silicongear

DG100N16P

***DG-FET™* 100V N-Channel Power Enhanced Mode MOSFET**

Key parameter	Value	Unit
$V_{(BR)DSS}$ min.	100	V
$R_{DS\ (ON)}$ max. V_{GS}=10V	8.2	mΩ
$R_{DS\ (ON)}$ max. V_{GS}=4.5V	10.6	mΩ
I_D	108	A
$V_{GS(TH)}$ Typ.	1.8	V
C_{iss} Typ.	2483	pF
Q_g 10V Typ.	52.1	nC
E_{AS}	7.3	mJ

Package outline

TO-220AB

Description

These devices used double-gate structure of MOSFET to provide excellent electrical parameter. There is high-speed switching capacity, low R_{DSON} resistance, low gate charge and stable characteristics for these devices. Moreover, it is a helpful choose for raise efficiency or reduce consumption in circuit. These features combine to be an advantage design for use in wide variety of application including converter and inverter design.

Features

◇ Fast switch capacity

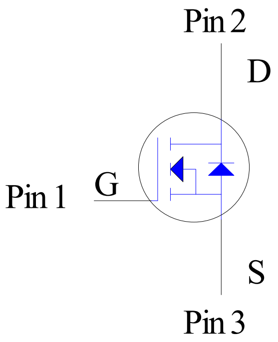
◇ Low $R_{DS(ON)}$ resistance

◇ Low input capacitance

◇ With voltage logic level driving characteristics

◇ Pb-free lead plating; RoHS compliant

Symbol and Pin assignment



Potential application

○ AC to DC adaptor

○ DC to DC Converter

○ Power Switch Mode Supply

○ Synchronous Rectifier for Power Delivery

○ Network equipment and display power supply unit

Order Information

Item	Description
1. Order Code	DG100N16P
2. Part Number	DG100N16P
3. Package Type	TO-220AB
4. Package Code	P
5. Packing Type	Tube
6. Quantity in Pack	50
7. RoHS Status	Halogen-Free

Content

Section	Subject	Page
1.	Absolute Maximum Ratings	3
2.	Thermal Resistance Ratings	3
3.	Electrical Characteristics	4
4.	Typical Operating Characteristics Diagram	5-7
5.	Package of Dimension	8
6.	Appendix	9-10

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

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	100	V
Gate-Source Voltage		V_{GS}	±20	V
Drain Current-Continuous Note 1	T_C=25°C	I_D	108	A
	T_C=100°C		68.5	A
Drain Current-Continuous Note 2	T_A=25°C	I_D	15.6	A
	T_A=70°C		12.4	A
Drain Current-Pulsed Note 3	T_A=25°C	I_{DM}	150	A
Avalanche Current		I_{AR}	12.1	A
Single Pulse Avalanche Energy Note 4		E_{AS}	7.3	mJ
Maximum Power Dissipation	T_C=25°C	P_D	183	W
	T_C=100°C		73.5	W
	T_A=25°C		3.80	W
	T_A=70°C		2.43	W
	Derate Factor Above TC=25°C		1.47	W/°C
Max. Operating Junction Temperature		T_J	150	°C
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to 150	°C

2. Thermal Resistance Ratings

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Thermal resistance, Junction-Case	$R_{\Theta JC-N}$	Please refer to Note 5	-	-	0.68	°C/W
Thermal resistance, Junction-Ambient	$R_{\Theta JA-N}$	Please refer to Note 5	-	-	32.85	°C/W

Notes:

1. Limited by silicon chip capability and $R_{\Theta JC-N}$ junction-to-case thermal resistance.
2. The maximum current rating is limited by package and $R_{\Theta JA-N}$ junction-to-ambient thermal resistance.
3. Must be ensure junction temperature does not exceed 150-degree C. (Pulse Width≦380uS, Duty≦2%)
4. Limited by T_{Jmax}, starting T_J=25°C, L=0.1mH, R_g=25Ω, I_D=12.1A, V_{GS}=10V.
5. 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.

