

Formosa MS

FMLDB1117A1V8AAH Thru FMLDB1117AADJCAH

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FMLDB1117A1V8AAH Thru FMLDB1117AADJCAH

1.0A Low Voltage Difference Bipolar
Fixed And Adjustable Voltage Regulators

Package outline

Features

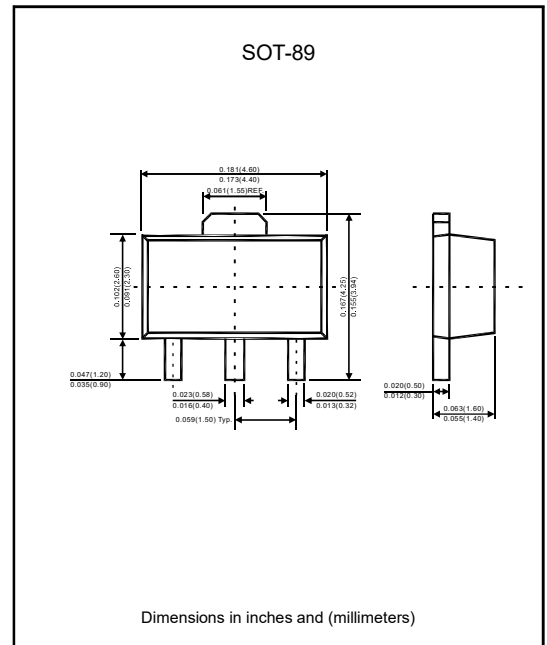
- Low Dropout Voltage: 1.3V_(typ.) at 0.8A Output Current.
- Thermal Shutdown.
- Three-Terminal Adjustable to 1.8V, 3.3V, 5V.
- Lead-free parts meet RoHS requirement.
- Halogen-free (IEC61249-2-21).

Applications

- PC Motherboard.
- LCD Monitor.
- Graphic Card.
- ADSL Modem.
- Printer and other peripheral Equipment.

Mechanical data

- Epoxy:UL94-V0 rated flame retardant.
- Case : Molded plastic, SOT-89.
- Weight : Approximated 53mg.



General Description

The FMLDB1117A~~XXXX~~AH series is a group of low dropout three-terminal regulators with a dropout of 1.3V_(typ.) at 0.8A output current. The FMLDB1117A~~XXXX~~AH series is available in an adjustable version, which can set the output voltage from 1.25V to 12V with only two external resistors. In addition, it is available in five fixed voltages : 1.8 V, 3.3 V and 5 V. The FMLDB1117A~~XXXX~~AH series offer thermal shutdown protection. Its circuit includes a Zener trimmed band gap reference to assure output voltage accuracy to within $\pm 2\%$. A minimum of 10 μ F tantalum capacitor is required at the output to improve the transient response and stability.

Maximum ratings (T_A=25°C, unless otherwise note)

Parameter	Symbol	Ratings	Unit
Input voltage	V _{IN}	20	V
Power dissipation	P _D	0.5	W
Electrostatic discharge (Note 4)	V _{ESD-HBM}	8	KV
Thermal resistance from junction to ambient	R _{θJA}	250	°C/W
Thermal resistance from junction to case	R _{θJC}	52.5	°C/W
Operating ambient temperature range (Note 4)	T _{OPT}	-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 :

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.

