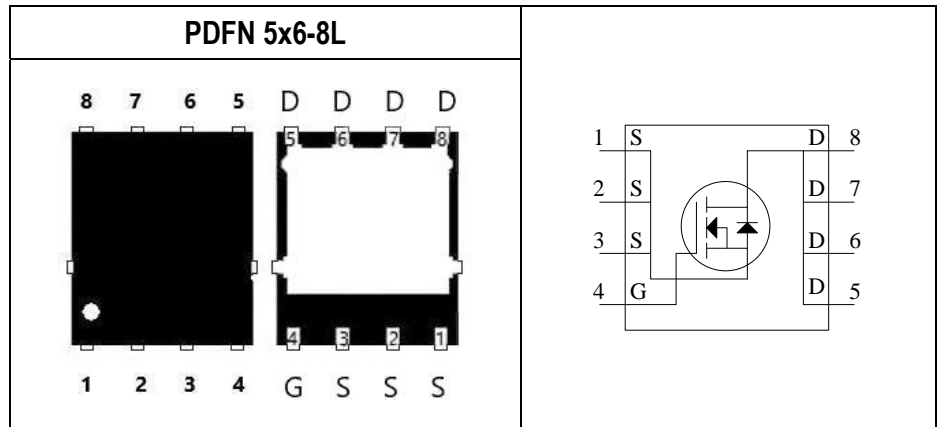


Parameter	Value	Unit
V_{DSS}	40	V
$R_{DS(ON) max. V_{GS}=10V}$	9.5	m Ω
$R_{DS(ON) max. V_{GS}=4.5V}$	14.5	m Ω
I_D	41.6	A
$Q_g 10V$	17.4	nC
Q_{gd}	5.9	nC
Q_{sw}	7.7	nC



Features	Application
<ul style="list-style-type: none"> • Low On-Resistance $R_{DS(on)}$ • Low Input Capacitance • Low Gate Charge • Fully Characterized Capacitance and Avalanche • Pb-free lead plating; RoHS compliant 	<ul style="list-style-type: none"> • Load Switch • Motor Driving Application • Switch Mode Power Supply • Laptop and PCs and Network Equipment • MOSFET for synchronous rectification in SMPS

Ordering Information

Ordering Code	RoHS Status	Package	Package Code	Packing	Quantity
DG40N21Q	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}	40	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous ^{Note 1}	I_D	$T_C=25^\circ\text{C}$	41.6
		$T_C=100^\circ\text{C}$	26.3
Drain Current-Continuous ^{Note 2}	I_D	$T_A=25^\circ\text{C}$	13.7
		$T_A=70^\circ\text{C}$	11.0
Drain Current-Pulsed ^{Note 3}	I_{DM}	85	A
Avalanche Current	I_{AR}	12.2	A
Single Pulse Avalanche Energy ^{Note 4}	E_{AS}	7.4	mJ
Maximum Power Dissipation	P_D	$T_C=25^\circ\text{C}$	24.7
		$T_C=100^\circ\text{C}$	9.8
		$T_A=25^\circ\text{C}$	2.7
		$T_A=70^\circ\text{C}$	1.7
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 ^{Note 5}	$R_{\theta JC}$	Steady State	-	-	4.6	$^\circ\text{C/W}$
Thermal resistance, Junction-Ambient ^{Note 5}	$R_{\theta JA}$	Steady State	-	-	42	$^\circ\text{C/W}$

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 100uS, Duty \leq 2%)
- Limited by T_{Jmax} , starting $T_J=25^\circ\text{C}$, $L=0.1\text{mH}$, $R_g=25\Omega$, $I_D=12.2\text{A}$, $V_{GS}=10\text{V}$.
- 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_J=25°C unless otherwise noted)

STATIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} =0V, I _{DS} =250μA	40	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =40V, V _{GS} =0V	-	-	1	μA
		V _{DS} =40V, V _{GS} =0V, T _J =125°C	-	-	100	μA
Gate-Body Leakage	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA

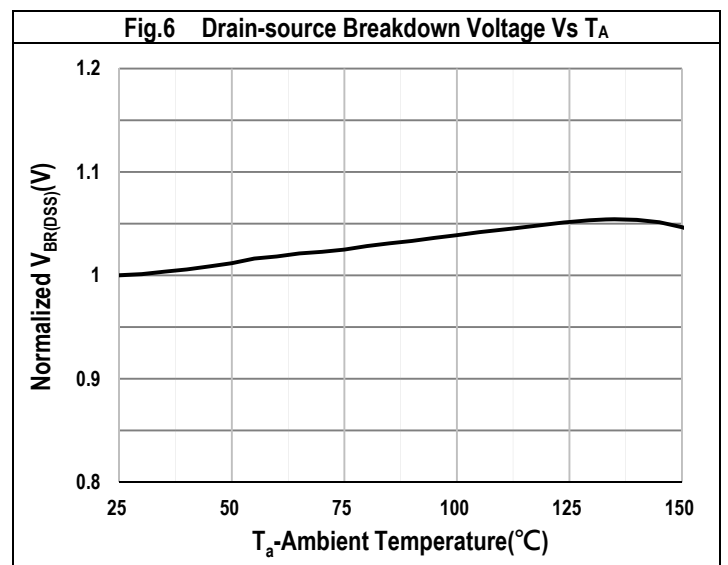
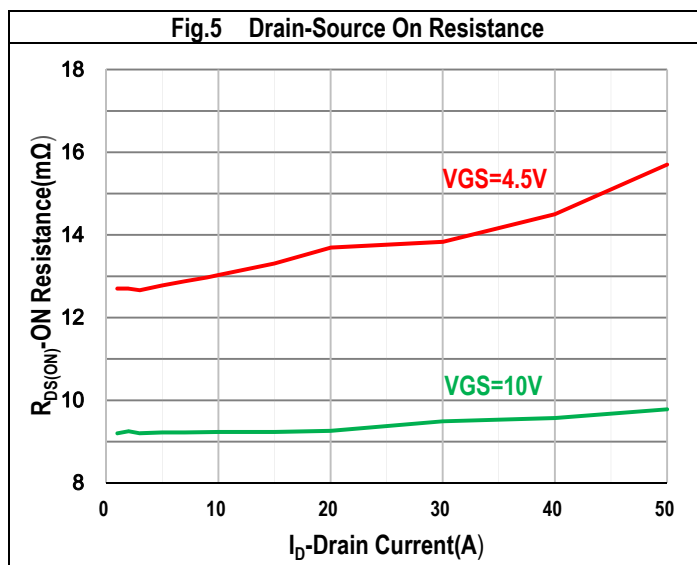
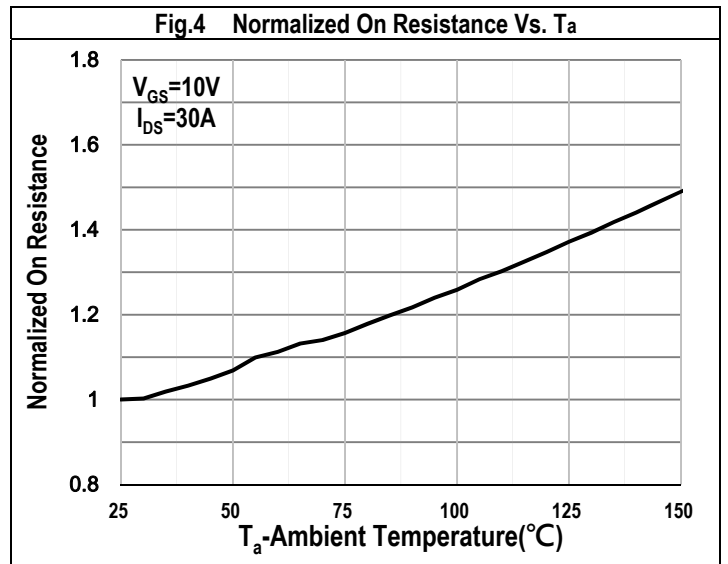
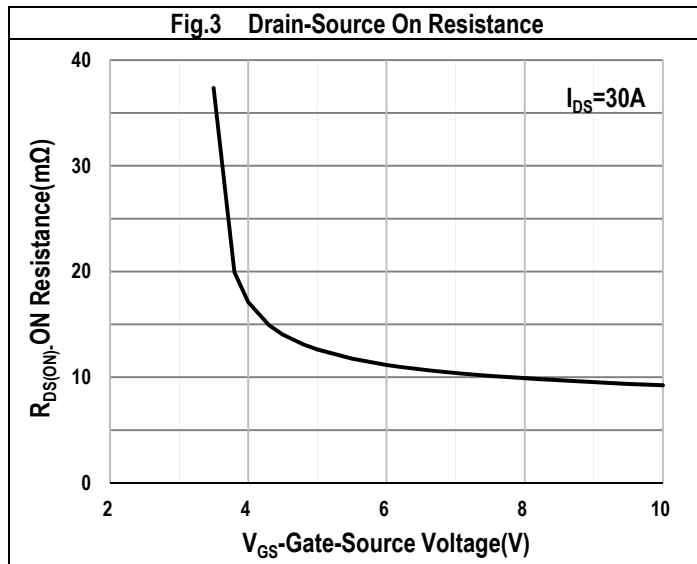
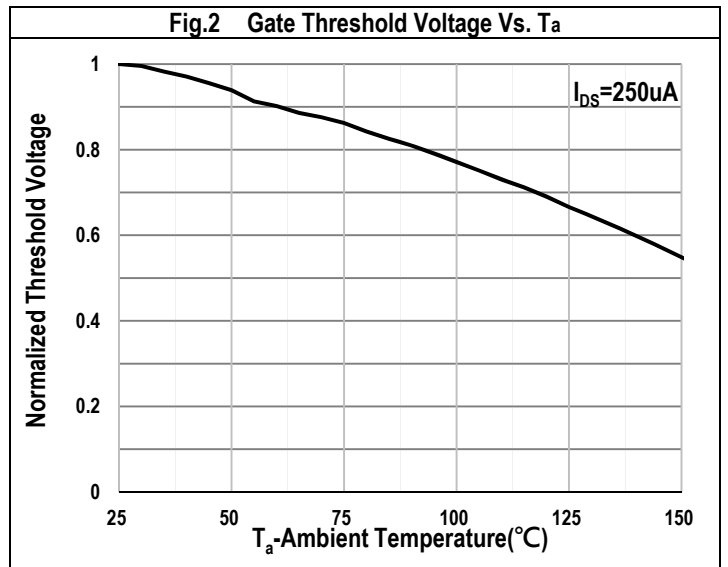
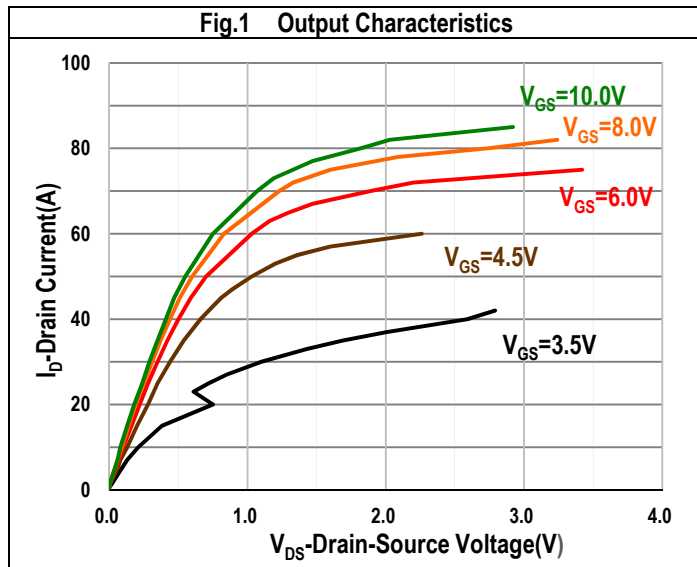
STATIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} =V _{GS} , I _{DS} =250μA	1.2	1.6	2	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _{DS} =30A	-	8.2	9.5	mΩ
		V _{GS} =4.5V, I _{DS} =20A	-	13.5	14.5	mΩ
Gate Resistance	R _g	V _{GS} =0V, V _{DS} =0V, f=1MHz	-	0.7	-	Ω
Forward Transconductance	g _{fs}	V _{DS} =5V, I _{DS} =10A	-	8	-	S

DYNAMIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C _{iss}	V _{DD} =40V, V _{DS} =20V, V _{GS} =0V, f=1MHz	-	680.1	-	pF
Output Capacitance	C _{oss}	V _{DD} =40V, V _{DS} =20V, V _{GS} =0V, f=1MHz	-	122.2	-	pF
Reverse Transfer Capacitance	C _{rss}	V _{DD} =40V, V _{DS} =20V, V _{GS} =0V, f=1MHz	-	117.1	-	pF
Turn-On Delay Time	T _{d(on)}	V _{DS} =20V, V _{GS} =10V, I _{DS} =30A, R _{GEN} =3Ω	-	5.8	-	nS
Rise Time	t _r	V _{DS} =20V, V _{GS} =10V, I _{DS} =30A, R _{GEN} =3Ω	-	56.9	-	nS
Turn-Off Delay Time	T _{d(off)}	V _{DS} =20V, V _{GS} =10V, I _{DS} =30A, R _{GEN} =3Ω	-	13.8	-	nS
Fall Time	t _f	V _{DS} =20V, V _{GS} =10V, I _{DS} =30A, R _{GEN} =3Ω	-	11.4	-	nS

GATE CHARGE CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate to Source Gate Charge	Q _{gs}	V _{DD} =20V, I _D =30A, V _{GS} =0 to 10V	-	3.2	-	nC
Gate charge at threshold	Q _{g(th)}	V _{DD} =20V, I _D =30A, V _{GS} =0 to 10V	-	1.3	-	nC
Gate to Drain Charge	Q _{gd}	V _{DD} =20V, I _D =30A, V _{GS} =0 to 10V	-	5.9	-	nC
Switching charge	Q _{sw}	V _{DD} =20V, I _D =30A, V _{GS} =0 to 10V	-	7.7	-	nC
Gate charge total	Q _{g 10V}	V _{DD} =20V, I _D =30A, V _{GS} =0 to 10V	-	17.4	-	nC
	Q _{g 4.5V}	V _{DD} =20V, I _D =30A, V _{GS} =0 to 4.5V	-	9.5	-	nC
Gate plateau voltage	V _{plateau}	V _{DD} =20V, I _D =30A, V _{GS} =0 to 10V	-	3.8	-	V
Gate charge total, sync. FET (Q _g - Q _{gd})	Q _{g(sync)}	V _{DS} =0.1V, V _{GS} =0 to 10V	-	11.5	-	nC

DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Body Diode continuous forward current	I _S	T _C =25°C	-	-	41.6	A
Body Diode pulse current	I _{SM}	T _C =25°C	-	-	85	A
Body Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =30A	-	0.9	1.1	V
Body Diode Reverse Recovery Time	t _{rr}	V _{DD} =32V, I _F =20A, di/dt=100A/μs	-	9.5	-	nS
Body Diode Reverse Recovery Charge	Q _{rr}	V _{DD} =32V, I _F =20A, di/dt=100A/μs	-	1.2	-	nC

Typical Operating Characteristics



Typical Operating Characteristics (Cont.)

