

Key parameter	Value	Unit
$V_{(BR)DSS}$ min.	20	V
$R_{DS(ON)}$ max. $V_{GS}=10V$	4.6	m Ω
$R_{DS(ON)}$ max. $V_{GS}=4.5V$	5.0	m Ω
$V_{GS(TH)}$ Typ.	0.7	V
I_D	72.1	A
C_{iss} Typ.	2683	pF
Q_g 10V Typ.	75.6	nC
E_{AS}	72.9	mJ

Package outline
PDFN3.3x3.3-8L

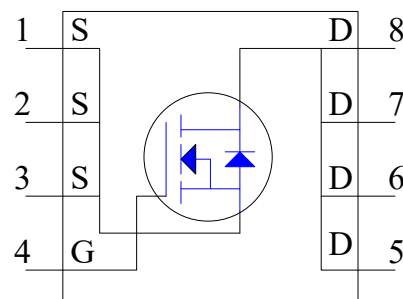
Description

These devices are used advanced trench technology of MOSFET to provide excellent electrical parameter. There is high speed switching capability, low $R_{DS(ON)}$ resistance, stabilizing qualified and 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 switch mode power supply and load switch.

Features

- ◇ Fast switch capacity
- ◇ Low $R_{DS(ON)}$ resistance
- ◇ Low input capacitance
- ◇ Low Switching Loss
- ◇ Pb-free lead plating; RoHS compliant

Symbol and Pin assignment



Potential application

- ☐ AC-DC adaptor
- ☐ DC-DC converter
- ☐ Load Switch
- ☐ Electric tool application
- ☐ Motor/Fan driving application

Order Information

Item	Description
1. Order Code	SG20N01E
2. Part Number	SG20N01E
3. Package Type	PDFN3.3x3.3-8L
4. Package Code	E
5. Packing Type	Tape & Reel
6. Quantity in Pack	5,000
7. RoHS Status	Halogen-Free

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

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	20	V
Gate-Source Voltage		V_{GS}	±12	V
Drain Current-Continuous ^{Note 1}	T _C =25°C	I_D	72.1	A
	T _C =100°C		45.6	A
Drain Current-Continuous ^{Note 2}	T _A =25°C	I_D	18.6	A
	T _A =70°C		14.9	A
Drain Current-Pulsed ^{Note 3}	T _A =25°C	I_{DM}	180	A
Avalanche Current		I_{AR}	19.1	A
Single Pulse Avalanche Energy ^{Note 4}		E_{AS}	72.9	mJ
Maximum Power Dissipation	T _C =25°C	P_D	37.0	W
	T _C =100°C		14.8	W
	T _A =25°C		2.48	W
	T _A =70°C		1.59	W
	Derate Factor Above T _C =25°C		0.3	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	-	-	3.37	°C/W
Thermal resistance, Junction-Ambient	$R_{\theta JA-N}$	Please refer to Note 5	-	-	50.23	°C/W

Notes:

- Limited by silicon chip capability and $R_{\theta JC-N}$ junction-to-case thermal resistance.
- The maximum current rating is limited by package and $R_{\theta JA-N}$ junction-to-ambient thermal resistance.
- Must be ensure junction temperature does not exceed 150-degree C. (Pulse Width ≤ 380uS, Duty ≤ 2%)
- Limited by T_{Jmax}, starting T_J=25°C, L=0.4mH, R_g=25Ω, I_D=19.1A, V_{GS}=10V.
- The value of thermal resistance is measured with the single device mounted on 1 inch² FR-4 PCB with 2 oz. copper under a still air environment temperature is 25°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	$V_{(BR)DSS}$	$V_{GS}=0V, I_{DS}=250\mu A$	20	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=20V, V_{GS}=0V$	-	-	1	μA
		$V_{DS}=20V, V_{GS}=0V, T_J=125^\circ C$	-	-	10	μA
Gate-Body Leakage	I_{GSS}	$V_{GS}=\pm 12V, V_{DS}=0V$	-	-	± 100	nA

STATIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_{DS}=250\mu A$	0.4	0.7	1.0	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_{DS}=20A$	-	4.0	4.6	m Ω
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=4.5V, I_{DS}=10A$	-	4.4	5.0	m Ω
Gate Resistance	R_g	$V_{GS}=0V, V_{DS}=0V, f=1MHz$	-	0.9	-	Ω
Forward Transconductance	g_{fs}	$V_{DS}=5V, I_{DS}=20.0A$	-	21.9	-	S

DYNAMIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C_{iss}	$V_{DD}=20V, V_{DS}=10V, V_{GS}=0V, f=1MHz$	-	2683	-	pF
Output Capacitance	C_{oss}	$V_{DD}=20V, V_{DS}=10V, V_{GS}=0V, f=1MHz$	-	442	-	pF
Reverse Transfer Capacitance	C_{rss}	$V_{DD}=20V, V_{DS}=10V, V_{GS}=0V, f=1MHz$	-	376	-	pF
Turn-On Delay Time	$T_{d(on)}$	$V_{DS}=10V, V_{GS}=10V, I_{DS}=20A, R_{GEN}=3.0\Omega$	-	9.0	-	nS
Rise Time	t_r	$V_{DS}=10V, V_{GS}=10V, I_{DS}=20A, R_{GEN}=3.0\Omega$	-	77.9	-	nS
Turn-Off Delay Time	$T_{d(off)}$	$V_{DS}=10V, V_{GS}=10V, I_{DS}=20A, R_{GEN}=3.0\Omega$	-	73.0	-	nS
Fall Time	t_f	$V_{DS}=10V, V_{GS}=10V, I_{DS}=20A, R_{GEN}=3.0\Omega$	-	40.7	-	nS

GATE CHARGE CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate to Source Gate Charge	Q_{gs}	$V_{DD}=10V, I_D=20A, V_{GS}=0 \text{ to } 10V$	-	6.5	-	nC
Gate charge at threshold	$Q_{g(th)}$	$V_{DD}=10V, I_D=20A, V_{GS}=0 \text{ to } 10V$	-	2.1	-	nC
Gate to Drain Charge	Q_{gd}	$V_{DD}=10V, I_D=20A, V_{GS}=0 \text{ to } 10V$	-	11.5	-	nC
Switching charge	Q_{SW}	$V_{DD}=10V, I_D=20A, V_{GS}=0 \text{ to } 10V$	-	16.0	-	nC
Gate charge total	$Q_{g 10V}$	$V_{DD}=10V, I_D=20A, V_{GS}=0 \text{ to } 10V$	-	75.6	-	nC
Gate charge total	$Q_{g 4.5V}$	$V_{DD}=10V, I_D=20A, V_{GS}=0 \text{ to } 10V$	-	35.4	-	nC
Gate plateau voltage	$V_{plateau}$	$V_{DD}=10V, I_D=20A, V_{GS}=0 \text{ to } 10V$	-	2.0	-	V
Gate charge total, sync. FET ($Q_g - Q_{gd}$)	$Q_{g(sync)}$	$V_{DS}=0.1V, V_{GS}=0 \text{ to } 10V$	-	64.1	-	nC

DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Body diode continuous forward current	I_S	$T_C=25^\circ C$	-	-	72.1	A
Body diode pulse current	I_{SM}	$T_C=25^\circ C$	-	-	180	A
Body diode forward voltage	V_{SD}	$V_{GS}=0V, I_S=20A$	-	0.85	1.0	V
Body diode reverse recovery time	t_{rr}	$V_{DD}=10V, I_F=8.0A, di/dt=50A/\mu s$	-	29.1	-	nS
Body diode reverse recovery charge	Q_{rr}	$V_{DD}=10V, I_F=8.0A, di/dt=50A/\mu s$	-	9.48	-	nC
Body diode peak reverse recovery charge	I_{rm}	$V_{DD}=10V, I_F=8.0A, di/dt=50A/\mu s$	-	0.56	-	A

