

■ DESCRIPTION

SP3303 has an optimum input voltage, step-down converter that operates in either CV (Constant Output Voltage) mode or CC (Constant Output Current) mode. The maximum input voltage is up to 36V and the operation input voltage from 7.5V to 32V.

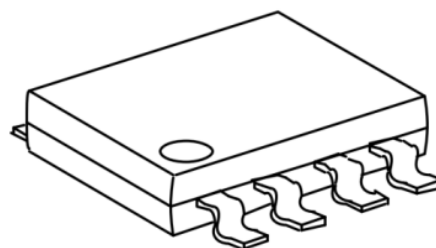
MOSFET, what build in 35mΩ High-Side and 25mΩ Low-Side, could deliver up to 3.5A of continuous output current and the output current accurate to within $\pm 7\%$.

External compensation is not need. It consists of inside line compensation function with 150mV at VIN (12V), and the constant current value can be set by an external resistance.

In conclusion, SP3303 is a full function and high performance, high reliability buck DC-DC converter.

■ FEATURES

- Build in High-Side and Low-Side MOSFET
- Max Output Current: 3.5A
- Constant Output Voltage: 5V
- Excellent Constant Current Accuracy: $\pm 7\%$
- Constant Voltage Accuracy: $\pm 2\%$
- Jitter Function
- Efficiency: Up to 95%
- Line Compensation: Typ.150mV@ $I_{OUT}=3A$
- Short Circuit Protection
- Over Voltage Protection
- Thermal shutdown Protection
- Under Voltage Lock Output
- Available in SOP-8L Package

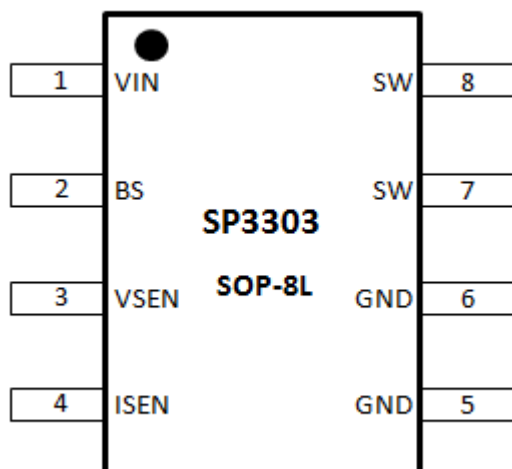


SOP-8L

■ APPLICATIONS

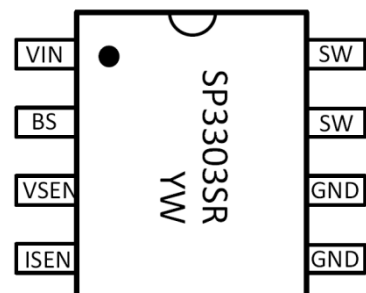
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|---------------------------|------------------------|
| ➤ Car Charger | ➤ Car DVD |
| ➤ Wall Charger | ➤ Black Box |
| ➤ Power Strip/Hub | ➤ Industry Application |
| ➤ Portable charger device | ➤ Other |

TYPICAL APPLICATION



PIN	NAME	DISCRIPTION
1	VIN	Power Supply Input. Bypass this pin with a 2.2μF ceramic capacitor to GND, placed as close to the IC as possible.
2	BS	Power to the internal high-side MOSFET gate driver. Connect a 22~100nF capacitor from BS pin to VIN pin
3	VSEN	Sense Of Output Voltage
4	ISEN	Current Sense Input
5 , 6	GND	Ground
7 , 8	SW	Positive Of Current Sense Power Switching Output to External Inductor

ORDER/MARKING INFORMATION

Order Information	Top Marking
<p>SP3303 - X - X</p> <p>— Packing R: Tape Reel</p> <p>— Package S: SOP-8L</p> <p>— Product Number</p>	 <p>Y: Year (15=2015,16=2016,...) W: Weekly (01-54)</p>

■ ABSOLUTE MAXIMUM RATINGS (at $T_A = 25^\circ\text{C}$)

