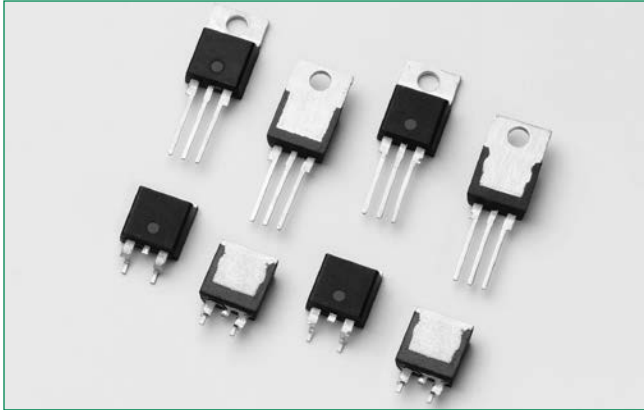


SJxx20xxA Series



Description

This SJxx20xxA high temperature SCR series is ideal for uni-directional switch applications such as phase control in heating, motor speed controls, converters/rectifiers and inrush current controllers.

These SCRs have a low gate current trigger level of 6 mA, 10 mA or 35 mA maximum at approximately 1.5 V.

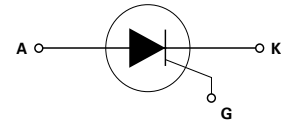
Features & Benefits

- Halogen free and RoHS compliant
- 150°C maximum junction temperature
- Surge capability up to 300 A at 60 Hz half cycle
- AEC-Q101 qualified
- Automotive Level manufacture control

Agency Recognitions

Agency	Agency File Number
	L Packages: E71639

Schematic Symbol



Main Features

Symbol	Value	Unit
$I_{T(RMS)}$	20	A
V_{DRM}/V_{RRM}	400 or 600	V
I_{GT}	6, 10 or 35	mA

Applications

Typical applications include AC Generator (ACG) rectifiers, battery voltage regulators, generic converters and inrush current controller in various AC to DC applications. Additional applications include controls for power tools, home/brown good and white goods appliances.

Isolated packages offered for ease of heat sinking.

Absolute Maximum Ratings — 20A SCR

Symbol	Parameter	Test Conditions	Value	Unit
V_{DSM}/V_{RSM}	Peak non-repetitive blocking voltage	PW=100 μ s	$V_{DRM}/\sqrt{V_{RRM}}+100$	V
$I_{T(RMS)}$	RMS on-state current	SJxx20LxA $T_c = 105^\circ\text{C}$	20	A
		SJxx20RxA SJxx20NxA $T_c = 130^\circ\text{C}$		
$I_{T(AV)}$	Average on-state current	SJxx20LxA $T_c = 105^\circ\text{C}$	12.8	A
		SJxx20RxA SJxx20NxA $T_c = 130^\circ\text{C}$		
I_{TSM}	Peak non-repetitive surge current	single half cycle; f = 50Hz; T_j (initial) = 25 $^\circ\text{C}$	225	A
		single half cycle; f = 60Hz; T_j (initial) = 25 $^\circ\text{C}$	300	
I^2t	I^2t Value for fusing	$t_p = 8.3$ ms	374	A ² s
di/dt	Critical rate of rise of on-state current	f = 60Hz ; $T_j = 150^\circ\text{C}$	125	A/ μ s
I_{GM}	Peak gate current	$T_j = 150^\circ\text{C}$	3	A
$P_{G(AV)}$	Average gate power dissipation	$T_j = 150^\circ\text{C}$	0.6	W
T_{stg}	Storage temperature range		-40 to 150	$^\circ\text{C}$
T_j	Operating junction temperature range		-40 to 150	$^\circ\text{C}$