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Electrical characteristics (T_J=25°C Unless otherwise specified)

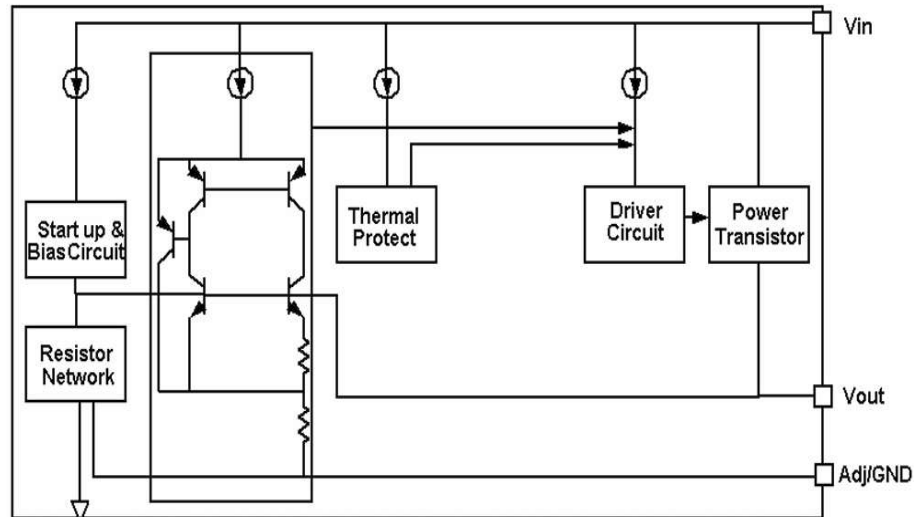
Parameter	Symbol	Part No.	Conditions	Min	Typ	Max	Unit
Reference voltage	V _{IROC}	FMLDB1117AADJCAH	I _{OUT} =10mA, V _{IN} =3.25V	1.225	1.25	1.275	V
			10mA≤I _{OUT} ≤1A, 2.75V≤V _{IN} -V _{OUT} ≤2V	1.219	1.25	1.281	
Output voltage	V _O	FMLDB1117A1V8AAH	I _{OUT} =10mA, V _{IN} =3.8V	1.764	1.80	1.836	V
			10mA≤I _{OUT} ≤1A, 3.3V≤V _{IN} ≤12V	1.755	1.80	1.845	
		FMLDB1117A3V3AAH	I _{OUT} =10mA, V _{IN} =5.3V	3.234	3.30	3.366	
			10mA≤I _{OUT} ≤1A, 4.8V≤V _{IN} ≤12V	3.218	3.30	3.382	
		FMLDB1117A5V0AAH	I _{OUT} =10mA, V _{IN} =7.0V	4.900	5.00	5.100	
			10mA≤I _{OUT} ≤1A, 6.5V≤V _{IN} ≤12V	4.875	5.00	5.125	
Line regulation	LNR	FMLDB1117AADJCAH	I _{OUT} =10mA, 1.5V≤V _{IN} -V _{OUT} ≤10.75V		0.03	0.2	%
		FMLDB1117A1V8AAH	I _{OUT} =10mA, 1.5V≤V _{IN} -V _{OUT} ≤10.2V		5	31	
		FMLDB1117A3V3AAH	I _{OUT} =10mA, 1.5V≤V _{IN} -V _{OUT} ≤8.7V		7	50	mV
		FMLDB1117A5V0AAH	I _{OUT} =10mA, 1.5V≤V _{IN} -V _{OUT} ≤7.0V		8	55	
Load regulation	LDR	FMLDB1117AADJCAH	V _{IN} -V _{OUT} =1.5V, 10mA≤I _{OUT} ≤1A		0.2	0.4	%
		FMLDB1117A1V8AAH			3	12	
		FMLDB1117A3V3AAH			6	24	
		FMLDB1117A5V0AAH			9	36	
Dropout voltage	V _D		I _{OUT} =1A		1.3	1.5	V
Adjust pin current	I _{ADJ}	FMLDB1117AADJCAH	V _{IN} =5V, I _{OUT} =10mA		55	120	μA
			V _{IN} =5V, I _{OUT} =1A		55	120	
I _{ADJ} change	I _{change}	FMLDB1117AADJCAH	V _{IN} =5V 10mA≤I _{OUT} ≤1A		0.2	10	μA
Minimum Load Current	I _L	FMLDB1117AADJCAH			2	10	mA
Quiescent Current	I _Q	FMLDB1117A1V8AAH	V _{IN} =12V		2	5	mA
		FMLDB1117A3V3AAH			2	5	
		FMLDB1117A5V0AAH			2	5	
Ripple rejection	RR		f=1kHz, C _{IN} =10μF/25V, C _{OUT} =10μF/25V, V _{IN} -V _{OUT} =2V, I _{OUT} =10mA		60		dB

Note : With package soldering to copper area over backside ground plane or internal power plane R_{θJA} can vary from 46 °C/W to >90°C/W depending on mounting technique and the size of the copper area.

