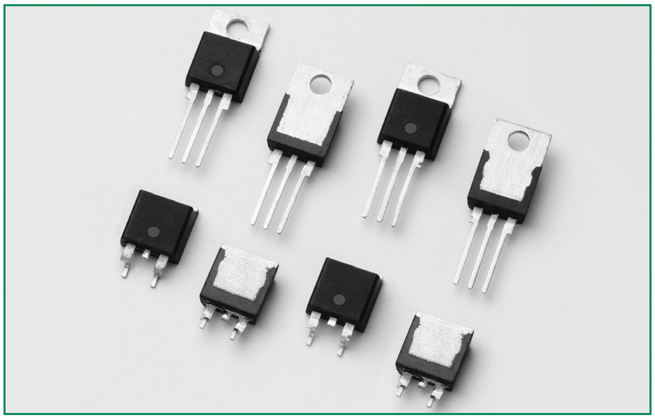
Sxx15x & Sxx16x Series

RoHS



Description

Excellent unidirectional switches for phase control applications such as heating and motor speed controls.

Standard phase control SCRs are triggered with few milliamperes of current at less than 1.5V potential.

Features & Benefits

- RoHS compliant
- Glass – passivated junctions
- Voltage capability up to 1000 V
- Surge capability up to 225 A

Agency Approval

Agency	Agency File Number
UL	L Package: E71639

Applications

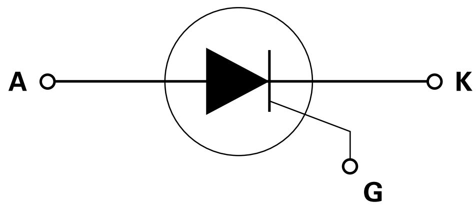
Typical applications are capacitive discharge systems for strobe lights, nailers, staplers and gas engine ignition. Also controls for power tools, home/brown goods and white goods appliances.

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

Main Features

Symbol	Value	Unit
$I_{T(RMS)}$	15 & 16	A
V_{DRM}/V_{RRM}	400 to 1000	V
I_{GT}	30	mA

Schematic Symbol



Absolute Maximum Ratings — Standard SCRs

Symbol	Parameter	Test Conditions		Value	Unit
$I_{T(RMS)}$	RMS on-state current	Sxx15L	T_C = 90°C	15	A
		Sxx16R Sxx16N	T_C = 110°C	16	
$I_{T(AV)}$	Average on-state current	Sxx15L	T_C = 90°C	9.5	A
		Sxx16R Sxx16N	T_C = 110°C	10.0	
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 = 125°C		125	A/μs
I_{GM}	Peak gate current	T_J = 125°C		3	A
$P_{G(AV)}$	Average gate power dissipation	T_J = 125°C		0.6	W
T_{stg}	Storage temperature range			-40 to 150	°C
T_J	Operating junction temperature range			-40 to 125	°C

Note: xx = voltage

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

Symbol	Test Conditions			Value Sxx15x Sxx16x	Unit
I_{GT}	V_D = 12V; R_L = 60 Ω		MAX.	30	mA
			MIN.	1	
V_{GT}			MAX.	1.5	V
dv/dt	$V_D = V_{DRM}$; gate open; T_J = 100°C	400V	MIN.	450	V/μs
		600V		425	
		800V		400	
		1000V		200	
	$V_D = V_{DRM}$; gate open; T_J = 125°C	400V		350	
		600V		325	
		800V		300	
V_{GD}	$V_D = V_{DRM}$ R_L = 3.3 kΩ T_J = 110°C		MIN.	0.2	V
I_H	I_T = 200mA (initial)		MAX.	40	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 = 12A		TYP.	2	μs

Note: xx = voltage, x = package
(1) I_T=2A; t_p=50μs; dv/dt=5V/μs; di/dt=-30A/μs

Static Characteristics

Symbol	Test Conditions				Value	Unit
V_{TM}	15A Device I_T = 30A; t_p = 380 μs			MAX.	1.6	V
	16A Device I_T = 32A; t_p = 380 μs					
I_{DRM} / I_{RRM}	$V_{DRM} = V_{RRM}$	T_J = 25°C	400 - 600V	MAX.	10	μA
			800 - 1000V		20	
		T_J = 100°C	400 - 600V		500	
			800V		1000	
			1000V		3000	
		T_J = 125°C	400 - 600V		1000	
			800V		2000	

