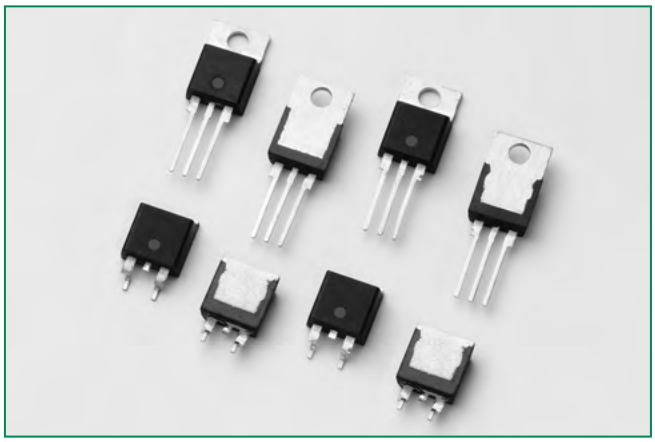
Thyristors
32 Amp Standard High Temperature SCRs

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

Agency Approvals

Agency	Agency File Number
	E71639*

* - L Package Only

Applications

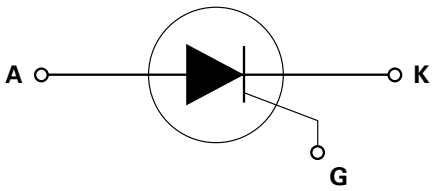
Typical applications are AC rectifier, voltage regulator, AC solid-state switches, industrial power tools, exercise equipment, white goods and commercial appliances.

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

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	Pw = 100µs	700	V
$I_{T(RMS)}$	RMS on-state current	SJxx32Ly T_C = 80°C SJxx32Ry/SJxx32Ny T_C = 115°C	32	A
$I_{T(AV)}$	Average on-state current	SJxx32Ly T_C = 80°C SJxx32Ry/SJxx32Ny T_C = 115°C	20	A
I_{TSM}	Peak non-repetitive surge current	single half cycle; f = 50Hz; T_J (initial) = 25°C single half cycle; f = 60Hz; T_J (initial) = 25°C	320 380	A
I^2t	I^2t Value for fusing	t_p = 8.3 ms	640	A^2s
di/dt	Critical rate of rise of on-state current	f = 60Hz ; T_J = 150°C	150	A/µs
I_{GM}	Peak gate current	$t_p \leq$ 10µs ; T_J = 150°C	4	A
$P_{G(AV)}$	Average gate power dissipation	$t_p \leq$ 10µs ; T_J = 150°C	1	W
T_{stg}	Storage temperature range		-40 to 150	°C
T_J	Operating junction temperature range		-40 to 150	°C

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Electrical Characteristics (T_J = 25°C, unless otherwise specified)

Symbol	Test Conditions			SJxx32x	SJxx32x2	Unit
I_{GT}	V_D = 12V; R_L = 30 Ω		MAX. MIN.	40 5	15 3	mA
V_{GT}			MAX.	1.5		V
dv/dt	$V_D = V_{DRM}$; gate open; T_J = 125°C	400V 600V	MIN.	650 600	400 350	V/µs
	$V_D = V_{DRM}$; gate open; T_J = 150°C	400V 600V		550 500	– –	
	V_D = 67%V_{DRM}; gate open; T_J = 150°C	400V 600V		– –	300 250	
V_{GD}	$V_D = V_{DRM}$; R_L = 3.3 kΩ; T_J = 150°C		MIN.	0.2		V
I_H	I_T = 400mA (initial)		MAX.	60	50	mA
t_q	I_T=2A; t_p=50µs; dv/dt=5V/µs; di/dt=-30A/µs		MAX.	35		µs
t_{gt}	I_G = 2 x I_{GT}; PW = 15µs; I_T = 64A		TYP.	2		µs

Note: xx = voltage, x = package

Static Characteristics

Symbol	Test Conditions			Value	Unit
V_{TM}	I_T = 64A; t_p = 380µs		MAX.	1.6	V
I_{DRM} / I_{RRM}	@ V_{DRM} / V_{RRM}	T_J = 25°C T_J = 125°C T_J = 150°C	MAX.	10 2000 4000	µA

Thermal Resistances

Symbol	Parameter	Value	Unit
$R_{\Theta(JC)}$	SJxx32Ly	1.9	°C/W
	SJxx32Ry/SJxx32Ny	0.8	

