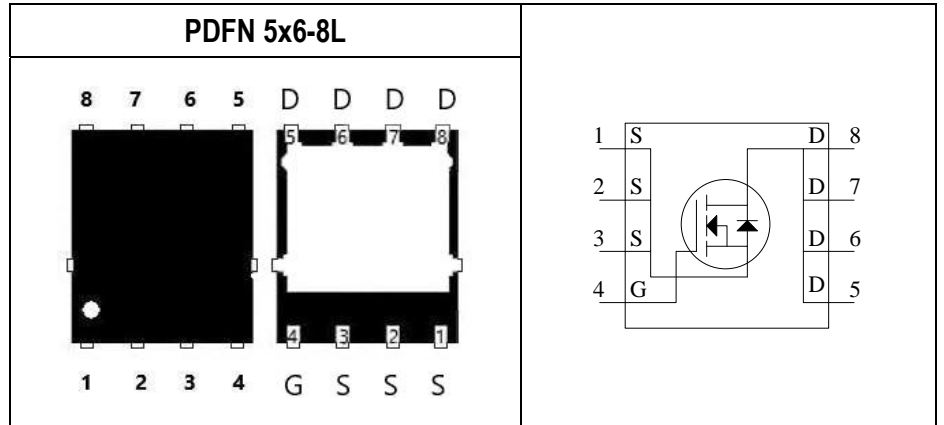


Parameter	Value	Unit
$V_{DSS}$	30	V
$R_{DS(ON) max. V_{GS}=10V}$	6.0	m $\Omega$
$R_{DS(ON) max. V_{GS}=4.5V}$	7.9	m $\Omega$
$I_D$	84.2	A
$Q_g 10V$	45.6	nC
$Q_{gd}$	9.3	nC
$Q_{sw}$	13.9	nC



Features	Application
<ul style="list-style-type: none"> <li>Low On-Resistance <math>R_{DS(on)}</math></li> <li>Low Input Capacitance</li> <li>Low Gate Charge</li> <li>Fully Characterized Capacitance and Avalanche</li> <li>Pb-free lead plating; RoHS compliant</li> </ul>	<ul style="list-style-type: none"> <li>Motor / Body Load Control</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
SG30N04Q	Halogen-Free	PDFN5x6-8L	Q	Tape & Reel	2,500

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	30	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous <sup>Note 1</sup>	$I_D$	$T_C=25^\circ\text{C}$	84.2 A
		$T_C=100^\circ\text{C}$	53.2 A
Drain Current-Continuous <sup>Note 2</sup>	$I_D$	$T_A=25^\circ\text{C}$	16.2 A
		$T_A=70^\circ\text{C}$	12.9 A
Drain Current-Pulsed <sup>Note 3</sup>	$I_{DM}$	200.0	A
Avalanche Current	$I_{AR}$	26.0	A
Single Pulse Avalanche Energy <sup>Note 4</sup>	$E_{AS}$	33.6	mJ
Maximum Power Dissipation	$P_D$	$T_C=25^\circ\text{C}$	65.4 W
		$T_C=100^\circ\text{C}$	26.1 W
		$T_A=25^\circ\text{C}$	2.4 W
		$T_A=70^\circ\text{C}$	1.5 W
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$

### Thermal Resistance Ratings

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Thermal resistance, Junction-Case <sup>Note 5</sup>	$R_{\theta JC}$	Steady State	-	-	1.9	$^\circ\text{C/W}$
Thermal resistance, Junction-Ambient <sup>Note 5</sup>	$R_{\theta JA}$	Steady State	-	-	46.6	$^\circ\text{C/W}$

- Notes:**
- Limited by silicon chip capability and  $R_{\theta JC}$  junction-to-case thermal resistance.
  - The maximum current rating is limited by package and  $R_{\theta JA}$  junction-to-ambient thermal resistance.
  - Must be ensure junction temperature does not exceed 150-degree C. (Pulse Width  $\leq 100\mu\text{s}$ , Duty  $\leq 2\%$ )
  - Limited by  $T_{Jmax}$ , starting  $T_J=25^\circ\text{C}$ ,  $L=0.1\text{mH}$ ,  $R_g=25\Omega$ ,  $I_D=26\text{A}$ ,  $V_{GS}=10\text{V}$ .
  - The value of thermal resistance is measured with the single device mounted on 1 inch<sup>2</sup> FR-4 PCB with 2 oz. copper under a still air environment temperature is 25 $^\circ\text{C}$  based on JEDEC standard JESD51-14 and JESD51-2a. Thermal resistance obtained depends on the user's specific board design and given application.

