JW1962O

Offline Boost PFC CV Controller

Parameters Subject to Change Without Notice

DESCRIPTION

The JW®1962O is a constant voltage controller with high voltage accuracy which applies to single stage boost power factor corrected(PFC) applications. The constant on time control strategy ensures high power factor, and the input voltage detection circuit is not needed, which simplifies the system design and saves the loss.

The critical conduction mode operation reduces the switching losses, improves the EMI performance and increases the efficiency.

JW1962O has multi-protection functions which largely enhance the safety and reliability of the system, including VCC UVLO, ISP over voltage protection, open feedback protection, FB over voltage protection and over-temperature protection.

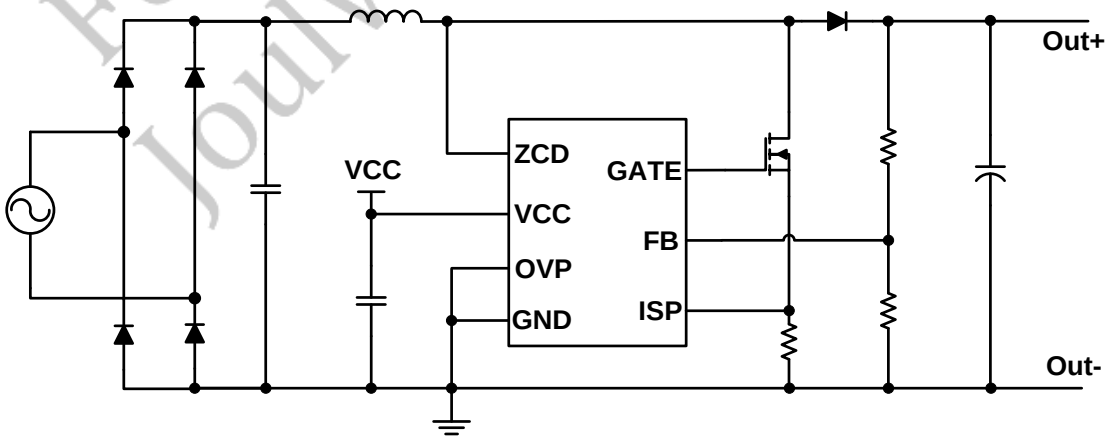
FEATURES

- Low quiescent current
- +600mA/-800mA peak gate drive current
- High power factor and low THD
- Critical conduction mode
- Additional OVP
- High reference voltage accuracy
- High efficiency over wide operating range
- Open feedback protection
- Disable function
- Pulse by pulse current limit
- FB over voltage protection
- ISP over voltage protection
- Internal over-temperature protection
- SOP8 package

APPLICATIONS

- SMPS
- AC-DC Adapter
- Flat TV

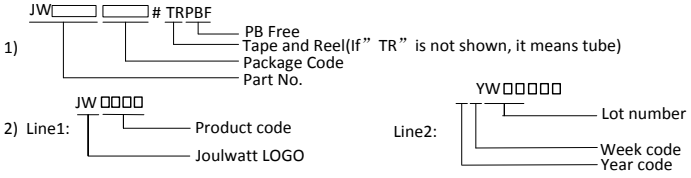
TYPICAL APPLICATION



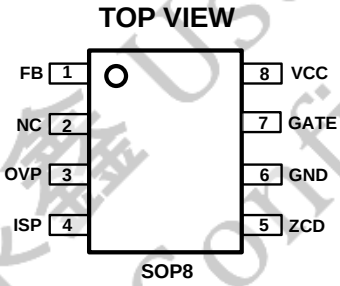
ORDER INFORMATION

Notes:

DEVICE[1)]	PACKAGE	TOP MARKING[2)]
JW1962OSOPB#TRPBF	SOP8	JW1962O YW□□□□□



PIN CONFIGURATION



ABSOLUTE MAXIMUM RATING[1)]

VCC Current 7mA
ZCD Voltage.....700V
GATE Voltage.....15V
All Other Pins.....5 V
Junction Temperature[2) 3)] 150ºC
Lead Temperature..... 260ºC
Storage Temperature..... -65ºC to +150ºC
ESD Susceptibility (Human Body Model) 2kV

