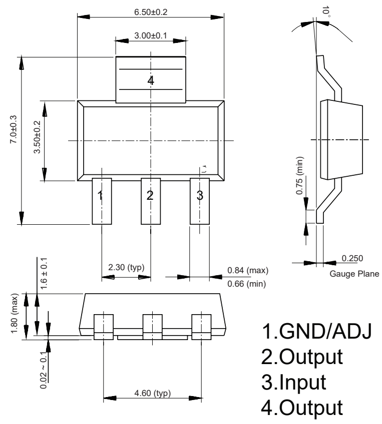
Features

- 1.4V maximum dropout at full load current
- Fast transient response
- Output current limiting
- Built-in thermal shutdown
- Good noise rejection
- 1A Adjustable or Fixed
  1.2V, 1.25V, 1.5V, 1.8V, 1.9V,2.5V, 2.85V, 3.3V, 5.0V
- Qualified for automotive applications

SOT-223 Unit:mm



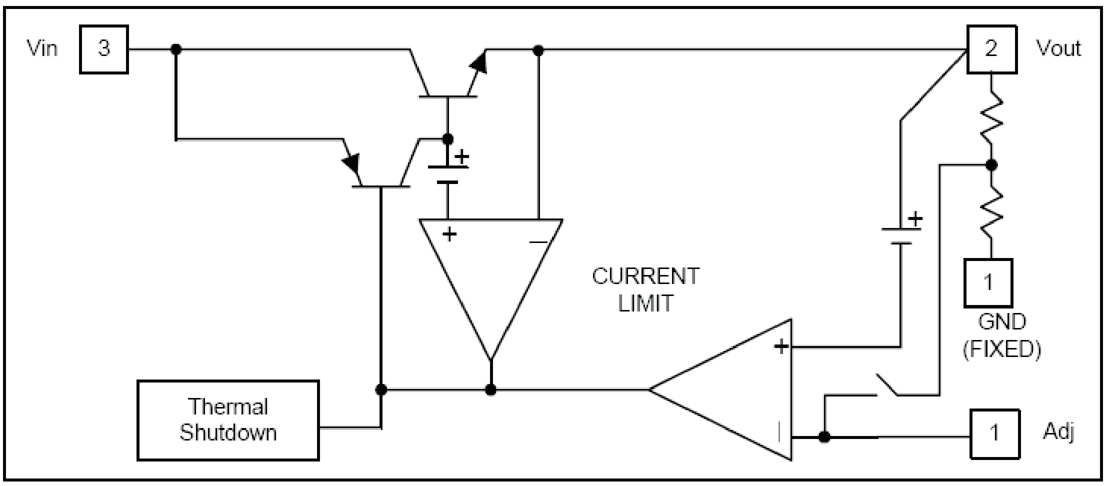
1.GND/ADJ
2.Output
3.Input
4.Output

Absolute Maximum Ratings Ta = 25℃

Parameter	Symbol	Rating	Unit
DC Supply Voltage	V_{in}	-0.3 to 18	V
Power Dissipation	P_D	Internally Limited	
Thermal Resistance Junction-to-Ambient	$R_{\theta JA}$	136	℃/W
Thermal Resistance Junction-to-Case *	$R_{\theta JC}$	20	℃/W
Operating Junction Temperature Range	T_{opr}	-40 to +125	℃
Storage Temperature	T_{stg}	-55 to +150	℃

