

Key Performance Parameters		
Parameter	Value	Unit
V_{DS}	45	V
$R_{DS(ON) \text{ max. } V_{GS}=10V}$	2.9	mΩ
I_D	42	A
Q_g	45.6	nC
Q_{gd}	11.7	nC
Q_{SW}	15.8	nC

PDFN 3.3x3.3-8L	

Features	Application
- Optimized for synchronous rectification Low Input Capacitance - Low Miller Capacitance - Fully Characterized Capacitance and Avalanche - Pb-free lead plating; RoHS compliant	- BLDC Motor drive applications - Battery powered circuits - Synchronous rectifier applications - Resonant mode power supplies

Ordering Information

Ordering Code	RoHS Status	Package	Package Code	Packing	Quantity
DG40N17E	Halogen-Free	PDFN 3.3x3.3-8L	E	Tape & Reel	5,000

Absolute Maximum Ratings ($T_J=25^\circ\text{C}$ unless otherwise noted)

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	45	V
Gate-Source Voltage		V_{GS}	±20	V
Drain Current-Continuous ^{Note 4}	T _C =25°C	I_D	42	A
	T _C =100°C		27	A
Drain Current-Pulsed ^{Note 1}	T _C =25°C	I_{DM}	111	A
Avalanche Current		I_{AR}	36	A
Single Pulse Avalanche Energy ^{Note 3}		E_{AS}	64	mJ
Maximum Power Dissipation	T _C =25°C	P_{tot}	7.3	W
Operating Junction Temperature Range		T _J	150	°C

Thermal Resistance Ratings

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Thermal resistance, Junction-to-Ambient ^{Note 2}	$R_{\theta JA}$	Steady State	-	50.7	-	$^\circ\text{C/W}$
Thermal resistance, Junction-to-Case	$R_{\theta JC}$	Steady State	-	17.2	-	$^\circ\text{C/W}$

Notes:

- Pulse Test: Pulse Width $\leq 10\text{ms}$, Duty Cycle $\leq 1\%$.
- For surface-mounted devices, both $R_{\theta CA}$ and $R_{\theta JC}$ are measured with the device mounted on approximately 1"x1" FR-4 PCBs. In actual applications, many factors including the PCB material and layout, may affect the thermal resistance of the device-board assembly. For best results, characterize the thermal resistance directly in the application circuit.
- Starting $T_J=25^\circ\text{C}$, $V_D=20\text{V}$, $L=0.1\text{mH}$, $V_{GS}=10\text{V}$.

Electrical Characteristics (T_J=25°C unless otherwise noted)

STATIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_{DS}=1mA$	45	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=32V, V_{GS}=0V, T_J=25^{\circ}C$	-	-	10	μA
		$V_{DS}=32V, V_{GS}=0V, T_J=125^{\circ}C$	-	-	100	μA
Gate-Body Leakage	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA

STATIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_{DS}=250\mu A$	1.0	-	2.4	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_{DS}=15A$	-	-	2.9	m Ω
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=4.5V, I_{DS}=10A$	-	-	4.5	m Ω
Gate Resistance	R_g	$V_{GS}=0V, V_{DS}=0V, f=1MHz$	-	2.2	-	Ω
Forward Transconductance	g_{fs}	$V_{DS}=5V, I_{DS}=20A$	-	7.9	-	S

