BW7385

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

FEATURES

- THD and Efficiency adjustable by RT Pin
- Low THD <15% (ADJ)
- Accuracy Constant Current (±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

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

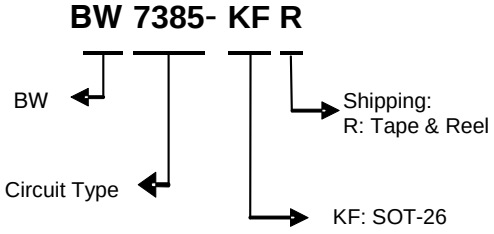
The IC achieves high power factor and high efficiency by BCM mode. The line and load regulation of LED current is about ±2.5% because of particular control method.

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

APPLICATIONS

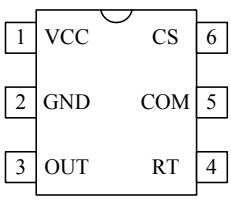
- LED lighting
- Down light
- Tube lamp
- PAR lamp
- Bulb

ORDER INFORMATION



PIN CONFIGURATIONS (TOP VIEW)

SOT-26



PIN DESCRIPTIONS

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

TYPICAL APPLICATION CIRCUITS

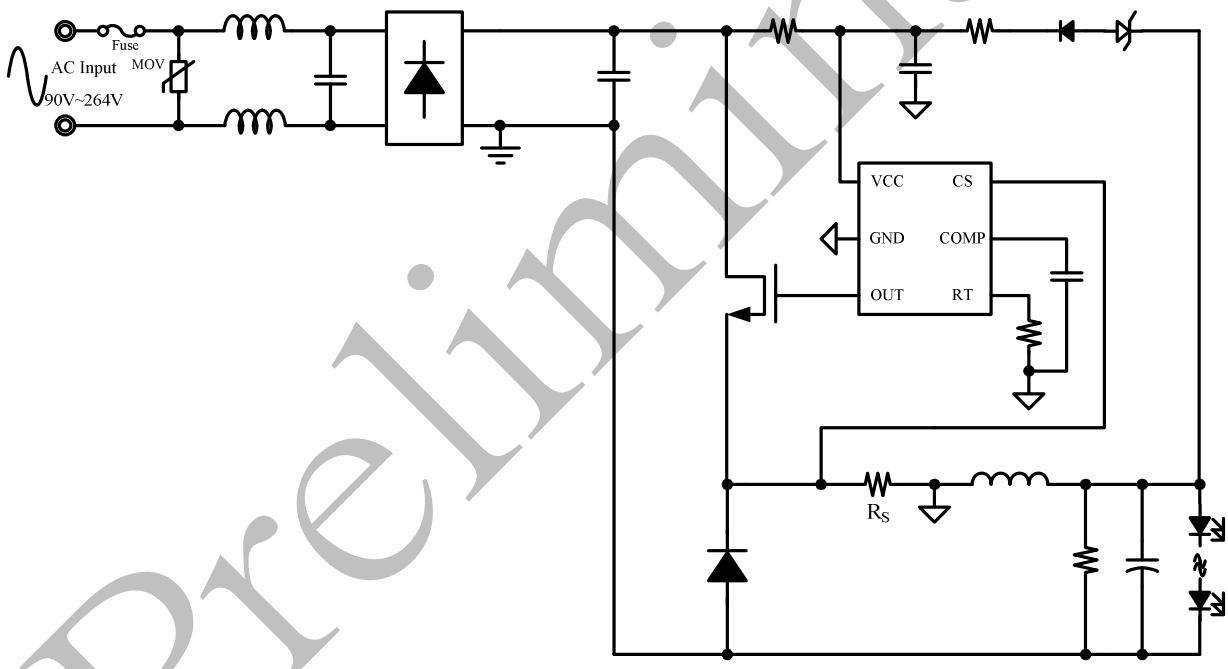


Figure 1

ABSOLUTE MAXIMUM RATINGS (Note 1)

