

$V_{DSS}$ , 40V $R_{DS(ON)}$ , 2.5m $\Omega$ (max.) @ $V_{GS}=10V$ $I_D$ , 149A	<b>TO-263</b>	

Description	Features
<p>The SG40N01G uses advanced Trench technology and designs to provide excellent <math>R_{DS(ON)}</math> with low gate charge. This device is suitable for use in PWM, load switching and general purpose applications.</p>	<ul style="list-style-type: none"> <li>• Low On-Resistance</li> <li>• Low Input Capacitance</li> <li>• Low Miller Charge</li> <li>• Low Input / Output Leakage</li> <li>• Pb-free lead plating; RoHS compliant</li> </ul>
	Applications
	<ul style="list-style-type: none"> <li>• Lithium-Ion Secondary Batteries</li> <li>• Load Switch</li> <li>• DC-DC converters and Off-line UPS</li> </ul>

### Ordering Information

Ordering Code	RoHS Status	Package	Package Code	Packing	Quantity
SG40N01G	Halogen-Free	TO-263	G	Tape & Reel	800

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	40	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous <small>Note 1</small>	$I_D$	$T_C=25^{\circ}C$	149
		$T_C=70^{\circ}C$	119
Drain Current-Pulsed <small>Note 1</small>	$I_{DM}$	480	A
Drain Current-Continuous	$I_D$	$T_A=25^{\circ}C$	30
		$T_A=70^{\circ}C$	24
Avalanche Current	$I_{AS}$	63.5	A
Avalanche Energy, $L=0.1mH$	$E_{AS}$	201	mJ
Maximum Power Dissipation	$P_D$	$T_C=25^{\circ}C$	83
		$T_C=70^{\circ}C$	53
		$T_A=25^{\circ}C$	2
		$T_A=70^{\circ}C$	1.3
Storage Temperature Range	$T_{STG}$	-55 to +150	$^{\circ}C$
Operating Junction Temperature Range	$T_J$	-55 to +150	$^{\circ}C$

### Thermal Resistance Ratings

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Maximum Junction-to-Ambient	$R_{\theta JA}$	Steady State	-	-	62	$^{\circ}C/W$
Maximum Junction-to-Case	$R_{\theta JC}$	Steady State	-	-	1.5	$^{\circ}C/W$

**Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

OFF CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>DS</sub> =250μA	40	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =32V, V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA

ON CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =250μA	2	3	4	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>DS</sub> =30A	-	-	2.5	mΩ

DYNAMIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, f=1MHz	-	4222	-	pF
Output Capacitance	C <sub>OSS</sub>		-	889	-	
Reverse Transfer Capacitance	C <sub>RSS</sub>		-	398	-	

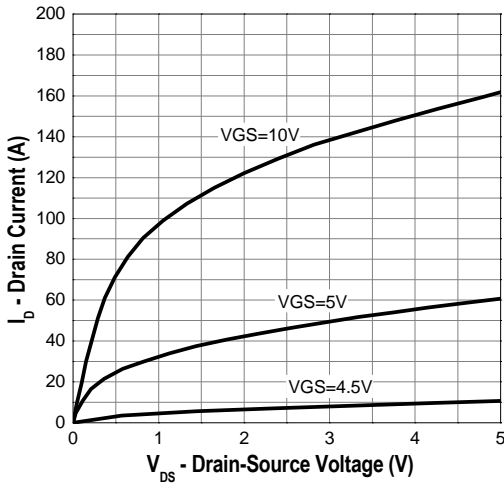
SWITCHING CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Turn-On Delay Time	T <sub>d(on)</sub>	V <sub>DS</sub> =20V, I <sub>DS</sub> =30A, V <sub>GS</sub> =10V, R <sub>GEN</sub> =3Ω	-	21	-	ns
Rise Time	t <sub>r</sub>		-	6	-	
Turn-Off Delay Time	T <sub>d(off)</sub>		-	98	-	
Fall Time	t <sub>f</sub>		-	17	-	
Total Gate Charge at 10V	Q <sub>g</sub>	V <sub>DS</sub> =20V, I <sub>DS</sub> =30A, V <sub>GS</sub> =10V	-	78.8	-	nC
Gate to Source Gate Charge	Q <sub>gs</sub>		-	23	-	
Gate to Drain "Miller" Charge	Q <sub>gd</sub>		-	4.85	-	

DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>DS</sub> =30A	-	-	1.3	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> =30A, dI/dt=100A/μs	-	32	-	ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>		-	120	-	nC

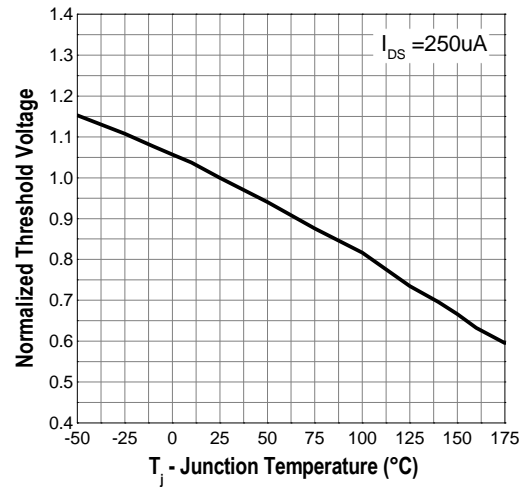
- Notes:**
1. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
  2. R<sub>θJA</sub> is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. R<sub>θJC</sub> is guaranteed by design while R<sub>θJA</sub> is determined by the user's board design. R<sub>θJA</sub> shown below for single device operation on FR-4 in still air.

## Typical Operating Characteristics

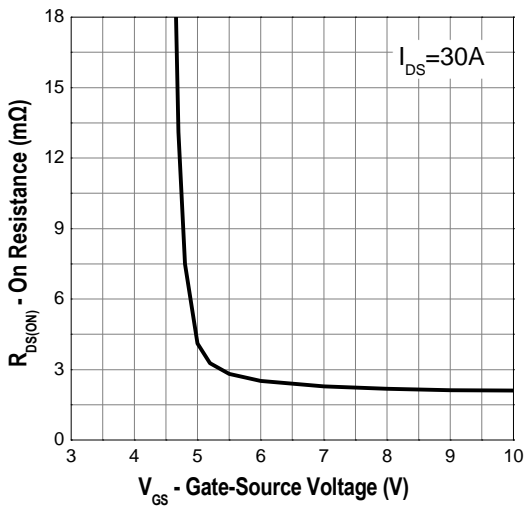
### Output Characteristics



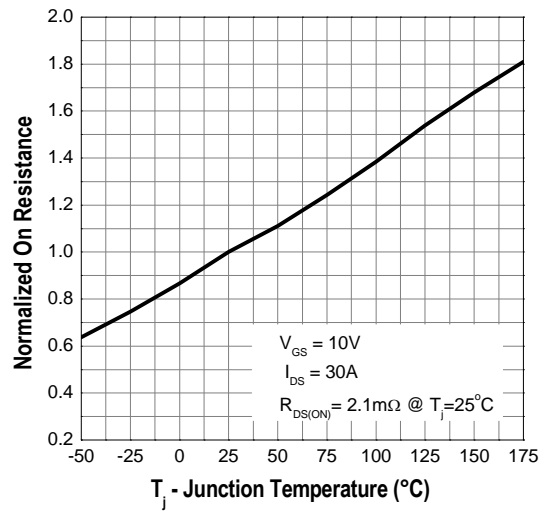
### Gate Threshold Voltage



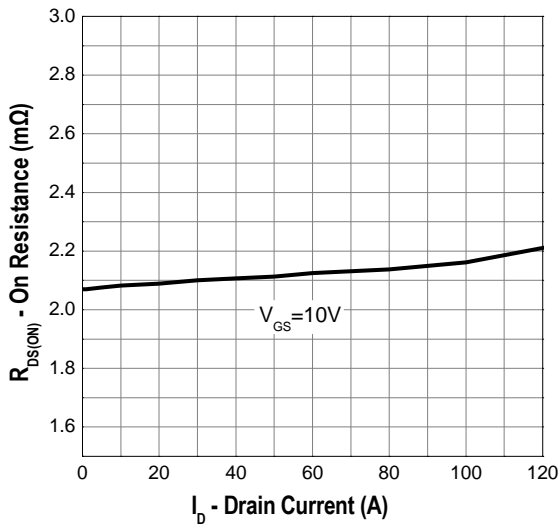
### Gate-Source On Resistance



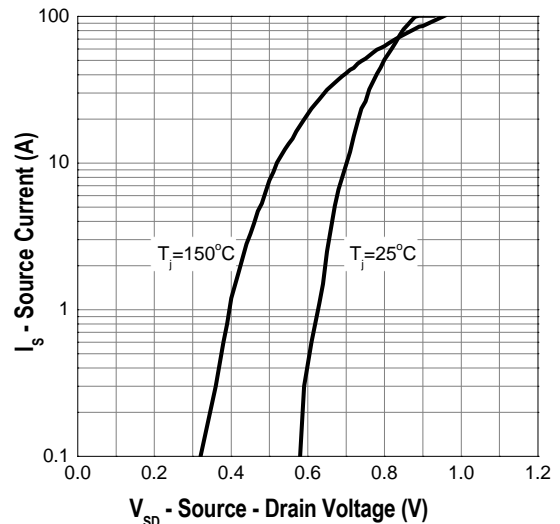
### Drain-Source On Resistance



### Drain-Source On Resistance

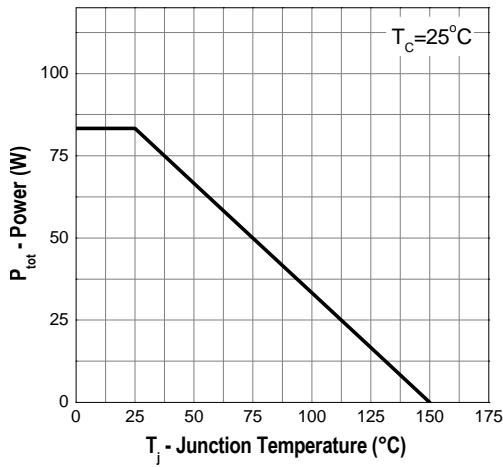


### Source-Drain Diode Forward

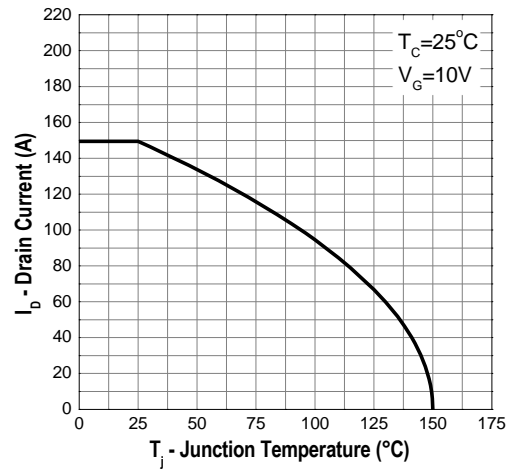


Typical Operating Characteristics (Cont.)

