

## 36V Input, 3.1A output Step-Down Converter in ESOP-8

### DESCRIPTION

The ETA2822 is a total solution IC specifically for high voltage USB charging applications. It includes a wide input range, high-efficiency, and high frequency DC-to-DC step-down switching regulator that is capable of delivering up to 3.1A of output current. The DC-DC in ETA2822 is a current mode converter with a fixed-frequency that is externally adjustable. There is also a cable resistance compensation feature that allows users to adjust the output voltage to compensate for the voltage drop due to cable resistance.

An OVP function protects the IC itself and its downstream system against input voltage surges. With this OVP function, the IC can stand off input voltage as high as 42V, making it an ideal solution for industrial applications such as smart power-meters as well as automotive applications. In automotive systems, power comes from the battery, with its voltage typically ranges between 9V and 24V. Including cold crank and double battery jump-starts, the minimum input voltage may be as low as 4V and the maximum up to 36V, This makes ETA2822 ideal for the automotive application.

ETA2822 is housed in an ESOP8 package.

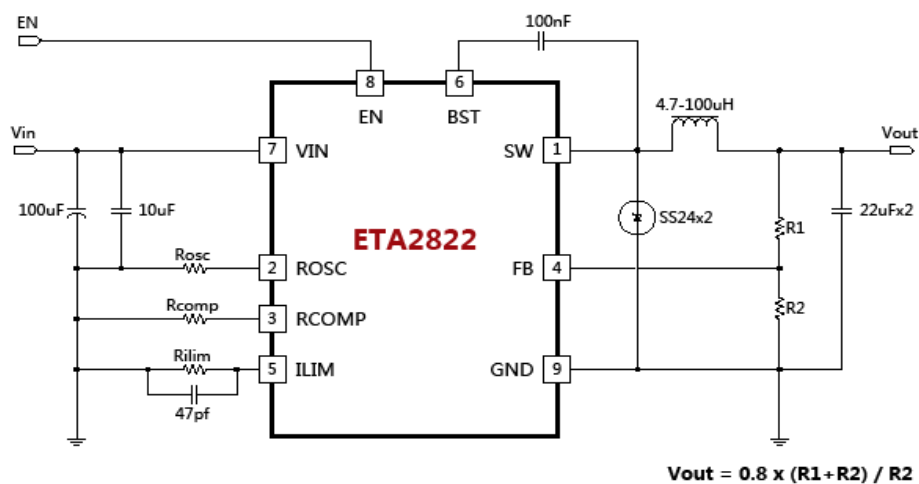
### FEATURES

- ◆ Wide Input Operating Range from 4V to 36V
- ◆ Standoff Input Voltage: 42V
- ◆ High Efficiency at 12V In 5V Out: Up to 91%:
- ◆ High Efficiency PFM mode at light load
- ◆ Capable of Delivering 3.1A output current
- ◆ Cable resistance compensation
- ◆ Adjustable Switching frequency
- ◆ Adjustable Output current limit
- ◆ Current Mode control
- ◆ Logic Control Shutdown
- ◆ Thermal shutdown and UVLO

### APPLICATIONS

- ◆ Car Charge ports
- ◆ Smart power-meter system
- ◆ General purpose with high voltage input

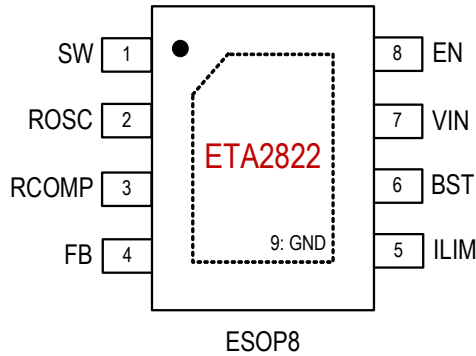
### TYPICAL APPLICATION



### ORDERING INFORMATION

PART No.	PACKAGE	TOP MARK	Pcs/Reel
ETA2822E8A	ESOP-8	ETA2822 YWW2L	4000

## PIN CONFIGURATION



## ABSOLUTE MAXIMUM RATINGS

(Note: Exceeding these limits may damage the device. Exposure to absolute maximum rating conditions for long periods may affect device reliability.)