Parameter	Symbol	Range	Unit
Power supply pin	V_{CC}	40	V
RT voltage to GND	V_{RT}	-0.3 to 5.5	V
OUT voltage to GND	V_{OUT}	-0.3 to 40	V
CS voltage to GND	V_{CS}	-0.3 to 5.5	V
COM voltage to GND	V_{COM}	-0.3 to 5.5	V
Junction Temperature Range	T_J	-40 to +150	℃
Storage Temperature Range	T_{STG}	-65 to +150	℃
Lead Temperature (Soldering 10 sec)	T_{LEAD}	260	℃
Power Dissipation @T_A=25 ℃	P_D	0.3	W
Thermal Resistance Junction to Ambient (Note 2)	θ_{JA}	220	℃/W
Thermal Resistance Junction to Case	θ_{JC}	106.6	℃/W
ESD Rating (Human body mode) (Note 3)	V_{ESD}	2	kV
ESD Rating (Machine mode) (Note 3)	V_{ESD}	200	V

RECOMMENDED OPERATING CONDITIONS (Note4)

Parameter	Symbol	Operation Conditions	Unit
Power supply pin	V_{CC}	33	V
RT voltage to GND	V_{RT}	-0.3 to 5	V
OUT voltage to GND	V_{OUT}	-0.3 to 19	V
CS voltage to GND	V_{CS}	-0.3 to 5	V
COM voltage to GND	V_{COM}	-0.3 to 5	V
Operating Junction Temperature Range	T_J	-40 to +125	℃
Operating Ambient Temperature Range	T_{OPA}	-40 to +85	℃

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 T_A=25℃.