3. 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	100	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=100V, V_{GS}=0V	-	-	1	uA
		V_{DS}=100V, V_{GS}=0V, T_J=125°C	-	-	10	uA
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	1.5	1.8	2.1	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_{DS}=20A	-	7.2	8.2	mΩ
	$R_{DS(ON)}$	V_{GS}=4.5V, I_{DS}=15A	-	9.4	10.6	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}=20A	-	31.7	-	S

DYNAMIC CHARACTERISTICS

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C_{iss}	V_{DD}=100V, V_{DS}=50V, V_{GS}=0V, F=1MHz	-	2483	-	pF
Output Capacitance	C_{oss}	V_{DD}=100V, V_{DS}=50V, V_{GS}=0V, F=1MHz	-	347	-	pF
Reverse Transfer Capacitance	C_{rss}	V_{DD}=100V, V_{DS}=50V, V_{GS}=0V, F=1MHz	-	12.6	-	pF
Turn-On Delay Time	$T_{d(on)}$	V_{DS}=50V, V_{GS}=10V, I_{DS}=20A, R_{GEN}=2.4Ω	-	10.8	-	nS
Rise Time	T_r	V_{DS}=50V, V_{GS}=10V, I_{DS}=20A, R_{GEN}=2.4Ω	-	33.8	-	nS
Turn-Off Delay Time	$T_{d(off)}$	V_{DS}=50V, V_{GS}=10V, I_{DS}=20A, R_{GEN}=2.4Ω	-	35.3	-	nS
Fall Time	T_f	V_{DS}=50V, V_{GS}=10V, I_{DS}=20A, R_{GEN}=2.4Ω	-	60.5	-	nS

GATE CHARGE CHARACTERISTICS

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate to Source Gate Charge	Q_{gs}	V_{DD}=50V, I_D=20A, V_{GS}=0 to 10V	-	9.3	-	nC
Gate charge at threshold	$Q_{g(th)}$	V_{DD}=50V, I_D=20A, V_{GS}=0 to 10V	-	4.7	-	nC
Gate to Drain Charge	Q_{gd}	V_{DD}=50V, I_D=20A, V_{GS}=0 to 10V	-	13.3	-	nC
Switching charge	Q_{SW}	V_{DD}=50V, I_D=20A, V_{GS}=0 to 10V	-	17.8	-	nC
Gate charge total	$Q_{g\ 10V}$	V_{DD}=50V, I_D=20A, V_{GS}=0 to 10V	-	52.1	-	nC
Gate charge total	$Q_{g\ 4.5V}$	V_{DD}=50V, I_D=20A, V_{GS}=0 to 10V	-	26.8	-	nC
Gate plateau voltage	$V_{plateau}$	V_{DD}=50V, I_D=20A, V_{GS}=0 to 10V	-	3.4	-	V
Gate charge total, sync. FET (Q_g - Q_{gd})	$Q_{g(sync)}$	V_{DS}=0.1V, V_{GS}=0 to 10V	-	38.8	-	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	-	-	108	A
Body Diode pulse current	I_{SM}	T_C=25°C	-	-	150	A
Body Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_S=20A	-	0.86	1.0	V
Body Diode Reverse Recovery Time	t_{rr}	V_{DD}=50V, I_F=20A, di/dt=100A/μs	-	55.3	-	nS
Body Diode Reverse Recovery Charge	Q_{rr}	V_{DD}=50V, I_F=20A, di/dt=100A/μs	-	84.1	-	nC
Body Diode Reverse Recovery Current	I_{rm}	V_{DD}=50V, I_F=20A, di/dt=100A/μs	-	2.6	-	A

