

<b>V<sub>DSS</sub> , 30V</b> <b>R<sub>DS(ON)</sub> , 7.8mΩ (max.) @ V<sub>GS</sub>=10V</b> <b>R<sub>DS(ON)</sub> , 10.5mΩ (max.) @ V<sub>GS</sub>=4.5V</b> <b>I<sub>D</sub> , 10.2A</b>	<b>SOP-8</b>	

Description	Features
<p>The SG30N09E uses advanced Trench technology and designs to provide excellent R<sub>DS(ON)</sub> 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

### Ordering Information

Ordering Code	RoHS Status	Package	Package Code	Packing	Quantity
SG30N09S	Halogen-Free	SOP-8	S	Tape & Reel	3,000

### Absolute Maximum Ratings (T<sub>A</sub>=25°C unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V <sub>DS</sub>	30	V
Gate-Source Voltage	V <sub>GS</sub>	±20	V
Drain Current-Continuous	I <sub>D</sub>	T <sub>A</sub> =25°C	10.2
		T <sub>C</sub> =70°C	8.2
Drain Current-Pulsed <small>Note 1</small>	I <sub>DM</sub>	170	A
Avalanche Current	I <sub>AS</sub>	35	A
Avalanche Energy, L=0.1mH	E <sub>AS</sub>	61.25	mJ
Maximum Power Dissipation	P <sub>D</sub>	T <sub>A</sub> =25°C	1.5
		T <sub>A</sub> =70°C	0.6
Storage Temperature Range	T <sub>STG</sub>	-55 to +175	°C
Operating Junction Temperature Range	T <sub>J</sub>	-55 to +175	°C

### Thermal Resistance Ratings

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Maximum Junction-to-Ambient	R <sub>θJA</sub>	Steady State	-	-	85	°C/W
Maximum Junction-to-Case	R <sub>θJC</sub>	Steady State	-	-	36	°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	30	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =30V, 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	1.2	-	2.5	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>DS</sub> =15A	-	-	7.8	mΩ
Drain-Source On-State Resistance		V <sub>GS</sub> =4.5V, I <sub>DS</sub> =10A	-	-	10.5	mΩ
Forward Transconductance	g <sub>fs</sub>	V <sub>DS</sub> =5V, I <sub>D</sub> =15A	-	36	-	S

DYNAMIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1MHz	-	1290	-	pF
Output Capacitance	C <sub>oss</sub>		-	159	-	
Reverse Transfer Capacitance	C <sub>rss</sub>		-	128	-	
Gate Resistance	R <sub>g</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz	-	1.5	-	Ω

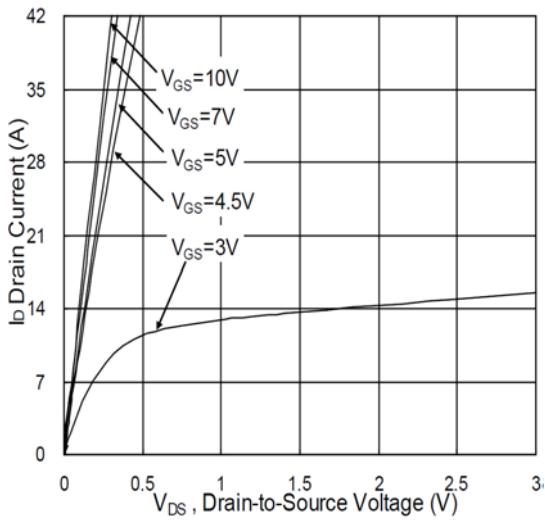
SWITCHING CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Turn-On Delay Time	T <sub>d(on)</sub>	V <sub>DD</sub> =15V, I <sub>D</sub> =15A, V <sub>GS</sub> =10V, R <sub>g</sub> =3.3Ω	-	4.5	-	ns
Rise Time	t <sub>r</sub>		-	11.9	-	
Turn-Off Delay Time	T <sub>d(off)</sub>		-	26	-	
Fall Time	t <sub>f</sub>		-	7.8	-	
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =15V, I <sub>DS</sub> =15A, V <sub>GS</sub> =4.5V	-	12.3	-	nC
Gate to Source Gate Charge	Q <sub>gs</sub>		-	4.1	-	
Gate to Drain "Miller" Charge	Q <sub>gd</sub>		-	5	-	

DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Maximum Body-Diode Continuous Current	I <sub>S</sub>	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	-	-	55	A
Pulsed Source Current	I <sub>SM</sub>	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	-	-	170	A
Drain-Source Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =1A	-	0.8	1.2	V

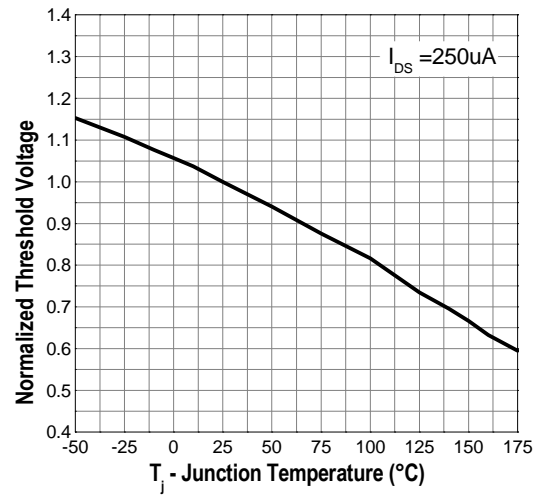
- Notes:**
- Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
  - R<sub>θJA</sub> is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. R<sub>θJC</sub> is guaranteed by design while R<sub>θCA</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

