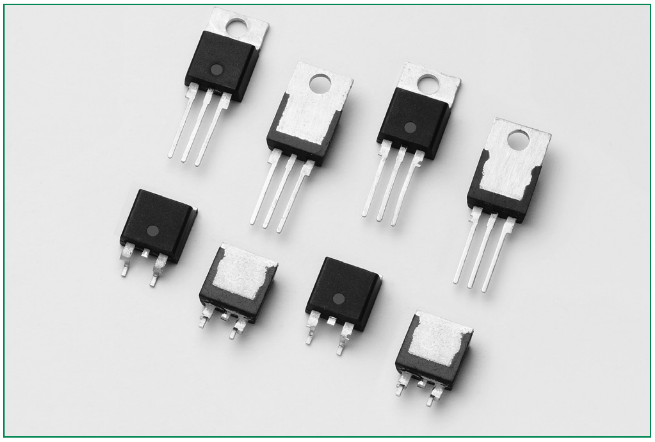
SVxx16xxQ series

16 Amp High Junction Temperature SCRs



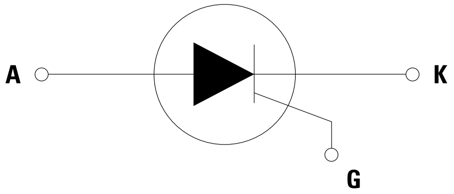
Agency Approval

Agency	Agency File Number
UL	L Packages: E71639

Main Features

Symbol	Value	Unit
$I_{T(RMS)}$	16	A
V_{DRM}/V_{RRM}	600	V
I_{GT}	6 to 10	mA

Schematic Symbol



Description

The SVxx16xxQ high junction temperature SCR series are 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, (IGT) trigger level of 6mA and 10mA maximum at approximately 1.5V for SVxx16x1Q and SVxx16x2Q, respectively.

Features & Benefits

- Halogen free and RoHS compliant
- 150°C maximum junction temperature
- Surge capability up to 225A at 60 Hz half cycle
- High dv/dt performance
- Low turn off time
- UL Recognized to UL 1557 as an Electrically Isolated Semiconductor Device

Applications

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

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

Revised: GD. 03/01/21

Absolute Maximum Ratings — Standard SCRs

Symbol	Parameter	Test Conditions		Value	Unit
V_{DSM}/V_{RSM}	Peak non-repetitive blocking voltage	P_W=100 µs		800	V
$I_{T(RMS)}$	RMS on-state current	SVxx16LxQ	T_C = 110°C	16	A
		SVxx16RxQ SVxx16NxQ	T_C = 135°C	16	
$I_{T(AV)}$	Average on-state current	SVxx16LxQ	T_C = 110°C	10.2	A
		SVxx16RxQ SVxx16NxQ	T_C = 135°C	10.2	
I_{TSM}	Peak non-repetitive surge current	single half cycle; f = 50Hz; T_J (initial) = 25°C		188	A
		single half cycle; f = 60Hz; T_J (initial) = 25°C		225	
I²t	I²t Value for fusing	t_p = 8.3 ms		210	A²s
di/dt	Critical rate of rise of on-state current	f = 60 Hz ; T_J = 150°C		100	A/µs
I_{GM}	Peak gate current	T_J = 150°C		4	A
$P_{G(AV)}$	Average gate power dissipation	T_J = 150°C		0.8	W
T_{stg}	Storage temperature range			-40 to 150	°C
T_J	Operating junction temperature range			-40 to 150	°C

Note: xx=voltage/10, x=sensitivity

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

Symbol	Test Conditions		SVxx16x1Q	SVxx16x2Q	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 = 150°C	MIN.	0.2	0.2	V
I_H	I_T = 200mA (initial)	MAX.	25	40	mA
t_q	I_T=2A; t_p=50µs; dv/dt=5V/µs; di/dt=-30A/µs	MAX.	12	12	µs
t_{gt}	I_G = 2 x I_{GT} P_W = 15µs I_T = 32A	TYP.	2.6	2.6	µs