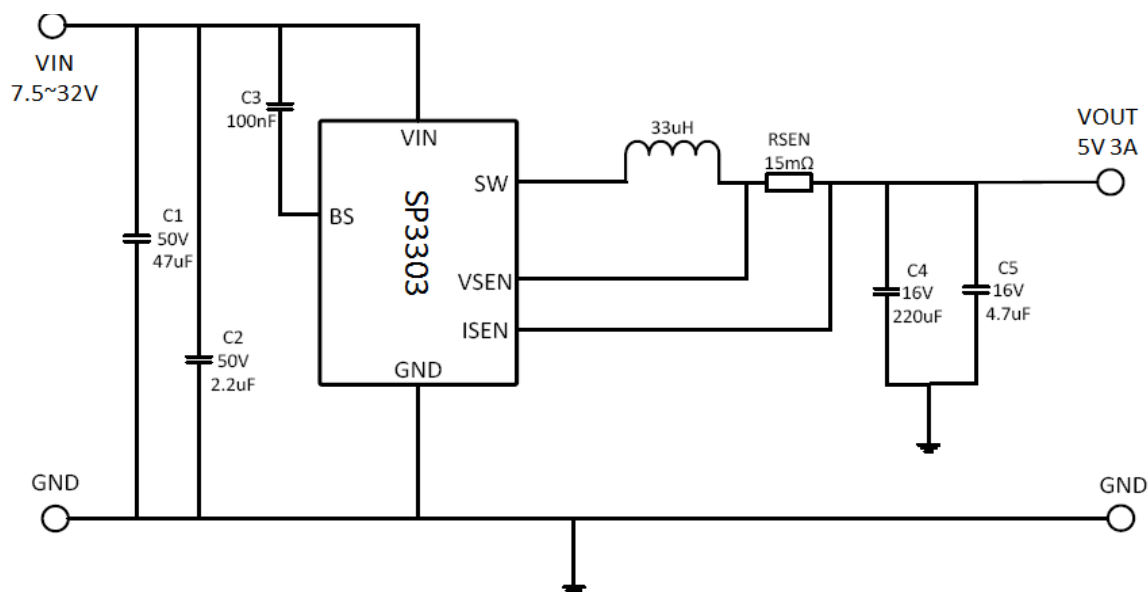
Parameter	Symbol	Rating	Units
VIN to GND		-0.3 to 36	V
SW to GND		-0.3 to 32	V
BS to GND		-0.3 to 36	V
ISEN, VSEN		-0.3 to 25	V
Junction to Ambient Thermal Resistance		105	$^\circ\text{C/W}$
Operating Junction Temperature		-40 to 150	$^\circ\text{C}$
Storage Junction Temperature		-55 to 150	$^\circ\text{C}$
Lead Temperature (Soldering 10 sec.)		300	$^\circ\text{C}$
Thermal Resistance from Junction to case	θ_{JC}	15	$^\circ\text{C/W}$
Thermal Resistance from Junction to ambient	θ_{JA}	40	$^\circ\text{C/W}$
ESD (HBM)		>2000	V

Note: Exceed these limits to damage to the device. Exposure absolute maximum rating conditions may affect device reliability.

