ABSOLUTE MAXIMUM RATINGS

Power Dissipation.. Internally Limited
Lead Temp (soldering, 10 seconds)... 300°C
Storage Temperature Range .... -65ºC to +150ºC
Operating Junction Temperature Range
SPX1583 Control Section ....0ºC to +125ºC
SPX1583 Power Transistor ....0ºC to +150ºC

Input Supply Voltage 6V
V_{CTRL} Input Voltage 13V

ELECTRICAL CHARACTERISTICS at V_S=14V, T_A=25°C, Io=10mA, C2=100µF, unless otherwise specified. (Note 1) (Boldface applies over full temperature range).

Parameters	Conditions		SPX1583 Min	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 1.5A		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 12V, I_O=10mA I_O=10mA to 1.5A		2.744 **2.688**	2.800	2.856 **2.912**	V
3.3V Version						
Output Voltage	V_{CTRL}=6.3V to 12V, V_{IN}=3.3V to 12V, I_O=10mA I_O=10mA to 1.5A		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 5.5V, I_O=10mA to 1.5A		1.237	1.250	1.263	V
Line Regulation	V_{CTRL}=2.5V to 12V, V_{IN}=1.75V to 5.5V, 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 1.5A,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=1A			**1.00**	**1.15**	V
Dropout Voltage Minimum V_{IN}(Note2) (V_{IN} - V_{OUT})	V_{ADJ}=0V V_{IN}=2.75V, I_O=1.5A			0.40	0.50	V
Current Limit	V_{CTRL}=2.75V, V_{IN}=2.05V,dV_O=100mV,V_{ADJ}=0V		**1.6**			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=2.1.5A,V_{ADJ}=0V T_J=25, V_{RIPPLE}=1Vpp at 120Hz		60	80		dB
Control Pin Current	V_{ADJ}=0V V_{CTRL} =2.75V, V_{IN}=2.05V, I_O=1.5A			**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-220-5	Junction to Case (θ_{JC})			3	°C/W
		Junction to Ambient (θ_{JA})			50	°C/W
	TO-263-5	Junction to Case (θ_{JC})			3	°C/W
		Junction to Ambient (θ_{JA})			60	°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 to 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.

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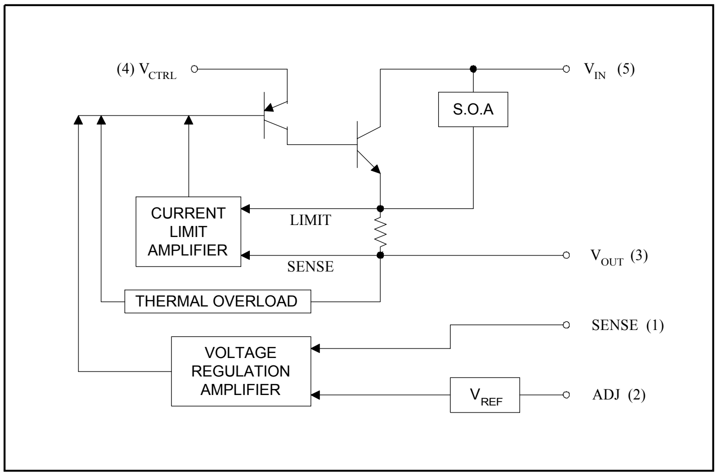
PIN DESCRIPTION

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.

Note that TAB is internally connected to Pin 3.

BLOCK DIAGRAM



APPLICATIONS NOTES

The SPX1583 is designed as a high performance and low cost solution for application requiring a lower dropout than traditional NPN regulators.

The SPX1583 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 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 SPX1583 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 SPX1583. 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.

