

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.

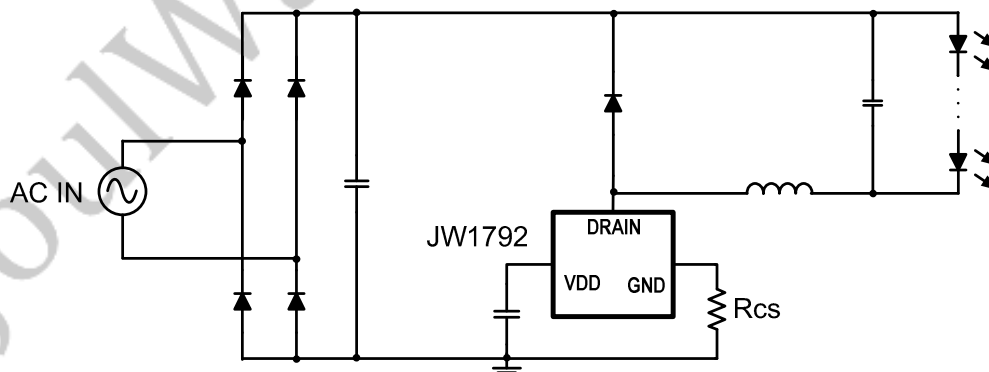
FEATURES

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

APPLICATIONS

- LED Lighting

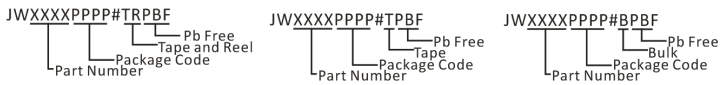
TYPICAL APPLICATION



ORDER INFORMATION

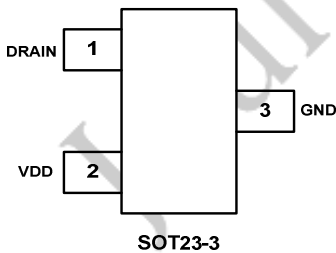
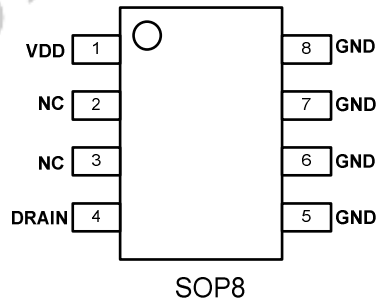
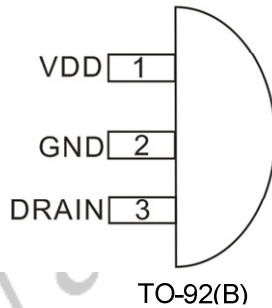
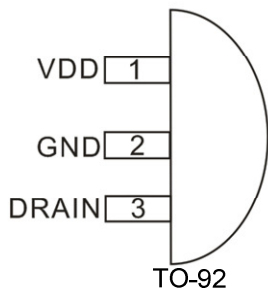
LEAD FREE FINISH	TAPE AND REEL	BULK	PACKAGE	TOP MARKING
	JW1792TOC#TPBF		TO-92	JW1792
		JW1792TOC#BPBF	TO-92(B)	JW1792
JW1792SOPB#PBF	JW1792SOPB#TRPBF		SOP8	JW1792
JW1792SOTF#PBF	JW1792SOTF#TRPBF		SOT23-3	JWBW

Note:



PIN CONFIGURATION

TOP VIEW



ABSOLUTE MAXIMUM RATING¹⁾

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

RECOMMENDED OPERATING CONDITIONS

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

THERMAL PERFORMANCE⁴⁾

	θ_{JA}	θ_{JC}
TO-92	120	60°C/W
SOP8.....	96	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

