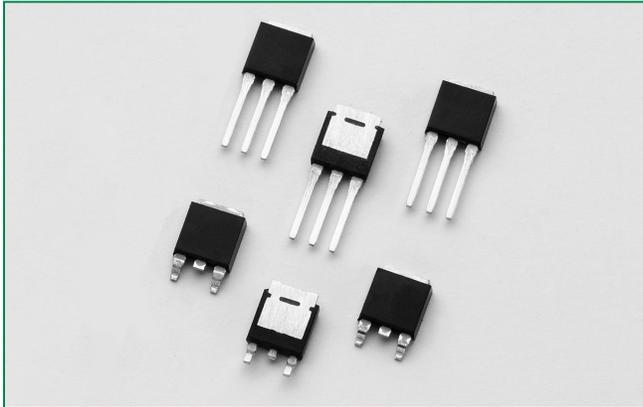


**SJxx12xx Series**



**Main Features**

Symbol	Value	Unit
$I_{T(RMS)}$	12	A
$V_{DRM}/V_{RRM}$	400 or 600	V
$I_{GT}$	6 to 20	mA

**Description**

This SJxx12xx high temperature SCR series is ideal for uni-directional switch applications such as phase control in heating, motor speed controls, converters/rectifiers and capacitive discharge ignitions.

These SCRs have a low gate current trigger level of 6mA or 20mA maximum at approximately 1.5V.

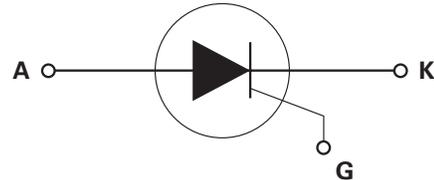
**Features & Benefits**

- Voltage capability up to 600V
- Surge capability up to 120A at 60 Hz half cycle
- 150°C maximum junction temperature
- Halogen free and RoHS compliant

**Applications**

Typical applications includes capacitive discharge system for motorcycle engine CDI, portable generator engine ignition, strobe lights and nailers, as well as generic rectifiers, battery voltage regulators and converters. Also controls for power tools, home/brown goods and white goods appliances.

**Schematic Symbol**



**Absolute Maximum Ratings**

Symbol	Parameter	Test Conditions	Value	Unit
$I_{T(RMS)}$	RMS on-state current	$T_c = 125^\circ\text{C}$	12	A
$I_{T(AV)}$	Average on-state current		7.6	A
$I_{TSM}$	Peak non-repetitive surge current (single half cycle, $T_j$ (initial) = $25^\circ\text{C}$ )	$f = 50\text{Hz}$	100	A
		$f = 60\text{Hz}$	120	
$I^2t$	$I^2t$ Value for fusing	$t_p = 8.3 \text{ ms}$	60	$\text{A}^2\text{s}$
$di/dt$	Critical rate of rise of on-state current	$f = 60\text{Hz}; T_j = 150^\circ\text{C}$	100	$\text{A}/\mu\text{s}$
$I_{GM}$	Peak gate current	$P_w = 20 \mu\text{s}; T_j = 150^\circ\text{C}$	2	A
$P_{G(AV)}$	Average gate power dissipation	$T_j = 150^\circ\text{C}$	0.5	W
$T_{stg}$	Storage temperature range		-40 to 150	$^\circ\text{C}$
$T_j$	Operating junction temperature range		-40 to 150	
$V_{DSM}/V_{RSM}$	Peak non-repetitive blocking voltage	$P_w = 100 \mu\text{s}$	$V_{DRM}/V_{RRM} + 100$	V

