

**S6X8ECS2**



**Description**

This new .8 A sensitive gate SCR in an TO-92 package with a GAK pin out, offers a high static component series with a high static dv/dt and a low turn off ( $t_q$ ) time by the use of small die planar construction implementation. All SCR's junctions are glass-passivated to ensure long term reliability and parametric stability.

**Features**

- Surge capability >10Amps
- High dv/dt noise immunity
- Improved turn-off time ( $t_q$ )  $\leq 25 \mu s$ .
- TO-92 G-A-K pinout
- Sensitive gate for direct microprocessor interface
- RoHS compliant and Halogen-Free

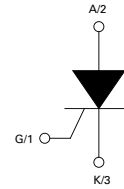
**Main Features**

Symbol	Value	Unit
$I_{T(RMS)}$	0.8	A
$V_{DRM} / V_{RRM}$	600	V
$I_{GT}$	30	$\mu A$

**Applications**

The S6X8ECS2 is specifically designed for GFCI (Ground Fault Circuit Interrupter) and gas ignition applications.

**Schematic Symbol**



**Absolute Maximum Ratings**

Symbol	Parameter	Value	Unit	
$I_{T(RMS)}$	RMS on-state current (full sine wave)	$T_c = 55^\circ C$	0.8 A	
$I_{T(AV)}$	Average on-state current	$T_c = 55^\circ C$	0.51 A	
$I_{TSM}$	Non repetitive surge peak on-state current (Single cycle, $T_J$ initial = $25^\circ C$ )	F = 50 Hz	8 A	
		F = 60 Hz	10 A	
$I^2t$	$I^2t$ Value for fusing	$t_p = 10$ ms	F = 50 Hz	0.32 A <sup>2</sup> s
		$t_p = 8.3$ ms	F = 60 Hz	0.41 A <sup>2</sup> s
di/dt	Critical rate of rise of on-state current $I_G = 10$ mA	$T_J = 125^\circ C$	50 A/ $\mu s$	
$I_{GM}$	Peak gate current	$t_p = 10 \mu s$	$T_J = 125^\circ C$	1.0 A
$P_{G(AV)}$	Average gate power dissipation	$T_J = 125^\circ C$	0.1 W	
$T_{stg}$	Storage junction temperature range		-40 to 150 $^\circ C$	
$T_J$	Operating junction temperature range		-40 to 125 $^\circ C$	

**Electrical Characteristics ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)**

Symbol	Description	Test Conditions	Value		Unit
			Min	Max	
$I_{GT}$	DC Gate Trigger Current	$V_D = 6\text{V}$ $R_L = 100\ \Omega$	1	30	$\mu\text{A}$
$V_{GT}$			—	0.8	V
$V_{GRM}$	Peak Reverse Gate Voltage	$I_{RG} = 10\ \mu\text{A}$	5	—	V
$I_H$	Holding Current	$R_{GK} = 1\ \text{k}\Omega$ Initial Current = 20mA	—	3	mA
(dv/dt)s	Critical Rate-of-Rise of Off-State Voltage	$T_J = 125^\circ\text{C}$ , $V_D = V_{DRM} / V_{RRM}$ Exponential Waveform, $R_{GK} = 1\ \text{k}\Omega$	75	—	V/ $\mu\text{s}$
$V_{GT}$	Gate Non-Trigger Voltage	$V_D = V_{DRM}$ , $R_{GK} = 1\ \text{k}\Omega$ $T_J = 25^\circ\text{C}$	0.2	—	V
$t_q$	Turn-Off Time	$T_J = 125^\circ\text{C}$ @ 600 V $R_{GK} = 1\ \text{k}\Omega$	—	25	$\mu\text{s}$
$t_{gt}$	Turn-On Time	$I_G = 10\text{mA}$ PW = 15 $\mu\text{sec}$ $I_T = 1.6\text{A}$ (pk)	2.0 (Typ)		$\mu\text{s}$

