

500 mA PFM Step-Up DC-DC Controller

CN5136

General Description

CN5136 is a high-efficiency pulse frequency modulation (PFM) DC-DC converter, and the maximum output current capability is up to 500mA. CN5136 has an on-chip power transistor, thus greatly reduces the external component count. Other features include the maximum inductor current limit, soft-start circuit.

CN5136 output voltage can be set by external resistors. High accuracy on-chip voltage reference ensures the accuracy of the output voltage and low temperature drift.

CN5136 can operate from the voltage of 2.7V to 6V, which is very suitable for lithium and three nickel-metal hydride battery-powered applications.

The device is available in 5 pin SOT23 package and is fully specified over the -40°C to +85°C extended temperature range.

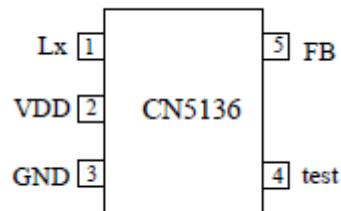
Applications

- Mobile power
- PDA and other portable products
- Electric toys
- Computer peripheral products

Features

- Operating voltage range: 2.7V to 6V
- Integrated power transistor
- Maximum inductor current limit function
- Output voltage can be set by external resistor
- Output voltage accuracy: $\pm 2\%$
- High efficiency: 90%
- On-chip soft-start circuit
- Operating Temperature Range
-40°C to +85°C
- Available in SOT23-5
- Pb-free

