High Efficiency, Boost Convertor with Programmable Current Limit

General Description

The LP6270 is a current mode boost DC-DC converter. Its PWM circuitry with built-in 2.6A Current power MOSFET makes this converter highly power efficiently. The non-inverting input its error amplifier is connected to an internal 0.6V precision reference voltage. Soft-Start time can be programmed with an external capacitor, which sets the input current ramp rate. A built-in charge pump is used to drive the N-Channel MOSFET that is free of parasitic body diode to eliminate any reversed current flow across the switch when it is powered off. Its low quiescent current (16μA) and small package (QFN-10) is particularly suitable in battery-powered portable equipment. Several protection functions include soft start to limit inrush current during plug-in, current limiting at 1500mA to meet USB power requirement, and thermal shutdown to protect damage under over current conditions.

Order Information

LP6270 ☐ ☐ ☐

F: Pb-Free

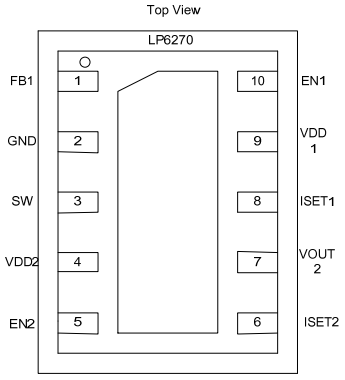
Package Type

QFN-10

Features

- Up to 94% efficiency
- Output to Input Disconnect at Shutdown Mode
- Output voltage Up to 5V
- Low Quiescent Current:16Ua
- Built-In Short-Circuit Protection
- Built-in Thermal Protection
- RoHS Compliant and 100% Lead (Pb)-Free

Pin Configurations



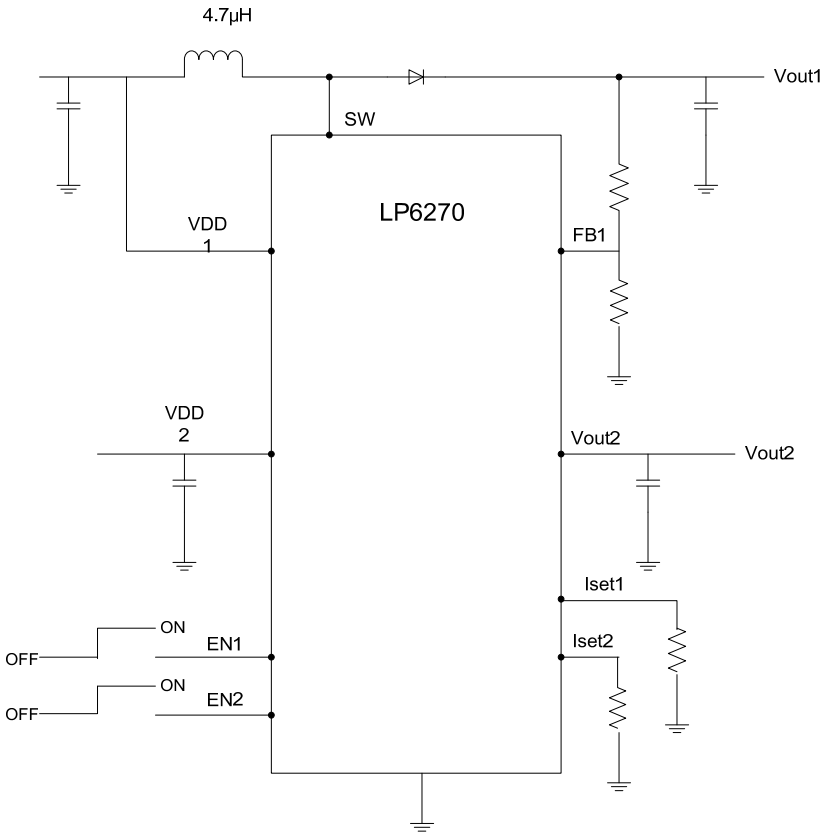
Applications

- ✧ Battery products
- ✧ Host Products
- ✧ Panel
- ✧ Power Switch
- ✧ USB Device
- ✧ Battery Charger Circuits