* Control Circuitry/Power Transistor

Block Diagram



■ Electrical Characteristics Ta = 25℃

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Reference Voltage	V_{REF}	AMS1117- ADJ	10mA≤I_{OUT}≤1A, 1.5V≤V_{IN} - V_{OUT}≤7V	1.225	1.25	1.275	V
Output Voltage	V_{OUT}	AMS1117-1.2	0≤I_{OUT}≤1A, 2.7V≤V_{IN}≤8.2V	1.175	1.2	1.225	
		AMS1117-1.25	0≤I_{OUT}≤1A, 2.75 V≤V_{IN}≤8.25V	1.238	1.25	1.275	
		AMS1117-1.5	0≤I_{OUT}≤1A, 3.0V≤V_{IN}≤8.5V	1.47	1.5	1.53	
		AMS1117-1.8	0≤I_{OUT}≤1A, 3.3V≤V_{IN}≤8.8V	1.764	1.8	1.836	
		AMS1117-1.9	0≤I_{OUT}≤1A, 3.4V≤V_{IN}≤8.9V	1.862	1.9	1.938	
		AMS1117-2.5	0≤I_{OUT}≤1A, 4.0V≤V_{IN}≤9.5V	2.45	2.5	2.55	
		AMS1117-2.85	0≤I_{OUT}≤1A, 4.35V≤V_{IN}≤9.85V	2.822	2.85	2.878	
		AMS1117-3.3	0≤I_{OUT}≤1A, 4.8V≤V_{IN}≤10.3V	3.234	3.3	3.366	
		AMS1117-5.0	0≤I_{OUT}≤1A, 6.5V≤V_{IN}≤12V	4.9	5	5.1	
Line Regulation	△V_{OUT}	AMS1117-ADJ	Iout=10mA,V_{OUT}+1.5V≤Vin≤12V		0.035	0.2	%
		AMS1117-1.2	Iout=10mA,2.7V≤Vin≤12V		9	12	mV
		AMS1117-1.25	Iout=10mA,2.75V≤Vin≤12V				
		AMS1117-1.5	Iout=10mA,3.0V≤Vin≤12V				
		AMS1117-1.8	Iout=10mA,3.3V≤Vin≤12V				
		AMS1117-1.9	Iout=10mA,3.4V≤Vin≤12V				
		AMS1117-2.5	Iout=10mA,4.0V≤Vin≤12V				
		AMS1117-2.85	Iout=10mA,4.35V≤Vin≤12V				
		AMS1117-3.3	Iout=10mA,4.8V≤Vin≤12V				
		AMS1117-5.0	Iout=10mA,6.5V≤Vin≤12V				
Load Regulation	△V_{OUT}	AMS1117-ADJ	V_{in}-V_{out}=2V, 10mA≤I_{out}≤1A		0.2	0.4	%
		AMS1117-1.2	V_{in}=3.2V, 10mA≤I_{out}≤1A		3	10	mV
		AMS1117-1.25	V_{in}=3.25V, 10mA≤I_{out}≤1A				
		AMS1117-1.5	V_{in}=3.5V, 10mA≤I_{out}≤1A				
		AMS1117-1.8	V_{in}=3.8V, 10mA≤I_{out}≤1A				
		AMS1117-1.9	V_{in}=3.9V, 10mA≤I_{out}≤1A				
		AMS1117-2.5	V_{in}=4.5V, 10mA≤I_{out}≤1A				
		AMS1117-2.85	V_{in}=4.85V, 10mA≤I_{out}≤1A				
		AMS1117-3.3	V_{in}=5.3V, 10mA≤I_{out}≤1A				
		AMS1117-5.0	V_{in}=7.0V, 10mA≤I_{out}≤1A				
Dropout Voltage	V_{IN}-V_{OUT}	AMS1117-XXX	ΔVout,ΔV_{REF}=1%, I_{OUT}=0.1A		1.11	1.2	V
			ΔVout,ΔV_{REF}=1%, I_{OUT}=0.5A		1.18	1.25	
			ΔVout,ΔV_{REF}=1%, I_{OUT}=1.0A		1.26	1.3	
Current Limit	I_{limit}	AMS1117-XXX	V_{IN}-V_{OUT}=2V , T_J = 25℃	1.25	1.4	1.6	A
		AMS1117-XXX	AMS1117-ADJ		5	10	mA
Adjust Pin Current	I_{ADJ}				55	120	uA
Adjust Pin Current Change	I_{Change}				0.2		

