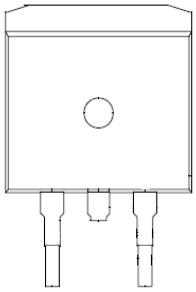
DG60N05HG

DG-FET™ 60V N-Channel Power MOSFET

Key Performance Parameters		
Parameter	Value	Unit
V_{DSS}	60	V
$R_{DS(ON)\ max.}$ V_{GS}=10V	2.6	mΩ
I_D	84	A
Q_g	67.7	nC
Q_{gd}	21.1	nC
Q_{SW}	28.8	nC
$Q_{g(sync)}$	46.6	nC

TO-263



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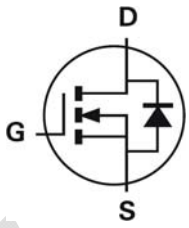


Features	Application
• Optimized for synchronous rectification • Low Input Capacitance • Low Switching Charge • Low Miller Capacitance • Fully Characterized Capacitance and Avalanche • Pb-free lead plating; RoHS compliant	• Battery powered circuits • BLDC Motor drive applications • Half-bridge and full-bridge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

Ordering Information

Ordering Code	RoHS Status	Package	Package Code	Packing	Quantity
DG60N05HG	Halogen-Free	TO-263	G	Tape & Reel	800

Absolute Maximum Ratings (T_J=25°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 Note 4	T_C=25°C	I_D	84	A
	T_C=100°C		84	A
Drain Current-Pulsed Note 1	T_C=25°C	I_{DM}	240	A
Avalanche Current		I_{AR}	38	A
Single Pulse Avalanche Energy Note 3		E_{AS}	72	mJ
Maximum Power Dissipation	T_C=25°C	P_{tot}	195	W
Operating and Storage 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	-	47		°C/W
Thermal resistance, Junction-to-Case	$R_{\theta JC}$	Steady State	-	0.64		°C/W

Notes:

1. Pulse Test: Pulse Width ≤ 10ms, Duty Cycle ≤ 1%.
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. Starting T_J=25°C, VD=30V, L=0.1mH, VG=10V, Rated VDS =60V N-CH.
4. The maximum current rating is package limited.

Preliminary

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}=250uA	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	-	0.9	2	Ω
Forward Transconductance	g_{fs}	V_{DS}=5V, I_{DS}=20A	-	14	-	S

DYNAMIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C_{iss}	V_{DS}=30V, V_{GS}=0V, f=1MHz	-	3762	-	pF
Output Capacitance	C_{oss}		-	1867	-	pF
Reverse Transfer Capacitance	C_{rss}		-	126	-	pF
Turn-On Delay Time	$T_{d(on)}$	V_{DS}=30V, V_{GS}=10V, I_{DS}=50A, R_{GEN}=4.7Ω	-	15.4	-	ns
Rise Time	t_r		-	85.6	-	ns
Turn-Off Delay Time	$T_{d(off)}$		-	45.9	-	ns
Fall Time	t_f		-	111.8	-	ns

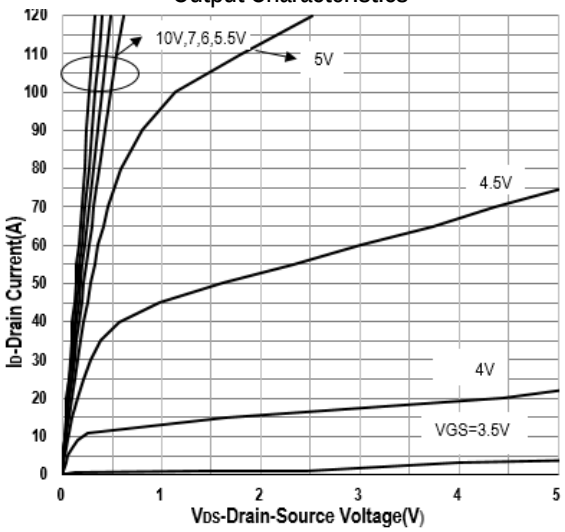
GATE CHARGE CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate to Source Gate Charge	Q_{gs}	V_{DD}=30V, I_D=50A	-	18.1	-	nC
Gate charge at threshold	$Q_{g(th)}$	V_{DD}=30V, I_D=50A	-	10.2	-	nC
Gate to Drain Charge	Q_{gd}	V_{DD}=30V, I_D=50A	-	21.1	-	nC
Switching charge	Q_{SW}	V_{DD}=30V, I_D=50A	-	28.8	-	nC
Gate charge total	Q_g	V_{DD}=30V, I_D=50A, V_{GS}=0 to 10V	-	67.7	-	nC
Gate plateau voltage	$V_{plateau}$	V_{DD}=30V, I_D=50A	-	4.7	-	V
Gate charge total, sync. FET (Q_g- Q_{gd})	$Q_{g(sync)}$	V_{DS}=0.1V	-	46.6	-	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}=30V, I_F=50A, di/dt=100A/μs	-	49.0	-	ns
		V_{DD}=30V, I_F=50A, di/dt=200A/μs	-	41.8	-	ns
Body Diode Reverse Recovery Charge	Q_{rr}	V_{DD}=30V, I_F=50A, di/dt=100A/μs	-	50.1	-	nC
		V_{DD}=30V, I_F=50A, di/dt=200A/μs	-	84.5	-	nC
Reverse Recovery Current	I_{RRM}	V_{DD}=30V, I_F=50A, di/dt=100A/μs	-	1.8	-	A
		V_{DD}=30V, I_F=50A, di/dt=200A/μs	-	3.4	-	A