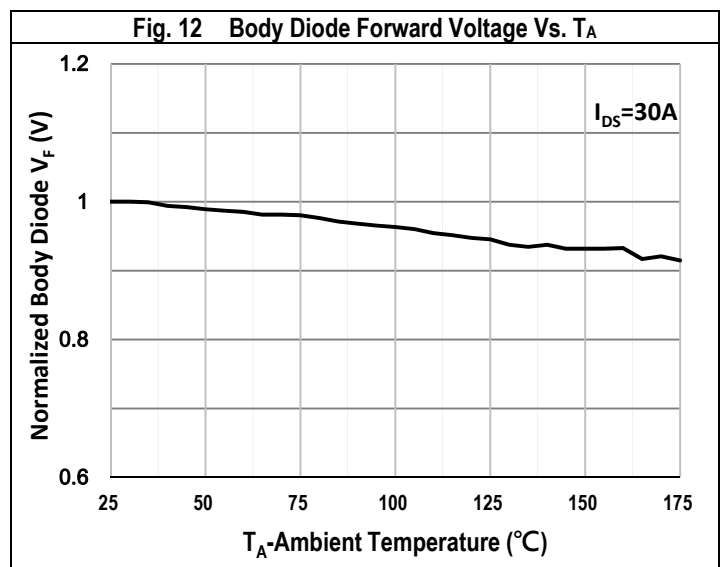
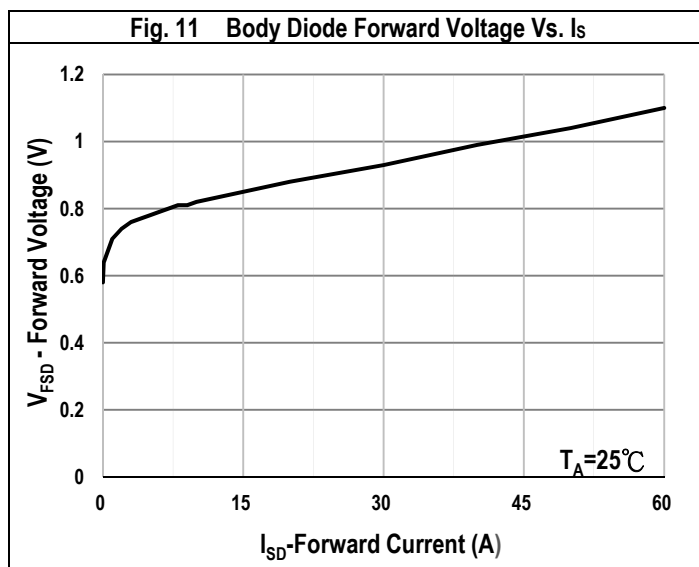
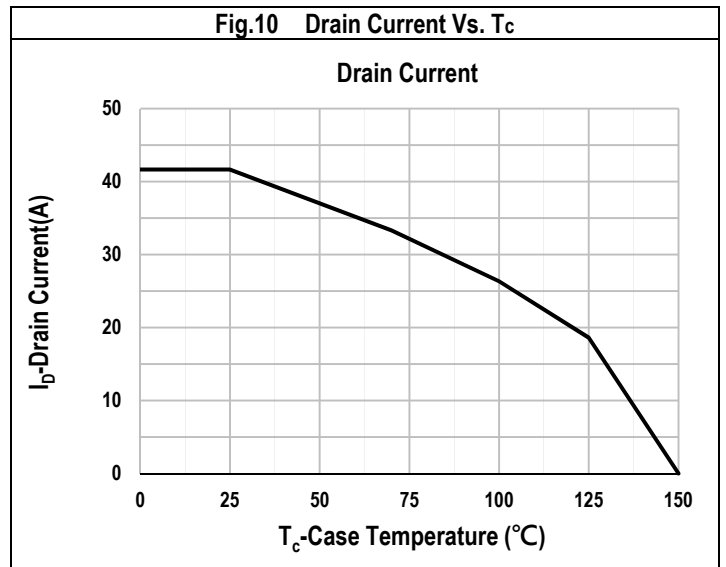
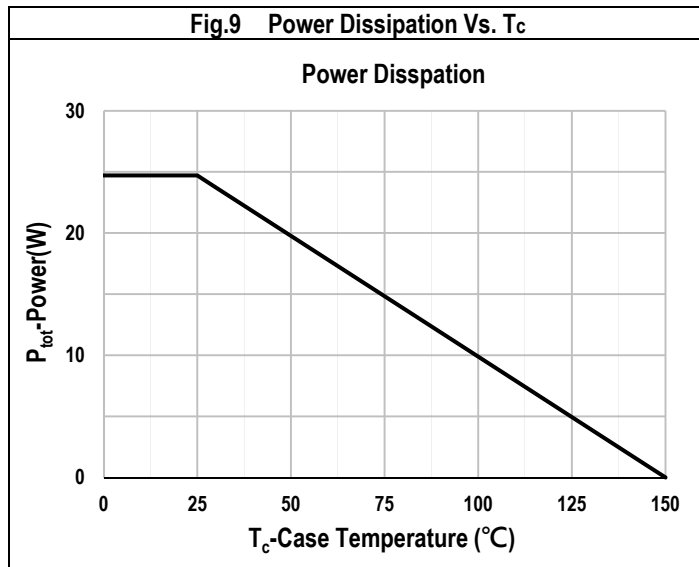
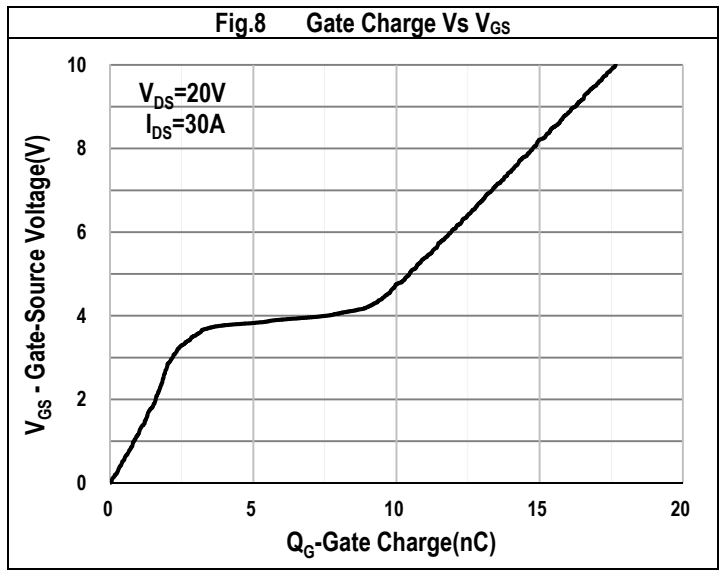
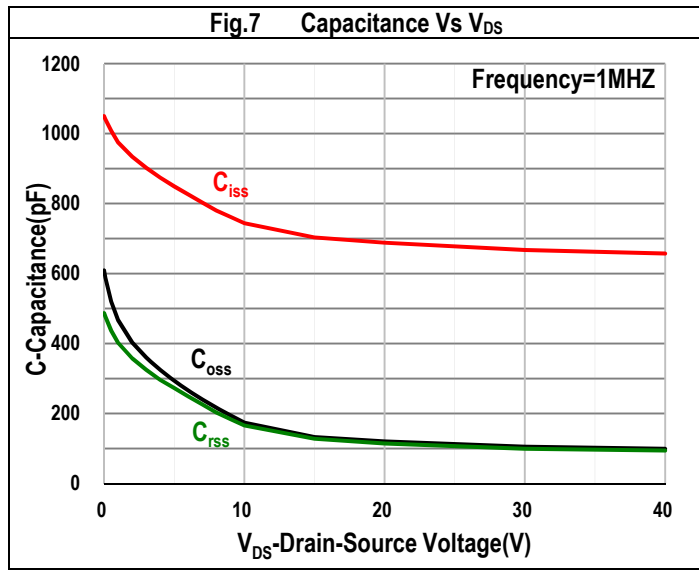


