JW1532M5

High Efficiency Off-line CV Regulator

Preliminary Specifications Subject to Change without Notice

DESCRIPTION

The JW1532M5 is a high efficiency low cost off-line constant voltage regulator for Buck and Buck-Boost topology with 650V MOSFET.

JW1532M5 can output 5V default voltage with few external components, which decreases the system cost. In light load condition, JW1532M5 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.

JW1532M5 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).

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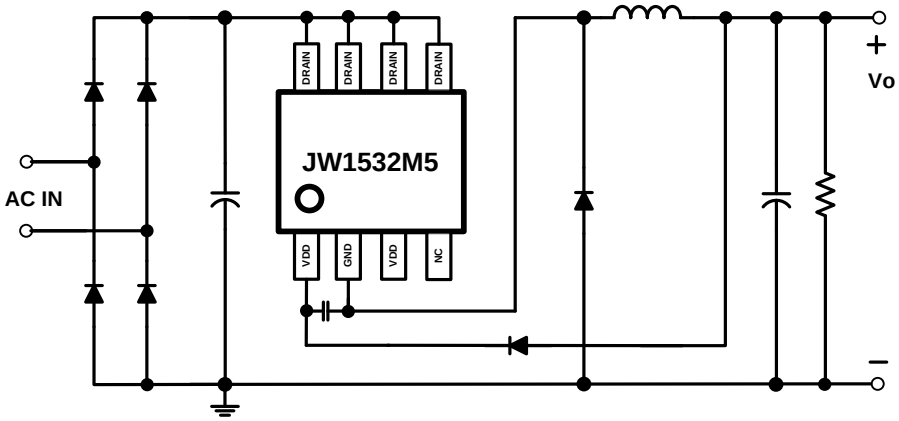
FEATURES

- Ultra Low System BOM Cost
- Integrated with 650V 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 Appliances
- Standby Power
- Consumer Electronics

TYPICAL APPLICATION



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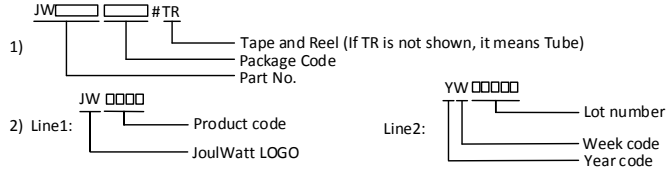
ORDER INFORMATION

DEVICE[1)]	PACKAGE	TOP MARKING[2)]	ENVIRONMENTAL[3)]
JW1532M5SOPB#TR	SOP8	JW1532M5 YW□□□□□	Green

Notes:

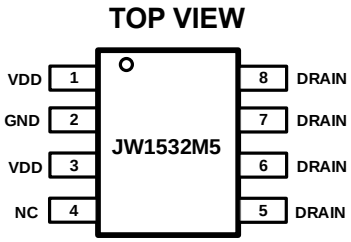


3) All JoulWatt products are packaged with Pb-free and Halogen-free materials and compliant to RoHS standards.

DEVICE INFORMATION

DEVICE	OPERATION MODE AT LIGHT LOAD	PAKAGE	MSL	STATUS
JW1532M5SOPB#TR	PFM	SOP8	MSL3	Available

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

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RECOMMENDED OPERATING CONDITIONS

DRAIN Voltage.....600V

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

Package	Recommended MAX Output Current
SOP8	300mA

THERMAL PERFORMANCE[4)]

	θ_{JA}	$\theta_{JC(top)}$
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 RECOMMENDED OPERATING CONDITIONS.

2) The JW1532M5 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.

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ELECTRICAL CHARACTERISTICS

T_A = 25ºC, unless otherwise stated.

Advance Information, not production data, subject to change without notice.

ITEM	SYMBLE	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}			0.2		A
Oscillator Frequency	f_{osc}			40		kHz
Frequency Jittering Range	$\lvert \pm \Delta f/f_{OSC} \rvert$			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		22		Ω
Over Thermal Protection Threshold[5)]				150		℃
Over Thermal Protection Recovery Hysteresis[5)]				30		℃

Note:

5) Guaranteed by design.