4. Typical Operating Characteristics Diagram

Fig. 1: Output Characteristics

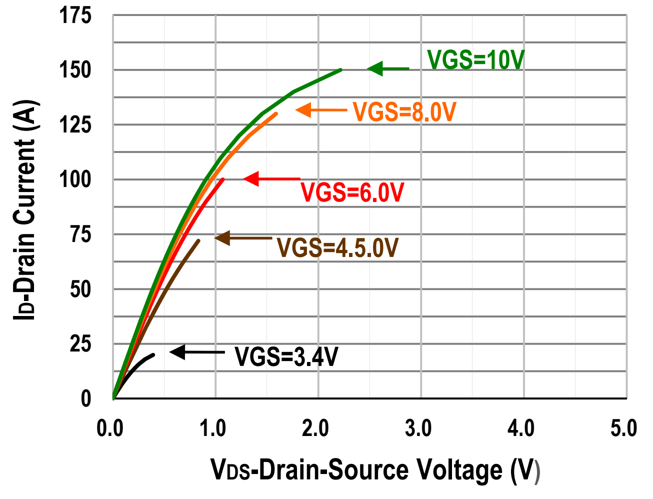


Fig. 2: Normalized $V_{(TH)GS}$ Voltage Vs. T_A

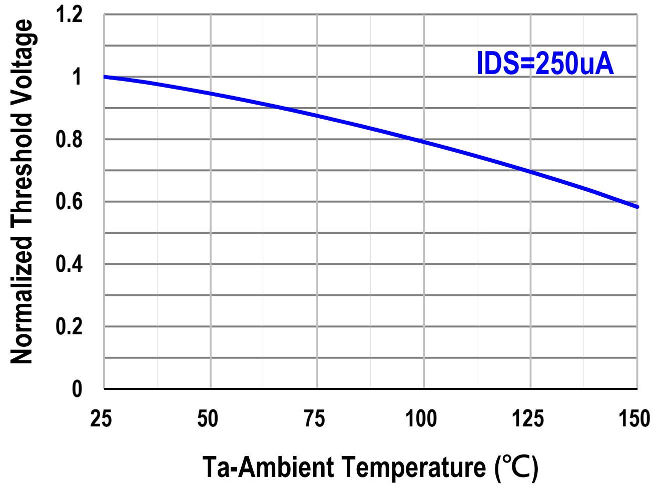


Fig. 3: Drain-Source On Resistance Vs V_{GS}

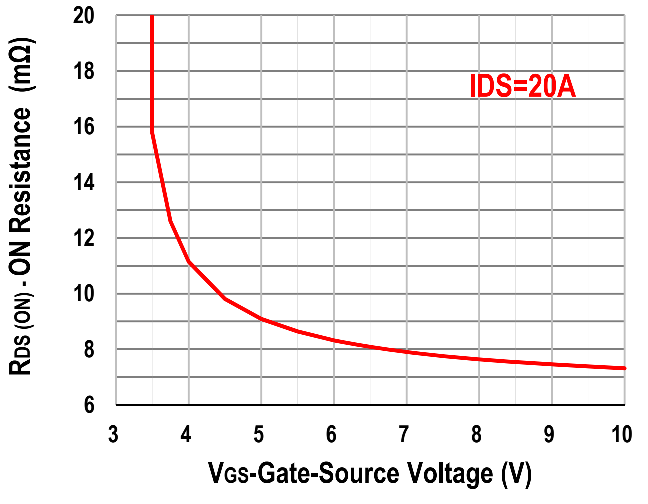


Fig. 4: Normalized $R_{DS(ON)}$ Resistance Vs. T_A

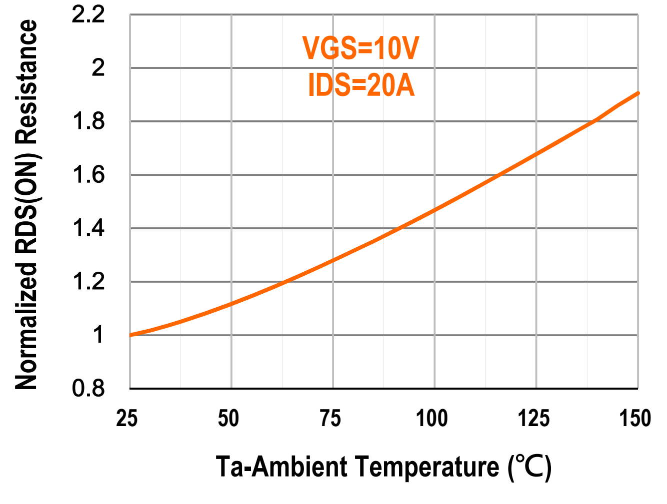


Fig. 5: Drain-Source On Resistance Vs I_D

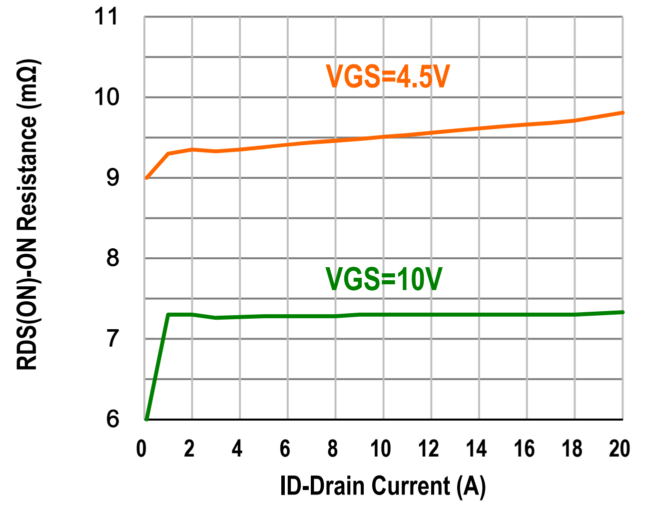
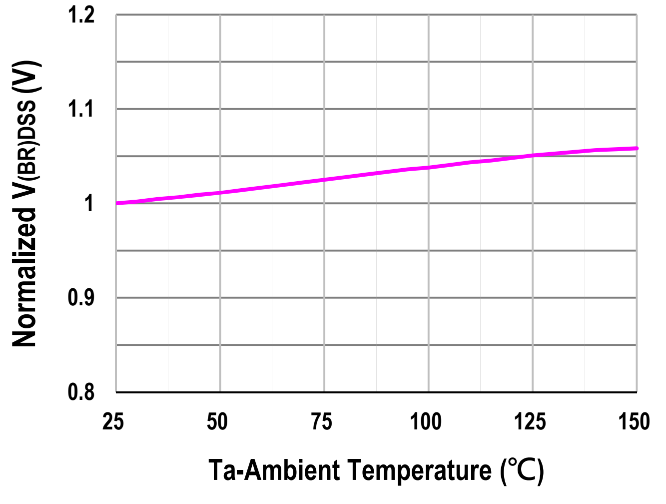


