30V 2.4A Synchronous Buck Converter

General Description

The LP6492 is a synchronous, rectified, step-down, switch-mode converter with built-in power MOSFET. The LP6492 offers a very compact solution that achieves a maximum of 2.4A of continuous output current.

The LP6492 has synchronous mode operation for high efficiency over the output current load range. Current-mode operation provides fast transient response and eases loop stabilization.

The LP6492 requires a minimum number of readily available standard external components. Other features include cable compensation, programmable current limit and thermal shutdown.

Features

- Wide 8V to 30V Continuous Operating Input Range
- 78mΩ/65mΩ Low $R_{DS(ON)}$ Internal Power MOSFET
- Up to 93% Efficiency
- Default 160kHz Switching Frequency
- Internal Soft Start
- Output Line Drop Compensation
- Over-Current Protection (OCP) programmable with External Resistor
- No Loop Compensation Required
- Thermal Shutdown
- Available in SOP-8 Package

Order Information

LP6492 □ □□ □-□

- Current Sense Voltage
  - A: V_{CS}=53mV
  - B: V_{CS}=65mV
- F: Pb-Free
- Package Type
  - SO: SOP-8
- V_{OUT} Voltage
  - Default: Adjustable

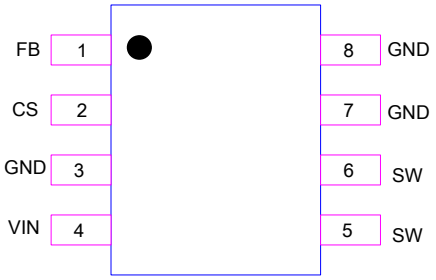
Applications

- Car Charger
- Pre-Regulator for Linear Regulators
- Distributed Power Systems
- USB Dedicated Charging Ports (DCP)

Marking Information

Device	Marking	Package	Shipping
LP6492SOF-A	LPS LP6492 XXX	SOP8	4K/REEL
LP6492SOF-B			
Marking indication: Y:Production year W:Production week X:Production batch			

