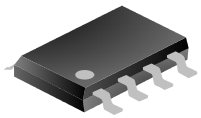
PRIMARY SIDE CONTROLLED LED CONTROLLER WITH PFC

DESCRIPTION

SD6857 is the primary side controlled LED controller with PFC. It adopts PFM technology for providing accurate constant current control with high average efficiency.

With SD6857, opto-couple, secondary feedback control, loop compensation circuit can be eliminated for reducing cost.



SOP-8-225-1.27

FEATURES

* Active power factor correction (APFC)
* PSR CC/CV
* Ultra-low start-up current
* Primary side control
* Leading edge blanking
* Pulse-Frequency Modulation(PFM)
* VCC overvoltage/undervoltage protection
* LED open/short circuit protection
* Internal over temperature protection
* Cycle by cycle current limiting
* Open loop protection
* Peak current compensation

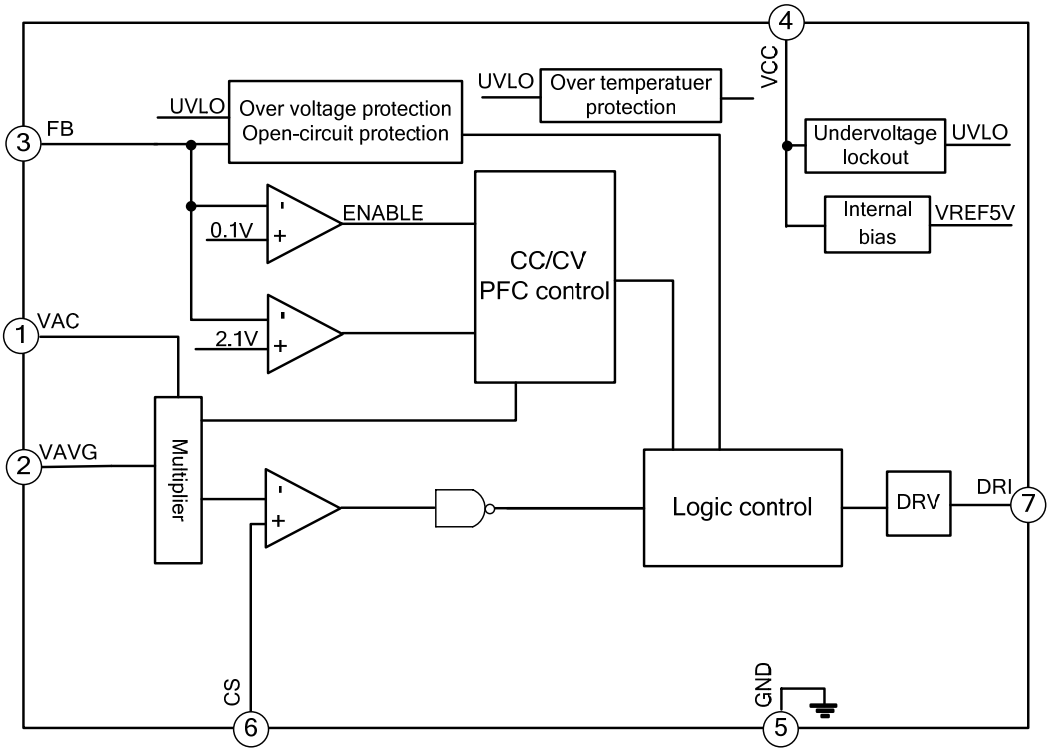
APPLICATIONS

* LED lamp
* Illuminance with AC input

ORDERING INFORMATION

Part No.	Package	Marking	Material	Packing
SD6857	SOP-8-225-1.27	SD6857	Pb free	Tube
SD6857TR	SOP-8-225-1.27	SD6857	Pb free	Tape & reel

