500V 0.3A PWM Buck Constant Voltage Regulator XL5002

Features

- Input Voltage Range: AC85V~265V
- Fixed Output Voltage: 5V
- Maximum Switch Current: 0.3A
- Integrated High-Voltage MOSFET
- Integrated Soft Start Function
- Integrated VCC Under-Voltage Protection Function
- Integrated Output Overload Protection Function
- Integrated Thermal Shutdown Function
- Device HBM ESD Classification: Class 3A
- Package Type: SOP7

General Description

The XL5002 is a low-cost, high-voltage non-isolated PWM buck-type AC/DC converter supporting a wide input voltage range of AC 85V to 265V. The chip integrates a self-supply function to meet low standby power requirements and features a soft start function that reduces device stress and effectively prevents inductor saturation during startup.

The XL5002 incorporates multiple protection functions, including VCC Under-Voltage Protection, Output Overload Protection, Thermal Shutdown Function, and other safeguards.

Applications

- Power Supply for Small Household Appliances
- Smart Lighting Control

Typical application schematic

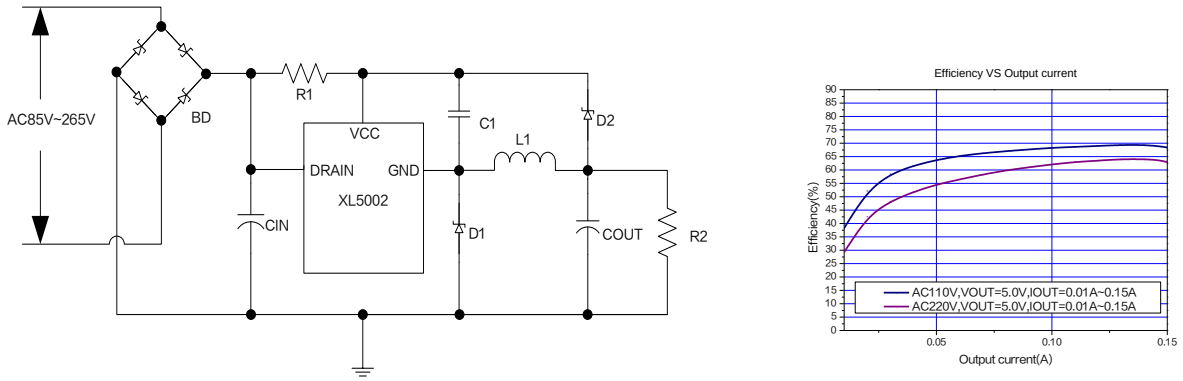
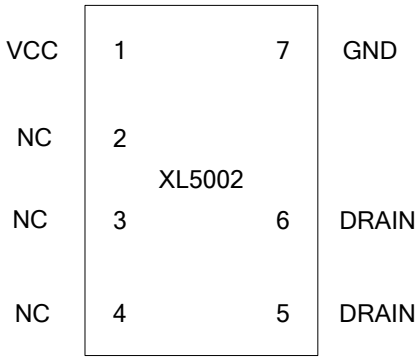


Figure 1.XL5002 Typical Application Diagram and Conversion Efficiency Curve

500V 0.3A PWM Buck Constant Voltage Regulator XL5002

Pin Configurations



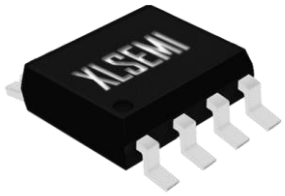


Figure2.Pin Configuration of XL5002

Table 1.Pin Description

Pin Number	Pin Name	Description
1	VCC	Internal Power Supply Pin of the IC.
2~4	NC	No Connection.
5~6	DRAIN	Power Input Pin.
7	GND	Internal Ground Pin of the IC.

