JW19836

Ultra-high Voltage Linear LED Driver

Parameters Subject to Change Without Notice

DESCRIPTION

JW®19836 is an ultra-high-voltage linear constant-power LED driver with a maximum input voltage of 700V, which is suitable for driving high-voltage low-current LED loads. The application solution has few external components and compact layout, and can be easily and flexibly applied to various small-size or flat LED products. JW19836 can provide 5 ~ 150mA constant current. JW19836 integrates a multiplier, greatly improved the power factor and THD of the system (meeting the highest IEC standard). At the same time, the simple linear drive method does not require magnetic components, which can effectively avoid the problem of EMI interference.

JW19836 adopts closed-loop control method to achieve constant output current control, and has excellent line and load regulation within a certain input voltage range. JW19836 also monitors the line voltage in real time to achieve the effect of inputting constant power.

When the internal junction temperature of the IC rises to 135°C, the JW19836 starts to reduce the output current.

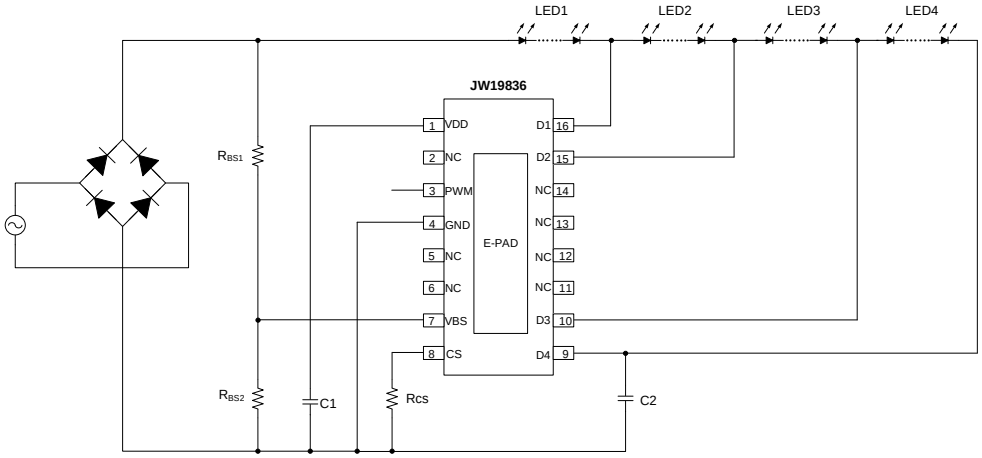
FEATURES

- 700V power N-MOSFET integrated
- Internal digital compensation
- Excellent line regulation
- Input and output constant power
- Maximum 150mA peak output current
- Multiple ICs can be used in parallel to meet large current output
- Meet IEC 61000-3-2 Standard
- LED open and short protection
- Over-temperature protection function
- ESOP-16 package

APPLICATIONS

- LED lighting

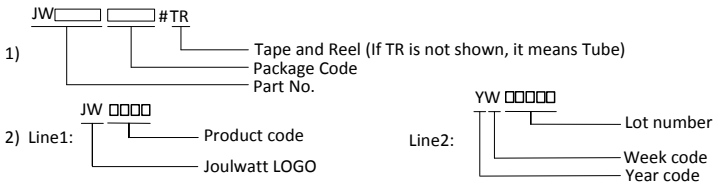
TYPICAL APPLICATION



ORDER INFORMATION

DEVICE[1)]	PACKAGE	TOP MARKING[2)]	ENVIRONMENTAL[3)]
JW19836ESOPA#TR	ESOP16	JW19836 YW□□□□□	Green

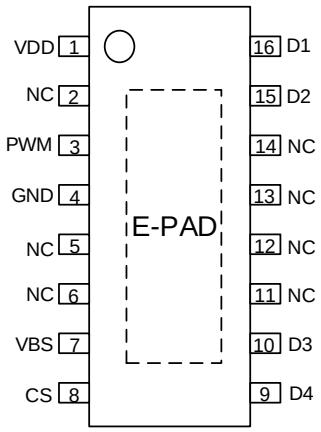
Notes:



3) All Joulwatt products are packaged with Pb-free and Halogen-free materials and compliant to RoHS standards.

PIN CONFIGURATION

TOP VIEW



ESOP-16

ABSOLUTE MAXIMUM RATING[1)]

D1.....-0.3V to +750V
D2,D3,D4…….....-0.3V to +700V
VDD …….....-0.3V to +5.5V
PWM …….....-0.3V to +5.5V
VBS…….....-0.3V to +5.5V
CS…….....-0.3V to +5.5V
Junction Temperature[2)3)]..... 150ºC
Operating Temperature .....-40ºC to +105ºC
Storage Temperature ....-40ºC to +150ºC

RECOMMENDED OPERATING CONDITIONS[2)]

D1.....6.0V~600V
D2, D3 ,D4.....6.0V~560V
VBS…….....0 V to +2V
Junction Temperature (T_J) .....-40ºC to 125ºC

THERMAL PERFORMANCE[4)]

	θ_{JA}	θ_{JC}
ESOP-16	50	10ºC/W

Note:

1) Exceeding these ratings may damage the device. These stress ratings do not imply function operation of the device at any other conditions beyond those indicated under RECOMMENDE OPERATING CONDITIONS.

2) The JW19836 includes thermal protection that is intended to protect the device in overload conditions. Continuous operation over the specified absolute maximum operating junction temperature may damage the device.

3) The device is not guaranteed to function outside of its operating conditions.

4) Measured on JESD51-7, 4-layer PCB.

ELECTRICAL CHARATERISTICS

Ta= 25℃, unless otherwise stated.

Item	Symbol	Condition	Min.	Typ.	Max.	Unit.
Operation current	I_{OP}	VD1=30V, DR2, DR3, DR4 CS Floating	150	250	350	μA
VDD regulation voltage[5)]	V_{DD}		4.98	5.26	5.52	V
VDD clamp voltage	V_{DDCLP}		5.5	5.8	6.1	V
Internal reference voltage	V_{REF}	RCS=1K; VBS=1V; VD1=30V, DR2, DR3, DR4 Floating	285	300	315	mV
V_{BS} constant power threshold voltage	V_{CP}		1.1	1.2	1.3	V
PWM turn-on voltage	V_{EN_H}			2.0	2.3	V
PWM shutdown voltage	V_{EN_L}		0.5	0.8		V
Temperature protection threshold[5)]	T_{TRIG}			135		℃
Temperature protection attenuation coefficient[5)]	K_T			-16		mV/℃
Thermal protection shutdown threshold[5)]	T_{SD}			155		℃

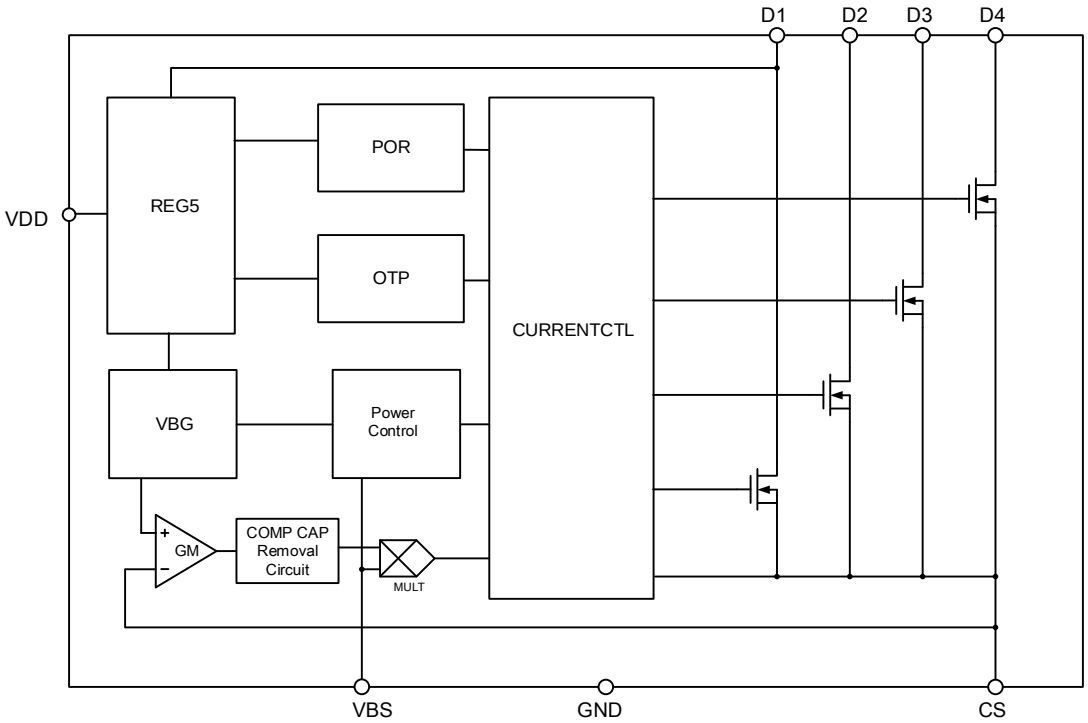
Note

5) Guaranteed by design

PIN DESCRIPTION

Pin ESOP-16	Name	Description
1	VDD	IC internal power supply, connect a capacitor to ground.
3	PWM	PWM dimming input pin.
4	GND	Ground pin.
7	VBS	Analog V_{BS} input pin, input constant power adjustment.
8	CS	Current sensing pin of LED.
9	D4	Connect to cathode of 1st LED string.
10	D3	Connect to cathode of 2nd LED string.
15	D2	Connect to cathode of 3rd LED string.
16	D1	Connect to cathode of 4th LED string.
2,5,6,11 12,13,14	NC	Not connected.

BLOCK DIAGRAM



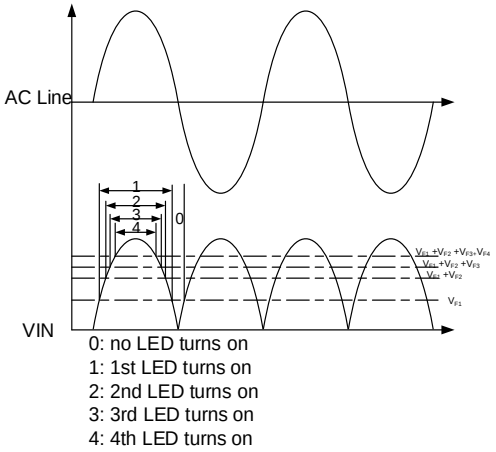
FUNCTIONAL DESCRIPTION

JW19836 is an integrated high-voltage LED driver for direct line operation.

Theory of Operation

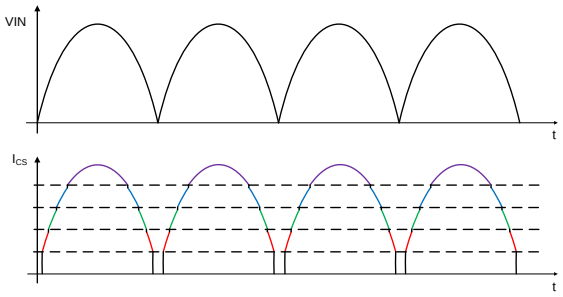
The input power is the rectified voltage from AC mains by bridge rectifier. When VIN is higher than the forward voltage of the 1st LED string, JW19836 can detect it and turn on the 1st N-MOSFET to lighten the 1st LED string. When VIN keeps increasing and exceeds the total forward voltage of the 1st and 2nd LED strings, JW19836 turns on the 2nd N-MOSFET to lighten the 1st and 2nd LED strings. In the same way, all LED strings are lightened as VIN increases.

When VIN decreases, JW19836 shuts down the N-MOSFET as the reverse sequence.



Power Factor Correction

The IC creatively introduces an analog multiplier into the linear IC to modulate the output LED current waveform, so that the output LED current has a sinusoidal waveform to achieve high PF and ultra-low THD, which can meet the IEC6100-3-2 harmonic standard. The VIN voltage waveform and current waveform are shown below.



Constant Current Control

JW19836 adopts a closed-loop current control strategy, and uses a low-frequency digital compensation technic to eliminate the external COMP capacitor which can save external capacitor and output pins. The average output current is set by the resistor Rcs between the CS pin and the chip ground. The average current can be calculated:

$$I_{LED} = Vref/Rcs$$

Input Constant Power

The chip sets an input constant power threshold of V_{CP}, which can be adjusted by the ratio of resistors R_{BS1} and R_{BS2} to set the starting AC voltage (Vac) of constant power.

$$R_{BS2}/(R_{BS1}+ R_{BS2})*Vac\sqrt{2}=V_{CP}$$

Over Temperature Protection

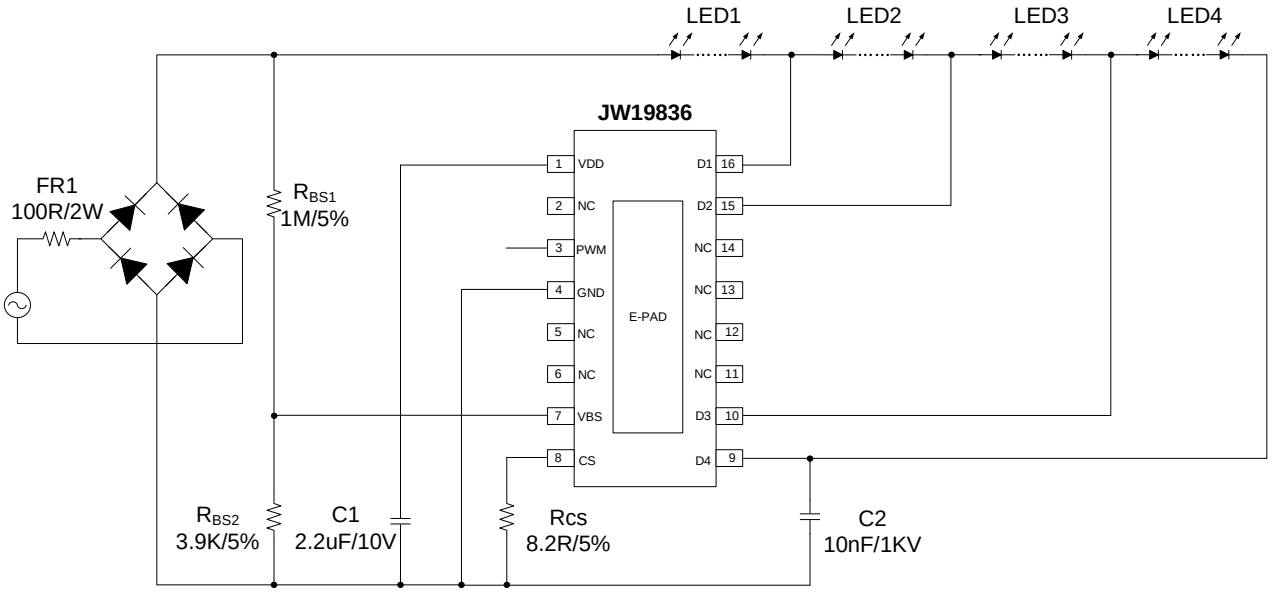
JW19836 integrates an intelligent over-temperature protection. When the junction temperature is higher than T_{TRIG} (typical value), the internal reference voltage decreases by a factor of K_T, and the output current decreases accordingly. When the junction temperature of the IC reaches T_{SD}, the output current will be reduced to zero.

APPLICATION REFERENCE

This reference design is suitable for 10~20W non-isolated step-down LED driver, using JW19836, with high efficiency, excellent line regulation.

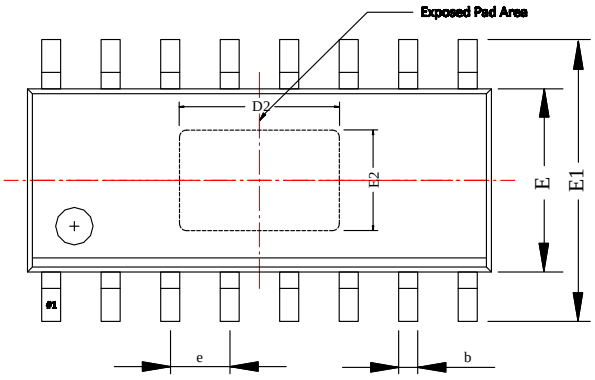
Reference 1：

V_{IN}: 180-300Vac
V_{OUT}: 18V*15PCS 5:4:3:3
I_{OUT}: 35mA
PF: PF>0.95
THD: THD<15%

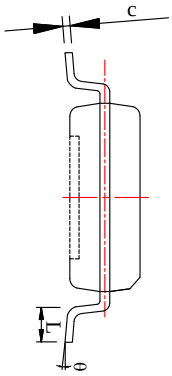


PACKAGE OUTLINE

ESOP16 UNIT：mm

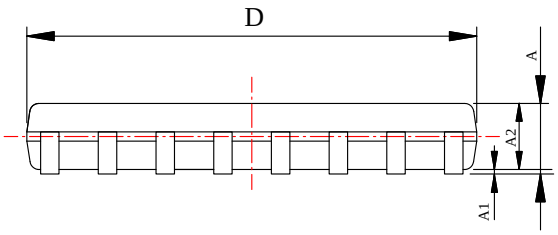


TOP VIEW



SIDE VIEW

SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	1.60	—	1.75
A1	0.05		0.25
A2	1.35	—	1.55
b	0.375	0.400	0.425
c	0.195	0.203	0.211
D	9.80	9.90	10.00
E	3.80	3.90	4.00
e	1.245	1.270	1.295
D2	3.61	3.81	4.01
E2	2.34	2.54	2.74
L	0.50	—	0.80
θ	0°	—	8°



BOTTOM VIEW

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