

Features

- Operate from a rectified 85V~265V AC mains supply.
- 0.1V current sense voltage reference.
- Directly drive 1~10 Series 1W LED.
- Excellent line and load regulation.
- Internal Optimize Power HV-MOSFET.
- Built in Thermal Shutdown Function.
- Built in Current Limiting Function.
- Built in Soft-Start Circuit.
- Available in SOIC-8 package.
- PF > 0.88 (Power Factor) with Suitable External Components.

General Description

The XL5002 is a monolithic high voltage switching regulator with PFM that is specifically designed to operate from a rectified 85V~265V AC mains supply.

The XL5002 is a high efficiency LED driver switching regulator. The LED string is driven at DC constant current rather than constant voltage, thus providing constant light output and enhanced reliability.

Applications

- E27, GU10, GU5.3, B22 lamp device
- LED Lighting & LED LAMP
- General purpose lighting



SOIC-8

Figure1. Package Type of XL5002

Pin Configurations

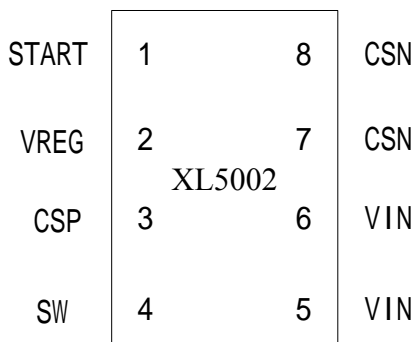


Figure2. Pin Configuration of XL5002 (Top View)

Table 1 Pin Description

Pin Number	Pin Name	Description
1	START	Internal start up Pin.
2	VREG	Internal Voltage Regulation Pin. (The VREG is about 8V)
3	CSP	Current Sense Positive Pin. (The current sense voltage is 0.1V)
4	SW	Output Switching Pin
5 , 6	VIN	Input high voltage Pin. (Operation voltage 100V~400V)
7 , 8	CSN	Current Sense Negative Pin.

