

$V_{DSS}$ , 60V $R_{DS(ON)}$ , 75m $\Omega$ (max.) @ $V_{GS}=10V$ $R_{DS(ON)}$ , 105m $\Omega$ (max.) @ $V_{GS}=4.5V$ $I_D$ , 3A	<b>SOT-23S</b>	

Description	Features
The SGN6090V uses advanced Trench technology and designs to provide excellent $R_{DS(ON)}$ with low gate charge. This device is suitable for use in PWM, load switching and general purpose applications.	<ul style="list-style-type: none"> <li>• Low On-Resistance</li> <li>• Low Input Capacitance</li> <li>• Low Miller Charge</li> <li>• Pb-free lead plating; RoHS compliant</li> </ul>
	Applications
	<ul style="list-style-type: none"> <li>• Lithium-Ion Secondary Batteries</li> <li>• Load Switch</li> <li>• DC-DC converters and Off-line UPS</li> </ul>

### Ordering Information

Ordering Code	RoHS Status	Package	Package Code	Packing	Quantity
SGN6090V	Halogen-Free	SOT-23S	V	Tape & Reel	3,000

### Absolute Maximum Ratings ( $T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	$T_A=25^\circ\text{C}$	3
		$T_A=70^\circ\text{C}$	2.4
Drain Current-Pulsed <small>Note 1</small>	$I_{DM}$	9	A
Maximum Power Dissipation	$P_D$	$T_A=25^\circ\text{C}$	1
		$T_C=25^\circ\text{C}$	0.6
Storage Temperature Range	$T_{STG}$	-55 to +150	$^\circ\text{C}$
Operating Junction Temperature Range	$T_J$	-55 to +150	$^\circ\text{C}$

### Thermal Resistance Ratings

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Maximum Junction-to-Ambient	$R_{\theta JA}$	Steady State	-	-	125	$^\circ\text{C}/\text{W}$
Maximum Junction-to-Case	$R_{\theta JC}$	Steady State	-	-	80	$^\circ\text{C}/\text{W}$

**Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

OFF CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>DS</sub> =250μA	60	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =48V, V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA

ON CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =250μA	1.2	-	2.5	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>DS</sub> =2A	-	60	75	mΩ
		V <sub>GS</sub> =4.5V, I <sub>DS</sub> =1A	-	72	105	mΩ
Forward Transconductance	g <sub>fs</sub>	V <sub>DS</sub> =5V, I <sub>D</sub> =2A	-	13	-	S

DYNAMIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1MHz	-	501	-	pF
Output Capacitance	C <sub>oss</sub>		-	37	-	
Reverse Transfer Capacitance	C <sub>rss</sub>		-	24	-	

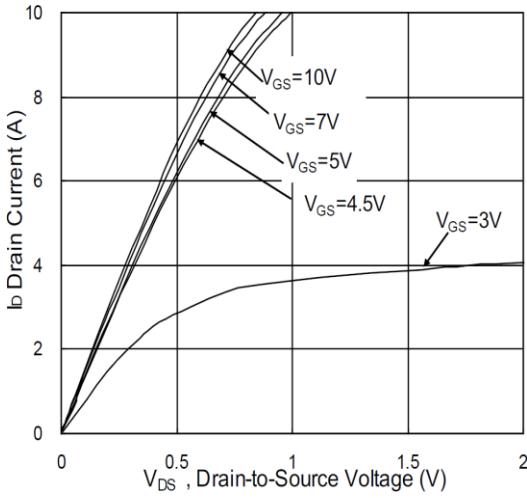
SWITCHING CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Turn-On Delay Time	T <sub>d(on)</sub>	V <sub>DS</sub> =30V, I <sub>D</sub> =2A, V <sub>GS</sub> =10V, R <sub>GEN</sub> =3.3Ω	-	1.5	-	ns
Rise Time	t <sub>r</sub>		-	7.1	-	
Turn-Off Delay Time	T <sub>d(off)</sub>		-	24	-	
Fall Time	t <sub>f</sub>		-	14.2	-	
Total Gate Charge at 10V	Q <sub>g</sub>	V <sub>DS</sub> =48V, I <sub>DS</sub> =2A, V <sub>GS</sub> =4.5V	-	4.9	-	nC
Gate to Source Gate Charge	Q <sub>gs</sub>		-	1.4	-	
Gate to Drain "Miller" Charge	Q <sub>gd</sub>		-	1.6	-	

DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =2A	-	-	1.2	V
Continuous Source Current	I <sub>S</sub>	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	-	-	3	A
Pulsed Source Current	I <sub>SM</sub>		-	-	9	A
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> =2A, dI/dt=100A/μs, T <sub>J</sub> =25°C	-	9.6	-	nS
Reverse Recovery Charge	Q <sub>rr</sub>		-	5.7	-	nC

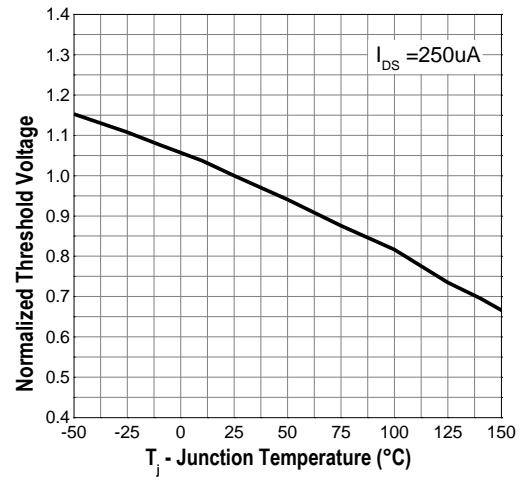
- Notes:**
1. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
  2. R<sub>θJA</sub> is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. R<sub>θJC</sub> is guaranteed by design while R<sub>θJA</sub> is determined by the user's board design. R<sub>θJA</sub> shown below for single device operation on FR-4 in still air.

