JWB1992S/N/M/A/B-C117

Non-isolated Buck LED Driver Regulator

Parameters Subject to Change Without Notice

DESCRIPTION

JW®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.

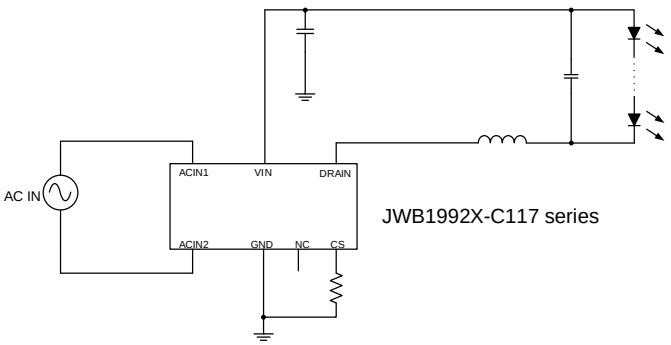
FEATURES

- 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

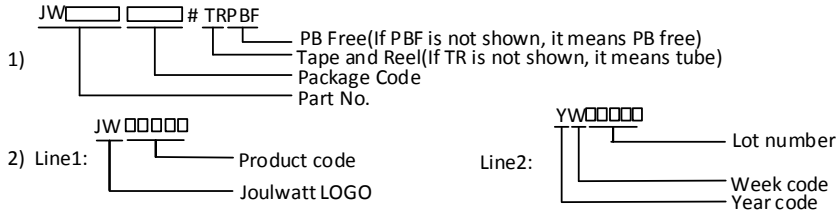
TYPICAL APPLICATION



ORDER INFORMATION

DEVICE[1)]	PACKAGE	TOP MARKING[2)]	ENVIRONMENTAL[3)]
JWB1992S-C117ASOPC#TR	ASOP7	JWB1992S YW□□□□□	Green
JWB1992NASOPC#TRPBF	ASOP7	JWB1992N YW□□□□□	Green
JWB1992MASOPC#TRPBF	ASOP7	JWB1992M YW□□□□□	Green
JWB1992AASOPC#TRPBF	ASOP7	JWB1992A YW□□□□□	Green
JWB1992BASOPC#TRPBF	ASOP7	JWB1992B YW□□□□□	Green

Note：

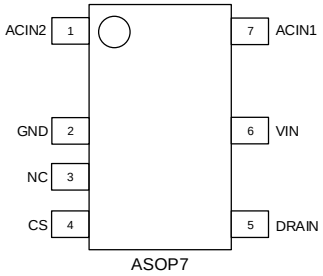


DEVICE INFORMATION

DEVICE	MOS BV	MOS RDSON	OUTPUT CURRENT
JWB1992S-C117ASOPC#TR	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

TOP VIEW



ASOP7

ABSOLUTE MAXIMUM RATING[1)]

VIN Voltage 700V
CS Voltage.....-0.3V to 8V
DRAIN Pin 500V
Junction Temperature[2)3)].....150ºC
Storage Temperature.....-65ºC to +150ºC

RECOMMENDED OPERATING CONDITIONS

VIN Voltage 400V
Operating Junction Temperature.....-25ºC to 125ºC

PN/Package	Limit Output Current (T_J=125℃）[4)]	Recommended MAX Output Current (T_J=125℃）[4)]
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 RECOMMENDE 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 TJ=125℃ (chip case temperature difference about 20℃). The maximum output current could be increased properly if the heat dissipation is better.

ELECTRICAL CHARACTERISTICS

T_A=25 ℃, unless otherwise stated

Item		Symbol	Condition	Min.	Typ.	Max.	Units
Threshold of VIN Power On[5)]		V_{IN_ON}	V_{IN} rising		8		V
VIN Quiescent Current		I_Q			85	110	uA
Reference Voltage		V_{REF}		388	400	412	mV
MOS Max On Time		T_{ONMAX}		30	40	55	μs
MOS Min On Time[5)]		T_{ONMIN}			0.4	0.8	μs
MOS Max Off Time		T_{OFFMAX}		300	400	500	μs
Drain-source Voltage	JWB1992X-C117 series	BV_{DSS}	Vg=0V Ids=250uA	500			V
MOS R_{DSON}	JWB1992S-C117	R_{DS_ON}	Ids=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_{DSS}	Vg=0V Vds=500V		1	5	uA
Diode Reverse Recovery Time[5)]		T_{RR}	I_F=0.5A,I_R=1A, I_{FF}=0.25A			35	ns
Freewheel Diode BV Voltage[5)]		V_{BRDSD}		600			V
Freewheel Diode Forward Voltage Drop[5)]		V_F	I_F=0.5A			1.68	V
Bridge Diode BV Voltage[5)]		V_{BR_BD}		800			V
Bridge Diode Forward Voltage Drop[5)]		V_{F_BD}	I_F=1A			1.1	V
Bridge Diode Average Forward Current[5)]		$I_{F(AV)}$				0.5	A
Bridge Diode Peak Forward Surge Current 1ms Single Half Sine Wave		I_{FSM}				30	A
Thermal Protection Threshold[5)]		OTP_{CHIP}		140	150	160	℃

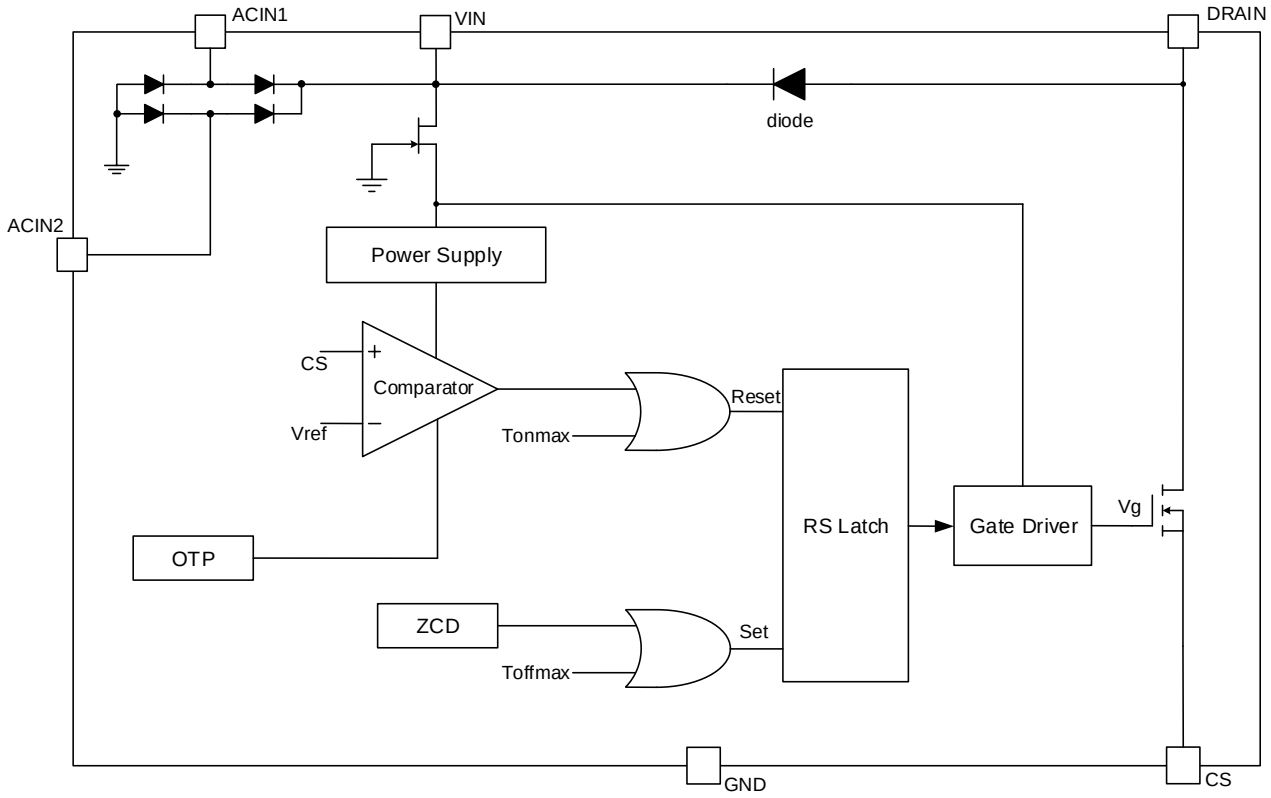
Notes:

5) Guaranteed by design

PIN DESCRIPTION

Pin ASOP7	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,

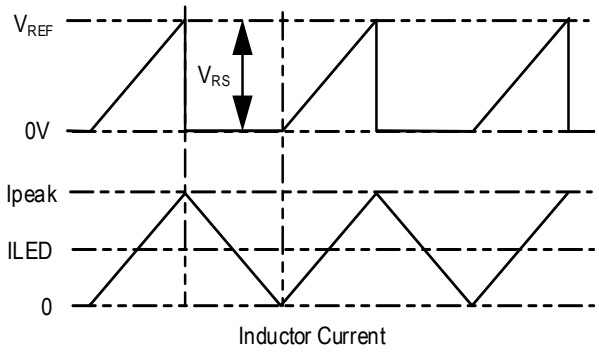
V_{REF} is the reference voltage;

R_{CS} – the sensing resistor connected between the PIN CS and chip GND.

The inductor current and V_{RS} waveforms are as follows:

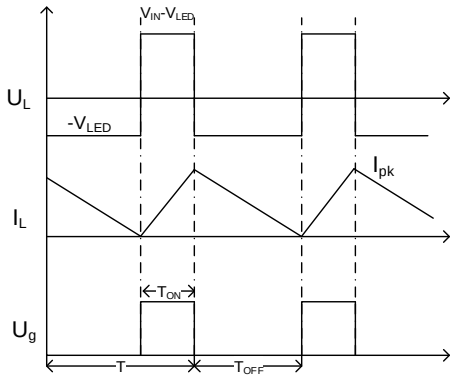
Where,

V_{RS} – 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_{LED} – output current of LED.

V_{IN} – input voltage after rectification and filtering.

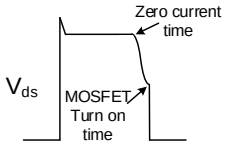
V_{LED} – output voltage.

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_{OFFMAX}. 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.

