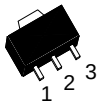
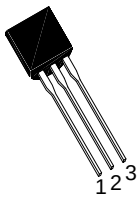
RS78L05
RS78L12

3-Terminal Positive Voltage Regulators

RS78LXX Series Pin Assignment



3-Lead Plastic **SOT-89**
Package Code: M
Pin 1: V_{OUT}
Pin 2: GND
Pin 3: V_{IN}



3-Lead Plastic **TO-92**
Package Code: A
Pin 1: V_{OUT}
Pin 2: GND
Pin 3: V_{IN}

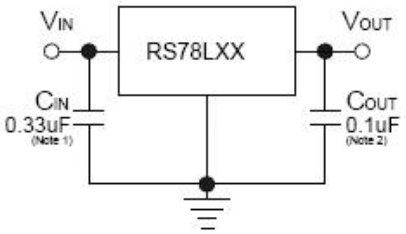
Description

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

Features

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

Typical Application



Note 1: C_{IN} is required if regulator is located an appreciable distance from power supply filter.

Note 2: C_{OUT} is not needed for stability; however, it does improve transient response. Values of less than 0.1uF could cause instability.

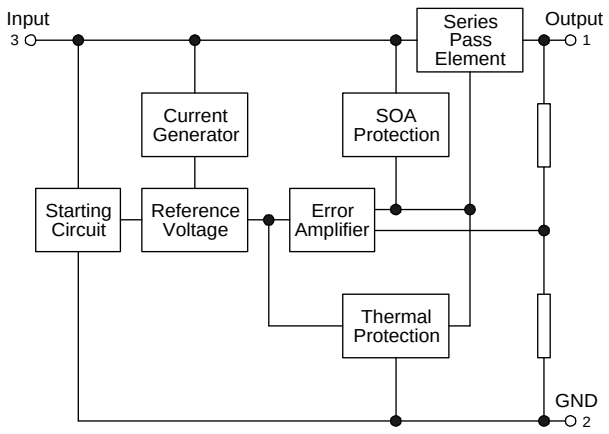
Absolute Maximum Ratings

(T_A=25°C, Unless Otherwise Specified)

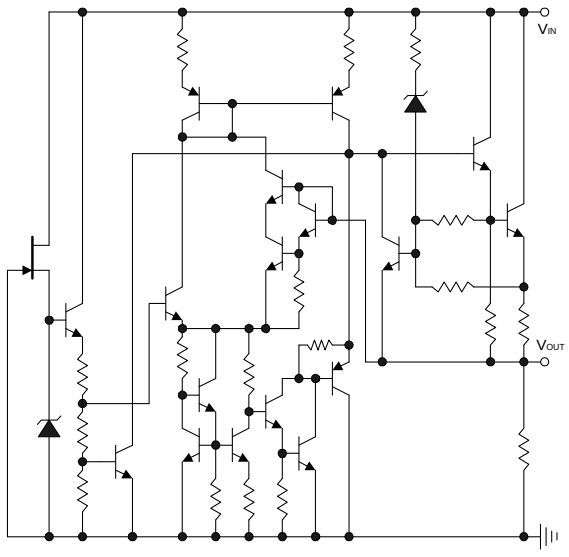
Characteristic	Symbol	Rating		Unit
Input Voltage	V_{IN}	30		V
Power Dissipation	P_D	TO-92	700	mW
		SOT-89	500	mW
Operating Temperature	T_{opr}	-40 to 125		°C
Storage Temperature	T_{stg}	-65 to 150		°C
Junction Temperature	T_j	150		°C
Thermal Resistance	$R_{th(j-a)}$	208		°C/W

Schematic Diagram & Equivalent Circuit

Schematic Diagram



Equivalent Circuit



RS78L05 Electrical Characteristics

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

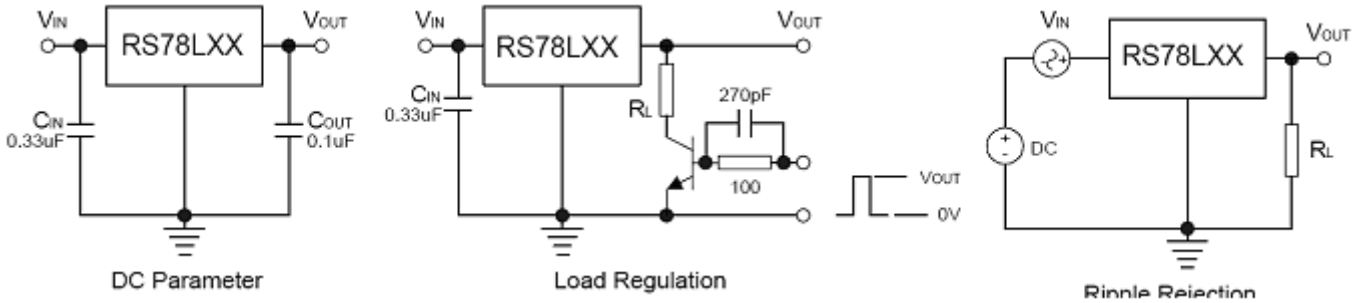
Symbol	Parameter	Conditions	RS78L05AM/AA			Units
			Min	Typ	Max	
V_O	Output Voltage	T_j=25°C	4.85	5	5.15	V
		1mA≤I_{OUT}≤70mA	4.85	5	5.15	
		7V≤V_{IN}≤20V, 1mA≤I_{OUT}≤40mA				
Reg_{line}	Line Regulation	T_j=25°C, 7V≤V_{IN}≤20V	-	15	150	mV
		T_j=25°C, 8V≤V_{IN}≤20V	-	15	100	
Reg_{load}	Load Regulation	T_j=25°C, 1mA≤I_{OUT}≤100mA	-	5	60	mV
		T_j=25°C, 1mA≤I_{OUT}≤40mA	-	8	30	
I_B	Quiescent Current	I_{OUT}=5mA, T_j=25°C	-	3.9	6	mA
ΔI_B	Quiescent Current Change	8V≤V_{IN}≤20V, T_j=25°C	-	-	1.5	mA
		1mA≤I_{OUT}≤40mA, T_j=25°C	-	-	0.1	
V_N	Output Noise Voltage	10Hz≤f≤100KHz, T_j=25°C	-	40	-	uVrms
RR	Ripple Rejection	8V≤V_{IN}≤18V, f=120Hz, T_j=25°C	47	62	-	dB
V_D	Dropout Voltage	T_j=25°C, I_{OUT}=100mA	-	1.7	2.5	V
I_{PK}	Peak Output Current			150		mA
R_O	Output Resistance	f=1KHz	-	17	-	mΩ
T_{CVO}	Average Temperature Coefficient of Output Voltage	I_{OUT}=5mA	-	-	-0.6	mV/°C

RS78L12 Electrical Characteristics

V_{IN}=19V, I_{OUT}=40mA, C_{IN}=0.33uF, C_{OUT}=0.1uF, 0°C≤T_j≤125°C (unless otherwise specified)

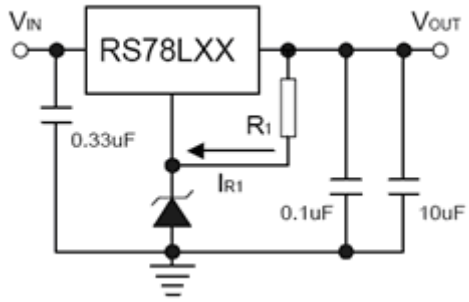
Symbol	Parameter	Conditions	RS78L12AM/AA			Units
			Min	Typ	Max	
V_O	Output Voltage	T_j=25°C	11.64	12	12.36	V
		1mA≤I_{OUT}≤70mA	11.64	12	12.36	
		14.5V≤V_{IN}≤27V, 1mA≤I_{OUT}≤40mA				
Reg_{line}	Line Regulation	T_j=25°C, 14.5V≤V_{IN}≤27V	-	15	150	mV
		T_j=25°C, 16V≤V_{IN}≤27V	-	15	100	
Reg_{load}	Load Regulation	T_j=25°C, 1mA≤I_{OUT}≤100mA	-	20	100	mV
		T_j=25°C, 1mA≤I_{OUT}≤40mA	-	10	50	
I_B	Quiescent Current	I_{OUT}=5mA, T_j=25°C	-	3.9	6	mA
ΔI_B	Quiescent Current Change	16V≤V_{IN}≤27V, T_j=25°C	-	-	1.5	mA
		1mA≤I_{OUT}≤40mA, T_j=25°C	-	-	0.1	
V_N	Output Noise Voltage	10Hz≤f≤100KHz, T_j=25°C	-	80	-	uVrms
RR	Ripple Rejection	15V≤V_{IN}≤25V, f=120Hz, T_j=25°C	41	54	-	dB
V_D	Dropout Voltage	T_j=25°C, I_{OUT}=100mA	-	1.7	2.5	V
I_{PK}	Peak Output Current			150		mA
R_O	Output Resistance	f=1KHz	-	17	-	mΩ
T_{CVO}	Average Temperature Coefficient of Output Voltage	I_{OUT}=5mA	-	-	-1.4	mV/°C

Test Circuits



Application Circuits

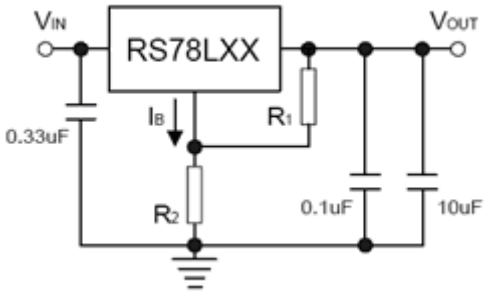
Constant Current Regulator



$V_{OUT}=V_{OUT(IC)}+V_Z$

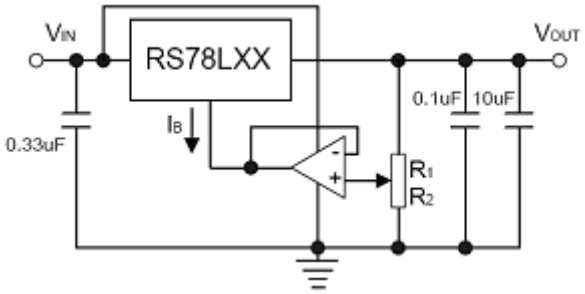
$I_1=V_{OUT(IC)}/R_1$

Circuit for Increasing Output Voltage



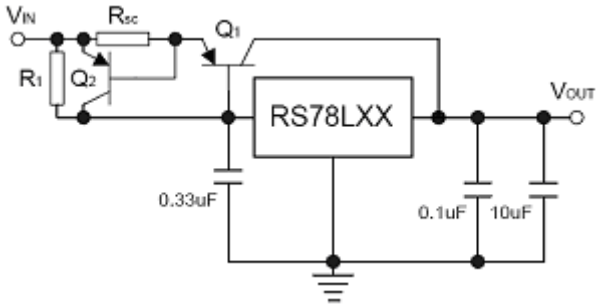
$V_{OUT}=V_{OUT(IC)}(1+R_2/R_1)+R_2*I_B$

Adjustable Output Regulator



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

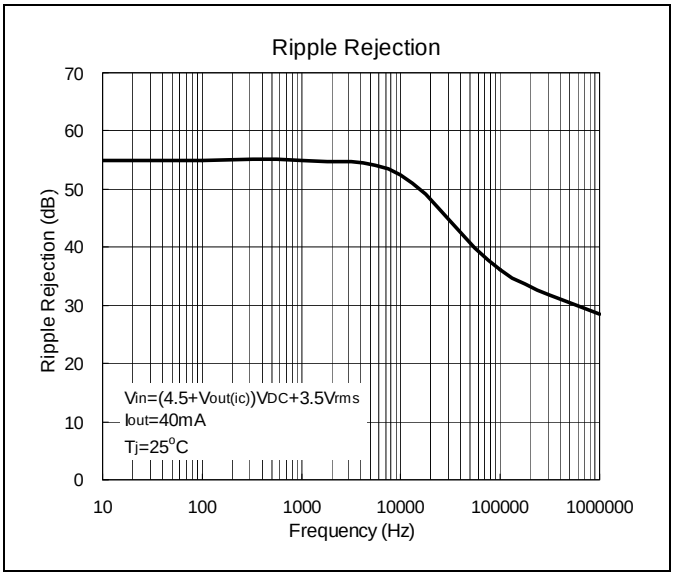
High Output Current with Short-circuit Protection

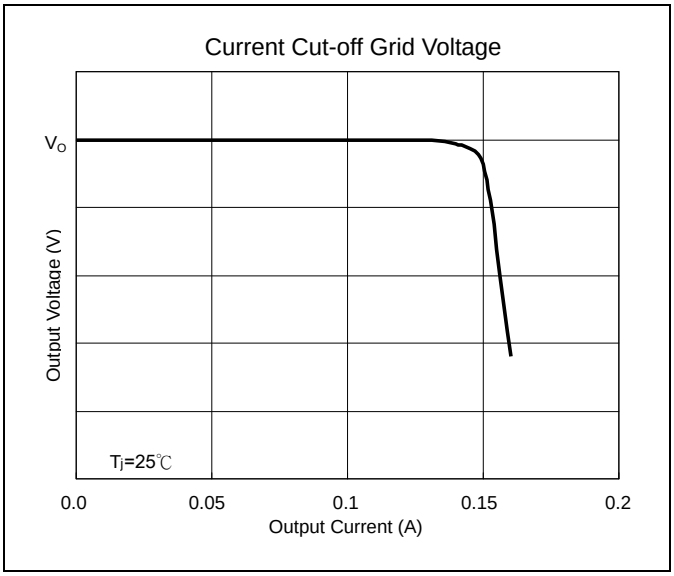


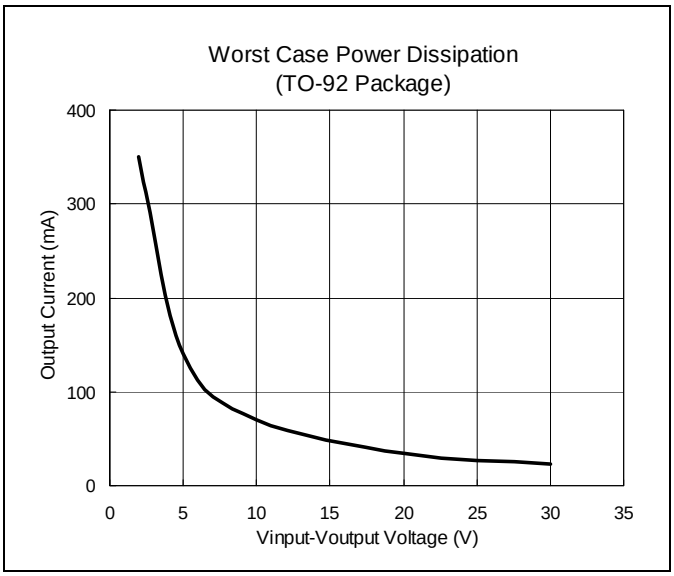
$R_1 \leq V_{BE1}/I_{B(max)}$

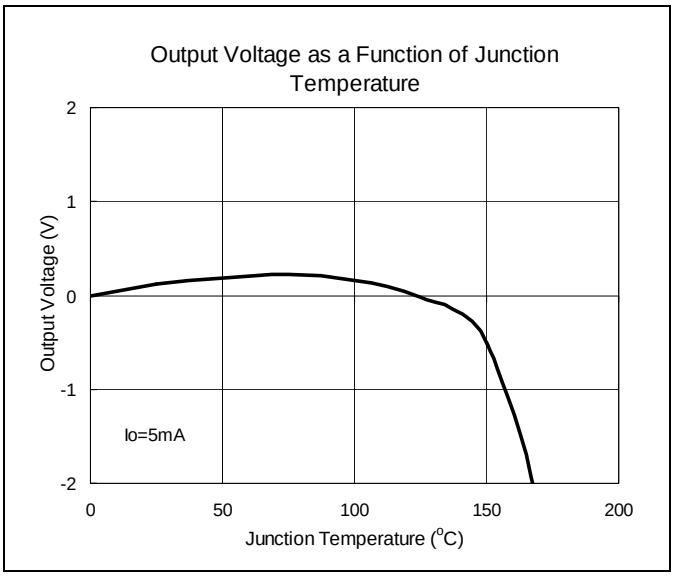
$R_{SC}=V_{BE2}/I_{SC}$, I_{SC}: Short-Circuit Current

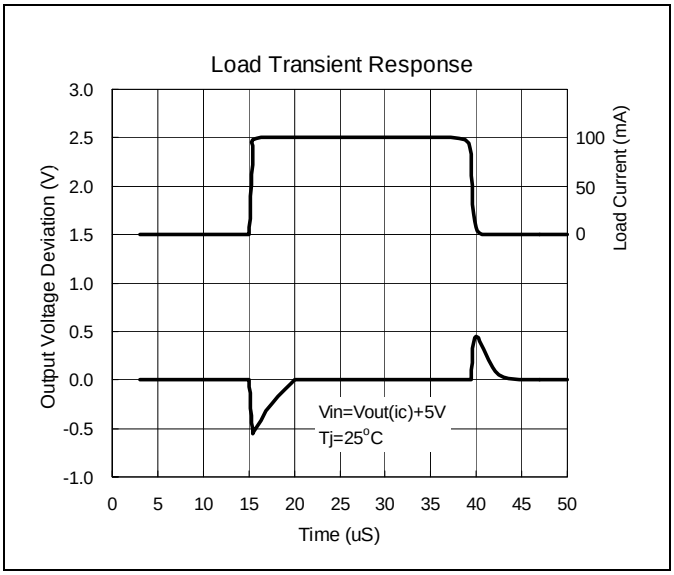
Characteristics Curve

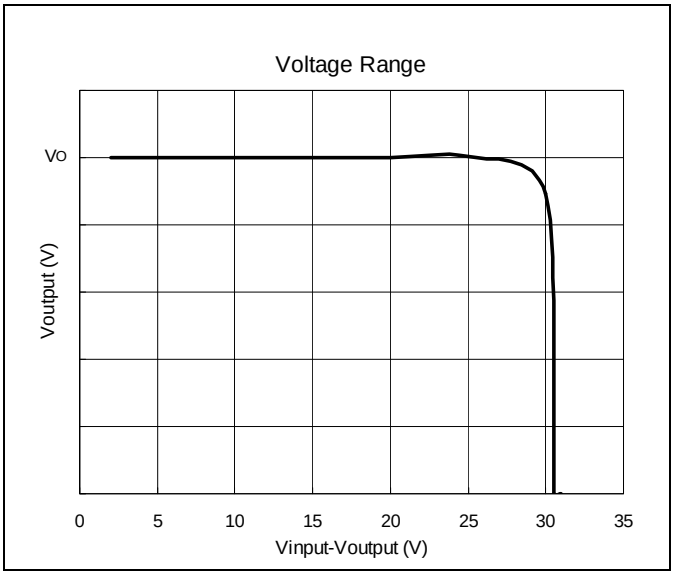




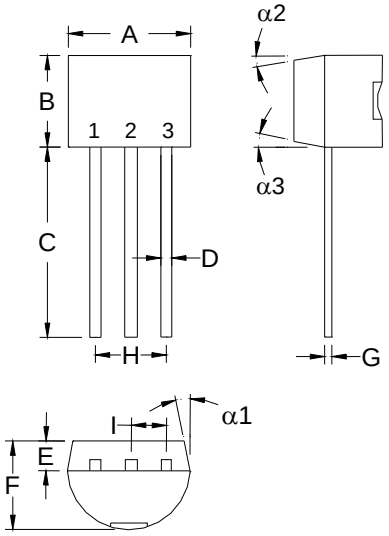








TO-92 Dimension

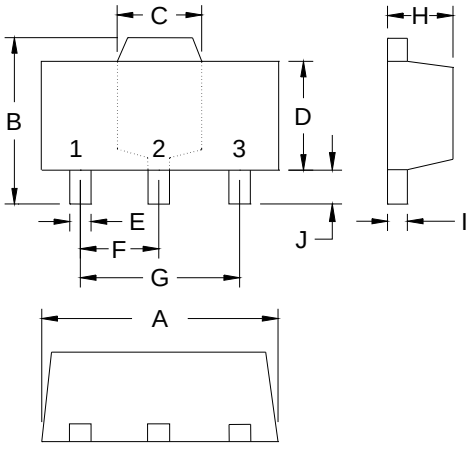


DIM	Min.	Max.
A	4.33	4.83
B	4.33	4.83
C	12.70	-
D	0.36	0.56
E	-	*1.27
F	3.36	3.76
G	0.36	0.56
H	-	*2.54
I	-	*1.27
α1	-	*5°
α2	-	*2°
α3	-	*2°

*: Typical, Unit: mm

3-Lead TO-92 Plastic Package
Package Code: A

SOT-89 Dimension



DIM	Min.	Max.
A	4.40	4.60
B	4.05	4.25
C	1.50	1.70
D	2.40	2.60
E	0.36	0.51
F	*1.50	-
G	*3.00	-
H	1.40	1.60
I	0.35	0.41

*: Typical, Unit: mm

3-Lead SOT-89 Plastic
Surface Mounted Package
Package Code: M

Ordering Information

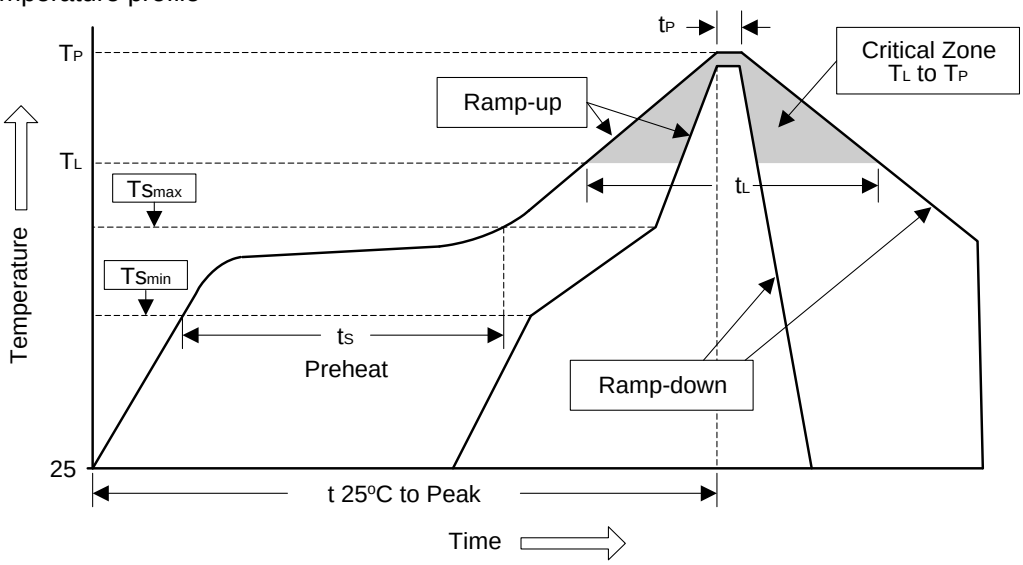
Part Number	V_{OUT}:	Package	Part Number	V_{OUT}:	Package
RS78L05AA	5V±0.25V	TO-92	RS78L05AM	5V±0.25V	SOT-89
RS78L12AA	12V±0.60V	TO-92	RS78L12AM	12V±0.60V	SOT-89

Soldering Methods for Orister'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 (Ts_{min}) - Temperature Max (Ts_{max}) - Time (min to max) (ts)	 100°C 150°C 60~120 sec	 150°C 200°C 60~180 sec
Tsmax to T_L - Ramp-up Rate	 <3°C/sec	 <3°C/sec
Time maintained above: - Temperature (T_L) - Time (t_L)	 183°C 60~150 sec	 217°C 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

Important Notice: