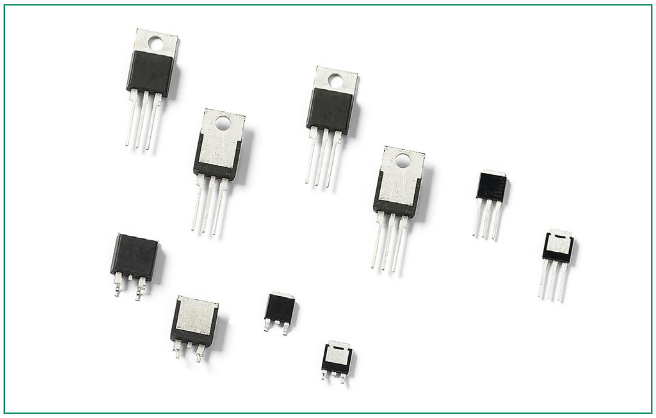
Sxx08xSx & Sxx08x Series

HF RoHS



Description

This Sxx08x SCR series is ideal for uni-directional switch applications such as phase control, heating, motor speed controls, converters/rectifiers and capacitive discharge ignitions.

These SCRs have a low gate current trigger level of 0.2 to 15 mA at approximately 1.5V, with a sensitive version of this series having a gate trigger current less than 500μA. The sensitive gate SCR version is easily triggered by sense coils, proximity switches, and microprocessors.

Agency Approval

Agency	Agency File Number
UL	E71639*

* - L Package Only

Features & Benefits

- Halogen-free and RoHS-compliant
- Glass – passivated junctions
- Voltage capability up to 1000 V
- Surge capability up to 100 A at 60 Hz half cycle
- L - Package is UL Recognized for 2500Vrms

Main Features

Symbol	Value	Unit
$I_{T(RMS)}$	8	A
V_{DRM}/V_{RRM}	400 to 1000	V
I_{GT}	0.2 to 15	mA

Applications

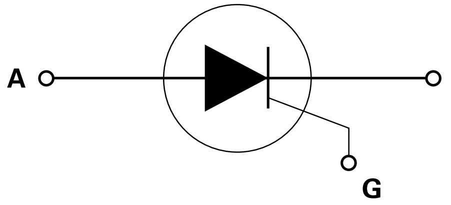
Typical applications are capacitive discharge systems for strobe lights, nailers, staplers and gas engine ignition. Also AC control & rectification for power tools, home/brown goods, white goods appliances and 2-wheeler rectifier/ battery regulators.

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

Additional Information

Datasheet | Resources | Samples

Schematic Symbol



Revised: BO.12/10/20

Absolute Maximum Ratings — Sensitive SCRs

Symbol	Parameter	Test Conditions		Value	Unit
$I_{T(RMS)}$	RMS on-state current	Sxx08LSy	T_C = 80°C	8	A
		Sxx08RSy/Sxx08NSy Sxx08DSy Sxx08VSy	T_C = 95°C		
$I_{T(AV)}$	Average on-state current	Sxx08LSy	T_C = 80°C	5.1	A
		Sxx08RSy/Sxx08NSy Sxx08DSy Sxx08VSy	T_C = 95°C		
I_{TSM}	Peak non-repetitive surge current	single half cycle; f = 50Hz; T_J (initial) = 25°C		83	A
		single half cycle; f = 60Hz; T_J (initial) = 25°C		100	
I^2t	I^2t Value for fusing	t_p = 8.3 ms		41	A^2s
di/dt	Critical rate of rise of on-state current	f = 60 Hz ; T_J = 110°C		70	A/μs
I_{GTM}	Peak gate current	T_J = 110°C		1.6	A
$P_{G(AV)}$	Average gate power dissipation	T_J = 110°C		0.4	W
T_{stg}	Storage temperature range			-40 to 150	°C
T_J	Operating junction temperature range			-40 to 110	°C

Note: xx = voltage, y = sensitivity

Absolute Maximum Ratings — Standard SCRs

Symbol	Parameter	Test Conditions		Value	Unit
$I_{T(RMS)}$	RMS on-state current	Sxx08L	T_C = 100°C	8	A
		Sxx08R/Sxx08N Sxx08D Sxx08V	T_C = 110°C		
$I_{T(AV)}$	Average on-state current	Sxx08L	T_C = 100°C	5.1	A
		Sxx08R/Sxx08N Sxx08D Sxx08V	T_C = 110°C		
I_{TSM}	Peak non-repetitive surge current	single half cycle; f = 50Hz; T_J (initial) = 25°C		83	A
		single half cycle; f = 60Hz; T_J (initial) = 25°C		100	
I^2t	I^2t Value for fusing	t_p = 8.3 ms		41	A^2s
di/dt	Critical rate-of-rise of on-state current	f = 60 Hz T_J = 125°C		100	A/μs
I_{GM}	Peak gate current	T_J = 125°C		2	A
$P_{G(AV)}$	Average gate power dissipation	T_J = 125°C		0.5	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) – Sensitive SCRs

Symbol	Test Conditions		Value				Unit
			Sxx08xS1	Sxx08xS2	Sxx08xS3	Sxx08x4	
I_{GT}	V_D = 6V R_L = 100 Ω	MAX.	50	200	500	100	µA
V_{GT}	V_D = 6V R_L = 100 Ω	MAX.	0.8				V
dv/dt	$V_D = V_{DRM}$; R_{GK} = 1kΩ; T_J = 110°C	TYP.	8				V/µs
V_{GD}	$V_D = V_{DRM}$ R_L = 3.3 kΩ T_J = 110°C	MIN.	0.2				V
V_{GRM}	I_{GR} = 10µA	MIN.	6				V
I_H	I_T = 20mA (initial)	MAX.	4	6	8	5	mA
t_q	I_T=2A; t_p=50µs; dv/dt=5V/µs; di/dt=-30A/µs	MAX.	75	50	45	60	µs
t_{gt}	I_G = 2 x I_{GT} PW = 15µs I_T = 12A	TYP.	3	4	5	4	µs

