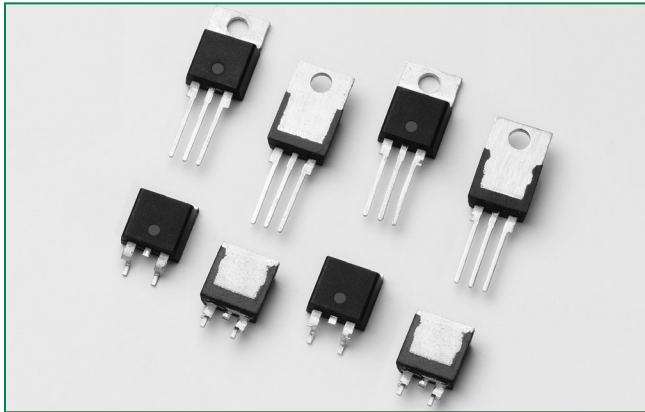


SVxx20xx Series



Description

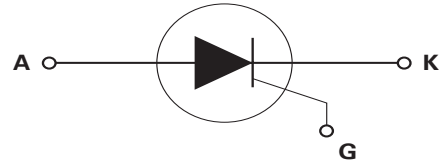
This SVxx20xx high temperature SCR series is ideal for uni-directional switch applications such as phase control in heating, motor speed controls, converters/rectifiers and inrush current controllers.

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

Features & Benefits

- Halogen free and RoHS compliant
- Surge capability up to 300A at 60 Hz half cycle
- 150 °C maximum junction temperature
- High dv/dt performance

Schematic Symbol



Main Features

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

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

Absolute Maximum Ratings – 20A SCR

Symbol	Parameter	Test Conditions	Value	Unit
V_{DSM}/V_{RSM}	Peak non-repetitive blocking voltage	$P_w = 100 \mu s$	800	V
$I_{T(RMS)}$	RMS on-state current	SVxx20Lx $T_c = 105 \text{ }^\circ\text{C}$	20	A
		SVxx20Rx SVxx20Nx $T_c = 130 \text{ }^\circ\text{C}$		
$I_{T(AV)}$	Average on-state current	SVxx20Lx $T_c = 105 \text{ }^\circ\text{C}$	12.8	A
		SVxx20Rx SVxx20Nx $T_c = 130 \text{ }^\circ\text{C}$		
I_{TSM}	Peak non-repetitive surge current	single half cycle; $f = 50\text{Hz}$; $T_j(\text{initial}) = 25 \text{ }^\circ\text{C}$	225	A
		single half cycle; $f = 60\text{Hz}$; $T_j(\text{initial}) = 25 \text{ }^\circ\text{C}$	300	
I^2t	I^2t Value for fusing	$t_p = 8.3 \text{ ms}$	374	A^2s
di/dt	Critical rate of rise of on-state current	$f = 60\text{Hz}$; $T_j = 150 \text{ }^\circ\text{C}$	125	$A/\mu s$
I_{GM}	Peak gate current	$T_j = 150 \text{ }^\circ\text{C}$	4	A
$P_{G(AV)}$	Average gate power dissipation	$T_j = 150 \text{ }^\circ\text{C}$	0.8	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

SVxx20xx Series

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

Symbol	Test Conditions		SVxx20x1	SVxx20x2	Unit
I _{GT}	V _D = 12V; R _L = 60 Ω	MIN.	2	5	mA
		MAX.	6	10	
V _{GT}		MAX.	1.5	1.5	V
dv/dt	V _D = 67% V _{DRM} ; gate open; T _J = 125°C	MIN.	400	800	V/μs
	V _D = 67% V _{DRM} ; gate open; T _J = 150°C		200	400	
V _{GD}	V _D = V _{DRM} R _L = 3.3 kΩ T _J = 110°C	MIN.	0.2	0.2	V
I _H	I _T = 200mA (initial)	MAX.	22	35	mA
t _q	I _T = 2A; t _p = 50μs; dv/dt = 5V/μs; di/dt = -30A/μs	MAX.	25	25	μs
t _{gt}	I _G = 2 × I _{GT} PW = 15μs I _T = 40A	TYP.	2.6	2.6	μs

