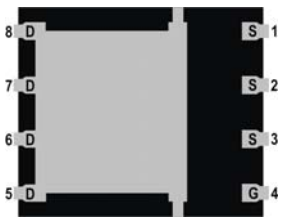
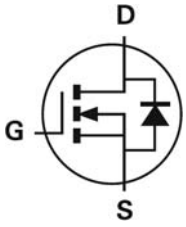
SG40N01LQ

40V N-Channel Power MOSFET

V_{DSS} , 40V $R_{DS(ON)}$, 2.5mΩ (max.) @ V_{GS}=10V $R_{DS(ON)}$, 2.8mΩ (max.) @ V_{GS}=4.5V I_D , 100A Note 3	PDFN 5x6-8L  	

Description

The SG40N01LQ 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.

Features

- Low On-Resistance
- Low Input Capacitance
- Low Miller Charge
- Low Input / Output Leakage
- Pb-free lead plating; RoHS compliant

Applications

- Lithium-Ion Secondary Batteries
- Load Switch
- DC-DC converters and Off-line UPS

Ordering Information

Ordering Code	RoHS Status	Package	Package Code	Packing	Quantity
SG40N01LQ	Halogen-Free	PDFN 5x6-8L	Q	Tape & Reel	2,500

Absolute Maximum Ratings (T_A=25°C unless otherwise noted)

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	40	V
Gate-Source Voltage		V_{GS}	±20	V
Drain Current-Continuous Note 1	T_C=25°C	I_D	100 Note 3	A
	T_C=70°C		100 Note 3	A
Drain Current-Pulsed Note 1		I_{DM}	400	A
Drain Current-Continuous	T_A=25°C	I_D	31	A
	T_A=70°C		25	A
Avalanche Current		I_{AS}	63.5	A
Avalanche Energy, L=0.1mH		E_{AS}	201	mJ
Maximum Power Dissipation	T_C=25°C	P_D	83	W
	T_C=70°C		53	W
	T_A=25°C		3.6	W
	T_A=70°C		2.3	W
Storage Temperature Range		T_{STG}	-55 to +150	°C
Operating Junction Temperature Range		T_J	-55 to +150	°C

Thermal Resistance Ratings

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Maximum Junction-to-Ambient Note 2	$R_{\theta JA}$	Steady State	-	-	35	°C/W
Maximum Junction-to-Case	$R_{\theta JC}$	Steady State	-	-	1.5	°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	40	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=32V, V_{GS}=0V	-	-	1	μA
Gate-Body Leakage	I_{GSS}	V_{GS}=±20V, 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_{DS}=250μA	1.3	-	2.4	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_{DS}=30A	-	2.2	2.5	mΩ
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=4.5V, I_{DS}=15A	-	2.5	2.8	mΩ

DYNAMIC CHARACTERISTICS						
Parameter	**Symbol**	**Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Input Capacitance	C_{iss}	V_{DS}=20V, V_{GS}=0V, f=1MHz	-	4222	-	pF
Output Capacitance	C_{oss}		-	889	-	
Reverse Transfer Capacitance	C_{rss}		-	398	-	
Gate Resistance	R_g	V_{GS}=0V, V_{DS}=0V, f=1MHz	-	2.2	3	Ω

SWITCHING CHARACTERISTICS						
Parameter	**Symbol**	**Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Turn-On Delay Time	$T_{d(on)}$	V_{DS}=20V, I_{DS} =30A, V_{GS}=10V, R_{GEN}=3Ω	-	21	-	ns
Rise Time	t_r		-	6	-	
Turn-Off Delay Time	$T_{d(off)}$		-	98	-	
Fall Time	t_f		-	17	-	
Total Gate Charge at 10V	Q_g	V_{DS}=20V, I_{DS}=30A, V_{GS}=10V	-	78	-	nC
Gate to Source Gate Charge	Q_{gs}		-	22	-	
Gate to Drain “Miller” Charge	Q_{gd}		-	4.7	-	

