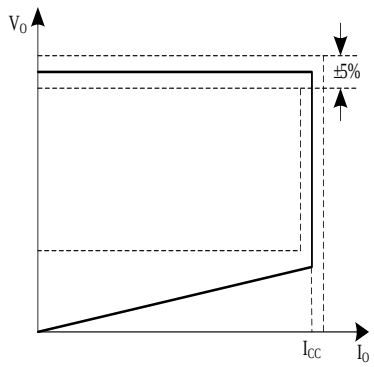
GENERAL DESCRIPTION

BL8802B is a high performance offline PSR power switch for low power AC/DC charger and adapter applications. It operates in primary-side sensing and regulation. Consequently, opto-coupler andTL431 could be eliminated. Proprietary ConstantVoltage (CV) and Constant Current (CC) control isintegrated as shown in the figure below. In CC control, the current and output power setting can be adjusted externally by the sense resistor Rs at CS pin. In CV control, multi-mode operations are utilized to achieve high performance and high efficiency. In addition, good load regulation is achieved by the built-in cable drop compensation.Device operates in PFM in CC mode at large load condition and it operates in PWM with frequency reduction at light/medium load. The chip consumes very low operation current. It achieves less than 75mW standby power to meet strict standby power standard. BL8802B offers comprehensive protection coverage with auto-recovery feature including
Cycle-by-Cycle current limiting, VDD over voltage protection, feedback loop open protection, short circuit protection, built-in leading edge blanking, VDD under voltage lockout (UVLO), OTP etc.

BL8802B is offered in DIP-7 packages.



Typical CC/CV Curve

FEATURES

- Primary-side sensing and regulation withoutTL431 and opto-coupler
- High precision constant voltage and current regulation at universal AC input
- Multi-mode PWM/PFM operation for efficiency improving
- Integrated 2A 1000V MOSFET
- Good dynamic response with synchronous rectifier application
- Programmable CV and CC regulation
- Built-in primary winding inductance compensation
- Programmable cable drop compensation
- No need for control loop compensation
- Audio noise free operation
- Built-in leading edge blanking (LEB)
- Ultra low start-up current and low operating current
- Comprehensive protection coverage with auto-recovery
  - On-chip OTP
  - VDD over voltage protection
  - VDD under voltage lockout with hysteresis (UVLO)
  - Cycle-by-Cycle current limiting
  - Feedback loop open protection
  - Output short circuit protection