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATING

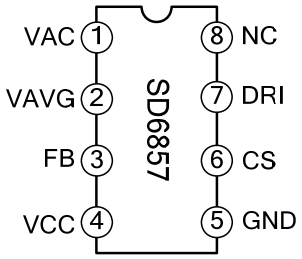
Characteristics	Symbol	Rating	Unit
Supply voltage	V_{DD}	-0.3~25	V
Input voltage on pin FB	V_{FB}	-20~22	V
Input voltage on other pins	V_{IN}	-0.3~ 5.3	V
Input current	I_{IN}	-10~10	mA
Operating junction temperature	T_J	+160	°C
Operating temperature Range	T_{amb}	-40~ +125	°C
Storage temperature Range	T_{STG}	-55~+150	°C

ELECTRICAL CHARACTERISTICS (unless otherwise specified, V_{CC}=18V, T_{amb}=25°C)

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Supply voltage						
Start-up current	I_{start}	V_{CC}=12V	--	5	10	μA
Operating current	I_{op}	F_S=50kHz	500	700	900	μA
Undervoltage						
Start threshold voltage	V_{start}		14	16	18	V
Stop threshold voltage	V_{stop}		7.0	8.0	9.0	V
FB Feedback						
Over voltage protection	V_{OVP}		2.3	2.4	2.5	V

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
S&H reference	$V_{S\&HREF}$		1.95	2.1	2.25	V
Open circuit protection threshold	V_{AUSB}		-0.55	-0.30	-0.05	V
Dynamitic characteristic						
Leading-edge blanking time	T_{LEB}		0.15	0.35	0.55	μs
Over voltage recover time	T_{OVP}		11	19	30	ms
Current Limit						
CS over current threshold value	V_{cs1}		1.3	1.4	1.5	V
Multiplier						
CS compare point	V_{cs2}	V_{AC}=2V, V_{AVG}=1V	0.45	0.55	0.65	V
AC OVP						
VAC over voltage protection	Vacovp	VAC voltage rising	3.3	3.5	3.7	V
Drive						
DRI high clamp voltage	DRCLAMP		15	16.5	18	V
Peak source current	Isource		--	300	--	mA
Peak sink current	Isink		--	-600	--	mA
Over Temperature Protection						
Over temperature detection	T_{sd}		125	140	--	°C
Over temperature hysteresis	T_{sdhys}		15	25	40	°C

PIN CONFIGURATION



PIN DESCRIPTION

Pin No.	Pin Name	I/O	Function description
1	VAC	I	AC input sense voltage
2	VAVG	I	AC input average voltage
3	FB	I	Feedback voltage input pin
4	VCC	I	Power supply
5	GND	I	Ground
6	CS	I	Current sense pin
7	DRI	O	Drive pin
8	NC	/	Not connected

FUNCTION DESCRIPTION

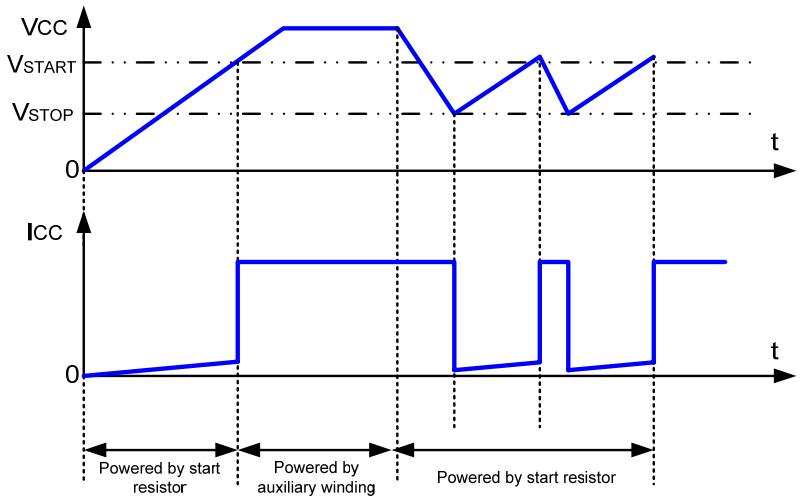
SD6857 is off-line LED controller with built-in PFC, it provides constant current output through detecting primary current. It adopts PFM technology and accurate constant current control loop for higher stability and average efficiency.

