



SILICONGEAR

SG40N01Q

40V N-CHANNEL POWER MOSFET

V_{DSS} , 40V $R_{DS(ON)}$, 2.3m Ω (max.) @ $V_{GS}=10V$ I_D , 100A ^{Note 3}	PDFN-8 5x6		

Description	Features
The SG40N01Q 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
	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
SG40N01Q	Halogen-Free	PDFN-8 5x6	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}	40	V
Gate-Source Voltage		V_{GS}	± 20	V
Drain Current-Continuous ^{Note 1}	$T_C=25^\circ\text{C}$	I_D	100 ^{Note 3}	A
	$T_C=70^\circ\text{C}$		100 ^{Note 3}	A
Drain Current-Pulsed ^{Note 1}		I_{DM}	400	A
Drain Current-Continuous	$T_A=25^\circ\text{C}$	I_D	31	A
	$T_A=70^\circ\text{C}$		25	A
Avalanche Current		I_{AS}	63.5	A
Avalanche Energy, $L=0.1\text{mH}$		E_{AS}	201	mJ
Maximum Power Dissipation	$T_C=25^\circ\text{C}$	P_D	83	W
	$T_C=70^\circ\text{C}$		53	W
	$T_A=25^\circ\text{C}$		3.6	W
	$T_A=70^\circ\text{C}$		2.3	W
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 ^{Note 2}	$R_{\theta JA}$	Steady State	-	-	35	$^\circ\text{C/W}$
Maximum Junction-to-Case	$R_{\theta JC}$	Steady State	-	-	1.5	$^\circ\text{C/W}$



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

OFF CHARACTERISTICS

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_{DS}=250\mu A$	40	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=32V, V_{GS}=0V$	-	-	1	μA
Gate-Body Leakage	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA

ON CHARACTERISTICS

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_{DS}=250\mu A$	2	3	4	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_{DS}=30A$	-	1.8	2.3	m Ω

DYNAMIC CHARACTERISTICS

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C_{iss}	$V_{DS}=20V, V_{GS}=0V, f=1\text{MHz}$	-	4222	-	pF
Output Capacitance	C_{oss}		-	889	-	
Reverse Transfer Capacitance	C_{rss}		-	398	-	

SWITCHING CHARACTERISTICS

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Turn-On Delay Time	$T_{d(on)}$	$V_{DS}=20V, I_{DS}=30A, V_{GS}=10V, R_{GEN}=3\Omega$	-	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}	$I_F=30A, di/dt=100A/\mu s$	-	32	-	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	120	-	nC

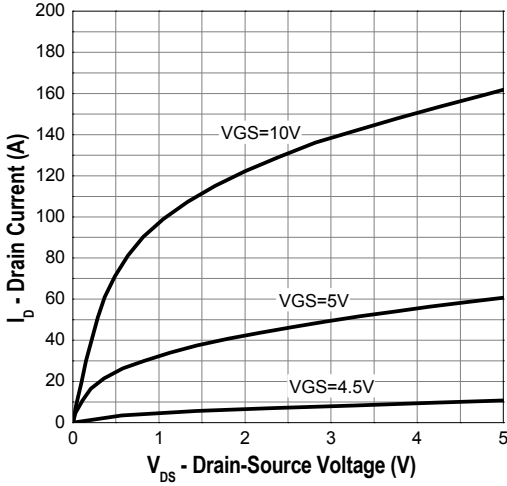
Notes:

- Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
- $R_{\theta JA}$ 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 $R_{\theta CA}$ is determined by the user's board design. $R_{\theta JA}$ shown below for single device operation on FR-4 in still air.
- The maximum current rating is limited by package.