Pin Assignment



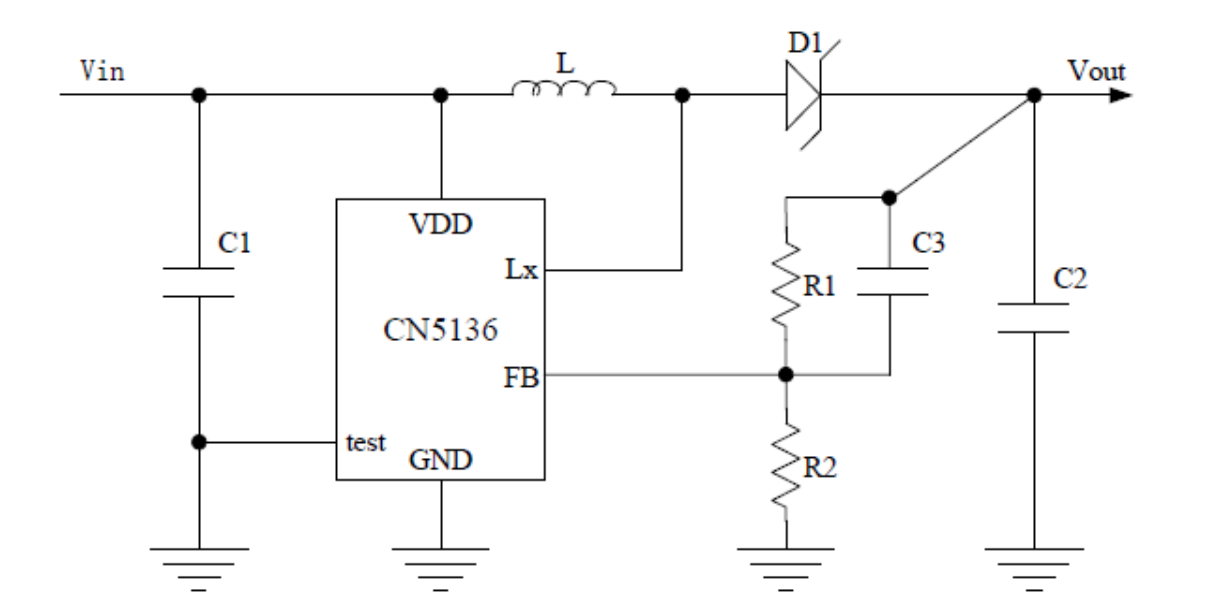


Figure 1 Typical Application Circuit

Block Diagram

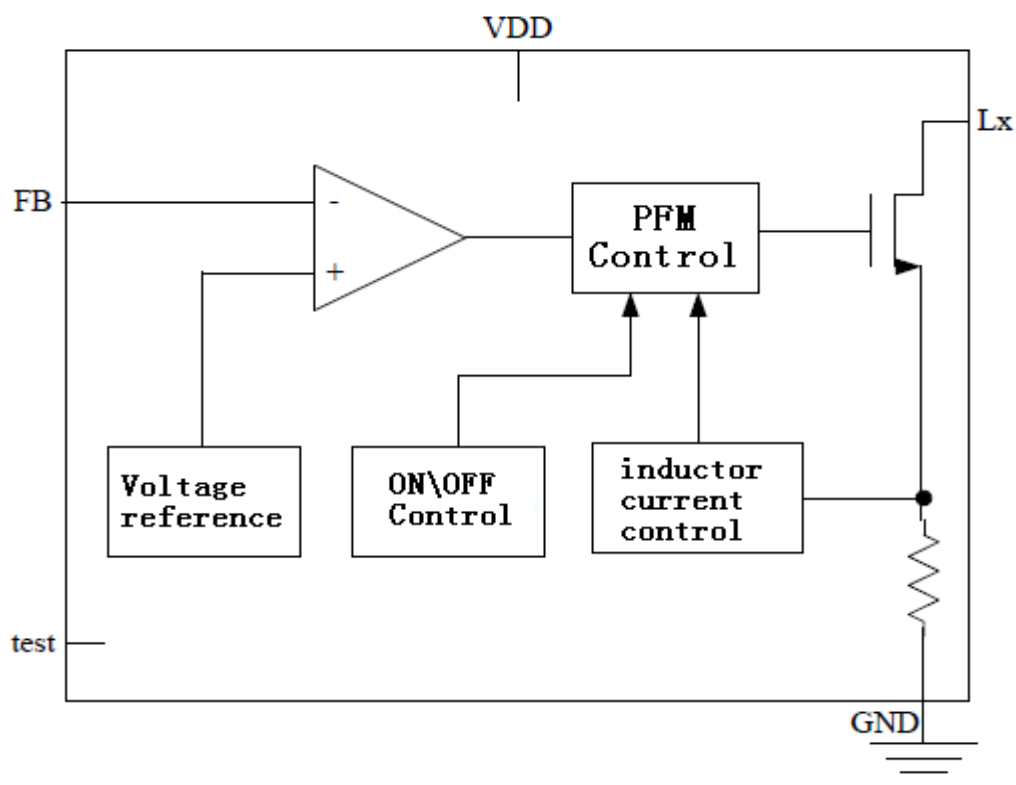


Figure 2 Block Diagram

Ordering Information

Part No.	Mark	Package	Operating Ambient Temperature
CN5136	5136	SOT23-5	−40°C to 85°C

Pin Description

Pin No.	Symbol	Description
1	Lx	Inductor Connection. This pin is connected to the drain of N-channel MOS transistor in device.
2	VDD	Positive Terminal of Power Supply.
3	GND	GND.
4	test	Test pin. This pin should be tied to ground.
5	FB	Voltage Feedback Pin. The output voltage is sampled and feedback to this pin.

ABSOLUTE MAXIMUM RATINGS

Terminal Voltage (With respect to GND)	Thermal Resistance.....300°C/W
V _{DD}-0.3V to +6.5V	Operating Temperature.....-40 to +85°C
Other terminal voltage.....-0.3V to V _{DD}	Storage Temperature.....-65 to +150°C
Maximum Junction Temperature..... 150°C	Lead Temperature (soldering, 10s)+260°C

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Electrical Characteristics

($V_{DD}=3.6V$, $T_A=25^{\circ}C$, unless otherwise noted.)

Parameters	Symbol	Test Conditions	Min	Typ	Max	Unit
Operating Voltage Range	VDD		2.7		6	V
Quiescent current	I_{VDD1}	$V_{FB}=1.3V$		85		uA
Dynamic operating current	I_{VDD2}	$V_{FB}=0V$		125		
FB pin input current	I_{FB}				1	uA
FB pin voltage modulation	V_{fth}	CN5136 normal output voltage modulation		1.22		V
Maximum on-time	t_{on}			2.6		us
Minimum off-time	t_{off}			0.9		us
Lx pin leakage current	I_{Lx}	$V_{FB}=1.3V$			1	uA
Maximum inductor current	I_L	Lx pin switch turns on		1.2		A
Power transistor resistance	R_{on}	Lx pin switch turns on		0.15		Ω

