JW77198B

80V, 15mΩ Synchronous Rectifier

Parameters Subject to Change Without Notice

DESCRIPTION

JW®77198B is a synchronous rectifier, used for the secondary side rectification of flyback. By driving an internal MOSFET, JW77198B is able to significantly improve the efficiency comparing with the conventional Diode rectifier.

When JW77198B senses V_{DS} of internal MOSFET less than -300mV, it turns on the internal MOSFET. Once the V_{SW} is greater than -10mV, JW77198B turns off the internal MOSFET.

JW77198B supports multiple operation modes, such as DCM, CrCM, CCM and Quasi-Resonant. By implementing the Joulwatt proprietary technology, JW77198B is able to handle CCM operation.

JW77198B is available in SOP-8 package.

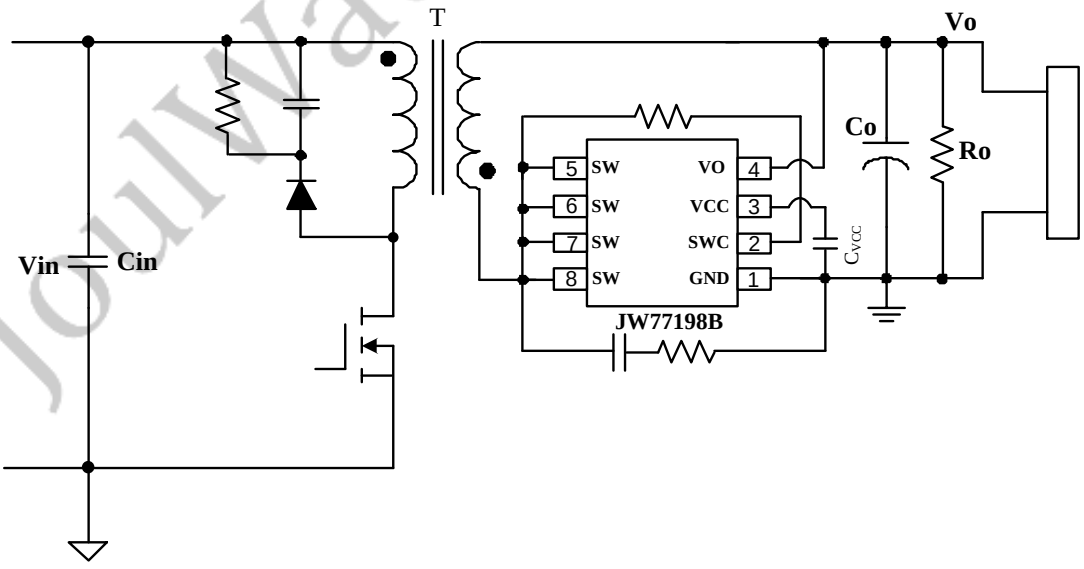
FEATURES

- Supports DCM, Quasi-Resonant, CrCM and CCM operation
- Support the flyback topology
- Output voltage directly supply VCC
- Low quiescent current
- Under-voltage protection
- Fast driver capability for CCM operation
- SOP-8 package

APPLICATIONS

- Flyback converter
- Adaptor

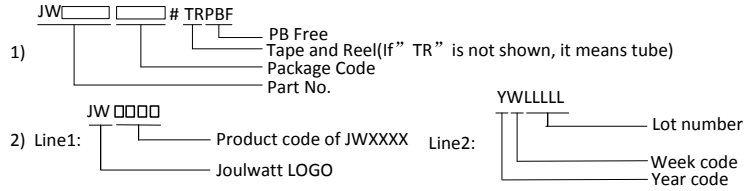
TYPICAL APPLICATION



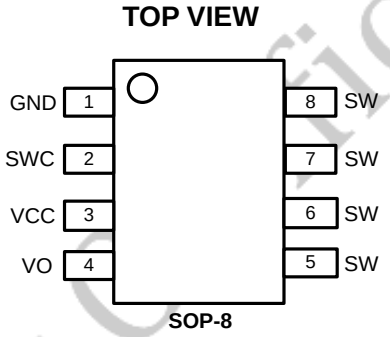
ORDER INFORMATION

DEVICE[1)]	PACKAGE	TOP MARKING[2)]
JW77198BSOPB#TRPBF	SOP8	JW77198B YWLLLLL

Notes:



PIN CONFIGURATION



ABSOLUTE MAXIMUM RATING[1)]

SW Pin 80V
SWC Pin 80V
VO Pin 30V
VCC Pin.....6.5V
Maximum Power Dissipation[2)].....1.3W
Junction Temperature[3)].....150ºC
Lead Temperature 260ºC
Storage Temperature.....-65ºC to150ºC
ESD Susceptibility (Human Body Model) 2kV

RECOMMENDED OPERATING CONDITIONS

SW Pin.....4.7V to 64V
SWC Pin.....4.7V to 64V
VO Pin.....2.5V to 20V
VCC Pin.....4.5V to 6.4V
Operation Junction Temp. ..... -40ºC to 125ºC

THERMAL PERFORMANCE[4)]

	θ_{JA}	θ_{Jc}
SOP8	96	45ºC/W

Note：

1) Exceeding these ratings may damage the device.

2) TA=25℃. The maximum allowable power dissipation is a function of the maximum junction temperature T_J(MAX), the junction-to-ambient thermal resistance θ_{JA}, and the ambient temperature T_A. The maximum allowable continuous power dissipation at any ambient temperature is calculated by $P_D(MAX)=(T_J(MAX)-T_A)/\theta_{JA}$.

3) The JW77198B 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.

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

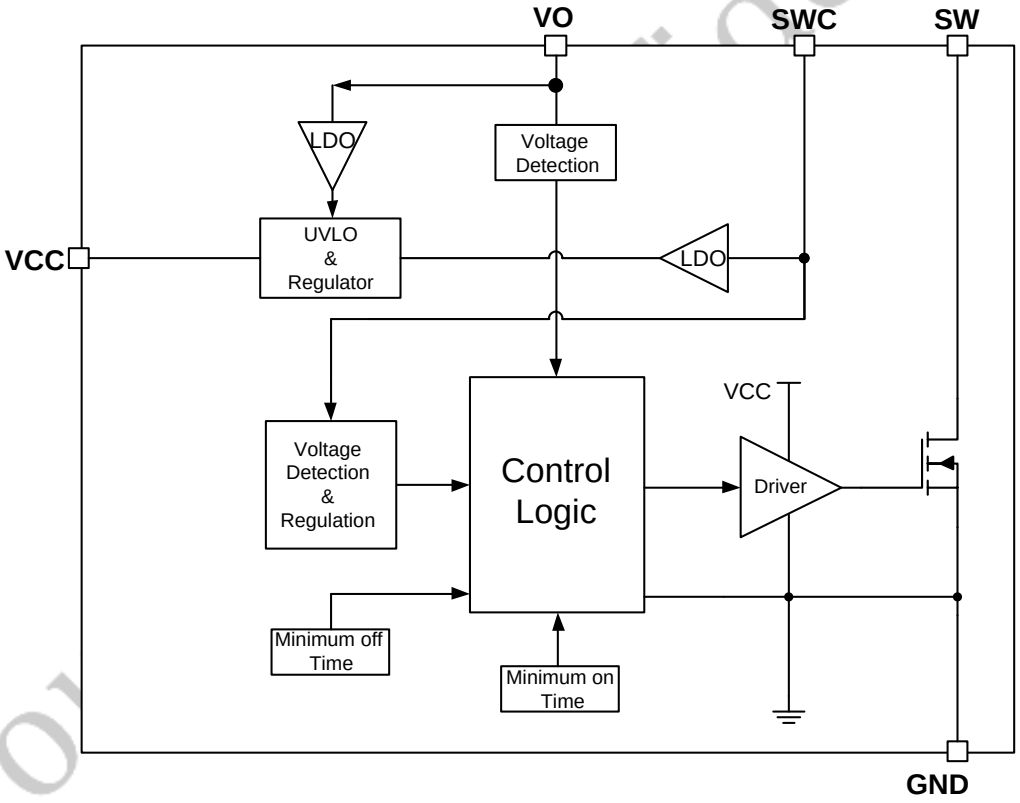
ELECTRICAL CHARACTERISTICS

T_A = 25ºC, unless otherwise stated						
Item	**Symbol**	**Condition**	**Min.**	**Typ.**	**Max.**	**Units**
VCC Section						
VCC Voltage	VCC	SW=40V, VCC=2.2uF	5.8	6.1	6.4	V
VCC Startup voltage	$V_{CC\_Startup}$		3.9	4.2	4.5	V
VCC UVLO	V_{CC_UVLO}		3.7	4.0	4.3	V
Quiescent Current	I_q	VCC=4.5V, VCC=2.2uF	20	32	55	uA
Internal Driver Section						
Internal Gate Pull up current	I_{GU}	GT=1V		0.65		A
Internal Gate Pull down current	I_{GD}	GT=5V		4.7		A
Internal Gate Minimum on Time	T_{MIN_ON}			1.3		uS
Internal Gate Minimum off Time	T_{MIN_OFF}			650		nS
Turn-on total delay	T_{DON}			84		nS
Turn-off total delay	T_{DOF}			22.4		nS
SW and VO Section						
Internal MOSFET Turn on Threshold	V_{SW_ON}			-300		mV
Internal MOSFET Turn off Threshold	V_{SW_OFF}			-10		mV
Internal MOSFET Turn off Threshold in MOT	$V_{SW\_OFF\_MOT}$			+150		mV
SW Control Voltage	V_{SW_REG}			-40		mV
SW Control Voltage MAX	$V_{SW\_REG\_MAX}$			-170		mV
VO Enable Charge Voltage	V_{O_EN}	VCC=4V, SW=0V		4.3		V
