



## 30V 2.4A Synchronous Buck Converter

### General Description

The LP6490 is a synchronous, rectified, step-down, switch-mode converter with built-in power MOSFETs. The LP6490 offers a very compact solution that achieves a maximum of 2.4A of continuous output current.

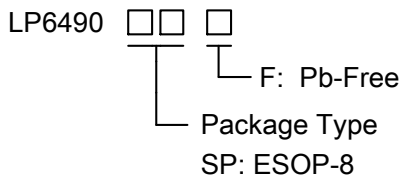
The LP6490 has synchronous mode operation for high efficiency over the output current load range. Current-mode operation provides fast transient response and eases loop stabilization.

The LP6490 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
- ◆ 80mΩ/60mΩ Low  $R_{DS(ON)}$  Internal Power MOSFETs
- ◆ Up to 93% Efficiency
- ◆ Default 180kHz Switching Frequency
- ◆ Internal Soft Start
- ◆ Output Line Drop Compensation
- ◆ Over- Voltage Protection (OVP)
- ◆ Over-Current Protection (OCP) programmable with External Resistor
- ◆ No Loop Compensation Required
- ◆ Thermal Shutdown
- ◆ Available in ESOP8 Package

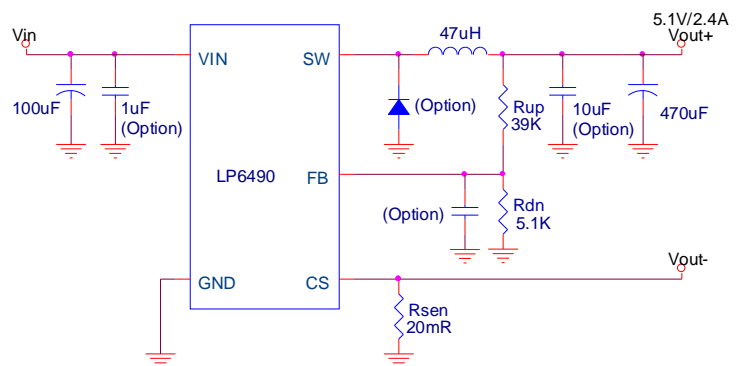
### Order Information



### Applications

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

### Typical Application Circuit



### Marking Information

Device	Marking	Package	Shipping
LP6490	LPS LP6490 YWX	ESOP8	4K/REEL
Marking indication: Y:Production year W:Production week X:Production batch			



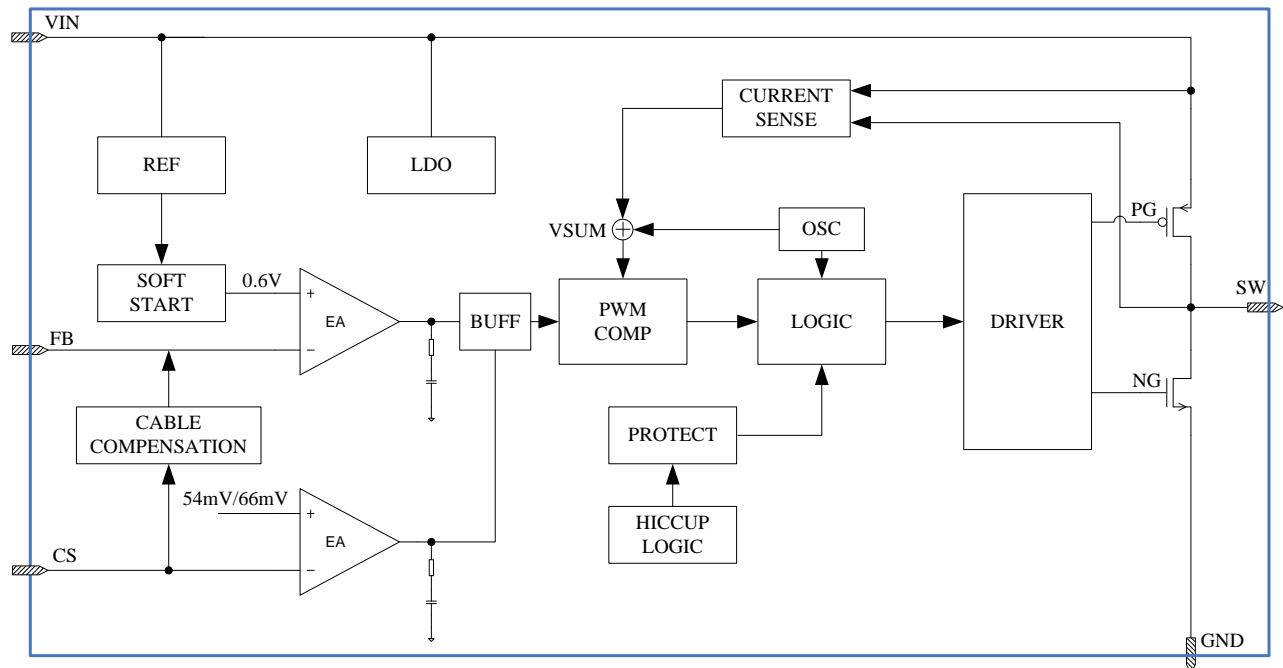
### Functional Pin Description

Package Type	Pin Configurations
ESOP8	

### 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.

### Function Diagram





## Absolute Maximum Ratings <sup>Note 1</sup>

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

**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 (  $P_D, T_A=25^\circ\text{C}$  ) ----- 2W
- ◇ Thermal Resistance ( $\theta_{JA}$ ) ----- 50°C/W

