

Parameters Subject to Change Without Notice

DESCRIPTION

JW1782B 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.

JW1782B 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, JW1782B 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.

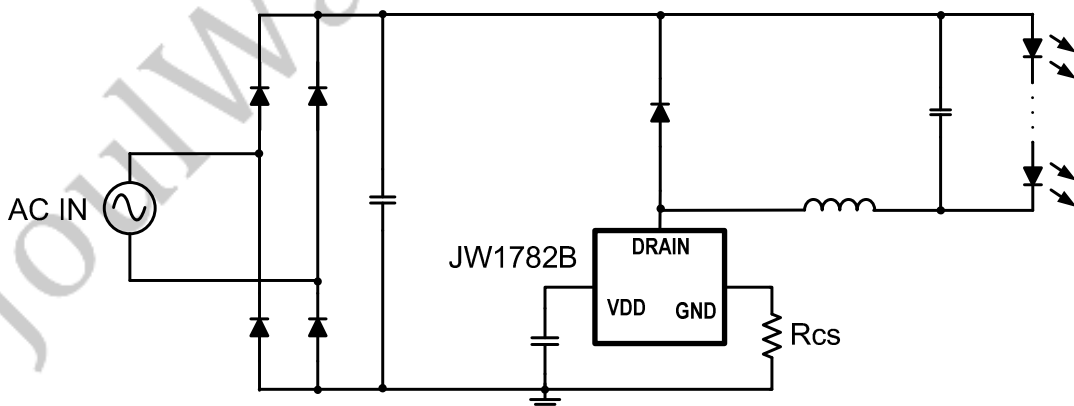
FEATURES

- 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

APPLICATIONS

- LED Lighting

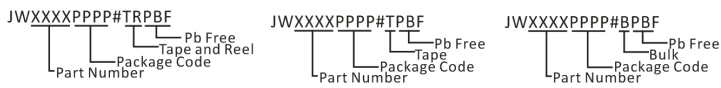
TYPICAL APPLICATION



ORDER INFORMATION

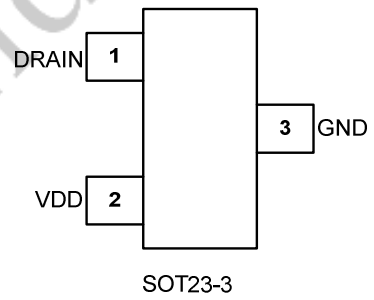
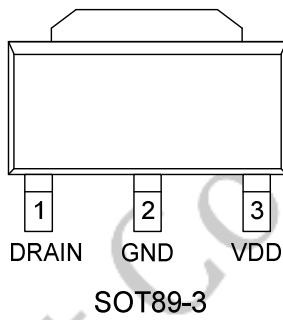
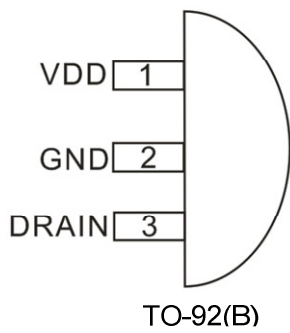
LEAD FREE FINISH	TAPE AND REEL	BULK	PACKAGE	TOP MARKING
		JW1782BTOC#BPBF	TO-92(B)	JW1782B
JW1782BSOTG#PBF	JW1782BSOTG#TRPBF		SOT89-3	JW1782B
JW1782BSOTF#PBF	JW1782BSOTF#TRPBF		SOT23-3	JWB5

Note:



PIN CONFIGURATION

TOP VIEW



ABSOLUTE MAXIMUM RATING¹⁾

DRAIN Voltage.....	550V
VDD Voltage.....	8V
GND Voltage.....	-0.3V to 5.5V
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
SOT89-3	83	25°C/W
SOT23-3.....	313.1	144°C/W

Note:

- 1) Exceeding these ratings may damage the device.
- 2) The JW1782B 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 JW1782B 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

