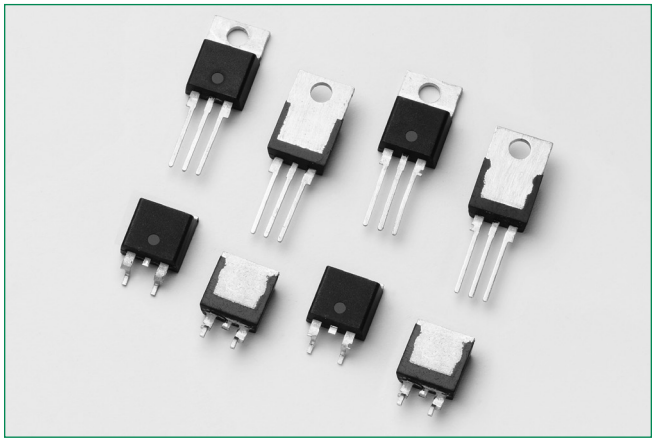
SVxx16xx series

16 Amp High Junction Temperature SCRs



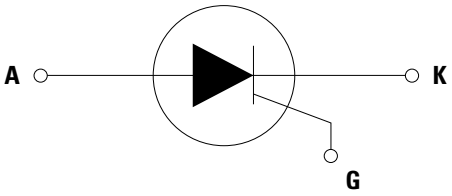
Agency Approval

Agency	Agency File Number
®	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 SVxx16xx high junction 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, (IGT) trigger level of 6mA and 10mA maximum at approximately 1.5V for SVxx16x1 and SVxx16x2, 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
- 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.

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SVxx16xx series
16 Amp High Junction Temperature SCRs

Absolute Maximum Ratings — Standard SCRs

Symbol	Parameter	Test Conditions		Value	Unit
V_{DSM}/V_{RSM}	Peak non-repetitive blocking voltage	PW=100 µs		800	V
$I_{T(RMS)}$	RMS on-state current	SVxx16Lx	T_C = 110°C	16	A
		SVxx16Rx SVxx16Nx	T_C = 135°C	16	
$I_{T(AV)}$	Average on-state current	SVxx16Lx	T_C = 110°C	10.2	A
		SVxx16Rx SVxx16Nx	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	
I^2t	I^2t Value for fusing	t_p = 8.3 ms		210	A^2s
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		SVxx16x1	SVxx16x2	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.	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 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.	1.6	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)	SVxx16Rx SVxx16Nx	1.0	°C/W
		SVxx16Lx	2.5	

Note: xx=voltage/10, x=sensitivity

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SVxx16xx series
16 Amp High Junction Temperature SCRs