Thermal Resistances

Symbol	Parameter		Value	Unit
$R_{\theta(J-C)}$	Junction to case (AC)	Sxx16R/ Sxx16N	1.1	°C/W
		Sxx15L	2.5	
$R_{\theta(J-A)}$	Junction to ambient	Sxx16R	40	°C/W
		Sxx15L	50	

Note: xx = voltage

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

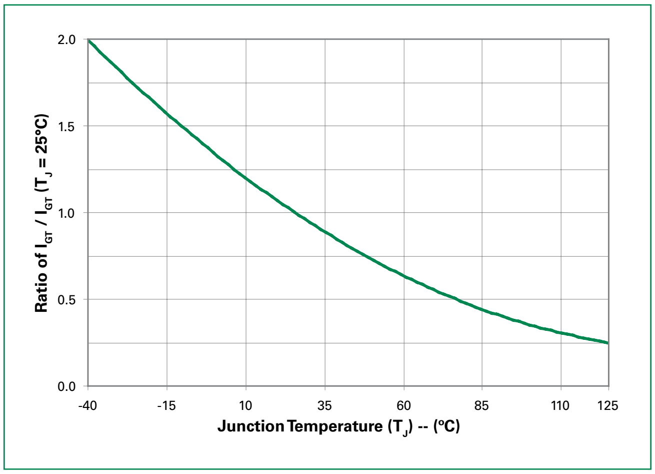


Figure 2: Normalized DC Gate Trigger Voltage vs. Junction Temperature

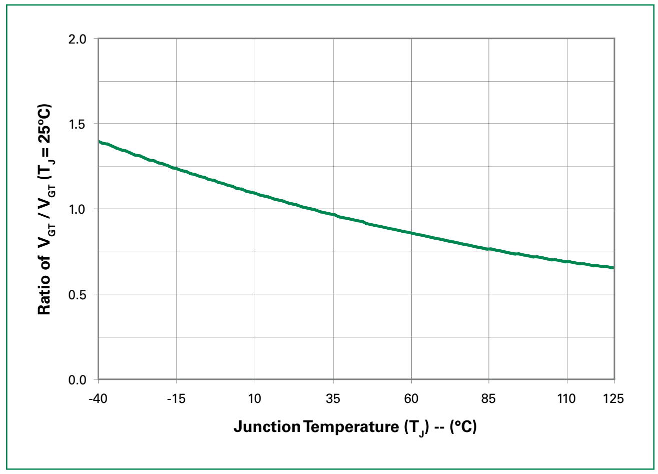


Figure 3: Normalized DC Holding Current vs. Junction Temperature

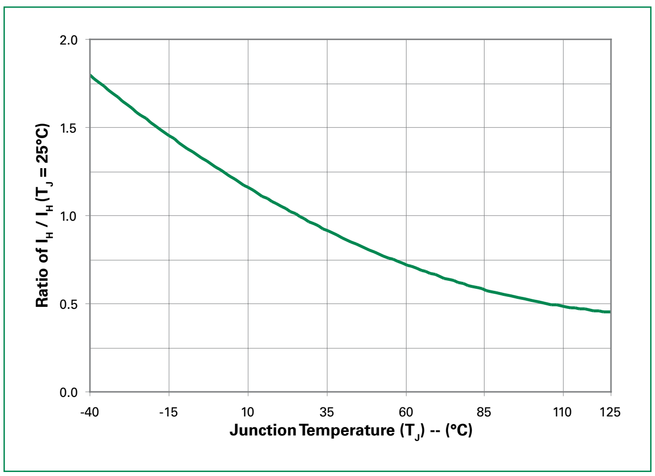


Figure 4: On-State Current vs. On-State Voltage (Typical)