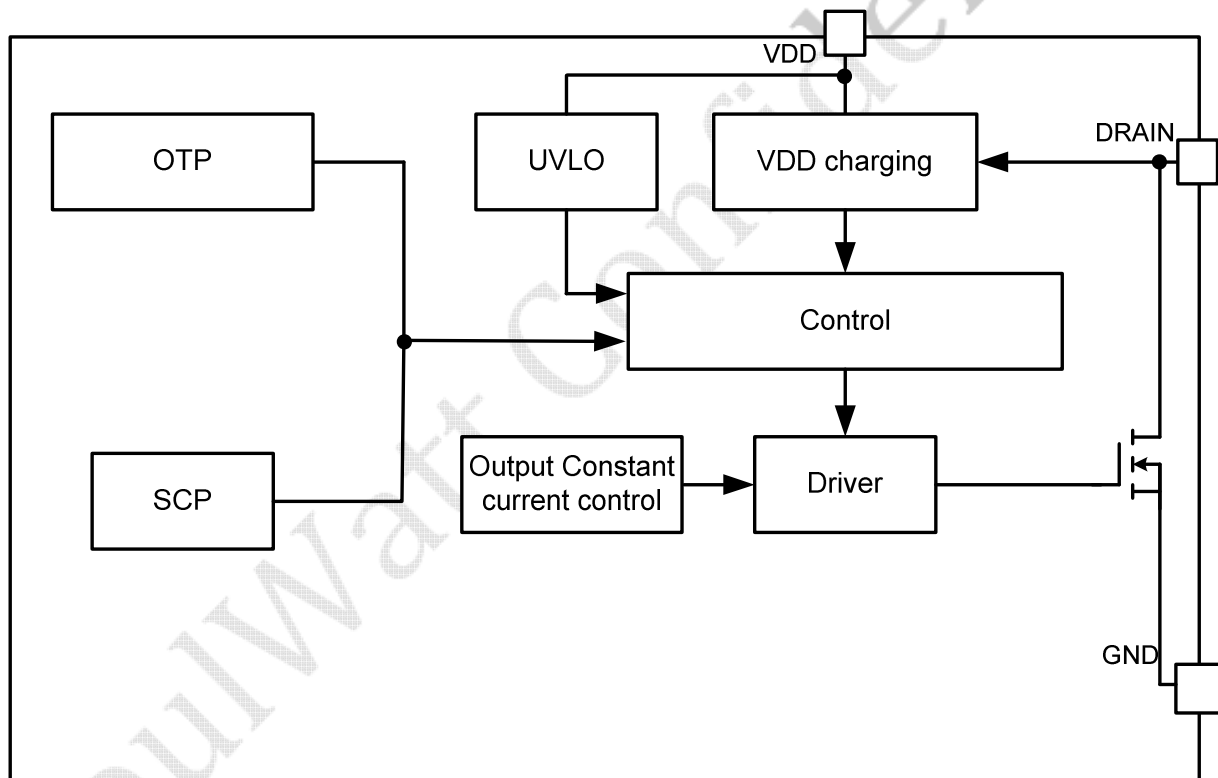
$T_A=25\text{ }^\circ\text{C}$, unless otherwise stated

Item	Symbol	Condition	Min.	Typ.	Max.	Units
V _{DD} Regulation Voltage	V _{DD}		5.25	5.5	5.75	V
V _{DD} Start Up threshold	V _{DD_ST}	V _{DD} rising	5.05	5.3	5.55	V
V _{DD} Under Voltage Lockout	V _{DD_UVLO}	V _{DD} falling	4.25	4.5	4.75	V
V _{DD} IQ	I _Q	V _{DD} =5.4V	230	280	320	μA
Reference Voltage	V _{REF}		580	600	620	mV
MOS Max ON Time	T _{ONMAX}		38	44	50	μs
MOS Min ON Time	T _{ONMIN}		353	386	417	ns
MOS Max OFF Time	T _{OFFMAX}		359	415	466	μs
MOS Min OFF Time	T _{OFFMIN}		3.5	3.7	4.3	μs
MOS Max Current	I _{MAX}		0.6	0.7		A
MOS BV Voltage	V _{BRDSS}		500	550		V
MOS R _{dson}	R _{dson}	I(DRAIN)=50mA,		14	14.5	Ω
Min Output Voltage	V _{OMIN}		35	35.5	36	V
Thermal Protection Threshold	OTP _{CHIP}		140	145	150	°C

