5V Synchronous Boost

GENERAL DESCRIPTION

PW5150 is a high efficiency synchronous step-up converter with ultralow quiescent current down to 1μA. It also features a true-shutoff function that disconnects the input from output, during shutdown and output short-circuit conditions. This eliminates the need for an external MOSFET and its control circuitry to disconnect the input from output and provides robust output overload protection. A switching frequency of 1.4MHz minimizes solution footprint by allowing the use of tiny and low profile inductors and ceramic capacitors. An internal synchronous MOSFET provides highest efficiency and with a current mode control that is internally compensated, external parts count is reduced to minimal.

FEATURES

- 0.8V Startup to 5 V Input Voltage
- Fixed Output voltage：5V ±3%
- Quiescent Current 1uA
- 1.4MHz Fixed Switching Frequency
- Output Capability：0.5A（VIN=3.7V）
- Internal Synchronous Rectifier and Output Disconnect
- Short-circuit Protection
- SOT23-6L

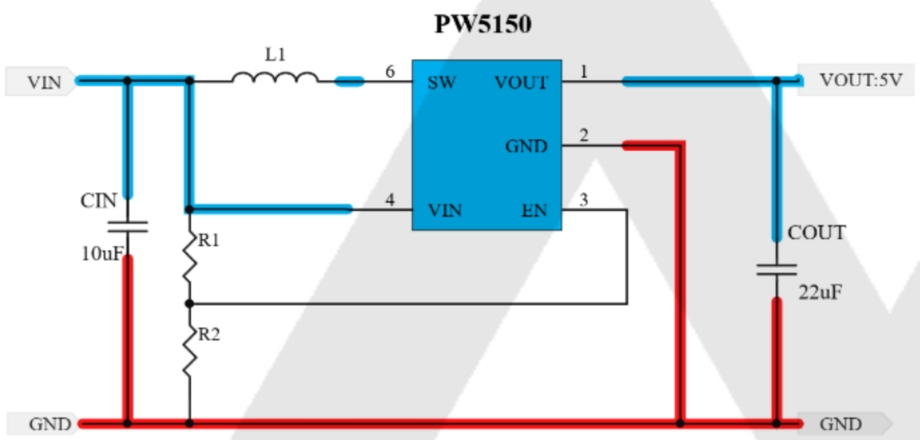
APPLICATIONS

- Power Bank
- LCD Displays
- Digital Cameras
- Handheld Devices
- Portable Products

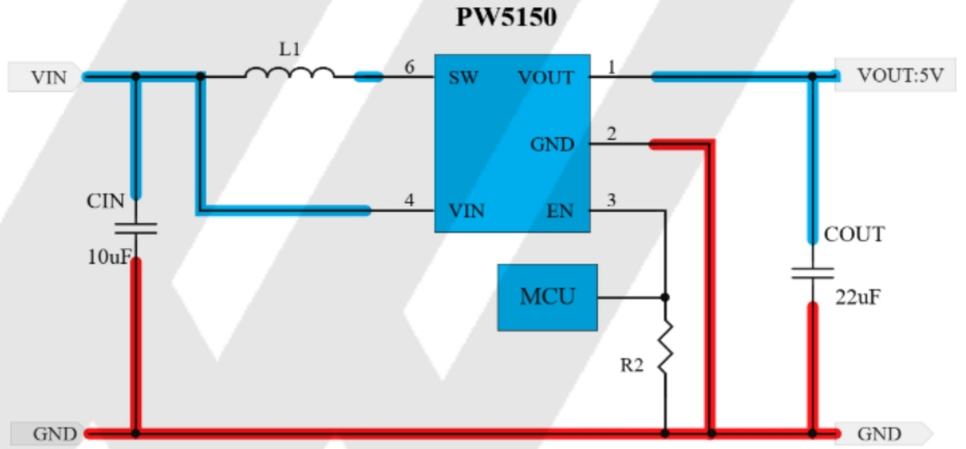
PCB Design Scheme

Products

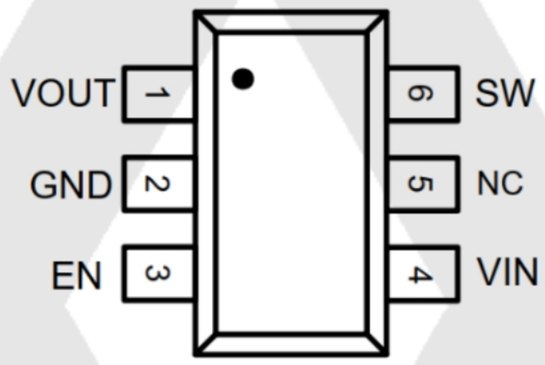
TYPICAL APPLICATION CIRCUIT



Refer to：R1:1M， R2:270K .