Note: xx=voltage/10, x=package

Static Characteristics

Symbol	Test Conditions		Value	Unit
V _{TM}	I _T = 40A; t _p = 380μs	MAX.	1.6	V
I _{DRM} / I _{RRM}	V _{DRM} / V _{RRM}	T _J = 25°C	10	μA
		T _J = 125°C	1000	
		T _J = 150°C	4000	

Thermal Resistances

Symbol	Parameter	Value	Unit
R _{θ(JC)}	Junction to case (AC)	SVxx20Rx SVxx20Nx	1.0
		SVxx20Lx	2.4

Note: xx=voltage/10, x=sensitivity

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

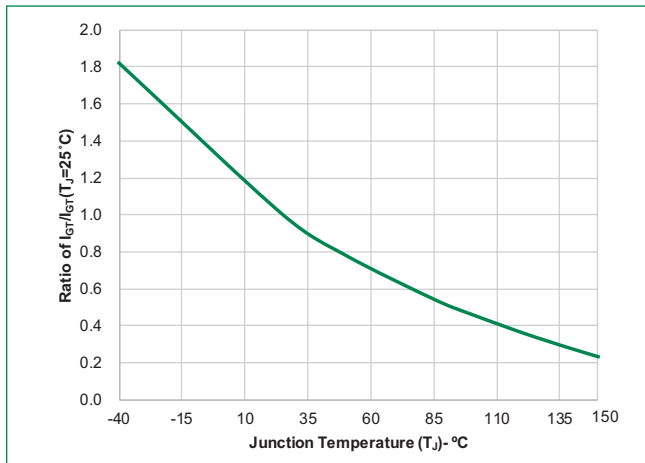


Figure 2: Normalized DC Gate Trigger Voltage vs. Junction Temperature

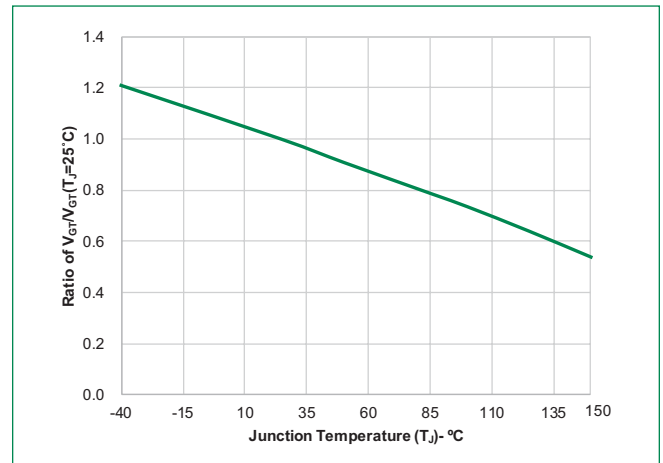


Figure 3: Normalized DC Holding Current vs. Junction Temperature

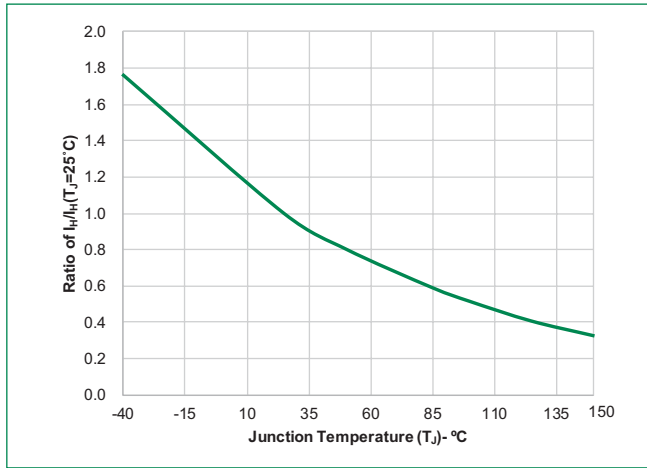


Figure 4: On-State Current vs. On-State Voltage (Typical)

