



### General Description

The QN3110M6N is the highest performance trench N-Channel MOSFET with extreme high cell density, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications .

The QN3110M6N meet the RoHS and Green Product requirement with full function reliability approved.

### Features

- Advanced high cell density Trench technology
- Green Device Available

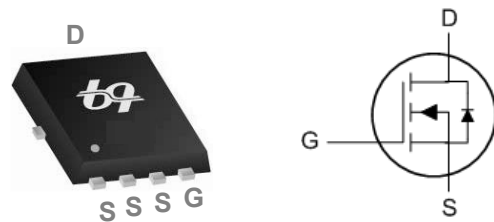
### Product Summary

BVDSS	RDSON (VGS=10V)	ID (Tc=25°C)
30V	1.1mΩ	189A

### Applications

- High Frequency Point-of-Load Synchronous Buck Converter for MB/NB/VGA
- Networking DC-DC Power System
- Load Switch

### PRPAK 5X6 Pin Configuration



### Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V <sub>DS</sub>	Drain-Source Voltage	30	V
V <sub>GS</sub>	Gate-Source Voltage	±20	V
I <sub>D</sub> @T <sub>C</sub> =25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V <sup>1,7</sup>	189	A
I <sub>D</sub> @T <sub>C</sub> =100°C	Continuous Drain Current, V <sub>GS</sub> @ 10V <sup>1,7</sup>	120	A
I <sub>D</sub> @T <sub>A</sub> =25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V <sup>1</sup>	35	A
I <sub>D</sub> @T <sub>A</sub> =70°C	Continuous Drain Current, V <sub>GS</sub> @ 10V <sup>1</sup>	28	A
I <sub>DM</sub>	Pulsed Drain Current <sup>2</sup>	378	A
EAS	Single Pulse Avalanche Energy <sup>3</sup>	720	mJ
I <sub>AS</sub>	Avalanche Current	120	A
P <sub>D</sub> @T <sub>C</sub> =25°C	Total Power Dissipation <sup>4</sup>	59	W
P <sub>D</sub> @T <sub>A</sub> =25°C	Total Power Dissipation <sup>4</sup>	2	W
T <sub>STG</sub>	Storage Temperature Range	-55 to 150	°C
T <sub>J</sub>	Operating Junction Temperature Range	-55 to 150	°C

### Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
R <sub>θJA</sub>	Thermal Resistance Junction-Ambient <sup>1</sup>	41	62	°C/W
R <sub>θJC</sub>	Thermal Resistance Junction-Case <sup>1</sup>	1.5	2.1	°C/W

### Electrical Characteristics ( $T_J=25^\circ\text{C}$ , unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	30	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BVDSS Temperature Coefficient	Reference to $25^\circ\text{C}$ , $I_D=1\text{mA}$	---	0.009	---	$V/^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance <sup>2</sup>	$V_{GS}=10V, I_D=30A$	---	0.86	1.1	m $\Omega$
		$V_{GS}=4.5V, I_D=30A$	---	1.1	1.4	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	1.2	---	2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-5.2	---	$\text{mV}/^\circ\text{C}$
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=24V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	1	$\mu\text{A}$
		$V_{DS}=24V, V_{GS}=0V, T_J=55^\circ\text{C}$	---	---	5	
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	$\pm 100$	nA
gfs	Forward Transconductance	$V_{DS}=5V, I_D=15A$	---	46.6	---	S
$R_g$	Gate Resistance	$V_{DS}=0V, V_{GS}=0V, f=1\text{MHz}$	---	0.9	---	$\Omega$
$Q_g$	Total Gate Charge (10V)	$V_{DS}=15V, V_{GS}=10V, I_D=15A$	---	95.7	---	nC
$Q_g$	Total Gate Charge (4.5V)	$V_{DS}=15V, V_{GS}=4.5V, I_D=15A$	---	45.2	---	
$Q_{gs}$	Gate-Source Charge		---	17.6	---	
$Q_{gd}$	Gate-Drain Charge		---	14.5	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=15V, V_{GS}=10V, R_G=3.3\Omega, I_D=15A$	---	16.6	---	ns
$T_r$	Rise Time		---	48.2	---	
$T_{d(off)}$	Turn-Off Delay Time		---	66.0	---	
$T_f$	Fall Time		---	20.4	---	
$C_{iss}$	Input Capacitance	$V_{DS}=15V, V_{GS}=0V, f=1\text{MHz}$	---	5924	---	pF
$C_{oss}$	Output Capacitance		---	2855	---	
$C_{rss}$	Reverse Transfer Capacitance		---	81	---	

