

*Parameters Subject to Change Without Notice*

## DESCRIPTION

JW1792 is a non-isolated, constant output current step-down LED driver with 500V MOSFET integrated. Operating in the boundary mode makes it high efficiency and low radiation. Patented algorithms ensure good current accuracy and excellent line/load regulations with lowest BOM cost.

JW1792 is supplied from the MOSFET drain directly, so the auxiliary winding is eliminated, which can light up the LED within 100mS.

With unique sampling techniques, JW1792 has multi-protection functions which can largely enhance the safety and reliability of the system, including VDD UVLO, inductor short protection, LED short protection and over-temperature protection.

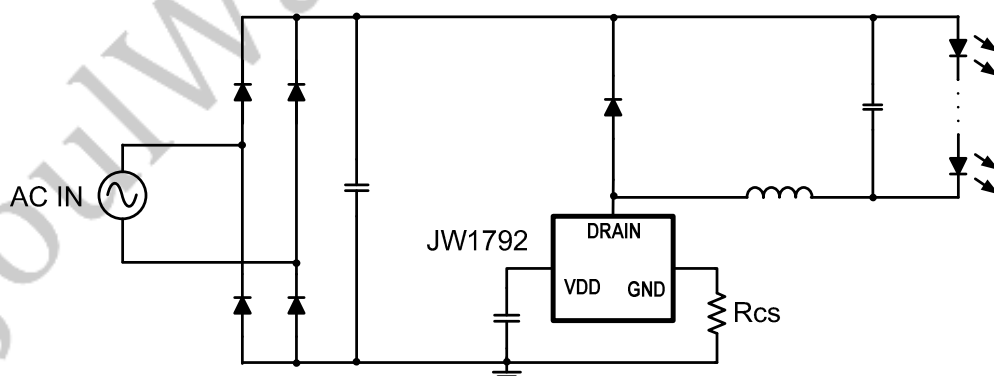
## FEATURES

- Integrate 500V, Low  $R_{ds(on)}$  MOSFET
- Excellent line/load regulation
- Boundary mode operation
- High efficiency
- LED SCP
- VDD UVLO
- Over-temperature protection
- Brown Out Protection
- Inductor short protection
- TO-92, SOP8 and SOT23-3 package

## APPLICATIONS

- LED Lighting

## TYPICAL APPLICATION



## ORDER INFORMATION

LEAD FREE FINISH	TAPE AND REEL	PACKAGE	TOP MARKING
	JW1792TOC#TPBF	TO-92	JW1792
JW1792SOPB#PBF	JW1792SOPB#TRPBF	SOP8	JW1792
JW1792SOTF#PBF	JW1792SOTF#TRPBF	SOT23-3	JWBW

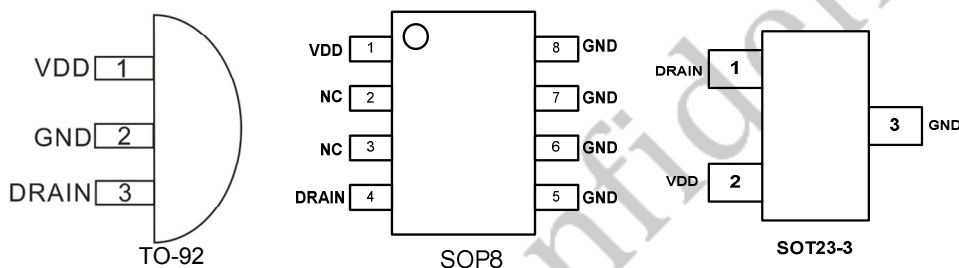
## Note:

JWXXXXPPP#TPBF  
 └─ Part Number    └─ Package Code    └─ Pb Free    └─ Tape and Reel (If "TR" is not shown, it means Tube)

JWXXXXPPP#TRPBF  
 └─ Part Number    └─ Package Code    └─ Pb Free    └─ Tape and Reel (If "TR" is not shown, it means Tube)