■ Electrical Characteristics Ta = 25℃

Quiescent Current	I_Q	AMS1117-1.2	Vin-Vout=1.25V		4	8	mA
		AMS1117-1.25					
		AMS1117-1.5					
		AMS1117-1.8					
		AMS1117-1.9					
		AMS1117-2.5					
		AMS1117-2.85					
		AMS1117-3.3					
		AMS1117-5.0					
Ripple Rejection	R_R	AMS1117-1.2	f =120Hz , C_{OUT} = 22μF Tantalum, I_{OUT} = 1A, (V_{IN}-V_{OUT}) = 3V	60	75		dB
		AMS1117-1.25					
		AMS1117-1.5					
		AMS1117-1.8					
		AMS1117-1.9					
		AMS1117-2.5					
		AMS1117-2.85					
		AMS1117-3.3					
		AMS1117-5.0					

■ Marking

Marking	1117-XXX ****

■ Application Hints

The AMS1117-XXX series of adjustable and fixed regulators are easy to use and are protected against short circuit and thermal overloads. Thermal protection circuitry will shut-down the regulator should the junction temperature exceed 165℃at the sense point.
Pin compatible with older three terminal adjustable regulators, these devices offer the advantage of a lower dropout voltage, more precise reference tolerance and improved reference stability with temperature.

Stability

The circuit design used in the AMS1117-XXX series requires the use of an output capacitor as part of the device frequency compensation. The addition of 22μF solid tantalum on the output will ensure stability for all operating conditions.
When the adjustment terminal is bypassed with a capacitor to improve the ripple rejection, the requirement for an output capacitor increases. The value of 22 µF tantalum covers all cases of bypassing the adjustment terminal. Without bypassing the adjustment terminal smaller capacitors can be used with equally good results.
To further improve stability and transient response of these devices larger values of output capacitor can be used.

Protection Diodes

Unlike older regulators, the AMS1117-XXX family does not need any protection diodes between the adjustment pin and the output and from the output to the input to prevent over-stressing the die. Internal resistors are limiting the internal current paths on the AMS1117-XXX adjustment pin, therefore even with capacitors on the adjustment pin no protection diode is needed to ensure device safety under short- circuit conditions.
Diodes between the input and output are not usually needed. Microsecond surge currents of 50A to 100A can be handled by the internal diode between the input and output pins of the device. In normal operations it is difficult to get those values of surge currents even with the use of large output capacitances. If high value output capacitors are used, such as 1000 µF to 5000 µF and the input pin is instantaneously shorted to ground, damage can occur. A diode from output to input is recommended, when a crowbar circuit at the input of the AMS1117-XXX is used (Figure 1).

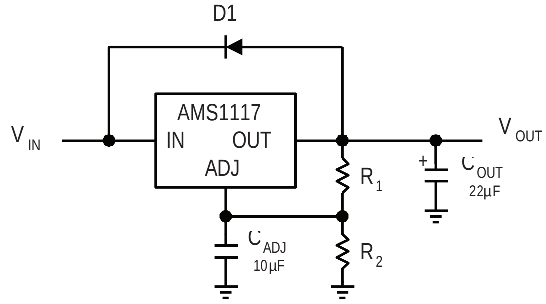
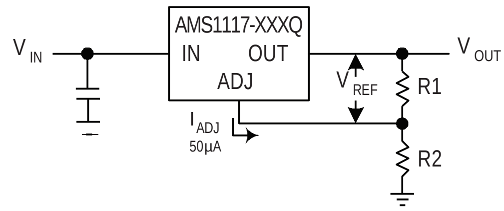


Figure 1.