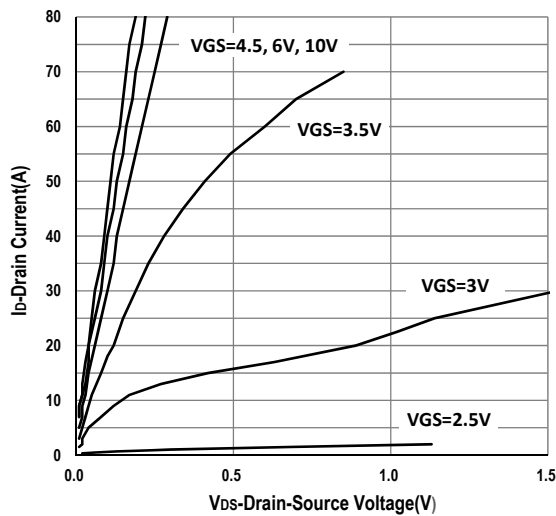
DYNAMIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C_{iss}	$V_{DS}=20V, V_{GS}=0V, f=1MHz$	-	2230	-	pF
Output Capacitance	C_{oss}	$V_{DS}=20V, V_{GS}=0V, f=1MHz$	-	1056	-	pF
Reverse Transfer Capacitance	C_{rss}	$V_{DS}=20V, V_{GS}=0V, f=1MHz$	-	108	-	pF
Turn-On Delay Time	$T_{d(on)}$	$V_{DS}=20V, V_{GS}=10V, I_{DS}=20A, R_{GEN}=3\Omega$	-	10.4	-	ns
Rise Time	t_r	$V_{DS}=20V, V_{GS}=10V, I_{DS}=20A, R_{GEN}=3\Omega$	-	46.2	-	ns
Turn-Off Delay Time	$T_{d(off)}$	$V_{DS}=20V, V_{GS}=10V, I_{DS}=20A, R_{GEN}=3\Omega$	-	46.0	-	ns
Fall Time	t_f	$V_{DS}=20V, V_{GS}=10V, I_{DS}=20A, R_{GEN}=3\Omega$	-	37.8	-	ns

GATE CHARGE CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate to Source Gate Charge	Q_{gs}	$V_{DD}=20V, I_D=20A$	-	7.95	-	nC
Gate charge at threshold	$Q_{g(th)}$	$V_{DD}=20V, I_D=20A$	-	3.81	-	nC
Gate to Drain Charge	Q_{gd}	$V_{DD}=20V, I_D=20A$	-	11.7	-	nC
Switching charge	Q_{SW}	$V_{DD}=20V, I_D=20A$	-	15.8	-	nC
Gate charge total	Q_g	$V_{DD}=20V, I_D=20A, V_{GS}=0 \text{ to } 10V$	-	45.6	-	nC
Gate plateau voltage	$V_{plateau}$	$V_{DD}=20V$	-	3.32	-	V
Gate charge total, sync. FET ($Q_g - Q_{gd}$)	$Q_{g(sync)}$	$V_{GS}=0 \text{ to } 10V$	-	34.0	-	nC

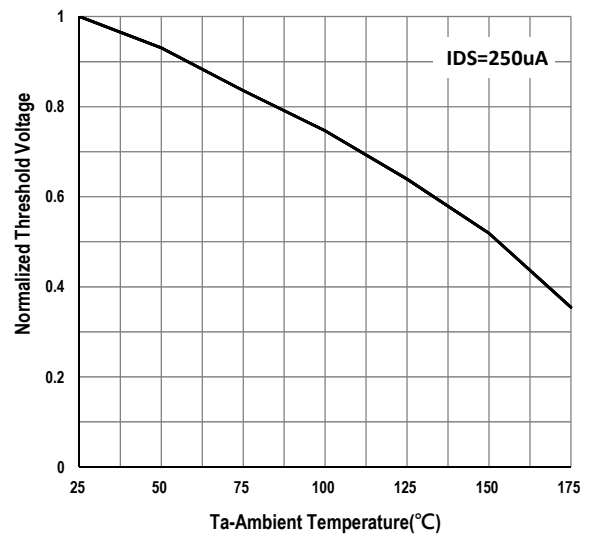
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_F=20A$	-	0.7	1.3	V
Body Diode Reverse Recovery Time	t_{rr}	$V_{DD}=32V, I_F=20A, di/dt=100A/\mu s$	-	39.8	-	ns
		$V_{DD}=32V, I_F=20A, di/dt=200A/\mu s$	-	35.5	-	ns
Body Diode Reverse Recovery Charge	Q_{rr}	$V_{DD}=32V, I_F=20A, di/dt=100A/\mu s$	-	31.8	-	nC
		$V_{DD}=32V, I_F=20A, di/dt=200A/\mu s$	-	61.7	-	nC
Reverse Recovery Current	I_{RRM}	$V_{DD}=32V, I_F=20A, di/dt=100A/\mu s$	-	1.39	-	A
		$V_{DD}=32V, I_F=20A, di/dt=200A/\mu s$	-	3.02	-	A