4. Typical Operating Characteristics

Fig. 1: Output Characteristics

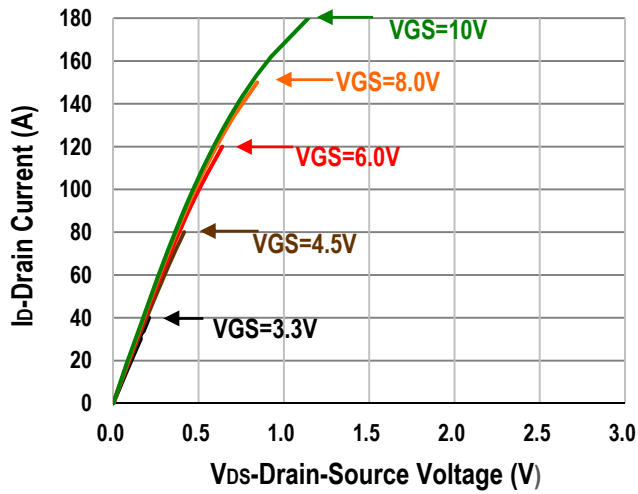


Fig. 2: Normalized $V_{(TH)GS}$ Voltage Vs. T_A

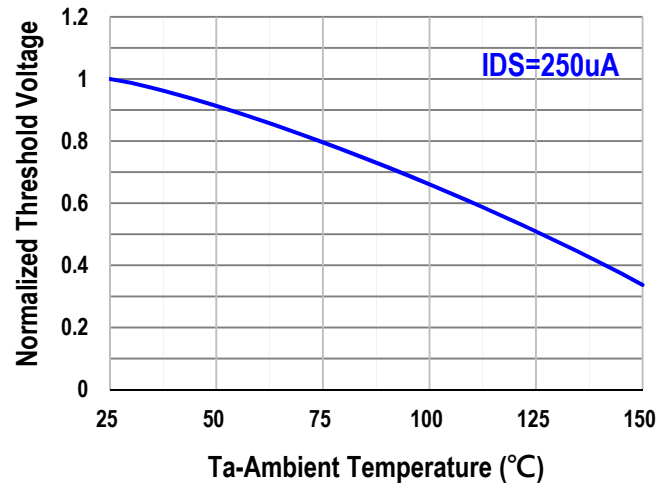


Fig. 3: Drain-Source On Resistance Vs V_{GS}

