



# JW1758AC/BC/CC/DC

## Offline Step-down LED Driver With PFC and High Voltage Current Source

*Parameters Subject to Change Without Notice*

### DESCRIPTION

The JW<sup>®</sup>1758AC/BC/CC/DC is a constant current LED driver with high current accuracy which applies to single stage step-down power factor corrected LED drivers. High voltage power MOS is integrated, which can significantly simplify the design of LED lighting system.

JW1758AC/BC/CC/DC integrates high voltage power source and can be supplied by line voltage directly, and auxiliary winding is not needed.

High accuracy of output current is achieved by sampling the output current directly. Critical conduction mode operation reduces the switching losses and largely increases the efficiency.

JW1758AC/BC/CC/DC has multi-protection functions which largely enhance the safety and reliability of the system, including VCC UVLO, ISP over voltage protection, LED open protection and over-temperature protection.

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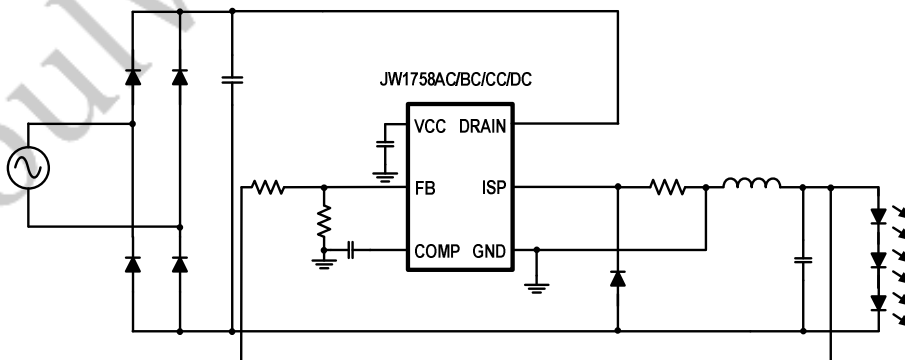
### FEATURES

- No auxiliary winding
- Supplied from line voltage directly
- high voltage power MOSFET integrated
- High current accuracy of line and load regulation
- High power factor
- Critical conduction mode
- High efficiency over wide operating range
- LED open protection
- ISP over voltage protection
- Internal over-temperature protection
- SOP7 and DIP7 package

### APPLICATIONS

- Non-isolation Offline LED driver

### TYPICAL APPLICATION



**ORDER INFORMATION**

DEVICE <sup>1)</sup>	PACKAGE	TOP MARKING <sup>2)</sup>
JW1758ACSOPA#TRPBF	SOP7	JW1758AC XXXXXX
JW1758BCSOPA#TRPBF	SOP7	JW1758BC XXXXXX
JW1758BCDIPA#PBF	DIP7	JW1758BC XXXXXX
JW1758CCSOPA#TRPBF	SOP7	JW1758CC XXXXXX
JW1758DCSOPA#TRPBF	SOP7	JW1758DC XXXXXX

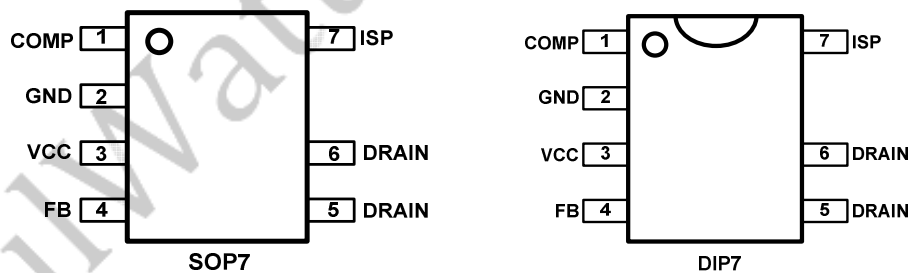
**Notes :**

1) JW     #TRPBF  
Part No. Package Code PB Free Tape and Reel (If "TR" is not shown, it means tube)

2) Line 1 of top marking means Part No., and the line 2 of top marking means Date Code.