Note: xx=voltage/10, x=package

Static Characteristics

Symbol	Test Conditions			Value	Unit
V_{TM}	I_T = 32A; t_p = 380 µs		MAX.	1.7	V
I_{DRM} / I_{RRM}	V_{DRM} = V_{RRM}	T_J = 25°C	MAX.	10	µA
		T_J = 125°C		1000	
		T_J = 150°C		3000	

Thermal Resistances

Symbol	Parameter		Value	Unit
$R_{\theta(JC)}$	Junction to case (AC)	SVxx16RxQ SVxx16NxQ	1.0	°C/W
		SVxx16LxQ	2.5	

Note: xx=voltage/10, x=sensitivity

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

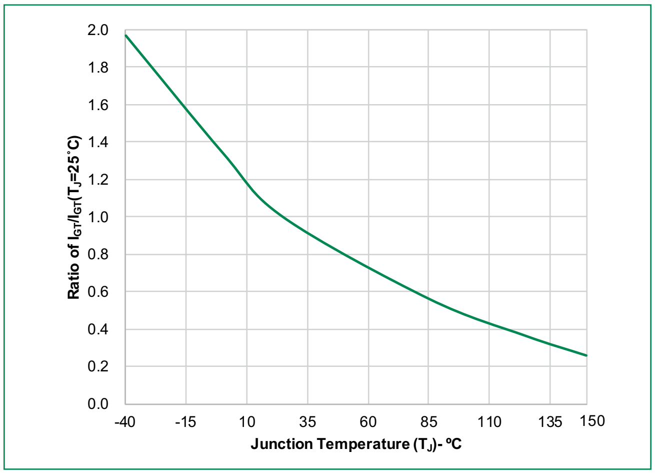


Figure 2: Normalized DC Gate Trigger Voltage vs. Junction Temperature

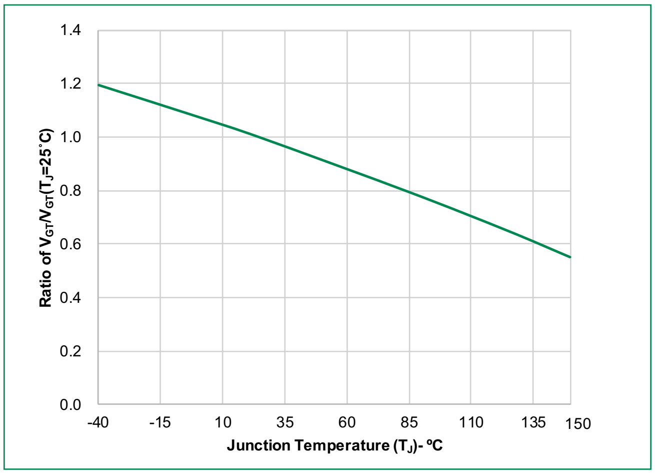


Figure 3: Normalized DC Holding Current vs. Junction Temperature

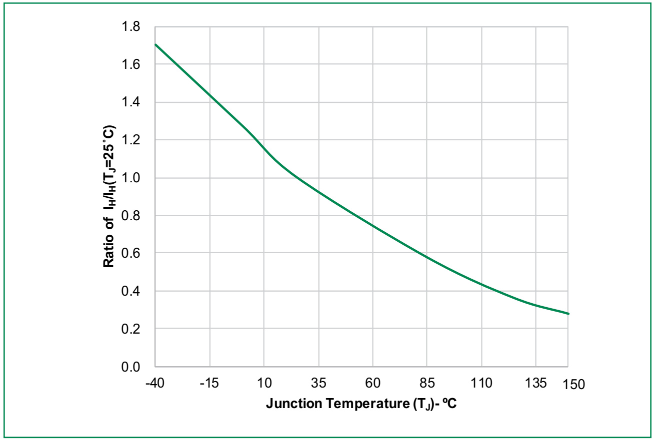


Figure 4: On-State Current vs. On-State Voltage (Typical)

