

# AT7383



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

Immense Advance Tech.

### 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

### DESCRIPTION

AT7383 is a non-isolation Buck type control IC with active power factor correction function for LED lighting application.

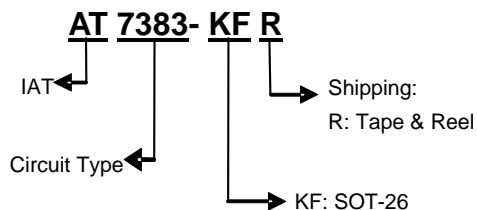
The IC achieves high power factor and high efficiency by BCM mode. The line and load regulation of LED current is about  $\pm 2.5\%$  because of particular control method.

AT7383 also provides gate driving voltage clamping, VCC over voltage protection and system output open/short circuit protection to increase IC performance.

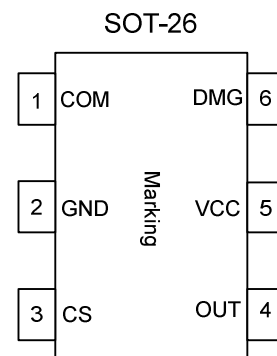
### APPLICATIONS

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

### ORDER INFORMATION



### PIN CONFIGURATIONS (TOP VIEW)



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## 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.
DMG	Zero current demagnetization sensing.

## TYPICAL APPLICATION CIRCUITS

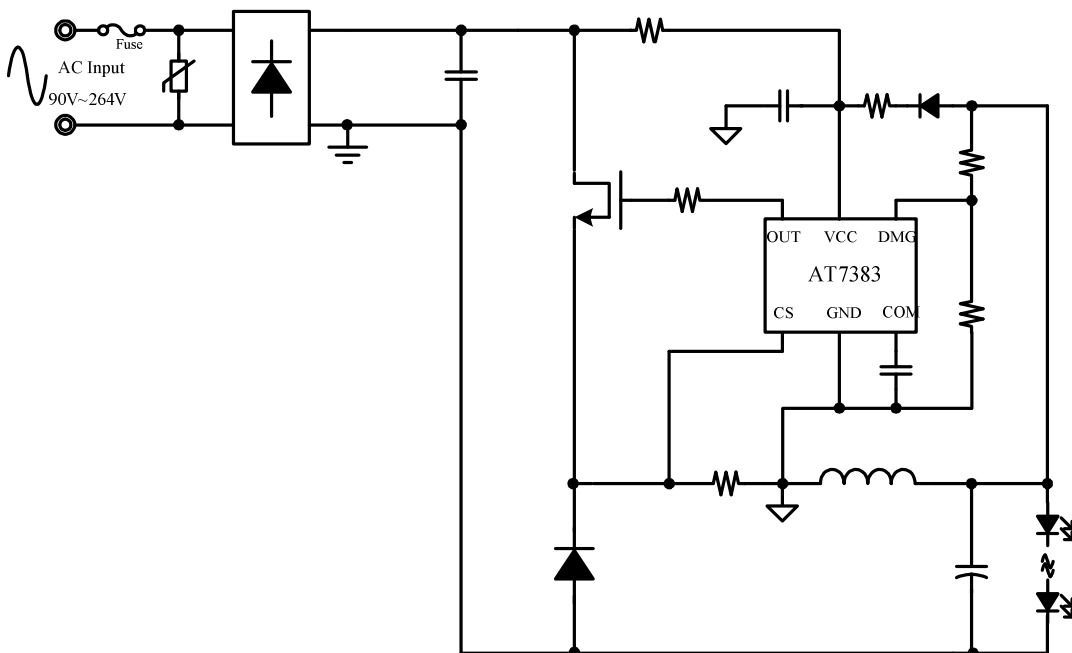


Figure 1

# AT7383



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

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### 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
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	°C
Storage Temperature Range	$T_{STG}$	-65 to +150	°C
Lead Temperature (Soldering 10 sec)	$T_{LEAD}$	260	°C
Power Dissipation @ $T_A=25$ °C	$P_D$	0.3	W
Thermal Resistance Junction to Ambient (Note 2)	$\theta_{JA}$	220	°C/W
Thermal Resistance Junction to Case	$\theta_{JC}$	106.6	°C/W
ESD Rating (Human body mode) (Note 3)	$V_{ESD}$	2	kV

### RECOMMENDED OPERATING CONDITIONS (Note4)

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
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	°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  $T_A=25$ °C.