Typical Operating Characteristics

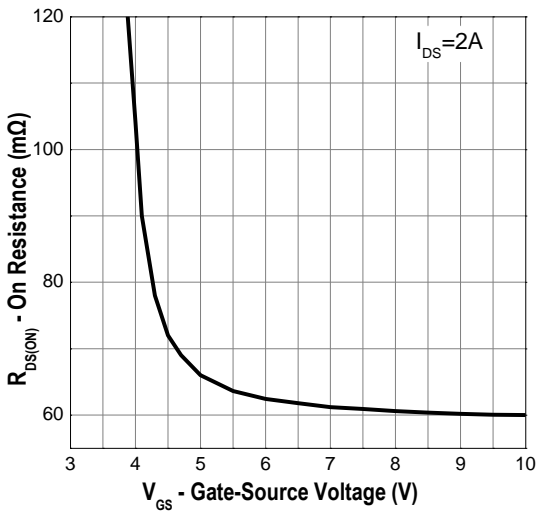
Output Characteristics



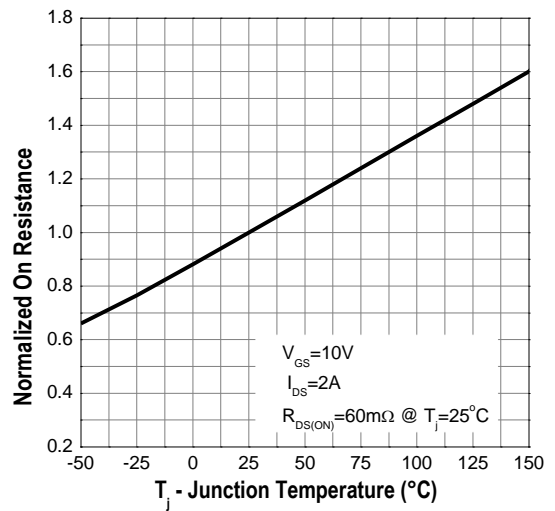
Gate Threshold Voltage



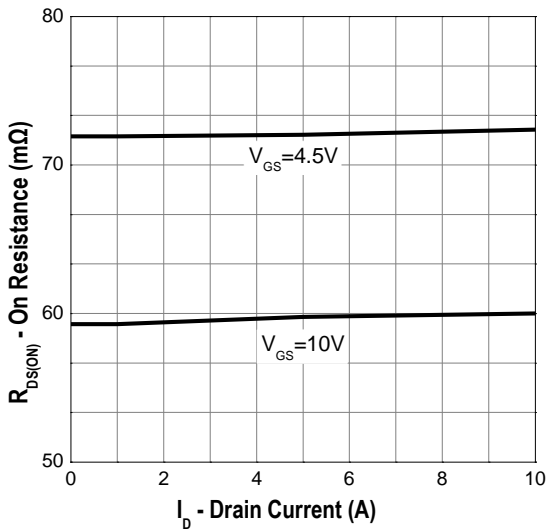
Gate-Source On Resistance



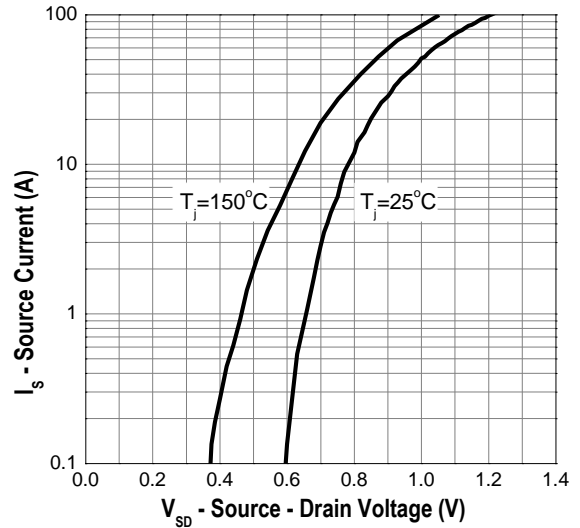
Drain-Source On Resistance



Drain-Source On Resistance

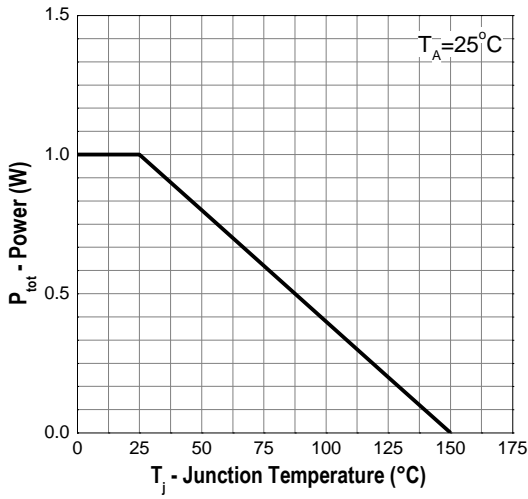


Source-Drain Diode Forward

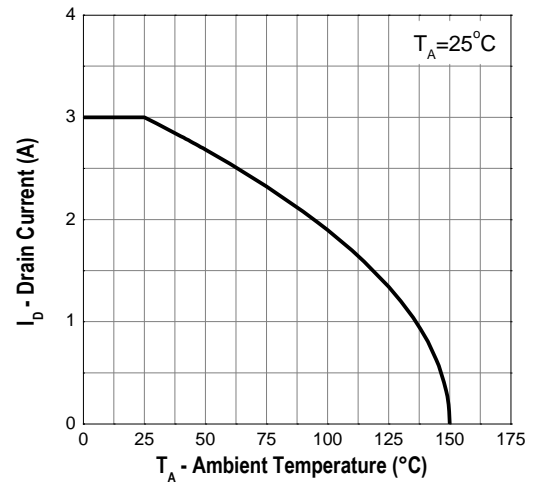


Typical Operating Characteristics (Cont.)

