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40V, 600mA , Step-Down Converter

Description

The BL9342 is a high frequency (1.8MHz) step-down switching regulator with integrated internal high-side high voltage power MOSFET. It provides single 0.6A(or less) highly efficient output with current mode control for fast loop response.

The wide input range(4.2V to 40V) accommodates a variety of step-down applications. Low shutdown mode quiescent current allows use in battery-powered applications.

High efficiency at light load condition is achieved by scaling down the switching frequency to reduce the switching and gate driving losses.

The BL9342 is available in SOT23-6L package.

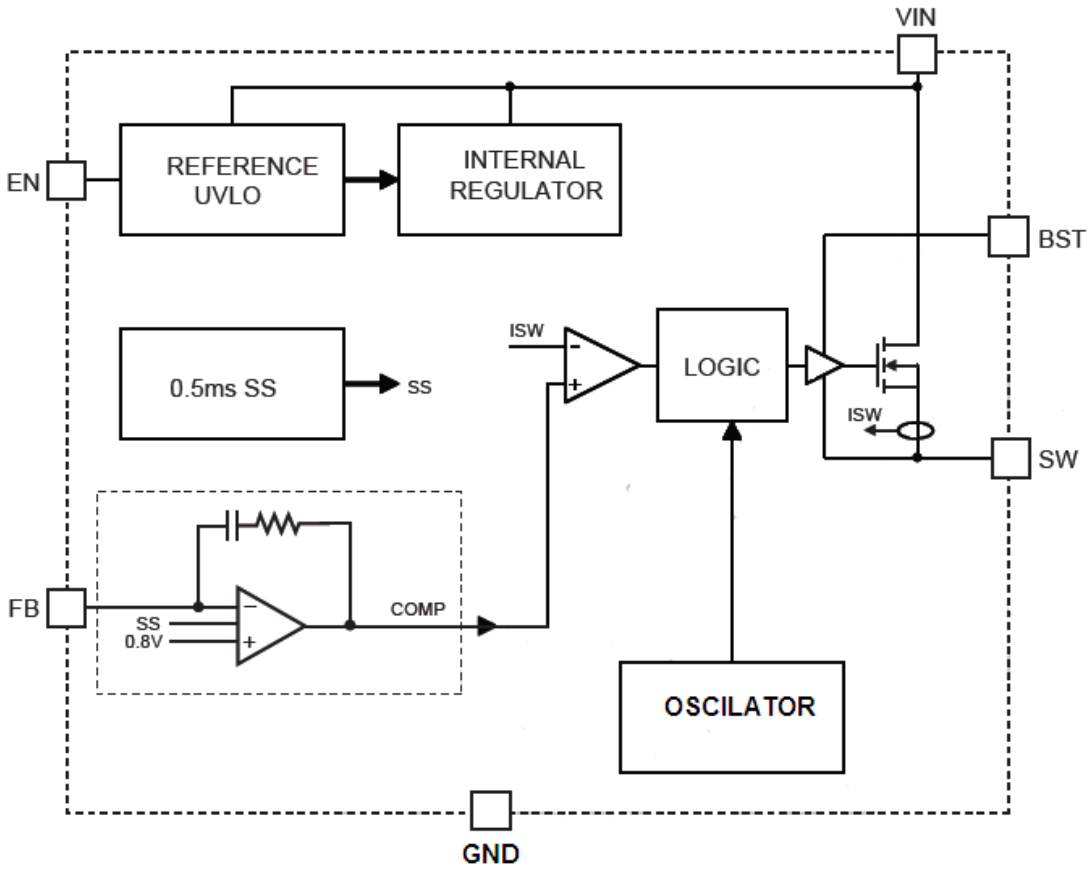
Features

- 4.2 V to 40 V operating input range
- 230uA operating quiescent current.
- Low shutdown supply current
- 500mΩ internal power MOSFET
- 1.8 MHz fixed switching frequency
- >90% efficiency
- Internally compensated
- Stable with ceramic output capacitors
- Internal soft-start
- Thermal shutdown function
- Precision current limit without current sensing resistor
- SOT23-6L package

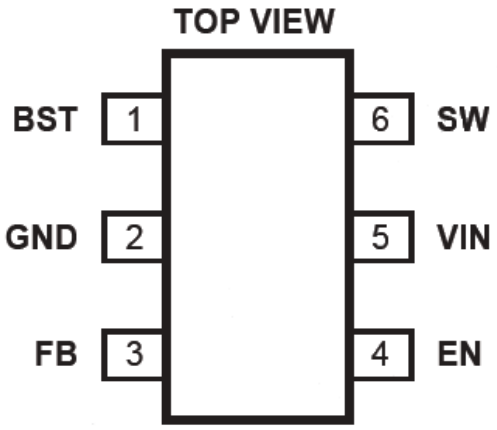
Applications

- High voltage power conversion
- Industrial power systems
- Power meter
- Battery powered systems

