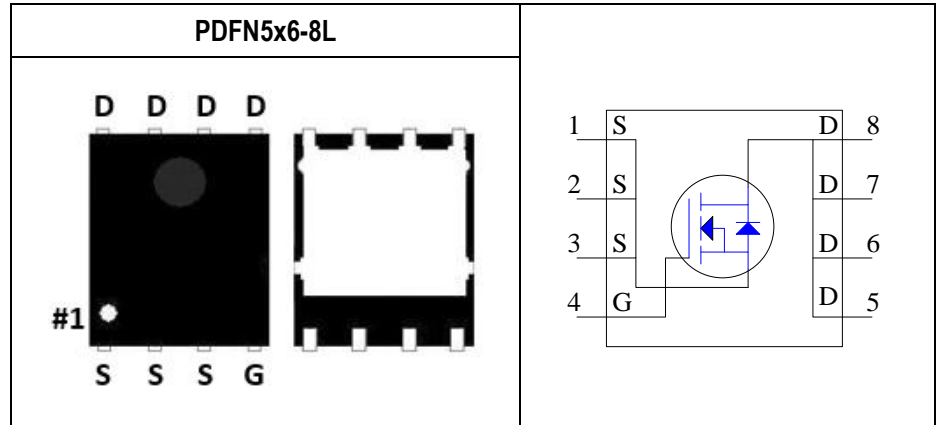


Parameter	Value	Unit
$V_{DSS}$	100	V
$R_{DS(ON) \text{ max. } V_{GS}=10V}$	10	m $\Omega$
$I_D$	40	A
$V_{GS(TH) \text{ Typ.}}$	1.6	V
$C_{iss} \text{ Typ.}$	1588	pF
$Q_{g10V} \text{ Typ.}$	33.5	nC
$E_{AS}$	12.3	mJ



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>• Quick Charger</li> <li>• DC to DC Converter</li> <li>• Switch Mode Power Supply</li> <li>• With Logic Level Driving Application</li> <li>• Synchronous Rectifier for Power Delivery</li> </ul>

## Ordering Information

Ordering Code	RoHS Status	Package	Package Code	Packing	Quantity
DG100N13Q	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	$V_{DS}$	100	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous <sup>Note 1</sup>	$I_D$	$T_C=25^\circ\text{C}$	40
		$T_C=100^\circ\text{C}$	25
Drain Current-Continuous <sup>Note 2</sup>	$I_D$	$T_A=25^\circ\text{C}$	10.9
		$T_A=70^\circ\text{C}$	8.7
Drain Current-Pulsed <sup>Note 3</sup>	$I_{DM}$	100	A
Avalanche Current	$I_{AR}$	15.7	A
Single Pulse Avalanche Energy <sup>Note 4</sup>	$E_{AS}$	12.3	mJ
Maximum Power Dissipation	$P_D$	$T_C=25^\circ\text{C}$	31
		$T_C=100^\circ\text{C}$	12.4
		$T_A=25^\circ\text{C}$	2.3
		$T_A=70^\circ\text{C}$	1.4
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	-	-	4.02	$^\circ\text{C/W}$
Thermal resistance, Junction-Ambient <sup>Note 5</sup>	$R_{\theta JA}$	Steady State	-	-	54.08	$^\circ\text{C/W}$

### 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  $T_J=25^\circ\text{C}$ ,  $L=0.1\text{mH}$ ,  $R_g=25\Omega$ ,  $I_D=15.7\text{A}$ ,  $V_{GS}=10\text{V}$ .
- The value of thermal resistance is measured with the single device put on cooling plate under a still air environment temperature is 25 degree 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	100	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =100V, V <sub>GS</sub> =0V	-	-	1	μA
		V <sub>DS</sub> =100V, V <sub>GS</sub> =0V, T <sub>J</sub> =125°C	-	-	10	μA
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA

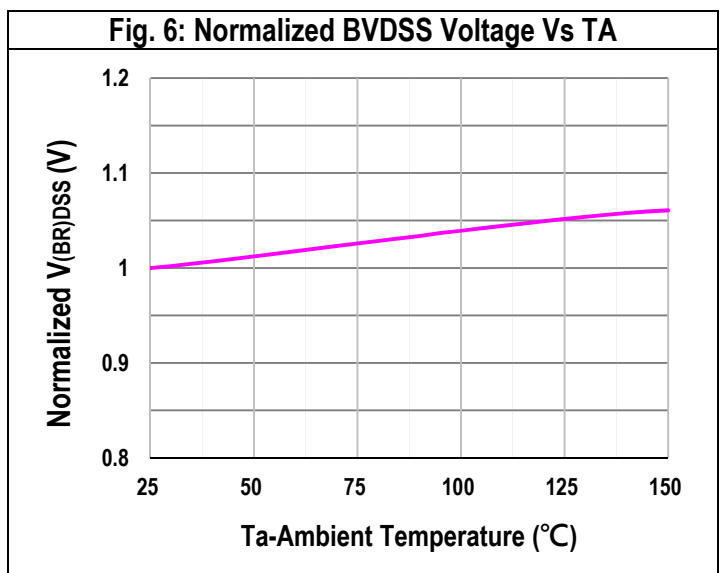
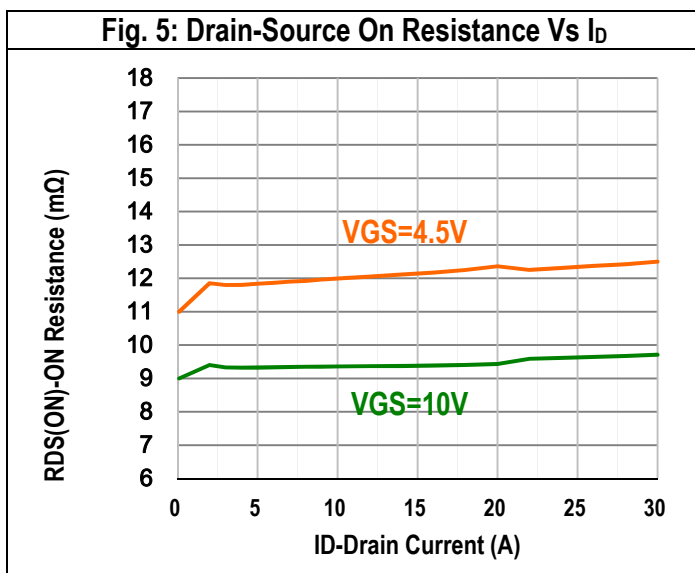
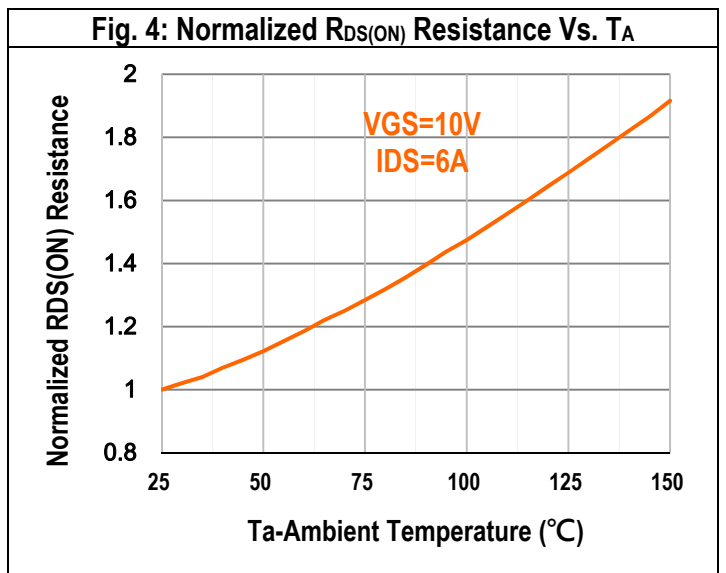
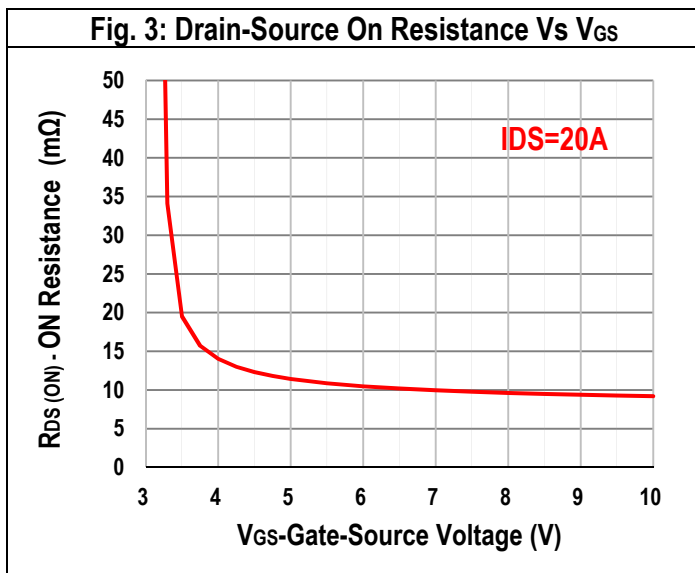
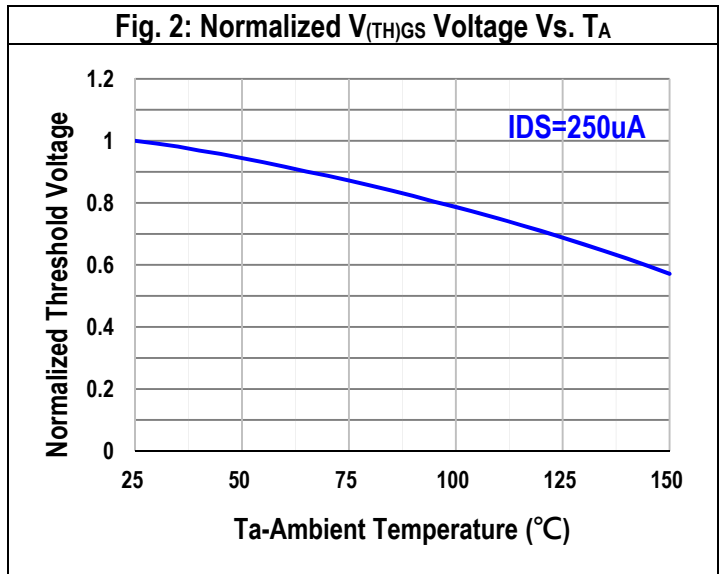
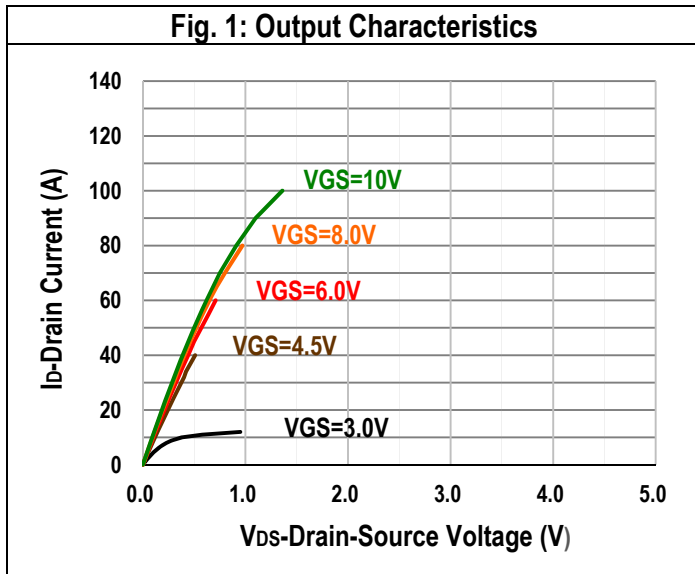
STATIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =250μA	1.4	1.6	1.8	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>DS</sub> =20A	-	9.3	10	mΩ
		V <sub>GS</sub> =4.5V, I <sub>DS</sub> =10A	-	11.8	13.6	mΩ
Gate Resistance	R <sub>g</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz	-	0.72	-	Ω
Forward Transconductance	g <sub>fs</sub>	V <sub>DS</sub> =5V, I <sub>DS</sub> =20A	-	30	-	S

DYNAMIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C <sub>iss</sub>	V <sub>DD</sub> =100V, V <sub>DS</sub> =50V, V <sub>GS</sub> =0V, f=1MHz	-	1588	-	pF
Output Capacitance	C <sub>oss</sub>	V <sub>DD</sub> =100V, V <sub>DS</sub> =50V, V <sub>GS</sub> =0V, f=1MHz	-	272	-	pF
Reverse Transfer Capacitance	C <sub>rss</sub>	V <sub>DD</sub> =100V, V <sub>DS</sub> =50V, V <sub>GS</sub> =0V, f=1MHz	-	9.1	-	pF
Turn-On Delay Time	T <sub>d(on)</sub>	V <sub>DS</sub> =50V, V <sub>GS</sub> =10V, I <sub>DS</sub> =20A, R <sub>GEN</sub> =3.0Ω	-	7.7	-	nS
Rise Time	T <sub>r</sub>	V <sub>DS</sub> =50V, V <sub>GS</sub> =10V, I <sub>DS</sub> =20A, R <sub>GEN</sub> =3.0Ω	-	16.8	-	nS
Turn-Off Delay Time	T <sub>d(off)</sub>	V <sub>DS</sub> =50V, V <sub>GS</sub> =10V, I <sub>DS</sub> =20A, R <sub>GEN</sub> =3.0Ω	-	24.5	-	nS
Fall Time	T <sub>f</sub>	V <sub>DS</sub> =50V, V <sub>GS</sub> =10V, I <sub>DS</sub> =20A, R <sub>GEN</sub> =3.0Ω	-	9.5	-	nS

