JW15328B

High Efficiency Off-line CV Regulator

DESCRIPTION

The JW15328B is a high efficiency low cost off-line constant voltage regulator for Buck and Buck- Boost topology with 650V MOSFET.

JW15328B can output 12V default voltage with few external components, which decreases the system cost. In light load condition, JW15328B operates in green mode, in which the inductor peak current and the switching frequency is lower than that of full load to improve the system efficiency and the reference voltage is decreased to ensure good load regulation.

JW15328B has multi-protection functions which largely enhance the safety and reliability of the system, including VDD under-voltage lockout (UVLO), short circuit protection (SCP), pulse-by-pulse current limit, over load protection (OLP) and over-temperature protection (OTP).

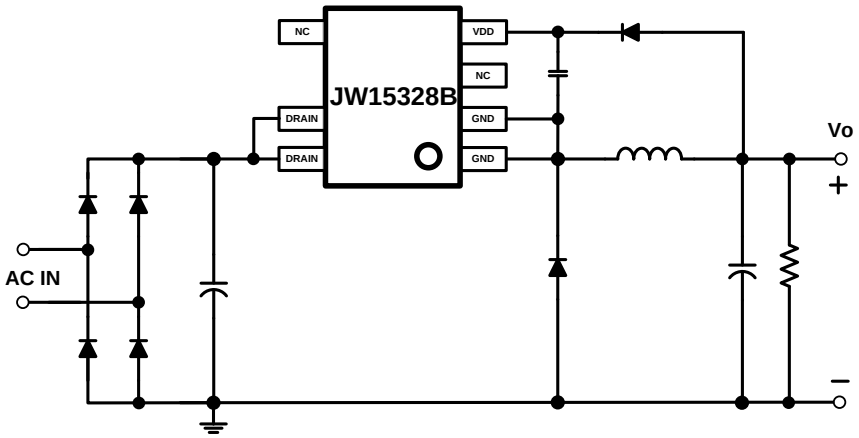
FEATURES

- Ultra Low System BOM Cost
- Integrated with 650V, Low R_{dson} MOSFET
- 12V Default Output Voltage
- Support Buck and Buck-Boost Topology
- Peak Current Mode Control
- Frequency Jittering for Good EMC
- High Efficiency Over Wide Operating Range
- Output Voltage Load Regulation Compensation
- VDD UVLO
- Short Circuit Protection
- Pulse-by-pulse Current Limit
- Over Temperature Protection
- DIP7 Package

APPLICATIONS

- Home Appliance
- Standby Power
- Consumer Electronics

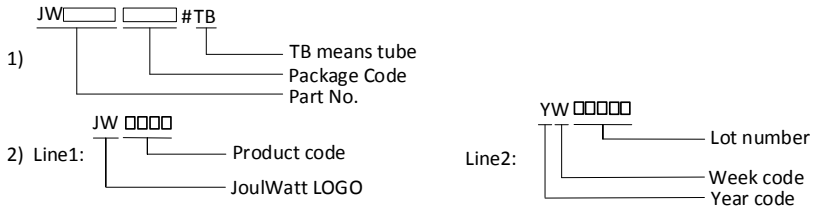
TYPICAL APPLICATION



ORDER INFORMATION

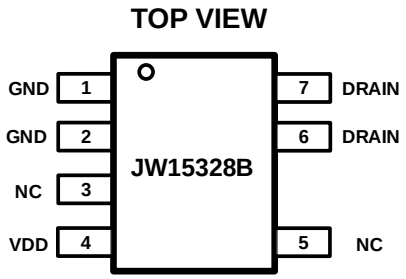
DEVICE[1)]	PACKAGE	TOP MARKING[2)]	ENVIRONMENTAL[3)]
JW15328BDIPA#TB	DIP7	J15328B YW□□□□□	Green

Notes:



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

PIN CONFIGURATION



ABSOLUTE MAXIMUM RATING[1)]

VDD Voltage to GND…….....-0.3V to 22V, 22V to 28V<1s
DRAIN Voltage to GND…….....-0.3V to 650V
Junction Temperature[2) 3)] 150ºC
Lead Temperature..... ..... 260ºC
Storage Temperature..... -65ºC to +150ºC
ESD Susceptibility (Human Body Model) 2.5kV

RECOMMENDED OPERATING CONDITIONS

DRAIN Voltage to GND….....600V

Operating Junction Temperature (T_J) .....-40ºC to 125ºC

Package	Recommended MAX Output Current （T_J=125℃）[4]
DIP7	550mA

THERMAL PERFORMANCE[5]

	θ_{JA}	θ_{JC}
DIP7	80	45ºC/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 JW15328B 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_J=125℃ (chip case temperature difference about 20℃). The maximum output current could be increased properly if the heat dissipation is better.

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

ELECTRICAL CHARACTERISTICS

T_A=25℃, unless otherwise stated.