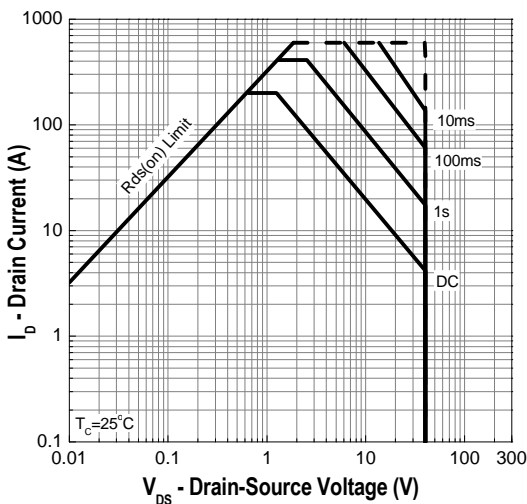
Power Dissipation



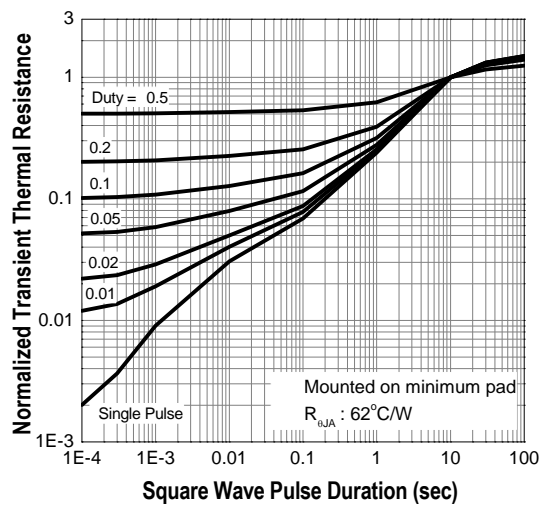
Drain Current



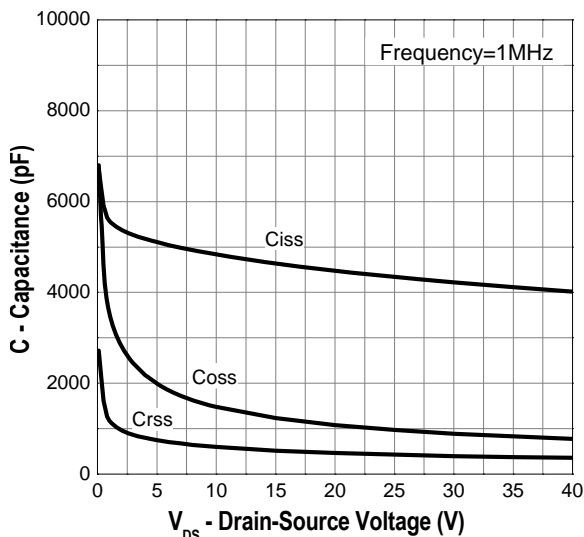
Safe Operation Area



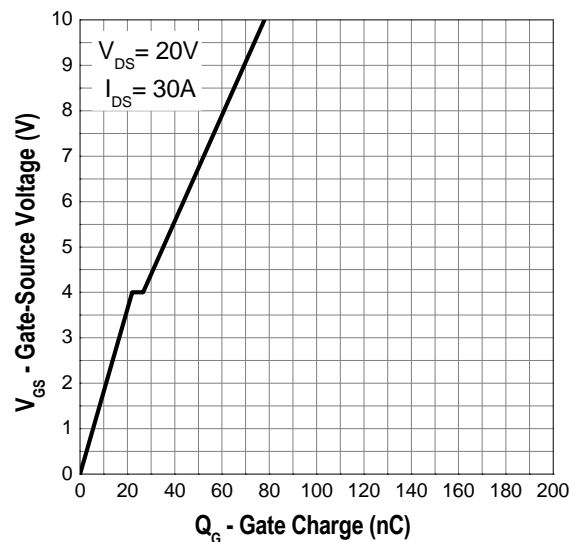
Transient Thermal Impedance



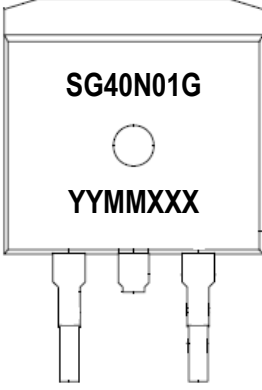
Capacitance



Gate Charge

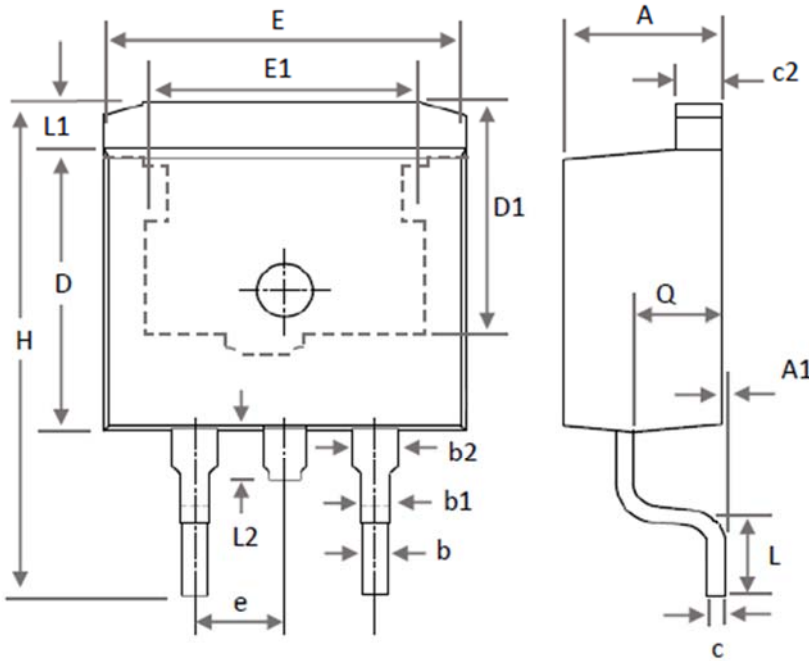


**Marking Information**

TO-263 (G)	Marking Rule