## PIN CONFIGURATION

## TOP VIEW

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

DRAIN Voltage.....	550V
VDD Voltage.....	12V
GND Voltage.....	-0.3V to 12V
Junction Temperature <sup>2)3)</sup> .....	150°C
Storage Temperature.....	-65°C to +150°C

## RECOMMENDED OPERATING CONDITIONS

DRAIN Voltage .....	500V
Operating Junction Temp. ....	-40°C to 125°C

THERMAL PERFORMANCE<sup>4)</sup>

	$\theta_{JA}$	$\theta_{JC}$
TO-92 .....	120	60°C/W
SOP8.....	90	45°C/W
SOT23-3.....	313.1	144°C/W

## Note:

- 1) Exceeding these ratings may damage the device.
- 2) The JW1792 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) The JW1792 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.

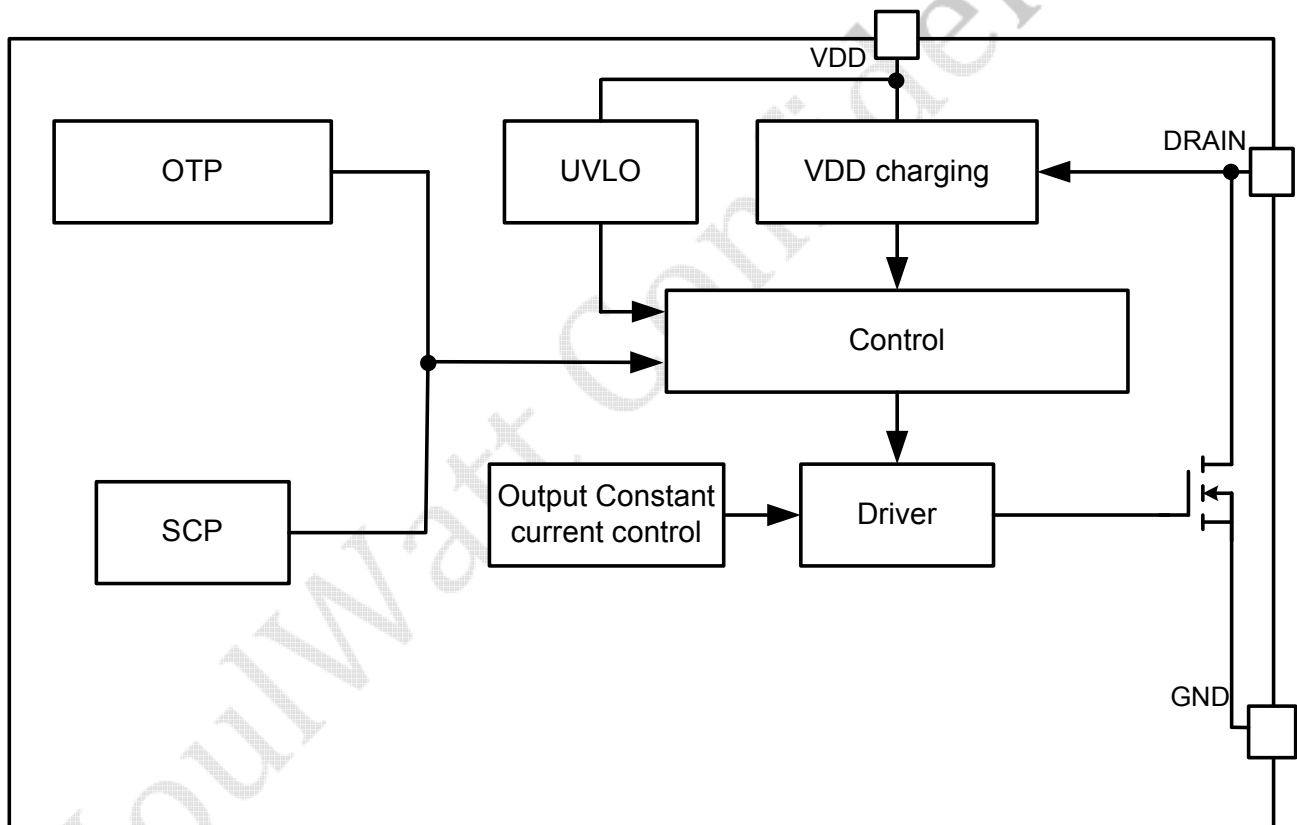
## ELECTRICAL CHARACTERISTICS

<i>T<sub>A</sub>=25 °C, unless otherwise stated</i>						
Item	Symbol	Condition	Min.	Typ.	Max.	Units
V <sub>DD</sub> Regulation Voltage	V <sub>DD</sub>			7.4		V
V <sub>DD</sub> Start Up threshold	V <sub>DD_ST</sub>	V <sub>DD</sub> rising		7.1		V