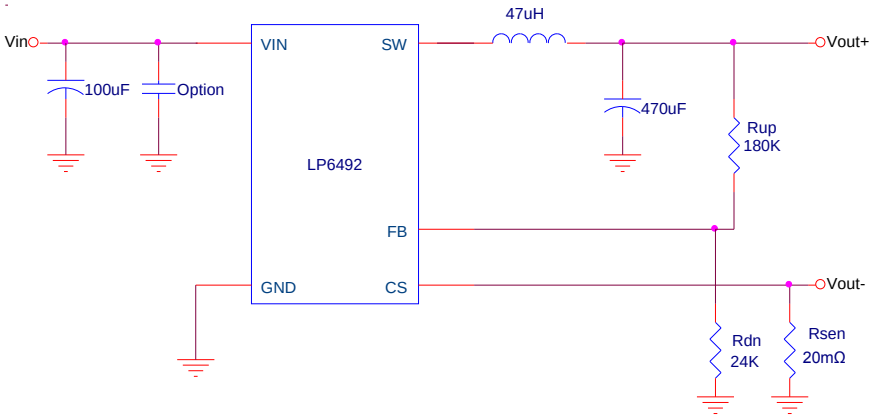
Functional Pin Description

Package Type	Pin Configurations
LP6492	

Pin Description

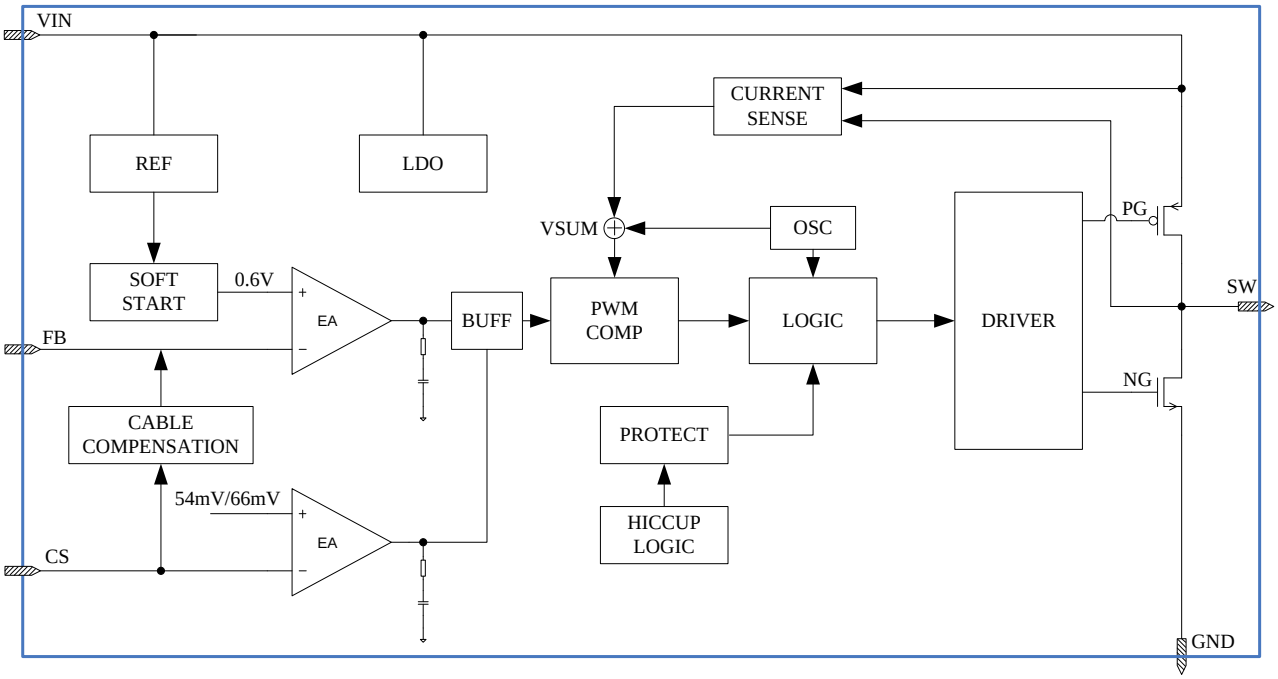
Pin	Name	Description
1	FB	Voltage Feedback. The feedback voltage is 0.6V.
2	CS	Output Current Sense PIN.
3	GND	Ground.
4	VIN	Input Supply Voltage.
5,6	SW	Switch PIN.
7,8	GND	Power Ground.

Typical Application Circuit



LP6492 Application Circuit

Function Diagram



Absolute Maximum Ratings Note 1

- ✧ VIN to GND ---------- -0.3V to +36V
- ✧ SW to GND ---------- -0.3V to +36V
- ✧ All other pin to GND ---------- -0.3V to +6V
- ✧ Storage temperature range ---------- -55℃ to +165℃
- ✧ Maximum Operating Junction temperature ---------- +150℃
- ✧ Maximum Soldering Temperature (at leads, 10 sec) ---------- +260℃

Note 1. Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Thermal Information

- ✧ Maximum Power Dissipation (P_D,T_A=25℃) ---------- 1.5W
- ✧ Thermal Resistance (θ_{JA}) ---------- 80℃/W

ESD Susceptibility

- ✧ HBM(Human Body Mode) ---------- 2KV
- ✧ MM(Machine Mode) ---------- 200V

Recommended Operating Conditions

- ✧ Ambient Temperature Range ---------- -40℃ to 85℃

Electrical Characteristics

V_{IN}=12V，T_A=25℃, unless otherwise noted

Parameter	Symbol	Condition	Min	Typ	Max	Units
Supply Current	I_Q	No switching, V_{FB}=0.8V		0.73	1	mA
	I_{SW}	Switching, I_{load}=0A		10	20	mA
VIN Under Voltage Lockout Threshold Rising	V_{IN_UVLO}	V_{IN} rising	6.6	7.3	8	V
VIN Under Voltage Lockout Threshold Hysteresis	V_{IN_HYS}			1		V
Oscillator Frequency	F_{SW}			160		KHz
Maximum Duty Cycle	D_{MAX}				98	%
FB Voltage Reference	V_{FB}	LP6492	0.588	0.6	0.612	V
OVP Voltage Reference	$V_{REF-OVP}$			0.706		V
SCP voltage Reference	V_{REF_SCP}			0.395		V
CS Voltage Reference	V_{CS}	LP6492SOF-A	48	53	60	mV
		LP6492SOF-B	58	65	72	mV
Line Compensation Current	I_{FB}			1.5	2	uA
SCP Frequency	F_{SW1}			61		KHz
Current Limit	I_{LIMIT}			4		A
High-Side Switch on Resistance	R_{DSON-H}			78		mΩ
Low-Side Switch on Resistance	R_{DSON-L}			65		mΩ
Thermal Shutdown	T_{OTP}	Temp rising		150		℃
Thermal Shutdown Hysteresis	T_{OTP_HYS}			15		℃
Hiccup Time	t_{HICCUP}			260		ms
Soft-start Time	t_{SS}			2.7		ms

Application Information

The LP6492 operates by a constant frequency, current mode architecture. The output voltage is set by an external divider returned to the FB pin. An error amplifier compares the divided output voltage with a reference voltage of 0.6V and adjusts the peak inductor current accordingly.

