



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.

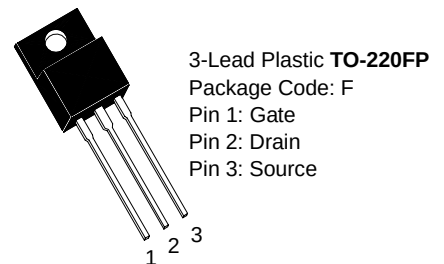
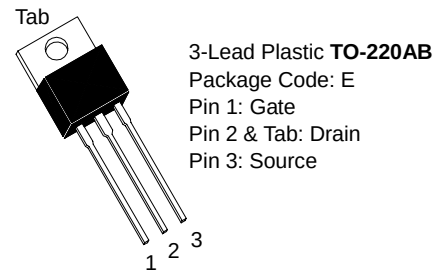
Features

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

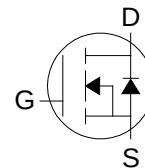
Thermal Characteristics

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

HIRF630 Series Pin Assignment



HIRF630 Series Symbol



Absolute Maximum Ratings

Symbol	Parameter	Value	Units
V_{DS}	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°C		
	TO-220AB	0.58	W/ $^{\circ}\text{C}$
	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	$^{\circ}\text{C}$
T_{stg}	Storage Temperature Range	-55 to 150	$^{\circ}\text{C}$
T_L	Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	300	$^{\circ}\text{C}$

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

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



Electrical Characteristics (T_j=25°C, unless otherwise specified)

Symbol	Characteristic	Min.	Typ.	Max.	Unit
V _{(BR)DSS}	Drain-Source Breakdown Voltage (V _{GS} =0V, I _D =250uA)	200	-	-	V
I _{DSS}	Drain-Source Leakage Current (V _{DS} =200V, V _{GS} =0V)	-	-	1	uA
	Drain-Source Leakage Current (V _{DS} =160V, V _{GS} =0V, T _j =125°C)			50	uA
I _{GSSF}	Gate-Source Leakage Current-Forward (V _{gsf} =30V, V _{DS} =0V)	-	-	100	nA
I _{GSSR}	Gate-Source Leakage Current-Reverse (V _{gsr} =-30V, V _{DS} =0V)	-	-	-100	nA
V _{GS(th)}	Gate Threshold Voltage (V _{DS} =V _{GS} , I _D =250uA)	2	-	4	V
R _{DS(on)}	Static Drain-Source On-Resistance (V _{GS} =10V, I _D =5.4A)(*4)	-	-	0.4	Ω
g _{FS}	Forward Transconductance (V _{DS} =50V, I _D =5.4A)(*4)	3.8	-	-	S
C _{iss}	Input Capacitance	-	800	-	pF
C _{oss}	Output Capacitance	-	240	-	
C _{rss}	Reverse Transfer Capacitance	-	76	-	
t _{d(on)}	Turn-on Delay Time	-	9.4	-	ns
t _r	Rise Time	-	28	-	
t _{d(off)}	Turn-off Delay Time	-	39	-	
t _f	Fall Time	-	20	-	
Q _g	Total Gate Charge	-	-	43	nC
Q _{gs}	Gate-Source Charge	-	-	7	
Q _{gd}	Gate-Drain Charge	-	-	23	
L _D	Internal Drain Inductance (Measured from the drain lead 0.25" from package to center of die)	-	4.5	-	nH
L _S	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_j≤150°C

