

V_{DS} , 60V $R_{DS(ON)}$, 5m Ω (max.) @ $V_{GS}=10V$ I_D , 100A <small>Note 3</small>	PDFN 5x6-8L		

Description	Features
The SG60N03Q 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"> • Low On-Resistance • Low Input Capacitance • Low Miller Charge • Low Input / Output Leakage • Pb-free lead plating; RoHS compliant
	Applications <ul style="list-style-type: none"> • Lithium-Ion Secondary Batteries • Load Switch • DC-DC converters and Off-line UPS

Ordering Information

Ordering Code	RoHS Status	Package	Package Code	Packing	Quantity
SG60N03Q	Halogen-Free	PDFN 5x6-8L	Q	Tape & Reel	2,500

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}	± 25	V
Drain Current-Continuous <small>Note 1</small>	I_D	$T_C=25^\circ\text{C}$	100 <small>Note 3</small>
		$T_C=70^\circ\text{C}$	100 <small>Note 3</small>
Drain Current-Pulsed <small>Note 1,</small>	I_{DM}	350	A
Drain Current-Continuous	I_D	$T_A=25^\circ\text{C}$	17
		$T_A=70^\circ\text{C}$	14
Avalanche Current, $L=0.5\text{mH}$	I_{AS}	26	A
Avalanche Energy, $L=0.5\text{mH}$	E_{AS}	169	mJ
Maximum Power Dissipation	P_D	$T_C=25^\circ\text{C}$	83
		$T_C=70^\circ\text{C}$	53
		$T_A=25^\circ\text{C}$	3.6
		$T_A=70^\circ\text{C}$	2.3
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	-	-	35	$^\circ\text{C/W}$
Maximum Junction-to-Case	$R_{\theta JC}$	Steady State	-	-	1.5	$^\circ\text{C/W}$

Electrical Characteristics (T_J=25°C unless otherwise noted)

OFF CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _{DS} =250μA	60	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =48V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage	I _{GSS}	V _{GS} =±25V, V _{DS} =0V	-	-	±100	nA

ON CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} =V _{GS} , I _D =250μA	2	3	4	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _{DS} =20A	-	-	5	mΩ

DYNAMIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C _{iss}	V _{DS} =30V, V _{GS} =0V, f=1MHz	-	3686	-	pF
Output Capacitance	C _{oss}		-	357	-	
Reverse Transfer Capacitance	C _{rss}		-	124	-	
Gate Resistance	R _g	V _{GS} =0V, V _{DS} =0V, f=1MHz	-	1.5	-	Ω

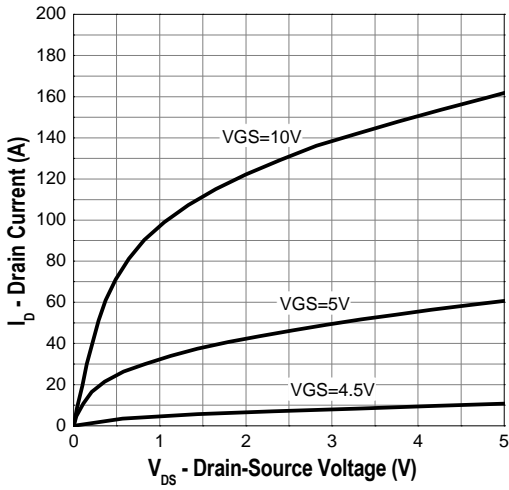
SWITCHING CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Turn-On Delay Time	T _{d(on)}	V _{DS} =30V, I _D =20A, V _{GS} =10V, R _{GEN} =3Ω	-	12	-	ns
Rise Time	t _r		-	4	-	
Turn-Off Delay Time	T _{d(off)}		-	50	-	
Fall Time	t _f		-	6	-	
Total Gate Charge at 10V	Q _g	V _{DS} =30V, I _{DS} =20A, V _{GS} =10V	-	50	-	nC
Gate to Source Gate Charge	Q _{gs}		-	15	-	
Gate to Drain "Miller" Charge	Q _{gd}		-	2.5	-	

DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _{DS} =20A	-	0.8	1.3	V
Body Diode Reverse Recovery Time	t _{rr}	I _F =20A, di/dt=100A/μs	-	22	-	ns
Body Diode Reverse Recovery Charge	Q _{rr}		-	120	-	nC