Note: xx=voltage/10, x=sensitivity

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

Symbol	Test Conditions		SJxx20xA	SJxx20x1A	SJxx20x2A	Unit
I_{GT}	$V_D = 12\text{V}; R_L = 60\ \Omega$	MIN.	8	2	5	mA
		MAX.	35	6	10	
V_{GT}		MAX.	1.5	1.5	1.5	V
dv/dt	$V_D = 67\% V_{DRM}; \text{gate open}; T_J = 125^\circ\text{C}$	MIN.	800	70	500	V/ μs
	$V_D = 67\% V_{DRM}; \text{gate open}; T_J = 150^\circ\text{C}$		400	-	200	
V_{GD}	$V_D = V_{DRM}; R_L = 3.3\ \text{k}\Omega; T_J = 110^\circ\text{C}$	MIN.	0.2	0.2	0.2	V
I_H	$I_T = 200\text{mA (initial)}$	MAX.	75	15	35	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.	40	40	40	μs
t_{gt}	$I_G = 2 \times I_{GT}; \text{PW} = 15\ \mu\text{s}; I_T = 40\text{A}$	TYP.	2	2	2	μs

Note: xx=voltage/10, x=package

Static Characteristics

Symbol	Test Conditions		Value	Unit
V_{TM}	$I_T = 40\text{A}; t_p = 380\ \mu\text{s}$	MAX.	1.6	V
I_{DRM} / I_{RRM}	V_{DRM} / V_{RRM}	$T_J = 25^\circ\text{C}$	10	μA
		$T_J = 125^\circ\text{C}$	1000	
		$T_J = 150^\circ\text{C}$	3000	

Thermal Resistances

Symbol	Parameter		Value	Unit
$R_{\theta(JC)}$	Junction to case (AC)	SJxx20RxA	1.0	$^\circ\text{C}/\text{W}$
		SJxx20NxX		
		SJxx20LxA	2.4	

Note: xx=voltage/10, x=sensitivity

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

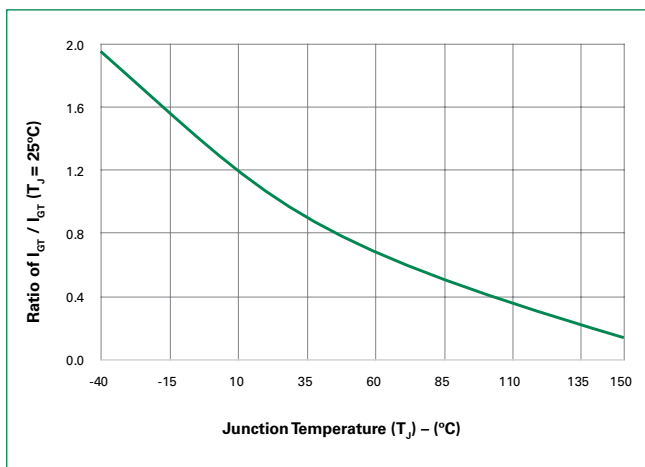


Figure 2: Normalized DC Gate Trigger Voltage vs. Junction Temperature

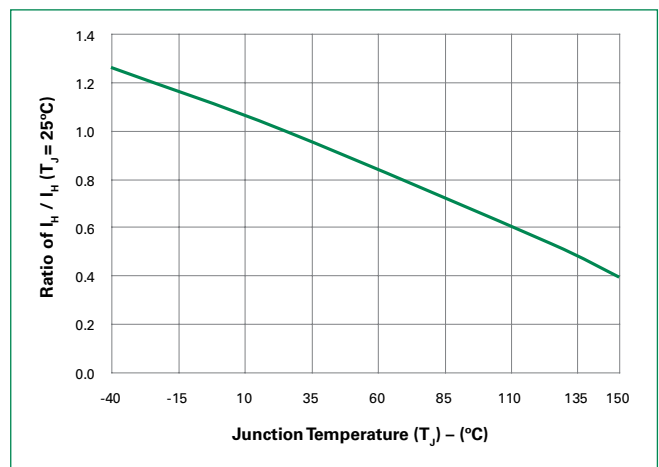


Figure 3: Normalized DC Holding Current vs. Junction Temperature

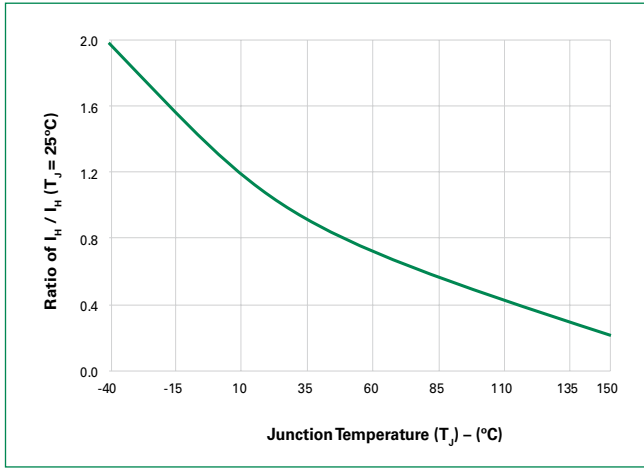


Figure 4: On-State Current vs. On-State Voltage (Typical)

