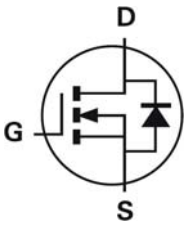
DG85N03PB

DG-FET™ 85V N-Channel Power MOSFET

Parameter	Value	Unit
V_{DSS}	85	V
$R_{DS(ON)\ max.}$ V_{GS}=10V	5.2	mΩ
I_D	111	A
Q_g	69.5	nC
Q_{gd}	19.8	nC
Q_{SW}	29.2	nC

TO-220AB-D



Features

- Extremely low on-resistance $R_{DS(on)}$
- Excellent Q_g x $R_{DS(on)}$ product (FOM)
- Fully Characterized Capacitance and Avalanche
- Pb-free lead plating; RoHS compliant

Application

- Motor control and drive
- Battery management
- UPS (Uninterruptible Power Supplies)

Ordering Information

Ordering Code	RoHS Status	Package	Package Code	Packing	Quantity
DG85N03PB	Halogen-Free	TO-220AB-D	PB	Tube	50

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

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	85	V
Gate-Source Voltage		V_{GS}	±20	V
Drain Current-Continuous Note 4	T_C=25°C	I_D	111	A
	T_C=100°C		70	A
Drain Current-Pulsed Note 1	T_C=25°C	I_{DM}	438	A
Avalanche Current		I_{AR}	25	A
Single Pulse Avalanche Energy Note 3		E_{AS}	31	mJ
Maximum Power Dissipation	T_C=25°C	P_D	113	W
	T_C=100°C		45	W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to 150	°C

Thermal Resistance Ratings

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Thermal resistance, Junction-to-Ambient Note 2	$R_{\theta JA}$	Steady State	-	-	24.93	°C/W
Thermal resistance, Junction-to-Case	$R_{\theta JC}$	Steady State	-	-	1.1	°C/W

Notes:

1. Pulse Test: Pulse Width ≤ 380μs, 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. Limited by T_{Jmax}, starting T_J=25°C, L=0.1mH, R_g=25Ω, I_D=25A, V_{GS}=10V.
4. The maximum current rating is package limited.

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	85	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=80V, V_{GS}=0V	-	-	1	µA
		V_{DS}=80V, 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	2	2.8	4	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_{DS}=50A	-	-	5.2	mΩ
Gate Resistance	R_g	V_{GS}=15mV, V_{DS}=0V, f=1MHz	-	1.3		Ω
Forward Transconductance	g_{fs}	V_{DS}=5V, I_{DS}=20A	-	13.1	-	S

DYNAMIC CHARACTERISTICS						
Parameter	**Symbol**	**Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Input Capacitance	C_{iss}	V_{DS}=40V, V_{GS}=0V, f=1MHz	-	3924	-	pF
Output Capacitance	C_{oss}	V_{DS}=40V, V_{GS}=0V, f=1MHz	-	855	-	pF
Reverse Transfer Capacitance	C_{rss}	V_{DS}=40V, V_{GS}=0V, f=1MHz	-	37	-	pF
Turn-On Delay Time	$T_{d(on)}$	V_{DS}=40V, V_{GS}=10V, I_{DS}=50A, R_{GEN}=3Ω	-	19	-	ns
Rise Time	t_r	V_{DS}=40V, V_{GS}=10V, I_{DS}=50A, R_{GEN}=3Ω	-	80	-	ns
Turn-Off Delay Time	$T_{d(off)}$	V_{DS}=40V, V_{GS}=10V, I_{DS}=50A, R_{GEN}=3Ω	-	6	-	ns
Fall Time	t_f	V_{DS}=40V, V_{GS}=10V, I_{DS}=50A, R_{GEN}=3Ω	-	96	-	ns

