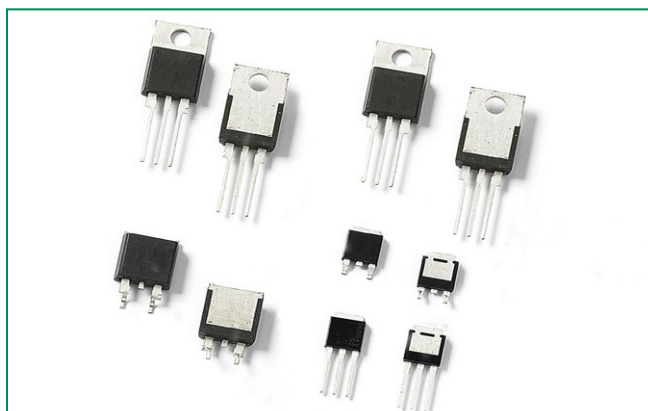
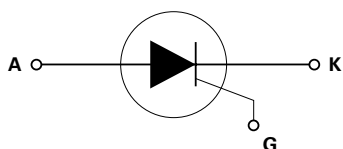


SJxx12xx series



Schematic Symbol



Main Features

Symbol	Value	Unit
$I_{T(RMS)}$	12	A
V_{DRM}/V_{RRM}	400 or 600	V
I_{GT}	6 to 20	mA

Description

This SJxx12xx high junction temperature SCR series is ideal for uni-directional switch applications such as phase control in heating, motor speed controls, converters/rectifiers, inrush current control and capacitive discharge ignitions.

These SCRs have a low gate current trigger level of 6mA, 10mA or 20mA maximum at approximately 1.5V.

Features & Benefits

- Halogen free and RoHS compliant
- Surge capability up to 120 A at 60 Hz half cycle
- 150°C maximum junction temperature

Applications

Typical applications include AC Generator (ACG) rectifiers, battery voltage regulators and 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 are offered for ease of heat sinking with high isolation voltage.

Absolute Maximum Ratings

Symbol	Parameter	Test Conditions	Value	Unit
V_{DSM}/V_{RSM}	Peak non-repetitive blocking voltage	$P_w = 100 \mu s$	$V_{DRM}/V_{RRM} + 100$	V
$I_{T(RMS)}$	RMS on-state current	SJxx12Lx $T_c = 110^\circ C$ SJxx12Rx $T_c = 135^\circ C$ SJxx12Nx $T_c = 125^\circ C$ SJxx12Dx SJxx12Vx	12	A
$I_{T(AV)}$	Average on-state current	SJxx12Lx $T_c = 110^\circ C$ SJxx12Rx SJxx12Ny $T_c = 135^\circ C$ SJxx12Dx SJxx12Vx $T_c = 125^\circ C$	7.6	A
I_{TSM}	Peak non-repetitive surge current (single half cycle, T_j (initial) = 25°C)	$f = 50Hz$ $f = 60Hz$	100 120	A
I^2t	I^2t Value for fusing	$t_p = 8.3 ms$	60	A ² s
di/dt	Critical rate of rise of on-state current	$f = 60Hz; T_j = 150^\circ C$	100	A/ μs
I_{GM}	Peak gate current	$T_j = 150^\circ C$	2	A
$P_{G(AV)}$	Average gate power dissipation	$T_j = 150^\circ C$	0.5	W
T_{stg}	Storage temperature range		-40 to 150	°C
T_j	Operating junction temperature range		-40 to 150	

Note: xx=voltage/10, x=sensitivity

SJxx12xx Series

12 Amps High Junction Temperature SCRs

Electrical Characteristics ($T_J = 25^\circ\text{C}$, unless otherwise specified) - TO-220L, TO-220R and TO-263 package

Symbol	Test Conditions		SJxx12x	SJxx12x1	SJxx12x2	Unit
I_{GT}	$V_D = 12V$ $R_L = 60\ \Omega$	MAX.	20	6	10	mA
		MIN.	8	2	5	
V_{GT}	$V_D = 12V$ $R_L = 60\ \Omega$	MAX.	1.5	1.5	1.5	V
dv/dt	$V_D = 67\% V_{DRM}$; gate open; $T_J = 125^\circ\text{C}$	MIN.	800	70	500	V/ μs
	$V_D = 67\% V_{DRM}$; gate open; $T_J = 150^\circ\text{C}$		400	-	200	
V_{GD}	$V_D = V_{DRM}$ $R_L = 3.3\ \text{k}\Omega$ $T_J = 125^\circ\text{C}$	MIN.	0.2	0.2	0.2	V
I_H	$I_T = 200\text{mA}$ (initial)	MAX.	60	15	35	mA
t_q	$I_T = 2A$; $t_p = 50\mu\text{s}$; $dv/dt = 5V/\mu\text{s}$; $di/dt = 30A/\mu\text{s}$	MAX.	40	40	40	μs
t_{gt}	$I_G = 2 \times I_{GT}$ $PW = 15\mu\text{s}$ $I_T = 24A$	TYP.	2	2	2	μs