Note: xx = voltage x = package

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

Symbol	Test Conditions			Value Sxx08x	Unit
I_{GT}	V_D = 12V R_L = 60 Ω		MAX.	15	mA
V_{GT}	V_D = 12V R_L = 60 Ω		MAX.	1.5	V
dv/dt	$V_D = V_{DRM}$; gate open; T_J = 100°C	400V	MIN.	350	V/µs
		600V		300	
		800V		250	
		1000V		100	
	$V_D = V_{DRM}$; gate open; T_J = 125°C	400V		250	
		600V		225	
		800V		200	
V_{GD}	$V_D = V_{DRM}$ R_L = 3.3 kΩ T_J = 125°C		MIN.	0.2	V
I_H	I_T = 200mA (initial)		MAX.	30	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 = 16A		TYP.	2	µs

Note: xx = voltage x = package

Static Characteristics

Symbol	Test Conditions					Value	Unit
V_{TM}	I_T = 16A; t_p = 380 µs				MAX.	1.6	V
I_{DRM} / I_{RRM}	$V_{DRM} = V_{RRM}$	Sxx08xyy	T_J = 25°C	400 - 600V	MAX.	5	µA
			T_J = 110°C	400 - 600V		250	
		Sxx08x	T_J = 25°C	400 - 800V		10	
				1000V		20	
			T_J = 100°C	400 - 800V		200	
				1000V		3000	
			T_J = 125°C	400 - 800V		500	

Note: xx = voltage, x = package, yy = sensitivity

Thermal Resistances

Symbol	Parameter		Value	Unit
$R_{\theta(J-C)}$	Junction to case (AC)	Sxx08RSy / Sxx08NSy	1.8	°C/W
		Sxx08LSy	3.4	
		Sxx08VSy	2.1	
		Sxx08DSy	1.5	
		Sxx08R / S xx08N	1.8	
		Sxx08L	3.4	
		Sxx08V	2.0	
		Sxx08D	1.5	
$R_{\theta(J-A)}$	Junction to ambient	Sxx08RSy	40	°C/W
		Sxx08LSy	65	
		Sxx08VSy	85	
		Sxx08R	40	
		Sxx08L	50	
		Sxx08V	70	

Note: xx = voltage, y = sensitivity

Figure 1: Normalized DC Gate Trigger Current vs. Junction Temperature (Sensitive SCR)

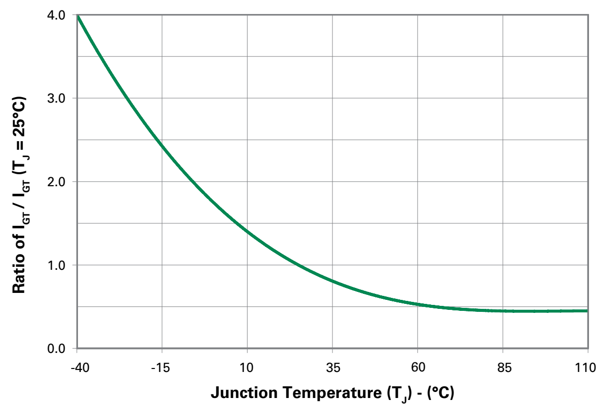


Figure 2: Normalized DC Gate Trigger Current vs. Junction Temperature (Standard SCR)

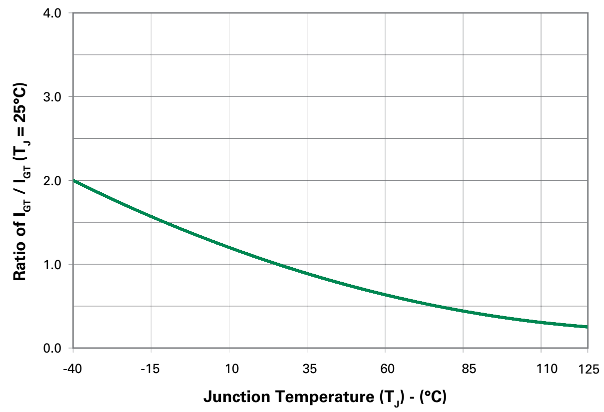


Figure 3: Normalized DC Gate Trigger Voltage vs. Junction Temperature

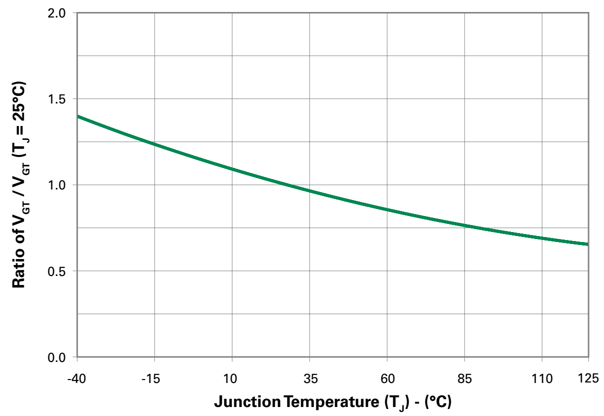


Figure 4: Normalized DC Holding Current vs. Junction Temperature

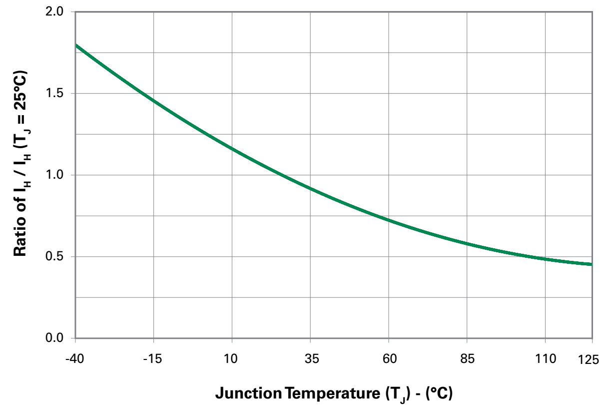


Figure 5: On-State Current vs. On-State Voltage (Typical)