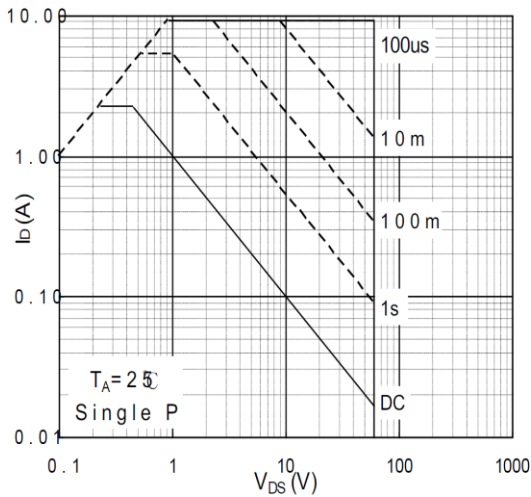
Power Dissipation



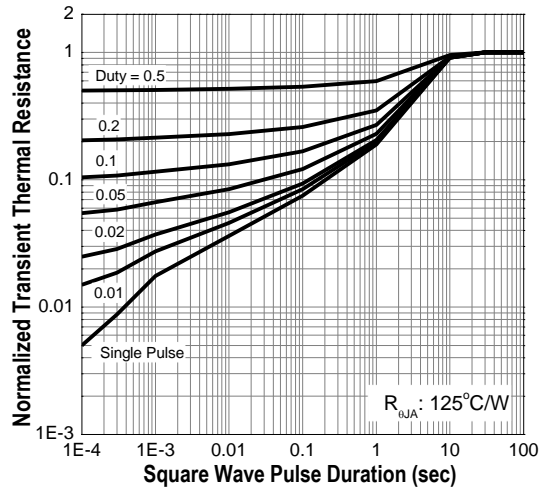
Drain Current



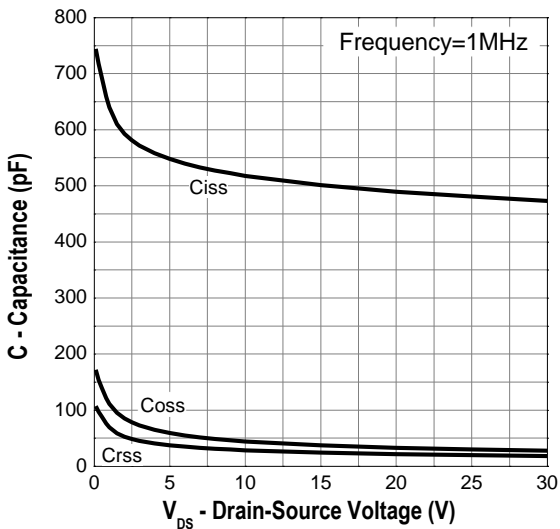
Safe Operation Area



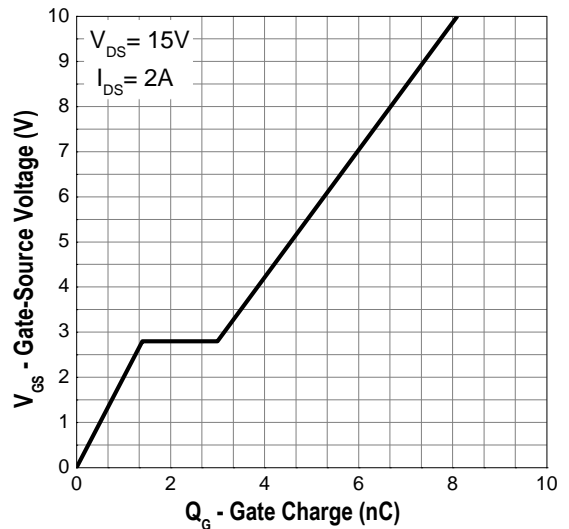
Transient Thermal Impedance



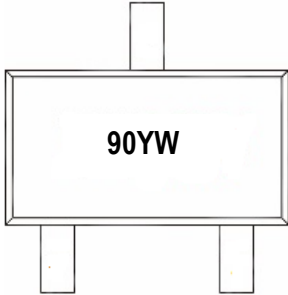
Capacitance



Gate Charge



## Marking Information

SOT-23S-3L (V)	Marking Rule
<p>Laser Marking</p> 	<p>Line 1 90YW</p> <p>90 : Product Code Y : Year Code W : Week Code</p> <p>Year Code / Week Code Description As Below</p>