Note: xx=voltage/10, x=package

Electrical Characteristics ($T_J = 25^\circ\text{C}$, unless otherwise specified) - TO-251 and TO-252 package

Symbol	Test Conditions		Value		Unit
			SJxx12x1	SJxx12x	
I_{GT}	$V_D = 12V$ $R_L = 60\ \Omega$	MAX.	6	20	mA
		MIN.	2	5	
V_{GT}		MAX.	1.5	1.5	V
dv/dt	$V_D = V_{DRM}$; gate open; $T_J = 125^\circ\text{C}$	400V	MIN.	100	V/ μs
		600V		75	
	$V_D = V_{DRM}$; gate open; $T_J = 150^\circ\text{C}$	400V		50	
		600V		10	
V_{GD}	$V_D = V_{DRM}$ $R_L = 3.3\ \text{k}\Omega$ $T_J = 125^\circ\text{C}$	MIN.	0.2	0.2	V
	$V_D = V_{DRM}$ $R_L = 3.3\ \text{k}\Omega$ $T_J = 150^\circ\text{C}$	MIN.	0.1	0.1	
I_H	$I_T = 200\text{mA}$ (initial)	MAX.	20	40	mA
t_q	$I_T = 2A$; $t_p = 50\mu\text{s}$; $dv/dt = 5V/\mu\text{s}$; $di/dt = 30A/\mu\text{s}$	MAX.	35	35	μs
t_{gt}	$I_G = 2 \times I_{GT}$ $PW = 15\mu\text{s}$ $I_T = 12A$	TYP.	0.5	2	μs

Note: xx=voltage/10, x=package

Static Characteristics

Symbol	Test Conditions		Value	Unit
V_{TM}	Component $I_T = 24A$; $t_p = 380\ \mu\text{s}$	MAX.	1.6	V
I_{DRM} / I_{RRM}	$V_{DRM} = V_{RRM}$	$T_J = 25^\circ\text{C}$	10	μA
		$T_J = 125^\circ\text{C}$	500	
		$T_J = 150^\circ\text{C}$	2000	

Thermal Resistances

Symbol	Parameter	Value	Unit
$R_{\theta(JC)}$	Junction to case (AC)	SJxx12Lx	2.4
		SJxx12Rx SJxx12Nx	1.1
		SJxx12Dx SJxx12Vx	1.4

