JW1532A5

High Efficiency Off-line CV Regulator

Parameters Subject to Change Without Notice

DESCRIPTION

The JW®1532A5 is a high efficiency low cost off-line constant voltage regulator for Buck and Buck- Boost topology with 650V MOSFET.

JW1532A5 can output 5V default voltage with few external components, which decreases the system cost. In light load condition, JW1532A5 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.

JW1532A5 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).

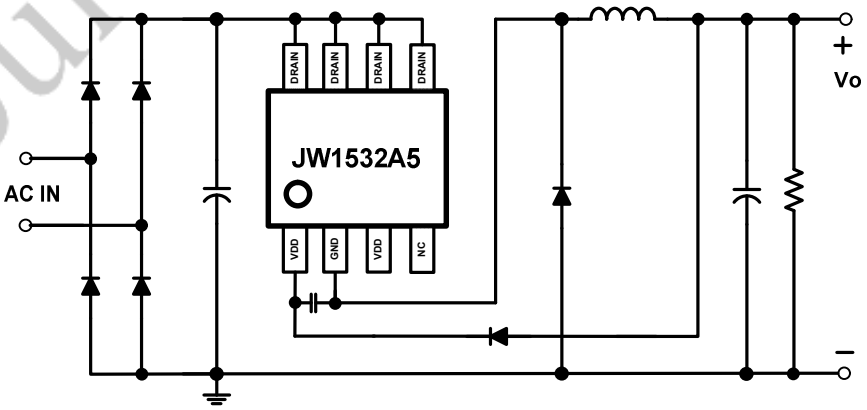
FEATURES

- Ultra low system BOM cost
- Integrated with 650V, low R_{dson} MOSFET
- 5V 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
- SOP8 package

APPLICATIONS

- Home appliance
- Standby power
- Consumer electronics

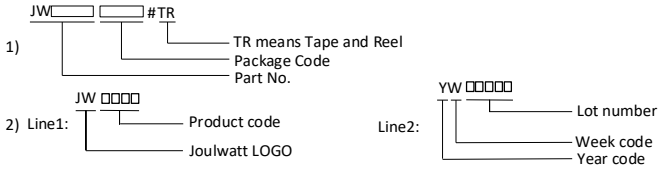
TYPICAL APPLICATION



ORDER INFORMATION

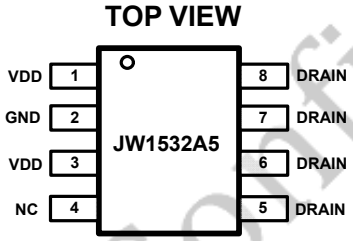
DEVICE[1)]	PACKAGE	TOP MARKING[2)]	ENVIRONMENTAL[3)]
JW1532A5SOPB#TR	SOP8	JW1532A5 YW□□□□□	Green

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 SOURCE.....-0.3V to 8V
DRAIN Voltage to SOURCE.....-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.....600V

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

Package	Recommended MAX Output Current (T_J=125℃) 4)
SOP8	450mA

THERMAL PERFORMANCE 5)

	θ_{JA}	θ_{JC}
SOP8	96	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 JW1532A5 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) 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		100		μA
Operation Current	I_{OP}	V_{DD_ST} +1V			230	uA
VDD Charge Current	I_{CH}	VDD=5V		1	2	mA
VDD Startup Voltage	V_{DD_ST}			5.296		V
VDD Under Voltage Lockout	V_{DD_UVLO}			3.5		V
VDD Clamping Voltage	V_{CLP}	Sink current =5mA		7.8		V
VDD Feedback Reference	V_{DDREF}			5.5		V
Peak Current Limit	I_{PK}			0.55		A
Oscillator Frequency	f_{osc}			40		kHz
Frequency Jittering Range	$\lvert\pm\triangle f/f_{OSC}\rvert$			8		%
Frequency Jittering Period	T_{Jit}			15		ms
Maximum On Time	T_{ONMAX}			10		μs
Leading Edge Blanking Time	T_{LEB}		350	400	450	ns
MOS Breakdown Voltage	BV		650			V
MOS Rdson	Rdson	Vgs=10V		13		Ω
Over Thermal Protection Threshold[6)]				150		℃
Over Thermal Protection Recovery Hysteresis[6)]				30		℃

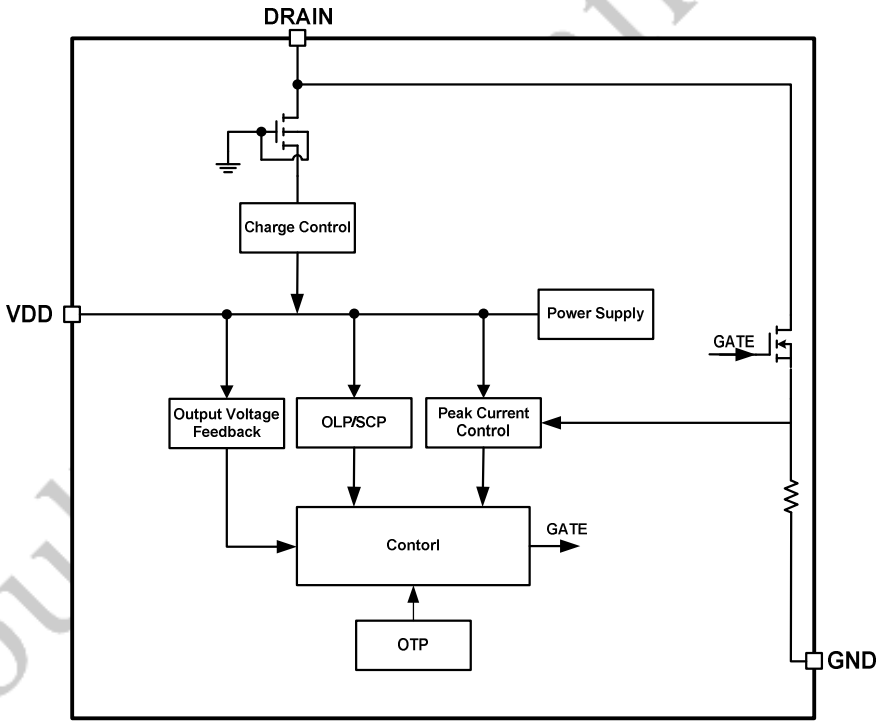
Note:

5) Guaranteed by design.

