Bay Linear

Inspire the Linear Power

5.0A Low Dropout Voltage Regulator

B1581

Adjustable & Fix Output

Description

The Bay Linear B1581 is Monolithic low power 5.0A Adjustable and fixed NPN voltage regulator that are easy to use with minimum external components. It is suitable for applications requiring a well-regulated positive output voltage with low input-output differential voltage requirements and output voltage 1.5V, 2.5V, 3.0V, 3.3V, or 5V.

The B1581 Outstanding features include full power usage up to 5.0Amp of load current internal current limiting and thermal shutdown. Other fixed versions are also available consult with factory.

The B1581 is offered in a 5-pin TO-220, & TO-263 packages compatible with other 5 terminal regulators. For 5A Low dropout Regulator refer to the B1581 data sheet.

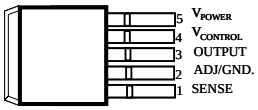
Features

- **Adjustable Output Down to 1.2V**
- **Fixed Output Voltages 2.5V, 3.0V 3.3V, and 5.0V**
- **Output Current of 5.0A**
- **Low Dropout Voltage 700mV Typ.**
- **Current & Thermal Limiting**
- **Standard 3-Terminal Low Cost TO-220, D^2 Packages**
- **Similar to industry Standard EZ1581/CS5205**

Applications

- **3.3V to 2.5V for Pentium Processor**
- **SMPS Post Regulator**
- **High Efficiency "Green" Computer Systems**
- **High Efficiency Linear Power Supplies**
- **5V to 3.XXV fro Pentium Processor**
- **Battery Charger**

Pin Connection



TO-263-5 Package

Ordering Information

Devices	Package	Temp.
B1581T	TO-220	0 °C to 70 °C
B1581S	TO-263	0 °C to 70 °C

Absolute Maximum Rating

Parameter	Symbol	Value	Unit
Maximum Input Voltage	V_{IN}	7	V
Power Dissipation	P_O	Internally Limited	W
Thermal Resistance Junction to Case	θ_{JC}	3	°C/W
Thermal Resistance Junction to Ambient	θ_{JA}	50	
Operating Junction Temperature Range Control Section Power Transistor	T_J	 0 to 125 0 to 150	°C
Storage Temperature Range	T_{STG}	-65 to 150	
Lead Temperature (Soldering 10 Sec.)	T_{LEAD}	260	

Electrical Characteristics

(V_{IN} = 4.75V to 5.25V; I_O = 10mA to 5.0Amp, unless otherwise specified)

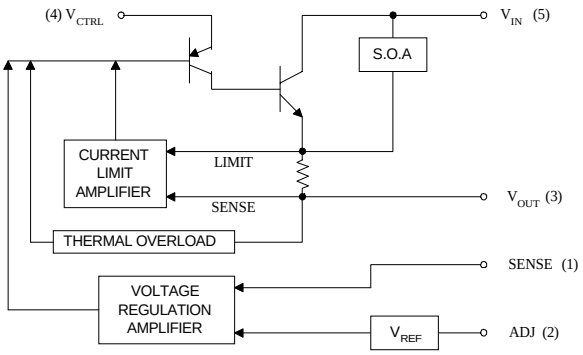
Parameter	Symbol	Conditions	MIN	TYP	MAX	UNIT
Output Voltage	V_O	V_{CONT}=4V, V_{PWR}=2V	1.485	1.5	1.515	V
		V_{CONT}=3V, V_{PWR}=2.3V, I_{LOAD}=10mA to 5A	1.475		1.525	
		V_{CONT}=5V, V_{PWR}=3.3V	2.475	2.5	2.525	
		V_{CONT}=4V, V_{PWR}=3.3V, I_{LOAD}=10mA to 5A	2.460		2.540	
		V_{CONT}=5.5V, V_{PWR}=3.5V	2.970	3.0	3.030	
		V_{CONT}=4.5V, V_{PWR}=3.8V, I_{LOAD}=10mA - 5A	2.950		3.050	
		V_{CONT}=5.8V, V_{PWR}=3.8V	3.267	3.3	3.333	
		V_{CONT}=4.8V, V_{PWR}=4.1V, I_{LOAD}=10mA - 5A	3.247		3.353	
		V_{CONT}=7.5V, V_{PWR}=5.5V	4.950	5.0	5.050	
		V_{CONT}=6.5V, V_{PWR}=5.8V, I_{LOAD}=10mA- 5A	4.920		5.080	
Reference Voltage	V_{ref}	V_{CONT}=2.75V, V_{PWR}=2V, I_{LOAD}=10mA	1.238	1.250	1.262	V
		V_{CONT}=2.7V, to 12V V_{PWR}=3.3V to 5.5V, I_{LOAD}=10mA to 5A	1.230		1.270	
Line Regulation (1)	$REG_{(line)}$	I_O = 10mA, V_{IN} =5V, T= 25 °C		0.04	0.2	%
Load Regulation (1)	$REG_{(LOAD)}$	I_O = 10mA, V_{IN} =5V, T= 25 °C		0.08	0.40	
Dropout Voltage	V_{PWR}-V_{OUT}	V_{CONT}=V_{OUT}+2.5V, I_{LOAD}=10mA		0.10	0.17	V
		V_{CONT}=V_{OUT}+2.5V, I_{LOAD}=5A		0.55	0.70	
Minimum load Current	I_{min}			5	10	mA
Current Limit	I_S	(V_{in}-V_{out})=3V	5.5	6.8		A
Ground Pin Current	I_Q	V_{IN} =5V		6	10	mA
Temperature Stability	T_S	I_O = 10mA, V_{IN} =5V		0.5		%
Thermal Regulation		T= 25 °C, 30ms pulse		0.003		%/W
Ripple Rejection	R_A	T= 25 °C, V_{IN} =5V	60	80		dB
Thermal Resistance	-	TO-220 Junction to Tab		3.0	3.0	°C/W
		Junction to Ambient		60	60	
		DD Package Junction to Tab		3.0	3.0	
		Junction to Ambient		60	60	