Note: xx = voltage, y = sensitivity & type

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

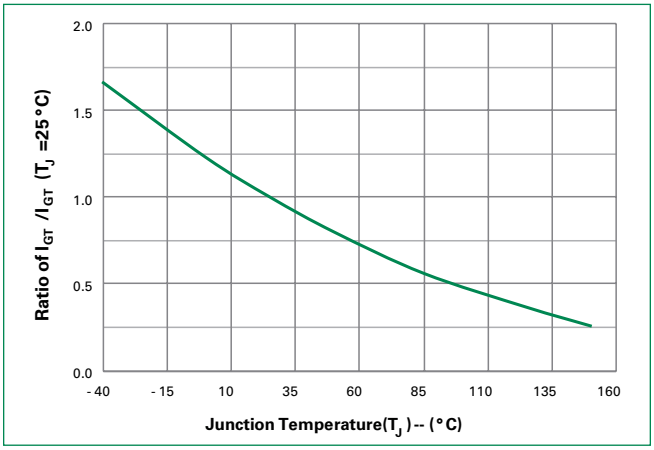

Figure 2: Normalized DC Gate Trigger Voltage vs. Junction Temperature

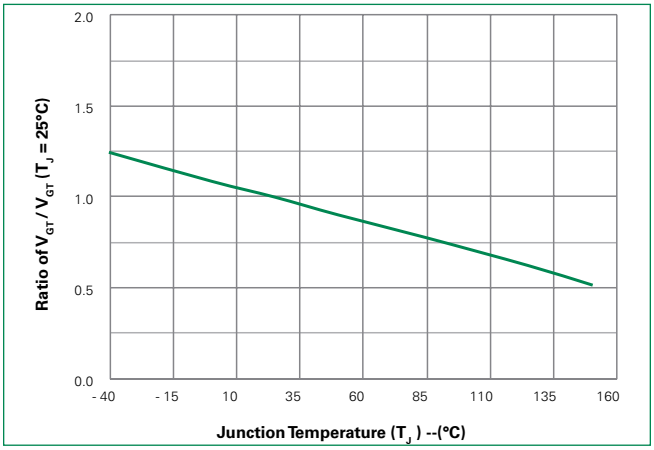

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Figure 3: Normalized DC Holding Current vs. Junction Temperature

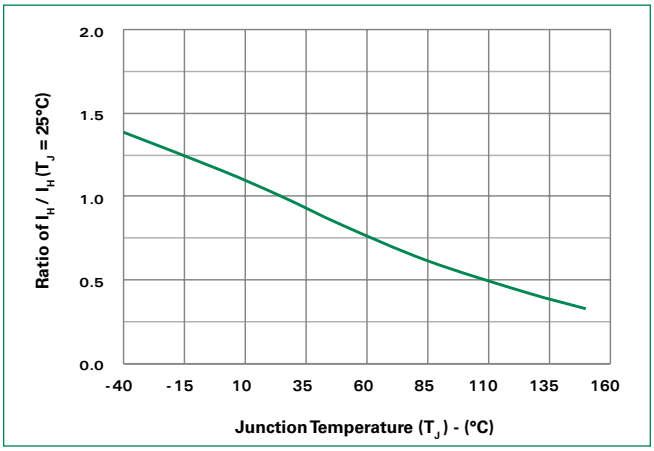

Figure 4: On-State Current vs. On-State Voltage (Typical)