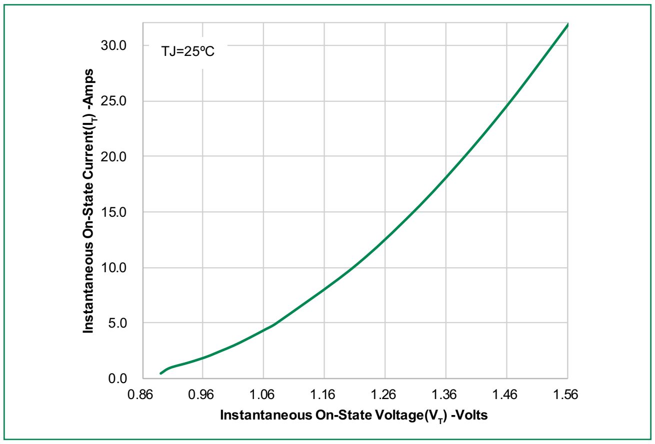


Figure 5: Power Dissipation (Typical) vs. RMS On-State Current

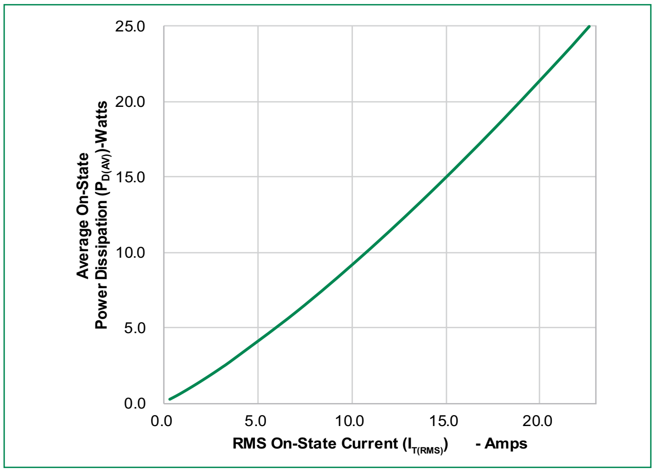


Figure 6: Maximum Allowable Case Temperature vs. RMS On-State Current

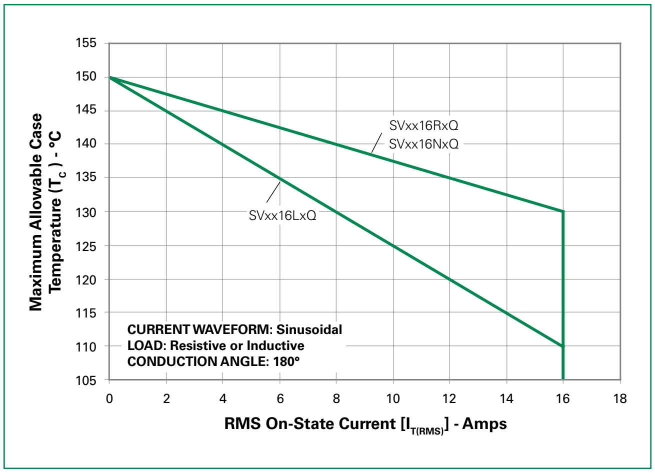


Figure 7: Maximum Allowable Case Temperature vs. Average On-State Current

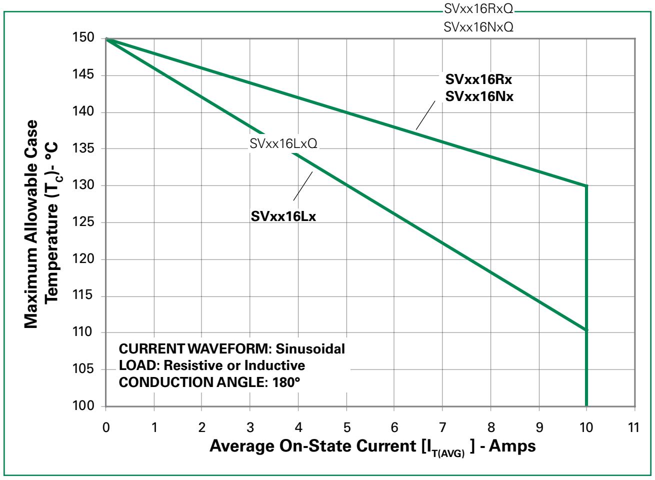


Figure 8: Peak Capacitor Discharge Current

