JW1530

High Efficiency Off-line CV Regulator

Parameters Subject to Change Without Notice

DESCRIPTION

The JW®1530 is a high efficiency low cost off-line constant voltage regulator for Buck and Buck-Boost topology with 700V MOSFET integrated.

JW1530 can output 5V default voltage with few external components, which decreases the system cost. In light load condition, JW1530 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.

JW1530 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).

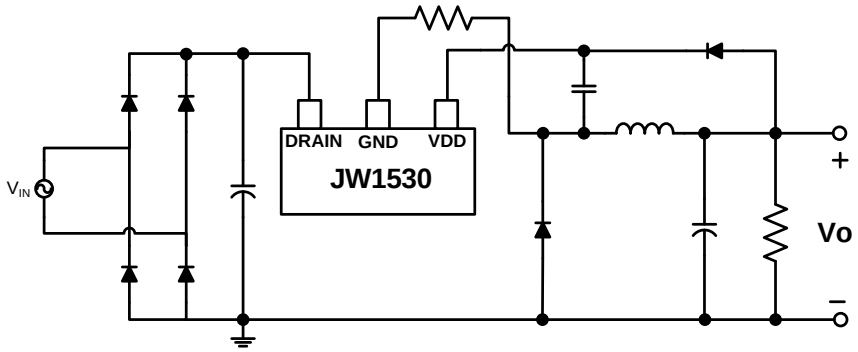
FEATURES

- Ultra low system BOM cost
- Integrated with 700V, low Rdson MOSFET
- 5V default output voltage
- Peak current mode control
- Built-in 30KHz Oscillator with frequency Jittering
- High efficiency over wide operating range
- VDD UVLO
- Short circuit protection
- Pulse-by-pulse current limit
- Over temperature protection
- TO-92,SOT23-3 package

APPLICATIONS

- Homeappliance
- Standby power
- Consumer electronics

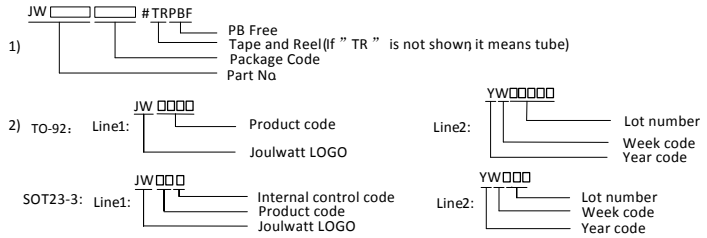
TYPICAL APPLICATION



ORDER INFORMATION

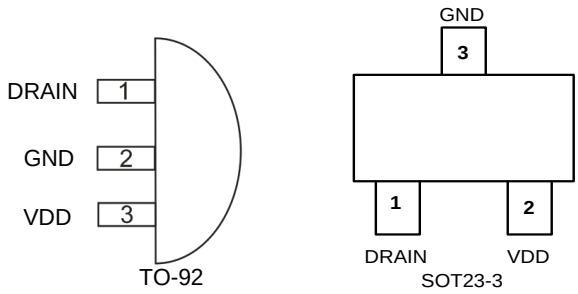
DEVICE[1)]	PACKAGE	TOP MARKING[2)]
JW1530TOC#TPBF	TO-92	JW1530 YW□□□□□
JW1530SOTF#TRPBF	SOT23-3	JWMD□ YW□□□

Notes:



PIN CONFIGURATION

TOP VIEW



ABSOLUTE MAXIMUM RATING[1)]

VDD Voltage.....6V
DRAIN Voltage.....700V
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.....450V

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

Package	Recommended MAX Output Current （T_J=125℃） 4)
TO-92	180mA
SOT23-3	160mA

THERMAL PERFORMANCE 5)

	θ_{JA}	θ_{JC}
TO-92	120	60ºC/W
SOT23-3	313.1	144º ºC/W

Note：

1) Exceeding these ratings may damage the device.

2) 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) 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 absolutemaximum operating junction temperature may damage the device.

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	IQ	VDD=5V		110	140	μA
VDD Startup Voltage	V_{DD_ST}		4.4	4.7	4.95	V
VDD Under Voltage Lockout	V_{DD_UVLO}		3.3	3.6	4	V
Output Reference Voltage	V_{REF}		5.37	5.6	5.83	V
Peak Current Reference Voltage	V_{PK}		490	520	550	mV
Power Mos Breakdown Voltage	BV		700			V
Power Mos Rdson[5)]	Rdson			15		Ω
Oscillator Frequency	f_{osc}		23	30	36	kHz
Frequency Jittering Range[5)]	$\Delta f/f_{OSC}$		-5		5	%
Frequency Jittering Period	T_{Jit}			15		ms
Maximum On Time[5)]	T_{ONMAX}		7	10	12.5	μs
Leading Edge Blanking Time	T_{LEB}		220	300	400	ns
Over Thermal Protection Threshold[5)]	$Temp_{OTP}$			150		℃