Output Voltage

The AMS1117-XXX series develops a 1.25V reference voltage between the output and the adjust terminal. Placing a resistor between these two terminals causes a constant current to flow through R1 and down through R2 to set the overall output voltage. This current is normally the specified minimum load current of 10mA. Because I_{ADJ} is very small and constant it represents a small error and it can usually be ignored.



$$V_{OUT} = V_{REF}\,(1+ R2/R1)+I_{ADJ}\,R2$$

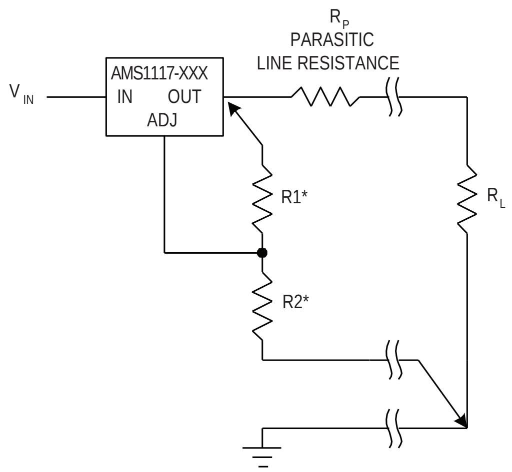
Figure 2. Basic Adjustable Regulator

Load Regulation

True remote load sensing it is not possible to provide, because the AMS1117-XXX is a three terminal device. The resistance of the wire connecting the regulator to the load will limit the load regulation. The data sheet specification for load regulation is measured at the bottom of the package. Negative side sensing is a true Kelvin connection, with the bottom of the output divider returned to the negative side of the load.
The best load regulation is obtained when the top of the resistor divider R1 is connected directly to the case not to the load. If R1 were connected to the load, the effective resistance between the regulator and the load would be:

$$R_P \times \left(\frac{R2+R1}{R1}\right), \quad R_P = \text{Parasitic Line Resistance}$$

Connected as shown , R_P is not multiplied by the divider ratio



* CONNECT R1 TO CASE
CONNECT R2 TO LOAD

Figure 3. Connections for Best Load Regulation

In the case of fixed voltage devices the top of R1 is connected Kelvin internally, and the ground pin can be used for negative side sensing.

Ripple Rejection

The ripple rejection values are measured with the adjustment pin bypassed. The impedance of the adjust pin capacitor at the ripple frequency should be less than the value of R1 (normally 100Ω to 200Ω) for a proper bypassing and ripple rejection approaching the values shown. The size of the re quired adjust pin capacitor is a function of the input ripple frequency. If R1=100Ω at 120Hz the adjust pin capacitor should be >13 µF. At 10kHz only 0.16 µF is needed.

The ripple rejection will be a function of output voltage, in circuits without an adjust pin bypass capacitor. The output ripple will increase directly as a ratio of the output voltage to the reference voltage (V_{OUT} / V_{REF}).