**Static Characteristics ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)**

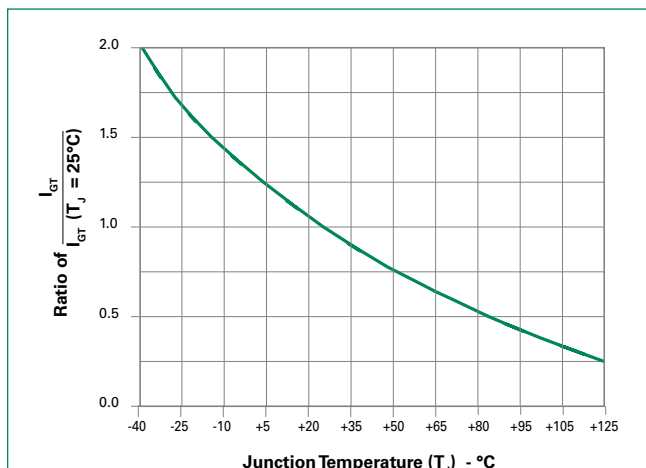
Symbol	Description	Test Conditions	Value	Unit
			Max	
$V_{TM}$	Peak On-State Voltage	$I_{TM} = 1.2\ \text{A}$ (pk)	1.4	V
$I_{DRM}$	Off-State Current, Peak Repetitive	$T_J = 25^\circ\text{C}$ @ $V_D = V_{DRM}$ , $R_{GK} = 1\ \text{k}\Omega$	3	$\mu\text{A}$
		$T_J = 125^\circ\text{C}$ @ $V_D = V_{DRM}$ , $R_{GK} = 1\ \text{k}\Omega$	500	$\mu\text{A}$

**Thermal Resistances**

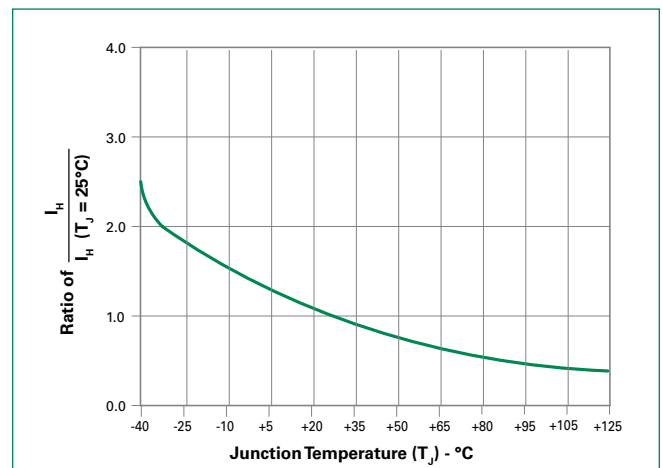
Symbol	Parameter	Value	Unit
$R_{\theta(JC)}$	Junction to case (AC)	75	$^\circ\text{C}/\text{W}$
$R_{\theta(JA)}$	Junction to ambient		150

$I_T = 0.8\ \text{A}$   $I_{RMS}$ , 60Hz AC resistive load condition, 100% conduction.

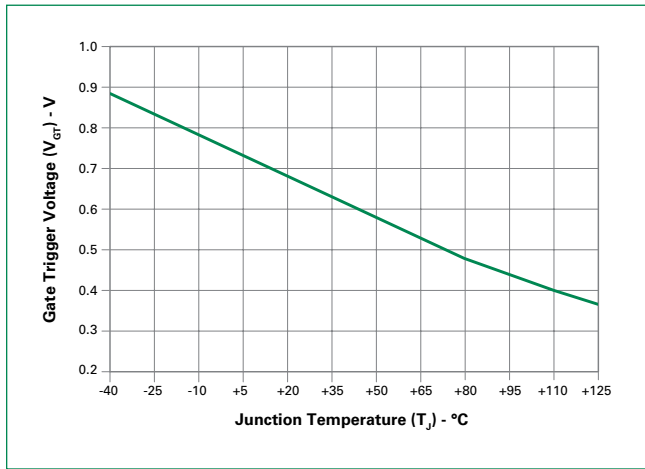
**Figure 1: Normalized DC Gate Trigger Current For All Quadrants vs. Junction Temperature**