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

Symbol	Test Conditions	Value		Unit		
		SJxx12x1	SJxx12x			
$I_{GT}$	$V_D = 12\text{V}$ $R_L = 60\ \Omega$	MAX.	6	20	mA	
		MIN.	2	5		
$V_{GT}$		MAX.	1.5	1.5	V	
dv/dt	$V_D = V_{DRM}$ ; gate open; $T_J = 125^\circ\text{C}$	400V	MIN.	100	250	V/ $\mu\text{s}$
		600V		75	225	
	$V_D = V_{DRM}$ ; gate open; $T_J = 150^\circ\text{C}$	400V	50	200		
		600V	10	175		
$V_{GD}$	$V_D = V_{DRM}$ $R_L = 3.3\ \text{k}\Omega$ $T_J = 125^\circ\text{C}$	MIN.	0.2	0.2	V	
	$V_D = V_{DRM}$ $R_L = 3.3\ \text{k}\Omega$ $T_J = 150^\circ\text{C}$	MIN.	0.1	0.1		
$I_H$	$I_T = 200\text{mA}$ (initial)	MAX.	20	40	mA	
$t_q$	$I_T = 2\text{A}$ ; $t_p = 50\ \mu\text{s}$ ; $dv/dt = 5\text{V}/\mu\text{s}$ ; $di/dt = 30\text{A}/\mu\text{s}$	MAX.	35	35	$\mu\text{s}$	
$t_{gt}$	$I_G = 2 \times I_{GT}$ $\text{PW} = 15\ \mu\text{s}$ $I_T = 12\text{A}$	TYP.	0.5	2	$\mu\text{s}$	

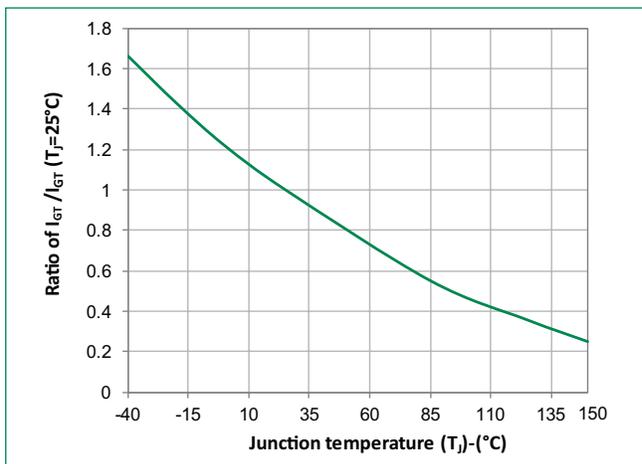
**Static Characteristics**

Symbol	Test Conditions	Value	Unit		
$V_{TM}$	$I_T = 24\text{A}$ ; $t_p = 380\ \mu\text{s}$	MAX.	1.6	V	
$I_{DRM} / I_{RRM}$	@ $V_{DRM} = V_{RRM}$	$T_J = 25^\circ\text{C}$	MAX.	10	$\mu\text{A}$
		$T_J = 125^\circ\text{C}$	MAX.	500	
		$T_J = 150^\circ\text{C}$	MAX.	2000	

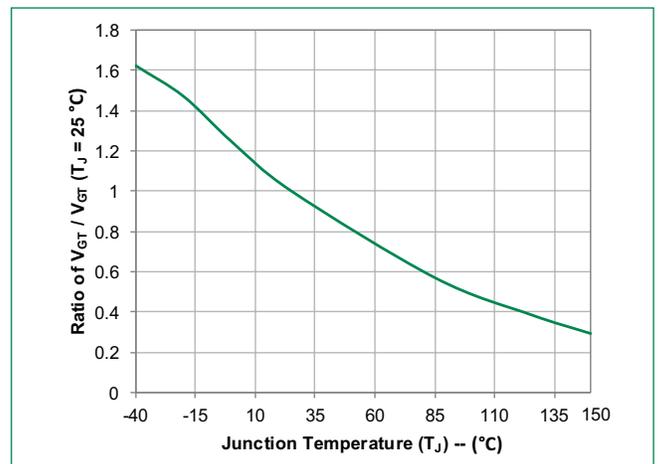
**Thermal Resistances**

Symbol	Parameter	Value	Unit
$R_{\theta(J-C)}$	Junction to case (AC)	1.4	$^\circ\text{C}/\text{W}$

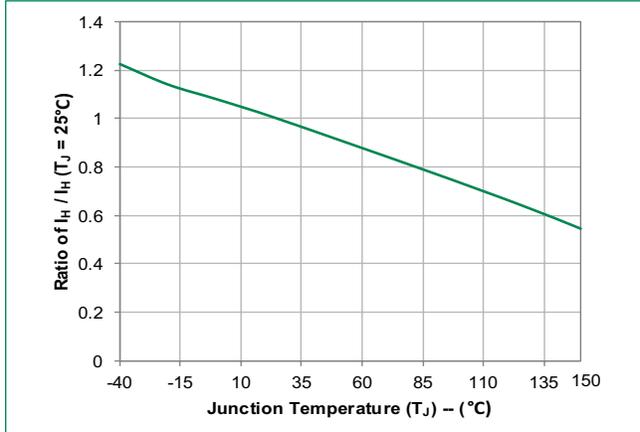
**Figure 1: Normalized DC Gate Trigger Current vs. Junction Temperature**