IN Voltage .....	-0.3V to 42V
SW, EN Voltage .....	-0.3V to VIN+0.3V
BST Voltage .....	-0.3V to SW+6V
Other Pins Voltage.....	-0.3V to +6V
SW to ground current.....	Internally limited
Operating Temperature Range .....	-40°C to 85°C
Storage Temperature Range .....	-55°C to 150°C
Thermal Resistance $\theta_{JA}$	
ESOP8.....	50 °C/W
Lead Temperature (Soldering, 10sec) .....	260°C
ESD HBM (Human Body Mode) .....	2KV
ESD MM (Machine Mode) .....	200V

## ELECTRICAL CHARACTERISTICS

(VIN =12V, unless otherwise specified. Typical values are at TA = 25°C.)

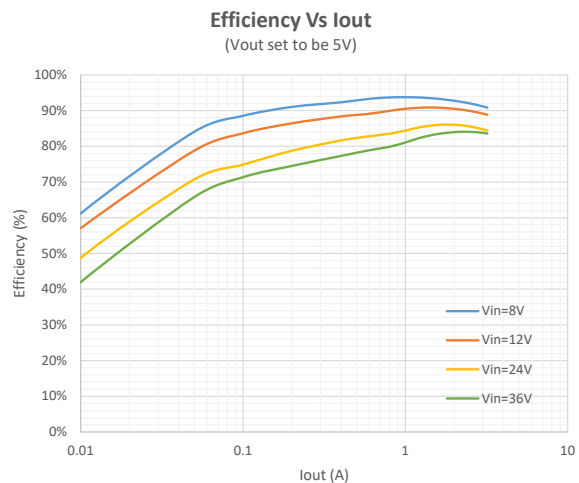
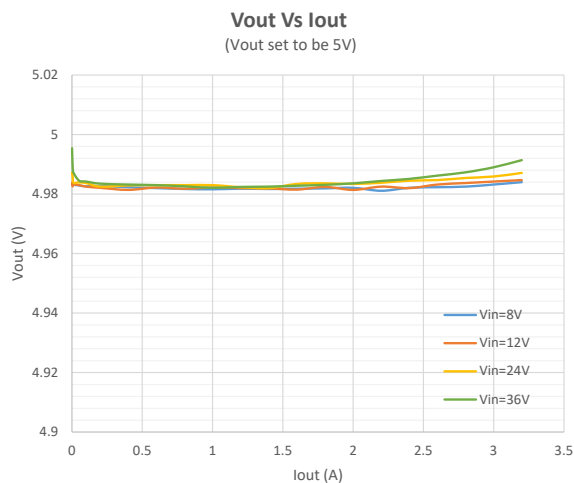
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Standoff Voltage		42			V
Input Voltage Range		4		36	V
Input UVLO	Rising. Hysteresis=150mV		3.80		V
Input OVP	Rising. Hysteresis=1.5V		37.5		V
Input Supply Current	V <sub>FB</sub> =0.85V. no switching		0.85	1	mA
Input Shutdown Current			6		µA
FB Voltage		0.776	0.800	0.824	V
FB Input Current		-1	0	1	µA
Switching Frequency	R <sub>OSC</sub> =200KΩ		500		KHz
FoldBack Frequency	V <sub>FB</sub> =0, R <sub>OSC</sub> =200KΩ		125		KHz
Maximum Duty Cycle	f <sub>OSC</sub> < 600KHz	90			%
High side Switch On Resistance	I <sub>SW</sub> =200mA		100		mΩ
High side Switch Current Limit	R <sub>LIM</sub> =250KΩ		4		A
SW Leakage Current	V <sub>IN</sub> =12V, V <sub>SW</sub> =0, EN= GND			10	µA
Soft-Start Time	I <sub>OUT</sub> =0A, f <sub>OSC</sub> =300kHz		200		µs
Short Circuit Hiccup time	ON		0.5		ms
	OFF		100		ms
EN Input Current	V <sub>IN</sub> =12V, V <sub>EN</sub> =5V		0.1	5	µA
EN Logic High Voltage	Rising	0.91	1.05	1.29	V
EN Logic Low Voltage	Falling	0.81	0.96	0.99	V
Thermal Shutdown	Rising, Hysteresis=30°C		150		°C