Note: xx=voltage/10, x=sensitivity

SJxx12xx Series

12 Amps High Junction Temperature SCRs

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

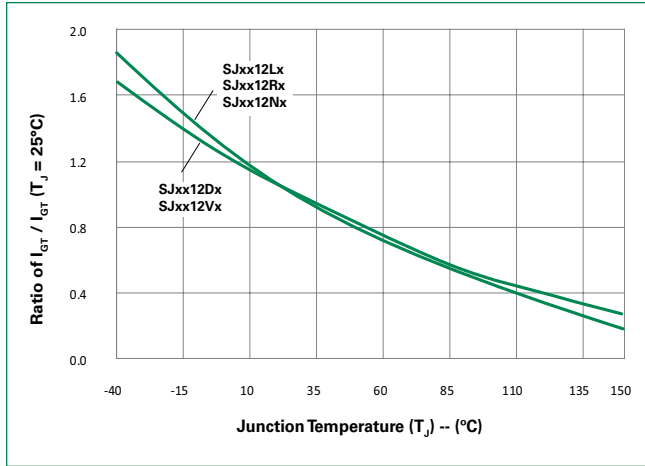


Figure 2: Normalized DC Gate Trigger Voltage vs. Junction Temperature

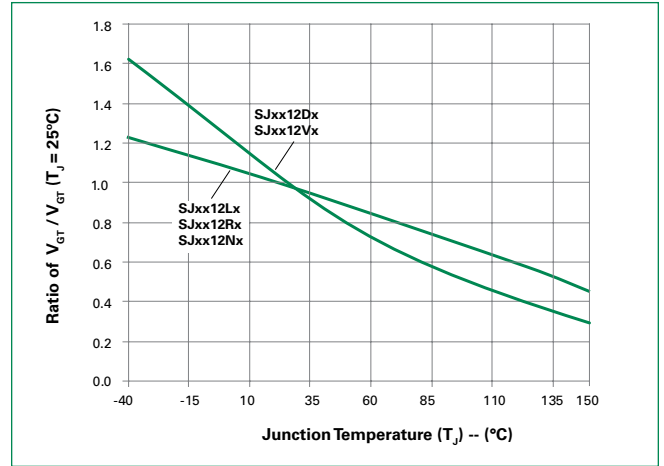


Figure 3: Normalized DC Holding Current vs. Junction Temperature

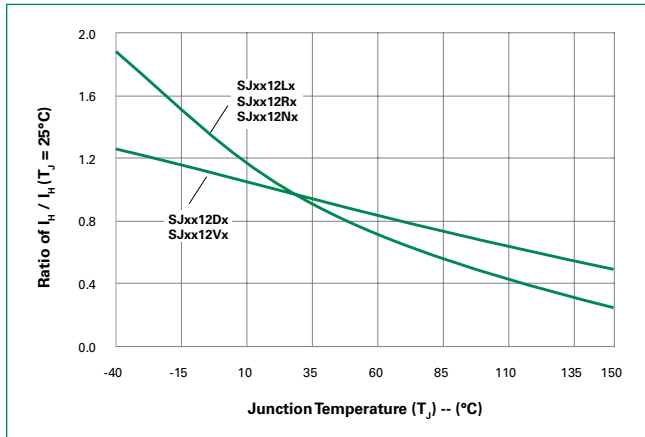


Figure 4: On-State Current vs. On-State Voltage (Typical)

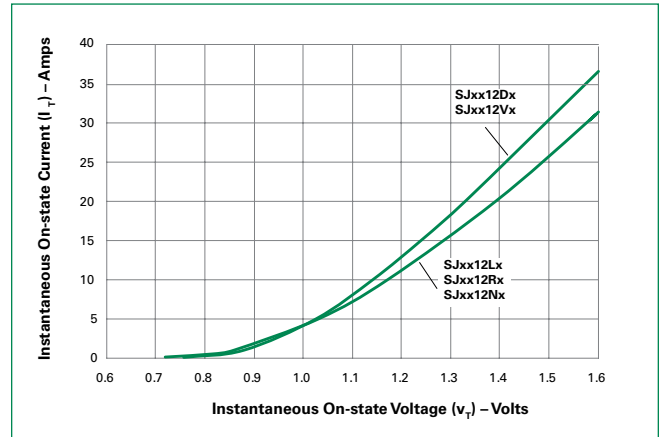


Figure 5: Power Dissipation (Typical) vs. RMS On-State Current

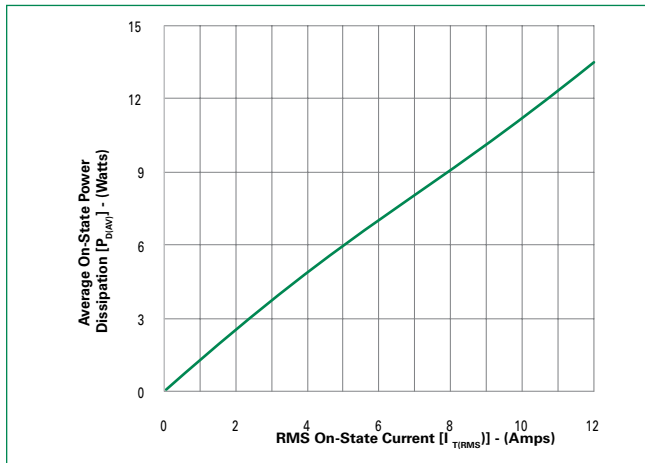
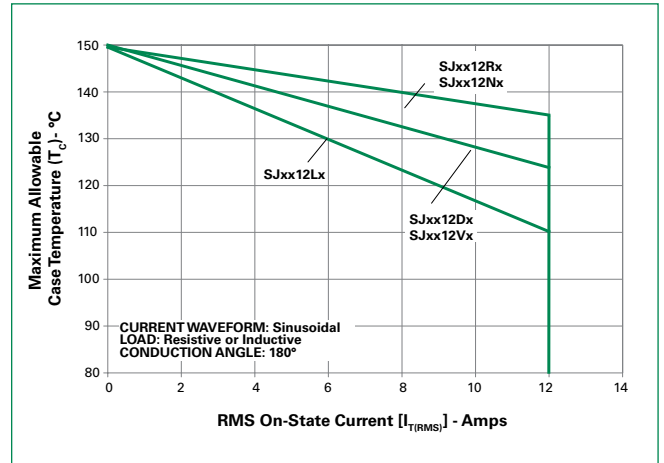