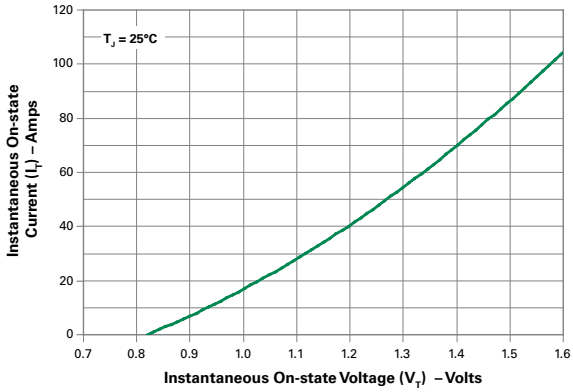

Figure 5: Power Dissipation (Typical) vs. RMS On-State Current

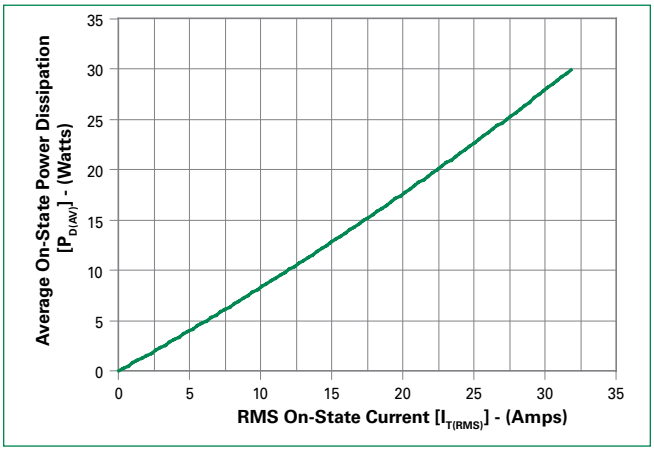

Figure 6: Maximum Allowable Case Temperature vs. RMS On-State Current

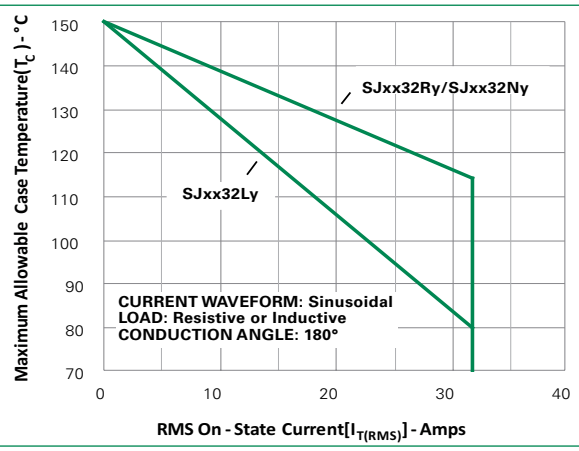

Figure 7: Maximum Allowable Case Temperature vs. Average On-State Current

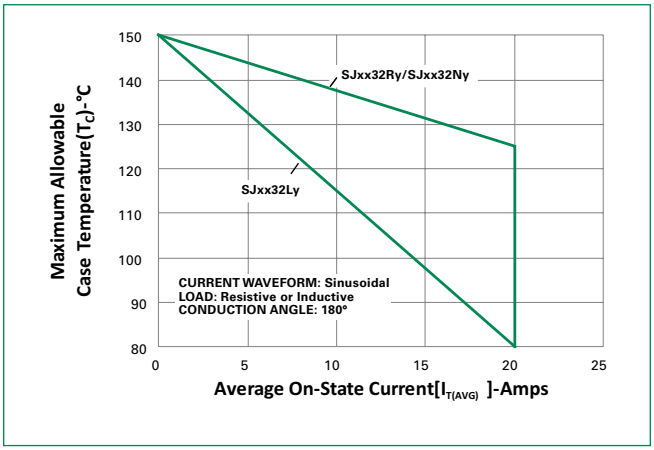

Figure 8: Peak Capacitor Discharge Current

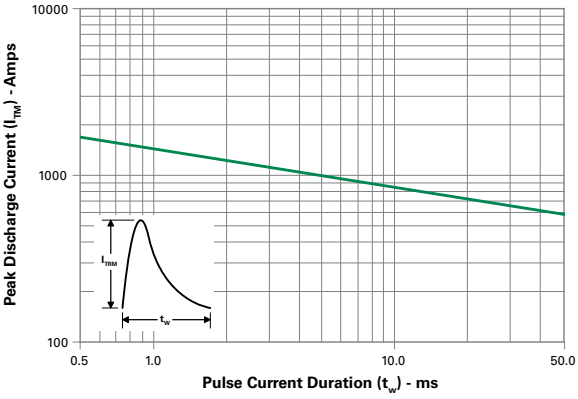

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Figure 9: Peak Capacitor Discharge Current Derating

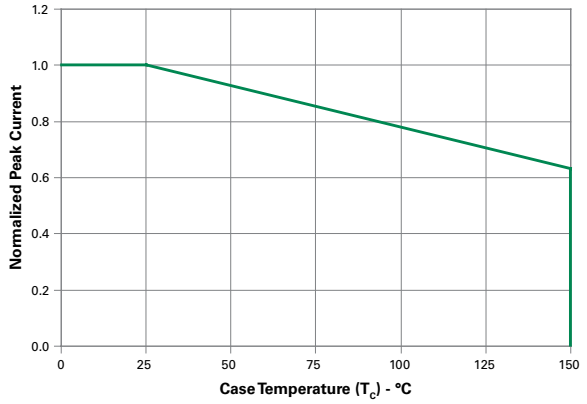
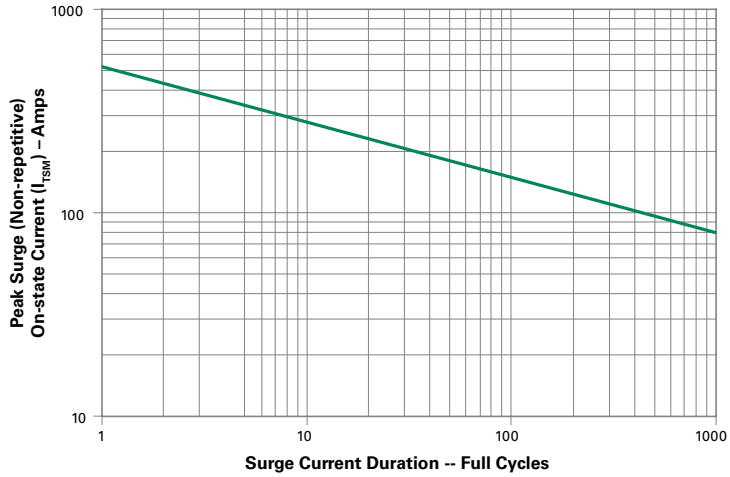