Fig. 6: Normalized B_{VDSS} Voltage Vs T_A



4. Typical Operating Characteristics Diagram

Fig. 7: Typical Capacitance Variation Vs V_{DS}

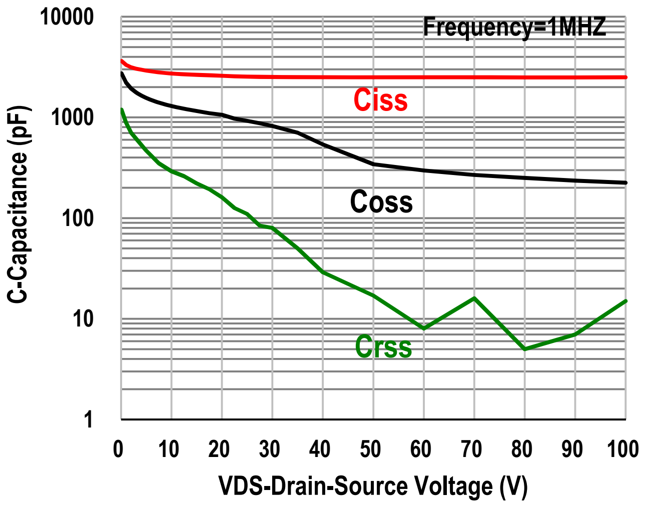


Fig. 8: Gate Charge Vs V_{GS}

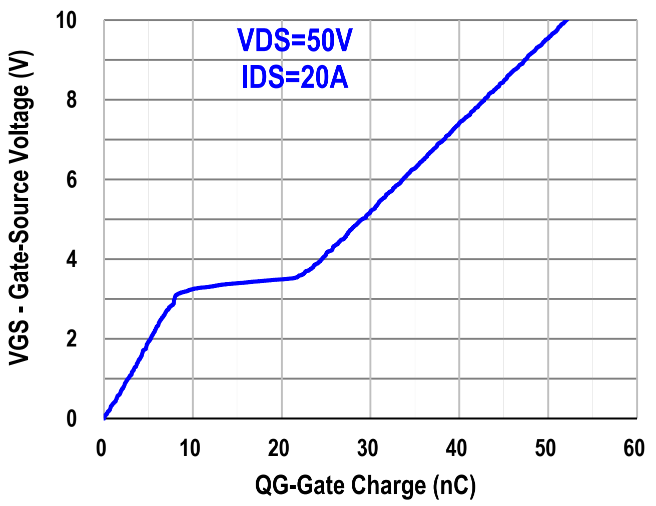