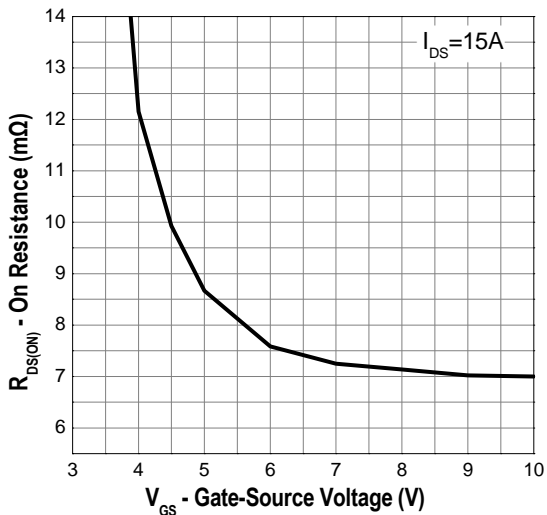
### Output Characteristics



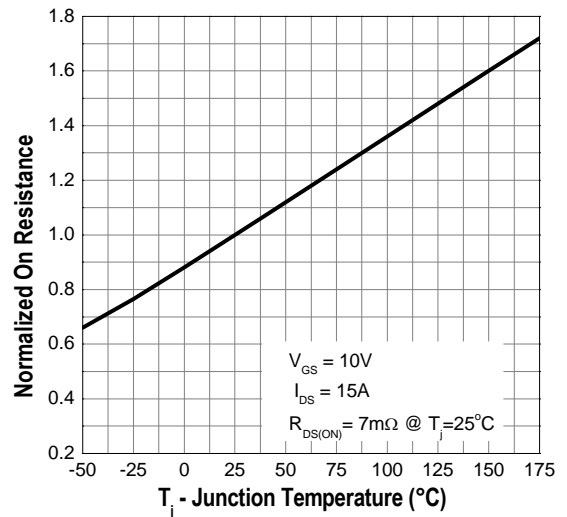
### Gate Threshold Voltage



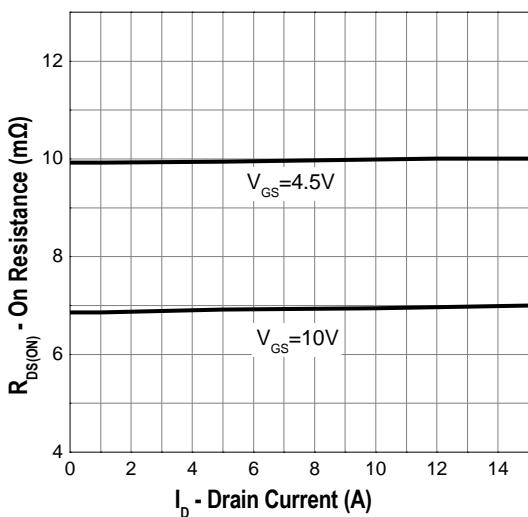
### Gate-Source On Resistance



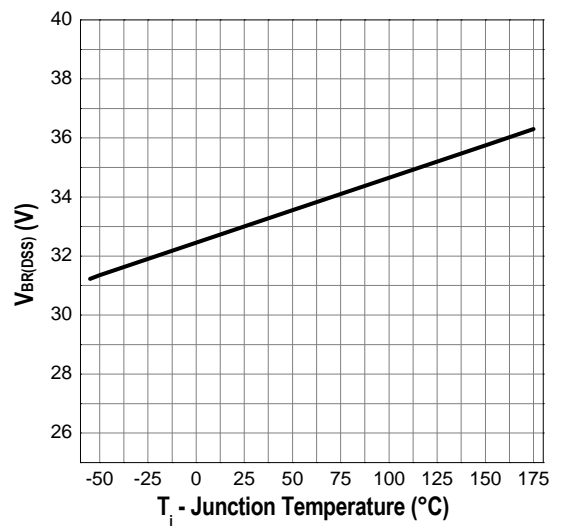
### Drain-Source On Resistance



### Drain-Source On Resistance

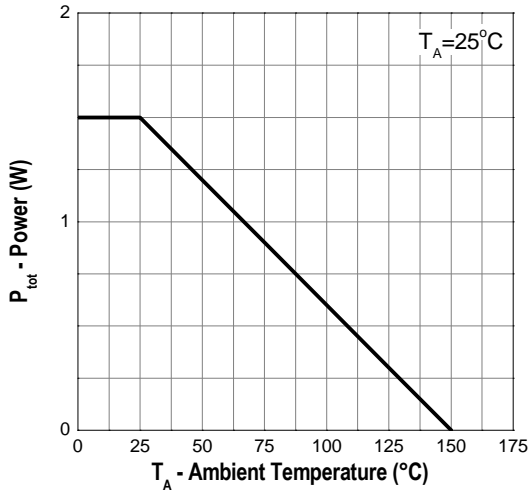


### Drain-source Breakdown Voltage

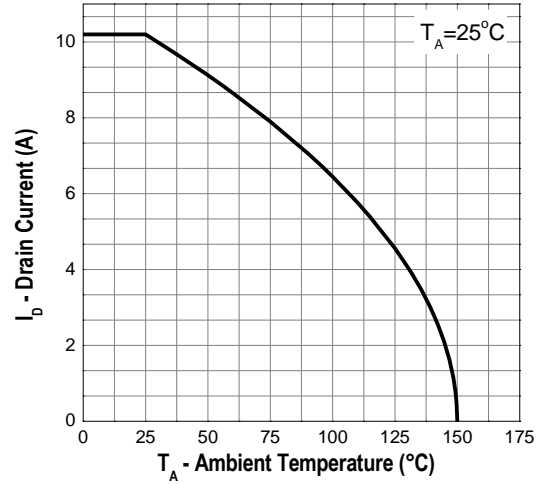


## Typical Operating Characteristics (Cont.)

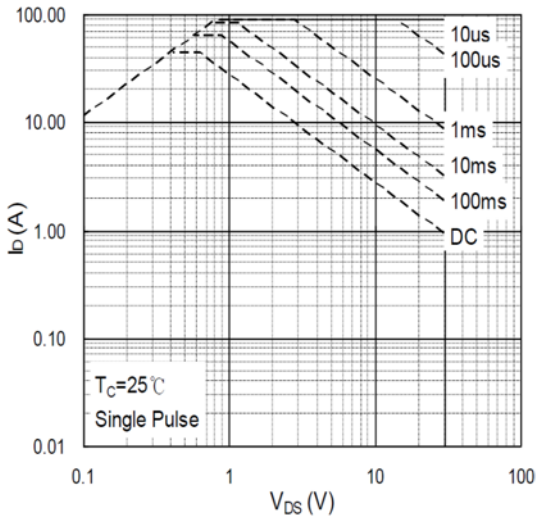
**Power Dissipation**



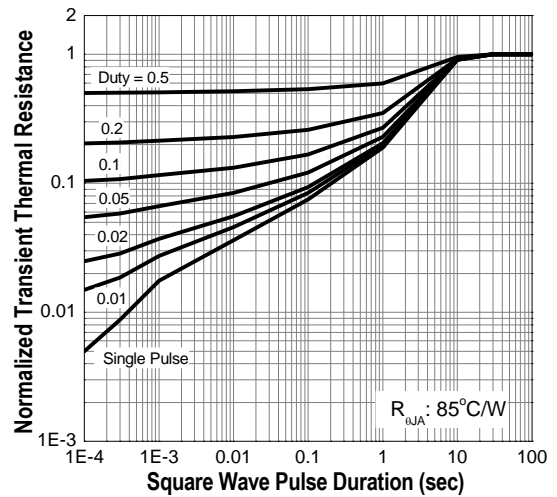
**Drain Current**



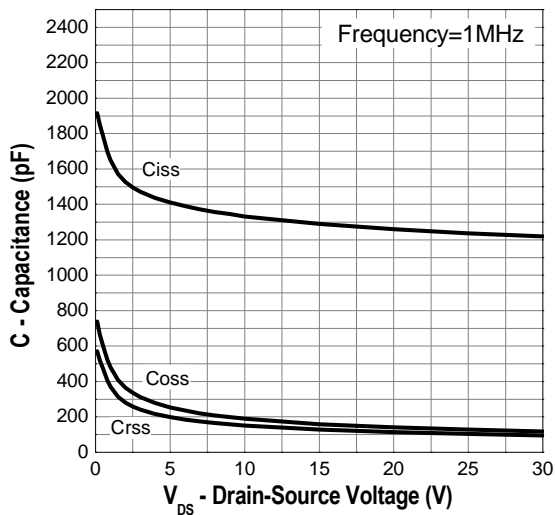