## Year Code / Week Code Description

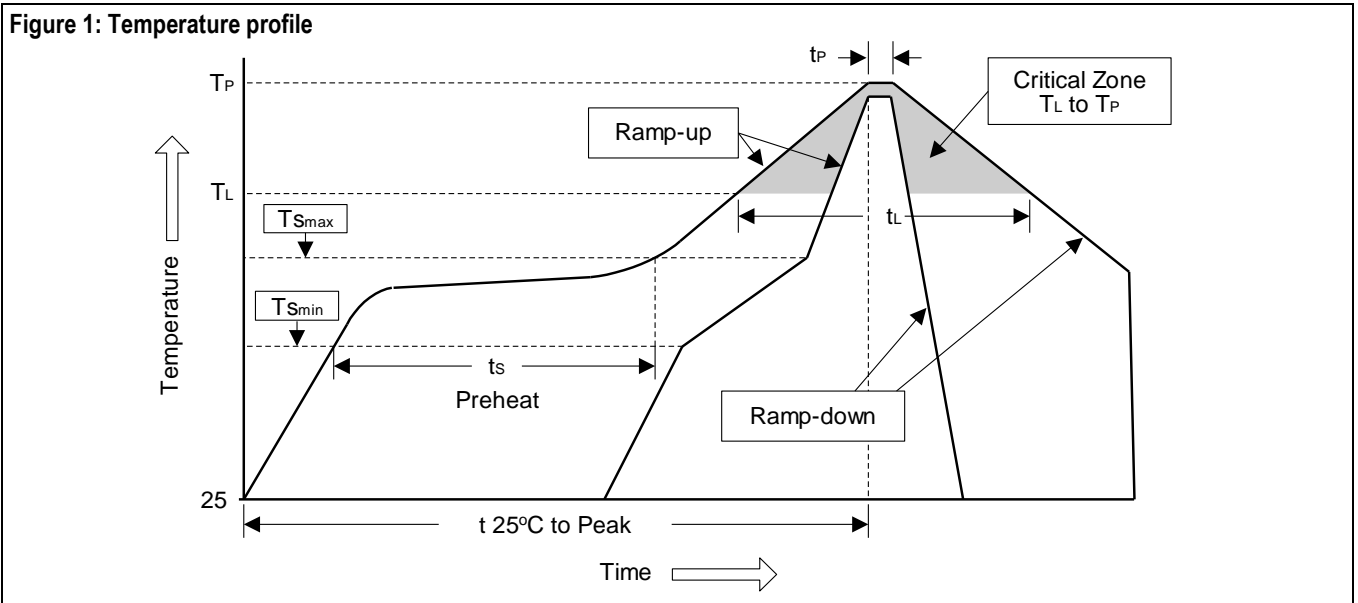
Year Code	Year	
0	2010	2020
1	2011	2021
2	2012	2022
3	2013	2023
4	2014	2024
5	2015	2025
6	2016	2026
7	2017	2027
8	2018	2028
9	2019	2029

Week Code	Week		Week Code	Week	
A	1	2	N	27	28
B	3	4	O	29	30
C	5	6	P	31	32
D	7	8	Q	33	34
E	9	10	R	35	36
F	11	12	S	37	38
G	13	14	T	39	40
H	15	16	U	41	42
I	17	18	V	43	44
J	19	20	W	45	46
K	21	22	X	47	48
L	23	24	Y	49	50
M	25	26	Z	51	52

## Soldering Methods for Silicongear's Products

1. Storage environment: Temperature=10°C to 35°C Humidity=65%±15%
2. Reflow soldering of surface-mount devices

Figure 1: Temperature profile



Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (TL to TP)	<3°C/sec	<3°C/sec
Preheat		
- Temperature Min (T <sub>smix</sub> )	100°C	150°C
- Temperature Max (T <sub>smix</sub> )	150°C	200°C
- Time (min to max) (ts)	60 to 120 sec	60 to 180 sec
T <sub>smix</sub> to TL		
- Ramp-up Rate	<3°C/sec	<3°C/sec
Time maintained above:		
- Temperature (TL)	183°C	217°C
- Time (t <sub>L</sub> )	60 to 150 sec	60 to 150 sec
Peak Temperature (TP)	240°C +0/-5°C	260°C +0/-5°C
Time within 5°C of actual Peak Temperature (tp)	10 to 30 sec	20 to 40 sec
Ramp-down Rate	<6°C/sec	<6°C/sec
Time 25°C to Peak Temperature	<6 minutes	<8 minutes

### 3. Flow (wave) soldering (solder dipping)

Products	Peak Temperature	Dipping Time
Pb devices.	245°C ±5°C	5sec ±1sec
Pb-Free devices.	260°C +0/-5°C	5sec ±1sec

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