The whole operating period consists of peak current detection and feedback voltage detection:

When MOSFET is on, primary current is detected by sense resistor and voltage at pin FB is negative, load is powered by output capacitor and output voltage V_O decreases. When primary current exceeds the limit, MOSFET is off and voltage at pin FB is detected. Output capacitor and load are powered by secondary current and V_O increases. MOSFET is on again after stop for T_{CV} (CV loop) and hold for T_{CC} (CC loop). And then, it comes to peak current detect again.

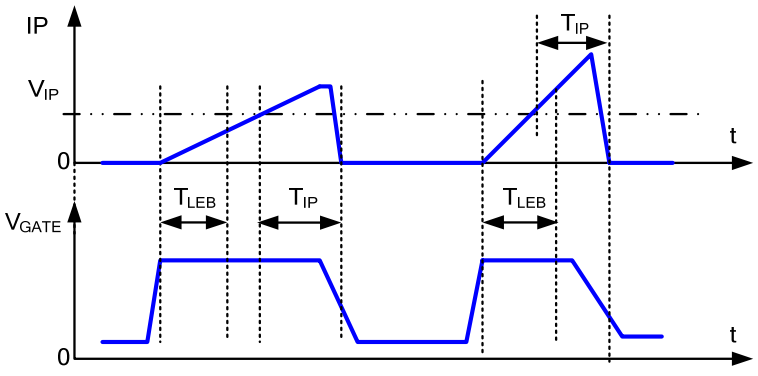
1. Start-up and under voltage lockout

At the beginning, the capacitor connected to pin V_{CC} is charged via start resistor by high voltage DC bus and the circuit starts to work if voltage at V_{CC} is 16V. The circuit is powered by auxiliary winding and V_{CC} decreases if the protection occurs. The whole control circuit is off and the current decreases if V_{CC} is decreased to 8V, capacitor connected to pin V_{CC} is recharged through start resistor.



2. Drive circuit

Drive circuit is power by VCC. When DRI＝1, MOSFET is on; When DRI＝0, MOSFET is off. T_{LEB}＝0.35μs is set to avoid the burr which will cause error at the turn-on transient of MOSFET.



3. Peak current detection

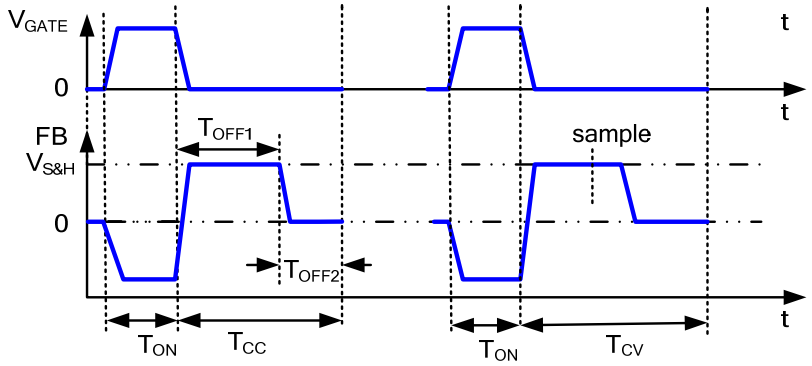
It integrates MOSFET and sense resistor. When MOSFET is on, voltage at FB is negative and primary current is detected through sense resistor, this current is linearity increased. The peak current is determined by the multiplier when this current exceeds the peal current, DRI＝0, MOSFET is off.

4. Feedback Voltage Detection

When MOSFET is off, the voltage at pin FB is positive and voltage is sensed at 2/3 duration of this positive voltage, this sensed voltage is used for T_{CV} control after comparison, amplifying and holding.