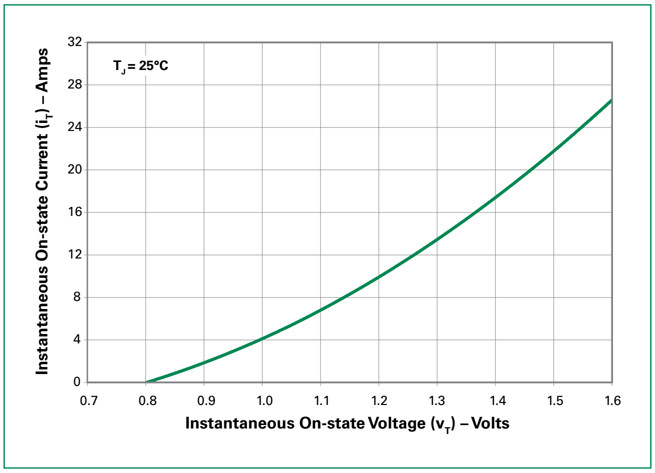


Figure 6: Power Dissipation (Typical) vs. RMS On-State Current

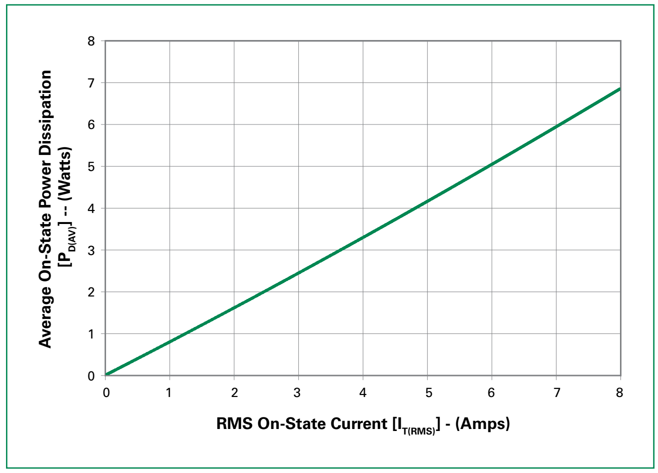


Figure 7: Maximum Allowable Case Temperature vs. RMS On-State Current

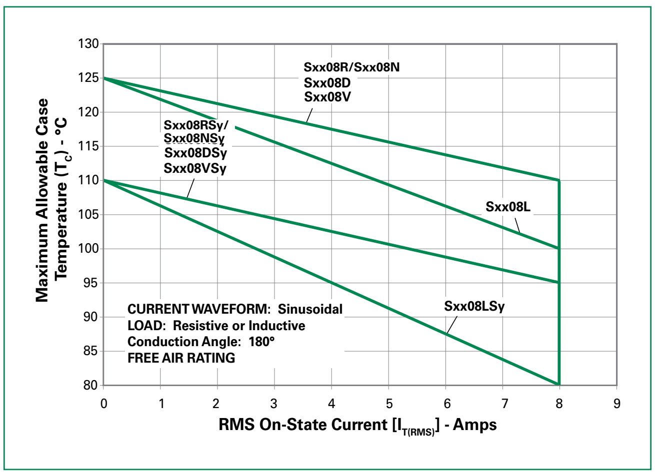


Figure 8: Maximum Allowable Case Temperature vs. Average On-State Current

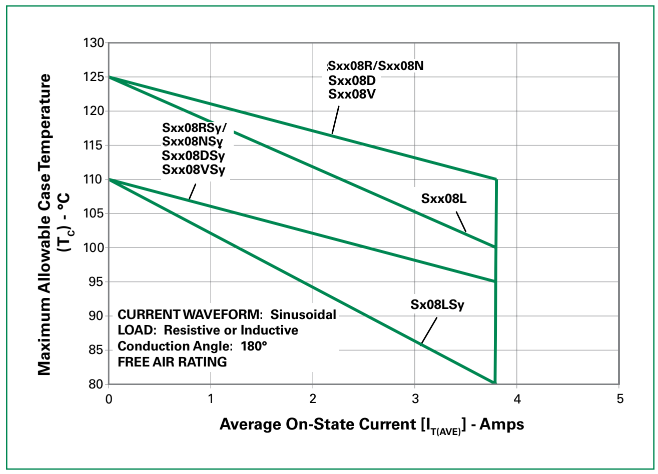


Figure 9: Maximum Allowable Ambient Temperature vs. RMS On-State Current

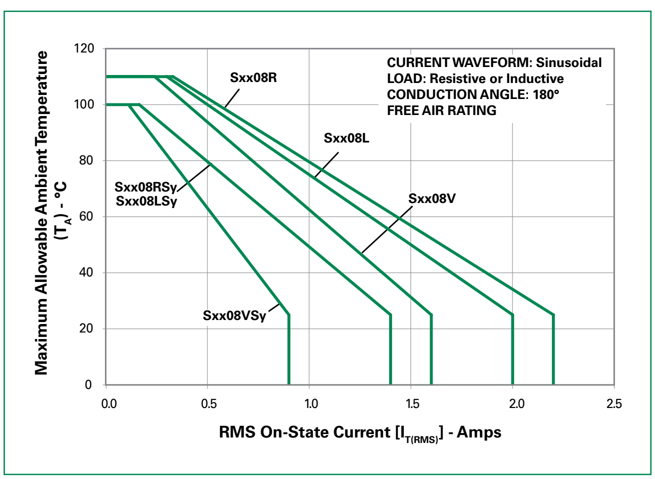
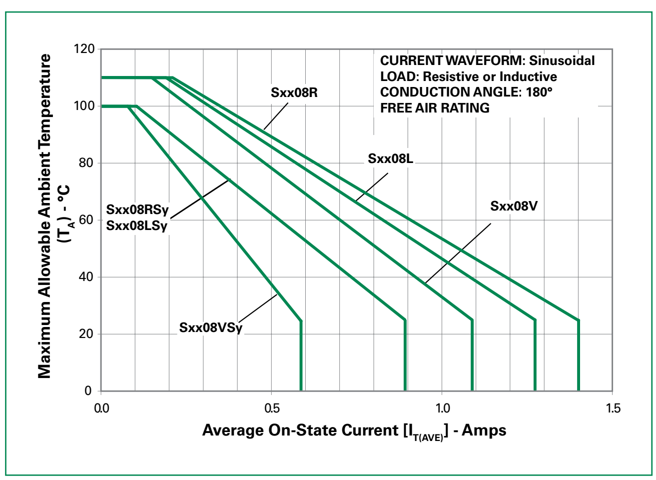


