



General Description

LD1117SxxTR is a series of low dropout three-terminal regulators with a dropout of 1.3V at 800mA load current. LD1117SxxTR features a very low standby current 2mA compared to 5mA of competitor.

Other than a fixed version, $V_{out} = 1.2V, 1.8V, 2.5V, 2.85V, 3.3V$, and 5V, LD1117SxxTR has an adjustable version, which can provide an output voltage from 1.25 to 12V with only two external resistors.

LD1117SxxTR offers thermal shut down function, to assure the stability of chip and power system. And it uses trimming technique to guarantee output voltage accuracy within 2%. Other output voltage accuracy can be customized on demand, such as 1%.

LD1117SxxTR is available in SOT-223 power package.

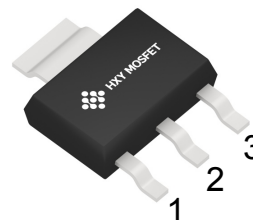
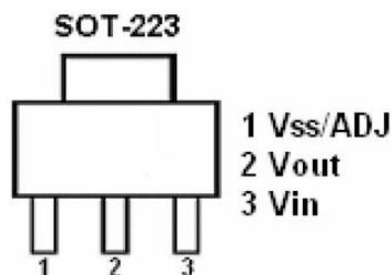
Features

- Maximum output current is 0.8A
- Range of operation input voltage: Max 15V
- Line regulation: 0.03%/V (typ.)
- Standby current: 2mA (typ.)
- Load regulation: 0.2%/A (typ.)
- Environment Temperature: -20°C~85°C

Application

- Power Management for Computer Mother Board, Graphic Card
- LCD Monitor and LCD TV
- DVD Decode Board
- ADSL Modem
- Post Regulators For Switching Supplies

Pin Configuration And Descriptions



Order Information

Orderable Device	Package	Output Voltage	Packing Option
LD1117SxxTR	SOT-223	1.2V, 1.8V, 2.5V, 2.85V, 3.3V, 5.0V, adj	2500/Reel

xx: From 12-50, ADJ



Absolute Maximum Ratings

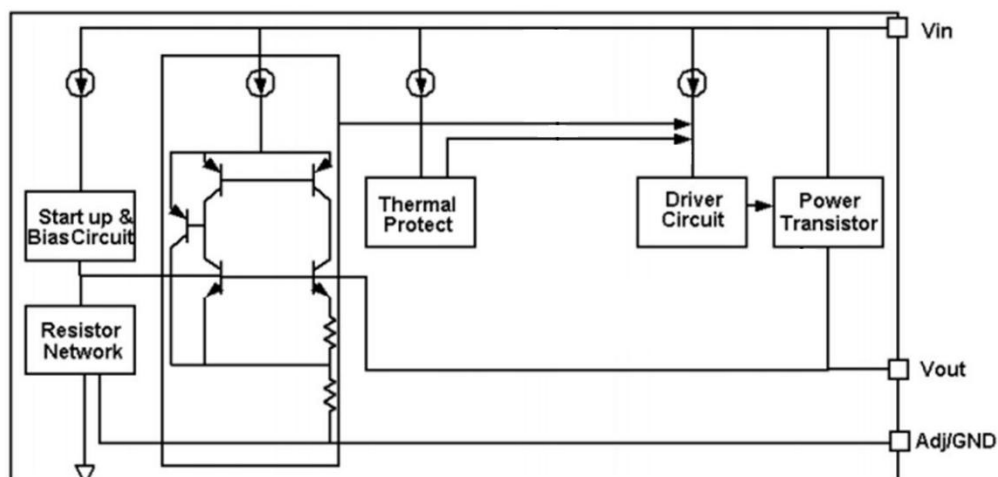
Description	Symbol	Value Range	Unit
MAX Input Voltage	V_{IN}	18	V
Max Operating Junction Temperature	T_j	150	°C
Storage Temperature	T_s	-55~+150	°C
Recommended operating junction temperature	T_j	-20~125	°C

Note: Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation 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.