Typical Operating Characteristics

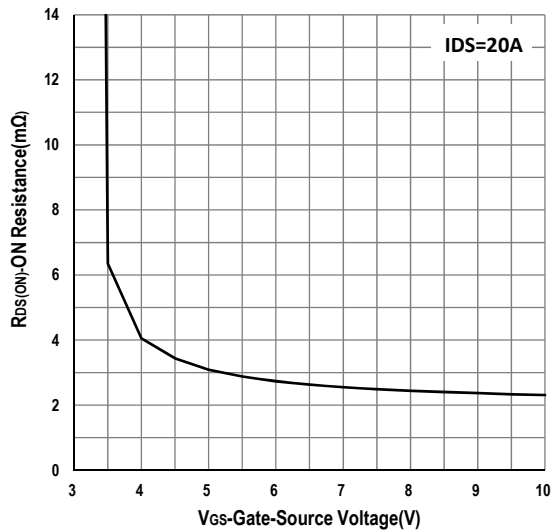
Output Characteristics



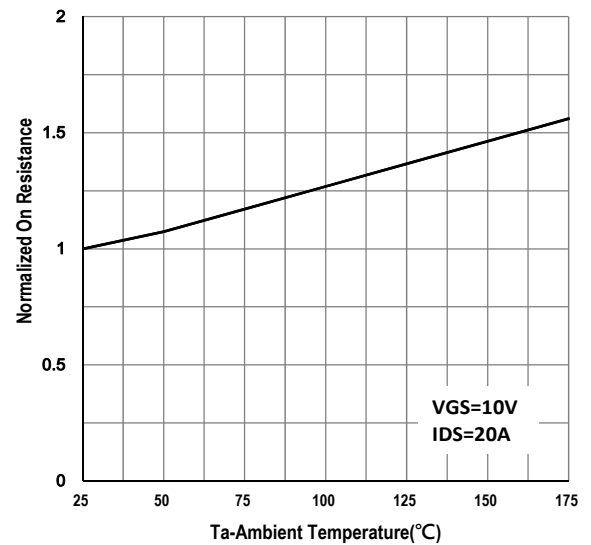
Gate Threshold Voltage



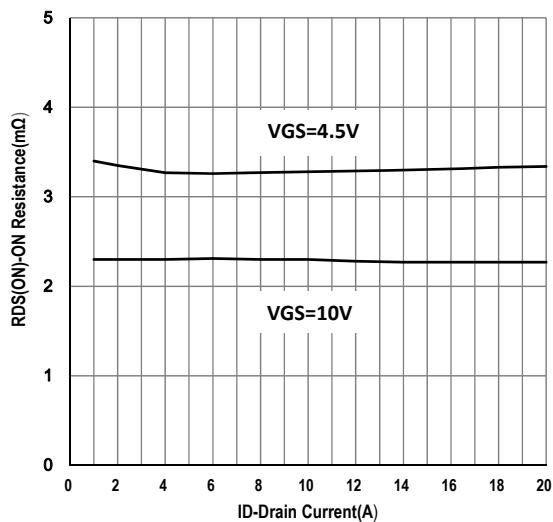
Gate-Source On Resistance



