



# HIRF630 / HIRF630F

N-CHANNEL POWER MOSFET

## Description

This power MOSFET is designed for low voltage, high speed power switching applications such as switching regulators, converters, solenoid and relay drivers.

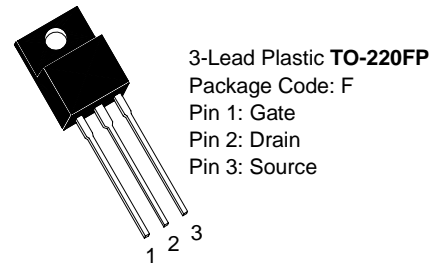
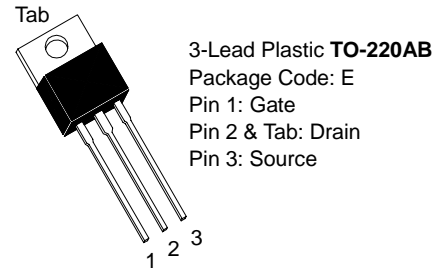
## Features

- Dynamic dv/dt Rating
- Repetitive Avalanche Rated
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements

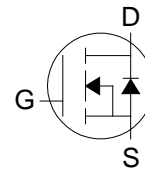
## Thermal Characteristics

Symbol	Parameter	Value		Units
$R\theta_{JC}$	Thermal Resistance Junction to Case Max.	TO-220AB	1.71	°C/W
		TO-220FP	3.3	
$R\theta_{JA}$	Thermal Resistance Junction to Ambient Max.	62		°C/W

### HIRF630 Series Pin Assignment



### HIRF630 Series Symbol



## Absolute Maximum Ratings

Symbol	Parameter	Value	Units
$V_{DSS}$	Drain-Source Voltage	200	V
$I_D$	Drain to Current (Continuous)	9	A
$I_{DM}$	Drain to Current (Pulsed) (*1)	36	A
$V_{GS}$	Gate-to-Source Voltage (Continue)	±30	V
$P_D$	Total Power Dissipation ( $T_c=25^\circ\text{C}$ )		
	TO-220AB	74	W
	TO-220FP	38	
	Derate above $25^\circ\text{C}$		
	TO-220AB	0.58	W/°C
	TO-220FP	0.3	
$E_{AS}$	Single Pulse Avalanche Energy (*2)	250	mJ
$I_{AR}$	Avalanche Current (*1)	9	A
$E_{AR}$	Repetitive Avalanche Energy (*1)	7.4	mJ
$d_v/d_t$	Peak Diode Recovery	5	V/ns
$T_j$	Operating Temperature Range	-55 to 150	°C
$T_{stg}$	Storage Temperature Range	-55 to 150	°C
$T_L$	Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	300	°C

\*1: Repetitive rating; pulse width limited by max. junction temperature

\*2:  $V_{DB}=50\text{V}$ , starting  $T_j=25^\circ\text{C}$ ,  $L=4.6\text{mH}$ ,  $R_G=25\Omega$ ,  $I_{AS}=9\text{A}$



### Electrical Characteristics (T<sub>j</sub>=25°C, unless otherwise specified)

Symbol	Characteristic	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage (V <sub>GS</sub> =0V, I <sub>D</sub> =250uA)	200	-	-	V
I <sub>DSS</sub>	Drain-Source Leakage Current (V <sub>DS</sub> =200V, V <sub>GS</sub> =0V)	-	-	1	uA
	Drain-Source Leakage Current (V <sub>DS</sub> =160V, V <sub>GS</sub> =0V, T <sub>j</sub> =125°C)			50	uA
I <sub>GSSF</sub>	Gate-Source Leakage Current-Forward (V <sub>gsf</sub> =30V, V <sub>DS</sub> =0V)	-	-	100	nA
I <sub>GSSR</sub>	Gate-Source Leakage Current-Reverse (V <sub>gsr</sub> =-30V, V <sub>DS</sub> =0V)	-	-	-100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage (V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA)	2	-	4	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance (V <sub>GS</sub> =10V, I <sub>D</sub> =5.4A)(*4)	-	-	0.4	Ω
g <sub>FS</sub>	Forward Transconductance (V <sub>DS</sub> =50V, I <sub>D</sub> =5.4A)(*4)	3.8	-	-	S
C <sub>iss</sub>	Input Capacitance	-	800	-	pF
C <sub>oss</sub>	Output Capacitance	-	240	-	
C <sub>rss</sub>	Reverse Transfer Capacitance	-	76	-	
t <sub>d(on)</sub>	Turn-on Delay Time	-	9.4	-	ns
t <sub>r</sub>	Rise Time	-	28	-	
t <sub>d(off)</sub>	Turn-off Delay Time	-	39	-	
t <sub>f</sub>	Fall Time	-	20	-	
Q <sub>g</sub>	Total Gate Charge	-	-	43	nC
Q <sub>gs</sub>	Gate-Source Charge	-	-	7	
Q <sub>gd</sub>	Gate-Drain Charge	-	-	23	
L <sub>D</sub>	Internal Drain Inductance (Measured from the drain lead 0.25" from package to center of die)	-	4.5	-	nH
L <sub>S</sub>	Internal Drain Inductance (Measured from the drain lead 0.25" from package to source bond pad)	-	7.5	-	nH