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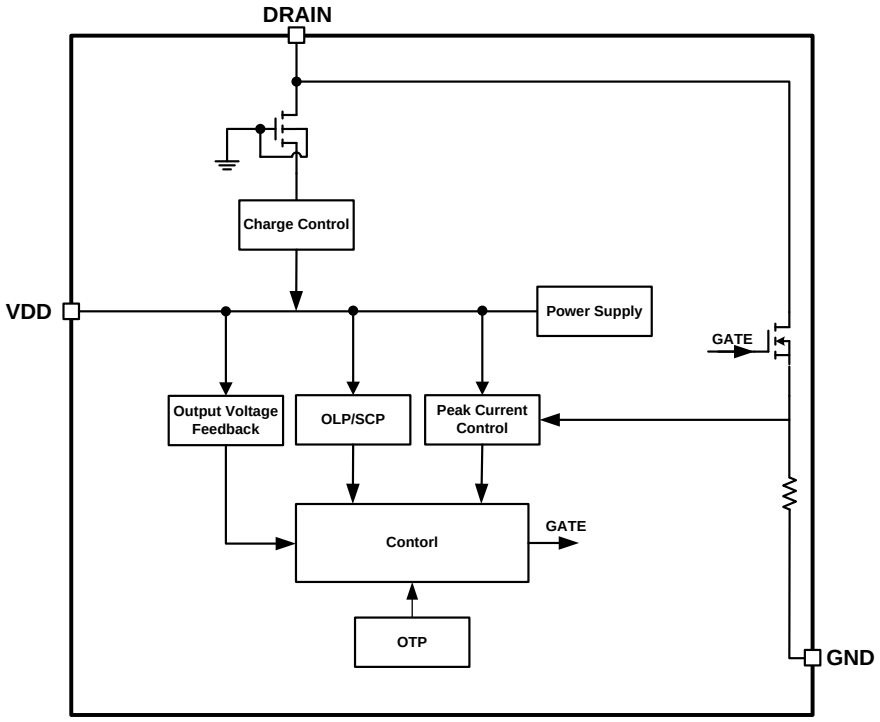
PIN DESCRIPTION

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



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FUNCTIONAL DESCRIPTION

JW1532M5 is a high efficiency low cost off-line constant voltage regulator for Buck and Buck-Boost topology.

Start Up

JW1532M5 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}, JW1532M5 stops switching.

Peak Current Control

JW1532M5 has the default peak current for output current. And it's also 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 JW1532M5 is fixed to f_{osc} with ±8% Jittering to improve the EMI performance.

Green Mode

In light or no load condition, JW1532M5 operates in DCM which means the OFF time is very long. JW1532M5 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}. JW1532M5 will operate in auto-restart mode which is represented in the following description if VDD<V_{DDREF} for some time.

Auto-restart Mode

JW1532M5 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, JW1532M5 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.

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REFERENCE DESIGN

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.

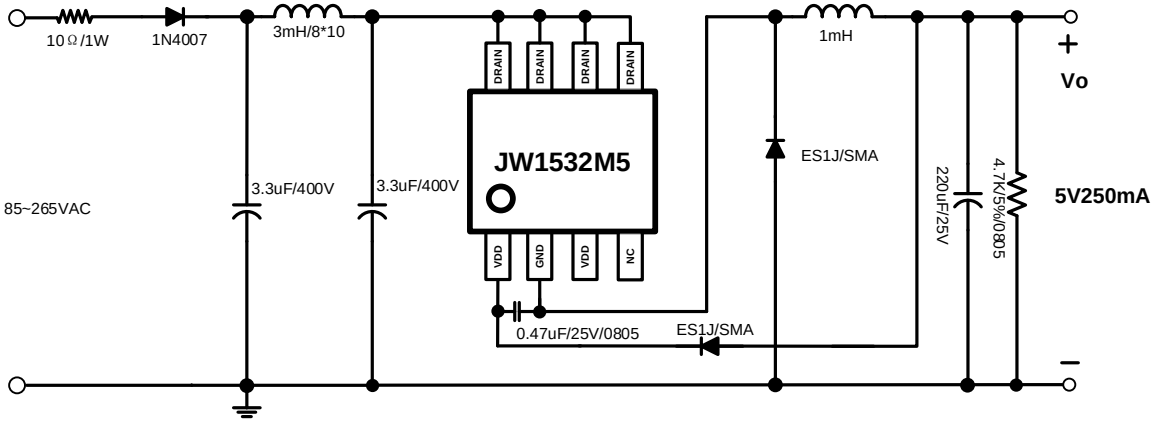
Reference:

The reference design is suitable for non-isolated buck power supply default 5V output, using JW1532M5.

V_{IN}: 85~265VAC

V_{OUT}: 5V

I_{OUT}: 250mA



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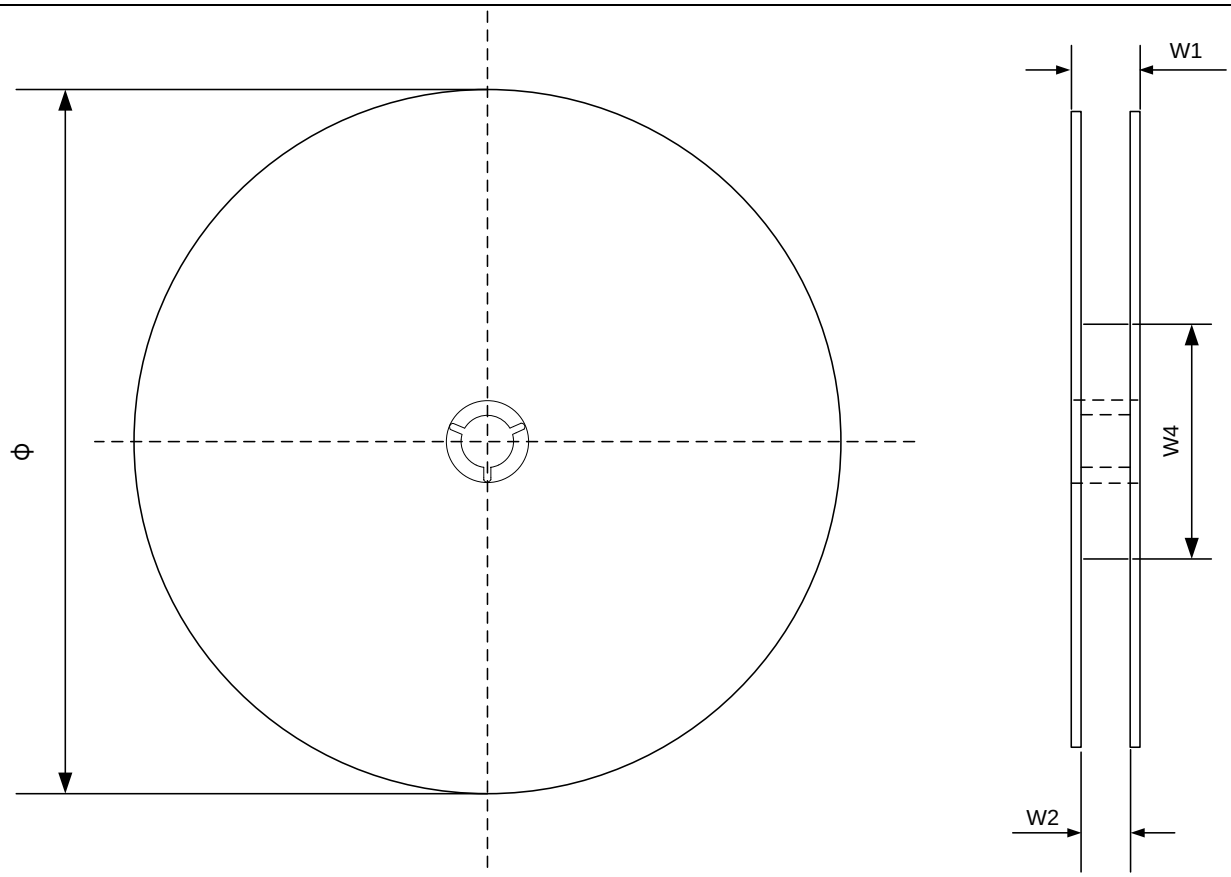
TAPE AND REEL INFORMATION