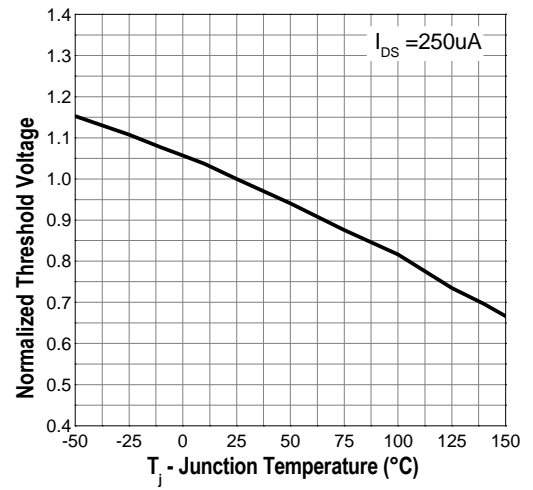
- Notes:**
1. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
 2. R_{θJA} is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. R_{θJC} is guaranteed by design while R_{θCA} is determined by the user's board design. R_{θJA} shown below for single device operation on FR-4 in still air.
 3. The maximum current rating is limited by package.

Typical Operating Characteristics

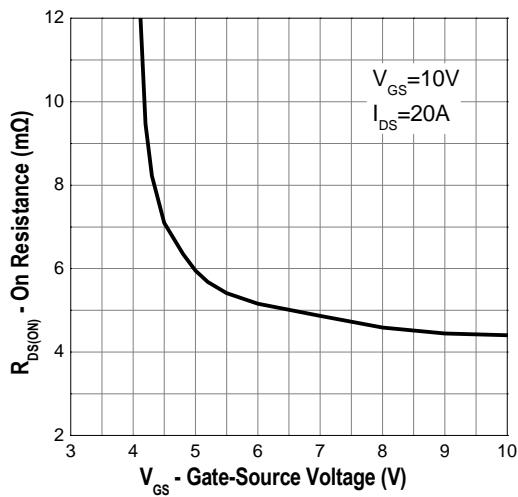
Output Characteristics



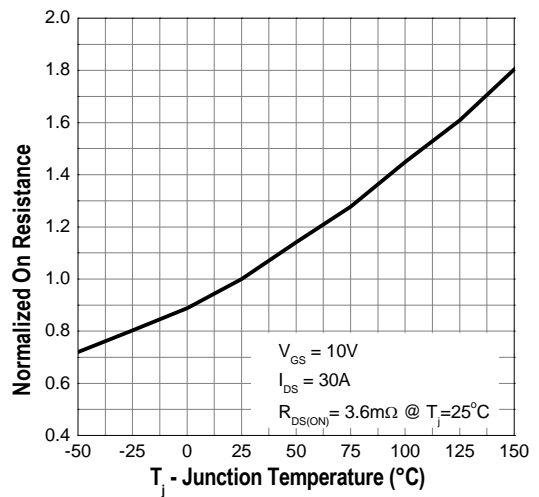
Gate Threshold Voltage



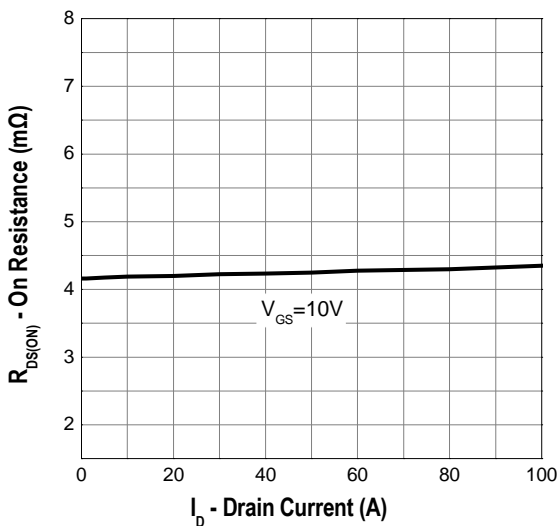
Gate-Source On Resistance



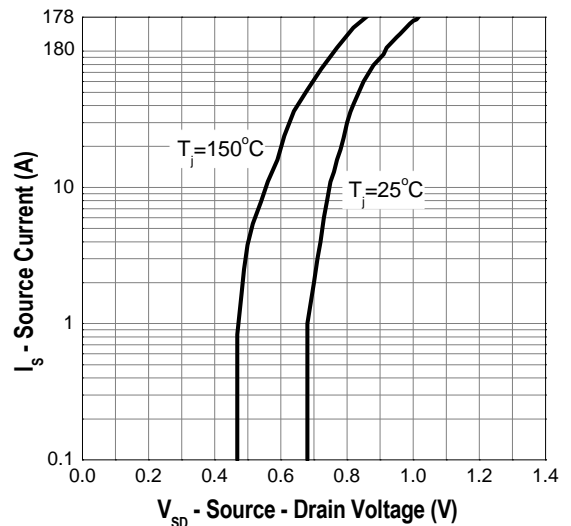
Drain-Source On Resistance



Drain-Source On Resistance

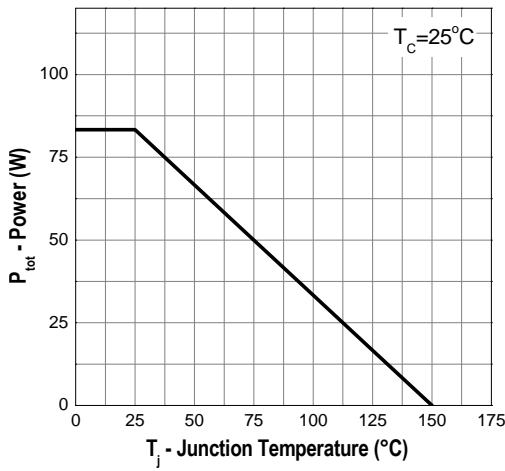


Source-Drain Diode Forward

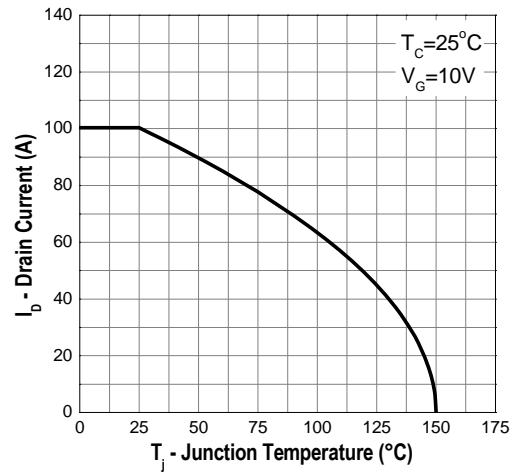


Typical Operating Characteristics (Cont.)

