COOLED
ACDrv1.3 LED Driver

Low cost, High Efficiency, TRIAC dimming
Easy to Use, AC Driving, 3 Segments

Datasheet

Features:

- LEDs driven directly from AC line
- Adjustable power setting
- Flexible with different kinds of Vf LEDs
- Built in MOSFETs, up to 10W per driver
- Constant current precision at 3%
- High efficiency, more than 90% at optimized configuration
- High power factor, up to 0.98
- Low THD, 13% THD typical
- Compatible with AC100V/220V operation
- 50/60 Hz operation
- Compatible with TRIAC dimming (Leading/Trialing edge)
- Over voltage protection
- Over temperature protection
- Minimum number of external components
- Small package ESOP8

Application:

- LED Bulb
- LED Filament
- Spot Light
- Down Light
- Ceiling lamp

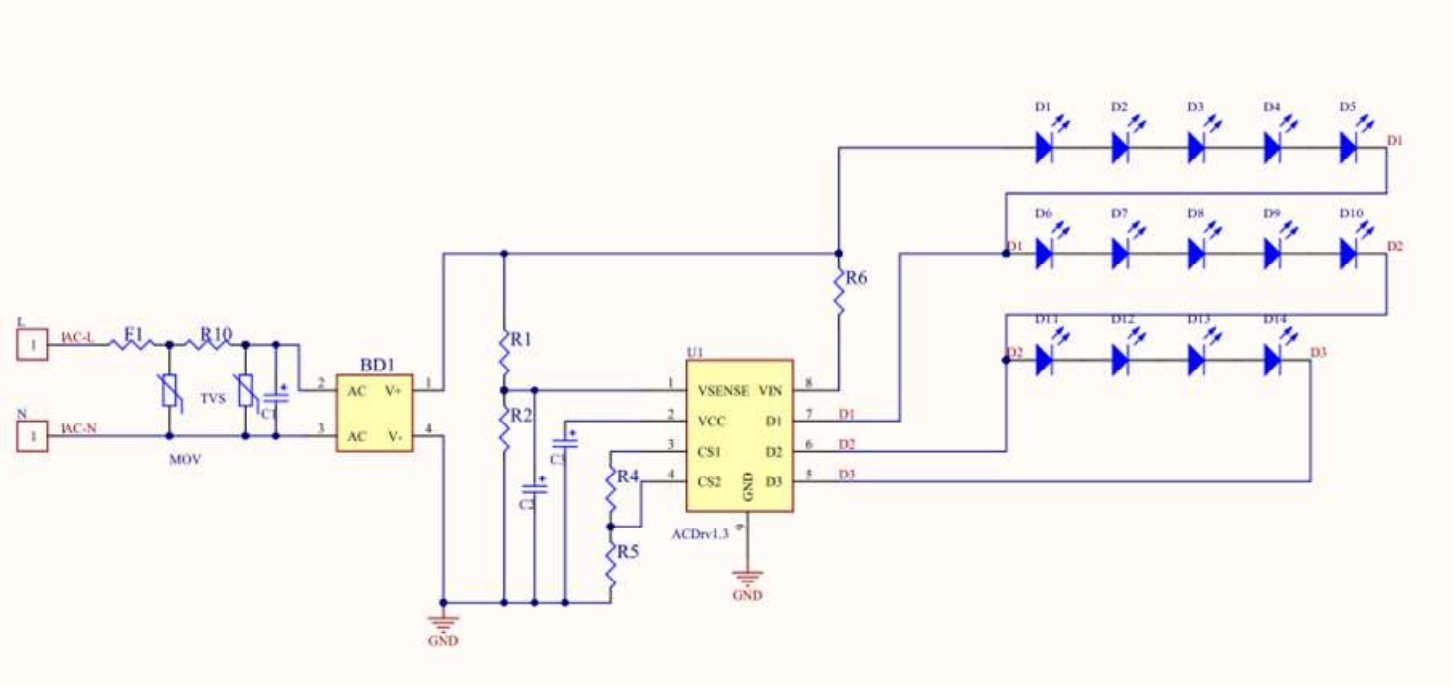
Description:

ACDrv1.3 is designed For AC directly driving LED, with creative architecture, ACDrv1.3 eliminates the Bulk capacitor and transformer, which are the bottleneck of LED lamp life time.
ACDrv1.3 provides a ideal driver for LED lighting with low cost, compact size, stable and long lifetime.
ACDrv1.3 integrates all the necessary components including MOSFET in single chip. With external resistors, the LED current could be set, which increases the LED utilization ratio and improves the THD.
Driver based on ACDrv1.3 has a ideal power parameters such as PF, Efficiency, THD,EMI.
ACDrv1.3 is compatible with various brands TRIAC. Providing blink free dimming.

Order Information

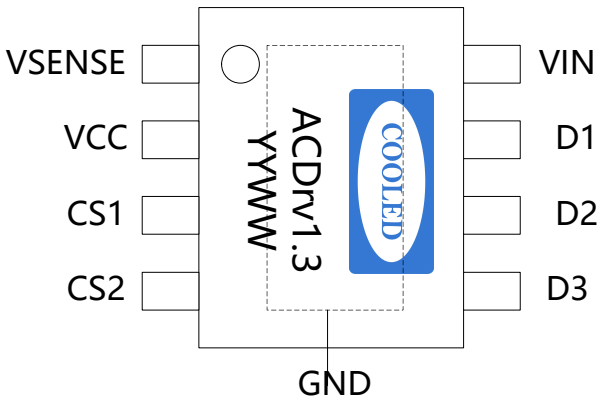
PART No	PACKAGE	DELIVERY
ACDrv1.3	ESOP8	4000/Reel

Application Schematics



TRIAC Dimming 120V 10W Application

Pin Description



No	Name	Type	Description
1	VSENSE	Input	Input Voltage sense to set TRIAC threshold
2	VCC	Output	Self power, connected with external capacitor
3	CS1	Input	Current sense input for TRIAC bleeding channel
4	CS2	Output	Current sense input for LEDs
5	D3	Input	Segment 3 control output
6	D2	Input	Segment 2 control output
7	D1	Input	Segment 1 control output
8	VIN	Input	Input voltage and TRIAC channel input
9	GND	/	Ground of controller

Operation Principle

D1,D2,D3 indicates a series string of LEDs or HVLEDs, for example at 120V input voltage, the LED1 LED2 could be Vf 60V HVLEDs.
The 120 VAC line is connected to a bridge rectifier to generate a rectified half sine waveform.
The LEDs and Driver are powered by the rectified AC voltage.
Current of D1 D2 D3 are set by the external sense resistors R1.
As the rectified voltage rises from 0V and exceeds the Vf of D1, the internal control logic will control the D1 to be Lighted on and set current in constant level 1,When the rectified line voltage continues to rise and exceeds the added Vf of D1 and D2, the internal control logic will control the D1 and D2 to be lighted on and set current in constant level 2.
As the rectified voltage continues to rise on its positive slope and exceeds the combined Vf of D1 D2 D3, control logic will control the D1 to D3 to be lighted and set current in constant level 3.
The control Logic will detect the LED VF and current of every segment LED to decide the internal state machine operation. Note the total voltage in series could be close to the peak voltage of peak rectified voltage in order to have a high conversion efficiency. For example in 220V application, the suggested total Vf of LED is from 240-260V. For 120V application, the suggested total Vf of LED is from 120-130V.

Current Setting

The current going through LEDs is 3 step constant controlled. Adjusting the external resistor connected with CS pin, the peak current could be set from 5mA to 150mA. Rs is the resistor connected with CS2 and GND

The step current is set as following

I_{D1}=500/Rs mA I_{D2}=750/Rs mA I_{D3}=900/Rs mA

The bleeding current is set by Resistor R_{BLEED} connected with CS1 and CS2.

I_{BLEED}=0.45/(R_{BLEED}+Rs)

Over Temperature Setting

Built in temperature detection circuit will detect the temperature on board, when the ambient temperature is too high, the over temperature protection will lower the power of driver by decreasing the internal reference voltage, in order to lower the generated heat. The start point of protection temperature is from 120 degree, when temperature increase 10 degree, the power is reduced 20% to have a new heat balance.

Over Voltage Setting

In order to work with high input voltage, ACDrv1.3 built in over voltage protection block, when the input AC voltage is higher, the D3 voltage is increased, which is fed back to over voltage protection block, in order to lower the power by lowering the internal reference voltage.

TRIAC Dimming

ACDrv1.3 built in bleeding current block to be compatible with different kind of dimmers, the VSENSE pad will detect the input voltage, sampling the peak voltage, to compare with a internal comparator to enable the TRIAC bleeding circuit. The bleeding current is set by external resistors, To increase the system efficiency, a trade off of current setting is necessary to have enough bleeding current and better efficiency.

DC Electrical Characteristics

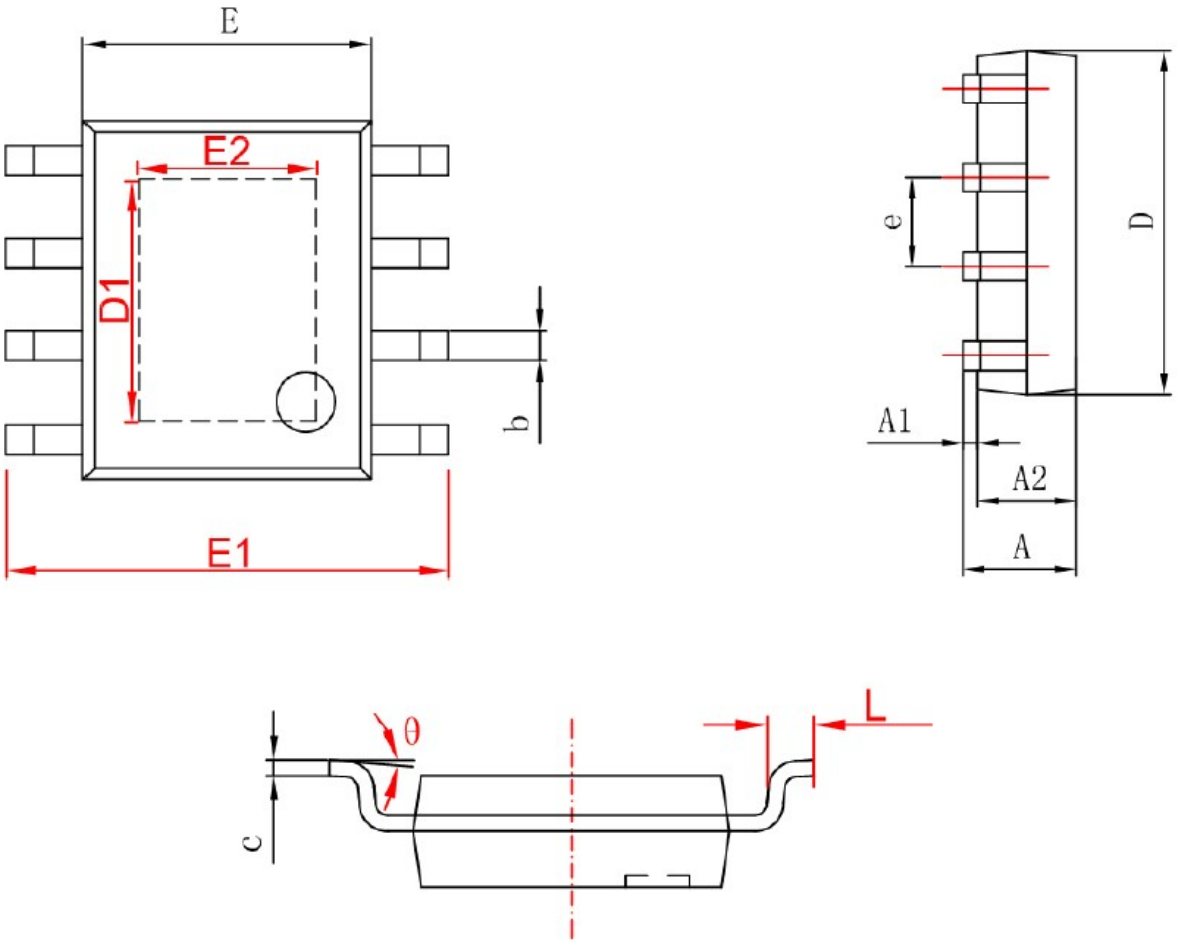
Parameters	Condition	Min	Typ	Max	Uint
Operating Current			400		uA
VREFO Output1 Voltage	@25C	-3%	0.5	+3%	V
VREFO Output2 Voltage	@25C	-3%	0.75	+3%	V
VREFO Output3 Voltage	@25C	-3%	0.9	+3%	V
VREFO TC			100		ppm
MOS FET working current		0		150	mA
Protection Section					
Over Temperature threshold			130		°C
Temperature Window			20		°C

Absolute Maximum Ratings

Item	Description	Unit
Voltage on CS	5	V
Voltage on D1 D2 D3	500	V
Current on D1 D2 D3 to GND	200	mA
Package Power	1	W
Working Junction temperature	-40-150	°C
Junction to Package (Back Metal Pad)	3	°C/W
Junction to Package (Top Plastic)	8	°C/W
Junction to Ambient	60	°C/W
Storage Temperature	-40-150	°C

Package

ESOP8



	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.050	0.150	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
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°