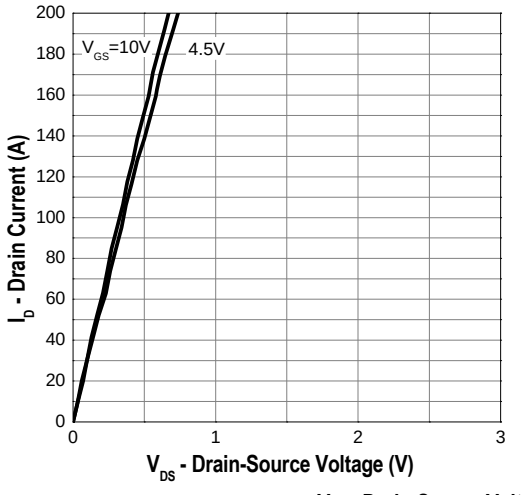
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Parameter	**Symbol**	**Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Drain-Source Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_{DS}=30A	-	-	1.3	V
Body Diode Reverse Recovery Time	t_{rr}	I_F=30A, dI/dt=100A/μs	-	32	-	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	120	-	nC

Notes:

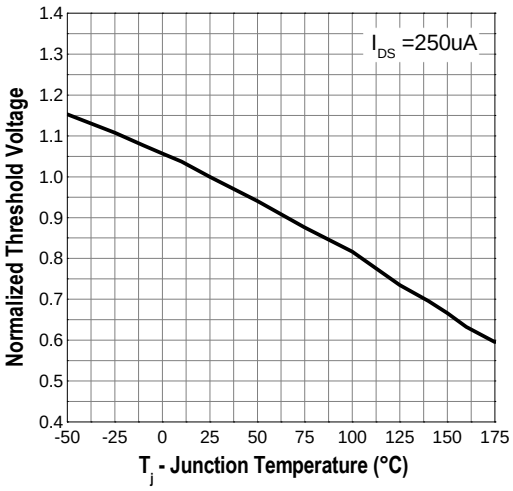
1. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
2. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$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