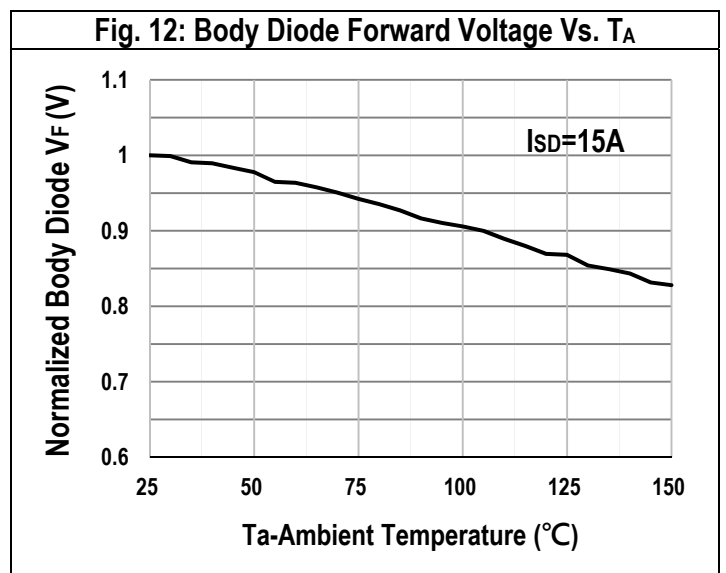
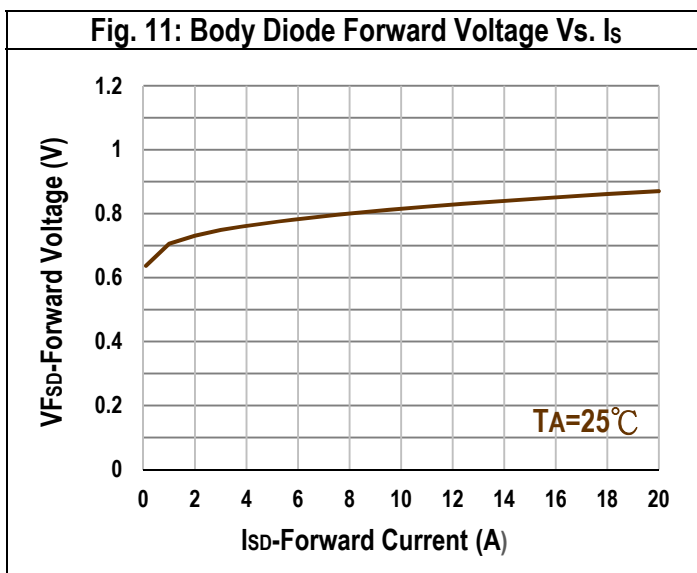
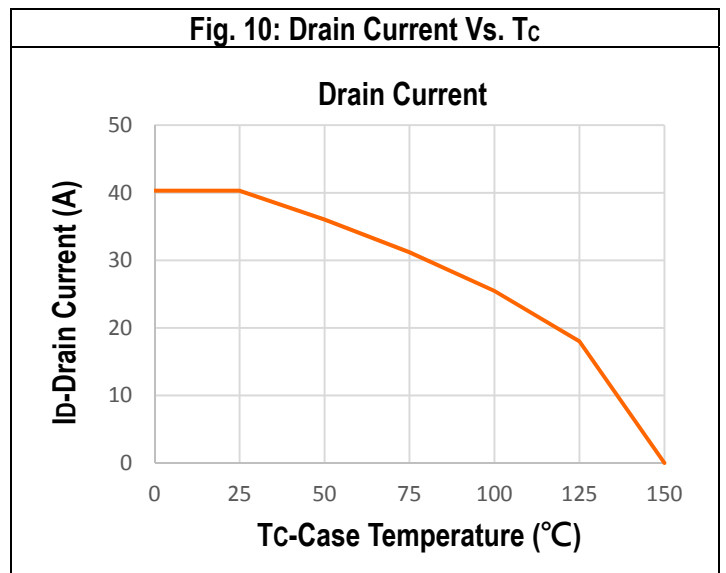
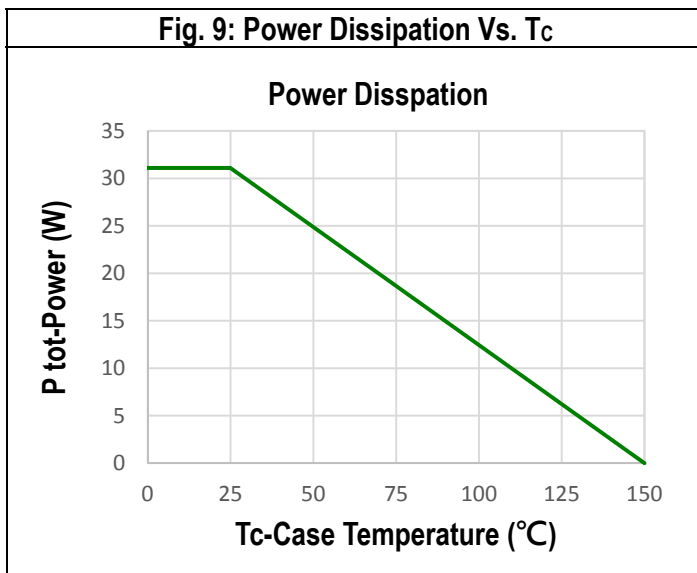
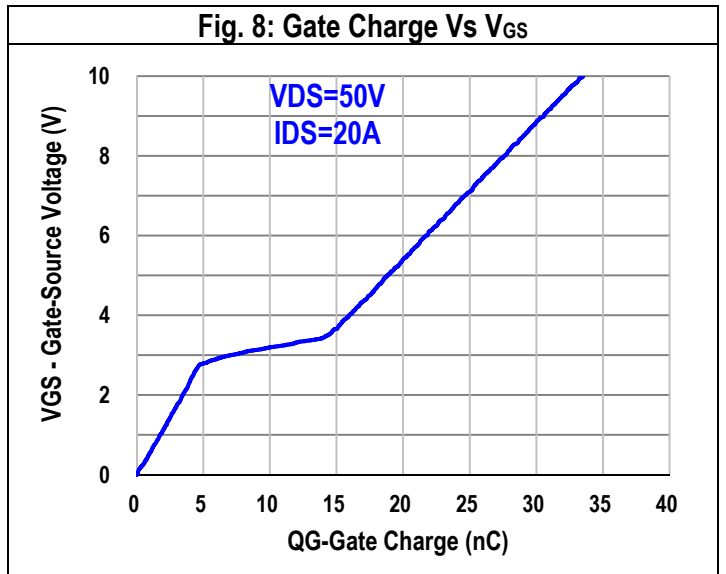
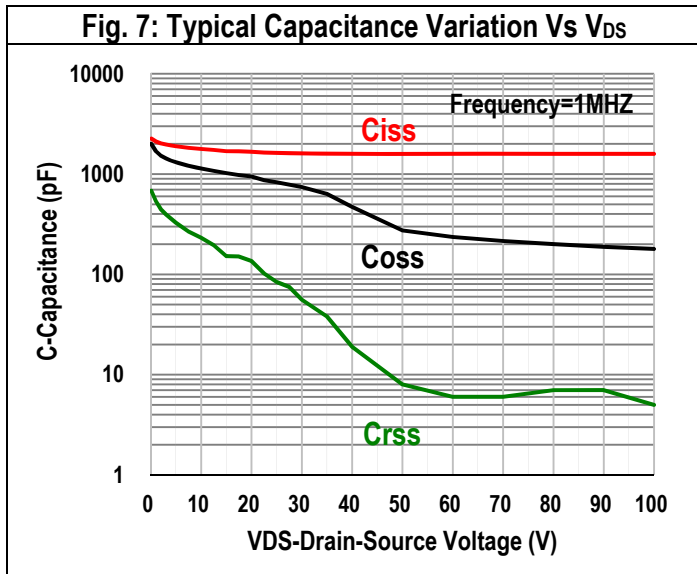
GATE CHARGE CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate to Source Gate Charge	Q <sub>gs</sub>	V <sub>DD</sub> =50V, I <sub>D</sub> =20A, V <sub>GS</sub> =0 to 10V	-	5.4	-	nC
Gate charge at threshold	Q <sub>g(th)</sub>	V <sub>DD</sub> =50V, I <sub>D</sub> =20A, V <sub>GS</sub> =0 to 10V	-	3	-	nC
Gate to Drain Charge	Q <sub>gd</sub>	V <sub>DD</sub> =50V, I <sub>D</sub> =20A, V <sub>GS</sub> =0 to 10V	-	8.8	-	nC
Switching charge	Q <sub>sw</sub>	V <sub>DD</sub> =50V, I <sub>D</sub> =20A, V <sub>GS</sub> =0 to 10V	-	11.3	-	nC
Gate charge total	Q <sub>g 10V</sub>	V <sub>DD</sub> =50V, I <sub>D</sub> =20A, V <sub>GS</sub> =0 to 10V	-	33.5	-	nC
Gate plateau voltage	V <sub>plateau</sub>	V <sub>DD</sub> =50V, I <sub>D</sub> =20A, V <sub>GS</sub> =0 to 10V	-	3.1	-	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	-	24.7	-	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	-	-	20	A
Body Diode pulse current	I <sub>SM</sub>	T <sub>C</sub> =25°C	-	-	100	A
Body Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>s</sub> =20A	-	0.86	1.0	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>	V <sub>DD</sub> =50V, I <sub>F</sub> =20A, di/dt=200A/μs	-	32.4	-	nS
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	V <sub>DD</sub> =50V, I <sub>F</sub> =20A, di/dt=200A/μs	-	72.5	-	nC
Body Diode Reverse Recovery Current	I <sub>rm</sub>	V <sub>DD</sub> =50V, I <sub>F</sub> =20A, di/dt=200A/μs	-	3.8	-	A