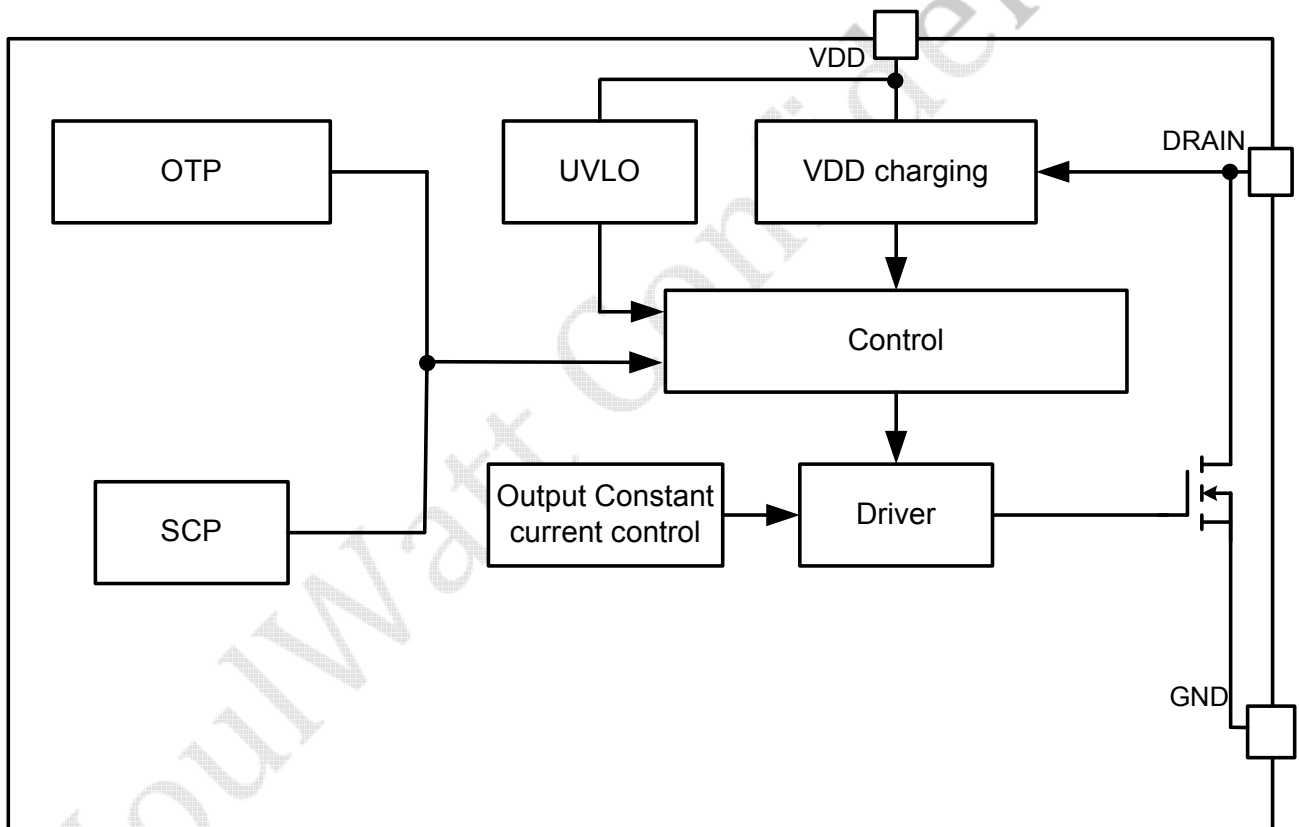
T_A=25 °C, unless otherwise stated

Item	Symbol	Condition	Min.	Typ.	Max.	Units
V _{DD} Regulation Voltage	V _{DD}		7	7.4	7.8	V
V _{DD} Start Up threshold	V _{DD_ST}	V _{DD} rising	6.7	7.1	7.5	V
V _{DD} Under Voltage Lockout	V _{DD_UVLO}	V _{DD} falling	5.9	6.1	6.3	V
V _{DD} IQ	I _Q	V _{DD} =7.4V	130	150	170	μA
Reference Voltage	V _{REF}		580	600	620	mV
MOS Max ON Time	T _{ONMAX}		48	60	72	μs
MOS Min ON Time	T _{ONMIN}		0.3	0.4	0.5	μs
MOS Max OFF Time	T _{OFFMAX}		330	440	550	μs
MOS Min OFF Time	T _{OFFMIN}		1	1.3	1.6	μs
MOS Max Current	I _{MAX}		0.6	0.7		A
MOS BV Voltage	V _{BRDSS}		500	550		V
MOS R _{ds(on)}	R _{ds(on)}	I(DRAIN)=50mA		12		Ω
Min Output Voltage	V _{OMIN}			3		V
Thermal Protection Threshold	OTP _{CHIP}		140	145	150	°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

