

5V3A , Step-Up Current Mode PWM Converter

GENERAL DESCRIPTION

The PW5303 is a current mode boost DC DC converter with PWM/PSM control. Its PWM circuitry with built-in 30mΩ high side switch and 30mΩ low side switch make this regulator highly power efficient.

The internal compensation network also minimizes external component counts to only 6. An internal 0.6V voltage is connected to error amplifier the non-inverting input as precision reference voltage. Built-in soft-start function can reduce the inrush current.

FEATURES

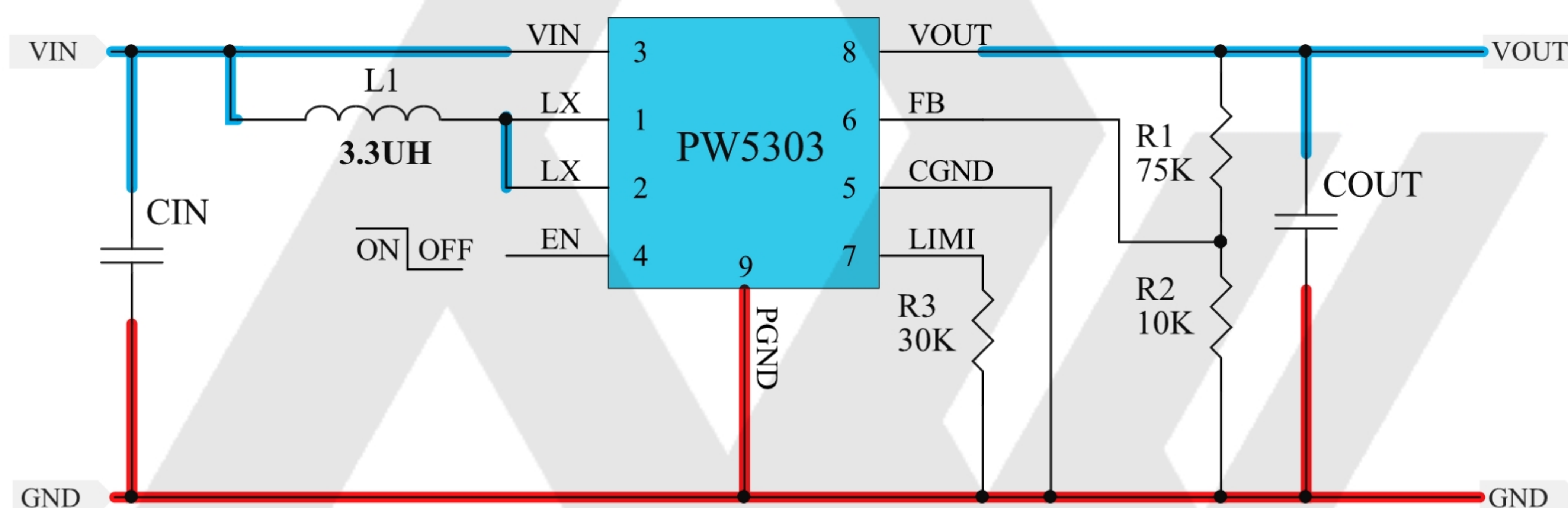
- Current mode with PWM/PSM control
- Input voltage range: 2.4V~4.5V
- Adjustable Output up to 5.3V
- Shutdown current: <1uA
- Oscillator frequency: 500KHz
- Reference voltage: 0.6V +/-2%
- Disconnect load during shutdown
- Cycle-by-cycle current limit
- Low RDS(on): 30mΩ for both high and low side
- Protection: OTP, OCP, SCP
- Internal compensation
- Internal soft-start: 7ms
- Package: SOP8-EP

