

Parameters Subject to Change Without Notice

## DESCRIPTION

JW<sup>®</sup>B1992S-C117/JWB1992N-C117/JWB1992M-C117/JWB1992A-C117/JWB1992B-C117(JWB1992X-C117 series) is a non-isolated constant current LED regulator with high current accuracy which applies to step-down LED drivers. Operating in the boundary mode makes it high efficiency and low radiation. Patented algorithms ensure good current accuracy and excellent line/load regulations.

JWB1992X-C117 series is supplied from the line directly without auxiliary winding or external capacitor, which can lower the system BOM cost. With unique sampling techniques, JWB1992X-C117 series has multi-protection functions which can largely enhance the safety and reliability of the system, including LED short protection and over-temperature protection.

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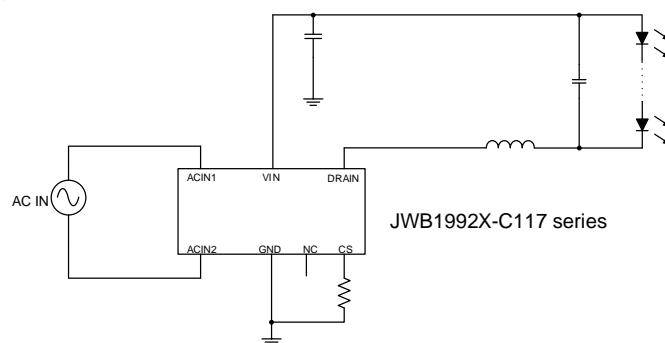
## FEATURES

- 800V bridge rectifier integrated
- 600V low  $V_F$  diode integrated
- 500V MOSFET integrated
- Excellent line/load regulation
- Boundary mode operation
- High efficiency
- LED short protection
- Over-temperature protection
- ASOP7 package

## APPLICATIONS

- LED lighting

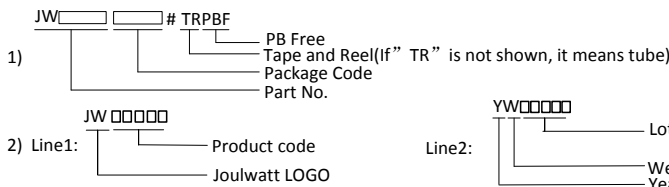
## TYPICAL APPLICATION



**ORDER INFORMATION**

DEVICE <sup>1)</sup>	PACKAGE	TOP MARKING <sup>2)</sup>
JWB1992SASOPC#TRPBF	ASOP7	JWB1992S YW□□□□□
JWB1992NASOPC#TRPBF	ASOP7	JWB1992N YW□□□□□
JWB1992MASOPC#TRPBF	ASOP7	JWB1992M YW□□□□□
JWB1992AASOPC#TRPBF	ASOP7	JWB1992A YW□□□□□
JWB1992BASOPC#TRPBF	ASOP7	JWB1992B YW□□□□□

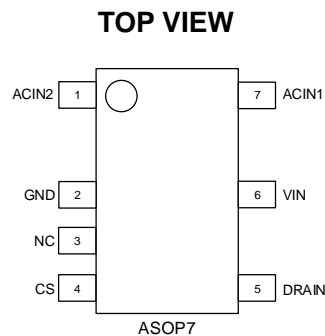
Note:



**DEVICE INFORMATION**

DEVICE	MOS BV	MOS RDSON	OUTPUT CURRENT
JWB1992SASOPC#TRPBF	500V	22 Ω	<110mA
JWB1992NASOPC#TRPBF	500V	17 Ω	<140mA
JWB1992MASOPC#TRPBF	500V	13 Ω	<190mA
JWB1992AASOPC#TRPBF	500V	8 Ω	<240mA
JWB1992BASOPC#TRPBF	500V	4.4 Ω	<300mA

**PIN CONFIGURATION**



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

VIN Voltage ..... 700V  
 CS Voltage.....-0.3V to 8V  
 DRAIN Pin .....500V  
 Junction Temperature<sup>2)3)</sup>.....150°C  
 Storage Temperature.....-40°C to +150°C

**RECOMMENDED OPERATING CONDITIONS**

VIN Voltage .....400V  
 Operating Junction Temperature.....-40°C to 125°C

PN/Package	Limit Output Current (T <sub>J</sub> =125°C) <sup>4)</sup>	Recommended MAX Output Current (T <sub>J</sub> =125°C) <sup>4)</sup>
JWB1992S-C117/ASOP7	<130mA	110mA
JWB1992N-C117/ASOP7	<200mA	140mA
JWB1992M-C117/ASOP7	<250mA	190mA
JWB1992A-C117/ASOP7	<350mA	240mA
JWB1992B-C117/ASOP7	<550mA	300mA