VO Disable Charge Voltage	V_{O_DIS}	VCC=4V, SW=0V		4.2		V
VCC Charge Current	I_{CV}	SW=40V, VCC=4V		18		mA
VO Charge Current	I_{VO_CHG}	SW=0V, VCC=4V, VO=5V		20		mA
Vo Short-circuit Detection Voltage	V_{O_SHORT}		1.8	2.1	2.3	V
Internal MOSFET Section						
Internal MOSFET Rdson	Rdson			15		mΩ
Breakdown voltage	$B_{(BR)DSS}$		80			V

PIN DESCRIPTION

Pin No.	Name	Description
1	GND	Power Ground.
2	SWC	Internal Power MOSFET Drain Voltage Sensing. Charging to VCC.
3	VCC	Power supply. Bypass a Capacitor Between VCC and GND.
4	VO	Output Voltage Sensing and Charging to VCC.
5,6,7,8	SW	Internal Power MOSFET Drain.

BLOCK DIAGRAM



FUNCTIONAL DESCRIPTION

Operation

JW77198B is a synchronous rectifier which combined with internal MOSFET can replace the Schottky Barrier Diode. It supports all operations, such as DCM, CrCM, (Quasi-Resonant) and CCM when adopted in flyback converter.

Startup

During the startup period, when the VCC is lower than startup voltage, the external MOSFET is turned off. The current flows though body diode before the VCC reaches to the startup voltage Vcc_startup.

Under-Voltage Lockout (UVLO)

When the VCC is below UVLO threshold, the external MOSFET is turned off and pulled low internally. Once the VCC exceeds the startup voltage Vcc_startup, the parts is activated again.

LDO Charging Logic

JW77198B have two internal LDO to charge the VCC pin. When VO is lower than 4.3V, JW77198B can power itself through the internal LDO connected to SWC pin during the SR turn-off period, which means primary the primary side MOSFET is turned on and SWC presents a positive voltage. A capacitor between VCC and GND is required to store the energy and supply to IC during the SR turn-on period.

The other internal LDO is connected from VO to VCC, it charges VCC pin when VO is higher than 4.3V.

Turn On Phase

When the synchronous MOEFET is conducting, current flows through the body diode of MOSFET, which generates a negative voltage V_{SW} across it. When V_{SW} is lower than V_{MOS_ON}, the part will pull the internal gate high to turn on the synchronous MOSFET after turn on delay time T_{DON}.