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Functional block diagram



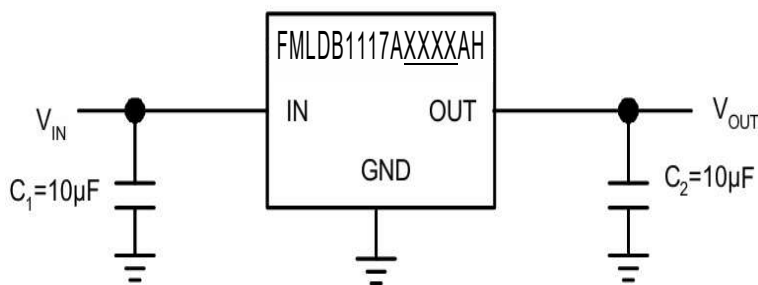
Detailed description

FMLDB1117A_{XXXX}AH 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, bandgap, 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 bandgap 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.

Typical application

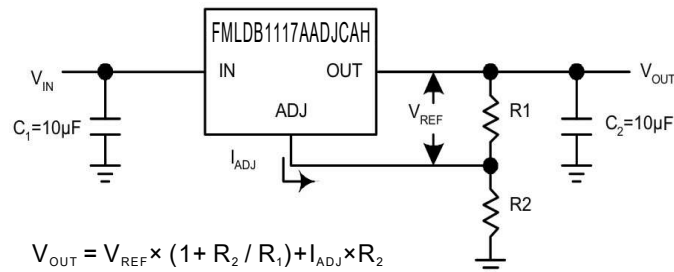
Fixed output voltage version



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

Typical application

Adjustable Output Voltage Version



The output voltage of adjustable version follows the equation: $V_{OUT} = 1.25 \times (1 + R_2 / R_1) + I_{ADJ} \times R_2$. We can ignore I_{ADJ} because I_{ADJ} (about 50µA) is much less than the current of R1 (about 2~10mA).

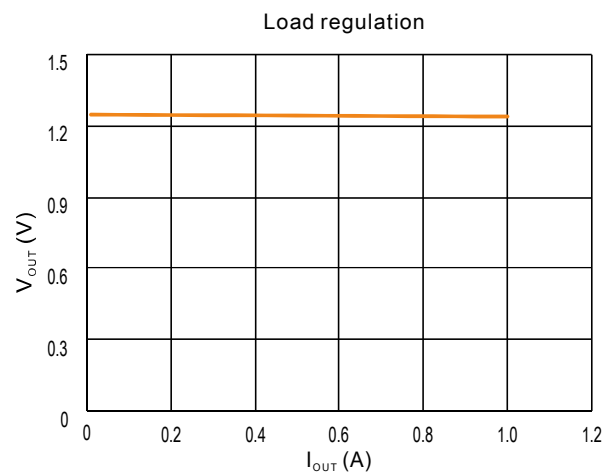
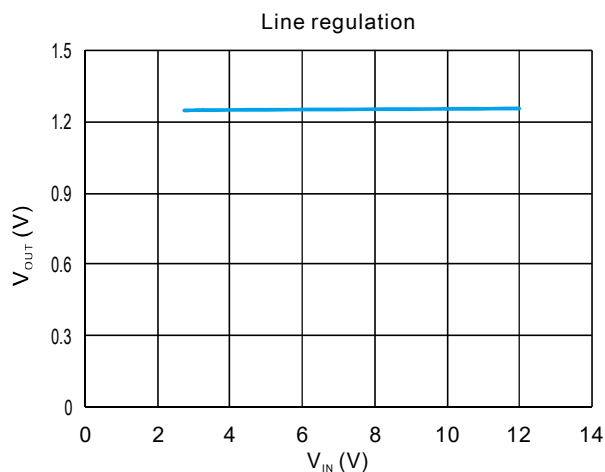
1. To meet the minimum load current (>10mA) requirement, R1 is recommended to be 125ohm or lower. As FMLDB1117AADJCAH can keep itself stable at load current about 2mA, R1 is not allowed to be higher than 625ohm.
2. Using a bypass capacitor (C_{ADJ}) between the ADJ pin and ground can improve ripple rejection. 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 :