**RECOMMENDED OUTPUT VOLTAGE**

JWB1992X-C117 series.....>15V

**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 RECOMMENDED OPERATING CONDITIONS.
- 2) The JWB1992X-C117 series 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) The maximum output current is recommended in the application according to chip junction temperature T<sub>J</sub>=125°C (chip case temperature difference about 20°C). The maximum output current could be increased properly if the heat dissipation is better.

**ELECTRICAL CHARACTERISTICS**

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

Item	Symbol	Condition	Min.	Typ.	Max.	Units
Threshold of VIN Power On <sup>5)</sup>	V <sub>IN_ON</sub>	V <sub>IN</sub> rising		8		V
VIN Quiescent Current	I <sub>Q</sub>			85	110	uA
Reference Voltage	V <sub>REF</sub>		388	400	412	mV
MOS Max On Time	T <sub>ONMAX</sub>		30	40	55	µs
MOS Min On Time <sup>5)</sup>	T <sub>ONMIN</sub>			0.4	0.8	µs
MOS Max Off Time	T <sub>OFFMAX</sub>		300	400	500	µs
Drain-source Voltage	JWB1992X-C117 series BV <sub>DSS</sub>	V <sub>g</sub> =0V I <sub>ds</sub> =250uA	500			V
MOS R <sub>DSON</sub>	JWB1992S-C117	I <sub>ds</sub> =10mA		22		ohm
	JWB1992N-C117			17	20	
	JWB1992M-C117			13	14	
	JWB1992A-C117			8	9	
	JWB1992B-C117			4.4	5.2	
DS Leakage Current	JWB1992X-C117 series I <sub>DSS</sub>	V <sub>g</sub> =0V V <sub>ds</sub> =500V		1	5	uA
Diode Reverse Recovery Time <sup>5)</sup>	T <sub>RR</sub>	I <sub>F</sub> =0.5A, I <sub>R</sub> =1A, I <sub>FF</sub> =0.25A			35	ns
Freewheel Diode BV Voltage <sup>5)</sup>	V <sub>BRDSD</sub>		600			V
Freewheel Diode Forward Voltage Drop <sup>5)</sup>	V <sub>F</sub>	I <sub>F</sub> =0.5A			1.68	V
Bridge Diode BV Voltage <sup>5)</sup>	V <sub>BR_BD</sub>		800			V
Bridge Diode Forward Voltage Drop <sup>5)</sup>	V <sub>F_BD</sub>	I <sub>F</sub> =1A			1.1	V
Bridge Diode Average Forward Current <sup>5)</sup>	I <sub>F(AV)</sub>				0.5	A
Bridge Diode Peak Forward Surge Current 1ms Single Half Sine Wave	I <sub>FSM</sub>				30	A
Thermal Protection Threshold <sup>5)</sup>	OTP <sub>CHIP</sub>		140	150	160	°C