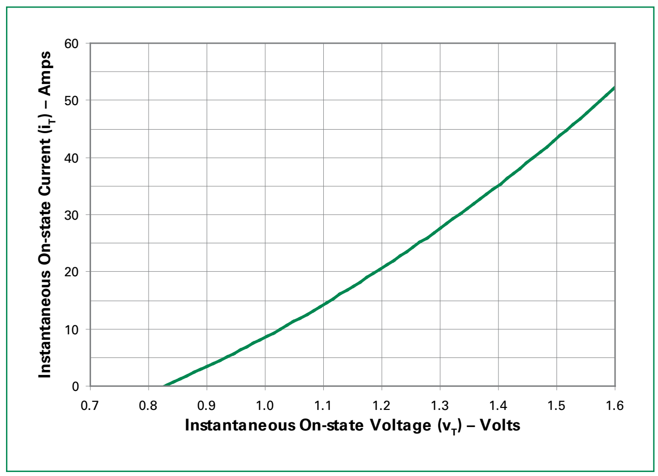


Figure 5: Power Dissipation (Typical) vs. RMS On-State Current

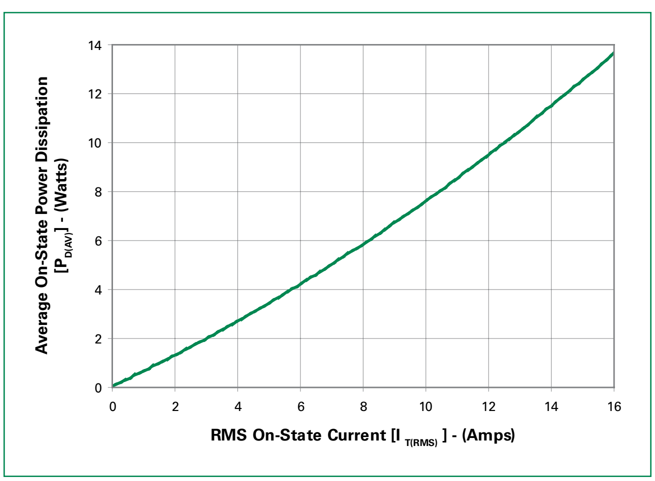


Figure 6: Maximum Allowable Case Temperature vs. RMS On-State Current

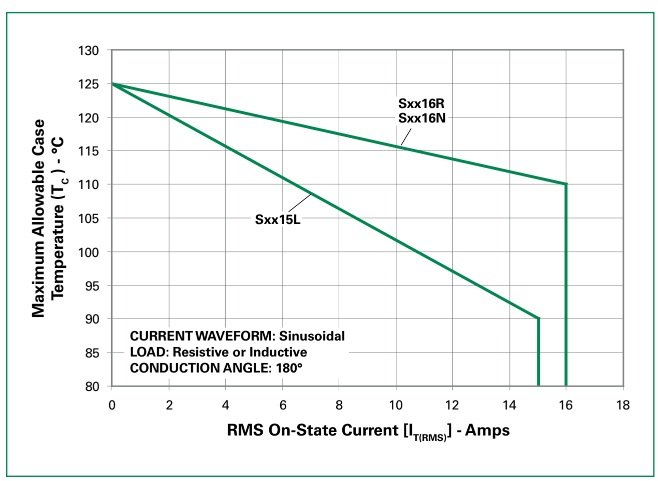


Figure 7: Maximum Allowable Case Temperature vs. Average On-State Current

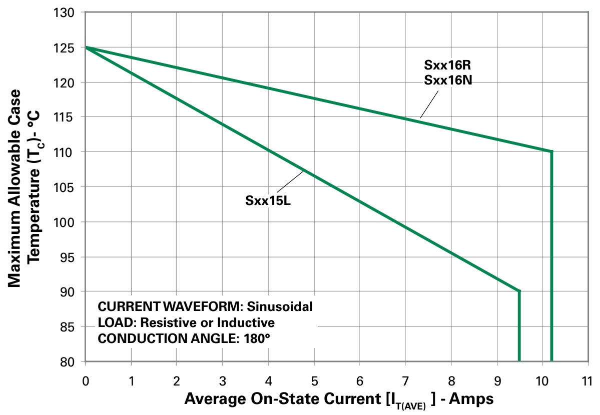


Figure 8: Maximum Allowable Ambient Temperature vs. RMS On-State Current

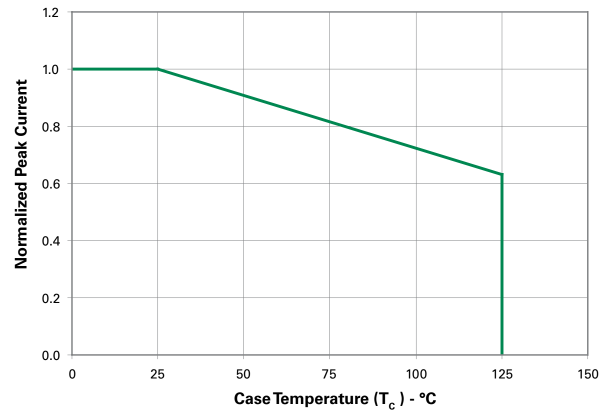
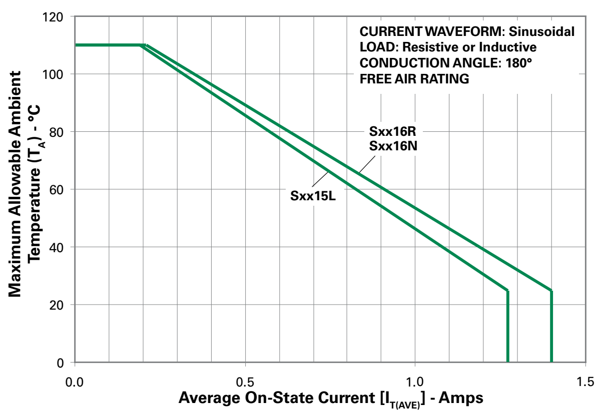