600V 0.5A Switching Current Buck PFM LED Constant Current Driver

XL5002

Function Block

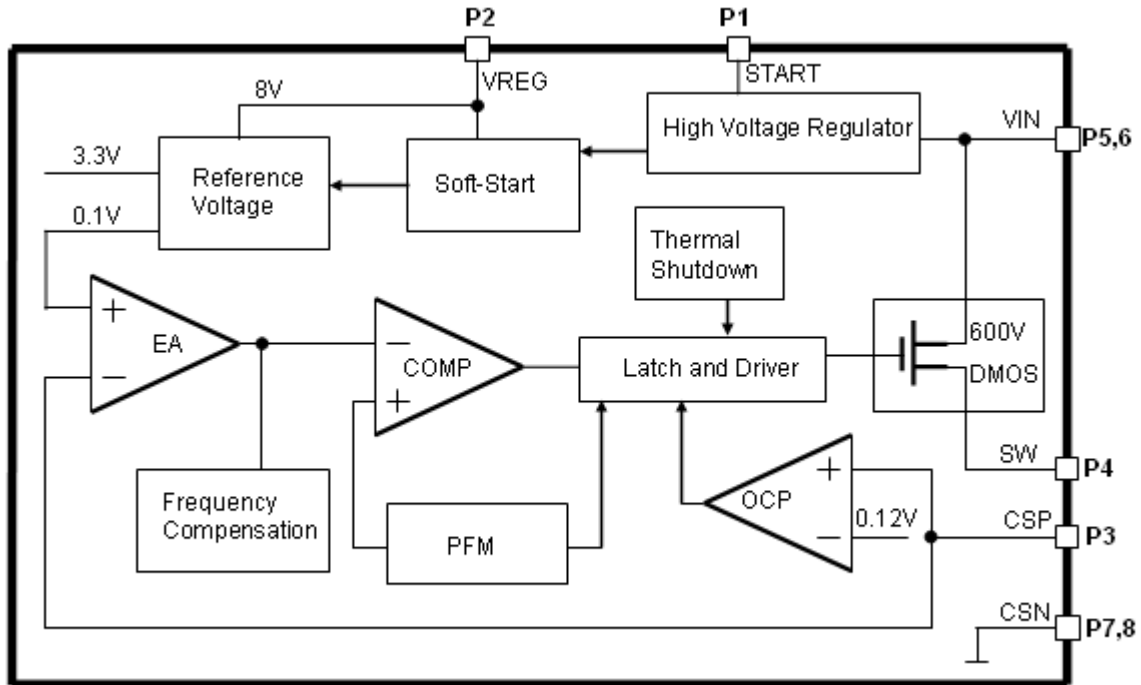


Figure3. Function Block Diagram of XL5002

Typical Application Circuit with PFC

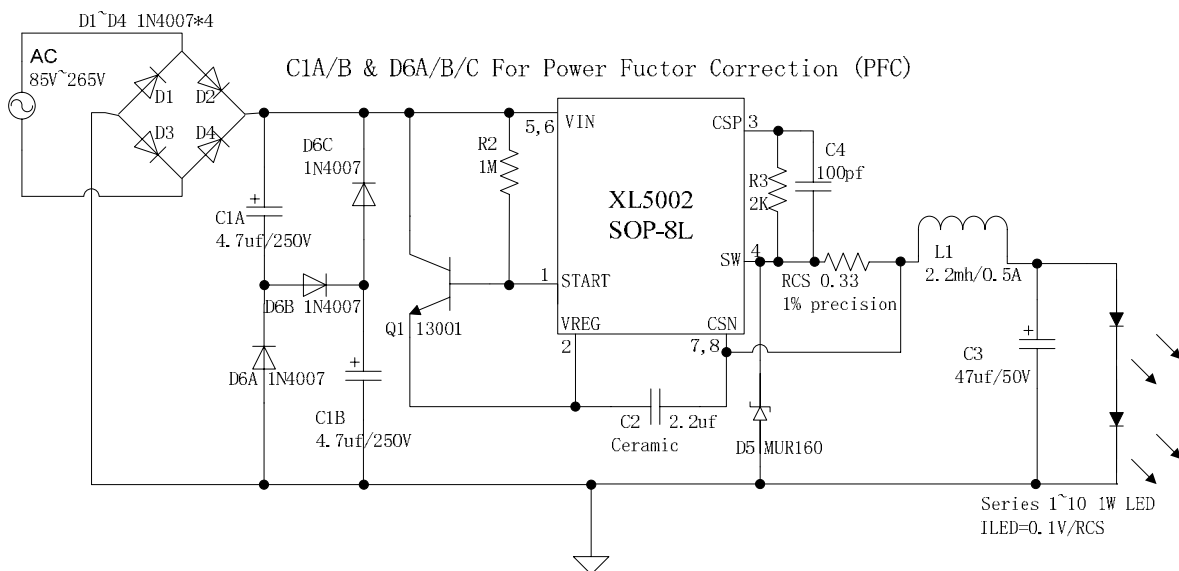


Figure4. XL5002 Typical Application (Mains supply 1~10W LED saving energy Lamp)

600V 0.5A Switching Current Buck PFM LED Constant Current Driver

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Ordering Information

Package	Temperature Range	Part Number	Marking ID	Packing Type
		Lead Free	Lead Free	
		XL5002E1	XL5002E1	Tube
		XL5002TRE1	XL5002E1	Tape & Reel

XLSEMI Pb-free products, as designated with “E1” suffix in the par number, are RoHS compliant.

Absolute Maximum Ratings (Note1)

Parameter	Symbol	Value	Unit
Input Voltage	V _{in}	-0.3 to 600	V
Power Dissipation	P _D	Internally limited	mW
Thermal Resistance (SOP-8L) (Junction to Ambient, No Heatsink, Free Air)	R _{JA}	100	°C/W
Operating Junction Temperature	T _J	-40 to 125	°C
Storage Temperature	T _{STG}	-65 to 150	°C
Lead Temperature (Soldering, 10 sec)	T _{LEAD}	260	°C
ESD (HBM)		3000	V

Note1: Stresses greater than those listed under Maximum Ratings may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

600V 0.5A Switching Current Buck PFM LED Constant Current Driver

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XL5002 Electrical Characteristics

