

ALPHA
SEMICONDUCTOR

Excellence in Analog Power Products

AS1217

800mA Ultra Low Dropout Voltage Regulator Fast Response, Adjustable & Fixed

FEATURES

- Low Dropout Voltage 300mV at 800mA Full Load Current
- Fixed Output Voltages of 3.3V & 2.5V
- Adjustable Output Down to 1.2V from ATX Power Supply
- Extremely Tight Voltage and Line Regulation
- Standard 5-Terminal Low Cost SOIC-8 & TO-263

APPLICATIONS

- Notebook
- 3.3V to 2.5V ATX Power Supplies
- Multimedia/ Graphic Card
- 3.3V to 2.5V for Portable PENTIUM™ Processor
- 5V to 3.5V VRE Supply
- High Efficiency “Green” Computer Systems

PRODUCT DESCRIPTION

The Alpha Semiconductor AS1217 is 800mA Low Dropout Regulator with extremely low dropout voltage. The adjustable version requires only two external resistors to set the output voltage. The fixed version has a preset output of 3.3V or 2.5V and does not require any external resistors to set the output. The AS1217 features a low dropout of less than 400mV(max.) and offers fast transient response. This device is suitable for Pentium applications requiring 2.5V from 3.3V ATX power supplies source a low current input voltage 1volt greater than the output voltage is available. With an external sense pin the load regulation is less than 1mV. This device is an excellent choice for the use in powering low voltage microprocessors that require a lower dropout, fast transient response to regulate from 3.3V and 5V supplies. The AS1217 is also an excellent choice as a post regulator for switching supplies applications.

The AS1217 offers full protection against over-current faults, reversed input polarity, reversed load insertion, over temperature operation and positive and negative transient voltage.

The AS1217 is offered in a SO-8, 5-pin TO-263.

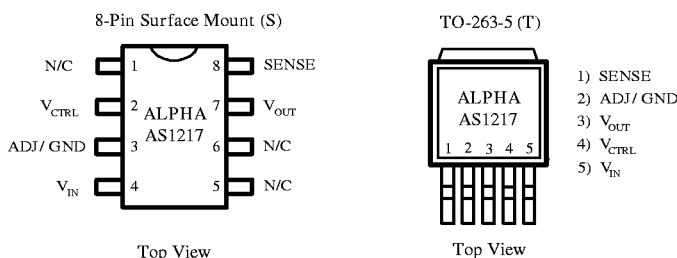
ORDERING INFORMATION

SOIC-8	TO-263 5 PIN	OUTPUT
AS1217S	AS1217T	Adjustable
AS1217S-X	AS1217T-X	Fixed

Consult with factory for other fixed output voltages.

X= Output Voltage: 2.5 for 2.5V, 3.3 for 3.3V etc

PIN CONNECTIONS



ABSOLUTE MAXIMUM RATINGS

Power Dissipation..... Internally Limited

Lead Temp (soldering, 10 seconds).....300°C

Storage Temperature Range.....-65°C to +150°C

Operating Junction Temperature Range

AS1217 Control Section0°C to +125°C

AS1217 Power Transistor0°C to +150°C

Input Supply Voltage..... 6V

 V_{CTRL} Input Voltage..... 13V

ELECTRICAL CHARACTERISTICS at $V_S=14V$, $T_a=25^\circ C$, $I_O=10mA$, $C_2=100\mu F$, unless otherwise specified. (Note 1)
(Boldface applies over full temperature range).

