

BW7383

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

Description

BW7383 is a non-isolation Buck type control IC with active power factor correction function for LED lighting application.

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.

BW7383 also provides gate driving voltage clamping, VCC over voltage protection and system output open/short circuit protection to increase IC performance.

Features

- Universal Input Voltage Range from 90VAC to 264VAC
- Transition-mode PFC operating
- Built-in Active Power Factor Correction Technique
- Constant Output Current Control LED driver
- Good Line and Load Regulation
- Open-LED Protection on DMG and VCC pin
- Over-Voltage Protection on VCC pin
- Short-LED Protection
- Cycle by Cycle Over current Protection on CS pin
- Over-Temperature Protection
- Gate Driving Voltage Clamping
- SOT26 Package Available
- RoHS compliant package

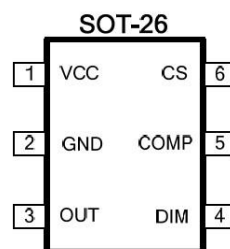
Packing & Order Information

3,000/Reel



RoHS
COMPLIANT

Pin Configurations (Top View)



Applications

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

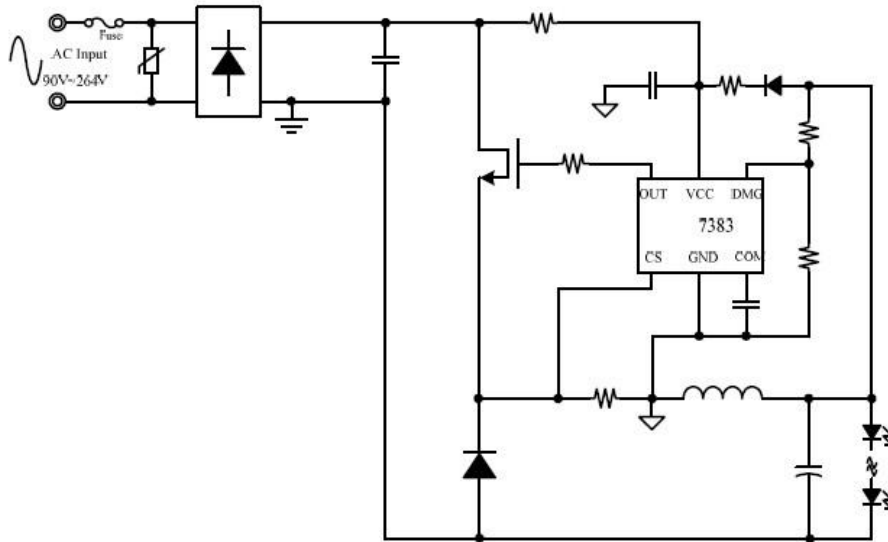
PIN DESCRIPTIONS

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 _{CC}	40	V
DMG voltage to GND	V _{DMG}	-0.3 to 40	V
CS voltage to GND	V _{CS}	-0.3 to 5.5	V
OUT voltage to GND	V _{OUT}	-0.3 to 40	V
COM voltage to GND	V _{COM}	-0.3 to 5.5	V
Maximum junction temperature	T _J	-40 to +150	°C
Storage temperature rang	T _{STG}	-65 to +150	°C
Lead temperature (Soldering 10 sec)	T _{LEAD}	260	°C
Power dissipation @TA=25°C	P _D	0.3	W
Thermal resistance junction to ambient (Note 2)	θ _{JA}	220	°C/W
Thermal Resistance	θ _{JC}	106.6	°C/W
ESD rating, Human body mode (Note 3)	V _{ESD}	2	kV

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RECOMMENDED OPERATING CONDITIONS (Note 4)

Parameter	Symbol	Operation Conditions	Unit
Power supply pin	V _{CC}	34.5	V
DMG voltage to GND	V _{DMG}	-0.3 to 11.2	V
CS voltage to GND	V _{CS}	-0.3 to 5	V
OUT voltage to GND	V _{OUT}	-0.3 to 19	V
COM voltage to GND	V _{COM}	-0.3 to 5	V
Operating Junction Temperature Range	T _J	-40 to +125	°C
Operating Ambient Temperature Range	T _{OPA}	-40 to +85	°C