APPLICATIONS

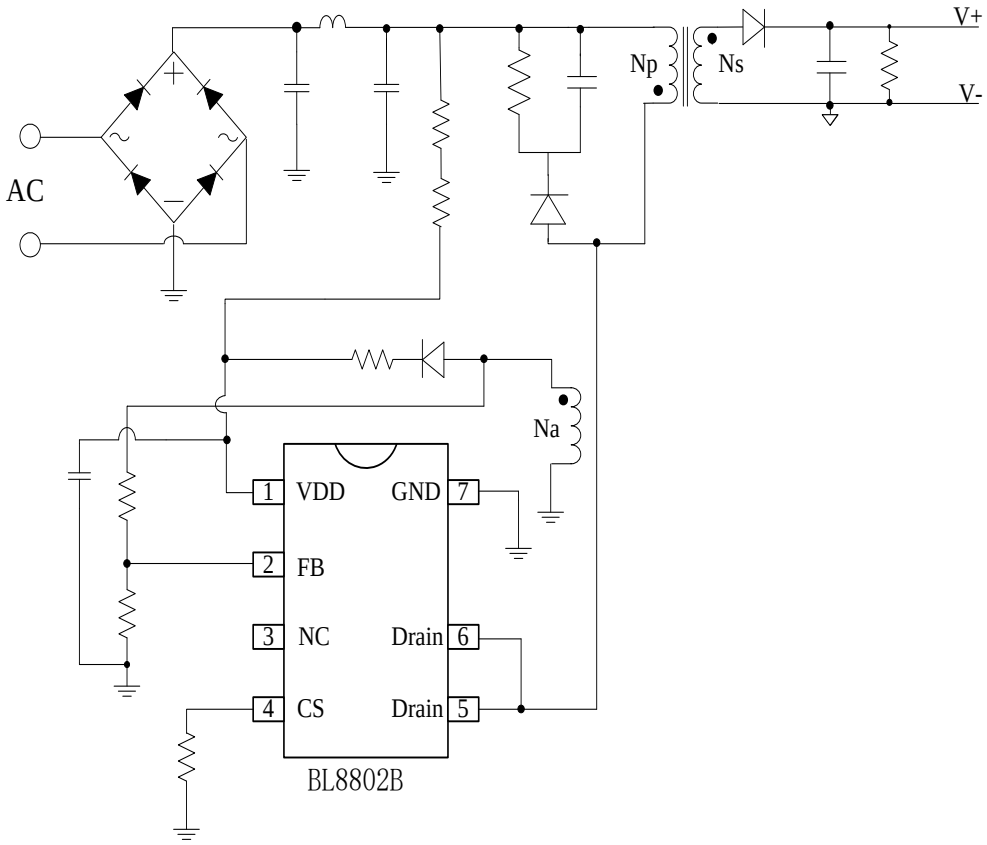
Low Power AC/DC offline SMPS for

- Industrial instruments: single / three-phase meters
- Outdoor monitoring / protection equipment
- AC / DC with high input voltage

Ordering Information：

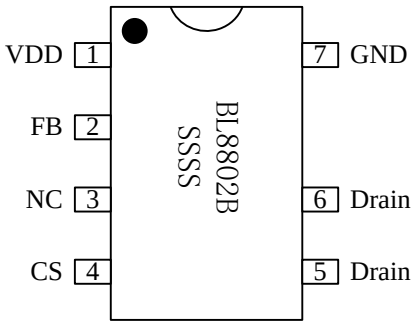
ordering code	encapsulation	Packing	Number
BL8802B	DIP-7	Tube loading	50PCS

Typical application schematic：



BL8802B Typical application schematic

Pin Configuration：



BL8802B(DIP-7)

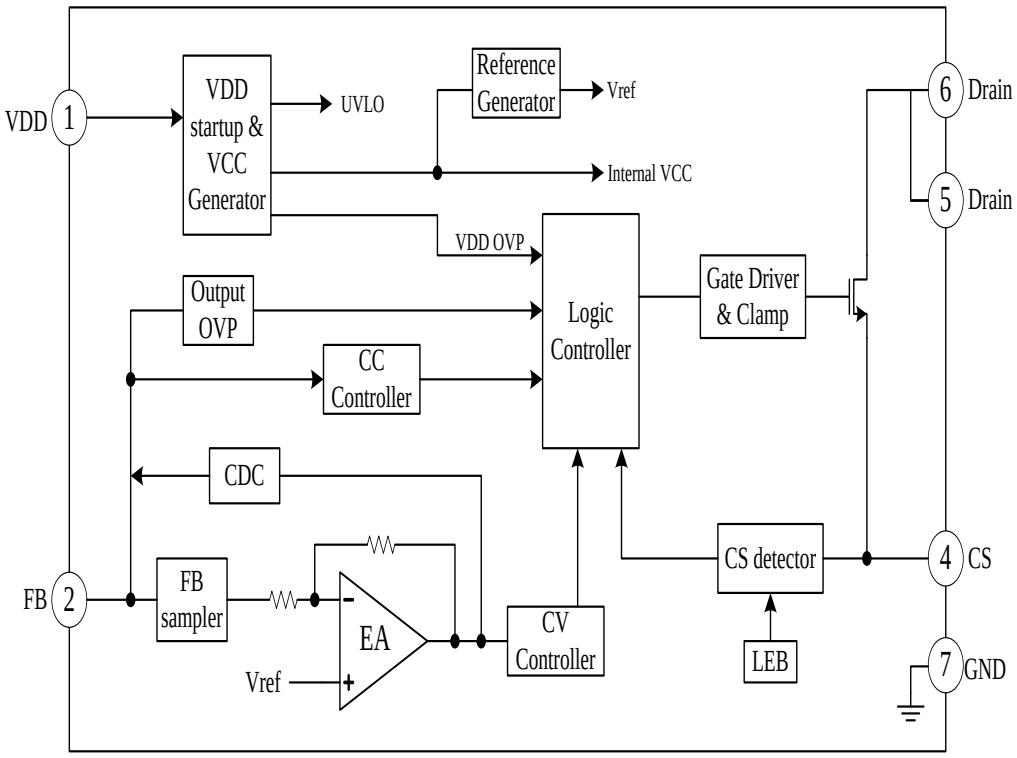
TERMINAL ASSIGNMENTS：

Pin Num.	Pin Name	Description
1	VDD	Power Supply
2	FB	The voltage feedback from auxiliary winding. Connected to resistor divider from auxiliary winding reflecting output voltage
3	NC	NC
4	CS	Power MOSFET source
5,6	Drain	Drain of internal power MOSFET
7	GND	Ground