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

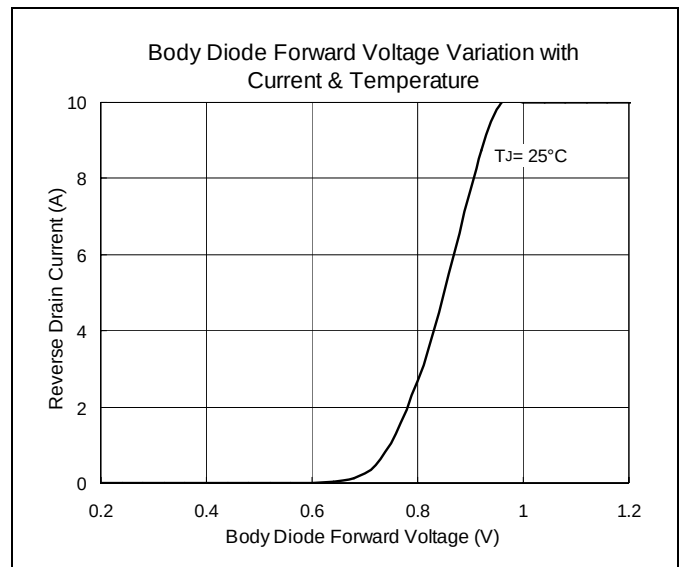
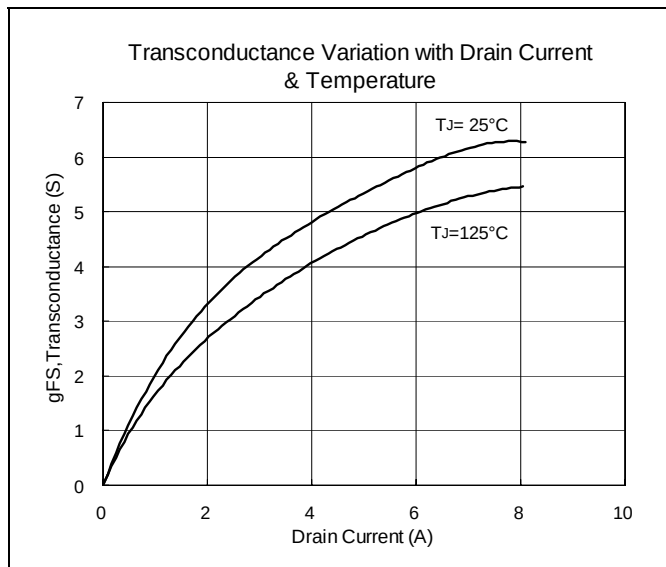
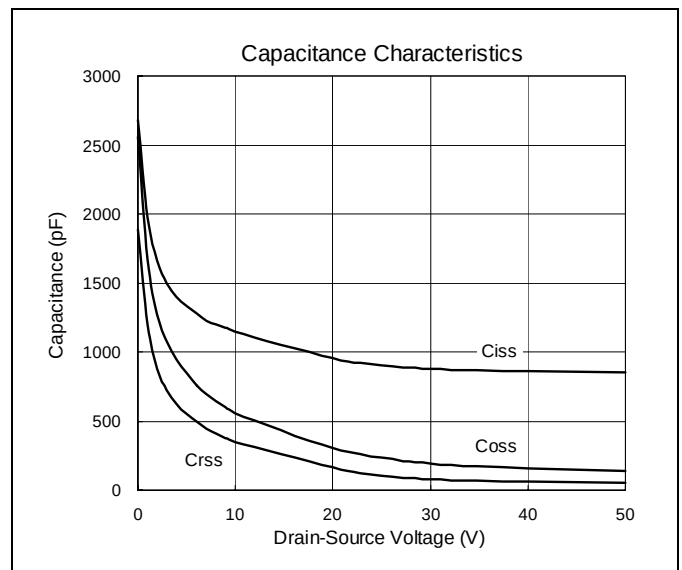