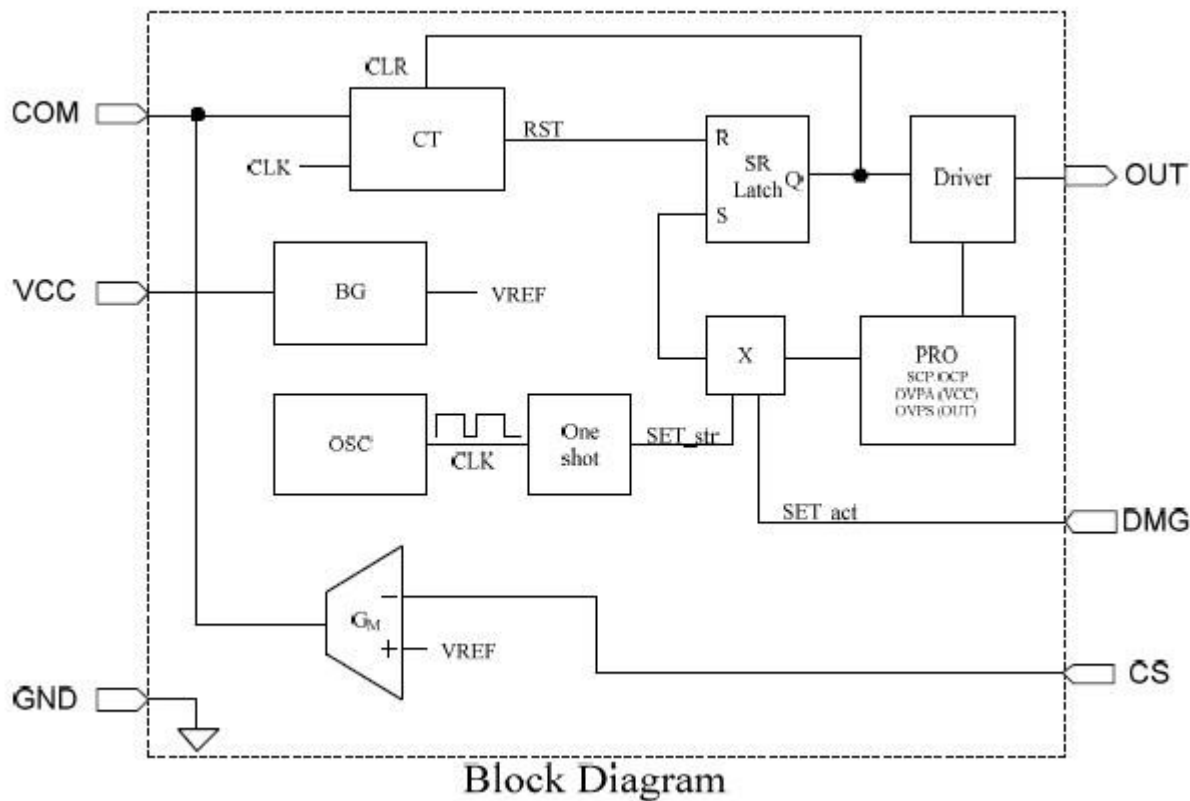
Note 1: Stresses listed as the above “Absolute Maximum Ratings” may cause permanent damage to the device. These are for stress ratings. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

Parameter	Symbol	Conditions	Min	Typ.	Max.	Units
Turn-on voltage	V _{CC_ON}		17.4	18.4	19.4	V
Turn-off voltage	V _{CC_OFF}		9.3	9.8	10.3	V
Quiescent current 1	I _{Q1}	V _{CC} =17V, at V _{CC_off}		30	50	uA
Quiescent current 2	I _{Q2}	Start up at 4.5 KHz		600	800	uA
Operation supply current	I _{CC}			2.5	3.0	mA

PROTECTION

Parameter	Symbol	Conditions	Min	Typ.	Max.	Units
VCC voltage protection	V _{O_VPA}		31.2	32.8	34.5	V
Output voltage protection	V _{O_VPS}		9.8	10.5	11.2	V
CS limit voltage	V _{O_CP}		1.15	1.25	13.35	V
Short circuit protection(Note 5)	V _{O_STR}					V