Fig. 9: Power Dissipation Vs. T_C

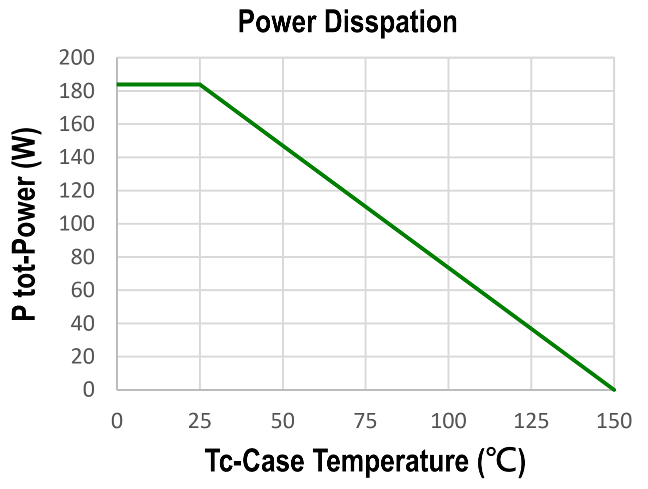


Fig. 10: Drain Current Vs. T_C

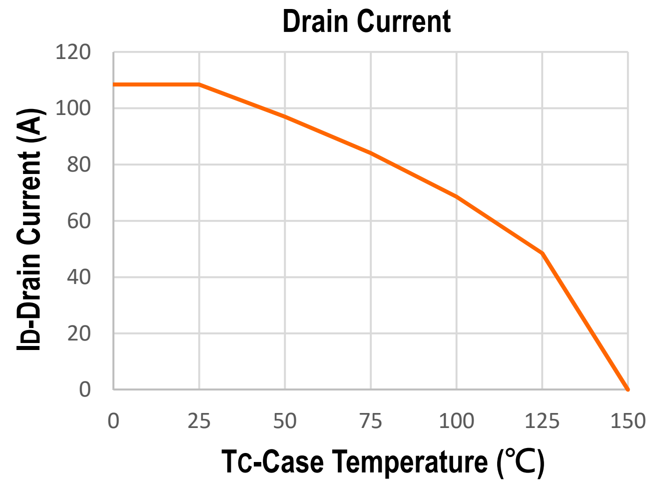


Fig. 11: Body Diode Forward Voltage Vs. I_S

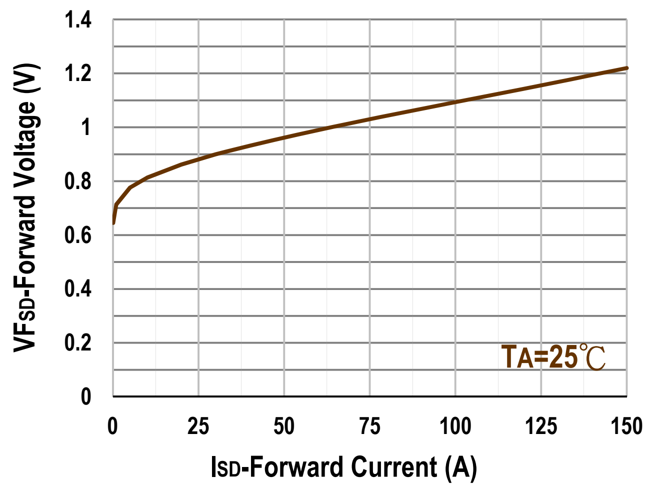
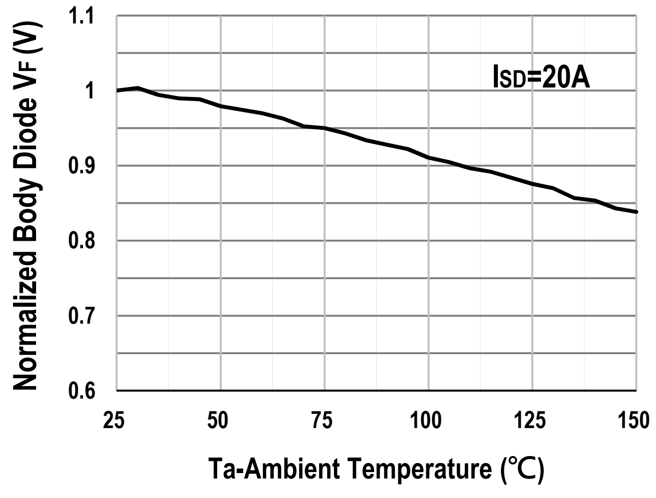


