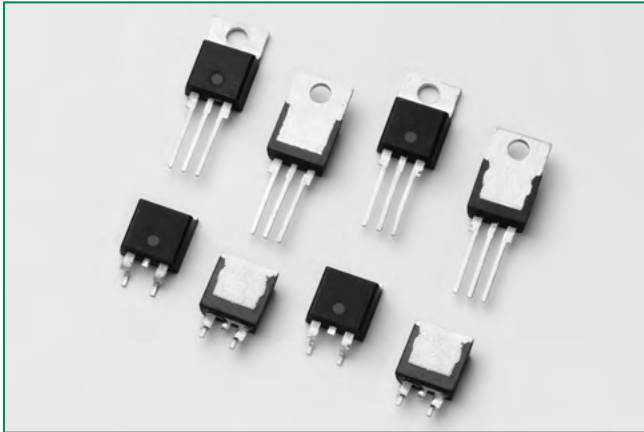


**SJxx32xx Series**



**Description**

This SJxx32xx high temperature SCR series is ideal for uni-directional switch applications such as phase control in heating, motor speed controls and AC rectifier and voltage regulator.

This SCR series offer low gate current trigger levels of 15 mA or 40 mA at approximately 1.5V.

**Features & Benefits**

- High junction temperature
- Voltage capability up to 600 V
- Surge capability up to 380 A at 60 Hz half cycle
- Halogen-free and RoHS-compliant

**Applications**

Typical applications are AC rectifier, voltage regulator, AC solid-state switches, industrial power tools, exercise equipment, white goods and commercial appliances.

Internally constructed isolated packages are offered for ease of heat sinking with highest isolation voltage.

**Agency Approvals**

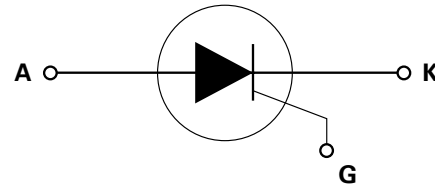
Agency	Agency File Number
	E71639*

\* - L Package Only

**Main Features**

Symbol	Value	Unit
$I_{T(RMS)}$	32	A
$V_{DRM}/V_{RRM}$	400 or 600	V
$I_{GT}$	15 or 40	mA

**Schematic Symbol**



**Absolute Maximum Ratings**

Symbol	Parameter	Test Conditions	Value	Unit
$V_{DSM}/V_{RSM}$	Peak non-repetitive blocking voltage	$P_w = 100\mu s$	700	V
$I_{T(RMS)}$	RMS on-state current	SJxx32Ly $T_c = 80^\circ C$ SJxx32Ry/SJxx32Ny $T_c = 115^\circ C$	32	A
$I_{T(AV)}$	Average on-state current	SJxx32Ly $T_c = 80^\circ C$ SJxx32Ry/SJxx32Ny $T_c = 115^\circ C$	20	A
$I_{TSM}$	Peak non-repetitive surge current	single half cycle; $f = 50Hz$ ; $T_J(\text{initial}) = 25^\circ C$	320	A
		single half cycle; $f = 60Hz$ ; $T_J(\text{initial}) = 25^\circ C$	380	A
$I^2t$	$I^2t$ Value for fusing	$t_p = 8.3 ms$	640	A <sup>2</sup> s
di/dt	Critical rate of rise of on-state current	$f = 60Hz$ ; $T_J = 150^\circ C$	150	A/ $\mu s$
$I_{GM}$	Peak gate current	$t_p \leq 10\mu s$ ; $T_J = 150^\circ C$	4	A
$P_{G(AV)}$	Average gate power dissipation	$t_p \leq 10\mu s$ ; $T_J = 150^\circ C$	1	W
$T_{stg}$	Storage temperature range		-40 to 150	$^\circ C$
$T_J$	Operating junction temperature range		-40 to 150	$^\circ C$