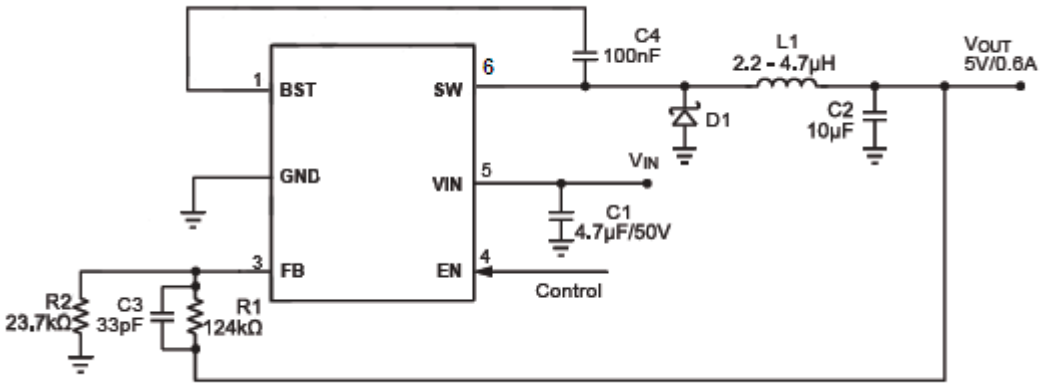
Function Block Diagram



Package Reference



Typical Application Circuits



Absolute Maximum Ratings

Description	Value
Supply Voltage(V_{IN})	–0.3V to 43V
Switch Voltage (V_{SW})	–0.3V to $V_{IN\ (MAX)}$+0.3V
BST to SW	-0.3 to 6.0V
All Other Pins	–0.3V to 5.0V
Continuous Power Dissipation(T_A=+25˚C)	0.57W
Junction Temperature	150˚C
Lead Temperature	260˚C
Storage Temperature	-65°C to 150˚C

Recommended Operating Conditions

Description	Value
Supply Voltage Vin	4.2V to 40V
Output Voltage V_{OUT}	Up to 40V
Operating Junction Temp（T_J)	–40˚C to +125℃

Thermal Resistance	θ_{JA}	θ_{JC}	
SOT23-6L	220	110	˚C/W

Electrical Characteristics

Vin=12V, Ven=2V, Ta=25℃, unless otherwise noted。

Symbol	Parameter	Condition	Min	Typ	Max	Units
Vfb	Feedback Voltage			0.794		V
Rsw	Upper Switch ON Resistance	Vbst-Vsw=5V		500		mΩ
Iswleak	Upper Switch Leakage	Ven=0V, Vsw=0V		0.1	1	uA
Ilim	Current Limit			1		A
Gcs	Transconductance	COMP to SENSE		3		A/V
Vin min	Minimum Operating Voltage		4.2			V
Vin(UVLO)	UVLO Up Threshold		3.3		4.2	V
Vin(UVLO)hys	UVLO Hysteresis			0.8		V
Tss	Soft-Start Time	FB from 0 to 1.8V		0.5		msec
Fosc	Oscillator Frequency			1.8		MHz
Ton min	Minimum Switch ON Time			100		ns
Isd	Shutdown Current	Ven<0.3V		3	15	uA
Isq	Quiescent Current	Vfb=0.9V，No load		200		uA
Temp	Thermal Shutdown			150		℃
Venh	Enable up threshold		1.6		2.0	V
En hys	Enable Threshold Hysteresis			0.6		V

Pin Functions

Pin #	Name	Description
1	BST	Bootstrap. This is the positive power supply for the internal floating high side MOSFET driver. Connect a bypass capacitor between this pin and SW pin.
2	GND	Ground. It should be connected as close as possible to the output capacitor.
3	FB	Feedback. This is the input to the error amplifier. An external resistive divider connected between the output and GND is compared to the internal +0.8V reference to set the regulation voltage.
4	EN	Enable input. Pull this pin below the specified threshold to disable. Pull it above the specified threshold to enable. Float this pin to disable.
5	VIN	Input Supply. A decoupling capacitor to ground is required close to this pin to reduce switching spikes.
6	SW	Switch node. This is the output from the high-side switch. A low V_F

		Schottky diode to ground is required close to this pin to reduce switching spikes.

Detailed Description

The BL9342 is a 1.8MHz, non-synchronous, step-down switching regulator with integrated internal high side MOSFET. It provides internally compensated single 0.6A high efficient output. It features wide input voltage range, internal soft-start control, and precision current limit. Low operational quiescent current feature is suit for battery powered applications.