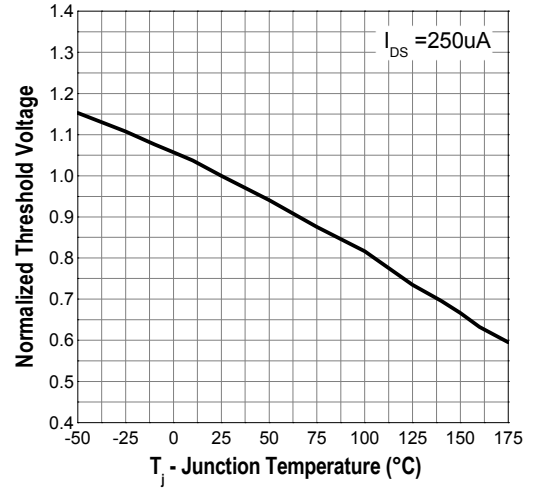


Typical Operating Characteristics

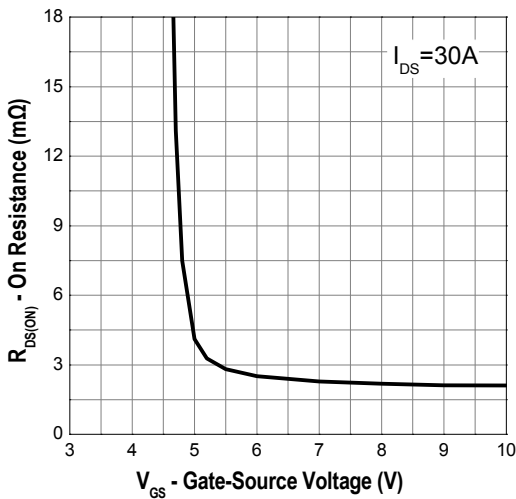
Output Characteristics



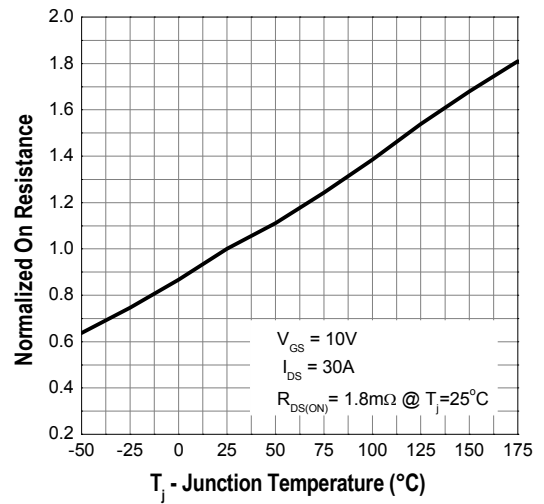
Gate Threshold Voltage



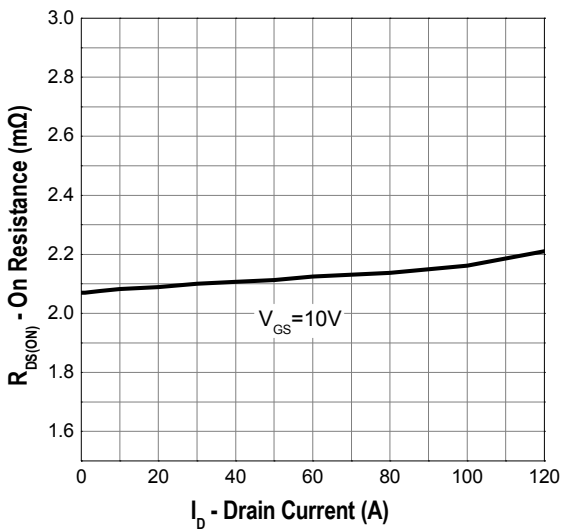
Gate-Source On Resistance



