Synchronous LED Driver with 0.1% Dimming Accuracy

DESCRIPTION

The ETA1637 is a driver specially designed for back-lighting. It consists of a high accuracy current sink that allows low duty dimming and a high efficiency step-up converter with an integrated low side and high side power MOSEFT. It runs with an optimal 0.6MHz frequency that enables use of small external components while still providing best efficiencies. It has an internal current limit as high as 1A, and it can drive up to 8 LEDs and 50mA in total output current. True PWM-Dimming can be achieved through the EN pin. One of the most important features of ETA1637 is that it provides an accurate current at dimming duty cycle down to 0.1%. This is very important for backlights that need to dim to very low light while still providing good consistency.
For maximum protection, the ETA1637 has an internal OVP protection at 30V to prevent the chip from damages when the LED string is not connected to the output.

ETA1637 is available in a space-saving SOT23-6 package.

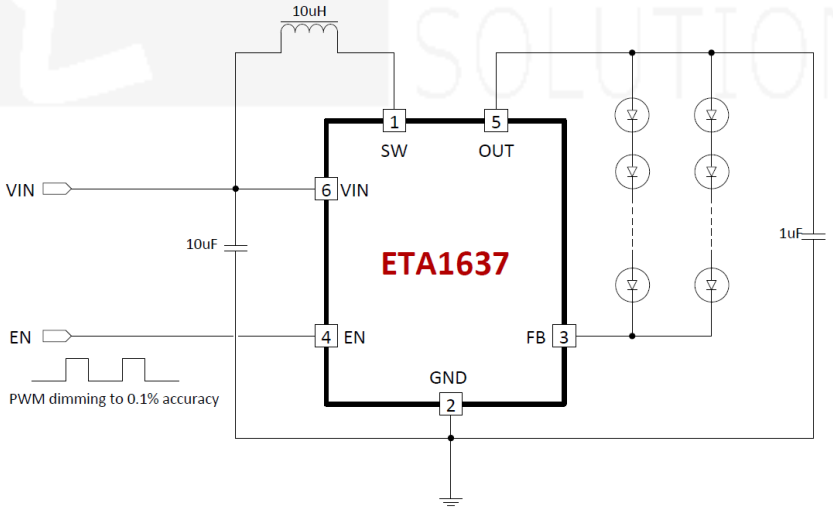
FEATURES

- Synchronous Boost, No Schottky Diode Needed
- Internal Current Source Driving, no need of external current setting resistor
- ±10% LED Current Accuracy at 1% Diming Ratio
- Capable of 0.1% dimming ratio
- Up to 85% Efficiency (6 LEDs)
- Drive up to 8 LEDs
- 30V Output Over Voltage Protection
- LED string Short Circuit Protection
- True PWM Brightness Control
- 1A current limit

APPLICATIONS

- Cellphone and Smartphone
- MID or Tablet PC
- Camera
- Car DVR Recorder

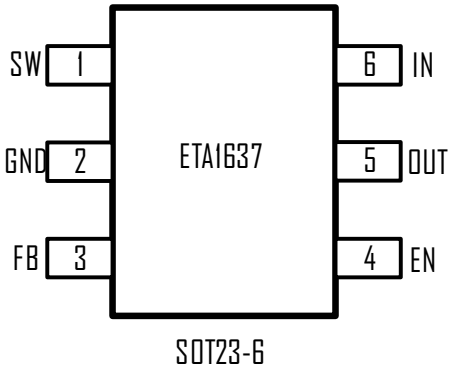
TYPICAL APPLICATION



ORDERING INFORMATION

PART No.	PACKAGE	TOP MARK	Pcs/Reel
ETA1637S2G	SOT23-6	EAYW	3000

PIN CONFIGURATION



SOT23-6

ABSOLUTEMAXIMUM RATINGS

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

SW, OUT Voltage .....–0.3V to 30V
All Other Pin Voltage .....–0.3V to 6.5V
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_{JC}	θ_{JA}	
SOT23-6	50	100	°C /W

Lead Temperature (Soldering, 10sec) .....260°C
ESD HBM (Human Body Mode) 2KV
ESD MM (Machine Mode) 200V

ELECTRICAL CHACRACTERISTICS

(V_{IN} = 3.6V, unless otherwise specified. Typical values are at TA = 25oC.)

