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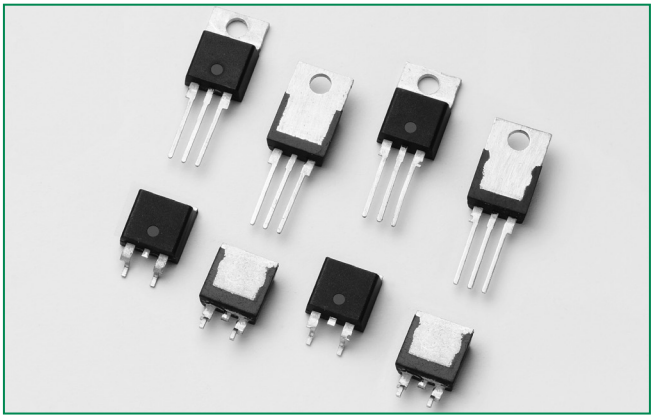
Teccor® brand Thyristors

40 Amp Standard High Temperature SCRs

SJxx40x Series

HF RoHS



Main Features

Symbol	Value	Unit
$I_{T(RMS)}$	40	A
V_{DRM}/V_{RRM}	400 or 600	V
I_{GT}	40	mA

Description

This SJxx40x high temperature SCR series is ideal for uni-directional switch applications such as phase control in heating, motor speed controls and AC rectifier and voltage regulator.

These SCRs have a low gate current trigger level of 40 mA maximum at approximately 1.5 V, with a sensitive version of this series having a gate trigger current of 15 mA maximum.

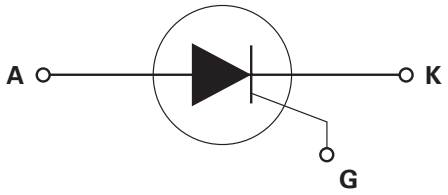
Features & Benefits

- High junction temperature
- Voltage capability up to 600 V
- Surge capability up to 520 A at 60 Hz half cycle
- Halogen free and RoHS compliant

Applications

Typical applications are AC rectifier, voltage regulator, AC solid-state switches, industrial power tools, exercise equipment, white goods and commercial appliances.

Schematic Symbol



Absolute Maximum Ratings

Symbol	Parameter	Test Conditions	Value	Unit
V_{DSM}/V_{RSM}	Peak non-repetitive blocking voltage	Pw = 100µs	700	V
$I_{T(RMS)}$	RMS on-state current	T_C = 120°C	40	A
$I_{T(AV)}$	Average on-state current	T_C = 120°C	25.0	A
I_{TSM}	Peak non-repetitive surge current	single half cycle; f = 50Hz; T_J (initial) = 25°C	430	A
		single half cycle; f = 60Hz; T_J (initial) = 25°C	520	
I^2t	I^2t Value for fusing	t_p = 8.3 ms	1122	A^2s
di/dt	Critical rate of rise of on-state current	f = 60Hz ; T_J = 150°C	150	A/µs
I_{GM}	Peak gate current	$t_p \leq$ 10µs ; T_J = 150°C	4	A
$P_{G(AV)}$	Average gate power dissipation	$t_p \leq$ 10µs ; T_J = 150°C	1	W
T_{stg}	Storage temperature range		-40 to 150	°C
T_J	Operating junction temperature range		-40 to 150	°C

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

Symbol	Test Conditions			SJxx40x	SJxx40x2	Unit
I_{GT}	V_D = 12V; R_L = 30 Ω		MAX.	40	15	mA
			MIN.	5	3	
V_{GT}			MAX.	1.5		V
dv/dt	$V_D = V_{DRM}$; gate open; T_J = 125°C	400V	MIN.	650	400	V/µs
		600V		600	350	
	$V_D = V_{DRM}$; gate open; T_J = 150°C	400V		550	300	
		600V		500	250	
V_{GD}	$V_D = V_{DRM}$; R_L = 3.3 kΩ; T_J = 150°C		MIN.	0.2		V
I_H	I_T = 400mA (initial)		MAX.	60	50	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 = 80A		TYP.	2		µs