\*3: ISD≤9A, di/dt≤120A/us, VDD≤V(BR)DSS, T<sub>J</sub>≤150°C

\*4: Pulse Test: Pulse Width≤300us, Duty Cycle≤2%

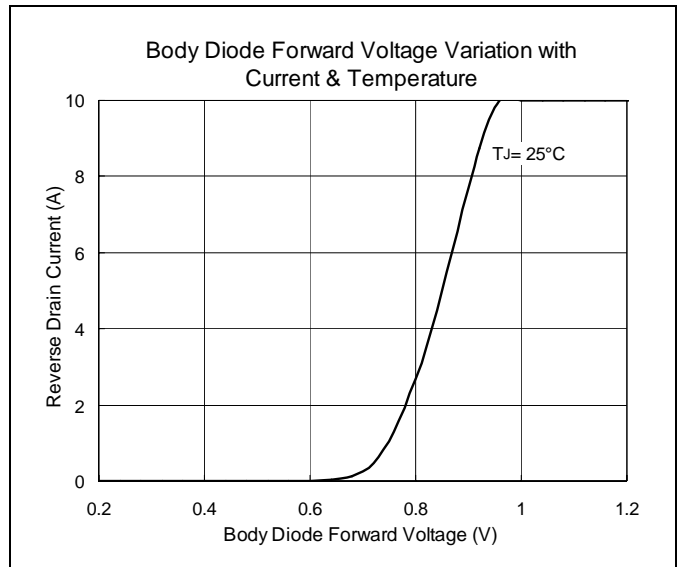
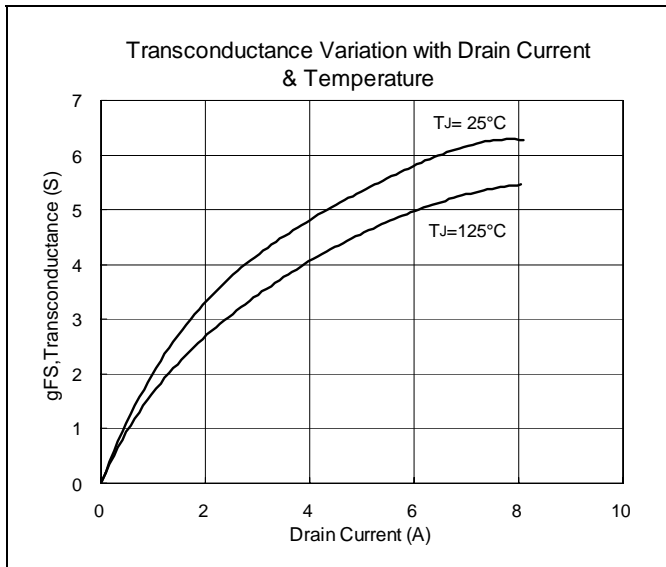