<p>Laser Marking</p>  <p>Diagram</p>	<p><u>Line 1</u> : Device Name SG40N01G</p> <p><u>Line 2</u> : Date Code YYMMXXX</p> <p>YY : Year Code MM : Month Code XXX : Serial Number</p>

Package of Dimension

TO-263S

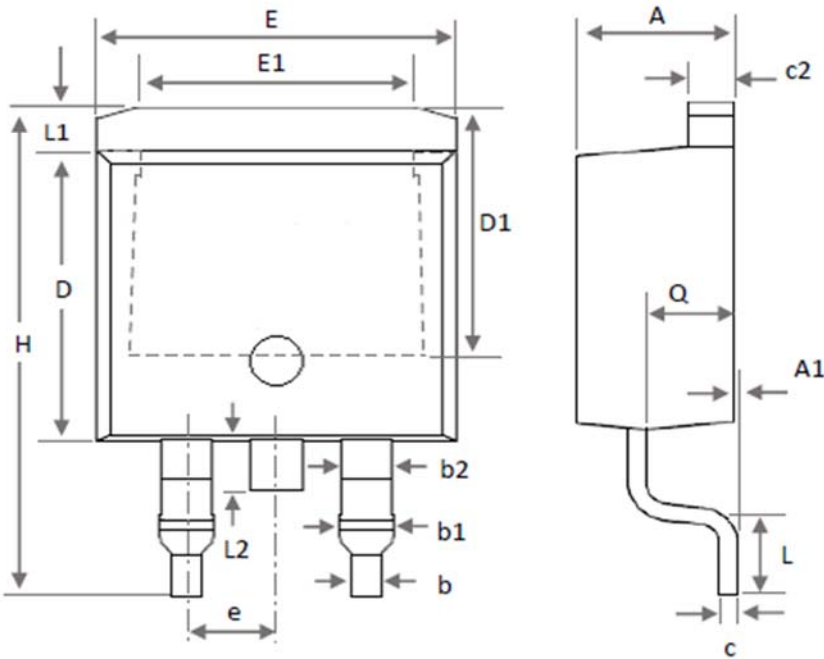


Symbol	Min	Nor	Max
A	4.24	4.44	4.64
A1	0.00	0.10	0.25
b	0.66	0.76	0.96
b1	0.76	0.86	1.06
b2	1.14	1.27	1.47
c	0.40	0.50	0.60
c2	1.15	1.30	1.45
D	8.38	8.60	8.90
D1	6.86	7.16	-
E	9.90	10.20	10.50
E1	7.80 Ref.		
e	2.54 BSC		
H	14.61	15.00	15.88
L	1.78	2.20	2.79
L1	1.40 REF.		
L2	1.50 REF.		
Q	-	2.49	2.70

