

*Parameters Subject to Change Without Notice*

### DESCRIPTION

The JW<sup>®</sup>5510 is a highly integrated Boost converter and can be widely used in portable applications.

The JW5510 implements a synchronous high-efficiency step-up boost converter with 10A switch current capability and is capable of providing an output voltage up to 20V.

The integrated low R<sub>ds(on)</sub> MOSFET minimizes physical footprint, maximizes the efficiency, which reduces the power dissipation. Constant current control is utilized to protect the device from overshooting in unwanted conditions. Built-in loop compensation simplifies the circuit and design. PFM is engaged to maintain high efficiency at light load.

JW5510 guarantees robustness with thermal protection and under voltage lockout.

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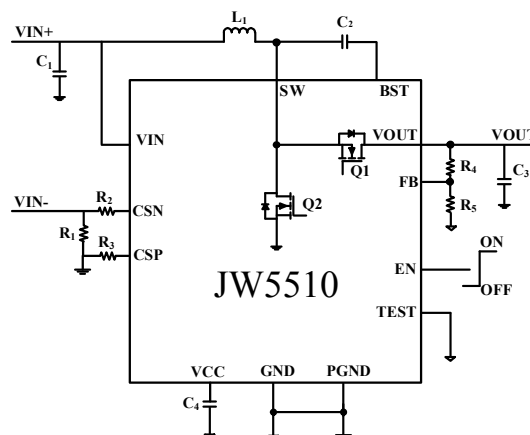
### FEATURES

- 3.0V to 20V input voltage range
- 4.0V to 20V output voltage range
- Integrate Low R<sub>DS(ON)</sub> Switch Power MOS and Synchronous Rectifier MOS.
- 10A Switch Current Limit
- Switch Frequency: 500kHz.
- High Efficiency over Full Load Range
- Thermal Shutdown
- QFN3\*4 package

### APPLICATIONS

- Battery Powered system
- Electronic Cigarette
- Bluetooth Speaker

### TYPICAL APPLICATION



Typical application circuit

**ORDER INFORMATION**

DEVICE <sup>1)</sup>	PACKAGE	TOP MARKING <sup>2)</sup>
JW5510QFNE#TRPBF	QFN3x4-15	JW5510 XXXXXX

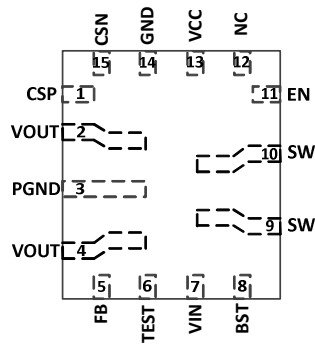
**Notes:**

1) JW [ ] [ ] #TRPBF  
 Part No.      Package Code      PB Free  
 Tape and Reel (If "TR" is not shown, it means tube)

2) Line 1 of top marking means Part No., and the line 2 of top marking means Date Code.

**PIN CONFIGURATION**

**TOP VIEW**



**ABSOLUTE MAXIMUM RATING<sup>1)</sup>**

VIN, VOUT, SW, FB Pin .....	-0.3V to 25V
BST-SW .....	-0.3V to 6.5V
All Other Pins .....	-0.3V to 6.5V
Junction Temperature <sup>2)3)</sup> .....	150°C
Lead Temperature .....	260°C
Storage Temperature .....	-65°C to +150°C

**RECOMMENDED OPERATING CONDITIONS**

Output Voltage VOUT .....	4.0V to 20V
Input Voltage VIN .....	3.0V to 20V
Operation Junction Temp (T <sub>J</sub> ) .....	-40°C to +125°C

**THERMAL PERFORMANCE<sup>4)</sup>**

	$\theta_{JA}$	$\theta_{JC}$
QFN3X4-15.....	48...11°C/W	

**Note:**

- 1) Exceeding these ratings may damage the device.
- 2) The JW5510 guarantees robust performance from -40°C to 150°C junction temperature. The junction temperature range specification is assured by design, characterization and correlation with statistical process controls.
- 3) The JW5510 includes thermal protection that is intended to protect the device in overload conditions. Thermal protection is active when junction temperature exceeds the maximum operating junction temperature. Continuous operation over the specified absolute maximum operating junction temperature may damage the device.
- 4) Measured on JESD51-7, 4-layer PCB.