Ordering Information

Order Information	Marking ID	Package Type	Eco Plan	Packing Type Supplied As
XL5002	XL5002	SOP7	RoHS & HF	4000 Units Per Reel

Function Block

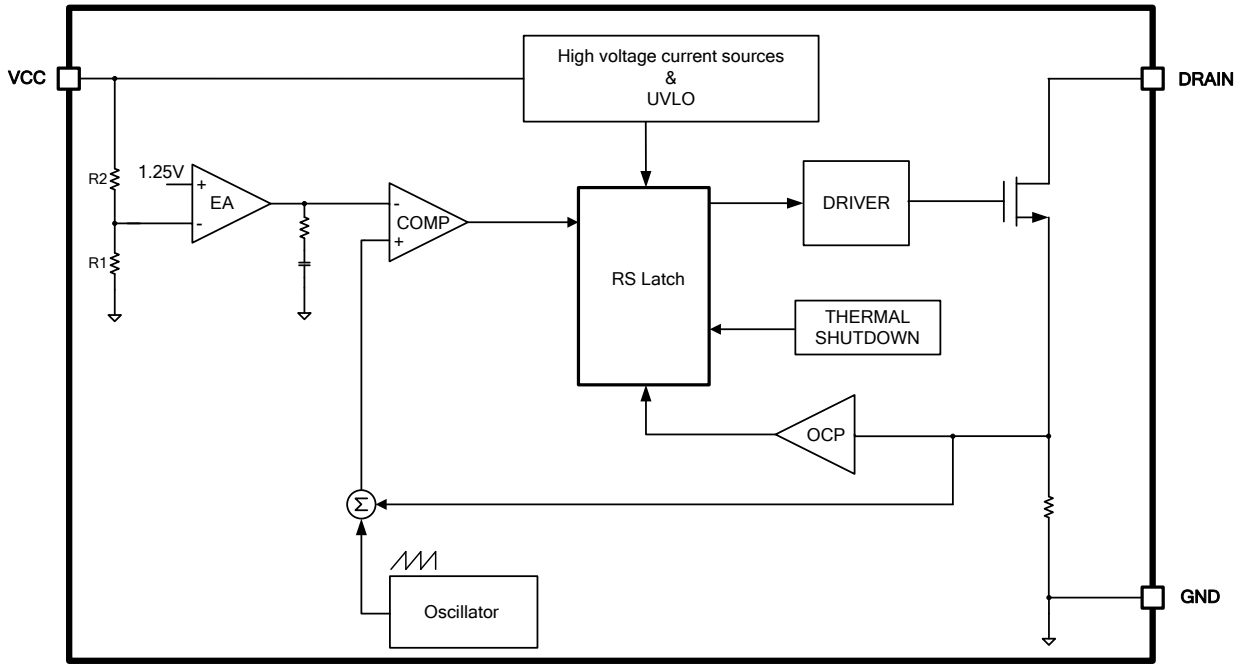


Figure3.Function Block Diagram of XL5002

Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Value	Unit
Input Voltage	V_{DRAIN}	−0.3 ~ 550	V
Input Pin Voltage	V_{DD}	−0.3 ~ 7	V
Power Dissipation	P_D	Internally limited	mW
Thermal Resistance (SOP7) (Junction to Ambient, No Heatsink, Free Air)	R_{JA}	100	℃/W
Operating Junction Temperature	T_J	−40 ~ 125	℃
Storage Temperature	T_{STG}	−65 ~ 150	℃
Lead Temperature (Soldering, 10 sec)	T_{LEAD}	260	℃
ESD (HBM)	−	>4000	V

Note 1: 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.

XL5002 Electrical Characteristics

T_A= 25°C, system parameters test circuit figure1, unless otherwise specified.

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V_{OUT}	Output Voltage	AC220V, V_{OUT}=5.0V I_{OUT}=0.1A	4.7	5.0	5.3	V
η	Efficiency	AC220V, V_{OUT}=5.0V I_{OUT}=0.1A	–	62.1	–	%

Electrical Characteristics (DC Parameters)

T_A = 25℃, AC220V, system parameters test circuit figure1, unless otherwise specified.