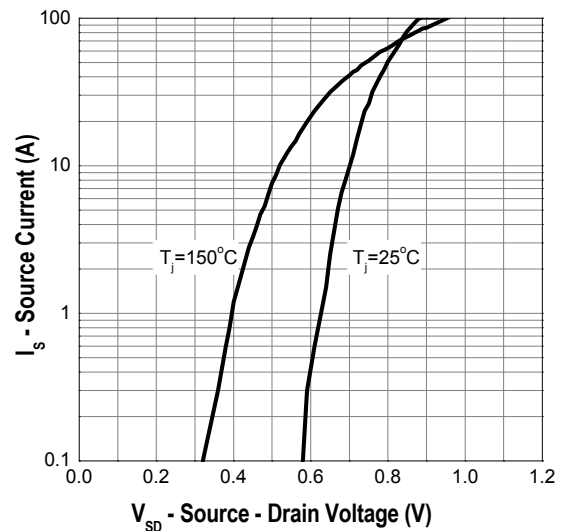
Drain-Source On Resistance



Drain-Source On Resistance



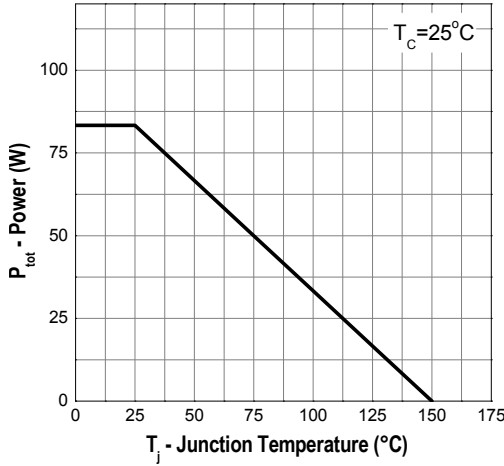
Source-Drain Diode Forward



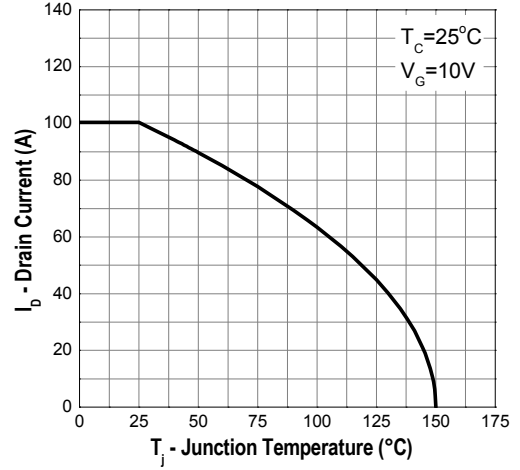


Typical Operating Characteristics (Cont.)

