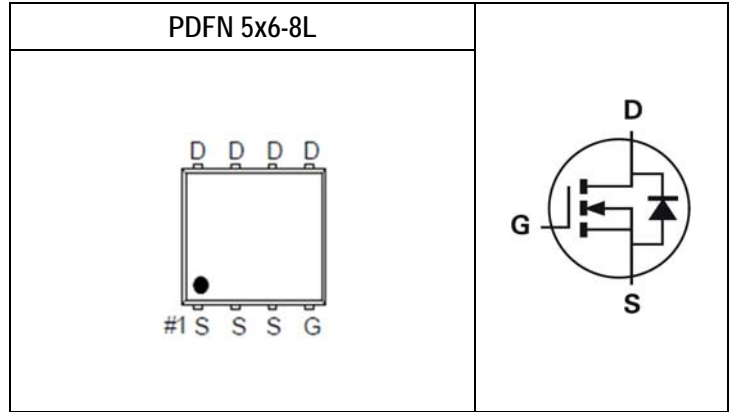


Key Performance Parameters		
Parameter	Value	Unit
V_{DSS}	60	V
$R_{DS(ON) \text{ max. } V_{GS}=10V}$	2.6	m Ω
I_D	50.0	A
Q_g	69.1	nC
Q_{gd}	21.9	nC
Q_{SW}	30.1	nC
$Q_{g(sync)}$	47.2	nC



Features	Application
<ul style="list-style-type: none"> Optimized for synchronous rectification Low Input Capacitance Low Switching Charge Low Miller Capacitance Fully Characterized Capacitance and Avalanche Pb-free lead plating; RoHS compliant 	<ul style="list-style-type: none"> Battery powered circuits BLDC Motor drive applications Half-bridge and full-bridge topologies Synchronous rectifier applications Resonant mode power supplies

Ordering Information

Ordering Code	RoHS Status	Package	Package Code	Packing	Quantity
DG60N05HQ	Halogen-Free	PDFN 5x6-8L	Q	Tape & Reel	3,000

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	$T_C=25^\circ\text{C}$	50.0
		$T_C=100^\circ\text{C}$	31.6
Drain Current-Pulsed ^{Note 1}	I_{DM}	151	A
Avalanche Current	I_{AR}	38	A
Single Pulse Avalanche Energy ^{Note 3}	E_{AS}	72	mJ
Maximum Power Dissipation	P_{tot}	11.5	W
Operating and Storage Temperature Range	T_J	150	$^\circ\text{C}$

Thermal Resistance Ratings

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Thermal resistance, Junction-to-Ambient ^{Note 2}	$R_{\theta JA}$	Steady State	-	62	-	$^\circ\text{C/W}$
Thermal resistance, Junction-to-Case	$R_{\theta JC}$	Steady State	-	10.9	-	$^\circ\text{C/W}$

Notes:

- Pulse Test: Pulse Width $\leq 10\text{ms}$, Duty Cycle $\leq 1\%$.
- $R_{\theta JA}$ 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. For surface-mounted packages, both $R_{\theta JA}$ and $R_{\theta JC}$ are measured with the device mounted on approximately 1"×1" FR-4 PCB. In actual applications, the PCB layout may greatly affect the thermal resistance and current-carrying capability of the device-board assembly.
- Starting $T_J=25^\circ\text{C}$, $V_D=30\text{V}$, $L=0.1\text{mH}$, $V_G=10\text{V}$, Rated $V_{DS}=60\text{V}$ N-CH.