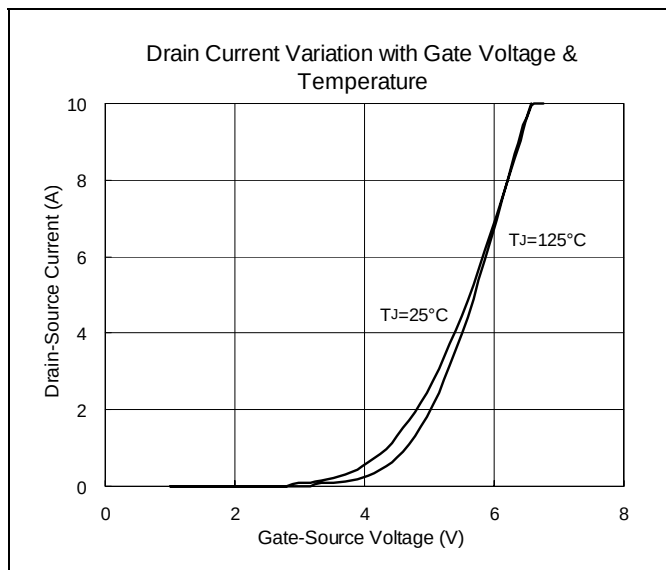
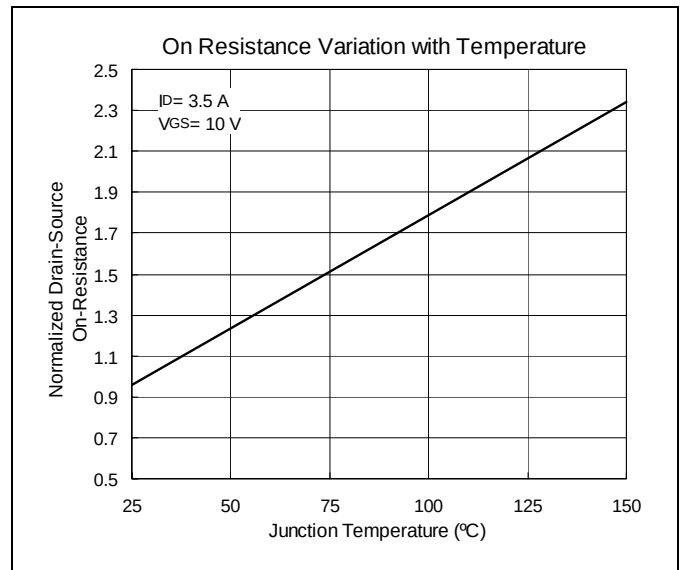
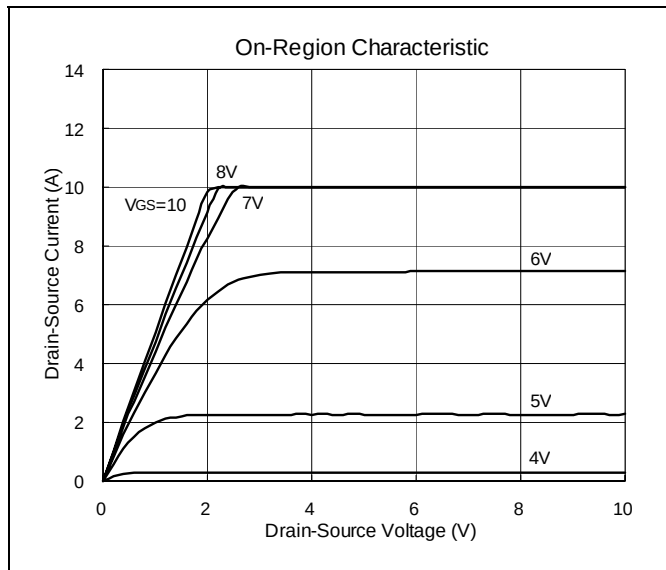
Source-Drain Diode

