

42V Input Standoff Voltage, 1A Step-Down LED Driver in SOT23-6

DESCRIPTION

The ETA2840 is a wide input range, high-efficiency, and high frequency DC-to-DC step-down LED driver, capable of delivering up to 1.5A of output current. ETA2840 provide 0.16V feedback voltage, which minimize the power loss on the sense resistor in a LED driver system. With a fixed switching frequency of 600KHz, This current mode PWM controlled LED Driver allows the use of small external components, such as ceramic input and output caps, as well as small inductors. ETA2840 also employs a proprietary control scheme that switches the device into a power save mode during light load, thereby extending the range of high efficiency operation. An OVP function protects the IC itself and its downstream system against input voltage surges. With the hysteresis, EN can be controlled by the ambient light-sensitive resistor.

ETA2840 is available in a space-saving SOT23-6 package.

FEATURES

- ◆ Wide Input Operating Range from 4.5V to 36V
- ◆ Standoff Input Voltage: 42V
- ◆ High Efficiency PFM mode at light load
- ◆ Capable of Delivering 1.5A
- ◆ No External Compensation Needed
- ◆ Current Mode control
- ◆ Logic Control Shutdown
- ◆ En can be controlled by ambient light
- ◆ Thermal shutdown and UVLO
- ◆ Available in SOT23-6 Package

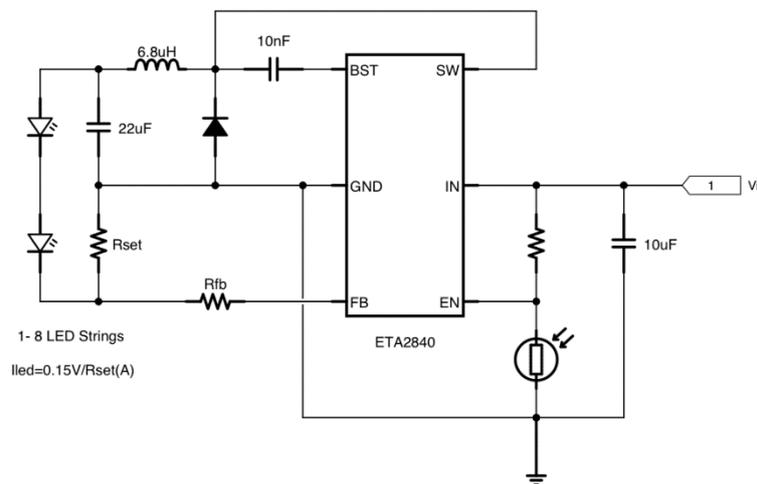
APPLICATIONS

- ◆ IR LED driver for surveillance camera
- ◆ LED lighting
- ◆ Constant current source

ORDERING INFORMATION

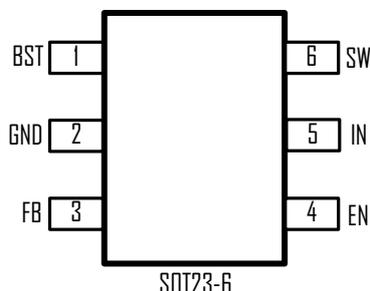
PART	PACKAGE PIN	TOP MARK
ETA2840S2G	SOT23-6	EQYW

TYPICAL APPLICATION



Typical Circuit of ETA2840

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 $V_{IN}+0.3V$
BST Voltage.....	-0.3V to $SW+6V$
FB 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	θ_{JA} θ_{JC}
SOT23-6.....	220 110..... °C /W

ELECTRICAL CHARACTERISTICS

($V_{IN} = 5V$, unless otherwise specified. Typical values are at $T_A = 25^\circ C$.)