Heat Dissipation

Description	Symbol	Package	Value Range	Unit
Thermal resistance	θ_{JA}	SOT-223	20	°C/W

Block Diagram





DC Characteristics (unless otherwise noted $T_A = 25^\circ\text{C}$)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Vref	Reference voltage	LD1117SADJTR $10\text{mA} \leq I_{\text{out}} \leq 800\text{mA}$, $V_{\text{in}} = 3.25\text{V}$	1.225	1.25	1.275	V
Vout	Output voltage	LD1117S12TR $0 \leq I_{\text{out}} \leq 800\text{mA}$, $V_{\text{in}} = 3.2\text{V}$	1.176	1.2	1.224	V
		LD1117S18TR $0 \leq I_{\text{out}} \leq 800\text{mA}$, $V_{\text{in}} = 3.8\text{V}$	1.764	1.8	1.836	V
		LD1117S25TR $0 \leq I_{\text{out}} \leq 800\text{mA}$, $V_{\text{in}} = 4.5\text{V}$	2.45	2.5	2.55	V
		TLD1117S285TR $0 \leq I_{\text{out}} \leq 800\text{mA}$, $V_{\text{in}} = 4.85\text{V}$	2.793	2.85	2.907	V
		LD1117S33TR $0 \leq I_{\text{out}} \leq 800\text{mA}$, $V_{\text{in}} = 5.3\text{V}$	3.234	3.3	3.366	V
		LD1117S50TR $0 \leq I_{\text{out}} \leq 800\text{mA}$, $V_{\text{in}} = 7.0\text{V}$	4.9	5	5.1	V
ΔV_{out}	Line regulation	LD1117S12TR $I_{\text{out}} = 10\text{mA}$, $2.7\text{V} \leq V_{\text{in}} \leq 10\text{V}$		0.03	0.2	%/V
		LD1117SADJTR $I_{\text{out}} = 10\text{mA}$, $2.75\text{V} \leq V_{\text{in}} \leq 12\text{V}$		0.03	0.2	%/V
		LD1117S18TR $I_{\text{out}} = 10\text{mA}$, $3.3\text{V} \leq V_{\text{in}} \leq 12\text{V}$		0.03	0.2	%/V
		LD1117S25TR $I_{\text{out}} = 10\text{mA}$, $4.0\text{V} \leq V_{\text{in}} \leq 12\text{V}$		0.03	0.2	%/V
		LD1117S285TR $I_{\text{out}} = 10\text{mA}$, $4.35\text{V} \leq V_{\text{in}} \leq 12\text{V}$		0.03	0.2	%/V
		LD1117S33TR $I_{\text{out}} = 10\text{mA}$, $4.8\text{V} \leq V_{\text{in}} \leq 12\text{V}$		0.03	0.2	%/V
		LD1117S50TR $I_{\text{out}} = 10\text{mA}$, $6.5\text{V} \leq V_{\text{in}} \leq 12\text{V}$		0.03	0.2	%/V
ΔV_{out}	Load regulation	LD1117S12TR $V_{\text{in}} = 2.7\text{V}$, $10\text{mA} \leq I_{\text{out}} \leq 800\text{mA}$		2	8	mV
		LD1117SADJTR $V_{\text{in}} = 2.75\text{V}$, $10\text{mA} \leq I_{\text{out}} \leq 800\text{mA}$		2	8	mV
		LD1117S18TR $V_{\text{in}} = 3.3\text{V}$, $10\text{mA} \leq I_{\text{out}} \leq 800\text{mA}$		3	12	mV
		LD1117S25TR $V_{\text{in}} = 4.0\text{V}$, $10\text{mA} \leq I_{\text{out}} \leq 800\text{mA}$		4	16	mV
		LD1117S285TR $V_{\text{in}} = 4.35\text{V}$, $10\text{mA} \leq I_{\text{out}} \leq 800\text{mA}$		5	20	mV
		LD1117S33TR $V_{\text{in}} = 4.8\text{V}$, $10\text{mA} \leq I_{\text{out}} \leq 800\text{mA}$		6	24	mV
		LD1117S50TR $V_{\text{in}} = 6.5$, $10\text{mA} \leq I_{\text{out}} \leq 800\text{mA}$		9	36	mV



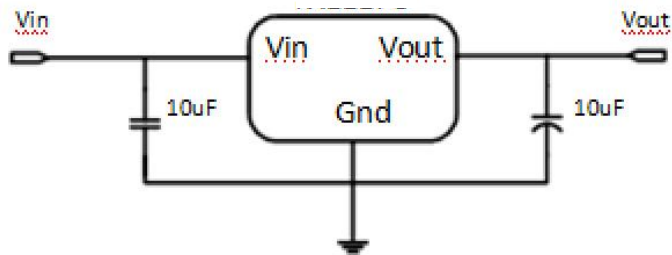
Vdrop	Dropout voltage	Iout =100mA		1.2	1.3	V
		Iout=800mA		1.3	1.5	V
Imin	Minimum load current	LD1117SADJTR		2	10	mA
Iq	Quiescent Current	LD1117S12TR,Vin=10V		2	5	mA
		LD1117S18TR,Vin=12V		2	5	mA
		LD1117S25TR,Vin=12V		2	5	mA
		LD1117S285TR,Vin=12V		2	5	mA
		LD1117S33TR,Vin=12V		2	5	mA
		LD1117S50TR,Vin=12V		2	5	mA
IAdj	Adjust pin current	LD1117SADJTR Vin=5V,10mA≤Iout≤800mA		55	120	uA
Ichange	Iadj change	LD1117SADJTR Vin=5V,10mA≤Iout≤800mA		0.2	10	uA
OTP	Thermal Shutdown	Junction Temperature		+200		℃
	Thermal Shutdown Hysteresis	Junction Temperature		+30		℃
ΔV/ΔT	Temperature coefficient			±100		ppm
θJC	Thermal resistance	SOT-223		20		℃/W