Parameters	Symbol	Min.	Typ.	Max.	Unit
VCC Startup Current	I_{ST}	–	150	300	μA
Quiescent Supply Current	I_Q	–	1.7	–	mA
No-Load Power Consumption	$P_{No-Load}$	–	100	–	mW
VCC Turn-On Voltage	VCC_{ON}	–	4.8	–	V
VCC Undervoltage Lockout Threshold Voltage	VCC_{OFF}	–	3.6	–	V
Oscillator Frequency	F_{OSC}	35	50	65	kHz
Static On-State Resistance	R_{DSON}	–	9	–	Ω
Max. Duty Cycle	D_{MAX}	–	–	20	%
Switch Current Limit	I_L	–	0.3	–	A

Typical System Application Schematic

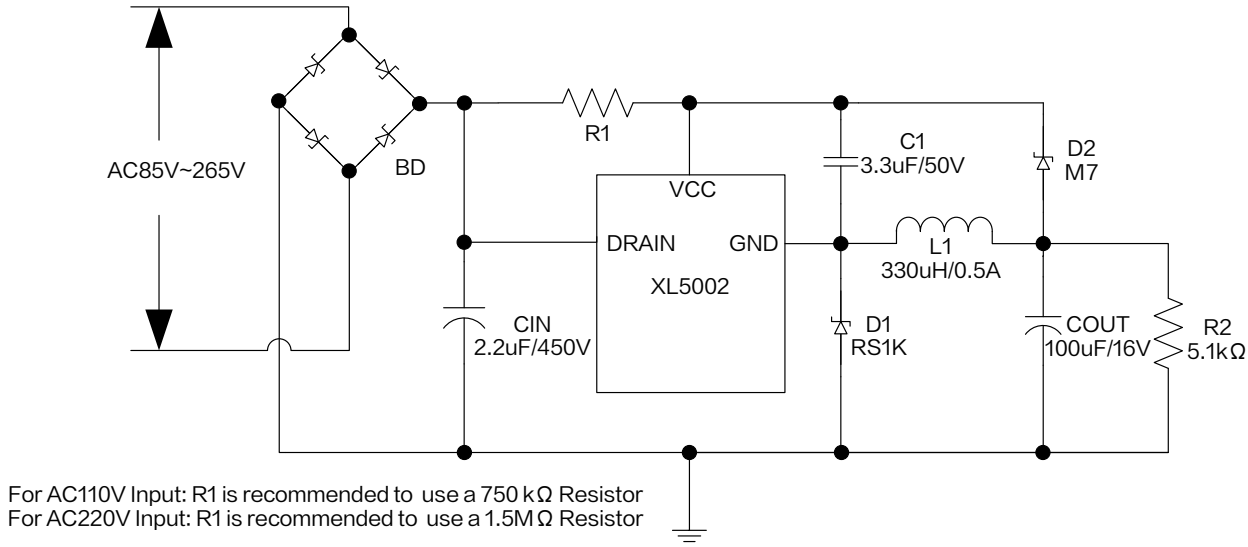


Figure4.XL5002 System Parameters Test Circuit (V_{OUT} = 5V, I_{OUT} = 0~0.15A)