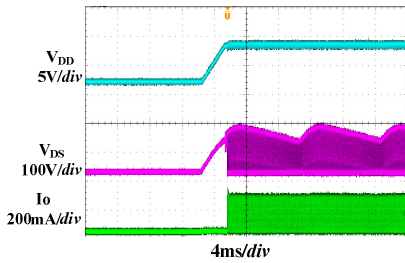
BLOCK DIAGRAM



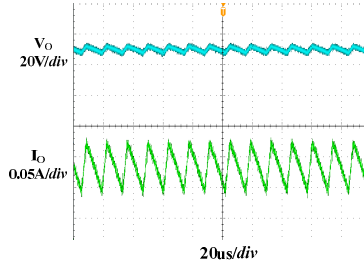
TYPICAL PERFORMANCE CHARACTERISTICS

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

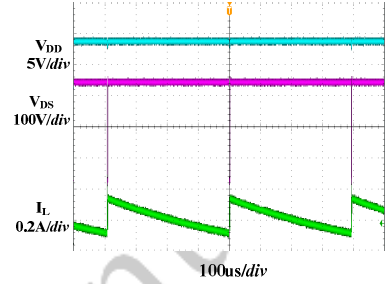
Start Up
 $V_{IN}=90Vac, I_o=120mA, P_o=7.2W$



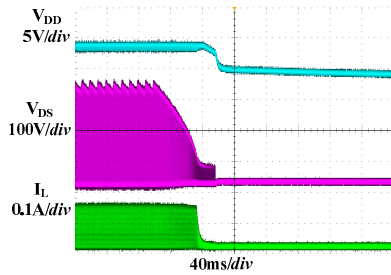
Steady State (Output)
 $V_{IN}=220Vac, I_o=120mA, P_o=7.2W$



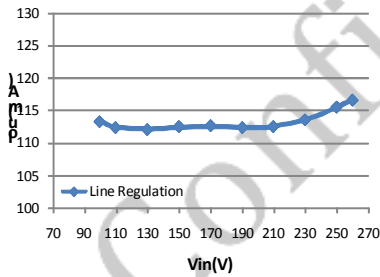
Short Circuit Protection
 $V_{IN}=220Vac$



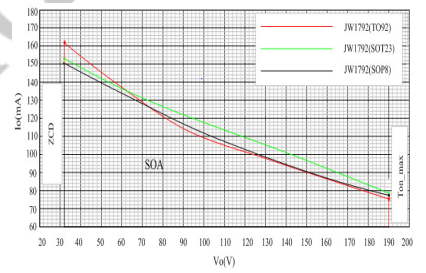
Power Off
 $V_{IN}=220Vac, I_o=120mA, P_o=7.2W$



Line Regulation



SOA



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:

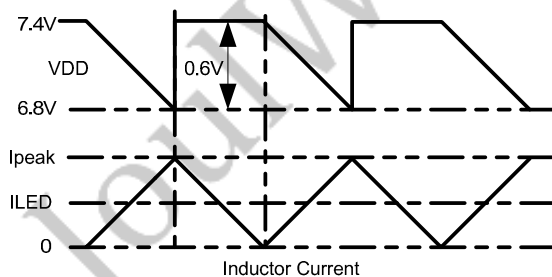
$$I_{LED} = V_{REF} / (2 R_{CS})$$

Where,

V_{REF} is the reference voltage;

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

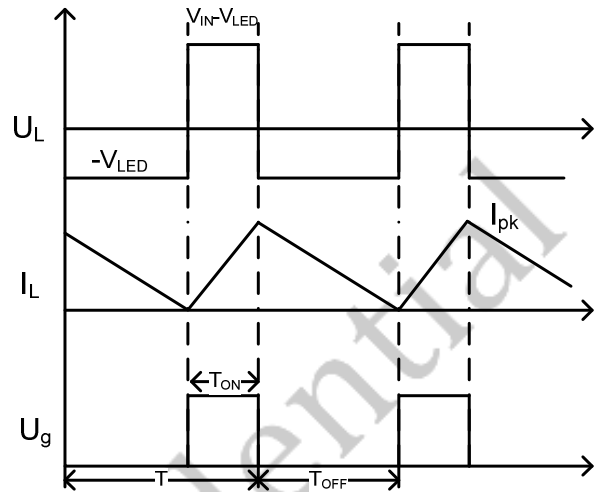
The inductor current and VDD waveforms are as follows:



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.