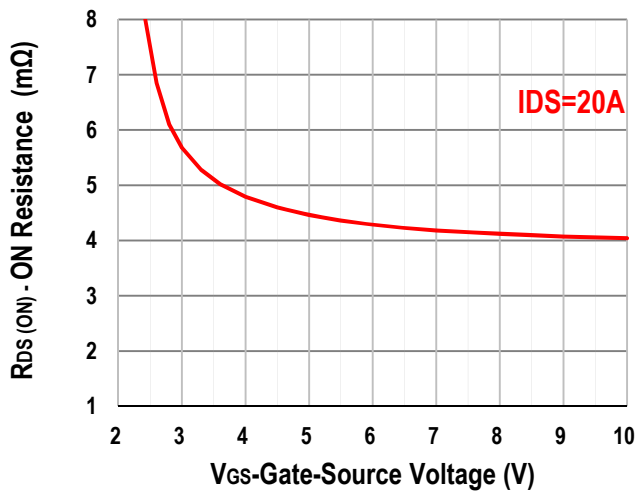


Fig. 4: Normalized $R_{DS(ON)}$ Resistance Vs. T_A

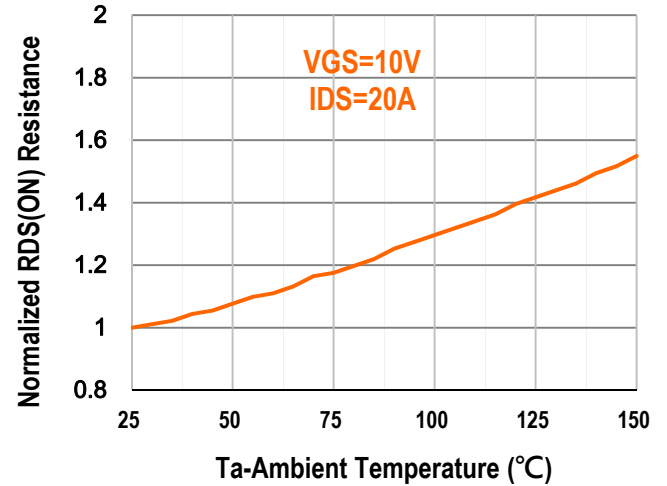


Fig. 5: Drain-Source On Resistance Vs I_D

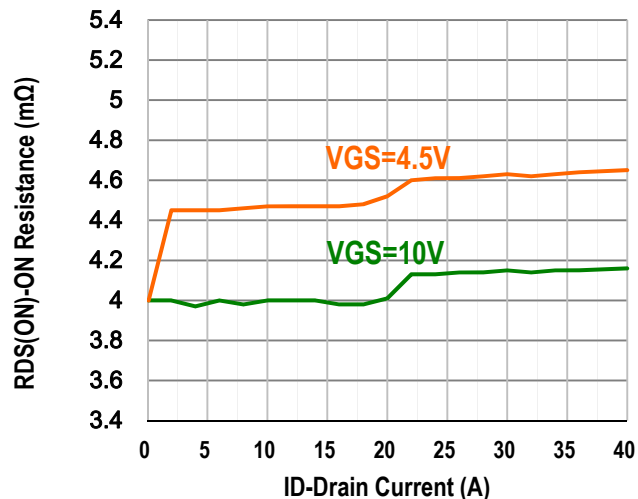
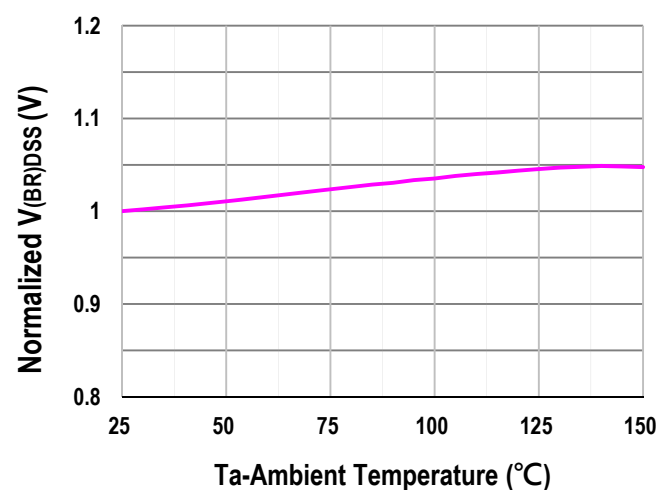