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

STATIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> =0V, I <sub>DS</sub> =250μA	30	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V	-	-	1	μA
		V <sub>DS</sub> =30V, V <sub>GS</sub> =0V, T <sub>J</sub> =125°C	-	-	100	μA
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA

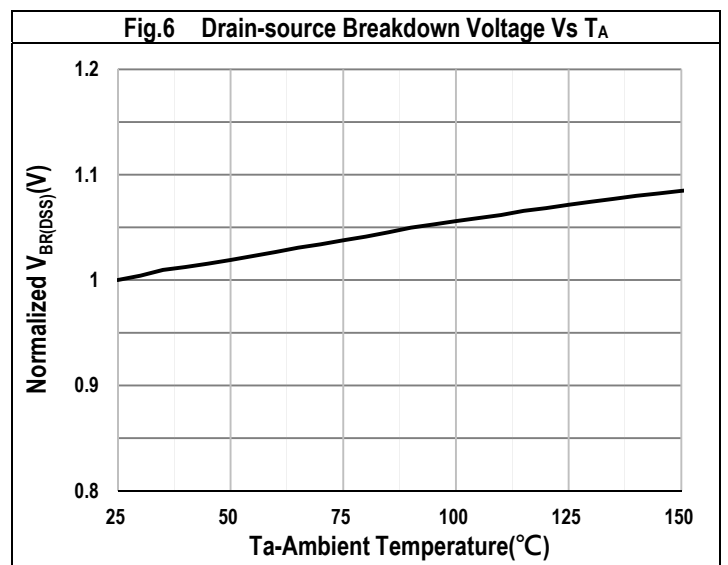
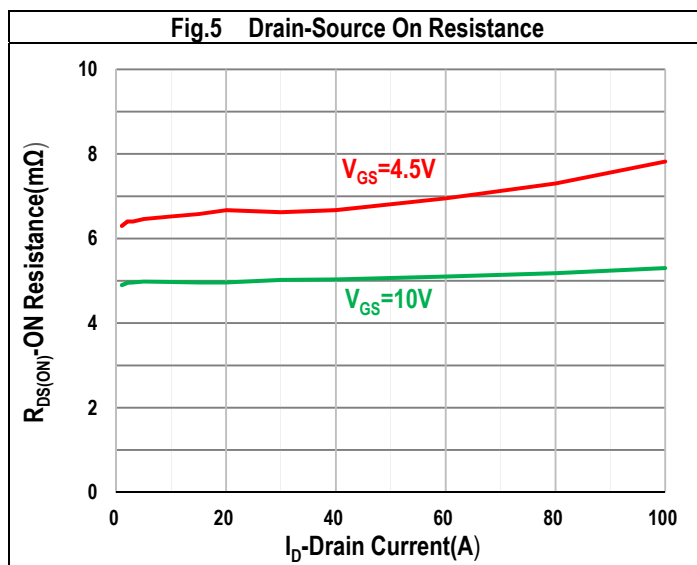
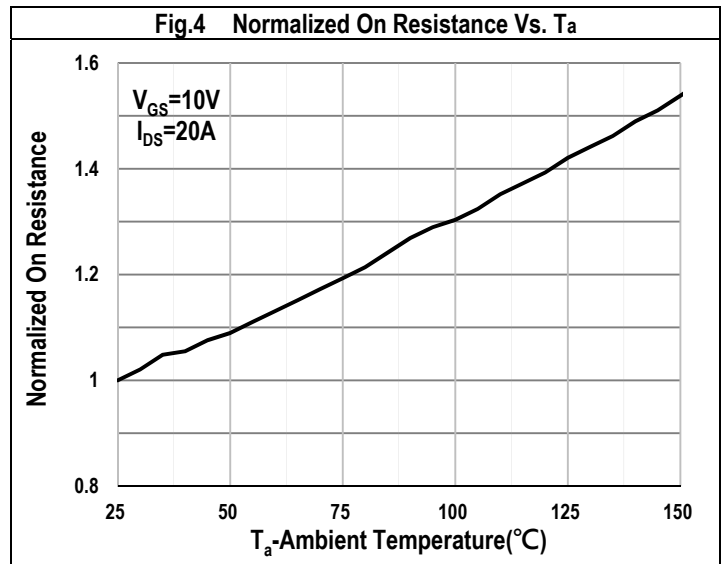
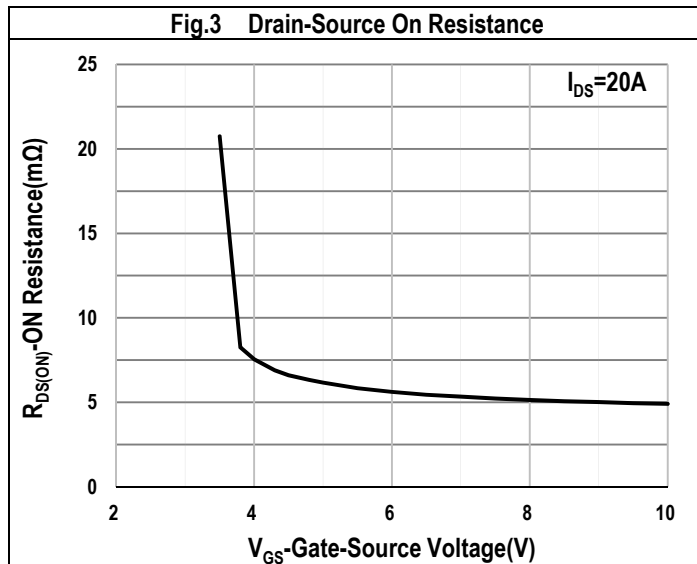
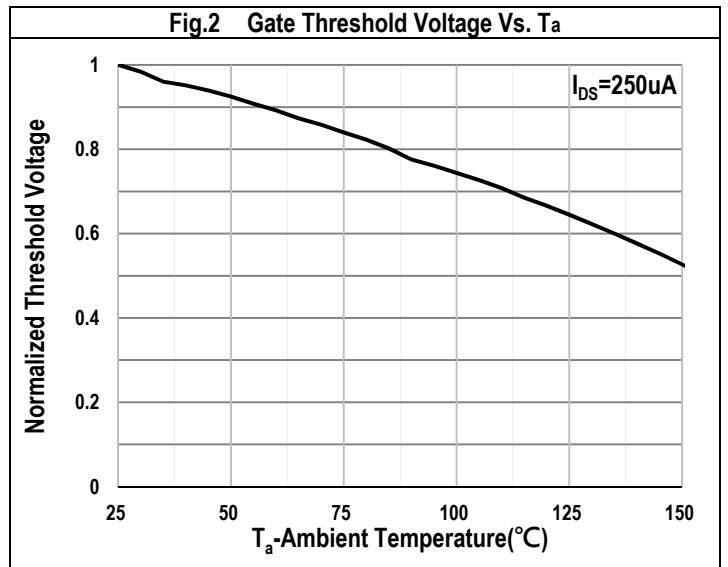
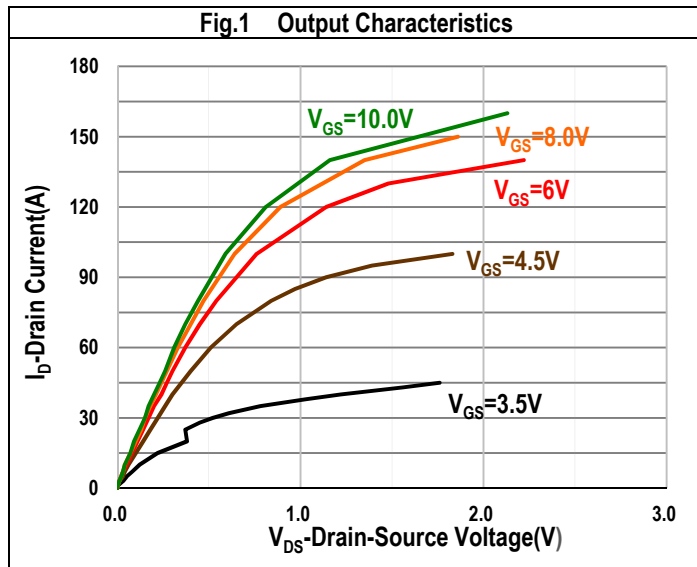
STATIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =250μA	1.2	1.6	2.0	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>DS</sub> =30A	-	5.0	6.0	mΩ
		V <sub>GS</sub> =4.5V, I <sub>DS</sub> =15A	-	6.6	7.9	mΩ
Gate Resistance	R <sub>g</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz	-	1.1	-	Ω
Forward Transconductance	g <sub>fs</sub>	V <sub>DS</sub> =5V, I <sub>DS</sub> =5A	-	13.4	-	S

DYNAMIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C <sub>iss</sub>	V <sub>DD</sub> =30V, V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1MHz	-	2016.6	-	pF
Output Capacitance	C <sub>oss</sub>	V <sub>DD</sub> =30V, V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1MHz	-	234.9	-	pF
Reverse Transfer Capacitance	C <sub>rss</sub>	V <sub>DD</sub> =30V, V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1MHz	-	205.3	-	pF
Turn-On Delay Time	T <sub>d(on)</sub>	V <sub>DS</sub> =15V, V <sub>GS</sub> =10V, I <sub>DS</sub> =20A, R <sub>GEN</sub> =3Ω	-	8.0	-	nS
Rise Time	t <sub>r</sub>	V <sub>DS</sub> =15V, V <sub>GS</sub> =10V, I <sub>DS</sub> =20A, R <sub>GEN</sub> =3Ω	-	51.9	-	nS
Turn-Off Delay Time	T <sub>d(off)</sub>	V <sub>DS</sub> =15V, V <sub>GS</sub> =10V, I <sub>DS</sub> =20A, R <sub>GEN</sub> =3Ω	-	34.3	-	nS
Fall Time	t <sub>f</sub>	V <sub>DS</sub> =15V, V <sub>GS</sub> =10V, I <sub>DS</sub> =20A, R <sub>GEN</sub> =3Ω	-	14.8	-	nS