### Guaranteed Avalanche Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
EAS	Single Pulse Avalanche Energy <sup>5</sup>	$V_{DD}=50V, L=0.1\text{mH}, I_{AS}=85A$	361.3	---	---	mJ

### Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$I_S$	Continuous Source Current <sup>1,6</sup>	$V_G=V_D=0V$ , Force Current	---	---	189	A
$I_{SM}$	Pulsed Source Current <sup>2,6</sup>		---	---	378	A
$V_{SD}$	Diode Forward Voltage <sup>2</sup>	$V_{GS}=0V, I_S=1A, T_J=25^\circ\text{C}$	---	---	1.2	V
trr	Reverse Recovery Time	$I_F=15A, di/dt=100A/\mu s, T_J=25^\circ\text{C}$	---	84	---	nS
Qrr	Reverse Recovery Charge		---	124	---	nC

Note :

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- 2.The data tested by pulsed , pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$
- 3.The EAS data shows Max. rating . The test condition is  $V_{DD}=50V, V_{GS}=10V, L=0.1\text{mH}$
- 4.The power dissipation is limited by  $150^\circ\text{C}$  junction temperature
- 5.The Min. value is 100% EAS tested guarantee.
- 6.The data is theoretically the same as  $I_D$  and  $I_{DM}$ , in real applications , should be limited by total power dissipation.
- 7.The maximum current rating is package limited.

