

## BW7385

### Non-isolation Buck current control IC with High PFC for LED Lighting

#### Description

The BW7385 is a THD and Efficiency adjustable, high accuracy and high power factor constant current PWM controller. This is capable of controlling THD and Efficiency optimization by an external resistor. These functions enable the LED driver to easily meet rule of LED current requirements

The IC achieves high power factor and high efficiency by BCM mode. The line and load regulation of LED current is about  $\pm 2.5\%$  because of particular control method.

BW7385 also provides gate driving voltage clamping, VCC over voltage protection and system output open/short circuit protection to increase IC performance.

#### Features

- THD and Efficiency adjustable by RT Pin
- Low THD <15% (ADJ)
- Accuracy Constant Current ( $\pm 2.5\%$ )
- High power factor (>0.9)
- Low BOM Cost
- Boundary Current Mode Control
- Gate Output Voltage Clamp
- LED Open Protection(OVP)
- LED Short Protection(SCP)
- Over Current Protection (OCP)
- Over Thermal Protection(OTP)
- SOT26 Package Available
- RoHS compliant package

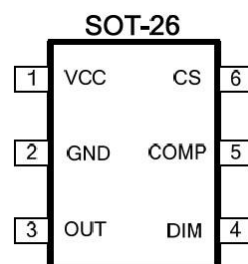


**RoHS  
COMPLIANT**

#### Packing & Order Information

3,000/Reel

#### Pin Configurations (Top View)



#### Applications

- LED lighting
- Down light
- Tube lamp
- PAR lamp
- Bulb

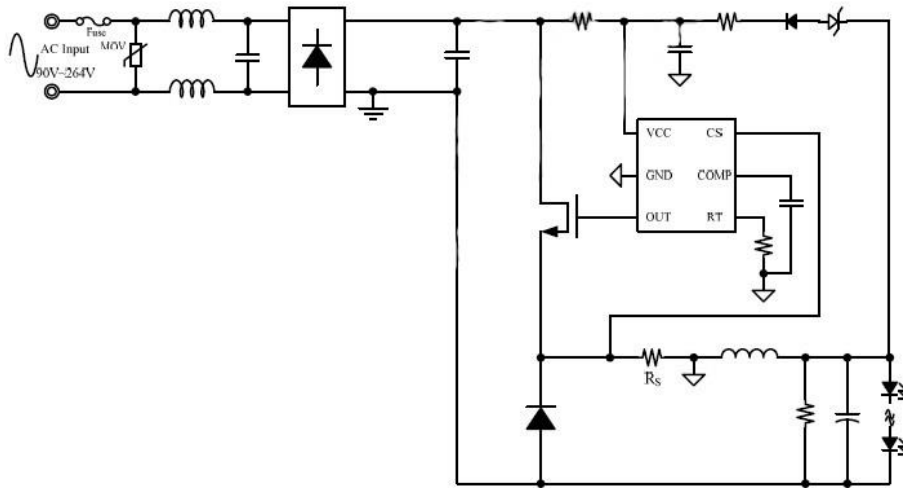
#### PIN DESCRIPTIONS

Pin Name	Pin Description
VCC	Power supply pin for all internal circuit
GND	Ground return for all internal circuit
OUT	Gate driver output
RT	Efficiency / THD option pin
COM	Output pin of error amplifier
CS	Input current sense pin

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### TYPICAL APPLICATION CIRCUITS



### ABSOLUTE MAXIMUM RATINGS (Note 1)

Parameter	Symbol	Range	Unit
Power supply pin	V <sub>CC</sub>	40	V
RT voltage to GND	V <sub>RT</sub>	-0.3 to 5.5	V
CS voltage to GND	V <sub>CS</sub>	-0.3 to 5.5	V
OUT voltage to GND	V <sub>OUT</sub>	-0.3 to 40	V
COM voltage to GND	V <sub>COM</sub>	-0.3 to 5.5	V
Maximum junction temperature	T <sub>J</sub>	-40 to +150	°C
Storage temperature rang	T <sub>STG</sub>	-65 to +150	°C
Lead temperature (Soldering 10 sec)	T <sub>LEAD</sub>	260	°C
Power dissipation @TA=25°C	P <sub>D</sub>	0.3	W
Thermal resistance junction to ambient (Note 2)	θ <sub>JA</sub>	220	°C/W
Thermal Resistance	θ <sub>JC</sub>	106.6	°C/W
ESD rating, Human body mode (Note 3)	V <sub>ESD</sub>	2	kV
ESD rating, machine mode (Note 3)	V <sub>ESD</sub>	200	V

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### RECOMMENDED OPERATING CONDITIONS (Note 4)