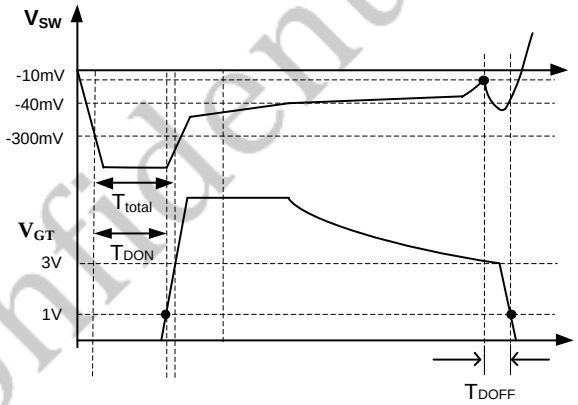


Figure-1 Turn on delay and turn off delay

Conducting Phase

When the synchronous MOSFET is turn on, the drain source voltage V_{SW} it is determined by its on resistance and the current through it. The part adjusts the gate voltage and regulates the Vsw to a internal threshold (typical -40mV) after the synchronous MOSFET turn on. When the V_{SW} is lower than -40mV, the gate keep its maximum voltage. And the synchronous MOSFET is fully on.

The control circuit contains a minimum on time function. The V_{SW} voltage may have a parasitic ring when the synchronous MOSFET turns on. So a minimum on time (MOT) is very important to avoid the MOSFET turn off threshold is false triggered. During the minimum time, the gate can still be turned off if V_{SW} touches a positive

threshold value, +150mV.

Turn Off Phase

After synchronous MOSFET conducting, once the voltage V_{SW} touches the MOSFET turn off threshold (-10mV), the internal gate is pulled to low after a turn off delay time T_{DOFF}. A 650nS blanking time is necessary to avoid error trigger.

Minimum on-time (MOT)

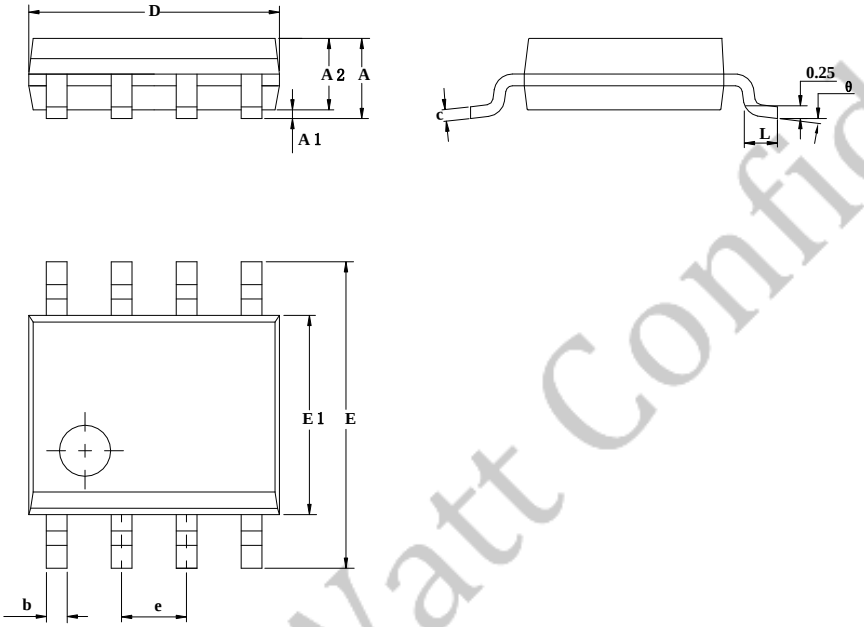
MOT stands for the minimum on time of synchronous MOSFET. For JW77198B, MOT is about 1.3uS.

Output Voltage Detection

The JW77198B has output voltage detection function via VO pin. To avoid the gate error turn on during starting-up period, the whole SR control logic is disabled when the VO voltage is lower than 2.1V. VCC is charged from VO pin when VO is higher than 4.3V to save power loss caused by the LDO when charging from SWC pin to VCC pin.

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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