### Typical Characteristics

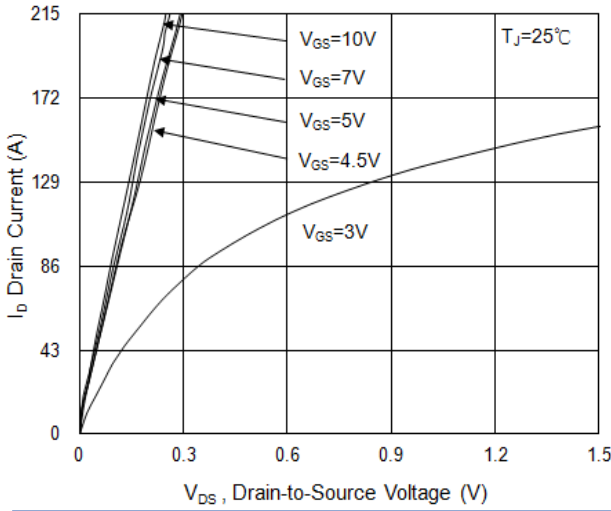


Fig.1 Typical Output Characteristics

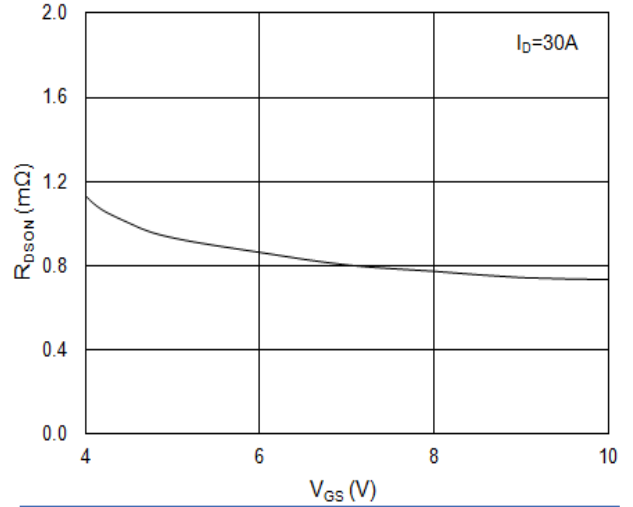


Fig.2 On-Resistance vs. Gate-Source

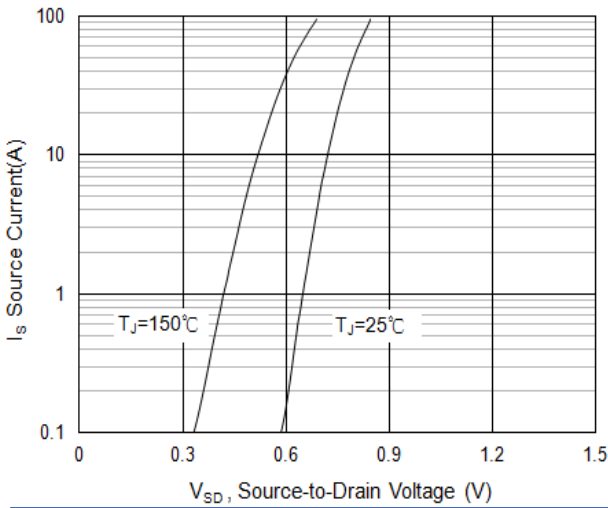


Fig.3 Forward Characteristics of Reverse

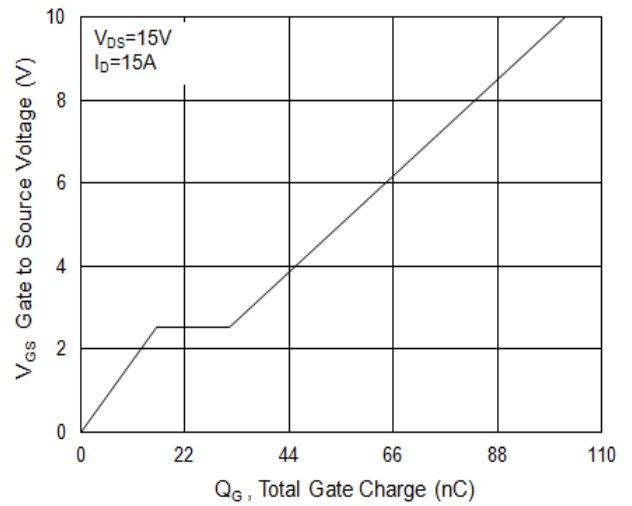


Fig.4 Gate-Charge Characteristics

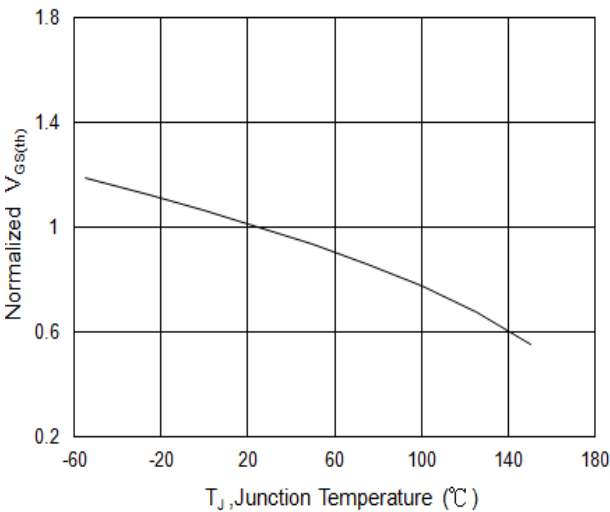