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	60	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =48V, V _{GS} =0V, T _J =25°C	-	-	10	μA
		V _{DS} =48V, 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	2.6	3.4	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _{DS} =50A	-	-	2.6	mΩ
Gate Resistance	R _g	V _{GS} =0V, V _{DS} =0V, f=1MHz	-	1.1	2	Ω
Forward Transconductance	g _{fs}	V _{DS} =5V, I _{DS} =20A	-	12	-	S

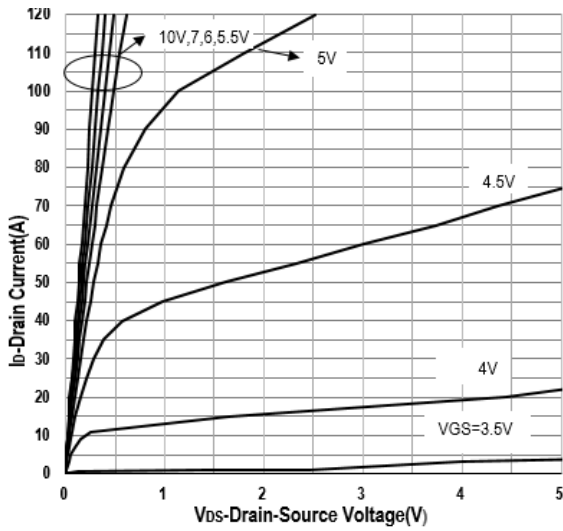
DYNAMIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C _{iss}	V _{DS} =30V, V _{GS} =0V, f=1MHz	-	3815	-	pF
Output Capacitance	C _{oss}		-	1866	-	pF
Reverse Transfer Capacitance	C _{rss}		-	132	-	pF
Turn-On Delay Time	T _{d(on)}	V _{DS} =30V, V _{GS} =10V, I _{DS} =50A, R _{GEN} =4.7Ω	-	18.6	-	ns
Rise Time	t _r		-	72.6	-	ns
Turn-Off Delay Time	T _{d(off)}		-	39.7	-	ns
Fall Time	t _f		-	39.4	-	ns

GATE CHARGE CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate to Source Gate Charge	Q _{gs}	V _{DD} =30V, I _D =50A	-	18.5	-	nC
Gate charge at threshold	Q _{g(th)}	V _{DD} =30V, I _D =50A	-	10.3	-	nC
Gate to Drain Charge	Q _{gd}	V _{DD} =30V, I _D =50A	-	21.9	-	nC
Switching charge	Q _{sw}	V _{DD} =30V, I _D =50A	-	30.1	-	nC
Gate charge total	Q _g	V _{DD} =30V, I _D =50A, V _{GS} =0 to 10V	-	69.1	-	nC
Gate plateau voltage	V _{plateau}	V _{DD} =30V, I _D =50A	-	4.83	-	V
Gate charge total, sync. FET (Q _g - Q _{gd})	Q _{g(sync)}	V _{DS} =0.1V	-	47.2	-	nC

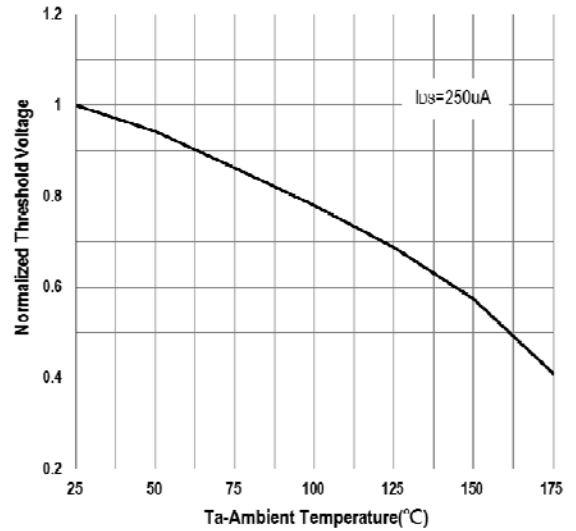
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _F =50A	-	-	1.3	V
Body Diode Reverse Recovery Time	t _{rr}	V _{DD} =48V, I _F =50A, di/dt=100A/μs	-	60.6	-	ns
		V _{DD} =48V, I _F =50A, di/dt=200A/μs	-	46.1	-	ns
Body Diode Reverse Recovery Charge	Q _{rr}	V _{DD} =48V, I _F =50A, di/dt=100A/μs	-	72.3	-	nC
		V _{DD} =48V, I _F =50A, di/dt=200A/μs	-	116.1	-	nC
Reverse Recovery Current	I _{RRM}	V _{DD} =48V, I _F =50A, di/dt=100A/μs	-	2.1	-	A
		V _{DD} =48V, I _F =50A, di/dt=200A/μs	-	4.4	-	A