Typical Operating Characteristics



Typical Operating Characteristics



4. Typical Operating Characteristics

Fig. 13: Safe Operation Area

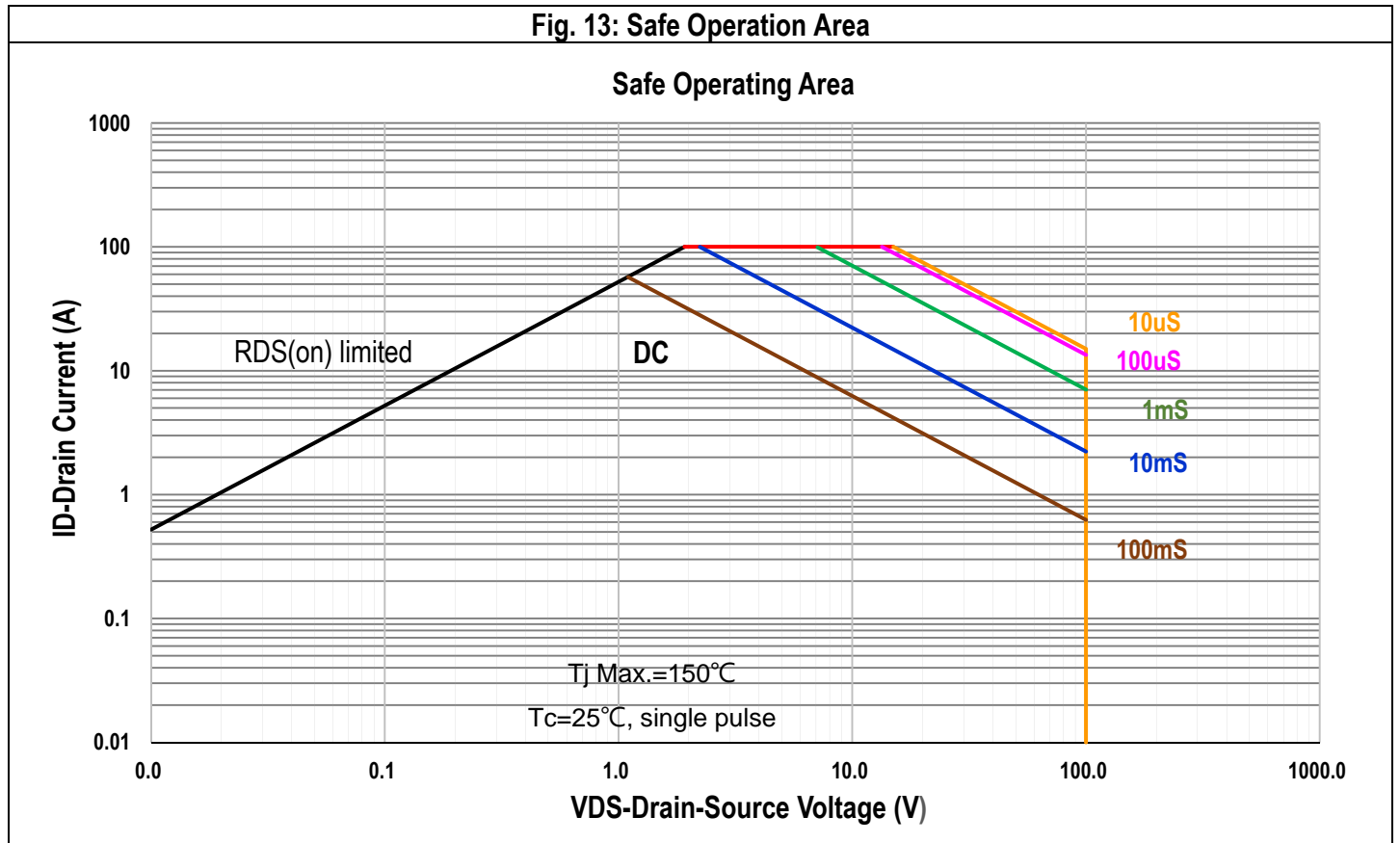
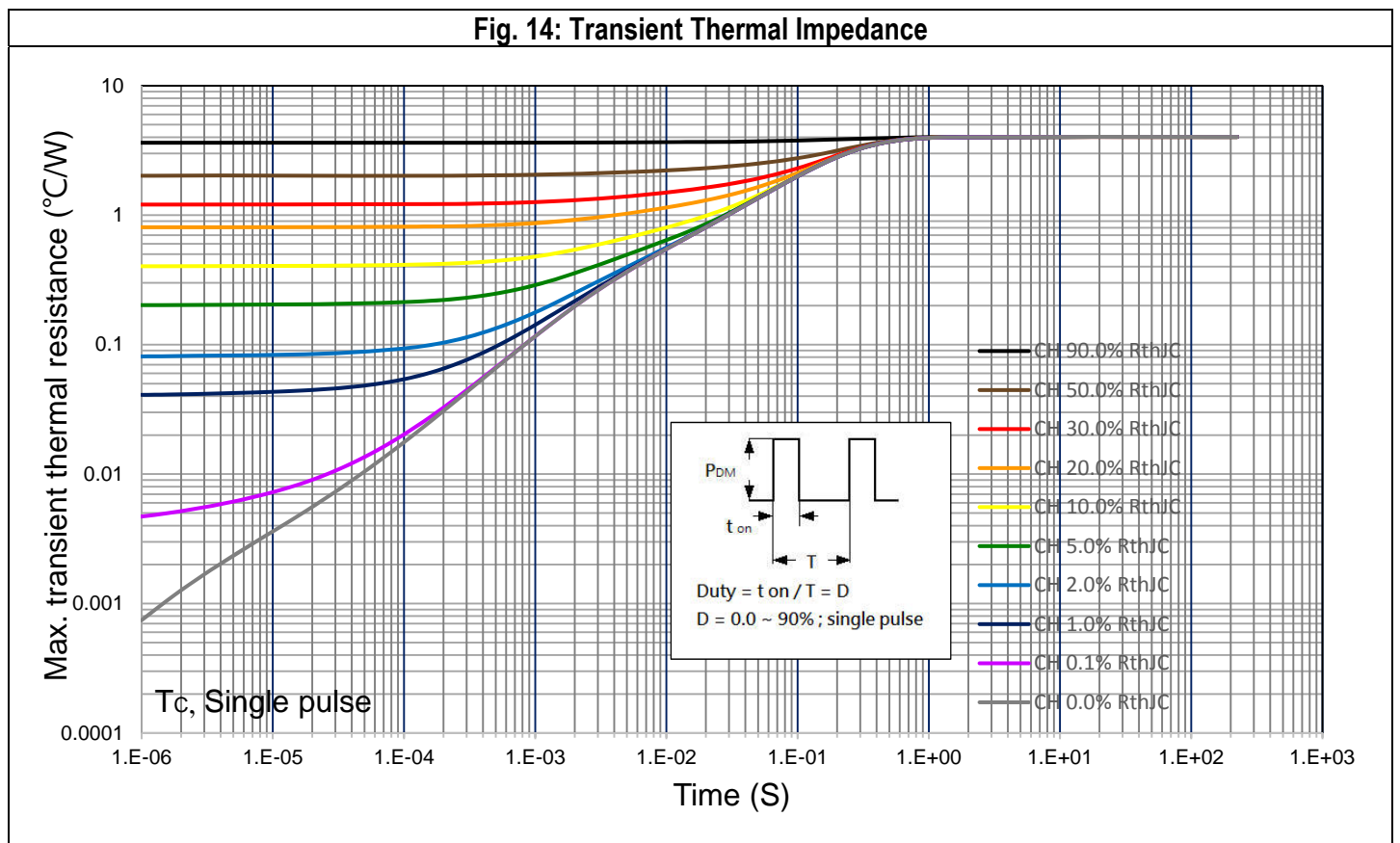