Figure 10: Surge Peak On-State Current vs. Number of Cycles

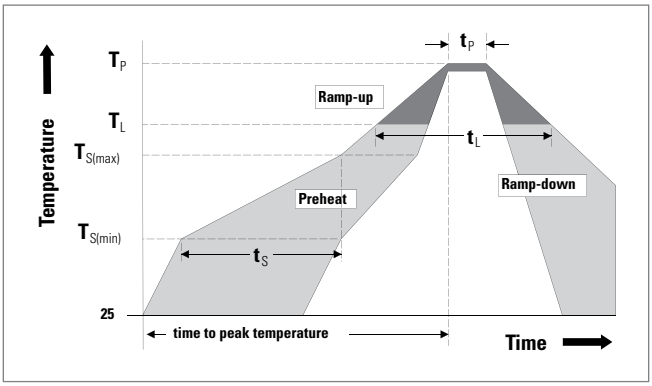


Supply Frequency: 60 Hz Sinusoidal
Load: Resistive
RMS On-State Current: [$I_{T(RMS)}$]: Maximum Rated Value at Specified Case Temperature

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

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
	- Time (t_L)	60 – 150 seconds
Peak Temperature (T_P)		$260^{+0/-5}$ °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



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Physical Specifications

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

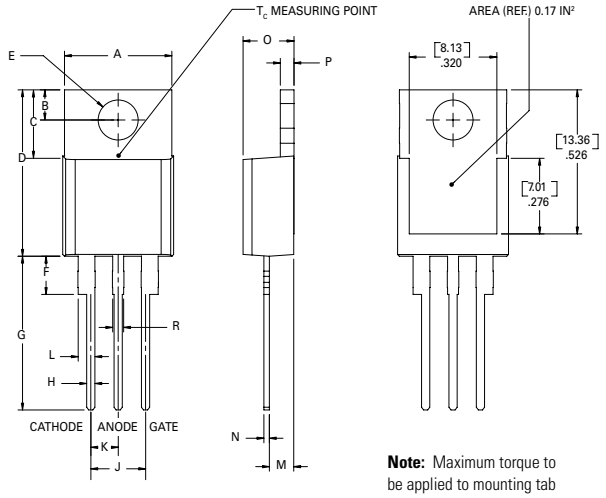
Design Considerations

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
AC Blocking	MIL-STD-750, M-1040, Cond A Applied Peak AC voltage @ 150°C for 1008 hours
Temperature Cycling	MIL-STD-750, M-1051, 1000 cycles; -55°C to +150°C; 15-min dwell-time
Temperature/Humidity	EIA / JEDEC, JESD22-A101 1008 hours; 160V - DC: 85°C; 85% rel humidity
High Temp Storage	MIL-STD-750, M-1031, 1008 hours; 150°C
Low-Temp Storage	1008 hours; -40°C
Resistance to Solder Heat	MIL-STD-750 Method 2031
Solderability	ANSI/J-STD-002, category 3, Test A
Lead Bend	MIL-STD-750, M-2036 Cond E
Moisture Sensitivity Level	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
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