Recommended scope of work:

Parameter	Min	Typ	Max	Company
VDD Voltage		-	27	V
Ambient operating temperature	-40	-	85	℃
Maximum switching frequency		110		KHZ

BLOCK DIAGRAM：



BL8802B System frame diagram

Limit parameter：

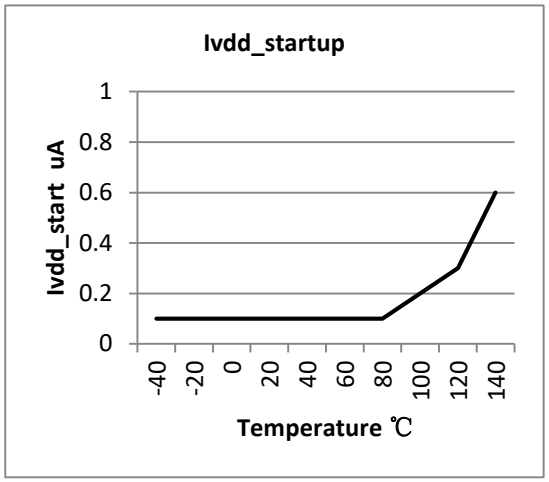
Parameter	Value	Company
VDD Voltage	-0.3-28.5V	V
FB Input Voltage	-0.3-7.0V	V
CS Input Voltage	-0.3-7.0V	℃
Min/Max Operating JunctionTemperature TJ	-40-150℃	℃
Operating Ambient Temperature TA	-40-125℃	℃
Lead Temperature (Soldering, 10secs)	260℃ 10 秒	

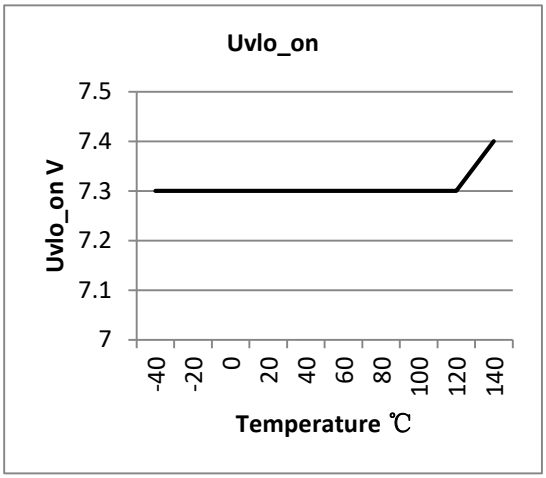
Typical paramet：

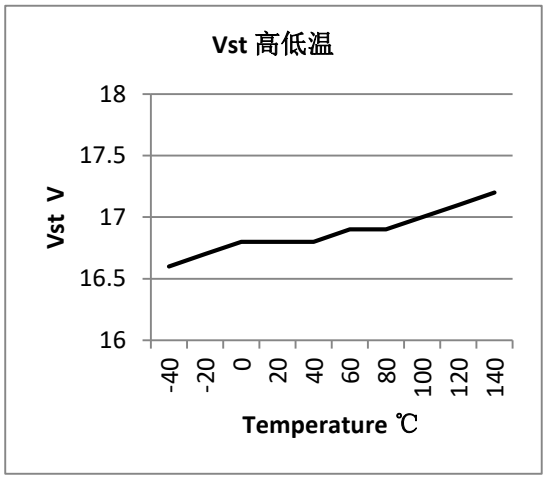
(TA = 25℃, VDD=15V, if not otherwise noted)

