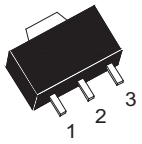
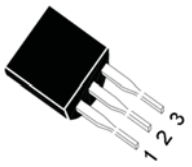
3-TERMINAL POSITIVE VOLTAGE REGULATORS

Description

These regulators employ internal current-limiting and thermal-shutdown, making them essentially ndestructible. They can deliver up to 100mA output current.

Features

- Maximum Output Current of 100mA (Tc=25℃)
- Internal Short-Circuit Current Limiting
- Internal Thermal Overload Protection
- TO-92 & SOT-89 Package

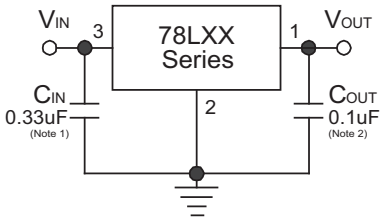
Package	Marking & Pin	Packing
	3-Lead Plastic SOT-89 Pin 1: V_{OUT} Pin 2: GND Pin 3: V_{IN}	Tape & Reel 1K/Reel 10K/Box
	3-Lead Plastic TO-92 Pin 1: V_{OUT} Pin 2: GND Pin 3: V_{IN}	Plastic Bags 1K/Bags 10K/Box 100K/Carton

Absolute Maximum Ratings

(Ta=25℃, Unles Otherwise Specified)

Characteristic	Symbol	Rating		Unit
Input Voltage	V_{IN}	40		V
Power Dissipation	P_D	TO-92	700	mW
		SOT-89	500	
Operating Temperature	Topr	-30 to +85		℃
Storage Temperature	Tstg	-55 to +150		
Junction Temperature	Tj	150		
Thermal Resistance	Rth(j-a)	208		℃/W

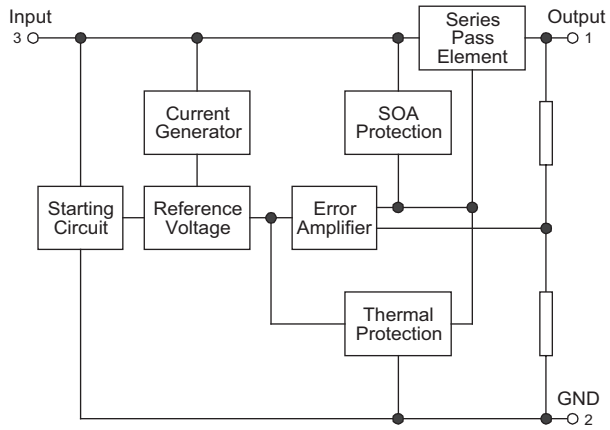
Typical Application



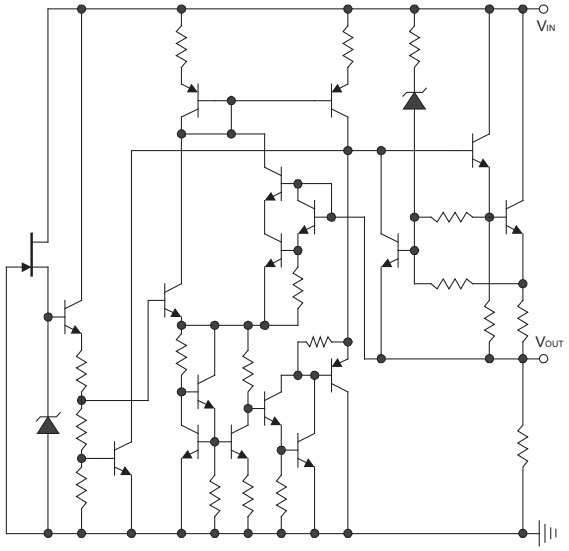
Note 1: CIN is required if regulator is located an appreciable distance from power supply filter.
Note 2: COUT is not needed for stability; however, it does improve transient response. Values of less than 0.1uF could cause instability.