**ELECTRICAL CHARACTERISTICS**

<i>V<sub>IN</sub>=5V, T<sub>A</sub>=25 °C, unless otherwise stated</i>						
<b>Item</b>	<b>Symbol</b>	<b>Condition</b>	<b>Min.</b>	<b>Typ.</b>	<b>Max.</b>	<b>Units</b>
<b>General parameters</b>						
VIN Voltage Range	V <sub>IN</sub>		3.0		20	V
VOUT voltage Range	V <sub>OUT</sub>		4.0		20	V
VCC output voltage	V <sub>CC</sub>	I <sub>VCC</sub> =2mA		4.9		V
VCC output current limit	I <sub>VCC</sub>	V <sub>CC</sub> >2.7V		50		mA
Supply current in shut-down mode	I <sub>Q</sub>	V <sub>IN</sub> =4V, EN=0V		65		µA
Switch frequency	F <sub>sw</sub>			500		kHz
Switch minimum off time	T <sub>off_min</sub>		80	100	120	ns
EN Logic HIGH	V <sub>ENH</sub>	V <sub>IN</sub> =8V			2.0	V
EN Logic LOW	V <sub>ENL</sub>	V <sub>IN</sub> =8V	0.8			V
Top switch on-resistance	R <sub>dsbkTG</sub>			12		mΩ
Bottom switch on-resistance	R <sub>dsbkBG</sub>			12		mΩ
Feedback voltage	V <sub>FB</sub>			0.9		V
Input average current limit	I <sub>IN_LIM</sub>	R <sub>1</sub> =5mΩ; R <sub>2</sub> =R <sub>3</sub> =3kΩ;		6		A
<b>Protection</b>						
VOUT OVP threshold	V <sub>O_OVP</sub>	VOUT rising		23.2		V
		VOUT falling		21.5		V
VOUT OVP deglitch time	t <sub>O_OVP</sub>			2		µs
VIN UVLO threshold	V <sub>IN_UVLO</sub>	VIN rising		3.0		V
		VIN falling		2.7		V
Thermal shutdown threshold <sup>5)</sup>	T <sub>SHUT</sub>			150		°C
Thermal recovery threshold <sup>5)</sup>	T <sub>REC</sub>			130		°C

**Notes:**

5) Guaranteed by design.