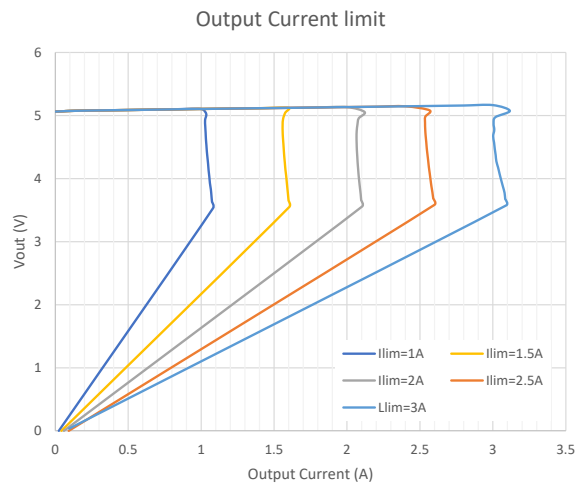
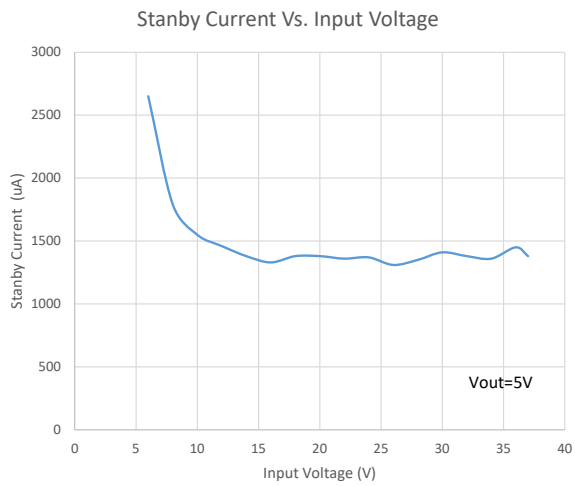
## PIN DESCRIPTION

PIN #	NAME	DESCRIPTION
1	SW	Inductor Connection. Connect an inductor between SW and the regulator output.
2	ROSC	Frequency Setting. Connect a resistor from this pin to GND to set the switching frequency.
3	RCOMP	Cable Resistance Compensation adjust pin. Connect a resistor from this pin to GND to compensate for voltage drop due to cord resistance
4	FB	Feedback Input. Connect an external resistor divider from the output to FB and GND to set VOUT
5	ILIM	Current Limit Setting. Connect a resistor from this pin to GND to set the current limit value.
6	BST	Bootstrap pin. Connect a 100nF capacitor from this pin to SW
7	VIN	Supply Voltage. Bypass with a 10 $\mu$ F ceramic capacitor to GND
8	EN	Enable pin for the IC. Drive this pin high to enable the part, low to disable.
Exposed Pad 9	GND	Ground