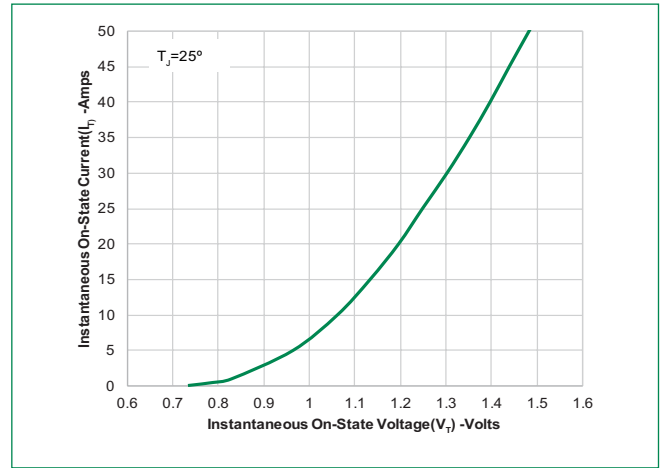


Figure 5: Power Dissipation (Typical) vs. RMS On-State Current

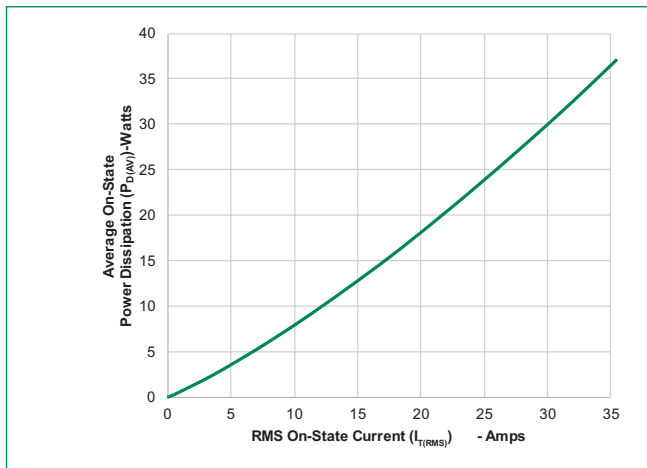


Figure 6: Maximum Allowable Case Temperature vs. RMS On-State Current