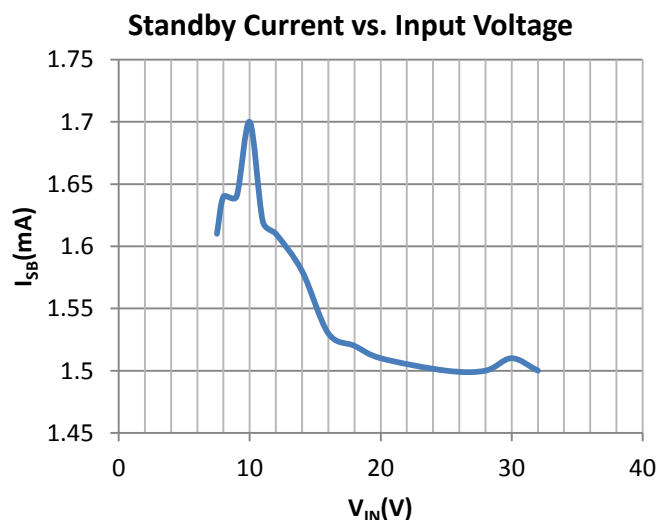
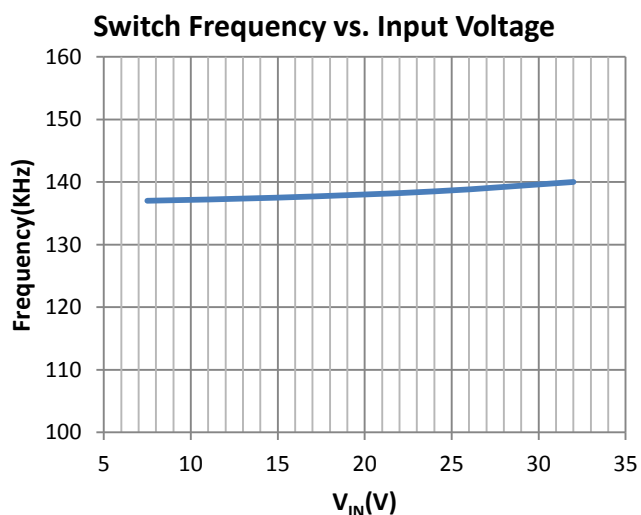
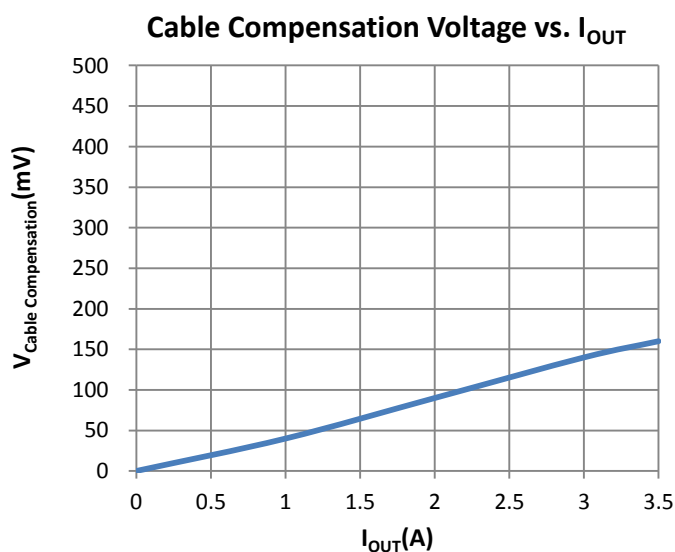
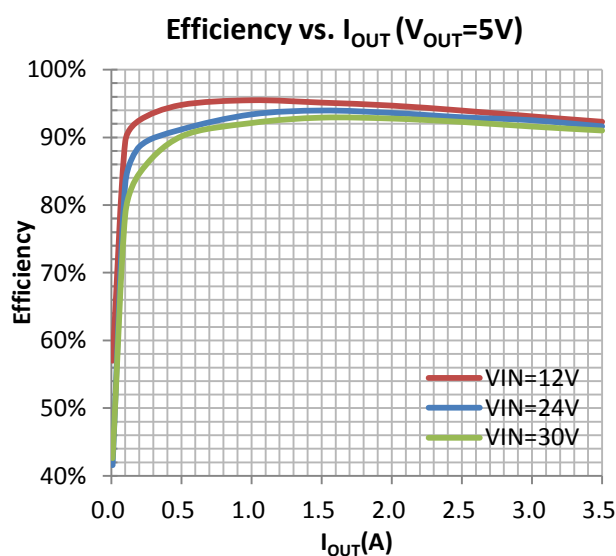
■ ELECTRICAL CHARACTERISTICS ($V_{IN}=12\text{V}$, $T_A = 25^\circ\text{C}$, unless otherwise stated)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Input Voltage	V_{IN}		7.5	-	36	V
Input OVP Threshold	$V_{OVP-VIN}$		31	32	33	V
UVLO Voltage	V_{UVLO}		7	7.5	8	V
UVLO Hysteresis			0.3	0.8	1	V
Quiescent Current	I_{CCQ}	$V_{FB}=1.5\text{V}$, force driver off.	-	1.5	-	mA
Standby Current	I_{SB}	No Load	-	1.6	2	mA
Output Voltage	V_{OUT}		4.9	5	5.1	V
Output OVP detect Voltage	V_{OVP}	Internal define	-	6	-	V
Switching Frequency	F_{SW}	$I_{OUT}=1\text{A}$	115	135	165	KHz
Reference Voltage Of Constant Current	Reference Of $V_{ISEN}-V_{VSEN}$	$0.4\text{V}<V_{FB}<0.95\text{V}$	46.5	50	53.5	mV
V_{OUT} -Short	V_{SEN}		2	2.2	2.4	V
RDS _{ON} Of Power MOS	High side	$I_{OUT}=1\text{A}$	30	35	40	m Ω
	Low side	$I_{OUT}=1\text{A}$	22	25	30	m Ω
Thermal shutdown Temp	T_{SD}		-	140	-	$^\circ\text{C}$
Thermal Shutdown Hysteresis	T_{SH}		-	30	-	$^\circ\text{C}$

TYPICAL APPLICATION CIRCUIT



TYPICAL PERFORMANCE CHARACTERISTICS



■ FUNCTIONAL DESCRIPTION

Input Under Voltage Protection

SP3303 provides an input voltage up to 36V and operates from an input voltage range of 7.5V to 32V. If V_{IN} drops below 7V, the UVLO circuit inhibits switching. Once V_{IN} rises above 7.5V, the UVLO clears, and the soft-start sequence activates.