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

Symbol	Test Conditions		SJxx32x	SJxx32x2	Unit
$I_{GT}$	$V_D = 12\text{V}; R_L = 30\ \Omega$	MAX.	40	15	mA
		MIN.	5	3	
$V_{GT}$		MAX.	1.5		V
dv/dt	$V_D = V_{DRM}$ ; gate open; $T_J = 125^\circ\text{C}$	400V	650	400	V/ $\mu\text{s}$
		600V	600	350	
			MIN.		
	$V_D = V_{DRM}$ ; gate open; $T_J = 150^\circ\text{C}$	400V	550	–	
		600V	500	–	
			–	–	
	$V_D = 67\%V_{DRM}$ ; gate open; $T_J = 150^\circ\text{C}$	400V	–	300	
		600V	–	250	
$V_{GD}$	$V_D = V_{DRM}; R_L = 3.3\ \text{k}\Omega; T_J = 150^\circ\text{C}$	MIN.	0.2		V
$I_H$	$I_T = 400\text{mA}$ (initial)	MAX.	60	50	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		$\mu\text{s}$
$t_{gt}$	$I_G = 2 \times I_{GT}; \text{PW} = 15\mu\text{s}; I_T = 64\text{A}$	TYP.	2		$\mu\text{s}$

Note: xx = voltage, x = package

**Static Characteristics**

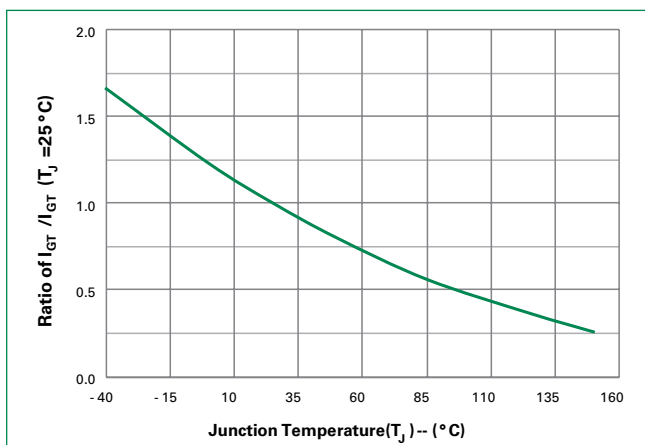
Symbol	Test Conditions		Value	Unit
$V_{TM}$	$I_T = 64\text{A}; t_p = 380\mu\text{s}$	MAX.	1.6	V
$I_{DRM} / I_{RRM}$	@ $V_{DRM} / V_{RRM}$	$T_J = 25^\circ\text{C}$	10	$\mu\text{A}$
		$T_J = 125^\circ\text{C}$	MAX. 2000	
		$T_J = 150^\circ\text{C}$	4000	

**Thermal Resistances**

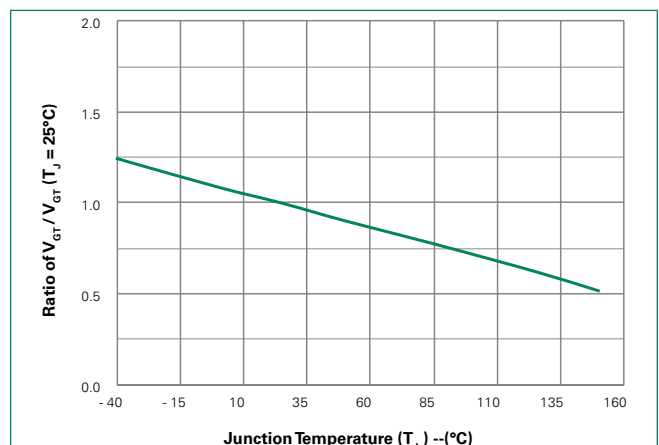
Symbol	Parameter	Value	Unit
$R_{\theta(JC)}$	SJxx32Ly	1.9	$^\circ\text{C}/\text{W}$
	SJxx32Ry/SJxx32Ny	0.8	