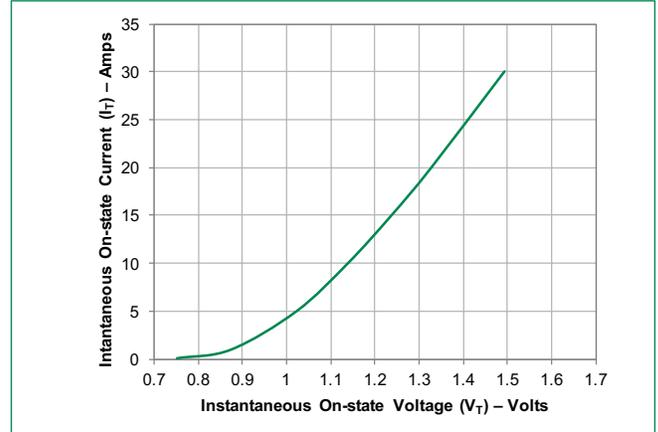
**Figure 2: Normalized DC Gate Trigger Voltage vs. Junction Temperature**



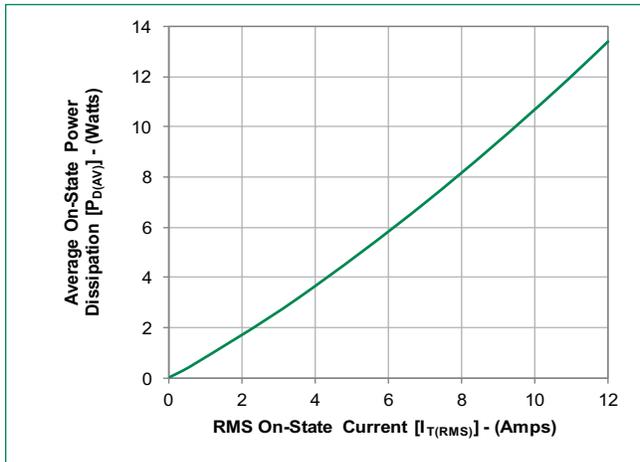
**Figure 3: Normalized DC Holding Current vs. Junction Temperature**



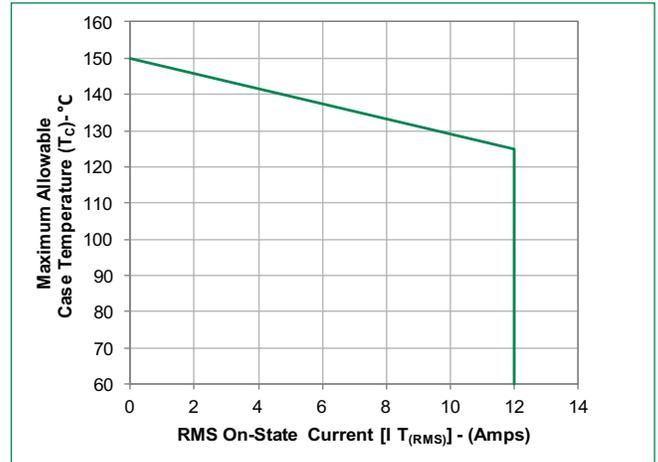
**Figure 4: On-State Current vs. On-State Voltage (Typical)**



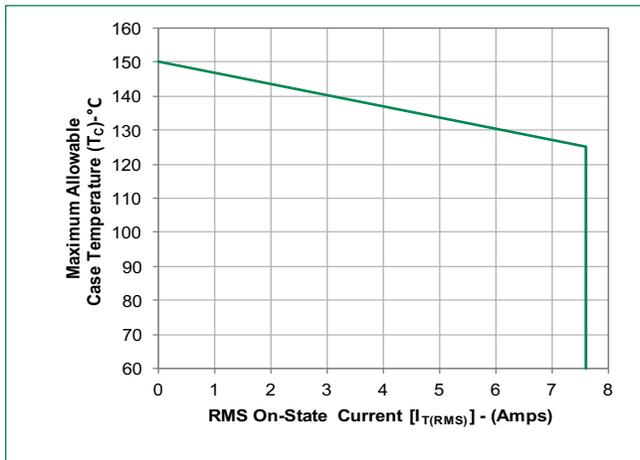
**Figure 5: Power Dissipation (Typical) vs. RMS On-State Current**