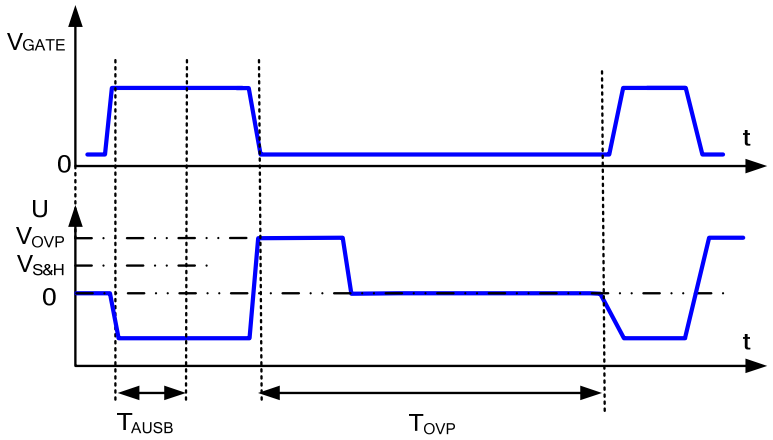
T_{OFF1}, T_{OFF2} and T_{ON} are counted at the same time which indicates durations of positive FB voltage, FB damping oscillation and FB negative voltage respectively. Positive FB voltage indicates there is current delivered to the secondary side of transformer, while negative and FB damping oscillation indicate there is no current delivered to the secondary side of transformer.

Hence, with constant peak current, $T_{OFF1}=T_{OFF2}+T_{ON}$ is guaranteed for CC output. CC is available by T_{CC} controlling through high/low VFB duration measure.



5. Over voltage protection

The output is shutdown if voltage at FB exceeds the threshold value and this state is kept for 19ms, then the circuit restarts.



6. Over Temperature Protection

If the circuit is over temperature, the output is shut down to prevent the circuit from damage. The over temperature protection has the hysteresis characteristic. The temperature should be decreased lower than

the threshold temperature by 25°C for normal operation. This is adopted to avoid frequently change between normal and protection modes.

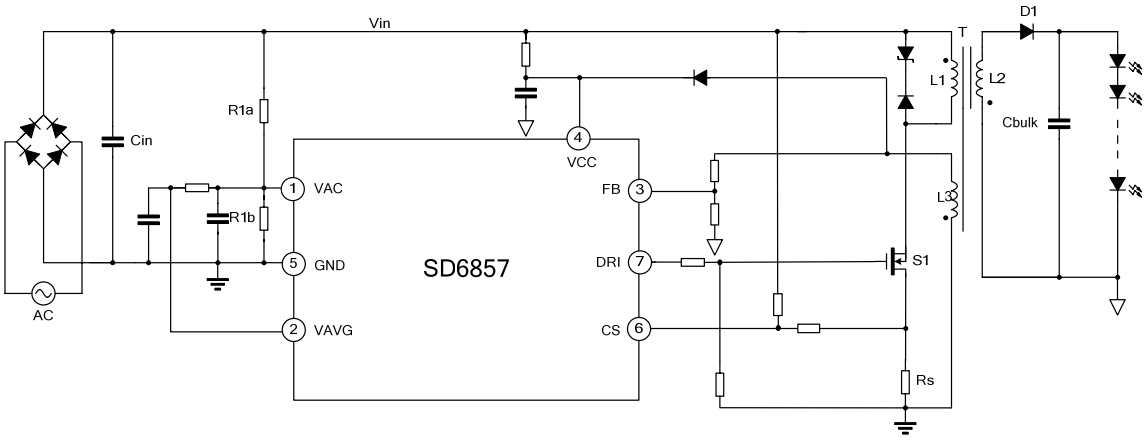
7. Open Loop Protection

When DRI＝1, MOSFET is on, if V_{FB}>－0.3V, the loop is open and open loop protection is active to shutdown the output, this is kept for 19ms and then the circuit restarts

8. CS over current protection

If CS sensed voltage is higher than 1.4V, power MOSFET is off and this state is held till Vcc is lower than under voltage threshold voltage. Then it restarts after power on.