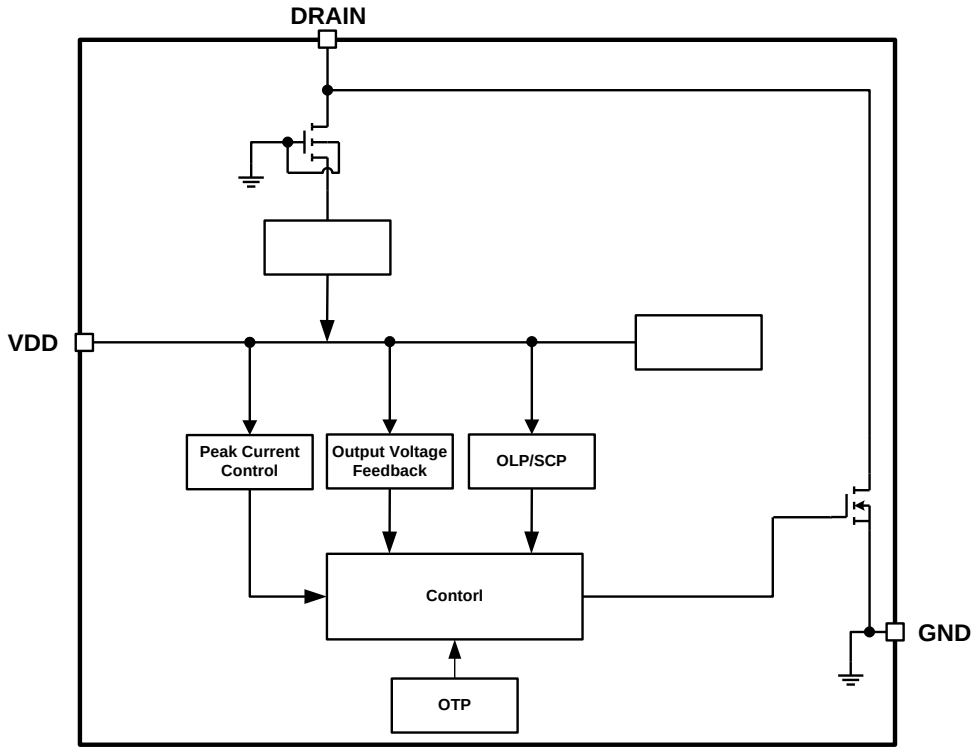
Note：

6) Guaranteed by design.

PIN DESCRIPTION

Pin TO-92	Name	Description
1	DRAIN	The drain of MOSFET
2	GND	Chip ground
3	VDD	Power supply pin

BLOCK DIAGRAM



FUNCTIONAL DESCRIPTION

JW1530 is a high efficiency low cost off-line constant voltage regulator for Buck and Buck-Boost topology.

Start Up

JW1530 can be supplied fromMOS DRAIN directly.When the internal high voltage (HV)power souse charges VDD up to the V_{DD_ST}, the gatedriver starts to switch. VDD will be powered by output voltage in steady state.Once the voltageof VDD is lower than V_{DD_UVLO}, JW1530 stops switching.

Peak Current Control

JW1530 controls the inductor peak current of the inductor from theinformation of the current sensing resistor. The peak current can be calculated as:

$$Ipeak=V_{PK}/R_{CS}$$

Where,

V_{PK} is the peak current reference voltage;

R_{CS} – the sensing resistor connected between chip GND and the VDD capacitor ground.

Normally Ipeak should be larger than 1.5*Io_max to avoid false triggered OLP.

Constant Voltage Control

The output voltage is sensed by VDD pin. The MOS is turned off if the current of the inductor reaches the designed value, and turned on if $VDD<V_{REF}\&f_s\leqslant f_{osc}$. The switching frequency of JW1530 is fixed to f_{osc} with $\pm$5% Jitteringto improve the EMI performance when $VDD<V_{REF}$. If $VDD>V_{REF}\&f_s\leqslant f_{osc}$, JW1530 keeps off until $VDD<V_{REF}$ again.

Green Mode

In light or no load condition, JW1530 operates in DCM which means the OFF timeis very long. JW1530 will reduce the peak current of the inductor to minimize the power loss. The longer Toff, the lower Ipeak. Also, the reference voltage V_{REF} is decreased to ensure good load regulation.

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

In short circuit or over loadcondition, VDD can't be charged to V_{REF}. JW1530 will operate in auto-restart mode which is represented in the following description if $VDD<V_{REF}$ for 120ms.