Fig. 6: Normalized B_{VDSS} Voltage Vs T_A



4. Typical Operating Characteristics

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

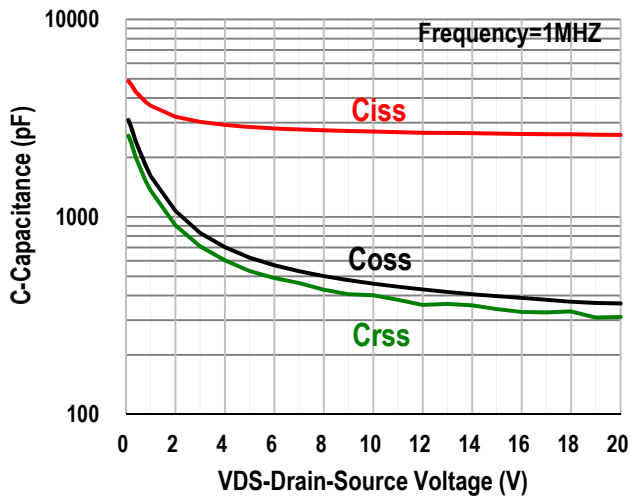


Fig. 8: Gate Charge Vs V_{GS}

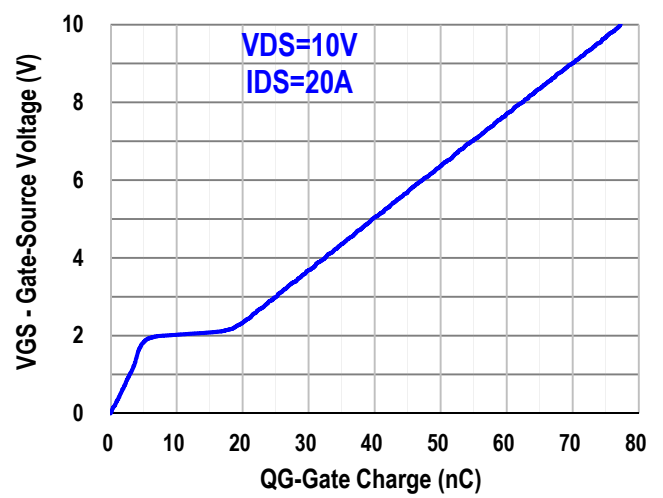


Fig. 9: Power Dissipation Vs. T_c

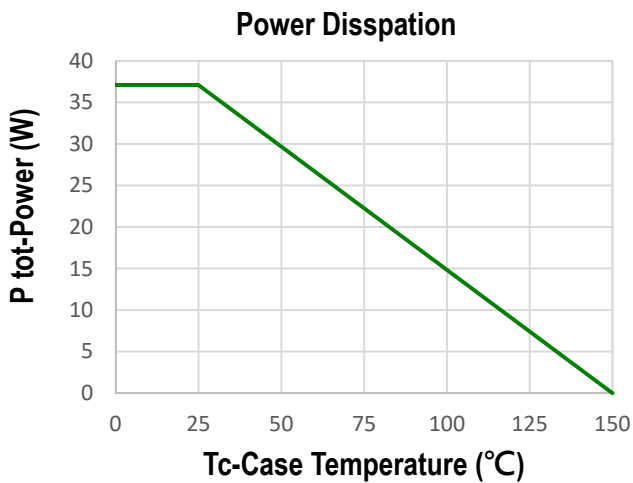


Fig. 10: Drain Current Vs. T_c

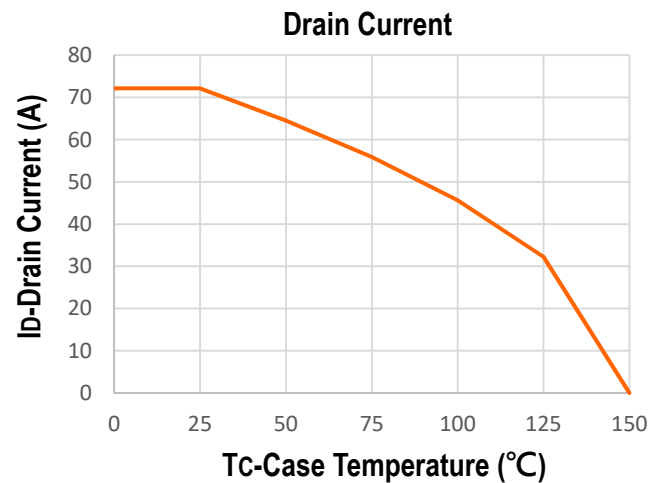


Fig. 11: Body Diode Forward Voltage Vs. I_s

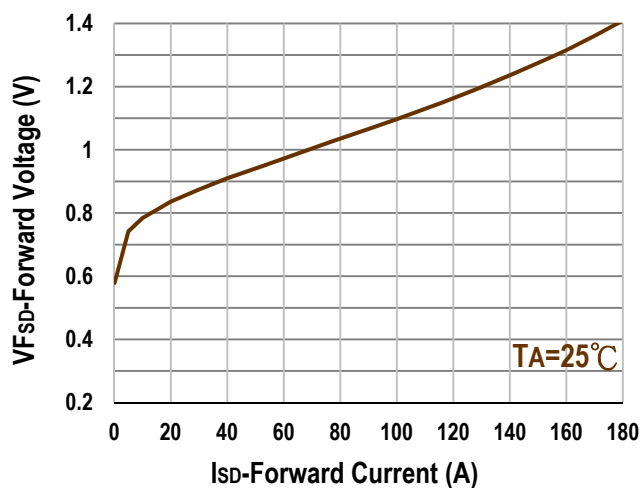
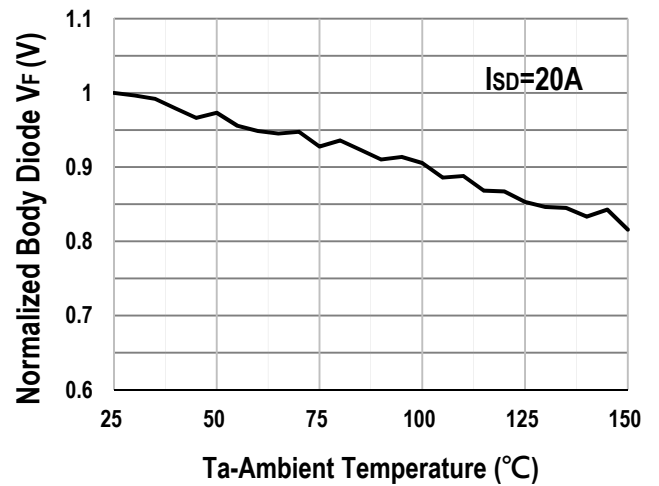