**PIN CONFIGURATION**

**TOP VIEW**



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

VCC voltage.....	20V
All other pins.....	-0.3V to 4.5V
Junction Temperature <sup>2) 3)</sup> .....	150°C
Lead Temperature.....	260°C
Storage Temperature.....	-65°C to +150°C
ESD Susceptibility (Human Body Model) .....	2kV

**RECOMMENDED OPERATING CONDITIONS**

VCC Voltage.....	12V
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FB PIN .....0.8V to 1.4V  
 Operating Junction Temp (T<sub>J</sub>)..... -40°C to 125°C

**THERMAL PERFORMANCE<sup>4)</sup>**

	$\theta_{JA}$	$\theta_{JC}$
SOP7.....	96.....	45°C/W
DIP7.....	80.....	45°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) Measured on JESD51-7, 4-layer PCB.

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**ELECTRICAL CHARACTERISTICS**

*T<sub>A</sub>=25 °C, unless otherwise stated.*

Item	Symbol	Condition	Min.	Typ.	Max.	Units
VCC Start-Up Voltage	V <sub>CC_ST</sub>		9	10.5	12	V
VCC Operation Voltage	V <sub>CC_S</sub>		10	11.5	13	V
VCC Under Voltage Lockout	V <sub>CC_UVLO</sub>		7.5	8.7	10	V
VCC Operational Current	I <sub>CCO</sub>			130	200	μA
VCC Over Voltage Threshold <sup>5)</sup>	V <sub>CC_OVP</sub>			13		V
VCC Shunt Current <sup>5)</sup>	I <sub>SHUNT</sub>	VCC=15V	2.5	5		mA
ISP Sample Reference	V <sub>REF</sub>		200	208	216	mV
Maximum On Time of MOSFET	T <sub>ON_MAX</sub>			35		μs
COMP Source Current	I <sub>COMP</sub>	COMP=2 V, ISP=0V	4	8	12	μA
Maximum Switch Frequency	F <sub>MAX</sub>			105	145	kHz
FB High Voltage Threshold	V <sub>FB_H</sub>		1.52	1.6	1.71	V
ISP Maximum Voltage	V <sub>ISP_MAX</sub>		2.5	2.7	2.9	V
Over Thermal Protection Threshold <sup>5)</sup>	Temp <sub>OTP</sub>			145		°C
MOS R <sub>dson</sub> <sup>5)</sup>	JW1758AC	R <sub>dson</sub>	V <sub>gs</sub> =7V		6.8	Ω
	JW1758BC				1.8	
	JW1758CC				3.5	
	JW1758DC				1.2	
Breakdown Voltage	JW1758AC/ BC/CC	BV		600		V
	JW1758DC			650		