Note: xx = voltage, y = sensitivity & type

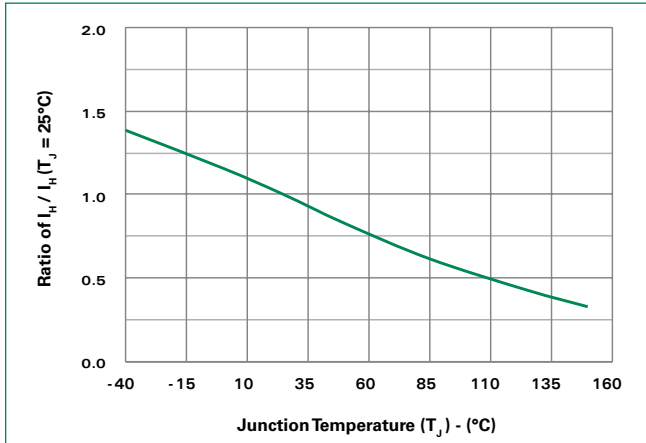
**Figure 1: Normalized DC Gate Trigger Current vs. Junction Temperature**



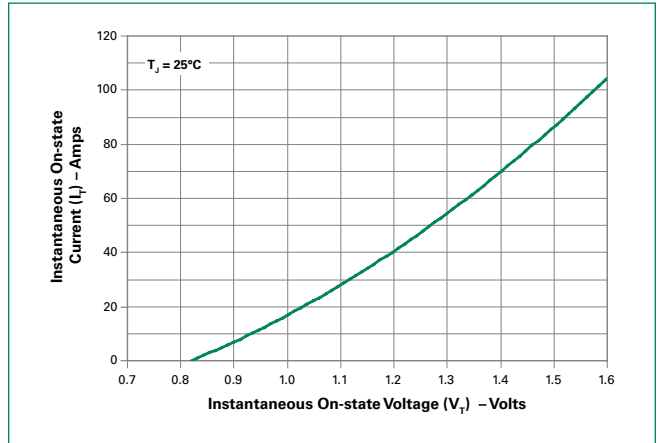
**Figure 2: Normalized DC Gate Trigger Voltage vs. Junction Temperature**



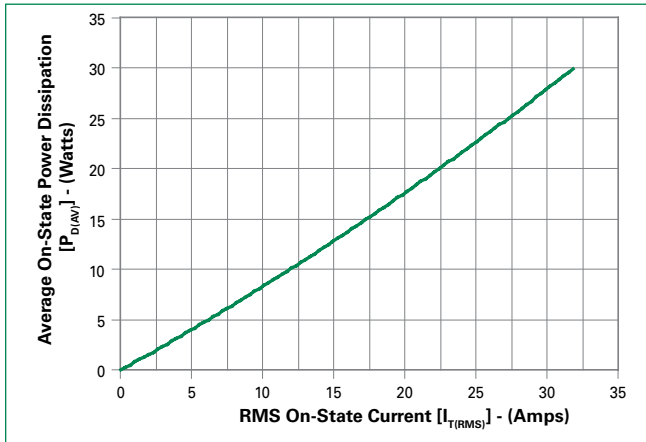
**Figure 3: Normalized DC Holding Current vs. Junction Temperature**



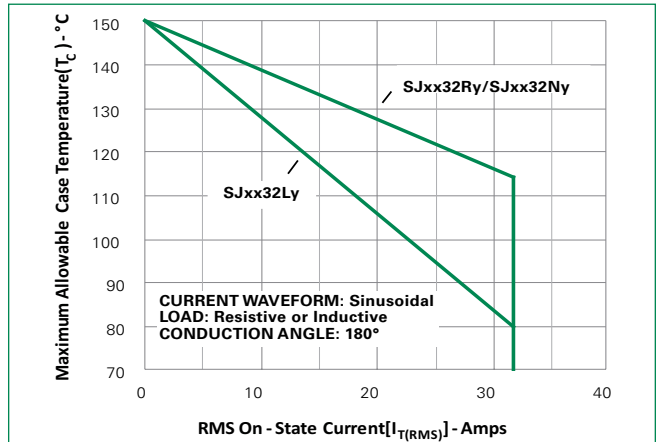
**Figure 4: On-State Current vs. On-State Voltage (Typical)**



