

GN78XX--- GN7805 3-TERMINAL POSITIVE VOLTAGE REGULATORS

Features

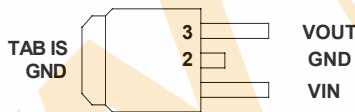
- Maximum Output Current of >1000mA ($T_c=25^{\circ}\text{C}$)
- Internal Short-Circuit Current Limiting
- Internal Thermal Overload Protection
- 3% Output Tolerance
- TO252,TO263,TO220 Package

Applications

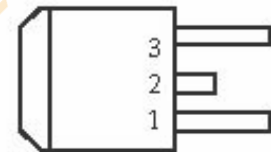
- LCD-TV tuner
- Car electronics

Pin Assignment

TO-252 FRONT VIEW



2L TO-263 FRONT VIEW



Description

GN78XX regulators employ internal current-limiting and thermal-shutdown, making them essentially indestructible. They can deliver up to 1000mA output with 0.5V drop continuously, output 1.0A

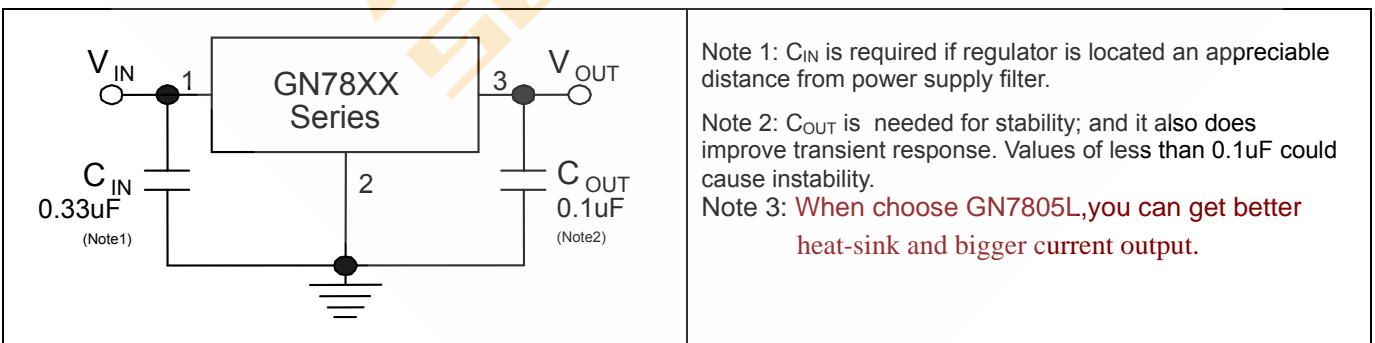
GN78M05 TO220 and TO263 can output 0.8A when +12V input

Ordering Information

GN78xxAS	1A	TO252 / TO220
GN7805L	1A	TO263-2

Note: XX: Voltage Output. 05(5V); 08(8V), 09(9V), 12(12V)