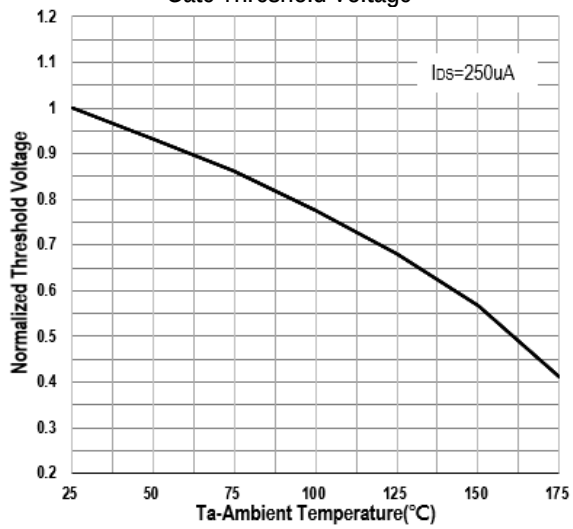
Preliminary

Typical Operating Characteristics

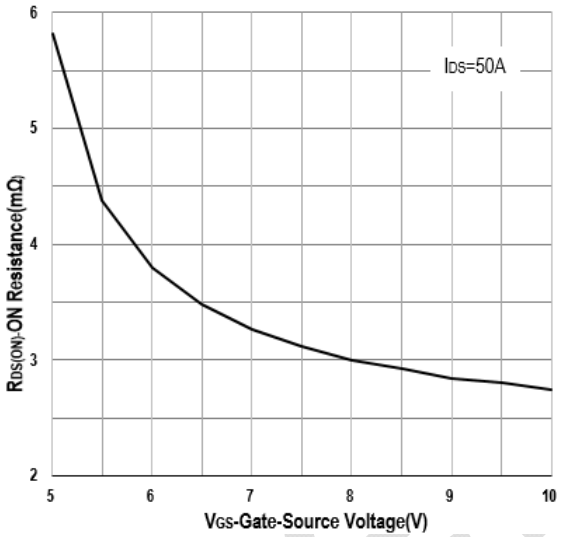
Output Characteristics



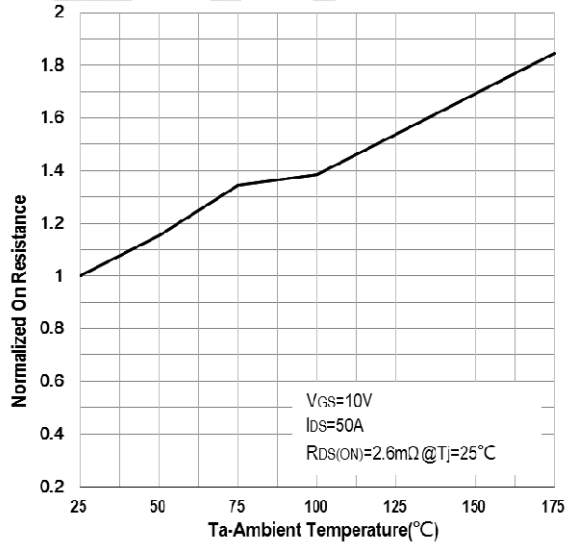
Gate Threshold Voltage



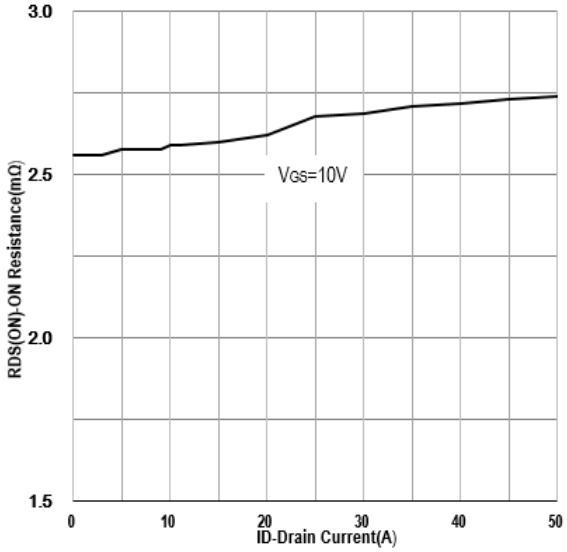