■ Schematic Diagram & Equivalent Circuit

Schematic Diagram



Equivalent Circuit



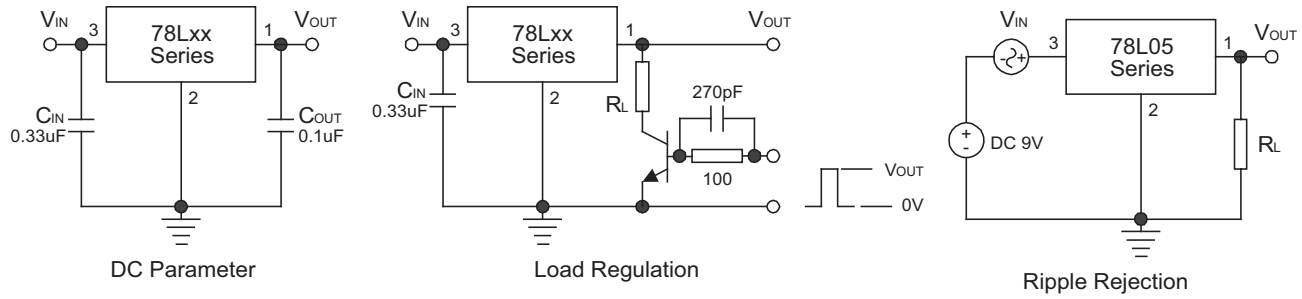
■ 78L05XX Electrical Characteristics

V_{IN}=10V, I_{OUT}=40mA, C_{IN}=0.33uF, C_{OUT}=0.1uF, 0℃≤Tj≤125℃(unless otherwise specified)

Symbol	Parameter	Conditions	78L05AM / AA			Units
			Min	Typ	Max	
V_O	Output Voltage	Tj=25℃	4.85	5	5.15	V
		1mA≤I_{OUT}≤70mA	4.85	5	5.15	
		7V≤V_{IN}≤20V, 1mA≤I_{OUT}≤40mA	4.85	5	5.15	
$Regl_{ine}$	Line Regulation	Tj=25℃, 7V≤V_{IN}≤20V	--	15	150	mV
		Tj=25℃, 8V≤V_{IN}≤20V	--	15	100	
Reg_{load}	Load Regulation	Tj=25℃, 1mA≤I_{OUT}≤100mA	--	11	60	
		Tj=25℃, 1mA≤I_{OUT}≤40mA	--	5	30	
I_B	Quiescent Current	I_{OUT}=5mA, Tj=25℃	--	3.9	6	mA
ΔI_B	Quiescent Current Change	8V≤V_{IN}≤20V, Tj=25℃	--	--	1.5	
		1mA≤I_{OUT}≤40mA, Tj=25℃	--	--	0.1	
V_N	Output Noise Voltage	10Hz≤f≤100KHz, Tj=25℃	--	40	--	uVrms
RR	Ripple Rejection	8V≤V_{IN}≤18V, f=120Hz, Tj=25℃	41	49	--	dB
V_D	Dropout Voltage	Tj=25℃, I_{OUT}=100mA	--	1.7	2.5	V
R_O	Output Resistance	f=1KHz	--	17	--	mΩ
I_{SC}	Short Circuit Current	V_{IN}=10V, Tj=25℃	--	1.5	2	A
T_{CVO}	Average Temperature Coefficient of Output Voltage	I_{OUT}=5mA	--	--	0.6	mV/℃

Symbol	Parameter	Conditions	78L05BM / BA			Units
			Min	Typ	Max	
V_O	Output Voltage	Tj=25℃	4.75	5	5.25	V
		1mA≤I_{OUT}≤70mA	4.75	5	5.25	
		7V≤V_{IN}≤20V, 1mA≤I_{OUT}≤40mA	4.75	5	5.25	
$Regl_{ine}$	Line Regulation	Tj=25℃, 7V≤V_{IN}≤20V	--	15	150	mV
		Tj=25℃, 8V≤V_{IN}≤20V	--	15	100	
Reg_{load}	Load Regulation	Tj=25℃, 1mA≤I_{OUT}≤100mA	--	11	60	
		Tj=25℃, 1mA≤I_{OUT}≤40mA	--	5	30	
I_B	Quiescent Current	I_{OUT}=5mA, Tj=25℃	--	3.9	6	mA
ΔI_B	Quiescent Current Change	8V≤V_{IN}≤20V, Tj=25℃	--	--	1.5	
		1mA≤I_{OUT}≤40mA, Tj=25℃	--	--	0.1	
V_N	Output Noise Voltage	10Hz≤f≤100KHz, Tj=25℃	--	40	--	uVrms
RR	Ripple Rejection	8V≤V_{IN}≤18V, f=120Hz, Tj=25℃	41	49	--	dB
V_D	Dropout Voltage	Tj=25℃, I_{OUT}=100mA	--	1.7	2.5	V
R_O	Output Resistance	f=1KHz	--	17	--	mΩ
I_{SC}	Short Circuit Current	V_{IN}=10V, Tj=25℃	--	1.5	2	A
T_{CVO}	Average Temperature Coefficient of Output Voltage	I_{OUT}=5mA	--	--	0.6	mV/℃

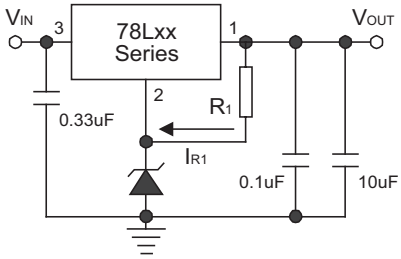
■ Test Circuits



■ Application Circuits

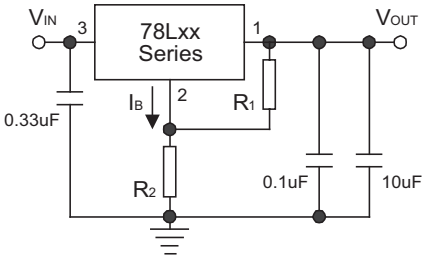
Typical Application 典型应用电路图

Constant Current Regulator



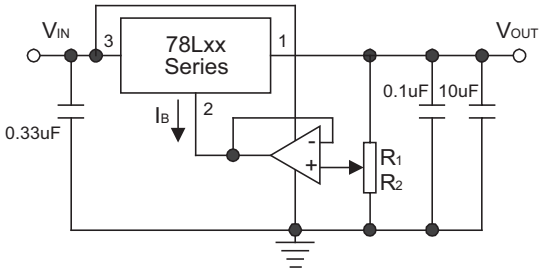
$V_{OUT}=V_{OUT(IC)}+VZ \quad I_1=V_{OUT(IC)}/R1$

Circuit for Increasing Output Voltage



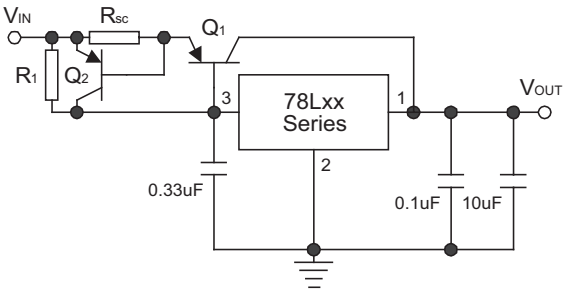
$V_{OUT}=V_{OUT(IC)}(1+R_2/R_1)+R_2*I_B$

Adjustable Output Regulator



$V_{OUT}=V_{OUT(IC)}(1+R_2/R_1)$

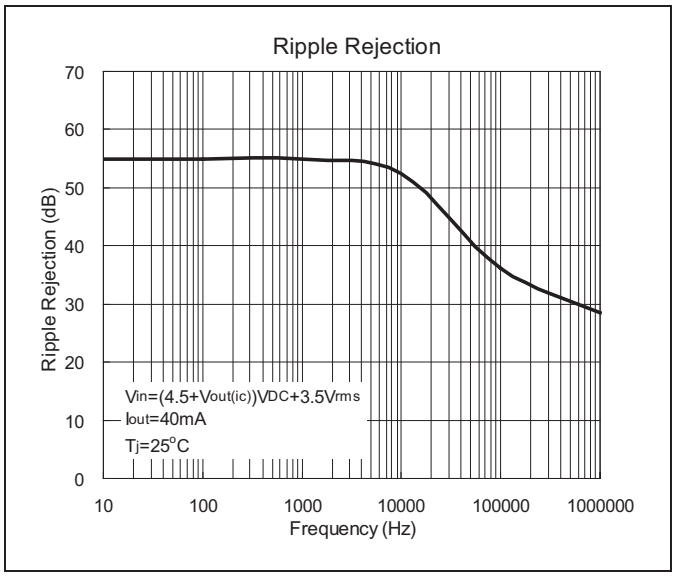
High Output Current with Short-circuit Protection

