

*Parameters Subject to Change Without Notice*

### DESCRIPTION

JW@1983 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 very few external components and compact layout, and can be easily and flexibly applied to various small-size or flat LED products. JW1983 can provide 5 ~ 150mA constant current. JW1983 integrated Multiplier, greatly improved the power factor and ultra-low 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.

JW1983 adopts closed-loop control method to achieve constant output current control, and has excellent line regulation and load regulation to ensure constant output average current within a certain input voltage range. JW1983 also monitors the line voltage in real time to achieve the effect of inputting constant power. In order to prevent the IC from overheating, the JW1983 integrates an intelligent temperature control

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function. When the internal junction temperature of the IC rises to 135 ° C, the JW1983 starts to reduce the output current.

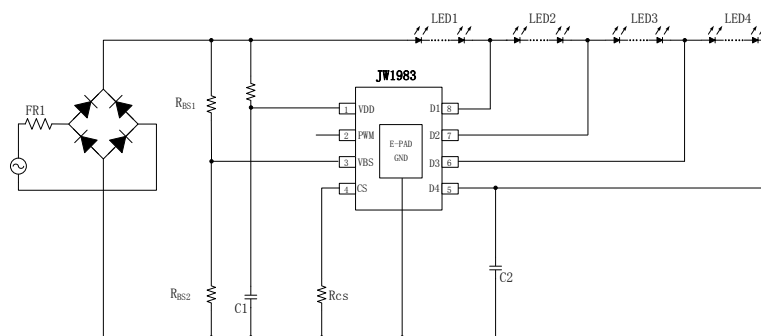
### FEATURES

- De-comp capacitor closed-loop control
- Excellent line regulation
- Input and output constant power
- Maximum 150mA peak output current
- ± 5% output current accuracy
- Multiple ICs can be used in parallel to meet large current output
- High power factor and ultra-low THD
- Very few external components
- LED open and short protection
- Intelligent over-temperature protection function
- ESOP-8 package

### APPLICATIONS

- LED bulb light
- LED tube light
- Other LED lights

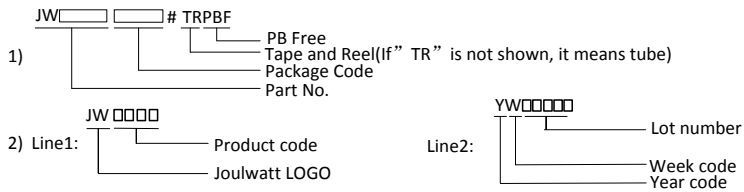
### TYPICAL APPLICATION



**ORDER INFORMATION**

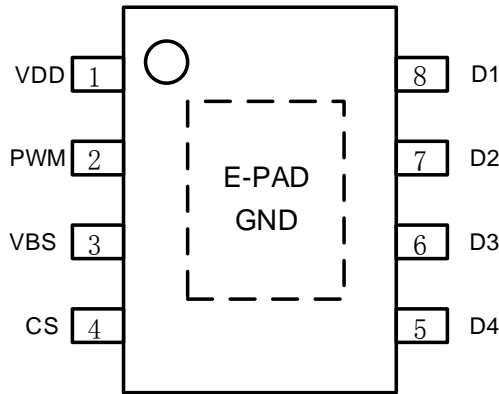
DEVICE <sup>1)</sup>	PACKAGE	TOP MARKING <sup>2)</sup>
JW1983ESOP#TRPBF	ESOP8	JW1983 YW□□□□

**Notes:**



**PIN CONFIGURATION**

**TOP VIEW**



ESOP-8

**ABSOLUTE MAXIMUM RATING<sup>1)</sup>**

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 <sup>2)3)</sup> .....	150°C
Operating Temperature .....	-40°C to +105°C
Storage Temperature .....	-40°C to +150°C

**RECOMMENDED OPERATING CONDITIONS<sup>2)</sup>**

D1.....	6.0V~675V
D2 D2 D4.....	6.0V~630V
VBS.....	0 V to +2V
Junction Temperature (T <sub>J</sub> ) .....	-40°C to 125°C

**THERMAL PERFORMANCE<sup>4)</sup>**

	$\theta_{JA}$	$\theta_{JC}$
ESOP-8.....	50.....	10°C/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 JW1983 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 CHARACTERISTICS

*T<sub>a</sub> = 25 °C, unless otherwise stated.*

Item	Symbol	Condition	Min.	Typ.	Max.	Unit.
Operation current	IOP	VD1=30V,DR2,DR3,DR4 CS Floating	150	250	350	μA
V <sub>DD</sub> regulation voltage <sup>5)</sup>	V <sub>DD</sub>		4.98	5.26	5.52	V
V <sub>DD</sub> clamp voltage	V <sub>DDCLP</sub>		5.5	5.8	6.1	V
Internal reference voltage	V <sub>REF</sub>	RCS=1K; VBS=1V; VD1=30V,DR2,DR3,DR4 Floating	285	300	315	mV
V <sub>BS</sub> constant power threshold voltage	V <sub>CP</sub>		1.1	1.2	1.3	V
PWM turn-on voltage	V <sub>EN,H</sub>			2.0	2.3	V
PWM shutdown voltage	V <sub>EN,L</sub>		0.5	0.8		V
Temperature protection threshold <sup>5)</sup>	T <sub>TRIG</sub>			135		°C
Temperature protection attenuation coefficient <sup>5)</sup>	K <sub>T</sub>			-16		mV/°C
Thermal protection shutdown threshold <sup>5)</sup>	T <sub>SD</sub>			155		°C

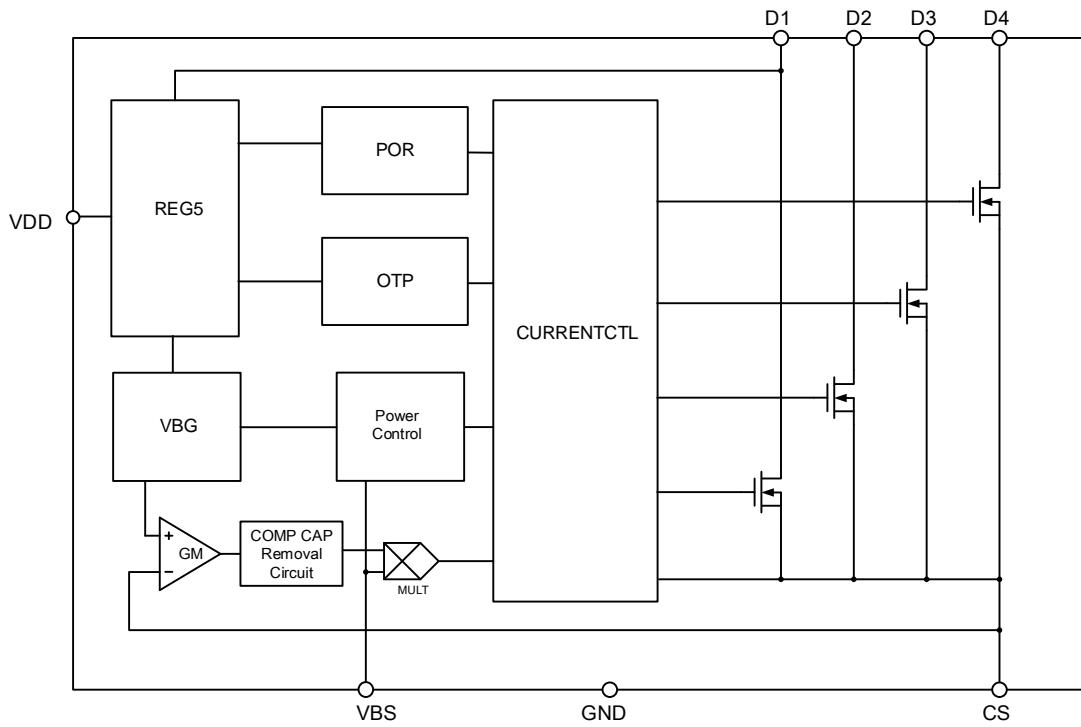
**Note**

5) Guaranteed by design

## PIN DESCRIPTION

Pin ESOP-8	Name	Description
1	VDD	IC internal power supply, connect a capacitor to ground
2	PWM	PWM dimming input pin
3	VBS	Analog $V_{BS}$ input pin, input constant power adjustment
4	CS	LED current setup pin
5	D4	Connect to Cathode of 1st LED string
6	D3	Connect to Cathode of 2nd LED string
7	D2	Connect to Cathode of 3rd LED string
8	D1	Connect to Cathode of 4th LED string
E-PAD	GND	Chip ground

BLOCK DIAGRAM



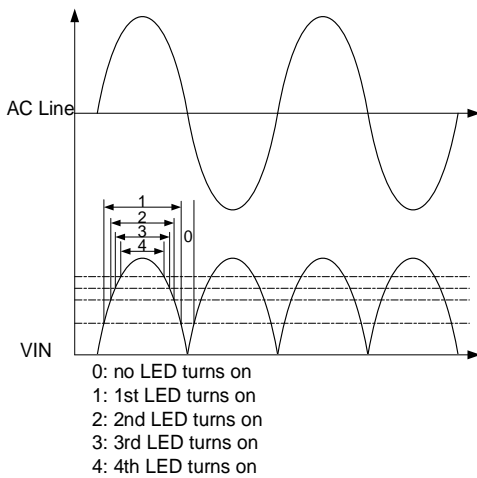
## FUNCTIONAL DESCRIPTION

JW1983 is an integrated high-voltage LED driver for direct line operation.

### Theory of Operation

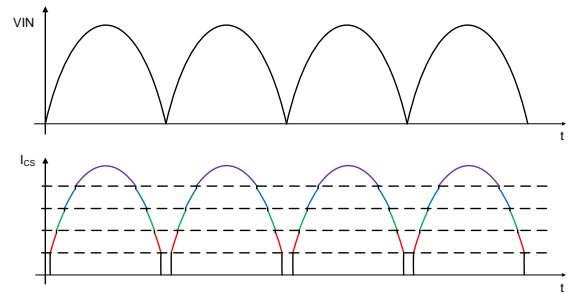
The input power is the rectified voltage from AC mains by bridge rectifier. When VIN is higher than the forward voltage of the 1<sup>st</sup> LED string, JW1983 can detect it and turn on the 1<sup>st</sup> N-MOSFET to lighten the 1<sup>st</sup> LED string. When VIN keeps increasing and exceeds the total forward voltage of the 1<sup>st</sup> and 2<sup>nd</sup> LED strings, JW1983 turns on the 2<sup>nd</sup> N-MOSFET to lighten the 1<sup>st</sup> and 2<sup>nd</sup> LED strings. In the same way, all LED strings are lightened as VIN increases.

During VIN decrease, JW1983 shuts down the N-MOSFET as the reverse sequence.



### Sine Wave Current Control

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 value 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

JW1983 creatively introduces closed-loop current control, and uses a low-frequency closed-loop control technology to eliminate the COMP capacitor, saves external capacitor, and saves output pins. The average output current is set by the resistor Rcs between the CS pin and the chip ground. The average current value can be calculated:

$$I_{LED} = V_{ref}/R_{cs}$$

### Input Constant Power

The chip sets an input constant power threshold of V<sub>CP</sub>, which can be adjusted by the ratio of resistors R<sub>BS1</sub> and R<sub>BS2</sub> to set the starting AC voltage(V<sub>ac</sub>) of constant power.

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

### Over Temperature Protection

JW1983 integrates an intelligent over-temperature protection. When the internal junction temperature of the IC is higher than T<sub>TRIG</sub> (typical value), the internal reference voltage decreases by a factor of 16mV/°C, and the output current decreases accordingly. When the internal junction temperature of the IC reaches 155°C, 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 JW1983, with high efficiency, excellent line regulation.

**Reference 1 :**

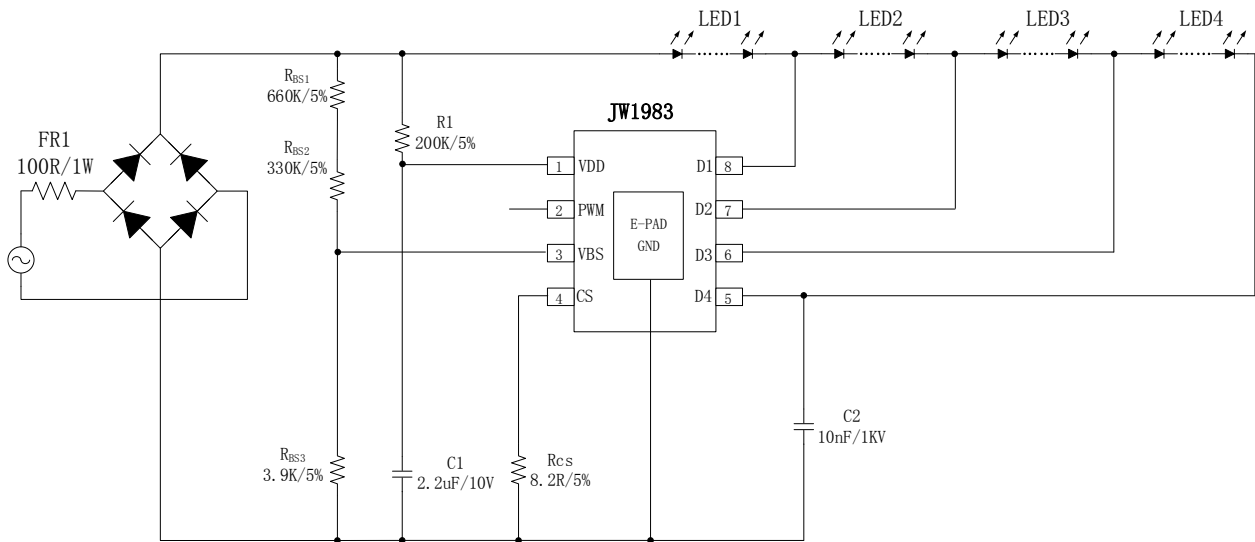
$V_{IN}$ : 180-300Vac

$V_{OUT}$ : 18V\*15PCS 5:4:3:3

$I_{OUT}$ : 35mA

PF: PF>0.95

THD: THD<15%

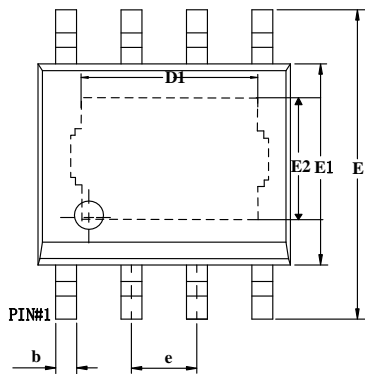
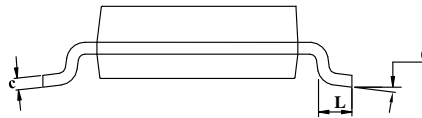
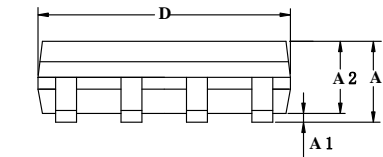




PACKAGE OUTLINE

ESOP-8

UNIT : mm



Symbol	MILLIMETER		
	MIN	NOM	MAX
A	1.30	—	1.70
A1	0.00	—	0.10
A2	1.35	—	1.60
b	0.33	—	0.51
c	0.17	—	0.25
D	4.70	—	5.10
E	5.80	6.00	6.20
E1	3.75	3.90	4.15
D1	3.05	—	3.40
E2	2.16	—	2.50
e	1.27BSC		
L	0.40	—	1.27
θ	0°	—	8°

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