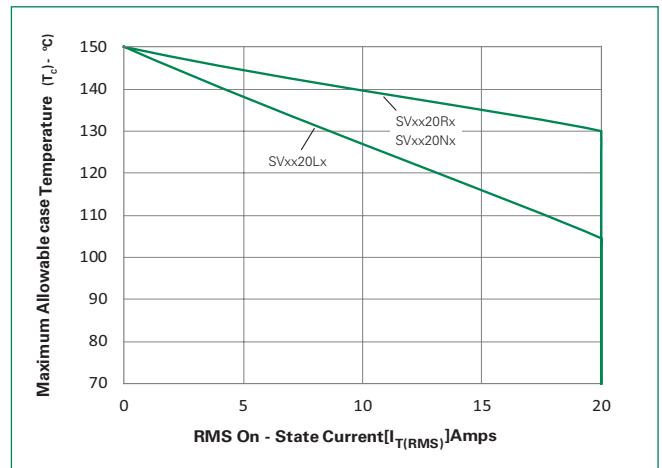


Figure 7: Maximum Allowable Case Temperature vs. Average On-State Current

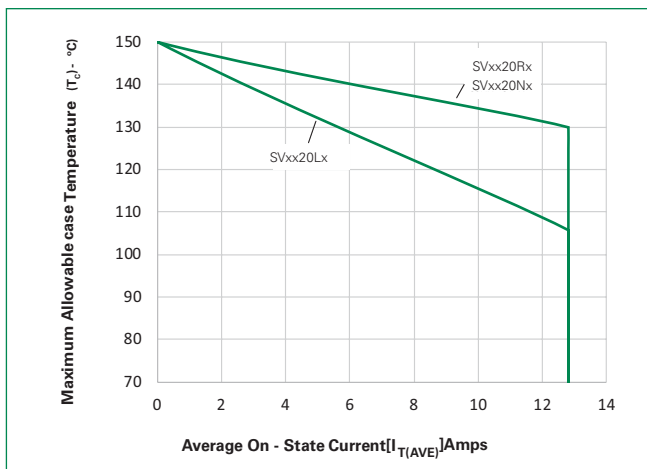


Figure 8: Peak Capacitor Discharge Current