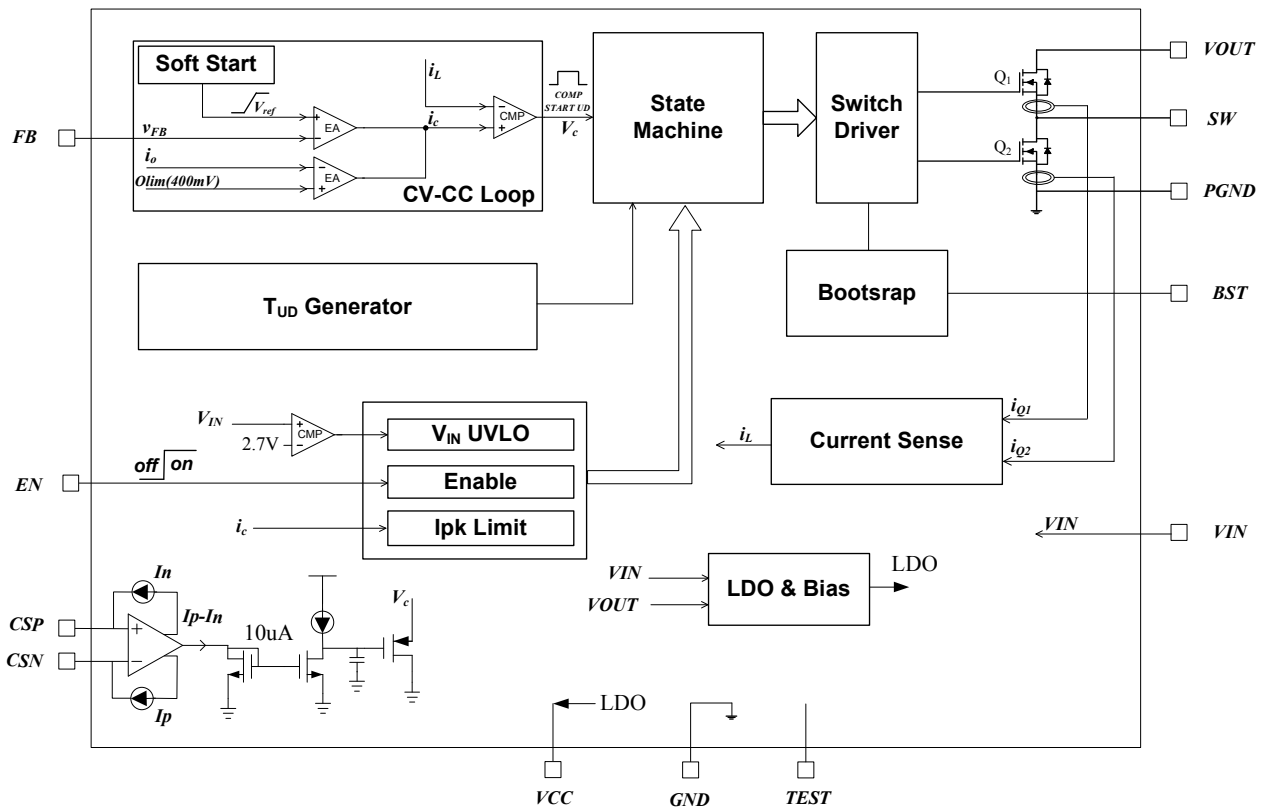
**PIN DESCRIPTION**

Pin No.	Name	Description
1	CSP	Positive terminal of current sense.
2, 4	VOUT	Output pin, connect this pin to GND with ceramic capacitor.
3	PGND	Power Ground.
5	FB	Output feedback pin.
6	TEST	Test pin. Tie this pin to GND for normal operation. Do not allow this pin to float.
7	VIN	Input voltage sense pin.
8	BST	Bootstrap supply pin for top switch. Connect this pin to SW with an 0.1μF capacitor.
9, 10	SW	Power switching node. Connect to input with inductor
11	EN	Enable control pin. Forcing the pin below 0.8V shuts down the converter, reducing quiescent current. Once the EN pin rises above 2.0V, the IC is turned on.
12	NG	No connection.
13	VCC	4.9V LDO for power driver and internal circuit. Must be bypassed to GND with a minimum of 10μF ceramic capacitor for stable operation.
14	GND	Signal GND.
15	CSN	Negative terminal of current sense.

Notes:

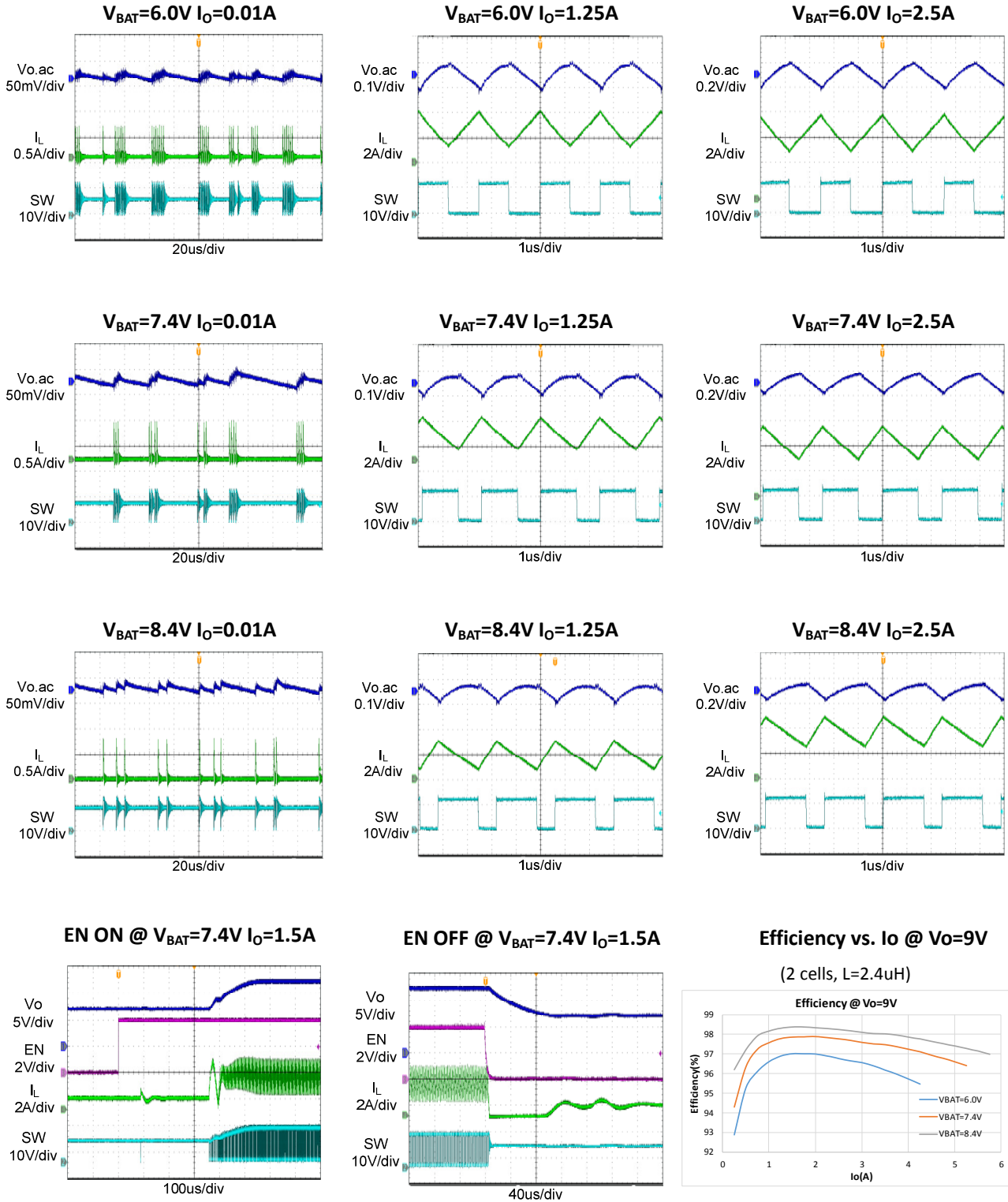
Highlighted pins are high current pins.

BLOCK DIAGRAM



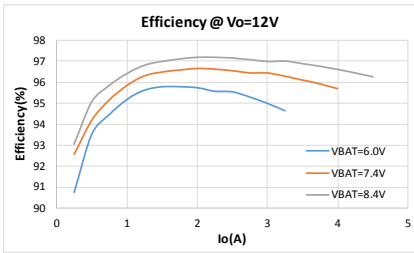
TYPICAL PERFORMANCE CHARACTERISTICS

$V_O = 12V$ ,  $L = 2.4\mu H$ ,  $C_{IN} = 22\mu F \times 2$ ,  $C_O = 22\mu F \times 5$ ,  $T_A = +25^\circ C$ , unless otherwise noted.



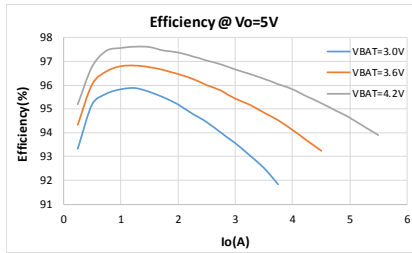
Efficiency vs. Io @ Vo=12V

(2 cells, L=2.4uH)



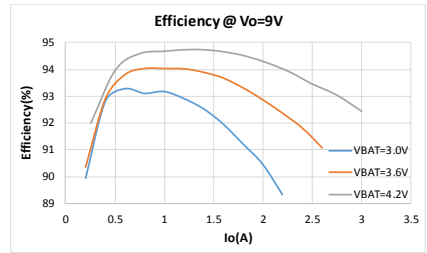
Efficiency vs. Io @ Vo=5V

(single cell, L=1.2uH)



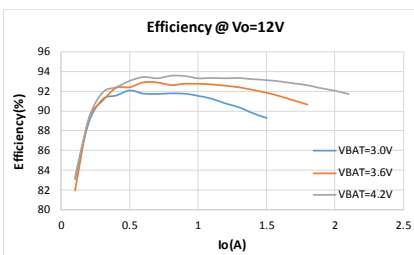
Efficiency vs. Io @ Vo=9V

(single cell, L=1.2uH)



Efficiency vs. Io @ Vo=12V

(single cell, L=1.2uH)





## FUNCTIONAL DESCRIPTION

JW5510 is a monolithic DC to DC converter that can operate over a wide input voltage range of 3.0V to 20V. The output voltage can be programmed up to 20V. Internal low  $R_{DS(ON)}$  N-channel power switches reduce the solution complexity and increase the efficiency.