NOTE: xx = voltage, x = package

Static Characteristics

Symbol	Test Conditions			Value	Unit
V_{TM}	I_T = 80A; t_p = 380µs		MAX.	1.7	V
I_{DRM} / I_{RRM}	@ V_{DRM} / V_{RRM}	T_J = 25°C	MAX.	10	µA
		T_J = 125°C		2000	
		T_J = 150°C		4000	

Thermal Resistances

Symbol	Parameter		Value	Unit
$R_{\theta(J-C)}$	Junction to case (AC)	SJxx40Ry/SJxx40Ny	0.8	°C/W
$R_{\theta(J-A)}$	Junction to ambient	Sxx40Ry	40	°C/W

Note: xx = voltage, y = sensitivity & type

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

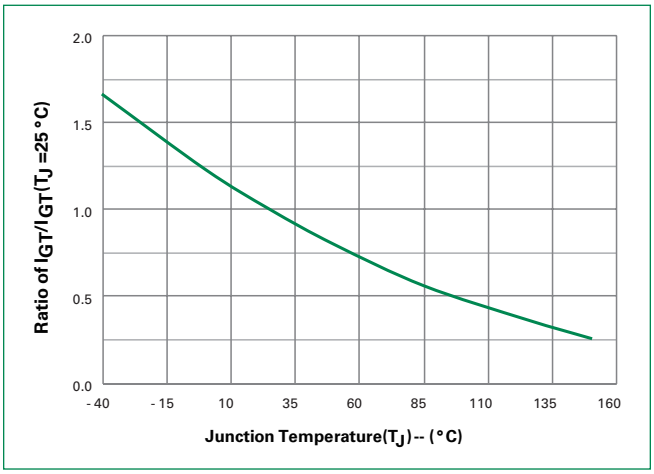

Figure 2: Normalized DC Gate Trigger Voltage vs. Junction Temperature

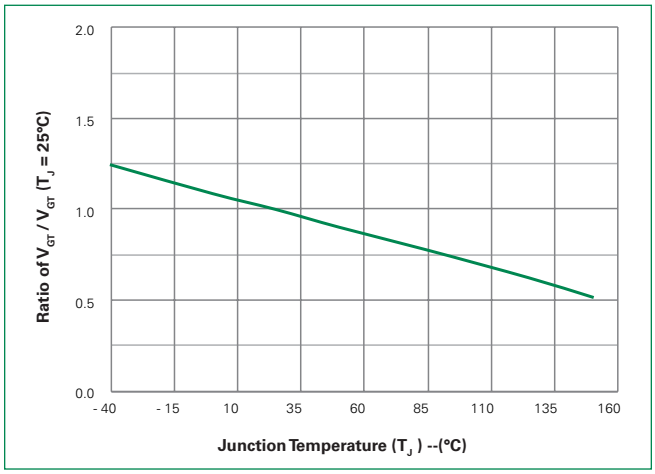

Figure 3: Normalized DC Holding Current vs. Junction Temperature

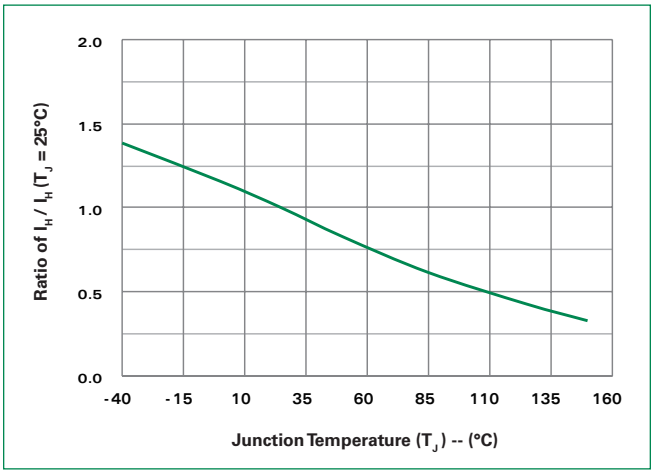

Figure 4: On-State Current vs. On-State Voltage (Typical)