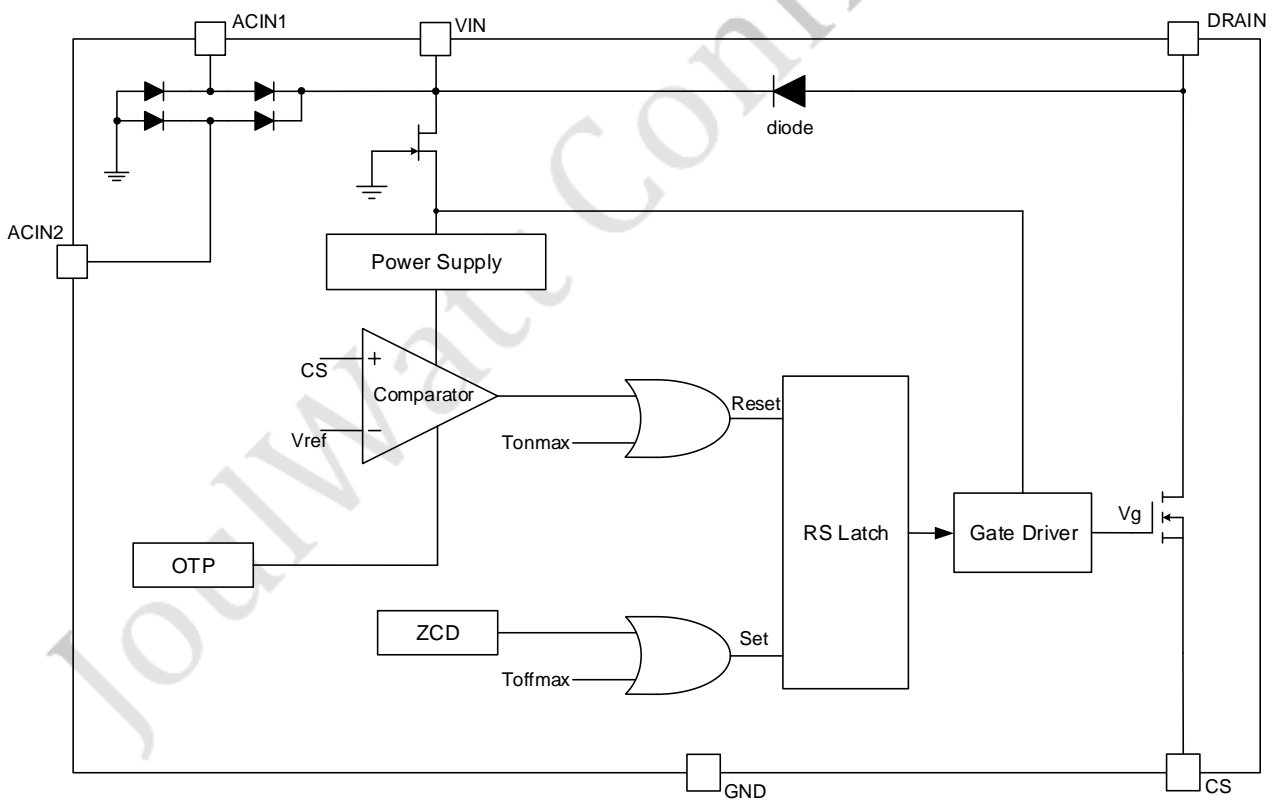
**Notes:**

5) Guaranteed by design

PIN DESCRIPTION

Pin	Name	Description
1,7	ACIN	AC voltage input.
2	GND	Chip ground
3	NC	Not connected
4	CS	Current sensing pin
5	DRAIN	The drain of internal power MOSFET
6	VIN	Power supply

BLOCK DIAGRAM



**FUNCTIONAL DESCRIPTION**

The JWB1992X-C117 series is a non-isolated constant current LED regulator, which applies to non-isolation step-down LED system. JWB1992X-C117 series can achieve excellent line and load regulation, high efficiency and low system cost with few peripheral components.

**Start Up**

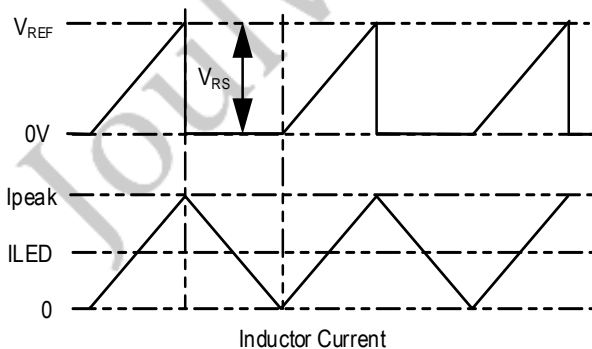
When the VIN exceeds the turn-on threshold, the gate driver will start to switch after 400us delay.

**Constant Current Control**

JWB1992X-C117 series controls the output current from the information of the current sensing resistor. The output LED average current can be calculated as:

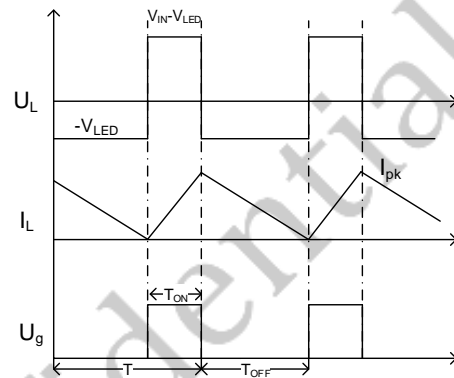
$$I_{LED} = V_{REF} / (2 R_{CS})$$

Where,  
 V<sub>REF</sub> is the reference voltage;  
 R<sub>CS</sub> – the sensing resistor connected between the PIN CS and chip GND.  
 The inductor current and V<sub>RS</sub> waveforms are as follows:  
 Where,  
 V<sub>RS</sub> – the voltage between PIN CS and chip GND.