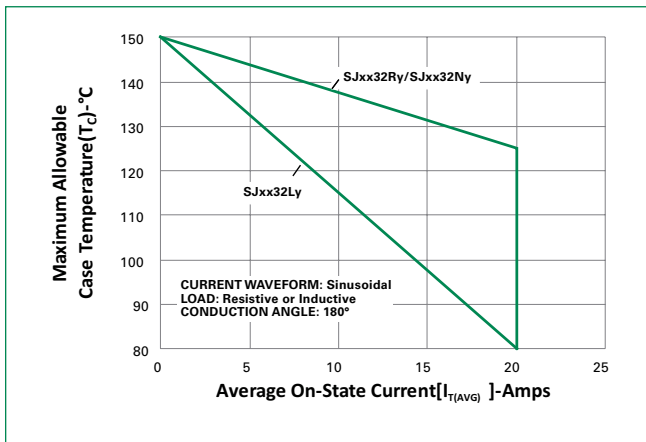
**Figure 5: Power Dissipation (Typical) vs. RMS On-State Current**



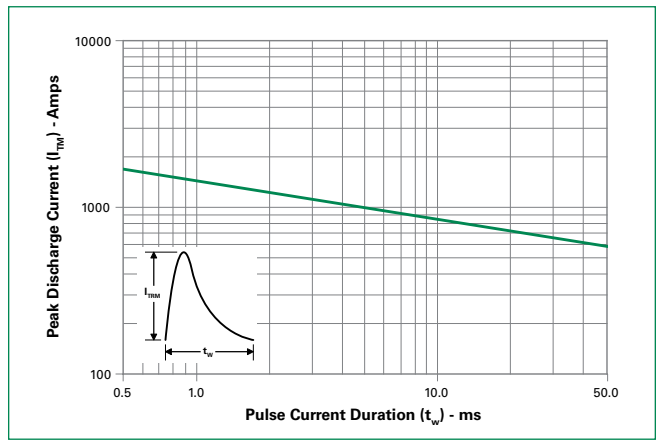
**Figure 6: Maximum Allowable Case Temperature vs. RMS On-State Current**



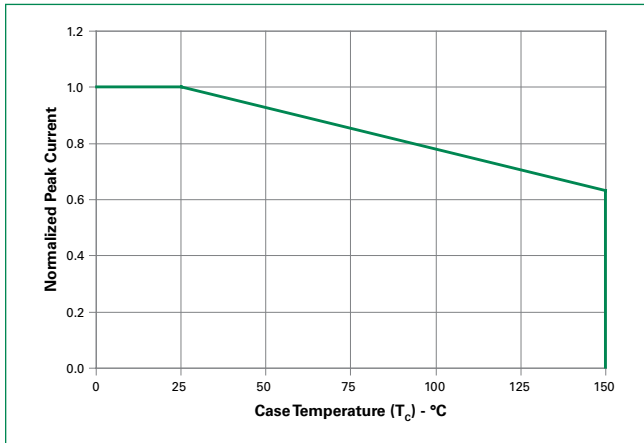
**Figure 7: Maximum Allowable Case Temperature vs. Average On-State Current**



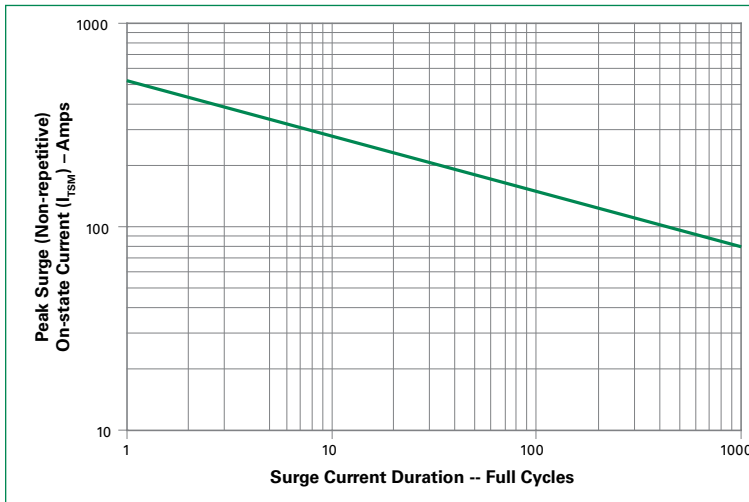
**Figure 8: Peak Capacitor Discharge Current**