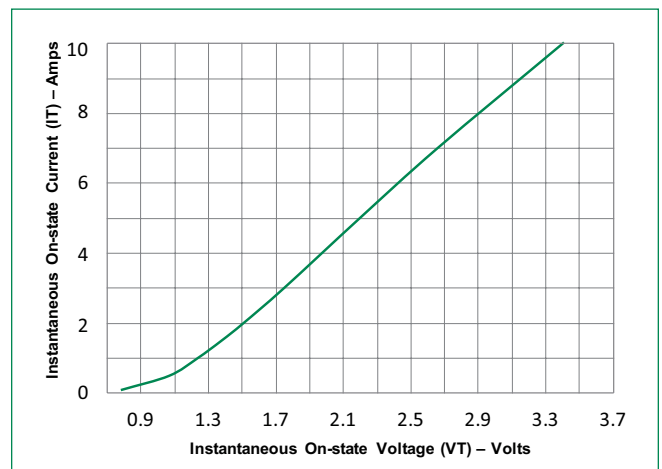
**Figure 2: Normalized DC Holding Current vs. Junction Temperature**



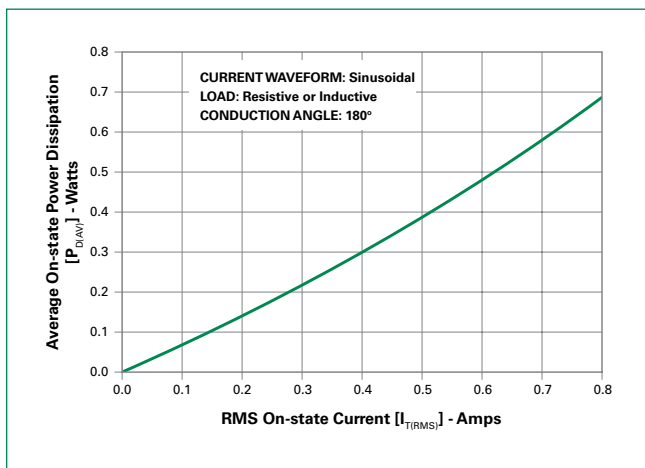
**Figure 3: DC Gate Trigger Voltage vs. Junction Temperature**



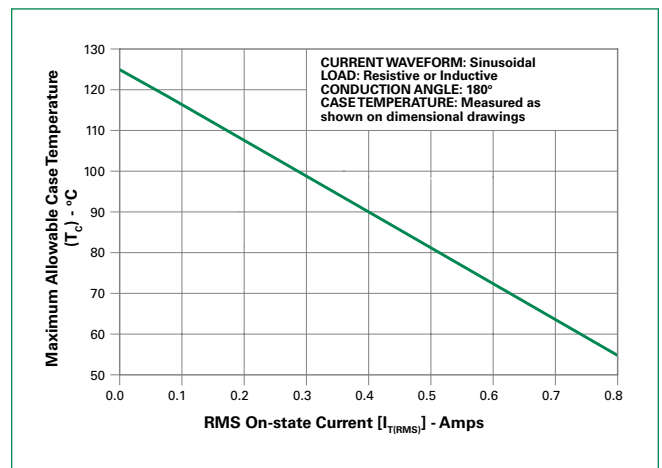
**Figure 4: On-State Current vs. On-State Voltage (Typical)**



