

V_{DS} , 30V $R_{DS(ON)}$, 5.4m Ω (max.) @ $V_{GS}=10V$ $R_{DS(ON)}$, 8.2m Ω (max.) @ $V_{GS}=4.5V$ I_D , 50A <small>Note 3</small>	PDFN 3.3x3.3-8L		

Description	Features
<p>The SG30N04E uses advanced Trench technology and designs to provide excellent $R_{DS(ON)}$ 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"> • Low On-Resistance • Low Input Capacitance • Low Miller Charge • Low Input / Output Leakage • Pb-free lead plating; RoHS compliant
	Applications
	<ul style="list-style-type: none"> • Motor / Body Load Control • Load Switch • DC-DC converters and Off-line UPS

Ordering Information

Ordering Code	RoHS Status	Package	Package Code	Packing	Quantity
SG30N04E	Halogen-Free	PDFN 3.3x3.3-8L	E	Tape & Reel	5,000

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	30	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	$T_C=25^\circ\text{C}$	50
		$T_C=100^\circ\text{C}$	30
Drain Current-Pulsed <small>Note 1</small>	I_{DM}	150	A
Drain Current-Continuous <small>Note 3</small>	I_D	$T_A=25^\circ\text{C}$	15
		$T_A=70^\circ\text{C}$	12
Avalanche Current	I_{AS}	50	A
Avalanche Energy, $L=0.1\text{mH}$	E_{AS}	125	mJ
Maximum Power Dissipation	P_D	$T_C=25^\circ\text{C}$	59
		$T_C=100^\circ\text{C}$	23
		$T_A=25^\circ\text{C}$	2
		$T_A=70^\circ\text{C}$	0.8
Storage Temperature Range	T_{STG}	-55 to +175	$^\circ\text{C}$
Operating Junction Temperature Range	T_J	-55 to +175	$^\circ\text{C}$

Thermal Resistance Ratings

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Maximum Junction-to-Ambient	$R_{\theta JA}$	Steady State	-	-	62	$^\circ\text{C}/\text{W}$
Maximum Junction-to-Case	$R_{\theta JC}$	Steady State	-	-	2.1	$^\circ\text{C}/\text{W}$

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

OFF CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _{DS} =250μA	30	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =24V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA

ON CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} =V _{GS} , I _{DS} =250μA	1.2	-	2.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _{DS} =20A	-	-	5.4	mΩ
Drain-Source On-State Resistance		V _{GS} =4.5V, I _{DS} =10A	-	-	8.2	

DYNAMIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C _{iss}	V _{DS} =15V, V _{GS} =0V, f=1MHz	-	2249	-	pF
Output Capacitance	C _{oss}		-	261	-	
Reverse Transfer Capacitance	C _{rss}		-	205	-	
Gate Resistance	R _g	V _{GS} =0V, V _{DS} =0V, f=1MHz	-	1.7	-	Ω

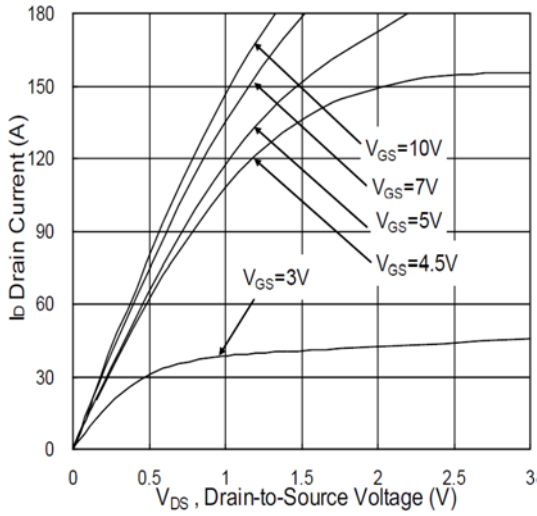
SWITCHING CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Turn-On Delay Time	T _{d(on)}	V _{DD} =15V, I _D =10A, V _{GS} =10V, R _g =3.3Ω	-	7.6	-	ns
Rise Time	t _r		-	14	-	
Turn-Off Delay Time	T _{d(off)}		-	36.5	-	
Fall Time	t _f		-	10.3	-	
Total Gate Charge	Q _g	V _{DS} =15V, I _{DS} =10A, V _{GS} =4.5V	-	19.6	-	nC
Gate to Source Gate Charge	Q _{gs}		-	7.4	-	
Gate to Drain "Miller" Charge	Q _{gd}		-	7	-	

DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Maximum Body-Diode Continuous Current	I _S	V _G =V _D =0V, Force Current	-	-	40	A
Pulsed Source Current	I _{SM}	V _G =V _D =0V, Force Current	-	-	140	A
Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =1A	-	0.8	1.2	V
Body Diode Reverse Recovery Time	t _{rr}	V _{DD} =15V, I _F =20A, di/dt=100A/μs	-	13	-	ns
Body Diode Reverse Recovery Charge	Q _{rr}	V _{DD} =15V, I _F =20A, di/dt=100A/μs	-	4	-	nC

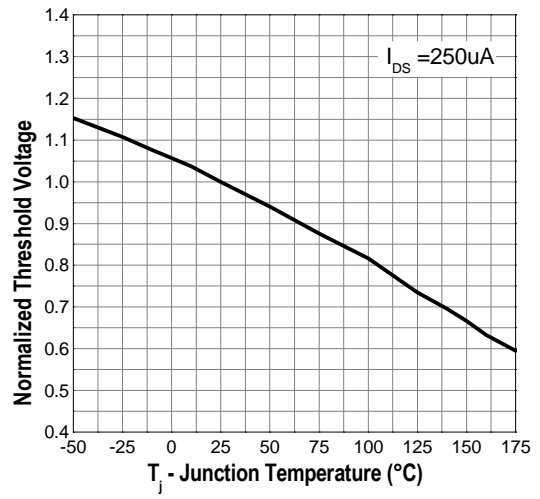
- Notes:**
1. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
 2. R_{θJA} is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. R_{θJC} is guaranteed by design while R_{θCA} is determined by the user's board design. R_{θJA} shown below for single device operation on FR-4 in still air.
 3. The maximum current rating is limited by package.