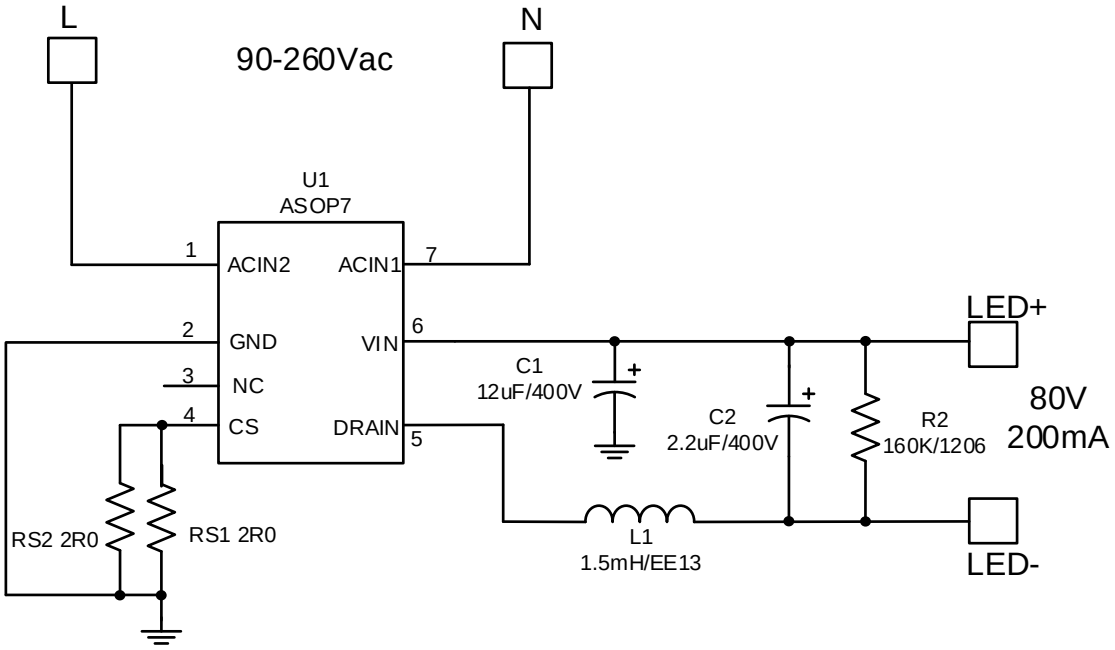
Reference ：

V_{IN}: 90VAC~260VAC

V_{OUT}: 80V

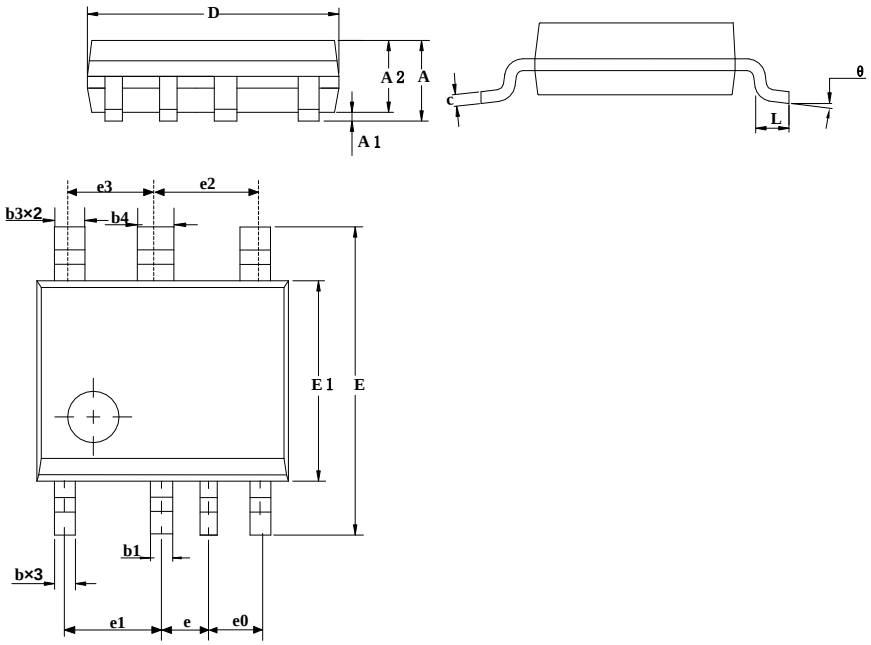
I_{OUT}: 200mA

PF: >0.5



PACKAGE OUTLINE

ASOP7 UNIT: mm



Symbol	MILLIMETER		
	MIN	NOM	MAX
A	1.25	—	1.45
A1	0.20REF		
A2	1.05	1.15	1.25
c	0.15	—	0.22
D	6.10	6.20	6.30
E	5.90	6.00	6.10
E1	3.80	3.90	4.00
e	1.23	1.33	1.43
e0	1.17	1.27	1.37
e1	2.41	2.51	2.61
e2	2.13	2.23	2.33
e3	2.63	2.73	2.83
b	0.30	0.40	0.50
b1	0.41	0.51	0.61
b3	0.45	0.55	0.65
b4	0.70	0.80	0.90
L	0.40	—	0.80
θ	**0°**	—	**8°**

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