■ Typical Applications

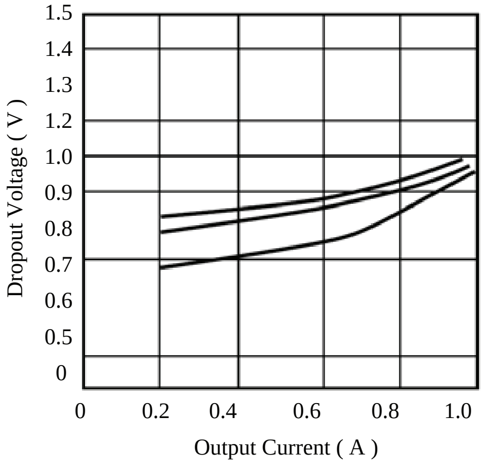


Figure 1. Dropout Voltage VS. Output Current

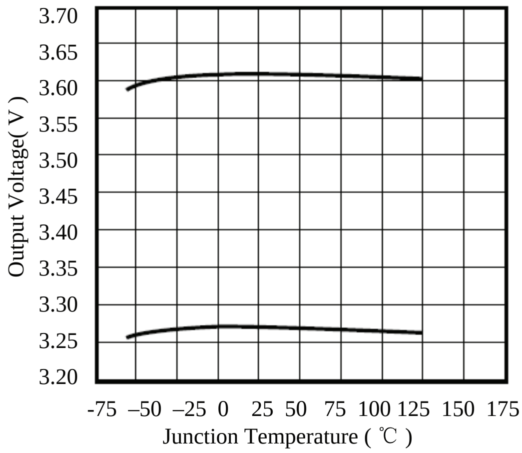


Figure 2. Output Voltage VS. Temperature

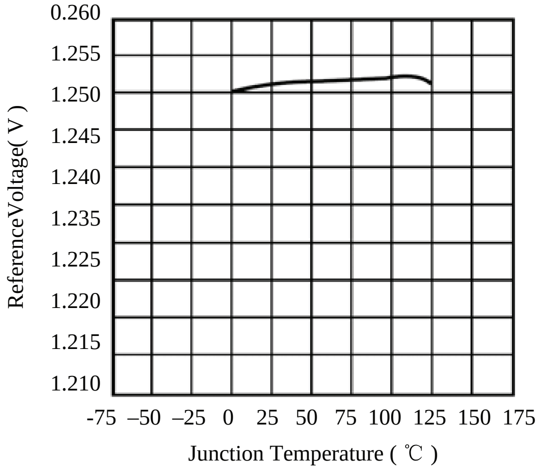


Figure 3. Reference Voltage VS. Temperature

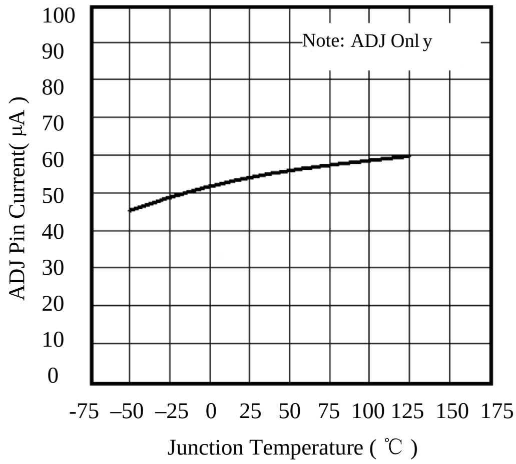


Figure 4. ADJ Pin Current VS. Temperature

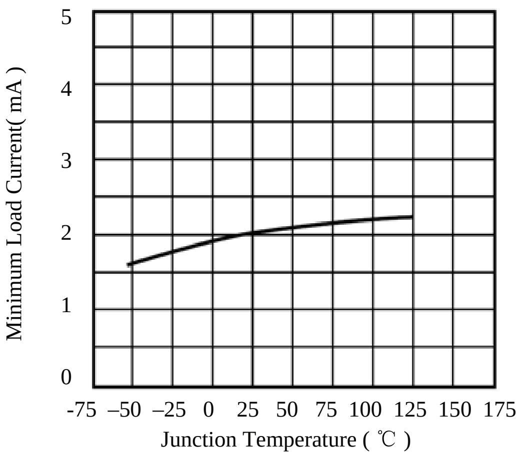


Figure 5. Minimum Load Current VS. Temperature

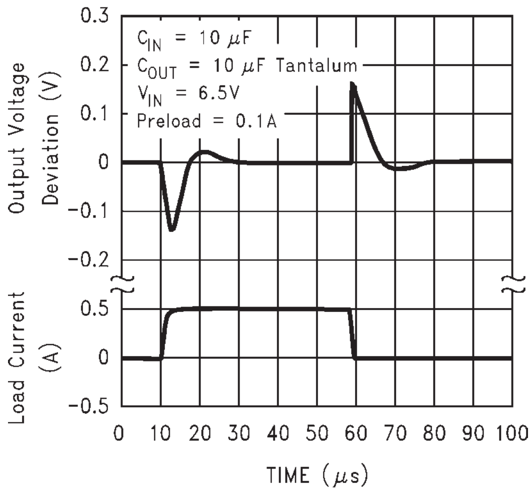


Figure 6. AMS1117-5.0 Load Transient Response