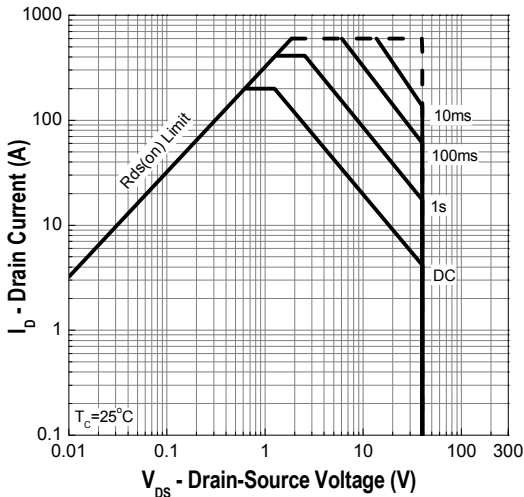
Power Dissipation



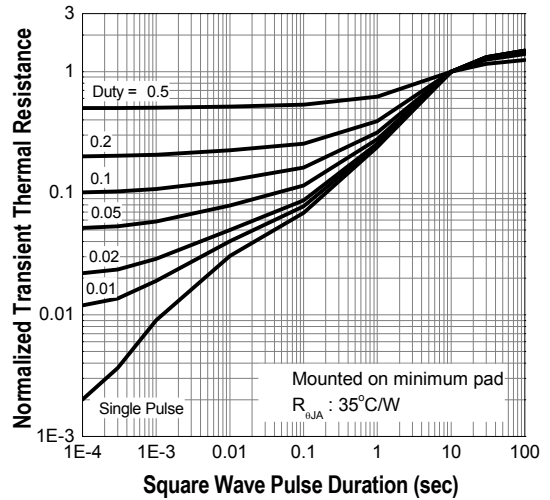
Drain Current



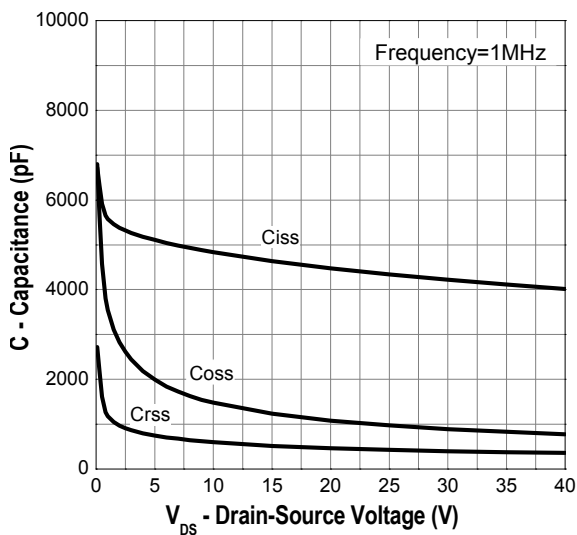
Safe Operation Area



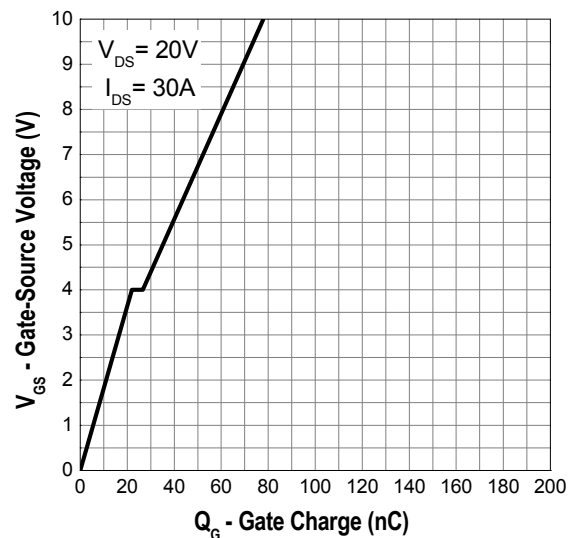
Transient Thermal Impedance



Capacitance



Gate Charge



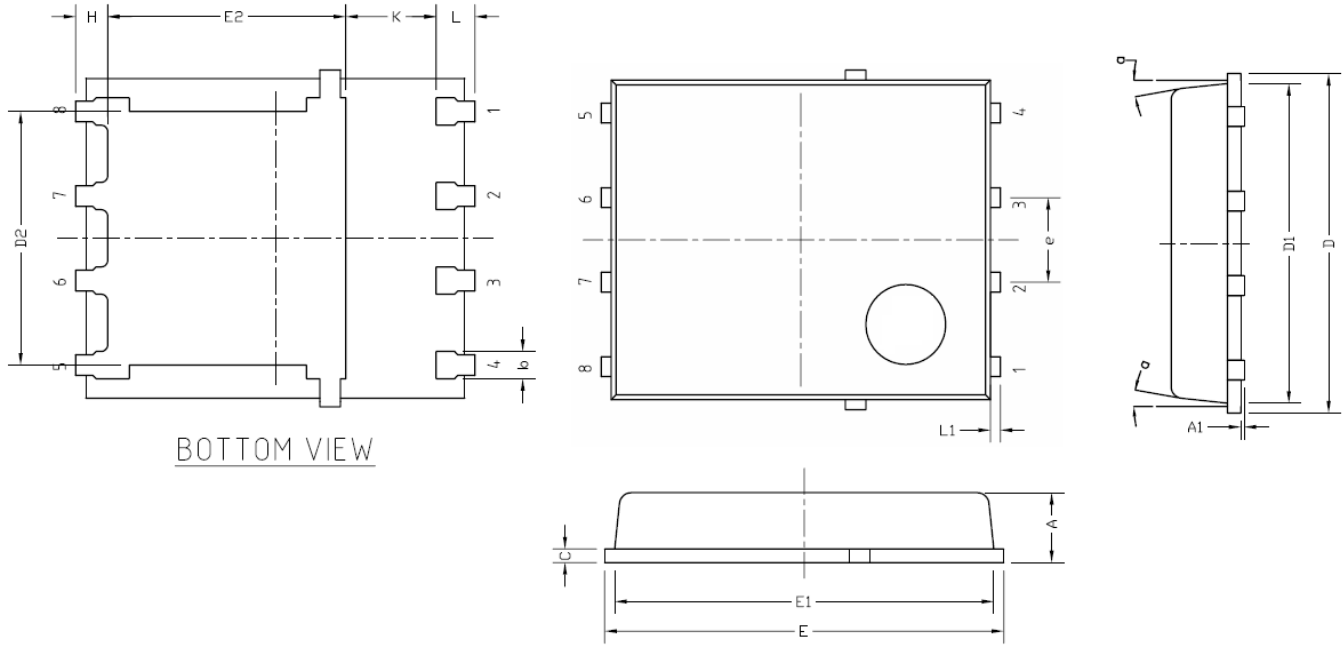


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Package Outline



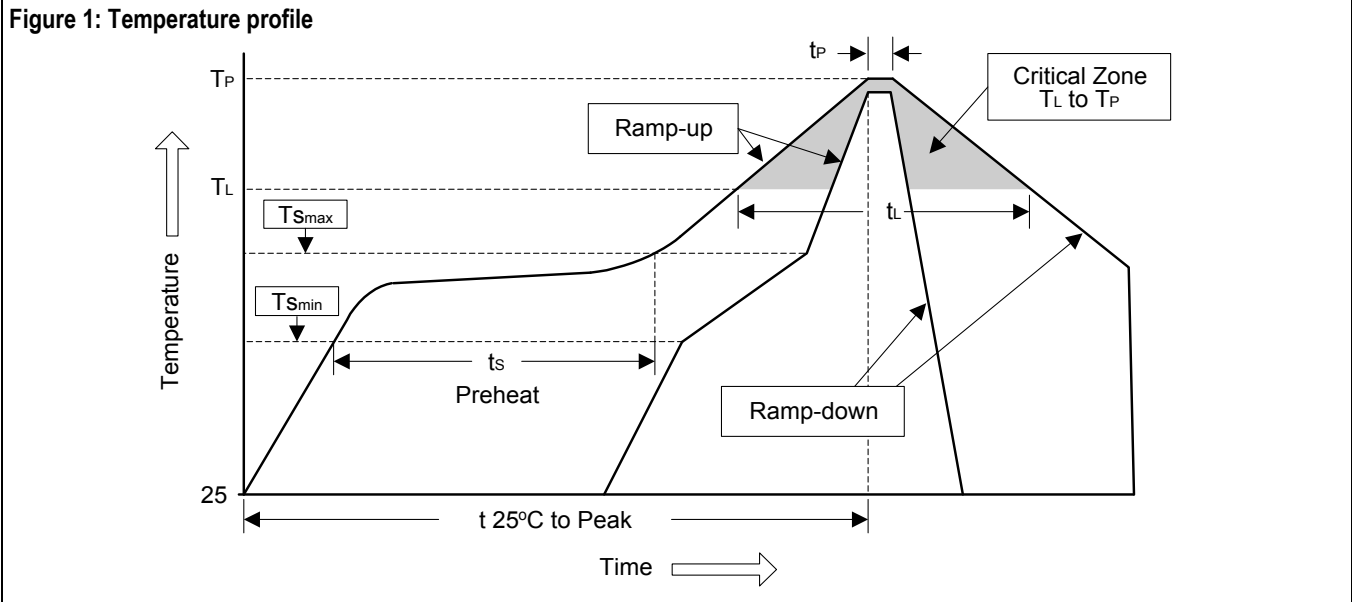
BOTTOM VIEW

PDFN-8 5x6 Dimensions						
Symbols	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.80	0.95	1.10	0.031	0.037	0.043
A1	0.00	0.05	0.10	0.000		0.004
b	0.33	0.41	0.51	0.013	0.016	0.020
c		0.254 REF			0.010 REF	
D	4.80	5.00	5.25	0.189	0.197	0.207
D1	4.80	4.90	5.10	0.189	0.193	0.201
D2	3.61	3.92	4.02	0.142	0.154	0.158
E	5.90	6.00	6.25	0.232	0.236	0.246
E1	5.70	5.80	6.00	0.224	0.228	0.236
E2		3.0 REF			0.118 REF	
e		1.27 BSC			0.050 BSC	
H	0.41	0.61	0.71	0.016	0.024	0.028
K	1.07			0.042		
L	0.51	0.61	0.71	0.020	0.024	0.028
L1	0.06	0.13	0.20	0.002	0.005	0.008
α	0°	6°	12°	0°	10°	12°



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



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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