PIN DESCRIPTION

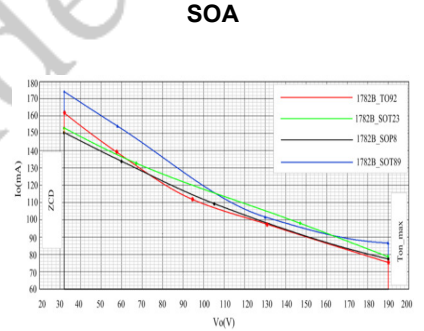
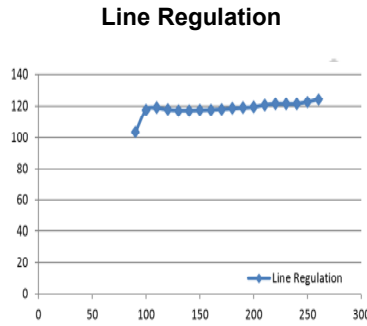
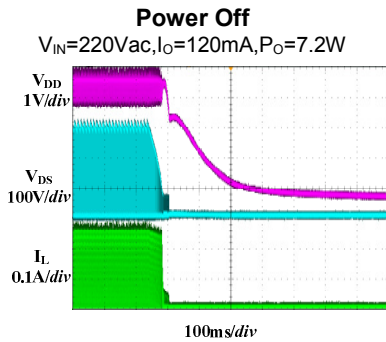
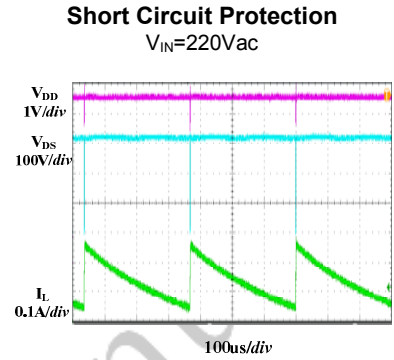
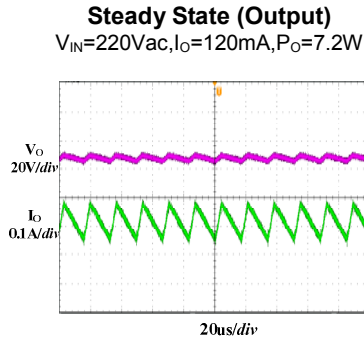
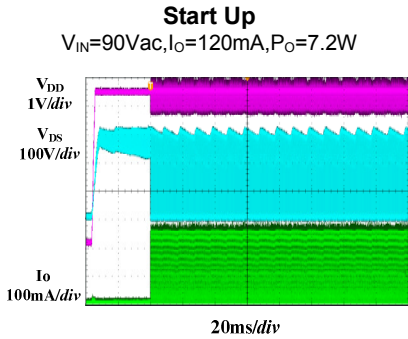
Pin TO-92 (B)	Name	Description
1	VDD	This pin supplies current to the internal start-up circuitry. This pin must be locally bypassed with a capacitor
2	GND	Chip ground
3	DRAIN	The drain of MOSFET

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 JW1782B is a constant current LED driver which applies to non-isolation step-down LED system. JW1782B 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 5.4V when the power MOSFET is off. Once the voltage of VDD is lower than 4.4V, JW1782B stops switching.

Constant Current Control

JW1782B controls the output current from the information of the current sensing resistor. The output LED average current can be calculated as:

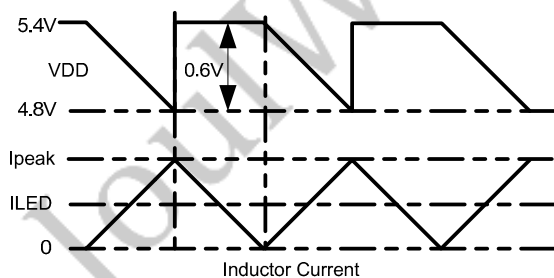
$$I_{LED} = V_{REF} / (2R_{CS})$$

Where,

V_{REF} – Reference voltage

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

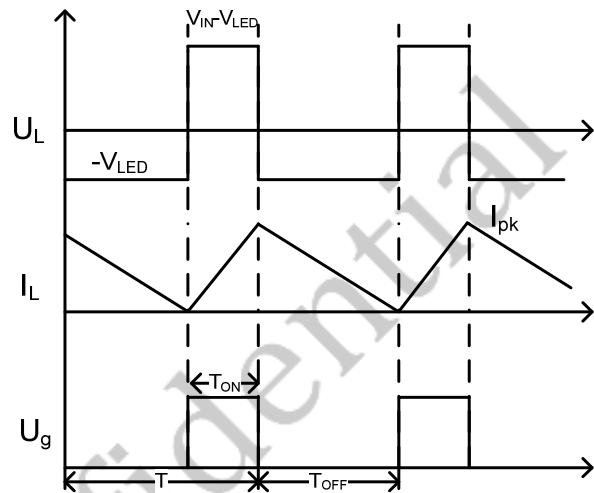
The inductor current and VDD waveforms are as follows:



Critical Conduction Mode Operation

JW1782B 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:



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

Where,

L – inductance.