## TYPICAL CHARACTERISTICS

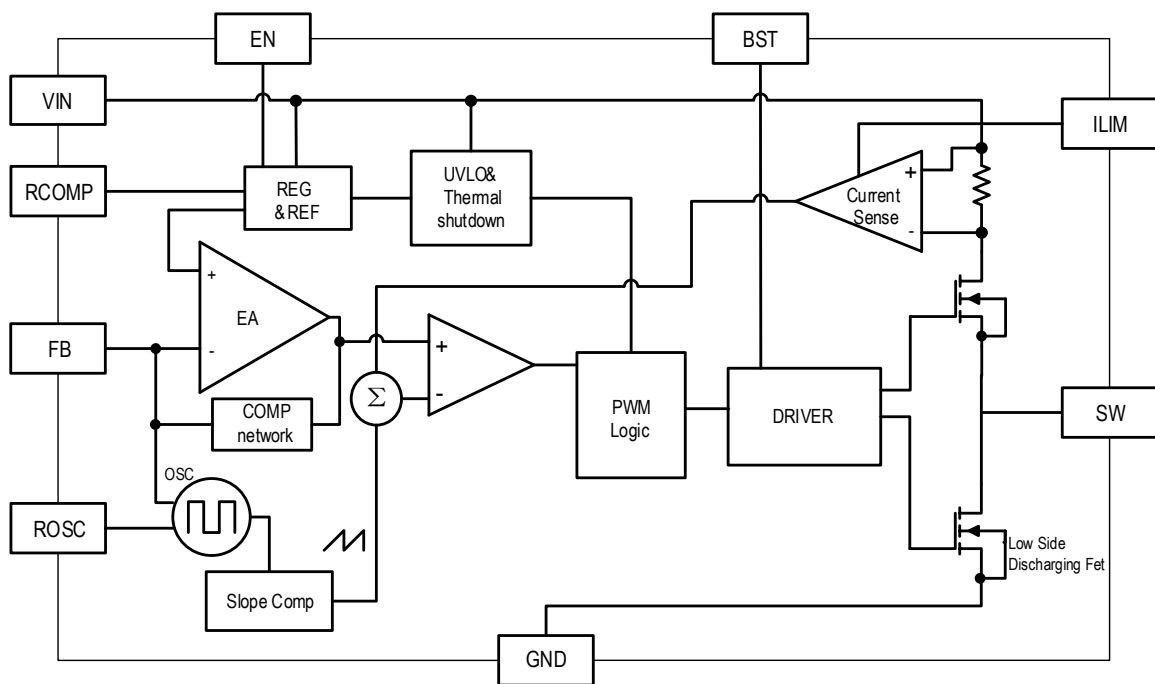
(Vin=12V, Vout=5V, T<sub>A</sub>=25°C, unless otherwise specified)





\*Vin=12V, Vout=5V, L=6.8µH, f=300KHz, Rcomp=510Kohm

## FUNCTIONAL BLOCK DIAGRAM



## APPLICATION INFORMATION

### Peripheral Capacitor and Inductor Selection

Table 1 .Recommended Peripherals

Frequency (KHz)	Cin (uF)	Cout (uF)	L(μH)	VOUT (V)
150	10	22x2	68-100	5
300	10	22x2	6.8-22	5
500	10	22x2	4.7-10	5
1000	10	22x2	2.2-4.7	5
2000	10	22x2	1.0	5

### Setting the Switching Frequency

The ETA2822 uses a constant frequency PWM architecture that can be programmed to switch from 100KHz to 2MHz by using a resistor tied from the R<sub>osc</sub> pin to ground. A table showing the necessary R<sub>osc</sub> value for a desired switching frequency is below.

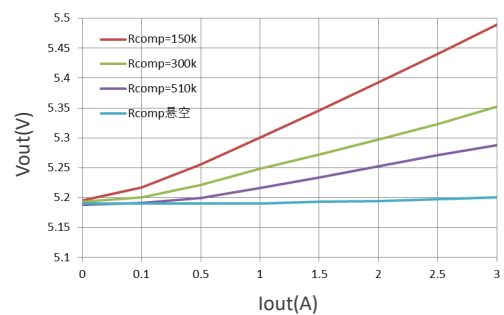
Table 2. SW Frequency vs R<sub>osc</sub> Value

ROSC(kΩ)	f(KHz)
82	1000
100	880
150	600
220	420
330	300
390	260
470	220
680	160

### Cable Resistance compensation

The ETA2822 has a cable cord resistance compensation feature to compensate the voltage drop due to cord resistance. The amount of added output voltage can be adjusted by an external resistor connected between RCOMP and GND pin.

I <sub>out</sub>	R <sub>comp</sub> =150k (R <sub>cable</sub> =100mΩ)	R <sub>comp</sub> =300k (R <sub>cable</sub> =50mΩ)	R <sub>comp</sub> =510k (R <sub>cable</sub> =30mΩ)
0	5.195	5.193	5.188
0.1	5.217	5.201	5.191
0.5	5.256	5.221	5.2
1	5.3	5.248	5.216
1.5	5.346	5.272	5.234
2	5.393	5.297	5.252
2.5	5.44	5.323	5.271
3	5.489	5.352	5.288