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

** : Negligible, Dominated by circuit inductance

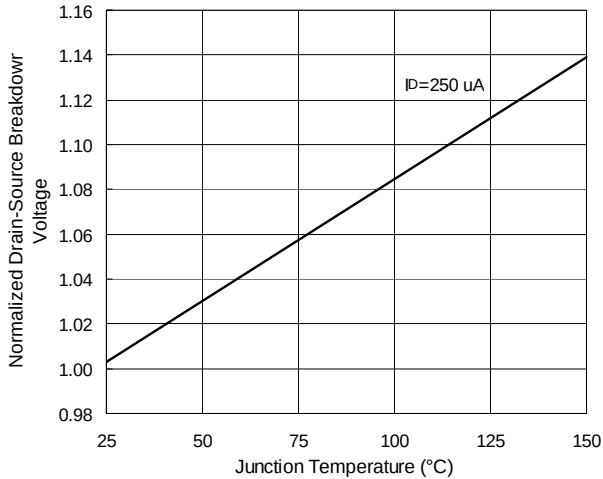


Characteristics Curve

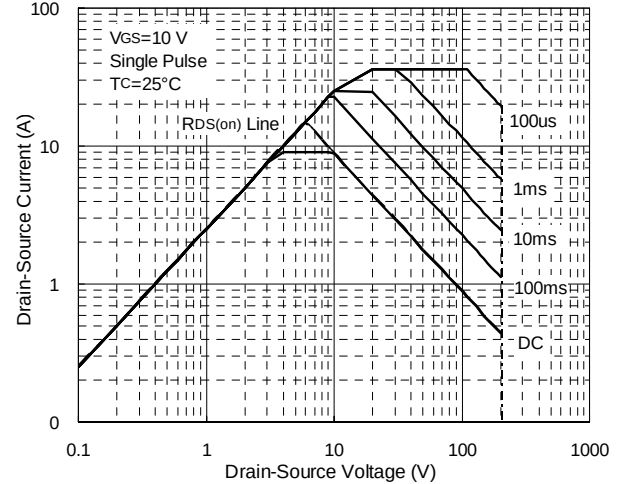




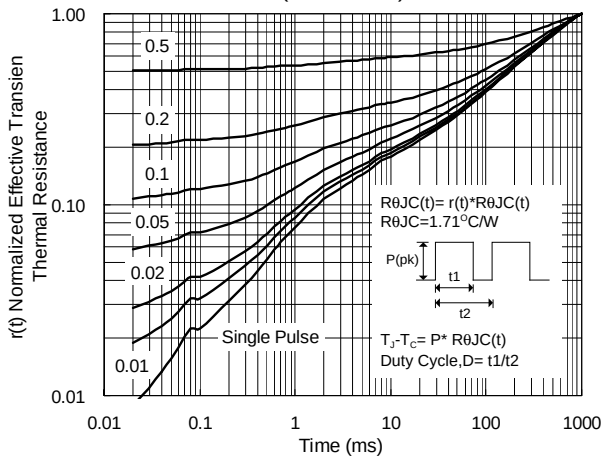
Breakdown Voltage Variation with Temperature



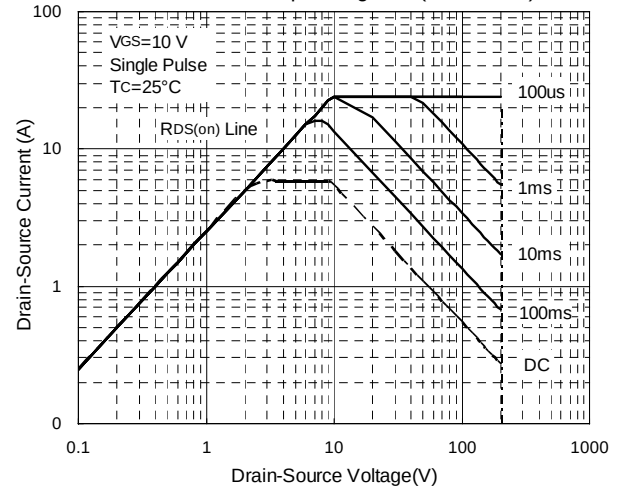
Maximum Safe Operating Area (TO-220AB)



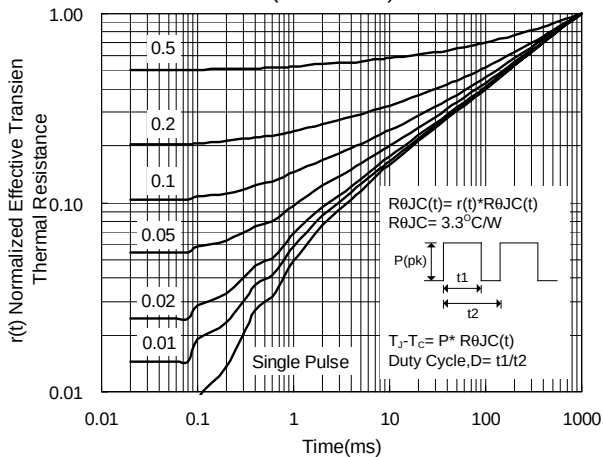
Transient Thermal Response Curve (TO-220AB)