RECOMMENDED OPERATING CONDITIONS

VCC Voltage.....13V

Operating Junction Temp (T_J)..... -40ºC to 125ºC

THERMAL PERFORMANCE[4)]

	θ_{JA}	θ_{JC}
SOP8	116	54ºC/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 JW1962O 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
VCC Start-Up Voltage	V_{CC_ST}		13.5	14.3	15.1	V
VCC Under Voltage Lockout	V_{CC_UVLO}		7.8	8.3	8.8	V
VCC Operational Current at Disable	I_{VCC_DIS}		32	44	56	μA
VCC Start-up Supply Current	I_{VCC_ST}	V_{CC}=8V		19	60	μA
VCC Over Voltage Threshold	V_{CC_OVP}	I_{VCC}=1mA	23.7	25	26.3	V
VCC Shunt Current[5)]	I_{SHUNT}	V_{CC}=26V		10		mA
ISP Clamp Voltage	V_{ISP_MAX}		0.47	0.5	0.53	V
ISP OVP Threshold	V_{ISP_OVP}		1.4	1.5	1.6	V
FB Reference Voltage	V_{FB_REF}		2.45	2.5	2.55	V
OVP Threshold at FB Pin	V_{FB_OVP}		2.62	2.7	2.78	V
FB OVP Hysteresis	$V_{FB\_OVP\_HYST}$		0.14	0.2	0.26	V
FB Start-up Voltage	V_{FB_ST}		368	400	432	mV
FB Quick Start-up Voltage	V_{FB_QST}		2	2.1	2.2	V
FB Quick Start-up Hysteresis[5)]	$V_{FB\_QST\_HYST}$			0.1		V
OVP Threshold at OVP Pin	V_{OVP_OVP}		2.4	2.5	2.6	V
GATE High Voltage	V_{GS_H}		9	10	11	V
Maximum On Time of MOSFET	T_{ON_MAX}		34	36	38	μs
Minimum On Time of MOSFET[5)]	T_{ON_MIN}		0.36	0.42		μs
Maximum Off Time of MOSFET	T_{OFF_MAX}		44	62	80	μs
Minimum Off Time of MOSFET[5)]	T_{OFF_MIN}		0.6	0.85		μs
Maximum Switching Frequency[5)]	F_{MAX}			240		kHz
Over Thermal Protection Threshold[5)]	T_{OTP}			140		℃
Over Thermal Protection Hysteresis[5)]	T_{OTP_HYST}			30		℃