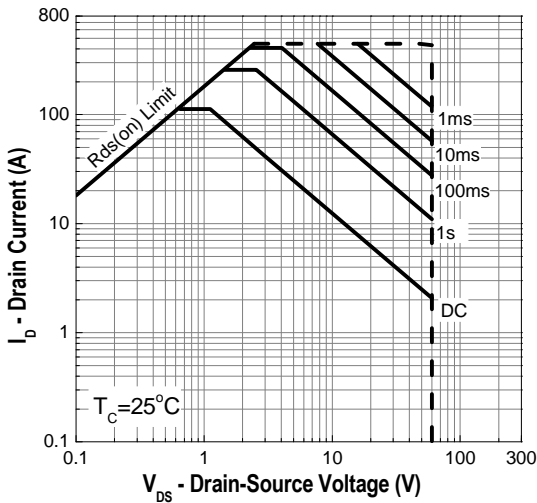
Power Dissipation



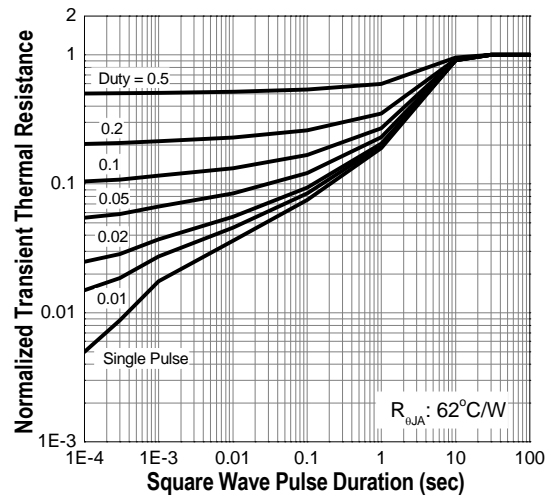
Drain Current



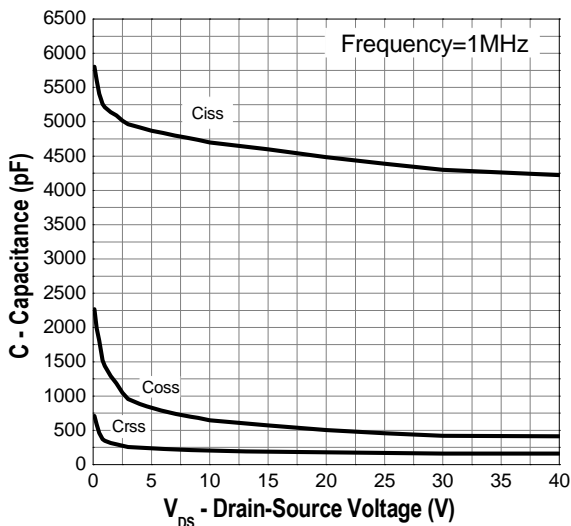
Safe Operation Area



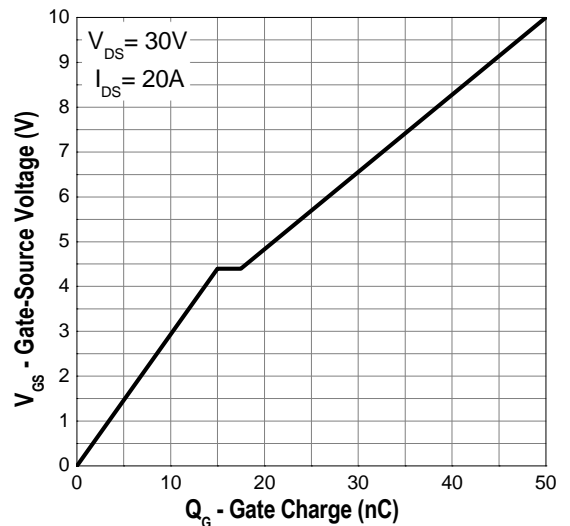
Transient Thermal Impedance




Capacitance



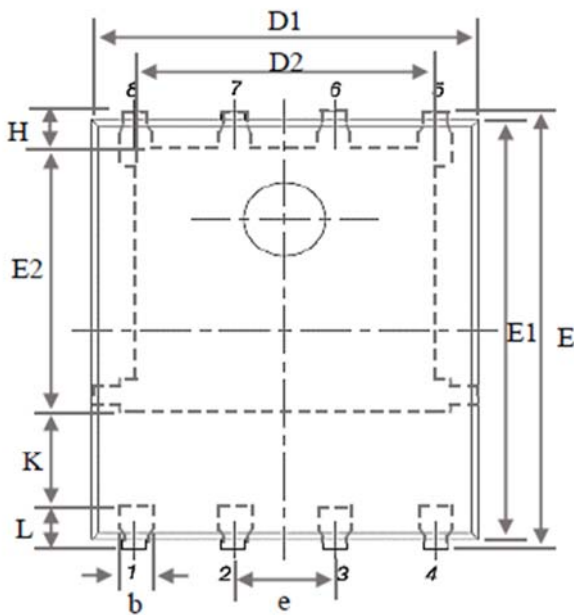
Gate Charge



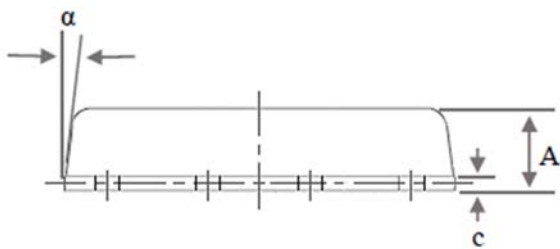
Marking Information

PDFN 5x6-8L (Q)	Marking Rule
<p>Laser Marking</p>  <p>Diagram</p>	<p><u>Line 1</u> : Device SG60N03Q</p> <p><u>Line 2</u> : Date Code YYMMXXX</p> <p>YY : Year Code MM : Month Code XXX : Serial Number</p>