Parameter	Symbol	Operation Conditions	Unit
Power supply pin	V <sub>CC</sub>	33	V
RT voltage to GND	V <sub>RT</sub>	-0.3 to 5	V
CS voltage to GND	V <sub>CS</sub>	-0.3 to 5	V
OUT voltage to GND	V <sub>OUT</sub>	-0.3 to 19	V
COM voltage to GND	V <sub>COM</sub>	-0.3 to 5	V
Operating Junction Temperature Range	T <sub>J</sub>	-40 to +125	°C
Operating Ambient Temperature Range	T <sub>OPA</sub>	-40 to +85	°C

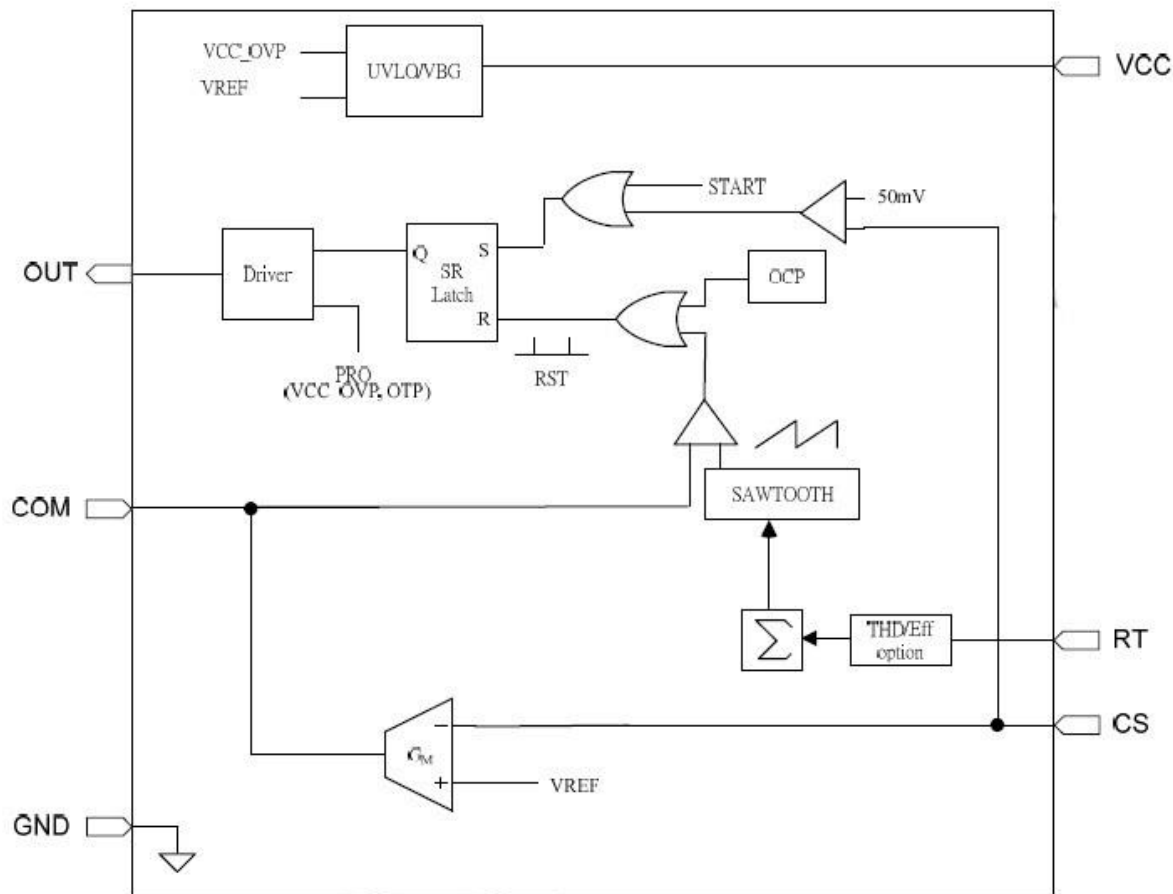
Note 1: Stresses listed as the above “Absolute Maximum Ratings” may cause permanent damage to the device. These are for stress ratings. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may remain possibility to affect device reliability.

Note 2: Thermal Resistance is specified with the component mounted on a low effective thermal conductivity test board in free air at TA=25°C.

Note 3: Devices are ESD sensitive. Handling precaution recommended.

Note 4: The device is not guaranteed to function outside its operating conditions.

### BLOCK DIAGRAM



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ELECTRICAL CHARACTERISTICS VCC=15V, TA= 25°C, unless otherwise specified.