## Setting of Output Current Limit

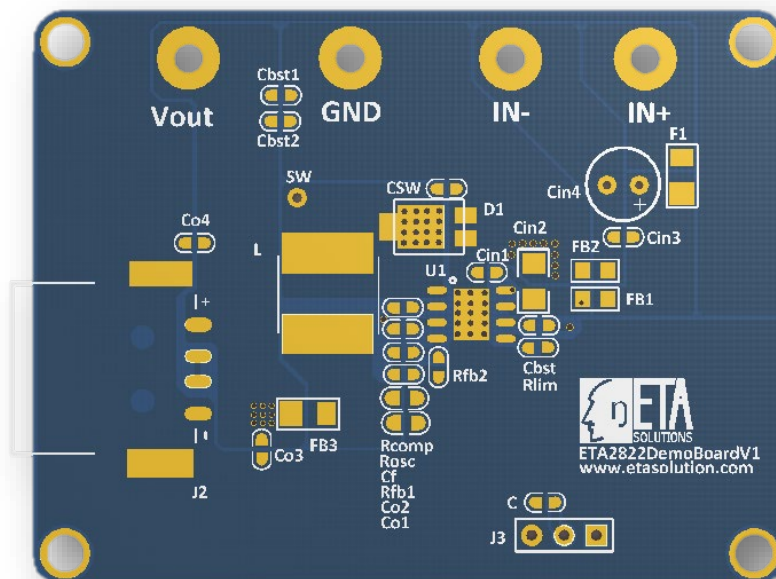
Given the input voltage, inductor value and oscillation frequency, the output current limit can be set by external resistor connected to  $R_{ILIM}$  pin. Several typical current limit setting is listed in following table at  $V_{in}=12V$ ,  $f=300KHz$  and  $L=6.8\mu H$ .

Output Current Limit (A)	$R_{ILIM}$ (K)
1	750
1.5	560
2	430
2.5	300
3.5	200

## Heat Consideration and PCB Guideline

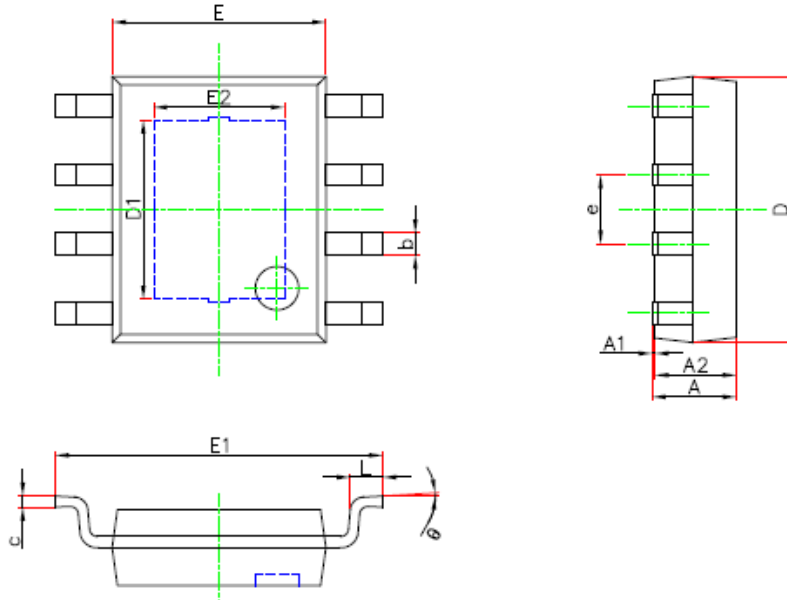
ETA2822 can deliver current up to 3.1A, and there will be a large amount of heat generated by the chip even though the efficiency is higher than 90% in most cases. Beside the ETA2822 itself, the 2 Schottky Diode (SBD) also generate a lot of heat. Please draw large heat sink area in PCB for ETA2822 and the 2 SBDs. In addition, 2 oz copper is recommended to be used on the PCB for better heat dissipation.

A picture of DEMO PCB is shown below. Please place the input capacitor (Cin1 and Cin2) as close to the chip as possible and placing this input capacitor is always the highest priority in drawing a PCB for ETA2822.



## PACKAGE OUTLINE

Package: ESOP-8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.300	1.700	0.051	0.067
A1	0.000	0.100	0.000	0.004
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.700	5.100	0.185	0.201
D1	3.202	3.402	0.126	0.134
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
E2	2.313	2.513	0.091	0.099
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°