Parameters	Conditions	Min	AS1217 Typ	Max	Units
2.5V Version					
Output Voltage	$V_{CTRL}=6.0V$ to 12V, $V_{IN}=3.0V$ to 5.0V, $I_O=10mA$ $I_O=10mA$ to 800mA	2.450 2.400	2.500	2.550 2.600	V
2.8V Version					
Output Voltage	$V_{CTRL}=6.3V$ to 12V, $V_{IN}=3.3V$ to 5.0V, $I_O=10mA$ $I_O=10mA$ to 800mA	2.744 2.688	2.800	2.856 2.912	V
3.3V Version					
Output Voltage	$V_{CTRL}=6.3V$ to 12V, $V_{IN}=3.8V$ to 5.0V, $I_O=10mA$ $I_O=10mA$ to 800mA	3.234 3.168	3.300	3.366 3.432	V
All Voltage Options					
Reference Voltage	$V_{CTRL}=2.75V$, $V_{IN}=2.00V$, $I_O=10mA$ $V_{CTRL}=2.7V$ to 12V, $V_{IN}=2.05V$ to 5.0V, $I_O=10mA$ to 800mA	1.237 1.200	1.250	1.263 1.300	V
Line Regulation	$V_{CTRL}=2.5V$ to 12V, $V_{IN}=1.75V$ to 5.0V, $I_O=10mA$ $V_{ADJ}=0V$		1.0	3.0	mV
Load Regulation (Note1)	$V_{CTRL}=2.75V$, $V_{IN}=2.1V$, $I_O=10mA$ to 800mA, $V_{ADJ}=0V$		1.0	5.0	mV
Dropout Voltage Minimum V_{CTRL} (Note2) ($V_{CTRL} - V_{OUT}$)	$V_{ADJ}=0V$ $V_{IN}=2.05V$, $I_O=550mA$		1.00	1.15	V
Dropout Voltage Minimum V_{IN} (Note2) ($V_{IN} - V_{OUT}$)	$V_{ADJ}=0V$ $V_{IN}=2.75V$, $I_O=800mA$		0.30	0.40	V
Current Limit	$V_{CTRL}=2.75V$, $V_{IN}=2.05V$, $dV_O=100mV$, $V_{ADJ}=0V$	1.0			A
Minimum Load Current	$V_{CTRL}=5V$, $V_{IN}=3.3V$, $V_{ADJ}=0V$		5	10	mA
Thermal Regulation	30ms Pulse		0.002	0.02	%W
Ripple Rejection	$V_{CTRL}=3.75V$, $V_{IN}=3.75V$, $I_O=800mA$, $V_{ADJ}=0V$ $T_J=25$, $V_{RIPPLE}=1V_{pp}$ at 120Hz	60	80		dB
Control Pin Current	$V_{ADJ}=0V$ $V_{CTRL}=2.75V$, $V_{IN}=2.05V$, $I_O=800mA$		60	120	mA
Adjustable Pin Current	$V_{CTRL}=2.75V$, $V_{IN}=2.05V$, $V_{ADJ}=0V$, $I_O=10mA$		50	90	μA
Thermal Resistance	TO-263-5	Junction to Case (θ_{JC})		3	$^\circ C/W$
		Junction to Ambient (θ_{JA})		60	$^\circ C/W$
	SOIC-8	Junction to Case (θ_{JC})		N/A	
		Junction to Ambient (θ_{JA})		180	$^\circ C/W$

The Bold specifications applying to the over full operating temperature range.

Note 1: Low duty cycle pulse testing with Kelvin connections is required in order to maintain accurate data.

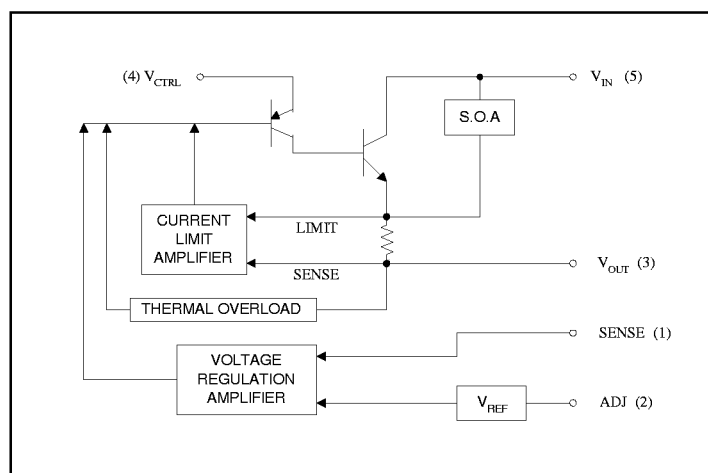
Note 2: Dropout voltage is defined as the minimum differential between V_{IN} and V_{OUT} or V_{CTRL} and V_{OUT} required to maintain regulation at V_{OUT} 99% Nominal V_{OUT} .

Note 3: V_{REF} is measured across Adjust pin to Sense pin.