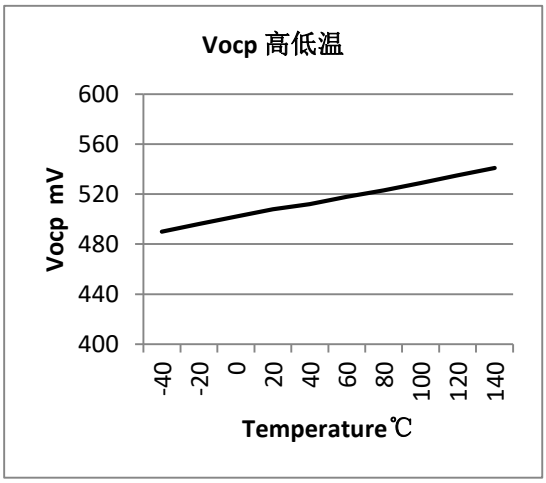
Symbol	Parameter	Test	Min	Typ.	Max	**Unit**
Supply Voltage (VDD) Section						
Istart	Start up current	VDD=UVLO_OFF-1V	0	0.5	1	uA
Ivdd	Static current		0.568		0.852	mA
UVLO(off)	VDD under voltage lockout exit		14.5	16.0	19.5	V
UVLO(on)	VDD under voltage lockout enter		6.5	7.0	7.5	V
VDD-OVP	VDD over voltage protection		27	28	29	V
VDD					27	V
Current Sense Input Section						
TLEB	LEB time			300		nS
Vth-ocp min	Minimum over current threshold		485	500	515	mV
Vth-ocp max	Maximum over current threshold			590		mV
Vcs min	CS minimum threshold		135			mV
FB Input Section						
Vref-FB	Reference voltage for feedback threshold		2.475	2.5	2.525	V
Tpause-min	Minimum Toff			2.0		uS
F-min	Minimum frequency		270	305	340	HZ
F-max	Maximum frequency		110			KHZ
Icomp-cable	Maximum cable compensation current		40	45	50	uA
Vth-cc shutdown	CC mode shut down threshold			1.55		V
TD-cc shutdown	CC mode shut down debounce		1024		2048	Cycle
Output Over Voltage Protection						
V-ovp	Output Over voltage threshold		3.15	3.3	3.45	V
MOSFET Section						
Bvds	MosfetDrain-SourceBreakdown Voltage		1000			V
Rdson	Static drain to source on resistance			8		Ω

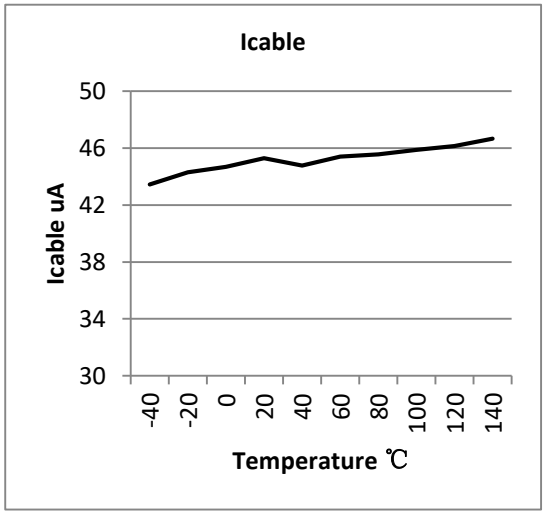
CHARACTERIZATION PLOTS:

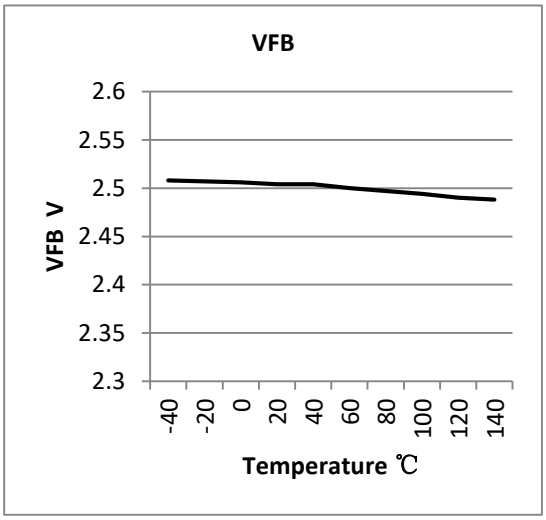












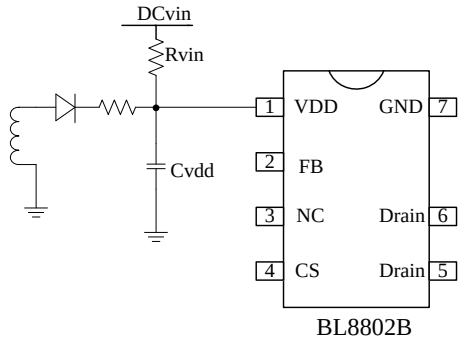
OPERATION DESCRIPTION:

BL8802B is a cost effective PSR power switch optimized for off-line low power AC/DC applications including battery chargers. It operates in primary side sensing and regulation, thusopto-coupler and TL431 are not required.

Proprietary built-in CV and CC control can achieve high precision CC/CV control meeting most charger application requirements.

Startup Current and Start up Contro

Startup current of BL8802B is designed to be very low so that VDD could be charged up above UVLO threshold level and device starts up quickly. A large value startup resistor can therefore be used to minimize the power loss yet achieve a reliable startup in application.



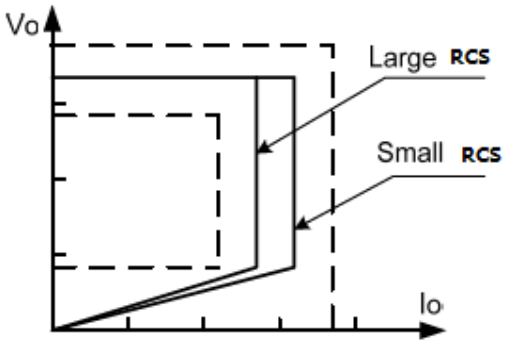
BL8802B Start up

Operating Current

The operating current of BL8802B is as low as 650uA (typical). Good efficiency and les than 75mW standby power is achieved with the low operating current.

Adjustable CC point and output power

In BL8802B series, CC point and maximum value The output power can be adjusted externally, and the external current detection resistor RCS (CS pin is described in the typical application diagram). The larger RCS, the smaller CC point, the smaller output power, and vice versa are shown as follows:



RCS&CC, output power

Switching frequency

The switching frequency of BL8802B is adaptive to the output load.

For flyback operation in DCM, the maximum The output power is given by the follo wingformula:

$$Po_{MAX} = \frac{1}{2} * L_p * F_{sw} * I_{peak}^{\ 2}$$

among:

Po_{MAX} Represents the maximum output power

L_p Indicates the primary side inductance of the inductance

F_{sw} Indicates the switching frequency of the system

I_{peak} Represents the peak current of the primary side

Through the above formula, it can be concluded that the maximum output power is caused by the primary inductance, and the switching frequency is caused by the internal locking of the system. The specific formula is as follows:

$$F_{sw} = \frac{1}{2 * T}$$

Therefore, the sum of the products is fixed, the maximum output power and the constant current of CC mode will not change, and the change of primary winding inductance is as high as ± 7%, and the change of primary winding inductance can be compensated.

Constant current function

BL8802B detects the peak current of the inductor one by one. The CS terminal is connected to the input terminal of the internal peak current comparator. Compared with the internal threshold voltage, when the external voltage of CS reaches the internal detection threshold, the power tube turns off.

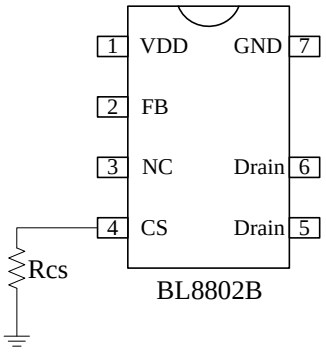
The expression of peak current of inductance at full load is as follows:

$$I_{P\_PK}(mA) = \frac{500}{R_{cs}}$$

The output of CS comparator also includes a 300 ns leading edge blanking time.

The calculation formula of output current is:

$$\mathrm{I}_{CC}(mA) = \frac{N}{4} * \frac{500}{R_{cs}}$$



CS Sampling diagram

among：

I_{cc} Is the current at the system output.