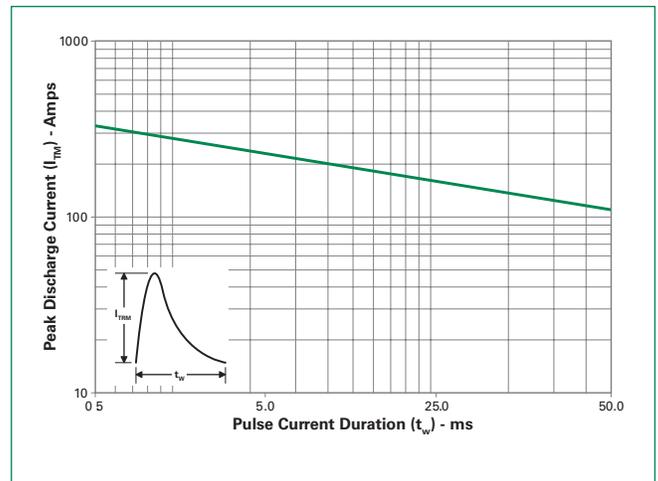
**Figure 6: Maximum Allowable Case Temperature vs. RMS On-State Current**



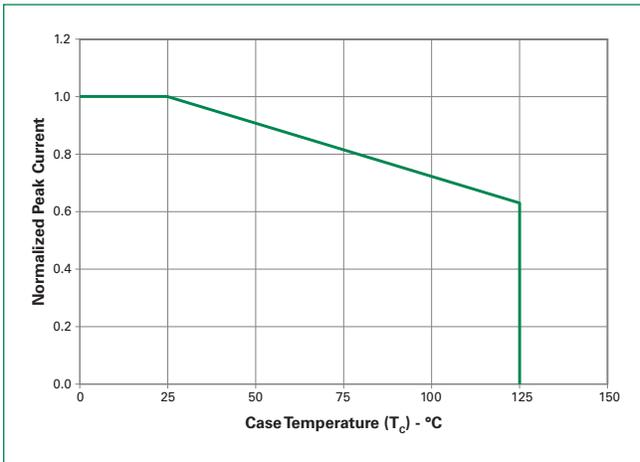
**Figure 7: Maximum Allowable Case Temperature vs. Average On-State Current**



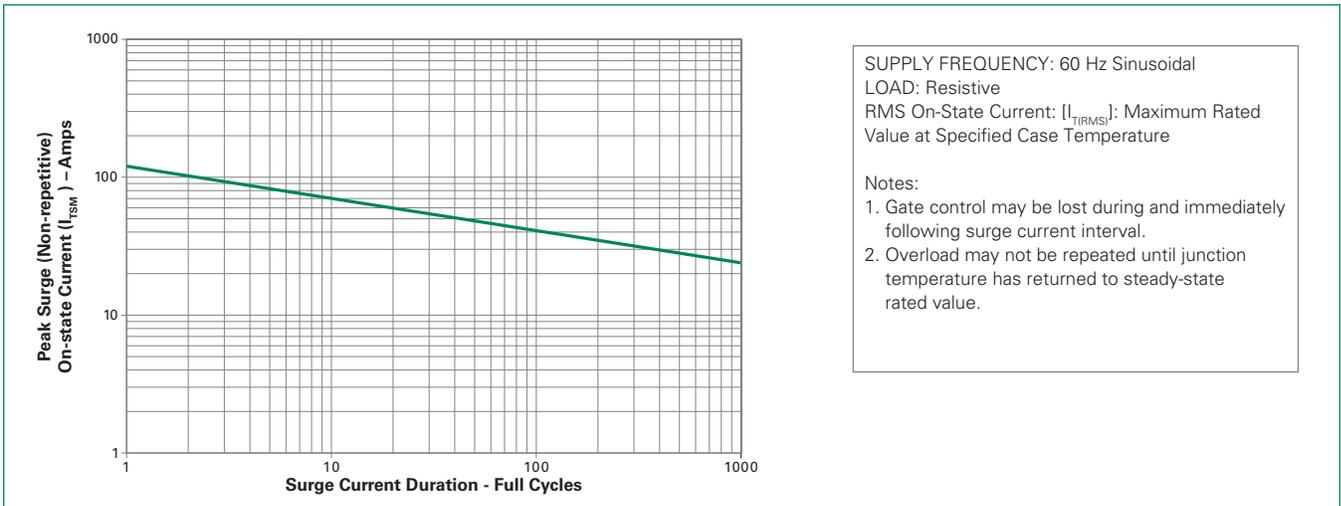
**Figure 8: Peak Capacitor Discharge Current**