**Safe Operation Area**



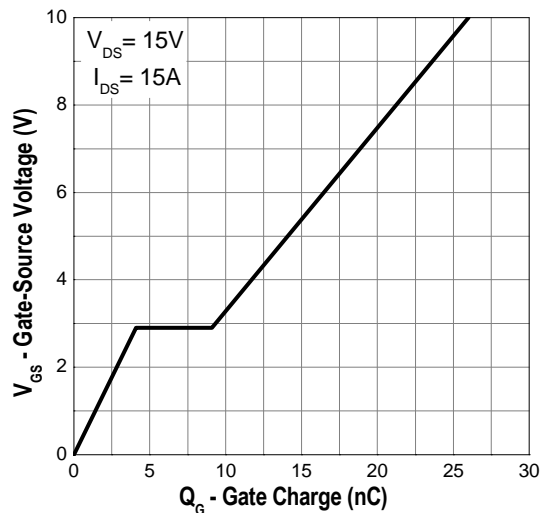
**Transient Thermal Impedance**




**Capacitance**



**Gate Charge**

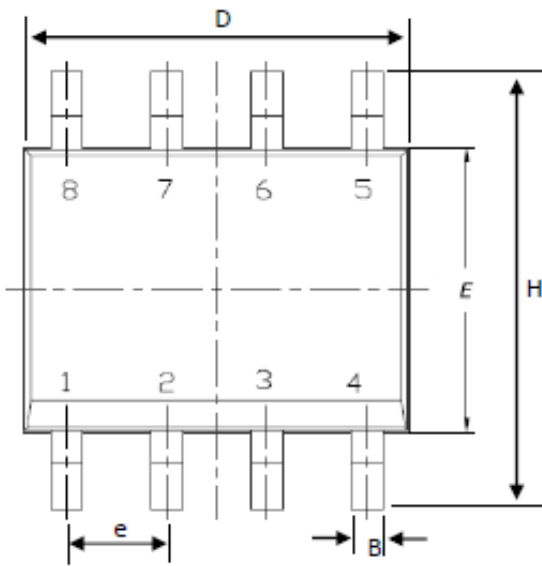


## Marking Information

SOP-8 (S)	Marking Rule
<p data-bbox="140 360 309 394">Laser Marking</p> 	<p data-bbox="826 360 1091 394"><u>Line 1</u> : Device Name</p> <p data-bbox="826 405 963 439">SG30N09S</p> <p data-bbox="826 495 1059 528"><u>Line 2</u> : Date Code</p> <p data-bbox="826 539 963 573">YYMMXXX</p> <p data-bbox="826 618 1023 651">YY : Year Code</p> <p data-bbox="826 663 1050 696">MM : Month Code</p> <p data-bbox="826 707 1082 741">XXX : Serial Number</p>