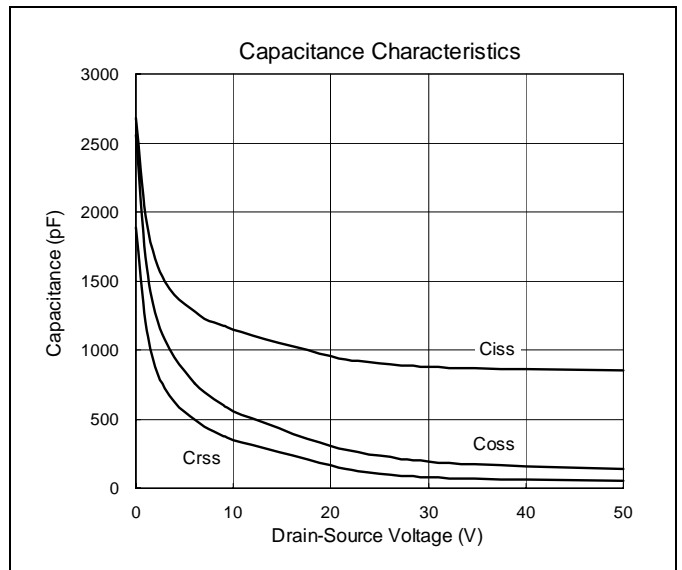
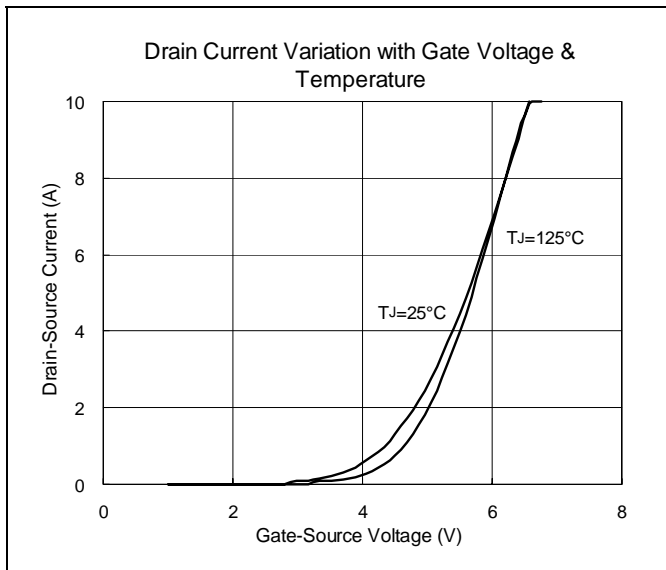
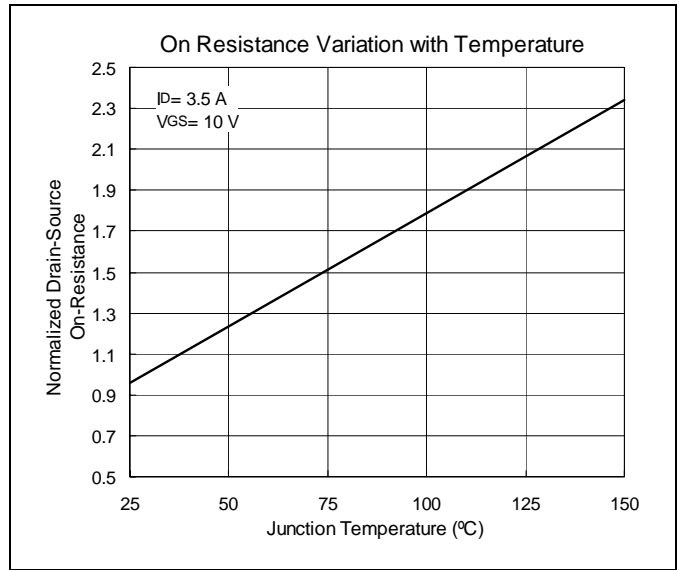
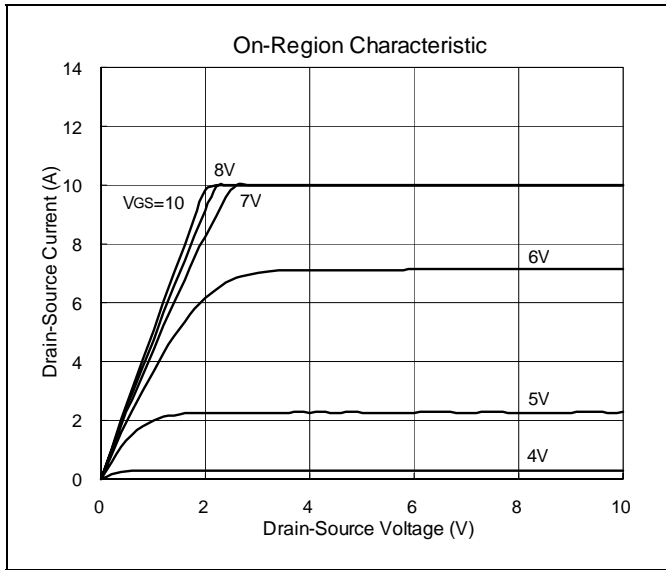
### Source-Drain Diode

