Transition Mode PFC Controller for LED Lighting

General Description

EM8609A is a voltage mode PFC controller operating at transition mode.

This device provides protections of internal soft start, over voltage protection, over current protection and thermal shutdown. It can minimize the external components counts, and makes the design easy.

It also provides functions of low start up current, disable function, under voltage lockout and internal leading edge blanking of the current sensing.

This part is available in SOP-8 package.

Ordering Information

Part Number	Package	Remark
EM8609AG	SOP-8	without AC Absent function

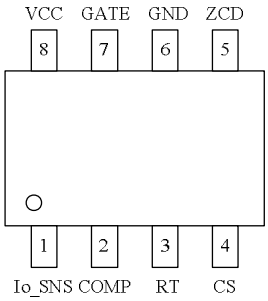
Features

- Transition Mode PFC
- Voltage Mode Control
- Programmable Max. On-Time
- Low Start Up Current (<30uA)
- Leading Edge Blanking on CS Pin
- Over Voltage Protection
- Cycle by Cycle Current Limiting
- Feedback Open Protection
- CS Open Protection
- RT Open/Short Protection
- 2ms Soft-Start Current Limit
- Thermal Shutdown

Applications

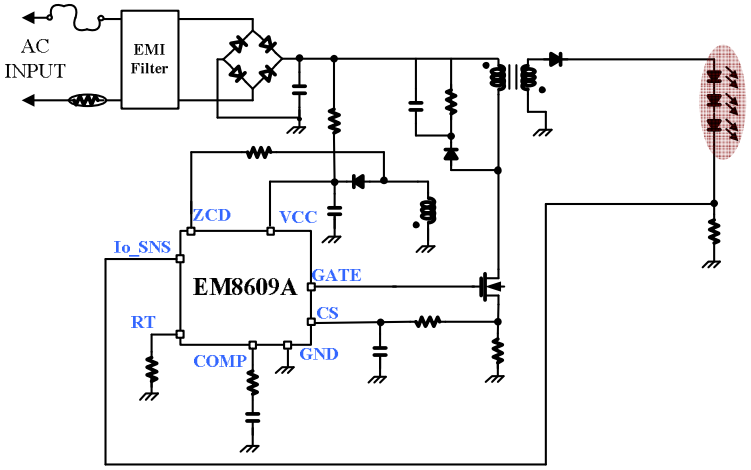
- Ballast
- General LED lighting

Pin Configuration

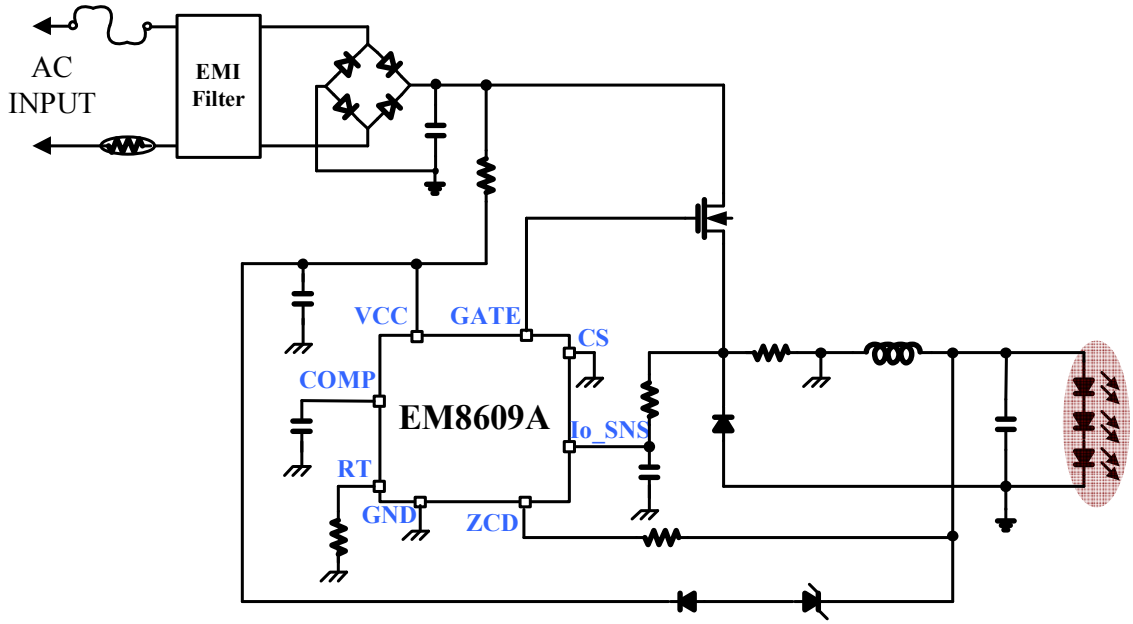


SOP-8
TOP VIEW

Typical Application Circuit



Fly-back Application

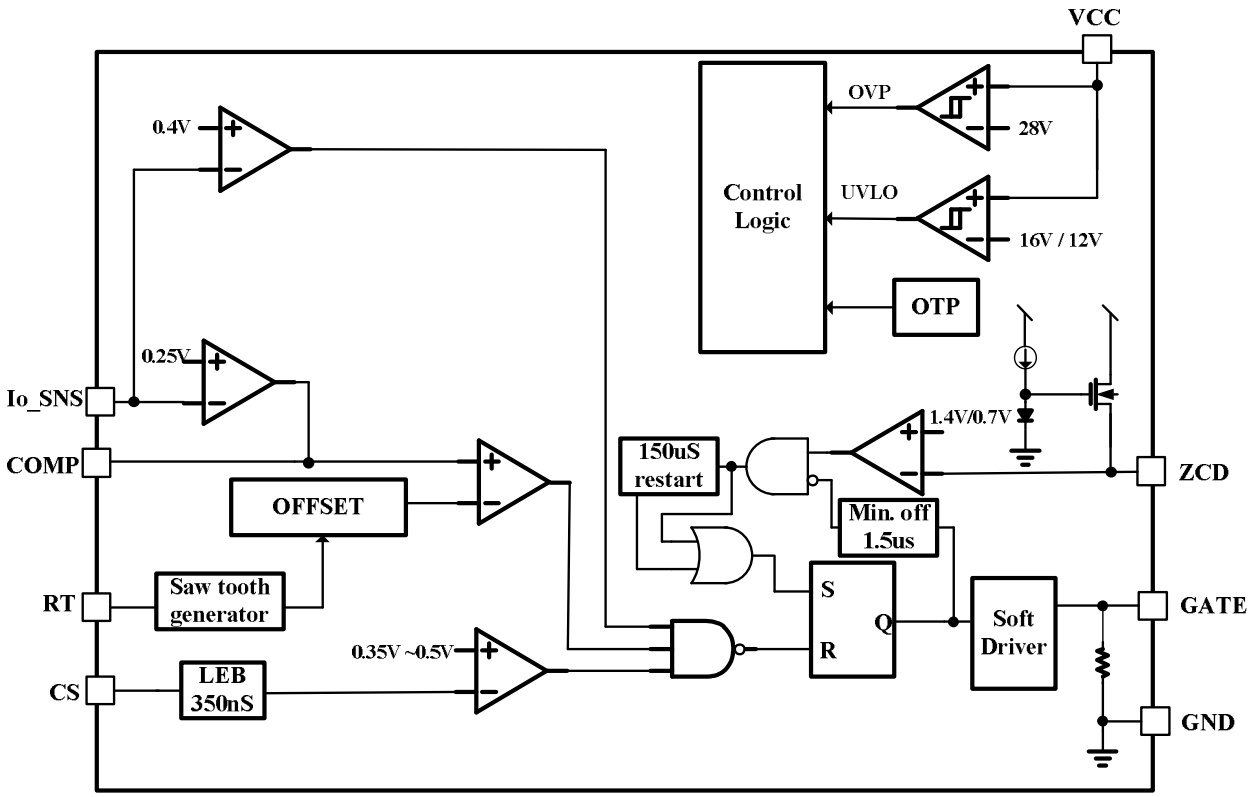


Buck Application

Pin Assignment

Pin Name	Pin No.	Pin Function
Io_SNS	1	Output current feedback control
COMP	2	Output of the error amplifier for voltage loop compensation
RT	3	Ramp generator, connecting a resistor to GND pin to set the saw tooth signal
CS	4	Senses the peak current.
ZCD	5	Detecting zero crossing of input signal
GND	6	Ground.
GATE	7	Gate drive output to drive the external MOSFET.
VCC	8	IC power supply pin.