Input Over Voltage Protection

If V_{IN} rises above 32V, the UVLO circuit inhibits switching. SP3303 will not be damaged until the voltage exceeds 36V. Once V_{IN} drops below 30V, the UVLO clears, and the soft-start sequence activates.

Soft-start

SP3303 has an internal soft-start circuitry to reduce supply inrush current during startup conditions. When the device exits under-voltage lockout (UVLO), shutdown mode, or restarts following a thermal-overload event, the soft-start circuitry slowly ramps up current available after 300us.

Constant Voltage Output

SP3303 presets the output voltage to 5V.

Constant Current Output

SP3303 senses the current by sampling the voltage difference between ISEN and VSEN, and adjusts the output current to the default value by the loop.

$$I_{OUTPUT} = \frac{50mV}{R_{ISEN}}$$

Constant current operates normally when VSEN is higher than 2.2V. When VSEN is below 2V causing by overload, SP3303 will enter short circuit protection mode.

Short Circuit Protection

When VSEN drops below 2V since too heavy load, SP3303 will enter short circuit protection function, and the system will enter hit-cup mode, and frequency drop to 40KHz per cycle and stop switching for 270mS.

Line Compensation

When output current from 0mA to full load, output voltage will be increased 150mV (Max) for line compensation.

Thermal Shutdown

Thermal-overload protection limits total power dissipation in the device. When the junction temperature exceeds $T_J = +150^{\circ}C$, a thermal sensor forces the device into shutdown, allowing the die to cool. The thermal sensor turns the device on again after the junction temperature cools by $25^{\circ}C$, resulting in a pulsed output during continuous overload conditions. Following a thermal-shutdown condition, the soft-start sequence begins.

■ APPLICATION GUIDELINES

Input capacitance selection

Input capacitance selection pressure 50V, the total capacity of 40 μF ceramic capacitor, of course, if considering the cost factor, can also choose a more than 50V voltage, capacity of more than 100 μF electrolytic capacitor, parallel a 50V voltage, capacity of 2.2 μF ceramic capacitors.

The location of the input capacitance, try to close to the chip VIN PIN position, if it is electrolytic capacitors and ceramic capacitors in parallel, ceramic capacitor is more close to the chip.

Inductance selection

SP3303 selection are amount at 22 μH ~51 μH inductance, if the demand is higher, the output ripple is advised to choose a larger inductance sense of values, such as 33 μH or 47 μH .

Require inductor saturation current must be not less than 1.5 times of the preset constant current value.

Output capacitance selection

Generally recommended to use a 470 μF electrolytic capacitor and a 4.7 μF ceramic capacitors in parallel as the output capacitance, the demand is higher, if the output ripple is proposed to 4.7 μF ceramic capacitor replacement for one or two ESR lower 22 μF ceramic capacitors, ceramic capacitors capacitance value, the greater the output ripple is smaller.