GM AMPLIFIER

Parameter	Symbol	Conditions	Min	Typ.	Max.	Units
Reference voltage	V _{REF}		195	200	205	mV
Transconductance	G _M			108		uA/V
Source current	I _{COMP_SOU}			20		uA

OSCILLATOR

Parameter	Symbol	Conditions	Min	Typ.	Max.	Units
Start Frequency	T _{STR}			220		us

DRIVER

Parameter	Symbol	Conditions	Min	Typ.	Max.	Units
Dropout voltage	V _{OH}	V _{CC} =33V, I _O = 10mA		1.2	1.5	V
	V _{OL}	V _{CC} =33V, I _O = -10mA		0.12		V
Rising time	T _{RISE}	V _{CC} =20V, C _O =1nF		40		ns
Falling time	T _{FAIL}	V _{CC} =20V, C _O =1nF		80		ns
Output clamp voltage	V _{O_CLAMP}				19	V
Leading edge blanking time	LEB _T			0.5		ns

OTP(Note 6)

Parameter	Symbol	Conditions	Min	Typ.	Max.	Units
OTP Trip Point				150		°C
OTP Release Point				115		°C
OTP Threshold Hysteresis				35		°C

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APPLICATION INFORMATION

1. Function Description

The BW7383 is a constant current Buck controller with PFC function for LED lighting applications.

The controller is BCM operation with constant on time based regulator design to achieve high power factor performance.

The BW7383 is built-in functions of VCC over voltage protection, open LED protection, short LED protection, over temperature protection, primary side current limit, and gate clamp within.

The BW7383 sense output current from CS pin to get the output current information. By the system close loop feedback. The average output current can express as below.

$$I_{OUT} = 0.2 / R_s$$

2. Pin Detail

2-1. COM

This is the output of the Gm amplifier. Connect with a suitable RC network to ground.

2-2. GND

GND is the reference node of internal circuit.

2-3. CS

MOSFET current signal sensing for LED constant current control and current limit setting function

2-4. OUT

Gate drive for external MOSFET's switch and is built-in Gate clamp function.

2-5. VCC

Power supply for the controller during normal operation. The controller will start up when VCC reaches 18.4V (typical) and will shut-down when VCC voltage is below 9.8V (typical). A decoupling capacitor should be connected between the VCC and GND pin as close as possible.

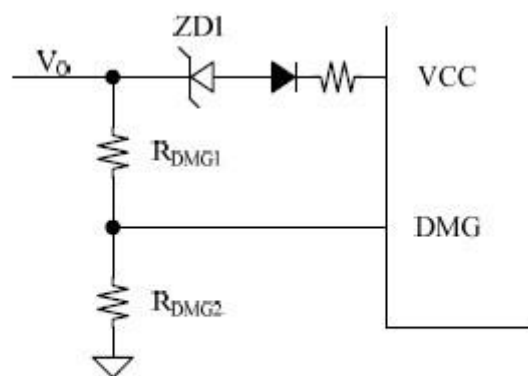
The BW7383 perform VCC over voltage protection though VCC pin. Once VCC pin exceed in 32.8V, BW7383 turns off and latch out the MOSFET's switcher until VCC under VCC_OFF.

2-6. DMG

The DMG pin can sense output information to depart from start up voltage (VO_STR) and protection voltage (VOVPS). Besides, the Internal resistance of DMG pin is 1.6Mohm.

When DMG sense voltage under VO_STR, the circuit will work on short circuit protection, and the system switching frequency $F_{STR} = 1/T_{str}$.

When DMG sense voltage over VOVPS, the circuit will work on over voltage protection, it will latch out off until VCC under VCC_OFF.



OVP Protection (By DMG)

$$V_{DMG_OVP} = V_{OVPS} \times \frac{R_{DMG1} + (R_{DMG2} // 1.6M)}{R_{DMG2} // 1.6M}$$

OVP Protection (By VCC)

$$V_{VCC_OVP} = V_{OVPA} + V_{ZD1}$$

Short Circuit Protection

$$V_{O_Short} = V_{O_STR} \times \frac{R_{DMG1} + (R_{DMG2} // 1.6M)}{R_{DMG2} // 1.6M}$$

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