JW1806M/JW1806A
JW1806B/JW1806C
TRIAC Dimmable Boost LED Driver

Parameters Subject to Change Without Notice

DESCRIPTION

JW®1806M/ JW1806A/ JW1806B/ JW1806C (JW1806X series) is an offline LED driver suitable for TRIAC dimming, which supports boost topology.

JW1806A series achieves good line and load regulation by a close-loop current regulator integrated.

Patented current sensing and digital compensation technics ensure a unit power factor and high accuracy output current. The critical conduction mode operation reduces the switching loss and increases the efficiency.

JW1806X series is supplied from line voltage directly, eliminating auxiliary winding and start-up circuitry, which can lower the system BOM cost.

Excellent algorithms ensure good dimmer compatibility.

JW1806X series incorporates multi-protection functions which largely enhance the safety and reliability of the system including output over voltage protection, cycle-by-cycle current limit and over-temperature protection.

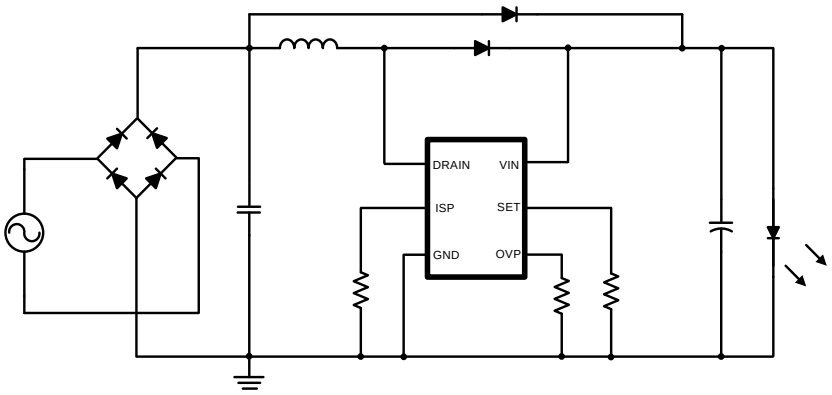
FEATURES

- Supply from Output Directly
- Internal Compensation PFC Technics
- Critical Conduction Mode
- Adaptive for TRIAC Dimming
- Good Line and Load Regulation
- Output Over-voltage Protection
- Cycle-by-cycle Current Limit
- Adjustable T_{ONMAX} and V_{ISPMAX}
- SOP8 Package

APPLICATIONS

- LED lighting

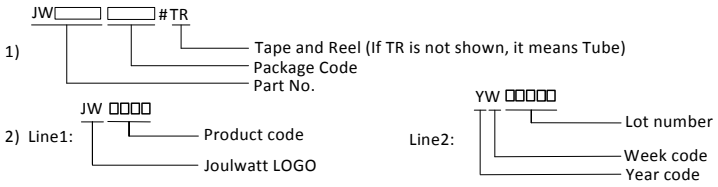
TYPICAL APPLICATION



ORDER INFORMATION

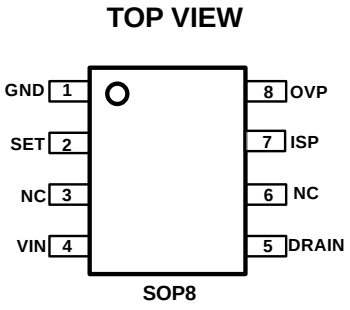
DEVICE[1)]	PACKAGE	TOP MARKING[2)]	ENVIRONMENTAL[3)]
JW1806MSOPB#TR	SOP8	JW1806M YW□□□□□	Green
JW1806ASOPB#TRPBF	SOP8	JW1806A YW□□□□□	Green
JW1806BSOPB#TR	SOP8	JW1806B YW□□□□□	Green
JW1806CSOPB#TR	SOP8	JW1806C YW□□□□□	Green

Notes:



3) All Joulwatt products are packaged with Pb-free and Halogen-free materials and compliant to RoHS standards.