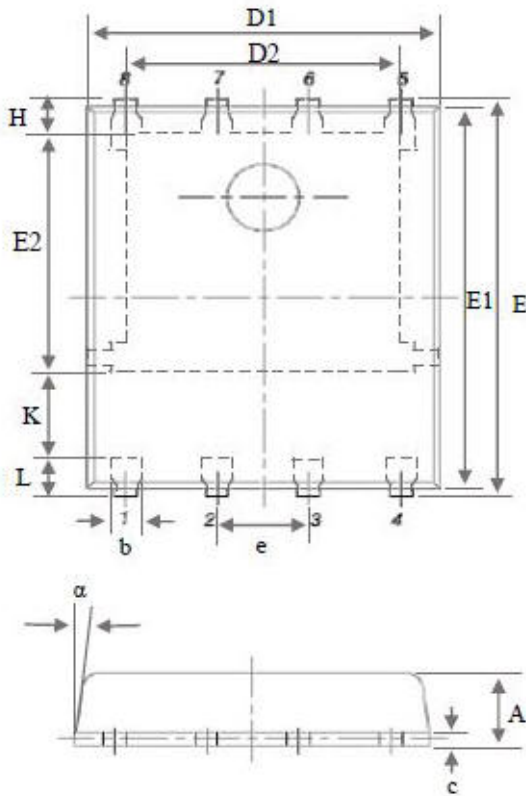
Fig. 14: Transient Thermal Impedance



## Marking Information

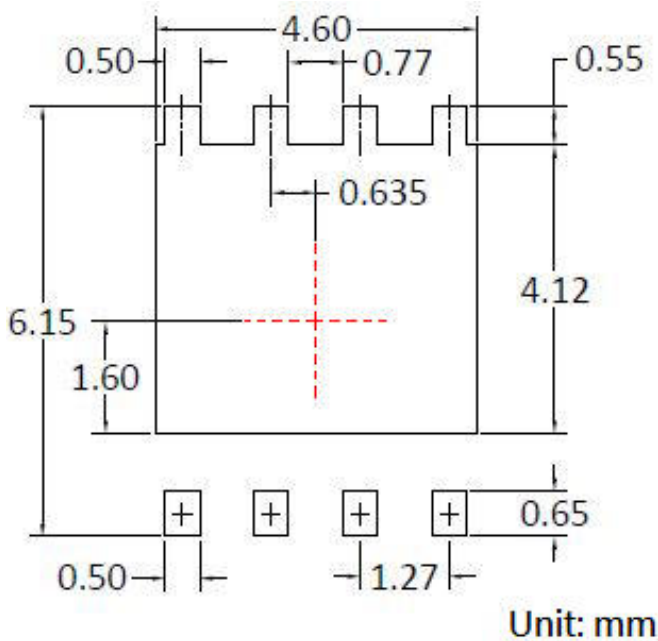
PDFN5x6-8L (Q)	Marking Rule
<p>Laser Marking</p> 	<p><u>Line 1</u> : Device DG100N13Q</p> <p><u>Line 2</u> : Date Code YYMMXXX</p> <p>YY : Year Code MM : Month Code XXX : Serial Number</p>

## 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

## Land Pattern (Footprint)

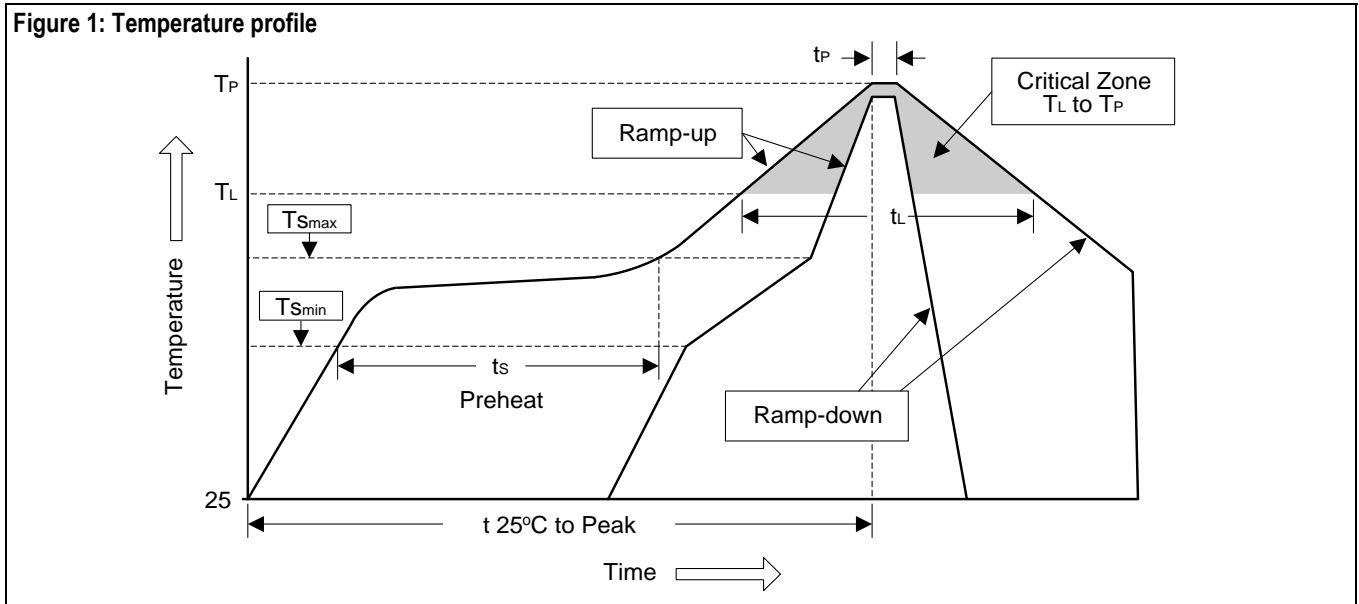


- Note 1: Land pattern (Footprint) design is for reference only.
- Note 2: Package body sizes exclude mold flash and burrs.
- Note 3: Dimension is measured in gauge plane.
- Note 4: Tolerance 0.1mm unless otherwise specified.

## Appendix-A

### Soldering Methods for Silicongear's Products (Just for SMD type of device)

- Storage environment: Temperature=10°C to 35°C Humidity=65%±15%
- 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>smin</sub> )	100°C	150°C
- Temperature Max (T <sub>smax</sub> )	150°C	200°C
- Time (min to max) (ts)	60 to 120 sec	60 to 180 sec
T <sub>smax</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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