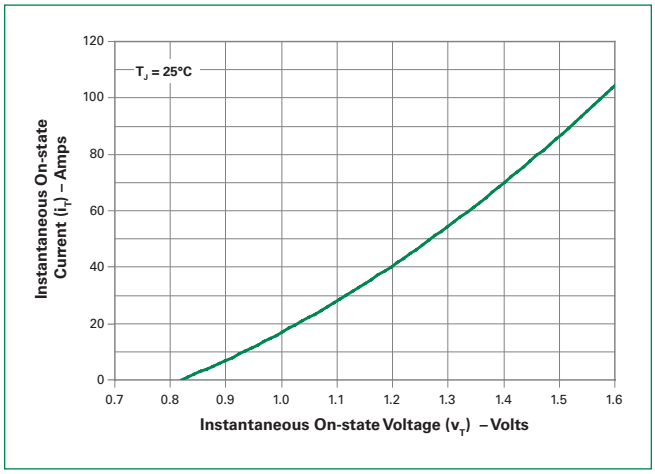

Figure 5: Power Dissipation (Typical) vs. RMS On-State Current

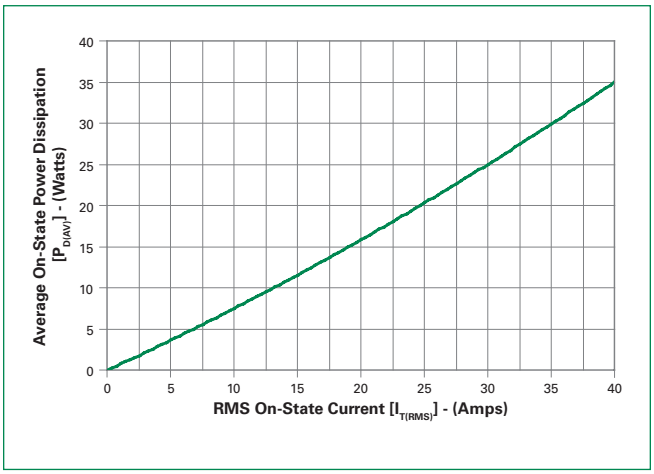

Figure 6: Maximum Allowable Case Temperature vs. RMS On-State Current

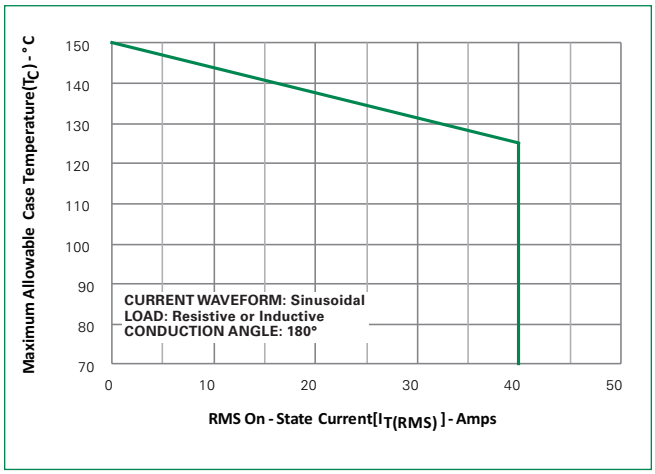

Figure 7: Maximum Allowable Case Temperature vs. Average On-State Current

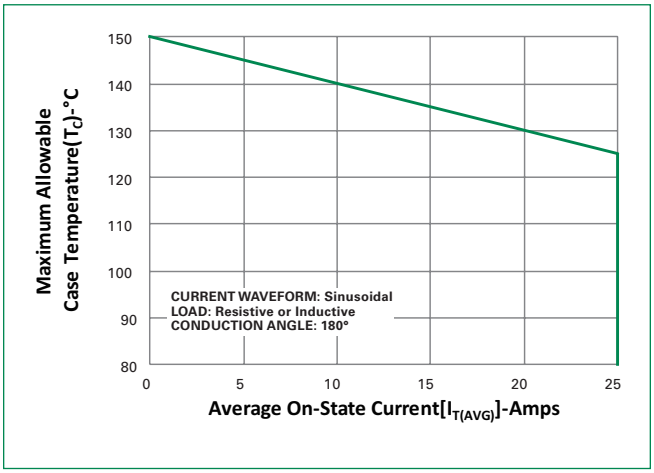

Figure 8: Maximum Allowable Ambient Temperature vs. RMS On-State Current

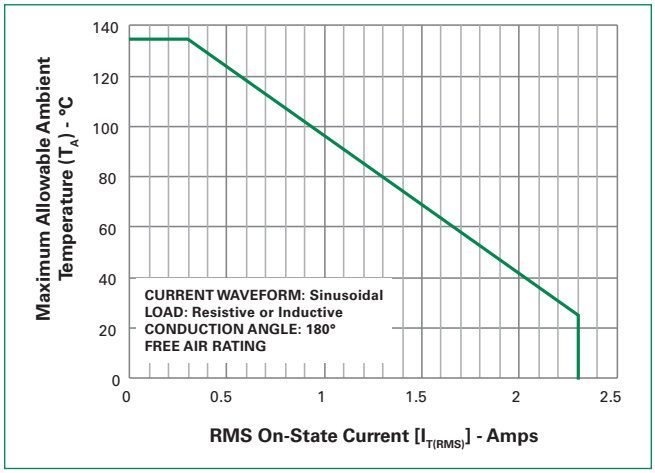

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Figure 9: Maximum Allowable Ambient Temperature vs. Average On-State Current