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

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

BLOCK DIAGRAM

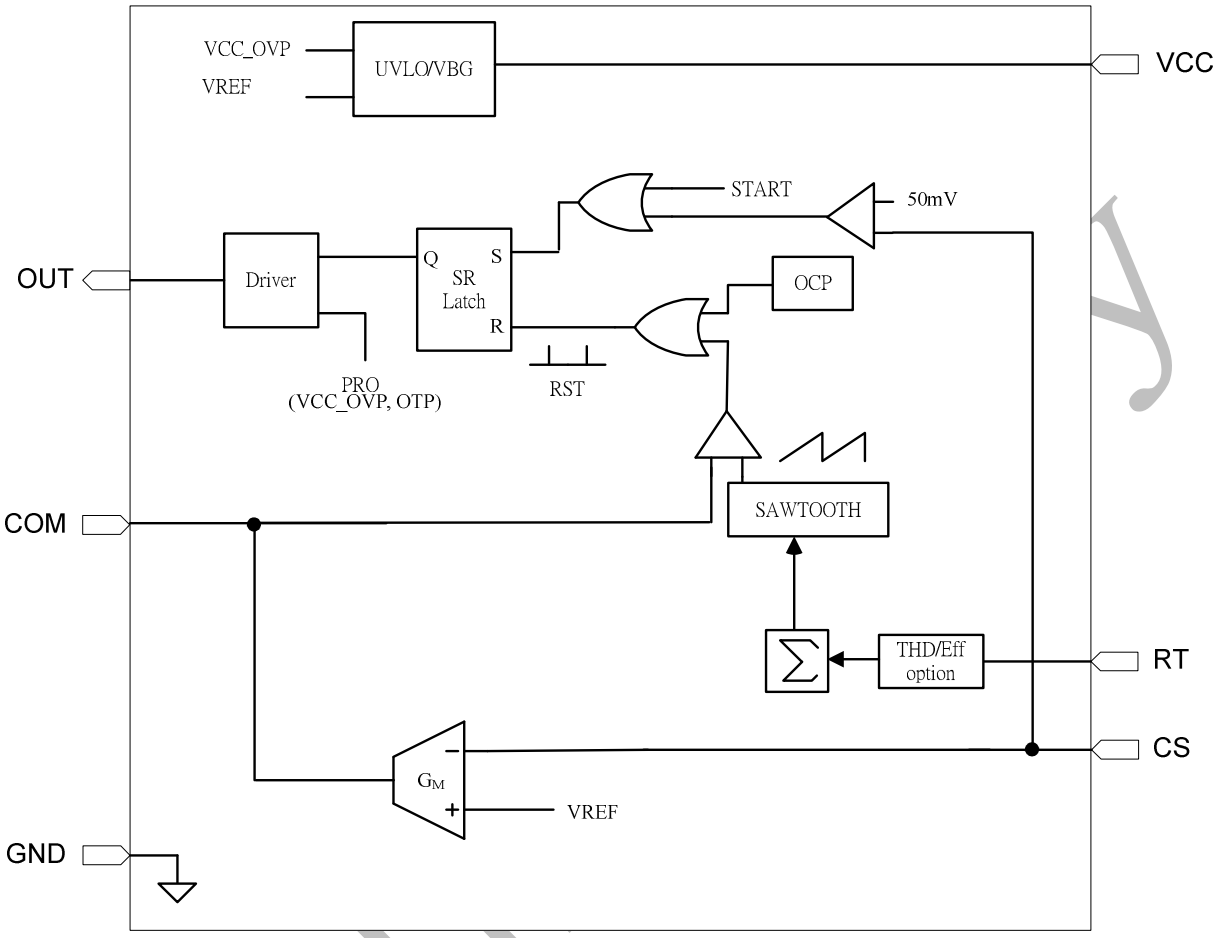


Figure 2

ELECTRICAL CHARACTERISTICS

V_{CC}=18V, T_A=25℃, unless otherwise specified.

Parameter	Symbol	Condition	Min	Typ	Max	Unit
SUPPLY VOLTAGE						
Start-up Current	$V_{CC(ST)}$	V_{CC}= $V_{UVLO(on)}$ -1V		45		uA
Operating Current	I_{OPA}	With 1nF load on OUT pin		2.1	2.6	mA
UVLO(off)	$V_{UVLO(off)}$		7	8	9	V
UVLO(on)	$V_{UVLO(on)}$		16	17.5	19	V
OVP Level on VCC Pin	V_{OVP}		29	31	33	V
VOLTAGE FEEDBACK						
Feedback Reference Voltage	V_{FB}		0.196	0.2	0.204	V
Trans conductance	G_M			58		uS
Output Sink Current	I_{O-SINK}			5.8		uA
Output Source Current	$I_{O-SOURCE}$			5.8		uA
CURRENT SENSING						
CS limit Voltage	V_{OCP}			1.4		V
Open Loop Voltage, CS Pin Open	V_{OLP}			5		V
Leading-Edge Blanking Time	LEB			400		nS
Delay to Output				100		nS
SWITCHING FREQUENCY						
Start Frequency	T_{STR}		3	4.5	6	KHz
GATE DRIVER OUTPUT						
Rising Time	T_{RISE}	Load Capacitance =1nF		90		nS
Falling Time	T_{FAIL}	Load Capacitance =1nF		40		nS
VGATE-Clamp	V_{GATE}			12.5	15	V
Thermal Section						
Thermal Shutdown				150		℃
Thermal Shutdown release				120		℃

Note 5: Guaranteed by design.

Note 6: Auto Recovery Type.

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 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 star-tup the LED driver, the start-up resistor should be matched with the start-up capacitor. Due to the low UVLO on level, so the turn-on delay time will also never greater than the general PWM IC.

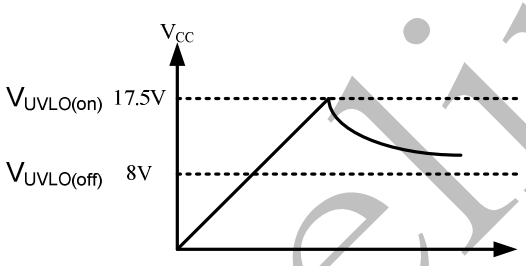


Fig. 3

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 cannot 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 V_{OCP} (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 V_{OVP} (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. If the OVP condition happens, the pulses will be stopped until 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.

