Description

The RLCP2510 is a constant frequency, current mode step-down converter. The device integrates a main switch and a synchronous rectifier for high efficiency without an external Schottky diode. It is ideal for powering portable equipment that runs from a single cell Lithium-Ion (Li+) battery. The output voltage can be regulated as low as 0.6V. The RLCP2510 can also run at 100% duty cycle for low dropout operation, extending battery life in portable system. This device offers two operation modes, PWM control and PFM Mode switching control, which allows a high efficiency over the wider range of the load. The RLCP2510 is offered in a low profile 5-pin, SOT23-5 package, and is available in an Adjustable version.

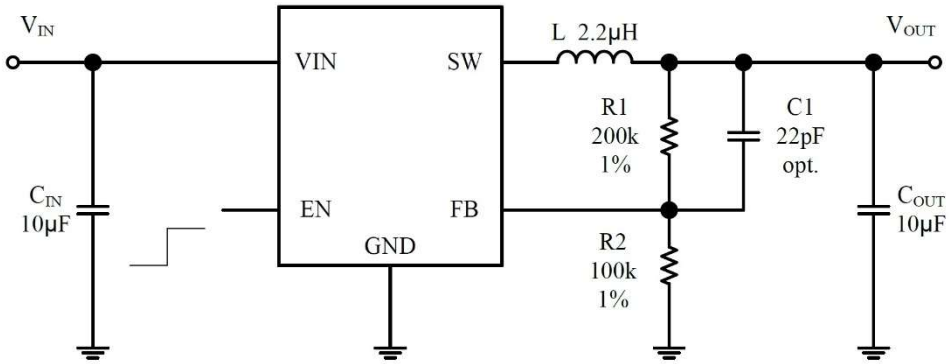
Features

- 2V to 6V Input Voltage Range
- 1A Output Current
- Low Quiescent Current: 10μA
- 1.5MHz Constant Frequency Operation
- Output Voltage as Low as 0.6V
- PFM Mode for High Efficiency in Light Load
- 100% Duty Cycle in Dropout Operation
- Short Circuit Protection
- Thermal Fault Protection
- Inrush Current Limit and Soft Start
- <1μA Shutdown Current
- SOT23-5 package

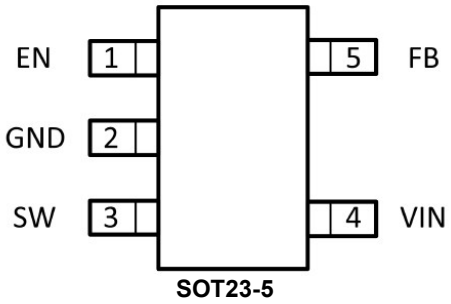
Applications

- Cellular and Smart Phones
- Wireless and DSL Modems
- PDAs
- Portable Instruments
- Digital Still and Video Cameras
- DTV

Typical Application



Pin Description



SOT23-5

The package of RLCP2510 is SOT23-5, with pin assignment shown in following table:

Pin Name	Pin Number	Description
EN	1	Chip Enable Pin. Drive EN above 1.5V to turn on the chip. Do not leave EN floating.
GND	2	Ground pin.
SW	3	The switching node, connecting a 2.2uH inductor to this node
VIN	4	The input power node, connecting a 10uF capacitor to ground.
FB	5	Output Voltage Feedback Pin. With VFB at 0.6V

order Information

Part NO	Package	Reel/ PCS
RLCP2510ST5/R6	SOT23-5	3000

Absolute Maximum Ratings(Note 1)

Item	Min	Max	Unit
Input Supply Voltage	-0.3	6.5	V
EN,FB Voltages	-0.3	VIN+0.3	V
SW Voltage	-0.3	VIN+0.3	V
Operating Temperature Range	-40	+85	℃
Storage Temperature Range	-60	+150	℃

Item	Value	Unit
Junction Temperature(Note2)	150	℃
Lead Temperature(Soldering,10s)	300	℃
ESD MM(Machine Mode)	2	KV
Power Dissipation	0.4	W
Thermal Resistance Θjc	130	℃/W
Thermal Resistance θJA	250	℃/W

Recommended Operating Condition (Note 2)

(VIN=VEN=3.6V, VOUT=1.8V, TA = 25℃, unless otherwise noted.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage Range		2		6	V
Supply Current (Quiescent)	VEN=3.0V		10	20	μA
Supply Current (Shutdown)	VEN=0		0	1	μA
Regulated Feedback Voltage VFB		0.588	0.600	0.612	V
Oscillation Frequency	Vout=100% Vout =0V		1.5		MHz
			300		kHz
On Resistance of PMOS	Isw=100mA		300	450	mΩ
On Resistance of NMOS	Isw=-100mA		300	450	mΩ
Peak Current Limit	VIN= 3V, VOUT =90%		2		A
Over Voltage Protection Threshold			6.5		V
EN High-Level Input Voltage	VENH	1.5			V
EN Low-Level Input Voltage	VENL			0.4	V
Under-Voltage Lockout Threshold	Wake up		1.9		V
	Shutdown		1.75		V
	Hysteresis		150		mV
SW Leakage Current	VEN=OV, VIN=VSw=5.5V		±0.01	±1.0	uA
Soft Start			800		uS
Thermal Shutdown			160		℃
Thermal Hysteresis			16		℃

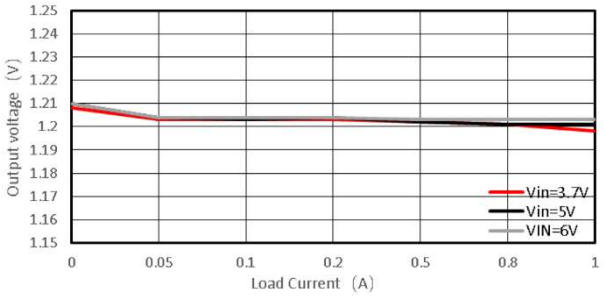
Note 1: Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

Note 2: 100% production test at +25℃. Specifications over the temperature range are guaranteed by design and characterization.

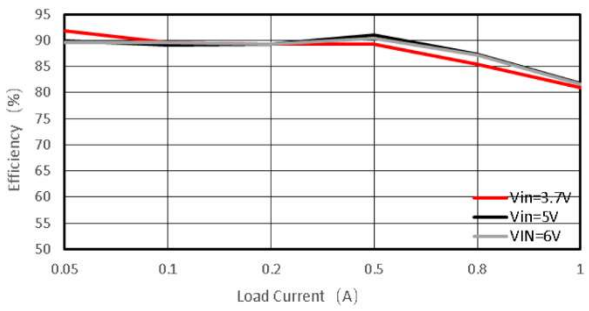
Typical Characteristics

VIN =5V, TA = +25° C, unless otherwise noted.

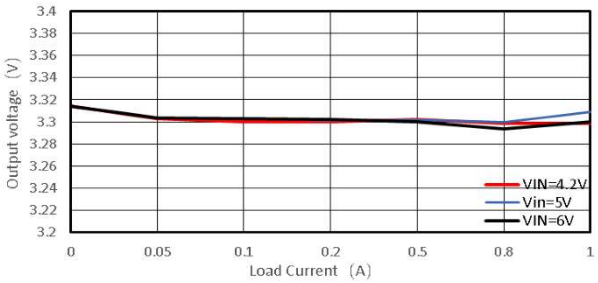
Load Regulation @ V_{OUT}=1.2V



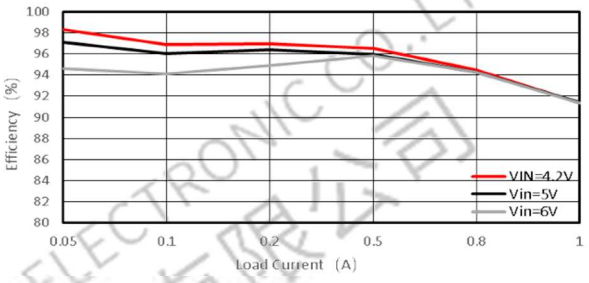
Efficiency @ V_{OUT}=1.2V



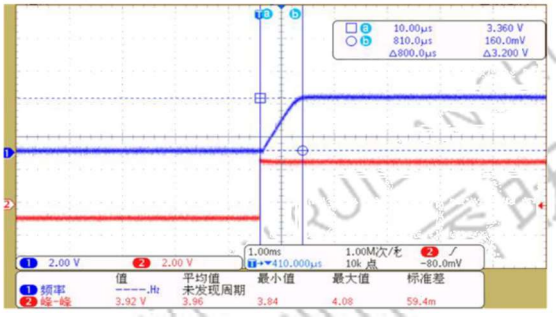
Load Regulation @ V_{OUT}=3.3V



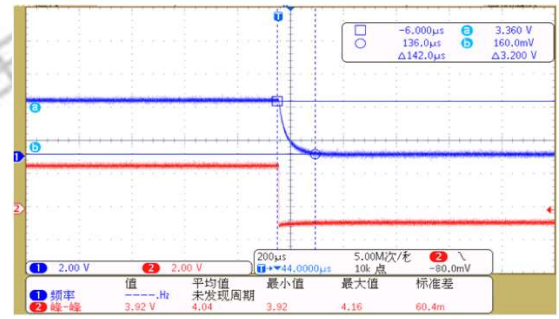
Efficiency @ V_{OUT}=3.3V



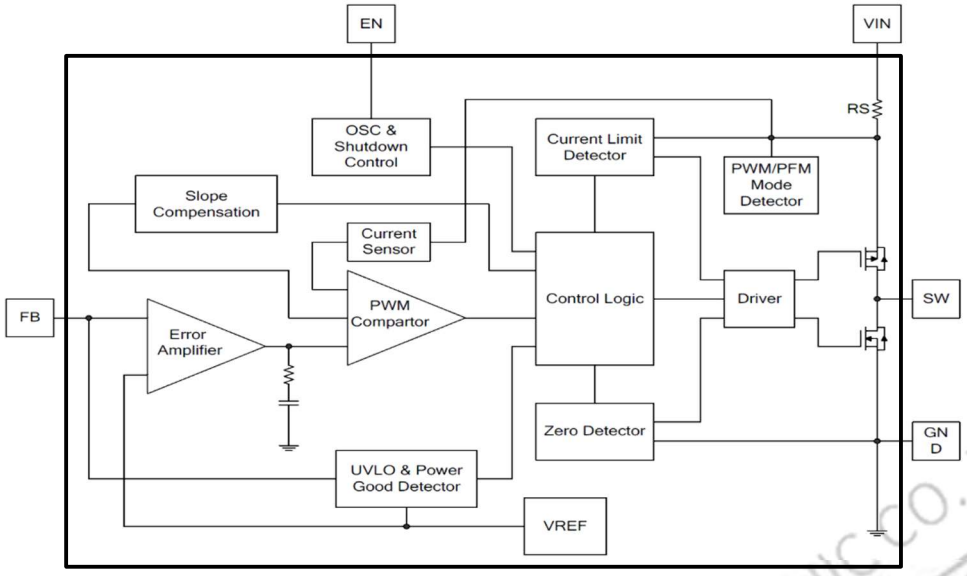
Enable Startup @ V_{OUT}=3.3V, I_{OUT}=0.8A



Enable Shutdown @ V_{OUT}=3.3V, I_{OUT}=0.8A



Functional Block Diagram



Applications Information

Setting the Output Voltage The internal reference VREF is 0.6V (Typical).The output voltage is divided by a resistor, R1 and R2 to the FB pin. The output voltage is given by:

$$V_{OUT} = 0.6 \times \left(1 + \frac{R1}{R2}\right)$$

Inductor Selection

RLCP2510 works at a 1.5MHz oscillating frequency which helps to have a small voltage ripple at output. And 2.2uH inductor is found the most suitable value while meeting requirements on small output voltage ripple as well as a high-power conversion efficiency.

Input Capacitor Selection

The input capacitor reduces the surge current drawn from the input and switching noise from the device. The input capacitor impedance at the switching frequency should be less than input source impedance to prevent high frequency switching current passing to the input. A low ESR input capacitor sized for maximum RMS current must be used. Ceramic capacitors with X5R or X7R dielectrics are highly recommended because of their low ESR and small temperature coefficients. A 4.7μF ceramic capacitor for most applications is sufficient. A large value may be used for improved input voltage filtering.

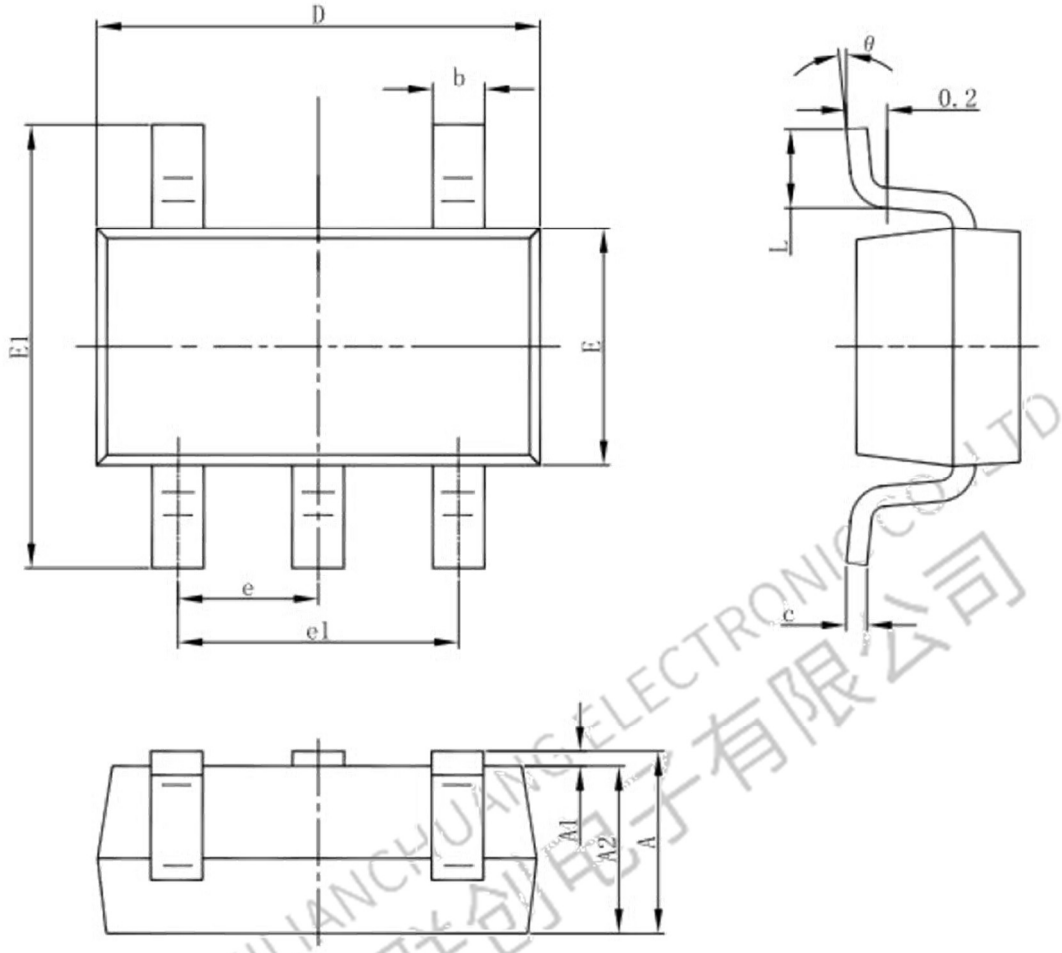
Output Capacitor Selection

The output capacitor is required to keep the output voltage ripple small and to ensure regulation loop stability. The output capacitor must have low impedance at the switching frequency. Ceramic capacitors with X5R or X7R dielectrics are recommended due to their low ESR and high ripple current ratings.

PCB Layout

An illustration of PCB layout recommendation with key elements is laid out as following. Please follow this PCB instruction to place the key peripheral devices such as input capacitors, output capacitors and inductor. And star-like connection for ground node is essential. And keeping power loop area as small as possible will improve the EMI performance.

Package Outline Dimensions (SOT23-5)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

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