Typical System Application Transfer Efficiency

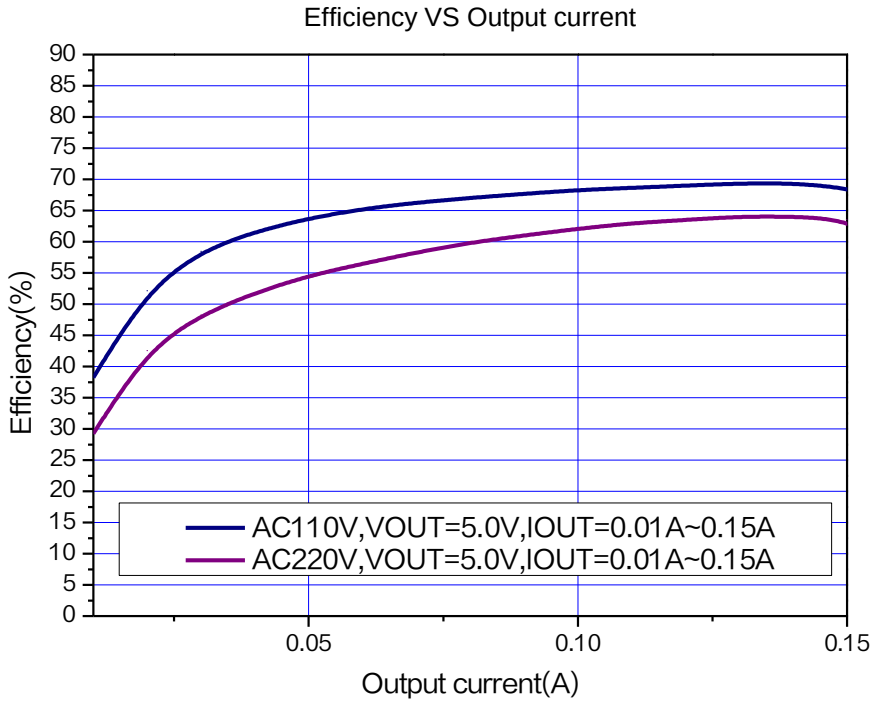
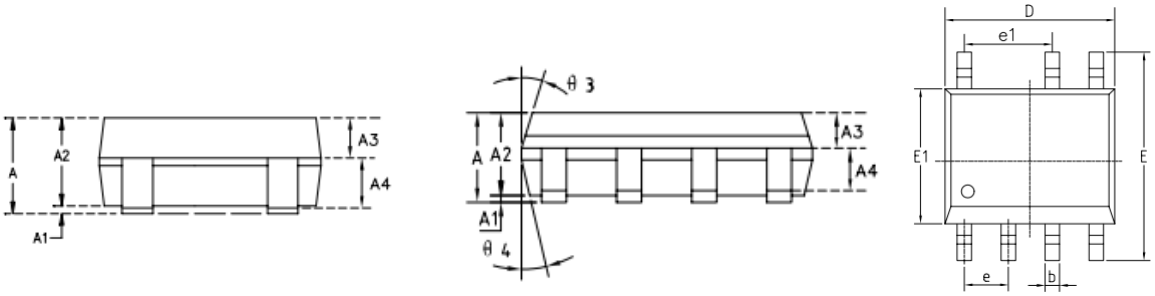


Figure5.XL5002 System Efficiency Curve

Package Information

SOP7



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	1.35	1.50	1.65	0.053	0.059	0.065
A1	0.05	0.10	0.15	0.002	0.004	0.006
A2	1.35	1.40	1.50	0.053	0.055	0.059
A3	0.50	0.60	0.70	0.020	0.024	0.028
A4	0.67	–	0.70	0.026	–	0.028
b	0.38	–	0.50	0.015	–	0.020
D	4.80	4.90	5.00	0.189	0.193	0.197
e	1.27BSC			0.05BSC		
e1	2.54BSC			0.10BSC		
E	5.80	6.00	6.20	0.229	0.236	0.244
E1	3.80	3.90	4.00	0.150	0.154	0.158
L	0.45	0.60	0.80	0.018	0.024	0.032
L1	1.04REF			0.041REF		
L2	0.25BSC			0.010BSC		
R	0.07	–	–	0.003	–	–
R1	0.07	–	–	0.003	–	–
h	0.30	0.40	0.50	0.012	0.016	0.020
θ	0°	–	8°	0°	–	8°
θ1	10°	12°	14°	10°	12°	14°
θ2	8°	10°	12°	8°	10°	12°
θ3	10°	12°	14°	10°	12°	14°
θ4	8°	10°	12°	8°	10°	12°

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