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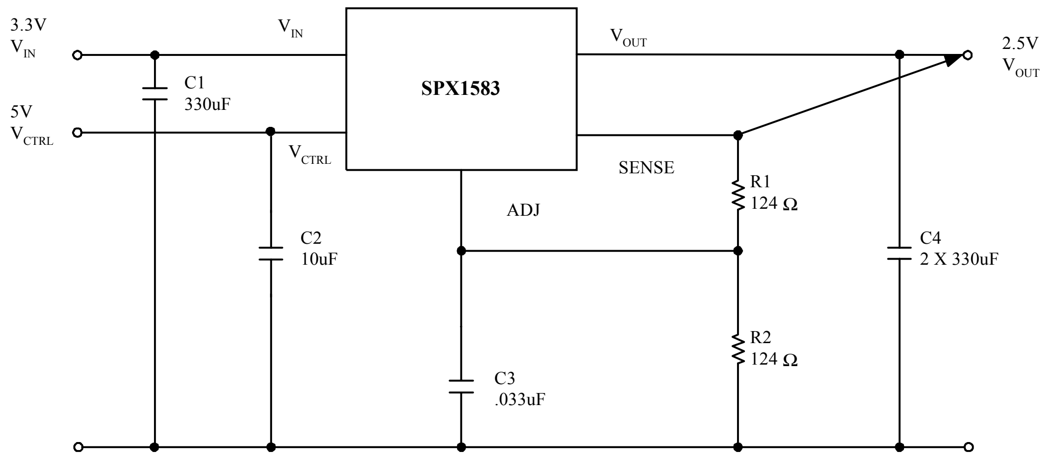
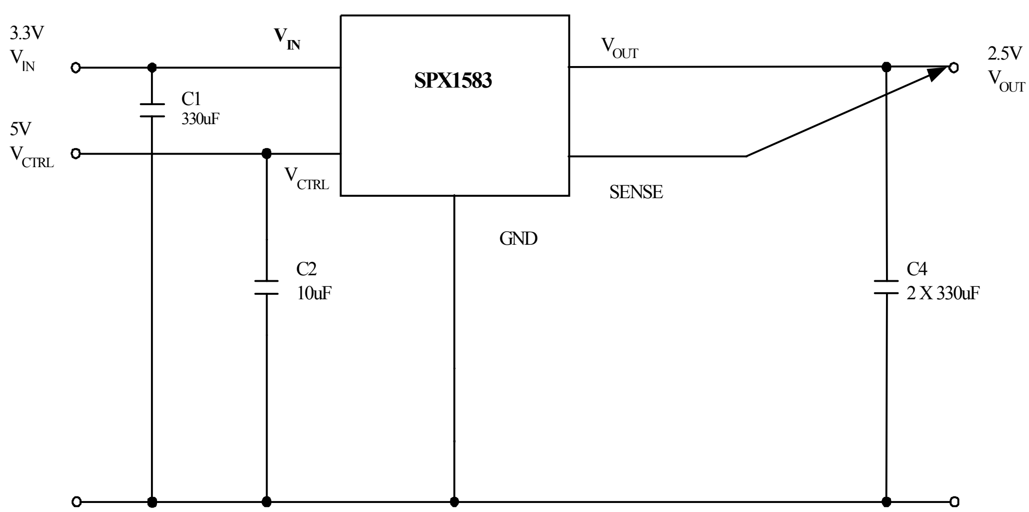
TYPICAL APPLICATION

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



(1) V_{CTRL} is needed when V_{IN} <5V.

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ORDERING INFORMATION

Ordering No.	Precision	Output Voltages	Packages
SPX1583U5	0.6%	Adj	5 Lead TO-220
SPX1583U5-1-5	0.6%	1.5V	5 Lead TO-220
SPX1583U5-2-5	0.6%	2.5V	5 Lead TO-220
SPX1583U5-3-0	0.6%	3.0V	5 Lead TO-220
SPX1583U5-3-3	0.6%	3.3V	5 Lead TO-220
SPX1583T5	0.6%	Adj	5 Lead TO-263
SPX1583T5-1-5	0.6%	1.5V	5 Lead TO-263
SPX1583T5-1-8	0.6%	1.8V	5 Lead TO-263
SPX1583T5-2-5	0.6%	2.5V	5 Lead TO-263
SPX1583T5-2-8	0.6%	2.8V	5 Lead TO-263
SPX1583T5-2-85	0.6%	2.85V	5 Lead TO-263
SPX1583T5-3-0	0.6%	3.0V	5 Lead TO-263
SPX1583T5-3-3	0.6%	3.3V	5 Lead TO-263
SPX1583T5-5-0	0.6%	5.0V	5 Lead TO-263

Available in lead free packaging. To order add "-L" suffix to part number.
Example: SPX1583T5-3-3/TR = standard; SPX1583T5-L-3-3/TR = lead free.
/TR = Tape and Reel
Pack quantity is 500 for TO-263.

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ANALOG EXCELLENCE

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