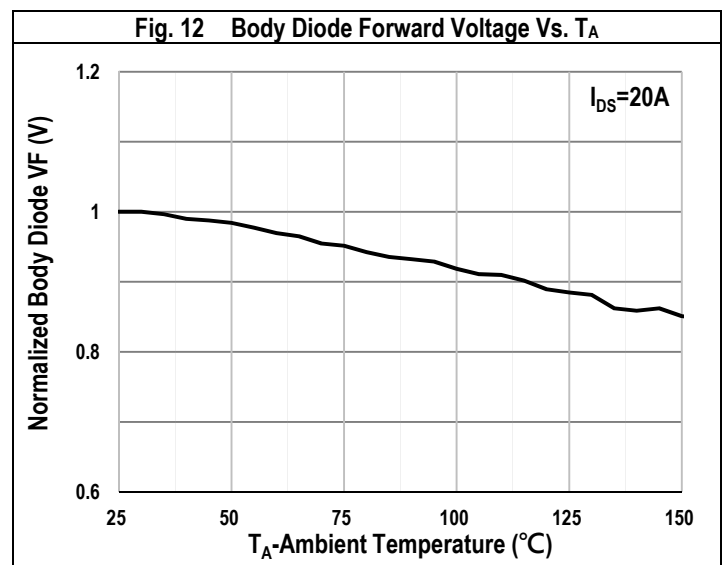
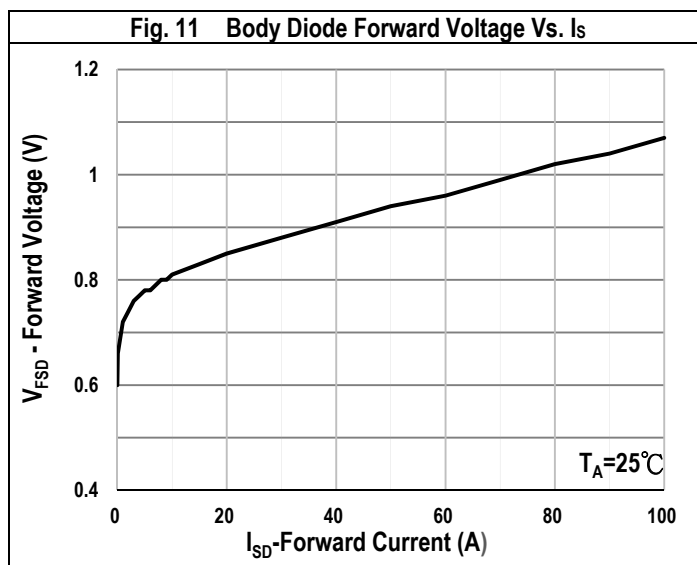
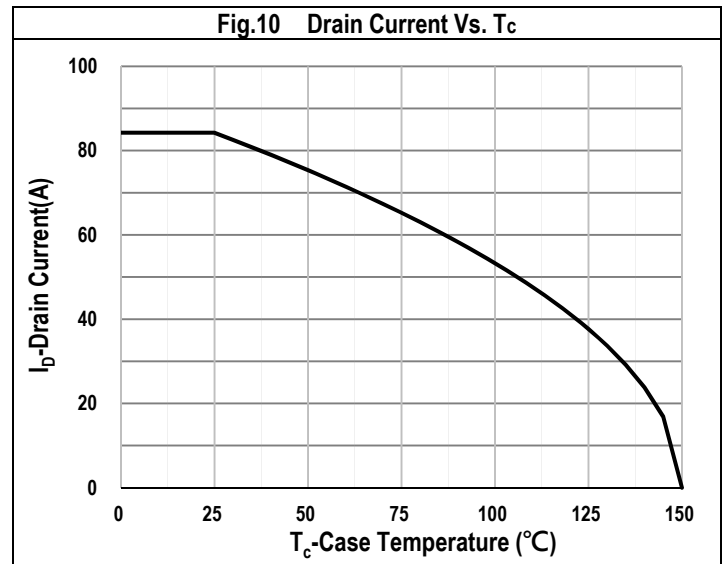
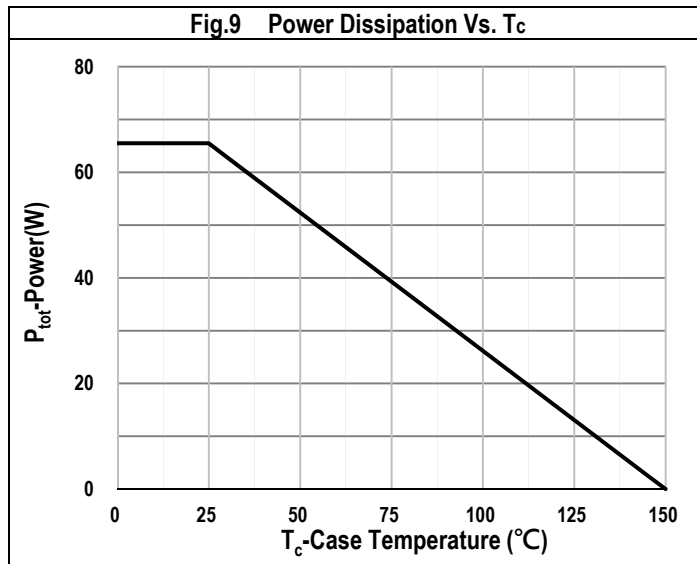
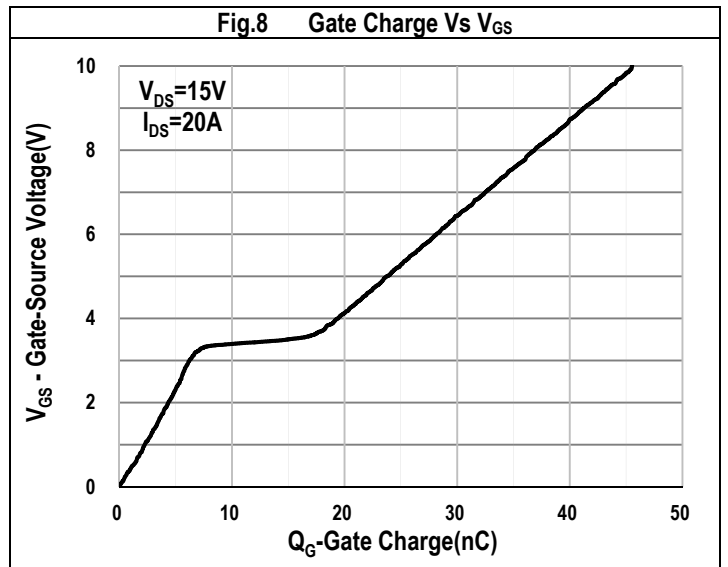
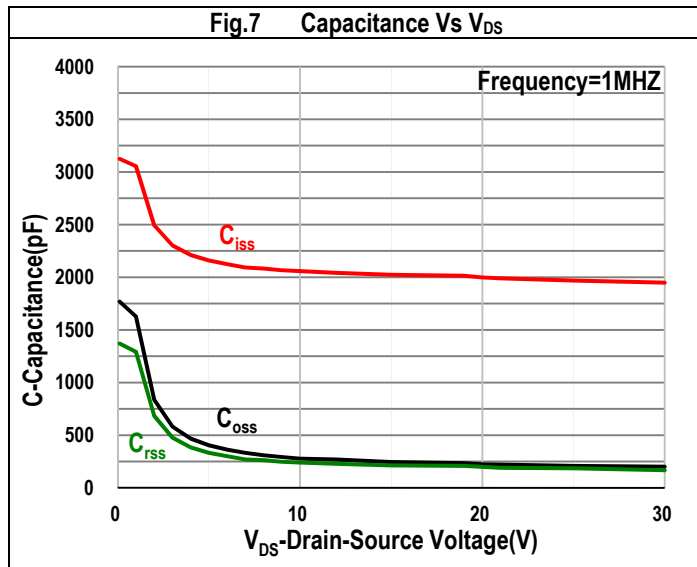
GATE CHARGE CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate to Source Gate Charge	Q <sub>gs</sub>	V <sub>DD</sub> =15V, I <sub>D</sub> =20A, V <sub>GS</sub> =0 to 10V	-	8.1	-	nC
Gate charge at threshold	Q <sub>g(th)</sub>	V <sub>DD</sub> =15V, I <sub>D</sub> =20A, V <sub>GS</sub> =0 to 10V	-	3.5	-	nC
Gate to Drain Charge	Q <sub>gd</sub>	V <sub>DD</sub> =15V, I <sub>D</sub> =20A, V <sub>GS</sub> =0 to 10V	-	9.3	-	nC
Switching charge	Q <sub>sw</sub>	V <sub>DD</sub> =15V, I <sub>D</sub> =20A, V <sub>GS</sub> =0 to 10V	-	13.9	-	nC
Gate charge total	Q <sub>g 10V</sub>	V <sub>DD</sub> =15V, I <sub>D</sub> =20A, V <sub>GS</sub> =0 to 10V	-	45.6	-	nC
	Q <sub>g 4.5V</sub>	V <sub>DD</sub> =15V, I <sub>D</sub> =20A, V <sub>GS</sub> =0 to 4.5V	-	21.5	-	nC
Gate plateau voltage	V <sub>plateau</sub>	V <sub>DD</sub> =15V, I <sub>D</sub> =20A, V <sub>GS</sub> =0 to 10V	-	3.4	-	V
Gate charge total, sync. FET (Q <sub>g</sub> - Q <sub>gd</sub> )	Q <sub>g(sync)</sub>	V <sub>DS</sub> =0.1V, V <sub>GS</sub> =0 to 10V	-	36.2	-	nC

DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Body Diode continuous forward current	I <sub>S</sub>	T <sub>C</sub> =25°C	-	-	84.2	A
Body Diode pulse current	I <sub>SM</sub>	T <sub>C</sub> =25°C	-	-	200.0	A
Body Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =20A	-	0.9	1.1	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>	V <sub>DD</sub> =15V, I <sub>F</sub> =20A, di/dt=100A/μs	-	5.4	-	nS
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	V <sub>DD</sub> =15V, I <sub>F</sub> =20A, di/dt=100A/μs	-	0.6	-	nC

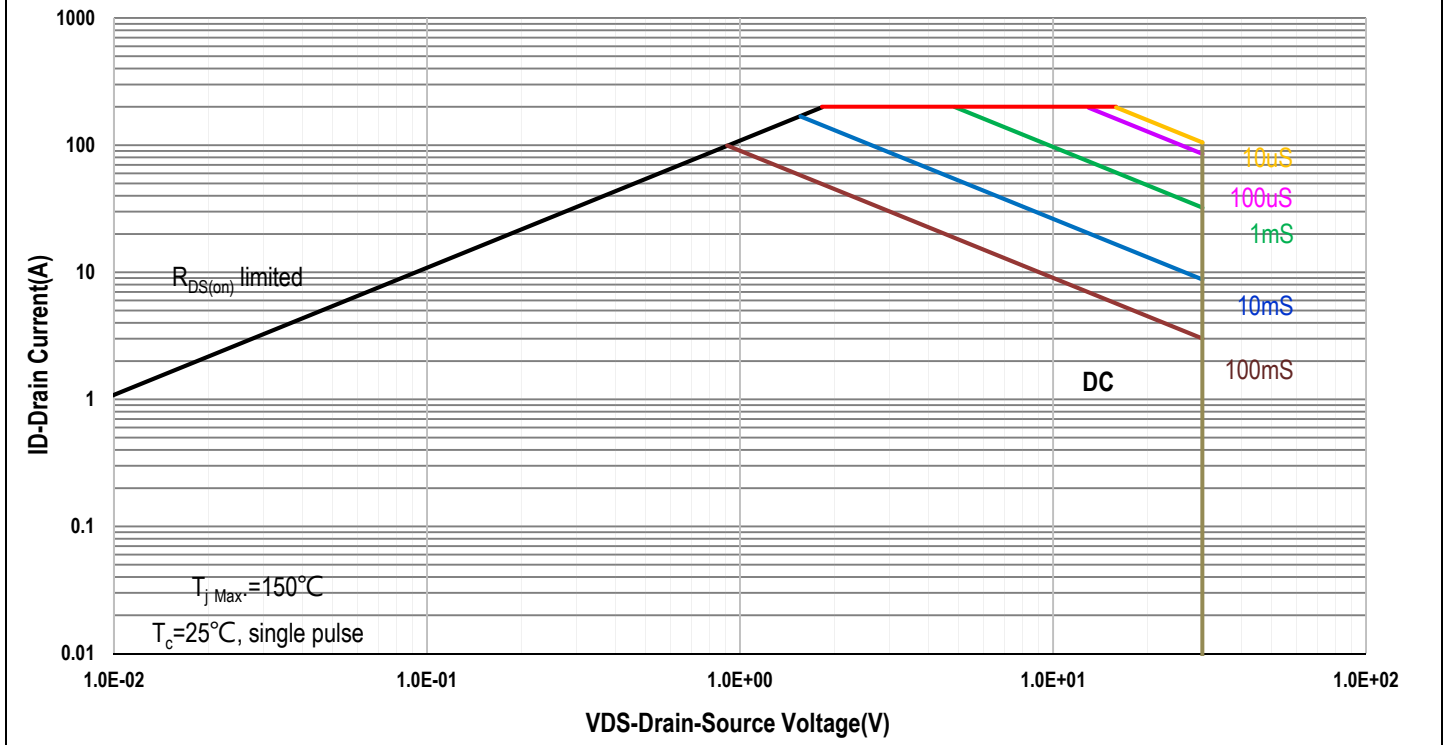
## Typical Operating Characteristics



## Typical Operating Characteristics (Cont.)

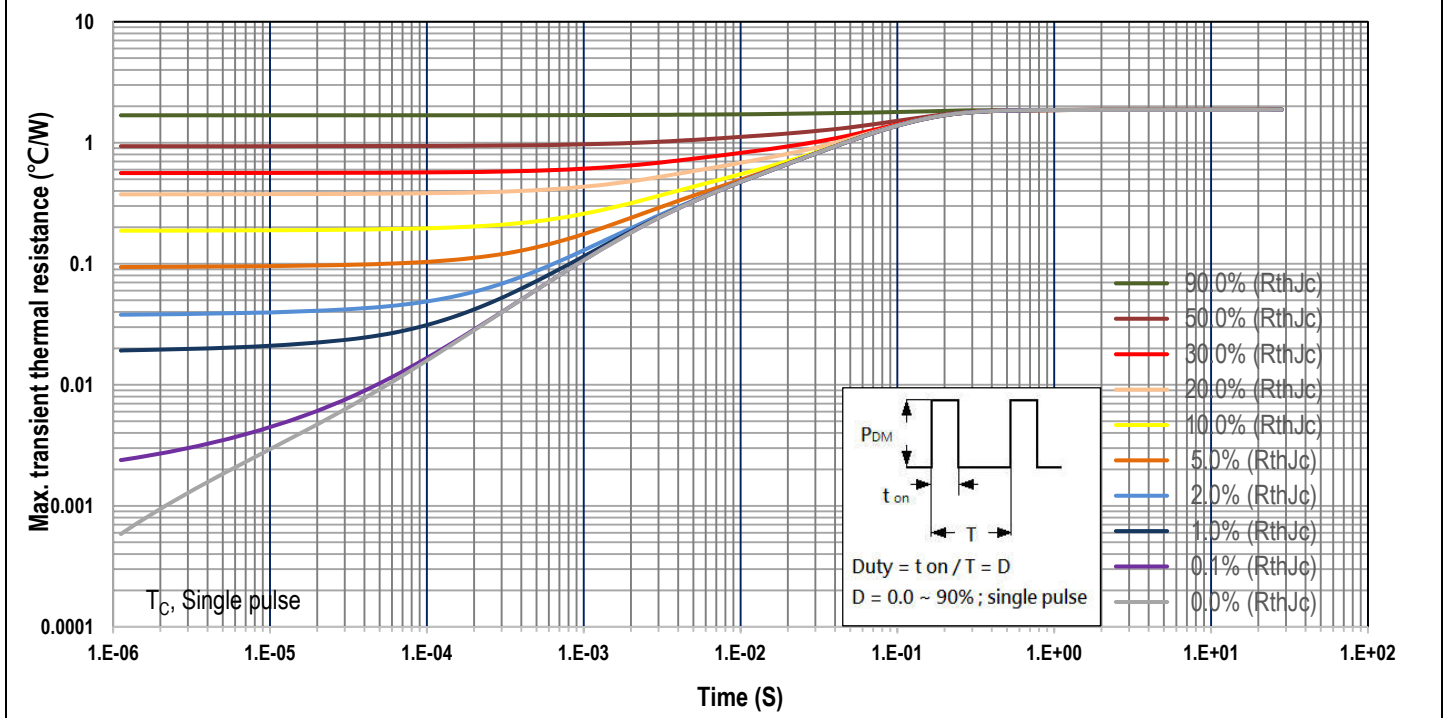


**Fig.11 Safe Operation Area**

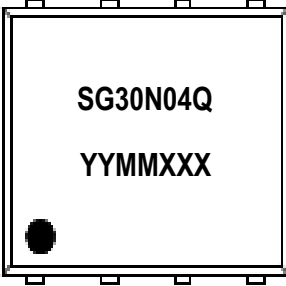


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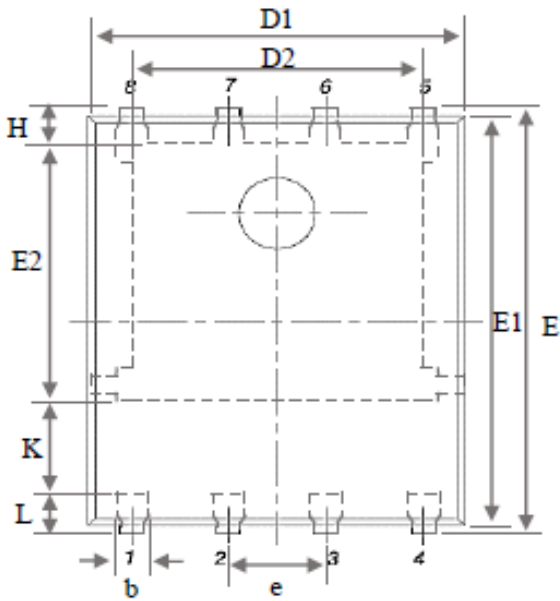
**Fig.12 Transient Thermal Impedance**