GATE CHARGE CHARACTERISTICS						
Parameter	**Symbol**	**Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Gate to Source Gate Charge	Q_{gs}	V_{DD}=40V, I_D=50A, V_{GS}=0 to 10V	-	21.1	-	nC
Gate charge at threshold	$Q_{g(th)}$	V_{DD}=40V, I_D=50A, V_{GS}=0 to 10V	-	11.6	-	nC
Gate to Drain Charge	Q_{gd}	V_{DD}=40V, I_D=50A, V_{GS}=0 to 10V	-	19.8	-	nC
Switching charge	Q_{SW}	V_{DD}=40V, I_D=50A, V_{GS}=0 to 10V	-	29.2	-	nC
Gate charge total	Q_g	V_{DD}=40V, I_D=50A, V_{GS}=0 to 10V	-	69.5	-	nC
Gate charge total	Q_g	V_{DD}=40V, I_D=50A, V_{GS}=0 to 4.5V	-	49.8	-	nC
Gate plateau voltage	$V_{plateau}$	V_{DD}=40V, I_D=50A, V_{GS}=0 to 10V	-	5.1	-	V
Gate charge total, sync. FET (Q_g- Q_{gd})	$Q_{g(sync)}$	V_{DS}=0.1V, V_{GS}=0 to 10V	-	49.7	-	nC

DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Parameter	**Symbol**	**Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Diode continuous forward current (Body Diode)	I_S	T_C=25°C	-	-	111	A
Diode pulse current (Body Diode)	I_{SM}	T_C=25°C	-	-	438	A
Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_S=1A	-	0.68	1.3	V
Body Diode Reverse Recovery Time	t_{rr}	V_{DD}=40V, I_F=20A, di/dt=200A/µs	-	49.1	-	ns
Body Diode Reverse Recovery Charge	Q_{rr}	V_{DD}=40V, I_F=20A, di/dt=200A/µs	-	129.5	-	nC