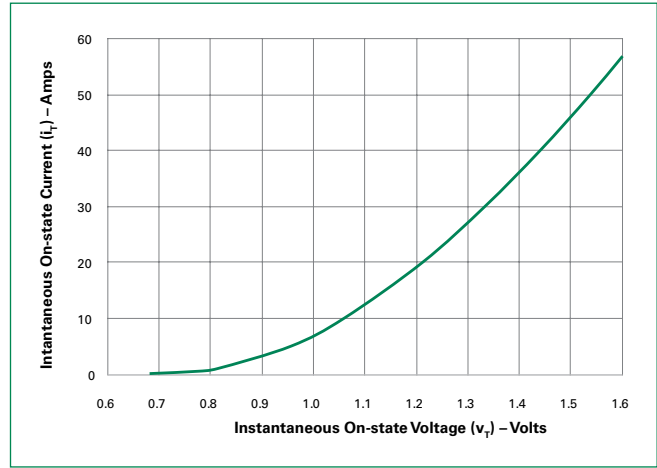


Figure 5: Power Dissipation (Typical) vs. RMS On-State Current

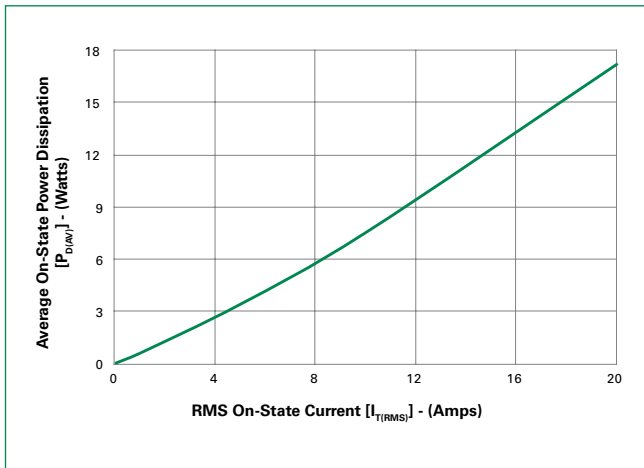


Figure 6: Maximum Allowable Case Temperature vs. RMS On-State Current

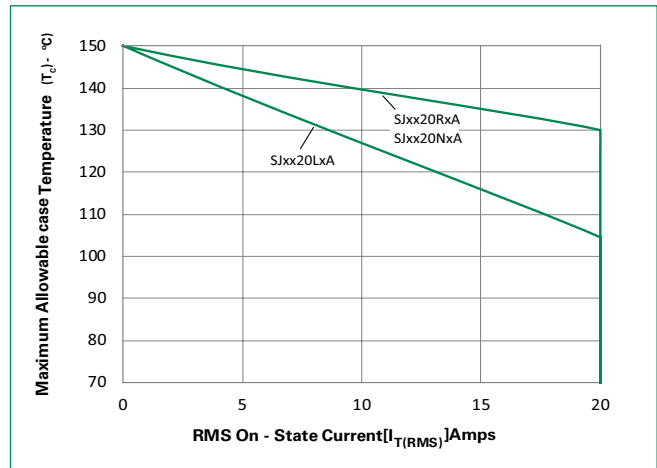


Figure 7: Maximum Allowable Case Temperature vs. Average On-State Current

