

JWB1536NC

Dynamic Response and Ultra-low Standby Power

All integrated off-line CV Regulator

Parameters Subject to Change Without Notice

DESCRIPTION

The JW[®]BJW1536NC is a ultra-low standby power and fast dynamic response all integrated off-line constant voltage regulator for Buck topology with 500V MOSFET integrated, and with only one external component around IC for operation, which is specialized for IoT module power supply.

JWB1536NC can output 3.3V default voltage, which decreases the system cost. In light load condition, JWB1536NC 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 it's also suppress the audible noise problem and guarantee the fast dynamic state response.

JWB1536NC has multi-protection functions which largely enhance the safety and reliability of the system, including BST under-voltage Lockout (UVLO), short circuit protection (SCP), over load protection(OLP), pulse-by- pulse current limit and over-temperature protection (OTP).

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FEATURES

- Integrated with 800V bridge rectifier and 600V low V_F diode
- Integrated with 500V MOS
- Ultra-low standby power consumption <30mW
- Ultra-low system BOM cost
- Integrated with 500V MOS
- 3.3V default output voltage with ±3% accuracy
- Fast dynamic state response, $< \pm 5\%$
- Peak current mode control
- Built-in frequency jittering for good EMI
- High efficiency over wide operating range
- Short circuit protection and over load protection
- Pulse-by-pulse current limit
- Over temperature protection
- ASOP7 package

APPLICATIONS

- IoT module
- Smart lighting

TYPICAL APPLICATION



ORDER INFORMATION

DEVICE ¹⁾	PACKAGE	TOP MARKING ²⁾	ENVIRONMENTAL ³⁾
JWB1536NCASOPC#TR	ASOP7	JWB1536NC	Green
Notes:			
JW # TR 1) Package O JW Part No. JW Product code 2) Line1:	Reel (If TR is not shown, it mear Code YW 00000 Line2:	ns Tube) ——— Lot number ——— Week code ——— Year code	

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

DEVICE INFORMATION

DEVICE	MOS BV	MOS RDSON	OUTPUT CURRENT
JWB1536NCASOPC#TR	500V	22Ω	<150mA

Notes: TJ=25℃

PIN CONFIGURATION



ABSOLUTE MAXIMUM RATING¹⁾

VIN Voltage to SW	500V
BST Voltage to SW	9.5V
VO Voltage to GND	6V
Junction Temperature ^{2) 3)}	150°C
Lead Temperature	260°C
Storage Temperature	65ºC to +150ºC
ESD Susceptibility (Human Body Model)	2.5kV

RECOMMENDED OPERATING CONDITIONS

THERMAL PERFORMANCE ⁴⁾	$ heta_{J\!A}$
Operating Junction Temp (T _J)	40°C to 125°C
VIN Voltage	400V

THERMAL PERFORMANCE⁴

ASOP7	:/W
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Note:

1) Exceeding these ratings may damage the device.

- 2) JWB1536NC guarantees robust performance from -40°Cto 150°C junction temperature. The junction temperature range specification is assured by design, characterization and correlation with statistical process controls.
- 3) The JWB1536NC 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

T_A =25 °C, unless otherwise stated.						
Item	Symbol	Condition	Min.	Тур.	Max.	Units
BST Charge ON Voltage	VBST_ON		7.5	8.0	8.5	V
BST Charge OFF Voltage	V_{BST_OFF}		7.9	8.4	8.9	V
HVJFET Charge Current	Iнv		0.7	1	2	mA
Quiescent Current	lq	no switch, sleep mode		40	50	uA
Operation Current	IOP	Fs=60kHz			120	uA
Output Voltage	Vo		3.201	3.3	3.399	V
Peak Current	I _{PK}		0.23	0.25	0.27	А
Maximum On Time	T _{ONMAX}			12		μs
Leading Edge Blanking Time	T _{LEB}			250	400	ns
Frequency Jittering Range ⁵⁾	∆f/f _{OSC}		-8		8	%
Frequency Jittering Period ⁵⁾	T _{Jit}			15		ms
Power MOS Breakdown Voltage	BV		500			V
Power MOS Rdson	Rdson	Vgs=10V		22	26	Ω
Freewheel Diode BV Voltage ⁵⁾	VBRDSD		600			V
Freewheel Diode Forward Voltage Drop ⁵⁾	VF	I⊧=0.5A			1.68	V
Diode Reverse Recovery Time ⁵⁾	T _{RR}	I _F =0.5A,I _R =1A,			35	ns
Bridge Diode BV Voltage ⁵⁾	Ved od	IFF=0.25A	800			V
Bridge Diode Forward Voltage Drop ⁵⁾	V BR_BD	IF=1A	000		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	IFSM				30	A
Over Thermal Protection Threshold ⁵⁾	T _{OTP}			150		°C
Thermal Protection Hysteresis ⁵⁾	T _{OTPHYS}			30		°C

Note:

5) Guaranteed by design.

PIN DESCRIPTION

Pin	Name	Description
1	ACIN1	AC voltage input pin1
2	GND	Chip ground power supply pin
3	VO	Output voltage detection
4	BST	Power supply for internal driver, 0.1uF value ceramic capacitor is ok for normal operation.
5	SW	Switching node
6	VIN	The drain of MOSFET and power supply for BST
7	ACIN2	AC voltage input pin2

BLOCK DIAGRAM



FUNCTIONAL DESCRIPTION

JWB1536NC is a high efficiency and high performance all integrated off-line constant voltage regulator for Buck topology, which is very suitable for IoT module application.

Start Up

JWB1536NC can be supplied from VIN directly. When the internal high voltage(HV) power souse charges BST cap up to the V_{BST_OFF}, the gate driver starts to switch. IC enters into open loop operation until the output voltage is higher than certain voltage. Once the output voltage is lower than certain voltage and last for certain time, JWB1536NC stops switching and enters into protection.

Peak Current Control

JWB1536NC detects the inductor peak current when internal MOS turn-on. MOS will be turned off immediately as the inductor peak reach the peak current reference. JWB1536NC will spread frequency when the peak current is higher than 1.3 reference especially at startup or short circuit condition, which is to avoid the inductor saturation and very high peak current for more reliability.

Constant Voltage Control

The output voltage is detect by VO pin. Internal close loop controller will regulate the peak current and work frequency to keep the output voltage stable and response the dynamic load state very quickly.

Green Mode

In light or no load condition, JWB1536NC operates in DCM which means the OFF time is very long. JWB1536NC will reduce the peak current of the inductor to minimize the power

loss. The longer Toff, the lower Ipeak, which optimize the efficiency and also decrease the power consumption especially when no-load condition.

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

In short circuit or over load condition, output voltage can't be charged to reference voltage. JWB1536NC will operate in auto-restart mode which is represented in the following description.

Auto-restart Mode

JWB1536NC will enter auto-restart mode if SCP/ OLP is triggered when the output voltage can't reach the reference for 120ms. The chip stops switching for 150ms and enter into restart mode repeatedly.

Over Temperature Protection

When internal temperature of the chip exceeds 150°C, JWB1536NC operates in auto-restart mode to help the chip cooling.

PCB Design

- 1. The BST ceramic capacitor must be located nearly to IC between the BST pin and SW.
- 2. Make the area of the power loop as small as possible in order to reduce the EMI radiation.
- IC should be kept away from noisy and heating components, such as power inductor.
- 4. The copper connected with VIN pin could be big enough for better thermal performance.

PACKAGE OUTLINE

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