Typical Operating Characteristics

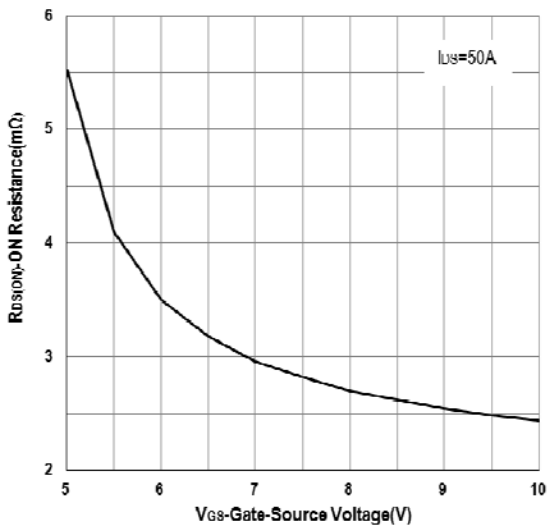
Output Characteristics



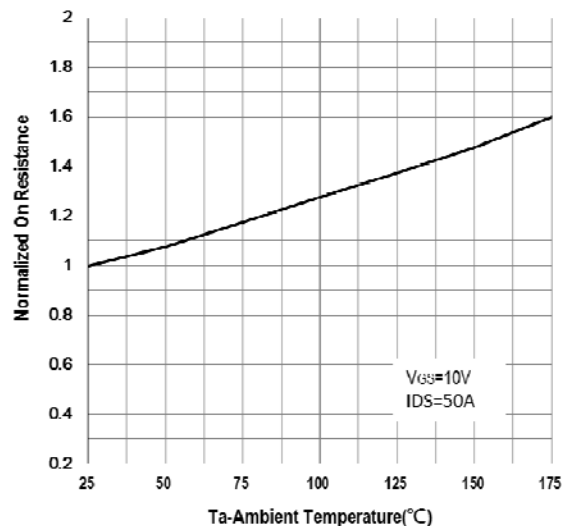
Gate Threshold Voltage



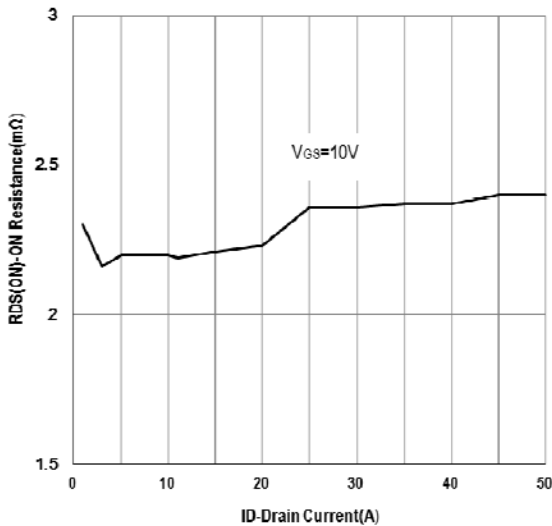
Gate-Source On Resistance