Figure 6: Maximum Allowable Case Temperature vs. RMS On-State Current



12 Amp High Junction Temperature SCRs

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

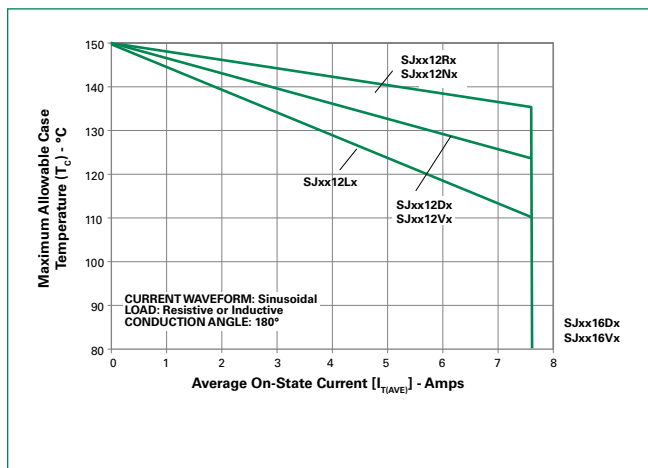


Figure 8: Peak Capacitor Discharge Current

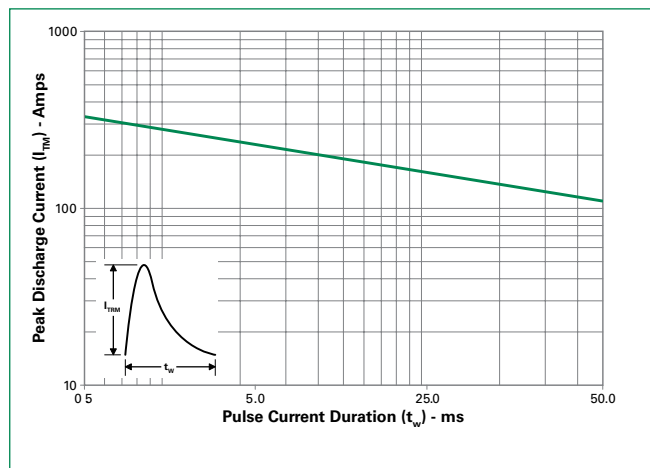


Figure 9: Peak Capacitor Discharge Current Derating

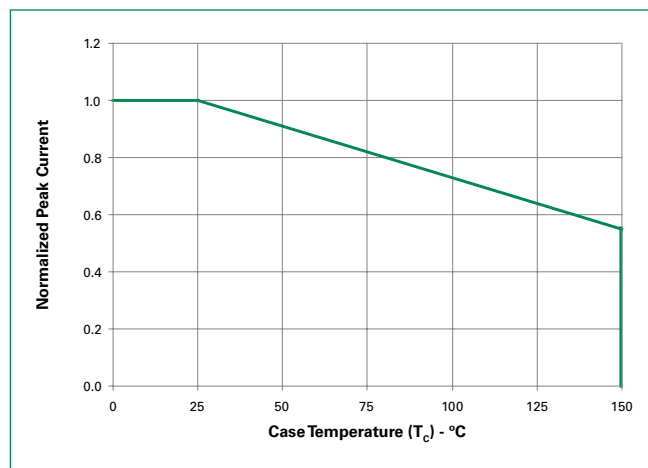
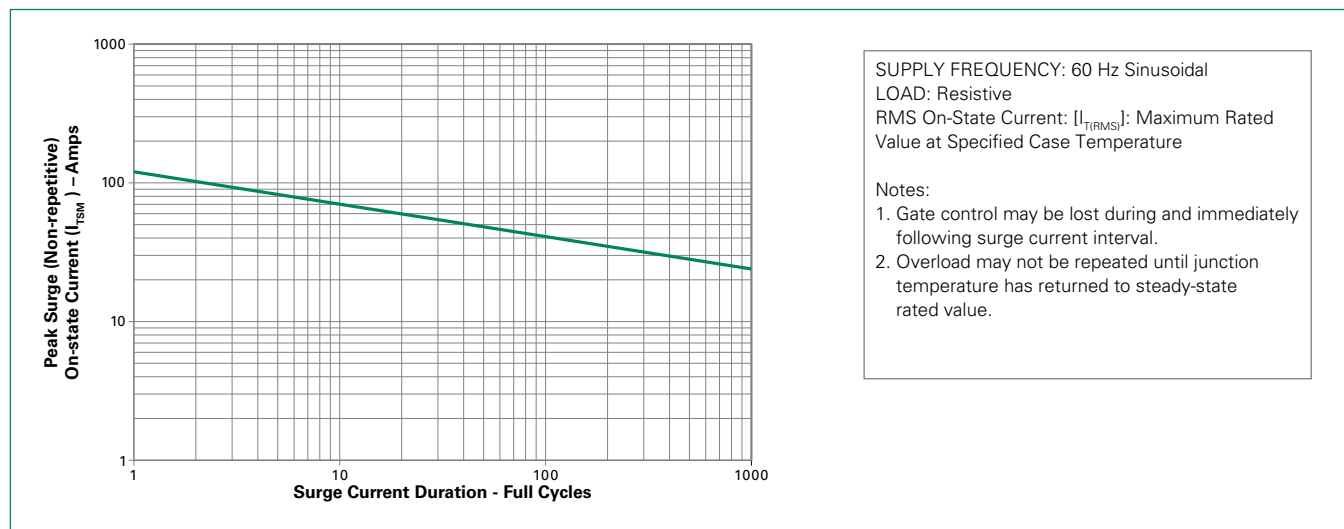


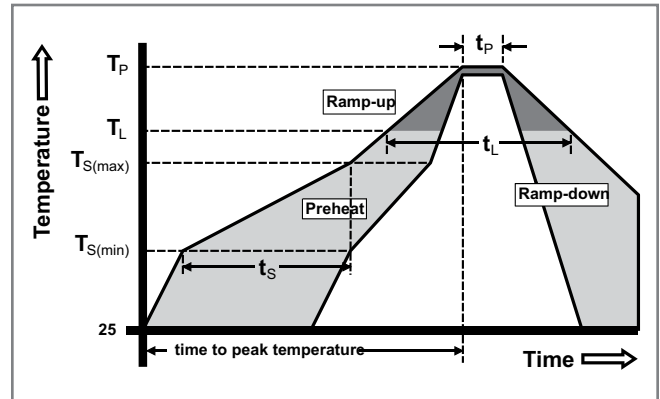
Figure 10: Surge Peak On-State Current vs. Number of Cycles