PIN DESCRIPTION

1. Sense = Allows Kelvin sense of V_{OUT} at the load. (Positive side of the reference voltage of the device).
2. ADJ = Negative side of the reference voltage for the device. Adding a small bypass capacitor from the ADJ pin to ground will improve the transient response.
3. V_{OUT} = Power output of the device.
4. V_{CTRL} = Supply pin for the control circuitry of the device. The current flow into this pin will be about 1% of the output current. V_{CTRL} must be between 1.0V and 1.3V greater than the output voltage for the device to regulate.
5. V_{IN} = Output load current is supplied through this pin. V_{IN} must be between 0.1V and 0.8V greater than the output voltage for the device to regulate.

BLOCK DIAGRAM



APPLICATIONS NOTES

The AS1217 is designed as a high performance and low cost solution for application requiring a lower dropout than traditional NPN regulators.

The AS1217 uses a separate input voltage V_{CTRL} ($V_{CTRL} \geq V_{OUT} + 1.3V$) to minimize the dropout voltage. This allows the 2.5V power for the load to come from a 3.3V system supply. As added benefit this will reduce the heat dissipation, and lower heatsink and cooling fan cost. A typical application would use 5V for V_{IN} and 3.3V for V_{CTRL} from a motherboard power supply to provide a nominal 2.5V output. Using the sense pin allows to Kelvin measure the output, reducing resistive-associated errors.

The AS1217 can power the 2.5V core voltage for microprocessors such as Pentium™, P55C™, AMD5k86™ and K6™ and the IBM PowerPC™ 603EV and 604EV processors.

Adjustable Regulator Design

1.25V reference voltage is being developed between the SENSE pin and the ADJ pin of the AS1217. Adding two external resistors (see fig 1.) will allow setting the output voltage from 1.25V to 6V. R_1 is chosen so that this current is specified minimum load current of 10mA. R_2 is given by the formula: $V_{OUT} = V_{REF} (1 + R_2/R_1) + I_{ADJ} (R_2)$. The current flowing from the ADJ pin is typically 50μA. This ADJ pin contributes to the final VOUT but is usually neglected. Connecting the sense pin to the top of the resistor divider will improve load regulation.

Lowering Noise

Using the SENSE pin to Kelvin the load will increase accuracy of the output voltage during load regulation. For the fixed voltage devices, adding a capacitor at the GND pin will improve transient response. This capacitor is chosen in the range of 1μF to 0.1μF and will depend on the amount of output capacitance in the system.

*The reduction of heat dissipation is a result of the increase of the regulator efficiency (efficiency = V_{OUT} / V_{IN})