V <sub>DD</sub> Under Voltage Lockout	V <sub>DD_UVLO</sub>	V <sub>DD</sub> falling		6		V
V <sub>DD</sub> IQ	I <sub>Q</sub>	V <sub>DD</sub> =7.4V		150		uA
MOS Max ON Time	T <sub>ONMAX</sub>			30		us
MOS Min ON Time	T <sub>ONMIN</sub>			0.4		us
MOS Max OFF Time	T <sub>OFFMAX</sub>			400		us
MOS Min OFF Time	T <sub>OFFMIN</sub>			1.3		us
Leading Edge Blanking Time	T <sub>LEB</sub>			400		ns
MOS Max Current	I <sub>MAX</sub>			0.7		A
MOS BV Voltage	V <sub>BRDSS</sub>			550		V
MOS R <sub>dson</sub>	R <sub>dson</sub>	I(DRAIN)=50mA,		14		Ω
Thermal Protection Threshold	OTP <sub>CHIP</sub>			145		°C

## PIN DESCRIPTION

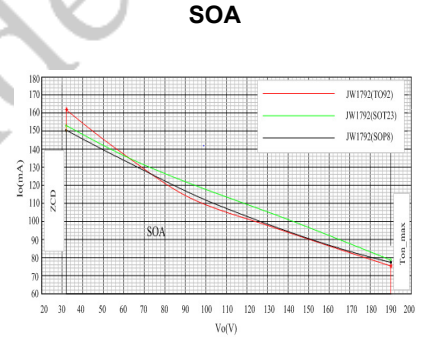
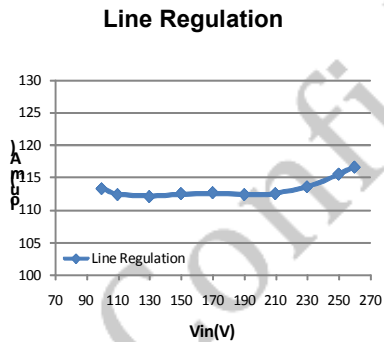
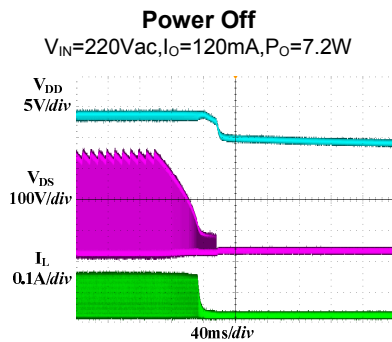
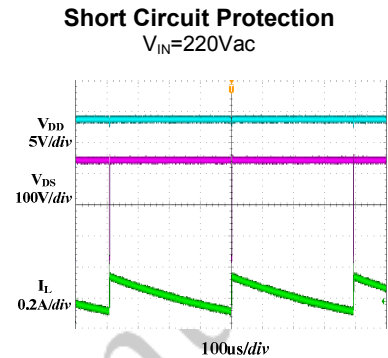
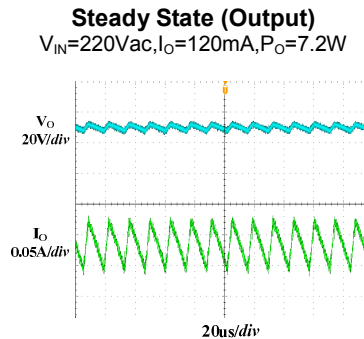
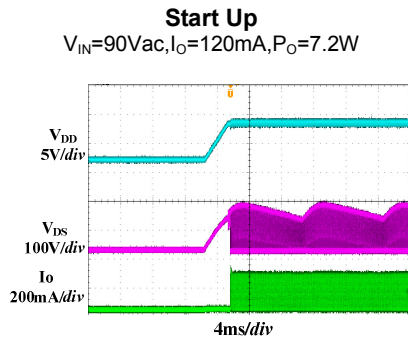
Pin TO-92	Name	Description
1	VDD	This pin supplies current to the internal start-up circuitry. This pin must be locally bypassed with a capacitor
2	GND	Chip ground
3	DRAIN	The drain of MOSFET