Gate-Source On Resistance



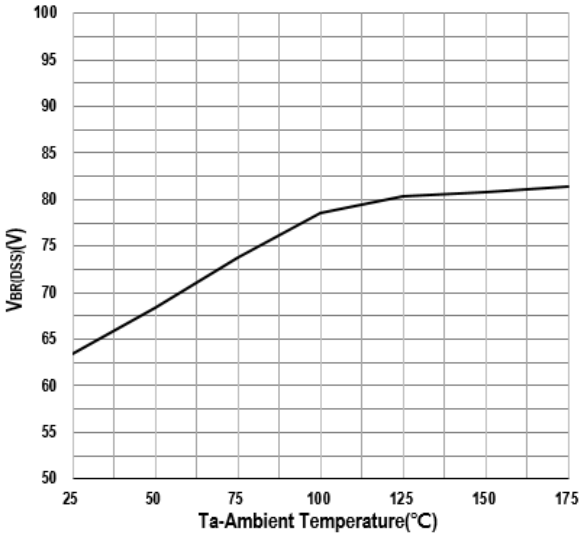
Drain-Source On Resistance



Drain-Source On Resistance

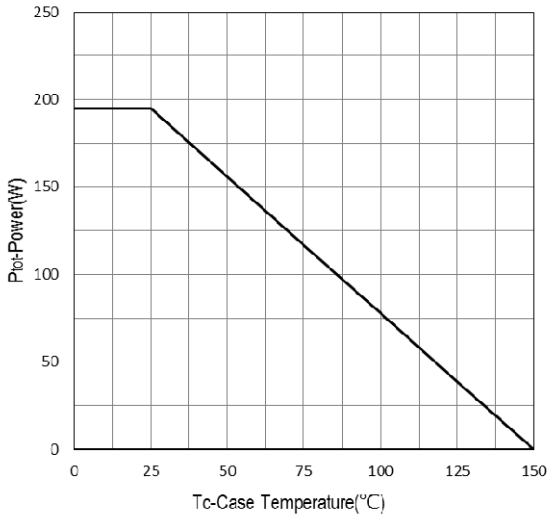


Drain-source Breakdown Voltage

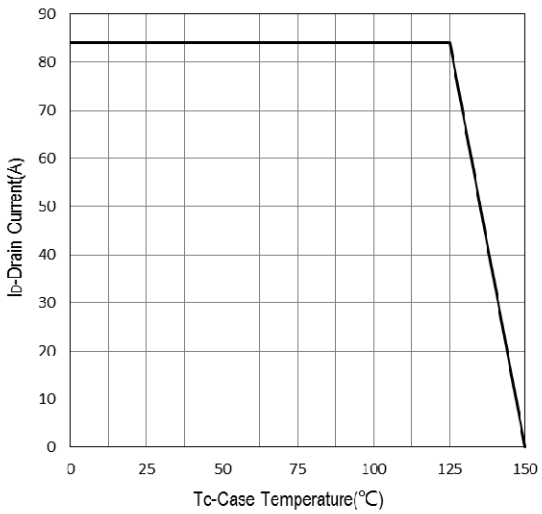


Typical Operating Characteristics (Cont.)