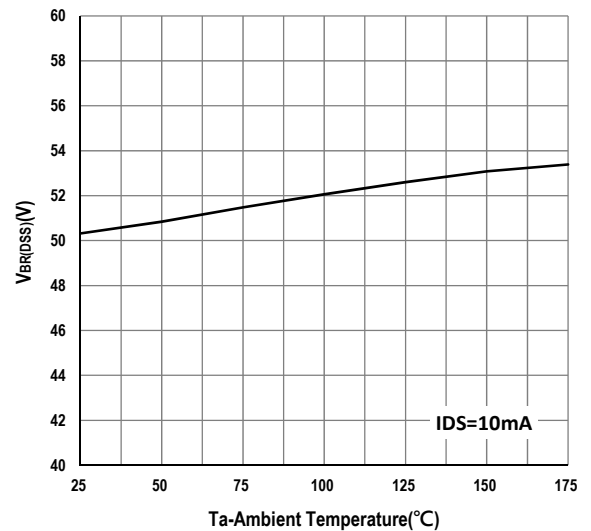
Drain-Source On Resistance



Drain-Source On Resistance

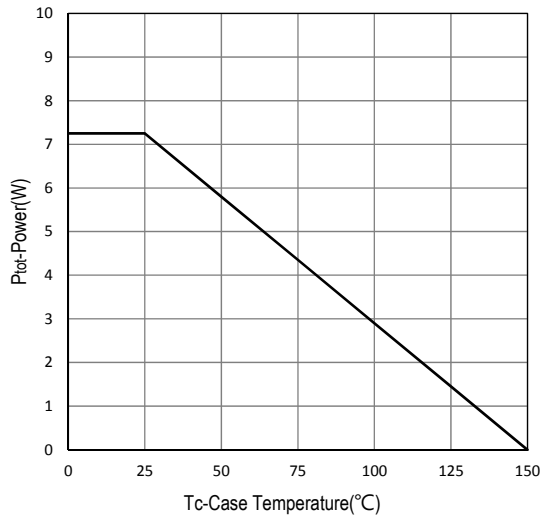


Drain-source Breakdown Voltage

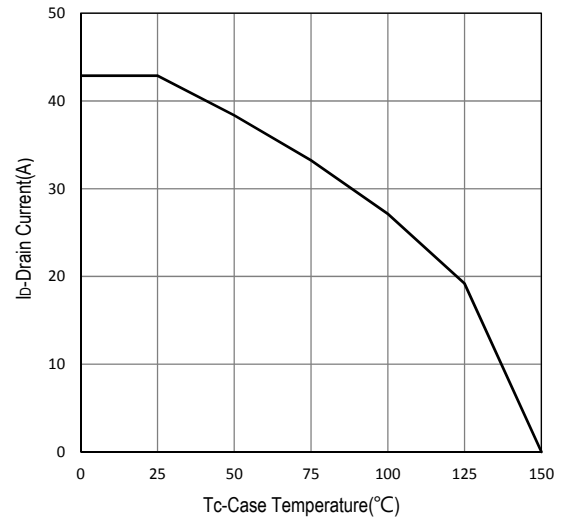


Typical Operating Characteristics (Cont.)