Figure 9: Maximum Allowable Ambient Temperature vs. Average On-State Current



Note: xx = voltage

Figure 10: Peak Capacitor Discharge Current

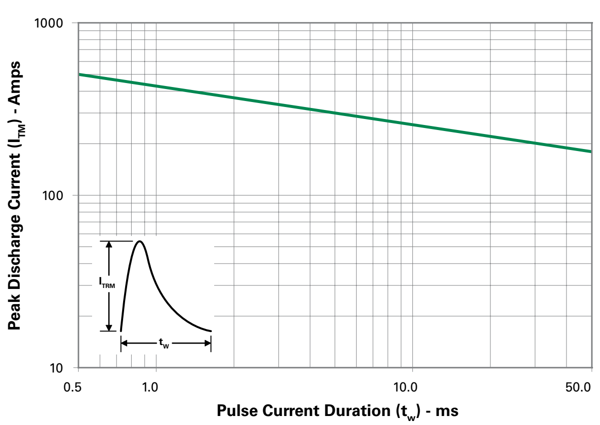


Figure 11: Peak Capacitor Discharge Current Derating

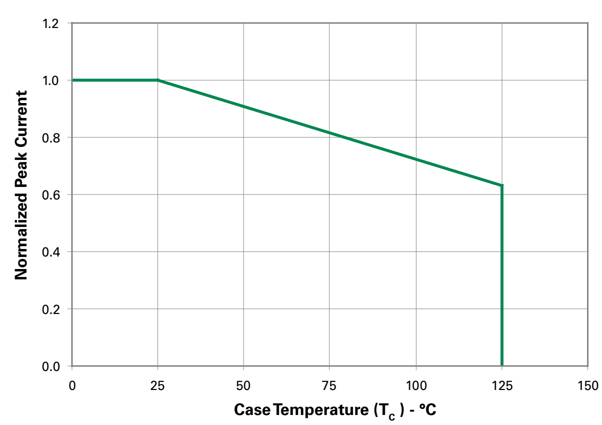
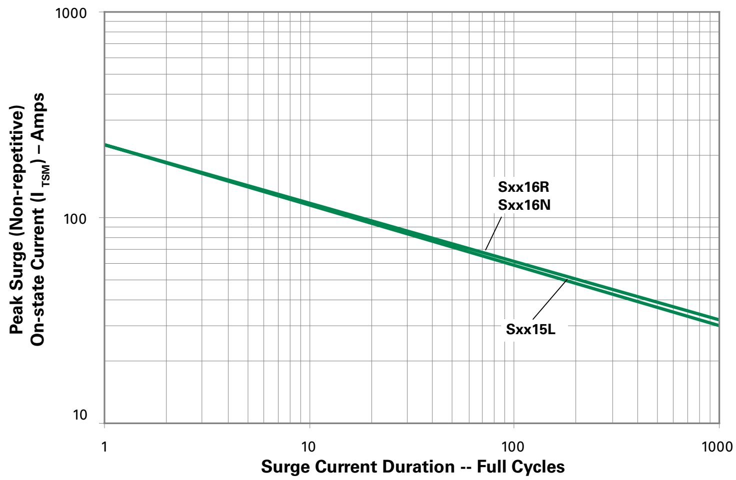