Thermal Protection

The total power dissipation in LP6492 is limited by a thermal protection circuit. When the device temperature rises to approximately +150℃, this circuit turns off the output, allowing the IC to cool. The thermal protection circuit can protect the device from being damaged by overheating in the event of fault conditions. Continuously running the LP6492 into thermal shutdown degrades device reliability.

Current Limit

The Current limit is set by outside resistance (R_{SEN}), When the CS voltage larger than 53mV/65mV, the current limit is happened that driver can be turned off. The current limit set according to the following equation:

$$I_{OUT} = V_{CS} / R_{SEN}$$

Setting Output Voltage

The output voltage is set with a resistor divider from the output node to the FB pin. It is recommended to use divider resistors with 1% tolerance or better. To improve efficiency at very light loads consider using larger value resistors. If the values are too high the regulator is more susceptible to noise and voltage errors from the FB input current are noticeable. For most applications, a resistor in the 10kΩ to 1MΩ range is suggested for R_{UP} and R_{DN}. The output voltage is established by the following equations

$$V_{OUT} = 0.6V \cdot (1 + R_{UP} / R_{DN})$$

Where V_{FB} is 0.6V.

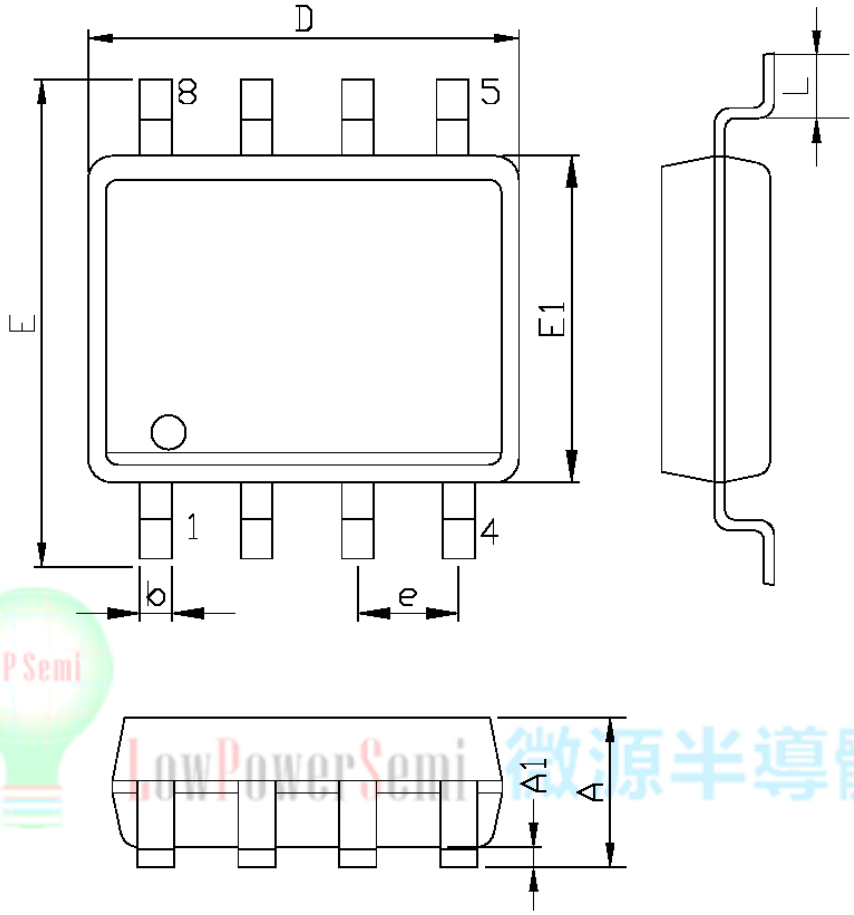
Output Cable Resistance Compensation

To compensate for resistive voltage drop across the charger's output cable, the LP6492 integrates a simple, user-programmable cable voltage drop compensation using the impedance at the FB pin. The delta V_{OUT} rises when the feedback resistance R_{SEN} value rises, use the equation below:

$$\Delta V_{OUT}(mV)=I_{OUT}(A)\cdot R_{SEN}(m\Omega) \cdot R_{UP}(K\Omega) /40\ K\Omega$$

Packaging Information

SOP-8



SYMBOLS	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
D	4.90		0.193	
E	5.80	6.20	0.228	0.244
E1	3.90		0.153	
L	0.40	1.27	0.016	0.050
b	0.31	0.51	0.012	0.020
e	1.27		0.050	