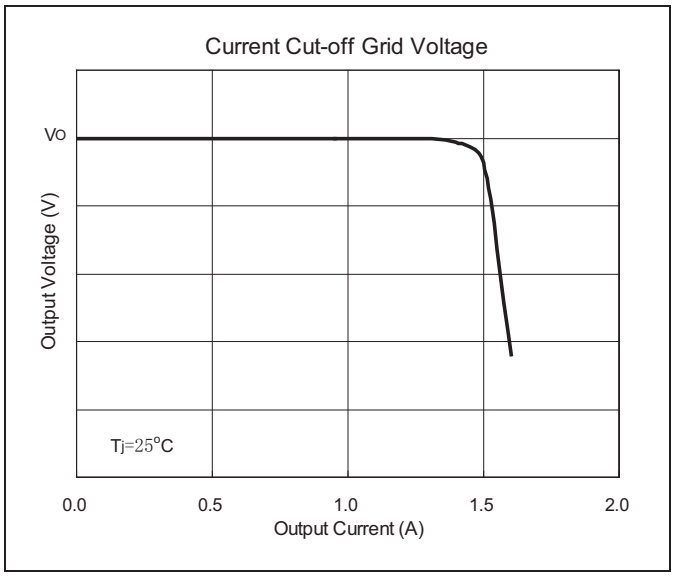


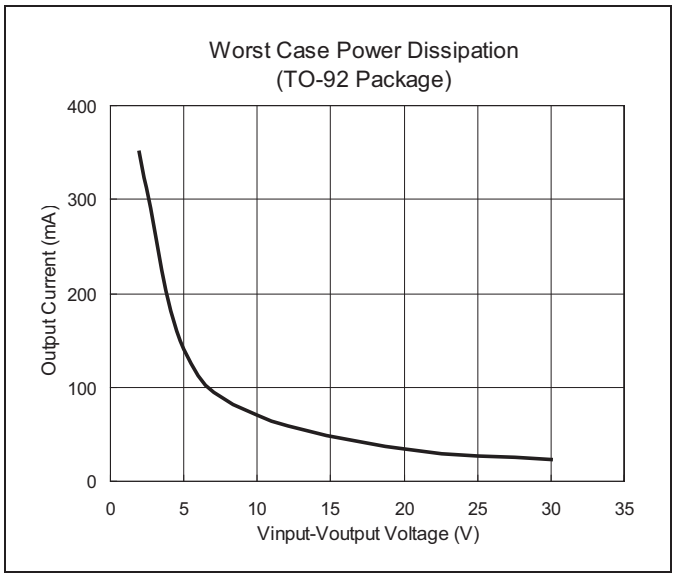
$R_1 \leqslant V_{BE1}/I_{B(max)}$

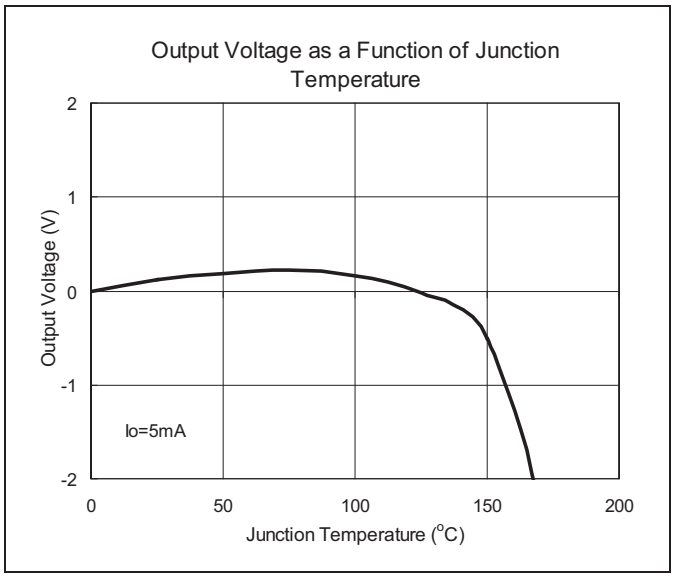
$R_{SC}=V_{BE2}/I_{SC}$, I_{SC}: Short-Circuit Current