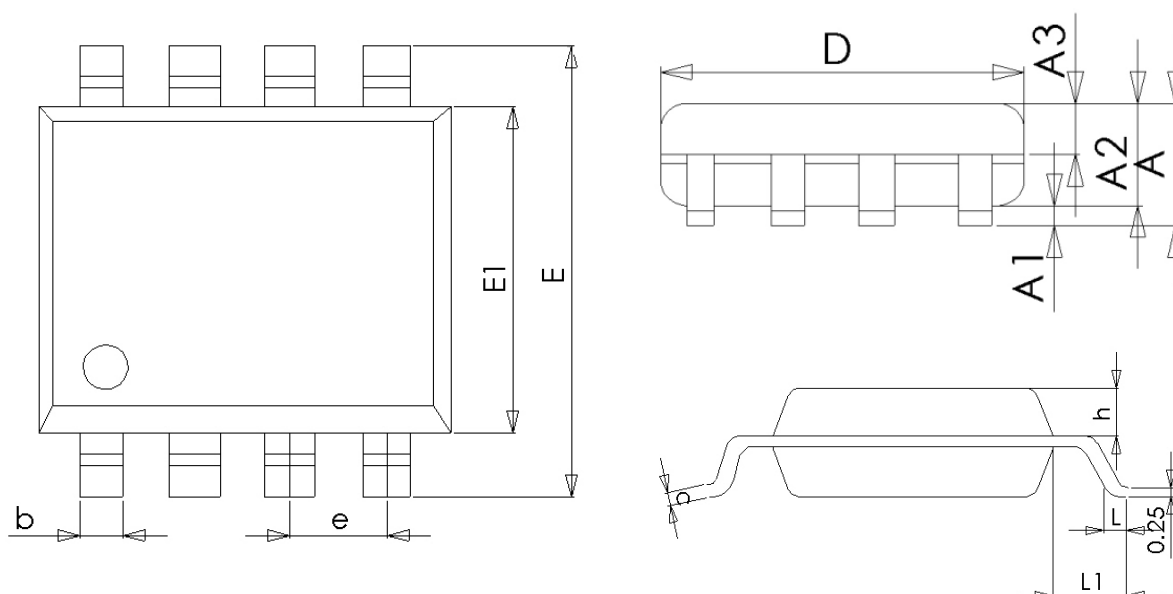
BS capacitance selection

BS and select let VIN proposal in 22nF~100nF ceramic capacitor, withstand voltage value of not less than 50V.

EMI/EMC

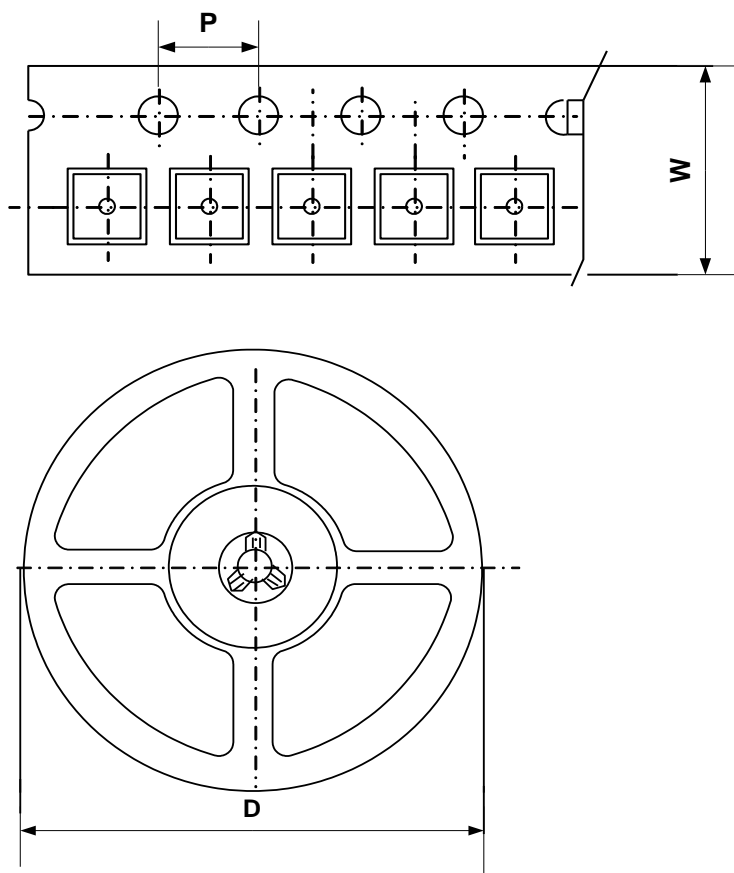
SW reserved RC circuit, resistance to choose 4.7R, 2.2nF capacitance advice; If the application version enough volume, can be reserved at input end type π circuit. SW pin reserved RC circuit of R2 4.7 Ω and C4 1nF; BS pin reserved R1 5.1 Ω string C3 100nF.

■ PACKAGE INFORMATION



Symbol	Dimensions In Millimeters		
	Min	NOM	Max
A	--	--	1.65
A1	0.05	--	0.15
A2	1.30	1.40	1.50
A3	0.60	0.65	0.70
D	4.70	4.90	5.10
E	5.80	6.00	6.20
E1	3.70	3.90	4.10
e	1.27BSC		
h	0.25	--	0.50
L	0.50	0.60	0.80
L1	1.05BSC		

■ TAPE AND REEL INFORMATION



Package Type	Carrier Width (W)	Pitch (P)	Reel Size(D)	Packing Minimum
SOP-8L	12.0±0.1 mm	8.0±0.1 mm	330±1 mm	4000pcs

Note: Carrier Tape Dimension, Reel Size and Packing Minimum