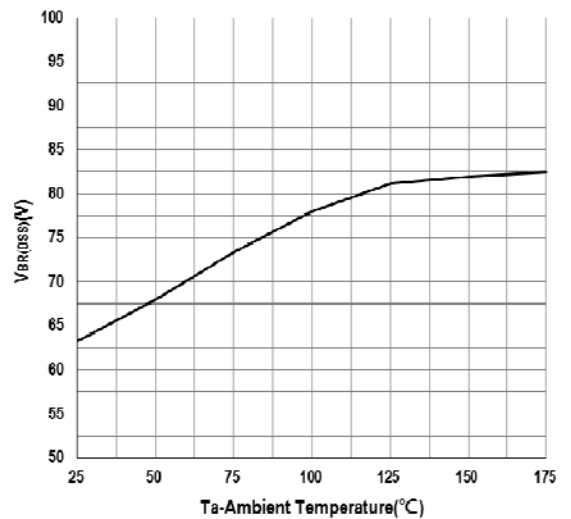
Drain-Source On Resistance



Drain-Source On Resistance

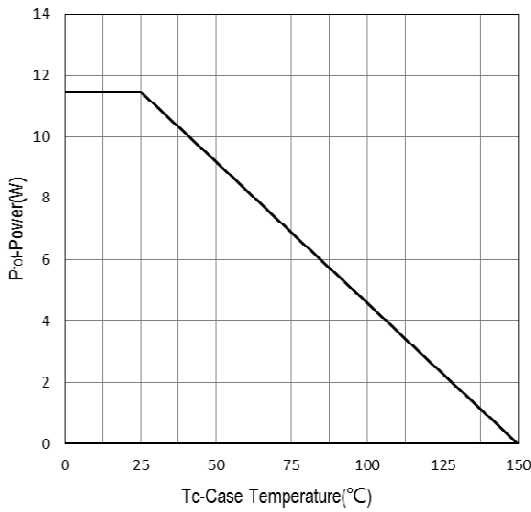


Drain-source Breakdown Voltage

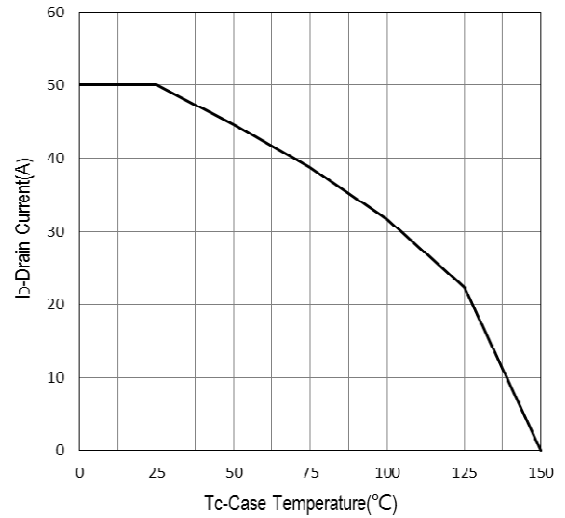


Typical Operating Characteristics (Cont.)