APPLICATIONS

- Chargers
- Handheld Devices
- Portable Products
- Power Bank



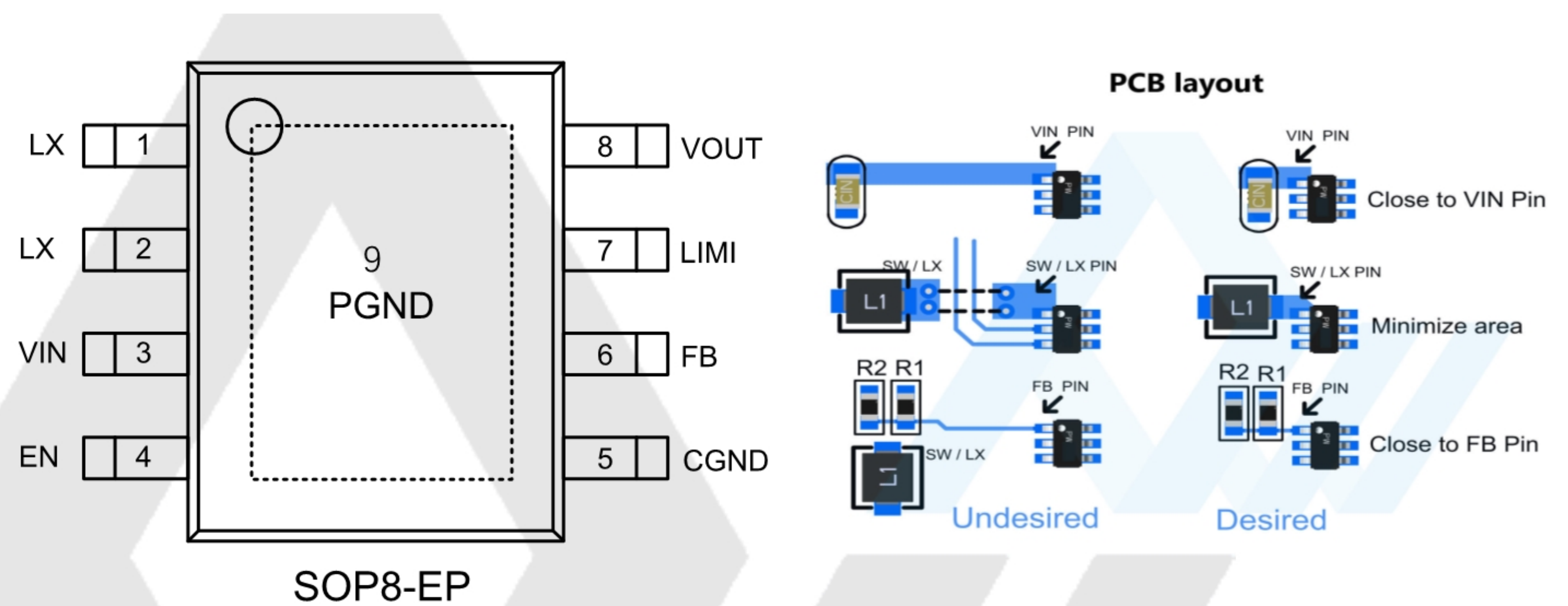
TYPICAL APPLICATION CIRCUIT



$$VOUT: (R1/R2+1)*0.6V, \text{ If: } R1=75K, R2=10K, VOUT=5.1V.$$

$$ILIMIT(A): 180 / R3(K), \text{ If: } R3=30K, ILIMIT=6A.$$

PIN ASSIGNMENT/DESCRIPTION



Pin Number	Pin Name	Function
1, 2	LX	Power Switch Output
3	VIN	IC Power Supply
4	EN	Enable Control (Active High)
5	GND	IC Ground
6	FB	Error Amplifier Inverting Input
7	LIMI	Adjustable Current Limit (Floating Available)
8	VOUT	Output Voltage Pin
9	PGND	IC Power Ground (Must connect to GND)

Absolute Maximum Ratings (note)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage	VCC		0		6	V
LX Voltage	VLX		0		6	V
EN,FB,LIMI,VOUT Voltage			0		6	V
Thermal Resistance (Note1)	θ_{JA}				+60	$^{\circ}\text{C} / \text{W}$
Junction Temperature	TJ				+150	$^{\circ}\text{C}$
Operating Temperature	TOP		-40		+85	$^{\circ}\text{C}$
Storage Temperature	TST		-65		+150	$^{\circ}\text{C}$
Lead Temperature		(soldering, 10 sec)			+260	$^{\circ}\text{C}$

Note 1: θ_{JA} is measured in the natural convection at $T_A=25^{\circ}\text{C}$ on a low effective thermal conductivity test board of JEDEC 51-3 thermal measurement standard