**Critical Conduction Mode Operation**

JWB1992X-C117 series works in the critical conduction mode of the inductor current. When the power MOSFET turns on, the inductor current increases from zero linearly. The turn-on time of the MOSFET can be calculated as:



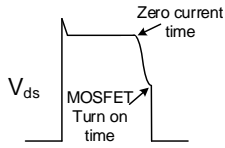
$$T_{ON} = 2 I_{LED} \times L / (V_{IN} - V_{LED})$$

Where,  
 L – inductance.  
 I<sub>LED</sub> – output current of LED.  
 V<sub>IN</sub> – input voltage after rectification and filtering.  
 V<sub>LED</sub> – output voltage.  
 When the power MOSFET turns off, the inductor current decreases. The power MOSFET turns on again when the inductor current is zero. The turn-off time of the MOSFET can be calculated as:

$$T_{OFF} = 2 I_{LED} \times L / V_{LED}$$

JWB1992X-C117 series works in quasi-resonant mode. When the inductor current decreases to zero, resonance takes place between the power inductor, MOSFET output capacitor and stray capacitor. JWB1992X-C117 series can detect the zero-current signals of the inductor, and turn on the MOSFET in the valley, which can reduce the power loss and the EMI radiation. If JWB1992X-C117 series cannot get the zero current signals, the turn-off time will be changed to T<sub>OFFMAX</sub>. The output voltage should be higher than recommended voltage in order to avoid the

loss of zero current signals.



### Over Temperature Protection

When the junction temperature is higher than  $OTP_{CHIP}$ , JWB1992X-C117 series works in DCM by increasing the MOS off time to decrease the LED current and help the chip cooling.

### LED Short Protection

When the output is shorted, JWB1992X-C117 series stops switching for  $T_{OFFMAX}$  until the next pulse.

### PCB Layout Guidelines

1. Make the area of the power loop as small as possible in order to reduce the EMI radiation.
2. JWB1992X-C117 series should be kept away from noisy and heating components, such as power inductor.

**APPLICATION REFERENCE**

This reference design is suitable for 10~20W non-isolated step-down LED driver, using JWB1992B-C117, with high efficiency, excellent line regulation.