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

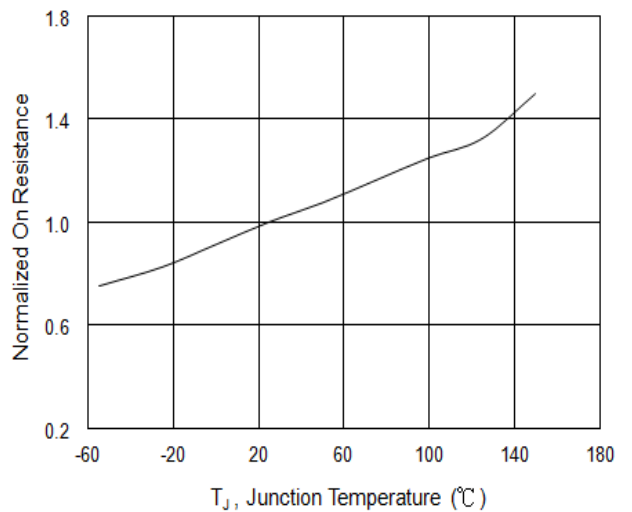


Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$

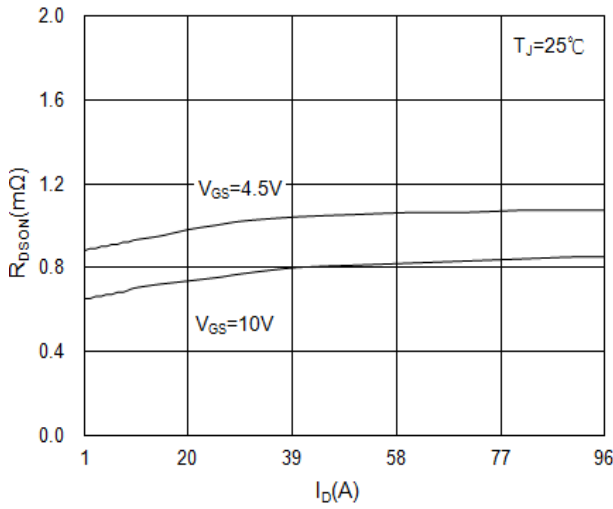


Fig.7 Drain-Source On-State Resistance

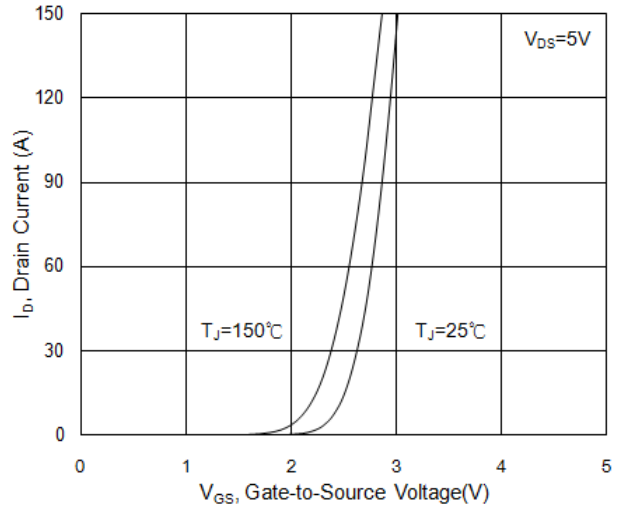


Fig.8 Transfer Characteristics

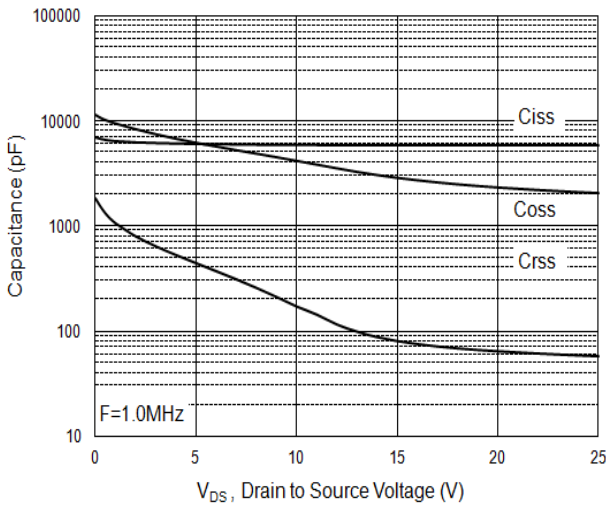


Fig.9 Capacitance

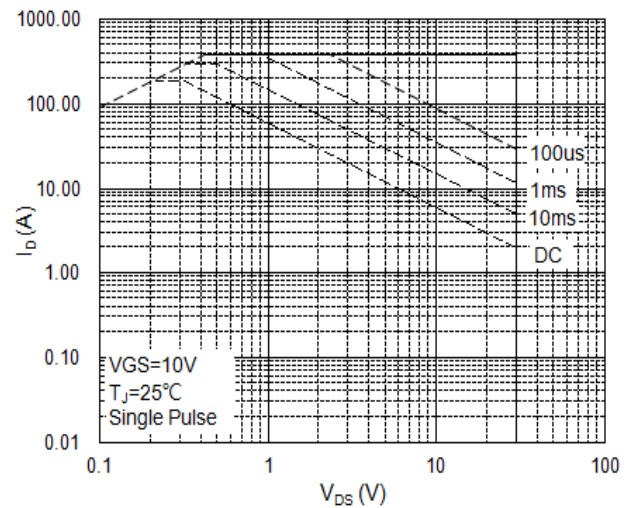


Fig.10 Safe Operating Area

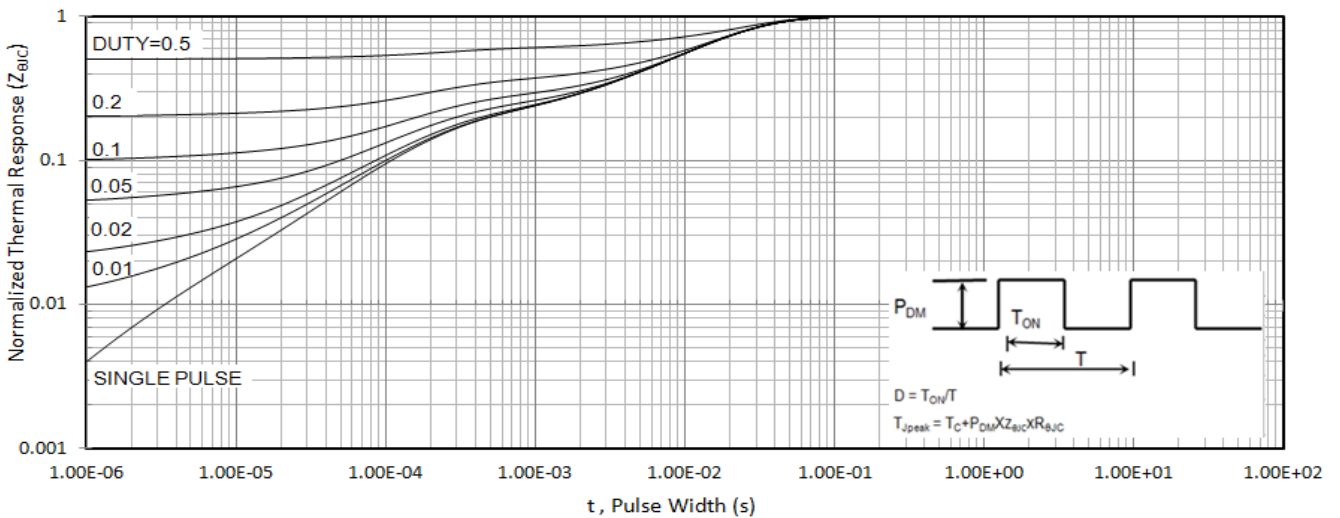
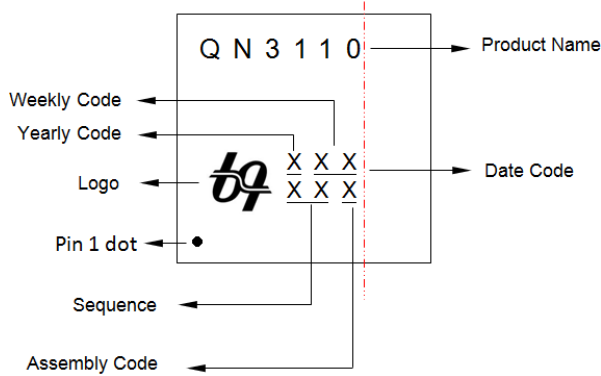
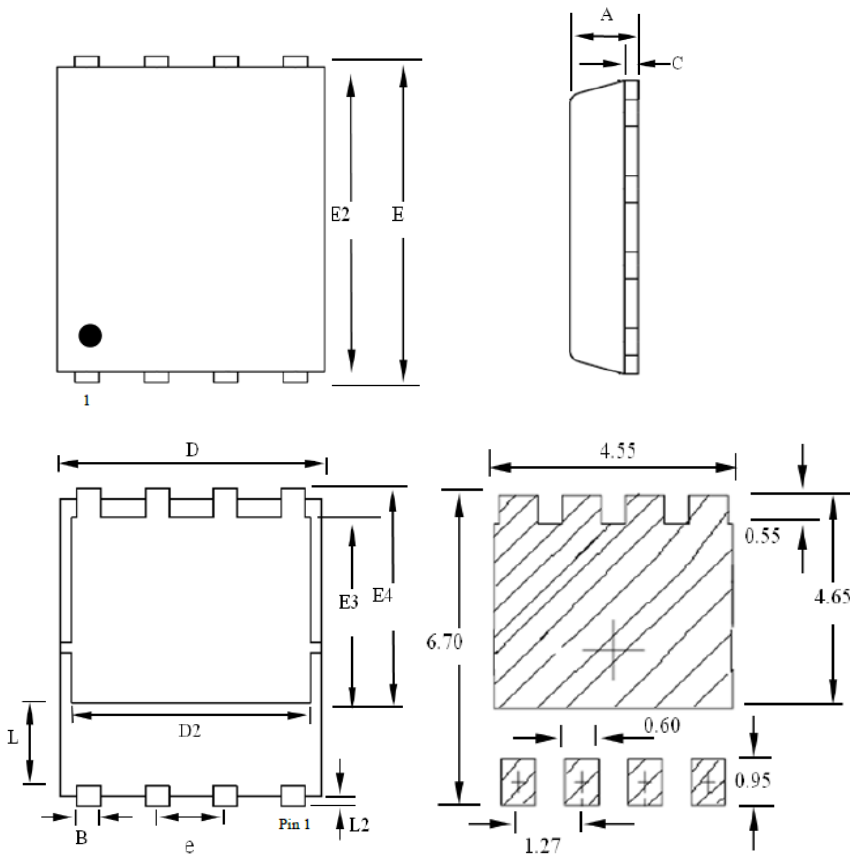


Fig.11 Transient Thermal Impedance

### Top Marking



### PRPAK5X6 Package Outline Drawing



SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	0.90	1.00	1.20
B	0.33	--	0.51
C	0.20	--	0.34
D	4.50	--	5.10
D2	3.60	--	4.22
E	5.90	--	6.13
E2	5.50	--	5.84
E3	3.18	--	4.30
E4	3.69	--	4.39
L	1.10	--	1.39
L2	0.02	--	0.33
e	--	1.27	--

LAND PATTERN RECOMMENDATION (Unit : mm)

**Note:**

1. ALL DIMENSIONS LISTED ON THE DRAWING MEETING JEDEC STANDARD.
2. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
3. RECOMMENDED LAND PATTERN DESIGN IS ONLY FOR REFERENCE