## BLOCK DIAGRAM



## TYPICAL PERFORMANCE CHARACTERISTICS

Waveforms ,  $V_{IN}=90\sim 260V_{ac}$ ,  $I_O=120mA$ ,  $V_O=60V$  or 20LEDs ( $V_F=3V$ ) in series



## FUNCTIONAL DESCRIPTION

The JW1792 is a constant current LED driver which applies to non-isolation step-down LED system. JW1792 can achieve excellent line and load regulation, high efficiency and low system cost with few peripheral components.

### Start Up

When the internal high voltage start-up circuit charges VDD up to the turn-on threshold, the gate driver starts to switch. In the normal working state, the current source charges VDD to 7.4V when the power MOSFET is off. Once the voltage of VDD is lower than 6V, JW1792 stops switching.

### Constant Current Control

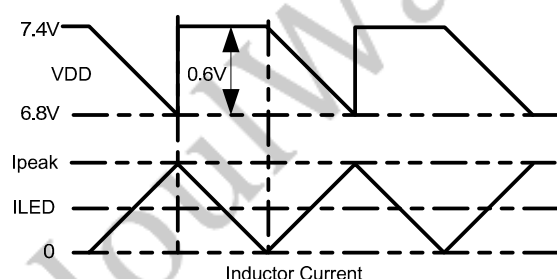
JW1792 controls the output current from the information of the current sensing resistor. The output LED average current can be calculated as:

$$I_{LED} = 0.3 / R_{CS}$$

Where,

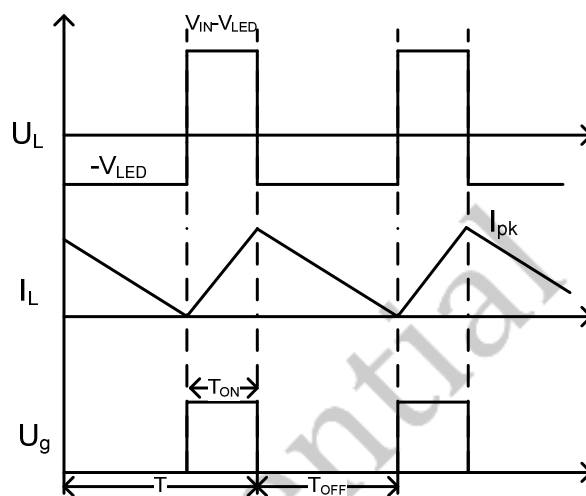
$R_{CS}$  – the sensing resistor connected between chip GND and the VDD capacitor ground.

The inductor current and VDD waveforms are as follows:



### Critical Conduction Mode Operation

JW1792 works in the critical conduction mode of the inductor current. When the internal power MOSFET turns on, the inductor current increases from zero linearly. The turn on time of the MOSFET can be calculated as:



$$T_{ON} = 2 I_{LED} \times L / (V_{IN} - V_{LED})$$

Where,

$L$  – inductance.

$I_{LED}$  – output led current.

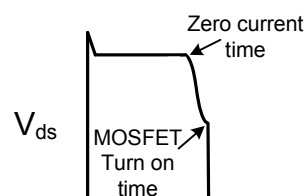
$V_{IN}$  – input voltage after rectification and filtering.

$V_{LED}$  – output voltage.