Fig.11 Safe Operation Area

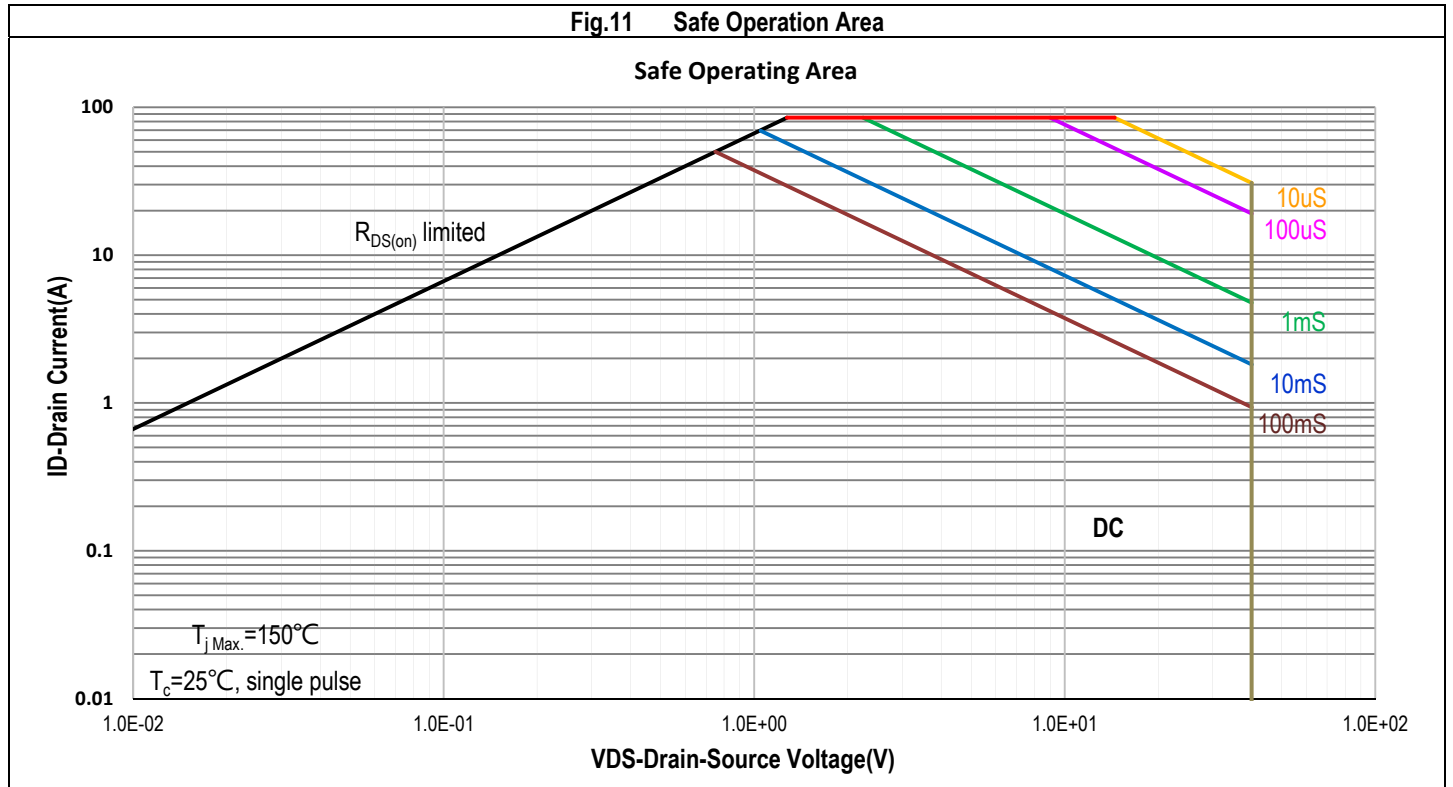
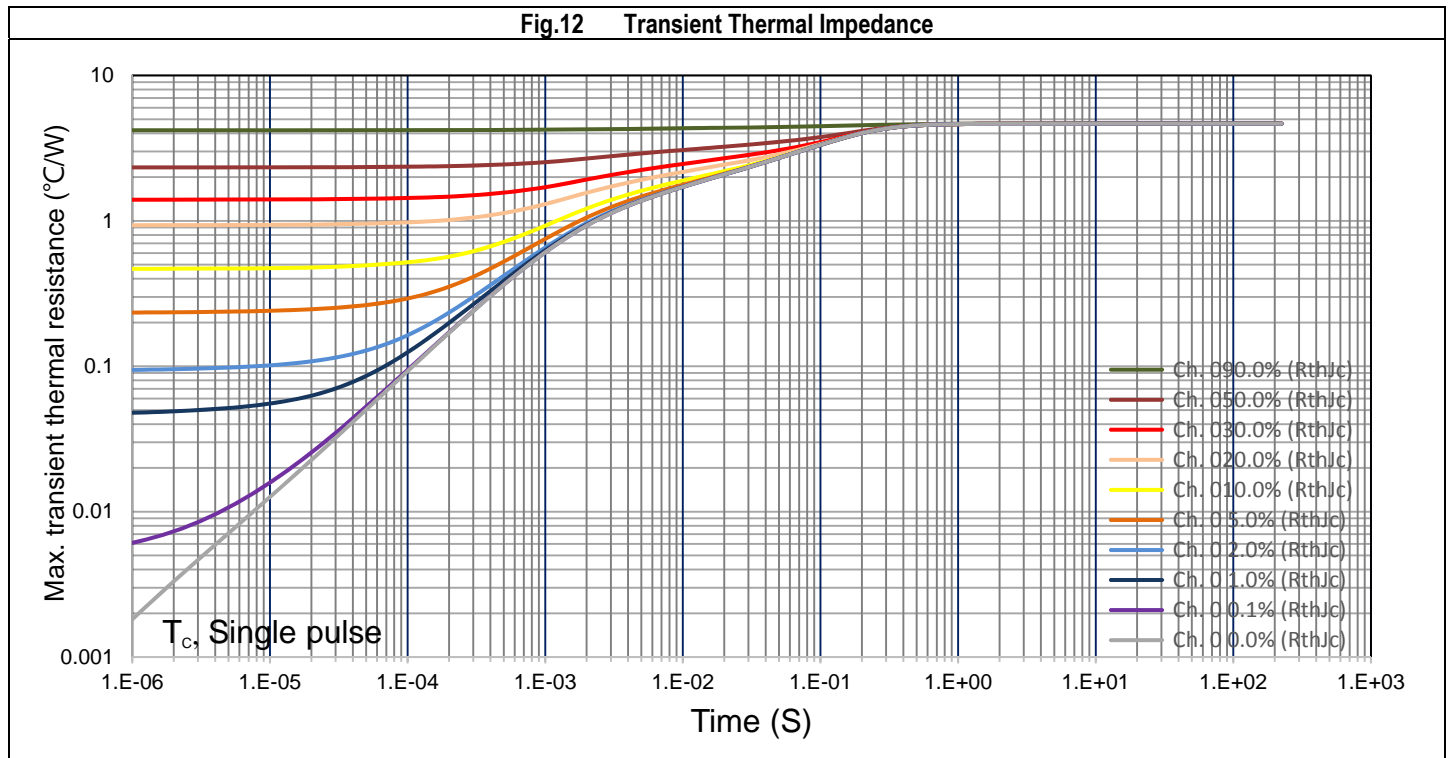
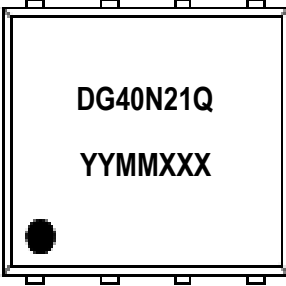