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

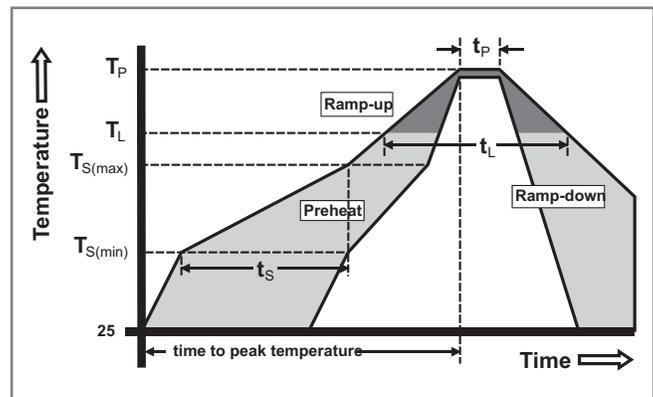


**Figure 12: Surge Peak On-State Current vs. Number of Cycles**



**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	
$T_{S(max)}$ to $T_L$ - Ramp-up Rate	5°C/second max	
Reflow	- Temperature ( $T_L$ ) (Liquidus)	217°C
	- Temperature ( $t_L$ )	60 – 150 seconds
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 rating V-0
<b>Lead Material</b>	Copper Alloy

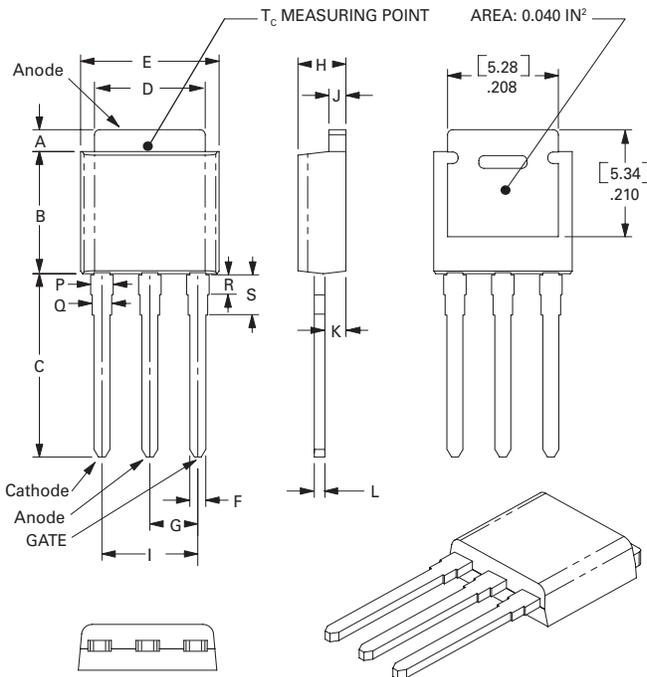
### Design Considerations

Careful selection of the correct component 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 component 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.