Typical Operating Characteristics

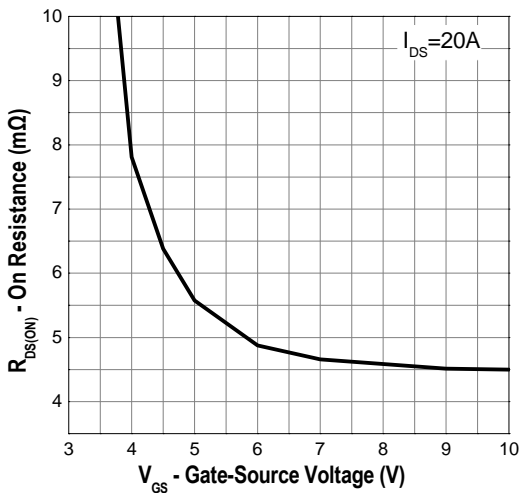
Output Characteristics



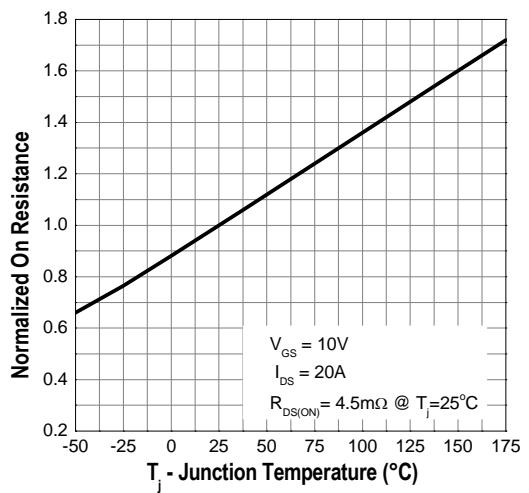
Gate Threshold Voltage



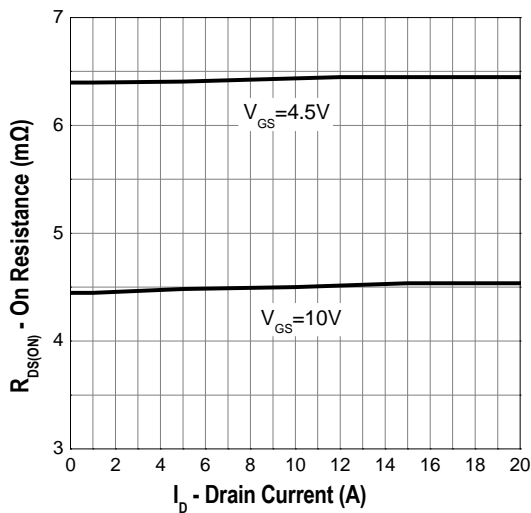
Gate-Source On Resistance



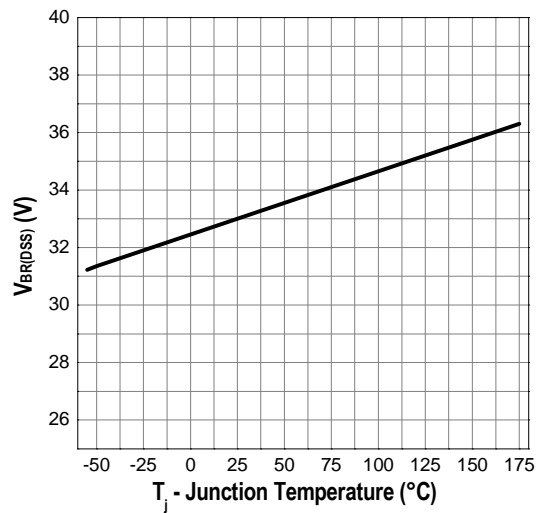
Drain-Source On Resistance



Drain-Source On Resistance

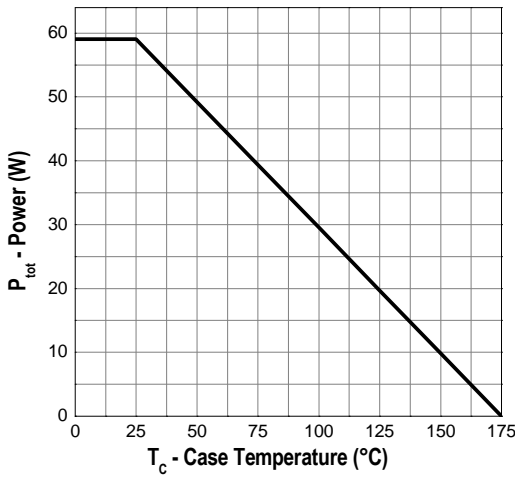


Drain-source Breakdown Voltage

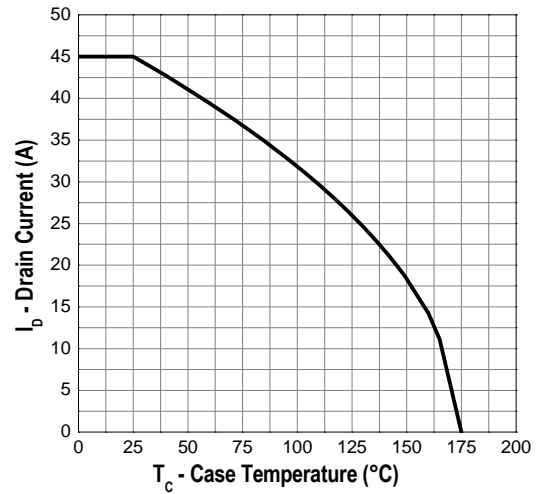


Typical Operating Characteristics (Cont.)