**Figure 9: Peak Capacitor Discharge Current Derating**



**Figure 10: Surge Peak On-State Current vs. Number of Cycles**

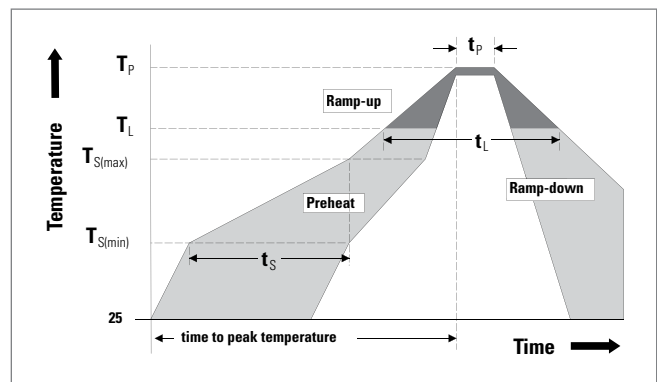


**Supply Frequency:** 60 Hz Sinusoidal  
**Load:** Resistive  
 RMS On-State Current ( $I_{TRMS}$ ): Maximum Rated Value at Specified Case Temperature

- Notes:**
1. Gate control may be lost during and immediately following surge current interval.
  2. Overload may not be repeated until junction temperature has returned to steady-state rated value.

**Soldering Parameters**

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



### Physical Specifications

<b>Terminal Finish</b>	100% Matte Tin-plated
<b>Body Material</b>	UL Recognized compound meeting flammability rating V-0
<b>Lead Material</b>	Copper Alloy

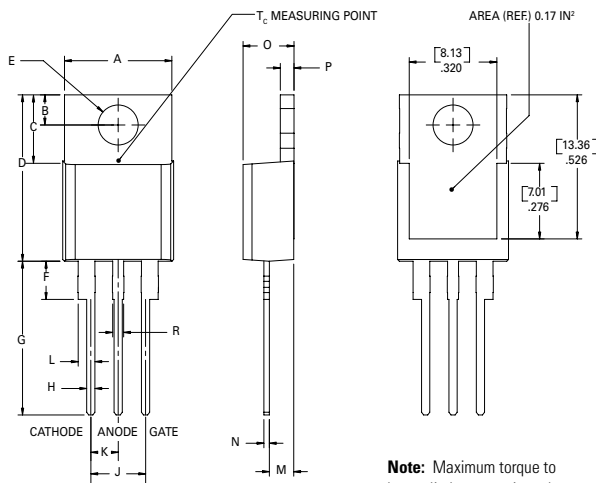
### Design Considerations

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, 1000 cycles; -55°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-020D

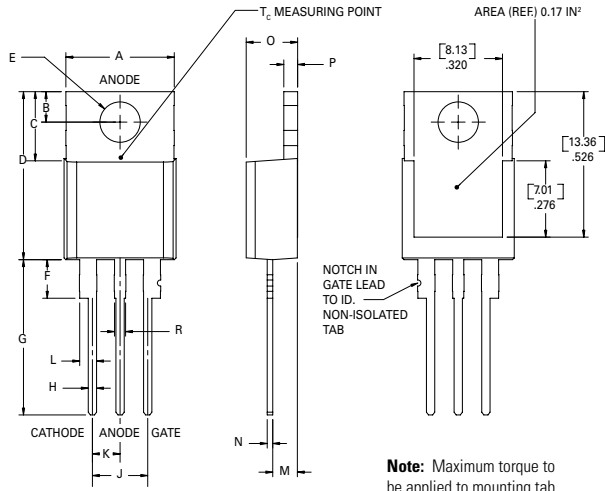
### Dimensions — TO-220AB (L-Package) — Isolated Mounting Tab