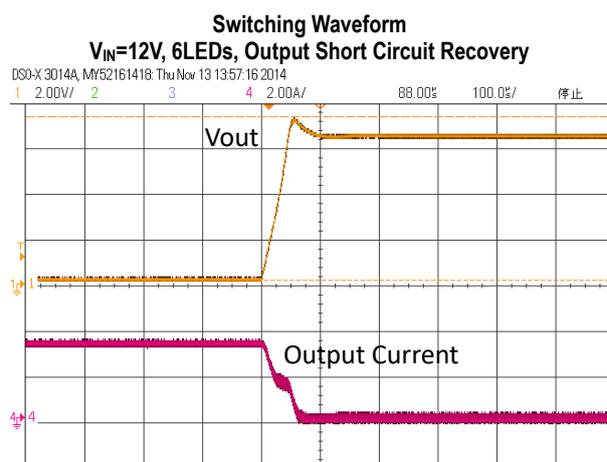
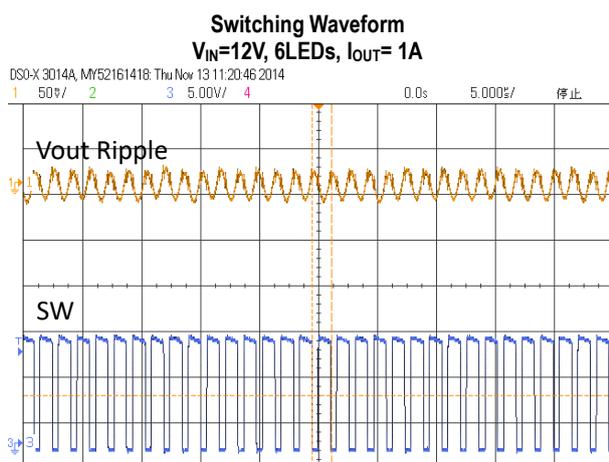
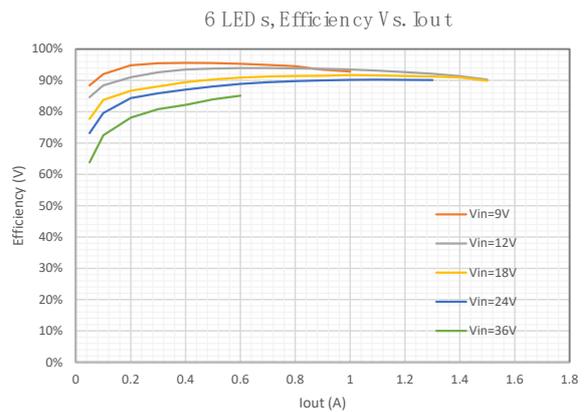
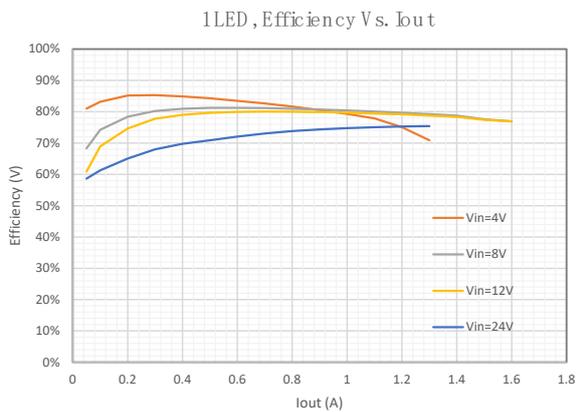
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Standoff Voltage		42			V
Input Voltage Range		4.5		36	V
Input UVLO	Rising, Hysteresis=170mV		3.90		V
Input OVP	Rising, Hysteresis=2V		38.7		V
Input Supply Current	$V_{FB}=1V$		0.5		mA
Input Shutdown Current			6		μA
FB Feedback Voltage		0.150	0.160	0.164	V
FB Input Current			0.01		μA
Switching Frequency			650		KHz
Maximum Duty Cycle		90			%
Fold-Back Frequency			170		KHz
High side Switch ON Resistance	$I_{SW}=200mA$		300		m Ω
High side Switch Current Limit			1.5		A
SW Leakage Current	$V_{IN}=12V, V_{SW}=0,$ $EN=GND$			10	μA
EN Input Current	$V_{IN}=12V, V_{EN}=5V$		1	5	μA
EN Input Low Voltage	Rising, Hysteresis=100mV	0.95	1.1	1.18	V
Thermal Shutdown	Hysteresis=40°C		150		°C

PIN DESCRIPTION

PIN #	NAME	DESCRIPTION
1	BST	Bootstrap pin. Connect a 10nF capacitor from this pin to SW.
2	GND	Ground Pin
3	FB	Feedback Input. Connect the LED string between OUTPUT node and this FB pin, and a resistor which is used to define the LED current from this FB pin to GND. The LED current is set by 0.16V divided by this resistor.
4	EN	Enable pin for the IC. Drive this pin high to enable the part, low to disable.
5	IN	Supply Voltage. Bypass with a 10 μ F ceramic capacitor to GND.
6	SW	Inductor Connection. Connect an inductor between SW and the regulator output.