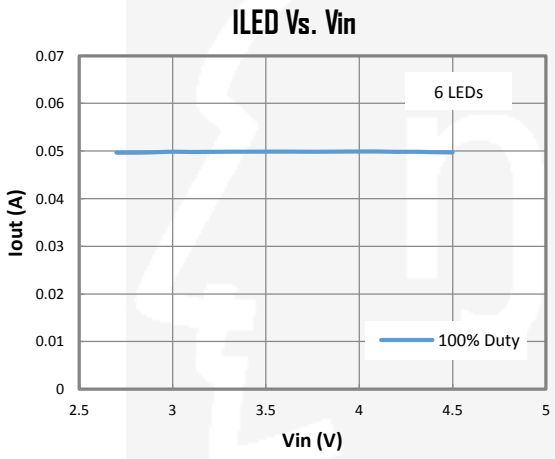
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
INPUT Range		2.7		6	V
INPUT UVLO	Rising, Hys=150mV		2.45		V
INPUT Operating Current	Switching,Iout=0		0.65	1	mA
	No Switching		0.3		mA
Shutdown Current at IN	VEN=0		5	10	μA
FB Current	100% duty	45	50	55	mA
	10% duty		5		mA
	1% duty		500		uA
Switching Frequency			0.6		MHz
Maximum Duty Cycle				90	%
NMOS Switch ON Resistance			380		mΩ
PMOS Switch ON Resistance			520		mΩ
SW Leakage Current	VEN=0			10	uA
OVP	VOUT Over voltage protect HYS=3V		30		V
EN Logic Input High		1.2			V
EN Logic Input Low				0.6	V
NMOS Switch Current Limit			1.5		A
PWM dimming frequency		25		100	KHz
Thermal Shutdown	Rising, Hys=20°C		140		°C

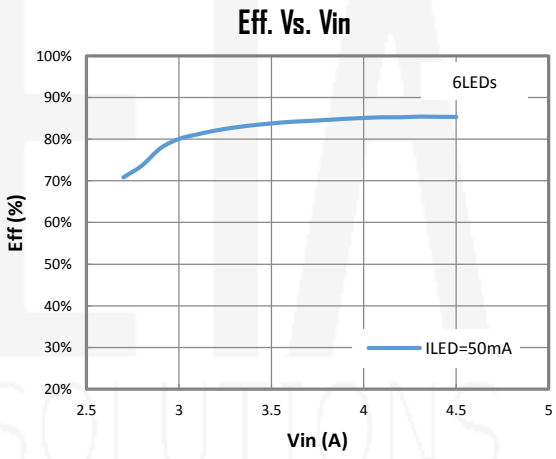
PIN DESCRIPTION

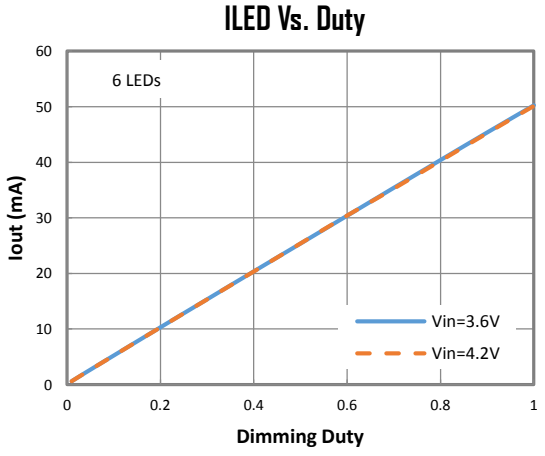
PIN #	NAME	DESCRIPTION
1	SW	Inductor Connection. Connect an inductor Between SW and IN.
2	GND	Ground Pin
3	FB	Feedback Input for Current. Connect this pin to the negative terminal of LED string.
4	EN	Control pin for the IC, It is default low. It is a multi-functional pin for enable control, PWM dimming
5	OUT	Output voltage pin
6	IN	Input Supply pin. Bypass with a 10μF or larger ceramic capacitor to GND