Maximum Safe Operating Area (TO-220FP)

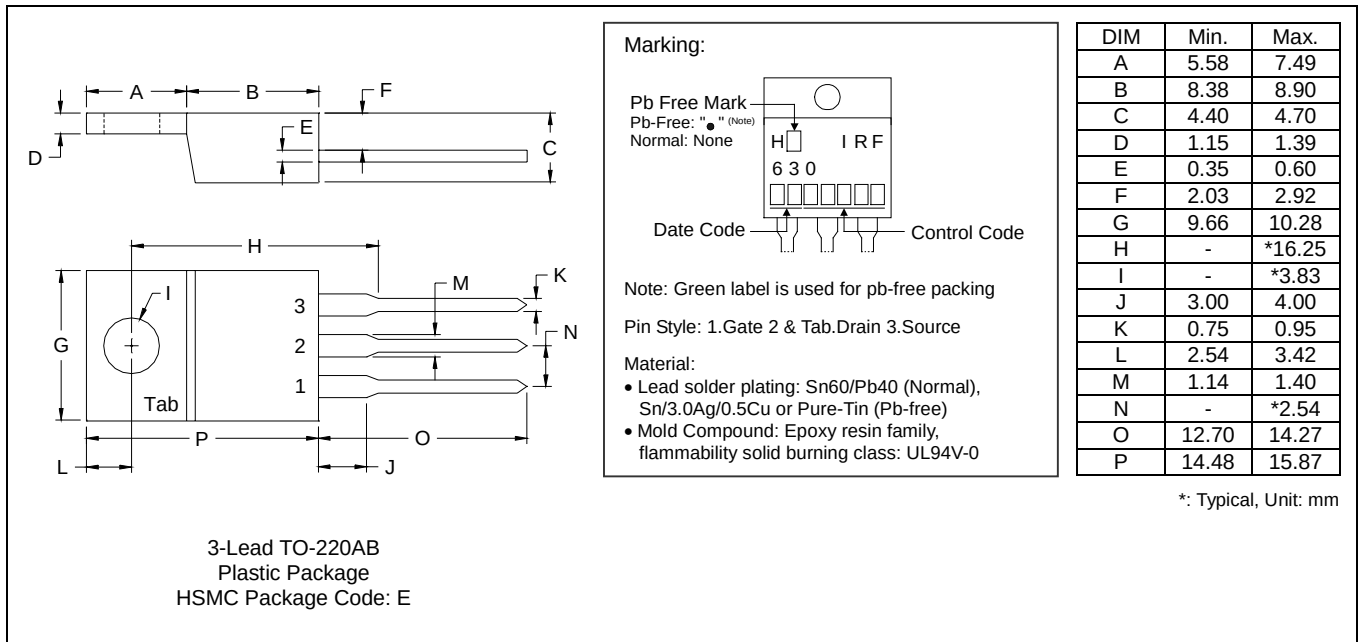


Transient Thermal Response Curve (TO-220FP)