12 Amps 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

Design Considerations

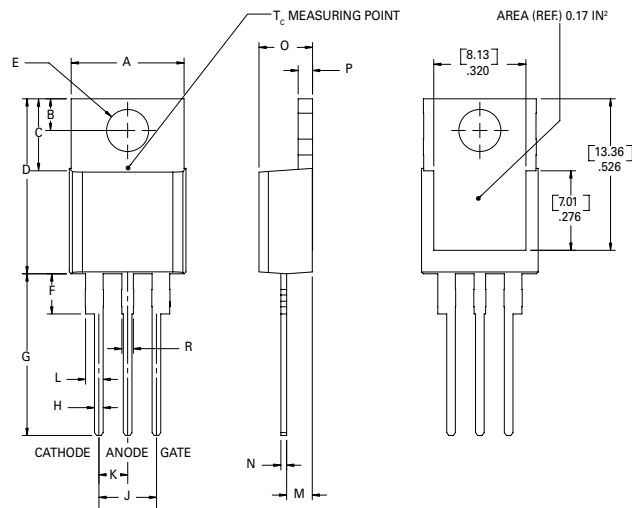
Careful selection of the correct component for the application's operating parameters and environment will go a long way toward extending the operating life of the Thyristor. Good design practice should limit the maximum continuous current through the main terminals to 75% of the component rating. Other 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

