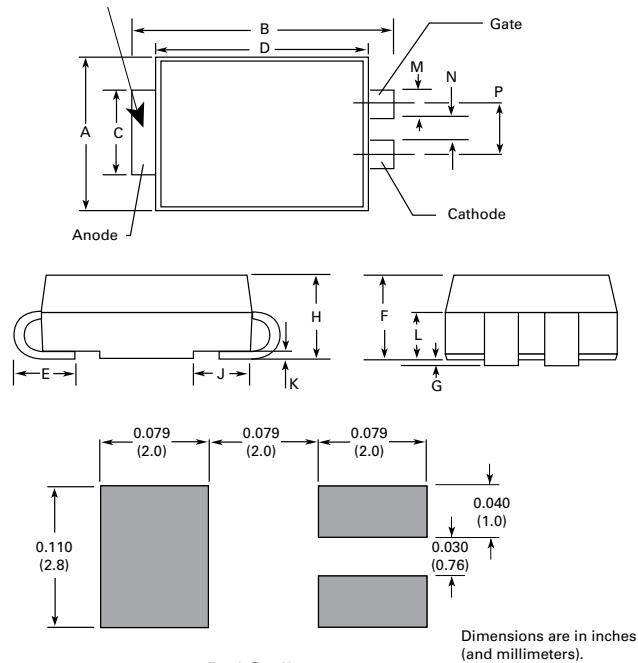


Dimension	Inches		Millimeters	
	Min	Max	Min	Max
A	0.176	0.196	4.47	4.98
B	0.500		12.70	
D	0.095	0.105	2.41	2.67
E	0.150		3.81	
F	0.046	0.054	1.16	1.37
G	0.135	0.145	3.43	3.68
H	0.088	0.096	2.23	2.44
J	0.176	0.186	4.47	4.73
K	0.088	0.096	2.23	2.44
L	0.013	0.019	0.33	0.48
M	0.013	0.017	0.33	0.43

All leads insulated from case. Case is electrically nonconductive.

### Dimensions - Compak (C Package)

T<sub>C</sub> / T<sub>L</sub> Temperature Measurement Point



Dimension	Inches		Millimeters	
	Min	Max	Min	Max
A	0.130	0.156	3.30	3.95
B	0.201	0.220	5.10	5.60
C	0.077	0.087	1.95	2.20
D	0.159	0.181	4.05	4.60
E	0.030	0.063	0.75	1.60
F	0.075	0.096	1.90	2.45
G	0.002	0.008	0.05	0.20
H	0.077	0.104	1.95	2.65
J	0.043	0.053	1.09	1.35
K	0.006	0.016	0.15	0.41
L	0.030	0.055	0.76	1.40
M	0.022	0.028	0.56	0.71
N	0.027	0.033	0.69	0.84
P	0.052	0.058	1.32	1.47

Dimensions are in inches  
(and millimeters).

Pad Outline

### Product Selector

Part Number	Voltage				Gate Sensitivity	Type	Package
	400V	600V	800V	1000V			
Sx01E	X	X			10mA	Standard SCR	TO-92
SxN1	X	X			10mA	Standard SCR	Compak

Note: x = Voltage

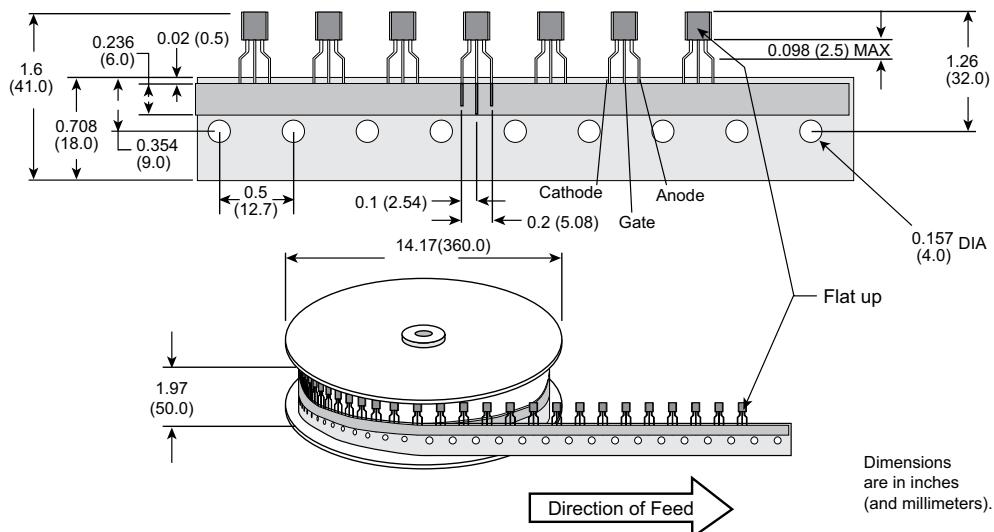
### Packing Options

Part Number	Marking	Weight	Packing Mode	Base Quantity
Sx01E	Sx01E	0.19 g	Bulk	2000
Sx01ERP	Sx01E	0.19 g	Reel Pack	2000
Sx01EAP	Sx01E	0.19 g	Ammo Pack	2000
SxN1RP	SxN1	0.08 g	Embossed Carrier	2500