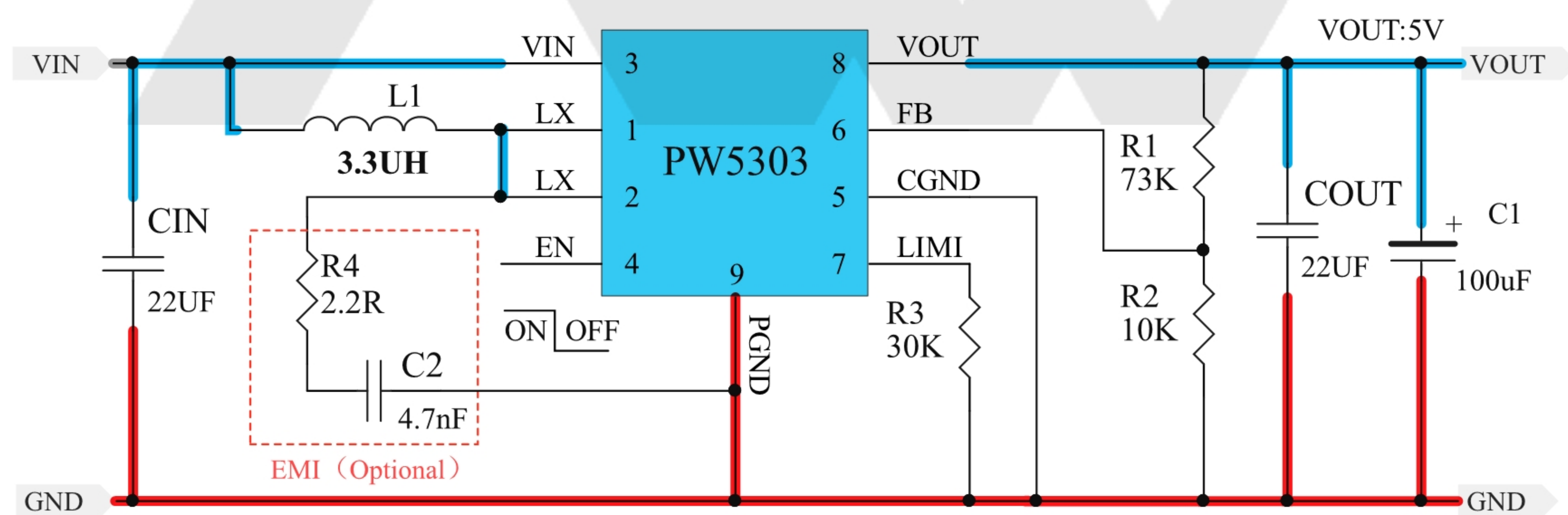
RECOMMENDED OPERATING RANGE

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage	VIN		2.4		4.5	V
Operating Temperature Range	TA	Ambient Temperature	-40		+85	$^{\circ}\text{C}$

Layout Considerations

1. The power traces, consisting of the GND trace, the LX trace and the VIN trace should be kept short, direct and wide.
2. LX、L and D switching node, wide and short trace to reduce EMI.
3. Place CIN near VIN pin as closely as possible to maintain input voltage steady and filter out the pulsing input current.
4. The resistive divider R1 and R2 must be connected to FB pin directly as closely as possible.
5. FB is a sensitive node. Please keep it away from switching node, LX.
6. The GND of the IC, CIN and COUT, C1 should be connected close together directly to a ground plane

Typical Application



Note: R4 and C2 are added for reducing EMI (Electromagnetic Interference).

ELECTRICAL CHARACTERISTICS

(VCC=3.3V, TA=25°C, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Voltage	V _{IN}		2.4		4.5	V
Under Voltage Lockout	V _{UVLO}			2.1		V
UVLO Hysteresis				0.1		V
Quiescent Current	I _{CC}	V _{FB} = 0.65V, No switch		280		μA
Shutdown Current	I _{CC}	V _{EN} = GND		0.1		μA
Operation Frequency	f _{OSC}	V _{FB} = 0.55V		500		kHz
Maximum Duty Ratio	D			90		%
Feedback Voltage	V _{REF}	V _{IN} = 4.5V	0.588	0.6	0.612	V
Enable Voltage	V _{EN}		0.96			V
Shutdown Voltage	V _{EN}				0.6	V
Soft-Start Time	t _{SS}	V _{IN} = 4.5V		7		ms
High Side Switch R _{DS(ON)}	R _{ON-PMOS}			30		mΩ
Low Side Switch R _{DS(ON)}	R _{ON-NMOS}			30		mΩ
Internal Switch Current Limit	I _{OCP}			7		A
Thermal Shutdown Threshold	T _{OTP}			150		°C
Thermal Shutdown Hysteresis				30		°C

Function Description

The PW5303 is a current mode synchronous boost converter. The constant switching frequency is 500 kHz and operates with pulse width modulation (PWM). Build-in 30mΩ high side switch and 30mΩ low side switch provides a high efficient conversion.

Soft Start Function

Soft start circuitry is integrated into PW5303 to avoid inrush current during power on. After the IC is enabled, the output of error amplifier is clamped by the internal soft-start function, which causes PWM pulse width increasing slowly and thus reducing input surge current.

Current Limit Program

A resistor between LIM1 and GND pin programs peak switch current. The resistor value should be between 26.5k and 300k. The current limit can be set from 7A to 0.8A. Keep traces at this pin as short as possible. Do not put capacitance at this pin. Set the over current trip point according to the following equation:

$$\frac{180}{R3} = I_{LIMIT}$$

Over Temperature Protection (OTP)

PW5303 will turn off the power MOSFET automatically when the internal junction temperature is higher than 150°C. The power MOSFET wake up when the junction temperature drops 30°C under the OTP threshold temperature.

Application Information

Inductor Selection

Inductance value is decided based on different condition. 1.5uH to 4.7μH inductor value is recommended for general application circuit. There are three important inductor specifications, DC resistance, saturation current and core loss. Low DC resistance has better power efficiency. Also, avoid inductor saturation which will cause circuit system unstable and lower core loss at 500KHz.