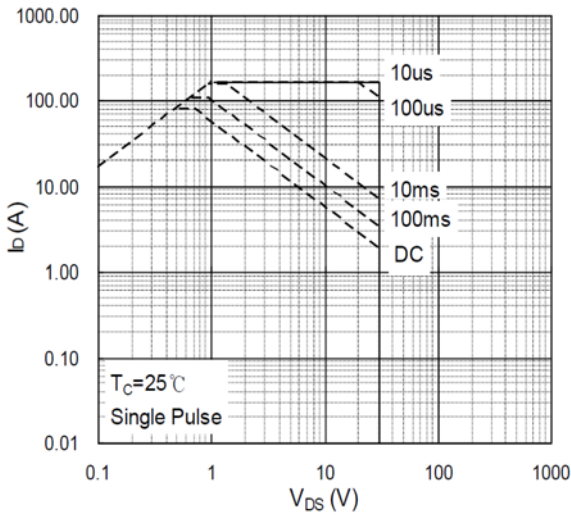
Power Dissipation



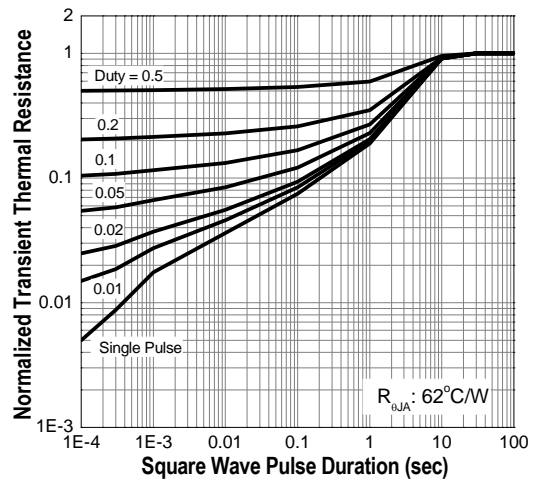
Drain Current



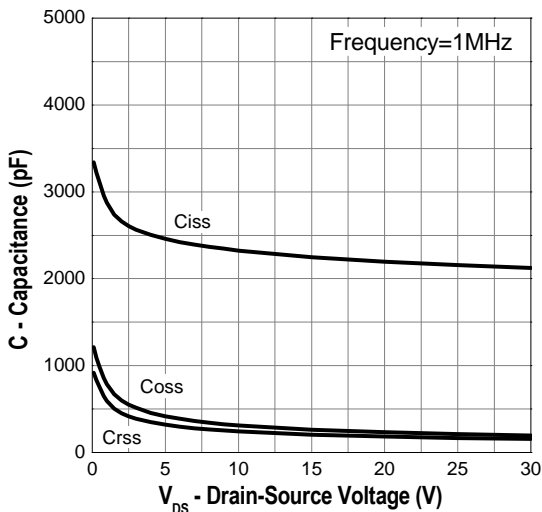
Safe Operation Area



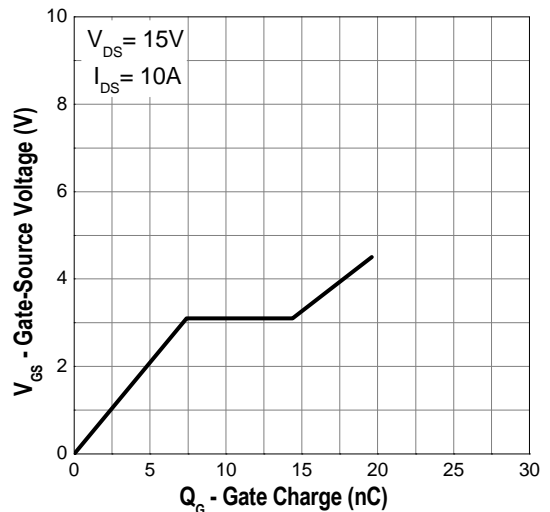
Transient Thermal Impedance



Capacitance



Gate Charge



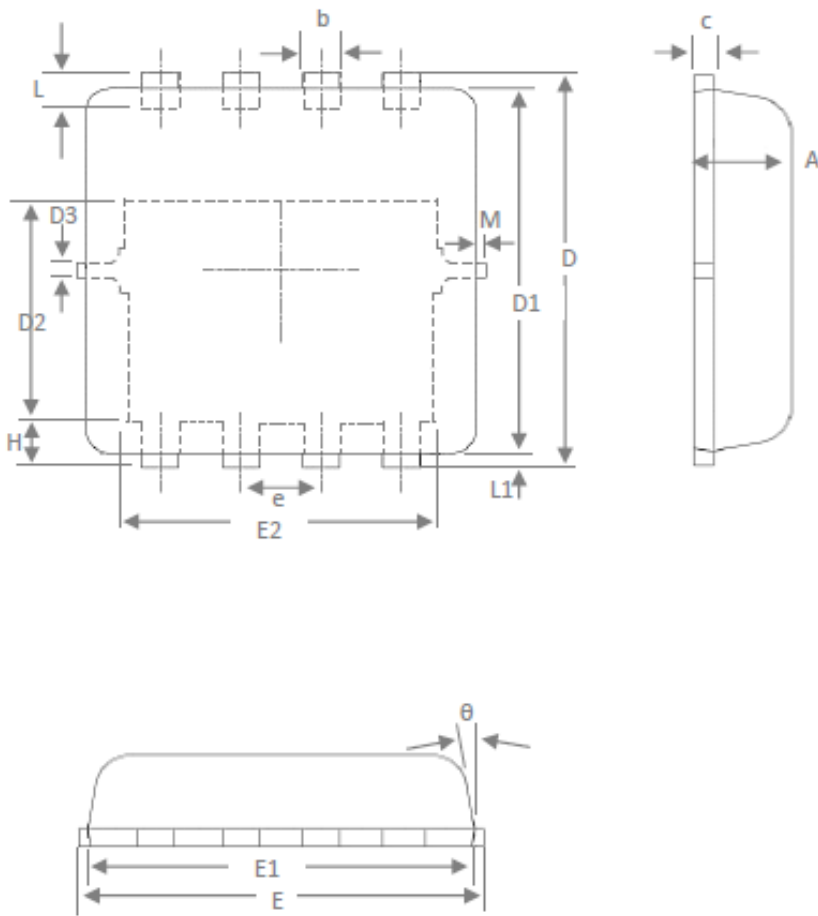
Marking Information

PDFN 3.3x3.3-8L (E)	Marking Rule
<p data-bbox="129 360 300 394">Laser Marking</p> <div data-bbox="338 450 571 689" style="text-align: center;"> <p data-bbox="416 517 512 551">30N04E</p> <p data-bbox="403 591 525 624">YMMXXX</p> </div> <p data-bbox="400 745 512 779">Diagram</p>	<p data-bbox="804 360 994 394"><u>Line 1</u> : Device</p> <p data-bbox="804 405 903 439">30N04E</p> <p data-bbox="804 450 1038 483"><u>Line 2</u> : Date Code</p> <p data-bbox="804 495 924 528">YMMXXX</p> <p data-bbox="804 584 983 618">Y : Year Code</p> <p data-bbox="804 629 1027 663">MM : Month Code</p> <p data-bbox="804 674 1062 707">XXX : Serial Number</p> <p data-bbox="804 763 1190 797">Year Code Description As Below</p>

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	1.48	1.58	1.68
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

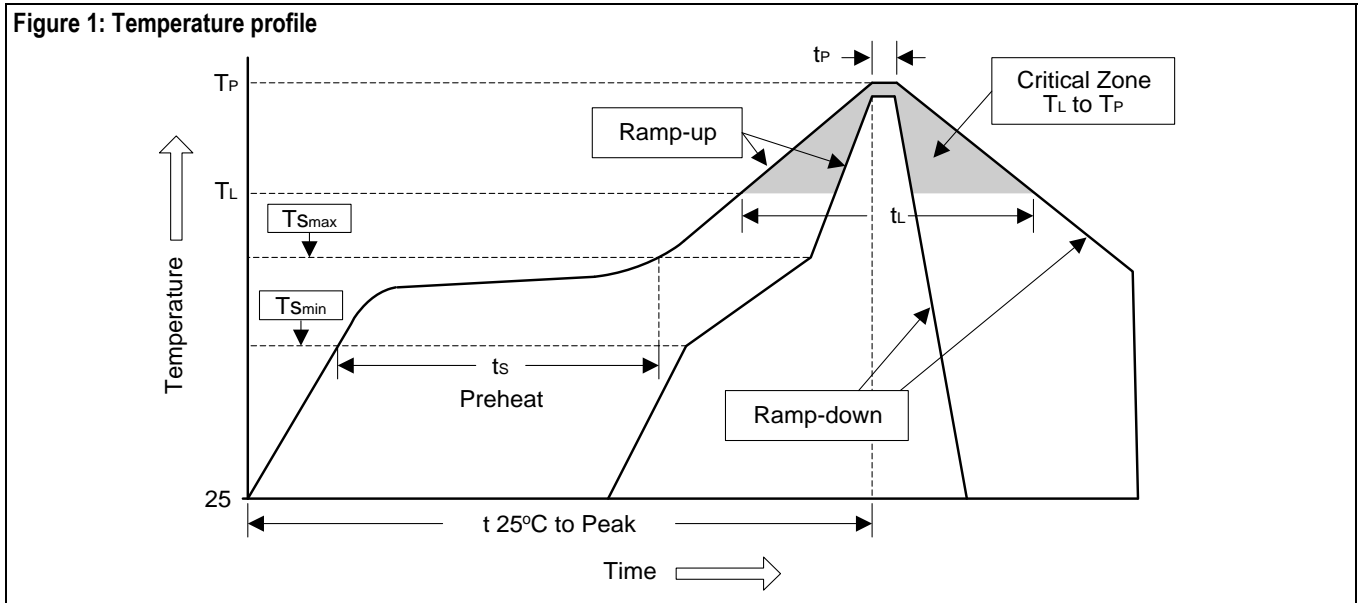
Note:

1. All Dimension Are In mm.
2. Package Body Sizes Exclude Mold Flash, Protrusion Or Gate Burrs.
Mold Flash, Protrusion Or Gate Burrs Shall Not Exceed 0.10 mm Per Side.
3. Package Body Sizes Determined At The Outermost Extremes Of The Plastic Body
Exclusive Of Mold Flash, Tie Bar Burrs, Gate Burrs And Interlead Flash,
But Including Any Mismatch Between The Top And Bottom Of The Plastic Body.

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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