20V 1A Fixed Output Linear Voltage Regulator

Features

- Pin-compatible with industry-standard x1117 devices
- Very Low Dropout Voltage: 580mV at 1A
- Low Quiescent Current: 128μA Typical
- Wide Input Voltage Range: 2.5V to 20V
- Output Voltage Range:
  - Fixed Operation: 1.8V, 2.5V, 3.3V, 5V
- Maximum output current: 1A
- Output Voltage Accuracy: 2% over Line, Load and Temperature
- Excellent Load and Line Transient Responses
- Thermal Shutdown and Over-Current Protection
- Stable with 2.2μF or Larger Ceramic Capacitor
- Operating Junction Temperature: -40°C to +125°C
- Available packages: SOT-223, TO-252

Description

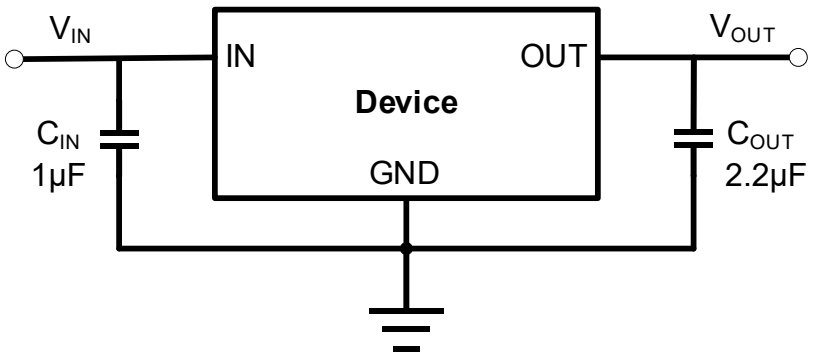
The device is a linear voltage regulator that improves the functionality of a traditional x1117 regulator with higher accuracy, much lower dropout voltage and lower quiescent current. The device has a wide input voltage range from 2.5V to 20V and provides an output voltage range from 1.8V to 5V.

The wide bandwidth PSRR performance of the device is typically greater than 60dB at 1kHz and over 30dB at 1MHz, which helps attenuate the switching noise of an upstream DCD/DC converter and minimizes post regulator filtering. The device also features over current limit and thermal shutdown protection, as well as automatic discharge function to quickly discharge VOUT in the disabled states.

Applications

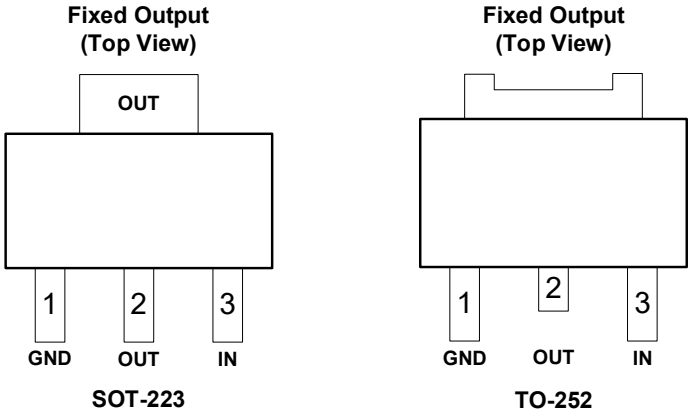
- Cellular Phones
- Laptop computers
- Portable Equipment
- Battery-Powered Systems
- High-Efficiency Linear Power Supplies

Typical Application Circuits



Fixed Output Voltage

Pin Configuration and Functions



Pin Descriptions

PIN Number	PIN Name	I/O	Function
1	GND	-	Ground.
2	OUT	O	Regulator output voltage pin. A 2.2μF or larger ceramic capacitor from OUT to ground is required to ensure regulator stability. The capacitor should be placed as close to the output as possible. Minimize the impedance from the OUT pin to the load.
3	IN	I	Input supply voltage pin. It is recommended to use a 1μF or larger ceramic capacitor from IN pin to ground to get a good power supply decoupling.