TYPICAL APPLICATION

Fig. 1 Adjustable Regulator

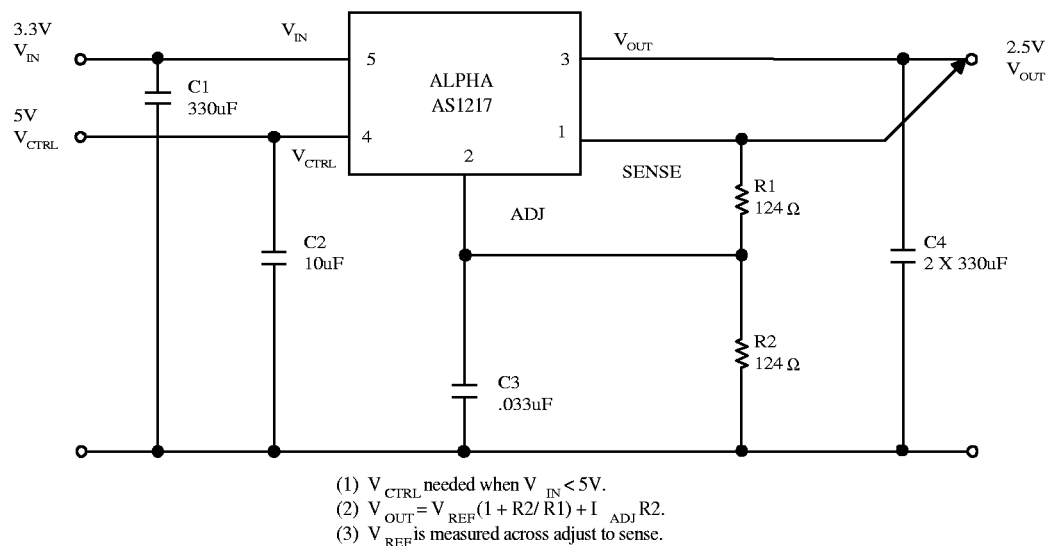
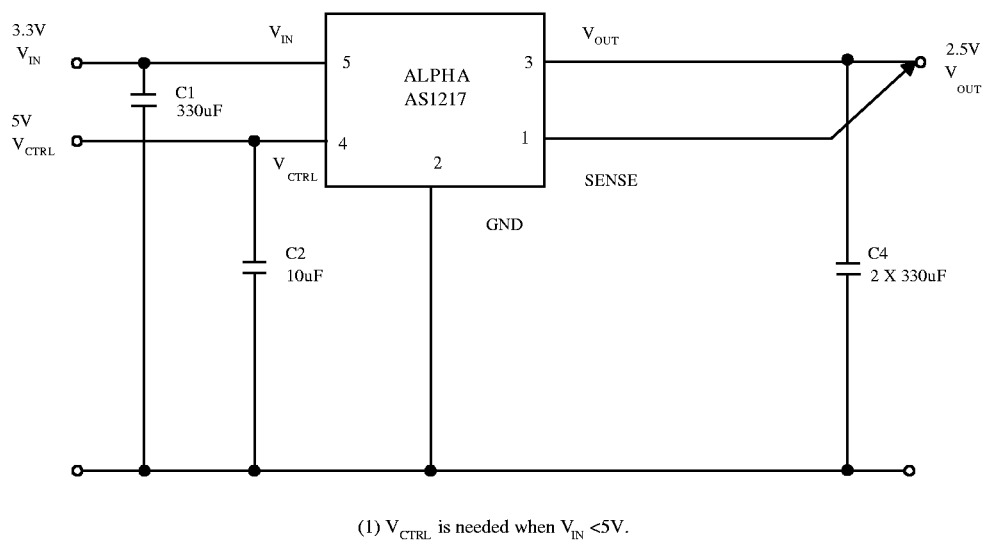
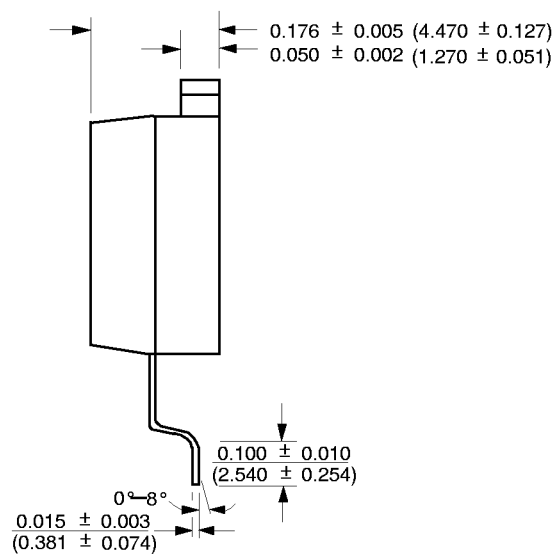
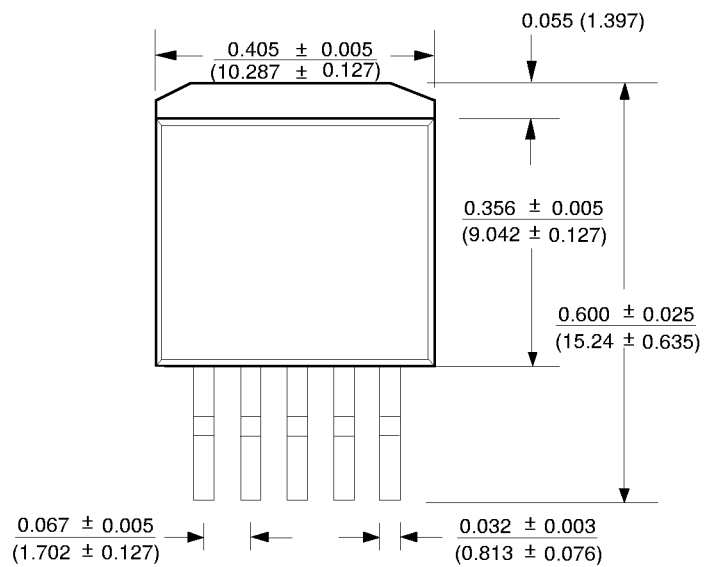


Fig.2 Typical Fixed Regulator



PACKAGE DRAWING
TO-263-5L (T)



PACKAGE DRAWING
SOIC-8