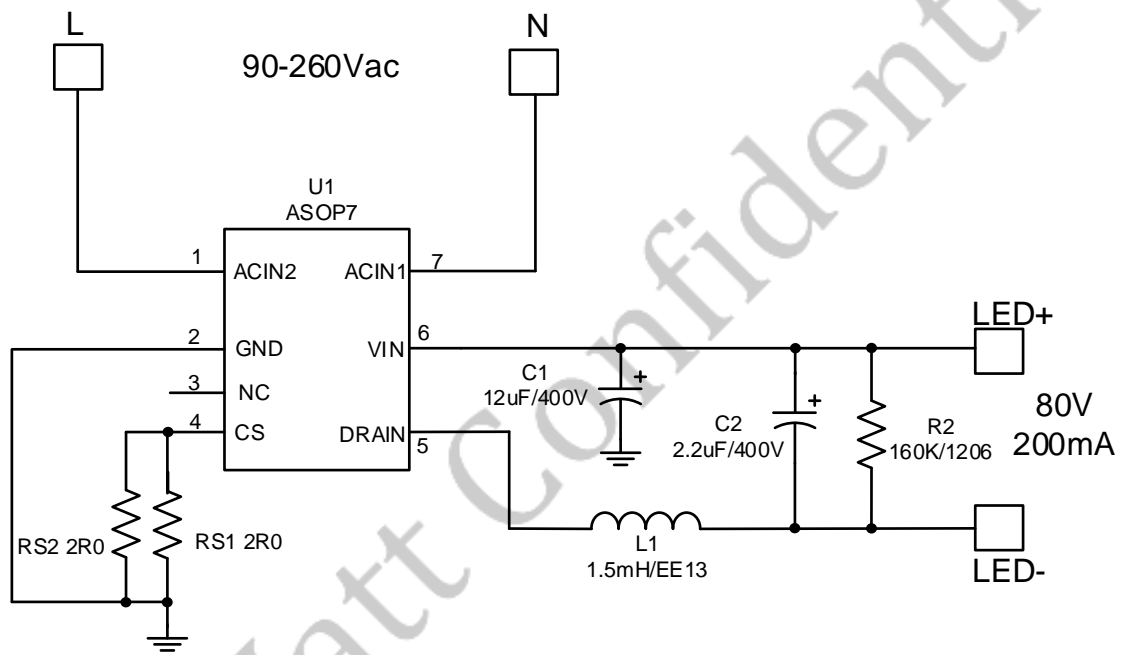
**Reference :**

$V_{IN}$ : 90VAC~260VAC

$V_{OUT}$ : 80V

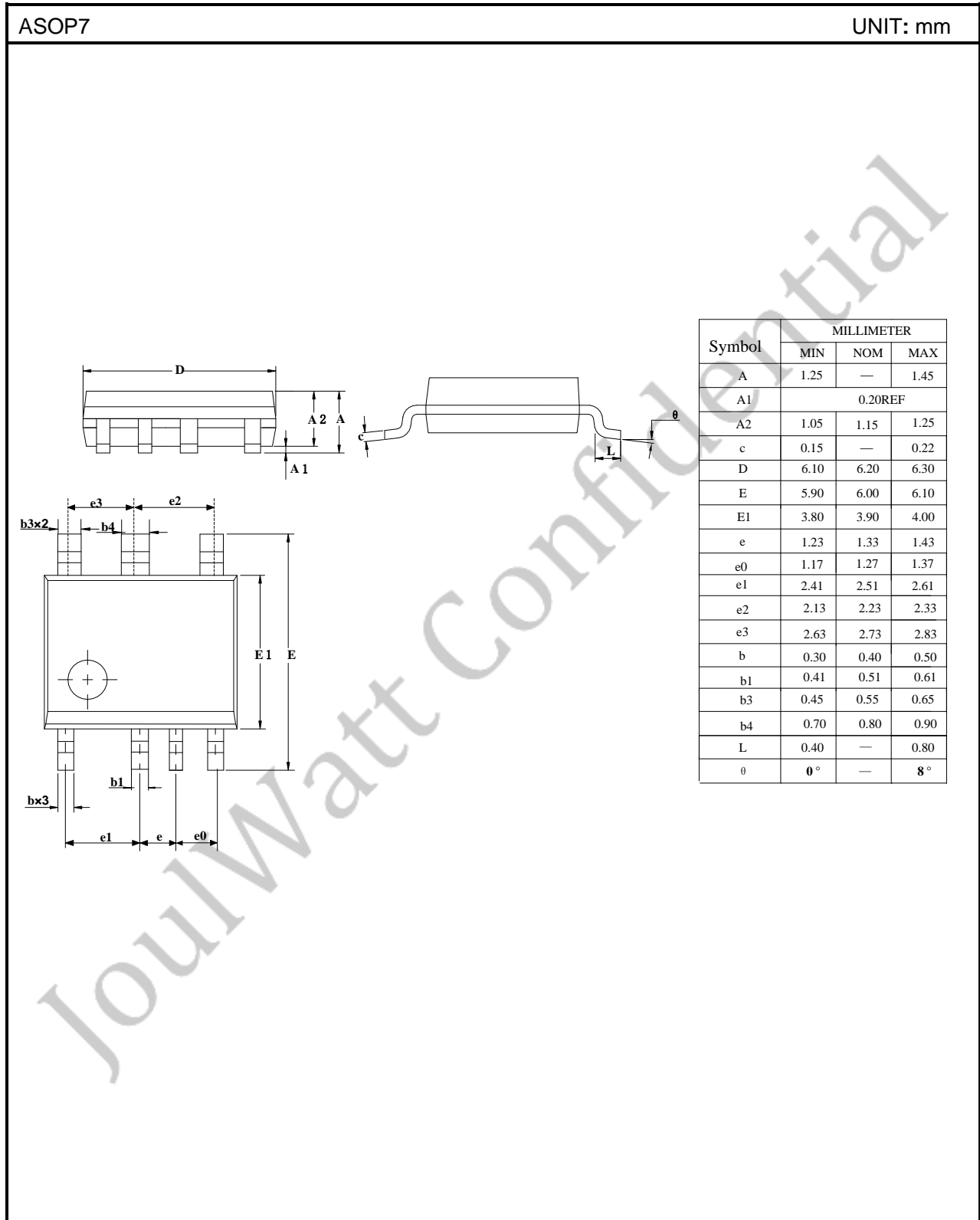
$I_{OUT}$ : 200mA

PF: >0.5





PACKAGE OUTLINE



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