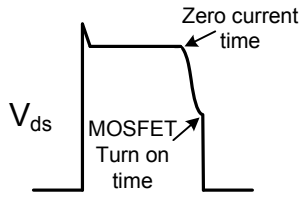
V_{IN} – input voltage after rectification and filtering.

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 T_{OFFMAX} .



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 T_{OFFMAX} 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.

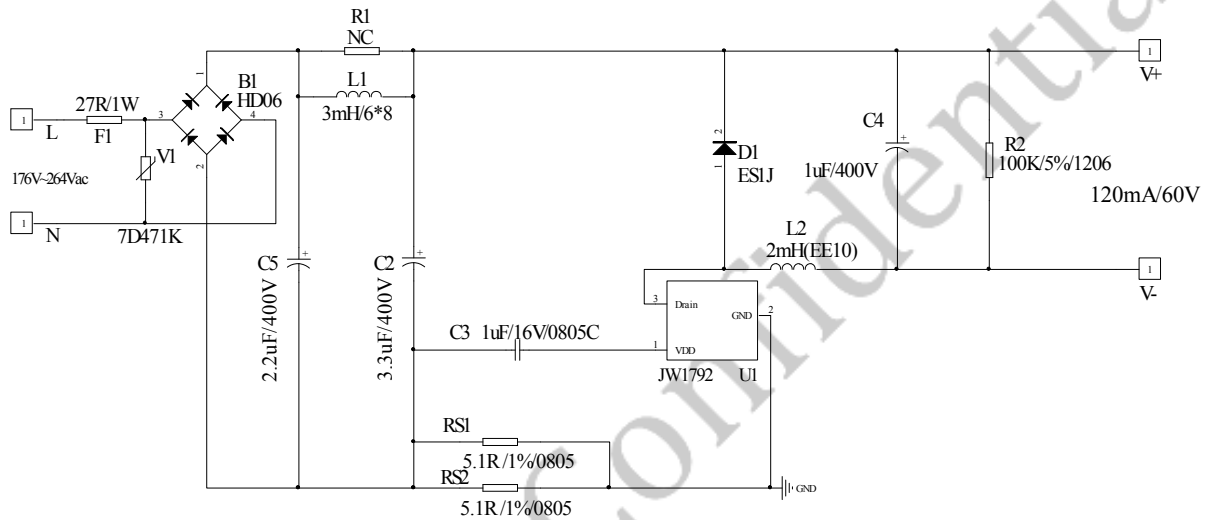
Reference :