$$1 / (2\pi \times f_{ripple} \times C_{ADJ}) < R_1.$$

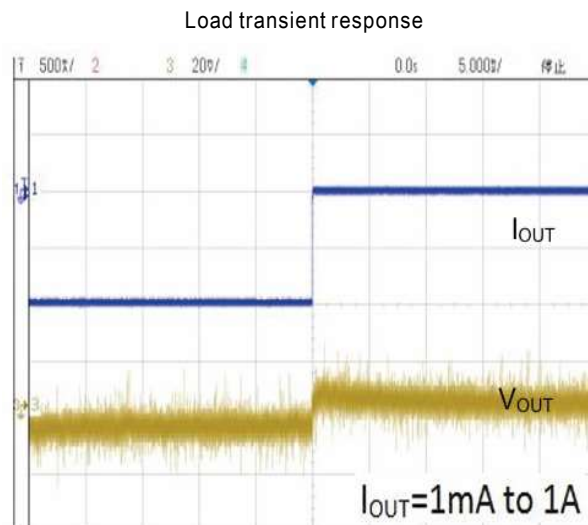
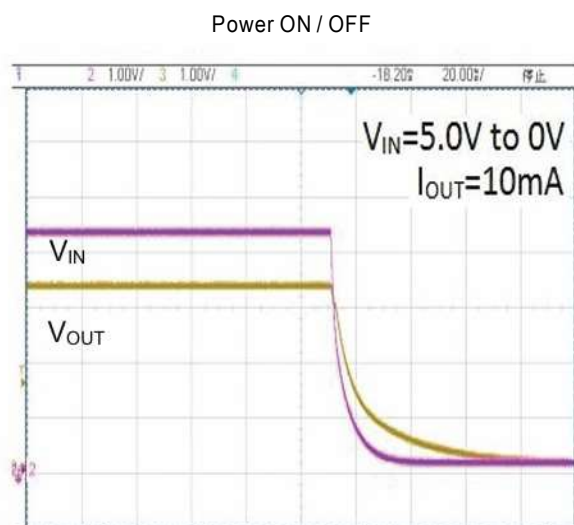
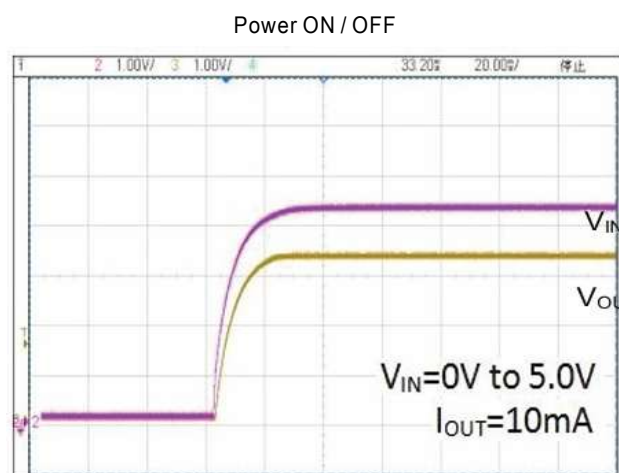
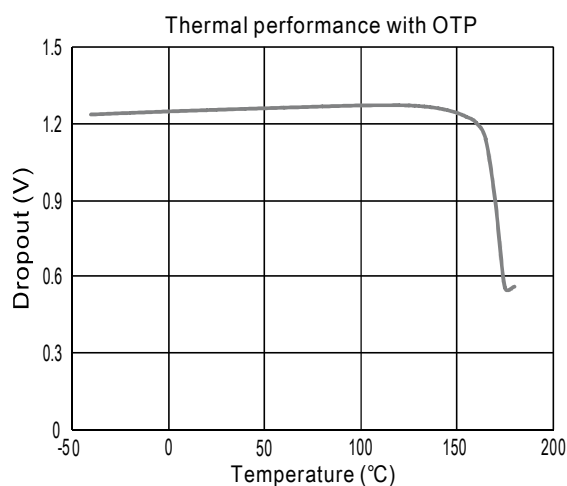
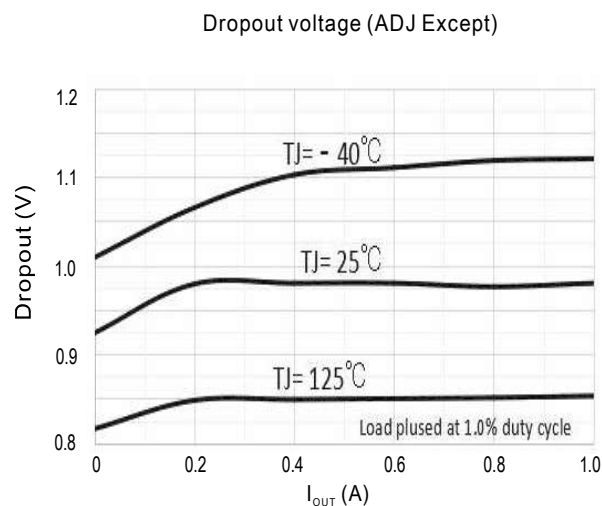
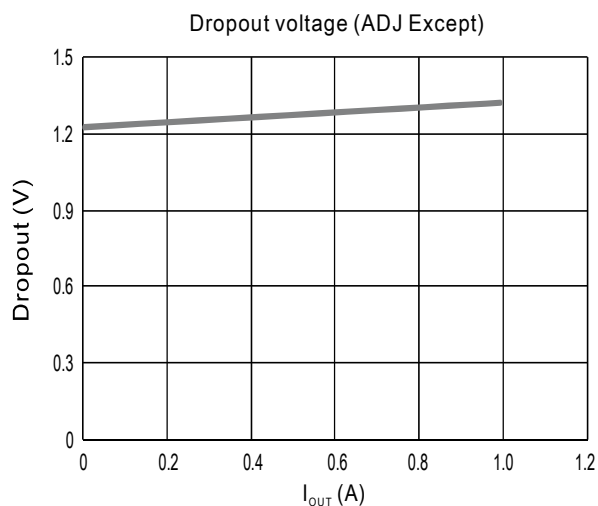
Thermal consideration

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 FMLDB1117AADJCAH is very large. FMLDB1117AADJCAH 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 x 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 are in PCB, the total thermal resistance will be as high as 120°C/W, then the power dissipation of FMLDB1117AADJCAH could allow on itself is less than 1W. And furthermore, FMLDB1117AADJCAH will work at junction temperature higher than 125°C under such condition and no lifetime is guaranteed.