I_{LED} – output led current.

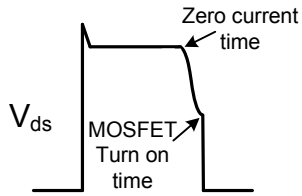
V_{IN} – input voltage after rectification and filtering.

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:

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

JW1782B 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. JW1782B 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 JW1782B cannot get the zero current signals, the turn off time will be changed to 400μS.



Over Temperature Protection

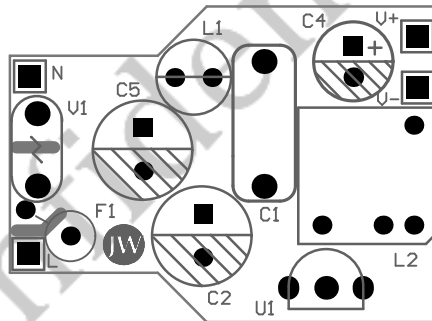
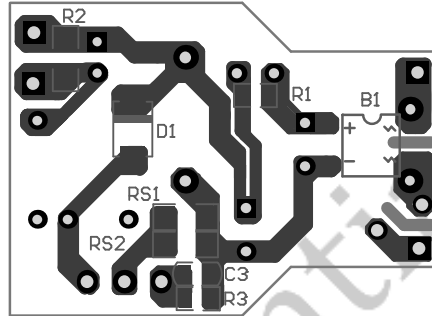
When JW1782B temperature is higher than 145°C, LED current reduces, and if it is higher than 155°C, the output current reduces to zero.

LED Short Protection

When the output is shorted, JW1782B can't get the zero current signals. The turn-off time will be 400µS.

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.



APPLICATION REFERENCE

This reference design is suitable for 5~ 8W non-isolated Step-down LED driver, using JW1782B, with high efficiency, excellent line regulation.

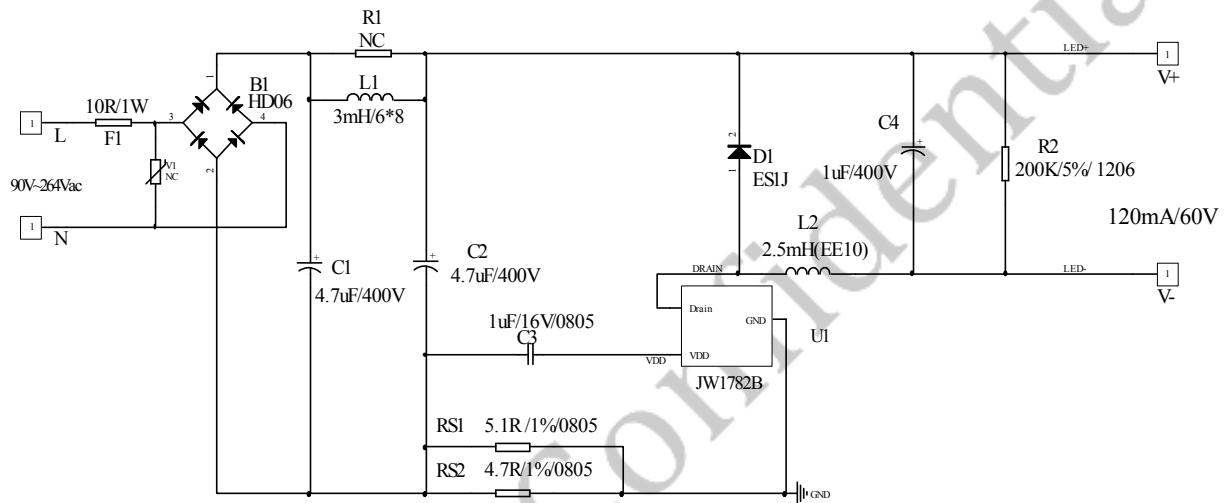
Reference :