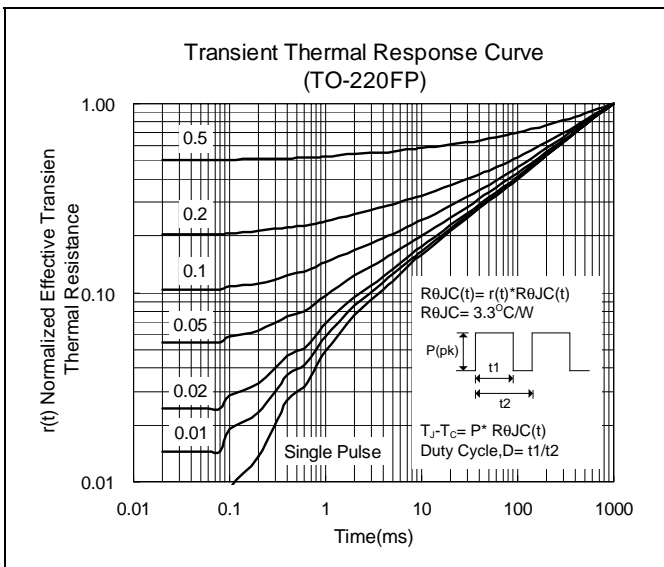
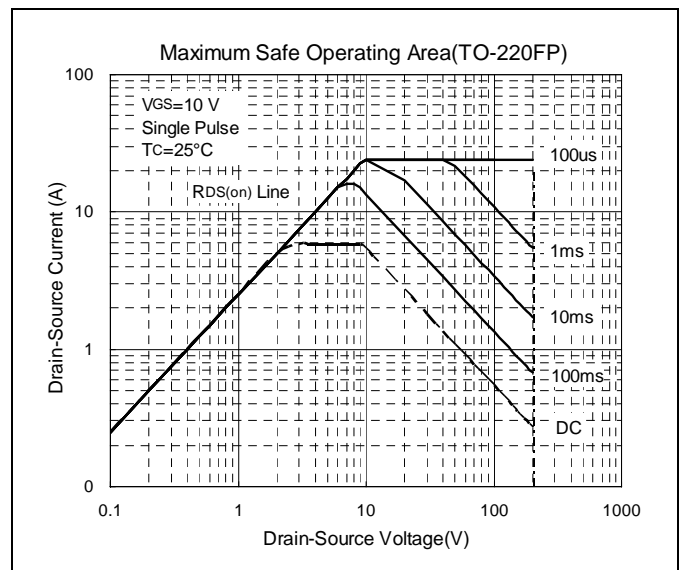
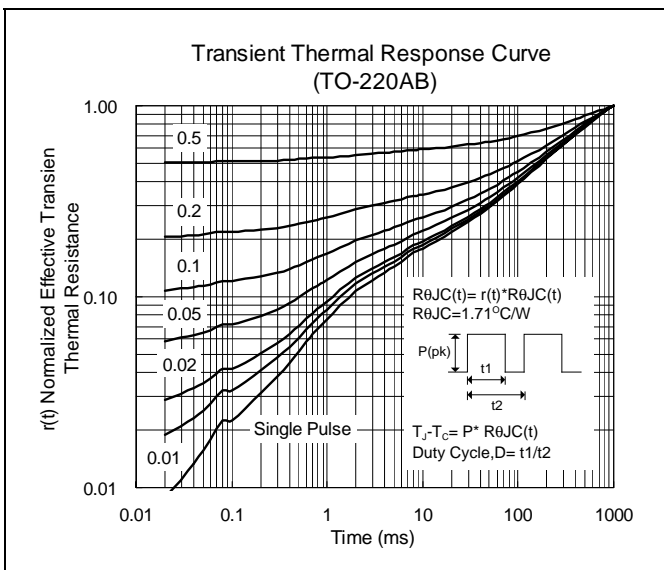
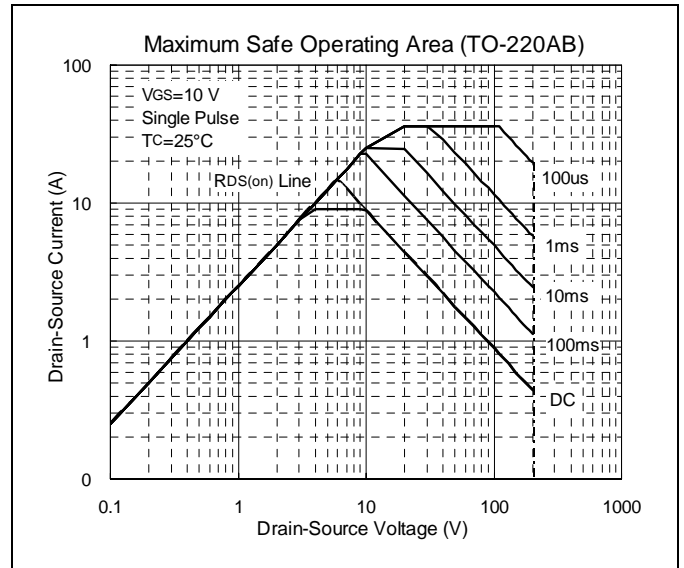
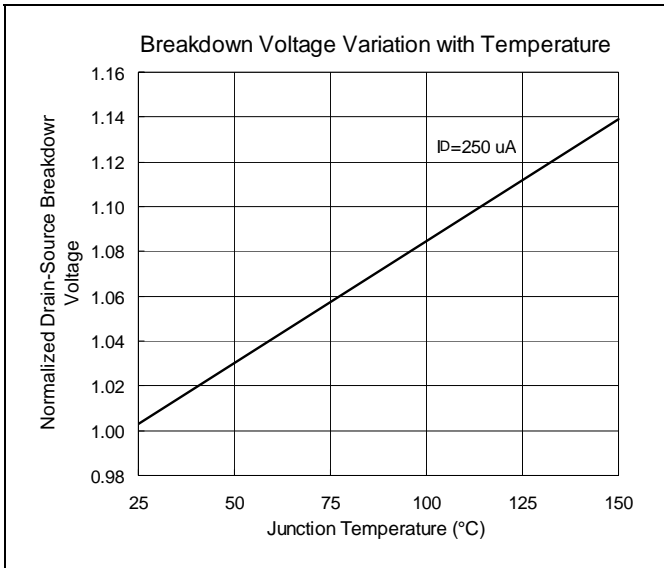
Symbol	Characteristic	Min.	Typ.	Max.	Units
Q <sub>rr</sub>	Reverse Recovery Charge	-	1.1	2.2	uC
t <sub>on</sub>	Forward Turn-On Time	-	**	-	
t <sub>rr</sub>	Reverse Recovery Time	-	170	340	ns
V <sub>SD</sub>	Diode Forward Voltage	-	-	2	V