Fig. 12: Normalized Body Diode Forward Voltage Vs. T_A



4. Typical Operating Characteristics Diagram

Fig. 13: Safe Operation Area

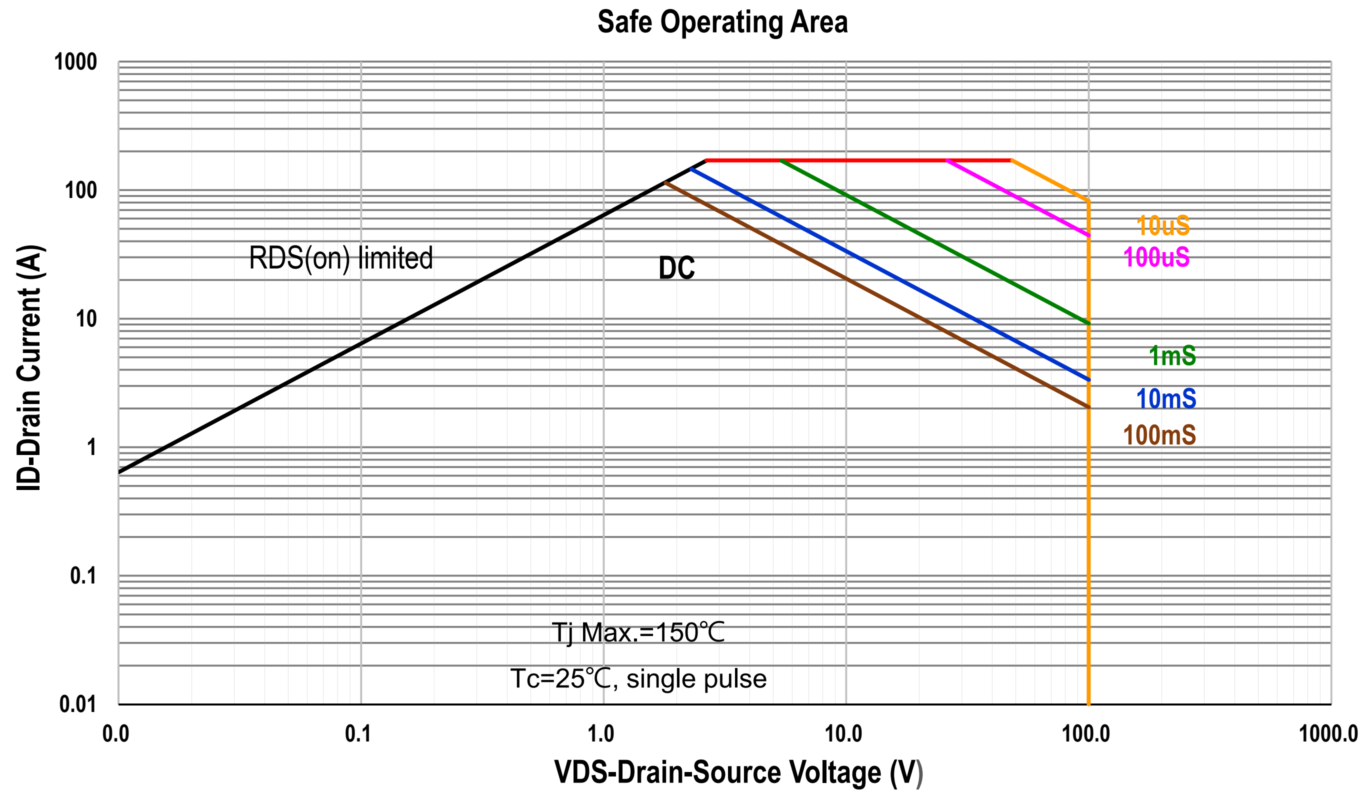
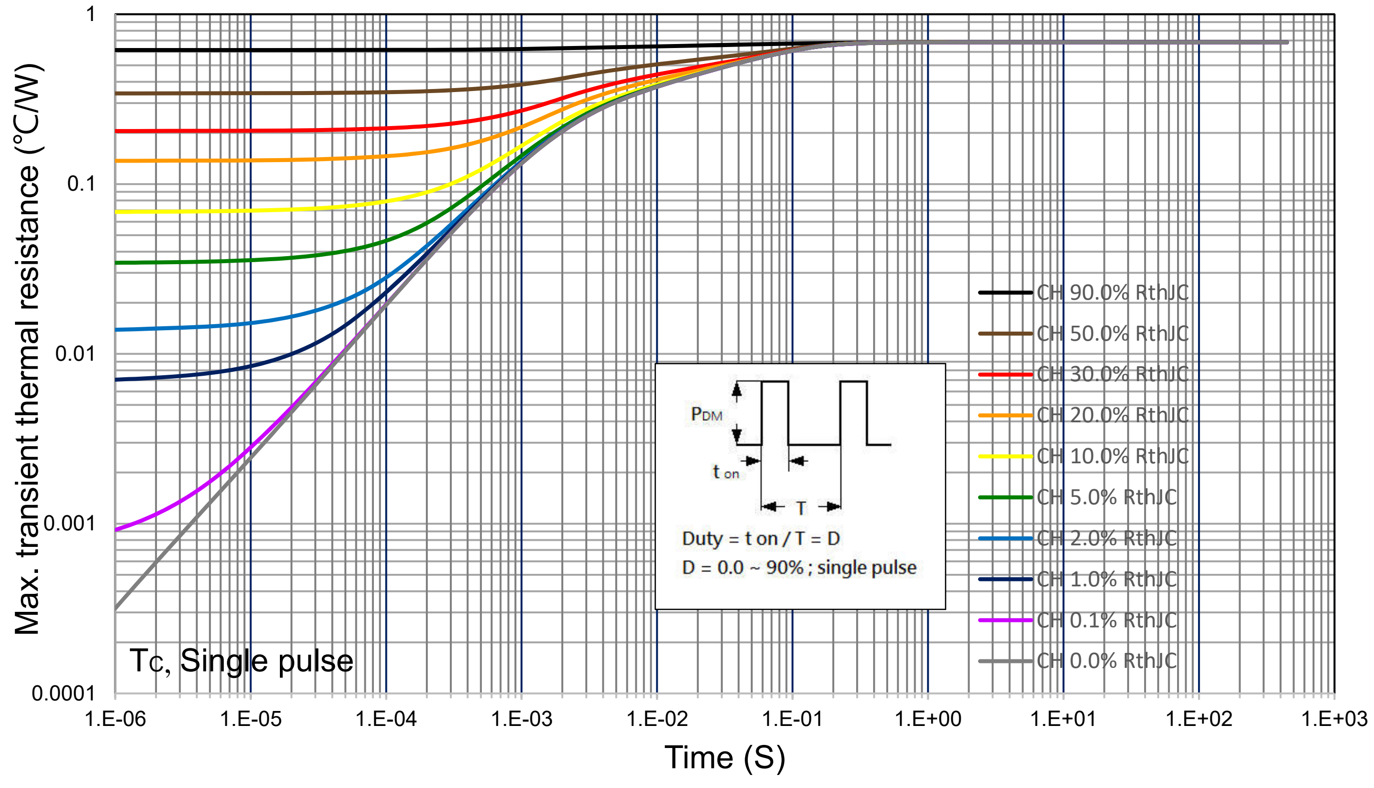