Marking Information

Device	Marking	Package	Shipping
LP6270	LPS LP6270 xxxx	QFN-10	3K/Set

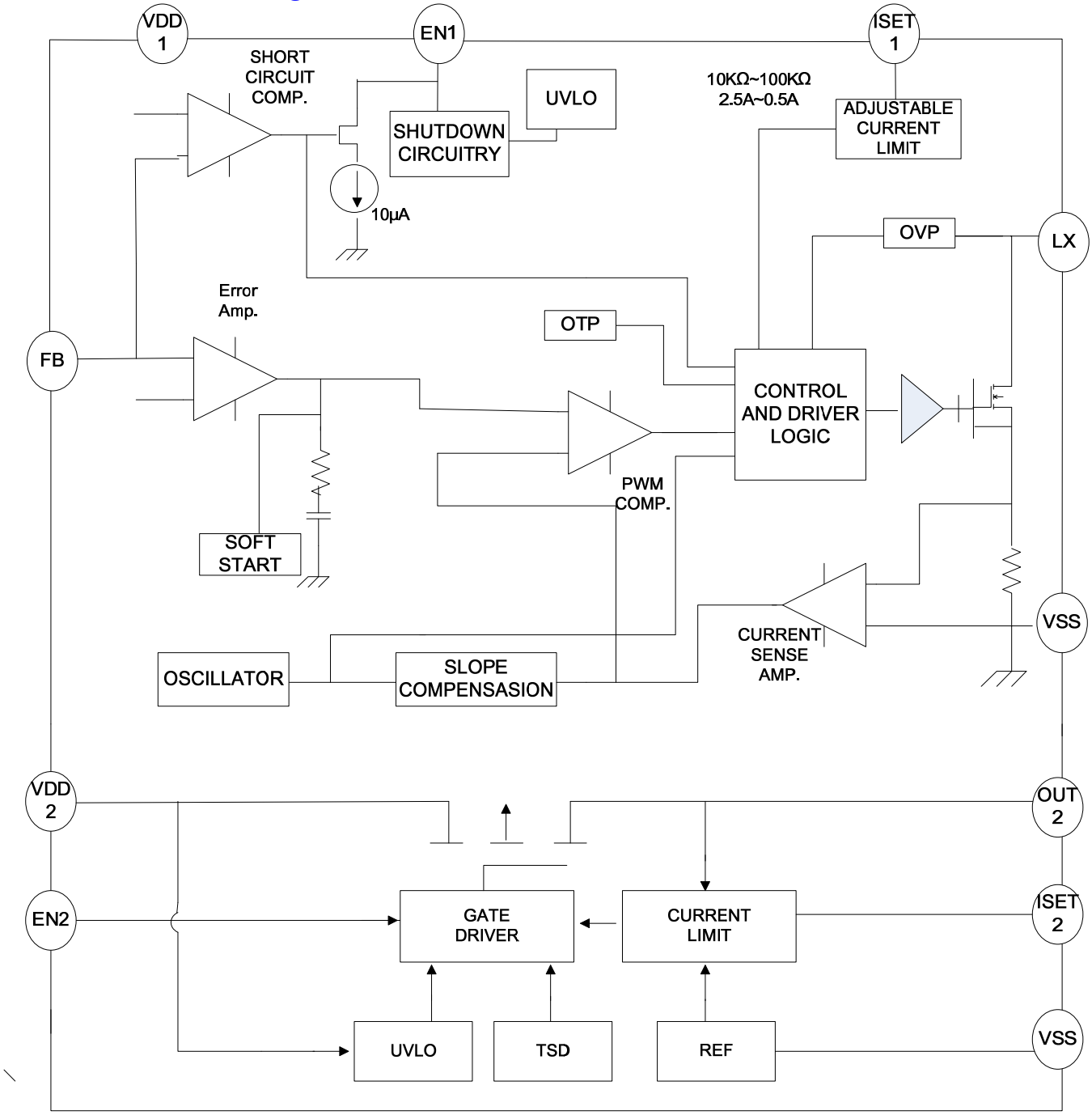
Typical Application Circuit



Functional Pin Description

Pin Number	Pin Name	Pin Function
1	FB1	Feedback Reference Voltage Pin. Series connect a resistor between WLED and ground as a current sense. Sense the current feedback voltage to set the current rating.
2	GND	Ground Pin
3	SW	Switch Pin. Connect this Pin to inductor and catch diode. Minimize the track area to reduce EMI.
4	VDD2	Working Voltage within the Device
5	EN2	Chip Enable (Active High). Voltage sensing input to trigger the function of over voltage protection. Note that this pin is high impedance. There should be a pull low 100kΩ resistor connected to GND when the control signal is floating.
6	ISET2	Charge Current Set Input.
7	VOUT	Output pin.
8	ISET1	Charge Current Set Input.
9	VDD1	Working Voltage within the Device.
10	EN1	Chip Enable (Active High). Voltage sensing input to trigger the function of over voltage protection. Note that this pin is high impedance. There should be a pull low 100kΩ resistor connected to GND when the control signal is floating.

Function Block Diagram



Absolute Maximum Ratings

- ✧ Input Voltage to GND ----------7V
- ✧ EN Voltage ----------0.3V to 7V
- ✧ Operation Junction Temperature Range ----------−40°C to 125°C
- ✧ Maximum Soldering Temperature (at leads, 1 0sec) ----------300℃
- ✧ Maximum Power Dissipation (PD) ----------0.25W
- ✧ Lead Temperature (Soldering, 10 sec.) ---------- 260°C