Note1: All test are conducted under ambient temperature 25℃ and within a short period of time 20ms

Note2: Load current smaller than minimum load current of LD1117SADJTR will lead to unstable or oscillation output.

Application Circuit

Basic Circuits



Application circuit of LD1117SxxTR fixed version



Function Description

LD1117SxxTR 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 drive circuit and so on.

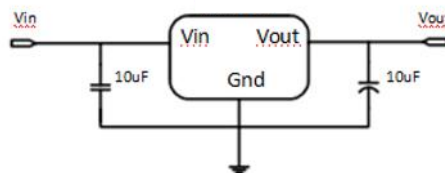
The thermal shut down module can assure chip and its application system working safety when the junction temperature is larger than 140°C.

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

LD1117SxxTR has an adjustable version and six fixed versions (1.2V, 1.8V, 2.5V, 2.85V, 3.3V and 5V)

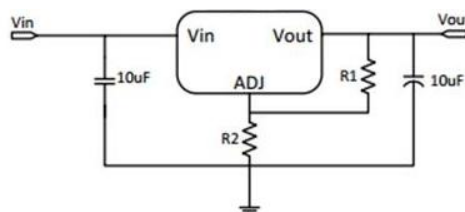
Fixed Output Voltage Version



Application circuit of LD1117SxxTR fixed 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.

Adjustable Output Voltage Version



Application Circuit of LD1117SADJTR

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 50uA) is much less than the current of R_1 (about 2~10mA).

1) To meet the minimum load current (>10mA) requirement, R_1 is recommended to be 125ohm or lower. As LD1117SADJTR can keep itself stable at load current about 2mA, R_1 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 R_1 to prevent ripple from being amplified. As R_1 is normally in the range of 100Ω~500Ω, the value of C_{ADJ} should satisfy this equation: $1/(2\pi \times f_{ripple} \times C_{ADJ}) < R_1$.

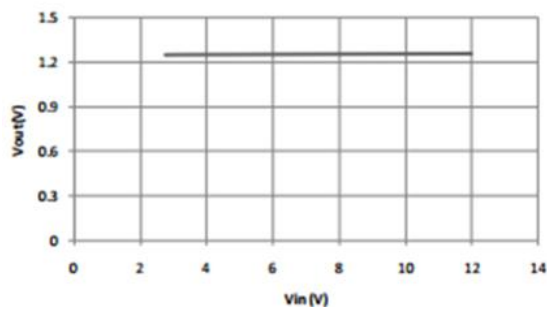


Thermal Considerations

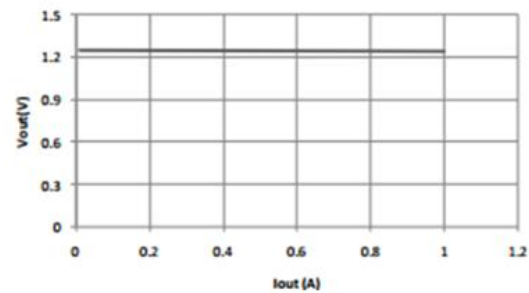
We have to take heat dissipation into great consideration when output current or differential voltage of input and output voltage is large. Because in such cases, the power dissipation consumed by LD1117SxxTR is very large. LD1117SxxTR series uses SOT-223 package type and its thermal resistance is about $20^{\circ}\text{C}/\text{W}$. And the copper area of application board can affect the total thermal resistance. If copper area is $5\text{cm} \times 5\text{cm}$ (two sides), the resistance is about $30^{\circ}\text{C}/\text{W}$. So the total thermal resistance is about $20^{\circ}\text{C}/\text{W} + 30^{\circ}\text{C}/\text{W}$. 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 $120^{\circ}\text{C}/\text{W}$, then the power dissipation of LD1117SxxTR could allow on itself is less than 1W. And furthermore, LD1117SxxTR will work at junction temperature higher than 125°C under such condition and no lifetime is guaranteed.