Figure 12: Surge Peak On-State Current vs. Number of Cycles

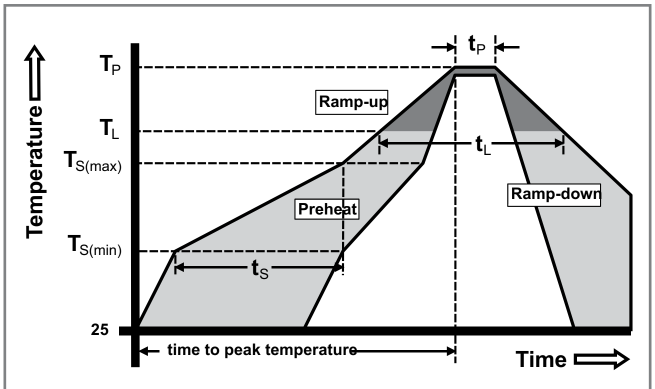


SUPPLY FREQUENCY: 60 Hz Sinusoidal
LOAD: Resistive
RMS On-State Current: [$I_{T(RMS)}$]: Maximum Rated Value at Specified Case Temperature

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
	-Temperature (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 epoxy meeting flammability classification 94V-0
Lead Material	Copper Alloy

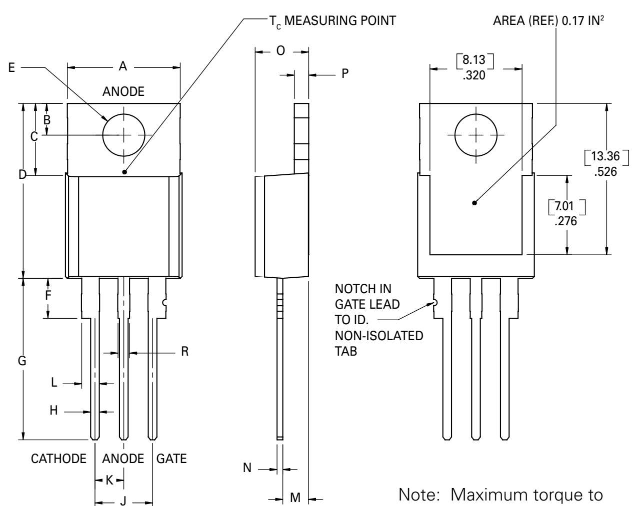
Design Considerations

Careful selection of the correct device 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 device 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 @ 125°C for 1008 hours
Temperature Cycling	MIL-STD-750, M-1051, 100 cycles; -40°C to +150°C; 15-min dwell-time
Temperature/ Humidity	EIA / JEDEC, JESD22-A101 1008 hours; 320V - 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
Thermal Shock	MIL-STD-750, M-1056 10 cycles; 0°C to 100°C; 5-min dwell-time at each temperature; 10 sec (max) transfer time between temperature
Autoclave	EIA / JEDEC, JESD22-A102 168 hours (121°C at 2 ATMs) and 100% R/H
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

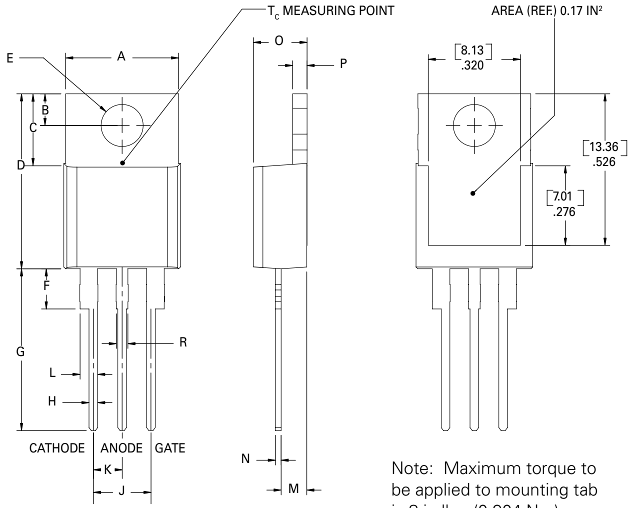
Dimensions — TO-220AB (R-Package) — Non-Isolated Mounting Tab Common with Center Lead