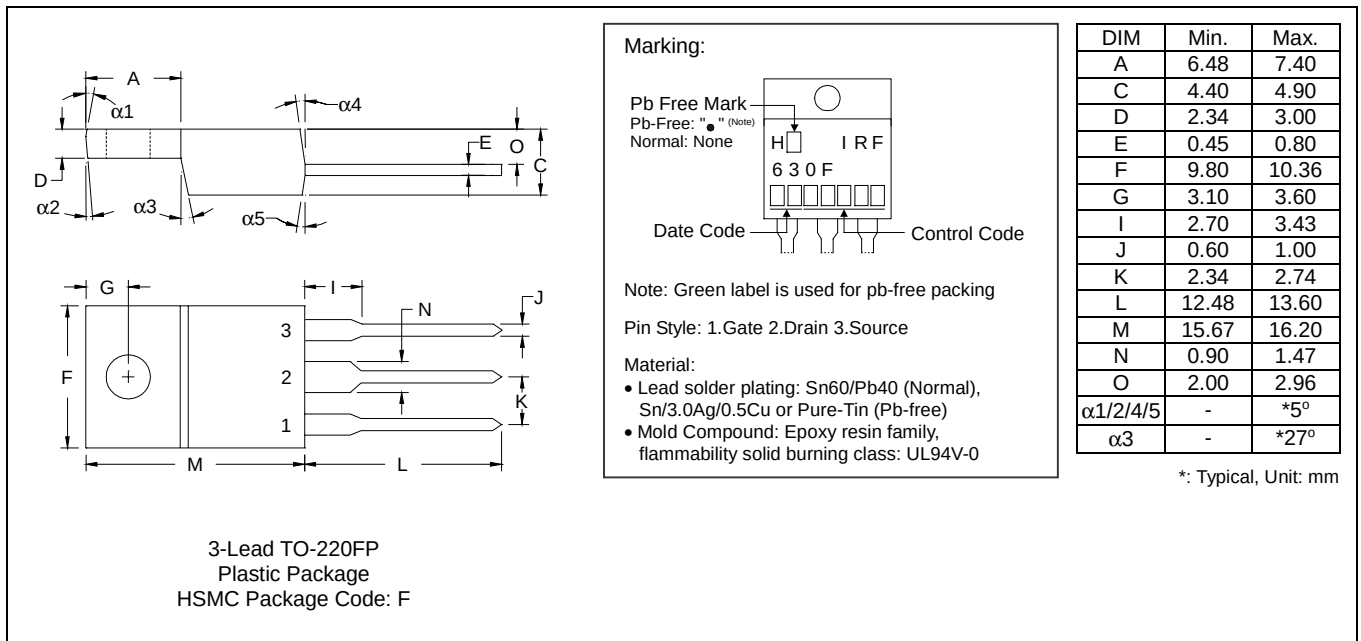




TO-220AB Dimension



TO-220FP Dimension



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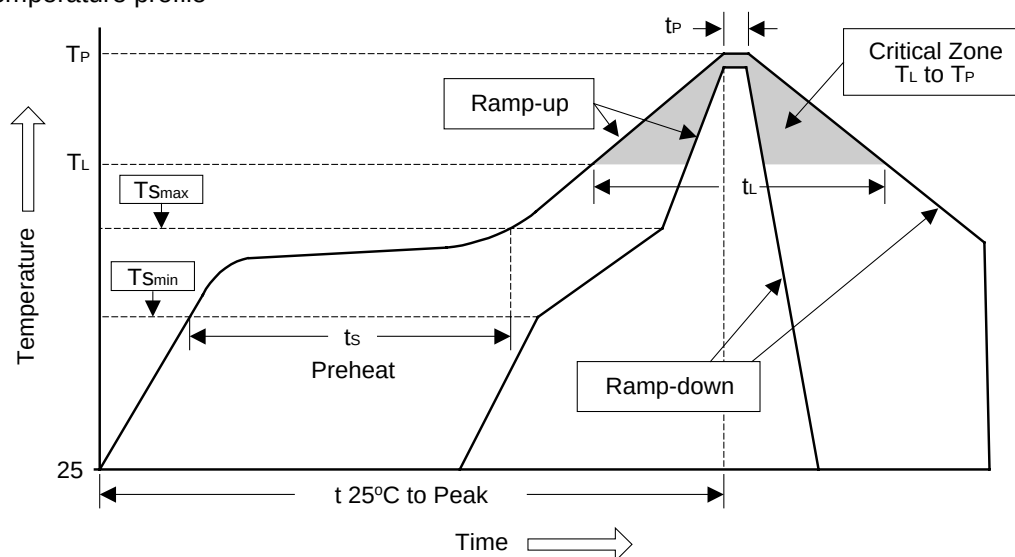


Soldering Methods for HSMC's Products

1. Storage environment: Temperature=10°C~35°C Humidity=65%±15%

2. Reflow soldering of surface-mount devices

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)	60~120 sec	60~180 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)	60~150 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°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