Typical Operating Characteristics

Fig.1 Output Characteristics

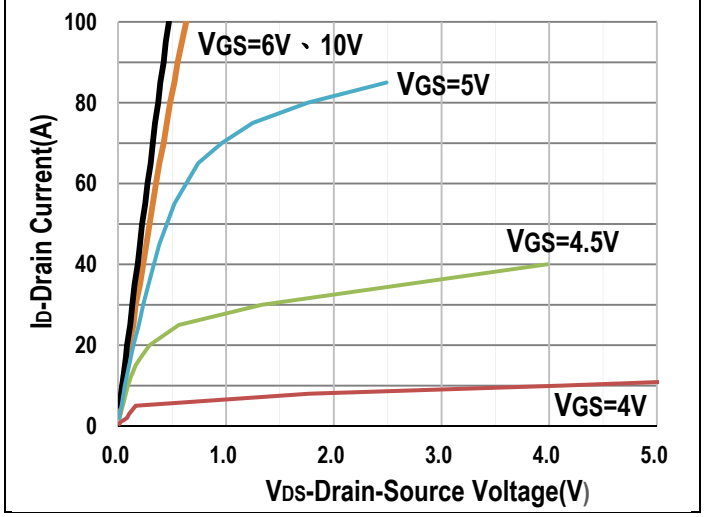


Fig.2 Gate Threshold Voltage Vs. Ta

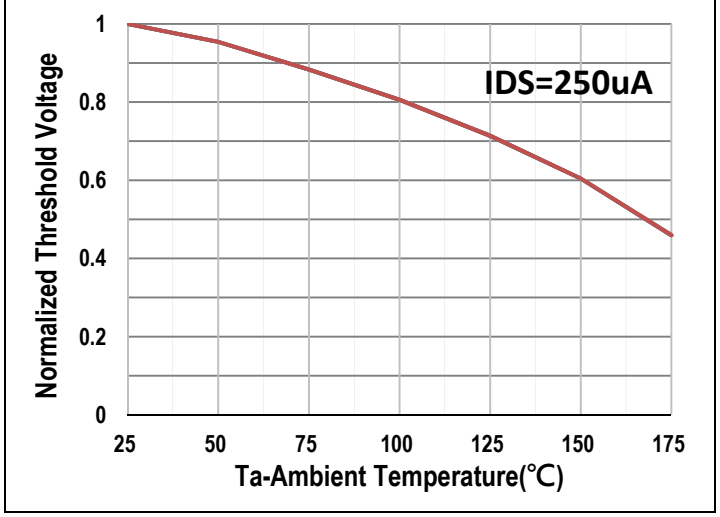


Fig.3 Drain-Source On Resistance

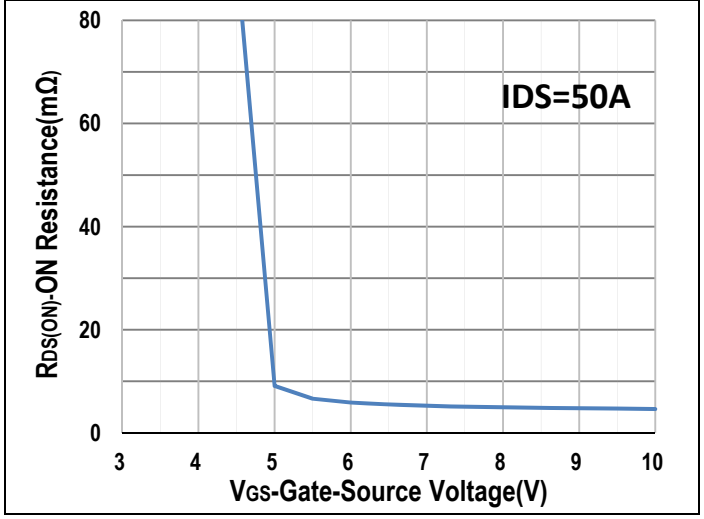