PIN ASSIGNMENT/DESCRIPTION



Pin Number	Pin Name	Function
1	VOUT	Output pin
2	GND	IC Ground
3	EN	Enable pin for the IC. Drive this pin high to enable the part, low to disable. Startup at 0.85V. To create a voltage divider for pure connections, you would need two resistors. If you're using an MCU to control the EN pin, you may need to add a pull-down resistor.
4	VIN	Input Supply Voltage
5	NC	NC
6	SW	Inductor Connection. Connect an inductor Between SW and the regulator output

Absolute Maximum Ratings (note)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
SW Voltage	V_{SW}		-0.3		6.5	V
EN FB Voltage	V_{EN}/ V_{FB}		-0.3		6.5	V
VIN VOUT Voltage			-0.3		6.5	V
Thermal Resistance	θ_{JA}				180	°C / W
Thermal Resistance	θ_{JC}				90	°C / W
Junction Temperature	T_J				+160	°C
Operating Temperature	T_{OP}		-40		+85	°C
Storage Temperature	T_{ST}		-55		+150	°C
Lead Temperature		(soldering, 10 sec)			260	°C
ESD HBM	HBM				2000	V
ESD MM	MM				200	V

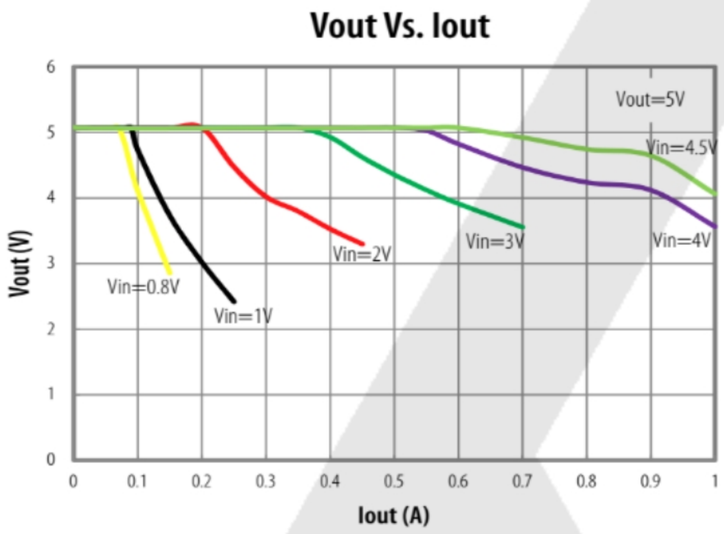
Note： Exceeding these limits may damage the device. Exposure to absolute maximum rating conditions for long periods may affect device reliability.)