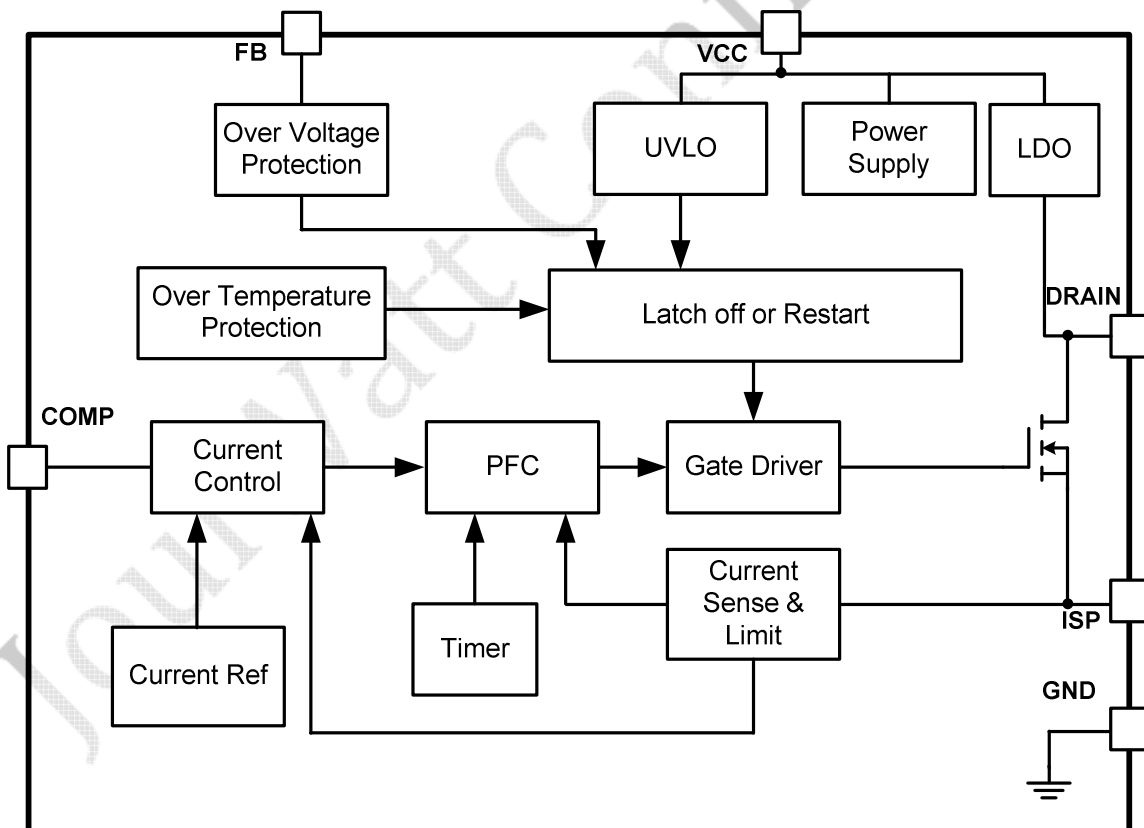
**Note:**

5) Guaranteed by design.

**PIN DESCRIPTION**

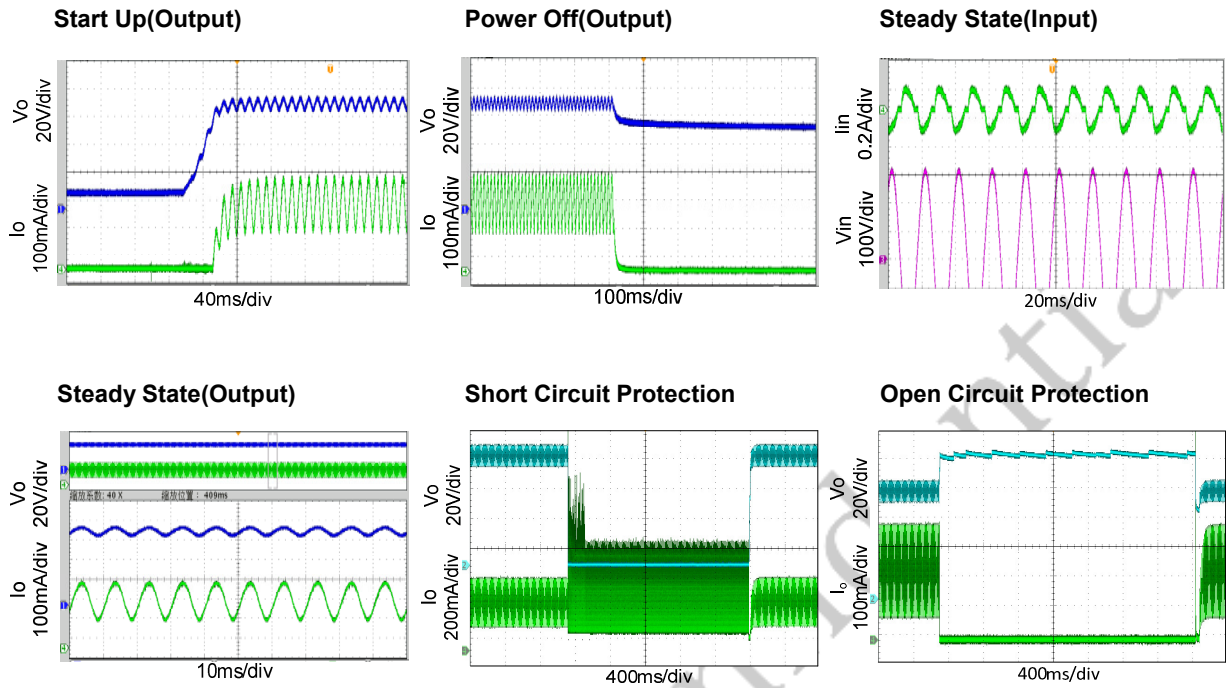
Pin No.	Name	Description
1	COMP	Compensation pin for internal error amplifier. Connect a capacitor between the pin and GND to compensate the internal feedback loop.
2	GND	Ground.
3	VCC	Power supply pin.
4	FB	Output voltage feedback pin.
5,6	DRAIN	DARIN of the MOSFET.
7	ISP	Output Current Sense Pin.