Capacitor Selection

The output capacitor is required to maintain the VO DC voltage. Low ESR capacitors are preferred to reduce the output voltage ripple. Ceramic capacitor of X5R and X7R are recommended, which have low equivalent series resistance (ESR) and wider operation temperature range.

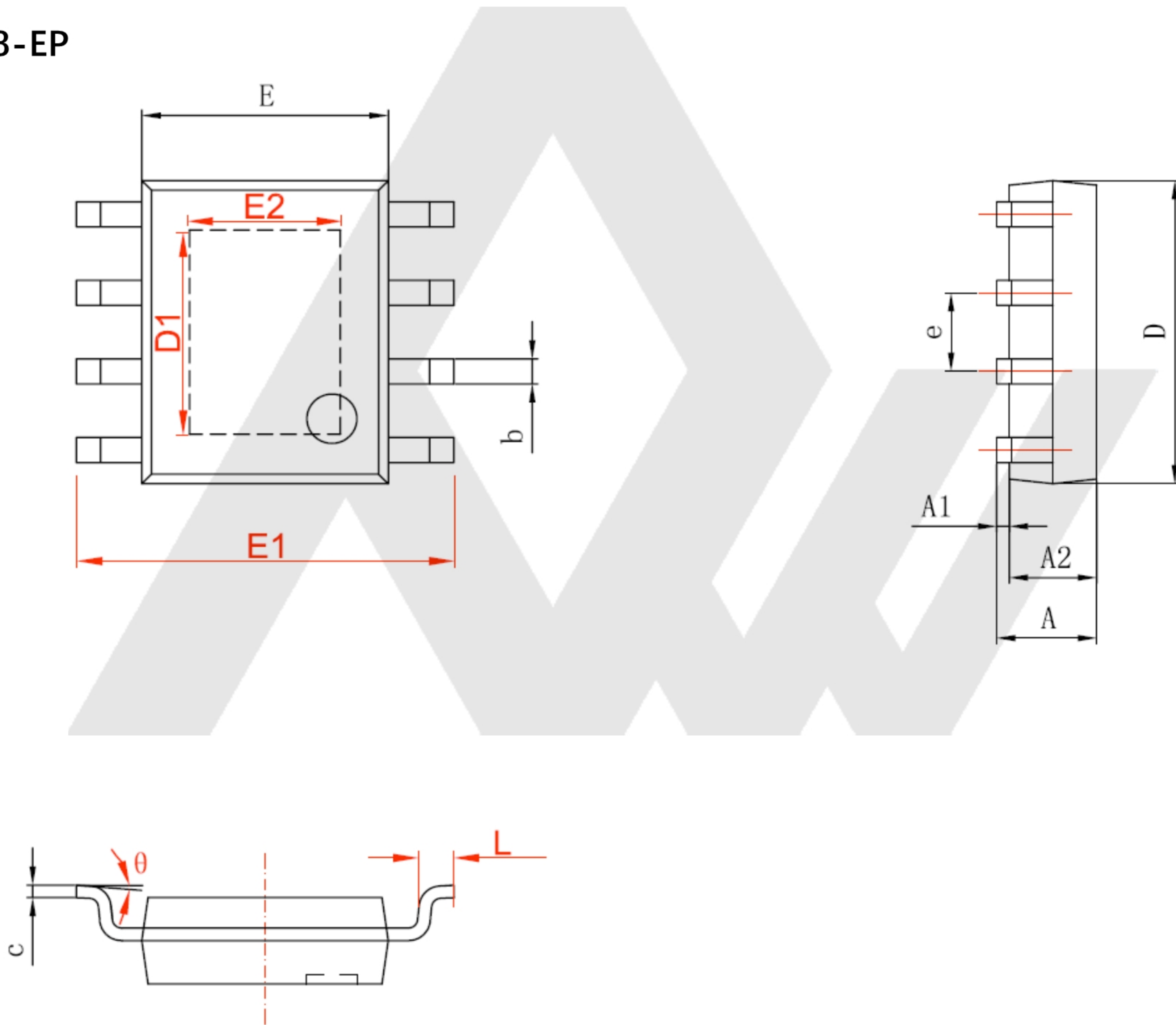
Output Voltage Programming

The output voltage is set by a resistive voltage divider from the output voltage to FB. The output voltage is:

$$\left(1 + \frac{R1}{R2}\right) * 0.6V = Vout$$

PACKAGE DESCRIPTION

SOP8-EP



字符	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.050	0.150	0.002	0.006
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.700	5.100	0.185	0.200
D1	3.202	3.402	0.126	0.134
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
E2	2.313	2.513	0.091	0.099
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

NOTE:

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