V_{IN}: 90VAC~264VAC

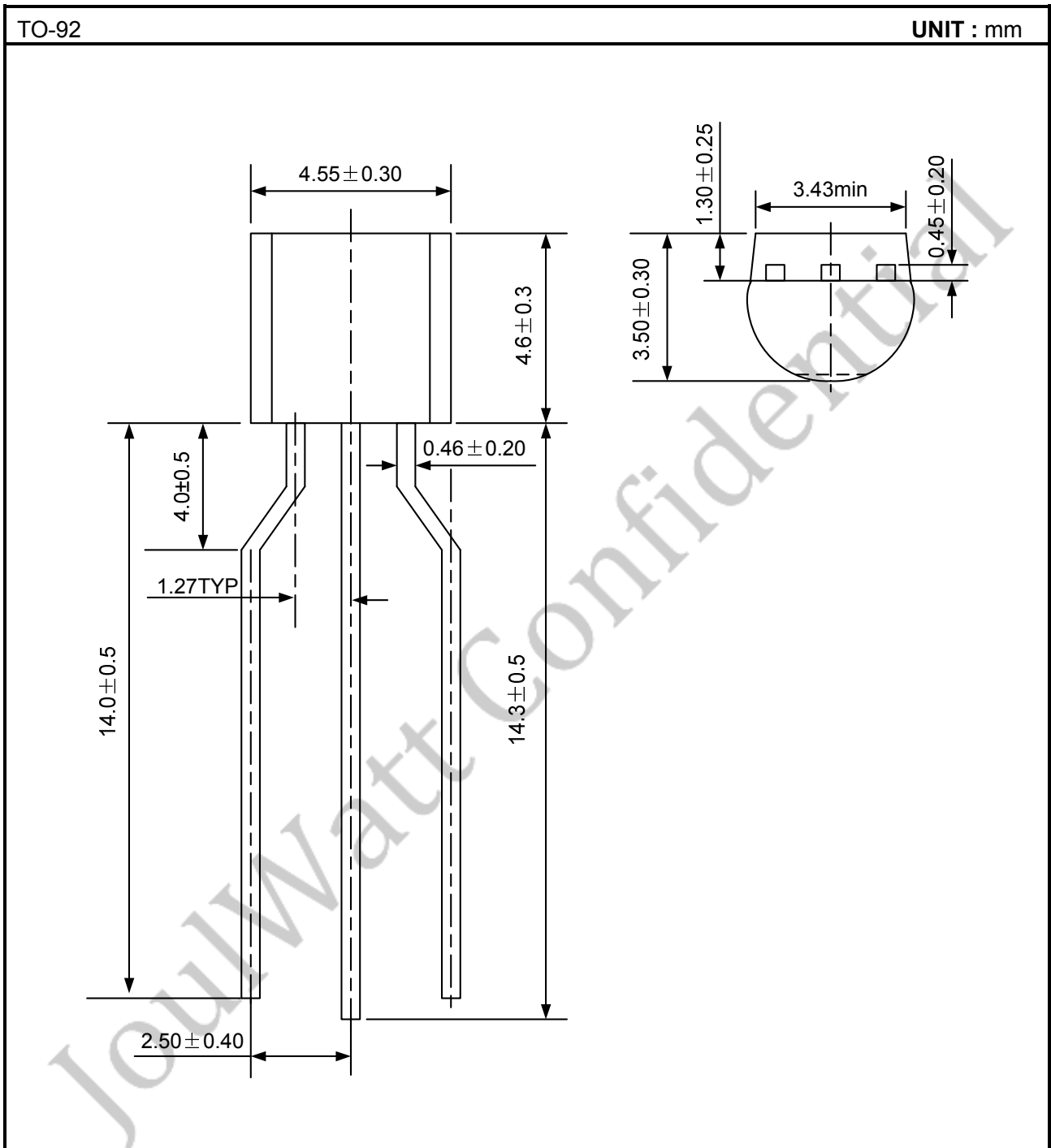
V_{OUT}: 40~60V

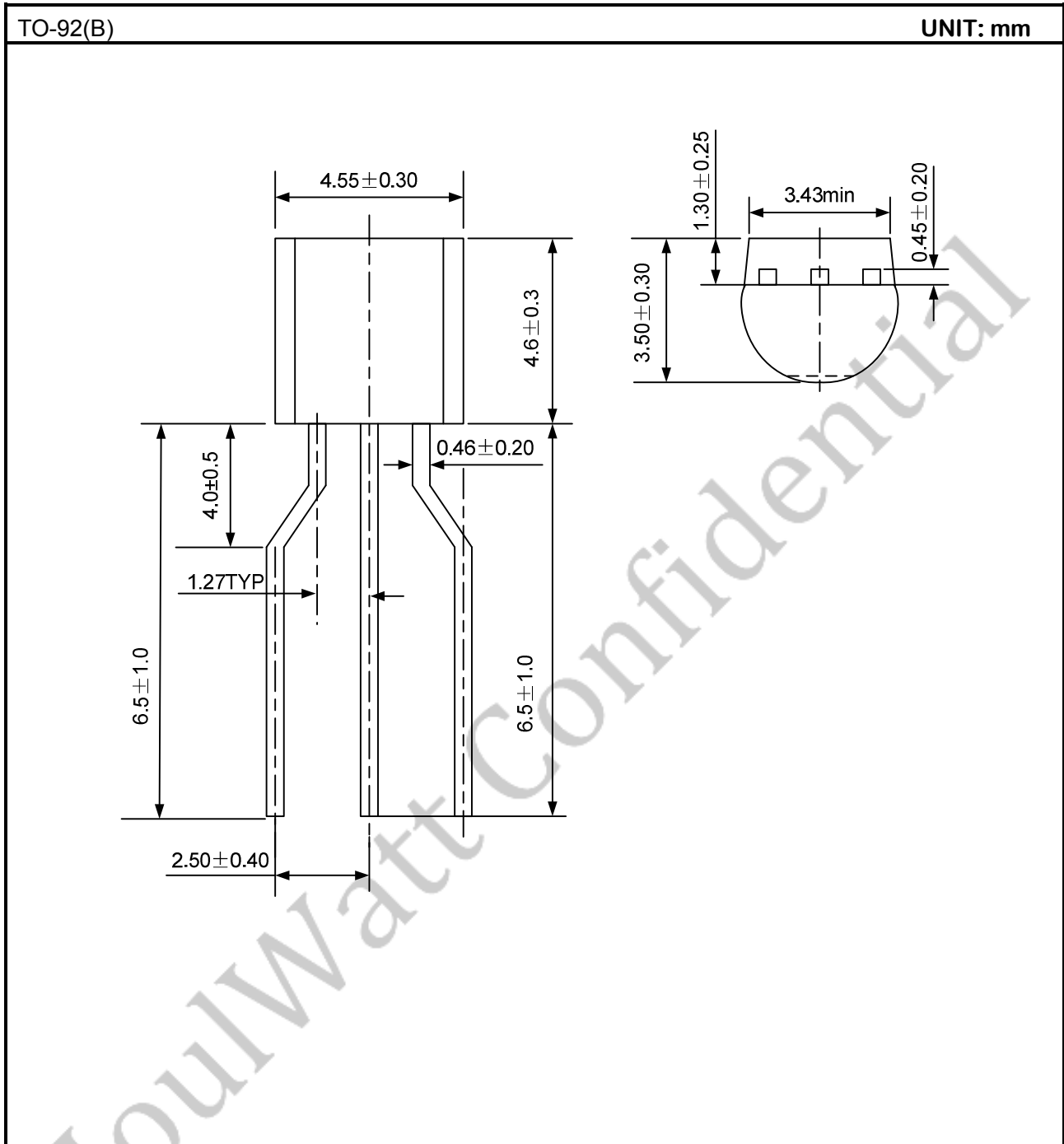
I_{OUT}: 120mA

PF: >0.5



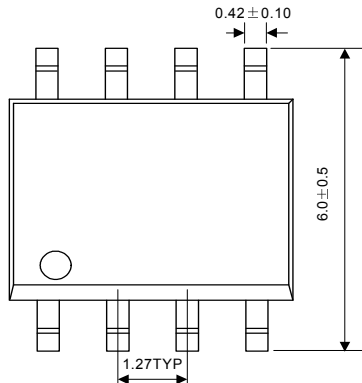
PACKAGE OUTLINE