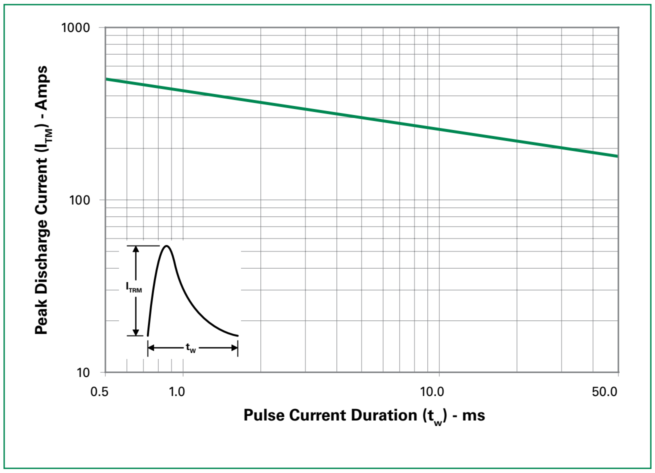


Figure 9: Peak Capacitor Discharge Current Derating

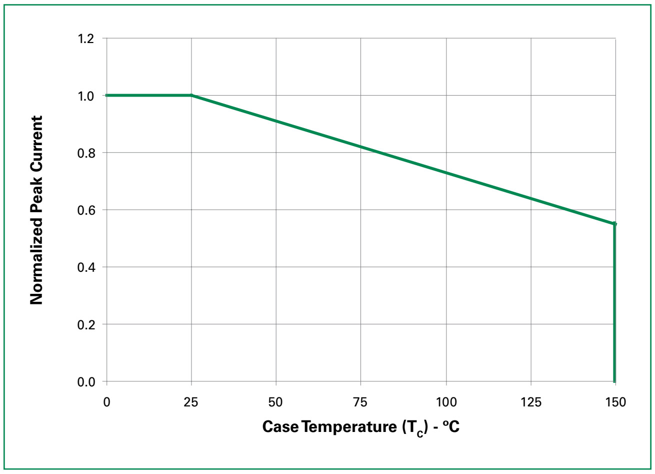
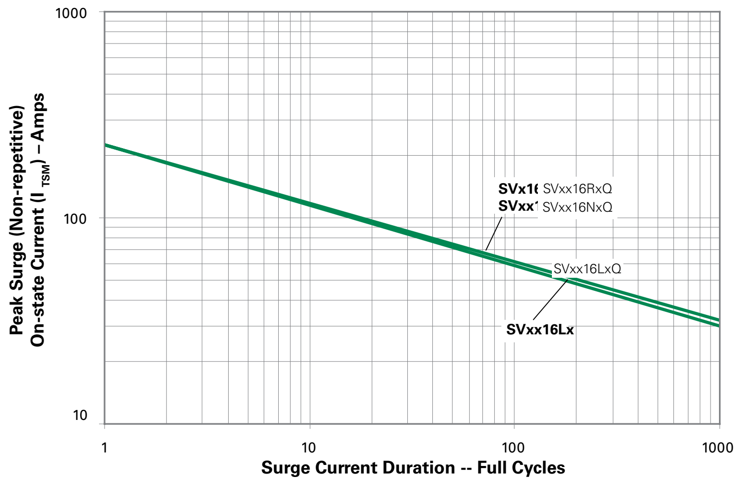


Figure 10: Surge Peak On-State Current vs. Number of Cycles



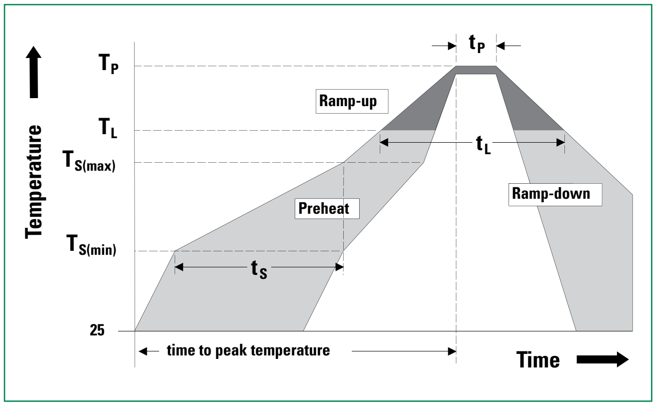
SUPPLY FREQUENCY: 60 Hz Sinusoidal
LOAD: Resistive
RMS On-State Current: [I$_{T(RMS)}$]: Maximum Rated Value at Specified Case Temperature