Reel UNIT: mm



Package	Diameter Φ	Thickness W1	Width W2	W4
SOP8	330±2	17.6±2	12.4±2	100±2

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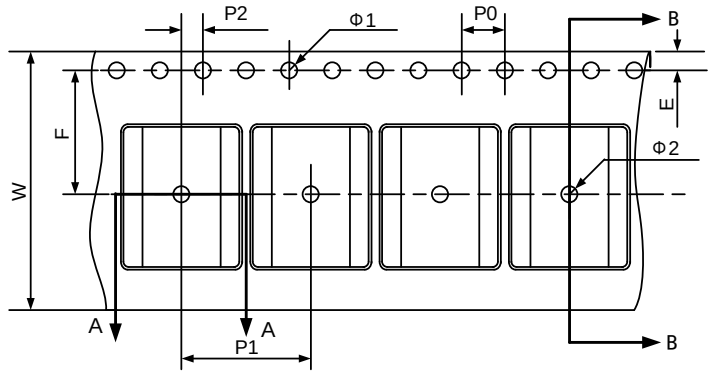
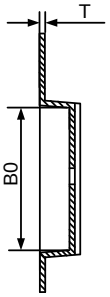
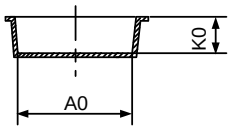
Carrier Tape UNIT: mm





SECTION B-B



SECTION A-A

Note :

1) The carrier type is black, and colorless transparent.
2) Carrier camber is within 1mm in 100mm.
3) 10 pocket hole pitch cumulative tolerance:±0.20.
4) All dimensions are in mm.

Package	Tape dimension (mm)											
	P0	P2	P1	A0	B0	W	T	K0	Φ1	Φ2	E	F
SOP8	4.0±0.1	2.0±0.1	8.0±0.1	6.40±0.3	5.35±0.3	12.0±0.3	0.25±0.2	2.00±0.2	1.50min	1.50min	1.75±0.1	5.50±0.10

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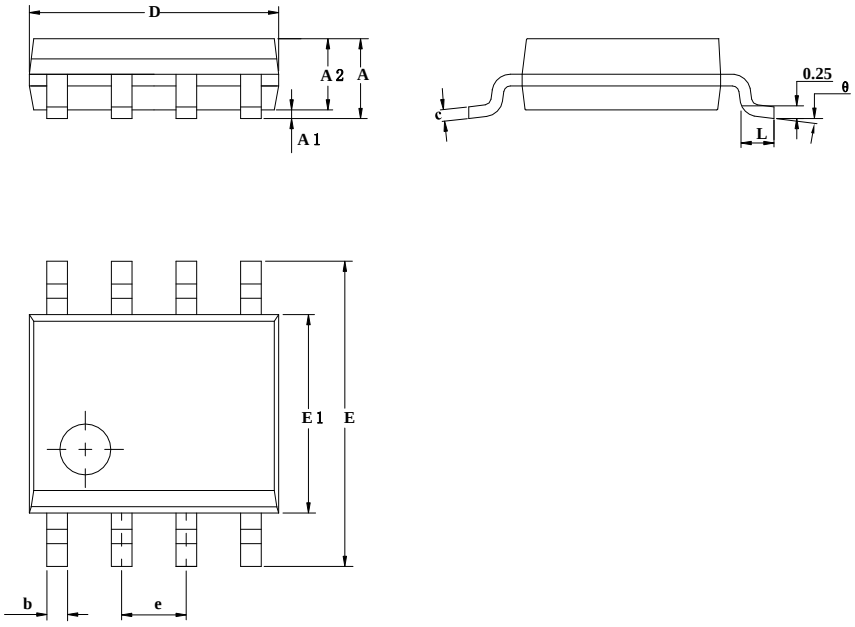
PACKAGE OUTLINE

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°

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