Fig.4 Normalized On Resistance Vs. Ta

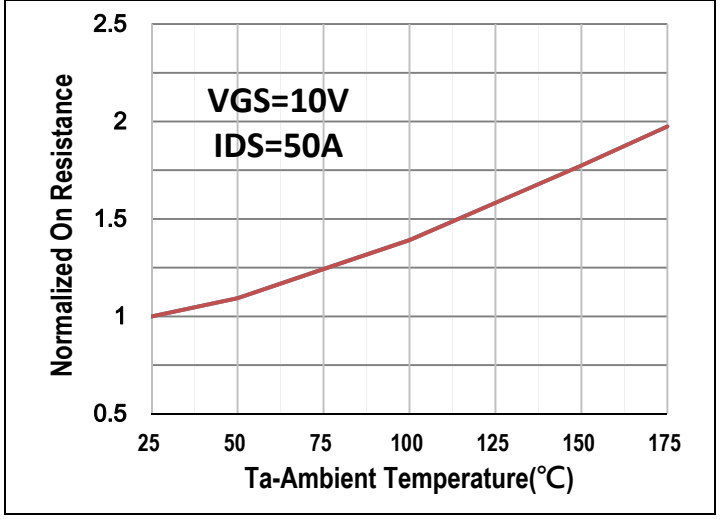


Fig.5 Drain-Source On Resistance

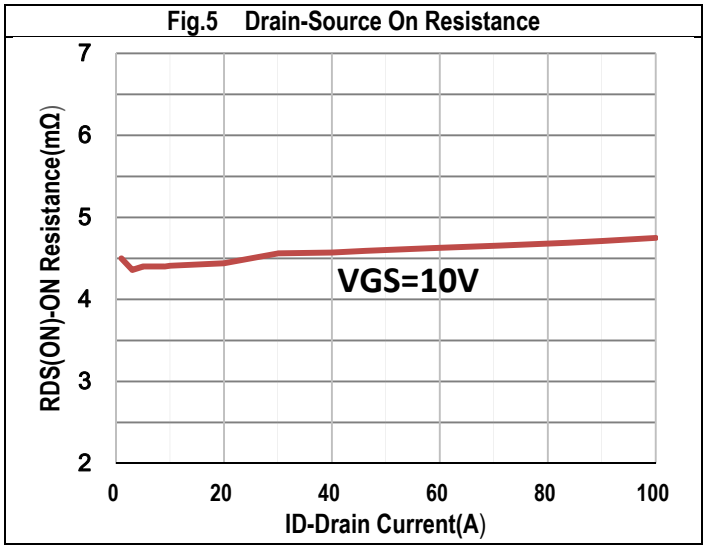
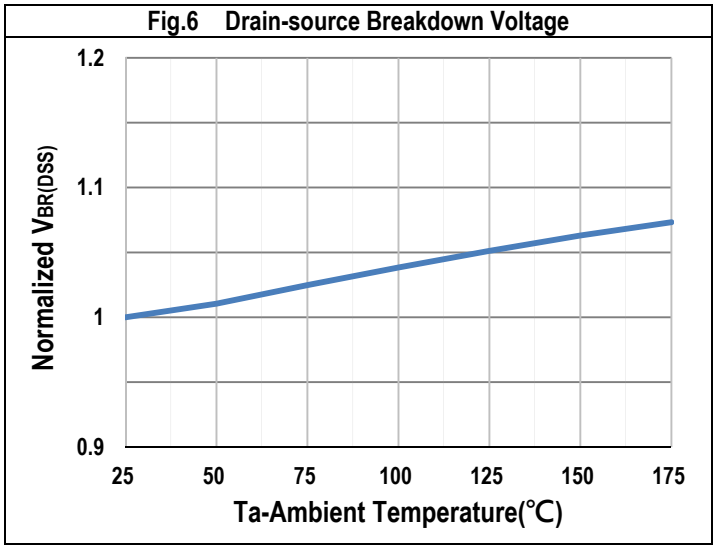


Fig.6 Drain-source Breakdown Voltage



Typical Operating Characteristics (Cont.)