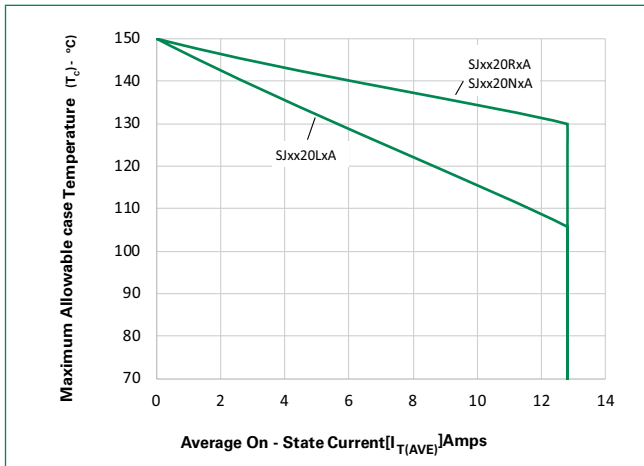


Figure 8: Peak Capacitor Discharge Current

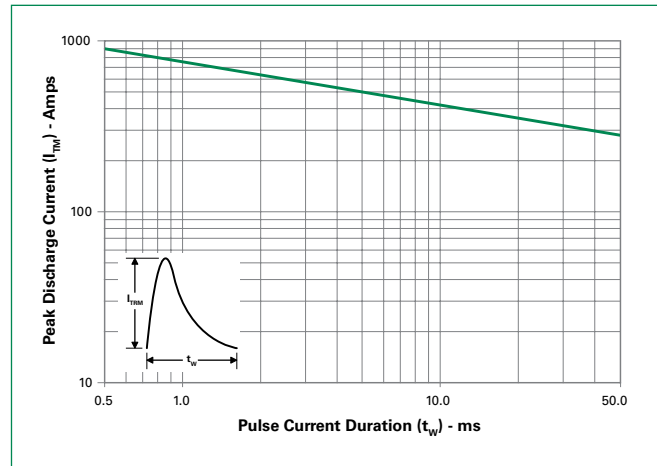


Figure 9: Peak Capacitor Discharge Current Derating

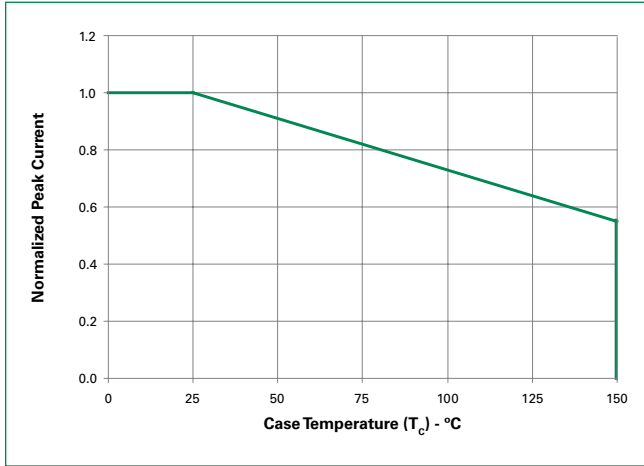
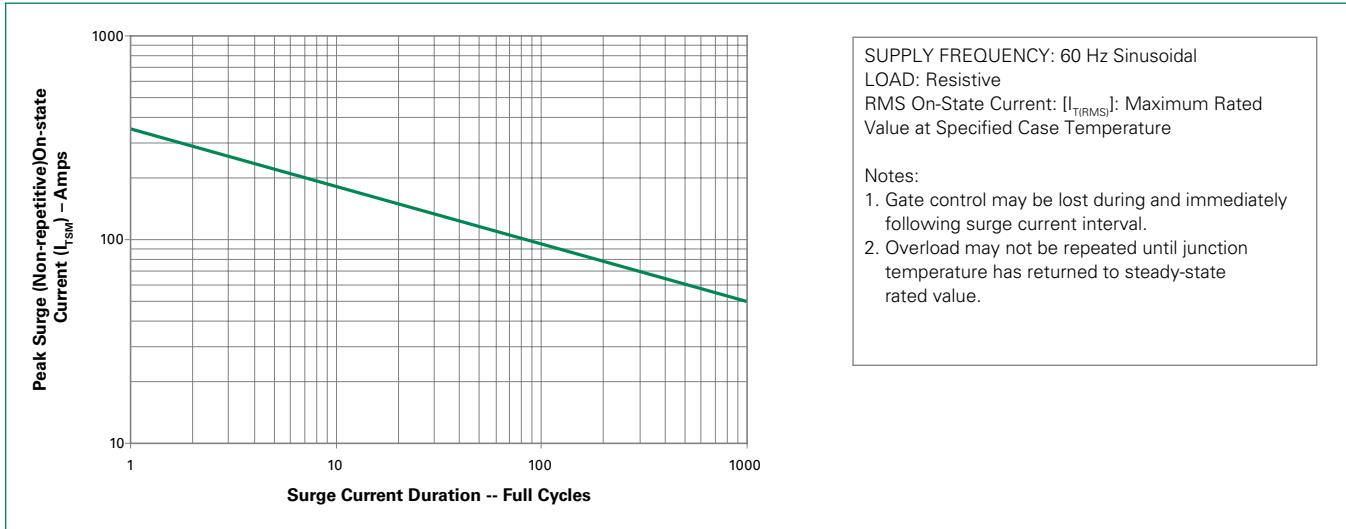


