PN8313

Chipown

Internal HV Start-up Non-isolated quasi-resonant mode Converter for LED Driver

General Description

The PN8313 consists of a high precision quasi-resonant mode CC primary side controller and a power MOSFET, specifically designed for a high performance low power LED lighting with minimal external components and single-inductance. The chip adopts buck topology and work in quasi-resonant mode; The chip adopts a patent HV DMOS self-supply technology, so auxiliary winding and HV Start-up resistance could be eliminated. The chip offers complete protection coverage with automatic self-recovery feature including Cycle-by-Cycle current limiting protection (OCP) and feedback loop open protection (OLP), over temperature regulation, Rcs open/short Protection and LED-open/short circuit protection etc. Internal HV Start-up circuit and the chip's very low consumption help to meet high efficiency. In CC control, the current and output power setting can be adjusted externally by the sense resistor Rcs at CS pin.

Features

■ Integrated 530V avalanche-rugged power MOSFET

■ Integrated HV Soft Start Circuit without additional Start-up resistance

■ Rapid self-supply patent technology without additional power supply circuit

■ ±3% precision LED current

■ Adjustable constant current output values

■ Good Protection Coverage With

    ✧   over temperature regulation

    ✧   over current limiting (OCP)

    ✧   LED open and short circuit protection

    ✧   Auto- recovery protection Mode

    ✧   Rcs open/short Protection

Applications

■ LED Fluorescent Lamp

■ LED Bulb

Package/Order Information

SOP8

CS	SW
VDD	SW
FB	NC
GND	NC
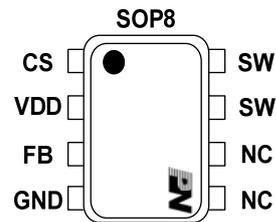
Order codes	Package	Input Voltage	Typical power
PN8313SEC-R1T	SOP8	90-265V	7.5W
		176-265V	11W

Note: the maximum output power should be tested in open frame at 85℃ ambient temperature.

Diagram Block
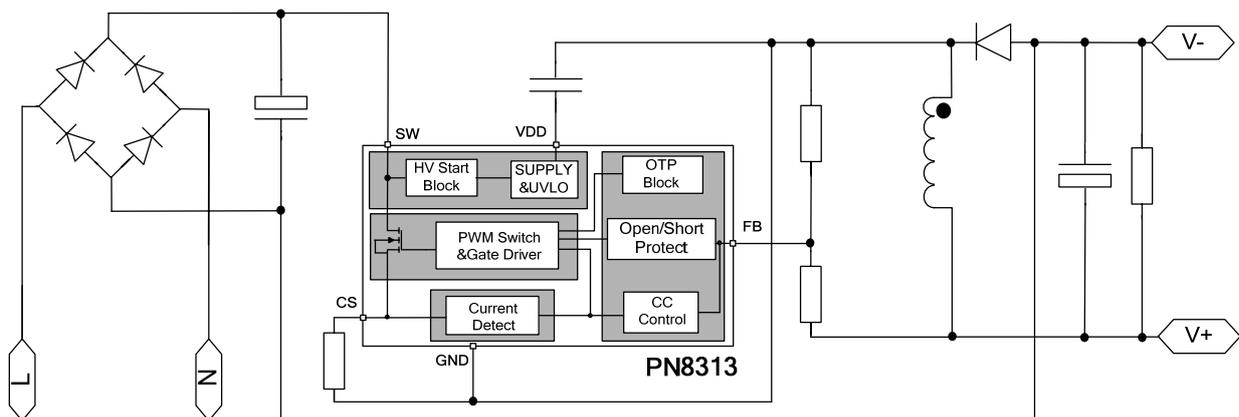
Pin Definitions

Table 1. Pin Definitions

Pin Number	Pin Name	Pin Function Description
1	CS	Current sense input pin.
2	VDD	Power supply pin
3	FB	Fly Back Pin
4	GND	Ground.
5	NC	Floating
6		
7	SW	Drain of the internal MOSFET
8		

Note: NC Pin could not be connected

Typical Power

Table 2. Typical Power

Part number	Input voltage	Open frame[1]
PN8313 SOP8	**90-265 V_{AC}**	**7.5W[2]**
	176-265 V_{AC}	**11W[3]**

Note:

1) the maximum output power should be tested in open frame at 85°C ambient temperature

2) Suggested output current is less than 120mA for maximum power application when input voltage range is 90-265V

3) Suggested output current is less than 145mA for maximum power application when input voltage range is 176-265V