**BLOCK DIAGRAM**



### TYPICAL PERFORMANCE CHARACTERISTICS

JW1758BC,  $V_{IN}=220VAC$ ,  $V_{OUT}=75V$ ,  $I_o=240mA$ ,  $L=700\mu H$ , unless otherwise noted



**FUNCTIONAL DESCRIPTION**

The JW1758AC/BC/CC/DC is a constant current LED driver which applies to non-isolation step-down LED system with power factor correction. JW1758AC/BC/CC/DC can achieve excellent line and load regulation, high efficiency and low system cost with few peripheral components.

**Start Up**

JW1758AC/BC/CC/DC can be supplied by line voltage directly. When DRIAN charges VCC up to VCC start-Up voltage(V<sub>CC\_ST</sub>), the GATE driver begins to switch. An internal 16V clamp is attached to the VCC pin to prevent VCC from being too high. When VCC is lower than VCC under voltage lockout(V<sub>CC\_UVLO</sub>), the chip stops switching.

**Loop Compensation**

An integrator configuration is applied to the output current feedback loop with a capacitor connected to the COMP pin. For offline applications, the crossover frequency should be set much less than the line frequency of 120Hz or 100Hz. A capacitor of 0.47μF to 1μF connected to COMP pin is recommended to ensure the excellent PFC performance.

**Constant Current Control**

The JW1758AC/BC/CC/DC controls the output current from the information of the sensed resistor voltage. The output LED mean current can be calculated as:

$$I_{LED} = V_{REF} / R_S$$

Where

V<sub>REF</sub> – The reference voltage;

R<sub>S</sub> – The sensing resistor connected between ISP and GND.

**Critical Conduction Mode Operation**

JW1758AC/BC/CC/DC works in the critical

conduction mode of the inductor current. When the internal power MOSFET is turned on, the inductor current begins to increase from zero. The turn on time of the MOSFET can be calculated as:

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

Where,

L – inductance.

I<sub>PK</sub> – peak current in one switch period.

V<sub>IN</sub> – input voltage after rectification and filtering.

V<sub>OUT</sub> – output LED voltage.

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

$$T_{OFF} = I_{PK} \times L / V_{OUT}$$

And the inductance of the system can be calculated as:

$$L = V_{OUT} \times (V_{IN} - V_{OUT}) / (f \times I_{PK} \times V_{IN})$$

Where, f is the frequency of the step-down system. You may choose the minimum input voltage when you want to set up the minimum system working frequency.

**Over Temperature Protection**

When internal temperature of the chip exceeds 145°C, JW1758AC/BC/CC/DC decrease the source current of COMP to degrade LED current.

**LED Open Protection**

The output voltage can be detected by the FB pin. When the FB voltage is higher than FB High Voltage Threshold(V<sub>FB\_H</sub>), the power MOSFET gate driver stops switching for 200ms, then system restarts. The recommended value of FB pull up resistor is 200KΩ.

**ISP Over Voltage Protection**

JW1758AC/BC/CC/DC stops switching for 200ms if ISP voltage is over  $V_{ISP\_MAX}$  after MOSFET turned off, then system restarts.

**PCB Design**

When designing the PCB of the JW1758AC/BC/CC/DC system, please follow the directions:

1. The VCC 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.
3. The chip should be far away from the heating element, such as the inductor and the freewheel diode.
4. Note the chip ground is not connected to the cathode of the input capacitor as usual.

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REFERENCE DESIGN

This reference design is suitable for 3 ~ 12W non-isolated Step-down LED driver, using JW1758AC, with high efficiency, excellent line regulation.

