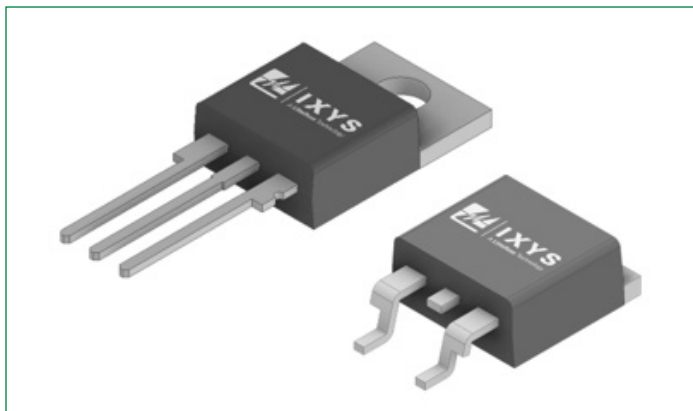
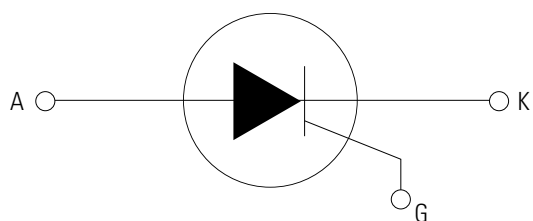


SVxx50xAx Series

50 A High Junction Temperature SCRs

 **AUTOMOTIVE GRADE** **HF** **RoHS**


Pinout Diagram



K: Cathode; **A:** Anode; **G:** Gate

Description

The SVxx50xAx Series is a family of 50 A standard SCRs designed for efficient power control and switching in industrial and automotive applications. Featuring a maximum junction temperature of 150 °C, high dv/dt immunity up to 1000 V/μs, and low gate trigger current requirements, these devices provide reliable operation in demanding environments. Available in TO-220AB and TO-263 packages and qualified to AEC-Q101 standards, the series is well suited for phase control, solid-state switching, rectification, and inrush current limiting applications

Features:

- Halogen-free and RoHS compliant
- 150 °C maximum junction temperature
- High dv/dt performance up to 1000 V/μs
- Surge capability up to 550 A at 60 Hz half cycle
- AEC-Q101 qualified

Benefits:

- Reliable operation at elevated temperatures
- Improved noise immunity
- Robust surge current handling
- Supports demanding automotive reliability requirements
- Environmentally compliant solution

Applications:

- Typical applications are AC solid-state switches
- Phase controller
- Rectifier and voltage regulator
- Inrush current limit circuit

Product Summary

Characteristic	Value	Unit
$I_{T(RMS)}$	50	A
V_{DRM} / V_{RRM}	600	V
I_{GT}	15	mA

Maximum Ratings ($T_{vj} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

Symbol	Characteristics	Conditions		Value	Units
V_{RSM} / V_{DSM}	Non-Repetitive Peak Reverse / Peak Off-State Voltage	Pulse Width = 100 μs		700	V
$I_{T(RMS)}$	R.M.S On-State Current	SVxx50RAx / SVxx50NAx	$T_C = 110\text{ }^{\circ}\text{C}$	50	A
		SVxx50RAx / SVxx50NAx	$T_C = 110\text{ }^{\circ}\text{C}$	31.5	A
I_{TSM}	Non-Repetitive Surge On-State Current	$f = 50\text{ Hz}$, $t_p = 10\text{ ms}$		456	A
		$f = 60\text{ Hz}$, $t_p = 8.3\text{ ms}$		550	
I^2t	I^2t Value	$t_p = 8.3\text{ ms}$		1255	A^2s
$di/dt_{(cr)}$	Critical Rate of Rise of On-State Current	$f = 60\text{ Hz}$, $T_{vj} = 150\text{ }^{\circ}\text{C}$		100	$\text{A}/\mu\text{s}$
I_{GM}	Peak Gate Current	$t_p = 20\text{ }\mu\text{s}$, $T_{vj} = 150\text{ }^{\circ}\text{C}$		4	A
$P_{G(AV)}$	Average Gate Power Dissipation	$T_{vj} = 150\text{ }^{\circ}\text{C}$		1	W
T_{vj}	Virtual Junction Temperature Range	–		-40 to 150	$^{\circ}\text{C}$
T_{stg}	Storage Temperature Range	–		-40 to 150	$^{\circ}\text{C}$

Electrical Characteristics - Static ($T_{vj} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

Symbol	Characteristics	Conditions	Value			Units
			Min.	Typ.	Max.	
I_{GT}	Gate Trigger Current	$V_D = 12\text{ V}$, $R_L = 60\text{ }\Omega$	6	–	15	mA
V_{GT}	Gate Trigger Voltage	$V_D = 12\text{ V}$, $R_L = 60\text{ }\Omega$	–	–	1.3	V
I_H	Holding current	$I_T = 400\text{ mA}$ (initial)	–	–	50	mA
V_{GD}	Gate Non-Trigger Voltage	$V_D = V_{DRM}$, $R_L = 3.3\text{ k}\Omega$, $T_{vj} = 150\text{ }^{\circ}\text{C}$	0.2	–	–	V
V_{TM}	Peak Sinusoidal On-State Voltage	$I_{TM} = 100\text{ A}$, $t_p = 380\text{ }\mu\text{s}$	–	–	1.6	V
$V_{(TO)}$	Threshold Voltage	$T_{vj} = 150\text{ }^{\circ}\text{C}$	–	–	0.8	V
r_T	Slope Resistance	$T_{vj} = 150\text{ }^{\circ}\text{C}$	–	–	9	$\text{m}\Omega$
I_{DRM} / I_{RRM}	Repetitive Peak Off-State/ Reverse Current	$T_{vj} = 25\text{ }^{\circ}\text{C}$	–	–	5	μA
		$T_{vj} = 150\text{ }^{\circ}\text{C}$	–	–	5	mA

Electrical Characteristics - Dynamic ($T_{vj} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

Symbol	Characteristics	Conditions	Value			Units
			Min.	Typ.	Max.	
dv/dt	Rate Of Rise Of Off-State Voltage	Gate Open, $T_{vj} = 150\text{ }^{\circ}\text{C}$	$V_D = 2/3 V_{DRM}$	1000	–	$\text{V}/\mu\text{s}$
			$V_D = V_{DRM}$	500	–	
t_q	Circuit-Commutated Turn-Off Time	$I_T = 2\text{ A}$; $t_p = 50\text{ }\mu\text{s}$; $dv/dt = 5\text{ V}/\mu\text{s}$; $di/dt = 30\text{ A}/\mu\text{s}$	–	–	25	μs
t_{gt}	Gate-Controlled Turn-On Time	$I_G = 2 \times I_{GT}$, $P_W = 15\text{ }\mu\text{s}$, $I_T = 100\text{ A}$	–	2	–	μs

Thermal Characteristics

Symbol	Characteristics	Conditions	Value			Units
			Min.	Typ.	Max.	
$R_{th(j-c)}$	Thermal Resistance Junction to Case	SVxx50RAx / SVxx50NAx	–	0.7	–	K/W

Characteristic Curves

Fig. 1. Normalized Gate Trigger Current vs. Virtual Junction Temperature

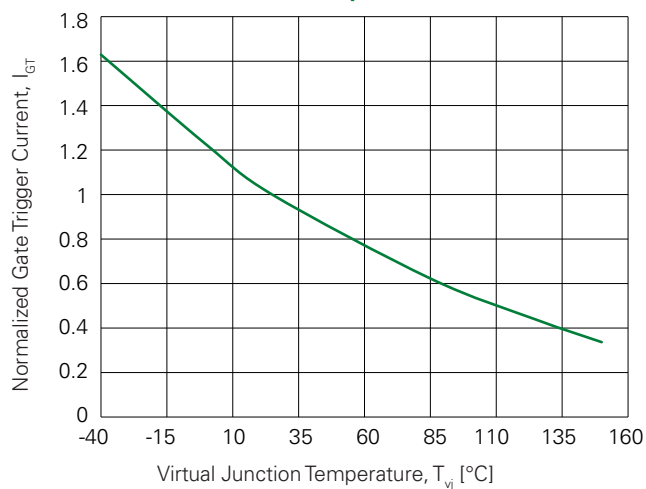


Fig. 2. Normalized Gate Trigger Voltage vs. Virtual Junction Temperature

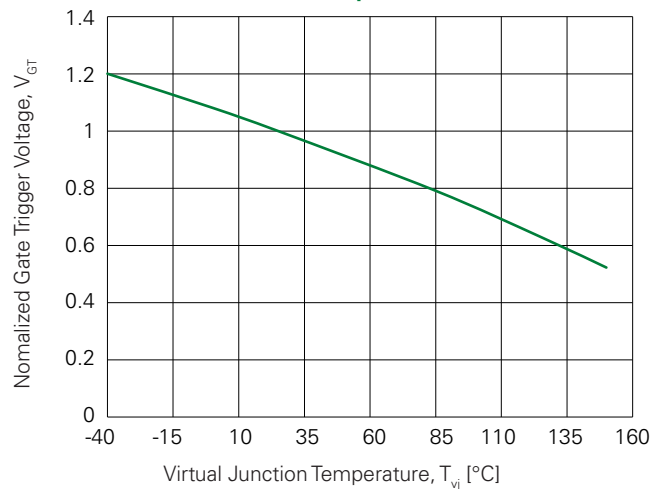


Fig. 3. Normalized Holding Current vs. Virtual Junction Temperature

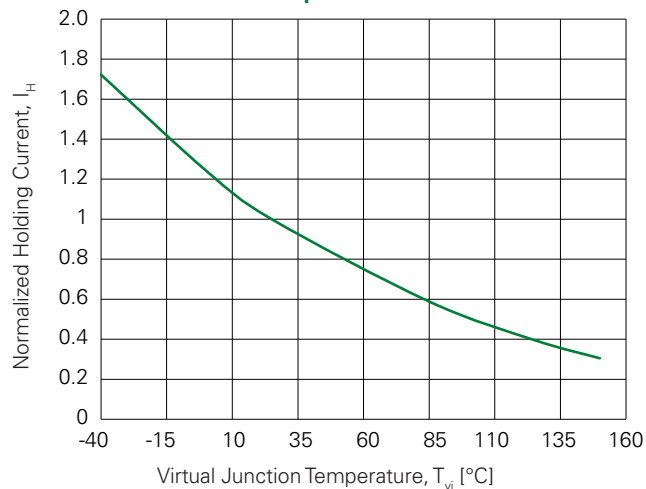


Fig. 4. Typical On-State Current vs. On-State Voltage

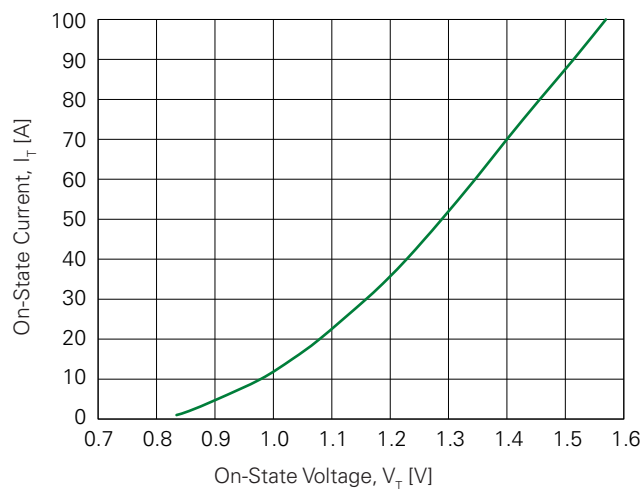


Fig. 5. Average On-State Power Dissipation vs. RMS On-State Current

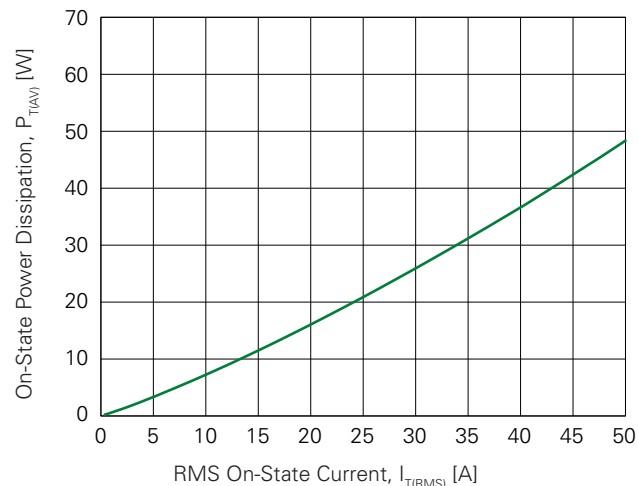
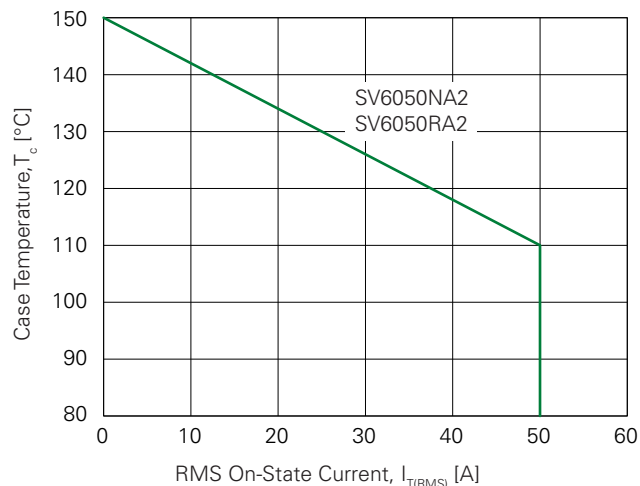


Fig. 6. Maximum Case Temperature vs. RMS On-State Current



Characteristic Curves

Fig. 7. Maximum Case Temperature vs. Average On-State Current

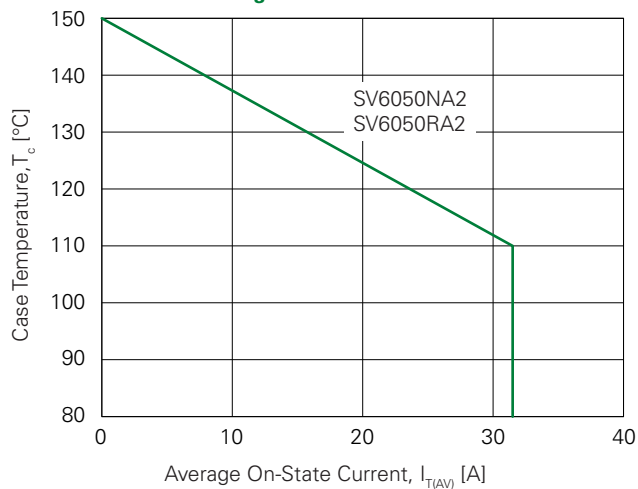
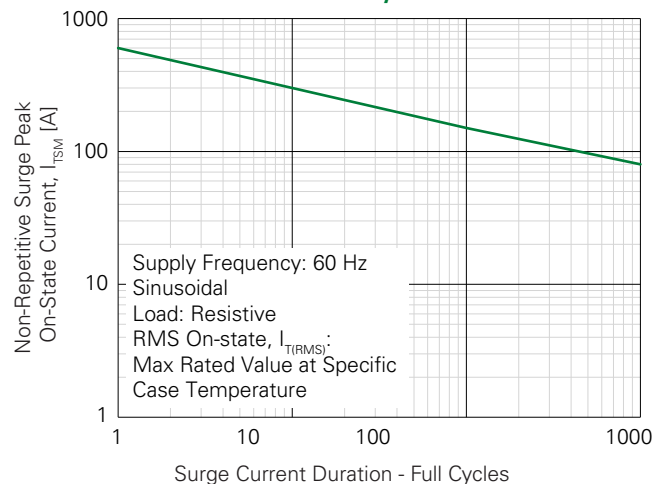


Fig. 8. Non-Repetitive Surge Peak On-State Current vs. Number of Cycles



Notes:

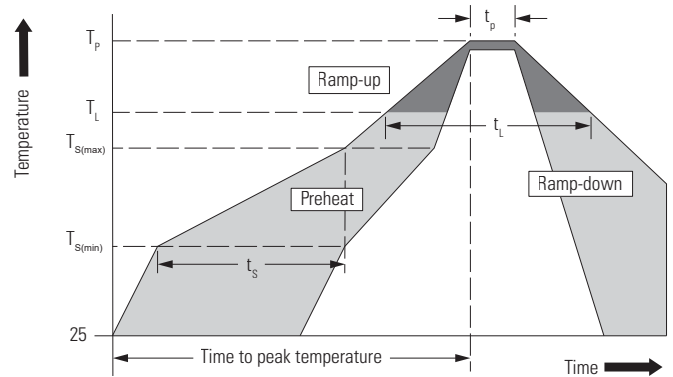
1. Gate control may be lost during and immediately following surge current interval.
2. Overload should not be repeated until junction temperature has returned to steady-state rated value.
3. Normalized Gate Trigger Current Value = Parameter @ $T_{vj} = 25^\circ\text{C}$.

$$4. \text{ Normalized Gate Trigger Voltage Value} = \frac{V_{GT}}{V_{GT}(T_{vj} = 25^\circ\text{C})}$$

$$5. \text{ Normalized Holding Current Value} = \frac{I_H}{I_H(T_{vj} = 25^\circ\text{C})}$$

Soldering Parameters

Reflow Condition		Pb-free Assembly
Pre-Heat	Temperature Min, TS(Min)	150 °C
	Temperature Max, TS(Max)	200 °C
	Time (Min to Max), ts	60 to 180 s
Average Ramp-up Rate Liquidus Temp., TL~ to peak		5 °C/s (Max)
TS(Max) to TL Ramp-up Rate		5 °C/s (Max)
Reflow	Temperature, TL Liquidus	217 °C
	Time, tL	60 to 150 s
Peak Temperature, TP		260 °C (±5 °C)
Time within 5 °C of Actual Peak Temperature, tP		20 to 40 s
Ramp-down Rate		5 °C/s (Max)
Time 25 °C to Peak Temperature, TP		8 minutes (Max)
Do Not Exceed		280 °C



Environmental Tests

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% relative humidity	MIL-STD-750: Method 1031 150 °C, 1008 hours
Resistance to Solder	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
UHAFT	JESD22A-118 , 96 hours, 130°C; 85% relative humidity
IOL	MIL-STD-750 Method 1037

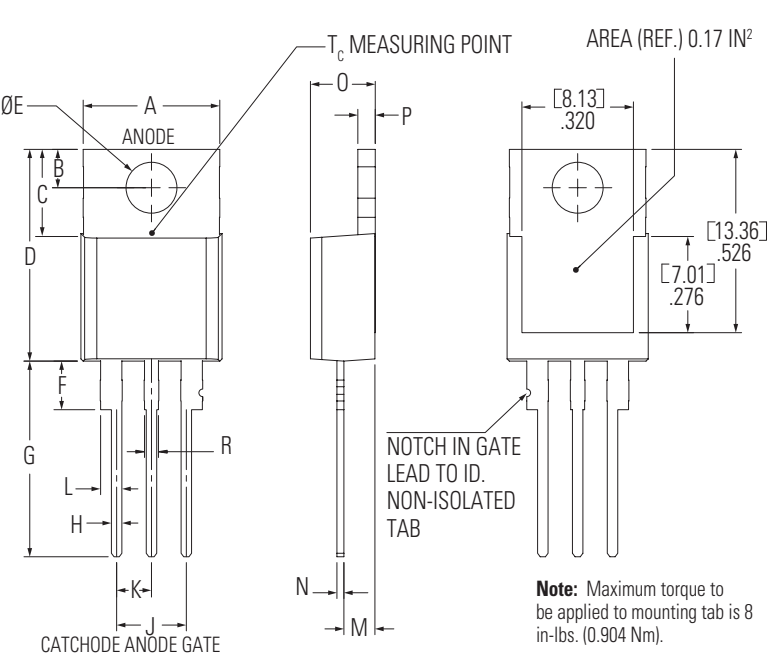
Physical Specifications

Terminal Finish	100% Matte Tin-plated
Body Material	UL Recognized Compound meeting Flammability Rating V-0
Terminal Material	Copper Alloy

Design Considerations

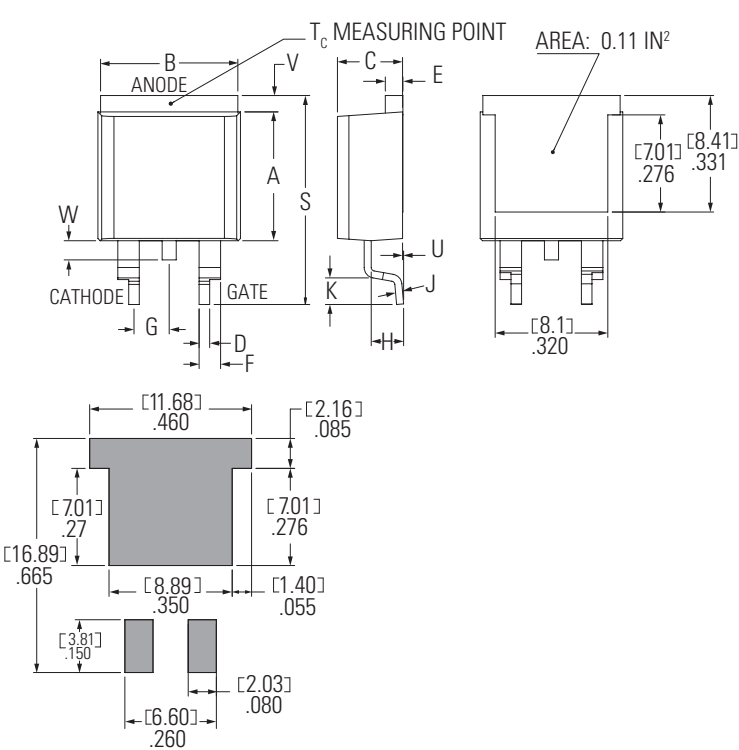
Careful selection of the correct component for the application's operating parameters and environment will go a long way toward extending the operating life of the Thyristor. Good design practice should limit the maximum continuous current through the main terminals to 75% of the component rating. Other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

Part Outline Drawing (TO-220 AB (R- Package) – Non-isolated Mounting Tab Common with Center Lead)



Dimensions	Millimeters		Inches	
	Min	Max	Min	Max
A	0.380	0.065	1.250	1.650
B	0.420	9.65	10.67	4.500
C	0.105	0.115	2.67	2.92
D	0.230	0.250	5.84	6.35
E	0.590	0.620	14.99	15.75
F	0.142	0.147	3.61	3.73
G	0.110	0.130	2.79	3.30
H	0.540	0.575	13.72	14.61
J	0.025	0.035	0.64	0.89
K	0.195	0.205	4.95	5.21
L	0.095	0.105	2.41	2.67
M	0.060	0.075	1.52	1.91
N	0.085	0.095	2.16	2.41
O	0.018	0.024	0.46	0.61
P	0.178	0.188	4.52	4.78
R	0.045	0.060	1.14	1.52
	0.038	0.048	0.97	1.22

Part Outline Drawing (TO-263 AB (N- Package) – D²Pak Surface Mount)



Dimension	Millimeters		Inches	
	Max	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

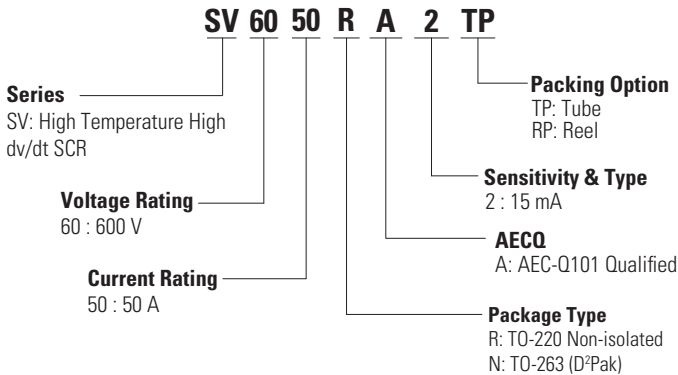
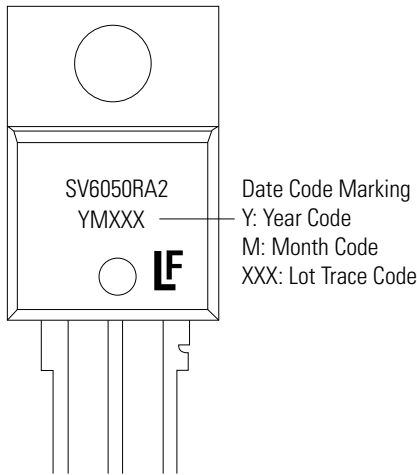
Part Number	Voltage	Gate Sensitivity	Type	Package
	600 V			
SV6050RA2TP	X	15 mA	Standard SCR	TO-220R
SV6050NA2TP	X	15 mA	Standard SCR	TO-263
SV6050NA2RP	X	15 mA	Standard SCR	TO-263