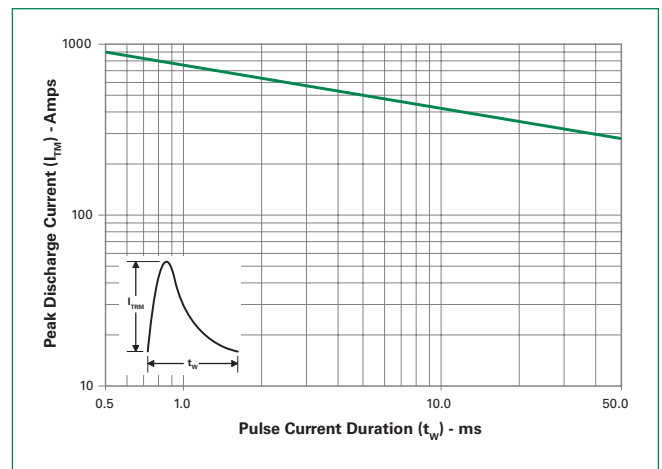


Figure 9: Peak Capacitor Discharge Current Derating

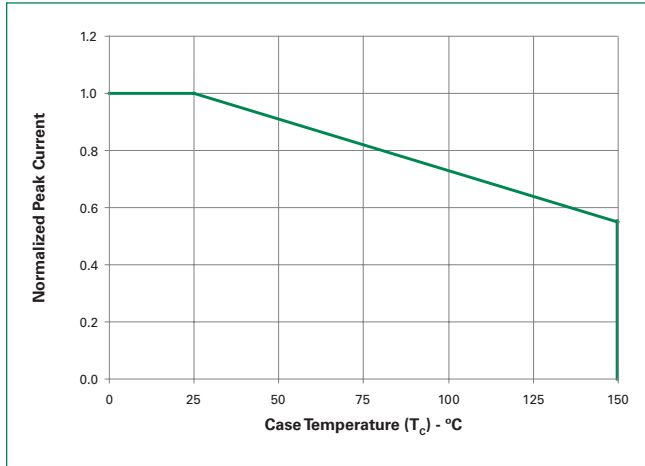
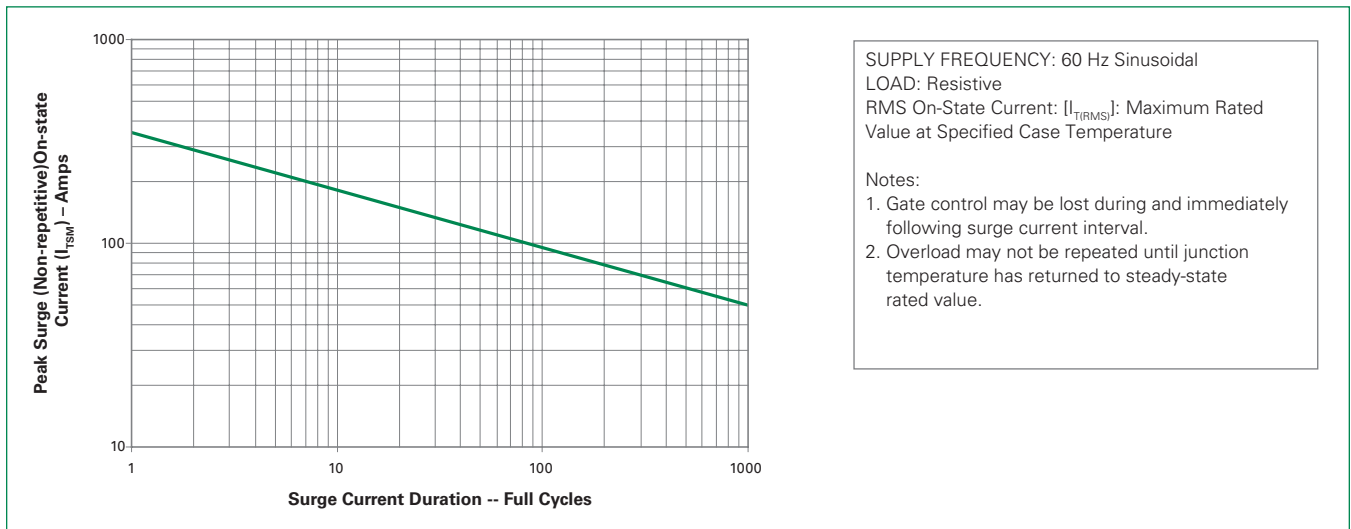
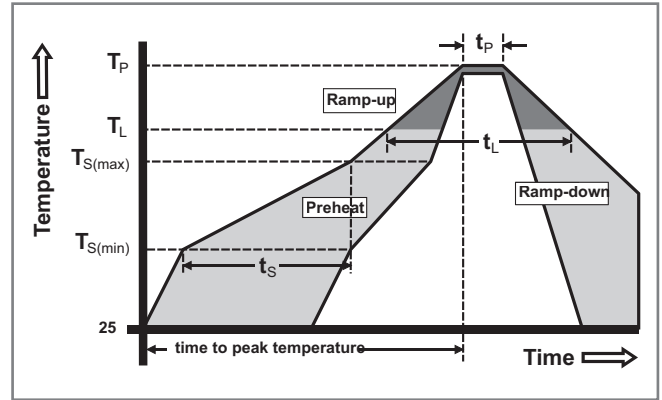