Typical Application

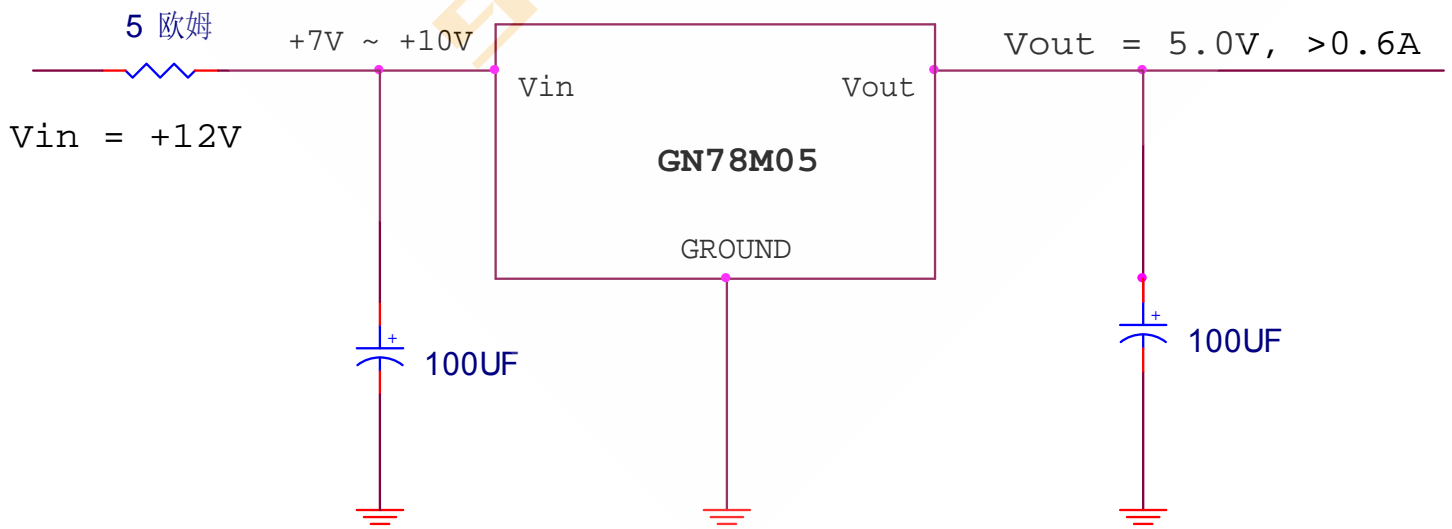
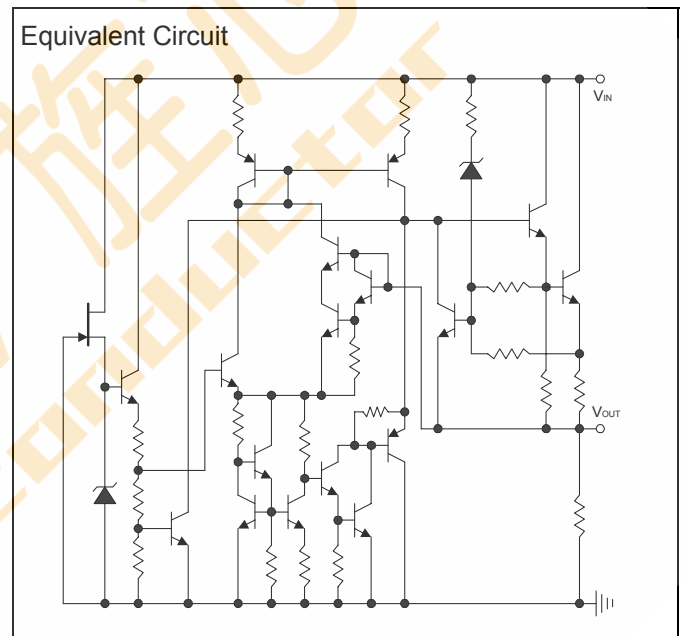
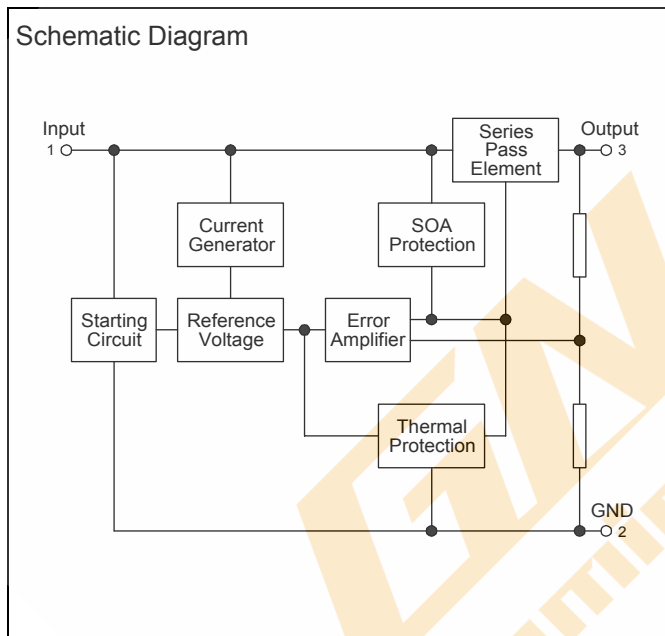


Absolute Maximum Ratings

(Ta=25°C, Unless Otherwise Specified)

Characteristic	Symbol	Rating	Unit
Input Voltage	V_{IN}	+37V	
Power Dissipation	P_D	TO252 3.50	W
Operating Temperature	T_{opr}	-20 to 85	°C
Storage Temperature	T_{stg}	-55 to 150	°C
Junction Temperature	T_j	150	°C
Thermal Resistance	$R_{th(j-a)}$	208	°C/W

Schematic Diagram & Equivalent Circuit



GN7805 Electrical Characteristics

$V_{IN}=10V$, $I_{OUT}=40mA$, $C_{IN}=0.33\mu F$, $C_{OUT}=0.1\mu F$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$

Symbol	Parameter	Conditions	GN7805			Units
			Min	Typ	Max	
V_O	Output Voltage	$T_j=25^{\circ}C$	4.85	5	5.15	V
		$1mA \leq I_{OUT} \leq 800mA$	4.85	5	5.15	
		$7V \leq V_{IN} \leq 18V$, $1mA \leq I_{OUT} \leq 40mA$				
Reg_{line}	Line Regulation	$T_j=25^{\circ}C$, $7V \leq V_{IN} \leq 18V$	-	15	150	mV
		$T_j=25^{\circ}C$, $8V \leq V_{IN} \leq 18V$	-	15	100	
Reg_{load}	Load Regulation	$T_j=25^{\circ}C$, $1mA \leq I_{OUT} \leq 500mA$	-	11	60	mV
		$T_j=25^{\circ}C$, $1mA \leq I_{OUT} \leq 40mA$	-	5	30	
I_B	Quiescent Current	$I_{OUT}=5mA$, $T_j=25^{\circ}C$	-	8	10	mA
ΔI_B	Quiescent Current Change	$8V \leq V_{IN} \leq 18V$, $T_j=25^{\circ}C$	-	-	1.5	mA
		$1mA \leq I_{OUT} \leq 40mA$, $T_j=25^{\circ}C$	-	-	0.1	
V_N	Output Noise Voltage	$10Hz \leq f \leq 100KHz$, $T_j=25^{\circ}C$	-	40	-	μV_{rms}
RR	Ripple Rejection	$8V \leq V_{IN} \leq 18V$, $f=120Hz$, $T_j=25^{\circ}C$	41	49	-	dB
V_D	Dropout Voltage	$T_j=25^{\circ}C$, $I_{OUT}=100mA$	1.7	2.5	-	V
R_O	Output Resistance	$f=1KHz$	-	17	-	$m\Omega$
I_{SC}	Short Circuit Current	$V_{IN}=10V$, $T_j=25^{\circ}C$	-	1.5	2	A
T_{CVO}	Average Temperature Coefficient of Output Voltage	$I_{OUT}=5mA$	-	-	0.6	$mV/^{\circ}C$

GN7808 Electrical Characteristics

$V_{IN}=14V$, $I_{OUT}=40mA$, $C_{IN}=0.33\mu F$, $C_{OUT}=0.1\mu F$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$ (unless otherwise specified)

Symbol	Parameter	Conditions	GN7808			Units
			Min	Typ	Max	
V_O	Output Voltage	$T_j=25^{\circ}C$	7.8	8	8.25	V
		$1mA \leq I_{OUT} \leq 1000mA$	7.8	8	8.25	
		$10.5V \leq V_{IN} \leq 23V$, $1mA \leq I_{OUT} \leq 40mA$				
Reg_{line}	Line Regulation	$T_j=25^{\circ}C$, $10.5V \leq V_{IN} \leq 23V$	-	20	175	mV
		$T_j=25^{\circ}C$, $11V \leq V_{IN} \leq 23V$	-	20	125	
Reg_{load}	Load Regulation	$T_j=25^{\circ}C$, $1mA \leq I_{OUT} \leq 500mA$	-	15	80	mV
		$T_j=25^{\circ}C$, $1mA \leq I_{OUT} \leq 40mA$	-	7	40	
I_B	Quiescent Current	$I_{OUT}=5mA$, $T_j=25^{\circ}C$	-	3.9	6	mA
ΔI_B	Quiescent Current Change	$11V \leq V_{IN} \leq 23V$, $T_j=25^{\circ}C$	-	-	1.5	mA
		$1mA \leq I_{OUT} \leq 40mA$, $T_j=25^{\circ}C$	-	-	0.1	
V_N	Output Noise Voltage	$10Hz \leq f \leq 100KHz$, $T_j=25^{\circ}C$	-	60	-	μV_{rms}
RR	Ripple Rejection	$12V \leq V_{IN} \leq 23V$, $f=120Hz$, $T_j=25^{\circ}C$	37	45	-	dB
V_D	Dropout Voltage	$T_j=25^{\circ}C$, $I_{OUT}=100mA$	-	1.7	2.5	V
R_O	Output Resistance	$f=1KHz$	-	17	-	$m\Omega$
I_{SC}	Short Circuit Current	$T_j=25^{\circ}C$	-	1.5	2	A
T_{CVO}	Average Temperature Coefficient of Output Voltage	$I_{OUT}=5mA$	-	-	0.9	$mV/^{\circ}C$

GN7809 Electrical Characteristics

$V_{IN}=15V$, $I_{OUT}=40mA$, $C_{IN}=0.33\mu F$, $C_{OUT}=0.1\mu F$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$ (unless otherwise specified)

Symbol	Parameter	Conditions	GN7809			Units
			Min	Typ	Max	
V_O	Output Voltage	$T_j=25^{\circ}C$	8.70	9	9.30	V
		$1mA \leq I_{OUT} \leq 500mA$	8.70	9	9.30	
		$11.4V \leq V_{IN} \leq 24V$, $1mA \leq I_{OUT} \leq 40mA$				
Reg_{line}	Line Regulation	$T_j=25^{\circ}C$, $11.4V \leq V_{IN} \leq 24V$	-	80	200	mV
		$T_j=25^{\circ}C$, $12V \leq V_{IN} \leq 24V$	-	20	160	
Reg_{load}	Load Regulation	$T_j=25^{\circ}C$, $1mA \leq I_{OUT} \leq 500mA$	-	17	90	mV
		$T_j=25^{\circ}C$, $1mA \leq I_{OUT} \leq 40mA$	-	8	45	
I_B	Quiescent Current	$I_{OUT}=5mA$, $T_j=25^{\circ}C$	-	3.9	6	mA
ΔI_B	Quiescent Current Change	$12V \leq V_{IN} \leq 24V$, $T_j=25^{\circ}C$	-	-	1.5	mA
		$1mA \leq I_{OUT} \leq 40mA$, $T_j=25^{\circ}C$	-	-	0.1	
V_N	Output Noise Voltage	$10Hz \leq f \leq 100KHz$, $T_j=25^{\circ}C$	-	65	-	μV_{rms}
RR	Ripple Rejection	$12V \leq V_{IN} \leq 24V$, $f=120Hz$, $T_j=25^{\circ}C$	36	44	-	dB
V_D	Dropout Voltage	$T_j=25^{\circ}C$, $I_{OUT}=100mA$	-	1.7	2.5	V
R_O	Output Resistance	$f=1KHz$	-	17	-	$m\Omega$

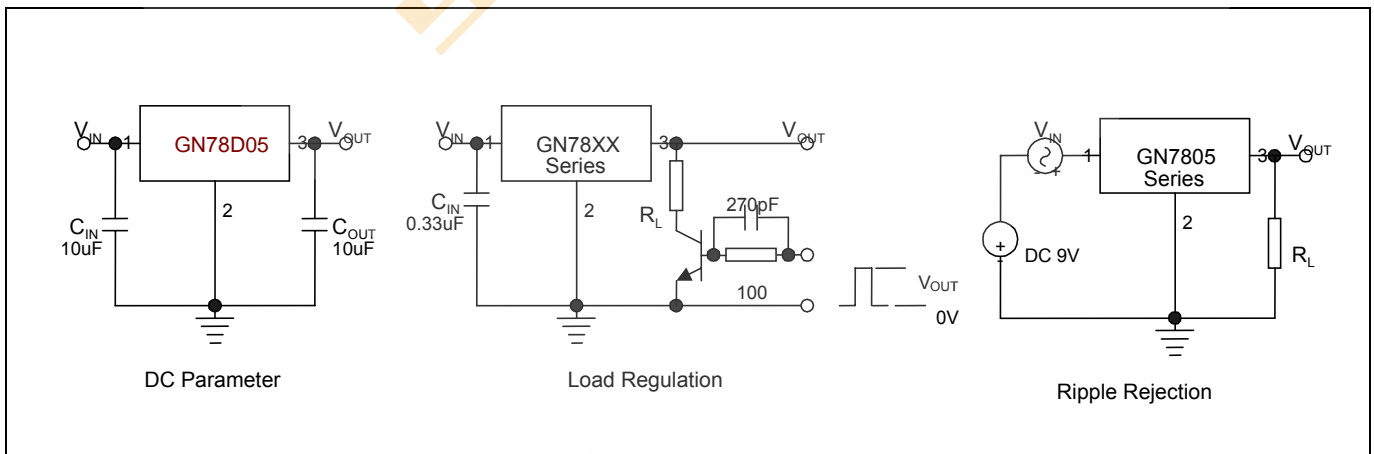
I_{SC}	Short Circuit Current	$T_j=25^{\circ}C$	-	1.5	2	A
T_{CVO}	Average Temperature Coefficient of Output Voltage	$I_{OUT}=5mA$	-	-	1	mV/ $^{\circ}C$

GN7812 Electrical Characteristics

$V_{IN}=19V$, $I_{OUT}=40mA$, $C_{IN}=0.33\mu F$, $C_{OUT}=0.1\mu F$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$ (unless otherwise specified)

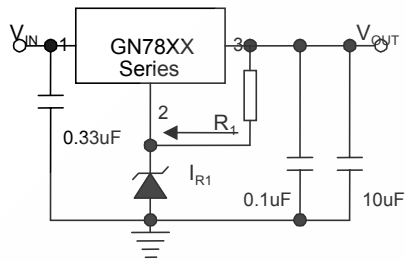
Symbol	Parameter	Conditions	GN7812			Units
			Min	Typ	Max	
V_O	Output Voltage	$T_j=25^{\circ}C$	11.5	12	12.5	V
		$1mA \leq I_{OUT} \leq 500mA$	11.5	12	12.5	
		$14.5V \leq V_{IN} \leq 27V$, $1mA \leq I_{OUT} \leq 40mA$	-	-	-	
Reg_{line}	Line Regulation	$T_j=25^{\circ}C$, $14.5V \leq V_{IN} \leq 27V$	-	120	250	mV
		$T_j=25^{\circ}C$, $16V \leq V_{IN} \leq 27V$	-	100	200	
Reg_{load}	Load Regulation	$T_j=25^{\circ}C$, $1mA \leq I_{OUT} \leq 500mA$	-	20	100	mV
		$T_j=25^{\circ}C$, $1mA \leq I_{OUT} \leq 40mA$	-	10	50	
I_B	Quiescent Current	$I_{OUT}=5mA$, $T_j=25^{\circ}C$	-	3.9	6	mA
ΔI_B	Quiescent Current Change	$16V \leq V_{IN} \leq 27V$, $T_j=25^{\circ}C$	-	-	1.5	mA
		$1mA \leq I_{OUT} \leq 40mA$, $T_j=25^{\circ}C$	-	-	0.1	
V_N	Output Noise Voltage	$10Hz \leq f \leq 100KHz$, $T_j=25^{\circ}C$	-	80	-	μV_{rms}
RR	Ripple Rejection	$15V \leq V_{IN} \leq 25V$, $f=120Hz$, $T_j=25^{\circ}C$	36	41	-	dB
V_D	Dropout Voltage	$T_j=25^{\circ}C$, $I_{OUT}=100mA$	-	1.7	2.5	V
R_O	Output Resistance	$f=1KHz$	-	17	-	$m\Omega$
I_{SC}	Short Circuit Current	$T_j=25^{\circ}C$	-	1.5	2	A
T_{CVO}	Average Temperature Coefficient of Output Voltage	$I_{OUT}=5mA$	-	-	1.4	mV/ $^{\circ}C$

Test Circuits



Application Circuits

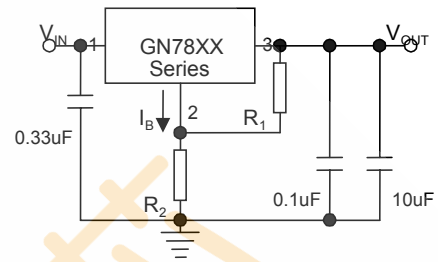
Constant Current Regulator



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

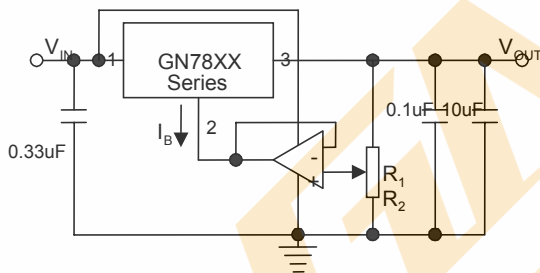
$$I_1 = V_{OUT(IC)} / R_1$$

Circuit for Increasing Output Voltage



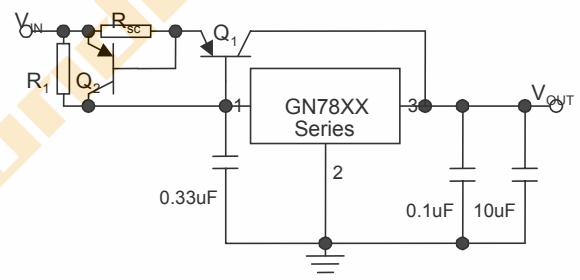
$$V_{OUT} = V_{OUT(IC)}(1 + R_2/R_1) + R_2 * I_B$$

Adjustable Output Regulator



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

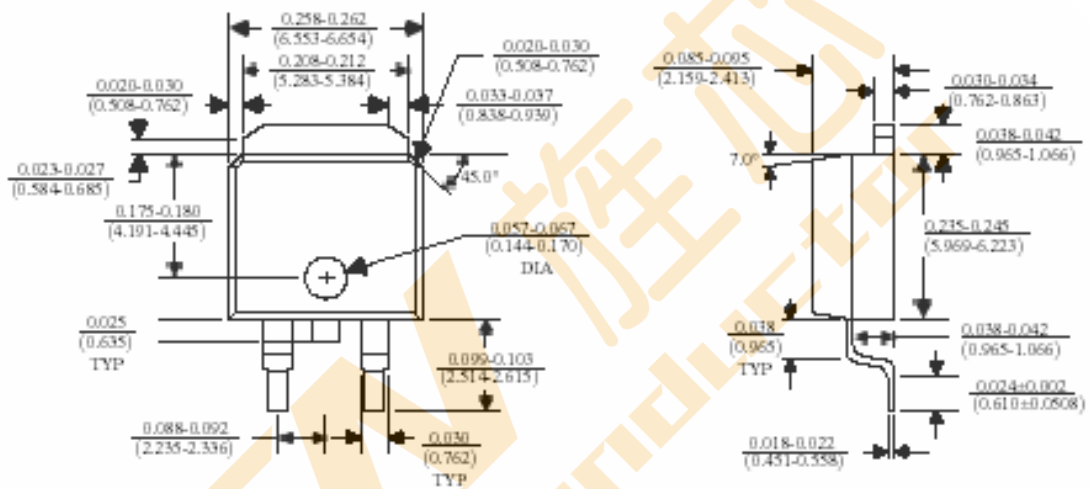
High Output Current with Short-circuit Protection



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

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

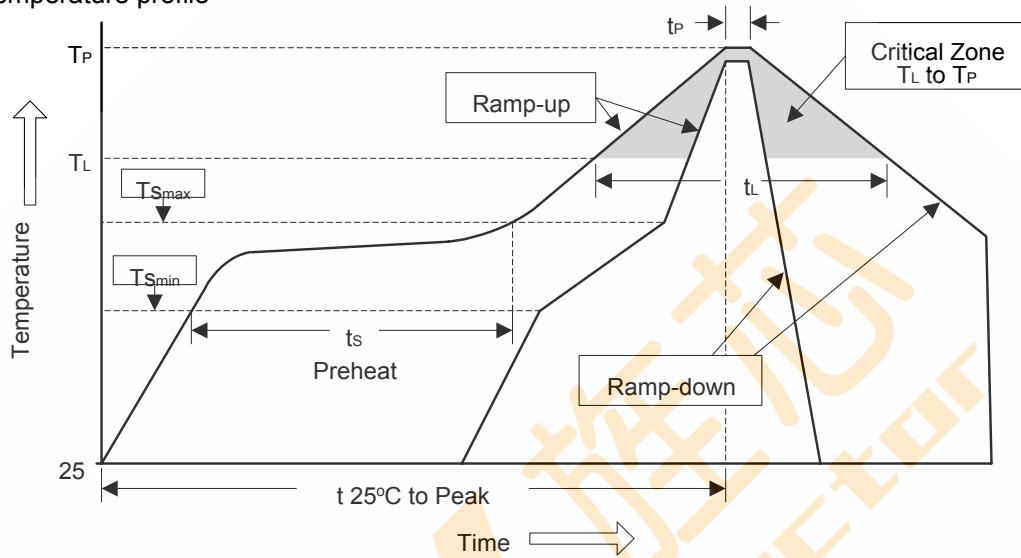
TO252-2 Dimension



Soldering Methods

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. STOPPED		
Pb-Free devices.	260°C +0/-5°C	5sec ±1sec