## IR Reflow Condition for MSL Qualification

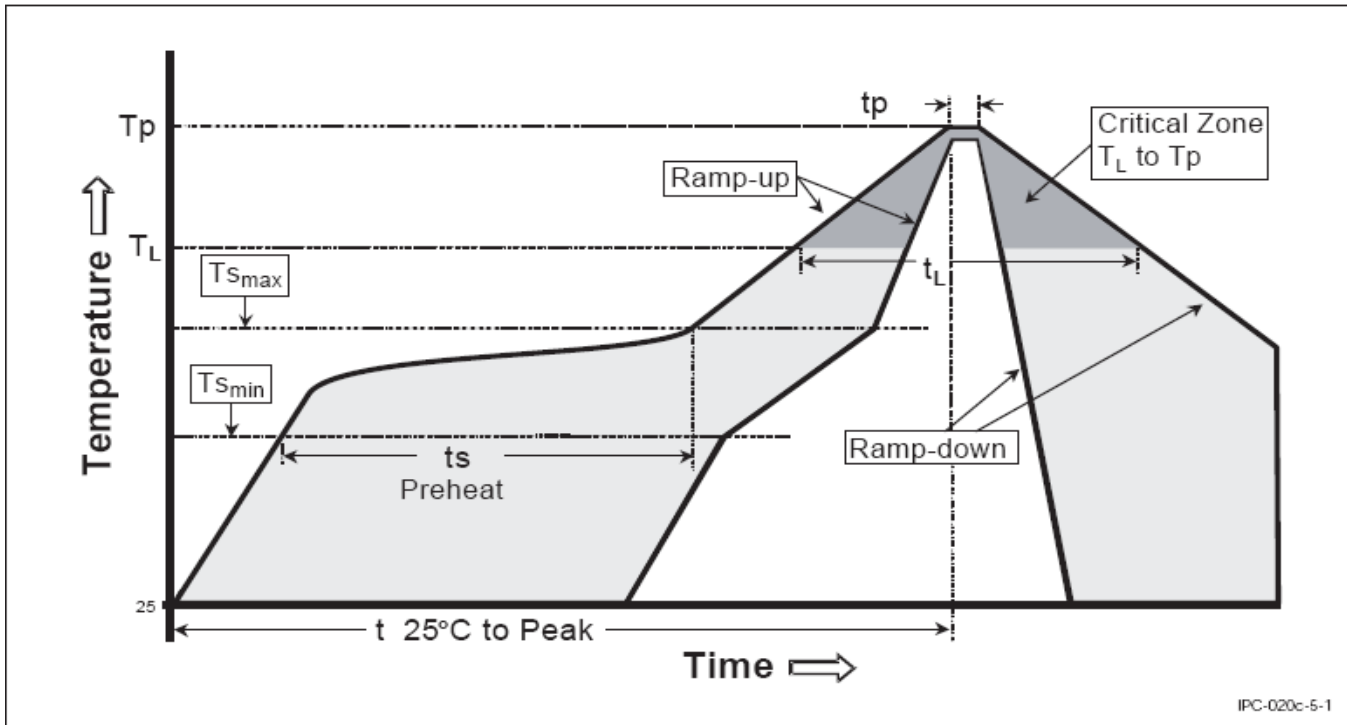


Table 1. Lead-Free Reflow Rprofile Recommendation(IPC/JEDEC J-STD-020C)	
Reflow Parameter	Lead-Free Assembly
Minimum preheat temperature( $T_{s \text{ MIN}}$ )	150° C
Maximum preheat temperature( $T_{s \text{ MAX}}$ )	200° C
Preheat Time	60-180 seconds
$T_{s \text{ MAX}}$ TO $T_L$ ramp-up rate	3° C/second maximum
Time above temperature $T_L$ ( $t_L$ )	217° C 60-150 seconds
Peak Temperature ( $T_p$ )	260° C
Time 25 C To $T_p$	8 minute maximum
Time within 5c of Peak $T_p$	20-40 seconds
Ramp-down rate	6° C/second maximum

\* Could meet three 3 cycles.

\* This product could qualify MSL level 3.