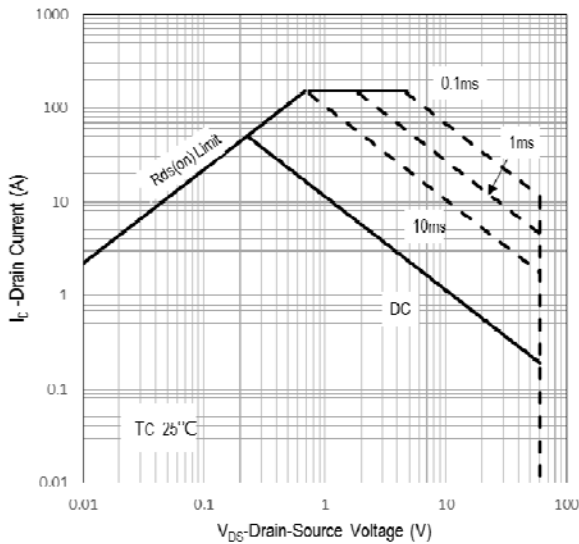
Power Dissipation



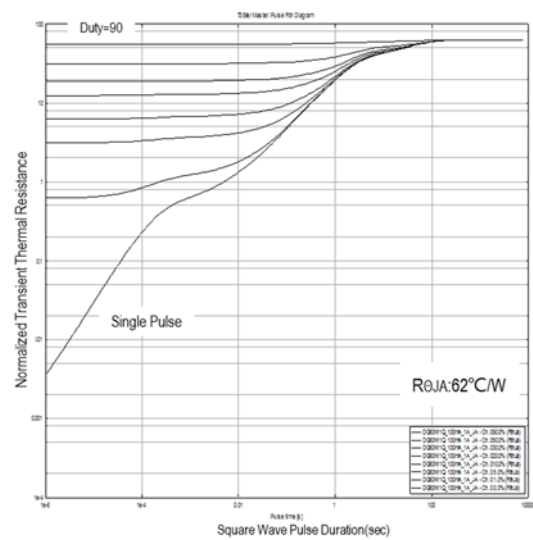
Drain Current



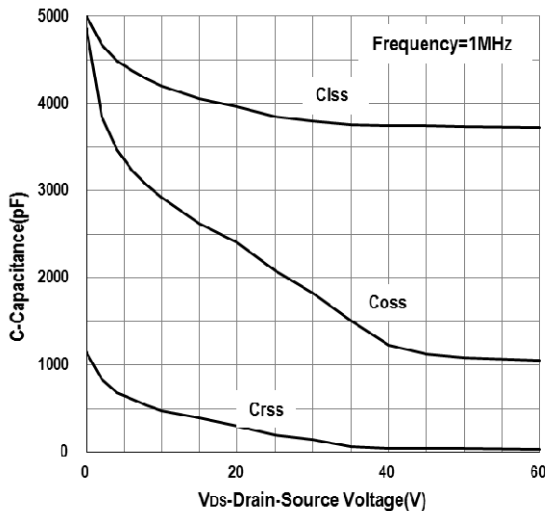
Safe Operation Area



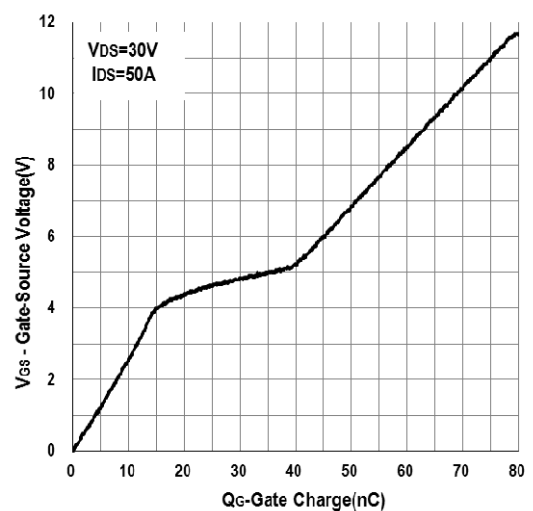
Transient Thermal Impedance




Capacitance



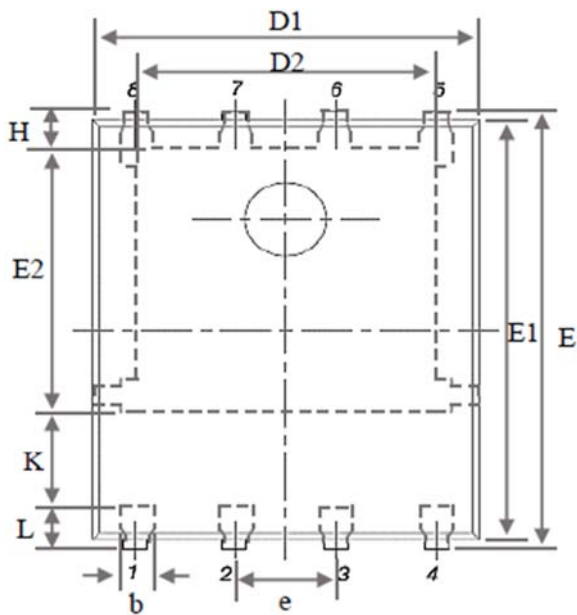
Gate Charge



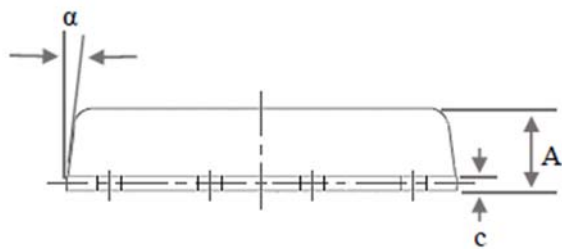
Marking Information

PDFN 5x6-8L (Q)	Marking Rule