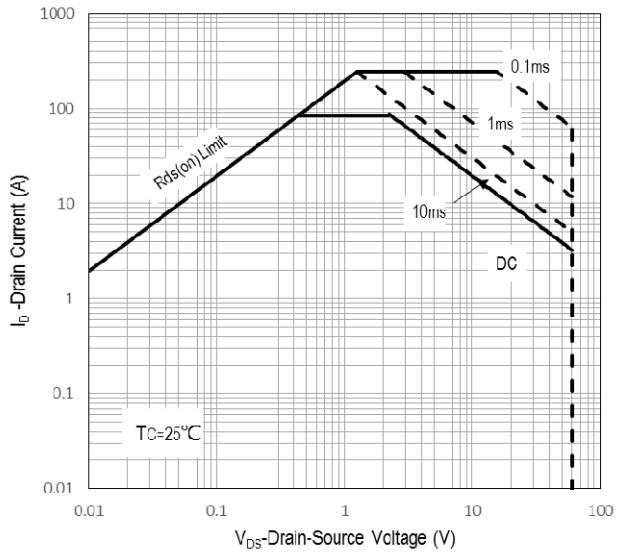
Power Dissipation



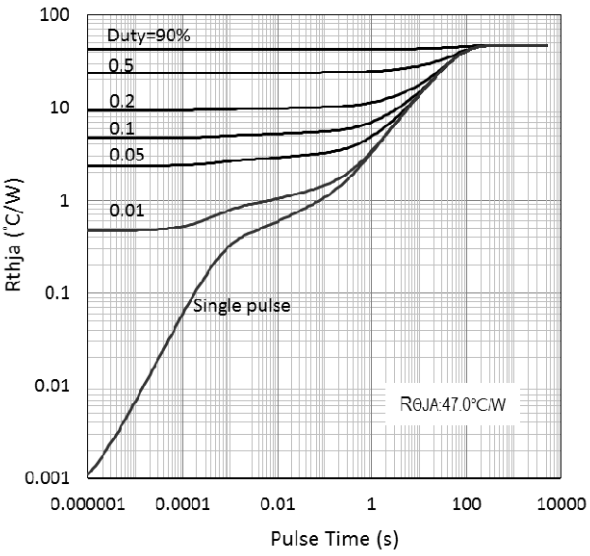
Drain Current



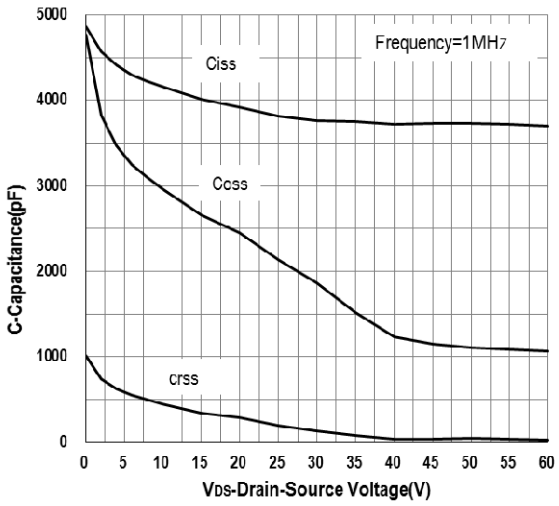
Safe Operation Area



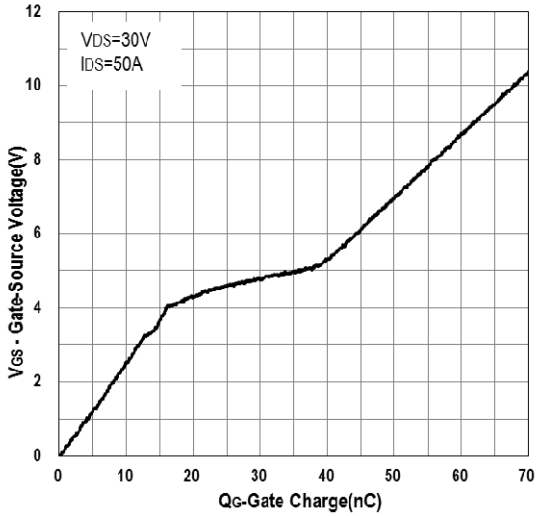
Transient Thermal Impedance



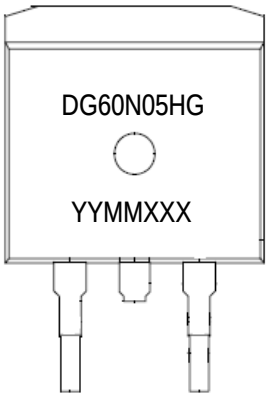
Capacitance



Gate Charge



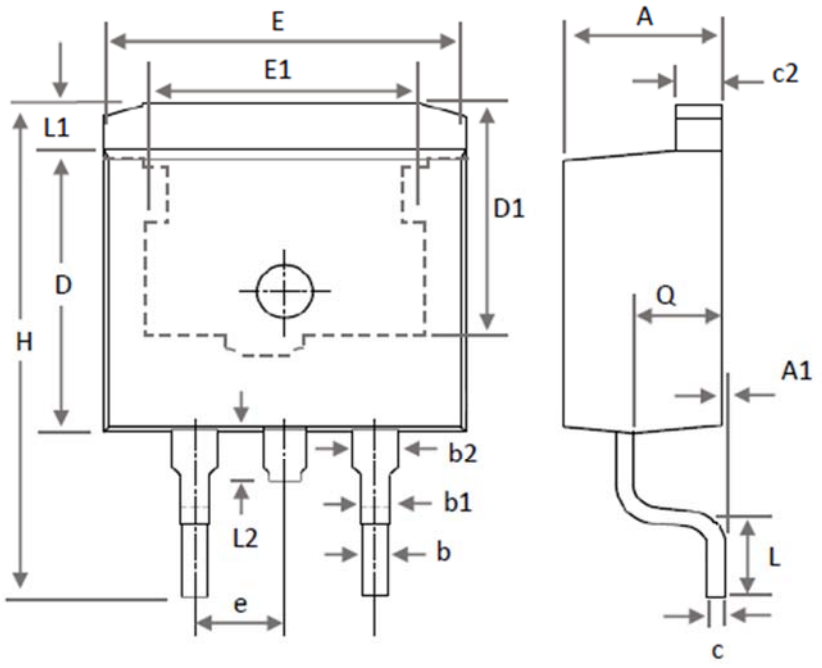
Marking Information

TO-263 (G)	Marking Rule
Laser Marking  	Line 1：Device Name DG60N05HG Line 2：Date Code YYMMXXX YY：Year Code MM：Month XXX：Serial Number

Preliminary