Note: Output Switch tests are performed under pulsed conditions to minimize power dissipation

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 B1581 is designed as a high performance and low cost solution for application requiring a lower dropout than traditional NPN regulators.

The B1581 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 heat sink and cooling fan cost. A typical application would use 5V for Vin 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 B1581 can power the 2.5V core voltage for microprocessors such as Pentium™, P55C™, AMD5k86™ and K6™ and the IBM PowerPC™ 603EV and 604EV processors.

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

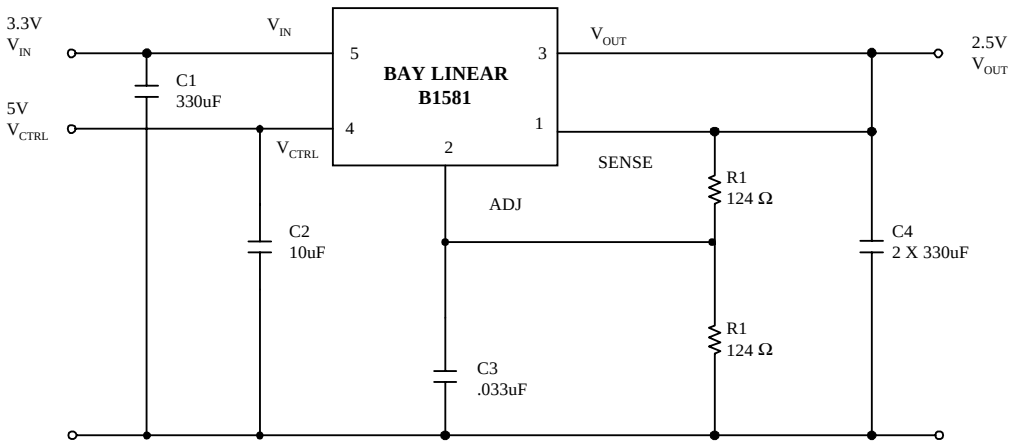
Adjustable Regulator Design

1.25V reference voltage is being developed between the SENSE pin and the ADJ pin of the AS1581. 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.

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.

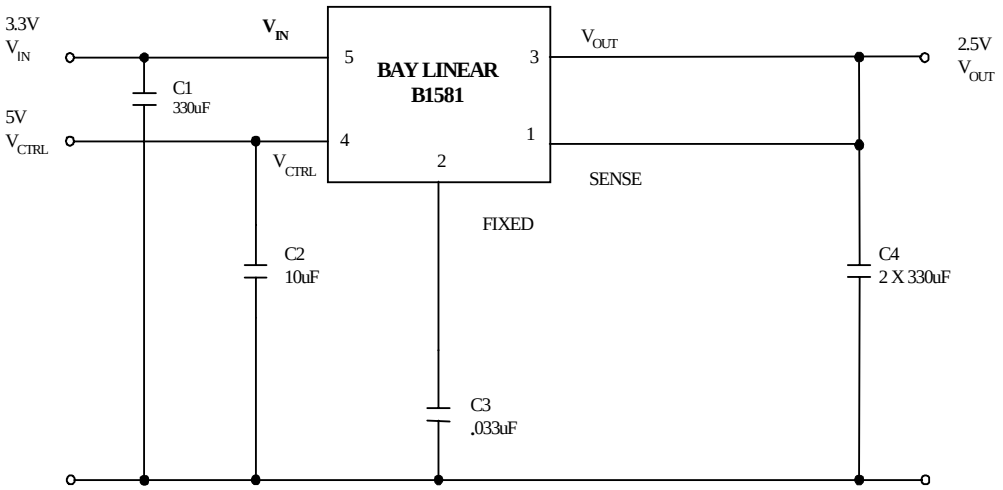
TYPICAL APPLICATION

Fig. 1 Adjustable Regulator



(1) V_{CTRL} needed when V_{IN} < 5V.
(2) $V_{OUT} = V_{REF} (1 + R2/ R1) + I_{ADJ} R2$.
(3) V_{REF} is measured across adjust to sense.