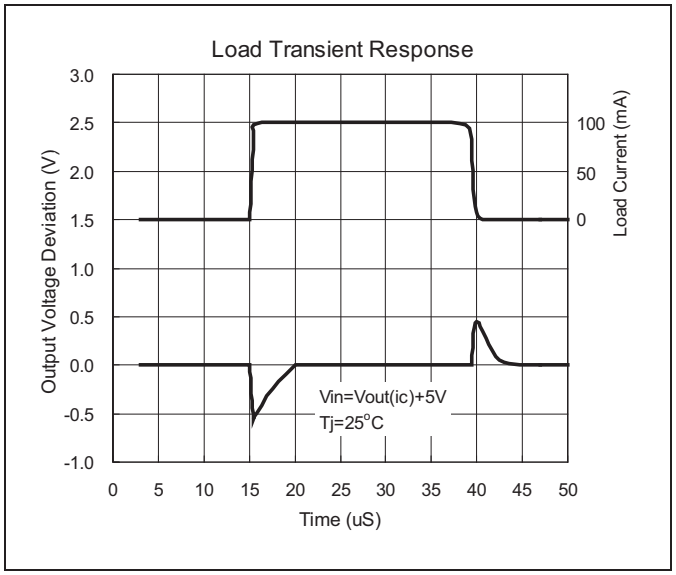
■ Characteristics Curve

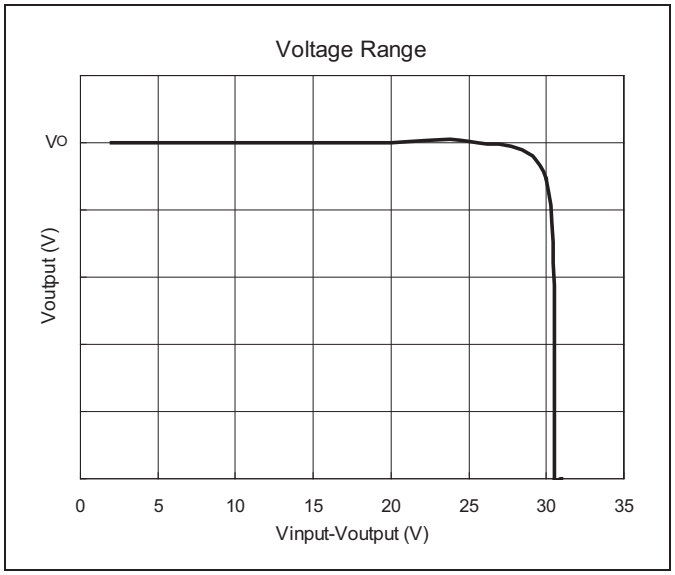






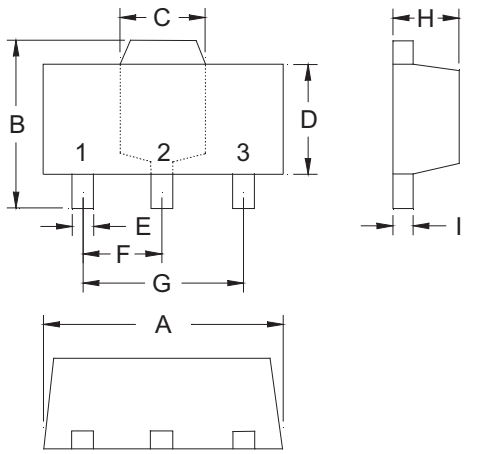






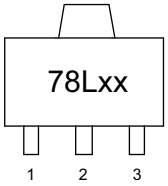
产品封装尺寸数据，单位：毫米

SOT-89 Dimension



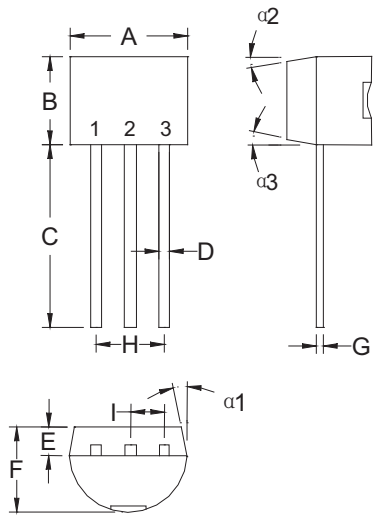
Package: SOT-89

Unit: mm		
DIM	Min.	Max.
A	4.40	4.60
B	4.05	4.25
C	1.50	1.70
D	2.40	2.80
E	0.36	0.51
F	1.50	--
G	3.00	--
H	1.40	1.60
I	0.35	0.41



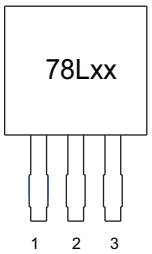
Note: Green label is used for pb-free packing
Pin Style: 1.Output，2.Ground，3.Input
Material:
• Lead solder plating: Sn60/Pb40 (Normal), Sn/3.0Ag/0.5Cu or Pure-Tin (Pb-free)
• Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0

TO-92 Dimension



Package: TO-92

Unit: mm		
DIM	Min.	Max.
A	4.33	4.83
B	4.33	4.83
C	12.7	--
D	0.36	0.56
E	--	1.27
F	3.36	3.76
G	0.36	0.56
H	--	2.54
I	--	1.27
α1	--	*5°
α2	--	*2°
α3		*2°

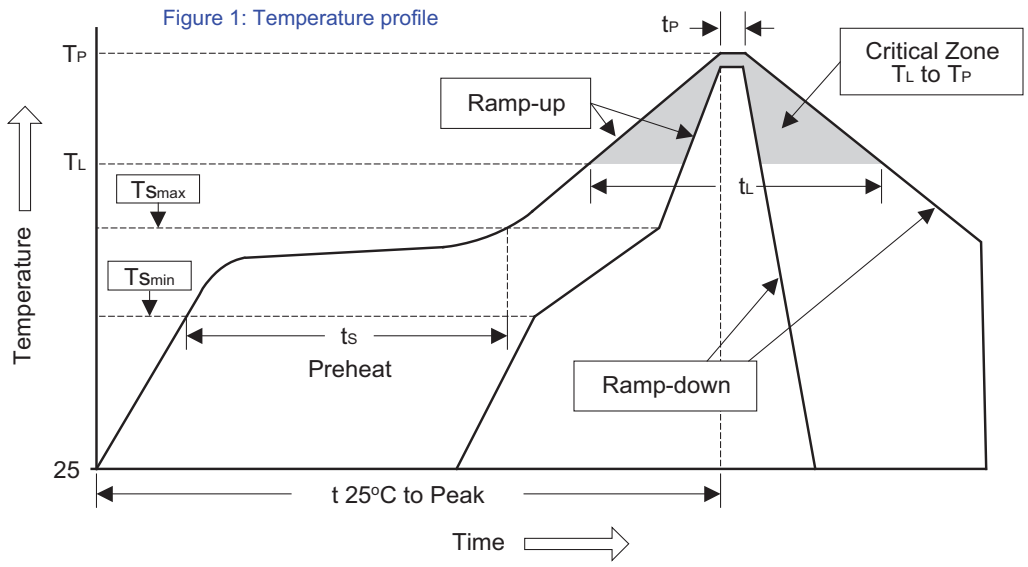


Note: Green label is used for pb-free packing
Pin Style: 1.Output, 2.Ground, 3.Input
Material:
• Lead solder plating: Sn60/Pb40 (Normal), Sn/3.0Ag/0.5Cu or Pure-Tin (Pb-free)
• Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0

■Soldering Methods for HAOHAI Products 浩海产品的焊接方法

1. Storage environment: Temperature=10℃~35℃ 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℃/sec	<3℃/sec
Preheat - Temperature Min (T_{smin}) - Temperature Max (T_{smax}) - Time (min to max) (ts)	 100℃ 150℃ 60~120 sec	 150℃ 200℃ 60~180 sec
Tsmax to T_L - Ramp-up Rate	<3℃/sec	<3℃/sec
Time maintained above: - Temperature (T_L) - Time (T_L)	 183℃ 60~150 sec	 217℃ 60~150 sec
Peak Temperature (T_P)	240℃ +0/-5℃	260℃ +0/-5℃
Time within 5oC of actual Peak Temperature (T_P)	10~30 sec	20~40 sec
Ramp-down Rate	<6℃/sec	<6℃/sec
Time 25oC to Peak Temperature	<6 minutes	<8 minutes

3. Flow (wave) soldering (solder dipping) 波峰焊、回流焊、焊锡浸渍温度

Products	Peak temperature	Dipping time
Pb devices.	245℃ ±5℃	5sec ±1sec
Pb-Free devices.	260℃ +0/-5℃	5sec ±1sec

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