Fig.7 Capacitance

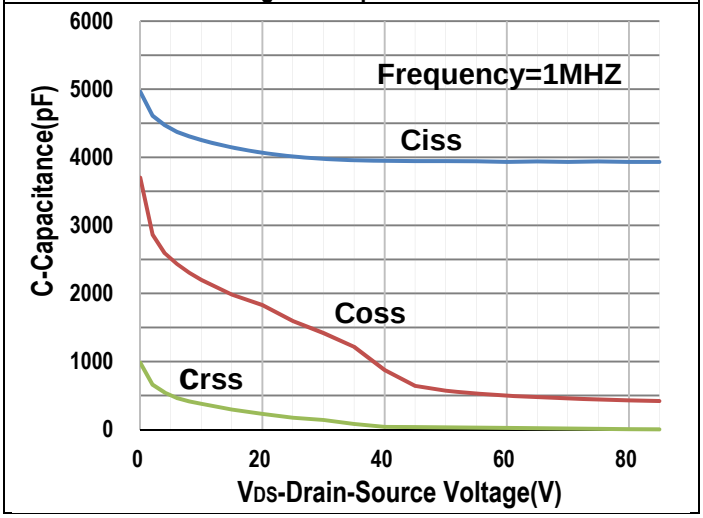


Fig.8 Gate Charge

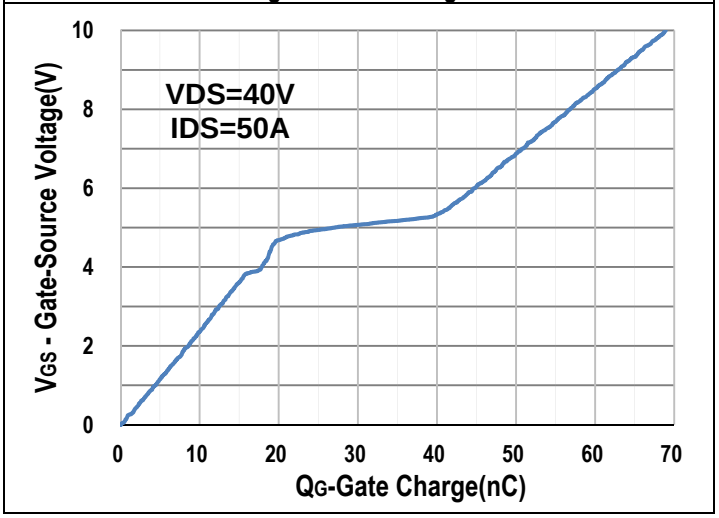


Fig.9 Power Dissipation Vs. Tc