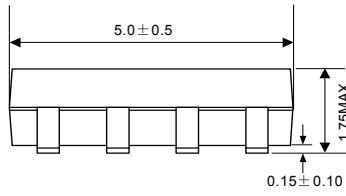


SOP8

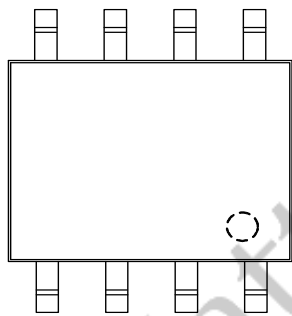
UNIT: mm



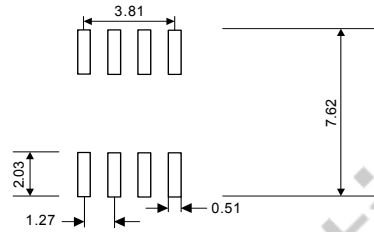
TOP VIEW



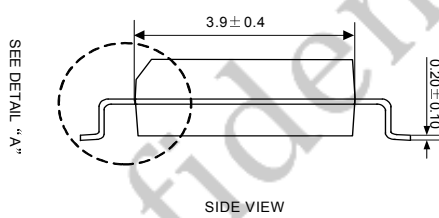
FRONT VIEW