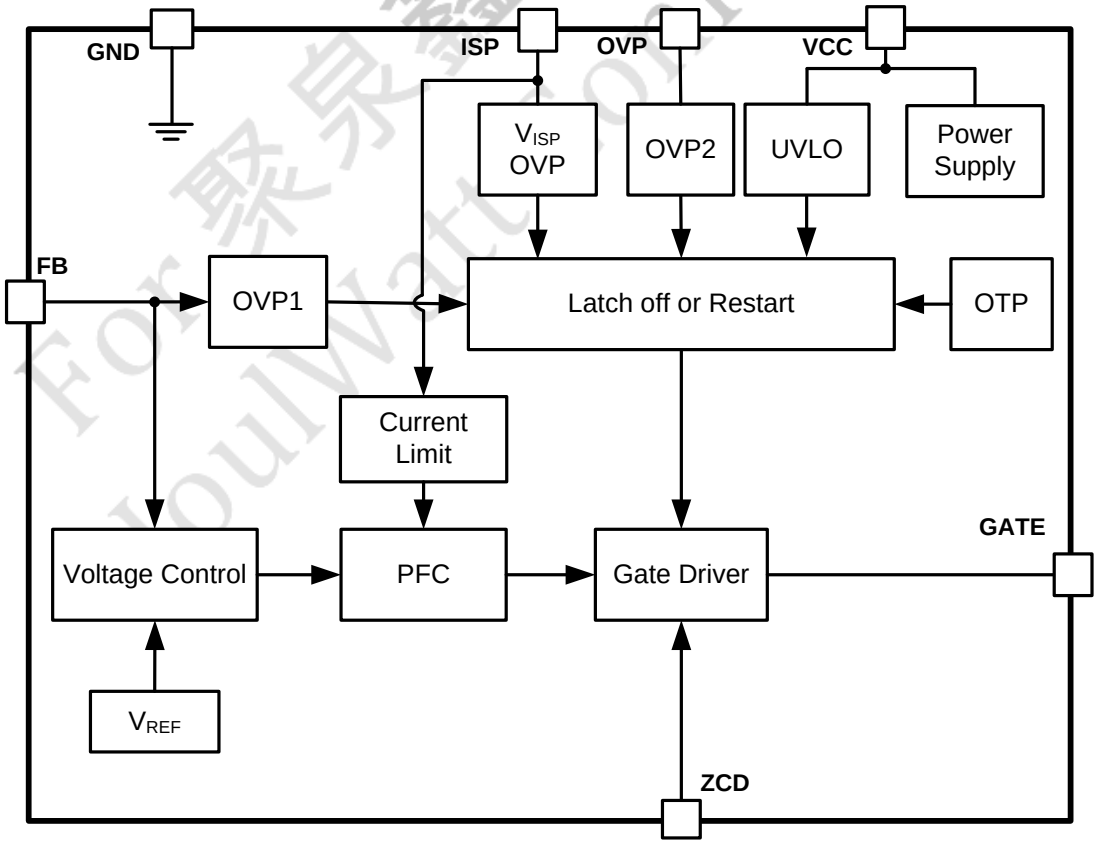
Note:

5) Guaranteed by design.

PIN DESCRIPTION

Pin No.	Name	Description
1	FB	Output voltage feedback pin.
2	NC	No connection.
3	OVP	Over voltage protection pin.
4	ISP	Current detection pin.
5	ZCD	Zero current detecting pin.
6	GND	Chip ground.
7	GATE	Gate driver for external power MOS.
8	VCC	Power supply output.

BLOCK DIAGRAM



FUNCTIONAL DESCRIPTION

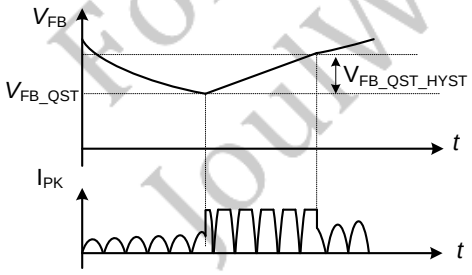
The JW1962O is a constant voltage(CV) controller which applies to boost system with power factor correction. JW1962O can achieve excellent line and load regulations, high efficiency and low system cost with few peripheral components.

Start Up

When VCC is charged to VCC Start-up Voltage(V_{CC_ST}), the GATE driver begins to switch. When VCC is higher than VCC Over Voltage Threshold(V_{CC_OVP}), VCC shunt current is enabled to prevent VCC from being too high. When VCC is lower than VCC Under Voltage Lockout(V_{CC_UVLO}), the chip stops switching.

Quick Start-up Function

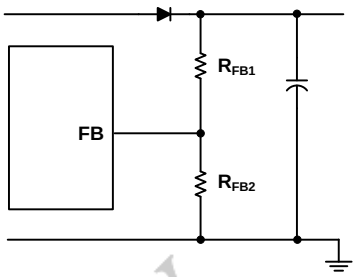
JW1962O enters into quick start up mode when V_{FB} is lower than FB Quick Start-up Voltage(V_{FB_QST}). I_{PK} is I_{PK_MAX} unless T_{ON} reaches Maximum ON Time(T_{ON_MAX}),which accelerates the start up process and decreases the voltage drop in light to heavy load transient. JW1962O quits this mode when V_{FB} is larger than V_{FB_QST}+ $V_{FB\_QST\_HYST}$.



Constant Voltage Control

The JW1962O controls the output voltage from the information of FB pin. The output voltage is

$$V_O = V_{FB\_REF} \times (R_{FB1}+R_{FB2}) / R_{FB2}$$



Where

V_{FB_REF} – The FB Reference Voltage.