\*\* : Negligible, Dominated by circuit inductance



### Characteristics Curve







### TO-220AB Dimension

3-Lead TO-220AB  
 Plastic Package  
 HSMC Package Code: E

**Marking:**

Pb Free Mark  
 Pb-Free: "●" (Note)  
 Normal: None

Date Code      Control Code

Note: Green label is used for pb-free packing

Pin Style: 1.Gate 2 & Tab.Drain 3.Source

Material:

- Lead solder plating: Sn60/Pb40 (Normal), Sn/3.0Ag/0.5Cu or Pure-Tin (Pb-free)
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0

DIM	Min.	Max.
A	5.58	7.49
B	8.38	8.90
C	4.40	4.70
D	1.15	1.39
E	0.35	0.60
F	2.03	2.92
G	9.66	10.28
H	-	*16.25
I	-	*3.83
J	3.00	4.00
K	0.75	0.95
L	2.54	3.42
M	1.14	1.40
N	-	*2.54
O	12.70	14.27
P	14.48	15.87

\*: Typical, Unit: mm

### TO-220FP Dimension

3-Lead TO-220FP  
 Plastic Package  
 HSMC Package Code: F

**Marking:**

Pb Free Mark  
 Pb-Free: "●" (Note)  
 Normal: None

Date Code      Control Code

Note: Green label is used for pb-free packing

Pin Style: 1.Gate 2.Drain 3.Source

Material:

- Lead solder plating: Sn60/Pb40 (Normal), Sn/3.0Ag/0.5Cu or Pure-Tin (Pb-free)
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0