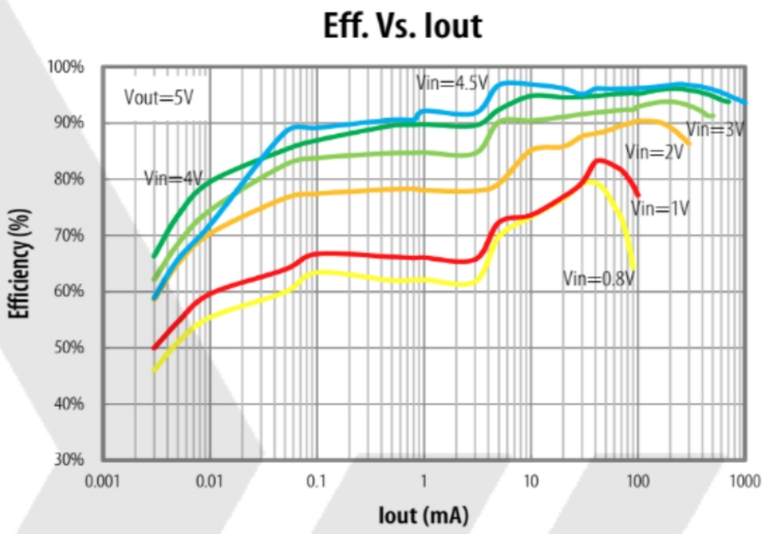
ELECTRICAL CHARACTERISTICS

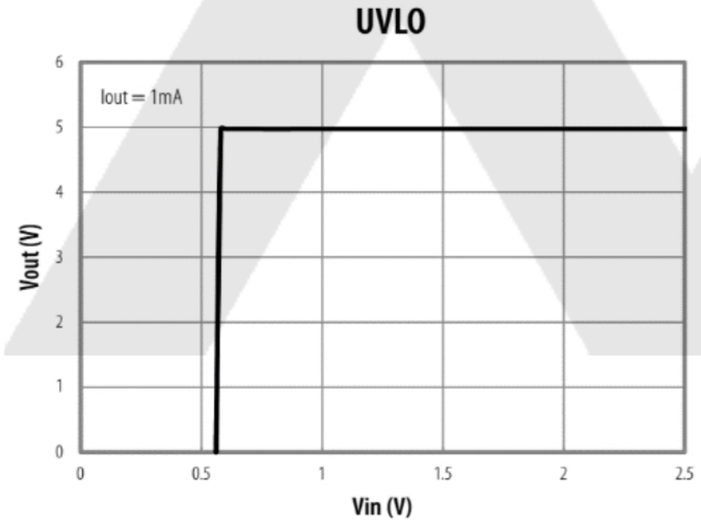
(Vin=3.6V， Vout=5V, TA=25°C,unless otherwise specified)

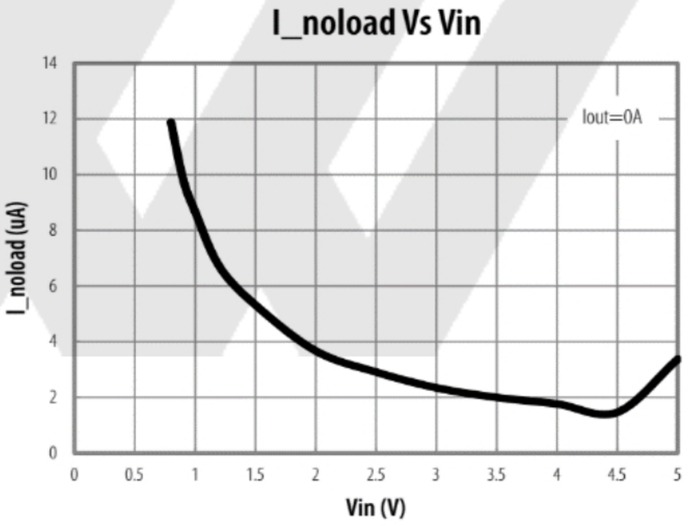
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Quiescent Current	VEN=IN, No load, Not switching		1.2	2.5	μA
Shutdown Supply Current at VIN	VEN =GND		0.32		μA
VIN Startup Voltage	IOUT=1mA		0.8		V
VIN Operation Voltage		0.8		5	V
Output Voltage at 5V		4.85	5	5.15	V
Switching Frequency			1.4		MHz
NMOS Switch On Resistance	ISW=100mA		250		mΩ
PMOS Switch On Resistance	ISW=100mA		160		mΩ
SW Leakage Current	VOUT=5V, VEN=GND, VSW=5V or VSW= 0V			10	μA
NMOS Switch Current Limit			1		A
Start-up Current Limit			1		A
Short Circuit Hiccup time	ON		1.3		ms
Short Circuit Hiccup time	OFF		33		ms
EN Input Current	VEN=5.0V or 0V	-1	0	1	μA
EN High Voltage	VOUT=5V	1.2			V
EN low Voltage	VOUT=5V			0.3	V
Thermal Shutdown	Rising, Hysteresis=25°C		155		°C

TYPICAL OPERATING CHARACTERISTICS









Function Description

PW5150 is a high efficiency synchronous step-up converter with ultra-low quiescent current down to 1μA. It integrates a 250mΩ Low Side Main MOSFET and 160mΩ synchronous MOSFET. It uses a PWM current-mode control scheme. An error amplifier integrates error between the FB signal and the internal reference voltage. The output of the integrator is then compared to the sum of a current-sense signal and the slope compensation ramp. This operation generates a PWM signal that modulates the duty cycle of the power MOSFETs to achieve regulation for output voltage.

The peak current of the NMOS switch is also sensed to limit the maximum current flowing through the switch and the inductor. The typical peak current limit is set to 1A. An internal temperature sensor prevents the device from getting overheated in case of excessive power dissipation.