Item	Symbol	Condition	Min.	Typ.	Max.	Units
VDD Quiescent Current	I_Q	V_{DD_ST} -1V	75	100	125	μA
Operation Current	I_{OP}	V_{DD_ST} +1V	200	215	230	uA
VDD Charge Current	I_{CH}	VDD=5V	0.9	1	1.2	mA
VDD Startup Voltage	V_{DD_ST}		9.0	9.5	10.0	V
VDD Under Voltage Lockout	V_{DD_UVLO}		7.0	7.2	7.5	V
VDD Clamping Voltage	V_{CLP}	Sink current =5mA	23	24	25	V
VDD Feedback Reference	V_{DDREF}		12.028	12.4	12.772	V
Peak Current Limit	I_{PK}		0.79	0.9	1.09	A
Oscillator Frequency	f_{osc}		60	70	78	kHz
Frequency Jittering Range	$\lvert \pm \Delta f/f_{OSC} \rvert$			8		%
Frequency Jittering Period	T_{Jit}			15		ms
Maximum On Time	T_{ONMAX}		7.5	8.5	9.5	μs
Leading Edge Blanking Time	T_{LEB}		350	400	450	ns
MOS Breakdown Voltage	BV		650	690		V
MOS Rdson	Rdson	Vgs=10V		6	8	Ω
Over Thermal Protection Threshold[6)]				150		℃
Over Thermal Protection Recovery Hysteresis[6)]				30		℃

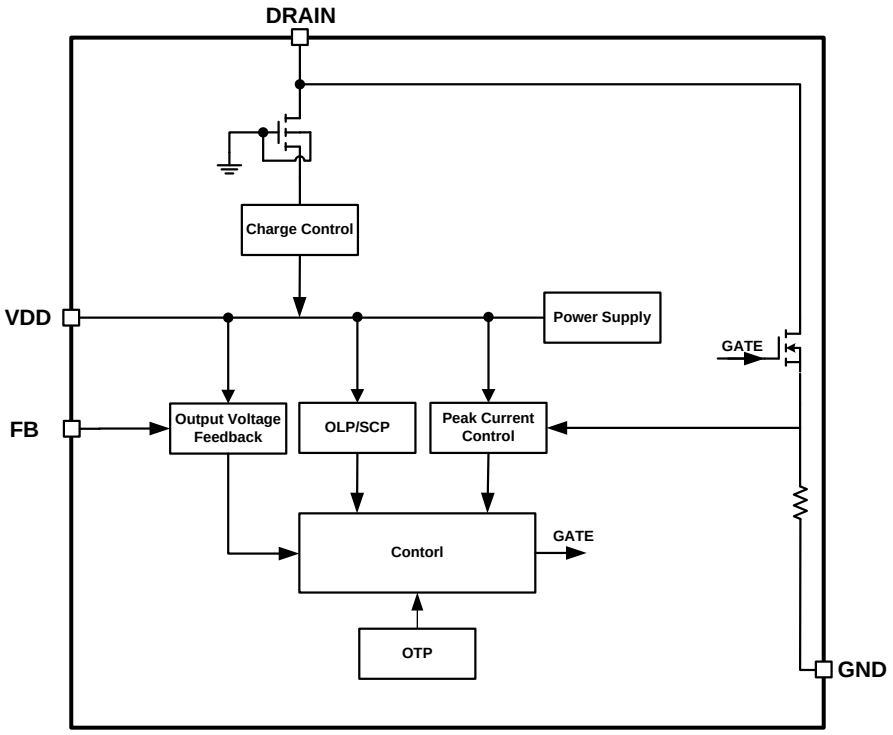
Note：

6) Guaranteed by design.

PIN DESCRIPTION

Pin SOP8	Name	Description
1	GND	IC ground
2	GND	IC ground
3	NC	
4	VDD	IC power supply and output voltage feedback
5	NC	
6	DRAIN	Internal MOS drain and HV power supply
7	DRAIN	Internal MOS drain and HV power supply

BLOCK DIAGRAM



FUNCTIONAL DESCRIPTION

JW15328B is a high efficiency low cost off-line constant voltage regulator for Buck and Buck-Boost topology.

Start Up

JW15328B can be supplied from MOS DRAIN directly. When the internal high voltage(HV) power souse charges VDD up to the V_{DD_ST}, the gate driver starts to switch. VDD will be powered by output voltage in steady state. Once the voltage of VDD is lower than V_{DD_UVLO}, JW15328B stops switching.

Peak Current Control

JW15328B has the default peak current for output current. And it also has the SCP limit peak current for abnormal state such as inductance short.

Constant Voltage Control

The output voltage is sensed by VDD pin and adjusted by internal control compensation loop automatically.

The switching frequency of JW15328B is fixed to f_{osc} with ±8% jittering to improve the EMI performance.

Green Mode

In light or no load condition, JW15328B operates in DCM which means the OFF time is very long. JW15328B will reduce the peak current of the inductor to minimize the power loss. The longer Toff, the lower I_{PK}.