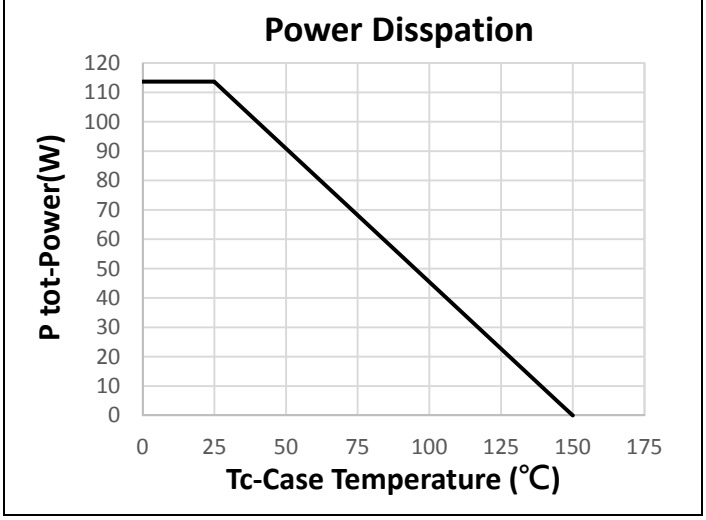


Fig.10 Drain Current Vs. Tc

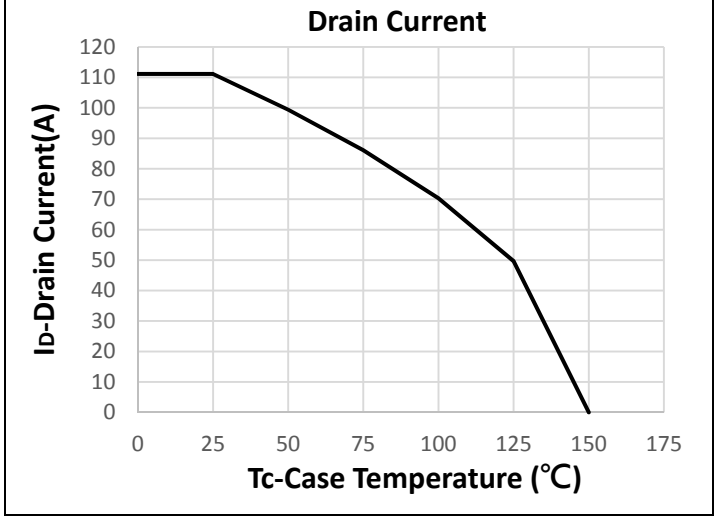