Typical performance characteristics

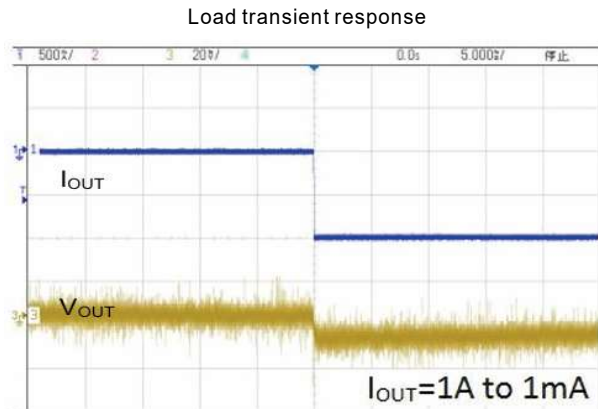


Typical performance characteristics



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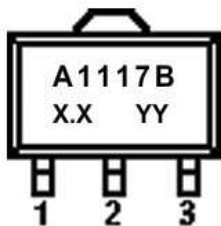
Typical performance characteristics



Pinning information

Pin	Simplified outline	Symbol
Pin 1 ADJ / GND Pin 2 OUT Pin 3 IN		

Marking

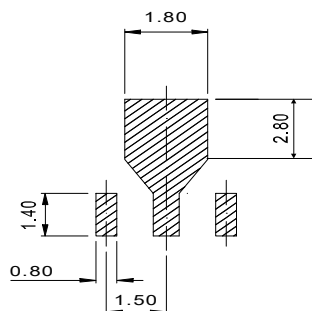


"A1117B": Device serial number.