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

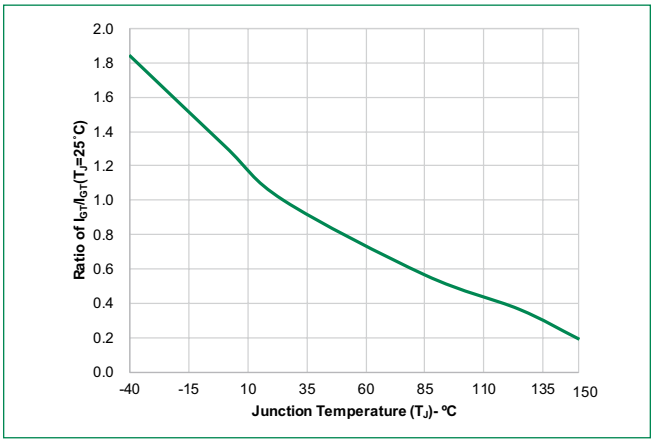


Figure 2:
Normalized DC Gate Trigger Voltage vs. Junction Temperature

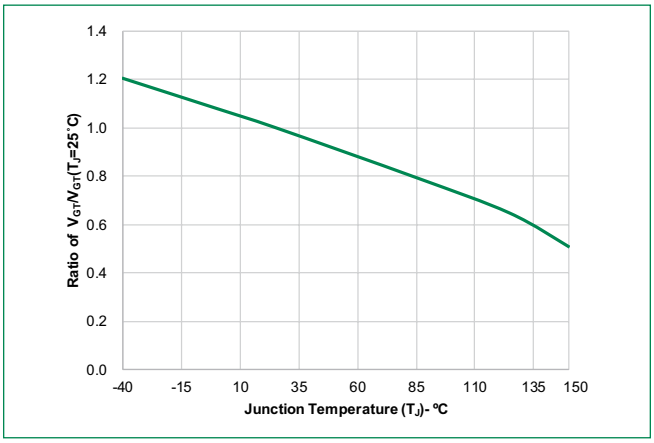


Figure 3:
Normalized DC Holding Current vs. Junction Temperature

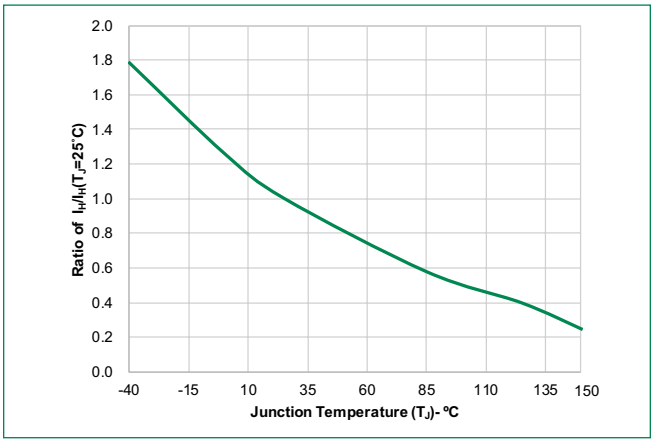


Figure 4:
On-State Current vs. On-State Voltage (Typical)

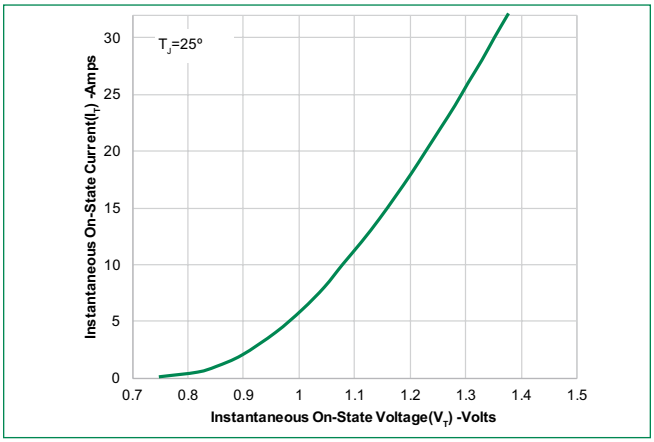


Figure 5:
Power Dissipation (Typical) vs. RMS On-State Current

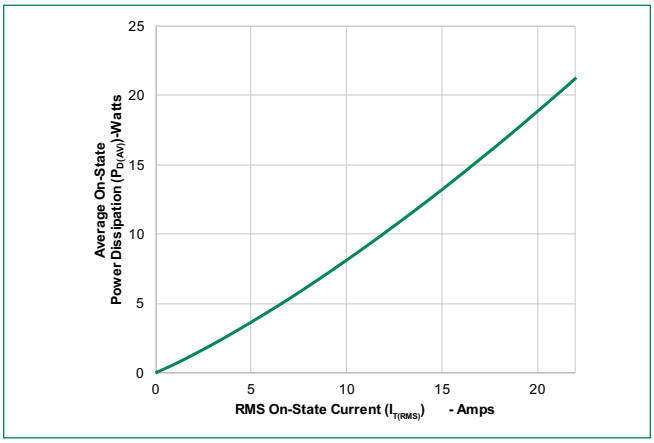
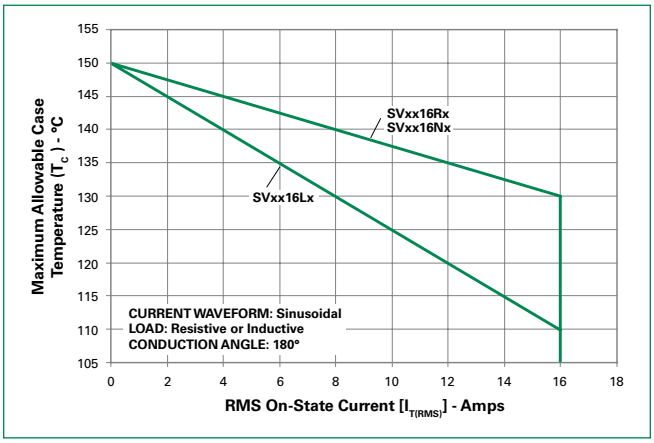