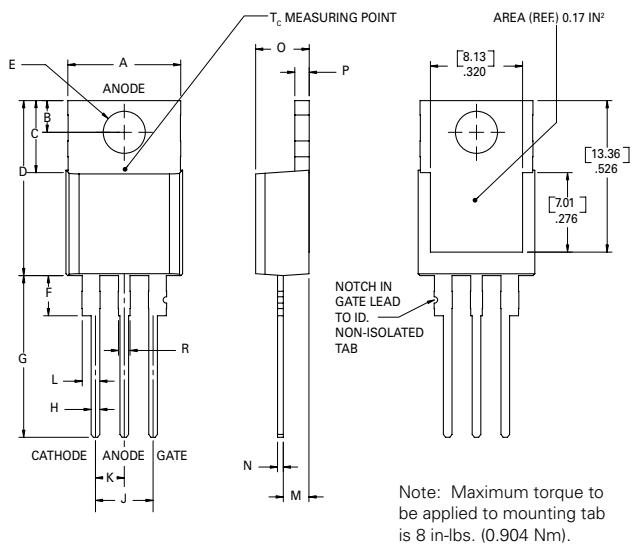
12 Amps High Junction Temperature SCRs

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

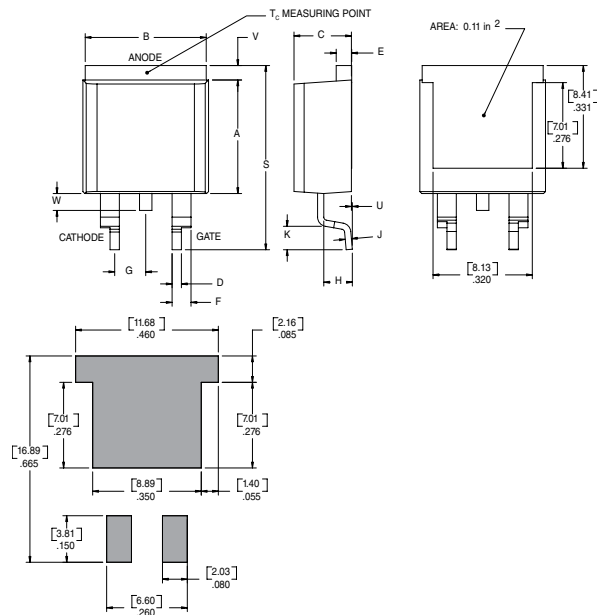
Dimensions — TO-220AB (R-Package) — Non-Isolated Mounting Tab Common with Center Lead