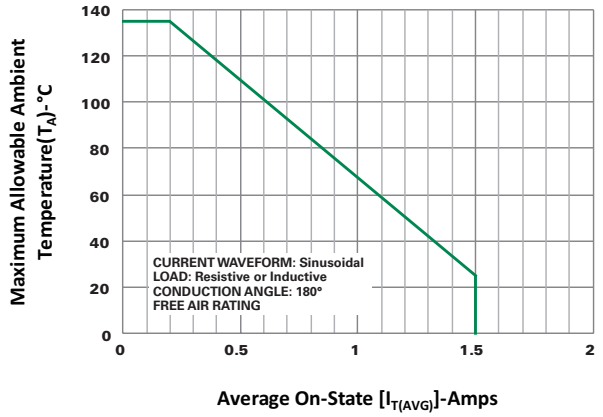


Figure 10: Peak Capacitor Discharge Current

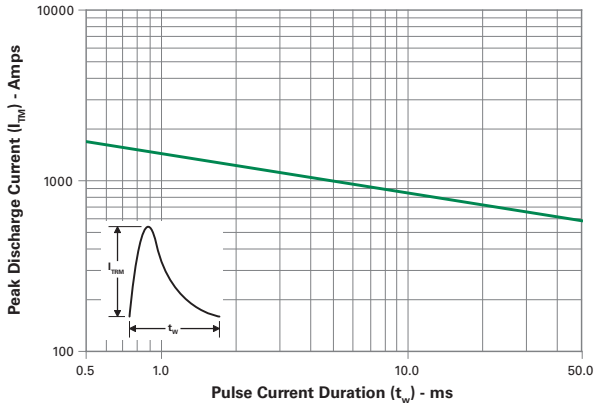


Figure 11: Peak Capacitor Discharge Current Derating

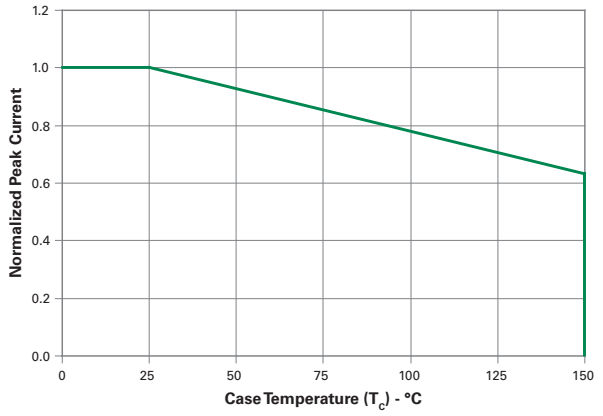
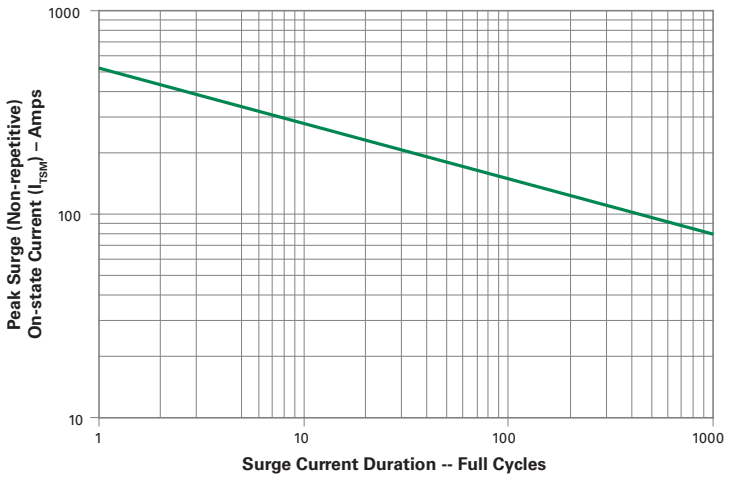


Figure 12: Surge Peak On-State Current vs. Number of Cycles



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.

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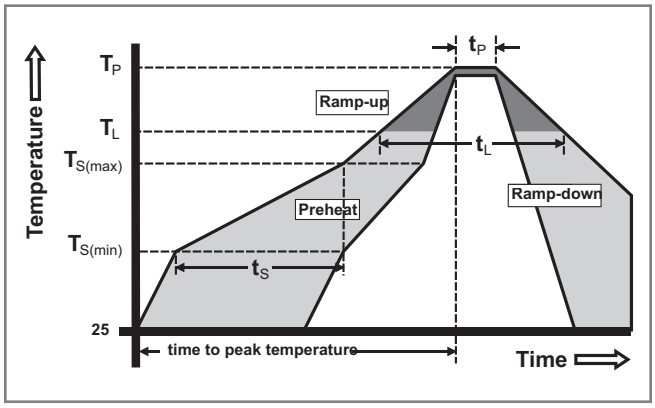