Figure 6:
Maximum Allowable Case Temperature vs. RMS On-State Current



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SVxx16xx series
16 Amp High Junction Temperature SCRs

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

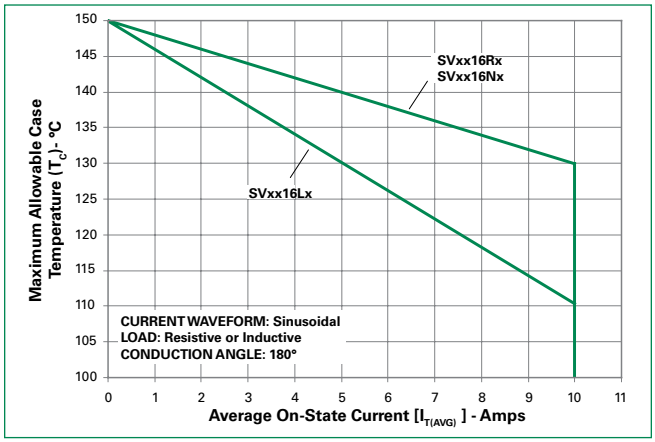


Figure 8:
Peak Capacitor Discharge Current

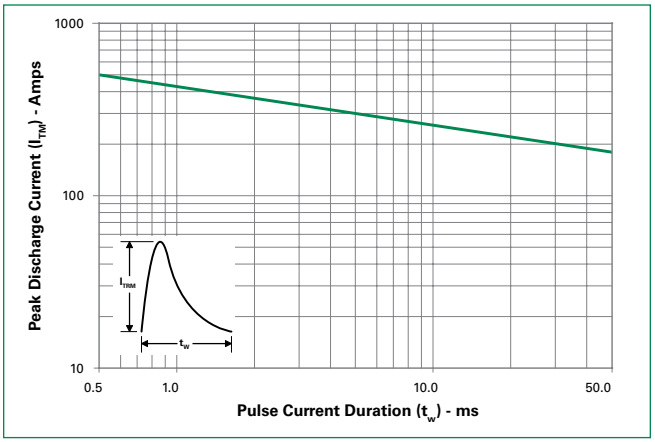


Figure 9:
Peak Capacitor Discharge Current Derating

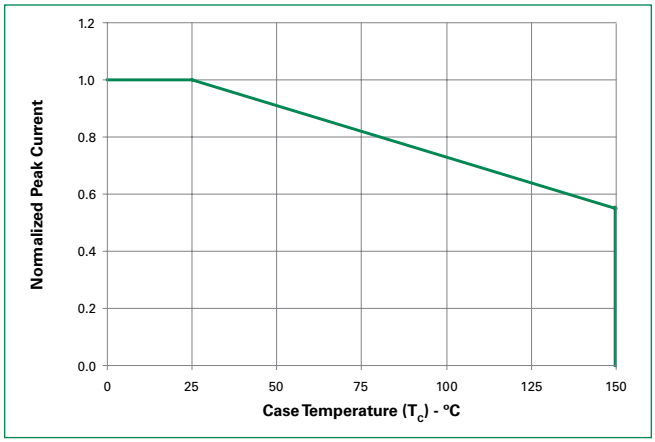
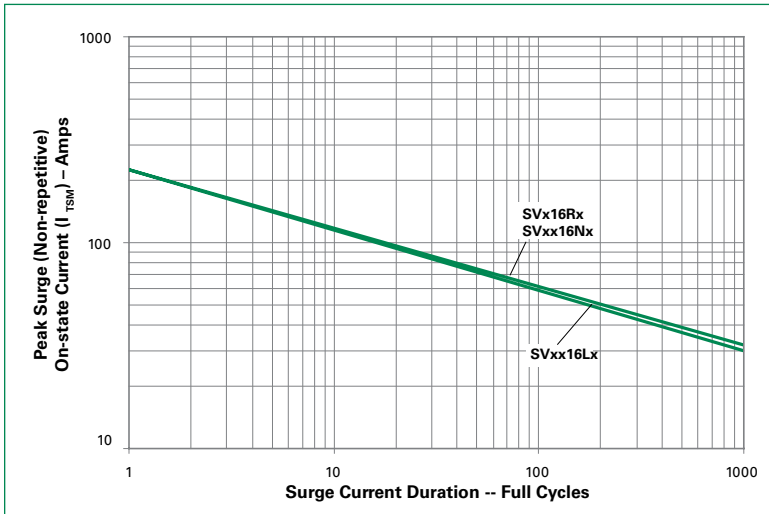


Figure 10: Surge Peak On-State Current vs. Number of Cycles



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.