Fig. 12: Body Diode Forward Voltage Vs. T_A



4. Typical Operating Characteristics

Fig. 13: Safe Operation Area

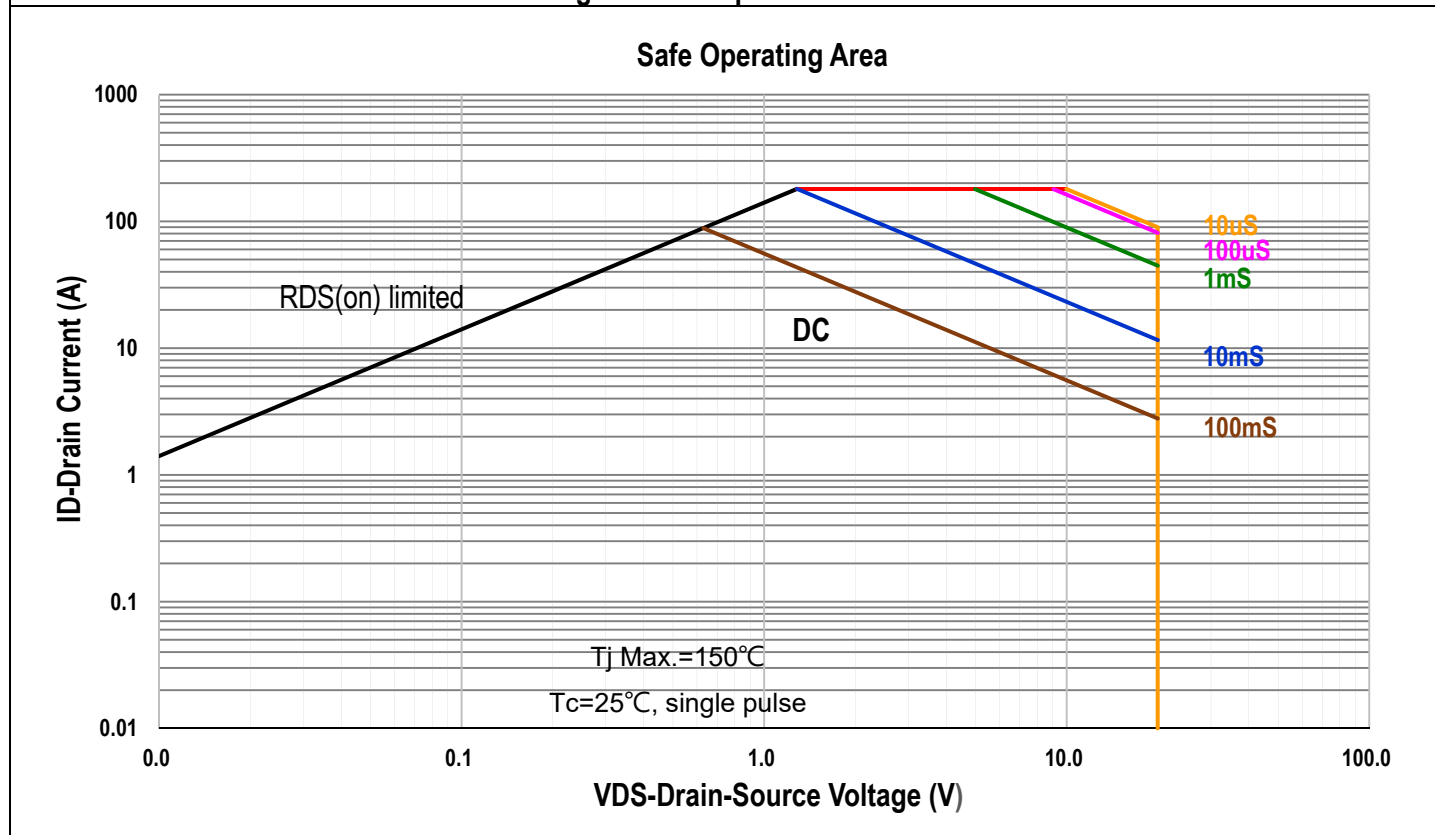
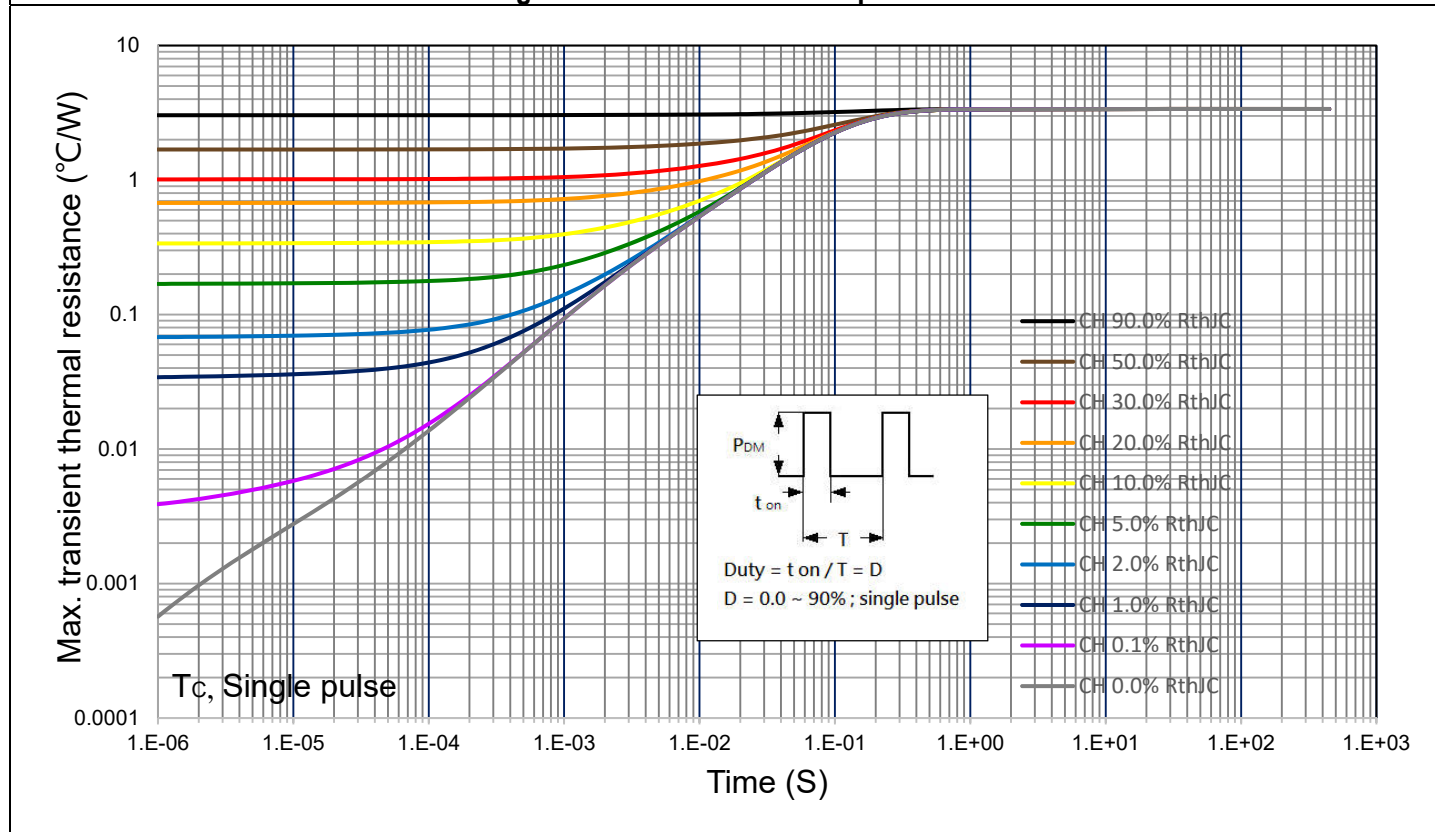
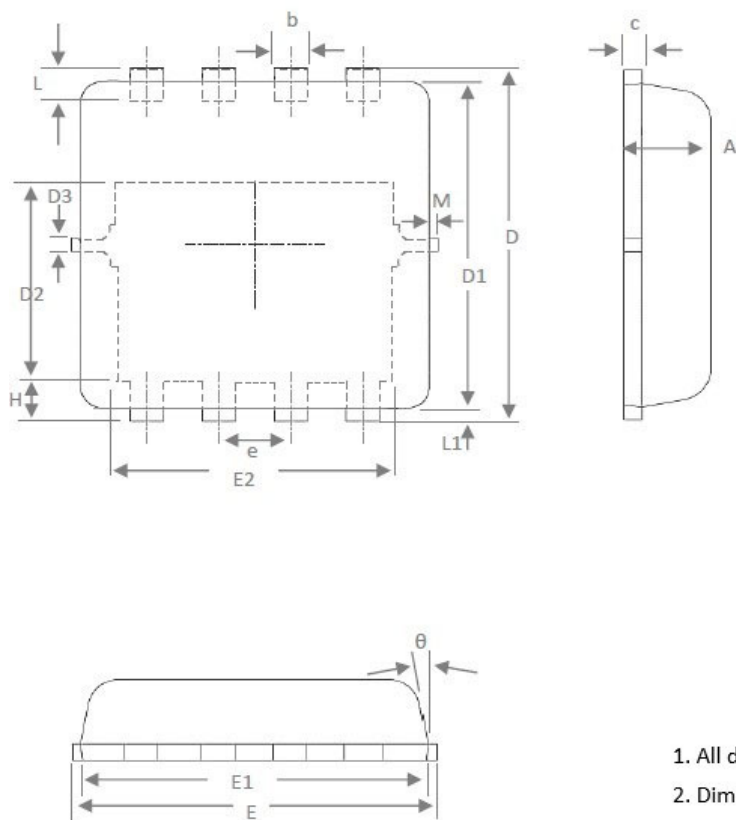