TYPICAL CHARACTERISTICS

(Typical values are at $T_A = 25^\circ\text{C}$ unless otherwise specified.)



APPLICATION INFORMATION

Setting LED Current

The current sense resistor is inserted between the anode of LED and GND. The current sense resistor value is calculated as: $R1 = \frac{0.16V}{I_{LED}}$. For 1A LED current, choose $R1 = 155m\Omega$

Inductor Selection

The peak-to-peak ripple is limited to 30% of the maximum output current. This places the peak current far enough from the minimum overcurrent trip level to ensure reliable operation while providing enough current ripples for the current mode converter to operate stably. In this case, for 1A maximum output current, the maximum inductor ripple current is 300 mA. The inductor size is estimated as following equation: $L_{IDEAL} = (V_{IN(MAX)} - V_{OUT}) / I_{RIPPLE} * D_{MIN} * (1 / F_{OSC})$.

Therefore, for $V_{OUT} = 5V$, The inductor values is calculated to be $L = 15\mu H$. Chose $10\mu H$ or $15\mu H$

For $V_{OUT} = 3.3V$, The inductor values is calculated to be $L = 4.9\mu H$. Chose $4.7\mu H$

Output Capacitor Selection

For most applications a nominal $22\mu F$ or larger capacitor is suitable. The ETA2840 internal compensation is designed for a fixed corner frequency that is equal to $FC = \frac{1}{2 * \pi * \sqrt{C_{OUT} * L}} = 10KHz$. For example, for $V_{OUT} = 5V$, $L = 15\mu H$, $C_{OUT} = 22\mu F$.

The output capacitor keeps output ripple small and ensures control-loop stability. The output capacitor must also have low impedance at the switching frequency. Ceramic, polymer, and tantalum capacitors are suitable, with ceramic exhibiting the lowest ESR and high-frequency impedance. Output ripple with a ceramic output capacitor is approximately as follows:

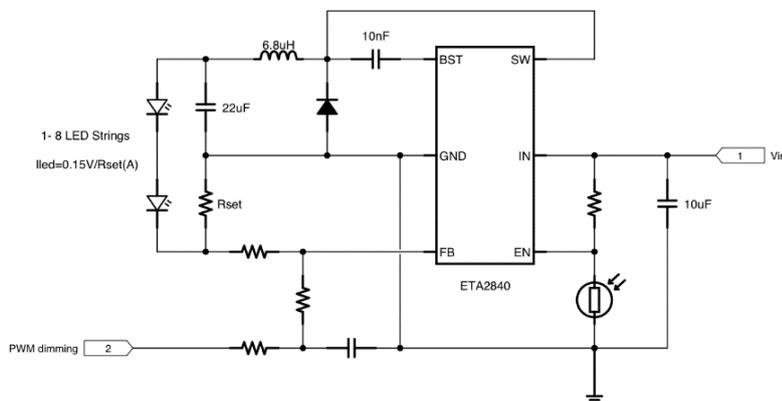
$V_{RIPPLE} = I_{L(PEAK)} [1 / (2\pi * f_{OSC} * C_{OUT})]$. If the capacitor has significant ESR, the output ripple component due to capacitor ESR is as follows: $V_{RIPPLE(ESR)} = I_{L(PEAK)} * ESR$

Input Capacitor Selection

The input capacitor in a DC-to-DC LED Driver reduces current peaks drawn from the battery or other input power source and reduces switching noise in the controller. The impedance of the input capacitor at the switching frequency should be less than that of the input source so high-frequency switching currents do not pass through the input source. The output capacitor keeps output ripple small and ensures control-loop stability.