DIM	Min.	Max.
A	6.48	7.40
C	4.40	4.90
D	2.34	3.00
E	0.45	0.80
F	9.80	10.36
G	3.10	3.60
I	2.70	3.43
J	0.60	1.00
K	2.34	2.74
L	12.48	13.60
M	15.67	16.20
N	0.90	1.47
O	2.00	2.96
$\alpha 1/2/4/5$	-	*5°
$\alpha 3$	-	*27°

\*: Typical, Unit: mm

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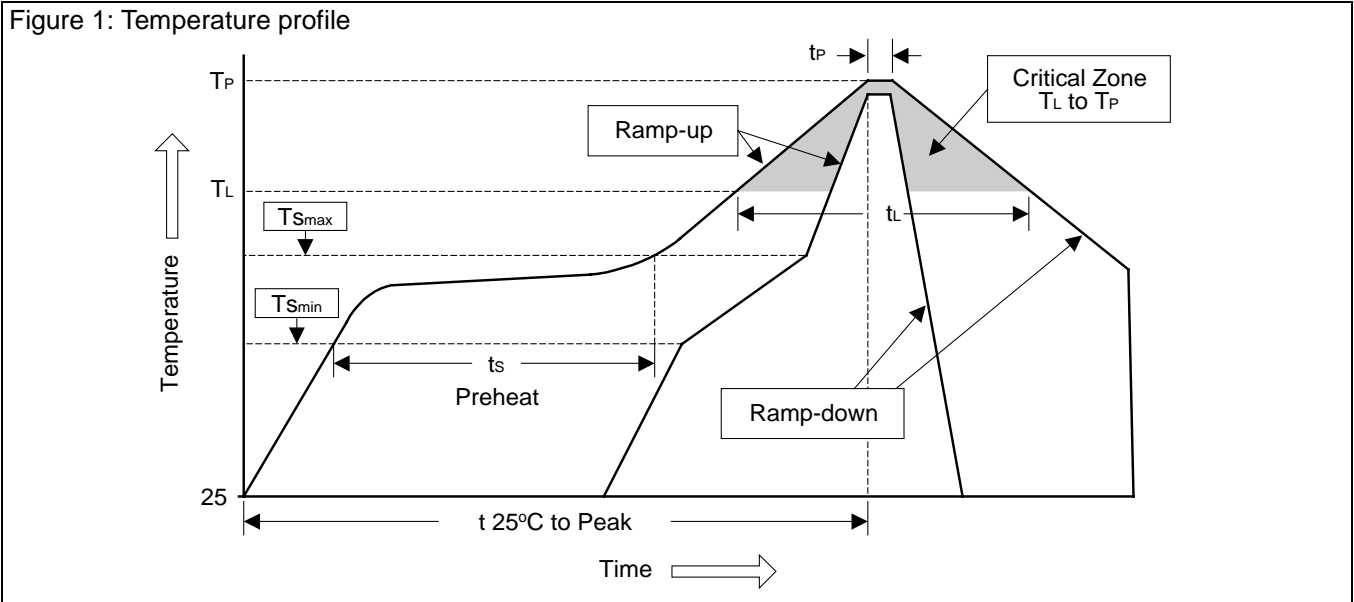
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## Soldering Methods for HSMC's Products

1. Storage environment: Temperature=10°C~35°C Humidity=65%±15%
2. Reflow soldering of surface-mount devices



Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate ( $T_L$ to $T_P$ )	$<3^\circ\text{C}/\text{sec}$	$<3^\circ\text{C}/\text{sec}$
Preheat		
- Temperature Min ( $T_{Smin}$ )	100°C	150°C
- Temperature Max ( $T_{Smax}$ )	150°C	200°C
- Time (min to max) ( $t_s$ )	60~120 sec	60~180 sec
$T_{Smax}$ to $T_L$		
- Ramp-up Rate	$<3^\circ\text{C}/\text{sec}$	$<3^\circ\text{C}/\text{sec}$
Time maintained above:		
- Temperature ( $T_L$ )	183°C	217°C
- Time ( $t_L$ )	60~150 sec	60~150 sec
Peak Temperature ( $T_P$ )	240°C +0/-5°C	260°C +0/-5°C
Time within 5°C of actual Peak Temperature ( $t_p$ )	10~30 sec	20~40 sec
Ramp-down Rate	$<6^\circ\text{C}/\text{sec}$	$<6^\circ\text{C}/\text{sec}$
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