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

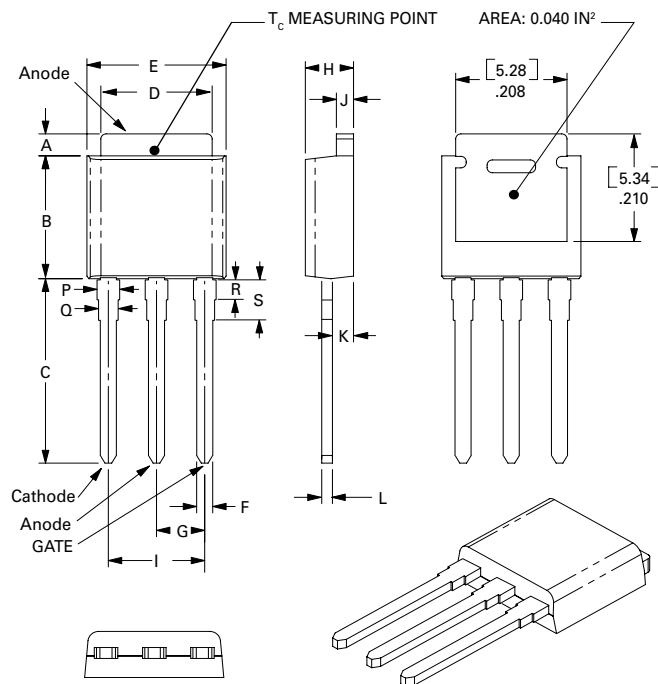
12 Amps High Junction Temperature SCRs

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

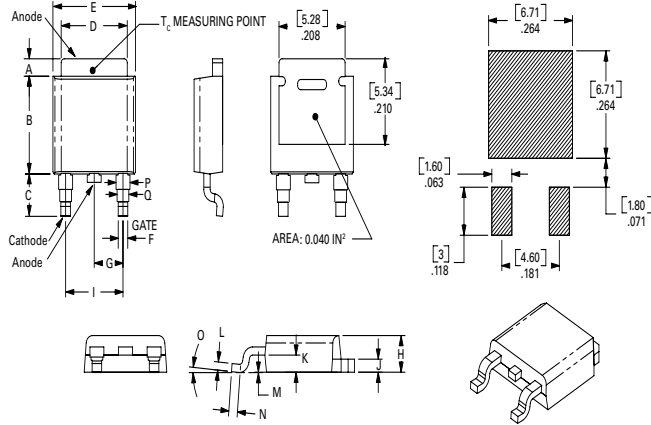
Dimensions — TO-251AA (V/I-Package) — V/I-PAK Through Hole



Dimension	Inches			Millimeters		
	Min	Typ	Max	Min	Typ	Max
A	0.040	0.044	0.050	1.02	1.11	1.27
B	0.235	0.242	0.245	5.97	6.15	6.22
C	0.350	0.361	0.375	8.89	9.18	9.53
D	0.205	0.208	0.213	5.21	5.29	5.41
E	0.255	0.262	0.265	6.48	6.66	6.73
F	0.027	0.031	0.033	0.69	0.80	0.84
G	0.087	0.090	0.093	2.21	2.28	2.36
H	0.085	0.092	0.095	2.16	2.34	2.41
I	0.176	0.180	0.184	4.47	4.57	4.67
J	0.018	0.020	0.023	0.46	0.51	0.58
K	0.038	0.040	0.044	0.97	1.01	1.12
L	0.018	0.020	0.023	0.46	0.52	0.58
P	0.042	0.047	0.052	1.06	1.20	1.32
Q	0.034	0.039	0.044	0.86	1.00	1.11
R	0.034	0.039	0.044	0.86	1.00	1.11
S	0.074	0.079	0.084	1.86	2.00	2.11

12 Amps High Junction Temperature SCRs

Dimensions — TO-252AA (D-Package) — D-PAK Surface Mount



Dimension	Inches			Millimeters		
	Min	Typ	Max	Min	Typ	Max
A	0.040	0.043	0.050	1.02	1.09	1.27
B	0.235	0.243	0.245	5.97	6.16	6.22
C	0.106	0.108	0.113	2.69	2.74	2.87
D	0.205	0.208	0.213	5.21	5.29	5.41
E	0.255	0.262	0.265	6.48	6.65	6.73
F	0.027	0.031	0.033	0.69	0.80	0.84
G	0.087	0.090	0.093	2.21	2.28	2.36
H	0.085	0.092	0.095	2.16	2.33	2.41
I	0.176	0.179	0.184	4.47	4.55	4.67
J	0.018	0.020	0.023	0.46	0.51	0.58
K	0.038	0.040	0.044	0.97	1.02	1.12
L	0.018	0.020	0.023	0.46	0.51	0.58
M	0.000	0.000	0.004	0.00	0.00	0.10
N	0.021	0.026	0.027	0.53	0.67	0.69
O	0°	0°	5°	0°	0°	5°
P	0.042	0.047	0.052	1.06	1.20	1.32
Q	0.034	0.039	0.044	0.86	1.00	1.11

Product Selector

Part Number	Voltage		Gate Sensitivity	Type	Package
	400V	600V			
SJxx12L	X	X	20mA	Standard SCR	TO-220L
SJxx12R	X	X	20mA	Standard SCR	TO-220R
SJxx12N	X	X	20mA	Standard SCR	TO-263
SJxx12V	X	X	20mA	Standard SCR	TO-251
SJxx12D	X	X	20mA	Standard SCR	TO-252
SJxx12L1	X	X	6mA	Standard SCR	TO-220L
SJxx12R1	X	X	6mA	Standard SCR	TO-220R
SJxx12N1	X	X	6mA	Standard SCR	TO-263
SJxx12V1	X	X	6mA	Standard SCR	TO-251
SJxx12D1	X	X	6mA	Standard SCR	TO-252
SJxx12L2	X	X	10mA	Standard SCR	TO-220L
SJxx12R2	X	X	10mA	Standard SCR	TO-220R
SJxx12N2	X	X	10mA	Standard SCR	TO-263

Note: xx = Voltage/10

12 Amps High Junction Temperature SCRs

TO-252 Embossed Carrier Reel Pack (RP) Specifications

Meets all EIA-481-2 Standards