Fig.11 Safe Operation Area

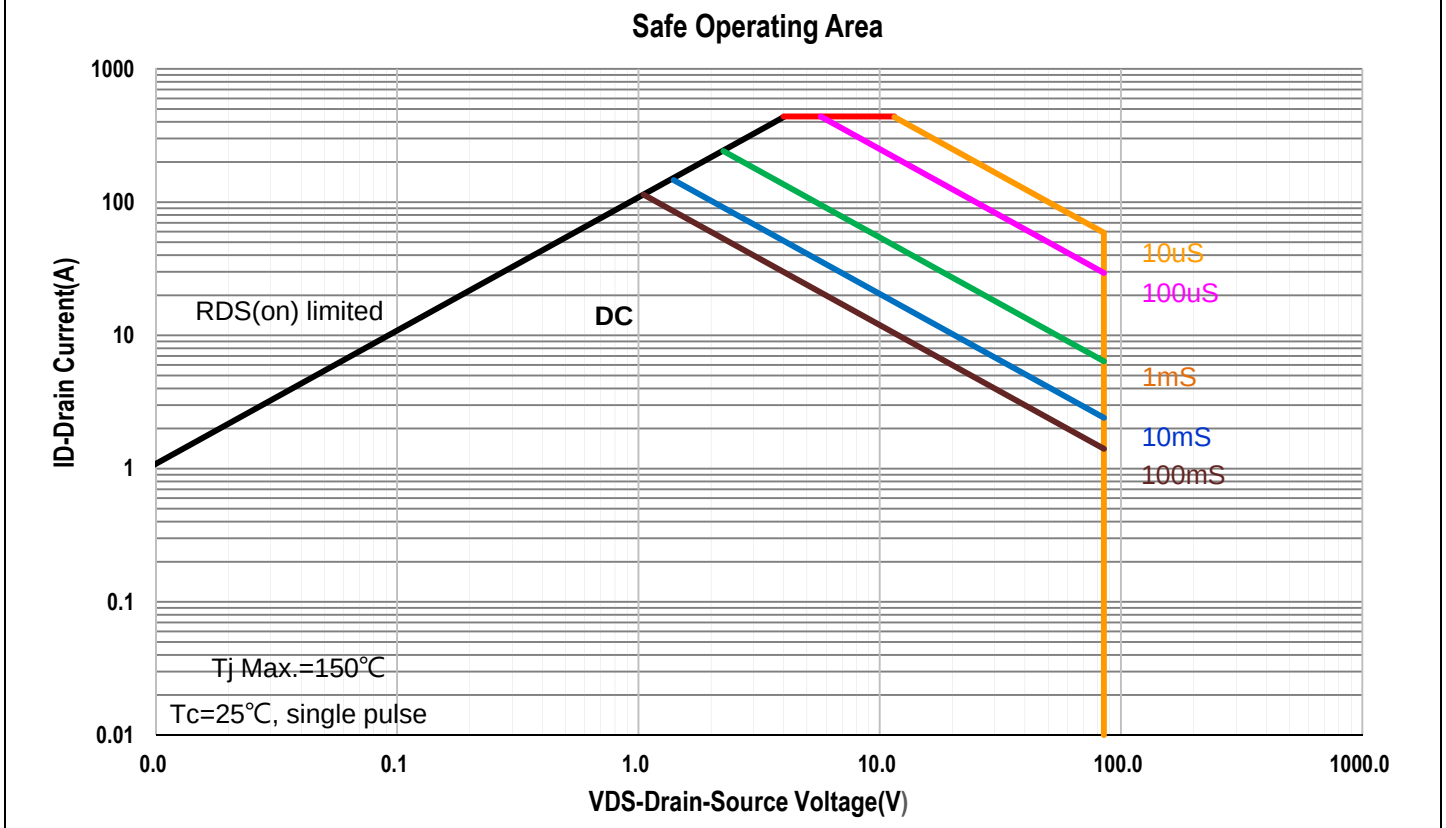
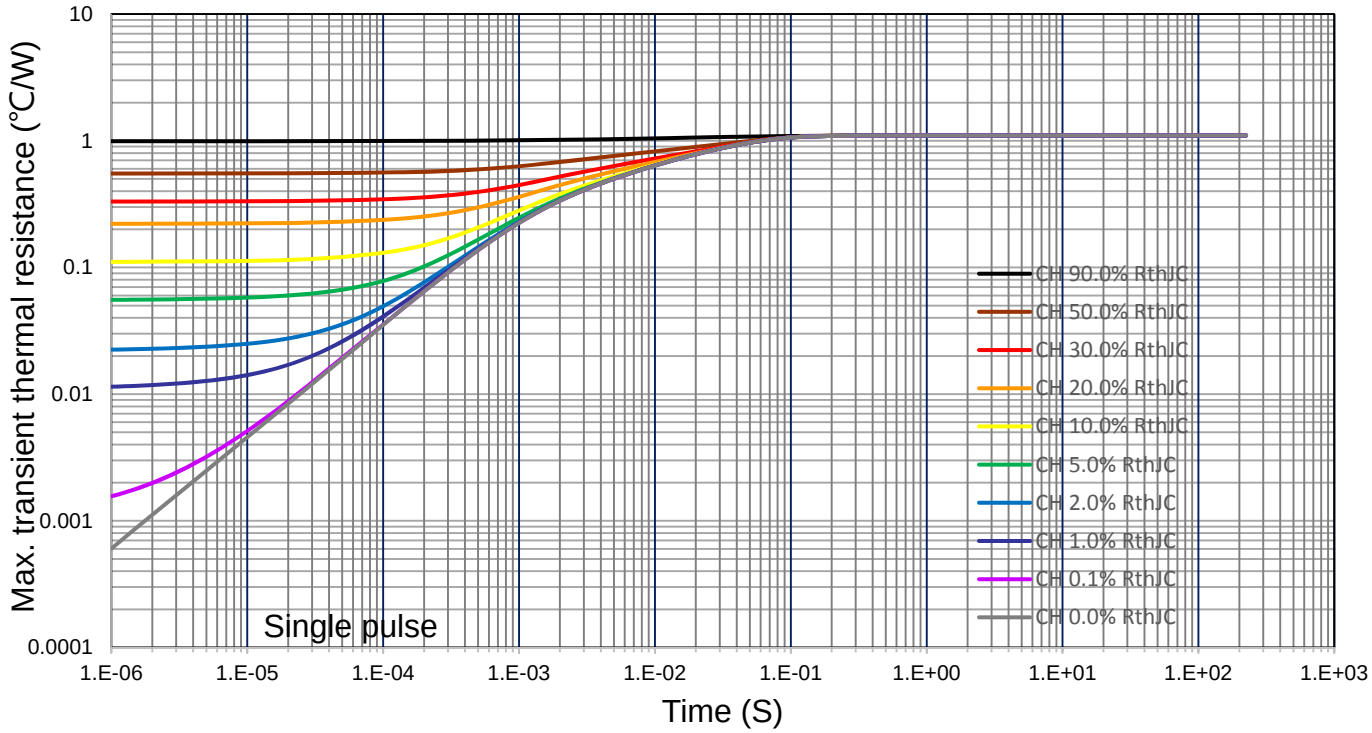
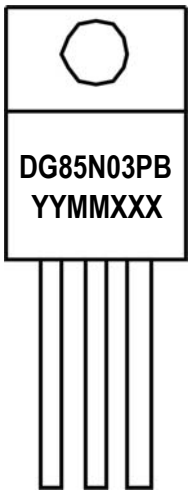