PIN CONFIGURATION



ABSOLUTE MAXIMUM RATING[1)]

VIN Pin Voltage.....700V
SET Pin Voltage.....30V
ISP,OVP Pin Voltage.....8V
Junction Temperature[(2) (3)].....150℃
Lead Temperature …….....260℃
Storage Temperature ..... -65 ℃ to +150℃

RECOMMENDED OPERATING CONDITIONS

VIN Voltage……..... 500V

Operating Junction Temperature.....-40℃ to 125℃

THERMAL PERFORMANCE[4)]

	θ_{JA}	θ_{JC}
SOP8	96	45℃/W

Note：

1) Exceeding these ratings may damage the device. These stress ratings do not imply function operation of the device at any other conditions beyond those indicated under RECOMMENDED OPERATING CONDITIONS.

2) The JW1806X series includes thermal protection that is intended to protect the device in overload conditions. Continuous operation over the specified absolute maximum operating junction temperature may damage the device.

3) The device is not guaranteed to function outside of its operating conditions.

4) Measured on JESD51-7, 4-layer PCB.

ELECTRICAL CHARACTERISTICS

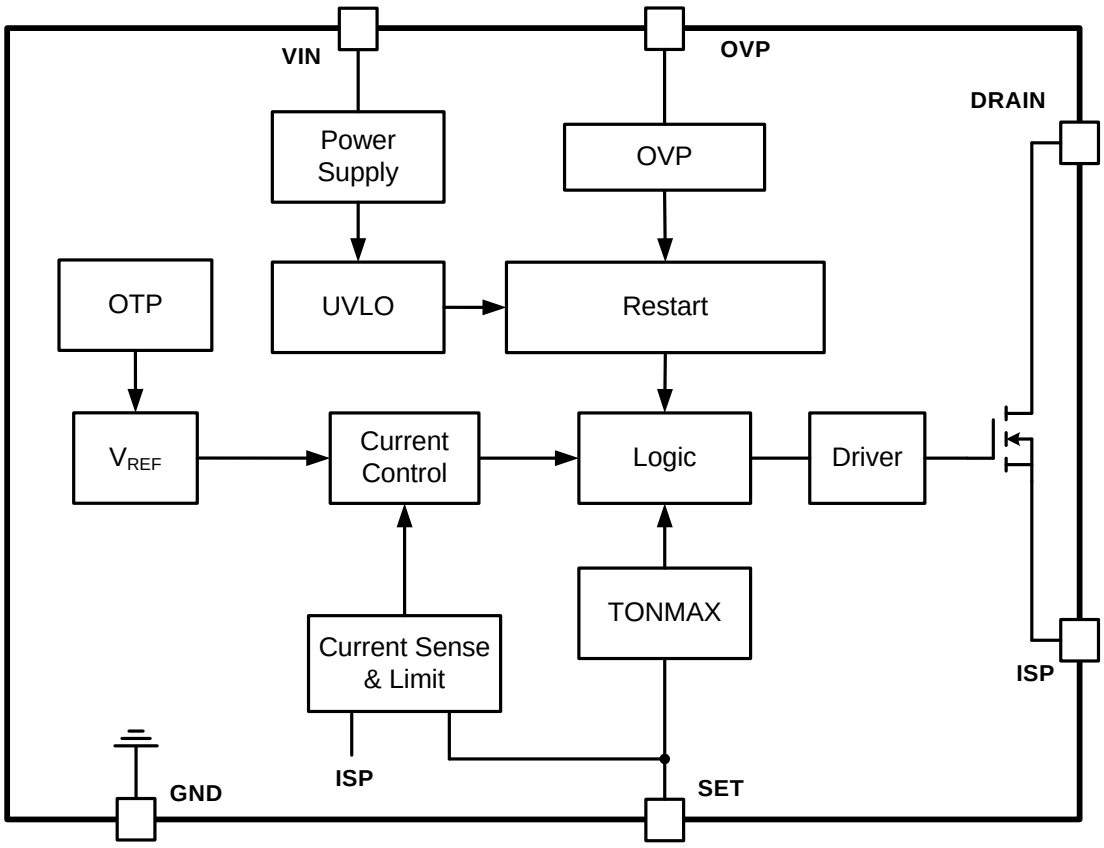
T_A=25℃, unless otherwise stated							
Item		**Symbol**	**Condition**	**Min.**	**Typ.**	**Max.**	**Units**
VIN supply							
V_{IN} Startup Voltage		v_{IN_ST}				12	V
Quiescent Current		I_Q			230		μA
Current regulation							
ISP Reference Voltage		V_{REF}			100		mV
Maximum ON Time1 of MOSFET		T_{ONMAX1}	ISP>190mV, R_{SET}=271kΩ		35		μs
Maximum ON Time2 of MOSFET		T_{ONMAX2}	ISP<190mV		40		μs
Minimum ON Time of MOSFET[5)]		T_{ONMIN}			1		μs
Maximum OFF Time1 of MOSFET		$T_{OFFMAX1}$	ISP<190mV		22		μs
Maximum OFF Time2 of MOSFET		$T_{OFFMAX2}$	ISP>190mV		460		μs
Minimum OFF Time of MOSFET[5)]		T_{OFFMIN}			1.2		μs
Maximum Switch Frequency[5)]		F_{MAX}			150		kHz
Protection							
ISP Over Voltage Protection Threshold		V_{ISP_MAX1}	V_{SET}<0.38V		0.7		V
		V_{ISP_MAX2}	V_{SET}>0.42V		1.2		
Output Over Voltage Protection Threshold		V_{OVP1}	V_{OVP}=2V		250		V
		V_{OVP2}	V_{OVP}=0V		450		
		V_{OVP3}	V_{OVP} >4V		500		
OVP Pin Current		I_{OVP}			4		μA
SET Pin Current		I_{SET}			10		μA
Thermal Protection Threshold[5)]		T_{OTP}			150		℃
MOS							
MOS Rdson[5)]	JW1806M	Rdson			13		Ω
	JW1806A				8.5		
	JW1806B				5.5		
	JW1806C				3		
Breakdown Voltage		BV		500			V