### Environmental Specifications

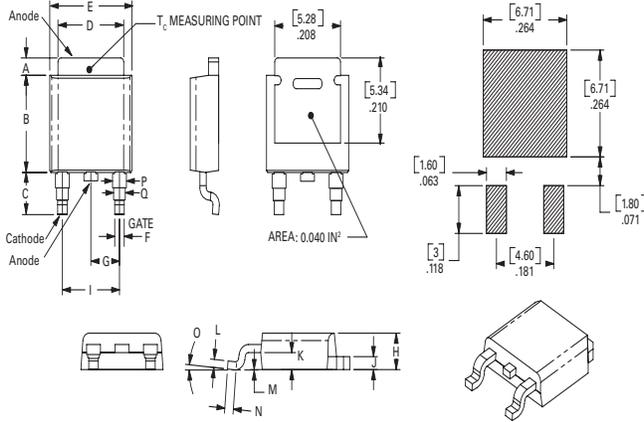
Test	Specifications and Conditions
<b>AC Blocking</b>	MIL-STD-750, M-1040, Cond A Applied Peak AC voltage @ 150°C for 1008 hours
<b>Temperature Cycling</b>	MIL-STD-750, M-1051, 100 cycles; -40°C to +150°C; 15-min dwell-time
<b>Temperature/Humidity</b>	EIA / JEDEC, JESD22-A101 1008 hours; 160V - DC: 85°C; 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
<b>Moisture Sensitivity Level</b>	Level 1, JEDEC-J-STD-020

### Dimensions — TO-251AA (V/I-Package) — V/I-PAK Through Hole



Dimension	Inches			Millimeters		
	Min	Typ	Max	Min	Typ	Max
A	0.040	0.044	0.050	1.02	1.11	1.27
B	0.235	0.242	0.245	5.97	6.15	6.22
C	0.350	0.361	0.375	8.89	9.18	9.53
D	0.205	0.208	0.213	5.21	5.29	5.41
E	0.255	0.262	0.265	6.48	6.66	6.73
F	0.027	0.031	0.033	0.69	0.80	0.84
G	0.087	0.090	0.093	2.21	2.28	2.36
H	0.085	0.092	0.095	2.16	2.34	2.41
I	0.176	0.180	0.184	4.47	4.57	4.67
J	0.018	0.020	0.023	0.46	0.51	0.58
K	0.038	0.040	0.044	0.97	1.01	1.12
L	0.018	0.020	0.023	0.46	0.52	0.58
P	0.042	0.047	0.052	1.06	1.20	1.32
Q	0.034	0.039	0.044	0.86	1.00	1.11
R	0.034	0.039	0.044	0.86	1.00	1.11
S	0.074	0.079	0.084	1.86	2.00	2.11

### Dimensions — TO-252AA (D-Package) — D-PAK Surface Mount



Dimension	Inches			Millimeters		
	Min	Typ	Max	Min	Typ	Max
A	0.040	0.043	0.050	1.02	1.09	1.27
B	0.235	0.243	0.245	5.97	6.16	6.22
C	0.106	0.108	0.113	2.69	2.74	2.87
D	0.205	0.208	0.213	5.21	5.29	5.41
E	0.255	0.262	0.265	6.48	6.65	6.73
F	0.027	0.031	0.033	0.69	0.80	0.84
G	0.087	0.090	0.093	2.21	2.28	2.36
H	0.085	0.092	0.095	2.16	2.33	2.41
I	0.176	0.179	0.184	4.47	4.55	4.67
J	0.018	0.020	0.023	0.46	0.51	0.58
K	0.038	0.040	0.044	0.97	1.02	1.12
L	0.018	0.020	0.023	0.46	0.51	0.58
M	0.000	0.000	0.004	0.00	0.00	0.10
N	0.021	0.026	0.027	0.53	0.67	0.69
O	0°	0°	5°	0°	0°	5°
P	0.042	0.047	0.052	1.06	1.20	1.32
Q	0.034	0.039	0.044	0.86	1.00	1.11

### Product Selector

Part Number	Voltage		Gate Sensitivity	Type	Package
	400V	600V			
SJxx12V	X	X	20mA	Standard SCR	TO-251
SJxx12D	X	X	20mA	Standard SCR	TO-252
SJxx12V1	X	X	6mA	Standard SCR	TO-251
SJxx12D1	X	X	6mA	Standard SCR	TO-252