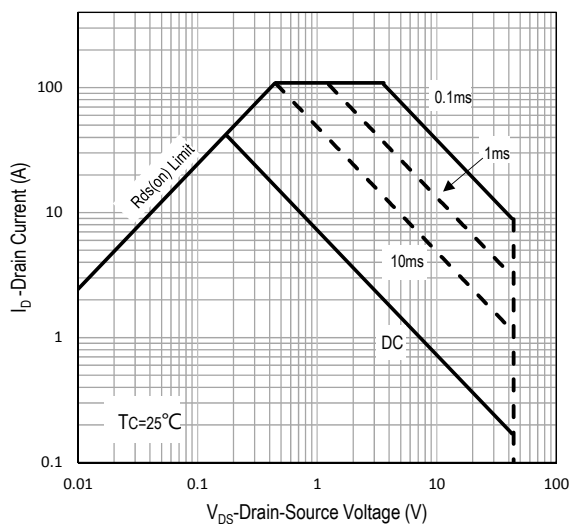
Power Dissipation



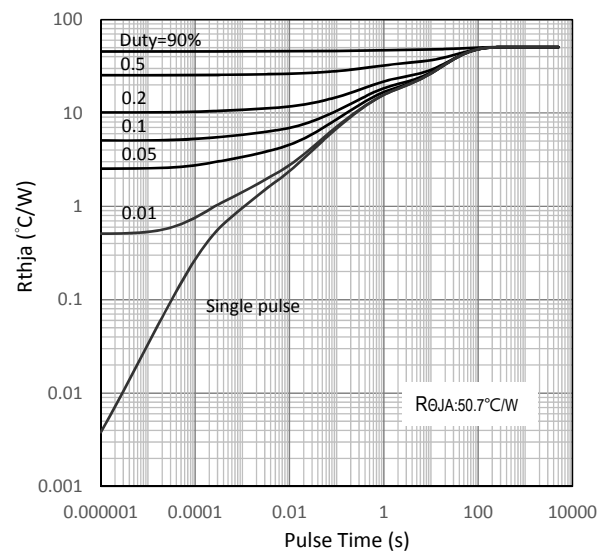
Drain Current



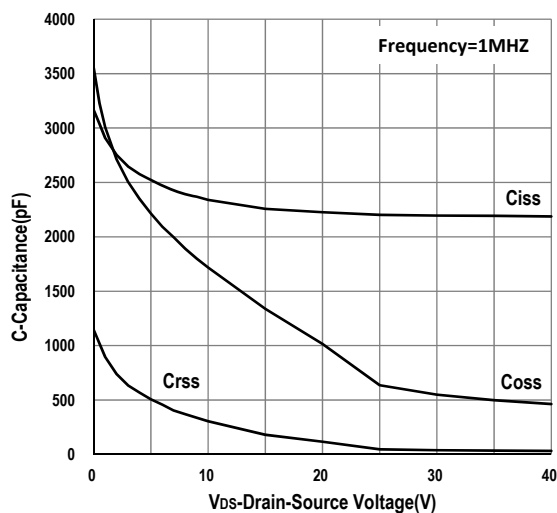
Safe Operation Area



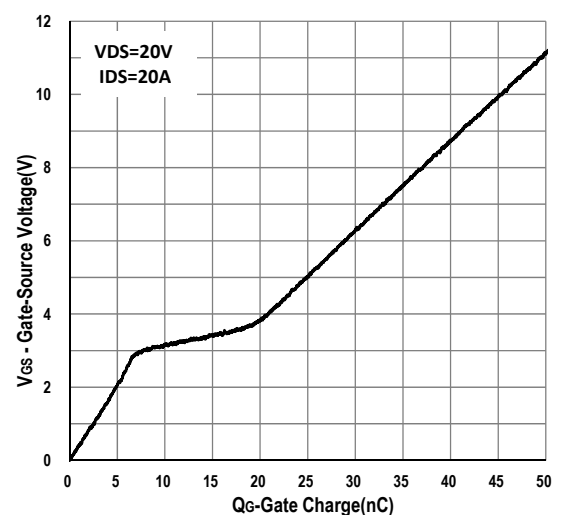
Transient Thermal Impedance



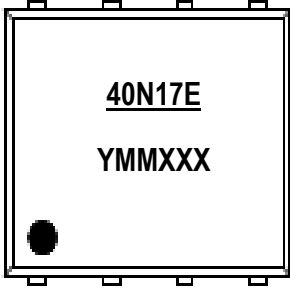
Capacitance



Gate Charge



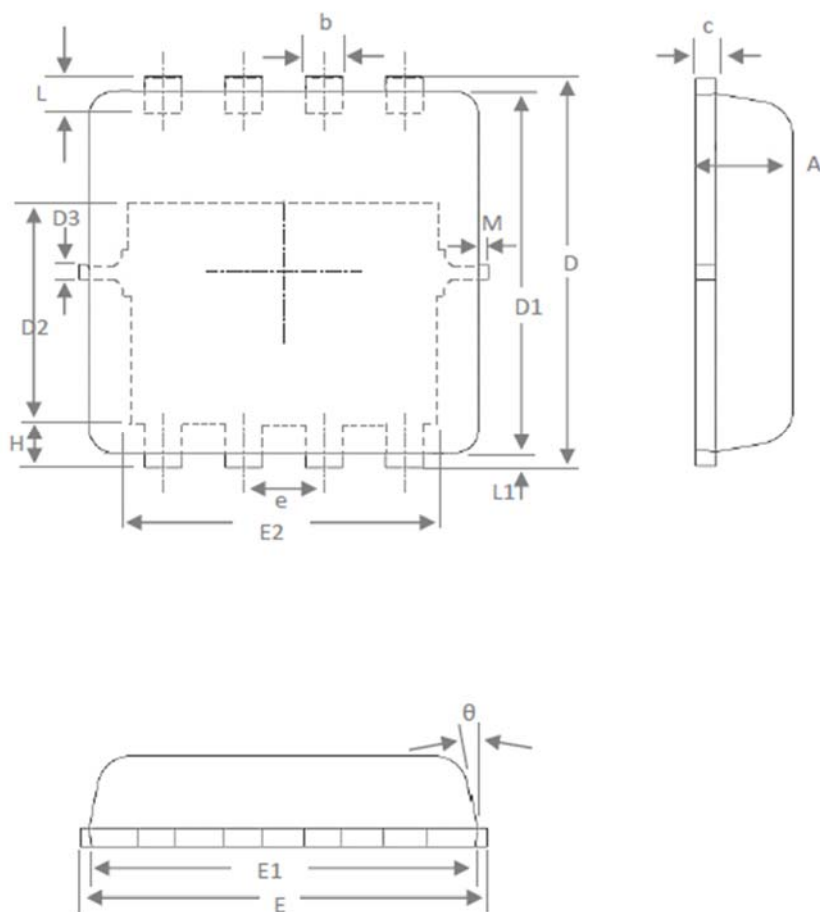
Marking Information

PDFN 3.3x3.3-8L (E)	Marking Rule
Laser Marking 	<u>Line 1</u> : Device DG40N17E <u>Line 2</u> : Date Code YMMXXX Y : Year Code MM : Month Code XXX : Serial Number

Year Code Description

Year Code	Year	
0	2010	2020
1	2011	2021
2	2012	2022
3	2013	2023
4	2014	2024
5	2015	2025
6	2016	2026
7	2017	2027