Package/Ordering Information

DEVICE	PACKAGE TYPE	OUTPUT VOLTAGE	PACKING OPTION
TLV76118DCYR	SOT-223	1.8V	Tape and Reel, 2500
TLV76125DCYR	SOT-223	2.5V	Tape and Reel, 2500
TLV76133DCYR	SOT-223	3.3V	Tape and Reel, 2500
TLV76150DCYR	SOT-223	5.0V	Tape and Reel, 2500
TLV76118KVUR	TO-252	1.8V	Tape and Reel, 2500
TLV76125KVUR	TO-252	2.5V	Tape and Reel, 2500
TLV76133KVUR	TO-252	3.3V	Tape and Reel, 2500
TLV76150KVUR	TO-252	5.0V	Tape and Reel, 2500

Electrical Specifications

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
IN and OUT Pins	IN and OUT	−0.3 to 22	V
Storage temperature range	T_{STG}	−65 to +150	°C
Output current	I_{OUT}	Internally Limited	A

Notes:

1. Exposure of the device under conditions beyond the limits specified by Maximum Ratings for extended periods may cause permanent damage to the device and affect product reliability. These conditions represent a stress rating only, and functional operations of the device at these or any other conditions above the operational limits noted in this specification is not implied.

ESD Ratings

			Value	Unit
V_{ESD}	Electrostatic Discharge	HBM (Human Body Model)	3000	V
		CDM (Charge Device Model)	1000	

Recommended Operation Conditions

Over operating temperature range unless otherwise noted

Parameter	Symbol	Min	Max	Unit
Input Supply Voltage	V_{IN}	2.5	20	V
Output Voltage	V_{OUT}	1.8	5	V
Output Capacitance	C_{OUT}	2.2	220	μF
Output Current	I_{OUT}	0	1	A
Operating Junction Temperature	T_J	-40	125	°C

Thermal Information

Package	$R_{\theta JA}$	Unit
TO-252	70	°C/W
SOT-223	95	°C/W

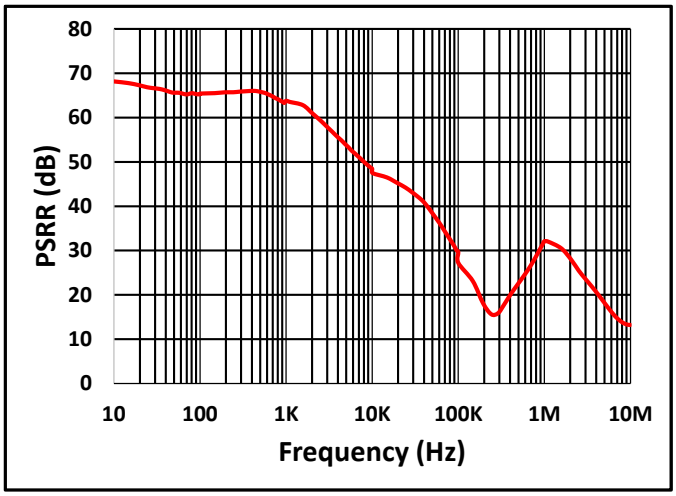
Electrical Characteristics

V_{IN} = 2.5V or V_{IN} = V_{OUT} + 1V (whichever is greater), I_{OUT} = 1mA, C_{OUT} = 2.2μF, typical values are at T_A = 25°C unless otherwise noted

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Voltage	V_{IN}		2.5	-	20	V
Output Voltage Accuracy		0.1mA ≤ I_{OUT} ≤ 1A	-2.0	0	2.0	%
GND Pin Current	I_{GND}	V_{IN} = 20V, No Load		128		μA
		V_{IN} = 20V, I_{OUT} = 1A		220		μA
Dropout Voltage	V_{DO}	V_{OUT} = 3.3V, I_{OUT} = 1A		580		mV
Output Current Limit	I_{LIM}	V_{OUT} = 0		1.6		A
Line Regulation	ΔV_{OUT} /ΔV_{IN}	V_{IN} = V_{OUT} +1V to 20V		0.01		%/V
Load Regulation	ΔV_{OUT} /ΔI_{OUT}	V_{IN} = 6V, I_{OUT} = 1mA to 1A		0.0003		%/mA
EN pin low-level input voltage (device disabled)	$V_{IL(EN)}$				0.5	V
EN pin high-level input voltage (device enabled)	$V_{IH(EN)}$		1.6			V
EN PIN Leakage Current	I_{EN}	V_{EN} = 20V		0.8		μA
Power Supply Ripple Rejection	PSRR	f = 1kHz, V_{OUT} = 5V, I_{OUT} = 1A		64		dB
Thermal Shutdown Temperature	TSD			160		°C
Thermal Shutdown Hysteresis	T_{HYS}			20		°C