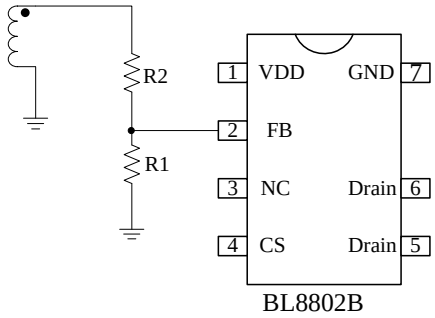
N Is the turn ratio of the primary stage of the transformer.

R_{cs} Is the resistance between chip CS pin and GND.

Constant voltage control

The FB of BL8802B detects the feedback voltage of the auxiliary winding through the partial voltage of resistance R2 and R1, and the difference between the FB voltage and the reference voltage controls the frequency of the switch signal through the amplification of the error amplifier. In order to improve the accuracy of the output voltage, the leakage induction of the transformer is reduced as much as possible. The output voltage can be obtained by the followingformula:

$$V_{out} = 2.5 * (1 + R2 / R1) * (N_s / N_a) - Vf$$



Feedback adjustment diagram

among:

R1 and R2 are pull-up and pull-down resistances of auxiliary winding.
Ns and Na Is the number of turns of the secondary and auxiliary windings of the transformer.

Vf Table output rectifier diode voltage drop.

Current detection and leading edge blanking

BL8802B provides cycle by cycle current limitation, and the power tube current is detected by resistance sampling connected to CS pin. When the power switch is on, there will be an opening spike on the sampling resistance. In order to avoid the misoperation caused by the opening spike, a 300 ns leading edge blanking time is set on the CS pin, so there is no RC filter circuit outside the CS pin.

Output line voltage compensation

In the constant voltage mode, the conventional chip adjusts the feedback voltage by changing the conduction time of the power tube, which does not include the voltage drop on the wire.
This leads to different output voltages due to the use of wires of different specifications and lengths. The BL8802B has a built-in line voltage drop compensation circuit for better load regulation.
BL8802B has the function of line loss compensation, which can compensate the voltage drop of output voltage on the wire.
Through the built-in current flowing into the resistance voltage divider, a compensation voltage is generated at the FB pin. As the converter load increases from no-load to the peak power point (the switching point between constant voltage and constant current), the voltage drop on the output wire will be compensated by increasing the reference voltage of the feedback pin. The controller determines the output load and the corresponding compensation degree according to the output of the state regulator. The proportion of the maximum compensation can be obtained by the following formula:

$$\frac{\Delta V}{V_{out}} = \frac{I_{comp-cable} \times (R1/R2) \times 10^{-6}}{2.5} \times 100\%$$

among:

ΔV Is the compensation voltage.

Vout Is the output voltage.

R2 and R1 are the pull-up resistance of FB. Icomp is the compensation current.

CC mode shutdown function

In BL8802B series, when the chip is in CC mode, to prevent the chip from working under abnormal conditions, the chip feeds back to the FB pin of the chip of the auxiliary winding through the sampling output voltage. When the FB

voltage is lower than 1.55V, and after 1024 and 2048 cycles, the chip is locked, and the system needs to be powered up again to resume work.

Optimize dynamic response

BL8802B optimizes the design of dynamic response performance to meet the needs of the adapter.

No abnormal sound work

Under the constant voltage mode, the working frequency of BL8802B changes with the change of load, so that it has no abnormal sound during the whole working process from no-load to full load.

Protection control

BL8802B integrates protection functions, including VDD over-voltage and under voltage protection, FB over-voltage and under voltage protection, output short circuit protection, OTP protection and all pin suspension protection.

DIP-7

封装信息

尺寸/标注	最小(mm)	最大(mm)	尺寸/标注	最小(mm)	最大(mm)
A	9.00	9.20	C2	0.50TYP	
A1	1.474	1.574	C3	3.20	3.40
A2	0.41	0.51	C4	1.47	1.57
A3	2.44	2.64	D	8.20	8.80
A4	0.51TYP		D1	0.244	0.264
A5	0.99TYP		D2	7.62	7.87
B	6.10	6.30	θ1	17° TYP4	
C	3.20	3.40	θ2	10° TYP4	
C1	7.10	7.30	θ3	8° TYP