ACE728E

42V Input Standoff Voltage, Step-Down LED Driver

Description

The ACE728E 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. ACE728E provide 0.15V 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 wel as small inductors. ACE728E 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.

ACE728E is available in a space-saving SOT23-6 package.

Features

- Wide Input Operating Range from 4.5V to 38V
- 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

Application

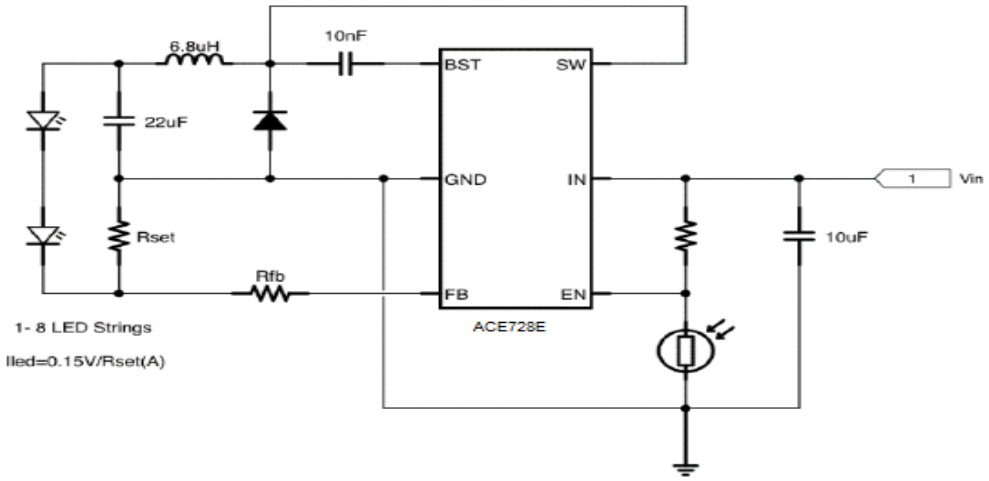
- IR LED driver for surveillance camera
- LED lighting
- Constant current source

Absolute Maximum Rating

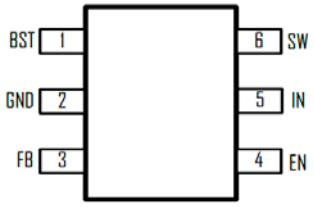
Parameter		Value
IN Voltage		–0.3V to 42V
SW ,EN Voltage		–0.3V to VIN+0.3
BST Voltage		–0.3V to SW+6V
FB Voltage		–0.3V to 6V
SW to ground current		Internally limited
Operating Temperature Range		–40°C to 85°
Storage Temperature Range		.–55°C to 150°C
Thermal Resistance	SOT23-6	θ_{JA} θ_{JC} 220 110 °C/W

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

Typical Application



Packaging Type



SOT-23-6

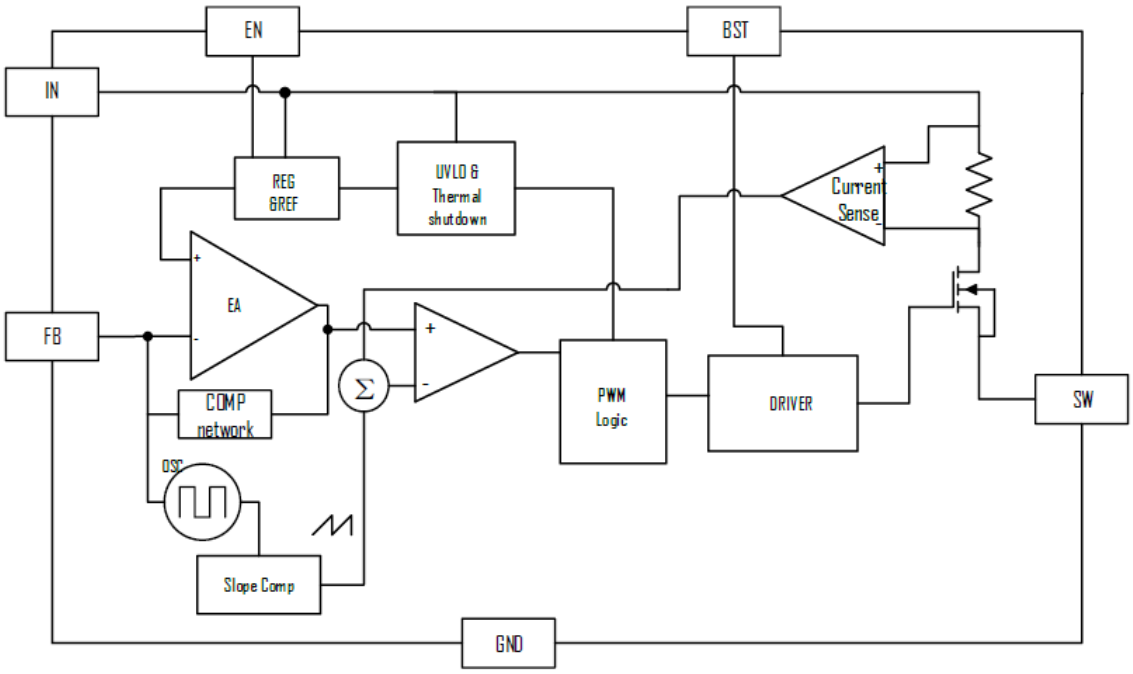
SOT-23-6	Description	Function
1	BST	Bootstrap pin. Connect a 10nF capacitor from this pin to SW.
2	GND	Ground Pin
3	FB	Feedback Input. Connect the LED string between OUTPUT node and this FB pin, and a resistor which is used to define the LED current from this FB pin to GND. The LED current is set by 0.155V 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 10μF ceramic capacitor to GND.
6	SW	Inductor Connection. Connect an inductor Between SW and the regulator output.