Soldering Parameters

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 epoxy 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; -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
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

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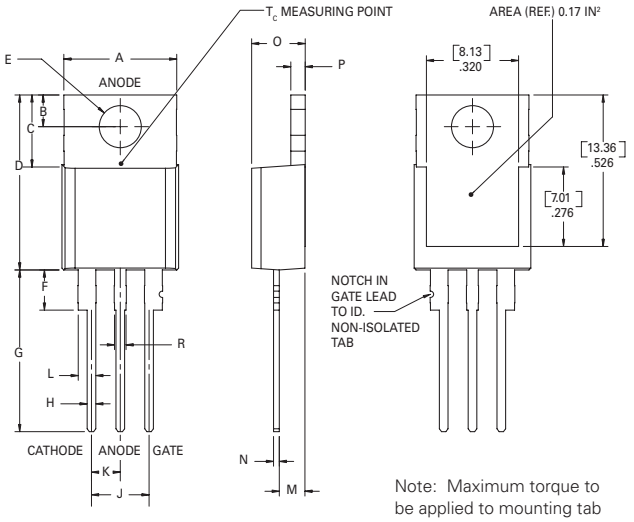
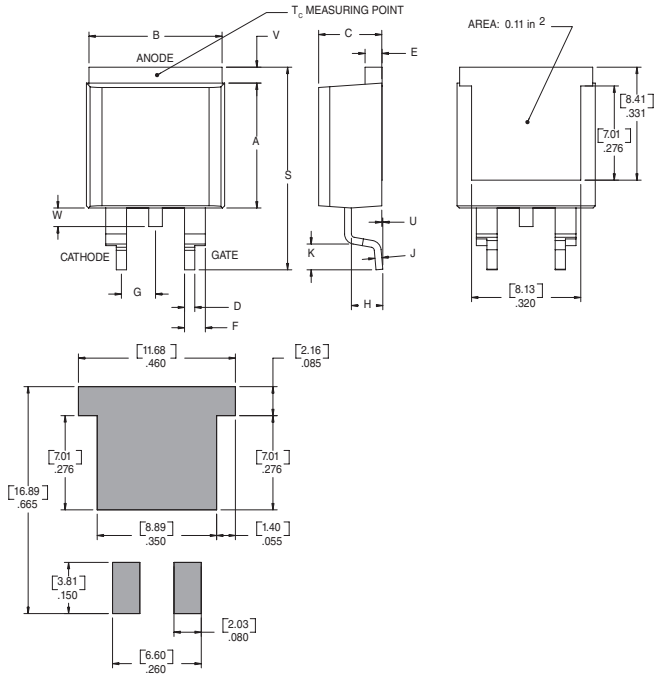
Dimensions — TO-220AB (R-Package) — Non-Isolated Mounting Tab Common with Center Lead



