

*Parameters Subject to Change Without Notice*

### DESCRIPTION

The JW<sup>®</sup>16800 is a constant current LED controller which applies to single stage flyback power factor corrected LED drivers.

JW16800 integrates high voltage power source, and can be supplied by line voltage directly, auxiliary winding and start up resistors are not needed.

Patented current sensing and digital compensation technics ensure a unit power factor and high accuracy output current. The critical conduction mode operation reduces the switching losses and increases the efficiency.

JW16800 has multi-protection functions which largely enhance the safety and reliability of the system, including LED open protection, LED short protection and over-temperature protection.

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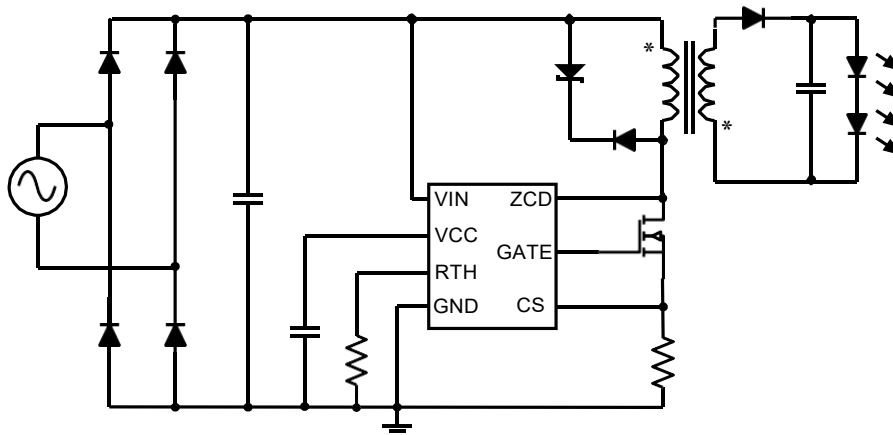
### FEATURES

- No auxiliary winding and start up resistors
- Supplied from line voltage directly
- High current accuracy of line and load regulation
- Internal compensation PFC technics
- Critical conduction mode
- High efficiency over wide operating range
- LED open protection
- LED short protection
- Adjustable Thermal Protection Threshold
- SOP8 package

### APPLICATIONS

- Isolation Offline LED driver

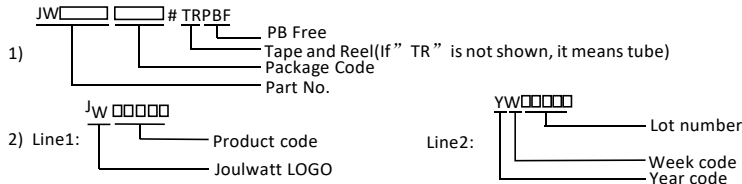
### TYPICAL APPLICATION



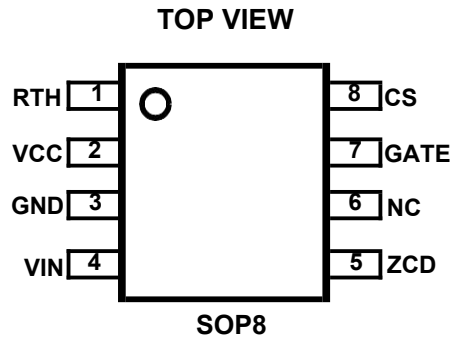
**ORDER INFORMATION**

DEVICE <sup>1)</sup>	PACKAGE	TOP MARKING <sup>2)</sup>
JW16800SOPB#TRPBF	SOP8	JW16800 YW□□□□□

**Notes:**



**PIN CONFIGURATION**



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

VIN,ZCD Voltage.....	V
RTH,CS Voltage.....	V
VCC Voltage.....	V
GATE Voltage.....	V
Junction Temperature <sup>2) 3)</sup> .....	150°C
Lead Temperature.....	260°C
Storage Temperature.....	-65°C to +150°C
ESD Susceptibility (Human Body Model).....	kV

**RECOMMENDED OPERATING CONDITIONS**

VIN Voltage.....	V to 500V
Operating Junction Temp (T <sub>J</sub> ).....	-40°C to 125°C

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

	$\theta_{JA}$	$\theta_{JC}$
SOP8.....	130.9.....	80°C/W

**Note:**

- 1) Exceeding these ratings may damage the device.
- 2) Guarantees robust performance from -40°C to 150°C junction temperature. The junction temperature range specification is assured by design, characterization and correlation with statistical process controls.
- 3) Includes thermal protection that is intended to protect the device in overload conditions. Thermal protection is active when junction temperature exceeds the maximum operating junction temperature. Continuous operation over the specified absolute maximum operating junction temperature may damage the device.
- 4) Measured on JESD51-7, 4-layer PCB.

**ELECTRICAL CHARACTERISTICS**

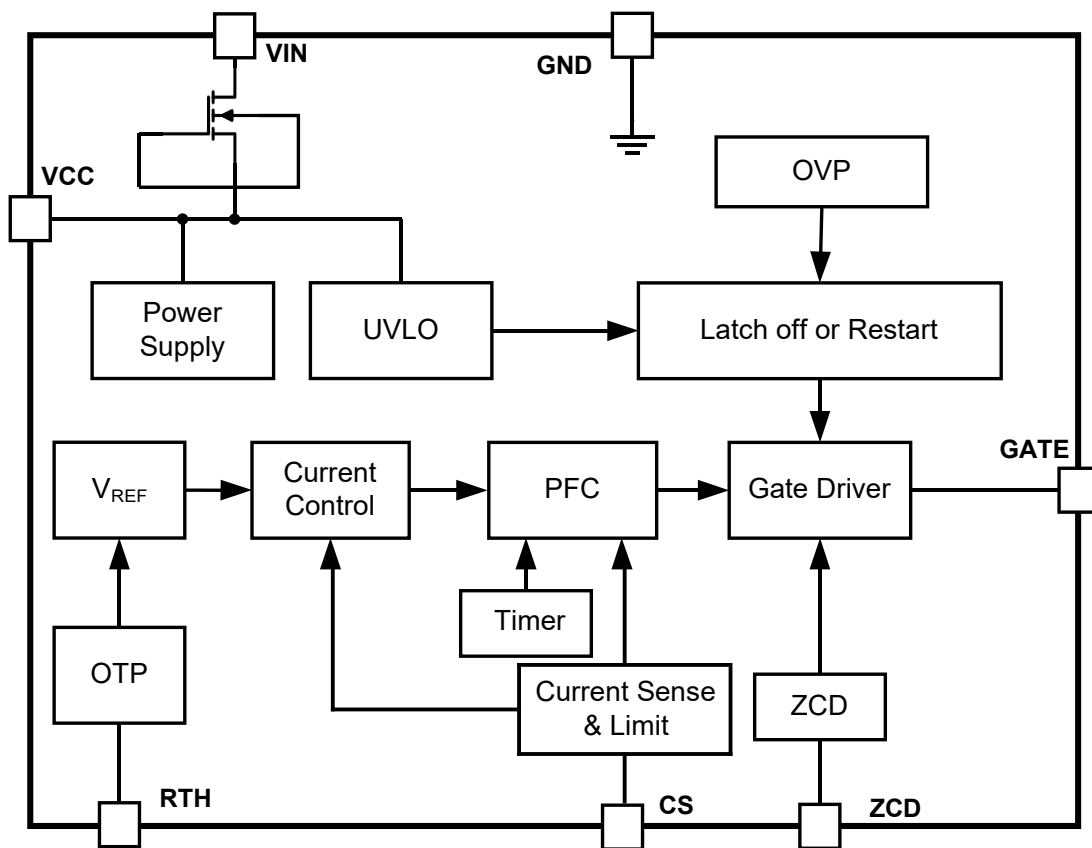
<i>T<sub>A</sub>=25 °C, unless otherwise stated.</i>						
Item	Symbol	Condition	Min.	Typ.	Max.	Units
<b>POWER SUPPLY</b>						
VCC Start-Up Voltage	V <sub>CC_ST</sub>			13.4		V
VCC Regulate Voltage	V <sub>CC</sub>			14.3		V
VCC Under Voltage Lockout	V <sub>CC_UVLO</sub>			9.4		V
VCC Clamp Voltage	V <sub>CC_CLAMP</sub>			18		V
VIN Quiescent Current	I <sub>INQ</sub>	GATE floating, V <sub>ISP</sub> =0.5V		205		μA
<b>CURRENT REGULATION</b>						
CS Sample Reference	V <sub>REF</sub>		97	100	103	mV
Minimum On Time of MOSFET <sup>5)</sup>	T <sub>ON_MIN</sub>			0.8		μS
Maximum On Time of MOSFET	T <sub>ON_MAX</sub>			20		μS
Minimum Off Time of MOSFET <sup>5)</sup>	T <sub>OFF_MIN</sub>			0.9		μS
Maximum Off Time of MOSFET <sup>5)</sup>	T <sub>OFF_MAX</sub>			420		μS
Maximum Switch Frequency <sup>5)</sup>	f <sub>MAX</sub>			122		KHz
Switching Period of VINL <sup>5)</sup>	T <sub>VINL</sub>			60		μS
Gate High Voltage	V <sub>GS_H</sub>			8.5		V
Gate Source Current	I <sub>Source</sub>			180		mA
Gate Sinking Current	I <sub>Sink</sub>			600		mA
<b>PROTECTION</b>						
CS Over Voltage Protection Threshold	V <sub>CS_MAX</sub>			1		V
Reflect Voltage Protection Threshold <sup>5)</sup>	V <sub>RF_OVP</sub>			139		V
Thermal Protection Threshold <sup>5)</sup>	T <sub>OTP1</sub>	0.1V<V <sub>RTH</sub> <0.3V		90		°C
	T <sub>OTP2</sub>	0.3V<V <sub>RTH</sub> <1V		105		
	T <sub>OTP3</sub>	1V<V <sub>RTH</sub> <3.5V		120		
	T <sub>OTP4</sub>	V <sub>RTH</sub> >3.5V		135		
	T <sub>OTP5</sub>	V <sub>RTH</sub> <0.1V		150		
RTH pin current	I <sub>RTH</sub>			4		μA

5) Guaranteed by design

**PIN DESCRIPTION**

Pin No.	Name	Description
1	RTH	Set OTP threshold.
2	VCC	VCC power supply
3	GND	Chip ground.
4	VIN	Line voltage input.
5	ZCD	Zero current detect
6	NC	Not connect
7	GATE	GATE driver for external MOSFET
8	CS	Current sense

**BLOCK DIAGRAM**



**FUNCTIONAL DESCRIPTION**

The JW16800 is a constant current LED driver which applies to flyback LED system with power factor correction. JW16800 can achieve excellent line and load regulation, high efficiency and low system cost with few peripheral components.

**Start Up**

JW16800 is supplied by line voltage directly. When VCC reaches VCC start up voltage (V<sub>CC\_ST</sub>), the chip begins to switch. Once VCC is lower than VCC under voltage lockout(V<sub>CC\_UVLO</sub>), JW16800 stops switching.

**Constant Current Control**

The JW16800 controls the output current from the information of the sensing resistor voltage. The output LED mean current can be calculated as:

$$I_{LED} = N \times V_{REF} / R_{CS}$$

Where

V<sub>REF</sub> – CS sample reference;

R<sub>CS</sub> – The sensing resistor connected between CS and GND.

N–Turns ratio of the transformer(N<sub>P</sub>/N<sub>S</sub>)

**Critical Conduction Mode Operation**

JW16800 works in the Critical conduction mode of the inductor current. When the power MOSFET is turned on, the inductor current begins to increase from zero. The turn on time of the MOSFET can be calculated as:

$$T_{ON} = I_{PK} \times L_P / V_{IN}$$

Where,

L<sub>P</sub> – Inductance of the primary winding.

I<sub>PK</sub> – MOSFET peak current in one switch cycle.

V<sub>IN</sub> – input voltage after rectification and filtering.

When the power MOSFET is turned off, the inductor current begins to decrease. The power MOSFET turns on again when the inductor

current is zero. The turn off time of the MOSFET can be calculated as:

$$T_{OFF} = I_{PK} \times L_P / (N \times V_{OUT})$$

And the inductance of the system can be calculated as:

$$L_P = V_{IN} \times V_{OUT} / (f \times I_{PK} \times (V_{IN} / N + V_{OUT}))$$

Where, f is the switching frequency of the system.

**Over Temperature Protection**

When internal temperature of the chip exceeds Thermal Protection Threshold(T<sub>OTP</sub>), JW16800 decreases LED current to help the chip cooling. The following table shows the OTP design guide:

RTH Pin	T <sub>OTP</sub> (°C)
Connected with 51K Ω resistor	T <sub>OTP1</sub>
Connected with 150K Ω resistor	T <sub>OTP2</sub>
Connected with 510K Ω resistor	T <sub>OTP3</sub>
Not connected	T <sub>OTP4</sub>
Short connected	T <sub>OTP5</sub>

**LED Open Protection**

When N\*Vo is higher than Reflect Voltage Protection Threshold (V<sub>RF\_OVP</sub>), LED open protection is triggered and the chip stops switching for 800ms.

**PCB Design**

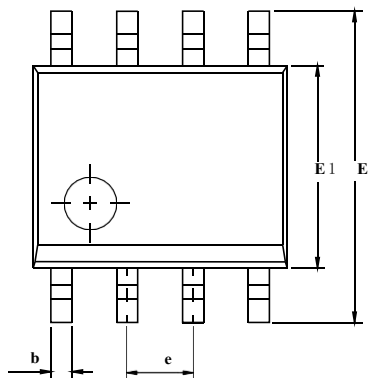
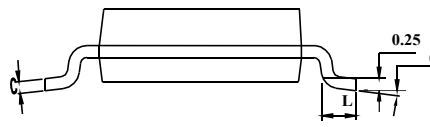
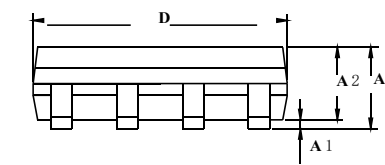
When designing the PCB of the JW16800 system, please follow the directions:

1. Make the area of the power loop as small as possible in order to reduce the EMI radiation.
2. The chip should be far away from the heating element, such as the power MOS, inductor and the freewheel diode.

PACKAGE OUTLINE

SOP8

UNIT: mm



Symbol	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.75
A1	0.05	0.15	0.25
A2	1.25	1.40	1.65
b	0.32	0.42	0.52
c	0.10	0.20	0.30
D	4.50	5.00	5.50
E	5.50	6.00	6.50
E1	3.50	3.90	4.30
e	1.27TYP		
L	0.40	—	1.27
theta	0	°	8

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