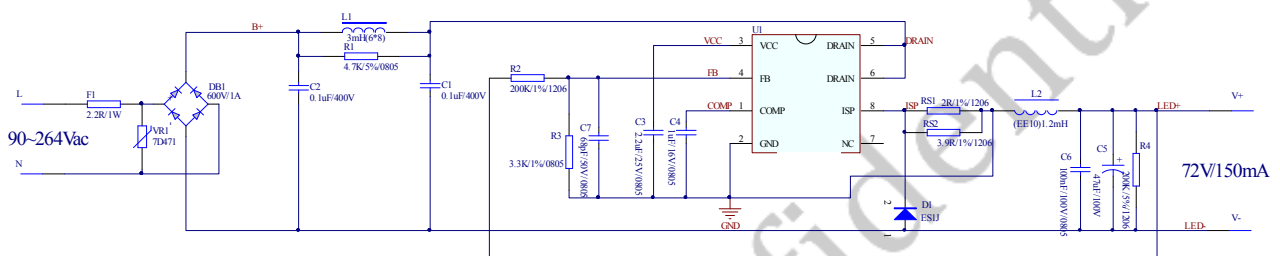
Reference :

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

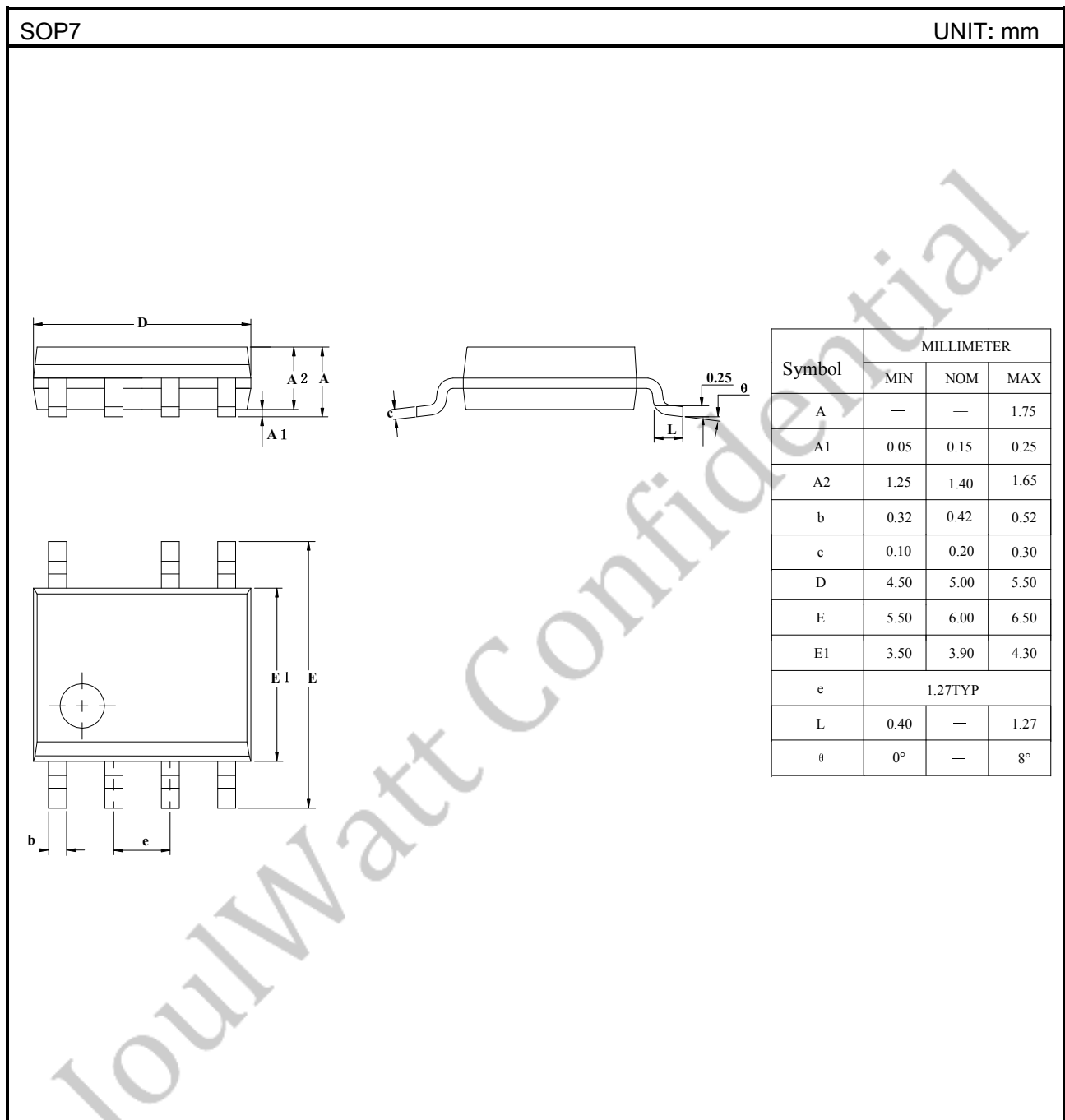
$V_{OUT}$ : 40~72V