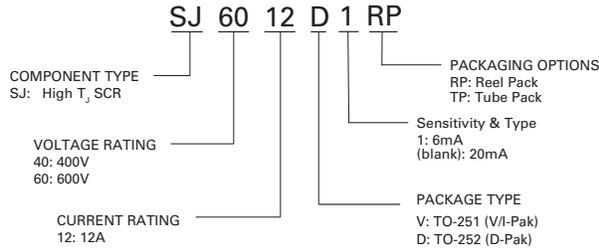
Note: xx = voltage

### Packing Options

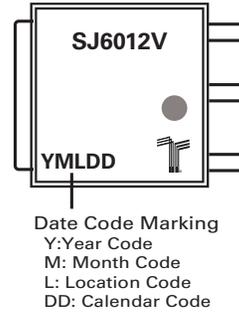
Part Number	Marking	Weight	Packing Mode	Base Quantity
SJxx12DTP	SJxx12D	0.3 g	Tube	750 (75 per tube)
SJxx12DRP	SJxx12D	0.3 g	Embossed Carrier	2500
SJxx12VTP	SJxx12V	0.4 g	Tube	750 (75 per tube)
SJxx12D1TP	SJxx12D1	0.3 g	Tube	750 (75 per tube)
SJxx12D1RP	SJxx12D1	0.3 g	Embossed Carrier	2500
SJxx12V1TP	SJxx12V1	0.4 g	Tube	750 (75 per tube)

Note: xx = Voltage

### Part Numbering System

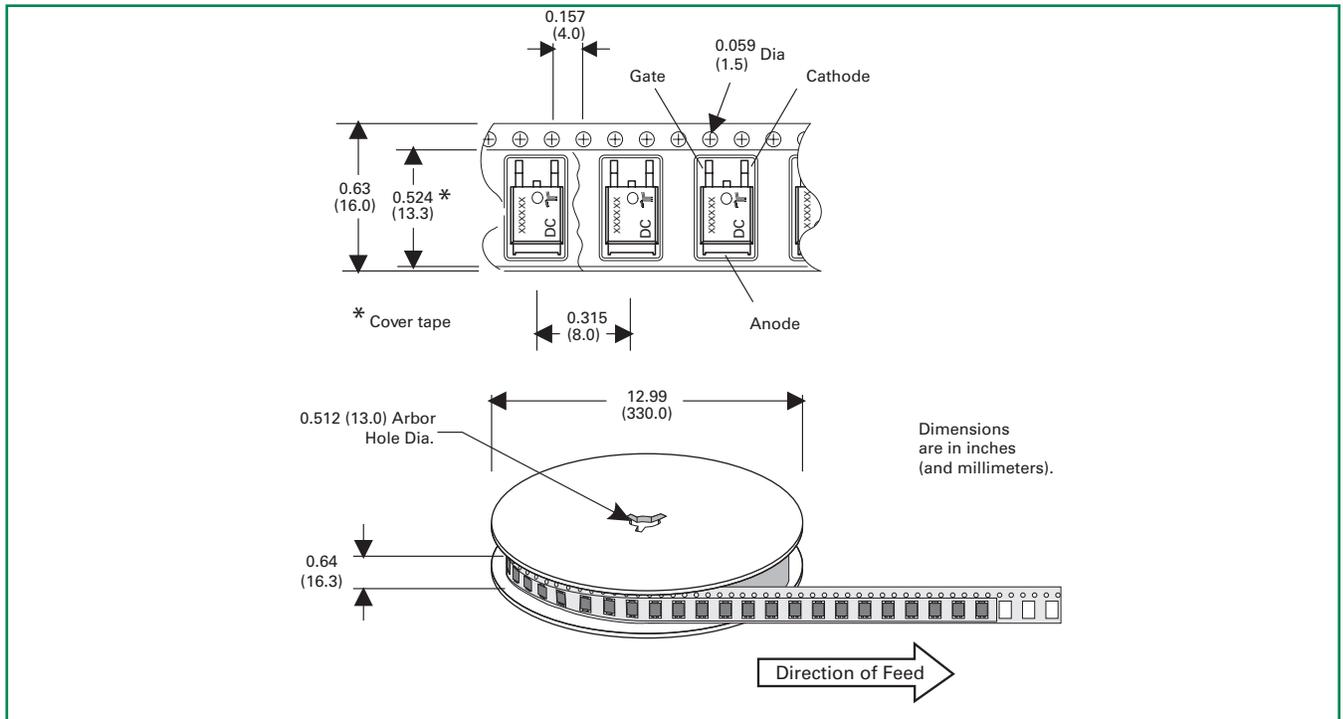


### Part Marking System



### TO-252 Embossed Carrier Reel Pack (RP) Specifications

Meets all EIA-481-2 Standards



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