5) Guaranteed by design.

PIN DESCRIPTION

Pin	Name	Description
1	GND	Chip ground.
2	SET	T_{ONMAX} and V_{ISP_MAX} set pin.
3,6	NC	No connection.
4	VIN	Power supply input.
5	DRAIN	Drain of the MOSFET.
7	ISP	Current detection pin.
8	OVP	OVP set pin.

BLOCK DIAGRAM



FUNCTIONAL DESCRIPTION

The JW1806X series is a TRIAC dimmable Boost LED driver IC.

Power Supply

JW1806X series is supplied by output voltage directly. When VIN reaches VIN start up voltage(V_{IN_ST}), the chip begins to switch. Once VIN is lower than VIN under voltage lockout(V_{IN_UVLO}), JW1806X series stops switching.

Constant Current Control

JW1806X series achieves constant current through average current control algorithm. The close-loop control method ensures good line and load regulation. The output LED average current can be expressed by:

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

Where,

R_S – the sensing resistor connected between ISP and chip ground.

V_{REF} – the reference voltage.

TRIAC Dimming

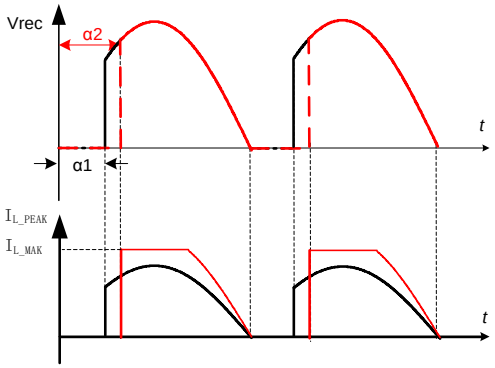
In non-dimming mode, the on time of the MOS(T_{ON}) is determined by the output of internal close-loop to ensure good current regulation. In dimming mode, along with dimming off angle increasing($\alpha1$ to $\alpha2$), JW1806X series slowly enters into open-loop state, T_{ON} reaches T_{ONMAX}, which is determined by the SET resistors. To ensure good dimming performance, V_{ISP} is also limited and:

$$T_{ONMAX} = \begin{cases} (R_{SET} + 2.1) \times 0.77\ \mu S; & R_{SET} \le 24\ (K\Omega) \\ (R_{SET} + 2.1) \times 0.128\ \mu S; & R_{SET} \ge 66\ (K\Omega) \end{cases}$$

$$V_{ISP\_MAX} = \begin{cases} V_{ISP\_MAX1}, & R_{SET} \le 24\ (K\Omega) \\ V_{ISP\_MAX2}, & R_{SET} \ge 66\ (K\Omega) \end{cases}$$

Where,

R_{SET} – the resistor connected between SET and chip ground.