Typical Operating Characteristics

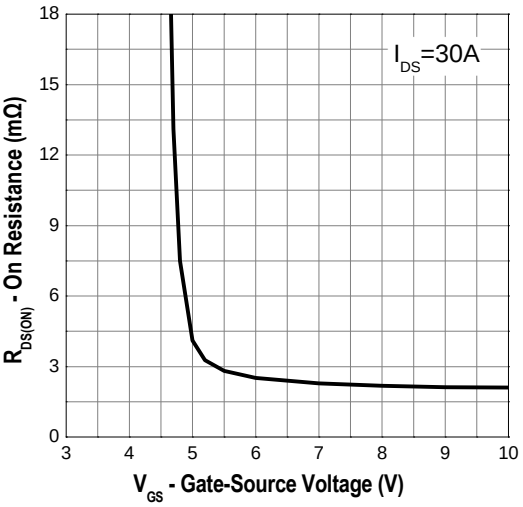
Output Characteristics



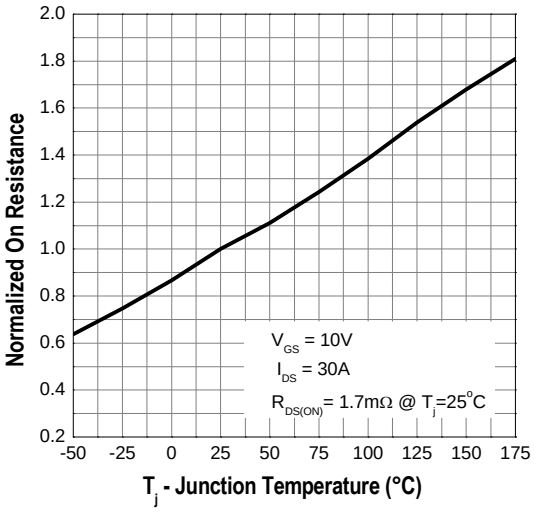
Gate Threshold Voltage



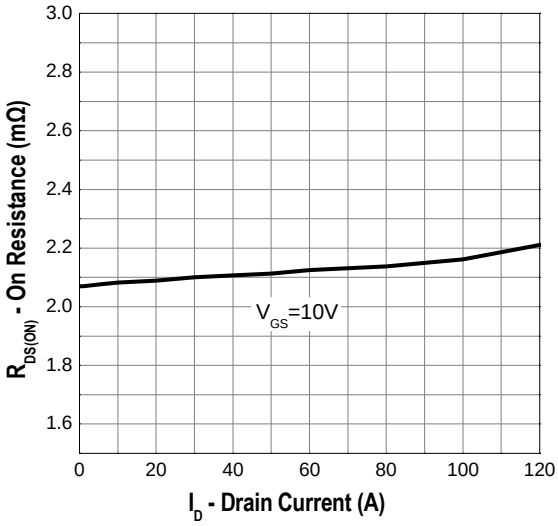
Gate-Source On Resistance



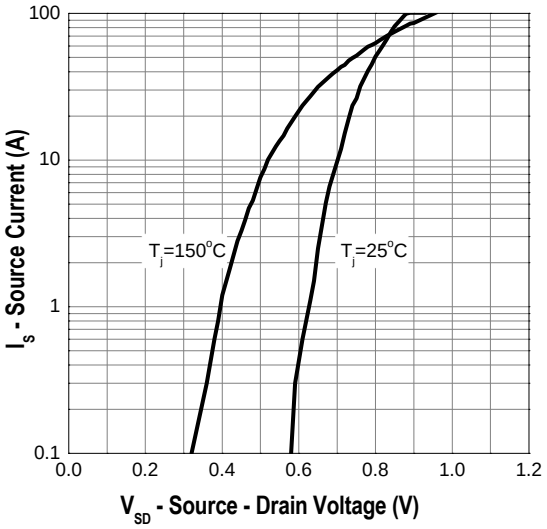
Drain-Source On Resistance



Drain-Source On Resistance

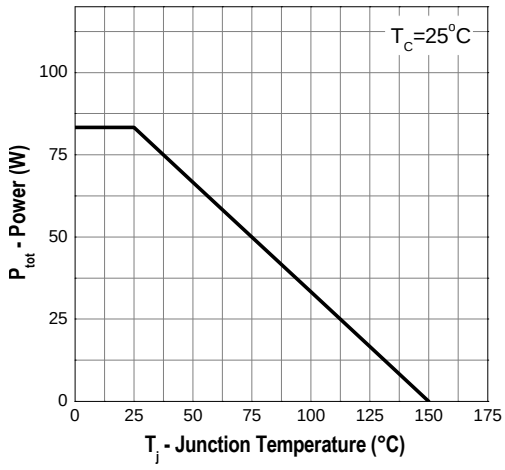


Source-Drain Diode Forward

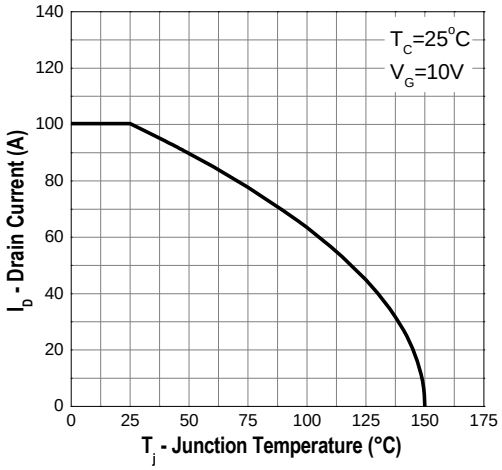


Typical Operating Characteristics (Cont.)