## ESD Susceptibility

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

## Recommended Operating Conditions

- ◇ Operating Junction Temperature Range (TJ) ----- -40°C to 150°C
- ◇ Ambient Temperature Range ----- -40°C to 85°C



## Electrical Characteristics

$V_{IN}=12V$  ,  $T_A=25^{\circ}C$ , 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
VIN OVP Voltage Lockout Threshold Rising	$V_{IN\_OVP}$	$V_{IN}$ rising		33		V
VIN OVP Voltage Lockout Threshold Hysteresis	$V_{IN\_HYS1}$			2.2		V
Oscillator Frequency	$F_{SW}$	$V_{FB}=0.6V$		180		KHz
Maximum Duty Cycle	$D_{MAX}$				98	%
FB Voltage Reference	$V_{REF}$		0.588	0.6	0.612	V
OVP Voltage Reference	$V_{OVP}$			0.706		V
SCP voltage Reference	$V_{REF\_SCP}$			0.267		V
CS Voltage Reference	$V_{CS}$		61	64	67	mV
Maximum Line Compensation Current	$I_{FB}$		5.8	6	7	uA
SCP Frequency	$F_{SW1}$			60		KHz
SCP Delay Time	$t_{D\_SCP}$			256		us
Hiccup Time	$t_{HICCUP}$			260		ms
Soft-start Time	$t_{SS}$			2.7		ms
Switch Current Limit	$I_{LIMIT}$			4.5		A
Thermal Shutdown	$T_{OTP}$	Temp rising		150		$^{\circ}C$
Thermal Shutdown Hysteresis	$T_{OTP\_HYS}$			15		$^{\circ}C$



## Application Information

The LP6490 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 LP6490 is limited by a thermal protection circuit. When the device temperature rises to approximately 150°C, 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 LP6490 into thermal shutdown degrades device reliability.

### Current Limit

The Current limit is set by outside resistance ( $R_{SEN}$ ), When the CS voltage larger than 64mV, 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

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

Where  $V_{REF}$  is 0.6V.

### Output Cable Resistance Compensation

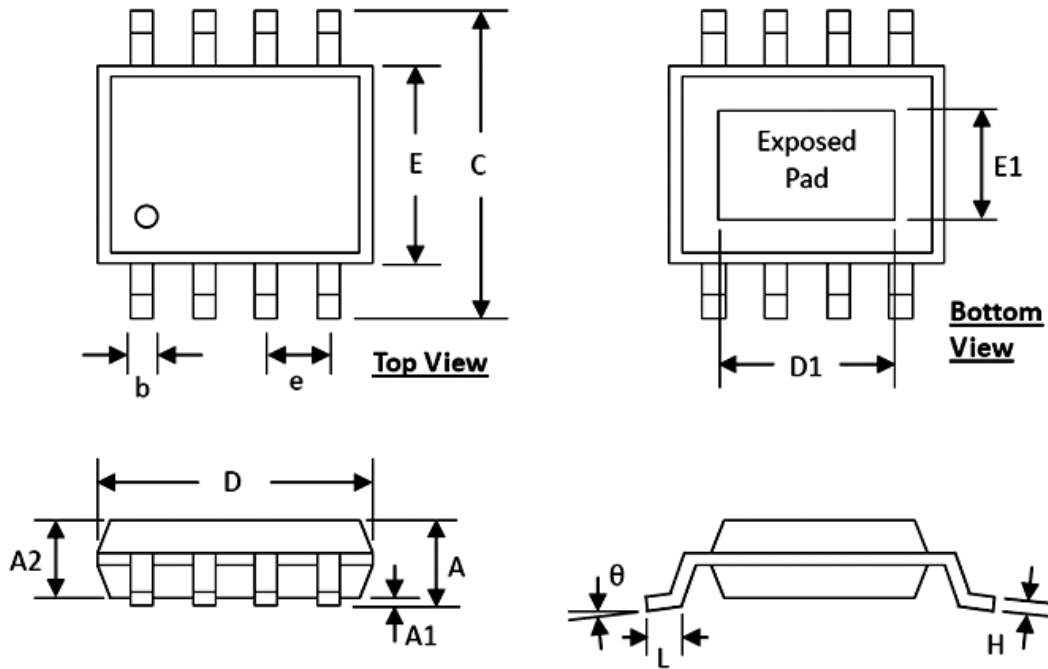
To compensate for resistive voltage drop across the charger's output cable, the LP6490 integrates a simple, user-programmable cable voltage drop compensation using the impedance at the FB pin. The delta  $V_{OUT}$  rises when the feedback resistance  $R_{SEN}$  value rises, use the equation below:

$$\Delta V_{OUT} = I_{OUT} \times R_{SEN} \times R_{UP} / 10K\Omega$$



### Packaging Information

#### ESOP8



SYMBOLS	DIMENSION (MM)		DIMENSION (INCH)	
	MIN	MAX	MIN	MAX
A	1.30	1.70	0.051	0.067
A1	0.00	0.15	0.000	0.006
A2	1.25	1.52	0.049	0.060
b	0.33	0.51	0.013	0.020
C	5.80	6.20	0.228	0.244
D	4.80	5.00	0.189	0.197
D1	3.15	3.45	0.124	0.136
E	3.80	4.00	0.150	0.157
E1	2.26	2.56	0.089	0.101
e	1.27 BSC		0.050 BSC	
H	0.19	0.25	0.0075	0.0098
L	0.41	1.27	0.016	0.050
$\theta$	0°	8°	0°	8°