8	2018	2028
9	2019	2029

Package of Dimension

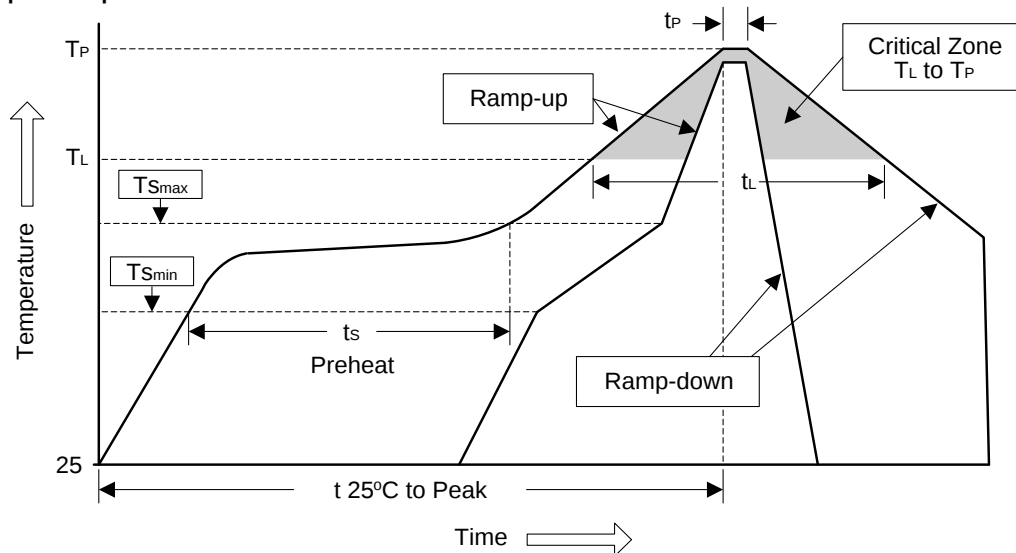


Symbol	Min	Nor	Max
A	0.70	0.75	0.80
b	0.25	0.30	0.35
c	0.10	0.15	0.25
D	3.25	3.35	3.45
D1	3.00	3.10	3.20
D2	1.78	1.88	1.98
D3	-	0.13	-
E	3.00	3.30	3.40
E1	3.00	3.15	3.20
E2	2.39	2.49	2.59
e	0.65BSC		
H	0.30	0.39	0.50
L	0.30	0.40	0.50
L1	-	0.13	-
θ	-	10°	12°
M	-	-	0.15

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 (TL to TP)	<3°C/sec	<3°C/sec
Preheat		
- Temperature Min (TSmin)	100°C	150°C
- Temperature Max (TSmax)	150°C	200°C
- Time (min to max) (ts)	60 to 120 sec	60 to 180 sec
TSmax 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

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