"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

Suggested solder pad layout

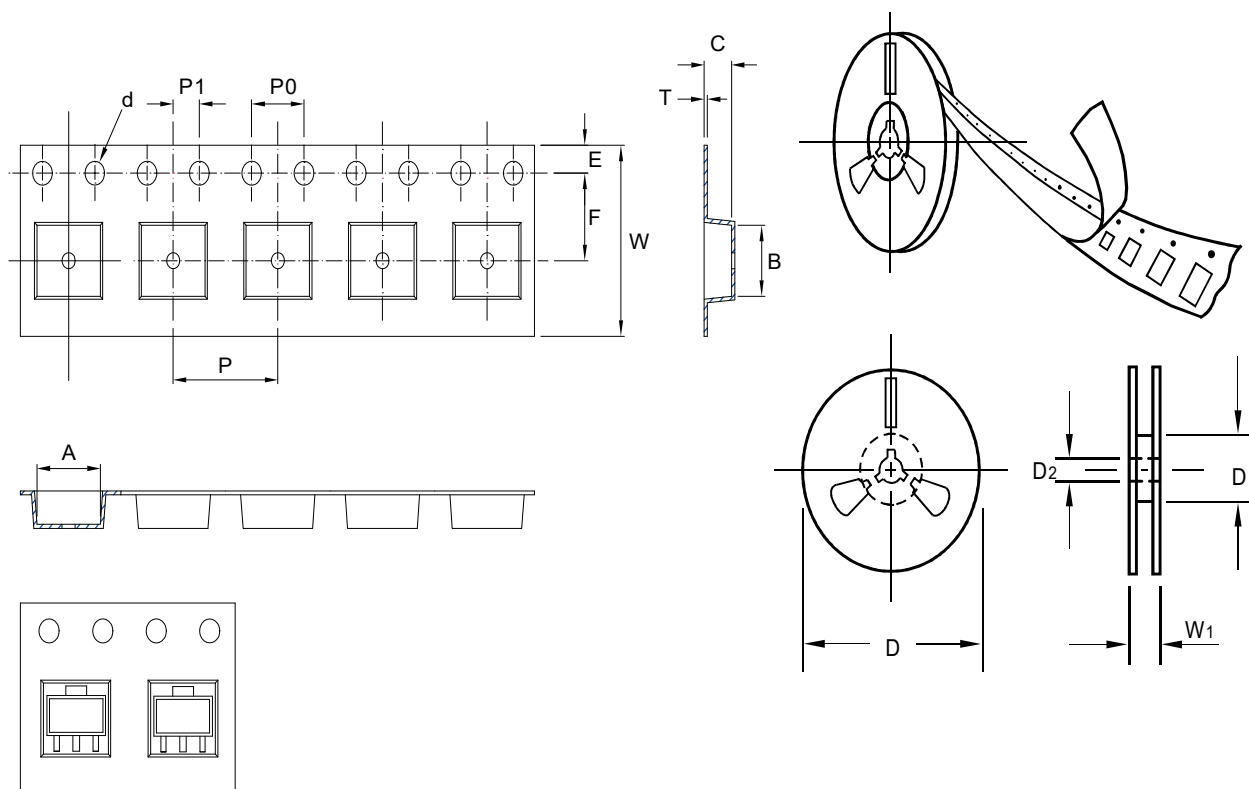


Note :

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

Dimensions in inches and (millimeters)

Packing information



Unit : mm

Item	Symbol	Tolerance	SOT-89
Carrier width	A	± 0.1	4.85
Carrier length	B	± 0.1	4.45
Carrier depth	C	± 0.1	1.85
Sprocket hole	d	± 0.1	1.50
7" Reel outside diameter	D	± 1.0	180.0
7" Reel inner diameter	D1	± 0.5	60.0
Feed hole diameter	D2	± 0.3	13.0
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	0.292
Tape width	W	± 0.5	12.0
Reel width	W1	± 0.5	16.5

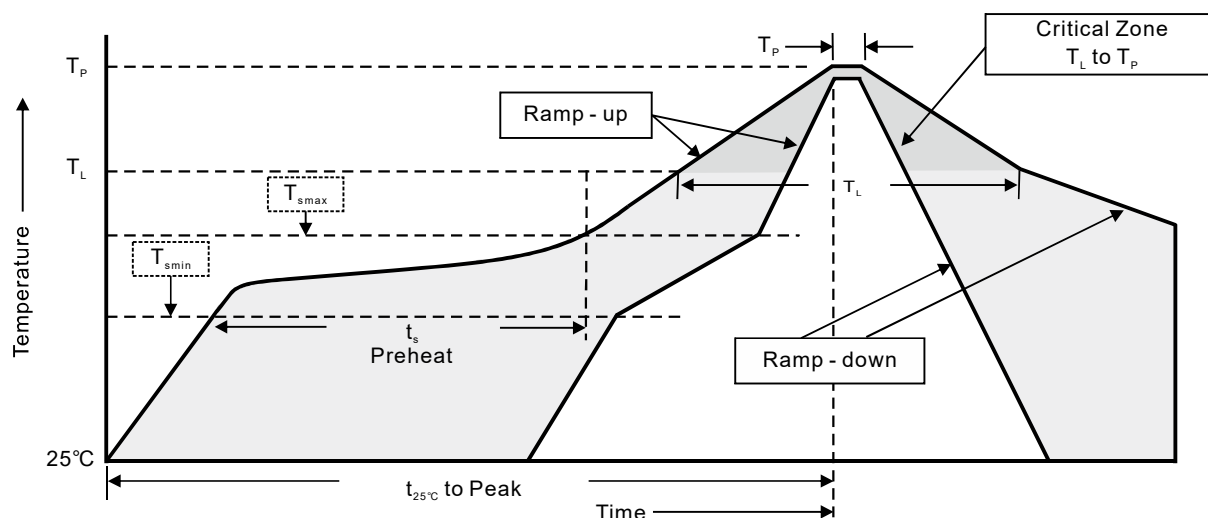
Note : Devices are packed in accordance with EIA standard RS-481-A and specifications listed above.

Reel packing

Package	Units (pcs)			Dimension (Unit : mm ³)		
	Reel	Inner Box	Outer Box	Reel DIA,	Inner Box	Outer Box
SOT-89	1,000	10,000	40,000	178 (7")	203 x 203 x 195	438 x 438 x 220

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