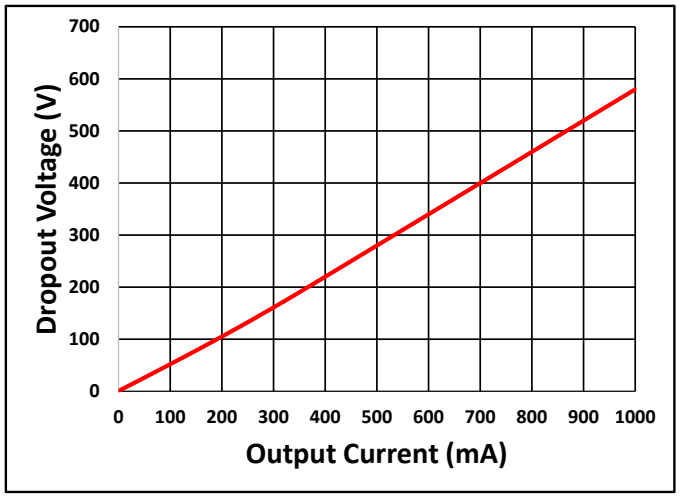
Typical Characteristics

C_{IN} = 1μF, C_{OUT} = 2.2μF, I_{OUT} = 1A, T_A = 25°C unless otherwise noted



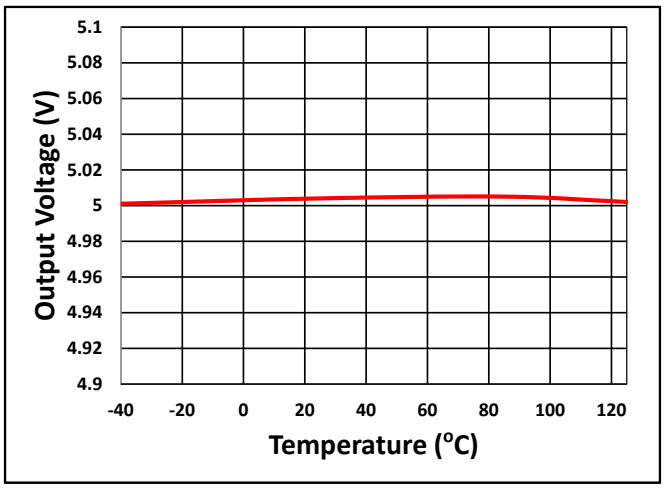
V_{IN} = 6.5V, V_{OUT} = 5V, I_{OUT} = 500mA, C_{OUT} = 2.2μF