PWM Control

At heavy load or moderate load condition, the BL9342 operates in a fixed frequency, peak current control mode to regulate the output voltage. A PWM cycle is initiated by the internal clock. The power MOSFET is turned on and remains on until its current reaches the value set by COMP voltage. When the power switch is off, it remains off for at least 100ns before the next cycle starts. If, in one PWM period, the current in the power MOSFET does not reach COMP set current value, the power MOSFET remains on, saving a turn-off operation. At light load condition, the BL9342 operates in pulse skipping mode to improve light load efficiency.

Internal Regulator

Most of the internal circuitry is powered on by the 2.6V internal regulator. When VIN is higher than 4.0V, the output of the regulator is in full regulation. When VIN is lower, the output degrades.

Under Voltage Lockout (UVLO)

VIN Under voltage lockout (UVLO) is implemented to protect the chip from operating at insufficient supply voltage.

Thermal Shutdown

Thermal shutdown is implemented to prevent the chip from thermally running away. When the temperature is higher than its upper threshold, the BL9342 will shut down. When the temperature is lower than its lower threshold, the chip is enabled again.

Application Information

Setting the Output Voltage

The output voltage is set using a resistive voltage divider from the output voltage to FB pin.

VFB=VOUT*R2/(R1+R2)

The feedback resistor R1 also sets the feedback loop bandwidth with the internal compensation capacitor. Choose R1 around 124kΩ for optimal transient response.

Inductor

The inductor is required to supply constant current to the output load. A larger value inductor will result in lower output ripple voltage. Generally, a good rule for determining the inductance to use is to allow the peak-to-peak ripple current in the inductor to be approximately 30% of the maximum load current. Also, make sure that the peak inductor current is below the maximum switch current limit.

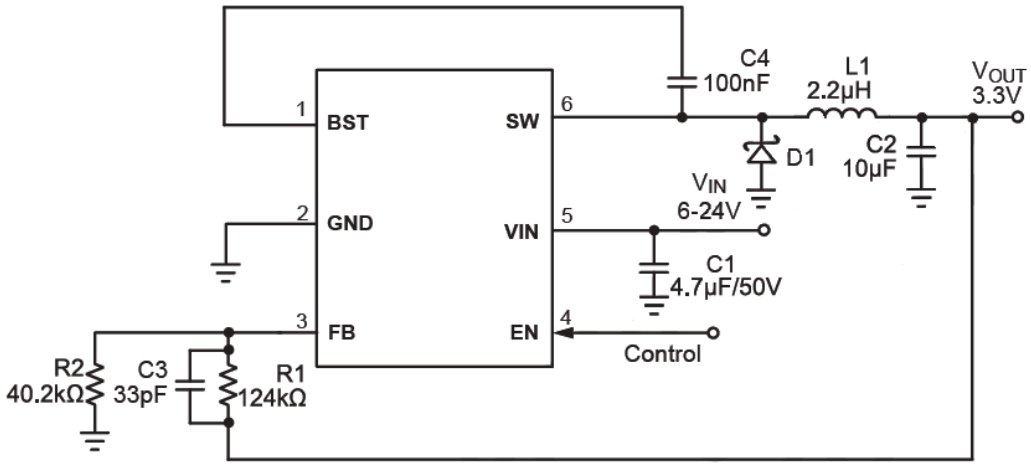
Input Capacitor

The input capacitor (C1) can be electrolytic, tantalum or ceramic. When using electrolytic or tantalum capacitors, a small, high quality ceramic capacitor, i.e. 0.1μF, should be placed as close to the IC as possible.

