

LM1117/LM1117I

800mA Low-Dropout Linear Regulator

General Description

The LM1117 is a series of low dropout voltage regulators with a dropout of 1.2V at 800mA of load current. It has the same pin-out as National Semiconductor's industry standard LM317.

The LM1117 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 five fixed voltages, 1.8V, 2.5V, 2.85V, 3.3V, and 5V.

The LM1117 offers current limiting and thermal shutdown. Its circuit includes a zener trimmed bandgap reference to assure output voltage accuracy to within $\pm 1\%$.

The LM1117 series is available in LLP, TO-263, SOT-223, TO-220, and TO-252 D-PAK packages. A minimum of 10 μ F tantalum capacitor is required at the output to improve the transient response and stability.

Features

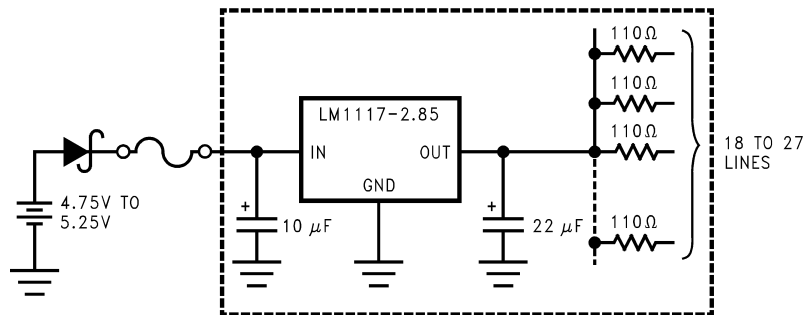
- Available in 1.8V, 2.5V, 2.85V, 3.3V, 5V, and Adjustable Versions
- Space Saving SOT-223 and LLP Packages
- Current Limiting and Thermal Protection
- Output Current 800mA
- Line Regulation 0.2% (Max)
- Load Regulation 0.4% (Max)
- Temperature Range
- LM1117 0°C to 125°C
- LM1117I -40°C to 125°C

Applications

- 2.85V Model for SCSI-2 Active Termination
- Post Regulator for Switching DC/DC Converter
- High Efficiency Linear Regulators
- Battery Charger
- Battery Powered Instrumentation

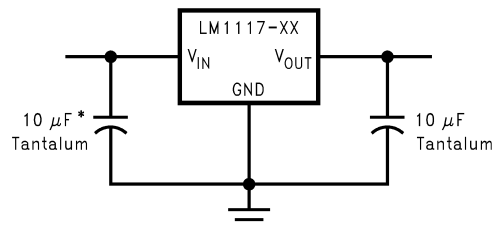
Typical Application

Active Terminator for SCSI-2 Bus



10091905

Fixed Output Regulator



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

10091928

Ordering Information

Package	Temperature Range	Part Number	Packaging Marking	Transport Media	NSC Drawing
3-lead SOT-223	0°C to +125°C	LM1117MPX-ADJ	N03A	Tape and Reel	MP04A
		LM1117MPX-1.8	N12A	Tape and Reel	
		LM1117MPX-2.5	N13A	Tape and Reel	
		LM1117MPX-2.85	N04A	Tape and Reel	
		LM1117MPX-3.3	N05A	Tape and Reel	
		LM1117MPX-5.0	N06A	Tape and Reel	
	-40°C to +125°C	LM1117IMPX-ADJ	N03B	Tape and Reel	
		LM1117IMPX-3.3	N05B	Tape and Reel	
		LM1117IMPX-5.0	N06B	Tape and Reel	
3-lead TO-220	0°C to +125°C	LM1117T-ADJ	LM1117T-ADJ	Rails	T03B
		LM1117T-1.8	LM1117T-1.8	Rails	
		LM1117T-2.5	LM1117T-2.5	Rails	
		LM1117T-2.85	LM1117T-2.85	Rails	
		LM1117T-3.3	LM1117T-3.3	Rails	
		LM1117T-5.0	LM1117T-5.0	Rails	
3-lead TO-252	0°C to +125°C	LM1117DTX-ADJ	LM1117DT-ADJ	Tape and Reel	TD03B
		LM1117DTX-1.8	LM1117DT-1.8	Tape and Reel	
		LM1117DTX-2.5	LM1117DT-2.5	Tape and Reel	
		LM1117DTX-2.85	LM1117DT-2.85	Tape and Reel	
		LM1117DTX-3.3	LM1117DT-3.3	Tape and Reel	
		LM1117DTX-5.0	LM1117DT-5.0	Tape and Reel	
	-40°C to +125°C	LM1117IDTX-ADJ	LM1117IDT-ADJ	Tape and Reel	
		LM1117IDTX-3.3	LM1117IDT-3.3	Tape and Reel	
		LM1117IDTX-5.0	LM1117IDT-5.0	Tape and Reel	
8-lead LLP	0°C to +125°C	LM1117LDX-ADJ	1117ADJ	Tape and Reel	LDC08A
		LM1117LDX-1.8	1117-18	Tape and Reel	
		LM1117LDX-2.5	1117-25	Tape and Reel	
		LM1117LDX-2.85	1117-28	Tape and Reel	
		LM1117LDX-3.3	1117-33	Tape and Reel	
		LM1117LDX-5.0	1117-50	Tape and Reel	
	-40°C to 125°C	LM1117ILDY-ADJ	1117IAD	Tape and Reel	
		LM1117ILDY-3.3	1117I33	Tape and Reel	
		LM1117ILDY-5.0	1117I50	Tape and Reel	
TO-263	0°C to +125°C	LM1117SX-ADJ	LM1117SADJ	Tape and Reel	TS3B
		LM1117SX-2.85	LM1117S2.85	Tape and Reel	
		LM1117SX-3.3	LM1117S3.3	Tape and Reel	
		LM1117SX-5.0	LM1117S5.0	Tape and Reel	

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)	20V
Power Dissipation (Note 2)	Internally Limited
Junction Temperature (T_J) (Note 2)	150°C
Storage Temperature Range	-65°C to 150°C
Lead Temperature	

TO-220 (T) Package	260°C, 10 sec
SOT-223 (IMP) Package	260°C, 4 sec
ESD Tolerance (Note 3)	2000V

Operating Ratings (Note 1)

Input Voltage (V_{IN} to GND)	15V
Junction Temperature Range (T_J)(Note 2)	
LM1117	0°C to 125°C
LM1117I	-40°C to 125°C

LM1117 Electrical Characteristics

Typicals and limits appearing in normal type apply for $T_J = 25^\circ\text{C}$. 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	LM1117-ADJ $I_{OUT} = 10\text{mA}$, $V_{IN}-V_{OUT} = 2\text{V}$, $T_J = 25^\circ\text{C}$	1.238	1.250	1.262	V
		$10\text{mA} \leq I_{OUT} \leq 800\text{mA}$, $1.4\text{V} \leq V_{IN}-V_{OUT} \leq 10\text{V}$	1.225	1.250	1.270	V
V_{OUT}	Output Voltage	LM1117-1.8 $I_{OUT} = 10\text{mA}$, $V_{IN} = 3.8\text{V}$, $T_J = 25^\circ\text{C}$ $0 \leq I_{OUT} \leq 800\text{mA}$, $3.2\text{V} \leq V_{IN} \leq 10\text{V}$	1.782	1.800	1.818	V
			1.746	1.800	1.854	V
		LM1117-2.5 $I_{OUT} = 10\text{mA}$, $V_{IN} = 4.5\text{V}$, $T_J = 25^\circ\text{C}$ $0 \leq I_{OUT} \leq 800\text{mA}$, $3.9\text{V} \leq V_{IN} \leq 10\text{V}$	2.475	2.500	2.525	V
			2.450	2.500	2.550	V
		LM1117-2.85 $I_{OUT} = 10\text{mA}$, $V_{IN} = 4.85\text{V}$, $T_J = 25^\circ\text{C}$ $0 \leq I_{OUT} \leq 800\text{mA}$, $4.25\text{V} \leq V_{IN} \leq 10\text{V}$ $0 \leq I_{OUT} \leq 500\text{mA}$, $V_{IN} = 4.10\text{V}$	2.820	2.850	2.880	V
			2.790	2.850	2.910	V
			2.790	2.850	2.910	V
		LM1117-3.3 $I_{OUT} = 10\text{mA}$, $V_{IN} = 5\text{V}$, $T_J = 25^\circ\text{C}$ $0 \leq I_{OUT} \leq 800\text{mA}$, $4.75\text{V} \leq V_{IN} \leq 10\text{V}$	3.267	3.300	3.333	V
			3.235	3.300	3.365	V
		LM1117-5.0 $I_{OUT} = 10\text{mA}$, $V_{IN} = 7\text{V}$, $T_J = 25^\circ\text{C}$ $0 \leq I_{OUT} \leq 800\text{mA}$, $6.5\text{V} \leq V_{IN} \leq 12\text{V}$	4.950	5.000	5.050	V
	4.900	5.000	5.100	V		
ΔV_{OUT}	Line Regulation (Note 6)	LM1117-ADJ $I_{OUT} = 10\text{mA}$, $1.5\text{V} \leq V_{IN}-V_{OUT} \leq 13.75\text{V}$		0.035	0.2	%
		LM1117-1.8 $I_{OUT} = 0\text{mA}$, $3.2\text{V} \leq V_{IN} \leq 10\text{V}$		1	6	mV
		LM1117-2.5 $I_{OUT} = 0\text{mA}$, $3.9\text{V} \leq V_{IN} \leq 10\text{V}$		1	6	mV
		LM1117-2.85 $I_{OUT} = 0\text{mA}$, $4.25\text{V} \leq V_{IN} \leq 10\text{V}$		1	6	mV
		LM1117-3.3 $I_{OUT} = 0\text{mA}$, $4.75\text{V} \leq V_{IN} \leq 15\text{V}$		1	6	mV
		LM1117-5.0 $I_{OUT} = 0\text{mA}$, $6.5\text{V} \leq V_{IN} \leq 15\text{V}$		1	10	mV

LM1117 Electrical Characteristics (Continued)

Typicals and limits appearing in normal type apply for $T_J = 25^\circ\text{C}$. 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	
ΔV_{OUT}	Load Regulation (Note 6)	LM1117-ADJ $V_{IN}-V_{OUT} = 3V, 10 \leq I_{OUT} \leq 800\text{mA}$		0.2	0.4	%	
		LM1117-1.8 $V_{IN} = 3.2V, 0 \leq I_{OUT} \leq 800\text{mA}$		1	10	mV	
		LM1117-2.5 $V_{IN} = 3.9V, 0 \leq I_{OUT} \leq 800\text{mA}$		1	10	mV	
		LM1117-2.85 $V_{IN} = 4.25V, 0 \leq I_{OUT} \leq 800\text{mA}$		1	10	mV	
		LM1117-3.3 $V_{IN} = 4.75V, 0 \leq I_{OUT} \leq 800\text{mA}$		1	10	mV	
		LM1117-5.0 $V_{IN} = 6.5V, 0 \leq I_{OUT} \leq 800\text{mA}$		1	15	mV	
		$V_{IN}-V_{OUT}$	Dropout Voltage (Note 7)	$I_{OUT} = 100\text{mA}$		1.10	1.20
$I_{OUT} = 500\text{mA}$				1.15	1.25	V	
$I_{OUT} = 800\text{mA}$				1.20	1.30	V	
I_{LIMIT}	Current Limit	$V_{IN}-V_{OUT} = 5V, T_J = 25^\circ\text{C}$	800	1200	1500	mA	
	Minimum Load Current (Note 8)	LM1117-ADJ $V_{IN} = 15V$		1.7	5	mA	
	Quiescent Current	LM1117-1.8 $V_{IN} \leq 15V$			5	10	mA
		LM1117-2.5 $V_{IN} \leq 15V$			5	10	mA
		LM1117-2.85 $V_{IN} \leq 10V$			5	10	mA
		LM1117-3.3 $V_{IN} \leq 15V$			5	10	mA
		LM1117-5.0 $V_{IN} \leq 15V$			5	10	mA
		Thermal Regulation	$T_A = 25^\circ\text{C}, 30\text{ms Pulse}$		0.01	0.1	%/W
	Ripple Regulation	$f_{RIPPLE} = 1\text{ 20Hz}, V_{IN}-V_{OUT} = 3V, V_{RIPPLE} = 1V_{PP}$	60	75		dB	
	Adjust Pin Current			60	120	μA	
	Adjust Pin Current Change	$10 \leq I_{OUT} \leq 800\text{mA}, 1.4V \leq V_{IN}-V_{OUT} \leq 10V$		0.2	5	μA	
	Temperature Stability			0.5		%	
	Long Term Stability	$T_A = 125^\circ\text{C}, 1000\text{Hrs}$		0.3		%	
	RMS Output Noise	(% of V_{OUT}), $10\text{Hz} \leq f \leq 10\text{kHz}$		0.003		%	
	Thermal Resistance Junction-to-Case	3-Lead SOT-223			15.0		$^\circ\text{C/W}$
		3-Lead TO-220			3.0		$^\circ\text{C/W}$
		3-Lead TO-252			10		$^\circ\text{C/W}$
Thermal Resistance Junction-to-Ambient (No air flow)	3-Lead SOT-223 (No heat sink)			136		$^\circ\text{C/W}$	
	3-Lead TO-220 (No heat sink)			79		$^\circ\text{C/W}$	
	3-Lead TO-252 (Note 9) (No heat sink)			92		$^\circ\text{C/W}$	
	3-Lead TO-263			55		$^\circ\text{C/W}$	
	8-Lead LLP (Note 10)			40		$^\circ\text{C/W}$	

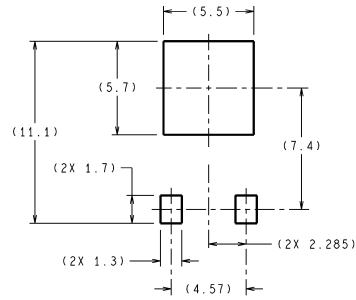
LM1117I Electrical Characteristics

Typicals and limits appearing in normal type apply for $T_J = 25^\circ\text{C}$. Limits appearing in **Boldface** type apply over the entire junction temperature range for operation, -40°C to 125°C .

Symbol	Parameter	Conditions	Min (Note 5)	Typ (Note 4)	Max (Note 5)	Units	
V_{REF}	Reference Voltage	LM1117I-ADJ $I_{OUT} = 10\text{mA}$, $V_{IN}-V_{OUT} = 2\text{V}$, $T_J = 25^\circ\text{C}$	1.238	1.250	1.262	V	
		$10\text{mA} \leq I_{OUT} \leq 800\text{mA}$, $1.4\text{V} \leq V_{IN}-V_{OUT} \leq 10\text{V}$	1.200	1.250	1.290	V	
V_{OUT}	Output Voltage	LM1117I-3.3 $I_{OUT} = 10\text{mA}$, $V_{IN} = 5\text{V}$, $T_J = 25^\circ\text{C}$	3.267	3.300	3.333	V	
		$0 \leq I_{OUT} \leq 800\text{mA}$, $4.75\text{V} \leq V_{IN} \leq 10\text{V}$	3.168	3.300	3.432	V	
		LM1117I-5.0 $I_{OUT} = 10\text{mA}$, $V_{IN} = 7\text{V}$, $T_J = 25^\circ\text{C}$	4.950	5.000	5.050	V	
		$0 \leq I_{OUT} \leq 800\text{mA}$, $6.5\text{V} \leq V_{IN} \leq 12\text{V}$	4.800	5.000	5.200	V	
ΔV_{OUT}	Line Regulation (Note 6)	LM1117I-ADJ $I_{OUT} = 10\text{mA}$, $1.5\text{V} \leq V_{IN}-V_{OUT} \leq 13.75\text{V}$		0.035	0.3	%	
		LM1117I-3.3 $I_{OUT} = 0\text{mA}$, $4.75\text{V} \leq V_{IN} \leq 15\text{V}$		1	10	mV	
		LM1117I-5.0 $I_{OUT} = 0\text{mA}$, $6.5\text{V} \leq V_{IN} \leq 15\text{V}$		1	15	mV	
ΔV_{OUT}	Load Regulation (Note 6)	LM1117I-ADJ $V_{IN}-V_{OUT} = 3\text{V}$, $10 \leq I_{OUT} \leq 800\text{mA}$		0.2	0.5	%	
		LM1117I-3.3 $V_{IN} = 4.75\text{V}$, $0 \leq I_{OUT} \leq 800\text{mA}$		1	15	mV	
		LM1117I-5.0 $V_{IN} = 6.5\text{V}$, $0 \leq I_{OUT} \leq 800\text{mA}$		1	20	mV	
$V_{IN}-V_{OUT}$	Dropout Voltage (Note 7)	$I_{OUT} = 100\text{mA}$		1.10	1.30	V	
		$I_{OUT} = 500\text{mA}$		1.15	1.35	V	
		$I_{OUT} = 800\text{mA}$		1.20	1.40	V	
I_{LIMIT}	Current Limit	$V_{IN}-V_{OUT} = 5\text{V}$, $T_J = 25^\circ\text{C}$	800	1200	1500	mA	
	Minimum Load Current (Note 8)	LM1117I-ADJ $V_{IN} = 15\text{V}$		1.7	5	mA	
	Quiescent Current	LM1117I-3.3 $V_{IN} \leq 15\text{V}$			5	15	mA
		LM1117I-5.0 $V_{IN} \leq 15\text{V}$			5	15	mA
	Thermal Regulation	$T_A = 25^\circ\text{C}$, 30ms Pulse		0.01	0.1	%/W	
	Ripple Regulation	$f_{RIPPLE} = 1\text{ 20Hz}$, $V_{IN}-V_{OUT} = 3\text{V}$ $V_{RIPPLE} = 1V_{PP}$	60	75		dB	
	Adjust Pin Current			60	120	μA	
	Adjust Pin Current Change	$10 \leq I_{OUT} \leq 800\text{mA}$, $1.4\text{V} \leq V_{IN}-V_{OUT} \leq 10\text{V}$		0.2	10	μA	
	Temperature Stability			0.5		%	
	Long Term Stability	$T_A = 125^\circ\text{C}$, 1000Hrs		0.3		%	
	RMS Output Noise	(% of V_{OUT}), $10\text{Hz} \leq f \leq 10\text{kHz}$		0.003		%	
	Thermal Resistance Junction-to-Case	3-Lead SOT-223			15.0		$^\circ\text{C/W}$
		3-Lead TO-252			10		$^\circ\text{C/W}$
	Thermal Resistance Junction-to-Ambient No air flow)	3-Lead SOT-223 (No heat sink)			136		$^\circ\text{C/W}$
		3-Lead TO-252 (No heat sink)(Note 9) 8-Lead LLP(Note 10)			92		$^\circ\text{C/W}$
				40		$^\circ\text{C/W}$	

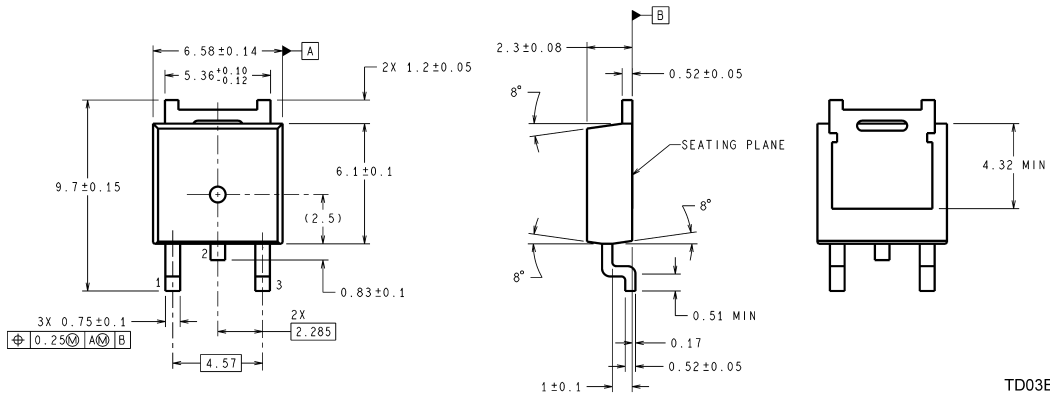
Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but specific performance is not guaranteed. For guaranteed specifications and the test conditions, see the Electrical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

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



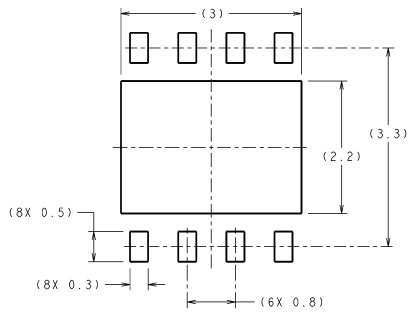
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LAND PATTERN RECOMMENDATION



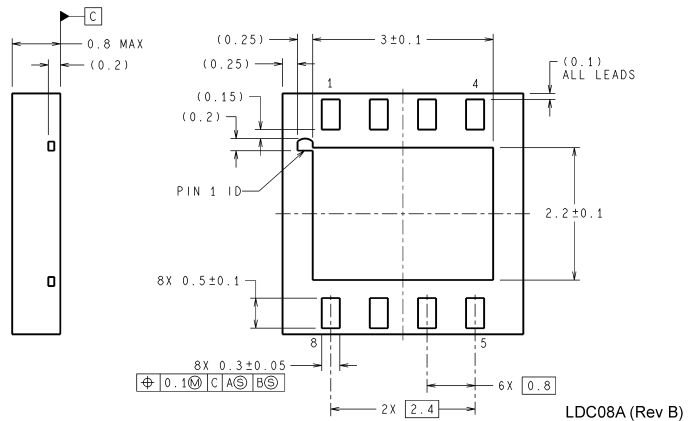
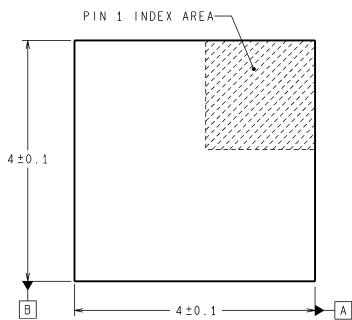
TD03B (Rev C)

3-Lead TO-252
NS Package Number TD03B



RECOMMENDED LAND PATTERN
1:1 RATION WITH PKG SOLDER PADS

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LDC08A (Rev B)

8-Lead LLP
NS Package Number LDC08A