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

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

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## BLOCK DIAGRAM

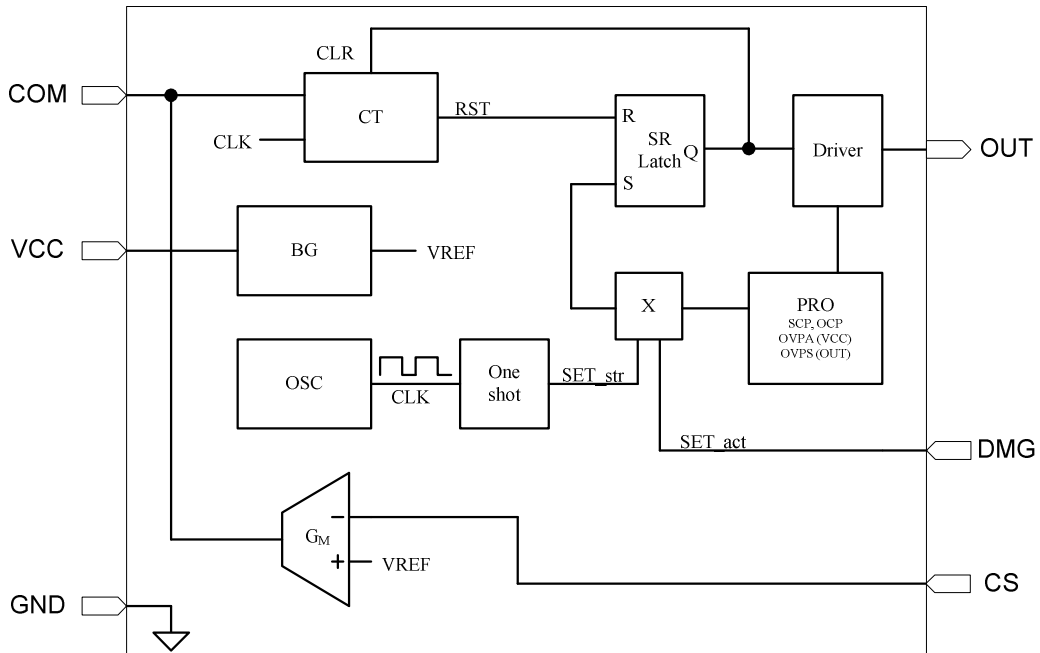


Figure 2

# AT7383



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

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### ELECTRICAL CHARACTERISTICS

T<sub>A</sub>= 25°C, unless otherwise specified.

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Turn-on voltage	V <sub>CC_ON</sub>		17.4	18.4	19.4	V
Turn-off voltage	V <sub>CC_OFF</sub>		9.3	9.8	10.3	V
Quiescent current 1	I <sub>Q1</sub>	V <sub>CC</sub> =17V, at V <sub>CC_off</sub>	--	30	50	uA
Quiescent current 2	I <sub>Q2</sub>	Start up at 4.5 KHz	--	600	800	uA
Operation supply current	I <sub>CC</sub>		--	2.5	3.0	mA
<b>PROTECTION</b>						
VCC voltage protection	V <sub>O_VPA</sub>		31.2	32.8	34.5	V
Output voltage protection	V <sub>O_VPS</sub>		9.8	10.5	11.2	V
CS limit voltage	V <sub>O_CP</sub>		1.15	1.25	1.35	V
Short circuit protection(Note 5)	V <sub>O_STR</sub>		--	2	--	V
<b>OSCILLATOR</b>						
Start up timer	T <sub>STR</sub>		--	220	--	us
<b>GM AMPLIFIER</b>						
Reference voltage	V <sub>REF</sub>		195	200	205	mV
Transconductance	G <sub>M</sub>		--	108	--	uA/V
Source current	I <sub>COMP_SOU</sub>		--	20	--	uA
<b>DRIVER</b>						
Dropout voltage	V <sub>OH</sub>	V <sub>CC</sub> =33V, I <sub>O</sub> = 10mA	--	1.2	1.5	V
	V <sub>OL</sub>	V <sub>CC</sub> =33V, I <sub>O</sub> = -10mA	--	0.12	--	V
Rising time	T <sub>RISE</sub>	V <sub>CC</sub> =20V, C <sub>O</sub> =1nF	--	40	--	ns
Falling time	T <sub>FAIL</sub>	V <sub>CC</sub> =20V, C <sub>O</sub> =1nF	--	80	--	ns
Output clamp voltage	V <sub>O_CLAMP</sub>		--	--	19	V
Leading edge blanking time	LEB <sub>T</sub>		--	0.5	--	ns
<b>OTP(Note 6)</b>						
OTP Trip Point			--	150	--	°C
OTP Release Point			--	115	--	°C
OTP Threshold Hysteresis			--	35	--	°C

Note 5: Guaranteed by design.

Note 6: Auto Recovery Type.