### Flexible Boost Converter

The JW5510 is a flexible boost DC-DC converter which utilizes proprietary single inductor current-mode control with better dynamic response.

Compensation is done internally on the chip. The JW5510 operates in PFM mode at light load. In PFM mode, switching frequency is continuously controlled in proportion to the load current, i.e. switch frequency is decreased when load current drops to increase power efficiency at light load by reducing switching-loss, minimizing the circuit.

### Output voltage

The output voltage is set by an external feedback resistive divider. The feedback signal is compared with internal precision 0.9V voltage reference by an error amplifier. The output voltage is given by the equation:

$$V_o(V) = \frac{0.9(V) \times (R_4 + R_5)}{R_5}$$

Where  $R_4$  and  $R_5$  are defined in typical application figure.

### Programmable Input / Output Current Limit

As shown in figure1, the current sense resistor  $R_{CS}$  should be placed at input terminal or output terminal and closed to the  $R_{ISET}$ . The input/output current limit is set by  $R_{ISET}$  and  $R_{CS}$ ,

which is optional. If the input/output current limit is not desired, the CSN pin should be shorted to VCC, and the CSP pin shorted to GND.

$$I_{LIMIT}(A) = \frac{R_{ISET}(k\Omega)}{R_{CS}(m\Omega)} \times 10(\mu A/A)$$

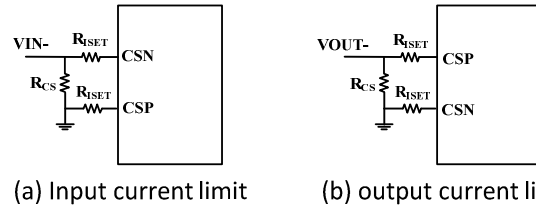


Figure1. Programmable current limit

When the input/output current equals to the current limit threshold, the current limit loop begins to work, it turns down output voltage to limit the output power.

### VIN UVLO

When  $V_{IN}$  decreases to  $V_{IN\_UVLO}$ , the converter is terminated. When the  $V_{IN}$  recovers and is larger than  $V_{IN\_UVLO}$ , the JW5510 can re-work if the  $V_{EN}$  is still high.

### Thermal Control

When the junction temperature of the JW5510 rises above  $135^{\circ}C$ , it begins to reduce the output power to prevent the temperature from rising further. If the junction temperature of JW5510 rises above  $150^{\circ}C$ , the chip stops.

### Shut-down Mode

The JW5510 shuts down when voltage at EN pin is below 0.8V. The entire regulator is off.

### Output Over-Voltage Protection

If the output voltage is larger than  $V_{O\_OVP}$  rising threshold, the device stops switching. Until the output voltage is less than  $V_{O\_OVP}$  falling threshold, the device re-starts switching again.