Figure 10: Maximum Allowable Ambient Temperature vs. Average On-State Current



Note: xx = voltage, y = sensitivity

Figure 11: Peak Capacitor Discharge Current

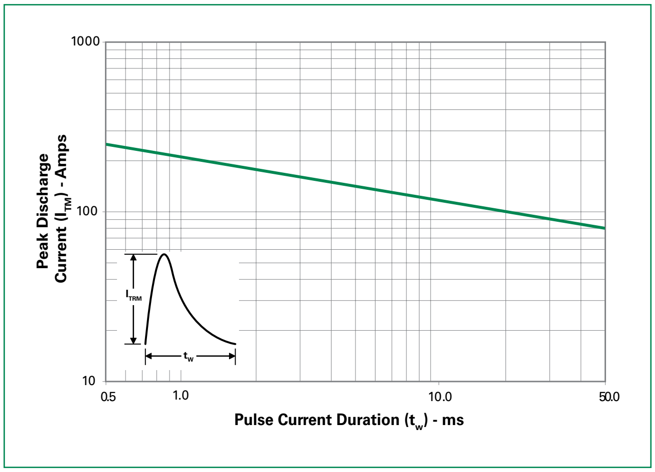


Figure 12: Peak Capacitor Discharge Current Derating

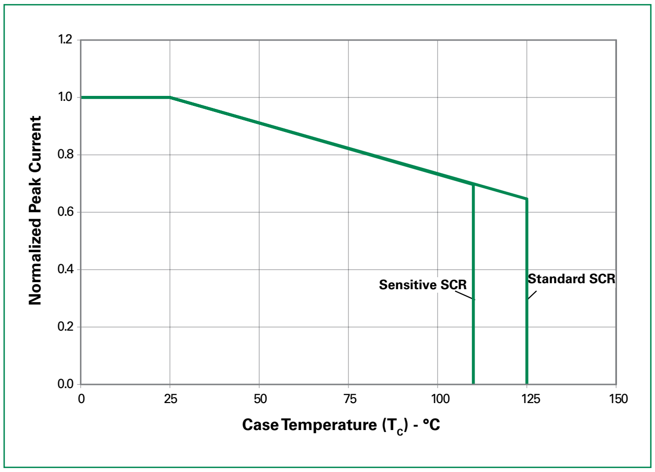


Figure 13-1: Typical DC Gate Trigger Current with R_{GK} vs. Junction Temperature for S6008xS2

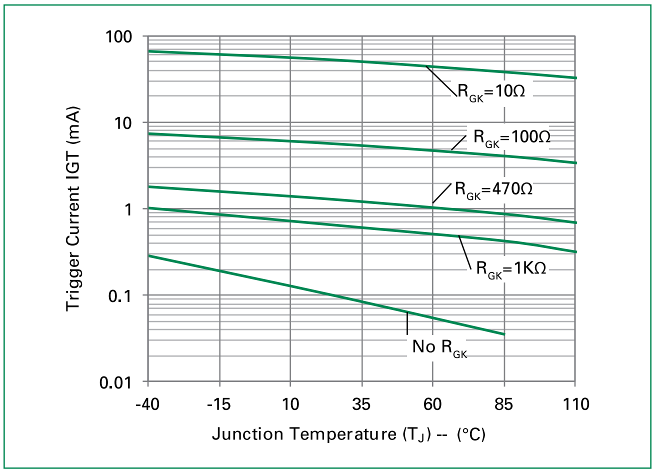


Figure 13-2: Typical DC Gate Trigger Current with R_{GK} vs. Junction Temperature for S6008xS3