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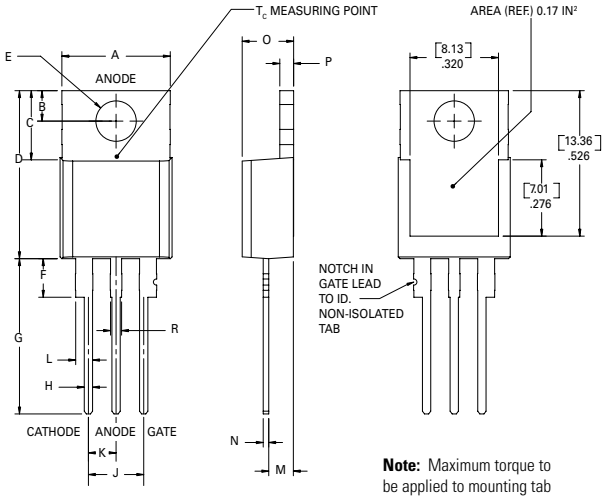
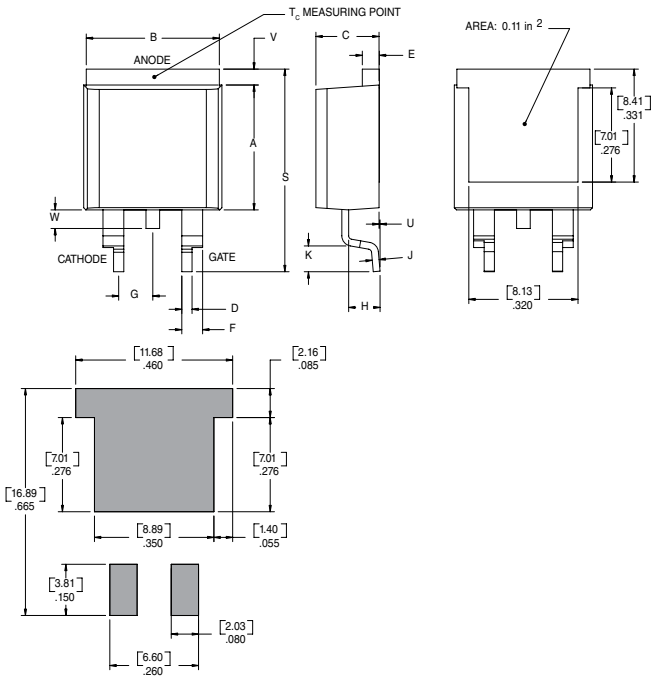
Dimensions — TO-220AB (R-Package) — Non-Isolated Mounting Tab Common with Center Lead



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) — D²-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

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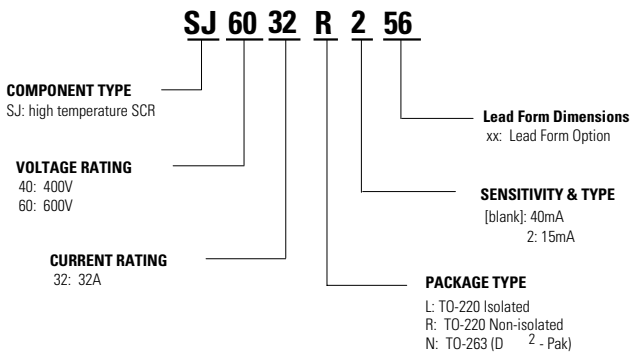
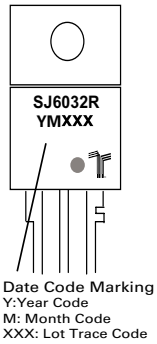
Part Numbering System



Part Marking System



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

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

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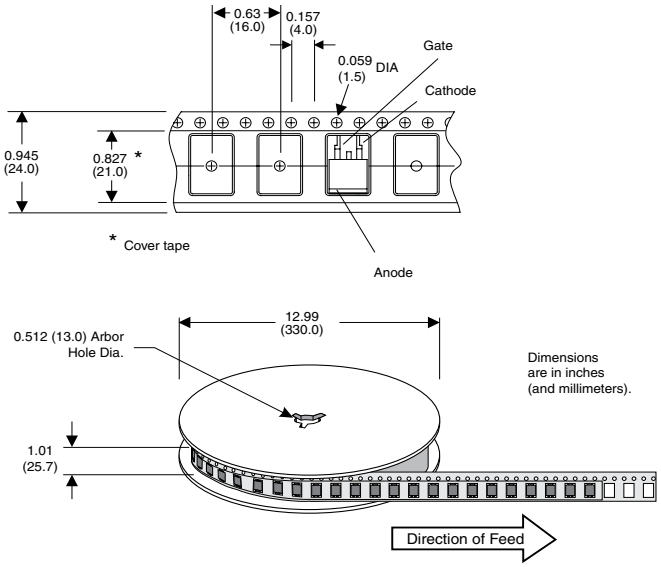
Reel Pack (RP) for TO-263 Embossed Carrier Specifications

Meets all EIA-481-2 Standards



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