Auto-restart Mode

JW1530 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 4.2V. If VDD is charged to 4.5V for 24 times, the system restarts.

Over Temperature Protection

When internal temperature of the chip exceeds 150°C, JW1530 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.

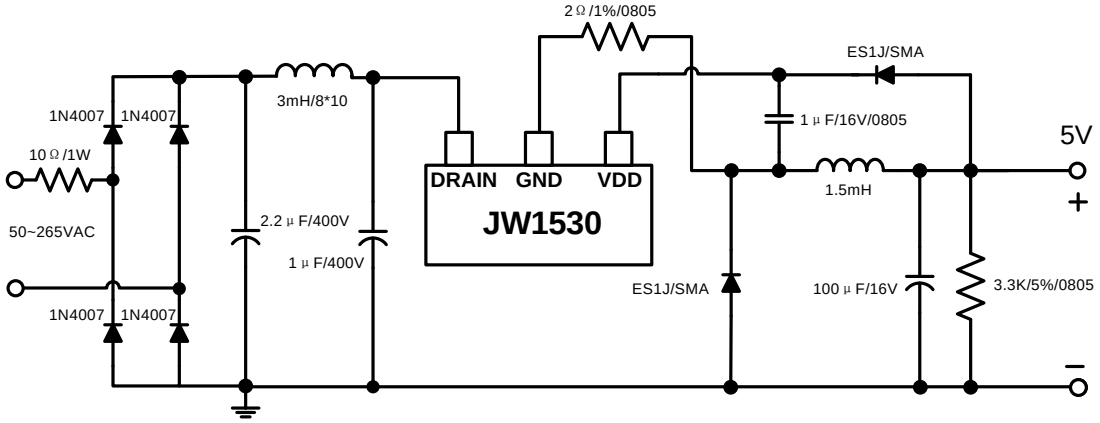
APPLICATION REFERENCE

The reference design is suitable for non-isolated buck power supply default 5V output, using JW1530.