Electrical Characteristics

Parameter	Symbol	Test Condition	Min	Typ.	Max	Units
System Supply Input						
Operation voltage Range	V_{DD}		2.7		5.5	V
Under Voltage Lock Out	V_{DD}			2.4		V
Supply Current	I_{DD}	FB=0V, Switching		0.8	1.3	mA
Shut Down Current	I_{DD}	V_{EN} < 0.4V		0.1	1	uA
Line Regulation		V_{IN} : 3.0~4.3V		2		%
Oscillator						
Operation Frequency	F_{OSC}		0.8	1.1		MHz
Maximum Duty Cycle				92		%
Feedback Voltage				600		mV
MOSFET						
On Resistance of MOSFET	$R_{DS(ON)}$			0.3		Ω
Protection						
Boost OCP				2600		mA
Current Limit OCP				1500		mA
Shut Down Voltage	V_{EN}				0.4	V
Enable Voltage	V_{EN}		1.5			V

Applications Information

The LP6270 uses a 1.2MHz fixed-frequency, current-mode regulation architecture to regulate the output voltage. The LP6270 measures the output voltage through an external resistive voltage divider and compares that to the internal 0.6V reference to generate the error voltage to the inductor current to regulate the output voltage. the use of current-mode regulation improves transient response and control loop stability.

Current Limitation

The internal power-MOS switch current is monitored cycle-by-cycle and is limited to the value not exceed 2.6A (Typ.). When the switch current reaches the limited value, the internal power-MOS is turned off immediately until the next cycle. Keep traces at this pin as short as possible. Do not put capacitance at this pin.

Inductor Selection

For a better efficiency in high switching frequency converter, the inductor selection has to use a proper core material such as ferrite core to reduce the core loss and choose low ESR wire to reduce copper loss. The most important point is to prevent the core saturated when handling the maximum peak current. Using a shielded inductor can minimize radiated noise in sensitive applications. The maximum peak inductor current is the maximum input current plus the half of inductor ripple current. The calculated peak current has to be smaller than the current limitation in the electrical characteristics. A typical setting of the inductor ripple current is 20% to 40% of the maximum input current. If the selection is 40%, the maximum peak inductor current is

$$I_{PEAK} = I_{IN(MAX)} + \frac{1}{2} I_{RIPPLE} = 1.2 \times I_{IN(MAX)}$$

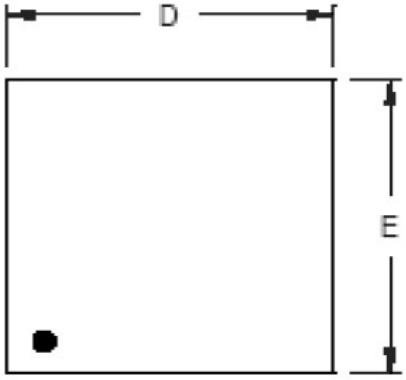
$$= 1.2 \times \left[\frac{I_{OUT(MAX)} \times V_{OUT}}{\eta \times V_{IN(MIN)}} \right]$$

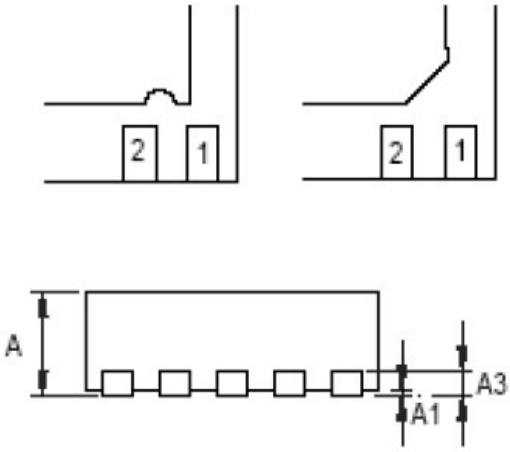
The minimum inductance value is derived from the following equation :

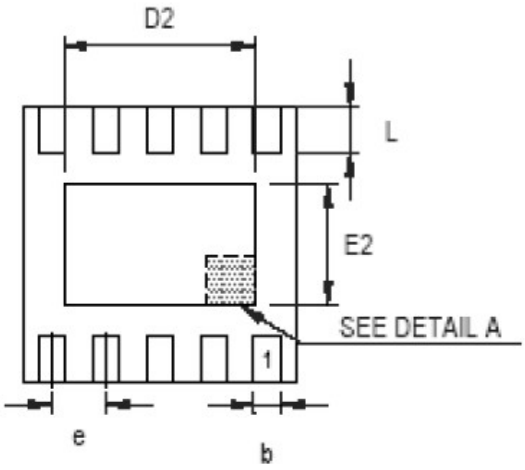
$$L = \frac{\eta \times V_{IN(MIN)}^2 \times [V_{OUT} - V_{IN(MIN)}]}{0.4 \times I_{OUT(MAX)} \times V_{OUT}^2 \times f_{OSC}}$$

Depending on the application, the recommended inductor value is between 2.2μH to 10μH.

Packaging Information







DETAIL A

Pin#1 ID and TIE Bar Mark Options

Note: The configuration of Pin #1 identifier is optional, but must be located within the zone indicated.

Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A3	0.175	0.250	0.007	0.010
b	0.180	0.300	0.007	0.012
D	2.950	3.050	0.116	0.120
D2	2.300	2.650	0.091	0.104
E	2.950	3.050	0.116	0.120
E2	1.500	1.750	0.059	0.069
e	0.500		0.020	
L	0.350	0.450	0.014	0.018