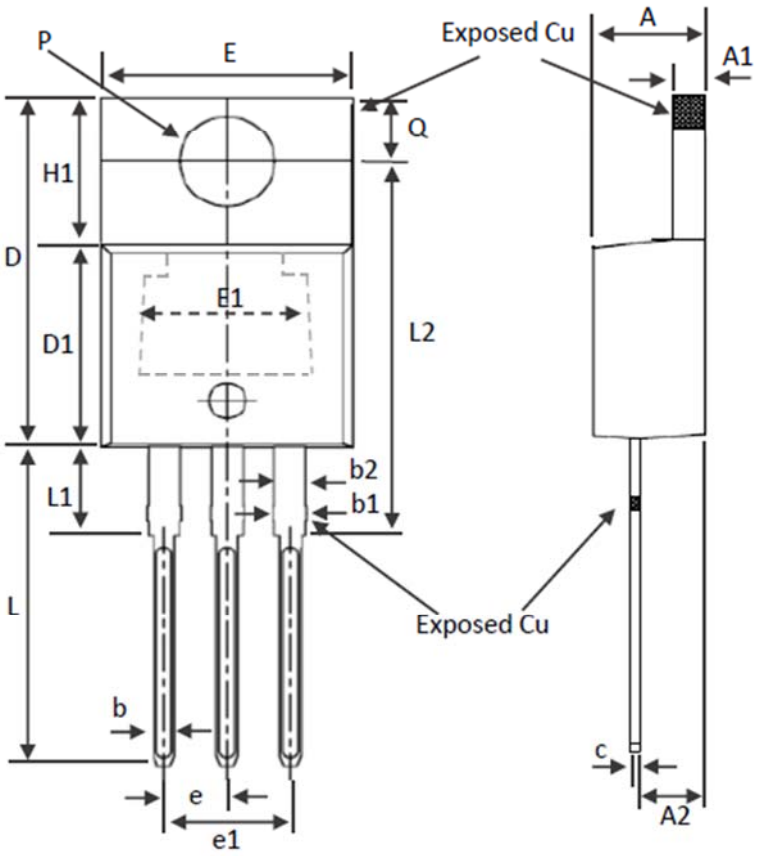
Fig.12 Transient Thermal Impedance



Marking Information

TO-220AB-D (PB)	Marking Rule
Laser Marking 	Line 1：Device DG85N03PB Line 2：Date Code YYMMXXX YY：Year Code MM：Month Code XXX：Serial Number

Package of Dimension

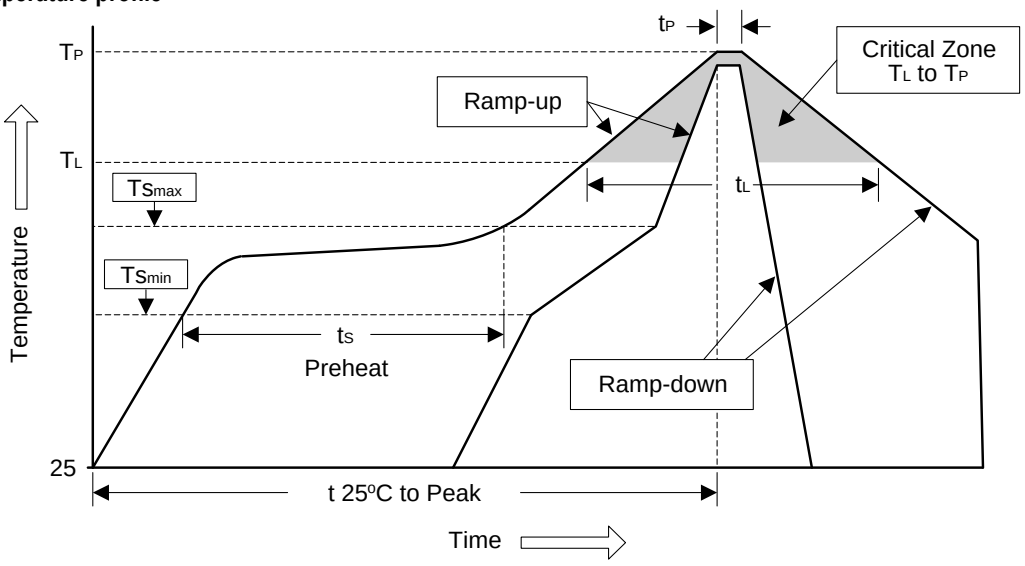


Symbol	Min	Nor	Max
A	3.56	4.57	4.82
A1	0.51	1.27	1.39
A2	2.04	2.67	2.92
b	0.39	0.81	1.01
b1	1.15	1.37	1.82
b2	1.15	1.27	1.77
D	14.22	15.00	16.51
D1	8.39	8.70	9.01
D2	11.45	11.94	12.87
E	9.66	10.11	10.66
E1	6.86	7.00	8.89
e		2.54 Ref.	
e1		5.08 Ref.	
H1	5.85	6.30	6.85
L	12.70	13.60	14.73
L1	-	3.75	6.35
L2	15.80	16.00	16.20
P	3.54	3.87	4.08
Q	2.54	2.74	3.42

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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