National Semiconductor

LMS8117A
1A Low-Dropout Linear Regulator

General Description

The LMS8117A is a series of low dropout voltage regulators with a dropout of 1.2V at 1A of load current. It has the same pin-out as National Semiconductor's industry standard LM317.

The LMS8117A is available in an adjustable version, which can set the output voltage from 1.25V to 13.8V with only two external resistors. In addition, it is also available in two fixed voltages, 1.8V and 3.3V.

The LMS8117A offers current limiting and thermal shutdown. Its circuit includes a zener trimmed bandgap reference to assure output voltage accuracy to within ±1%.

The LMS8117A series is available in SOT-223 and TO-252 D-PAK packages. A minimum of 10µF tantalum capacitor is required at the output to improve the transient response and stability.

Features

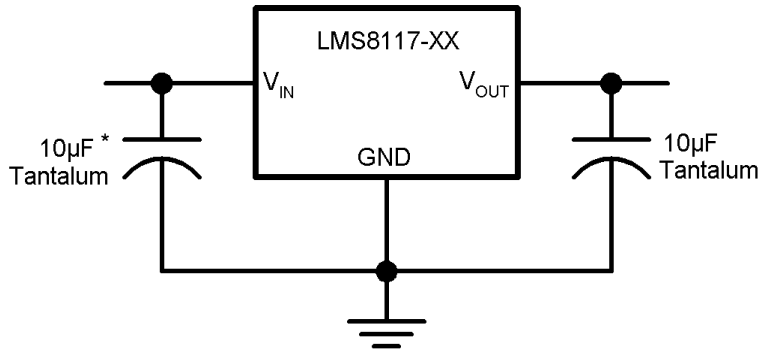
- Available in 1.8V, 3.3V, and Adjustable Versions
- Space Saving SOT-223 and TO-252 Packages
- Current Limiting and Thermal Protection
- Output Current 1A
- Temperature Range 0˚C to 125˚C
- Line Regulation 0.2% (Max)
- Load Regulation 0.4% (Max)

Applications

- Post Regulator for Switching DC/DC Converter
- High Efficiency Linear Regulators
- Battery Charger
- Battery Powered Instrumentation

Typical Application

Fixed Output Regulator



*Required if the regulator is located far from the power supply filter

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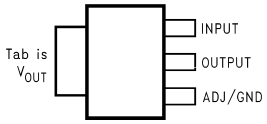
Ordering Information

Package	Temperature Range (T_J) 0˚C to +125˚C	Packaging Marking	Transport Media	NSC Drawing
3-lead SOT-223	LMS8117AMP-ADJ	LS0A	1k Tape and Reel	MP04A
	LMS8117AMPX-ADJ	LS0A	2k Tape and Reel	
	LMS8117AMP-1.8	LS00	1k Tape and Reel	
	LMS8117AMPX-1.8	LS00	2k Tape and Reel	
	LMS8117AMP-3.3	LS01	1k Tape and Reel	
	LMS8117AMPX-3.3	LS01	2k Tape and Reel	
3-lead TO-252	LMS8117ADT-ADJ	LMS8117ADT-ADJ	Rails	TD03B
	LMS8117ADTX-ADJ	LMS8117ADT-ADJ	2.5k Tape and Reel	
	LMS8117ADT-1.8	LMS8117ADT-1.8	Rails	
	LMS8117ADTX-1.8	LMS8117ADT-1.8	2.5k Tape and Reel	
	LMS8117ADT-3.3	LMS8117ADT-3.3	Rails	
	LMS8117ADTX-3.3	LMS8117ADT-3.3	2.5k Tape and Reel	

Connection Diagrams

SOT-223



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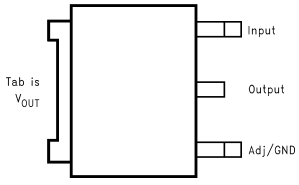
Top View

TO-252



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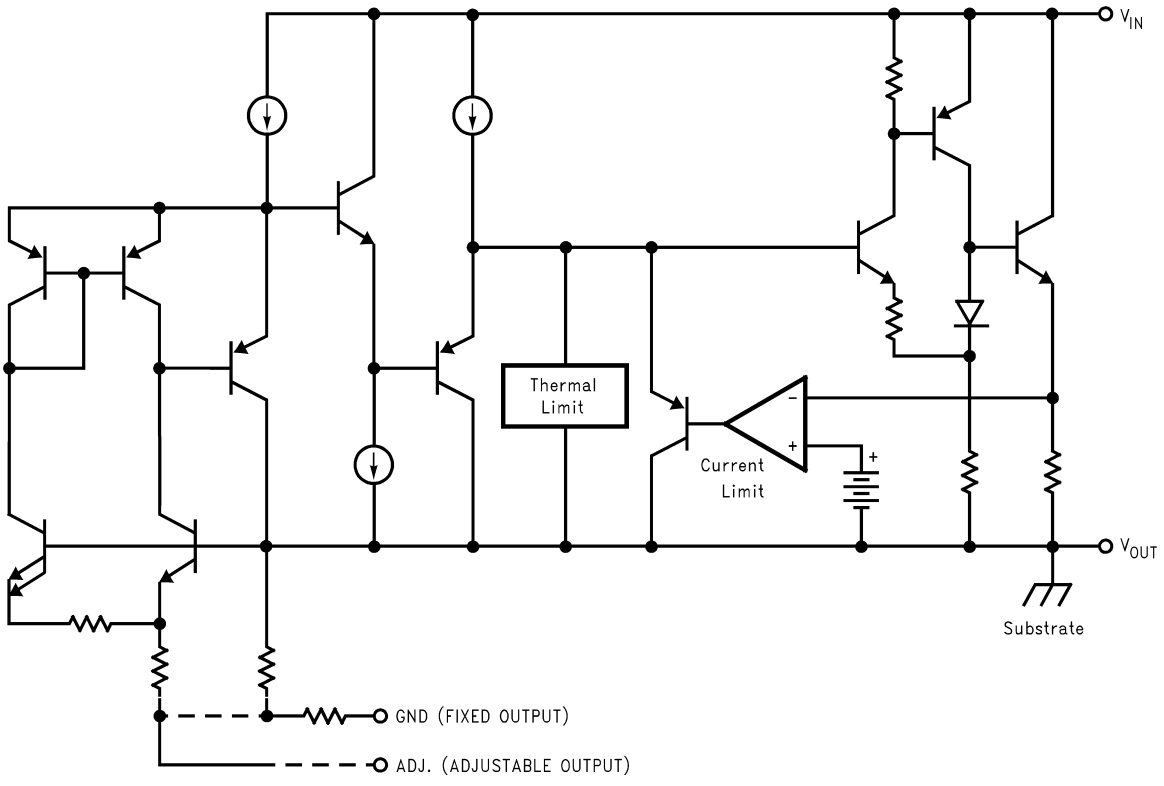
Top View

Block Diagram



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Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/ Distributors for availability and specifications.

Maximum Input Voltage (V_{IN} to GND)	
LMS8117A-ADJ, LMS8117A-1.8, LMS8117A-3.3	20V
Power Dissipation (Note 2)	Internally Limited
Junction Temperature (T_J) (Note 2)	150˚C
Storage Temperature Range	-65˚C to 150˚C
Soldering Information	
Infrared (20 sec)	235˚C
ESD Tolerance (Note 3)	2000V

Operating Ratings (Note 1)

Input Voltage (V_{IN} to GND)	
LMS8117A-ADJ, LMS8117A-1.8, LMS8117A-3.3	15V
Junction Temperature Range (T_J)(Note 2)	0˚C to 125˚C

Electrical Characteristics

Typicals and limits appearing in normal type apply for T_J = 25˚C. Limits appearing in **Boldface** type apply over the entire junction temperature range for operation, 0˚C to 125˚C.

Symbol	Parameter	Conditions	Min (Note 5)	Typ (Note 4)	Max (Note 5)	Units
V_{REF}	Reference Voltage	LMS8117A-ADJ				
		I_{OUT} = 10mA, V_{IN}-V_{OUT} = 2V, T_J = 25˚C	1.238	1.250	1.262	V
		10mA ≤ I_{OUT} ≤ 1A, 1.4V ≤ V_{IN}-V_{OUT} ≤ 10V	**1.225**	1.250	**1.270**	V
V_{OUT}	Output Voltage	LMS8117A-1.8				
		I_{OUT} = 10mA, V_{IN} = 3.8V, T_J = 25˚C	1.782	1.800	1.818	V
		0 ≤ I_{OUT} ≤ 1A, 3.2V ≤ V_{IN} ≤ 10V	**1.746**	1.800	**1.854**	V
		LMS8117A-3.3				
		I_{OUT} = 10mA, V_{IN} = 5V T_J = 25˚C	3.267	3.300	3.333	V
		0 ≤ I_{OUT} ≤ 1A, 4.75V ≤ V_{IN} ≤ 10V	**3.235**	3.300	**3.365**	V
ΔV_{OUT}	Line Regulation (Note 6)	LMS8117A-ADJ				
		I_{OUT} = 10mA, 1.5V ≤ V_{IN}-V_{OUT} ≤ 13.75V		0.035	**0.2**	%
		LMS8117A-1.8		1	**6**	mV
		I_{OUT} = 0mA, 3.2V ≤ V_{IN} ≤ 10V				
		LMS8117A-3.3				
		I_{OUT} = 0mA, 4.75V ≤ V_{IN} ≤ 15V		1	**6**	mV
ΔV_{OUT}	Load Regulation (Note 6)	LMS8117A-ADJ				
		V_{IN}-V_{OUT} = 3V, 10mA ≤ I_{OUT} ≤ 1A		0.2	**0.4**	%
		LMS8117A-1.8				
		V_{IN} = 3.2V, 0 ≤ I_{OUT} ≤ 1A		1	**10**	mV
		LMS8117A-3.3				
		V_{IN} = 4.75V, 0 ≤ I_{OUT} ≤ 1A		1	**10**	mV
V_{IN}-V_{OUT}	Dropout Voltage (Note 7)	I_{OUT} = 100mA		1.1	**1.15**	V
		I_{OUT} = 500mA		1.15	**1.2**	V
		I_{OUT} = 1A		1.2	**1.25**	V
I_{LIMIT}	Current Limit	V_{IN}-V_{OUT} = 5V, T_J = 25˚C	1.0	1.4	1.9	A
	Minimum Load Current (Note 8)	LMS8117A-ADJ				
		V_{IN} = 15V		1.7	**5**	mA
	Quiescent Current	LMS8117A-1.8		5	**10**	mA
		V_{IN} ≤ 15V				
		LMS8117A-3.3				
		V_{IN} ≤ 15V		5	**10**	mA
	Thermal Regulation	T_A = 25˚C, 30ms Pulse		0.01	0.1	%/W
	Ripple Regulation	f_{RIPPLE} = 120Hz, V_{IN}-V_{OUT} = 3V	**60**	75		dB
		V_{RIPPLE} = $1V_{PP}$				
	Adjust Pin Current			60	**120**	µA
	Adjust Pin Current Change	10mA ≤ I_{OUT} ≤ 1A,				
		1.4V ≤ V_{IN}-V_{OUT} ≤ 10V		0.2	**5**	µA

Electrical Characteristics (Continued)

Typicals and limits appearing in normal type apply for T_J = 25˚C. Limits appearing in **Boldface** type apply over the entire junction temperature range for operation, 0˚C to 125˚C.

Symbol	Parameter	Conditions	Min (Note 5)	Typ (Note 4)	Max (Note 5)	Units
	Temperature Stability			0.5		%
	Long Term Stability	T_A = 125˚C, 1000Hrs		0.3		%
	RMS Output Noise	(% of V_{OUT}), 10Hz ≤ f ≤ 10kHz		0.003		%
	Thermal Resistance Junction-to-Case	3-Lead SOT-223 3-Lead TO-252		15.0 10		˚C/W ˚C/W
	Thermal Resistance Junction-to-Ambient (No heat sink; No air flow)	3-Lead SOT-223 3-Lead TO-252 (Note 9)		136 92		˚C/W ˚C/W

Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but specific performance is not guaranteed. For guaranteed specifications and the test conditions, see the Electrical Characteristics.

Note 2: The maximum power dissipation is a function of $T_{J(MAX)}$, θ_{JA}, and T_A. The maximum allowable power dissipation at any ambient temperature is $P_D = (T_{J(MAX)} - T_A)/\theta_{JA}$. All numbers apply for packages soldered directly into a PC board.

Note 3: For testing purposes, ESD was applied using human body model, 1.5kΩ in series with 100pF.

Note 4: Typical Values represent the most likely parametric norm.

Note 5: All limits are guaranteed by testing or statistical analysis.

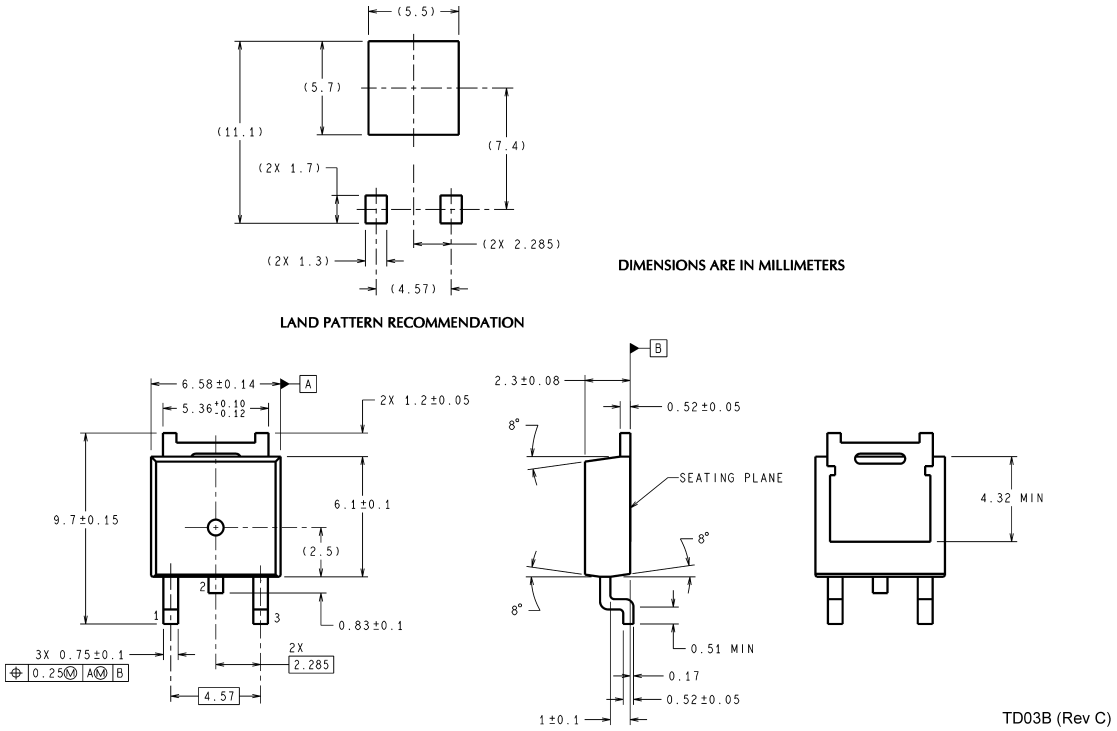
Note 6: Load and line regulation are measured at constant junction room temperature.

Note 7: The dropout voltage is the input/output differential at which the circuit ceases to regulate against further reduction in input voltage. It is measured when the output voltage has dropped 100mV from the nominal value obtained at $V_{IN} = V_{OUT}$ +1.5V.

Note 8: The minimum output current required to maintain regulation.

Note 9: Minimum pad size of $0.038in^2$

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



3-Lead TO-252
NS Package Number TD03B