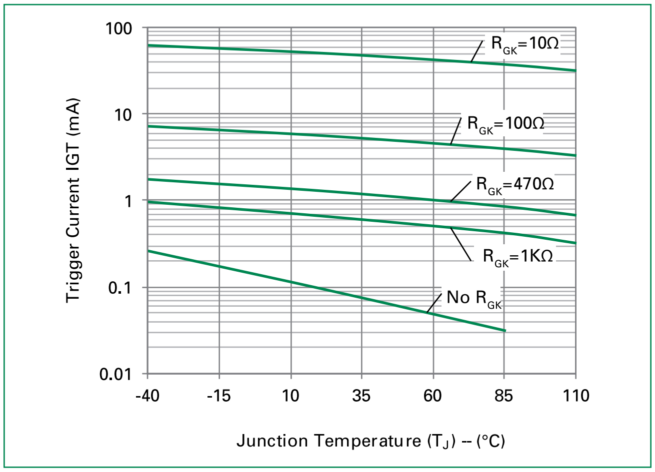


Figure 14-1: Typical DC Holding Current with R_{GK} vs. Junction Temperature for S6008xS2

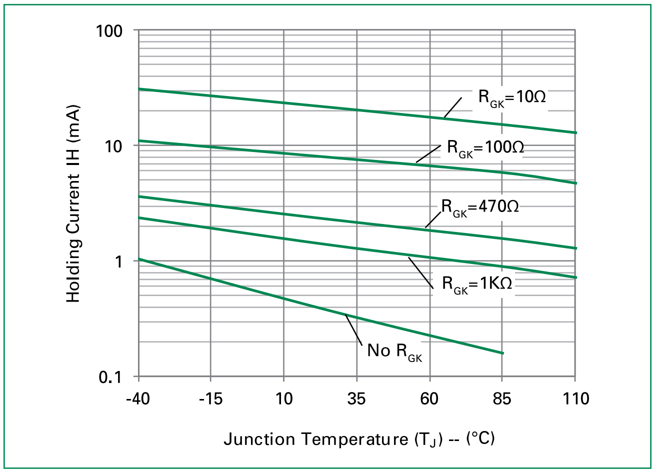


Figure 14-1: Typical DC Holding Current with R_{GK} vs. Junction Temperature for S6008xS3

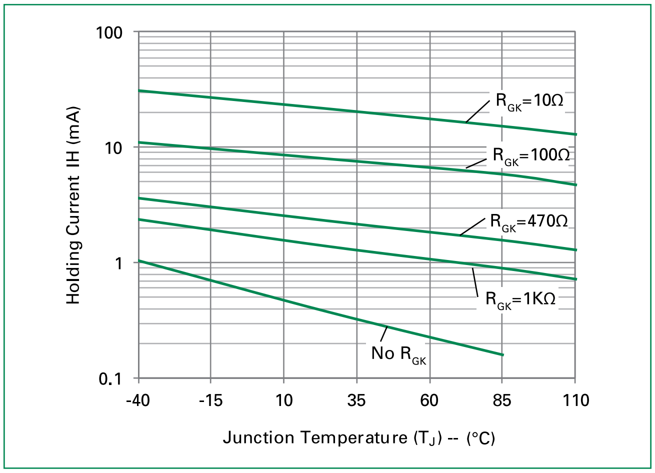


Figure 15-1: Typical Static dv/dt with R_{GK} vs. Junction Temperature for S6008xS2

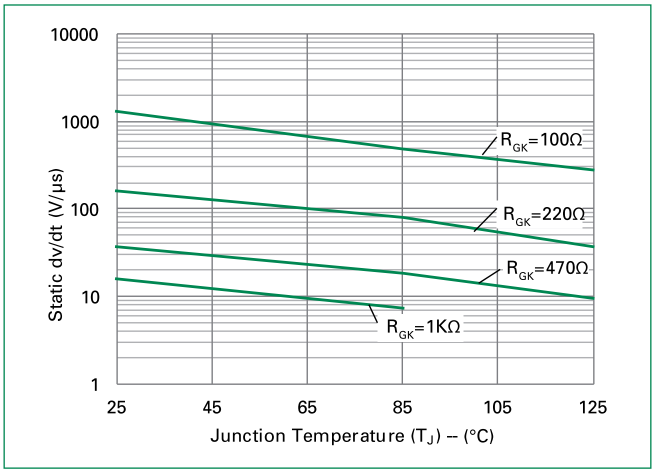


Figure 15-2: Typical Static dv/dt with R_{GK} vs. Junction Temperature for S6008xS3

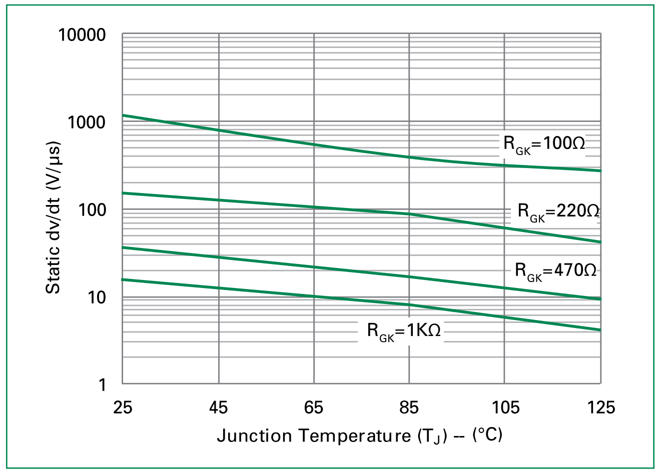


Figure 16-1: Typical turn off time with R_{GK} vs. Junction Temperature for S6008xS2