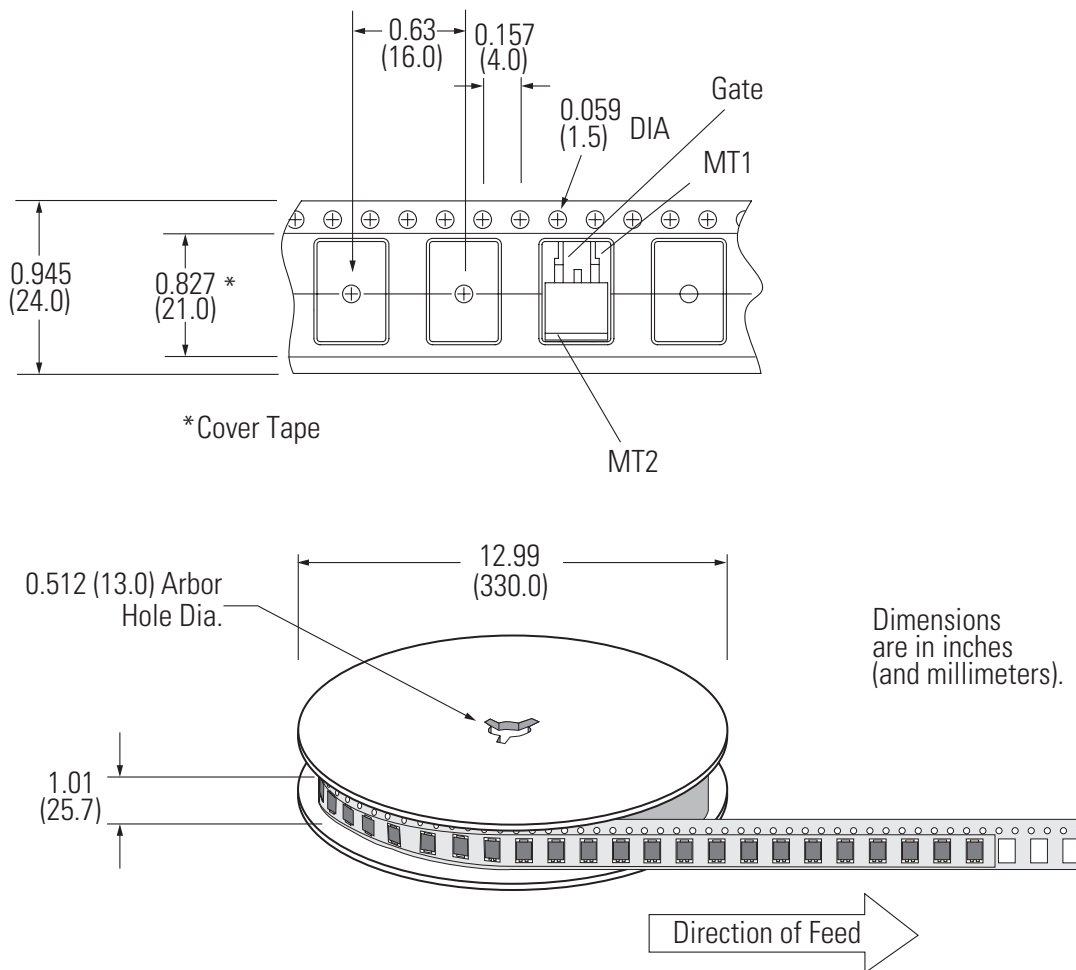
Packing Options

SV6050RA2TP	SV6050RA2	2.2 g	Tube Pack	1000 (50 per tube)
SV6050NA2TP	SV6050NA2	1.6 g	Tube Pack	1000 (50 per tube)
SV6050NA2RP	SV6050NA2	1.6 g	Embossed Carrier	500

Part Marking and Numbering

TO - 220 AB (R package)
TO - 263 AB (N package)



Tape and Reel Specifications (TO-263 Embossed Carrier Reel Pack (RP))**Disclaimer Notice**

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Part of:

