

Formosa MS

FMLDB1117A1V8ATH Thru FMLDB1117AADJCTH

List

List.....	1
Features.....	2
Package outline.....	2
Applications.....	2
Mechanical data.....	2
Maximum ratings	2
Electrical characteristics.....	3
Detailed Description.....	4
Application and Implementation.....	5
Rating and characteristic curves.....	5~6
Pinning information.....	7
Marking.....	7
Suggested solder pad layout.....	7
Packing information.....	8
Reel packing.....	9
Suggested thermal profiles for soldering processes.....	9

Formosa MS

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1.0A Low Voltage Difference Bipolar Fixed and adjustable Voltage Regulators

Features

- Thermal Shutdown.
- Three-Terminal Adjustable to 1.8V, 3.3V, 5.0V.
- Low Dropout voltage : 1.3V(typ.) @1.0A Output Current.
- Output voltage Accuracy to within $\pm 2\%$.
- ESD protected up to 8.0KV (HBM).
- Lead-free parts meet RoHS requirements.

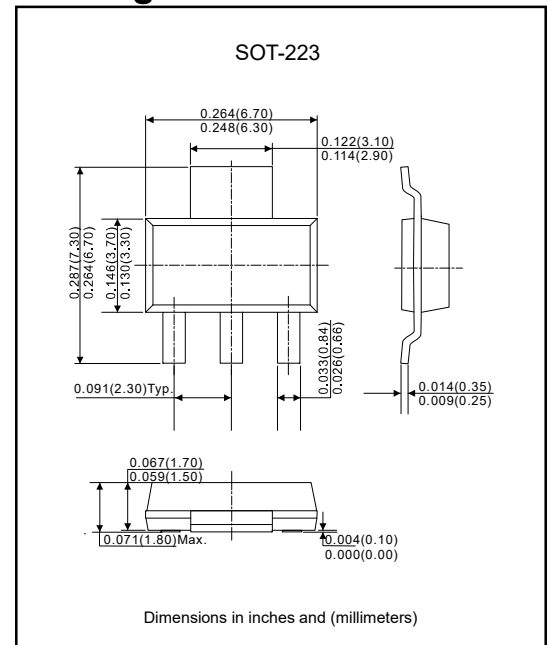
Applications

- DVD-Video Player.
- LCD Monitor.
- Graphic Card.
- NIC/Switch.
- PC Motherboard.
- Telecom Modem, ADSL Modem.
- Printer and Other Peripheral Equipment.

Mechanical data

- Epoxy:UL94-V0 rated flame retardant.
- Case : Molded plastic, SOT-223.
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026.
- Weight : Approximated 205mg.

Package Outline



Maximum ratings (T_{OPT}=25°C, unless otherwise note)

Parameter	Symbol	Ratings	Unit
Input voltage	V _{IN}	20	V
Thermal resistance, junction to ambient	R _{θJA}	100	°C/W
Thermal resistance, junction to case	R _{θJC}	20	°C/W
Ambient temperature range	T _A	-40 to +85	°C
Maximum Junction temperature range	T _J	-40 to +150	°C
Storage temperature	T _{STG}	-40 to +150	°C
Soldering temperature and time (10s)	T _{Solder}	+260	°C

Note :

- (1) Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.
- (2) Thermal metric is measured in still air with T_A = 25°C and mounted on a 1 in2 FR-4 substrate PCB covered with 2 ounces of copper.

Formosa MS

FMLDB1117A1V8ATH Thru FMLDB1117AADJCTH

Electrical characteristics (T_A = 25°C, unless otherwise specified)

Parameter	Symbol	Part NO.	Conditions	Min	Typ	Max	Unit
Reference voltage	V _{IROC}	FMLDB1117AADJCTH	I _{OUT} =10mA, V _{IN} =3.25V	1.225	1.25	1.275	V
			10mA≤I _{OUT} ≤1A, V _{IN} -V _{OUT} =2.75V to 12V	1.219	1.25	1.281	
Output voltage	V _{OUT}	FMLDB1117A1V8ATH	I _{OUT} =10mA, V _{IN} =3.8V	1.764	1.8	1.836	V
			10mA≤I _{OUT} ≤1A, V _{IN} =3.3V to 12V	1.755	1.8	1.845	
		FMLDB1117A3V3ATH	I _{OUT} =10mA, V _{IN} =5.3V	3.234	3.3	3.366	
			10mA≤I _{OUT} ≤1A, V _{IN} =4.8V to 12V	3.218	3.3	3.382	
		FMLDB1117A5V0ATH	I _{OUT} =10mA, V _{IN} =7.0V	4.900	5.0	5.100	
			10mA≤I _{OUT} ≤1A, V _{IN} =6.5V to 12V	4.875	5.0	5.125	
Quiescent current	I _Q	FMLDB1117A1V8ATH	V _{IN} =12V		2	5	mA
		FMLDB1117A3V3ATH					
		FMLDB1117A5V0ATH					
Dropout voltage	V _{DO}		I _{OUT} =1A		1.3	1.5	mV
Line regulation	LNR	FMLDB1117AADJCTH	I _{OUT} =10mA, V _{IN} -V _{OUT} =1.5V to 10.75V		0.03	0.2	% / V
		FMLDB1117A1V8ATH	I _{OUT} =10mA, V _{IN} -V _{OUT} =1.5V to 10.20V				
		FMLDB1117A3V3ATH	I _{OUT} =10mA, V _{IN} -V _{OUT} =1.5V to 8.7V				
		FMLDB1117A5V0ATH	I _{OUT} =10mA, V _{IN} -V _{OUT} =1.5V to 7.0V				
Load regulation	LDR	FMLDB1117AADJCTH	V _{IN} -V _{OUT} =1.5V, I _{OUT} =10mA to 1A		2	8	mV
		FMLDB1117A1V8ATH			3	12	
		FMLDB1117A3V3ATH			6	24	
		FMLDB1117A5V0ATH			9	36	
Adjust Pin current	I _{adj}	FMLDB1117AADJCTH	V _{IN} =5V, I _{OUT} =10mA		55	120	μA
			V _{IN} =5V, I _{OUT} =1A				
I _{adj} change	I _{change}	FMLDB1117AADJCTH	V _{IN} =5V, I _{OUT} =10mA to 1A		0.2	10	μA
Load Current (Min)	I _L	FMLDB1117AADJCTH			2	10	mA
Ripple Rejection	RR		f=1kHz, C _{IN} =10μF/25V, C _{OUT} =10μF/25V, V _{IN} -V _{OUT} =2V, I _{OUT} =10mA		60		dB

Formosa MS

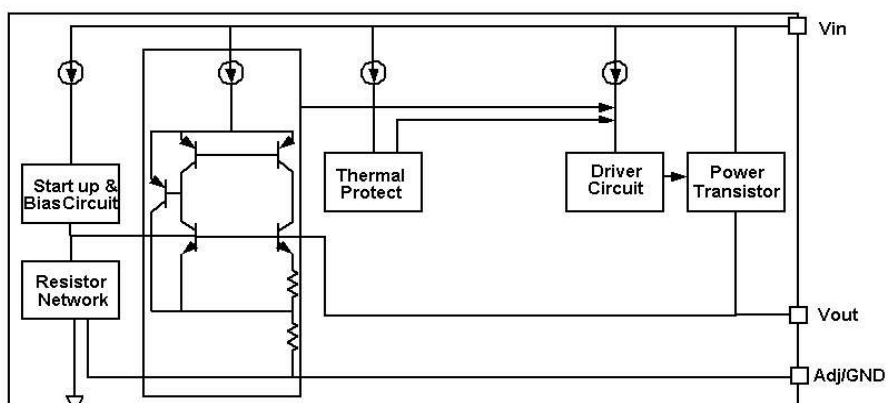
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Detailed Description

1. Description

The FMLDB1117A1V8ATH Thru FMLDB1117AADJCTH is a series of low dropout voltage, three terminal regulators. Its application circuit is very simple: the fixed version only needs two capacitors and the adjustable version only needs two resistors and two capacitors to work. It is composed of some modules including start-up circuit, bias circuit, band gap, thermal shutdown, power transistors and its driver circuit and so on. The thermal shut down modules can assure chip and its application system working safety when the junction temperature is larger than 170°C. The band gap module provides stable reference voltage, whose temperature coefficient is compensated by careful design considerations. The temperature coefficient is under 100 ppm/°C. And the accuracy of output voltage is guaranteed by trimming technique.

2. Functional block diagram



3. Thermal Consideration

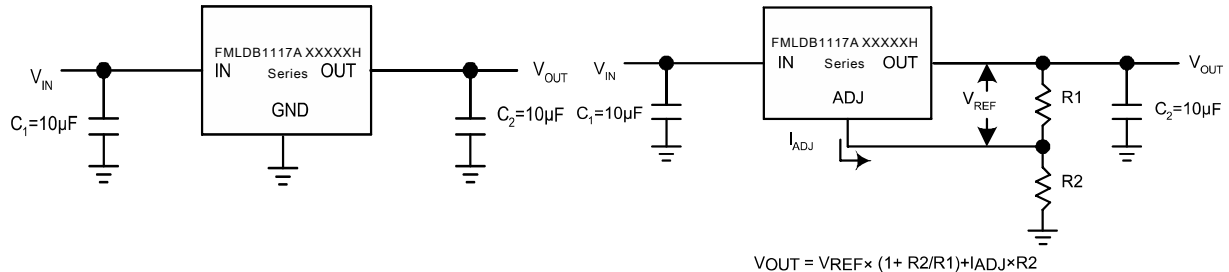
We have to take heat dissipation into great consideration when output current or differential voltage of input and output voltage is large. Because in such cases, the power dissipation consumed by FMLDB1117AADJCTH is very large. FMLDB1117AADJCTH series uses SOT-223 package type and its thermal resistance is about 20°C/W. And the copper area of application board can affect the total thermal resistance. If copper area is 5cm*5cm (two sides), the resistance is about 30°C/W. So the total thermal resistance is about 20°C/W+30°C/W. We can decrease total thermal resistance by increasing copper area in application board. When there is no good heat dissipation copper area in PCB, the total thermal resistance will be as high as 120°C/W, then the power dissipation of FMLDB1117AADJCTH could allow on itself is less than 1W. And furthermore, FMLDB1117AADJCTH will work at junction temperature higher than 125°C under such condition and no lifetime is guaranteed.

Formosa MS

FMLDB1117A1V8ATH Thru FMLDB1117AADJCTH

Application and Implementation

1. Typical Application Circuit



2. Application Information

2.1. Fixed Output Voltage Version

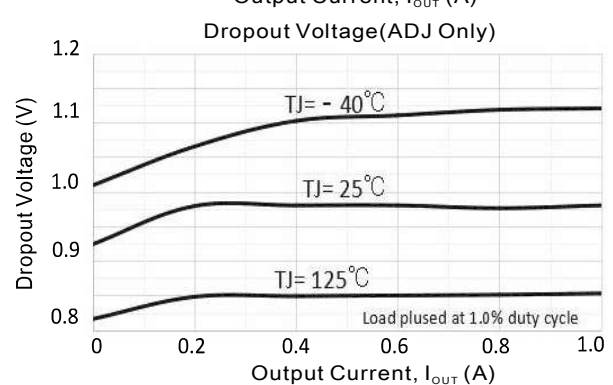
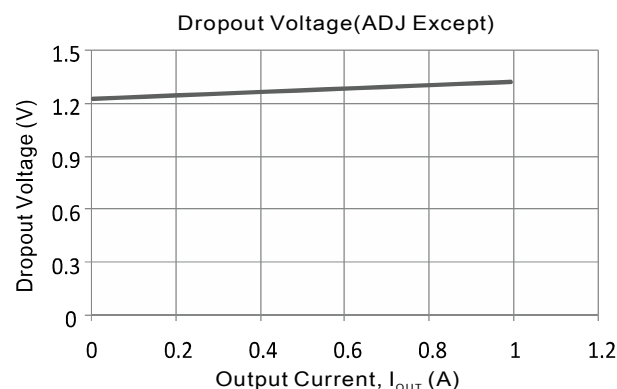
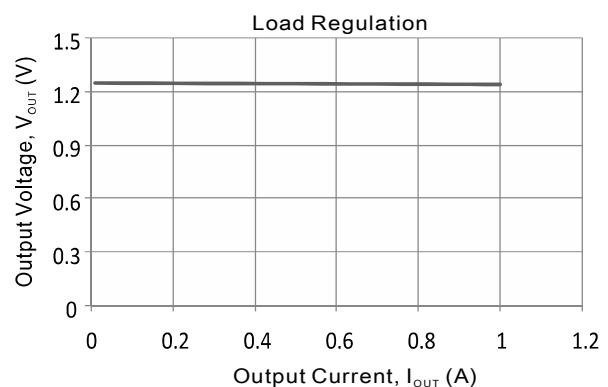
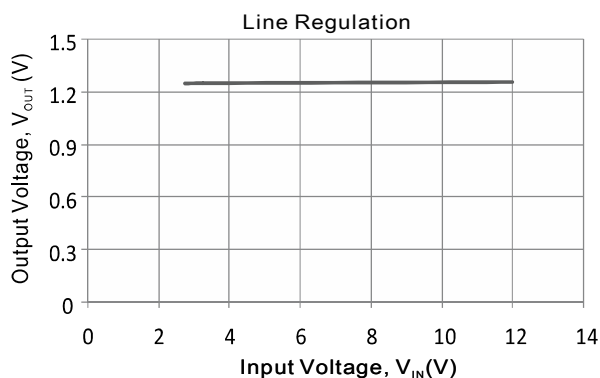
1. Recommend using 10uF tan capacitor as bypass capacitor (C1) for all application circuit.
2. Recommend using 10uF tan capacitor to assure circuit stability.

2.2 Fixed Output Voltage Version

The output voltage of adjustable version follows the equation : $V_{out} = 1.25 \times (1 + R2/R1) + I_{adj} \times R2$. We can ignore I_{adj} because I_{adj} (about 50uA) is much less than the current of R1 (about 2~10mA).

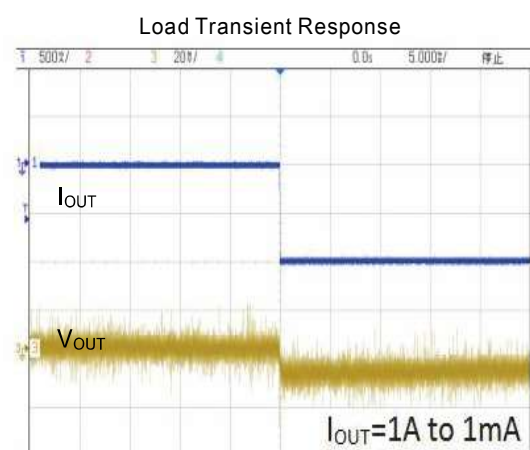
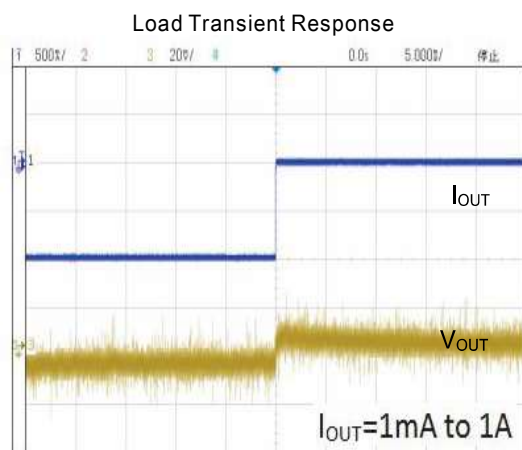
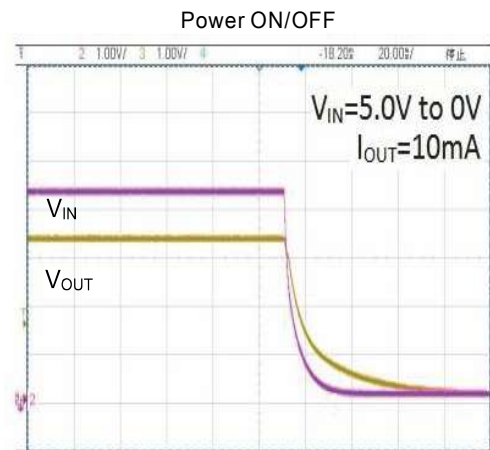
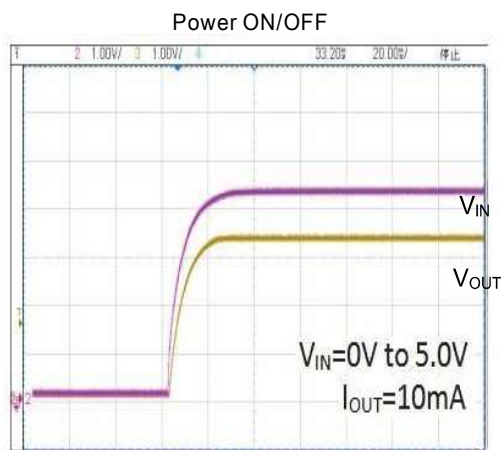
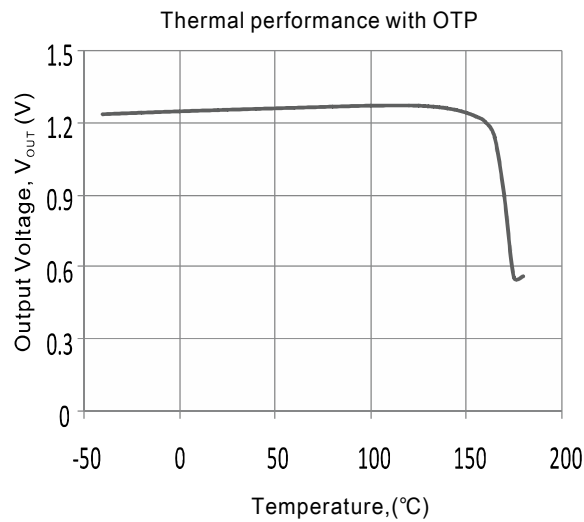
1. To meet the minimum load current (>10mA) requirement, R1 is recommended to be 125ohm or lower. As FMLDB1117AADJCTH can keep itself stable at load current about 2mA, R1 is not allowed to be higher than 625ohm.
2. Using a bypass capacitor (C_{ADJ}) between the ADJ pin and ground can improve ripple rejection. This bypass capacitor prevents ripple from being amplified as the output voltage is increased. The impedance of C_{ADJ} should be less than R1 to prevent ripple from being amplified. As R1 is normally in the range of 100Ω~500Ω, the value of C_{ADJ} should satisfy this equation: $1/(2\pi \times \text{fripple} \times C_{ADJ}) < R1$.

Rating and characteristic curves ($T_A = 25^\circ\text{C}$, unless otherwise specified)



Formosa MS FMLDB1117A1V8ATH Thru FMLDB1117AADJCTH

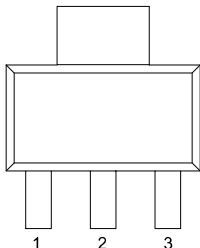
Rating and characteristic curves ($T_A = 25^{\circ}\text{C}$, unless otherwise specified)



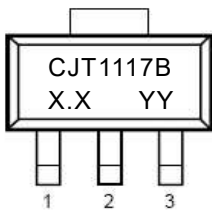
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FMLDB1117A1V8ATH Thru FMLDB1117AADJCTH

Pinning information

Pin	Simplified outline
Pin 1 ADJ/GND Pin 2 V_{OUT} Pin 3 V_{IN}	

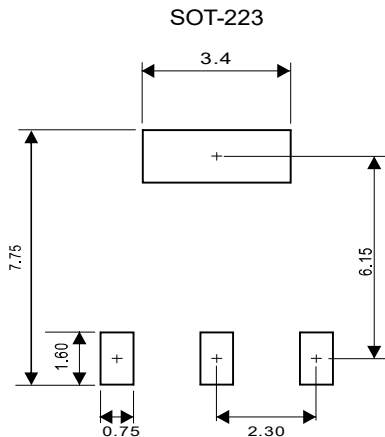
Marking



Marking code	Description
CJT1117B	Device serial number.
X.X	Output voltage, for example, if $V_{OUT} = 3.0V$, "X.X" = 3.0.
YY	A code composed of one uppercase letter and one number, indicates weekly record information of production

YY : Represents any character.

Suggested solder pad layout

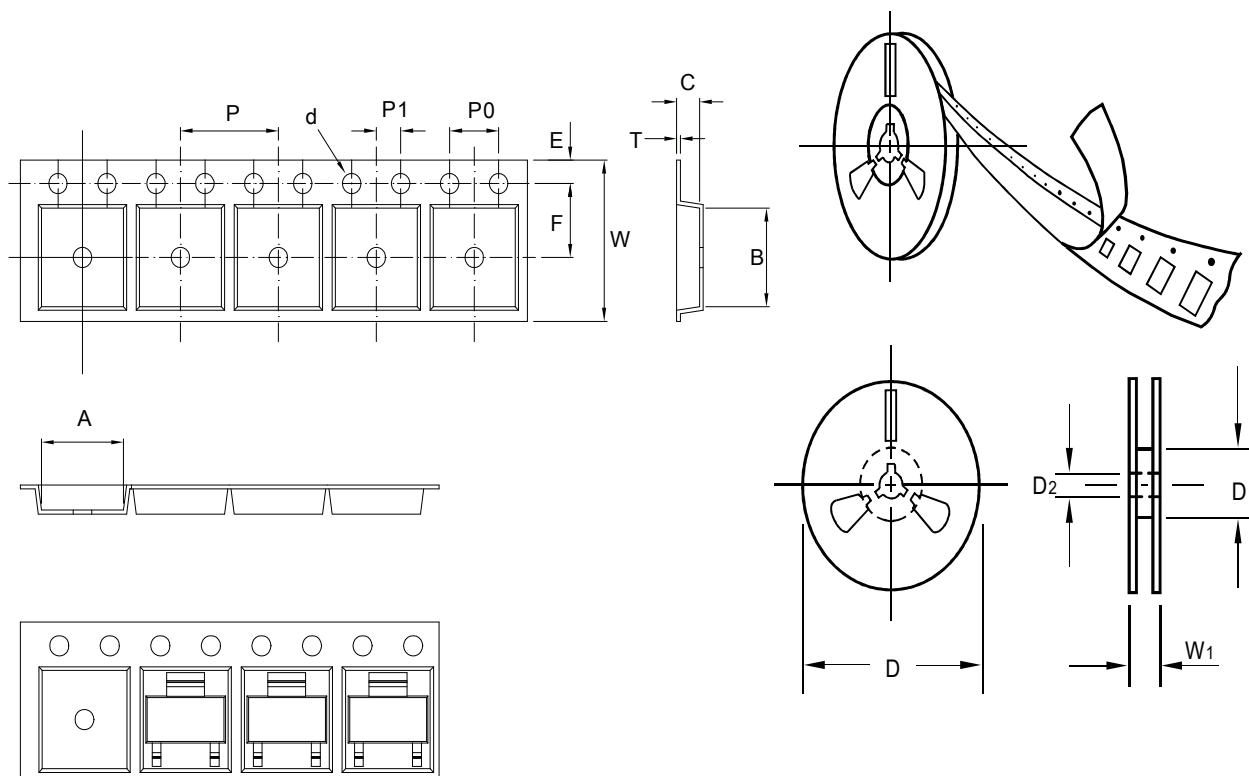


Note :
1. Controlling dimension : In millimeters.
2. General tolerance : $\pm 0.05mm$.
3. The pad layout is for reference purposes only.

Formosa MS

FMLDB1117A1V8ATH Thru FMLDB1117AADJCTH

Packing information



Unit : mm

Item	Symbol	Tolerance	SOT-223
Carrier width	A	±0.1	6.76
Carrier length	B	±0.1	7.33
Carrier depth	C	±0.1	1.88
Sprocket hole	d	±0.1	1.50
13" Reel outside diameter	D	±1.0	330.0
13" Reel inner diameter	D1	±0.5	99.0
Feed hole diameter	D2	±0.3	13.1
Sprocket hole position	E	±0.1	1.75
Punch hole position	F	±0.1	5.50
Punch hole pitch	P	±0.1	8.00
Sprocket hole pitch	P0	±0.1	4.00
Embossment center	P1	±0.1	2.00
Over all tape thickness	T	±0.1	0.25
Tape width	W	±0.5	12.00
Reel width	W1	±0.5	12.80

Note : Devices are packed in accordance with EIA standard RS-481-A and specifications listed above.

Formosa MS

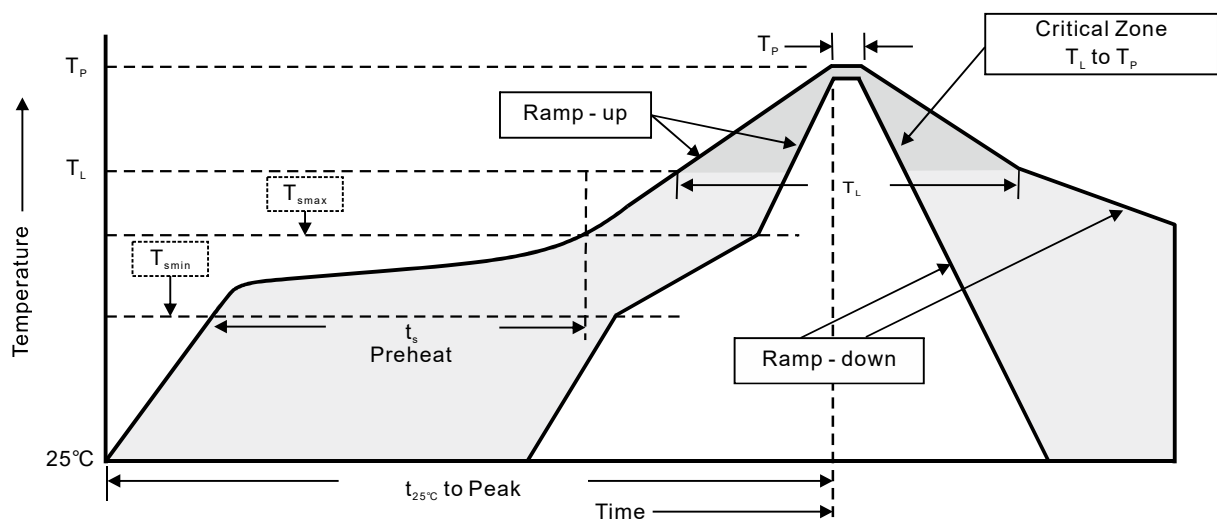
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Reel packing

Package	Units (pcs)			Dimension (Unit : mm ³)		
	Reel	Inner Box	Outer Box	Reel DIA,	Inner Box	Outer Box
SOT-223	2,500	5,000	2,500	330 (13")	336x 336 x 48	445 x 355 x 365

Suggested thermal profiles for soldering processes

1. Storage environment : Temperature = 5°C ~ 40°C, Humidity = 55%, ±25%.
2. Reflow soldering of surface - Mount devices.



3. Reflow soldering

Profile feature	Soldering condition
Average ramp-up rate (T_L to T_p)	< 3 °C/sec
Preheat - Temperature Min (T_{smin}) - Temperature Max (T_{smax}) - Time (Min to Max) (t_s)	150°C 200°C 60 ~ 120 sec
T_{smax} to T_L - Ramp-up rate	< 3 °C / sec
Time maintained above : - Temperature (T_L) - Time (T_L)	217°C 60 ~ 260 sec
Peak temperature (T_p)	255 °C -0 / +5°C
Time with 5°C of actual peak temperature (T_p)	10 ~ 30 sec
Ramp-down rate	< 6°C / sec
Time 25°C to peak temperature	< 6 minutes