

Parameters Subject to Change Without Notice

### DESCRIPTION

The JW<sup>®</sup>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).

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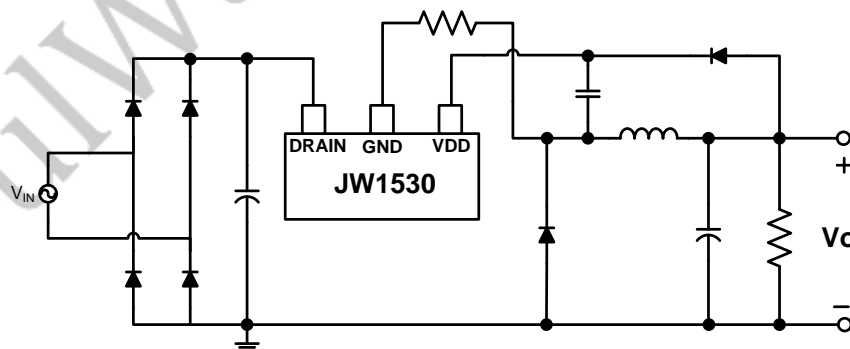
### FEATURES

- Ultra low system BOM cost
- Integrated with 700V, low R<sub>dson</sub> 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

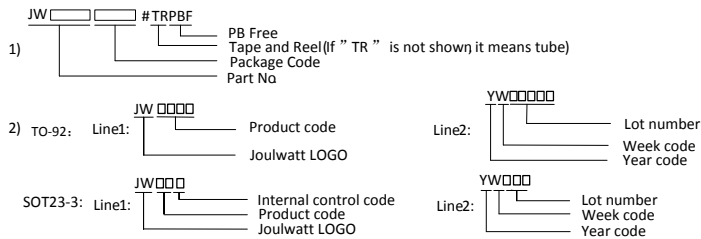
### TYPICAL APPLICATION



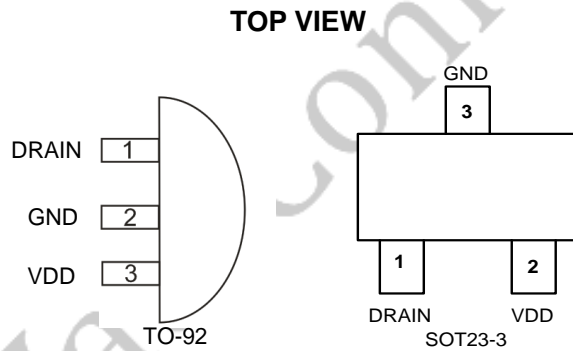
**ORDER INFORMATION**

DEVICE <sup>1)</sup>	PACKAGE	TOP MARKING <sup>2)</sup>
JW1530TOC#TPBF	TO-92	JW1530 YW□□□□□
JW1530SOTF#TRPBF	SOT23-3	JWMD□ YW□□□

**Notes :**



**PIN CONFIGURATION**



**ABSOLUTE MAXIMUM RATING<sup>1)</sup>**

VDD Voltage.....	6V
DRAIN Voltage.....	700V
Junction Temperature <sup>2) 3)</sup> .....	150°C
Lead Temperature.....	260°C
Storage Temperature.....	-65°C to +150°C
ESD Susceptibility (Human Body Model) .....	2.5kV

**RECOMMENDED OPERATING CONDITIONS**

DRAIN Voltage.....450V  
 Operating Junction Temp (T<sub>J</sub>) .....-40°C to 125°C

Package	Recommended MAX Output Current (T <sub>J</sub> =125°C) <sup>4)</sup>
TO-92	180mA
SOT23-3	160mA

**THERMAL PERFORMANCE<sup>5)</sup>**

$\theta_{JA}$        $\theta_{JC}$

TO-92.....120.....60°C/W  
 SOT23-3.....313.1...144° °C/W

**Note:**

- 1) Exceeding these ratings may damage the device.
- 2) Guarantees robust performance from -40°C to 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 absolute maximum operating junction temperature may damage the device.
- 4) The maximum output current is recommended in the application according to chip junction temperature T<sub>J</sub>=125°C (chip case temperature difference about 20°C). The maximum output current could be increased properly if the heat dissipation is better.
- 5) Measured on JESD51-7, 4-layer PCB.

## ELECTRICAL CHARACTERISTICS

$T_A=25\text{ }^\circ\text{C}$ , unless otherwise stated.						
Item	Symbol	Condition	Min.	Typ.	Max.	Units
VDD Quiescent Current	I <sub>Q</sub>	VDD=5V		110	140	μA
VDD Startup Voltage	V <sub>DD_ST</sub>		4.4	4.7	4.95	V
VDD Under Voltage Lockout	V <sub>DD_UVLO</sub>		3.3	3.6	4	V
Output Reference Voltage	V <sub>REF</sub>		5.37	5.6	5.83	V
Peak Current Reference Voltage	V <sub>PK</sub>		490	520	550	mV
Power Mos Breakdown Voltage	BV		700			V
Power Mos Rdson <sup>5)</sup>	Rdson			15		Ω
Oscillator Frequency	f <sub>osc</sub>		23	30	36	kHz
Frequency Jittering Range <sup>5)</sup>	Δf/f <sub>OSC</sub>		-5		5	%
Frequency Jittering Period	T <sub>Jit</sub>			15		ms
Maximum On Time <sup>5)</sup>	T <sub>ONMAX</sub>		7	10	12.5	μs
Leading Edge Blanking Time	T <sub>LEB</sub>		220	300	400	ns
Over Thermal Protection Threshold <sup>5)</sup>	Temp <sub>OTP</sub>			150		°C

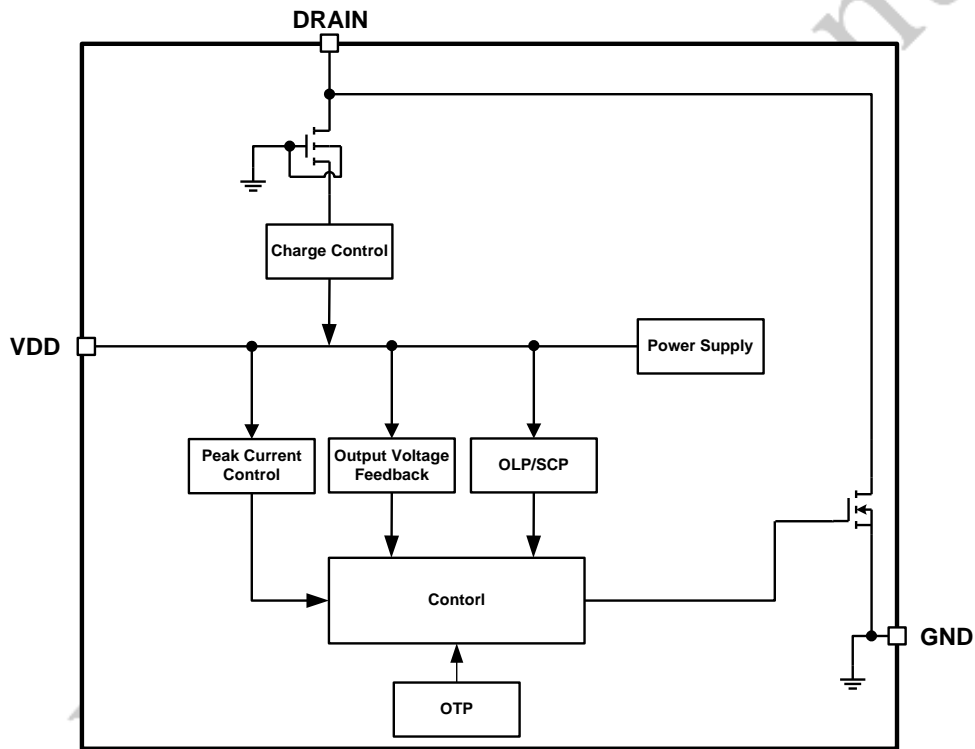
**Note:**

- 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 from MOS DRAIN directly. When the internal high voltage (HV) power source 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 voltage of VDD is lower than  $V_{DD\_UVLO}$ , JW1530 stops switching.

**Peak Current Control**

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

$$I_{peak} = V_{PK} / R_{CS}$$

Where,

$V_{PK}$  is the peak current reference voltage;  
 $R_{CS}$  – the sensing resistor connected between chip GND and the VDD capacitor ground.  
 Normally  $I_{peak}$  should be larger than  $1.5 * I_{o\_max}$  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  $V_{DD} < V_{REF} \& f_s \leq f_{osc}$ . The switching frequency of JW1530 is fixed to  $f_{osc}$  with  $\pm 5\%$  Jittering to improve the EMI performance when  $V_{DD} < V_{REF}$ . If  $V_{DD} > V_{REF} \& f_s \leq f_{osc}$ , JW1530 keeps off until  $V_{DD} < V_{REF}$  again.

**Green Mode**

In light or no load condition, JW1530 operates in DCM which means the OFF time is very long. JW1530 will reduce the peak current of the inductor to minimize the power loss. The longer  $T_{off}$ , the lower  $I_{peak}$ . 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 load condition, VDD can't be charged to  $V_{REF}$ . JW1530 will operate in auto-restart mode which is represented in the following description if  $V_{DD} < V_{REF}$  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.

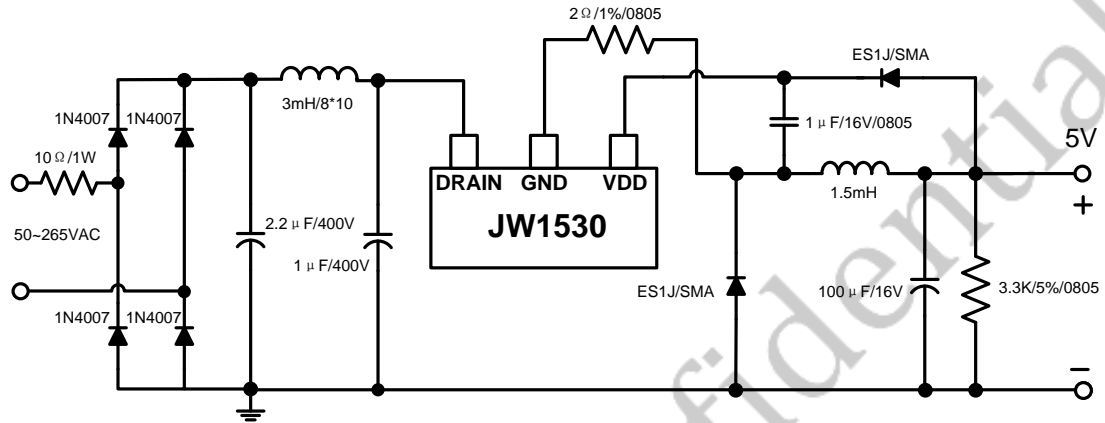
APPLICATION REFERENCE

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

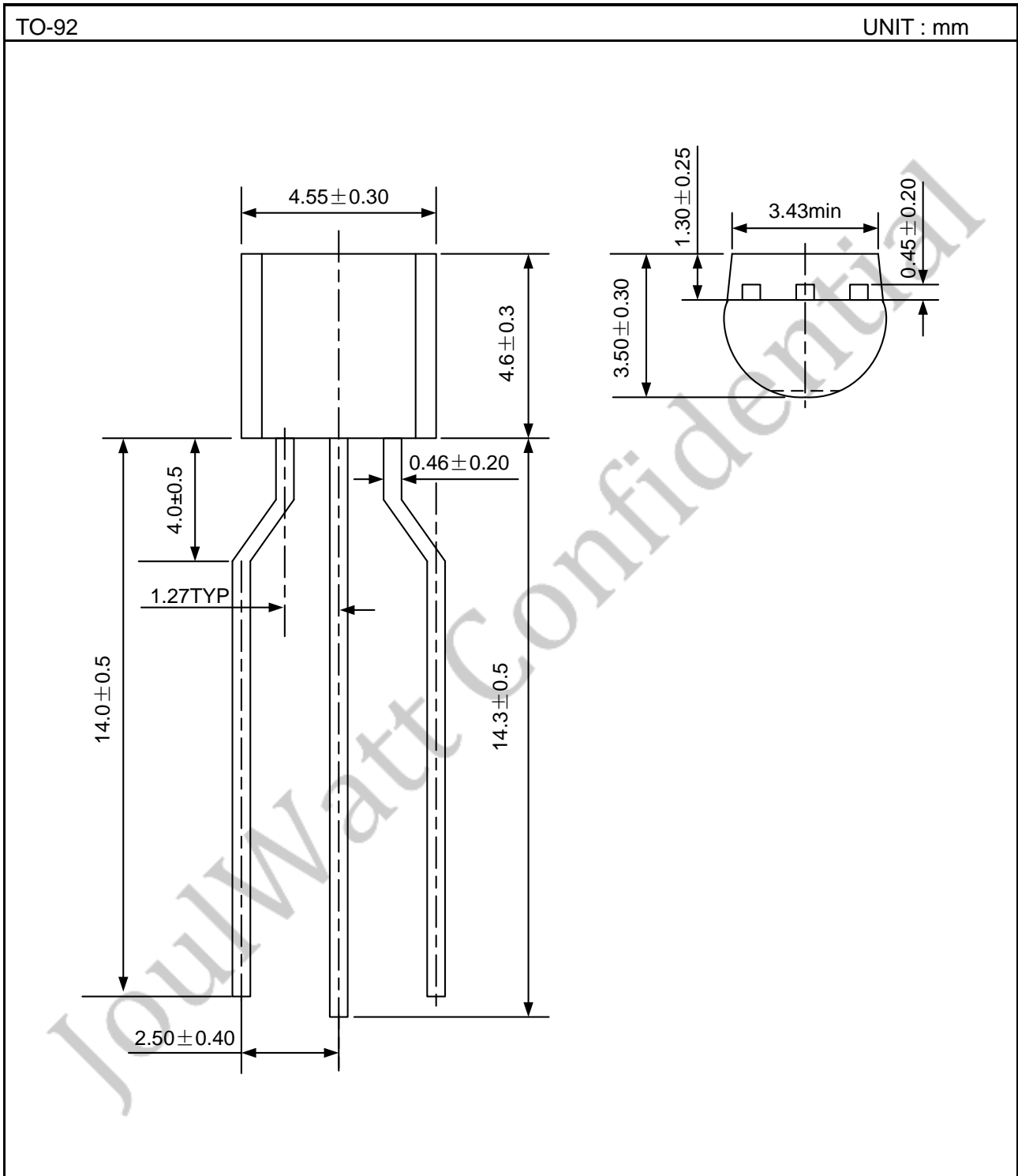
V<sub>IN</sub>: 50~265VAC

V<sub>OUT</sub>: 5V

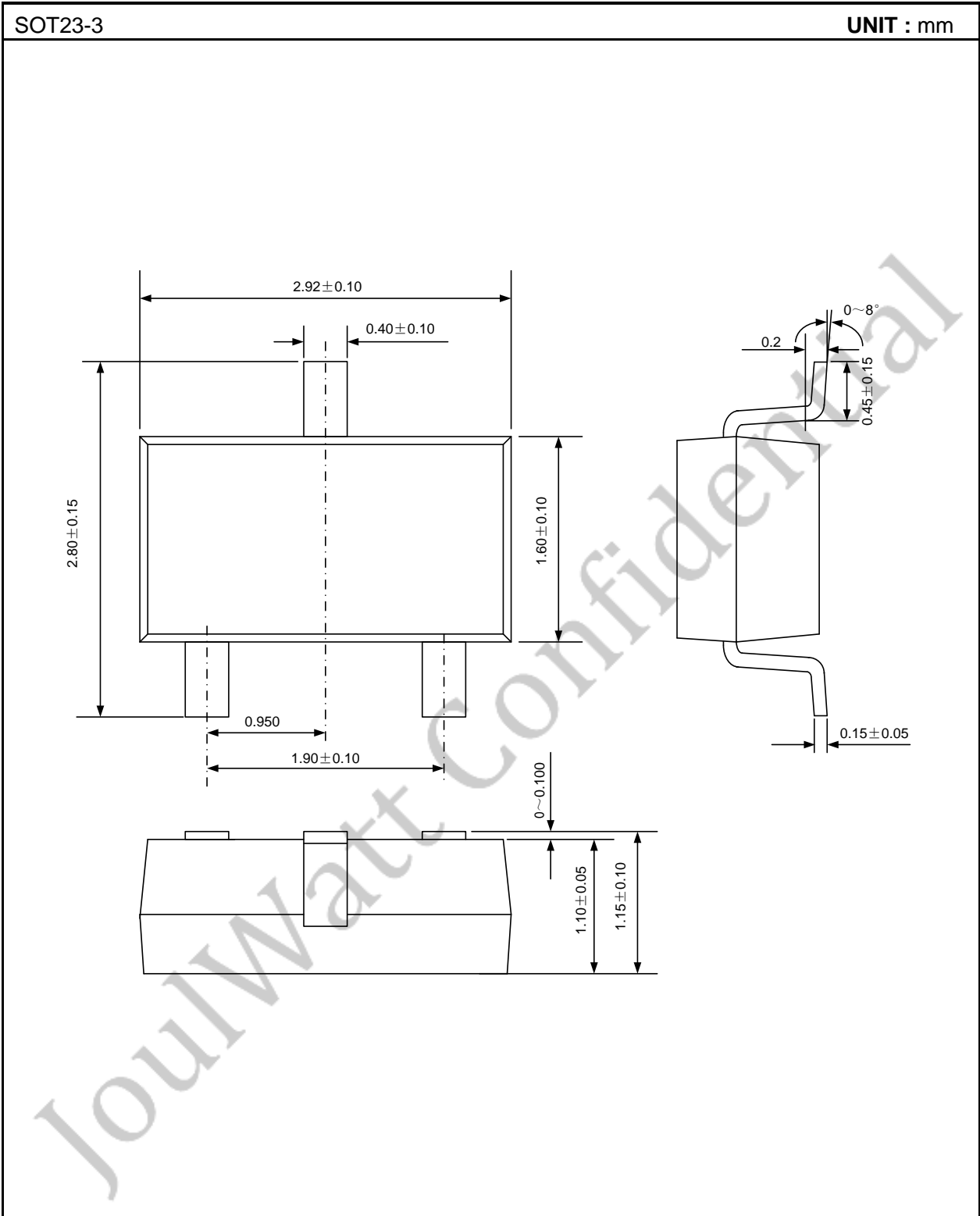
I<sub>OUT</sub>: 150mA



PACKAGE OUTLINE







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