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-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
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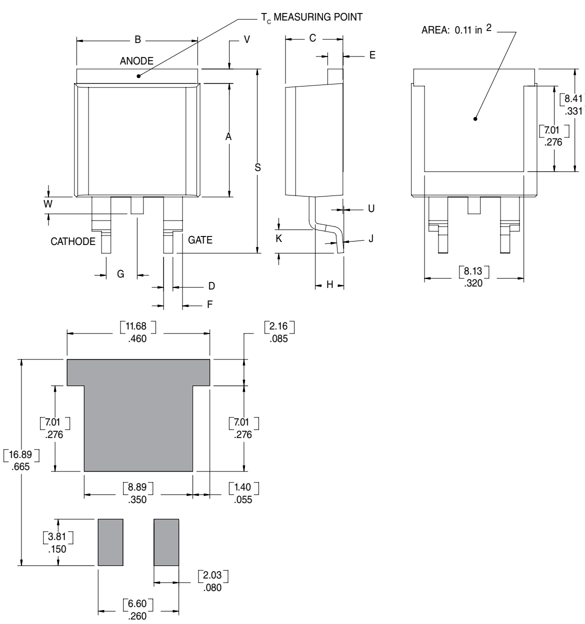
C	0.230	0.250	5.84	6.35
D	0.590	0.620	14.99	15.75
E	0.142	0.147	3.61	3.73
F	0.110	0.130	2.79	3.30
G	0.540	0.575	13.72	14.61
H	0.025	0.035	0.64	0.89
J	0.195	0.205	4.95	5.21
K	0.095	0.105	2.41	2.67
L	0.060	0.075	1.52	1.91
M	0.085	0.095	2.16	2.41
N	0.018	0.024	0.46	0.61
O	0.178	0.188	4.52	4.78
P	0.045	0.060	1.14	1.52
R	0.038	0.048	0.97	1.22

Dimensions — TO- 263AA (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
	400V	600V	800V	1000V			
Sxx15L	X	X	X	X	30mA	Standard SCR	TO-220L
Sxx16R	X	X	X	X	30mA	Standard SCR	TO-220R
Sxx16N	X	X	X	X	30mA	Standard SCR	TO-263

Note: xx = Voltage

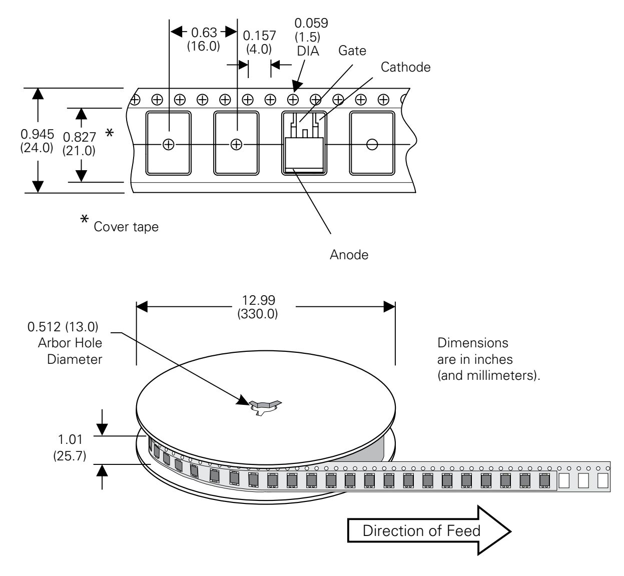
Packing Options

Part Number	Marking	Weight	Packing Mode	Base Quantity
Sxx15L	Sxx15L	2.2 g	Bulk	500
Sxx15LTP	Sxx15L	2.2 g	Tube	500 (50 per tube)
Sxx16R	Sxx16R	2.2 g	Bulk	500
Sxx16RTP	Sxx16R	2.2 g	Tube	500 (50 per tube)
Sxx16NTP	Sxx16N	1.6 g	Tube	500 (50 per tube)
Sxx16NRP	Sxx16N	1.6 g	Embossed Carrier	500

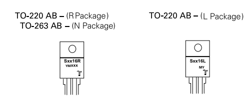
Note: xx = Voltage

TO-263 Embossed Carrier Reel Pack (RP) Specs

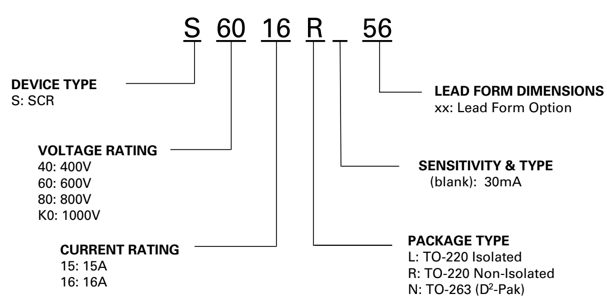
Meets all EIA-481-2 Standards



Part Marking System



Part Numbering System



OCEAN CHIPS
Океан Электроники
Поставка электронных компонентов

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Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
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- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

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Телефон: 8 (812) 309-75-97 (многоканальный)
Факс: 8 (812) 320-03-32
Электронная почта: ocean@oceanchips.ru
Web: http://oceanchips.ru/
Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А