Package of Dimension

TO-263S



Symbol	Min	Nor	Max
A	4.24	4.44	4.64
A1	0.00	0.10	0.25
b	0.66	0.76	0.96
b1	0.76	0.86	1.06
b2	1.14	1.27	1.47
c	0.40	0.50	0.60
c2	1.15	1.30	1.45
D	8.38	8.60	8.90
D1	6.86	7.16	-
E	9.90	10.20	10.50
E1	7.80 Ref.		
e	2.54 BSC		
H	14.61	15.00	15.88
L	1.78	2.20	2.79
L1	1.40 REF.		
L2	1.50 REF.		
Q	-	2.49	2.70

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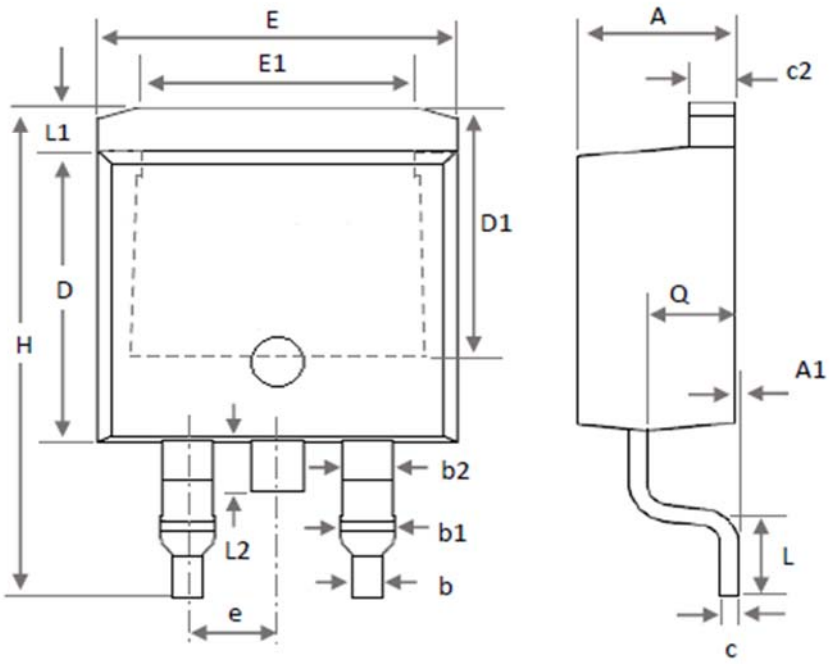
1. All dimension are in millimeters.
2. Dimension dose not include burrs and mold flash/protrusions.