Fig. 1 PSRR



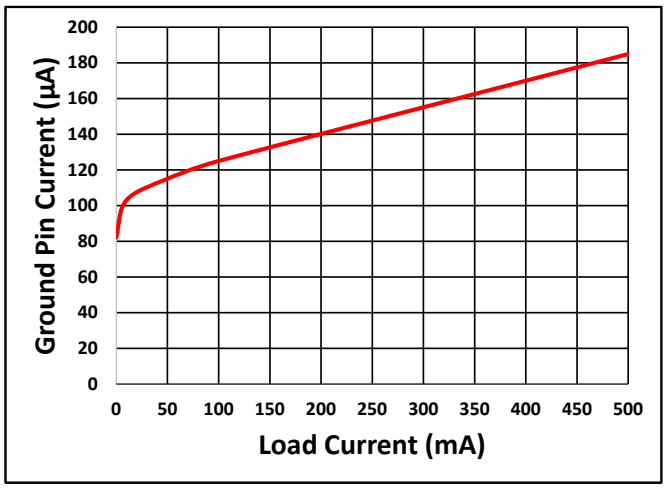
V_{IN} = 6.5V

Fig. 2 Dropout Voltage



V_{IN} = 6V, I_{OUT} = 0.1mA

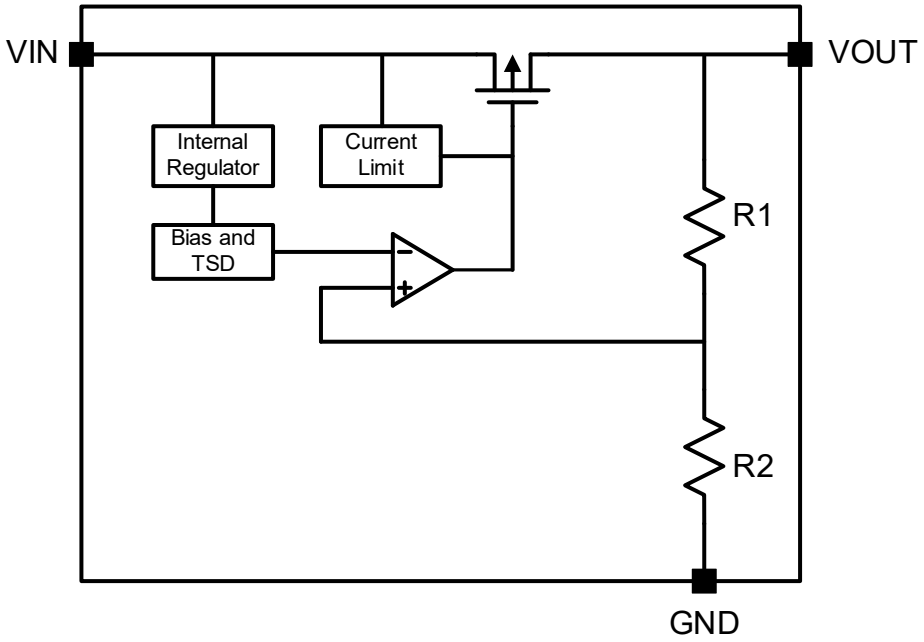
Fig. 3 Output Voltage vs Temperature



V_{IN} = 2.5V, I_{OUT} = 0.1mA

Fig. 4 Ground Current vs Load Current

Functional Block Diagram



Block Diagram of Fixed Output Voltage

Feature Description

Dropout Voltage

Dropout voltage is defined as the input voltage minus the output voltage at the rated output current where the pass transistor is fully on. The pass transistor is in the ohmic or triode region of operation and acts as a switch. The device has a very low dropout voltage compared to most of the x1117 LDOs on the market.

Output Current Limit and Short-Circuit Protection

When overload events happen, the output current is internally limited.

Undervoltage Lockout (UVLO)

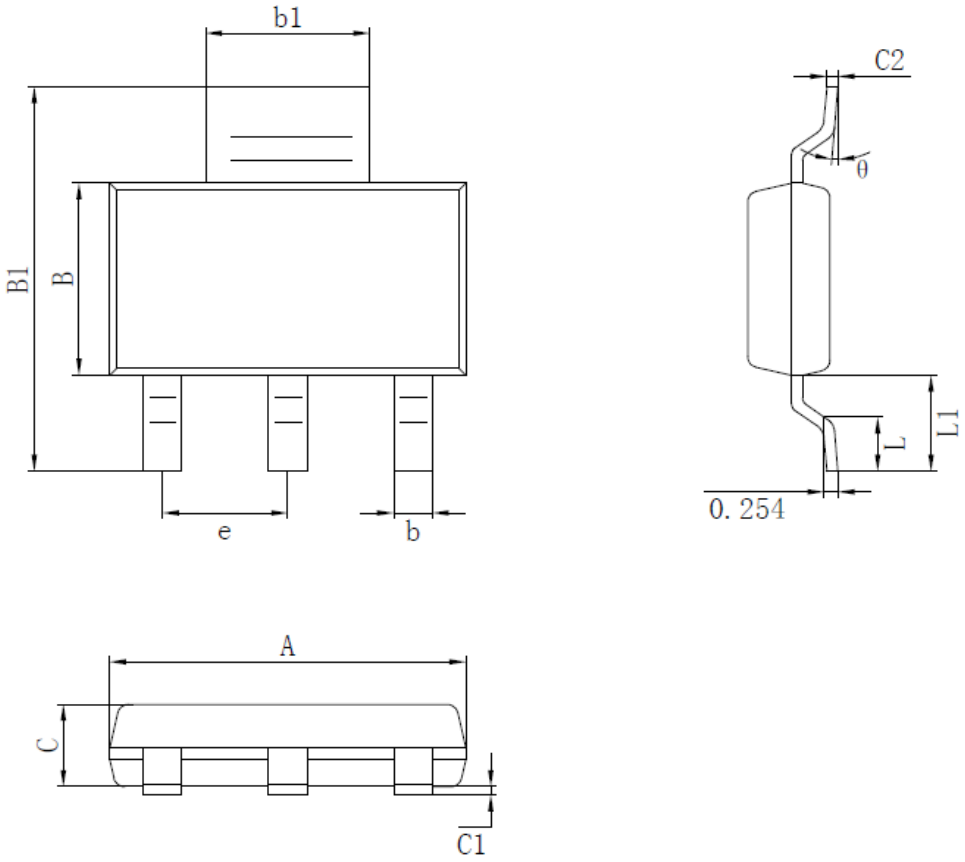
The device uses an undervoltage lockout circuit to keep the output shut off until the internal circuitry is operating properly.