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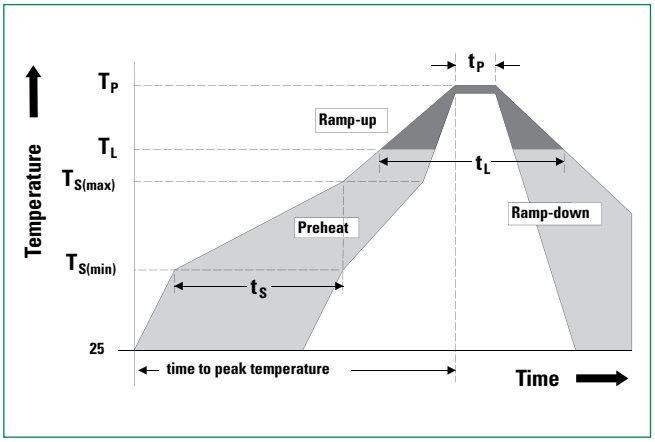
SVxx16xx series
16 Amp High Junction Temperature SCRs

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

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

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.

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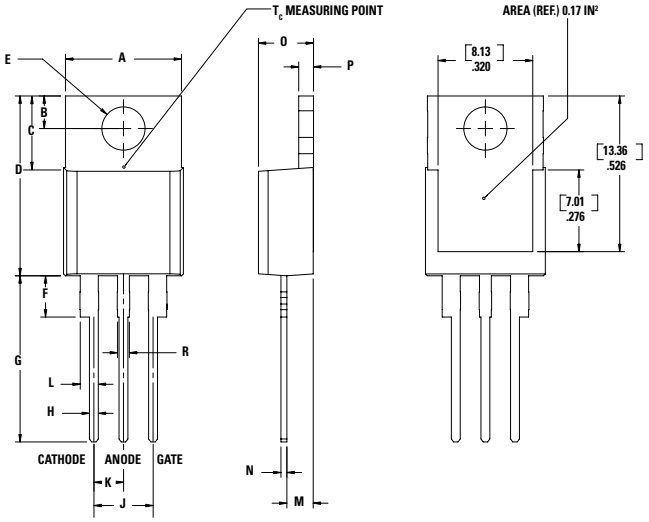
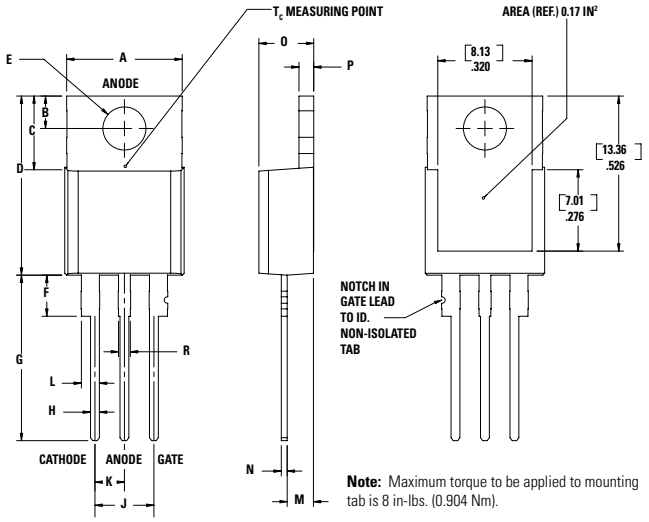
SVxx16xx series
16 Amp High Junction Temperature SCRs