Figure 10: Surge Peak On-State Current vs. Number of Cycles



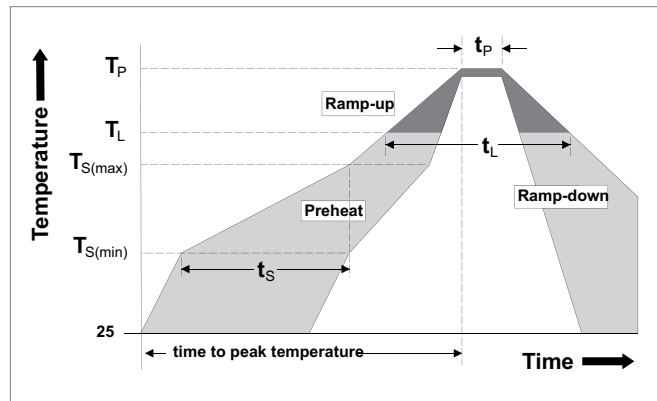
SUPPLY FREQUENCY: 60 Hz Sinusoidal
 LOAD: Resistive
 RMS On-State Current: [$I_{T(RMS)}$]: Maximum Rated Value at Specified Case Temperature

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_r)	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



Physical Specifications

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

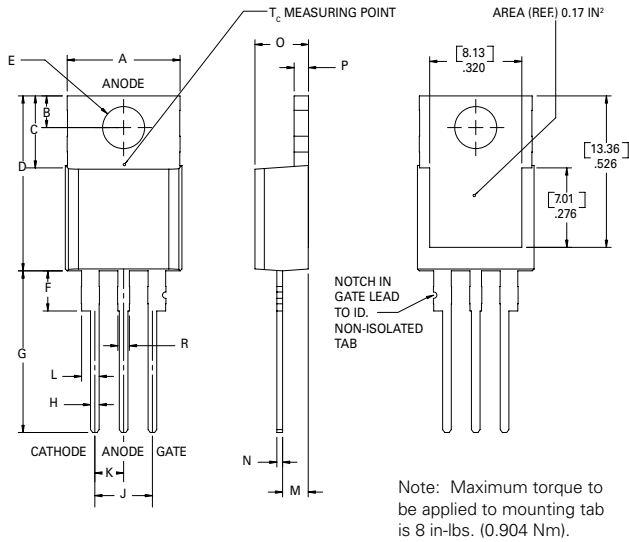
Design Considerations

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

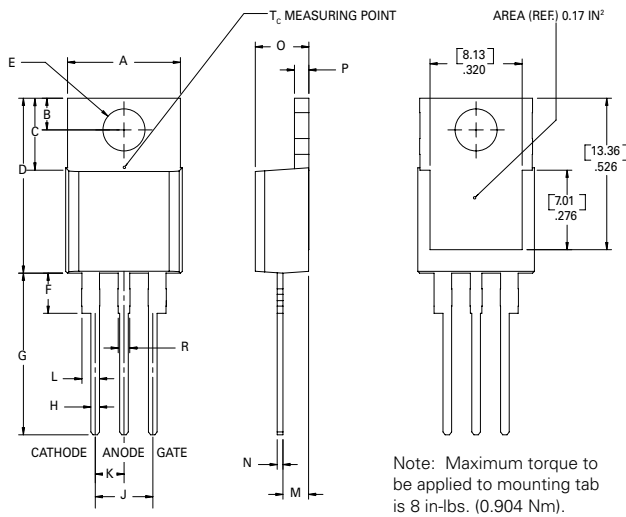
Test	Specifications and Conditions
AC Blocking	MIL-STD-750, M-1040, Cond A Applied Peak AC voltage @ 150°C for 1008 hours
Temperature Cycling	MIL-STD-750, M-1051, 100 cycles; -55°C to +150°C; 15-min dwell-time
Temperature/Humidity	EIA / JEDEC, JESD22-A101 1008 hours; 160V - DC: 85°C; 85% rel humidity
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 (R-Package) — Non-Isolated Mounting Tab Common with Center Lead