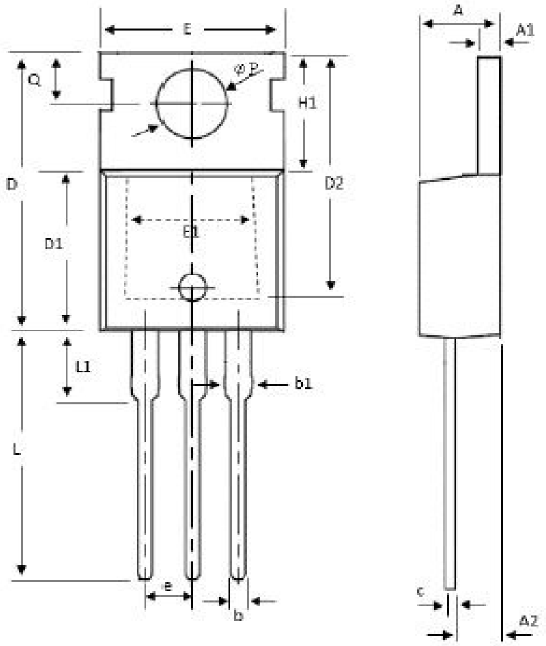
Fig. 14: Transient Thermal Impedance



5. Package of Dimension

Package type: TO-220AB

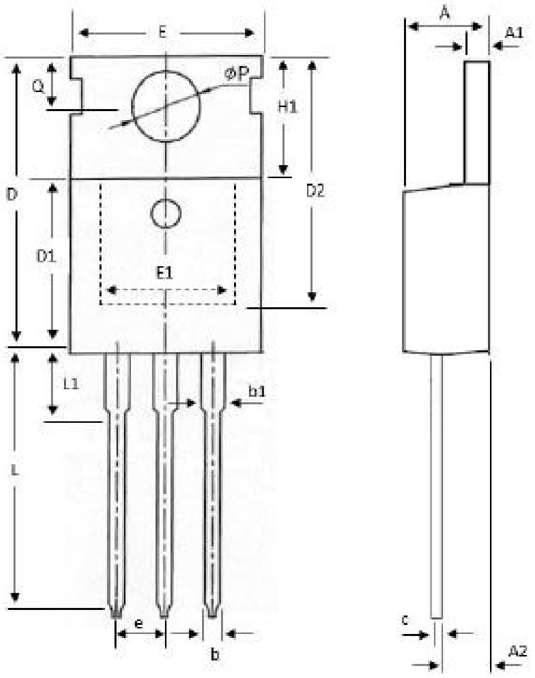
G-TYPE



Symbol	Min	Nor	Max
A	4.20	4.45	4.70
A1	1.15	1.28	1.40
A2	2.20	2.45	2.70
b	0.70	0.83	0.95
b1	1.15	1.45	1.75
c	0.40	0.50	0.60
D1	8.80	9.10	9.40
D2	11.75	-	-
E	9.70	10.03	10.36
E1	6.86	-	-
e	2.54 BSC		
H1	6.25	6.55	6.85
L	12.75	13.38	14.00
L1	-	-	4.00
P	3.40	3.70	4.00
Q	2.60	2.80	3.00

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

P-TYPE
H-TYPE

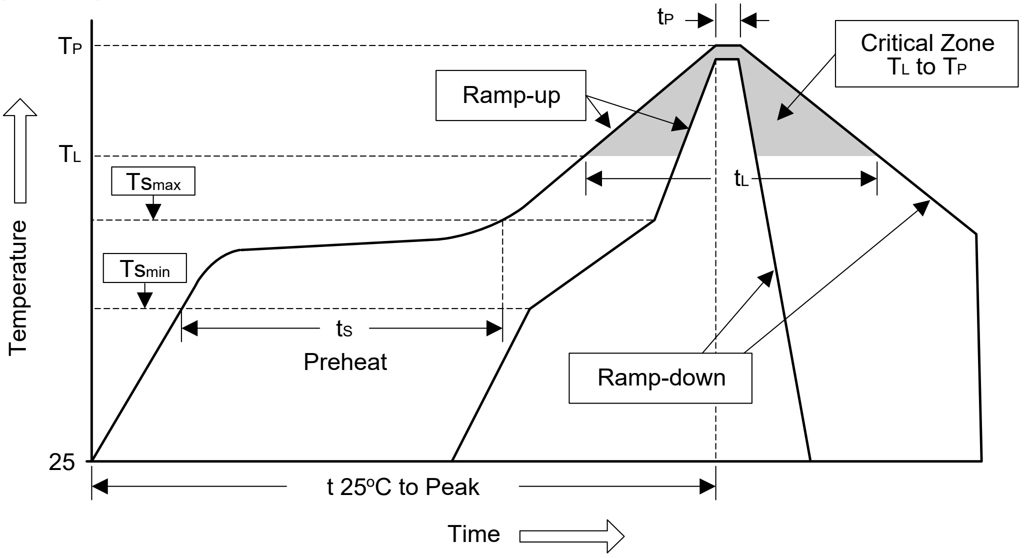


6. Appendix-A

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

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

6. Appendix-B

Important Notice

© Silicongear Corporation

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Silicongear cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in an Silicongear product. No circuit patent licenses, copyrights, mask work rights, or other intellectual property rights are implied.

Silicongear Corporation, its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Silicongear”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Silicongear makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Silicongear disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Silicongear’s knowledge of typical requirements that are often placed on Silicongear products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer’s responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer’s technical experts. Product specifications do not expand or otherwise modify Silicongear’s terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Silicongear products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Silicongear product could result in personal injury or death. Customers using or selling Silicongear products not expressly indicated for use in such applications do so at their own risk and agree to fully indemnify and hold Silicongear and its distributors harmless from and against any and all claims, liabilities, expenses and damages arising or resulting in connection with such use or sale, including attorneys fees, even if such claim alleges that Silicongear or its distributor was negligent regarding the design or manufacture of the part. Please contact authorized Silicongear personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Silicongear. Product names and markings noted herein may be trademarks of their respective owners.

Silicongear and the Silicongear logo are trademarks of Silicongear Corporation. All other brand and product names appearing in this document are registered trademarks or trademarks of their respective holders.