R_{FB1}, R_{FB2} – FB divide resistors.

Critical Conduction Mode Operation

JW1962O works in the critical conduction mode of the inductor current. When the power MOSFET is turned on, the inductor current increases from zero. The turn on time of the MOSFET can be calculated as:

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

Where,

L – Inductance.

V_{IN} – Input voltage.

I_{PK} is the peak current in one switching period and the maximum value(I_{PK_MAX}) is limited by the MOS current sensing resistor(R_{ISP}).

$$I_{PK\_MAX}=V_{ISP\_MAX}/R_{ISP}$$

V_{ISP_MAX} – ISP Clamp 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:

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

Where,

V_{OUT} – Output voltage.

The power inductance can be calculated as:

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

Where, f is the switching frequency of the boost system.

Disable Function

The FB pin can also be used for device disabling. If V_{FB} is pulled down and lower than FB Start-up Voltage(V_{FB_ST}), JW1962O stops switching and enters in green mode which reduces the power consumption. JW1962O will restart if $V_{FB}>V_{FB\_ST}$.

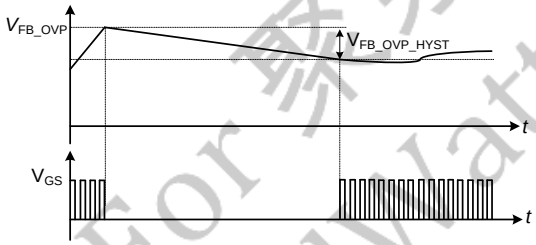
ISP Over Voltage Protection

Normally the Maximum V_{ISP} is clamped to V_{ISP_MAX}, but V_{ISP} is very high if the inductor or the freewheeling diode is shorted. When V_{ISP} is higher than ISP OVP Threshold(V_{ISP_OVP}), ISP over voltage protection is triggered and JW1962O stops switching for 800mS.

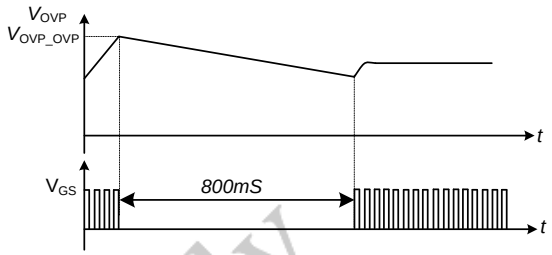
FB/OVP Over Voltage Protection

The over voltage protection is triggered if one of the following conditions is satisfied.

1) V_{FB} is over than FB Over Voltage Protection Threshold(V_{FB_OVP}). The internal comp will be reset and the power MOSFET gate driver stops switching unless FB voltage is decreased to V_{FB_OVP}-$V_{FB\_OVP\_HYST}$.



2) The voltage of OVP pin(V_{OVP}) is over than its OVP Threshold(V_{OVP_OVP}), then JW1962O stops switching for 800mS and restarts if $V_{OVP}<V_{OVP\_OVP}$.



Over Temperature Protection

When internal temperature of the chip exceeds the Over Thermal Protection Threshold(T_{OTP}), JW1962O stops switching unless the junction temperature is decreased to T_{OTP} -T_{OTP_HYST}.

PCB Design

When designing the PCB system, please follow the directions as the following figure shows:

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.

REFERENCE DESIGN

This reference design is suitable for 160W PFC, using JW1962O, with high efficiency, excellent load regulation.