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_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

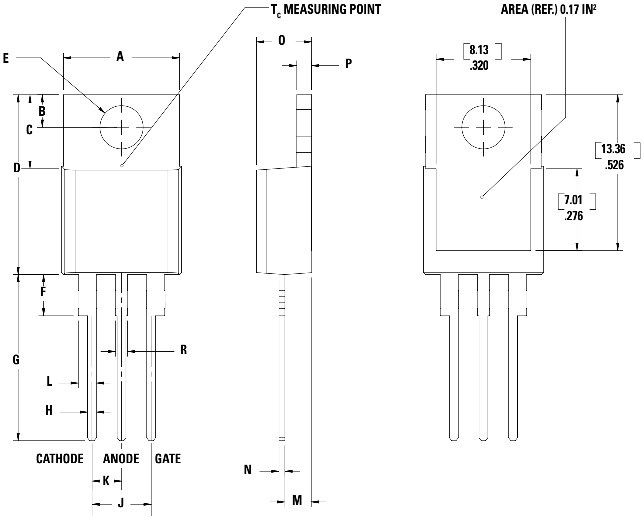
Design Considerations

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

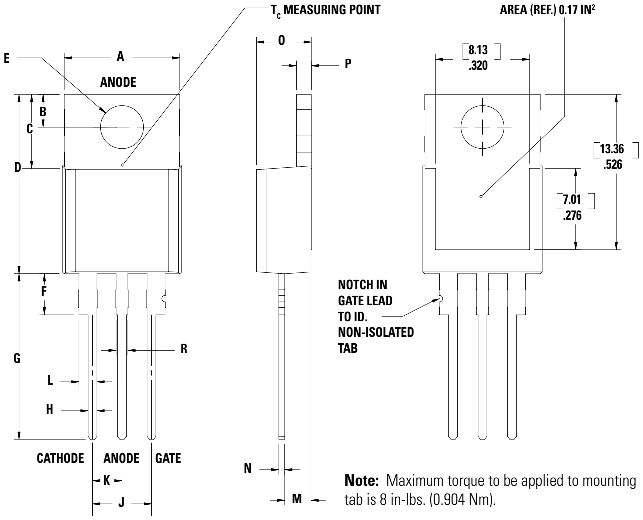
Test	Specifications and Conditions
AC Blocking	MIL-STD-750, M-1040, Cond A Applied Peak AC voltage @ 150°C for 1008 hours
Temperature Cycling	MIL-STD-750, M-1051, 1000 cycles; -55°C to +150°C; 15-min dwell-time
Temperature/Humidity	EIA / JEDEC, JESD22-A101 1008 hours; 160V - DC: 85°C; 85% rel humidity
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



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 (R-Package) — Non-Isolated Mounting Tab Common with Center Lead



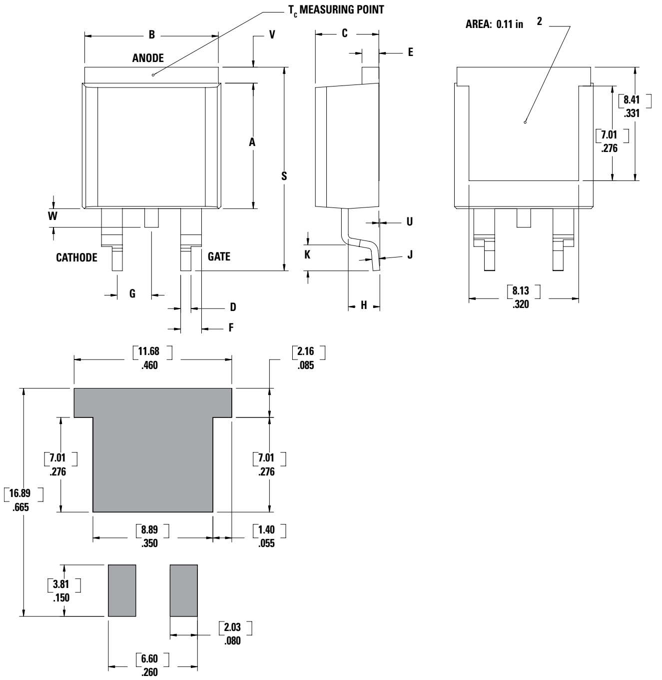
Note: Maximum torque to be applied to mounting tab is 8 in-lbs. (0.904 Nm).