PIN DESCRIPTION

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

BLOCK DIAGRAM



FUNCTIONAL DESCRIPTION

JW1532A5 is a high efficiency low cost off-line constant voltage regulator for Buck and Buck-Boost topology.

Start Up

JW1532A5 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}, JW1532A5 stops switching.

Peak Current Control

JW1532A5 has the default peak current for 300mA output current. And it's 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 JW1532A5 is fixed to f_{osc} with ±8% Jittering to improve the EMI performance.

Green Mode

In light or no load condition, JW1532A5 operates in DCM which means the OFF time is very long. JW1532A5 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_{DDREF}. JW1532A5 will operate in auto-restart mode which is represented in the following description if VDD<V_{DDREF} for 120ms.

Auto-restart Mode

JW1532A5 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_UVLO} for 24 times, the system restarts.

Over Temperature Protection

When internal temperature of the chip exceeds 150°C, JW1532A5 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.

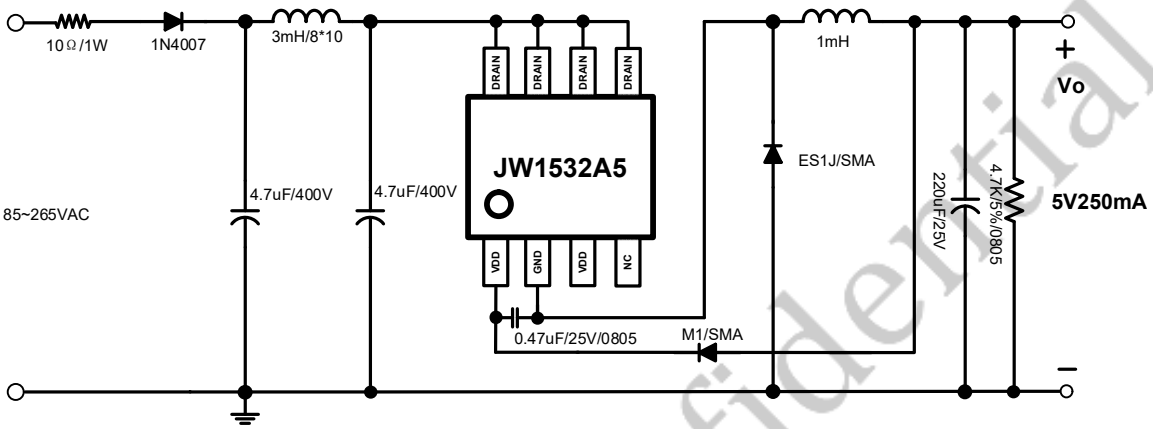
APPLICATION REFERENCE

The reference design is suitable for non-isolated buck power supply default 5V output, using JW1532A5.

V_{IN}: 85~265VAC

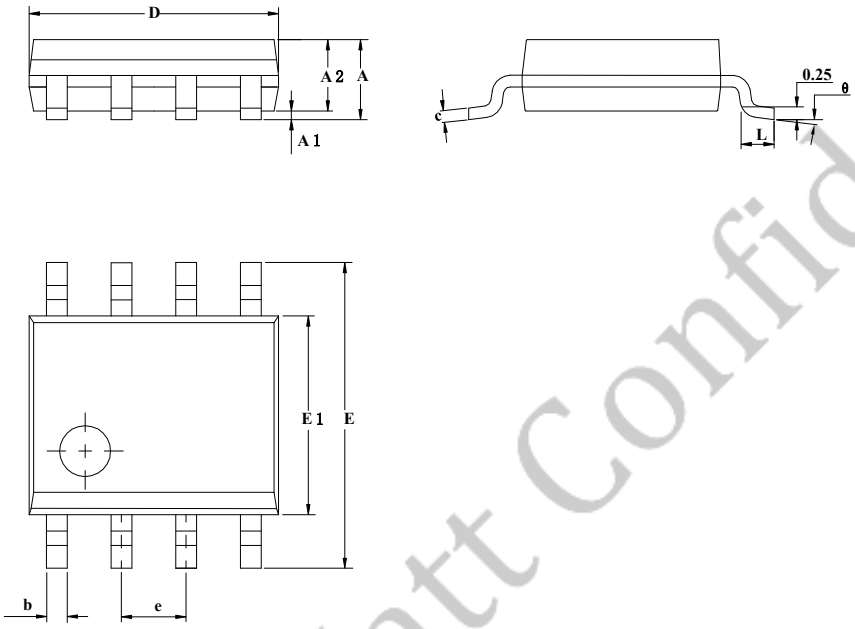
V_{OUT}: 5V

I_{OUT}: 250mA



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
θ	0°	—	8°

IMPORTANT NOTICE

- **Joulwatt Technology Inc. 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 Inc. does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel.**