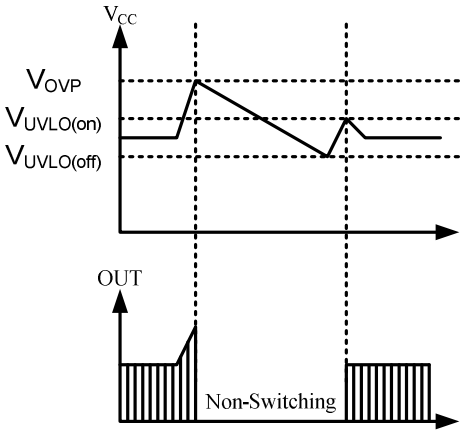


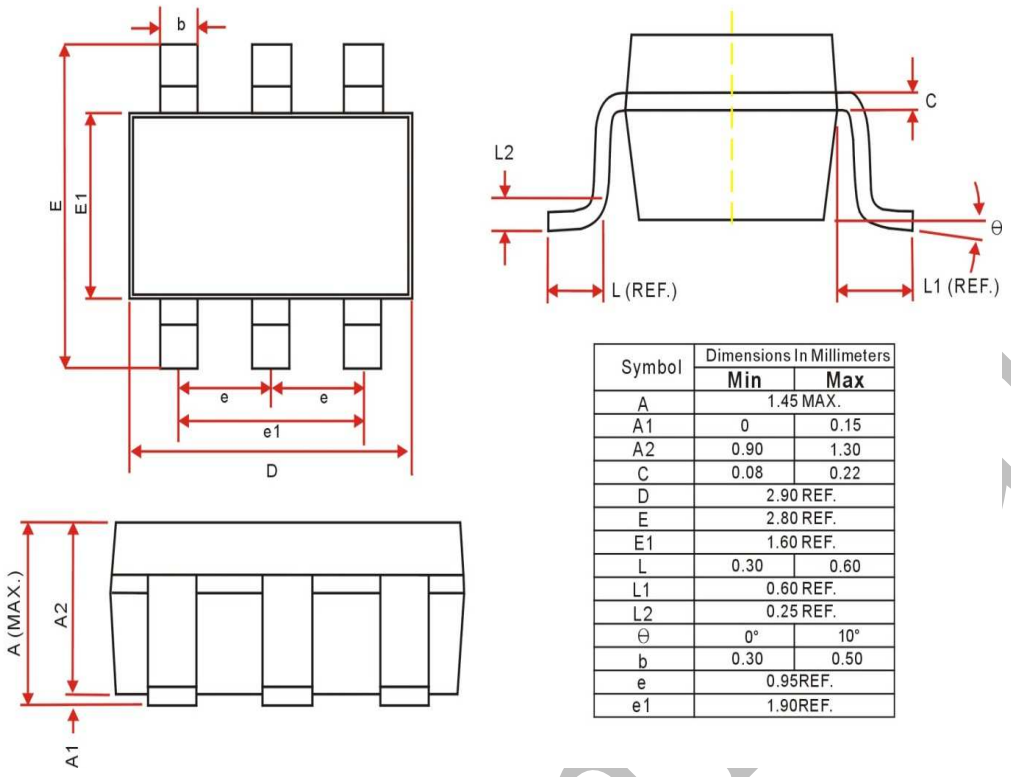
Fig. 4

Gate Clamp

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

PACKAGE OUTLINE DIMENSIONS

SOT-26 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters	
	Min	Max
A	1.45 MAX.	
A1	0	0.15
A2	0.90	1.30
C	0.08	0.22
D	2.90 REF.	
E	2.80 REF.	
E1	1.60 REF.	
L	0.30	0.60
L1	0.60 REF.	
L2	0.25 REF.	
θ	0°	10°
b	0.30	0.50
e	0.95REF.	
e1	1.90REF.	

Note:

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