Package of Dimension

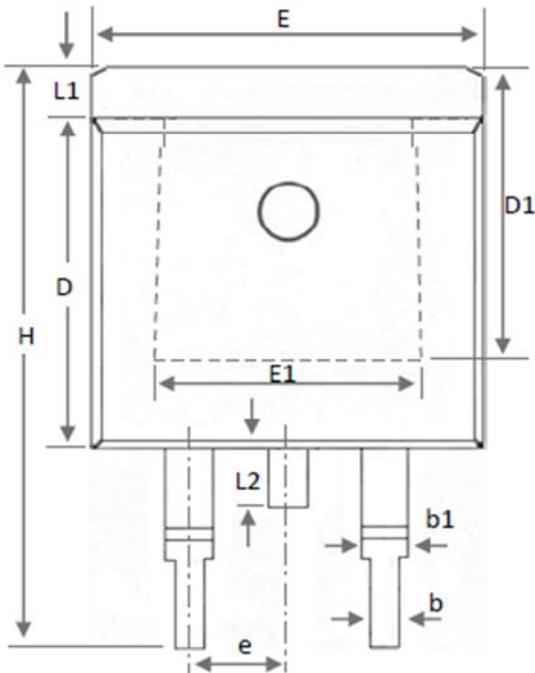
TO-263

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

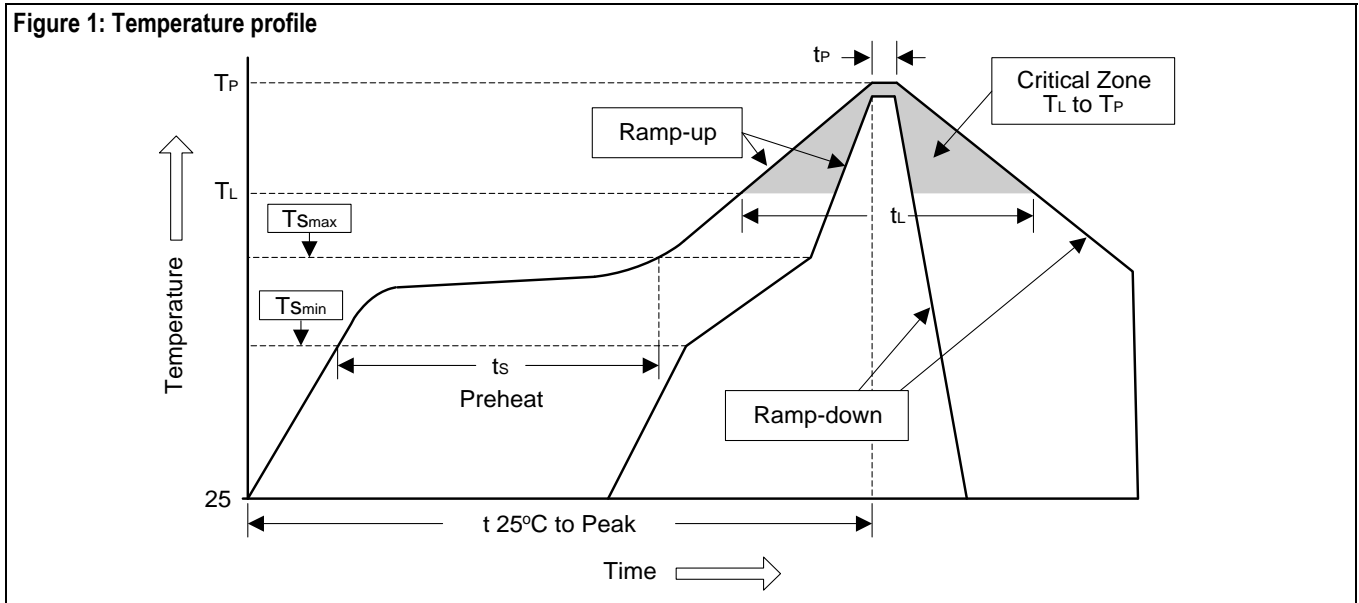
H-TYPE



## 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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