<p>Laser Marking</p> 	<p><u>Line 1</u> : Device Name DG60N05HQ</p> <p><u>Line 2</u> : Date Code YYMMXXX</p> <p>YY : Year Code MM : Month 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

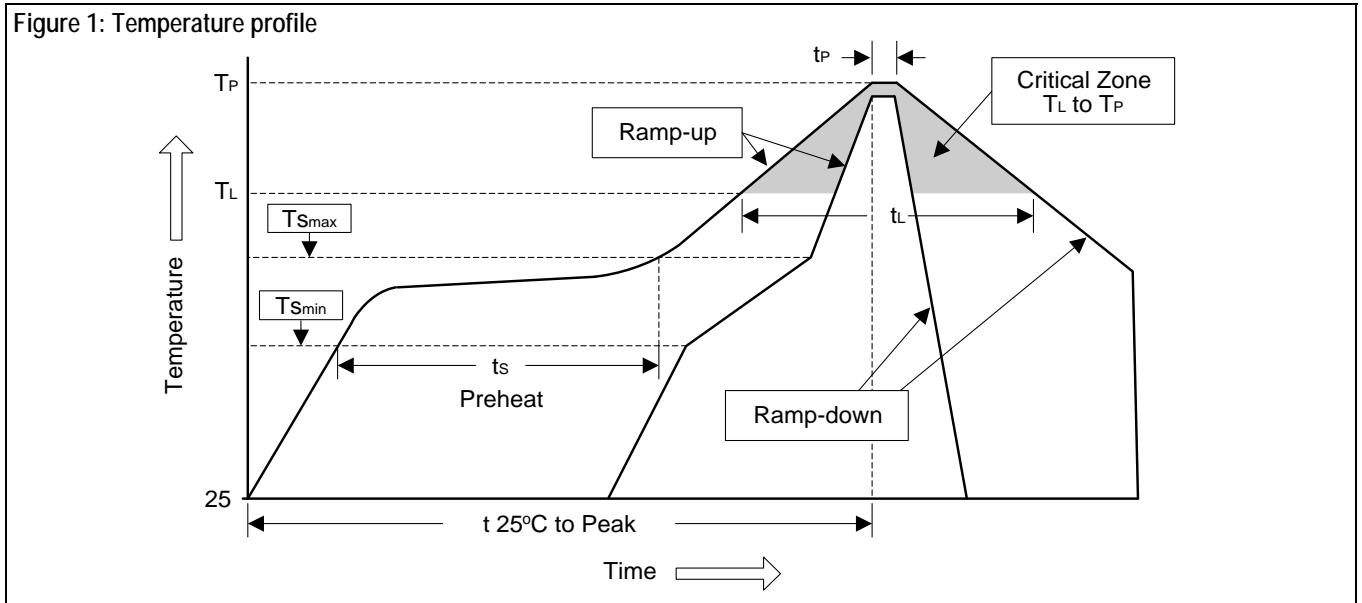


1. All dimension are in millimeters.
2. Dimension dose not include burrs and mold flash/protrusions.

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 (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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