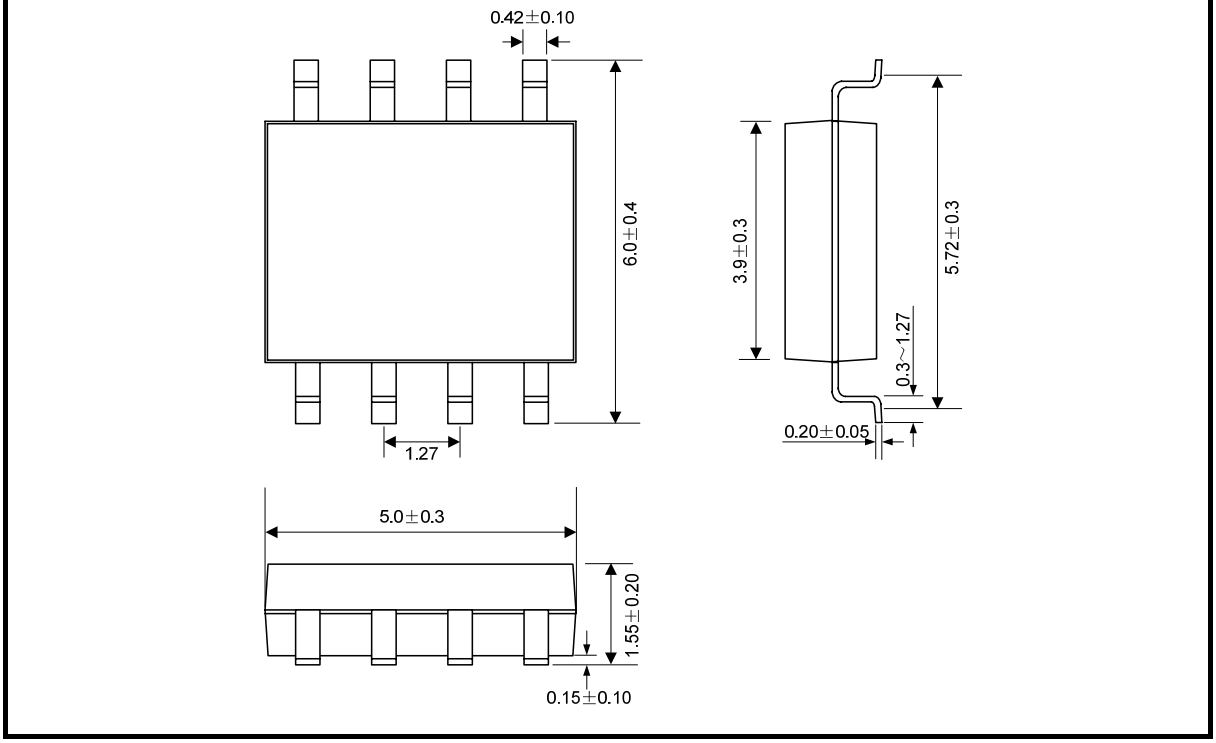
TYPICAL APPLICATION CIRCUIT



Note: The circuit and parameters are for reference only; please set the parameters of the real application circuit based on the real test.

PACKAGE OUTLINE

SOP-8-225-1.27 单位：mm



MOS DEVICES OPERATE NOTES:

Electrostatic charges may exist in many things. Please take following preventive measures to prevent effectively the MOS electric circuit as a result of the damage which is caused by discharge:

- The operator must put on wrist strap which should be earthed to against electrostatic.
- Equipment cases should be earthed.
- All tools used during assembly, including soldering tools and solder baths, must be earthed.
- MOS devices should be packed in antistatic/conductive containers for transportation.

ATTACHMENT

Revision History

Date	REV	Description	Page
2011.11.28	1.0	Initial release	
2012.04.27	1.1	Modify “FEATURES”, “APPLICATIONS”, “ABSOLUTE MAXIMUM RATING”, “ELECTRICAL CHARACTERISTICS” and “FUNCTION DESCRIPTION”	