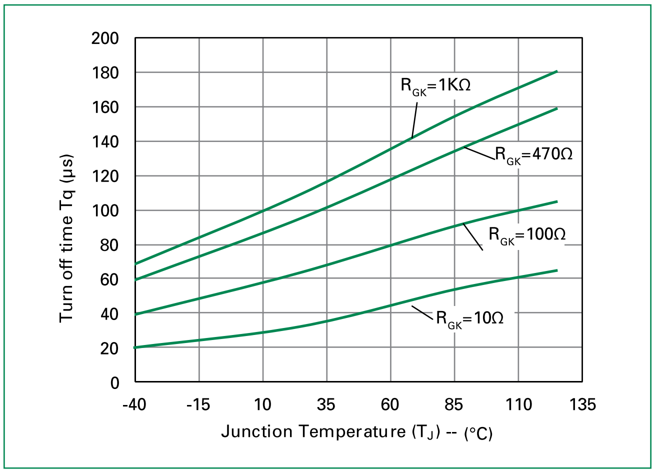


Figure 16-2: Typical DC Gate Trigger Current with R_{GK} vs. Junction Temperature for S6008xS3

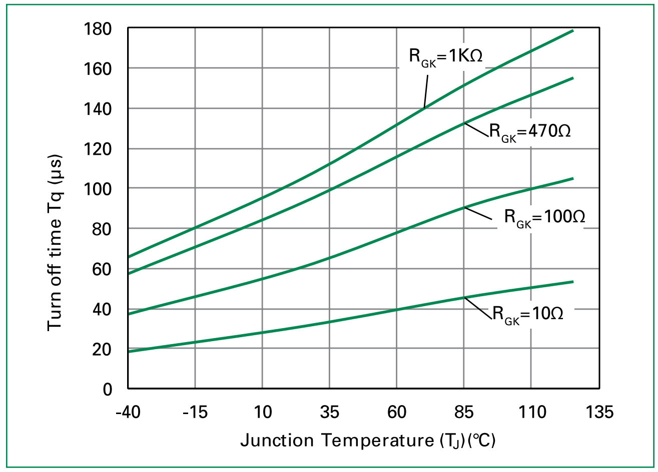
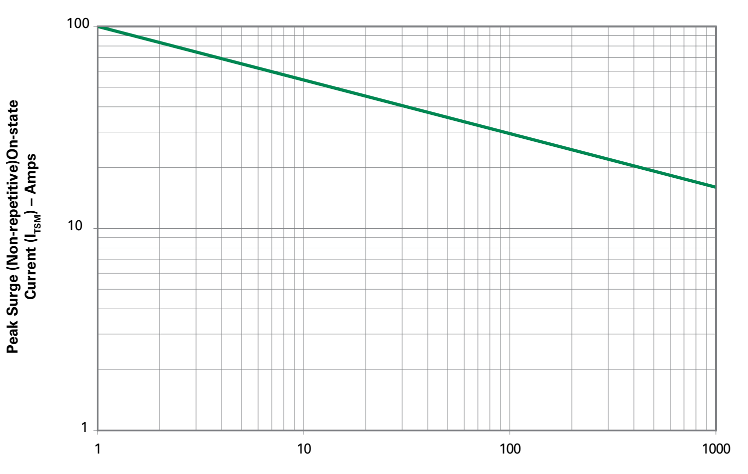


Figure 17: Surge Peak On-State Current vs. Number of Cycles



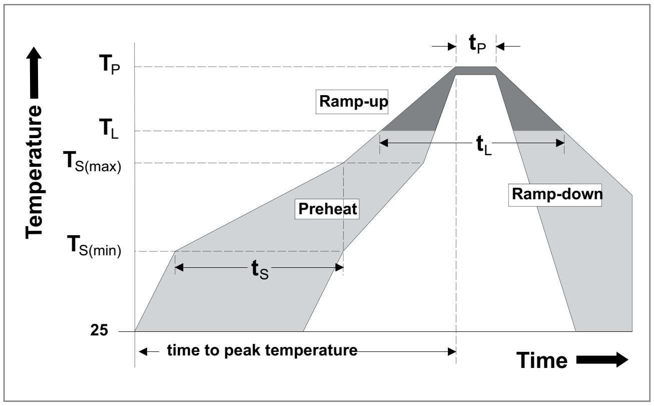
SUPPLY FREQUENCY: 60 Hz Sinusoidal
LOAD: Resistive
RMS On-State Current: [$I_{T(RMS)}$]: Maximum Rated Value at Specified Case Temperature

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 rating 94V-0
Lead Material	Copper Alloy

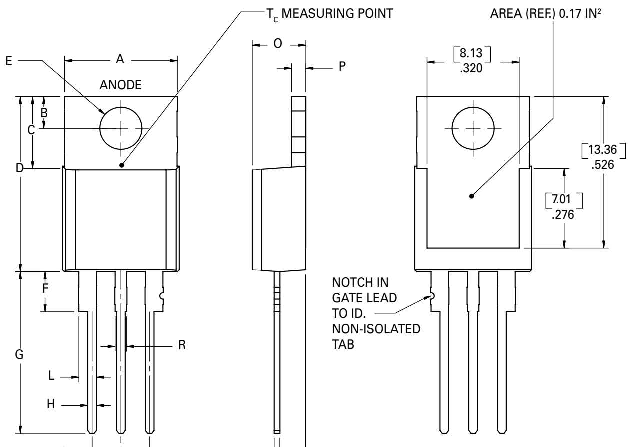
Design Considerations

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 @ 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
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

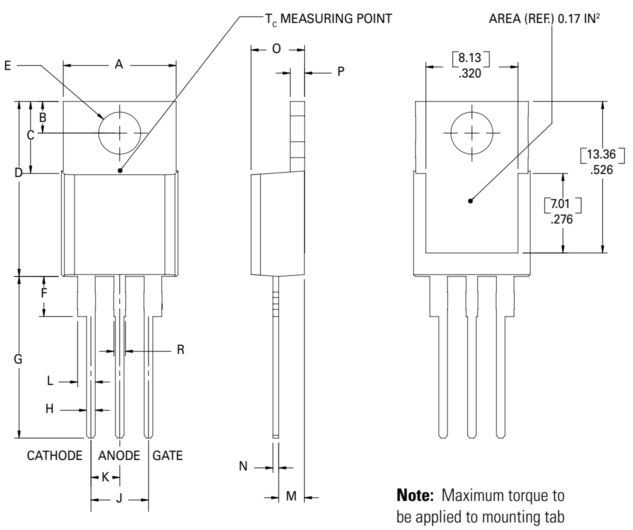
Dimensions — TO-220AB (R-Package) — Non-Isolated Mounting Tab Common with Center Lead



