Description

The RLCP2520 is a compact 5V Buck Converter which can deliver 2A output current.RLCP2520 employs a proprietary control loop to achieve a fast transient load response. It keeps high converting efficiency in both light load and heavy load.RLCP2520 is equipped with all kinds of protection,such as input over voltage protection, output short circuit protection, over current protection and over temperature protection.

RLCP2520 consists of internal power tree generator, bandgap voltage reference module,under-voltage-lockout (UVLO) module, error amplifier,protection circuitry, driver block, current sensing block and two power MOSFETs.RLCP2520 is housed in a SOT23-5 package.

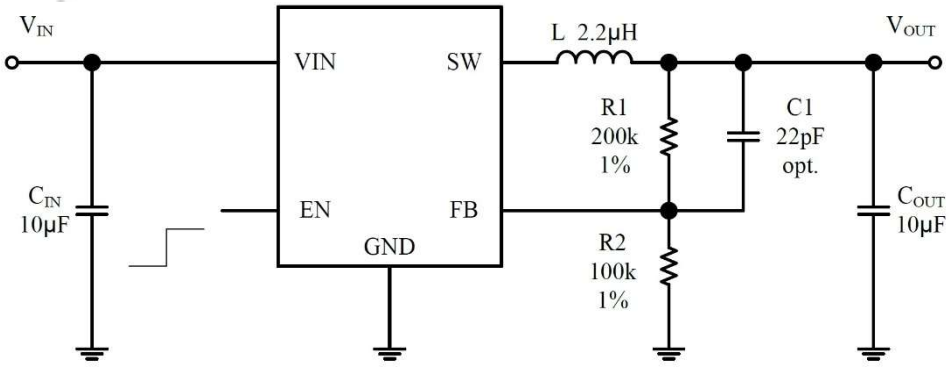
Features

- 2.7V to 5.5V Input Voltage Range
- Input over voltage protection at 6V
- 40uA quiescent current in operation
- Output current up to 2A
- Efficiency up to 97%
- OCP, SCP and OTP protection
- SOT23-5 package

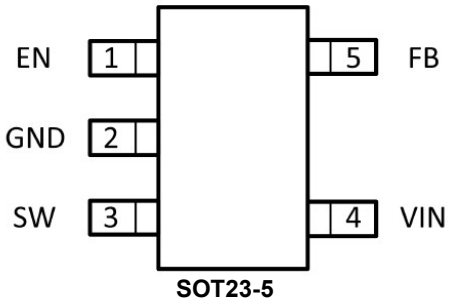
Applications

- Set-top Box
- Solid State Drive
- WIFI and Network Devices
- Security surveillance system
- Toys
- TV
- All other electronic devices

Typical Application



Pin Description



SOT23-5

The package of RLCP2520 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
RLCP2520ST5/R6	SOT23-5	3000

Absolute Maximum Ratings

Item	Min	Max	Unit
Input Supply Voltage (1)	-0.3	6.0	V
VOUT Voltages (1)	-0.3	5.5	V
Operating Temperature Range	-40	+85	℃
Storage Temperature Range	-60	+150	℃

Item	Value	Unit
Junction Temperature	-40~+150	℃
Lead Temperature(Soldering,10s)	260 Max	℃
ESD MM(Machine Mode)	2	KV
Power Dissipation (2)	0.4	W
Thermal Resistance Θjc (3)	75	℃/W
Thermal Resistance θJA (3)	170	℃/W

Recommended Operating Condition (Note 2)

(VIN=5V, TA=25°C, unless otherwise specified.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage Range		2.7		5.5	V
Input Over Voltage Protection		5.8	6	6.5	V
Quiescent Current (IQ)	VIN=5.0V	20	40	60	μA
Shutdown Current	VIN=5.0V, VEN=0		0.1	2.0	μA
Regulated Feedback Voltage VFB	VIN=5.0V	0.588	0.600	0.612	V
Oscillation Frequency	VIN =5V	1	1.3	1.8	MHz
On Resistance of PMOS	VIN =5V		140		mΩ
On Resistance of NMOS	VIN =5V		80		mΩ
EN High-Level Input Voltage	VENH VIN =5V	0.9	1.1		V
EN Low-Level Input Voltage	VENL VIN =5V		0.4	0.7	V
Input Voltage UVLO	Rising		2.55	2.65	V
	Falling	2.25	2.65		V
EN pull-down resistor			750		KΩ
Output Discharge resistor，Rpd	VIN =5V		50		Ω
Thermal Shutdown			150		℃
Thermal Hysteresis			40		℃

Note (1): Exceeding these ratings may damage the device.

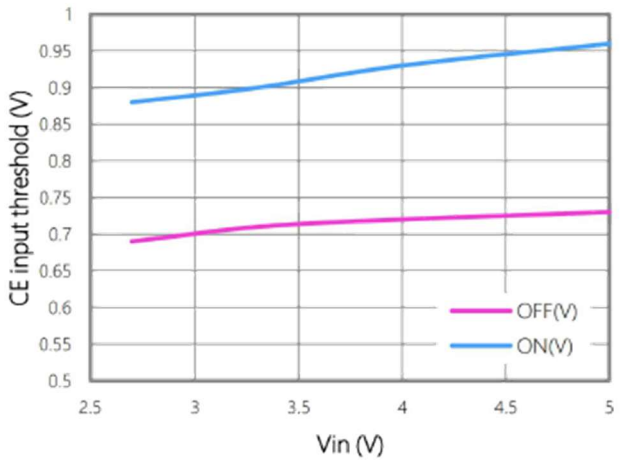
Note (2): The maximum allowable power dissipation is a function of the maximum junction temperature TJ(MAX), the junction-toambient thermal resistance θJA, and the ambient temperature TA. The maximum allowable continuous power dissipation at any ambient temperature is calculated by PD(MAX)=(TJ(MAX)-TA)/θJA. Exceeding the maximum allowable power dissipation will cause excessive die temperature, and the regulator will go into thermal shutdown. Internal thermal shutdown circuitry protects the device from permanent damage.

Note (3): Measured on JESD51-7, 4-layer PCB.

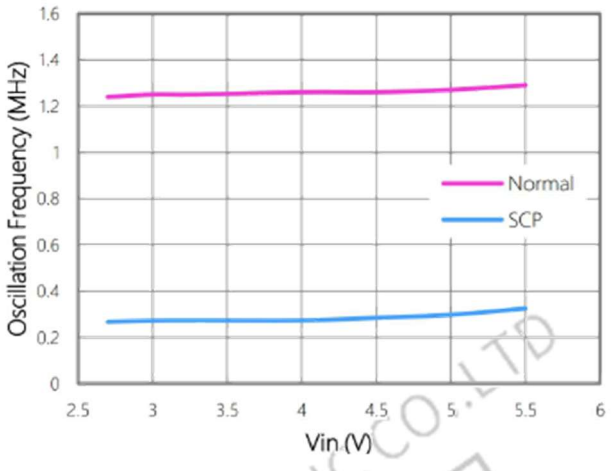
Typical Characteristics

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

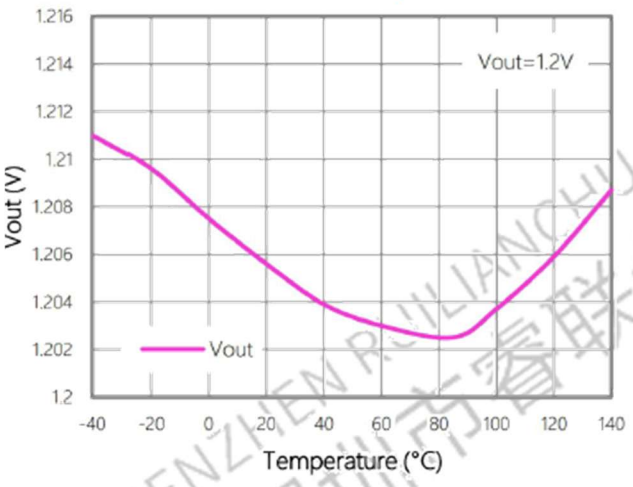
Threshold vs. Vin



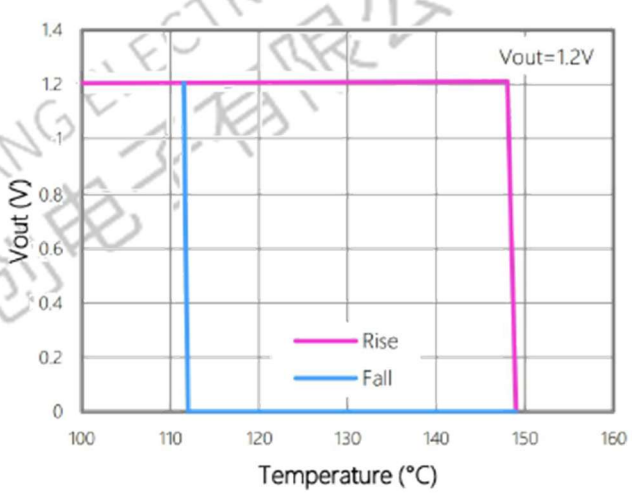
Frequency vs. Vin



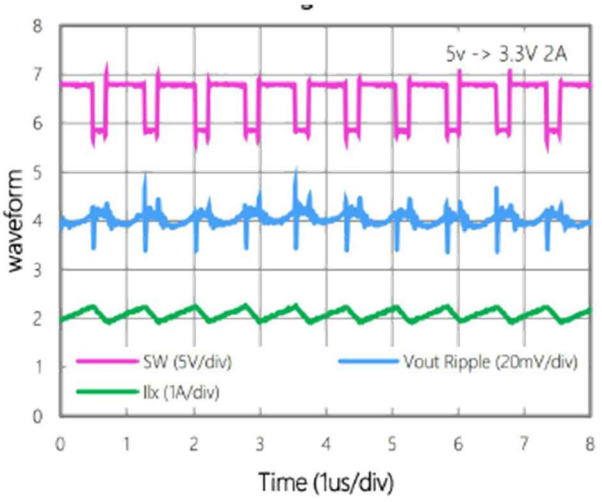
Vout vs. Temp



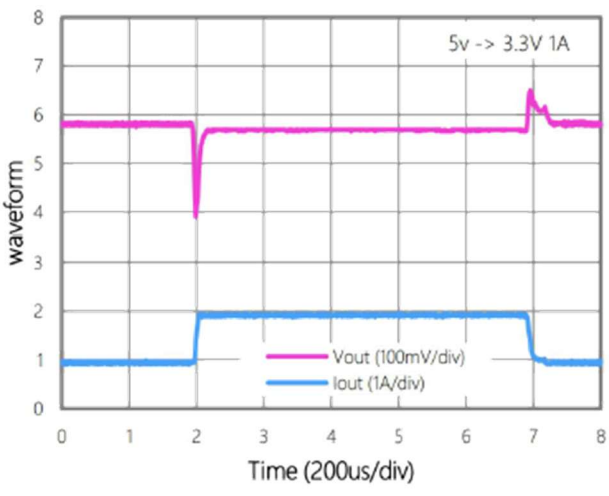
OTP Hystersis



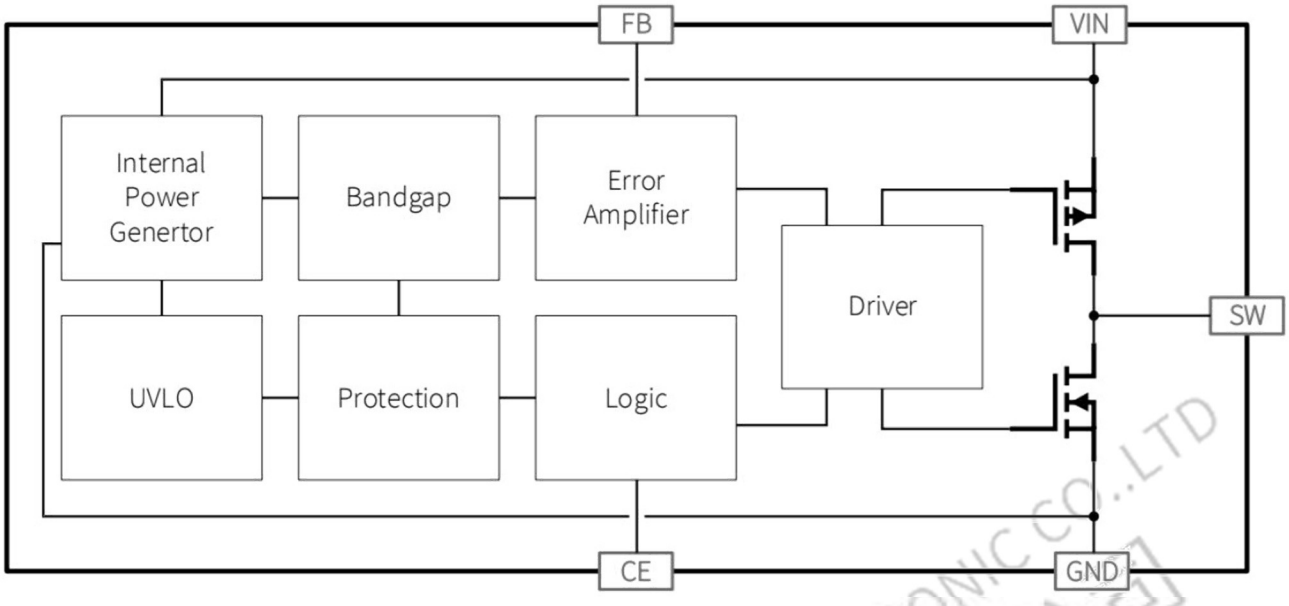
Switching Waveform



Load Transient Response



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

RLCP2520 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

RLCP2510 requires one minimal 10uF MLCC capacitor at VIN node and one 10uF MLCC capacitor at VOUT node,however, it is always recommended to have two 10uF MLCC capacitors placed in parallel both at VIN and VOUT node to minimize the noise and withstand the current surge. It is also essential to place both input capacitors and output capacitors as close to RLCP2510's VIN pin and VOUT pin as possible. An PCB layout example is shown at PCB layout recommendation section.

Output Capacitor Selection

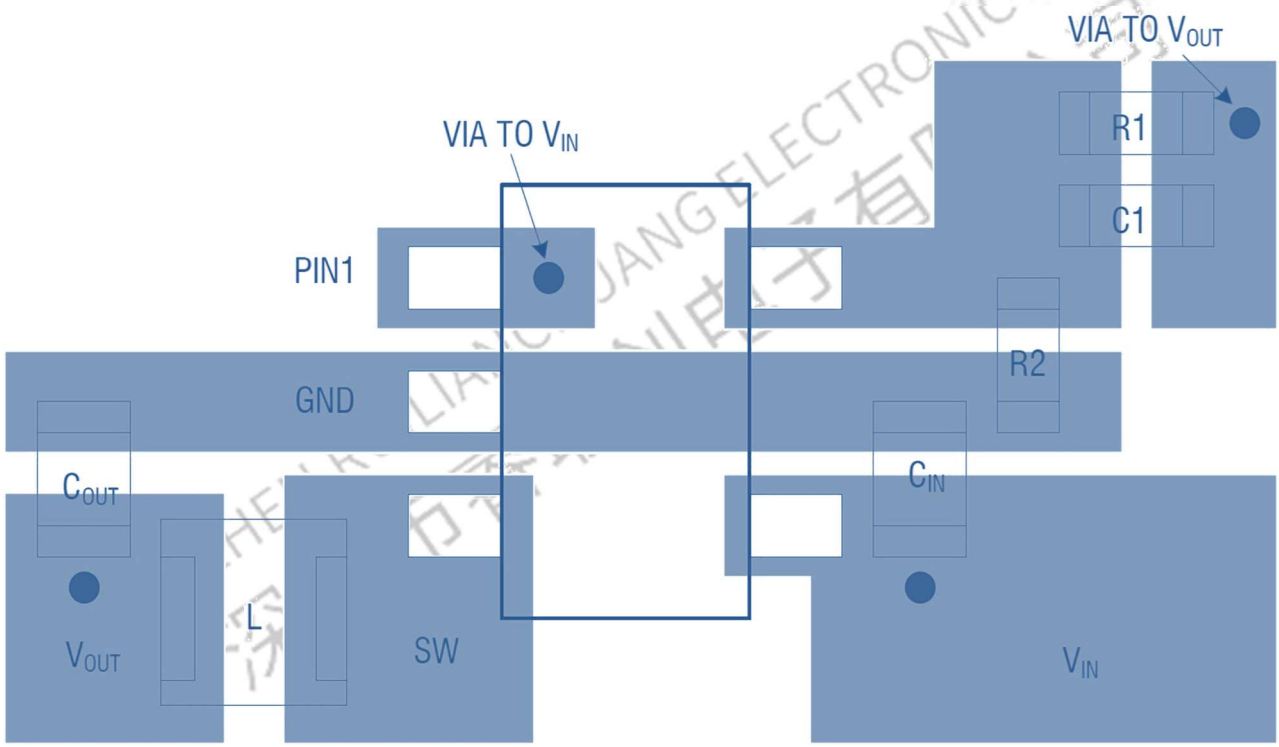
The output capacitor is required to keep the output voltage ripple small and to ensure regulation loop stability. The output capacitor must have low impedance at the switching frequency. Ceramic capacitors with X5R or X7R dielectrics are recommended due to their low ESR and high ripple current ratings.

Thermal Considerations

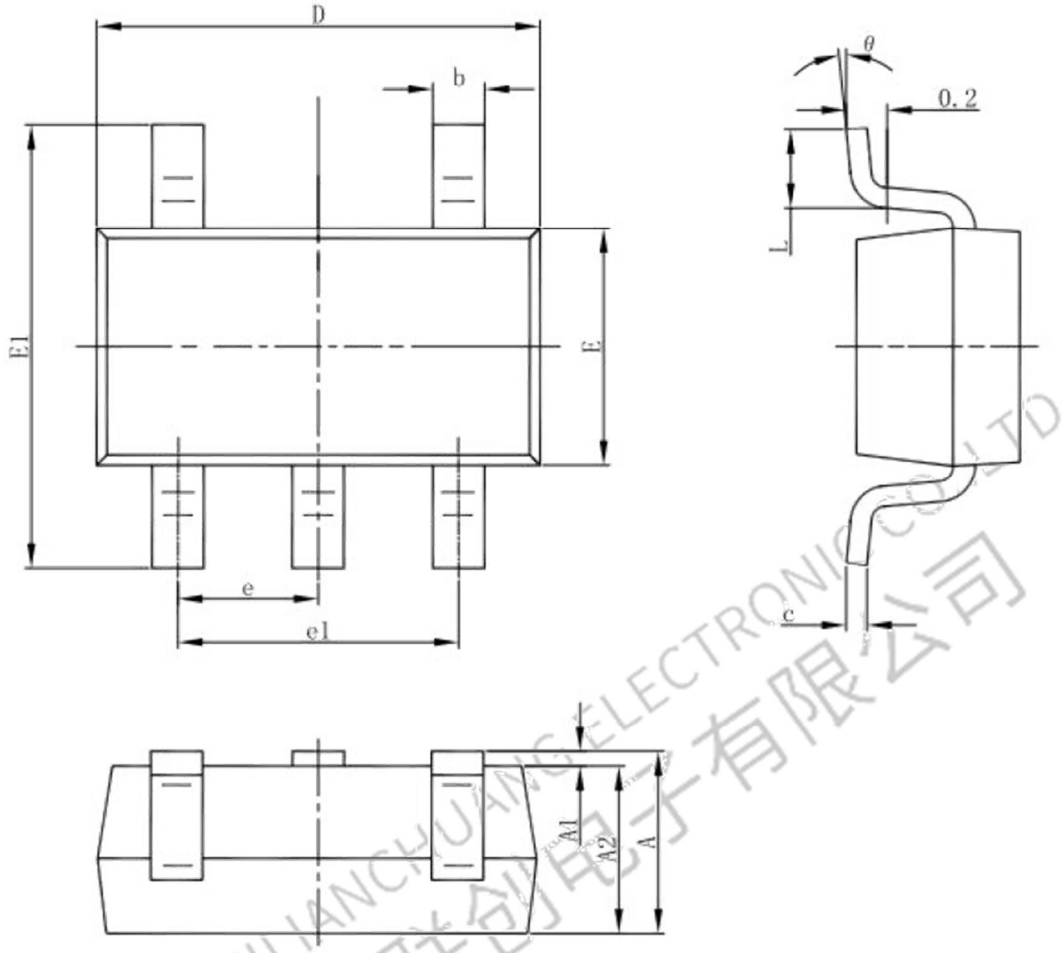
Though RLCP2510 is a high efficiency DC/DC converter, there will always be some power lost during conversion,most of which becomes heat to make junction temperature higher. PCB design to ensure a good heat dissipation is important. Because the heat dissipation of the SOT23-5L package is conducted through the pin No. 2, which is GND node of RLCP2510, please make sure the ground plate of PCB is big enough to carry away the heat generated in the chip.

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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