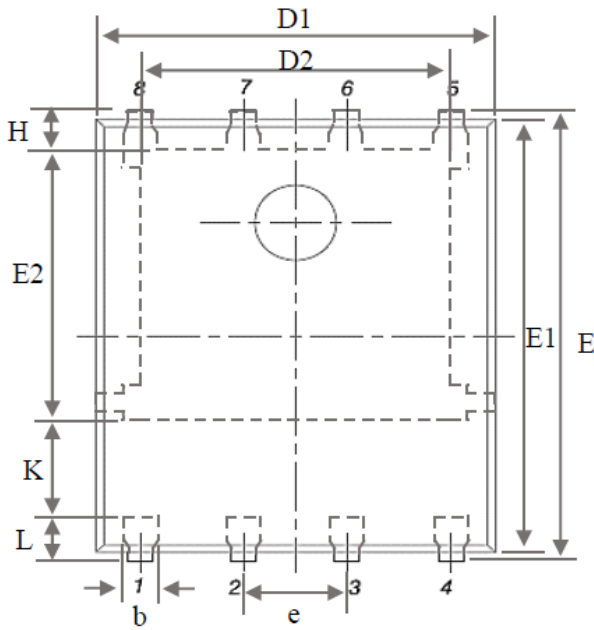
Fig.12 Transient Thermal Impedance



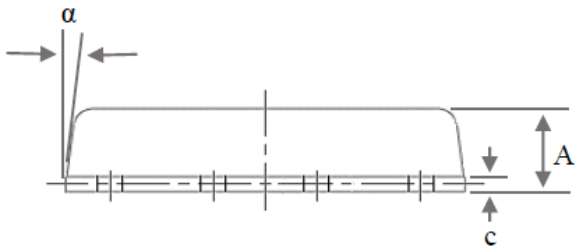
Marking Information

PDFN 5x6-8L (Q)	Marking Rule
<p data-bbox="129 353 296 389">Laser Marking</p> 	<p data-bbox="807 353 991 389"><u>Line 1</u> : Device</p> <p data-bbox="807 400 948 436">DG40N21Q</p> <p data-bbox="807 488 1038 524"><u>Line 2</u> : Date Code</p> <p data-bbox="807 535 943 571">YYMMXXX</p> <p data-bbox="807 622 1002 658">YY : Year Code</p> <p data-bbox="807 669 1027 705">MM : Month Code</p> <p data-bbox="807 716 1062 752">XXX : Serial Number</p>

Package of Dimension

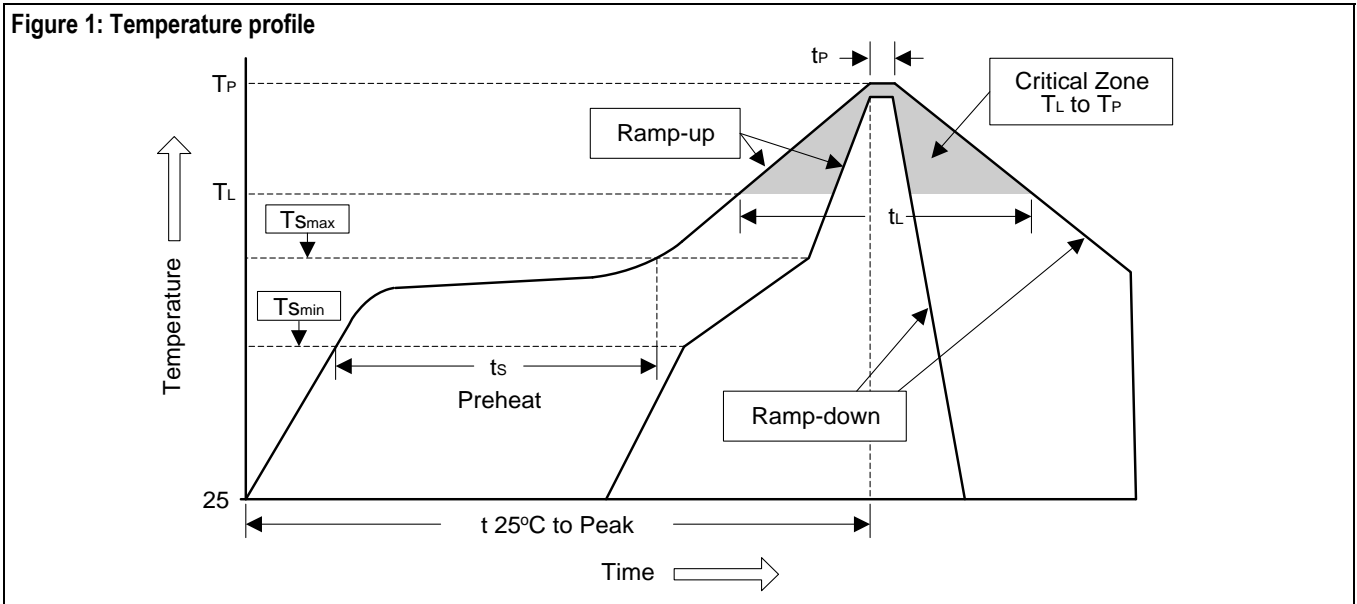


Symbol	Min	Nor	Max
A	0.90	1.04	1.17
b	0.33	0.42	0.51
C	0.06	0.20	0.35
D1	4.80	5.10	5.40
D2	3.61	3.96	4.31
E	5.90	6.03	6.15
E1	5.65	5.75	5.85
E2	3.30	3.54	3.78
e	1.27 BSC		
H	0.38	0.50	0.61
L	0.38	0.55	0.71
L1	0.05	0.15	0.25



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



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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