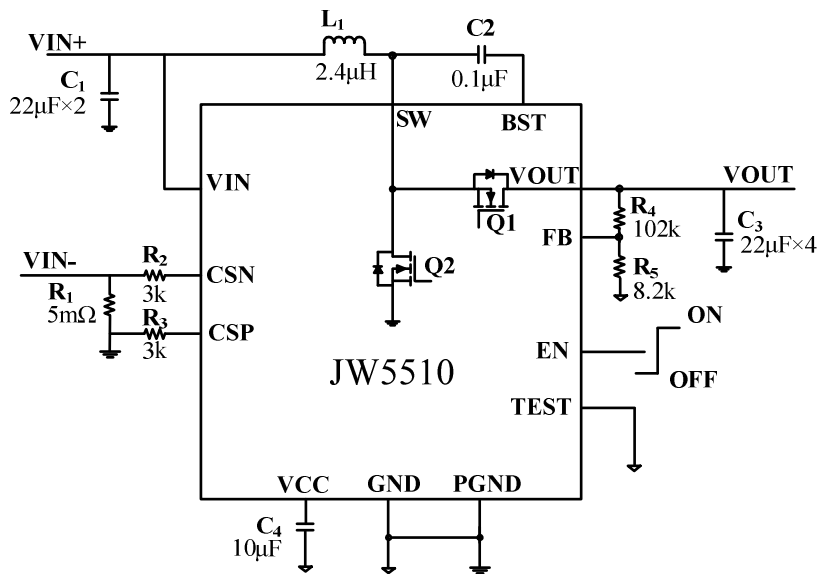
Reference Design

Reference 1: Input current limit set

V<sub>IN</sub>: 6.0V ~ 8.4V

V<sub>OUT</sub>: 12V

I<sub>IN\_LIM</sub>: 6A



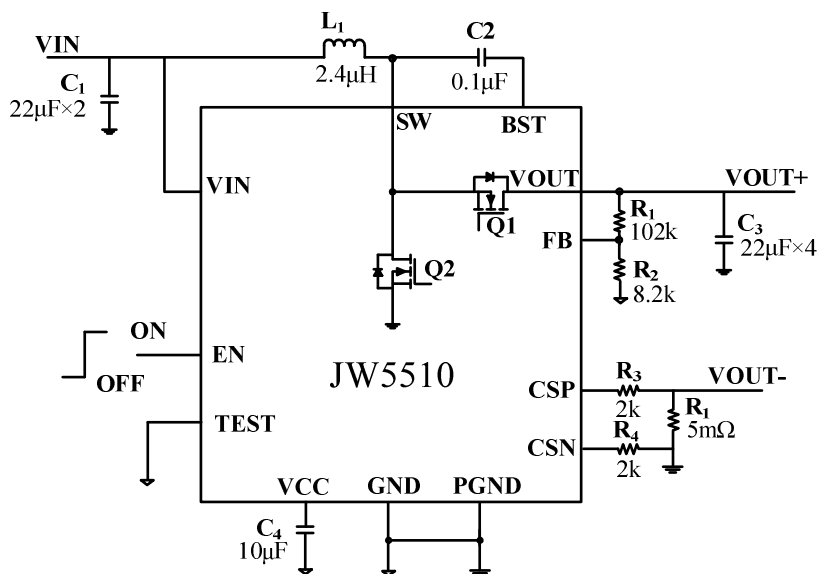
for single cell application we recommend L1=1.2uH.

Reference 2: output current limit set

V<sub>IN</sub>: 6.0V ~ 8.4 V

V<sub>OUT</sub>: 12V

I<sub>O\_LIM</sub>: 4A

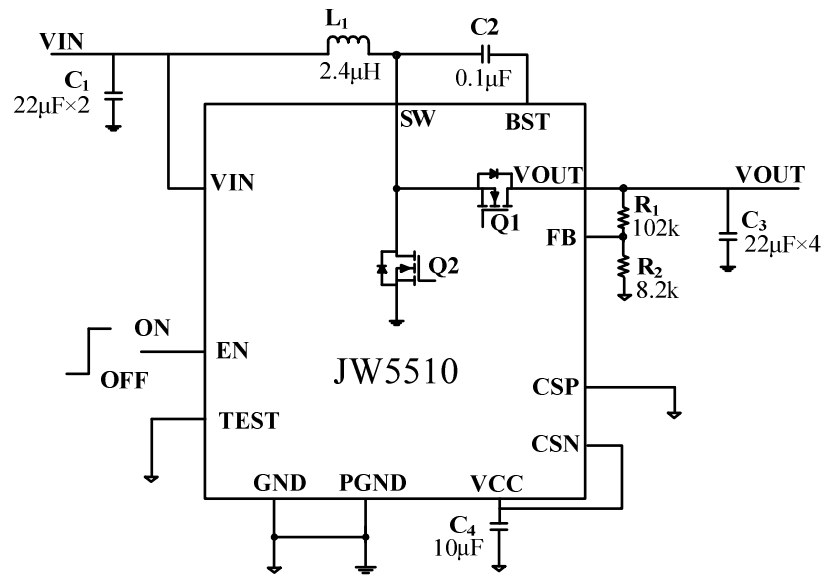


for single cell application we recommend L1=1.2uH.