**Note:** Maximum torque to be applied to mounting tab is 8 in-lbs. (0.904 Nm).

Dimension	Inches		Millimeters	
	Min	Max	Min	Max
<b>A</b>	0.380	0.420	9.65	10.67
<b>B</b>	0.105	0.115	2.67	2.92
<b>C</b>	0.230	0.250	5.84	6.35
<b>D</b>	0.590	0.620	14.99	15.75
<b>E</b>	0.142	0.147	3.61	3.73
<b>F</b>	0.110	0.130	2.79	3.30
<b>G</b>	0.540	0.575	13.72	14.61
<b>H</b>	0.025	0.035	0.64	0.89
<b>J</b>	0.195	0.205	4.95	5.21
<b>K</b>	0.095	0.105	2.41	2.67
<b>L</b>	0.060	0.075	1.52	1.91
<b>M</b>	0.085	0.095	2.16	2.41
<b>N</b>	0.018	0.024	0.46	0.61
<b>O</b>	0.178	0.188	4.52	4.78
<b>P</b>	0.045	0.060	1.14	1.52
<b>R</b>	0.038	0.048	0.97	1.22

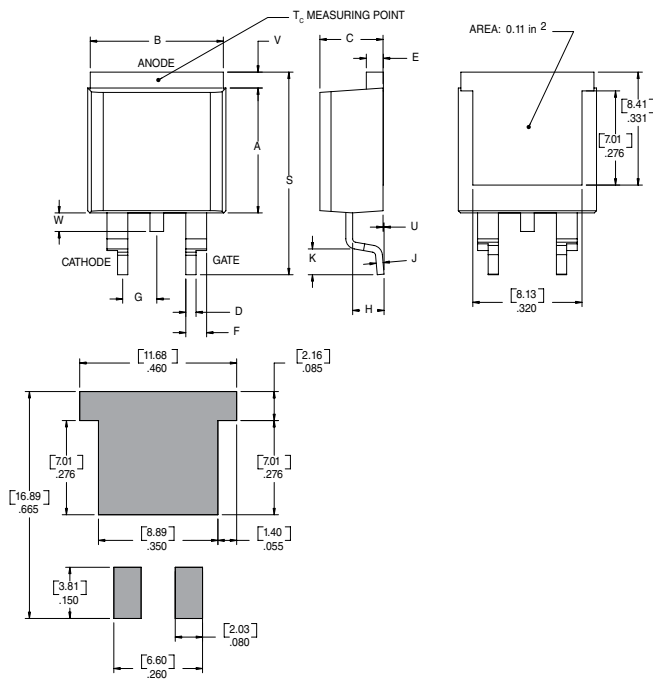
**Dimensions – TO-220AB (R-Package) – Non-Isolated Mounting Tab Common with Center Lead**



**Note:** Maximum torque to be applied to mounting tab is 8 in-lbs. (0.904 Nm).

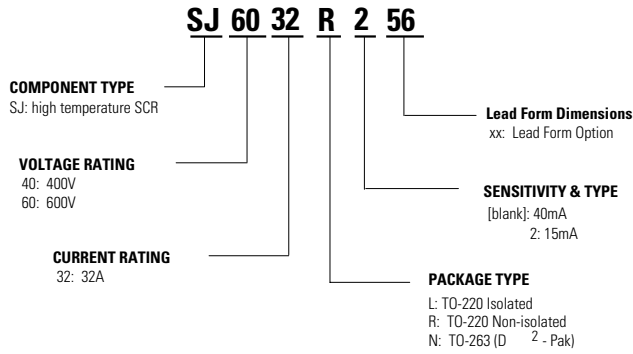
Dimension	Inches		Millimeters	
	Min	Max	Min	Max
A	0.380	0.420	9.65	10.67
B	0.105	0.115	2.67	2.92
C	0.230	0.250	5.84	6.35
D	0.590	0.620	14.99	15.75
E	0.142	0.147	3.61	3.73
F	0.110	0.130	2.79	3.30
G	0.540	0.575	13.72	14.61
H	0.025	0.035	0.64	0.89
J	0.195	0.205	4.95	5.21
K	0.095	0.105	2.41	2.67
L	0.060	0.075	1.52	1.91
M	0.085	0.095	2.16	2.41
N	0.018	0.024	0.46	0.61
O	0.178	0.188	4.52	4.78
P	0.045	0.060	1.14	1.52
R	0.038	0.048	0.97	1.22