For low input condition(VIN=100~132Vac), R_{SET}≥66KΩ is recommend. And R_{SET}≤24KΩ is suitable for high input condition(VIN>176Vac).

Critical Conduction Mode Operation

JW1806X series works in the critical conduction mode of the inductor current. When the power MOSFET turns on, the inductor current increases from zero linearly. The turn-on time of the MOSFET can be calculated as:

$$T_{ON} = I_{PK} * L / V_{IN}$$

Where,

L –inductance.

I_{PK} – Peak current of the inductor.

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

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 is:

$$T_{OFF} = I_{PK} * L / (V_{LED} - V_{IN})$$

Where, V_{LED} – output voltage.

Over Temperature Protection

When JW1806X series temperature is higher than thermal Protection Threshold(T_{OTP}), LED current reduces to decrease the temperature of the LED system, thus ensures the reliability.

LED Open Protection

The OVP threshold (V_{O_OVP}) is set by the OVP pin. When Vo is higher than V_{O_OVP}, LED open protection is triggered and the chip stops switching for 800ms. The following table shows the V_{O_OVP} design guide:

OVP Pin	V_{O_OVP}(V)
Connected with 510 KΩ resistor	V_{O_OVP1}
Short connected	V_{O_OVP2}
Not connected	V_{O_OVP3}

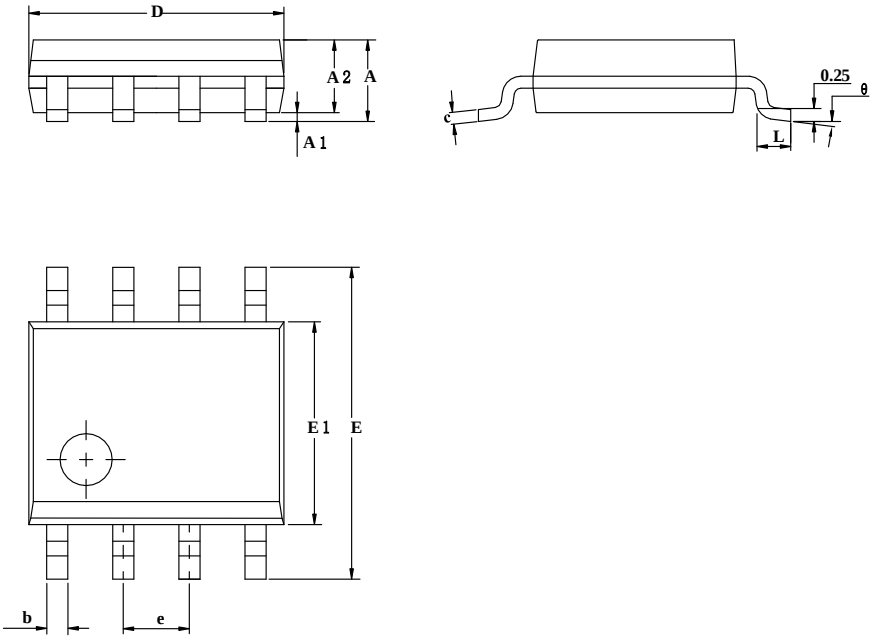
PCB Layout Guidelines

When designing the PCB of the JW1806X series system, please follow the directions:

1. Make the area of the power loop as small as possible in order to reduce the EMI radiation.
2. The chip should be far away from the heating element, such as the inductor and the freewheel diode.

PACKAGE OUTLINE

SOP8 UNIT: mm



Symbol	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.75
A1	0.05	0.15	0.25
A2	1.25	1.40	1.65
b	0.32	0.42	0.52
c	0.10	0.20	0.30
D	4.50	5.00	5.50
E	5.50	6.00	6.50
E1	3.50	3.90	4.30
e	1.27TYP		
L	0.40	—	1.27
θ	0°	—	8°

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