Thermal Protection

The device contains a thermal shutdown protection circuit to turn off the output current when excessive heat is dissipated in the LDO.

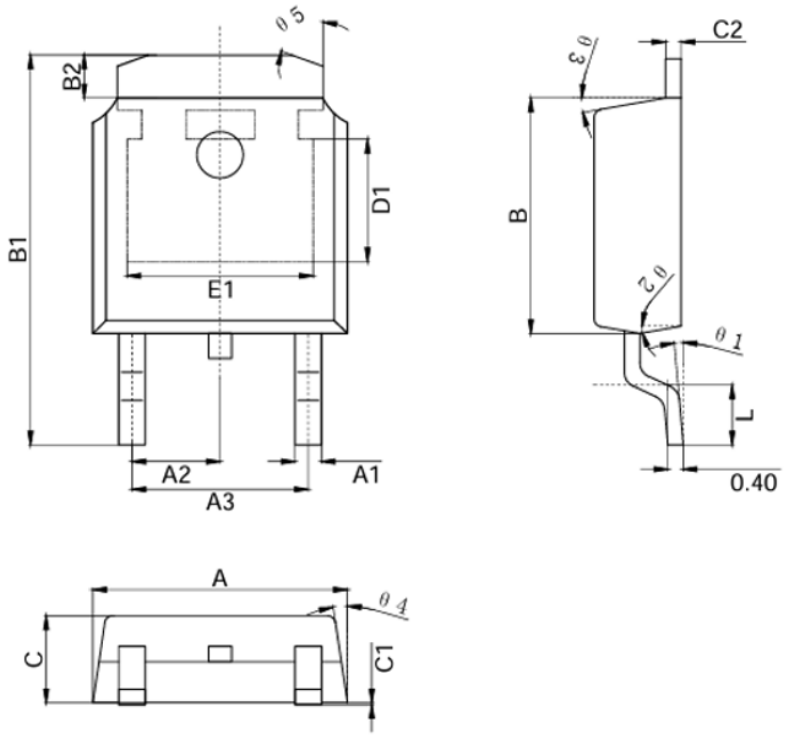
PACKAGE OUTLINE DIMENSIONS

SOT-223



Symbol	Dimensions (mm)		Symbol	Dimensions (mm)	
	Min	Max		Min	Max
A	6.40	6.60	C	1.45	1.65
e	2.29 (BSC)		C1	0.03	0.15
b	0.66	0.76	C2	0.20	0.35
b1	2.95	3.05	L	0.76	1.16
B	3.40	3.60	L1	1.70	1.80
B1	6.85	7.15	θ	0°	8°

TO-252



Symbol	Dimensions (mm)		Symbol	Dimensions (mm)	
	Min	Max		Min	Max
A	6.50	6.70	C2	0.375	0.45
A1	0.64	0.74	L	1.45	1.65
A2	2.286 TYP		D1	3.166 REF	
A3	4.572 TYP		E1	4.826 REF	
B	6.00	6.20	Θ1	0° ~ 8°	
B1	9.95	10.25	Θ2	10° TYP2	
B2	1.06	1.16	Θ3	10° TYP	
C	2.15	2.35	Θ4	8.5° TYP4	
C1	0.00	0.10	Θ5	70° TYP	