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### APPLICATION INFORMATION

#### 1. Function Description

The AT7383 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 AT7383 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 AT7383 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

$$I_{CS(Limit)} = \frac{1.25}{R_s}$$

##### 2-4. OUT

Gate drive for external MOSFET 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 AT7383 perform VCC over voltage protection though VCC pin. Once VCC pin exceed in 32.8V, AT7383 turns off and latch out the MOSFET switcher until VCC under  $V_{CC\_OFF}$ .

##### 2-6. DMG

The DMG pin can sense output information to depart from start up voltage( $V_{O\_STR}$ ) and protection voltage( $V_{OVPS}$ ). Besides, the Internal resistance of DMG pin is 1.6Mohm.

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

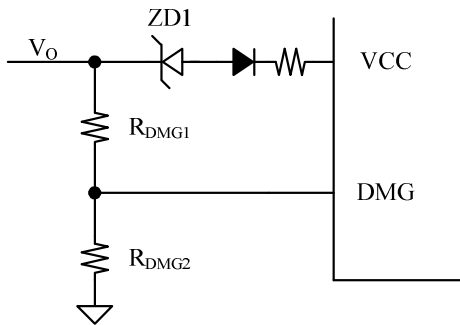
When DMG sense voltage over  $V_{OVPS}$ , the circuit will work on over voltage protection, it will latch out off until VCC under  $V_{CC\_OFF}$ .

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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

$$V_{O\_Short} = V_{O\_STR} \times \frac{R_{DMG1} + (R_{DMG2} // 1.6M)}{R_{DMG2} // 1.6M}$$

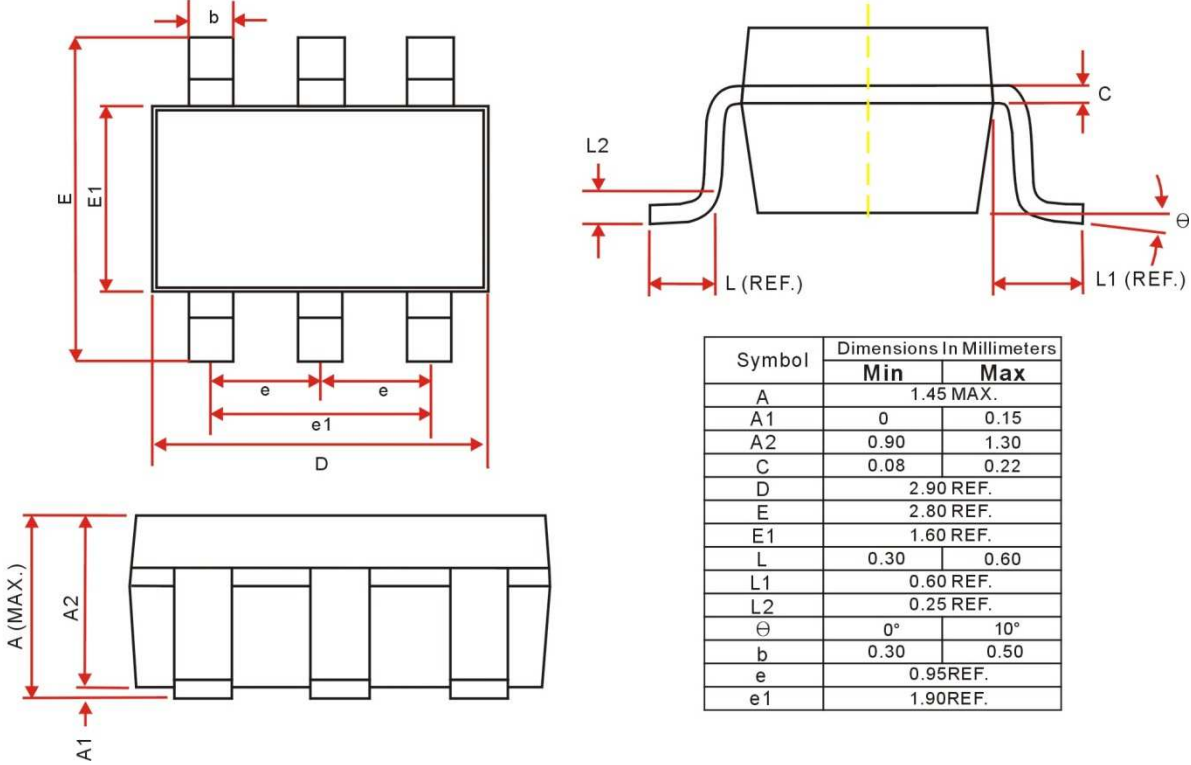
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## PACKAGE OUTLINE DIMENSIONS SOT-26 PACKAGE OUTLINE DIMENSIONS



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