V_{IN} : 90VAC~264VAC

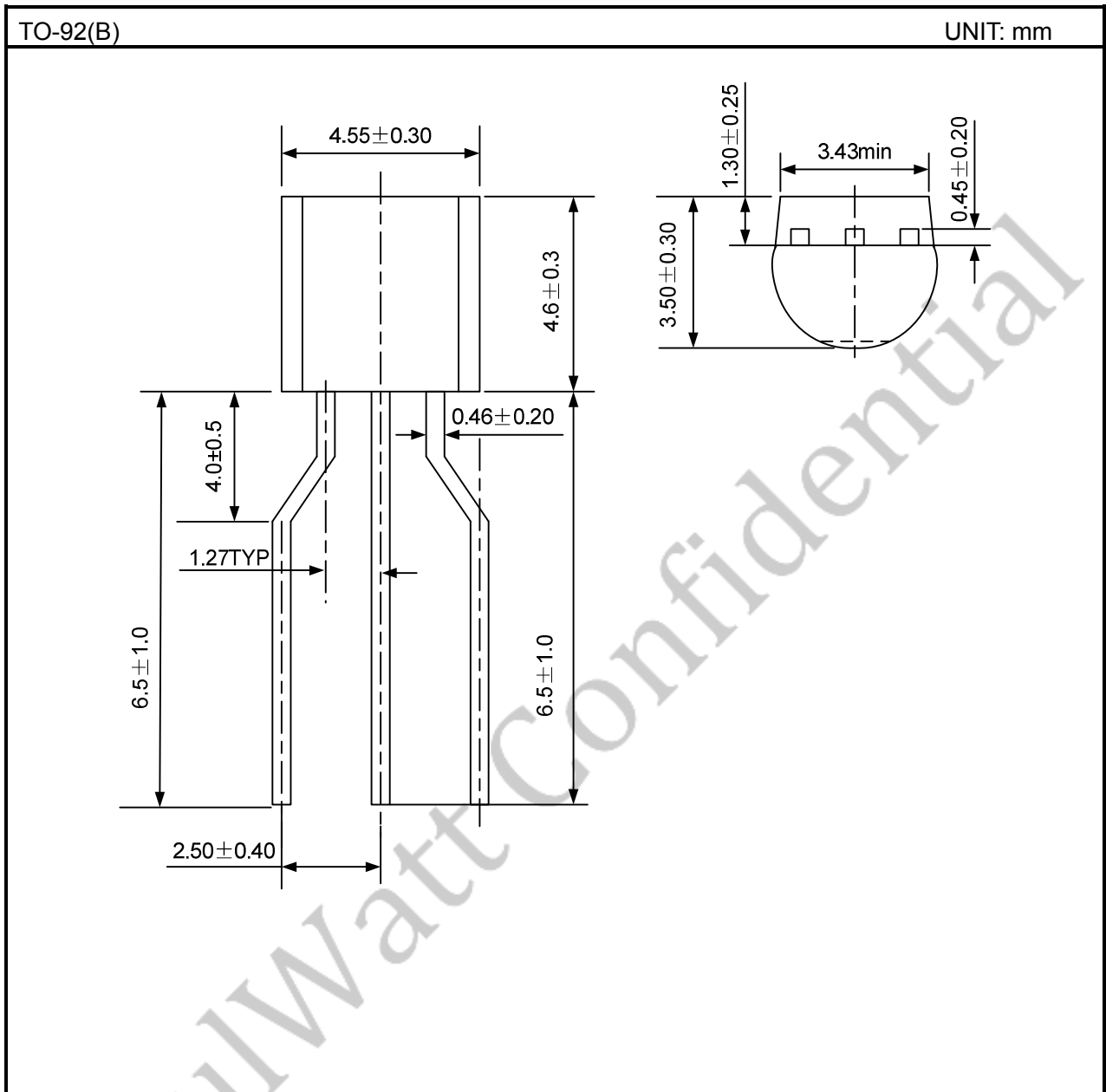
V_{OUT} : 40~60V

I_{OUT} : 120mA

PF: >0.5

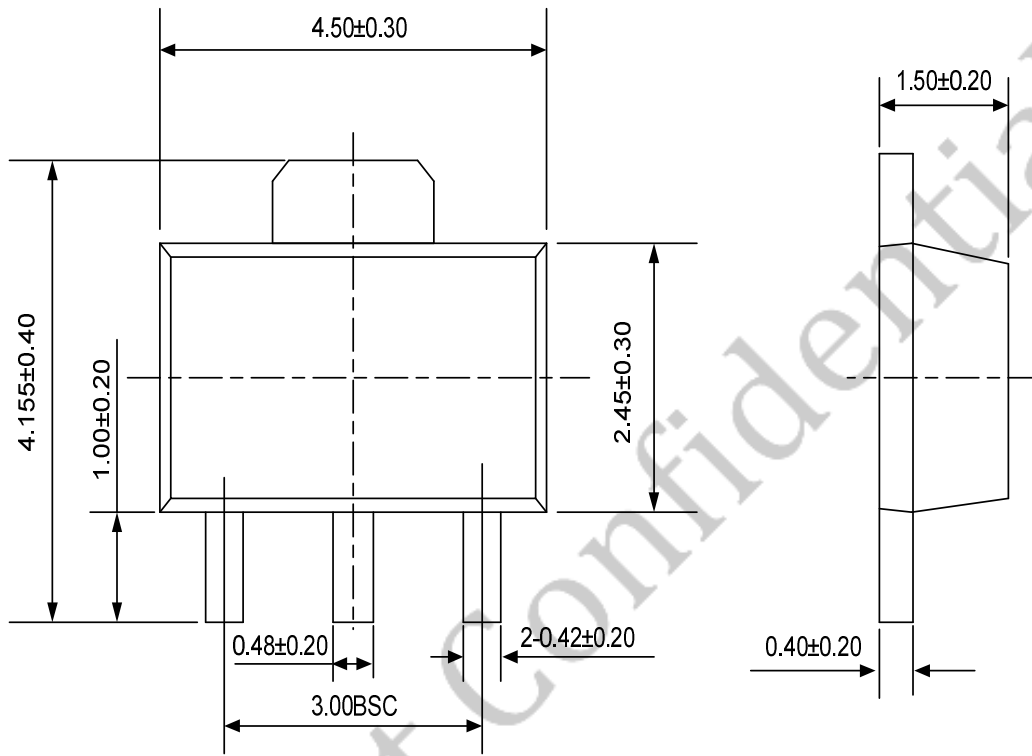