When the power MOSFET turns off, the inductor current decreases. The power MOSFET turns on again when the inductor current is zero. The turn-off time of the MOSFET can be calculated as:

$$T_{OFF} = 2 I_{LED} \times L / V_{LED}$$

JW1792 works in quasi-resonant mode. When the inductor current decreases to zero, resonance takes place between the power inductor, MOSFET output capacitor and stray capacitor. JW1792 can detect the zero-current signals of the inductor, and turn on the MOSFET in the valley, which can reduce the power loss and the EMI radiation. If JW1792 cannot get the zero current signals, the turn off time will be changed to 400uS.



**Over Temperature Protection**

When JW1792 temperature is higher than 145°C, LED current reduces, and if it is higher than 155°C, the output current reduces to zero.

**LED Short Protection**

When the output is shorted, JW1792 can't get the zero current signals. JW1792 stops switching for 400uS until the next pulse.

**PCB Layout Guidelines**

1. The VDD pin must be locally bypassed by a ceramic capacitor.
2. Make the area of the power loop as small as possible in order to reduce the EMI radiation.

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## APPLICATION REFERENCE

This reference design is suitable for 5~ 8W non-isolated Step-down LED driver, using JW1792, with high efficiency, excellent line regulation.

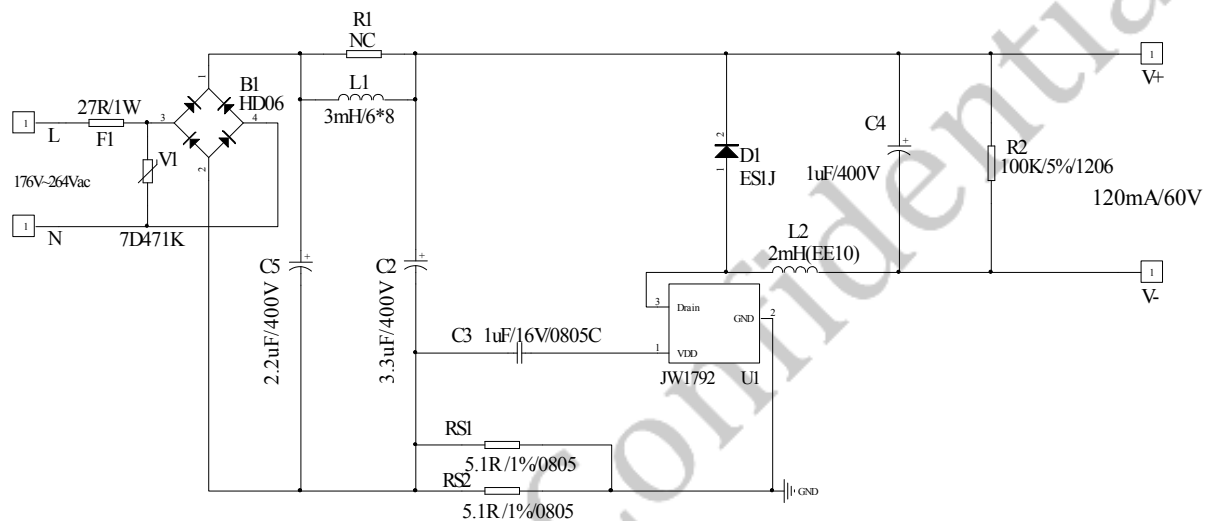
**Reference :**

$V_{IN}$ : 90VAC~264VAC

$V_{OUT}$ : 40~60V

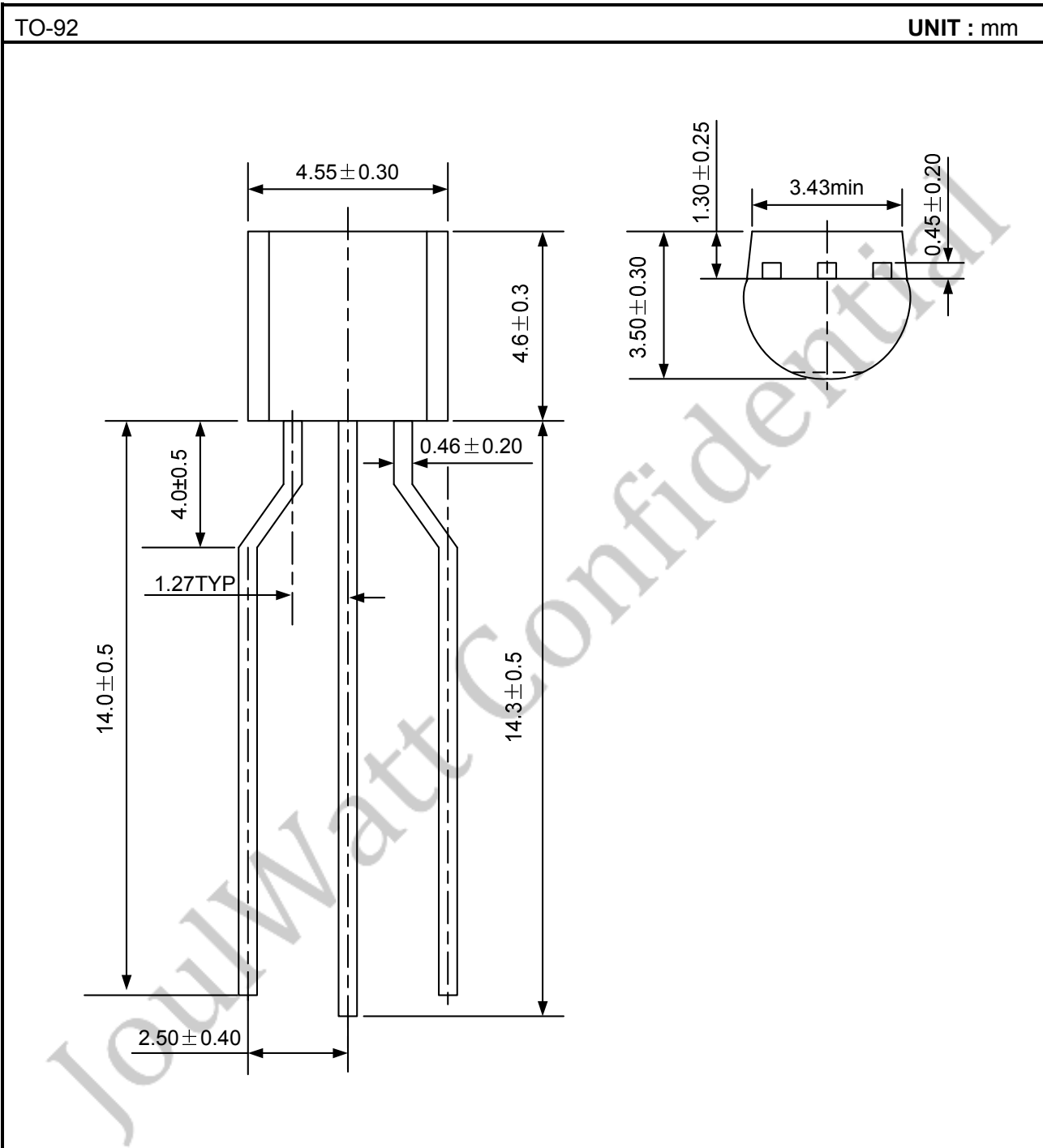
$I_{OUT}$ : 120mA

PF: >0.5



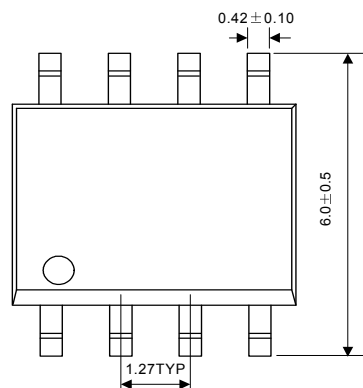


PACKAGE OUTLINE

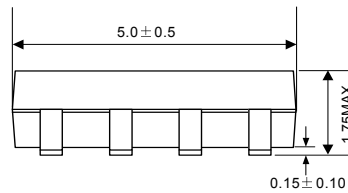


SOP8

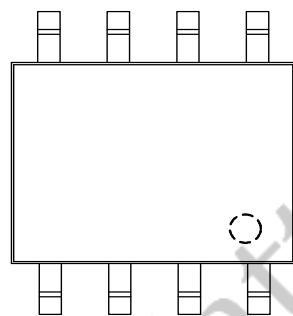
UNIT: mm



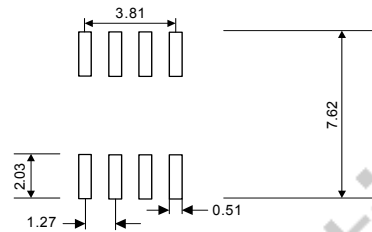
TOP VIEW



FRONT VIEW

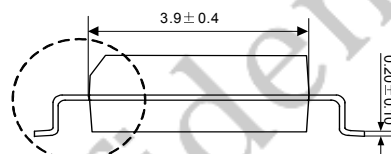


BOTTOM VIEW

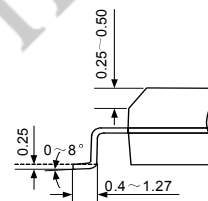


RECOMMENDED LAND PATTERN

SEE DETAIL "A"



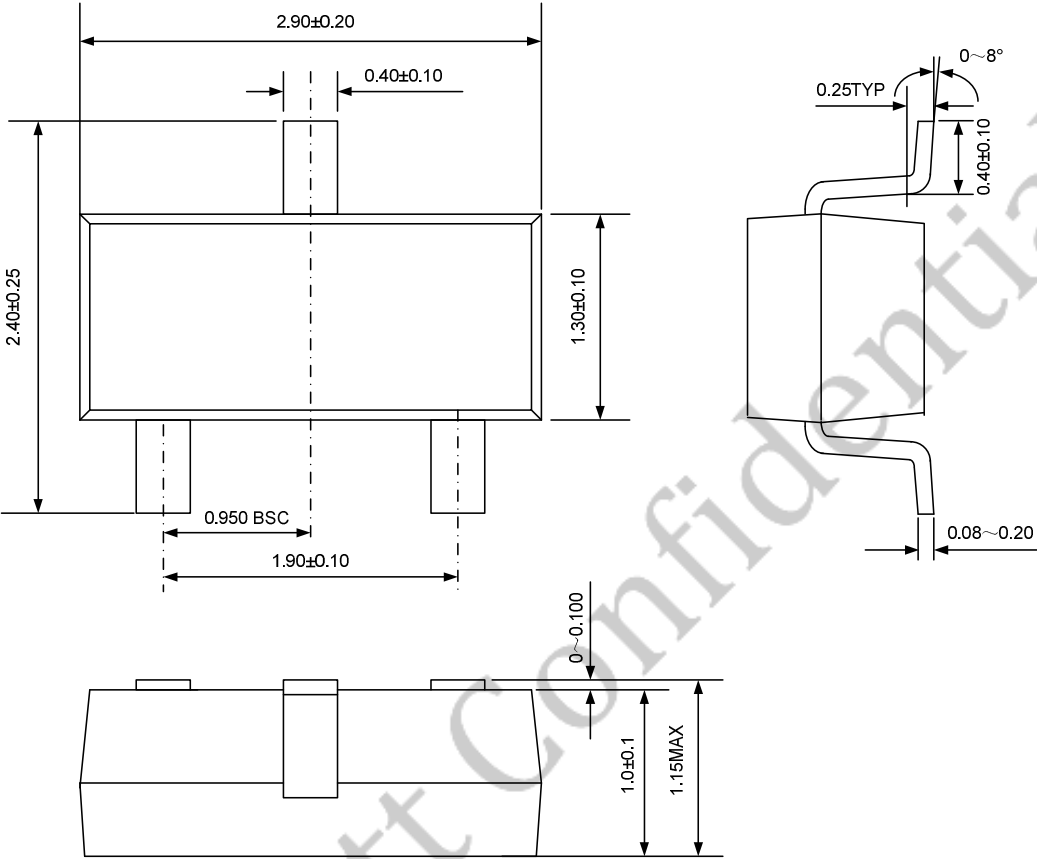
SIDE VIEW



DETAIL "A"

SOT23-3

UNIT: mm



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