Operating Profile

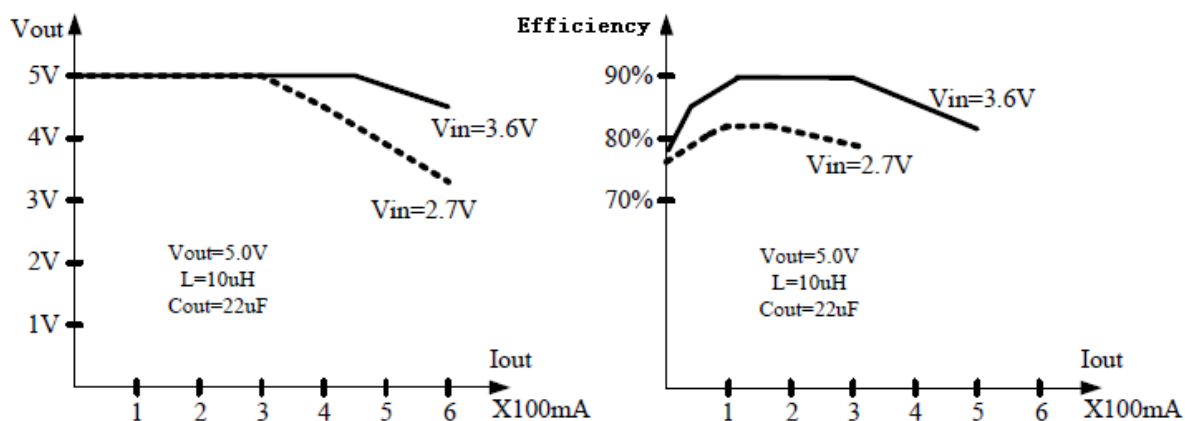


Figure 3 Operating Profile

Detailed Description

CN5136 is a high-efficiency pulse frequency modulation (PFM) step-up DC-DC converter. It consists of a voltage reference, a comparator, on / off control circuit, the inductor current limit, the soft start block and power switch. CN5136 switching frequency is up to 300KHz, the circuit requires only two external resistors, an inductor, a capacitor and a Schottky diode as the rectifier. Output voltage can be set up to 6V. The inductor current is monitored on a cycle by cycle basis. When the inductor current reaches the maximum value, power transistor is turned off, then the inductor current will not increase any more.

Applications Information

The selection of external components in Figure 1.

(1) Capacitor C1:

Input bypass capacitor.

(2) Capacitor C2:

Output filter capacitor, 22uF capacitor can meet the requirements

(3) Capacitor C3:

Loop compensation capacitor for lower the output ripple and noise, capacitance value is 10pF.

(4) Inductance L:

Inductance can choose between the 10uH to 22uH, the smaller the inductance value, the larger the output current, the higher the output ripple voltage.

(5) Diode D1:

D1 is the rectifier diode, Schottky diode should be used for better efficiency. Generally speaking, the diodes such as 1N5819, SS12 can be used.

(6) Resistors R1 and R2:

Resistors R1 and R2 set the output voltage, the output voltage is determined by the following equation:

$$V_{out} = 1.22 \times (1 + R1 / R2)$$

Design example

Figure 4 is a design example with the following technical requirements:

(1) Input voltage is 3.2V to 4.2V from a lithium battery

(2) Output voltage is 5V with 500mA output current

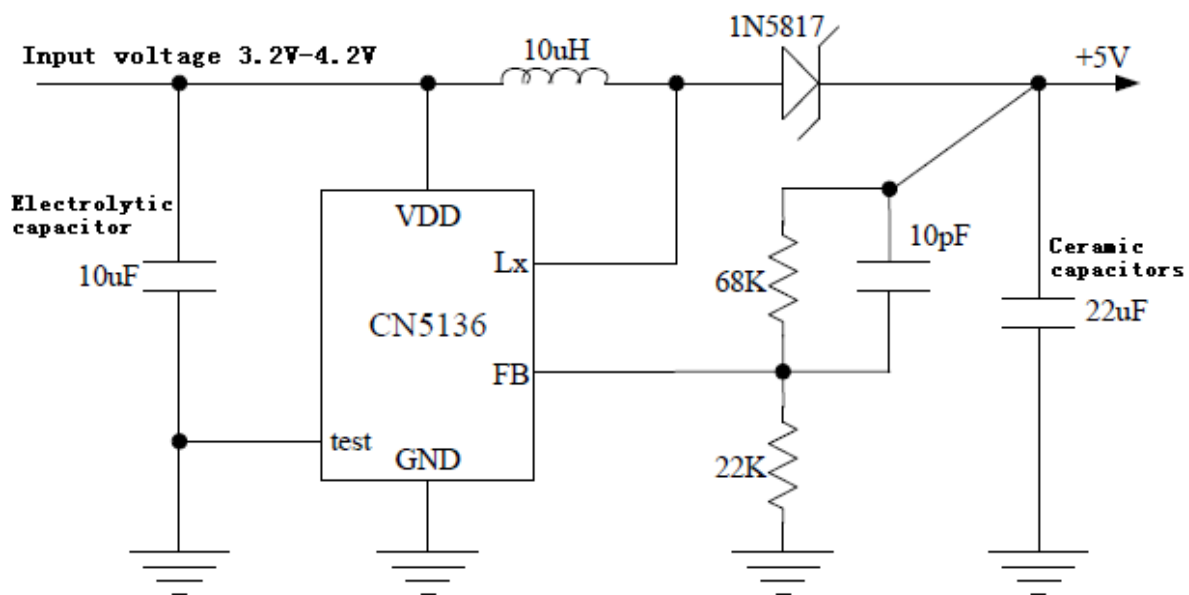
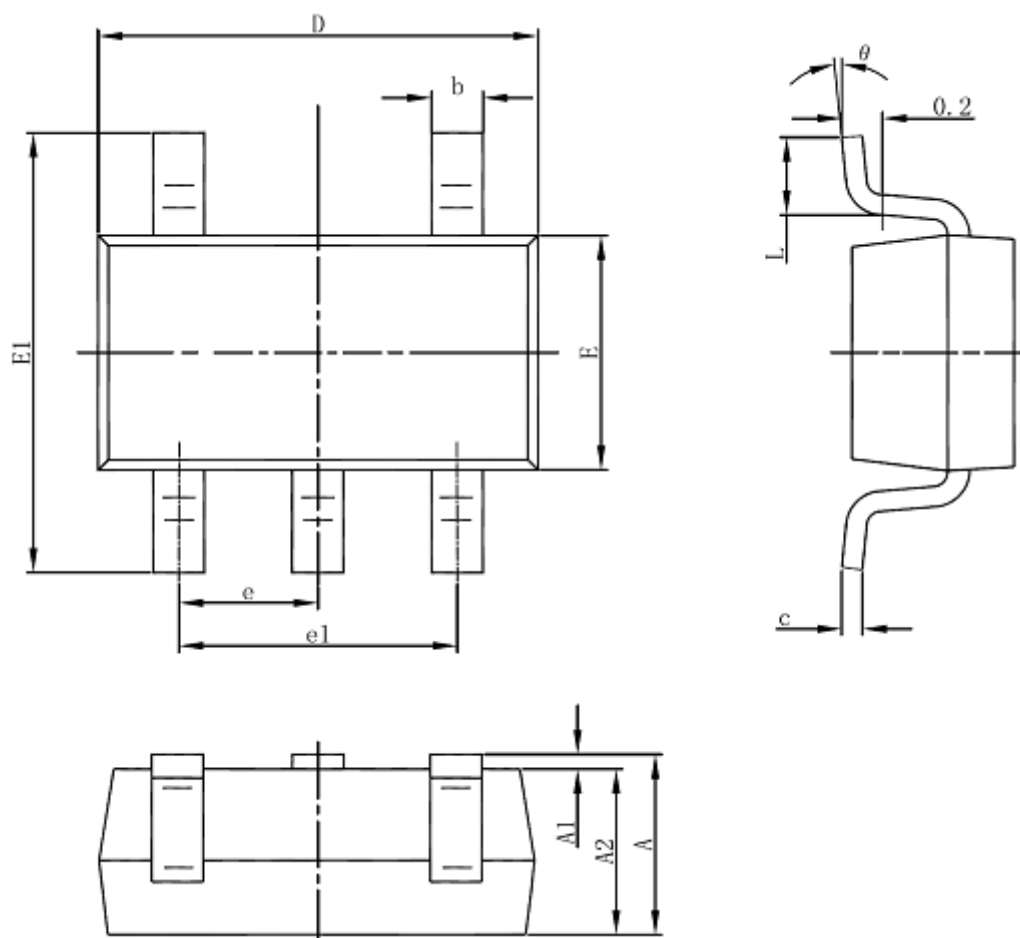


Figure 4 Design example

Package Information



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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