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

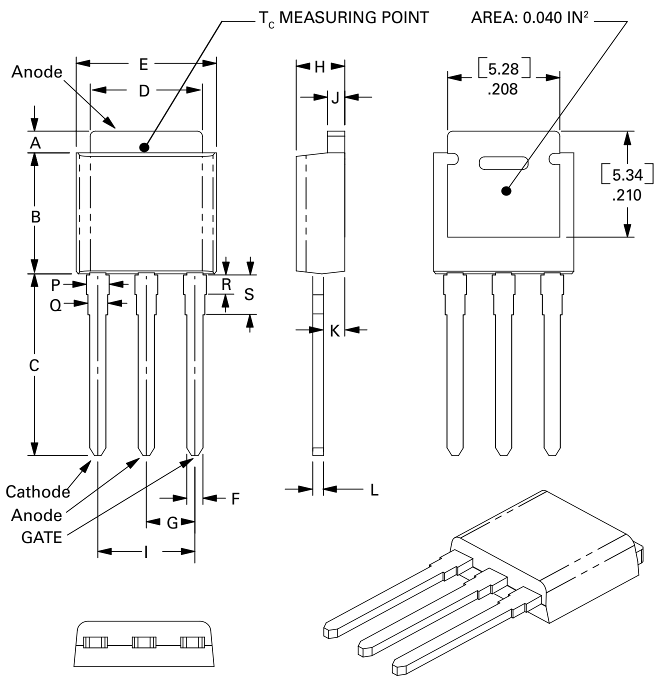
Dimensions — TO-220AB (L-Package) — Isolated Mounting Tab



Note: Maximum torque to be applied to mounting tab is 8 in-lbs. (0.904 Nm).

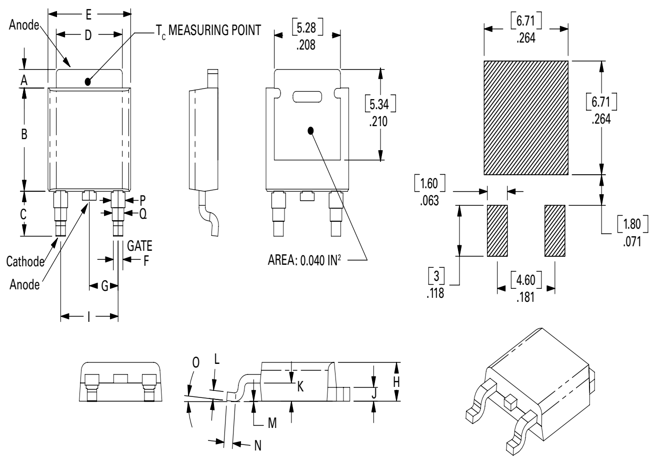
Dimension	Inches		Millimeters	
	Min	Max	Min	Max
A	0.380	0.420	9.65	10.67
B	0.105	0.115	2.67	2.92
C	0.230	0.250	5.84	6.35
D	0.590	0.620	14.99	15.75
E	0.142	0.147	3.61	3.73
F	0.110	0.130	2.79	3.30
G	0.540	0.575	13.72	14.61
H	0.025	0.035	0.64	0.89
J	0.195	0.205	4.95	5.21
K	0.095	0.105	2.41	2.67
L	0.060	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-251AA (V/I-Package) — V/I-PAK Through Hole



Dimension	Inches			Millimeters		
	Min	Typ	Max	Min	Typ	Max
A	0.037	0.040	0.043	0.94	1.01	1.09
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	0.035	0.037	0.039	0.90	0.95	1.00
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

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



Dimension	Inches			Millimeters		
	Min	Typ	Max	Min	Typ	Max
A	0.037	0.040	0.043	0.94	1.01	1.09
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	0.035	0.037	0.039	0.90	0.95	1.00
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	800V	1000V			
Sxx08RS2	X	X	-	-	0.2mA	Sensitive SCR	TO-220R
Sxx08LS2	X	X	-	-	0.2mA	Sensitive SCR	TO-220L
Sxx08VS2	X	X	-	-	0.2mA	Sensitive SCR	TO-251
Sxx08DS2	X	X	-	-	0.2mA	Sensitive SCR	TO-252
Sxx08RS3	X	X	-	-	0.5mA	Sensitive SCR	TO-220R
Sxx08LS3	X	X	-	-	0.5mA	Sensitive SCR	TO-220L
Sxx08VS3	X	X	-	-	0.5mA	Sensitive SCR	TO-251
Sxx08DS3	X	X	-	-	0.5mA	Sensitive SCR	TO-252
Sxx08R	X	X	X	X	15mA	Standard SCR	TO-220R
Sxx08L	X	X	X	X	15mA	Standard SCR	TO-220L
Sxx08V	X	X	X	X	15mA	Standard SCR	TO-251
Sxx08D	X	X	X	X	15mA	Standard SCR	TO-252
Sxx08NS2	X	X	-	-	0.2mA	Sensitive SCR	TO-263
Sxx08NS3	X	X	-	-	0.5mA	Sensitive SCR	TO-263
Sxx08N	X	X	X	X	15mA	Standard SCR	TO-263
Sxx08DS1	-	X	-	-	50µA	Sensitive SCR	TO-252
Sxx08DS4	-	X	-	-	100µA	Sensitive SCR	TO-252