### SUPPLY VOLTAGE

Parameter	Symbol	Conditions	Min	Typ.	Max.	Units
Startup Current	V <sub>CC(ST)</sub>	VCC= VUVLO(on) -1V		45		uA
Operating Current	I <sub>OPA</sub>	With 1nF load on OUT pin		2.1	2.6	mA
UVLO(off)	V <sub>UVLO(off)</sub>		7	8	9	V
UVLO(on)	V <sub>UVLO(on)</sub>		16	17.5	19	V
OVP Level on VCC Pin	V <sub>OVP</sub>		29	31	33	V

### VOLTAGE FEEDBACK

Parameter	Symbol	Conditions	Min	Typ.	Max.	Units
Feedback Reference Voltage	V <sub>FB</sub>		0.196	0.2	0.204	V
Tran-Conductance	G <sub>M</sub>			58		uS
Output Sink Current	I <sub>o-sink</sub>			5.8		uA
Output Source Current	I <sub>o-source</sub>			5.8		uA

### CURRENT SENSING

Parameter	Symbol	Conditions	Min	Typ.	Max.	Units
CS limit Voltage	V <sub>OCP</sub>			1.4		V
Open Loop Voltage, CS Pin Open	V <sub>OLP</sub>			5		V
Leading-Edge Blanking Time	LEB			400		nS
Delay to Output				100		nS

### SWITCHING FREQUENCY

Parameter	Symbol	Conditions	Min	Typ.	Max.	KHz
Start Frequency	TSTR		3	4.5	6	KHz

### GATE DRIVER OUTPUT

Parameter	Symbol	Conditions	Min	Typ.	Max.	Units
Rising Time	T <sub>RISE</sub>	Load Capacitance = 1000pF		90		nS
Falling Time	T <sub>FAIL</sub>	Load Capacitance = 1000pF		40		nS
VGATE-Clamp	V <sub>GATE</sub>			12.5	15	V

### Thermal Section

Parameter	Symbol	Conditions	Min	Typ.	Max.	Units
Thermal Shutdown				150		°C
Thermal Shutdown release				120		°C

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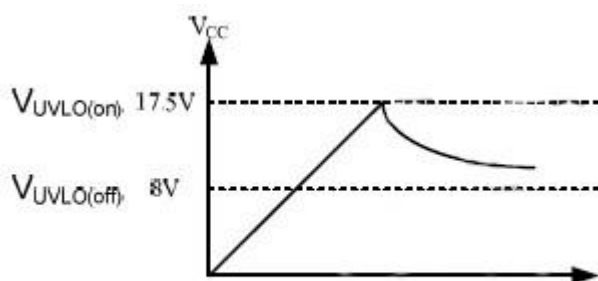
#### APPLICATION INFORMATION

##### Start-up Current

The typical start-up current is around 45uA. Very low start-up current allows the PWM controller to increase the value of start-up resistor and then reduce the power dissipation on it.

##### UVLO(Under Voltage Lockout)

A hysteresis UVLO comparator is implemented in BW7385 then the turn-on and turn-off thresholds level are fixed at 17.5V and 8V respectively. This hysteresis shown in Fig.3 ensures that the start-up capacitor will be adequate to supply the chip during start-up. For quickly startup the LED driver, the start-up resistor should be matched with the startup capacitor. Due to the low UVLO on level, so the turn-on delay time will also never greater than the general PWM IC.



##### LEB(Leading-Edge Blanking)

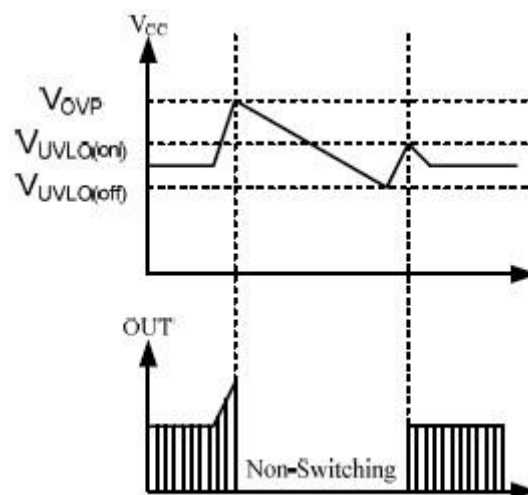
Each time the power MOSFET is switched on, a turn-on spike will inevitably occur at the sense resistor. To avoid fault trigger, a 400ns leading-edge blanking time is built in. Conventional RC filtering can therefore be omitted. During this blanking period, the current-limit comparator is disabled and can not switch off the gate driver.

##### OCP(Over Current Protection)

The BW7385 is built cycle by cycle over current protection function on CS pin. As the CS pin voltage is larger than VOCP (1.4V), the gate output will be turned off immediately to avoid the driver board be burned out.

##### OVP (Over Voltage Protection) on VCC

To prevent the LED driver from being damaged, the BW7385 is implemented an OVP function on VCC. When the VCC voltage is higher than the OVP threshold voltage 31V, the output gate driver circuit will be shut down immediately to stop the switching of power MOSFET. The VCC pin OVP function is an auto recovery type protection (latch off type optional). If the OVP condition happens, the pulses will be stopped and never recovery unless the VCC pin voltage is down to the UVLO off level. The BW7385 is working in an auto-recovery mode as shown in Fig. 4.



##### Gate Clamp

Driver is clamped to 12.5V by an internal clamping circuit to avoid the Gate of MOSFET be damage.

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#### Disclaimer

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