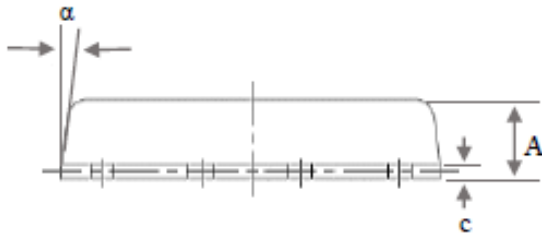
## Marking Information

PDFN 5x6-8L (Q)	Marking Rule
<p data-bbox="129 353 296 387">Laser Marking</p> 	<p data-bbox="807 353 991 387"><u>Line 1</u> : Device</p> <p data-bbox="807 400 946 434">DG30N04Q</p> <p data-bbox="807 488 1038 521"><u>Line 2</u> : Date Code</p> <p data-bbox="807 535 941 568">YYMMXXX</p> <p data-bbox="807 622 1002 656">YY : Year Code</p> <p data-bbox="807 669 1027 703">MM : Month Code</p> <p data-bbox="807 716 1059 750">XXX : Serial Number</p>

## Package of Dimension



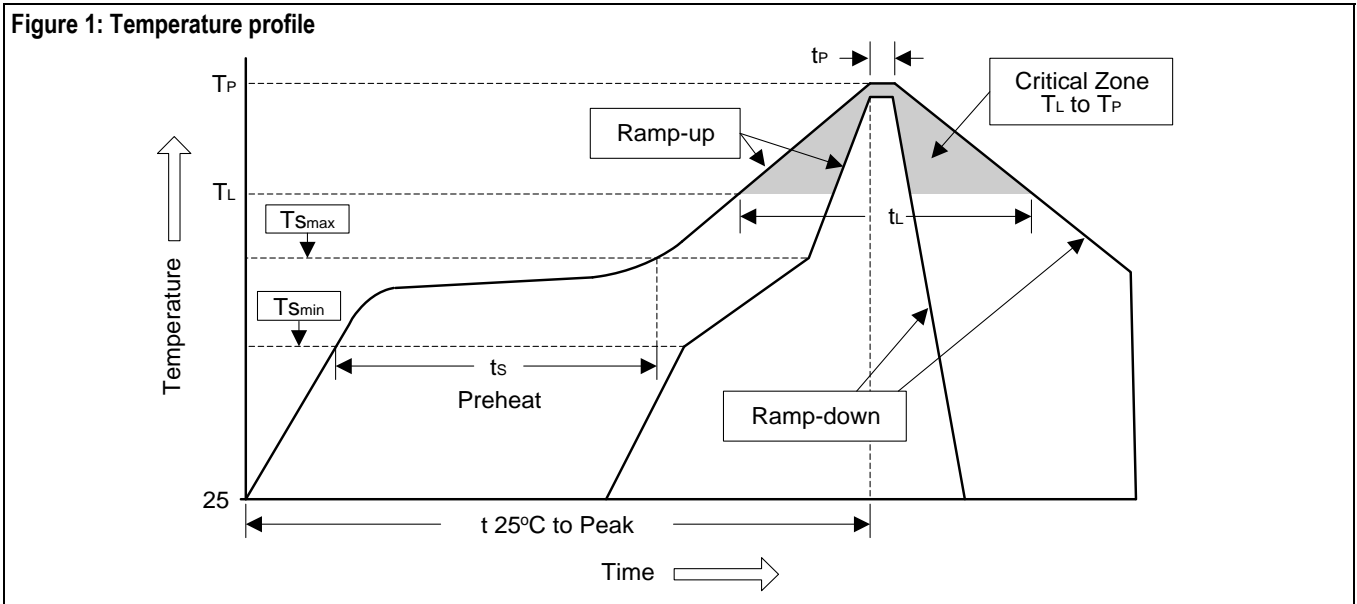
Symbol	Min	Nor	Max
A	0.90	1.04	1.17
b	0.33	0.42	0.51
C	0.06	0.20	0.35
D1	4.80	5.10	5.40
D2	3.61	3.96	4.31
E	5.90	6.03	6.15
E1	5.65	5.75	5.85
E2	3.30	3.54	3.78
e	1.27 BSC		
H	0.38	0.50	0.61
L	0.38	0.55	0.71
L1	0.05	0.15	0.25



1. All dimension are in millimeters.
2. Dimension does not include burrs and mold flash/protrusions.

## 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 <sub>L</sub> to T <sub>P</sub> )	<3°C/sec	<3°C/sec
Preheat		
- Temperature Min (T <sub>smmin</sub> )	100°C	150°C
- Temperature Max (T <sub>smmax</sub> )	150°C	200°C
- Time (min to max) (ts)	60 to 120 sec	60 to 180 sec
T <sub>smmax</sub> to T <sub>L</sub>		
- Ramp-up Rate	<3°C/sec	<3°C/sec
Time maintained above:		
- Temperature (T <sub>L</sub> )	183°C	217°C
- Time (t <sub>L</sub> )	60 to 150 sec	60 to 150 sec
Peak Temperature (T <sub>P</sub> )	240°C +0/-5°C	260°C +0/-5°C
Time within 5°C of actual Peak Temperature (t <sub>p</sub> )	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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