**Dimensions – TO- 263 (N-package) – D<sup>2</sup>-Pak Surface Mount**

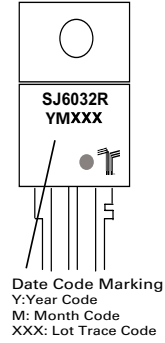


Dimension	Inches		Millimeters	
	Min	Max	Min	Max
A	0.360	0.370	9.14	9.40
B	0.380	0.420	9.65	10.67
C	0.178	0.188	4.52	4.78
D	0.025	0.035	0.63	0.89
E	0.048	0.055	1.22	1.40
F	0.060	0.075	1.52	1.91
G	0.095	0.105	2.41	2.67
H	0.083	0.093	2.11	2.36
J	0.018	0.024	0.46	0.61
K	0.090	0.110	2.29	2.79
S	0.590	0.625	14.99	15.87
V	0.035	0.045	0.89	1.14
U	0.002	0.010	0.05	0.25
W	0.040	0.070	1.02	1.78

**Part Numbering System**



**Part Marking System**



**Product Selector**

Part Number	Voltage		Gate Sensitivity	Type	Package
	400V	600V			
SJxx32L	X	X	40mA	Standard SCR	TO-220L
SJxx32R	X	X	40mA	Standard SCR	TO-220R
SJxx32N	X	X	40mA	Standard SCR	TO-263
SJxx32L2	X	X	15mA	Standard SCR	TO-220L
SJxx32R2	X	X	15mA	Standard SCR	TO-220R
SJxx32N2	X	X	15mA	Standard SCR	TO-263

Note: xx = Voltage/10

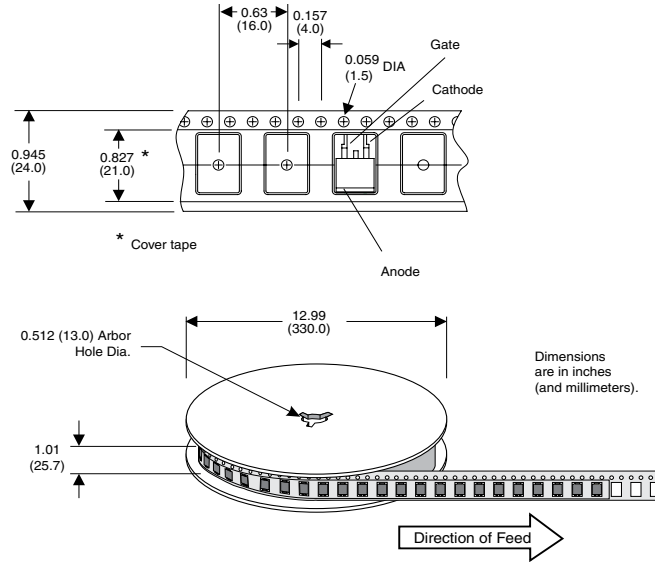
**Packing Options**

Part Number	Marking	Weight	Packing Mode	Base Quantity
SJxx32LTP	SJxx32L	2.2g	Tube	1000 (50 per tube)
SJxx32RTP	SJxx32R	2.2g	Tube	1000 (50 per tube)
SJxx32NTP	SJxx32N	1.6g	Tube	1000 (50 per tube)
SJxx32NRP	SJxx32N	1.6g	Embossed Carrier	500
SJxx32L2TP	SJxx32L2	2.2g	Tube	1000 (50 per tube)
SJxx32R2TP	SJxx32R2	2.2g	Tube	1000 (50 per tube)
SJxx32N2RP	SJxx32N2	1.6g	Embossed Carrier	500

Note: xx = Voltage/10

**Reel Pack (RP) for TO-263 Embossed Carrier Specifications**

Meets all EIA-481-2 Standards



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