Ordering information

ACE728E XX + H

- H: Halogen - free
- +: Pb - free
- XX: GM : SOT-23-6

Block Diagram



Electrical Characteristics

V_{IN}=V_{EN}=5, T_A=25℃

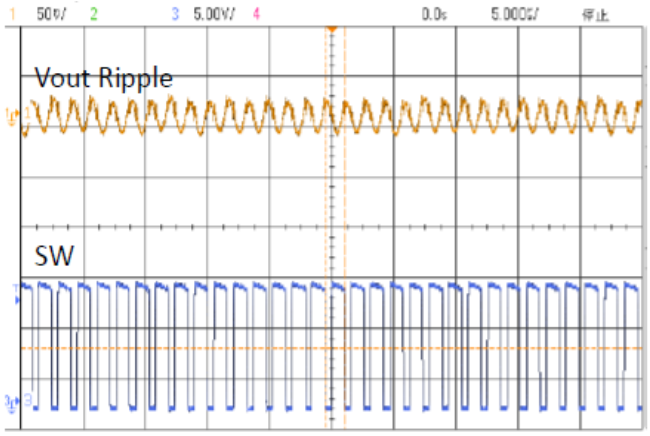
Parameter	Conditions	Min	Typ	Max	Unit
Input Standoff Voltage		42			V
Input Voltage Range		4		38	V
Input UVLO	Rising, Hysteresis=140mV		3.80		V
Input OVP	Rising, Hysteresis=1.3V		38		V
Input Supply Current	V_{FB}=0.85V		0.6		mA
Input Shutdown Current			6		uA
FB Feedback Voltage		0.14	0.155	0.170	V
FB Input Current			0.01		uA
Switching Frequency					KHz

Parameter	Conditions	Min	Typ	Max	Unit
Maximum Duty Cycle		90			%
Fold-Back Frequency			170		KHz
High side Switch ON Resistance	I_{SW}=200mA		300		mΩ
High side Switch Current Limit			1.5		A
SW Leakage Current	V_{IN}=12V, V_{SW}=0, EN=GND			10	uA
EN Input Current	V_{IN}=12V, V_{EN}=5V		1	5	uA
EN Input Low Voltage	Rising, Hysteresis=100mV	0.8	1.1	1.4	V
Thermal Shutdown	Hysteresis=40℃		150		℃

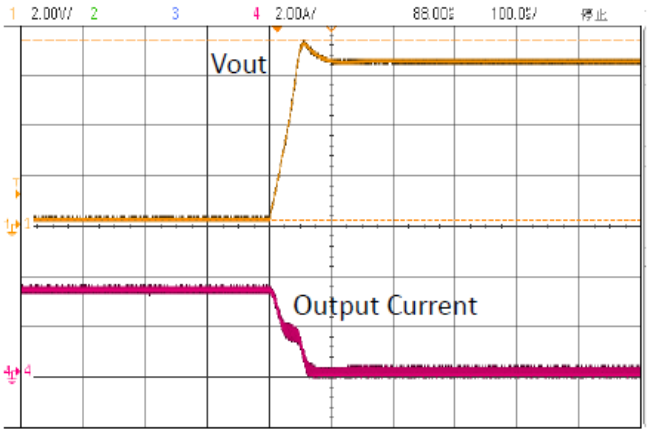
Typical Characteristics

(Typical values are at TA=25℃ unless otherwise specified)

1LED,Efficiency Vs,Iout



6LEDs,Efficiency Vs,Iout



Switching Waveform

V_{in}=12V,6LEDs,I_{OUT}=1A

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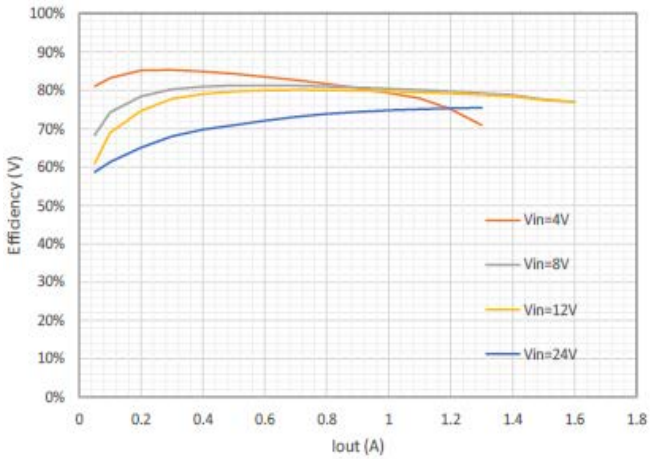

Switching Waveform

V_{in}=12V,6LEDs,Output ShortCircuit Recovery

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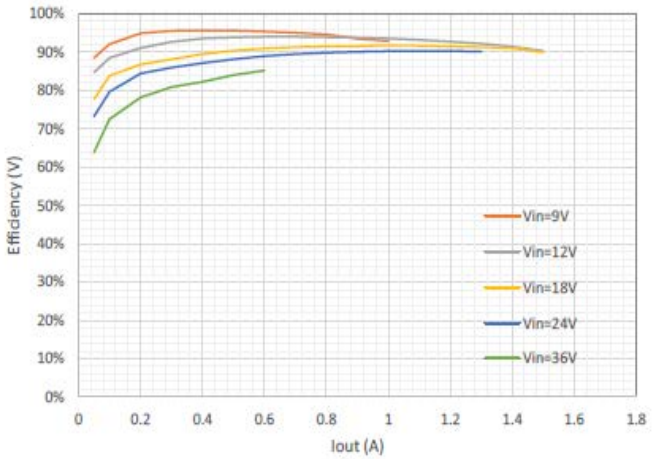


APPLICATION INFORMATION

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=0.155V／I_{LED} For 1A LED current, choose R1=155Mω

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 = 15μH. Chose 10μH or 15μH
For V_{OUT} =3.3V, The inductor values is calculated to be L = 4.9μH. Chose 4.7μH

Output Capacitor Selection

For most applications a nominal 22μF or larger capacitor is suitable. The ACE728E 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=15μH, C_{OUT}=22μF.

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:VRIPPLE = $IL_{(PEAK)}$[1 / (2π x f_{OSC} x C_{OUT})].

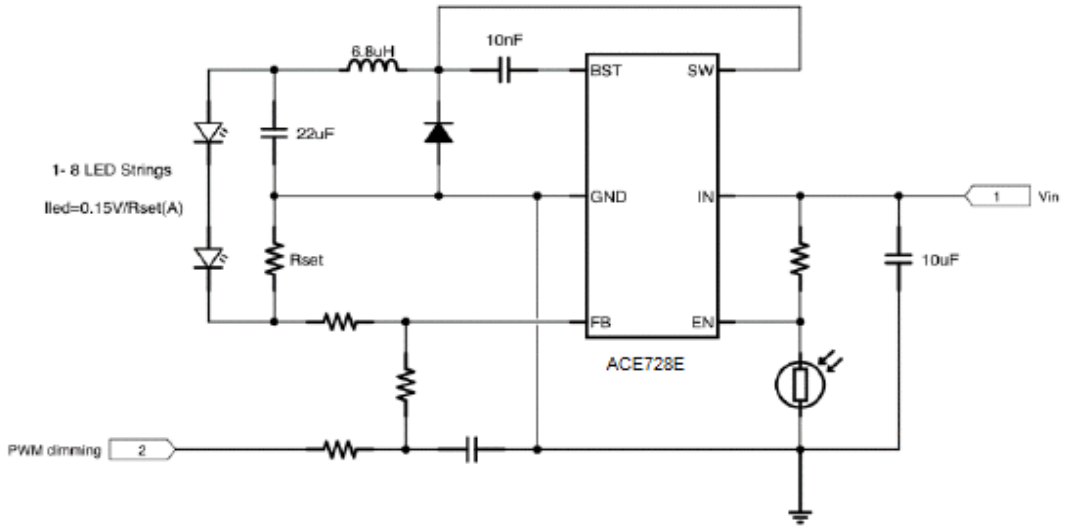
If the capacitor has significant ESR, the output ripple component due to capacitor ESR is as follows: $V_{RIPPLE(ESR)}$ = $IL_{(PEAK)}$ x ESR

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

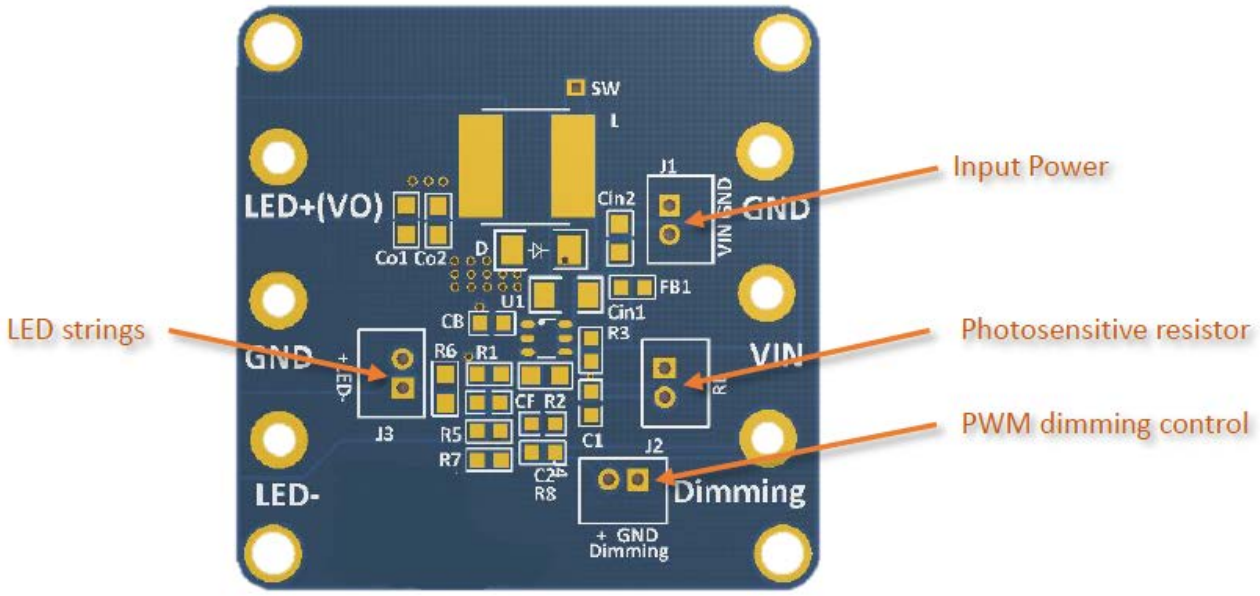
Dimming Control

A typical application of ACE728E with PWM dimming control is shown at right-hand, please contact ACE engineers' technical support for defining the peripheral R, C values.



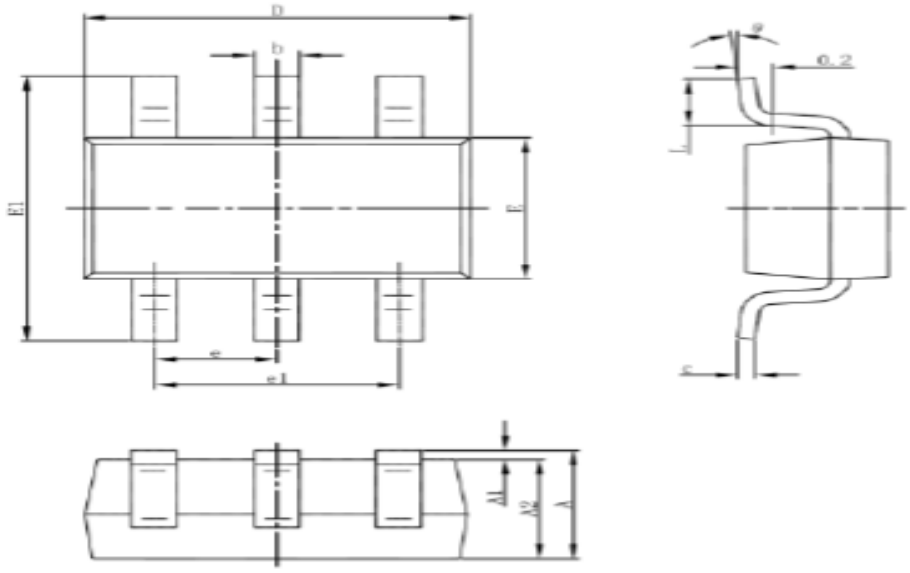
PCB GUIDELINES

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 goes 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.



Packing Information

SOT-23-6



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°

Notes

ACE does not assume any responsibility for use as critical components in life support devices or systems without the express written approval of the president and general counsel of ACE Electronics Co., LTD. As sued herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and shoes failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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