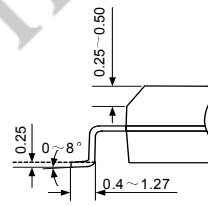
BOTTOM VIEW



RECOMMENDED LAND PATTERN



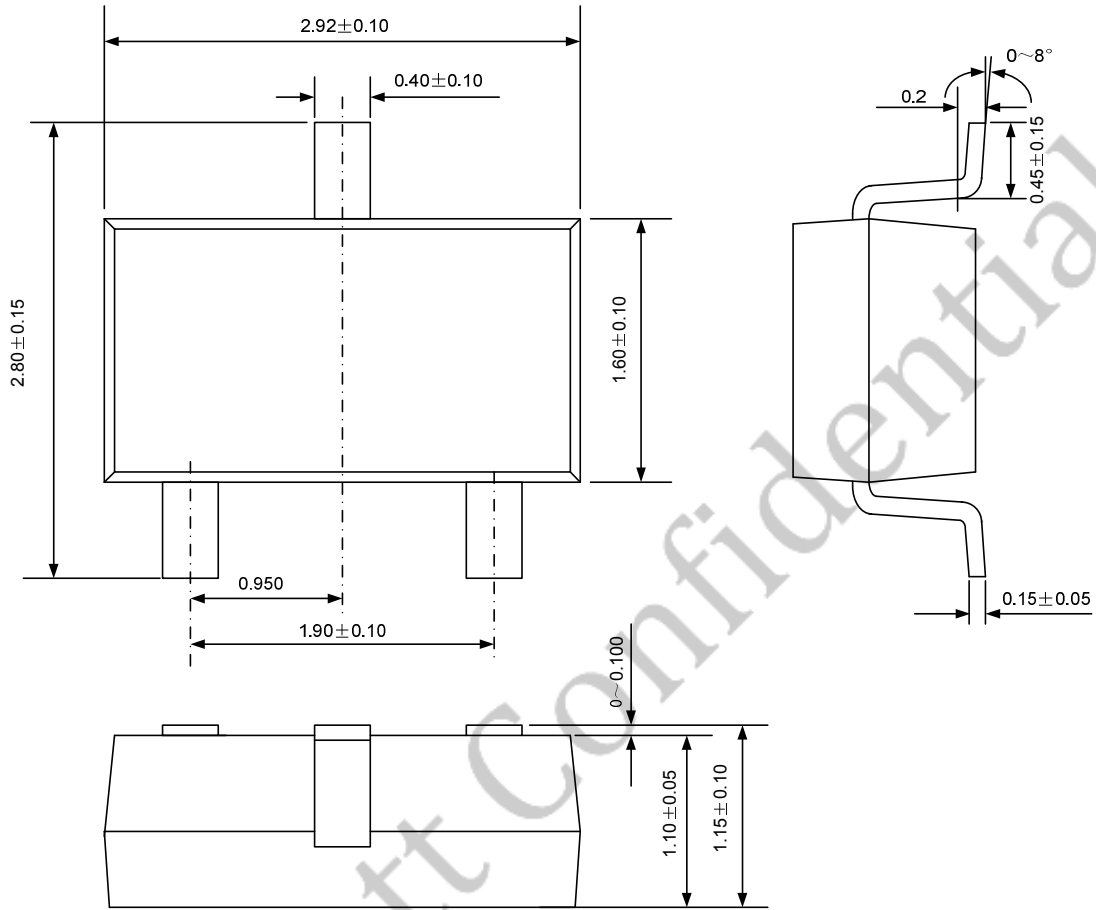
SIDE VIEW



DETAIL "A"

SOT23-3

UNIT: mm



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