$I_{OUT}$ : 150mA

PF: >0.9

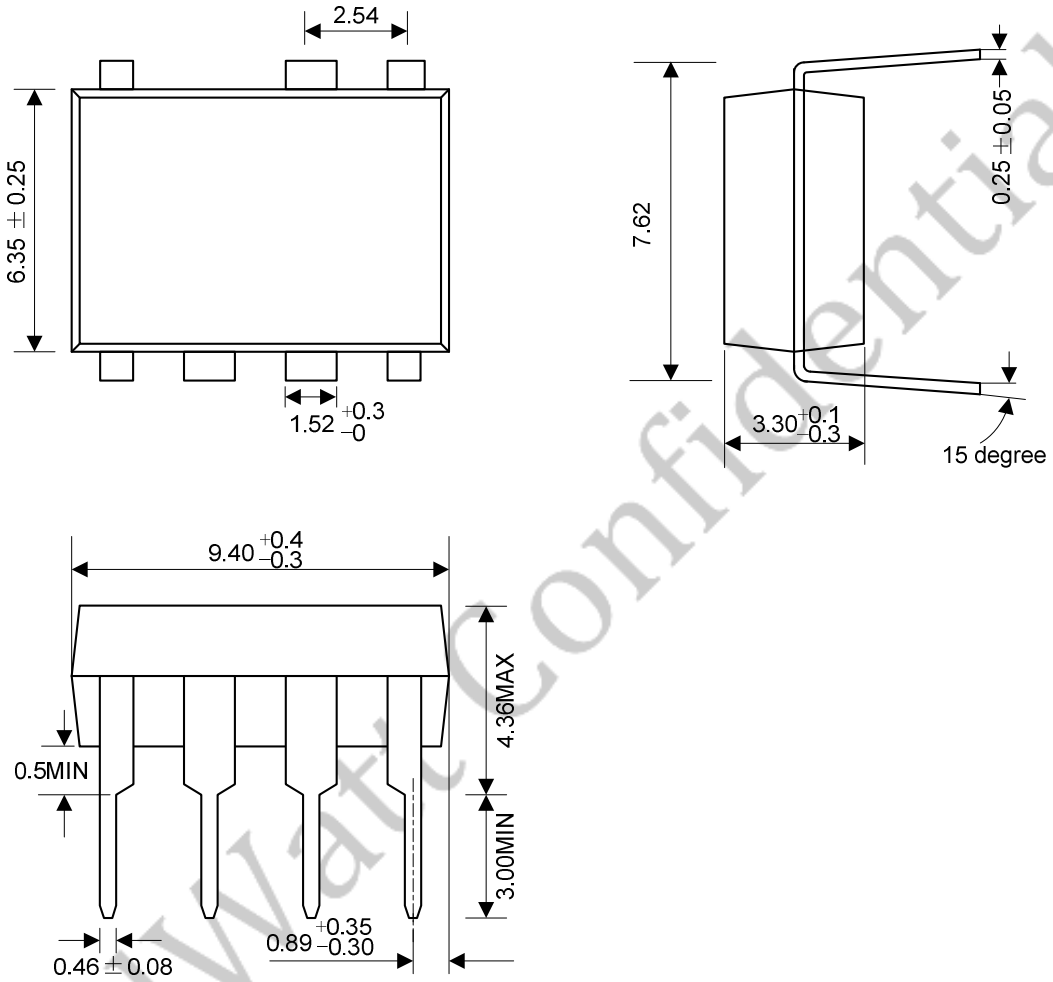


PACKAGE OUTLINE



DIP7

UNIT: mm



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