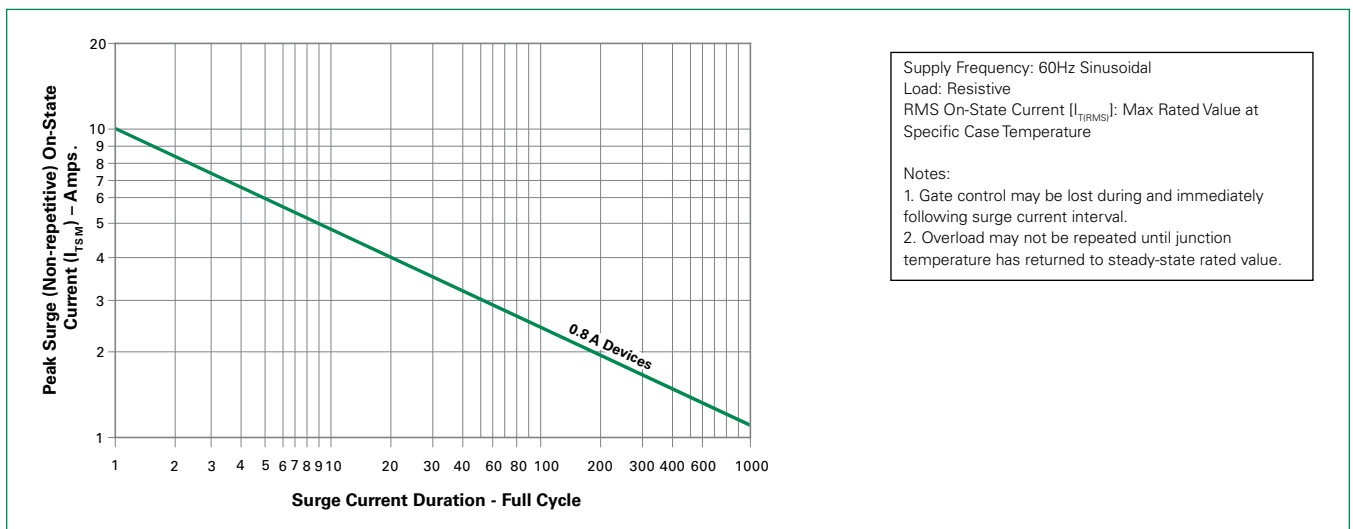
**Figure 5: Power Dissipation (Typical) vs. RMS On-State Current**



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

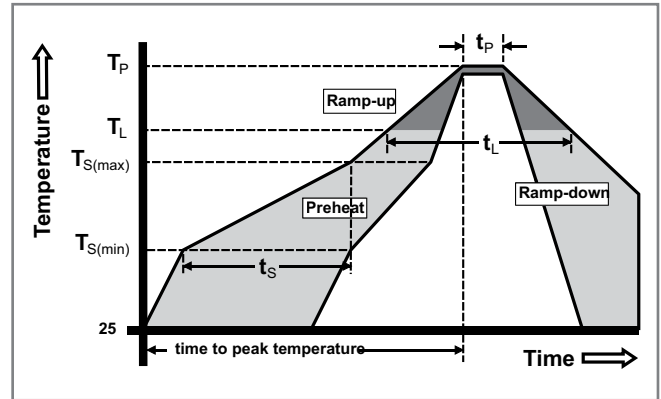


**Figure 7: Surge Peak On-State Current vs. Number of Cycles**



**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 (min to max) ( $t_s$ )	60 – 150 seconds
Peak Temperature ( $T_p$ )		260 <sup>+0/-5</sup> °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**

<b>Terminal Finish</b>	100% Matte Tin-plated.
<b>Body Material</b>	UL Recognized compound meeting flammability rating V-0.
<b>Lead Material</b>	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.

**Reliability/Environmental Tests**

Test	Specifications and Conditions
<b>AC Blocking</b>	MIL-STD-750, M-1040, Cond A Applied Peak AC voltage @ 125°C for 1008 hours
<b>Temperature Cycling</b>	MIL-STD-750, M-1051, 100 cycles; -40°C to +150°C; 15-min dwell-time
<b>Temperature/Humidity</b>	EIA / JEDEC, JESD22-A101 1008 hours; 320V - DC: 85°C; 85% rel humidity
<b>High Temp Storage</b>	MIL-STD-750, M-1031, 1008 hours; 150°C
<b>Low-Temp Storage</b>	1008 hours; -40°C
<b>Resistance to Solder Heat</b>	MIL-STD-750 Method 2031
<b>Solderability</b>	ANSI/J-STD-002, category 3, Test A
<b>Lead Bend</b>	MIL-STD-750, M-2036 Cond E