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

SVxx16xxQ series

16 Amp High Junction Temperature SCRs

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	1.02	1.78

Product Selector

Part Number	Voltage	Gate Sensitivity	Type	Package
	600V			
SVxx16L1Q	X	6mA	Standard SCR	TO-220L
SVxx16R1Q	X	6mA	Standard SCR	TO-220R
SVxx16N1Q	X	6mA	Standard SCR	TO-263
SVxx16L2Q	X	10mA	Standard SCR	TO-220L
SVxx16R2Q	X	10mA	Standard SCR	TO-220R
SVxx16N2Q	X	10mA	Standard SCR	TO-263

Note: xx = Voltage/10

Packing Options

Part Number	Marking	Weight	Packing Mode	Base Quantity
SVxx16LxQTP	SVxx16LxQ	2.2g	Tube	1000 (50 per tube)
SVxx16RxQTP	SVxx16RxQ	2.2g	Tube	1000 (50 per tube)
SVxx16NxQTP	SVxx16NxQ	1.6g	Tube	1000 (50 per tube)
SVxx16NxQRP	SVxx16NxQ	1.6g	Embossed Carrier	500

Note: xx=voltage/10, x=sensitivity

SVxx16xxQ series

16 Amp High Junction Temperature SCRs

Part Numbering System

SV 60 16 L 1 Q TP

Componant Type
SV: high temperature
high dv/dt SCR

Voltage Rating
60: 600V

Current Rating
16: 16A

Packaging Type
L: TO-220 Isolated
R: TO-220 Non-Isolated
N: TO-263 (D²-Pak)

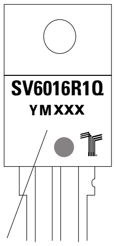
Sensitivity & Type
1: 6mA
2: 10mA

Turn off Time Rating
Q: low t_q

Packing Type
TP: Tube Pack
RP: Reel Pack

Part Marking System

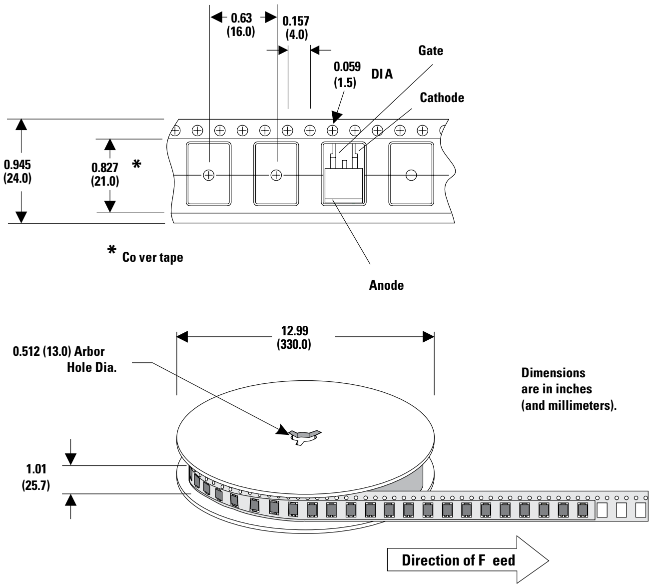
TO-220 AB - (L and R Package)
TO-263 AB - (N Package)



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

TO-263 Embossed Carrier Reel Pack (RP) Specifications

Meets all EIA-481-2 Standards



Dimensions
are in inches
(and millimeters).