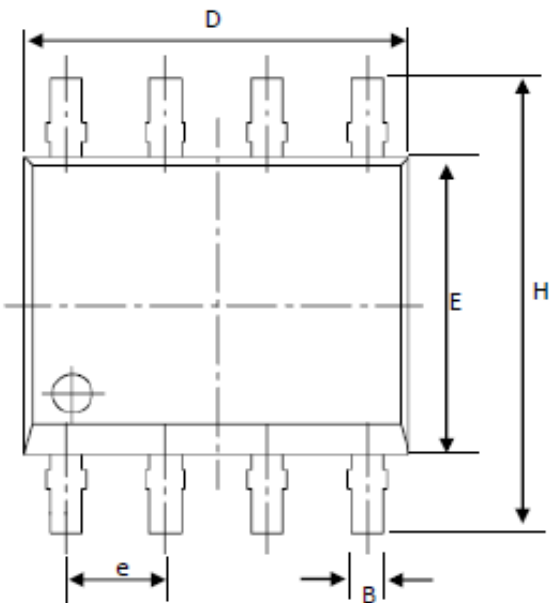
## Package of Dimension

G-TYPE



Symbol	Min	Nor	Max
A	1.35	1.55	1.75
A1	0.10	0.18	0.25
B	0.31	0.41	0.51
c	0.17	0.21	0.25
D	4.80	4.90	5.00
E	3.80	3.90	4.00
e	1.27	1.27	1.27
H	5.80	6.00	6.20
L	0.40	0.84	1.27
$\alpha$	0.00	4.00	8.00

B-TYPE

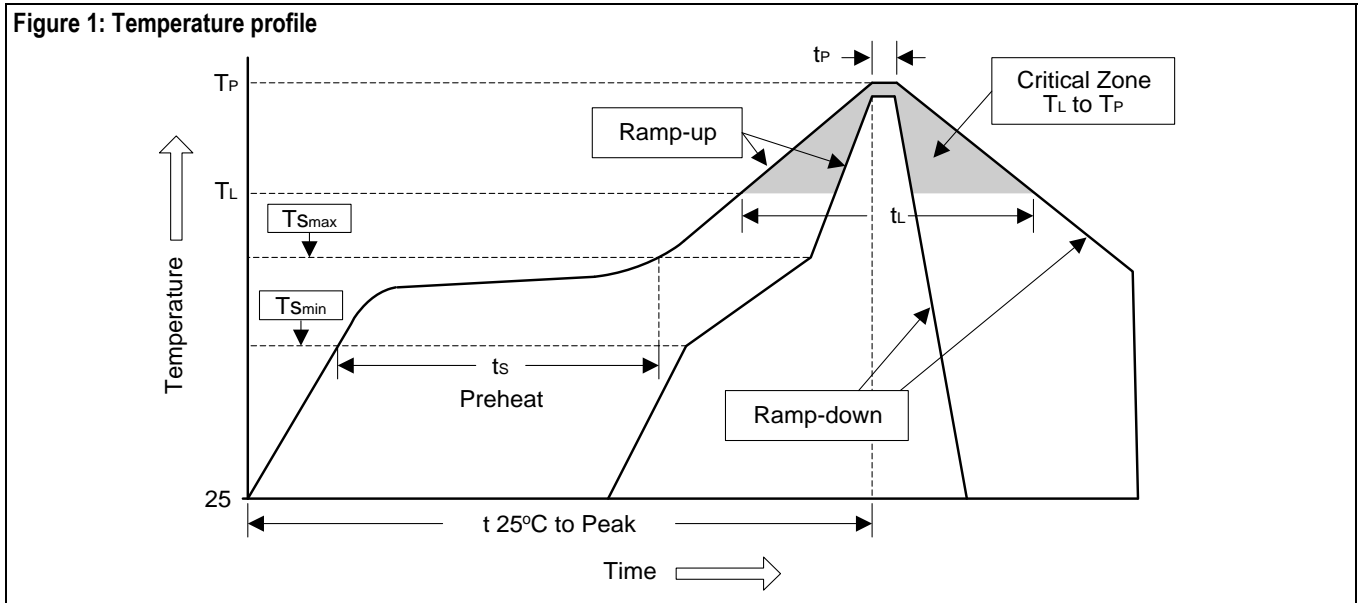


1. All dimension are in millimeters.
2. Dimension does not include burrs and mold flash/protrusions.

## 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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