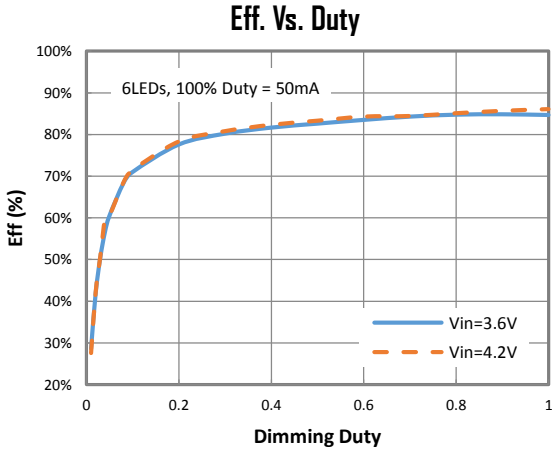
TYPICAL CHARACTERISTICS

(Typical values are at T_A = 25°C unless otherwise specified.)









FUNCTIONAL DECRIPTIONS

The ETA1637 is a high efficiency boost LED driver with a small package size. The device is ideal for driving 4-16LEDs for backlight application in smartphone. The device integrates a 30V/1.5A switch FET and operates in pulse width modulation (PWM) with a 0.6MHz fixed switching frequency. The duty cycle of the converter is set by the error amplifier output and the current signal applied to the PWM control comparator.

Output Open Circuit Protection

Output open circuit protection circuitry prevents IC damage as the result of output open circuit (e.g. LED string absence). The ETA1637 monitors the voltage at the OUT pin. The circuitry turns off the switch FET and shuts down the IC when the OUT voltage exceeds the 30V OVP threshold. When the OUT voltage fall below 27V, the IC will restart.

True Shutdown

The ETA1637 enters shutdown mode when the EN voltage is logic low for more than 5ms. During shutdown, the input supply current for the device is less than 1μA (max), and the output is zero, which minimize the possible leakage caused by LEDs.

PWM Dimming Control or Output Voltage Programming

IFB =Duty*50 mA

Where

Duty = duty cycle of the PWM signal,

This PWM dimming eliminates the audible noise which often occurs when the output current is pulsed in replica of the frequency and duty cycle of PWM control. Unlike other scheme which filters the PWM signal for analog dimming, ETA1637 regulation voltage is independent of the PWM logic voltage level which often has large variations. For optimum performance, use the PWM dimming frequency in the range of 25kHz to 100kHz.

APPLICATION INFORMATION

Inductor Selection

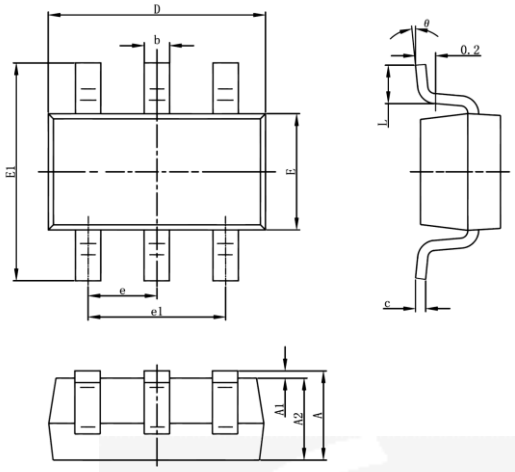
Using an inductor with a smaller inductance value forces discontinuous PWM when the inductor current ramps down to zero before the end of each switching cycle. This reduces the boost converter's maximum output current, causes large input voltage ripple and reduces efficiency. Large inductance value provides much more output current and higher conversion efficiency. For these reasons, a 10μH to 22μH inductor value range is recommended. A 22μH inductor optimized the efficiency for most application while maintaining low inductor peak to peak ripple. But for cellphone application, given the limited space requirement, 10uH is recommended. Below table lists the recommended inductor for the ETA1637.

Recommended Inductors for ETA1637

L(μH)	Saturation Current (mA)	Vendor
10 22	>750mA (for cellphone application) >1A	Microgate / Sunlord

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
θ	0°	8°	0°	8°