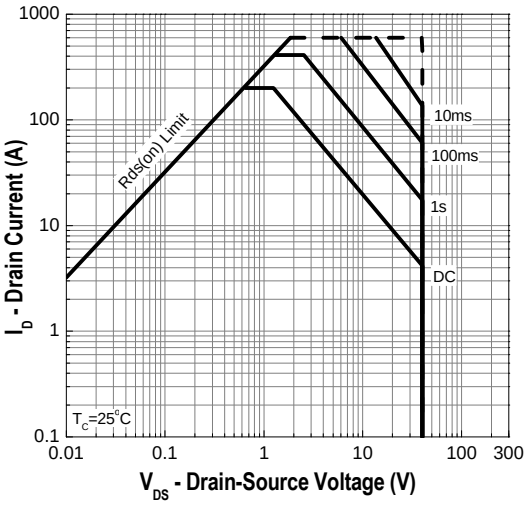
Power Dissipation



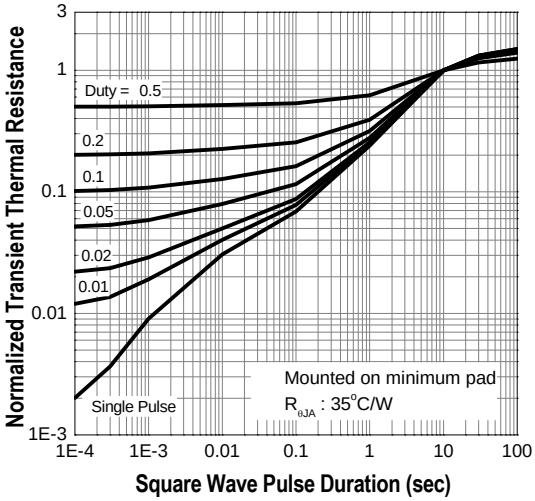
Drain Current



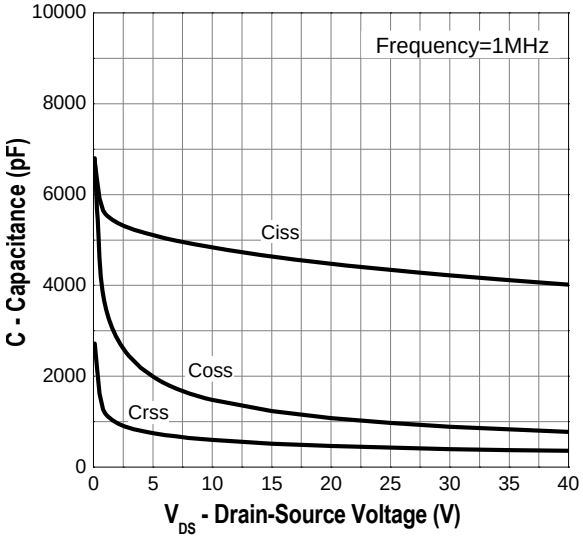
Safe Operation Area



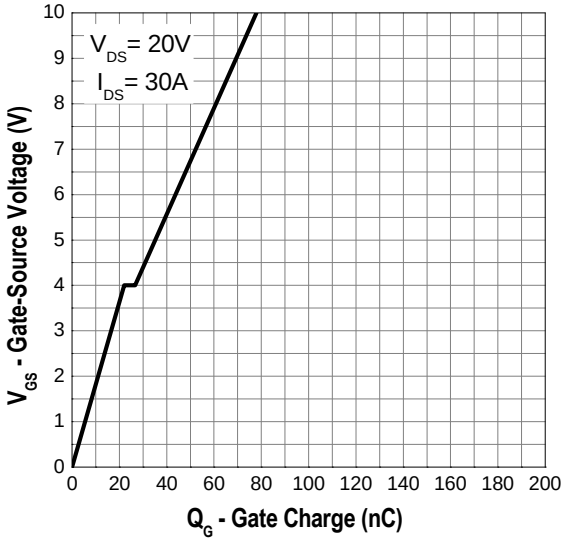
Transient Thermal Impedance



Capacitance



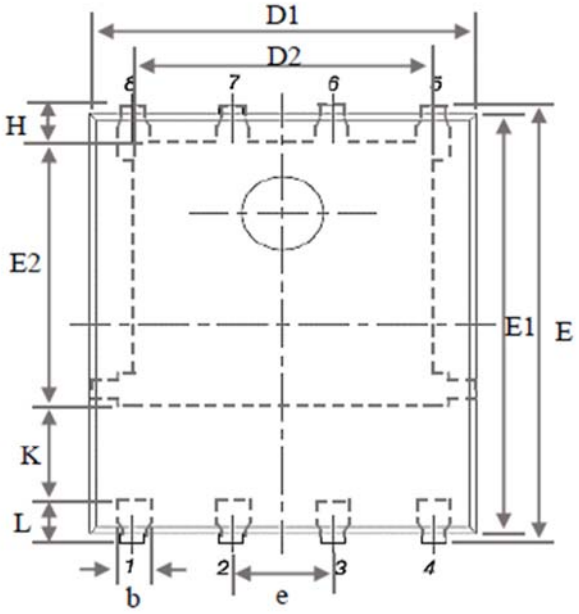
Gate Charge

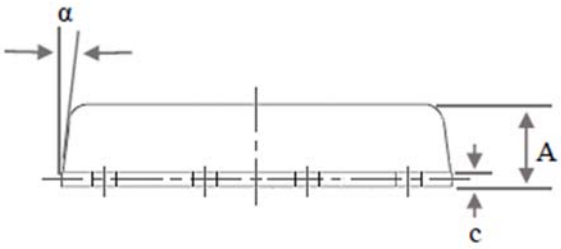


Marking Information

PDFN 5x6-8L (Q)	Marking Rule
Laser Marking  Diagram	Line 1：Device SG40N01LQ Line 2：Date Code YYMMXXX YY：Year Code MM：Month Code XXX：Serial Number

Package of Dimension



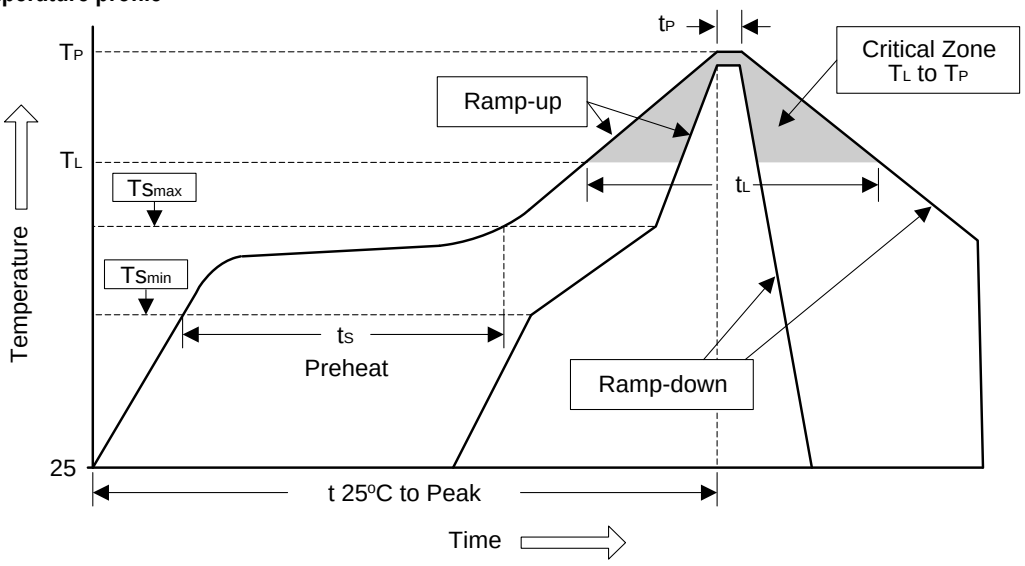


Symbol	Min	Nor	Max
A	0.90	1.04	1.17
b	0.33	0.42	0.51
C	0.06	0.20	0.35
D1	4.80	5.10	5.40
D2	3.61	3.96	4.31
E	5.90	6.03	6.15
E1	5.65	5.75	5.85
E2	3.30	3.54	3.78
e	1.27 BSC		
H	0.38	0.50	0.61
L	0.38	0.55	0.71
L1	0.05	0.15	0.25

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 (Ts_{min}) - Temperature Max (Ts_{max}) - Time (min to max) (ts)	 100°C 150°C 60 to 120 sec	 150°C 200°C 60 to 180 sec
Tsmax to T_L - Ramp-up Rate	 <3°C/sec	 <3°C/sec
Time maintained above: - Temperature (T_L) - Time (t_L)	 183°C 60 to 150 sec	 217°C 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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