Typical Characteristics

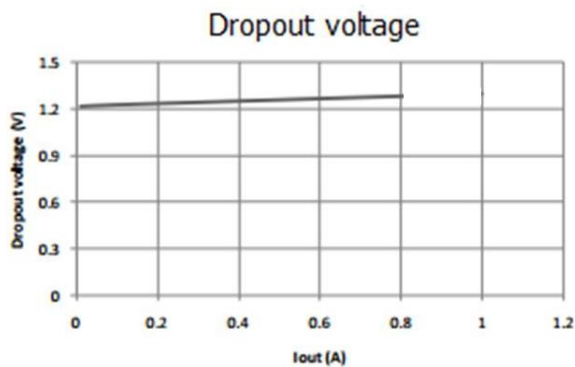
Line regulation



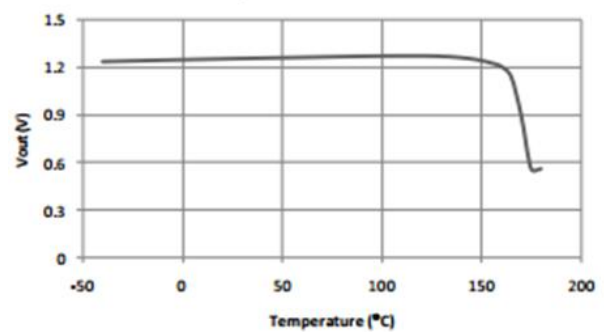
Load regulation



Dropout voltage

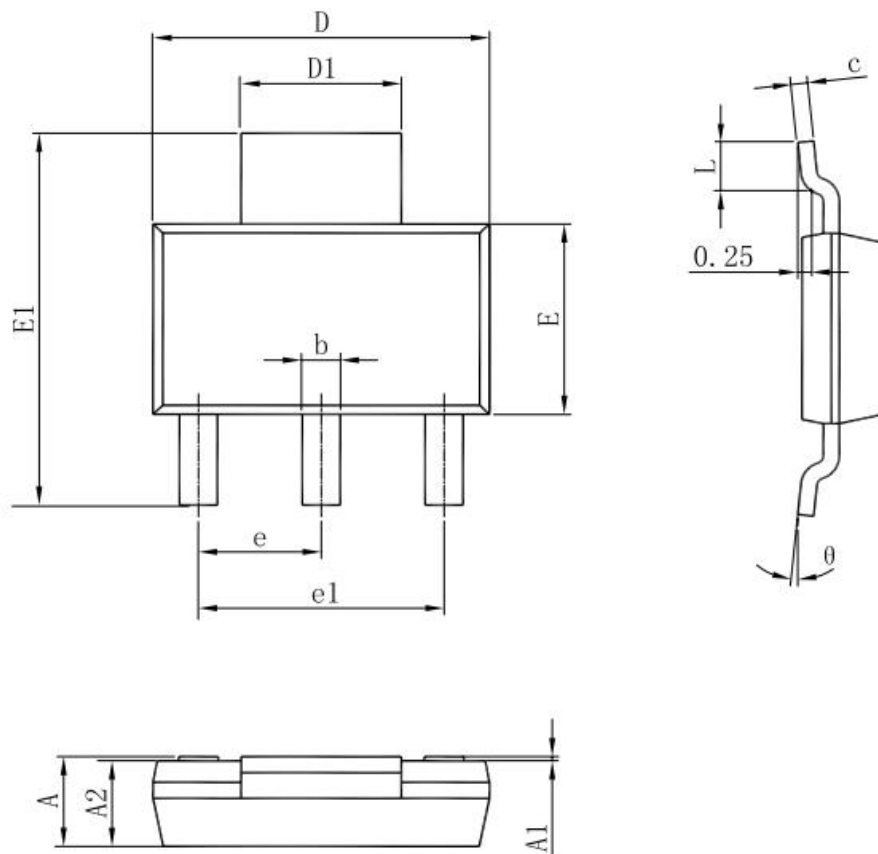


Thermal performance with OTP





Package Outline Dimensions SOT-223



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.520	1.800	0.060	0.071
A1	0.000	0.100	0.000	0.004
A2	1.500	1.700	0.059	0.067
b	0.660	0.820	0.026	0.032
c	0.250	0.350	0.010	0.014
D	6.200	6.400	0.244	0.252
D1	2.900	3.100	0.114	0.122
E	3.300	3.700	0.130	0.146
E1	6.830	7.070	0.269	0.278
e	2.300(BSC)		0.091(BSC)	
e1	4.500	4.700	0.177	0.185
L	0.900	1.150	0.035	0.045
θ	0°	10°	0°	10°



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