Package of Dimension



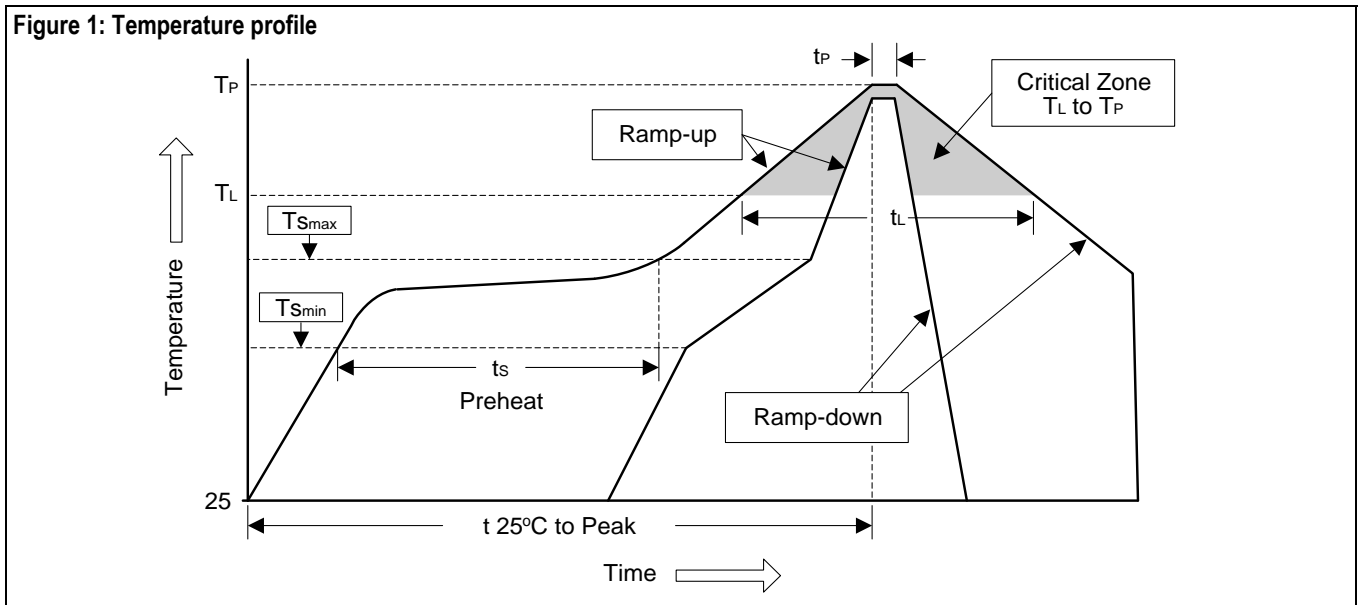
Symbol	Min	Nor	Max
A	0.90	1.04	1.17
b	0.33	0.42	0.51
C	0.06	0.20	0.35
D1	4.80	5.10	5.40
D2	3.61	3.96	4.31
E	5.90	6.03	6.15
E1	5.65	5.75	5.85
E2	3.30	3.54	3.78
e	1.27 BSC		
H	0.38	0.50	0.61
L	0.38	0.55	0.71
L1	0.05	0.15	0.25



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 (T_L to T_P)	<3°C/sec	<3°C/sec
Preheat		
- Temperature Min (T_{Smin})	100°C	150°C
- Temperature Max (T_{Smax})	150°C	200°C
- Time (min to max) (t_s)	60 to 120 sec	60 to 180 sec
T_{Smax} to T_L		
- Ramp-up Rate	<3°C/sec	<3°C/sec
Time maintained above:		
- Temperature (T_L)	183°C	217°C
- Time (t_L)	60 to 150 sec	60 to 150 sec
Peak Temperature (T_P)	240°C +0/-5°C	260°C +0/-5°C
Time within 5°C of actual Peak Temperature (t_P)	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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