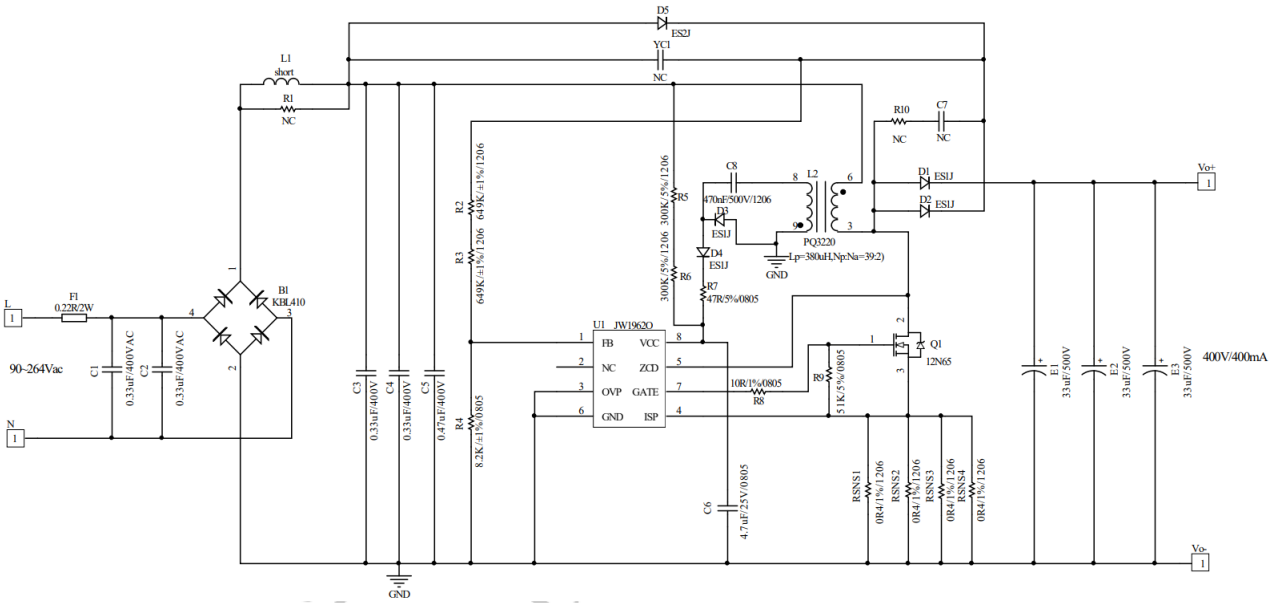
Reference ：

V_{IN}: 90VAC~264VAC

V_{OUT}: 400V

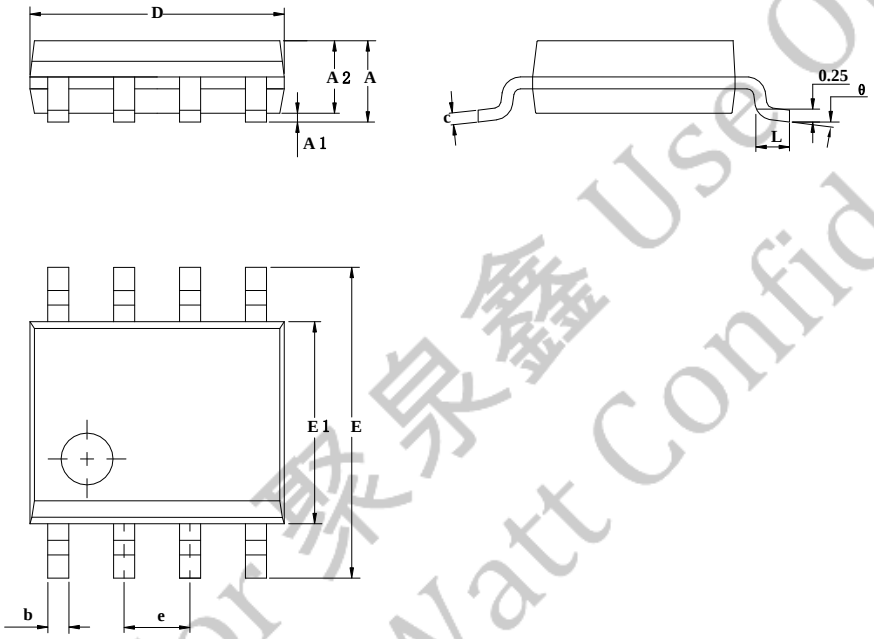
Maximum I_{OUT}: 400mA

PF: >0.9



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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