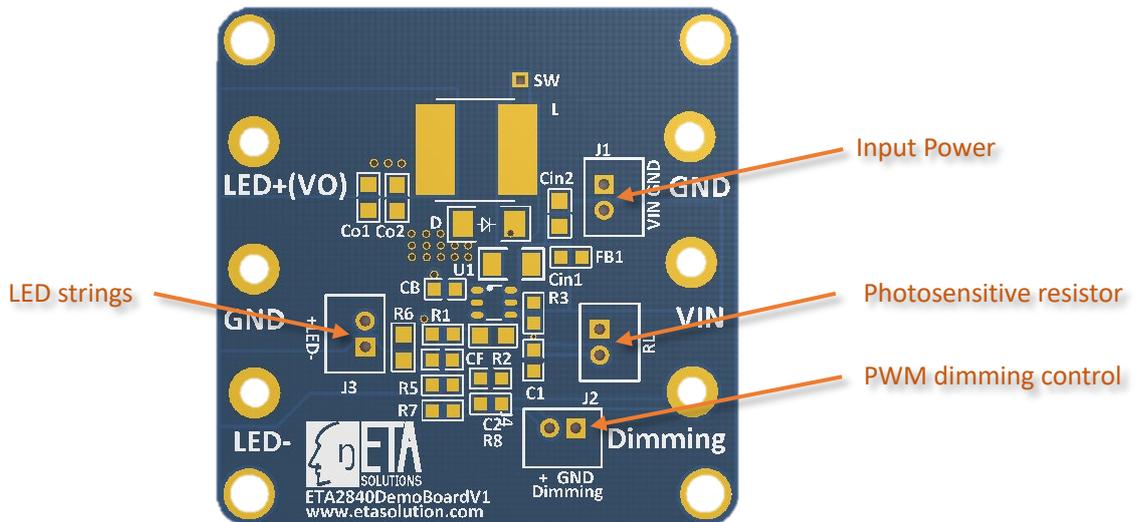
Dimming Control

A typical application of ETA2840 with PWM dimming control is shown at right-hand, please contact ETA engineers' technical support for defining the peripheral R, C values.

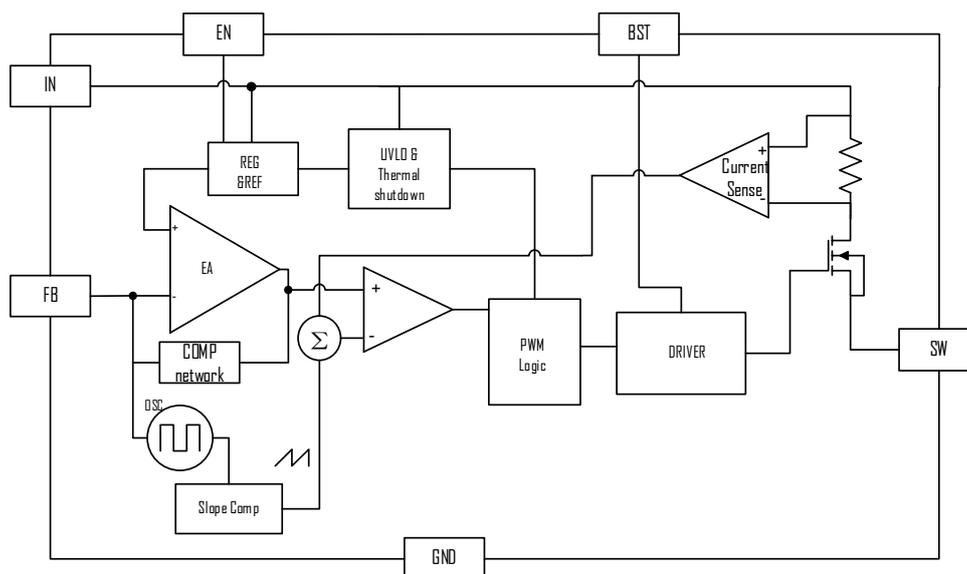


PCB GUIDELINES

A typical PCB layout is shown below, which includes PWM dimming function. Please do place the input capacitor as close to the chip as possible, and take this as the first priority when drawing the layout. The Ground wire can go underneath the chip and directly get close to the IN pin, so that the input capacitor can have shortest wire to both IN and GND pin.

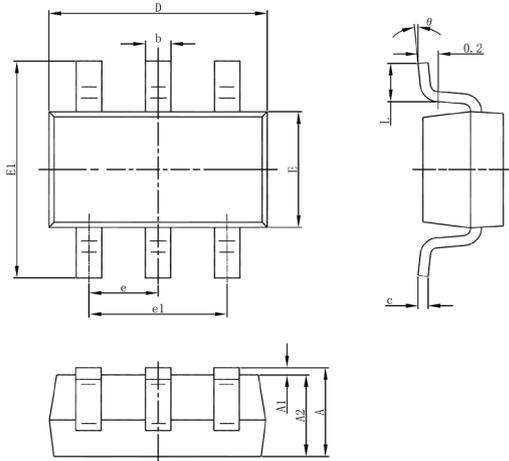


BLOCK DIAGRAM



PACKAGE OUTLINE

Package: SOT23-6



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
theta	0°	8°	0°	8°