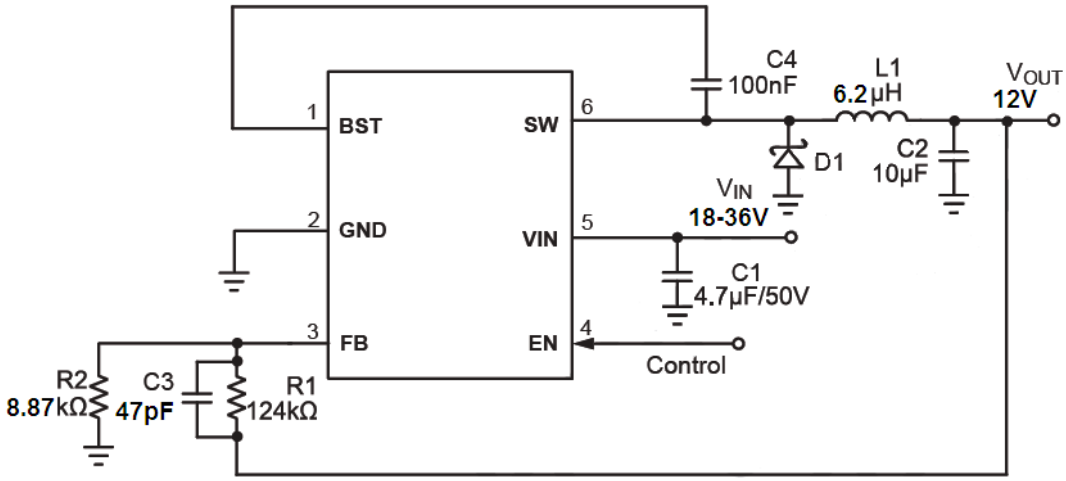
Output Capacitor

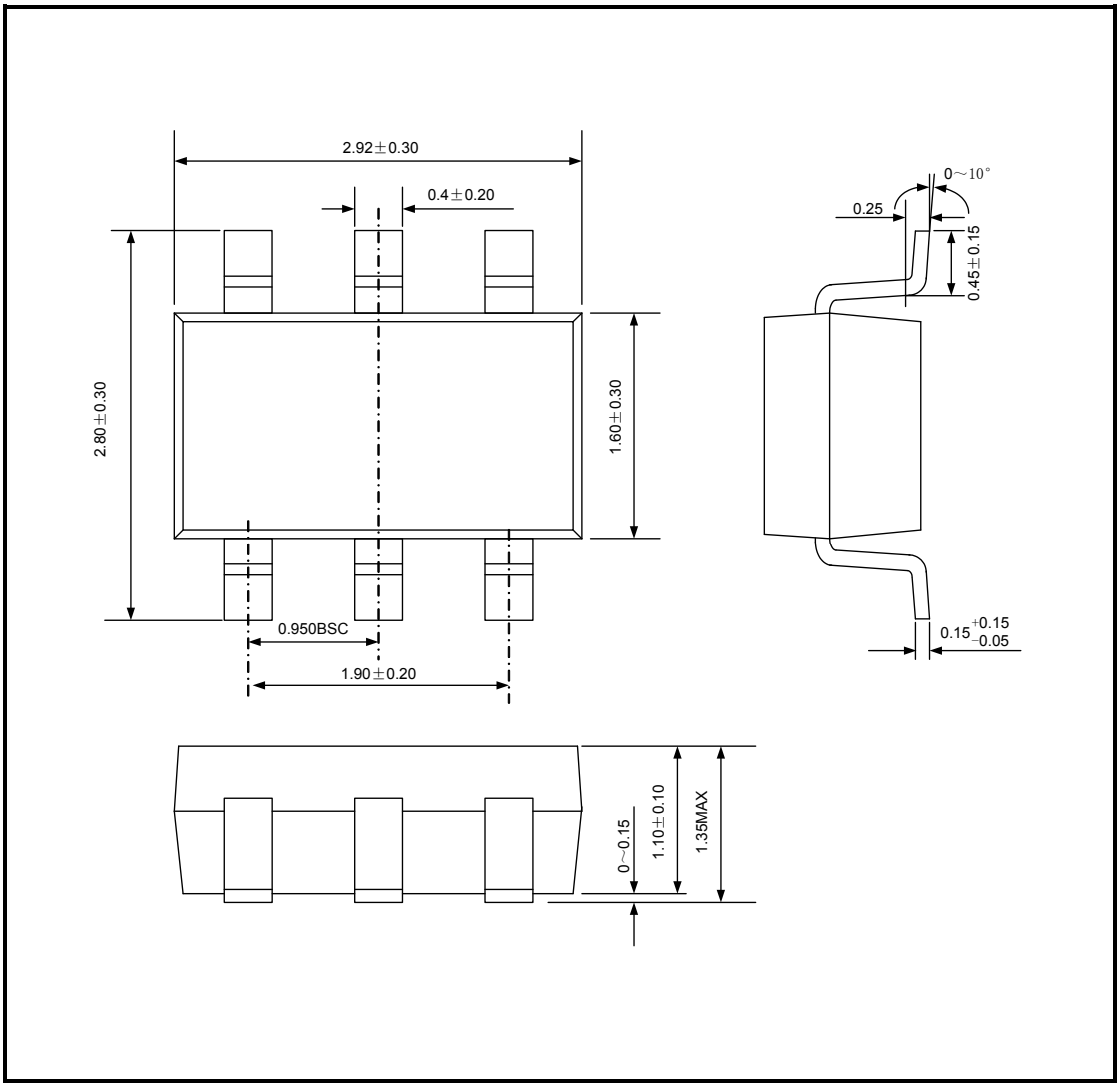
The output capacitor (C2) is used to maintain the DC output voltage. Ceramic, tantalum, or low ESR electrolytic capacitors are recommended. Low ESR capacitors are preferred to keep the output voltage ripple low.

Typical Application circuits



3.3V output typical application circuit



12V output typical application circuit

Package Information