Function Block Diagram



Absolute Maximum Ratings (Note 1)

- Supply Input Voltage, VCC ---------- 32V
- Gate pin---------- 32V
- other Pins ---------- - 0.3V to 6V
- Power Dissipation, PD @ TA = 25 C
- SOP8 ---------- 0.909W
- Package Thermal Resistance
- SOP-8 (Note 2), ---------- 110°C /W
- Junction Temperature ---------- 150°C
- Lead Temperature (Soldering, 10 sec.) ---------- 260°C
- Storage Temperature Range ---------- -65°C to 150°C
- ESD Susceptibility (Note3)
- HBM (Human Body Mode) ---------- 2kV
- MM (Machine Mode) ---------- 200V
- Gate Output Current---------- 500mA

Recommended Operating Conditions (Note4)

- Junction Temperature ---------- -40°C to 125°C
- Ambient Temperature ---------- -40°C to 85°C
- Supply Input Voltage, V_{CC} ---------- 12V to 16V
- V_{CC} capacitor ---------- 4.7uF to 10uF

Electrical Characteristics

V_{CC}=16V, T_A=25℃, unless otherwise specified

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
VCC Section						
Start Up Current		VCC<UVLO (on)		20		uA
Operating Current (C_{GATE}=1nF)				2		mA
UVLO (OFF)				9		V
UVLO (ON)			16	17	18	V
VCC OVP Protect voltage	V_{OVP}		26.5	28	29.6	V
Error Amplifier						
Feedback input voltage, V_{REF}				0.25		V
Trans-conductance				115		uS
Output upper clamp voltage		V_{Io_SNS}=V_{REF}-0.1V		5.4		V
Io_SNS Section						

OVP threshold			0.35	0.4	0.45	V
OVP hysteresis				0.175		V
CS Section						
Current sense input threshold voltage		I_{ZCD} < 100 uA		0.5		V
		I_{ZCD} > 450 uA		0.35		
Input bias current		V_{CS}=0V~1V			1	uA
Leading edge blank time				350		ns
ZCD section						
Upper Clamp Voltage		I_{ZCD}=2mA		6.7		V
Lower Clamp Voltage		I_{ZCD}=-2mA		-0.7		V
Input voltage threshold				1.4		V
		Hysteresis		0.7		V
Input bias current		V_{ZCD}=1V~5V, OUT=OFF			1	uA
Max. delay from ZCD to OUT				250		ns
RT Section						
Max. On-Time voltage		R_{RT}=20k		2.9		V
Max. On-Time programming		R_{RT}=20k	10	12	14	us
Max. On-Time		R_{RT}=100k		40		us
Min. Off-Time Section						
Min. Off-Time				1.5		us
GATE Drive Output Section						
Output low level		VCC=16V, I_{SINK}=20mA			0.5	V
Rising time		VCC=16V, CL=1000pF		35		ns
Falling time		VCC=16V, CL=1000pF		25		ns
Protection Section						
Start time period				150		us
Soft Start Time				2		ms
VIN Absent Delay		EM8609A		20		ms
OTP trip level				140		°C
OTP hysteresis				30		°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.

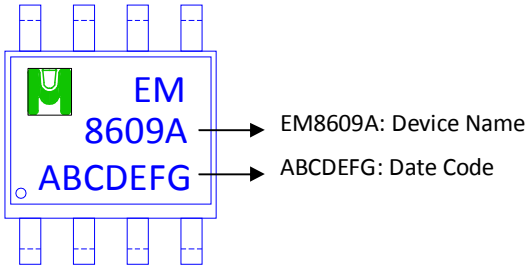
Note 2. θ_{JA} SOP-8 packages is 52°C /W on JEDEC 51-7 (4 layers,2S2P) thermal test board with 50mm^2 copper area.

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

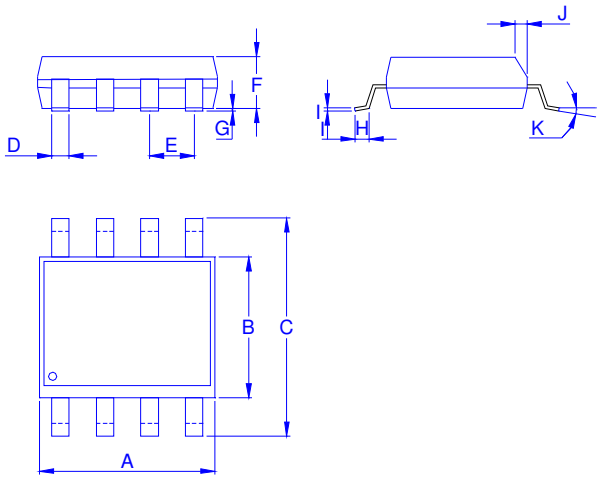
Note 4. The device is not guaranteed to function outside its operating conditions.

Ordering & Marking Information

Device Name: EM8609AG for SOP-8



Outline Drawing



Dimension in mm

Dimension	A	B	C	D	E	F	G	H	I	J	K
Min.	4.70	3.70	5.80	0.33		1.20	0.08	0.40	0.19	0.25	0°
Typ.					1.27						
Max.	5.10	4.10	6.20	0.51		1.62	0.28	0.83	0.26	0.50	8°