Figure 10: Surge Peak On-State Current vs. Number of Cycles



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



Physical Specifications

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

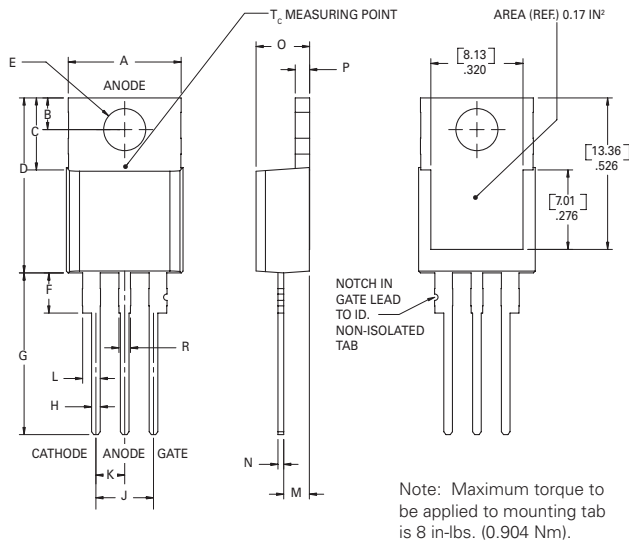
Design Considerations

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

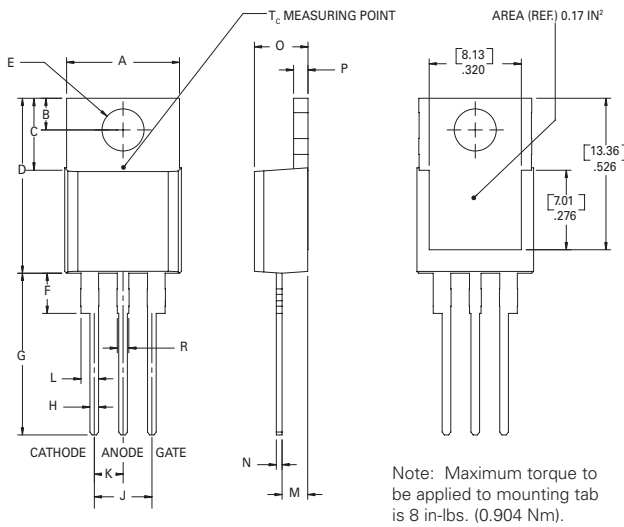
Test	Specifications and Conditions
AC Blocking	MIL-STD-750, M-1040, Cond A Applied Peak AC voltage @ 150°C for 1008 hours
Temperature Cycling	MIL-STD-750, M-1051, 100 cycles; -55°C to +150°C; 15-min dwell-time
Temperature/Humidity	EIA / JEDEC, JESD22-A101 1008 hours; 160V - DC; 85°C; 85% rel humidity
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



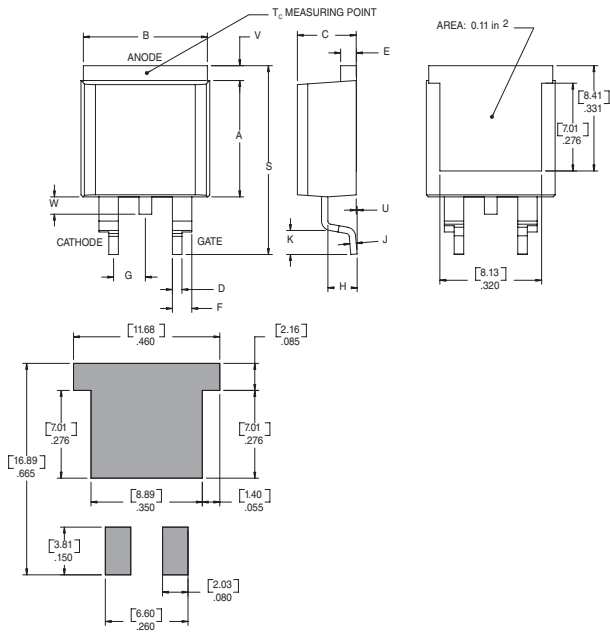
Dimension	Inches		Millimeters	
	Min	Max	Min	Max
A	0.380	0.420	9.65	10.67
B	0.105	0.115	2.67	2.92
C	0.230	0.250	5.84	6.35
D	0.590	0.620	14.99	15.75
E	0.142	0.147	3.61	3.73
F	0.110	0.130	2.79	3.30
G	0.540	0.575	13.72	14.61
H	0.025	0.035	0.64	0.89
J	0.195	0.205	4.95	5.21
K	0.095	0.105	2.41	2.67
L	0.060	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
	600V			
SVxx20L1	X	6mA	Standard SCR	TO-220L
SVxx20R1	X	6mA	Standard SCR	TO-220R
SVxx20N1	X	6mA	Standard SCR	TO-263
SVxx20L2	X	10mA	Standard SCR	TO-220L
SVxx20R2	X	10mA	Standard SCR	TO-220R
SVxx20N2	X	10mA	Standard SCR	TO-263

Note: xx = Voltage/10

Packing Options

Part Number	Marking	Weight	Packing Mode	Base Quantity
SVxx20LxTP	SVxx20Lx	2.2g	Tube	500 (50 per tube)
SVxx20RxTP	SVxx20Rx	2.2g	Tube	500 (50 per tube)
SVxx20NxTP	SVxx20Nx	1.6g	Tube	500 (50 per tube)
SVxx20NxRP	SVxx20Nx	1.6g	Embossed Carrier	500

Note: xx=voltage/10, x=sensitivity