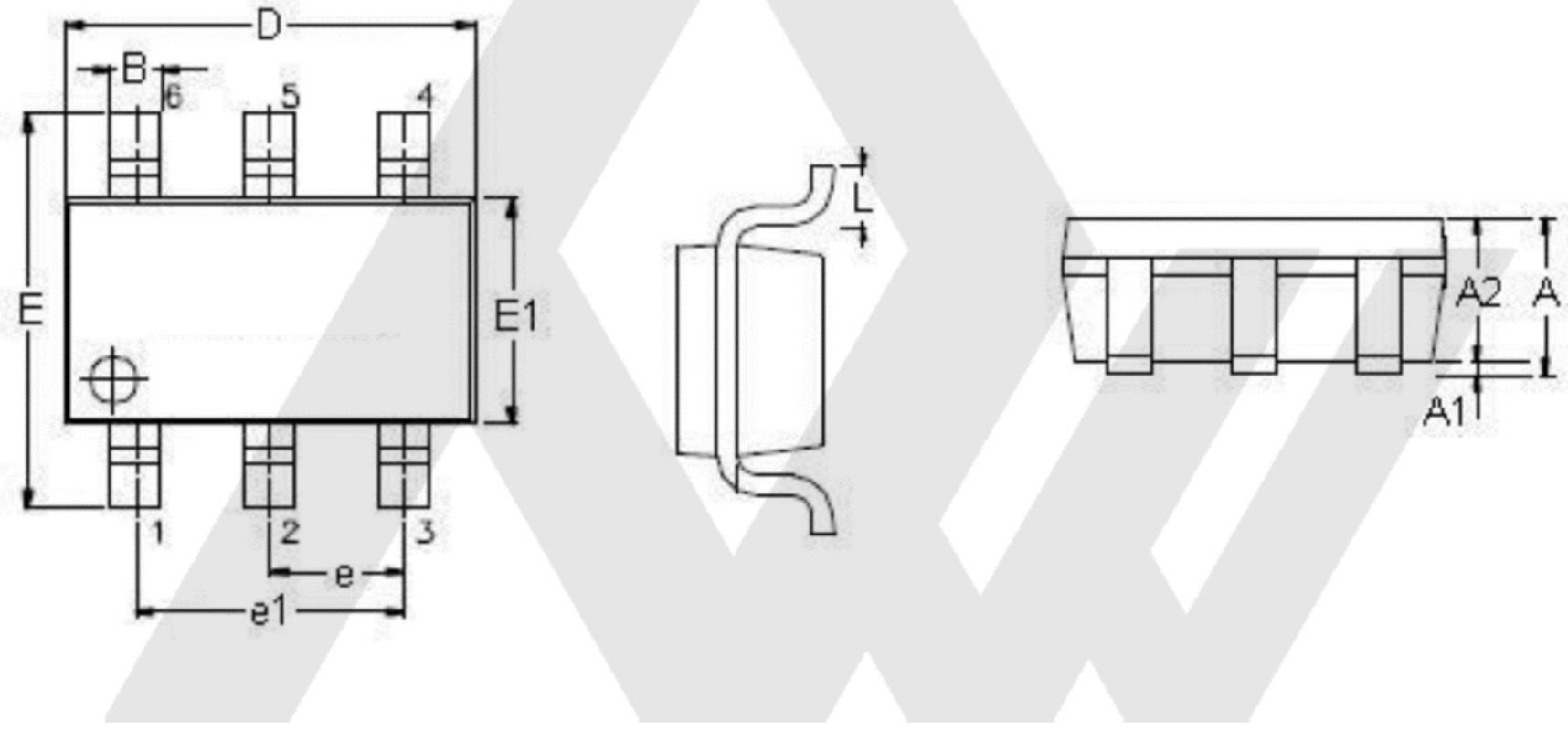
Traditionally, a fixed constant frequency PWM DC/DC regulator always switches even when the output load is small. When energy is shuffling back and forth through the power MOSFETs, power is lost due to the finite RDSONs of the MOSFETs and parasitic capacitances. At light load, this loss is prominent and efficiency is therefore very low. PW5150 employs a proprietary control scheme that improves efficiency in this situation by enabling the device into a power saving mode during light load and the no load quiescent current can be as low as 1μA.

Short-Circuit Protection

Unlike most step-up converters, the PW5150 allows for short circuits on the output. In the event of a short circuit, the device first turns off the NMOS when the sensed current reaches the current limit. When OUT drops below IN, the device then enters a linear charge period with the current limited same as with the start-up period. In addition, the thermal shutdown circuits disable switching if the die temperature rises above 155°C.

PACKAGE DESCRIPTION

SOT23-6L Package (Unit: mm)



SYMBOLS UNIT	DIMENSION IN MILLIMETER	
	MIN	MAX
A	0.90	1.45
A1	0.05	0.15
A2	0.90	1.30
B	0.30	0.50
D	2.80	3.00
E	2.60	3.00
E1	1.50	1.70
e	0.90	1.00
e1	1.80	2.00
L	0.30	0.60

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