**Reference 3: no current limit set**

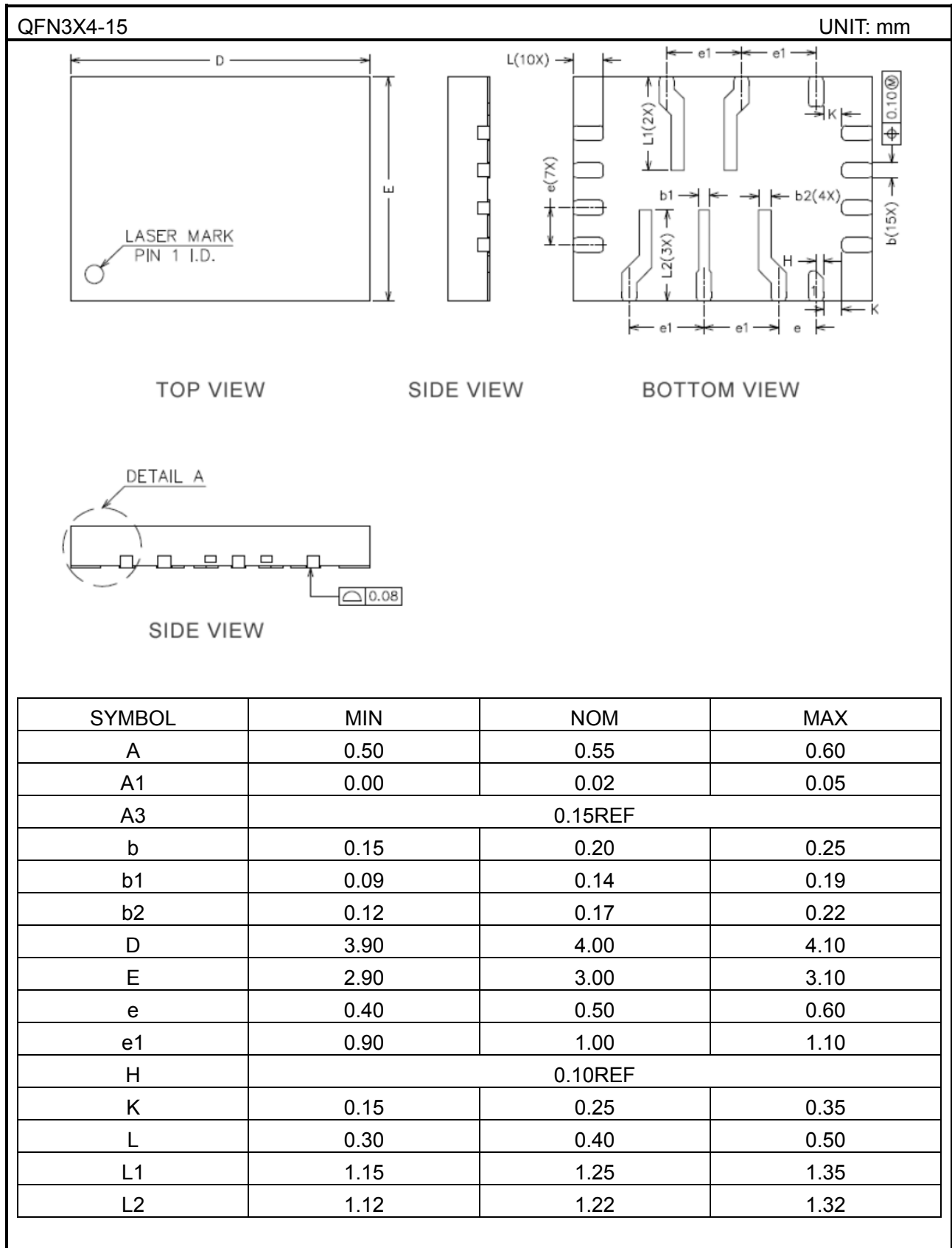
V<sub>IN</sub>: 6.0V ~ 8.4 V

V<sub>OUT</sub>: 12V



for single cell application we recommend L1=1.2uH.

PACKAGE OUTLINE



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