Fig.2 Typical Fixed Regulator



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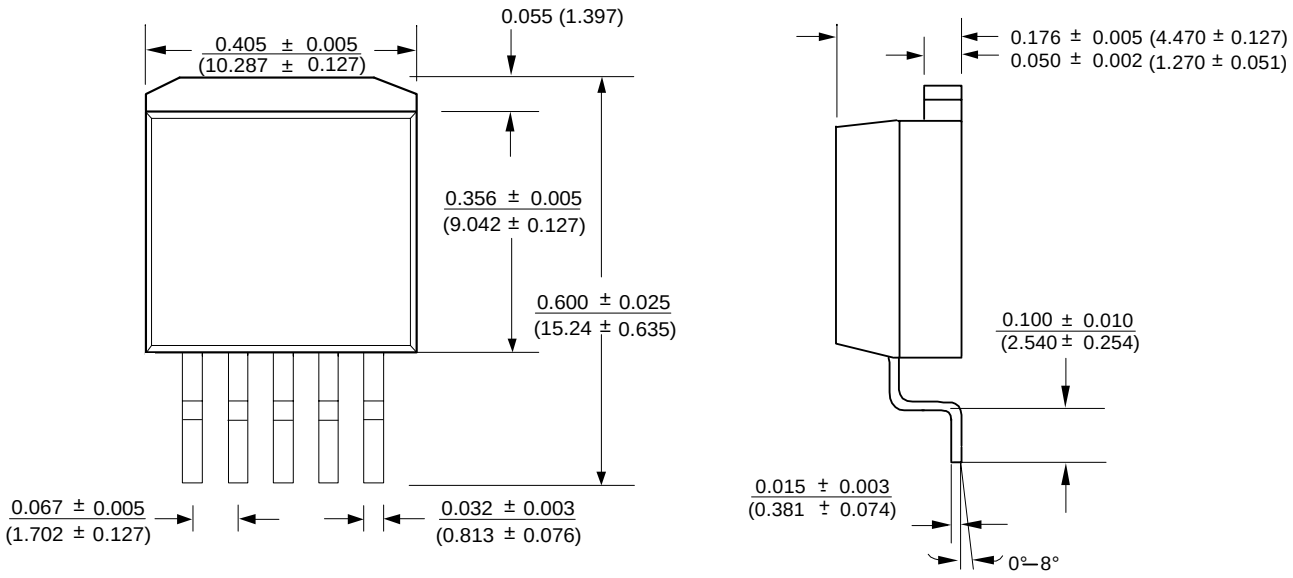
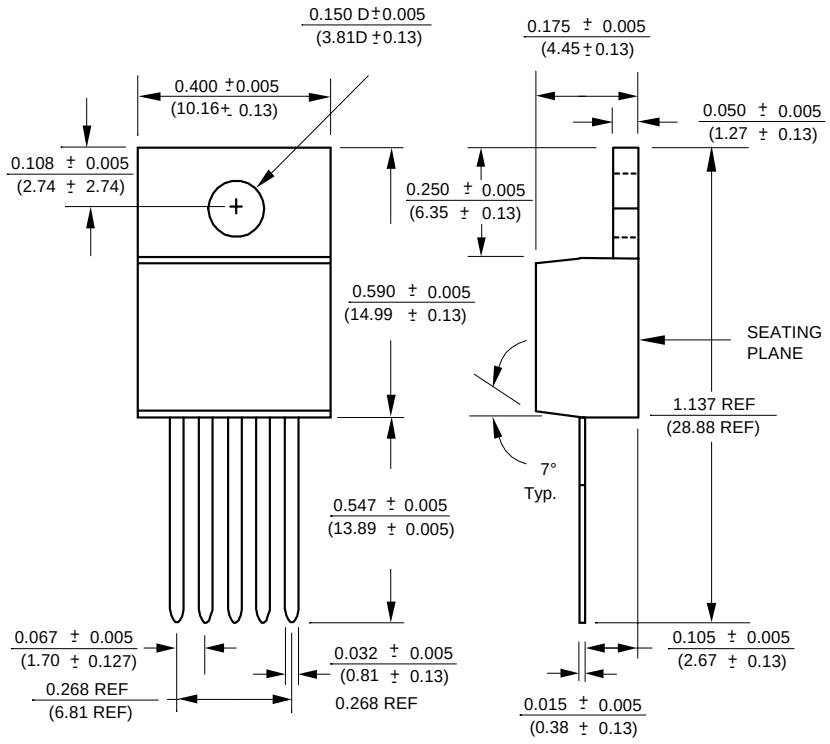


TO-220-5



Advance Information- These data sheets contain descriptions of products that are in development. The specifications are based on the engineering calculations, computer simulations and/ or initial prototype evaluation.

Preliminary Information- These data sheets contain minimum and maximum specifications that are based on the initial device characterizations. These limits are subject to change upon the completion of the full characterization over the specified temperature and supply voltage ranges.

The application circuit examples are only to explain the representative applications of the devices and are not intended to guarantee any circuit design or permit any industrial property right to other rights to execute. Bay Linear takes no responsibility for any problems related to any industrial property right resulting from the use of the contents shown in the data book. Typical parameters can and do vary in different applications. Customer's technical experts must validate all operating parameters including " Typical" for each customer application.

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