Note: xx = Voltage/10

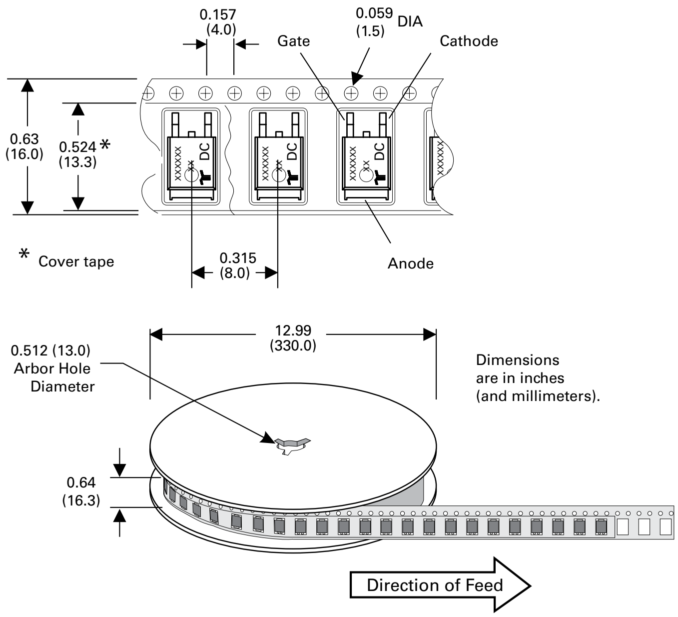
Packing Options

Part Number	Marking	Weight	Packing Mode	Base Quantity
Sxx08L/RyyTP	Sxx08L/Ryy	2.2 g	Tube	1000 (50 per tube)
Sxx08DyyTP	Sxx08Dyy	0.3 g	Tube	750 (75 per tube)
Sxx08DyyRP	Sxx08Dyy	0.3 g	Embossed Carrier	2500
Sxx08VyyTP	Sxx08Vyy	0.4 g	Tube	750 (75 per tube)
Sxx08L/RTP	Sxx08L/R	2.2 g	Tube	1000 (50 per tube)
Sxx08DTP	Sxx08D	0.3 g	Tube	750 (75 per tube)
Sxx08DRP	Sxx08D	0.3 g	Embossed Carrier	2500
Sxx08NyyTP	Sxx08Nyy	1.6g	Tube	1000 (50 per tube)
Sxx08NyyRP	Sxx08Nyy	1.6g	Embossed Carrier	500
Sxx08NTP	Sxx08N	1.6g	Tube	1000 (50 per tube)
Sxx08NRP	Sxx08N	1.6g	Embossed Carrier	500
Sxx08VRP	Sxx08V	0.4 g	Tube	750 (75 per tube)

Note: xx = Voltage/10; yy = Sensitivity

TO-252 Embossed Carrier Reel Pack (RP) Specifications

Meets all EIA-481-2 Standards



Part Numbering System

S 60 08 L S2 56

COMPONENT TYPE
S: SCR

VOLTAGE RATING
40: 400V
60: 600V
80: 800V
K0: 1000V

CURRENT RATING
08: 8A

PACKAGE TYPE
L: TO-220 Isolated
R: TO-220 Non-Isolated
V: TO-251 (V/I-Pak)
D: TO-252 (D-Pak)
N: TO-263 (D²PAK)

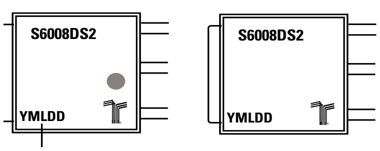
SENSITIVITY & TYPE

Sensitive SCR:	Standard SCR:
S1: 50µA	(blank): 15mA
S2: 200µA	
S3: 500µA	
S4: 100µA	

LEAD FORM DIMENSIONS
xx: Lead Form Option

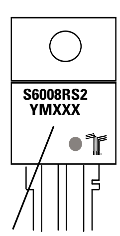
Part Marking System

TO-251AA - (V Package)
TO-252AA - (D Package)



Date Code Marking
Y:Year Code
M: Month Code
L: Location Code
DD: Calendar Code

TO-263 AA - (N Package)
TO-220 AB - (L and R Package)



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

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Littelfuse:

S4008LS2TP S2008R S4008F1 S6008DS3RP S2008FS21 S4008DS3RP S6008R67 SK008L S4008FS24 S8008DRP S4008DS3TP S6008DRP S6008R67TP S4008DS2TP S6008VS3TP S6008L65 S4008VS2TP S4008VTP S6008RS3 S8008VTP S4008LS2 S6008L56 S2008FS22 S2008VS2TP S2008DS3TP S6008R S2008VTP S6008L53 S6008DS3TP S4008FS21 S2008LS3 S6008L S6008FS21 S4008DS2RP S2008F1 S4008DRP S8008R S4008R S6008LS2 S8008L SK008DTP SK008R S2008DS3RP S2008FS31 S6008L58 S2008F12 S2008R55 S4008LS3 S6008LS3 S4008L S8008DTP S6008F1 S6008DTP S2008DS2RP S2008VS3TP S2008L SK008DRP S6008VS2TP S6008DS2RP S6008VTP S4008DTP SK008VTP S6008LTP S6008FS31 S4008FS31 S2008DRP S6008DS2TP S2008DS2TP S2008LS2 S6008LS2TP S4008RS2 S6008RS3TP SK008RTP SK008LTP S4008RS2TP S4008LTP S4008LS3TP S6008LS3TP S8008RTP S6008RTP S4008RTP S8008LTP S6008RS2TP S4008RS3TP