Short Circuit Protection (SCP)/ Over Load Protection (OLP)

In short circuit or over load condition, VDD can't be charged to V_{REF}. JW15328B will operate in auto-restart mode which is represented in the following description if VDD<V_{REF} for some time.

Auto-restart Mode

JW15328B will enter auto-restart mode if SCP/OLP/OTP is triggered. The chip stops switching and the HV power source is disconnected until VDD decreases to V_{DD_UVLO}. If VDD is charged to V_{DD_ST} for several cycles, the system restarts.

Over Temperature Protection

When internal temperature of the chip exceeds 150°C, JW15328B operates in auto-restart mode to help the chip cooling.

PCB Design

1. The VDD pin must be locally bypassed with a capacitor.
2. Make the area of the power loop as small as possible in order to reduce the EMI radiation.

APPLICATION REFERENCE

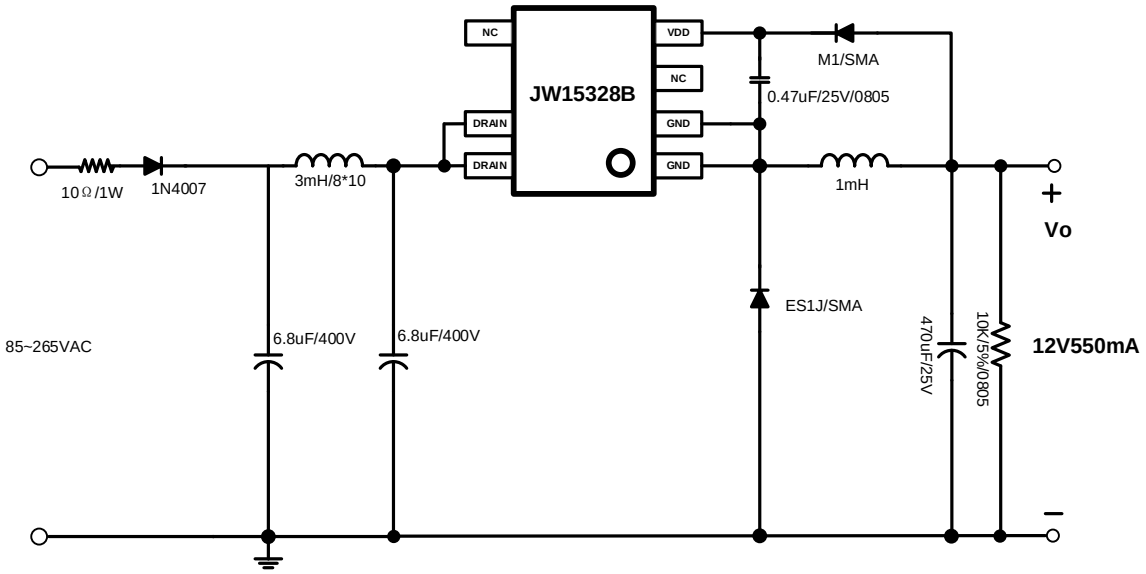
Note: Information in the following reference design sections is not part of JoulWatt component specification. Customers are responsible for determining suitability of components chosen for their purposes and should validate their design implementation to make sure the proper system functionality.

The reference design is suitable for non-isolated buck power supply default 12V output, using JW15328B.

V_{IN}: 85~265VAC

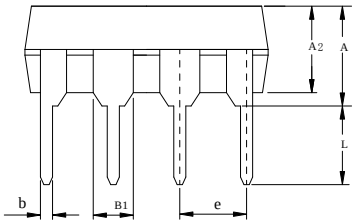
V_{OUT}: 12V

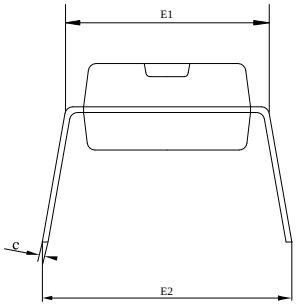
I_{OUT}: 550mA

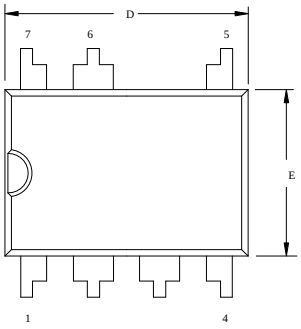


PACKAGE OUTLINE

DIP7 UNIT : mm







SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	3.60	—	4.80
A2	3.15	—	3.60
b	0.38	0.46	0.57
B1	1.42	1.52	1.62
c	0.20	0.25	0.36
D	9.00	__	9.45
E	6.10	—	6.60
E1	7.32	__	8.25
e	2.54BSC		
E2	7.62	__	9.30
L	2.92	__	3.81

IMPORTANT NOTICE

- **Joulwatt Technology Co.,Ltd reserves the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein.**
- **Any unauthorized redistribution or copy of this document for any purpose is strictly forbidden.**
- **Joulwatt Technology Co.,Ltd does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel.**
- **JOULWATT TECHNOLOGY CO.,LTD PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, SAFETY INFORMATION AND OTHER RESOURCES, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.**