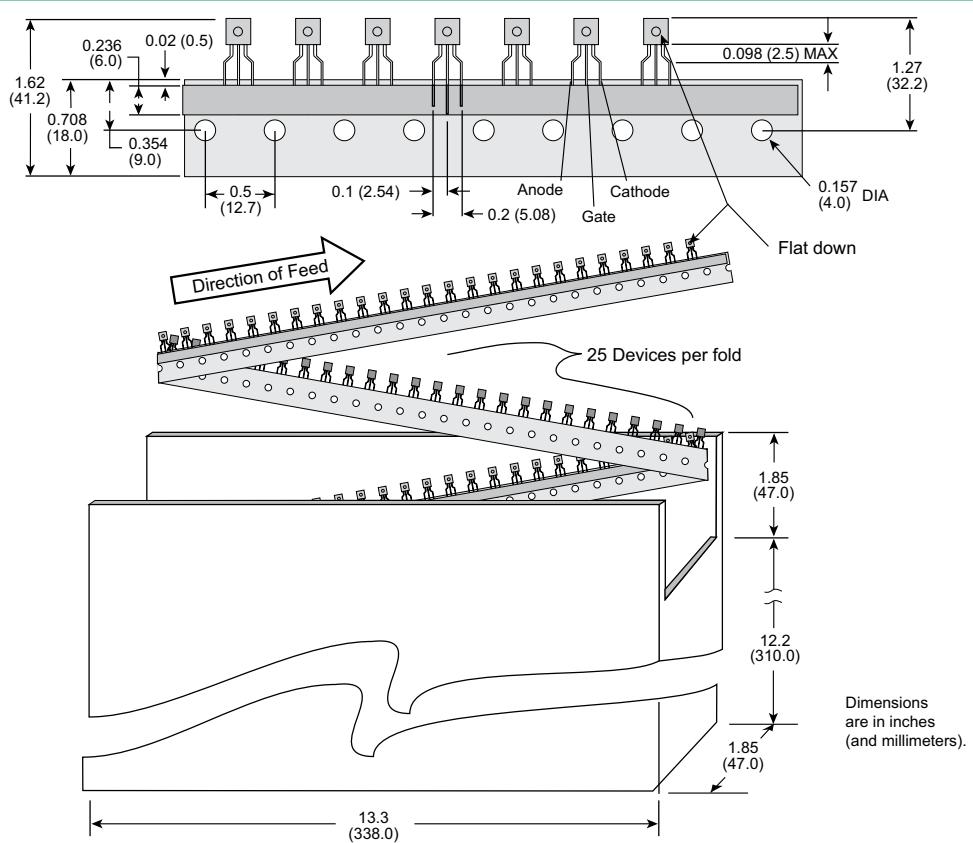
Note: x = Voltage

**TO-92 (3-lead) Reel Pack (RP) Radial Leaded Specifications**

Meets all EIA-468-C Standards

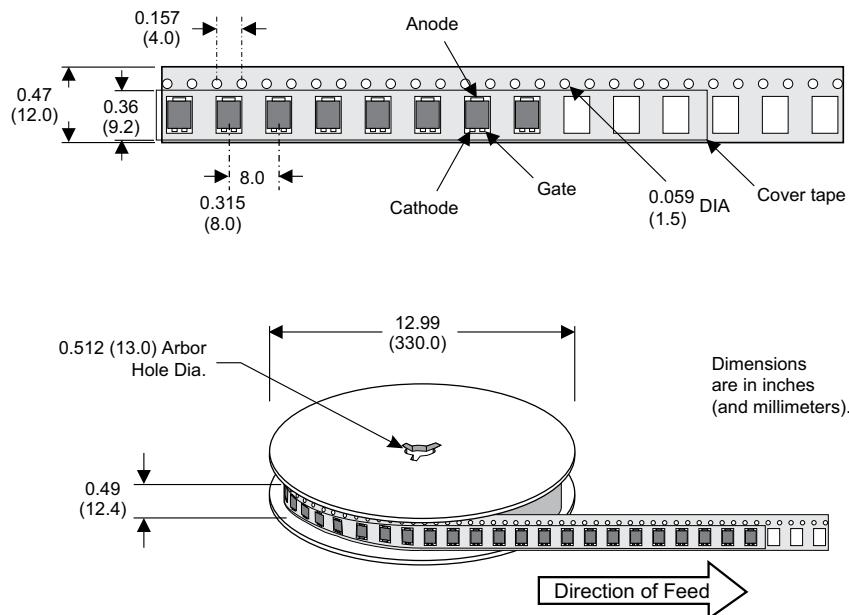
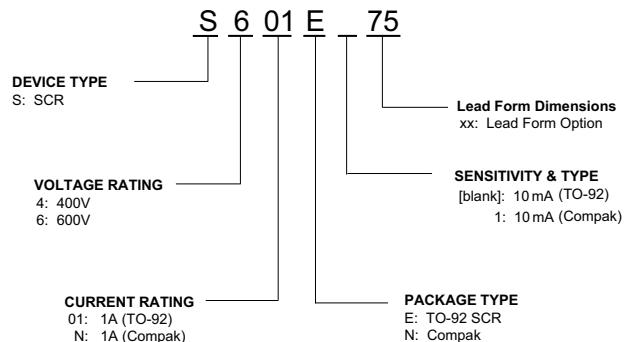
**TO-92 (3-lead) Ammo Pack (AP) Radial Leaded Specifications**

Meets all EIA-468-C Standards

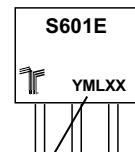


**Compak Embossed Carrier Reel Pack (RP) Specifications**

Meets all EIA-481-1 Standards

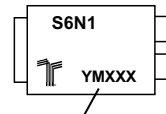

**Part Numbering System**

**Part Marking System**

TO-92 (E Package)



Date Code Marking  
 Y: Year Code  
 M: Month Code  
 L: Location Code  
 XX: Lot Serial Code

Compak (C Package)



Date Code Marking  
 Y: Year Code  
 M: Month Code  
 XXXX: Lot Trace Code