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

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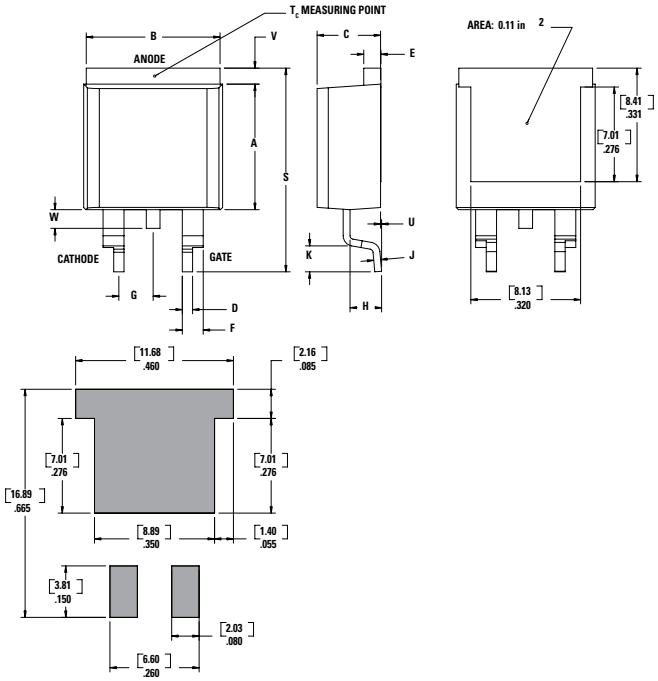
Dimensions — TO- 263AB (N-package) — D2-Pak Surface Mount



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			
SVxx16L1	X	6mA	Standard SCR	TO-220L
SVxx16R1	X	6mA	Standard SCR	TO-220R
SVxx16N1	X	6mA	Standard SCR	TO-263
SVxx16L2	X	10mA	Standard SCR	TO-220L
SVxx16R2	X	10mA	Standard SCR	TO-220R
SVxx16N2	X	10mA	Standard SCR	TO-263

Note: xx = Voltage/10

Packing Options

Part Number	Marking	Weight	Packing Mode	Base Quantity
SVxx16LxTP	SVxx16Ly	2.2g	Tube	1000 (50 per tube)
SVxx16RxTP	SVxx16Ry	2.2g	Tube	1000 (50 per tube)
SVxx16NxTP	SVxx16Ny	1.6g	Tube	1000 (50 per tube)
SVxx16NxRP	SVxx16Ny	1.6g	Embossed Carrier	500

Note: xx=voltage/10, x=sensitivity

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SVxx16xx series
16 Amp High Junction Temperature SCRs

Part Numbering System

SV 60 16 L 1 TP

Component Type
SV: high temperature high dv/dt SCR

Voltage Rating
60: 600V

Current Rating
16: 16A

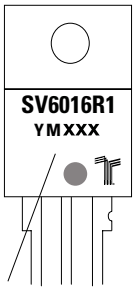
Package Type
L: TO-220 Isolated
R: TO-220 Non-Isolated
N: TO-263 (D^2-Pak)

Sensitivity & Type
1: 6mA
2:10mA

Packing Type
TP: Tube Pack
RP: Reel Pack

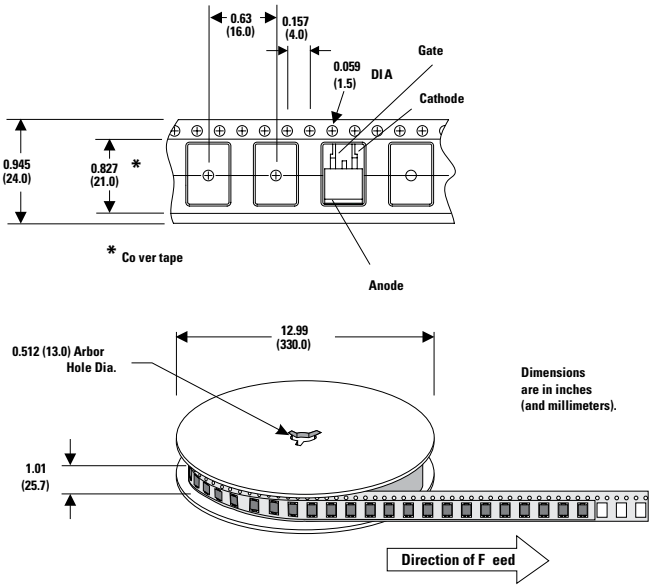
Part Marking System

T0-220 AB - (L and R Package)
T0-263 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



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