Current mode Control LED driver IC

GENERAL DESCRIPTION

The SHT6088 is a current mode control LED driver IC. The SHT6088 can support DC voltage which ranges from 12V to 450V, with duty cycle up to 100%. TheSHT6088 can be used in non-isolation LEDs driving system and can support AC supply voltage from 85V to 265V. The SHT6088 uses Specialized technique for source driver and constant current compensation, so LEDs current has ±5％ accuracy with AC supply voltage variation from 85V to 265V. What's more, the Specialized technique for the driving scheme ensures 90% higher efficiency in the application of 18W LEDs lighting with AC voltage range from 85V to 265V. In AC voltage range from 85V to 265V, the SHT6088 can drive 3W-36W LEDs array which is widely used in E14/E27/PAR30/PAR38/GU10 lighting and tube LEDs lighting. The SHT6088 has multiple LED protections, including LED open-circuit protection, LED short-circuit protection and thermal shutdown protection. If system has a failure, the SHT6088 will operate in protection mode until system recovers.

SHT6088 used sop8 package.

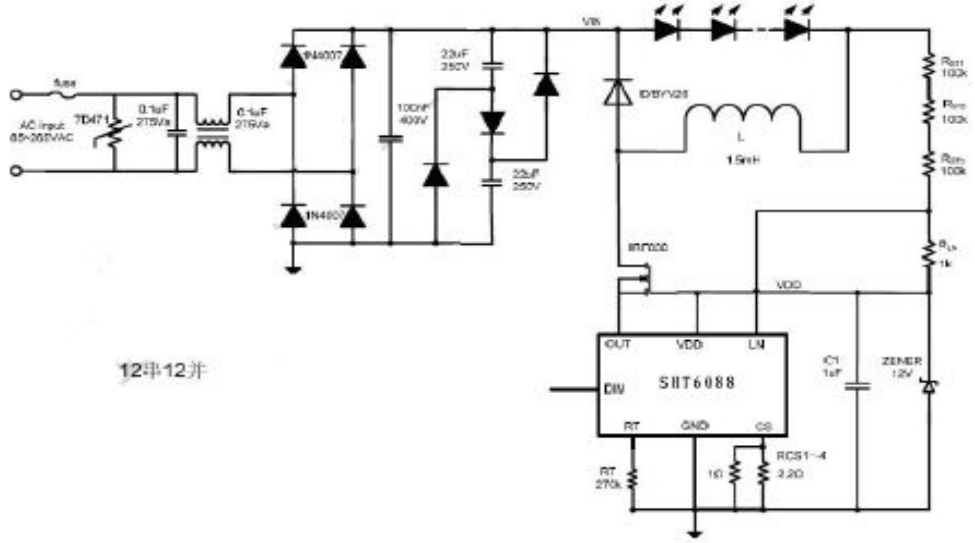
FEATURES

- System DC supply voltage: 12V to 450V.
  System AC supply voltage: 85V to 265V.
- Duty Cycle up to 100%.
- Typical ±5% output current accuracy.
- Up to 93% system efficiency.
- LED open-circuit protection; LED short-circuit protection.
- Internal thermal shutdown protection.
- Single DIM pin for dynamic temperature compensation and brightness control using DC voltage or PWM signal
- Adjustable constant current output control

TYPICAL APPLICATIONS

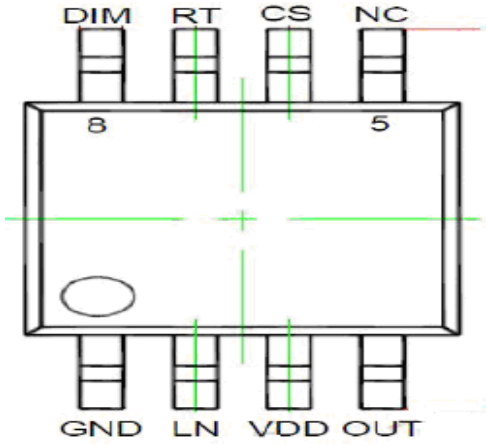
- LED Tube lighting
- E14/PAR30/PAR38/GU10/E27 LED spotlight
- LED projective lighting
- LED Signal lighting
- LED landscape lighting

Typical Application Circuit



图表 1 典型应用图

PIN



PIN ASSIGNMENTS

Pin No.	Name	Description
1	GND	Signal and power ground. Connect directly to ground plane
2	LN	Line voltage compensation of the peak threshold. Sensing the voltage between LN and VDD
3	VDD	Input Supply Pin. Must be locally bypassed
4	OUT	Drain of internal power switch, source of external power switch
5	NC	No connection
6	CS	Current sense input, sampling resistor connected between CS and GND
7	RT	Fixed turn off time setting
8	DIM	Enable switch, analog and PWM dimming input.

Ordering Information

Order Type	Package	Temperature range	Tape and Reel	Print
SHT6088	sop8	-40 ℃to 85 ℃	Tape and Reel	SHT6088

Absolute Maximum Rating

Symbol	Items	Value	Unite
V_{DD}	Supply Voltage	−0.3～18	V
LN	Line voltage compensation	−0.3～18	V
OUT	Drain of internal power switch	−0.3～24	V
CS	Pin of current sense	−0.3～6	V
DIM	Enable switch, analog and PWM dimming input.	−0.3～6	V
R_T	Fixed turn off time setting	−0.3～6	V
I_{OUT}	Output current of power switch	0.8	A
$P_{D\text{-}MAX}$	Power Dissipation	0.5	W
P_{TR}	Thermal Resistance SOP8（θJA）	150	℃/W
T_J	Operation Junction Temperature Range	−40～85	℃
T_{stg}	Storage Temperature	−55～150	℃
	ESD Susceptibility	3000	V

Note: The maximum power dissipation must be decreasing with elevating temperatures and is dictated by TJMAX, θJA, and the ambient temperature TA. The maximum allowable power dissipation is PDMAX = (TJMAX - TA)/ θJA or the lower number given in Absolute Maximum Ratings

Recommend Operating Range

Symbol	Items	Value	Unite
V_{DD}	V_{DD} Supply Voltage	0～16	V
T_{OPT}	Operating Temperature	−40～+85	℃

Electrical Characteristics

Symbol	Items	Conditions	Min.	Typ.	Max.	Unite
V_{DD}	Input Voltage		11		16	V
V_{UVLO}	Under voltage lock out	VDD rising		8.5	10	V

$V_{UVLO, HYS}$	UVLO hysteresis			2.5		V
Current Sense						
V_{CS-TH}	Current sense threshold voltage	ΔVLN = 0	240	250	260	mV
T_{LEB}	Current sense blank interval	VCS=VCS-TH+50mV		500		ns
T_{DELAY}	Delay to output	VCS=VCS-TH+50mV		600		ns
ΔV_{CS-TH} @ ΔV_{LN}	ΔVLN =VLN -VDD	ΔVLN = 1V		−30		mV
Fixed Toff control						
T_{OFF}	Fixed turn off interval	RT=270K	9.7	10.8	12	μs
V_{RT}	RT voltage		1.1	1.25	1.4	V
I_{RT}	RT circuit	RT=270K		5		μA
Operating Current						
I_{OFF}	Quiescent supply current with output off	V_{DIM} < 0.4 V		90		μA
I_{OP}	Operating supply current	f_{OSC} = 50 kHz		200		μA
DIM Input						
V_{DIM}	Internal supply voltage	DIM floating		5.2		V
V_{DIM_H}	DIM input voltage High		2.8			V
V_{DIM_L}	DIM input voltage Low				0.8	V
V_{DIM_DC}	DC brightness control		0.8		2.8	V
R_{DIM}	DIM pull up resistor to Internal supply voltage			150		kΩ
I_{DIM_L}	DIM input leakage low	V_{DIM} = 0		33		μA
Output Switch						
R_{SW}	SW On Resistance	V_{DD} = 12 V		0.8		Ω
I_{SWmean}	Continuous SW Current				700	mA
I_{LEAK}	SW Leakage Current			0.5	5	μA
Thermal Shutdown						
T_{SD}	Thermal Shutdown Threshold			150		℃
T_{SD-HYS}	Thermal Shutdown hysteresis			20		℃

Application Information

The SHT6088 is a special constant current LEDs driver. SHT6088 operates in continuous conduction mode step-down converter system. By controlling LEDs peak current and ripple current, SHT6088 can regulate LEDs mean current. Using a few external components,

SHT6088 provides a solution to constant current control, with DC voltage dimming and PWM signal dimming.

The resistor connected to RT programs MOSFET turn off time. At the beginning of each cycle, MOSFET is turned on until the inductor current ramps up to its peak value $I_P = V_{REF} / R_{CS}(mA)$.

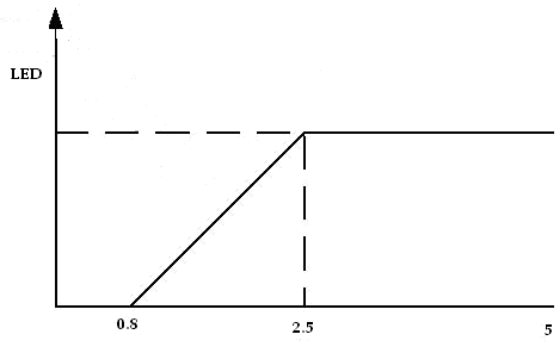
Once the MOSFET is turned off, its off time is set by $T_{OFF}=4\times10^{-5}\times R_T$ （μs）. When the off time is complete, MOSFE is turned on again and repeats this operation. The off time control the ripple current $I_R = \frac{10^3 \times T_{OFF} \times V_{LED}}{L}(mA)$ and LED mean current $I_{LED} = I_P - 0.5\times I_R$（mA）.

In the case of fixed quantity LEDs system, voltage of each LED is relatively stable. So LEDs output current is constant, when inductor value is settled. It is remarkable that, theoretically, LEDs current is independent on the line voltage (Vbulk). However, practically, because of system delay, the peak current will follow with the increasing input line voltage. The SHT6088 uses a Specialized technique to compensate the peak current variation. The pin 'LN' is used to detect input line voltage and compensate output current. For example, if the potential difference of LN and VDD is 1V, the reference voltage will decrease 15mV. In this way, system can provide constant current in a wider voltage range. Moreover, the LN pin can compensate the output voltage variation, as well.

In order to solve the deviation of LED ripple current caused by the difference of forward voltage drop,Recommended to increases the value of the inductance under the premise of meeting the current ability.which can reduce the influence of the LED ripple current on the average LED current

To achieve high system efficiency, SHT6088 utilizes special technique to drive power MOSFET by source driver scheme. In this way, the chip operating current is extremely low. On the same time, system efficiency is greatly enlarged by using power MOSFET's dissipation to supply chip through the feeding diode.

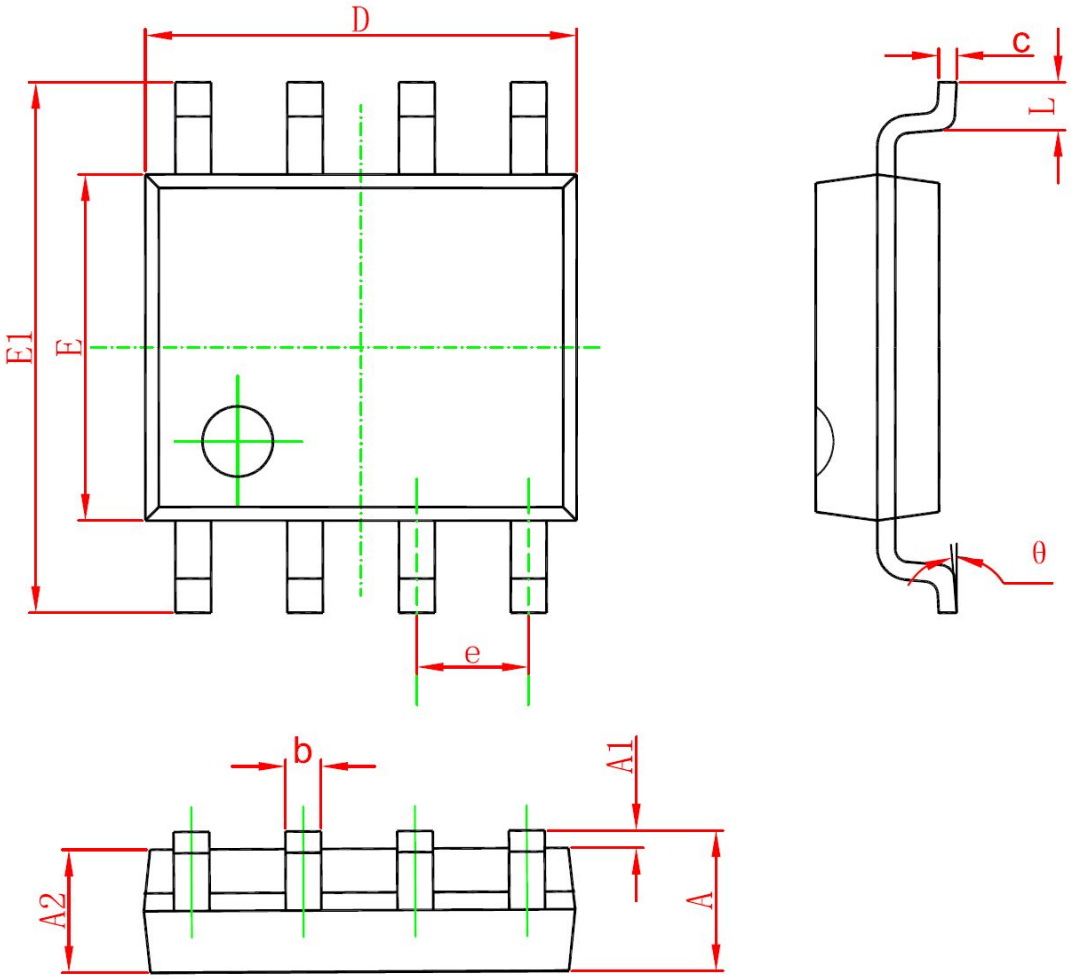
DIM pin of SHT6088 can receive simulate or PWM dimming signal. The features graph is shown.



SHT6088 has the feature of thermal shutdown, output LEDs short-circuit protection and open-circuit protection. This device is suitable for high efficient LEDs tube lighting and spotlight.

PACKAGING INFORMATION

SOP8



符号	mm		inches	
	最小值	最大值	最小值	最大值
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°