PACKAGE OUTLINE



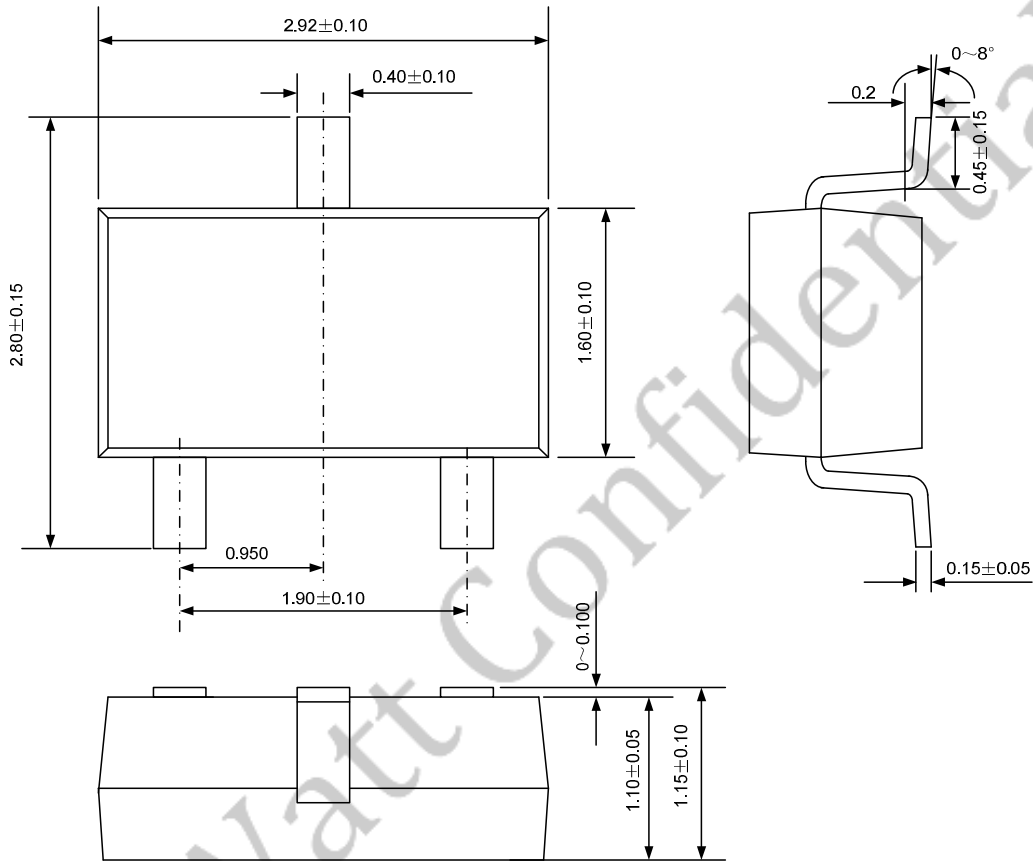
SOT89-3

UNIT: mm



SOT23-3

UNIT: mm



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