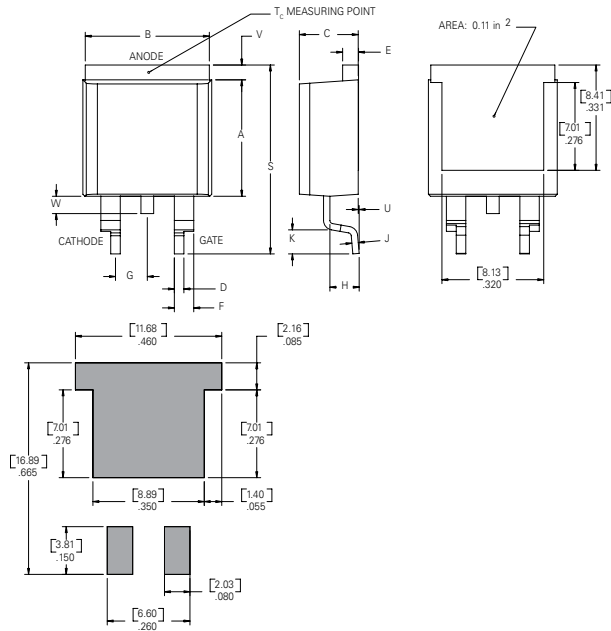
Dimension	Inches		Millimeters	
	Min	Max	Min	Max
A	0.380	0.420	9.65	10.67
B	0.105	0.115	2.67	2.92
C	0.230	0.250	5.84	6.35
D	0.590	0.620	14.99	15.75
E	0.142	0.147	3.61	3.73
F	0.110	0.130	2.79	3.30
G	0.540	0.575	13.72	14.61
H	0.025	0.035	0.64	0.89
J	0.195	0.205	4.95	5.21
K	0.095	0.105	2.41	2.67
L	0.060	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-220AB (L-Package) — Isolated Mounting Tab



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- 263AB (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	0.64	0.89
E	0.045	0.060	1.14	1.52
F	0.060	0.075	1.52	1.91
G	0.095	0.105	2.41	2.67
H	0.092	0.102	2.34	2.59
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	15.88
V	0.035	0.045	0.89	1.14
U	0.002	0.010	0.05	0.25
W	0.040	0.070	1.016	1.78

Product Selector

Part Number	Voltage		Gate Sensitivity	Type	Package
	400V	600V			
SJxx20LA	X	X	35mA	Standard SCR	TO-220L
SJxx20RA	X	X	35mA	Standard SCR	TO-220R
SJxx20NA	X	X	35mA	Standard SCR	TO-263
SJxx20L1A	X	X	6mA	Standard SCR	TO-220L
SJxx20R1A	X	X	6mA	Standard SCR	TO-220R
SJxx20N1A	X	X	6mA	Standard SCR	TO-263
SJxx20L2A	X	X	10mA	Standard SCR	TO-220L
SJxx20R2A	X	X	10mA	Standard SCR	TO-220R
SJxx20N2A	X	X	10mA	Standard SCR	TO-263

Note: xx = Voltage/10

Packing Options

Part Number	Marking	Weight	Packing Mode	Base Quantity
SJxx20LxATP	SJxx20LxA	2.2g	Tube	500 (50 per tube)
SJxx20RxATP	SJxx20RxA	2.2g	Tube	500 (50 per tube)
SJxx20NxATP	SJxx20NxA	1.6g	Tube	500 (50 per tube)
SJxx20NxARP	SJxx20NxA	1.6g	Embossed Carrier	500

Note: xx=voltage/10, x=sensitivity