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- 263 (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	0.63	0.89
E	0.048	0.055	1.22	1.40
F	0.060	0.075	1.52	1.91
G	0.095	0.105	2.41	2.67
H	0.083	0.093	2.11	2.36
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	15.87
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

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Part Numbering System

SJ 60 40 R 2 56

DEVICE TYPE
SJ: high temperature SCR

VOLTAGE RATING
40: 400V
60: 600V

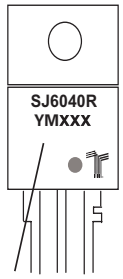
CURRENT RATING
40: 40A

PACKAGE TYPE
R: TO-220 (Non-isolated)
N: TO-263 (D^2- Pak)

SENSITIVITY & TYPE
[blank]: 40mA
2: 15mA

Lead Form Dimensions
xx: Lead Form Option

Part Marking System



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

Product Selector

Part Number	Voltage		Gate Sensitivity	Type	Package
	400V	600V			
SJxx40R	X	X	40mA	Standard SCR	TO-220R
SJxx40N	X	X	40mA	Standard SCR	TO-263
SJxx40R2	X	X	15mA	Standard SCR	TO-220R
SJxx40N2	X	X	15mA	Standard SCR	TO-263

Note: xx = Voltage

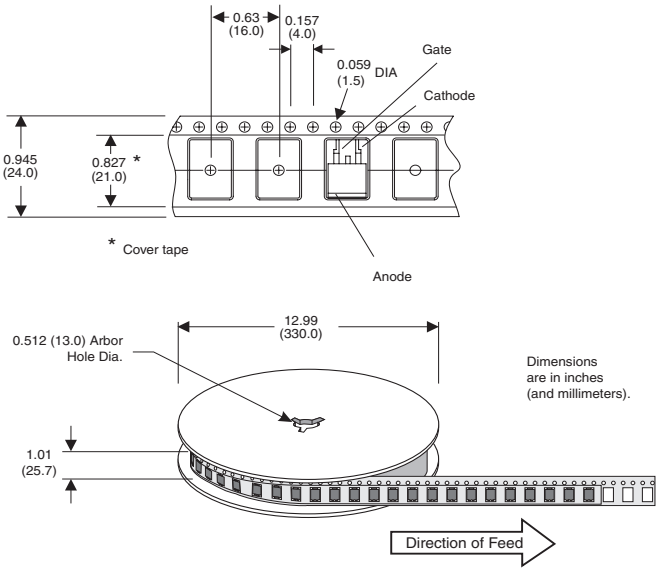
Packing Options

Part Number	Marking	Weight	Packing Mode	Base Quantity
SJxx40RTP	SJxx40R	2.2g	Tube	500 (50 per tube)
SJxx40NTP	SJxx40N	1.6g	Tube	500 (50 per tube)
SJxx40NRP	SJxx40N	1.6g	Embossed Carrier	500
SJxx40R2TP	SJxx40R2	2.2g	Tube	500 (50 per tube)
SJxx40N2RP	SJxx40N2	1.6g	Embossed Carrier	500

Note: xx = Voltage

Reel Pack (RP) for TO-263 Embossed Carrier Specifications

Meets all EIA-481-2 Standards



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