Package of Dimension

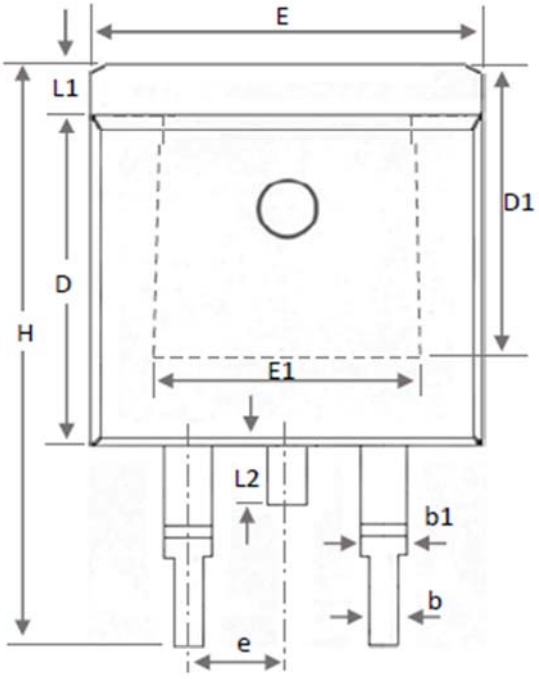
TO-263

G-TYPE



Symbol	Min	Nor	Max
A	4.24	4.51	4.77
A1	0.00	0.13	0.25
b	0.70	0.83	0.96
b1	1.17	1.46	1.75
b2	1.20	1.45	1.70
c	0.30	0.45	0.60
c2	1.15	1.29	1.42
D	8.50	8.76	9.02
D1	6.60	7.13	7.65
E	9.86	10.11	10.36
E1	6.89	7.39	7.89
e	2.54 BSC		
H	14.61	15.25	15.88
L	1.78	2.29	2.79
L1	1.07	1.27	1.47
L2	1.40	1.55	1.70
Q	2.30	2.60	2.89

H-TYPE

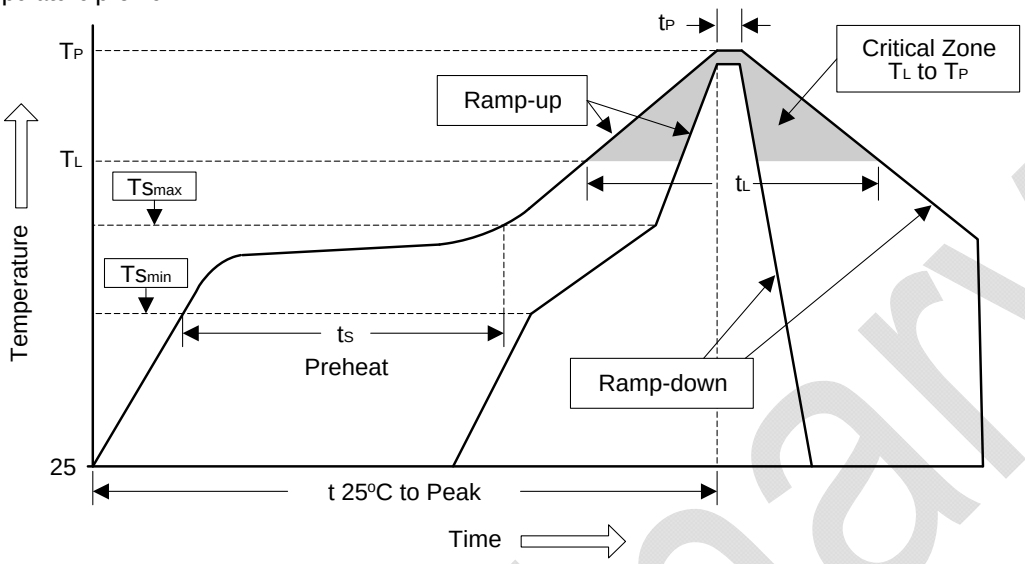


1. All dimension are in millimeters.
2. Dimension dose not include burrs and mold flash/protrusions.

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 (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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