Fig. 14: Transient Thermal Impedance



5. Package of Dimension

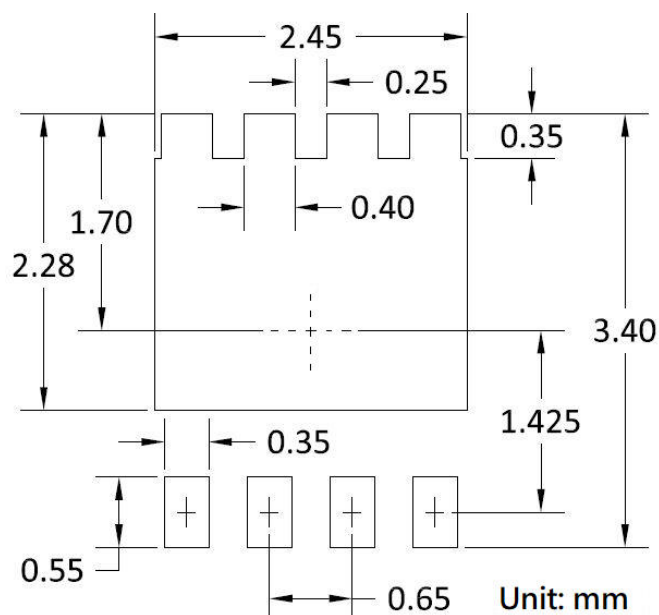
Package type: PDFN3.3x3.3-8L



Symbol	Min	Nor	Max
A	0.70	0.75	0.80
b	0.25	0.30	0.35
c	0.10	0.15	0.25
D	3.25	3.35	3.45
D1	3.00	3.10	3.20
D2	1.48	1.58	1.68
D3	-	0.13	-
E	3.00	3.30	3.40
E1	3.00	3.15	3.20
E2	2.39	2.49	2.59
e	0.65BSC		
H	0.30	0.39	0.50
L	0.30	0.40	0.50
L1	-	0.13	-
θ	-	10°	12°
M	-	-	0.15

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

6. Land pattern (Footprint)



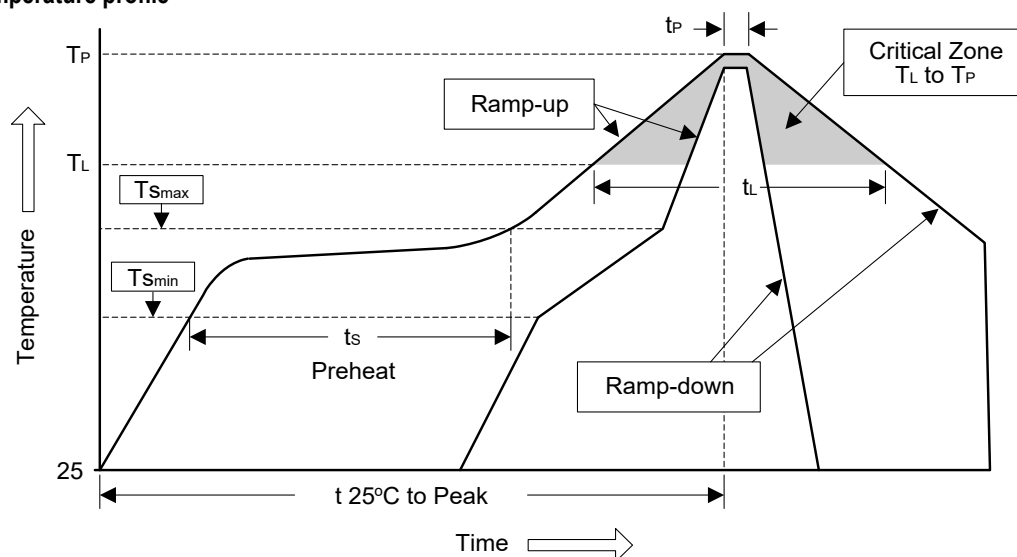
- Note 1:** Land pattern (Footprint) design is for reference only.
Note 2: Package body sizes exclude mold flash and burrs.
Note 3: Dimension is measured in gauge plane.
Note 4: Tolerance 0.1mm unless otherwise specified.

7. 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 (TL to TP)	<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) (ts)	60 to 120 sec	60 to 180 sec
T _{smax} to TL		
- Ramp-up Rate	<3°C/sec	<3°C/sec
Time maintained above:		
- Temperature (TL)	183°C	217°C
- Time (tL)	60 to 150 sec	60 to 150 sec
Peak Temperature (TP)	240°C +0/-5°C	260°C +0/-5°C
Time within 5°C of actual Peak Temperature (tp)	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

7. Appendix-B**Important Notice****© Silicongear Corporation**

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