V_{IN}: 50~265VAC

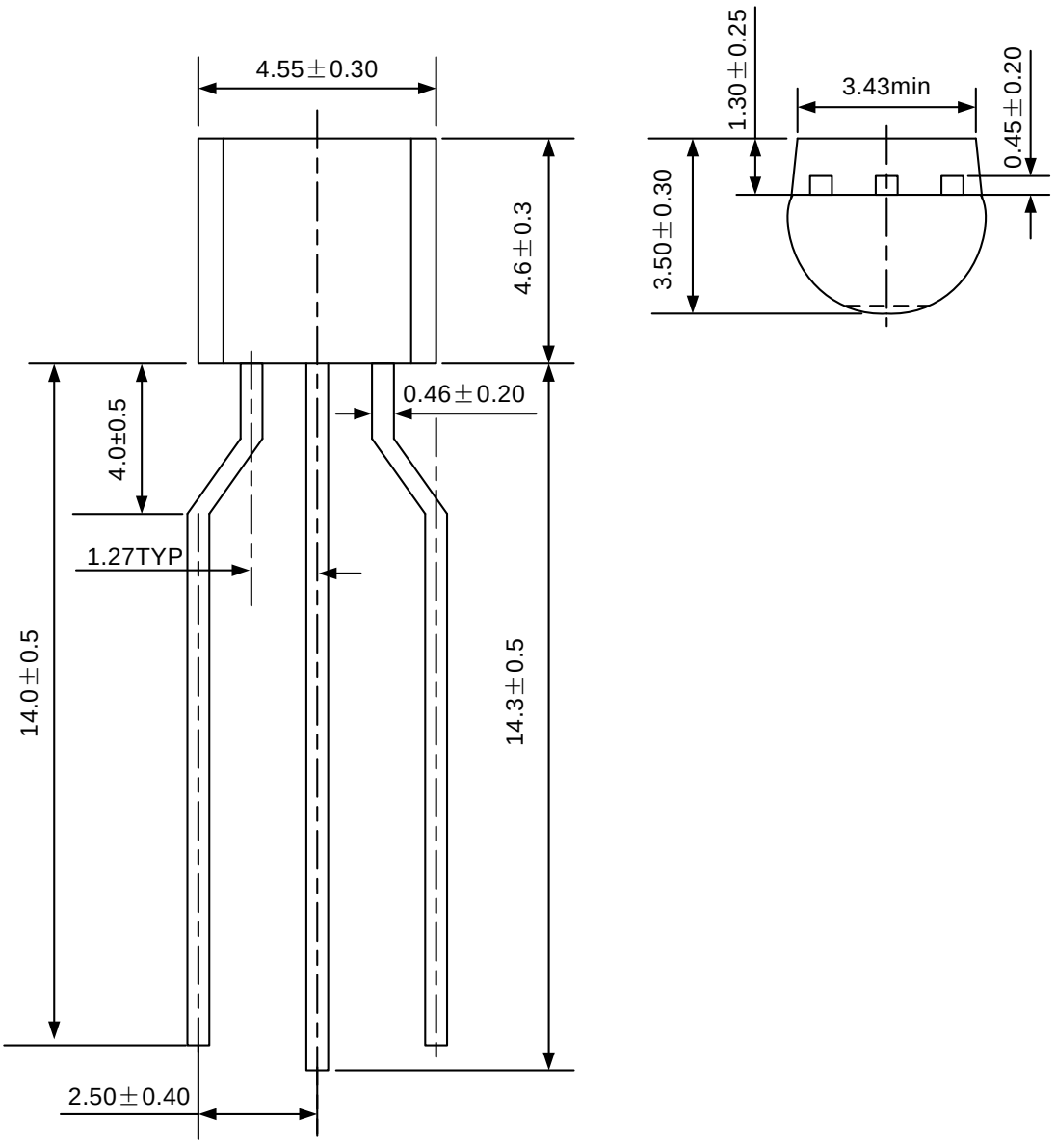
V_{OUT}: 5V

I_{OUT}: 150mA

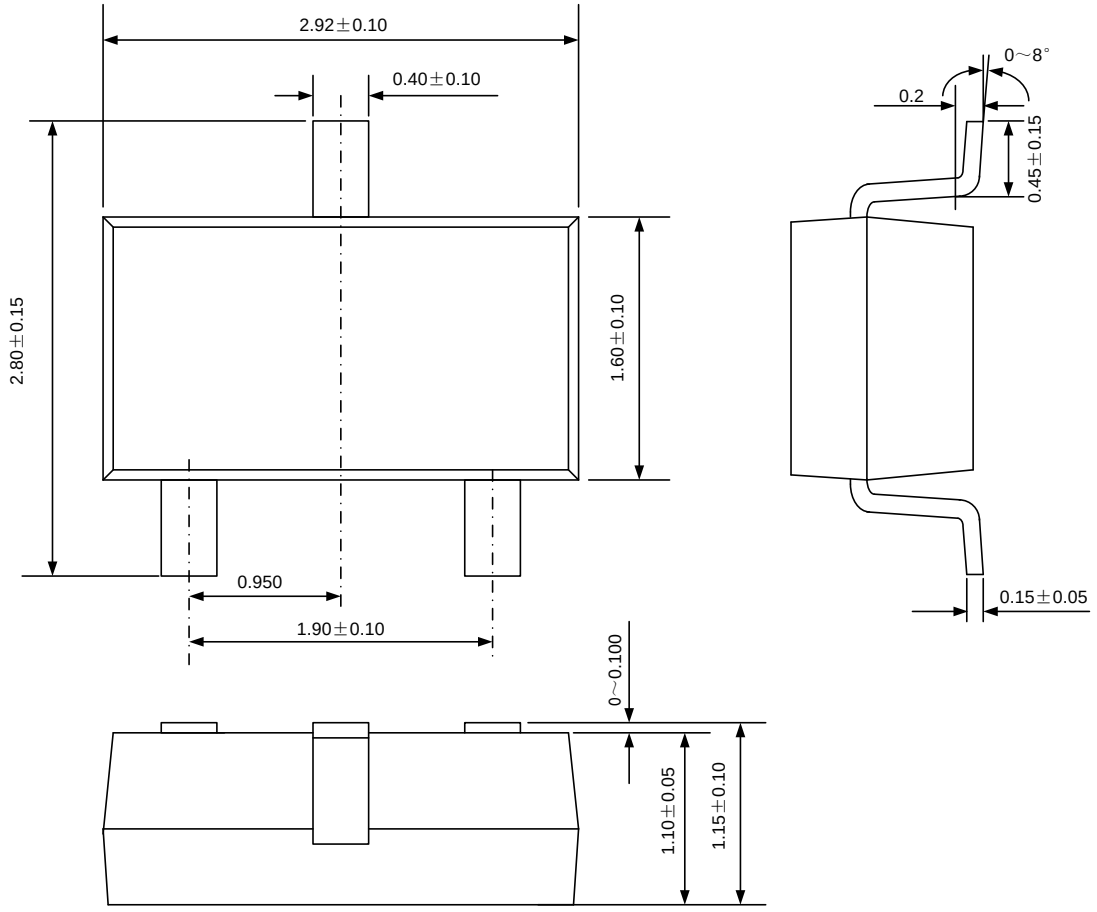


PACKAGE OUTLINE

TO-92 UNIT : mm



SOT23-3 **UNIT :** mm



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