$T_a = 25$; unless otherwise specified. Reference test circuit figure6

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
VCSP	CSP Voltage	VAC = 205V to 235V, Iled=0.3A	97	100	103	mV
VCSP	CSP Voltage	VAC = 85V to 265V, Iled=0.3A	94	100	106	mV
Efficiency	η	VAC=110V, Iled=0.3A, Pout=8W	-	84	-	%
Efficiency	η	VAC=220V, Iled=0.3A, Pout=8W	-	84	-	%

Electrical Characteristics (DC Parameters)

Parameters	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Input operation voltage	VIN		100		400	V
Quiescent Supply Current	I_q	Figure4, VAC=220V Iled=0		0.15	0.3	mA
Switching Frequency	Fosc	Figure6 (3*1W) VAC=220V	16.64	20.8	24.96	KHz
Max. Duty Cycle	D _{MAX}			25		%
VDMOS Drain-Source Breakdown Voltage	V _{BRDS}	V _{GS} =0V, I _{DS} =250uA	600			V
VDMOS Drain-Source on resistor	R _{DS(on)}	I _{DS} =0.5A, V _{GS} =10V		10	12	Ohm
Thermal Shutdown	OTP	T _j		165		^o C
Thermal Shutdown Window				25		^o C

600V 0.5A Switching Current Buck PFM LED Constant Current Driver

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[1] Typical System Application with PFC Function (1~10*1W with PFC)

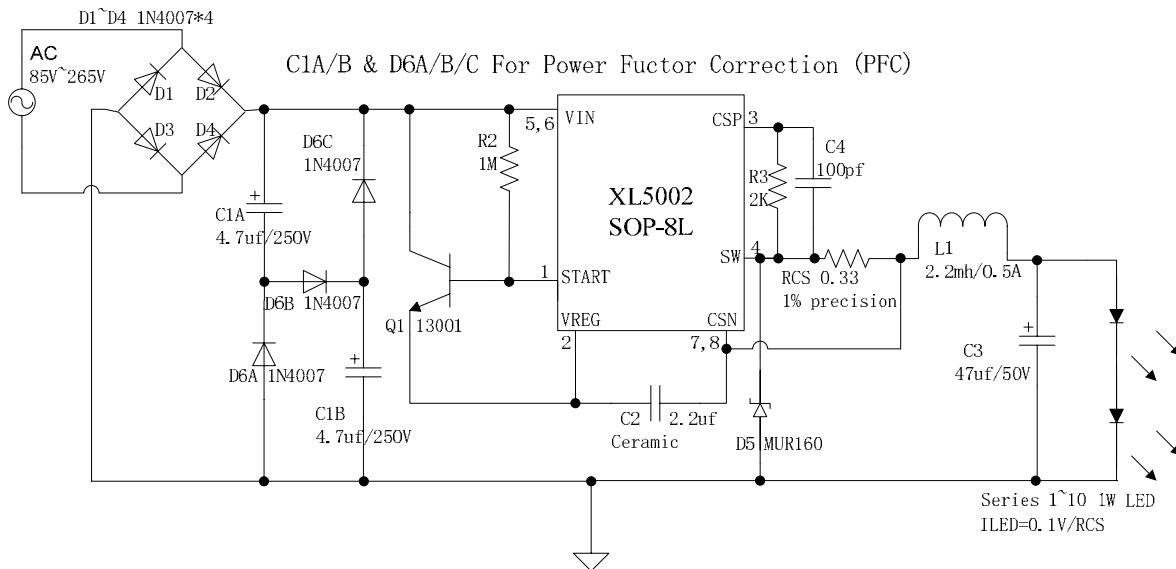


Figure5. XL5002 System Application for AC LED LAMP with PFC (1W ~ 10W)

Figure5 Input VAC=110V system parameters table:

LED String 1W*N	VAC (V)	IAC (mA)	Apparent Power (VA)	Active Power (W)	OSC (KHz)	Output Power (W)	Efficiency (%)	Power Factor (cos)
1	110.1	19	2.09	1.80	10.2	1.030	57.2	0.853
2	110.0	30	3.30	3.00	18.5	2.054	68.5	0.909
3	110.0	41	4.51	4.10	22.2	3.068	74.8	0.911
4	110.2	52	5.73	5.20	31.3	4.028	77.5	0.912
5	110.2	66	7.27	6.40	34.4	5.084	79.4	0.912
6	110.2	78	8.60	7.30	37.8	6.043	82.8	0.869
7	110.1	91	10.02	8.40	41.6	6.945	82.7	0.840
8	110.2	108	11.90	9.50	45.4	7.889	83.0	0.805
9	110.2	114	12.56	10.30	51.0	8.651	84.0	0.830
10	110.3	118	13.02	10.90	54.4	9.245	84.8	0.838

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Figure5 Input VAC=220V system parameters table:

LED String 1W*N	VAC (V)	IAC (mA)	Apparent Power (VA)	Active Power (W)	OSC (KHz)	Output Power (W)	Efficiency (%)	Power Factor (cos)
1	220.1	11	2.42	2.20	8.1	1.118	50.8	0.875
2	220.0	18	3.96	3.40	17.9	2.243	66.0	0.918
3	220.0	24	5.28	4.60	20.8	3.341	72.6	0.884
4	220.0	30	6.60	5.80	24.3	4.379	75.5	0.878
5	220.0	36	7.92	6.90	29.1	5.567	80.7	0.886
6	220.0	42	9.24	8.10	37.8	6.632	81.9	0.880
7	220.0	47	10.34	9.30	42.4	7.672	82.5	0.902
8	219.8	53	11.65	10.30	46.3	8.695	84.4	0.896
9	219.8	58	12.75	11.60	49.0	9.689	83.5	0.891
10	219.9	64	14.07	12.60	53.2	10.719	85.1	0.838

[2] Typical System Application with PFC & Dimming (1~10*1W with PFC & Dimming)

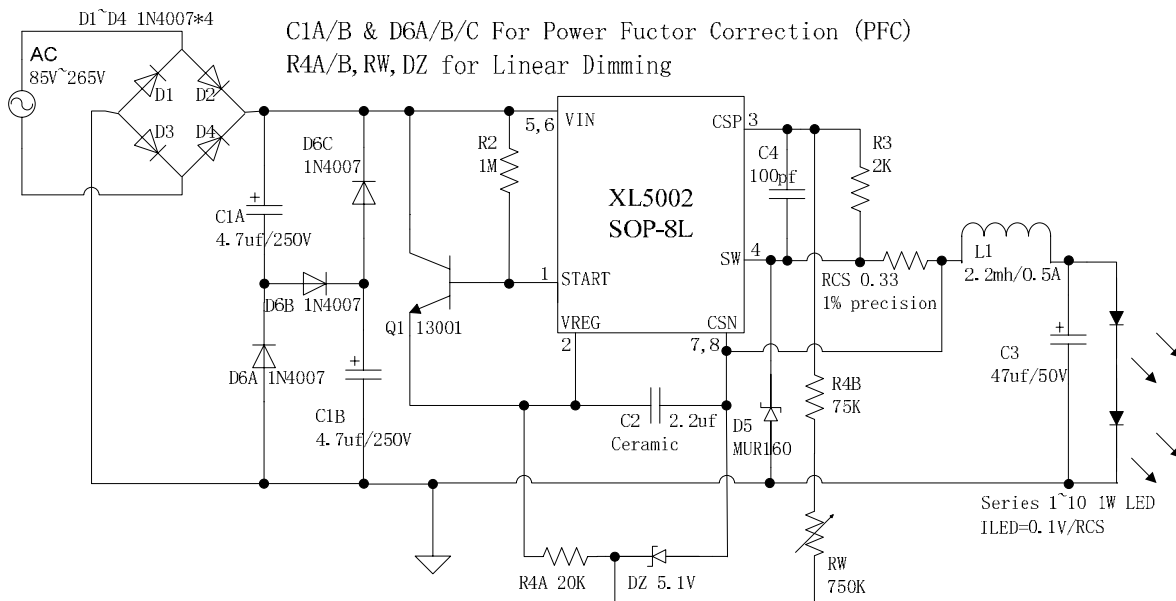


Figure6. XL5002 System Application for AC LED LAMP with PFC & Dimming (1W ~ 10W)