Absolute Maximum Ratings

VDD max support voltage ....……………………….…… ……………………….……………..…………..……… 40V

SW max support voltage…..…………………………….…. ………. …………….…………..……… 500V

CS, FB work voltage …………………………………………………………….……….........….....……. -0.3--5V

Junction Ambient Temperature……………………………………….…. ……………….…….…….…… -40℃ to 150℃

Package Thermal Temperature (SOP-8)……………………………………...…………....…..……… 80°C/W

Storage Temperature Range………………………………………….……. …………………..…..…..… -55~150℃

Lead Temperature (Soldering, 10secs)……………………………………………. …………. …………. 260℃

ESD (HBM, , ESDA/JEDEC JDS-001-2014)………………………………………………………….….. 2.0kV

The biggest drain pulse current………………………………………………………………………….…. 0.8A

Electrical Characteristics (T_J=25°C, V_{DD}= 15 V；Special circumstances shall be separately noted)

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
Power Section						
V_{BVDSS}	Break-down voltage	I_{SW} = 250uA, V_{CS} = 0.4V, T_J = 25℃		530		V
I_{OFF}	Off-state drain current	V_{SW} = 500 V, V_{CS} = 0.4V			150	uA
$R_{DS(on)}$	Drain-source on state resistance	I_{SW} = 0.4A, T_J = 25℃		14		Ω
Supply Voltage Section						
V_{SW_START}	Start up voltage		45		75	V
I_{DD_CH}	Start up charging current	V_{SW} = 105 V, V_{CS} = 0.4V, V_{DD} = 11 V		-6		mA
V_{DDon}	V_{DD} start up threshold		11.5	13.0	14.5	V
V_{DDoff}	V_{DD} under voltage shutdown threshold		7.0	8.0	9.0	V
V_{ddchon}	Self-powered turn off voltage		12.0	13.0	14.5	V
$V_{ddchoff}$	Self-powered turn on voltage		9.0	11.0	12.0	V
$V_{DDclamp}$	V_{DD} clamp voltage		18	20	22	V
Supply Cuurent Section						
I_{DD1}	Operating supply current	V_{CS} = 1 V, V_{FB} = 0.6 V, VDD= 14.5V	0.19		0.4	mA
I_{DD2}	supply current when ic shutdown	V_{CS} = 1 V, V_{FB} = 0.6 V, VDD= 7.0V			0.24	mA
$I_{DD-FAULT}$	supply current when ic in fault	V_{CS} = 0.2 V, V_{FB} = 0.1 V	0.1		0.24	mA
Current Sense Section						
T_{LEB}	Leading edge blanking time			450		ns
V_{TH_OC}	Current limiting threshold voltage		535	550	565	mV
T_{ON_MAX}	Maximal turn ON time		40		100	us
FB Section						
FB_{OVP}	FB over voltage protect			3.3		V
FB_{SHORT}	FB low-voltage protection			0.3		V
$T_{OFF-MIN}$	Minimum turn off time			3.8		us
$T_{OFF-MAX}$	Maximal turn off time			150		us
Thermal Section						
T_{REG}	Thermal regulation temperature			150		°C

Typical Application

90~265Vac 65V120mA

Functional Description

1. Startup

At start up, the internal high-voltage current source supplies the internal bias and charges the external VDD capacitor. When VDD reaches 13V, the device starts switching and the internal high-voltage current source stops charging the capacitor. The device is in normal operation provided VDD does not drop below 11V.

2. CC Operation Mode

In CC operation, PN8313 captures the flyback signal at FB pin through a resistor divider network. The pulse width of the flyback signal determines the PN8313 oscillator frequency. The chip work in quasi-resonant mode. The higher the output voltage is, the shorter the pulse width is. And the chip oscillator frequency is higher, thus the constant output current can be achieved.

3. Current Sense & Leading Edge Blanking

Cycle-by-Cycle current limiting is offered in PN8313. The switch current is detected by a sense resistor into the CS pin. The CC set-point and maximum output power can be externally adjusted by external current sense resistor at CS pin. An internal leading edge blanking circuit chops off the sensed voltage spike at initial power MOSFET on state so that the external RC filtering on sense input is no longer needed.

4. Protection Control

The PN8313 has several self-protection functions, such as Over-Voltage Protection , Over Temperature Regulation, Feedback Loop open Protection ,Output short circuit Protection, CS resistor short circuit Protection and Under Voltage Lockout on VDD. All protections are implemented as auto-restart mode.

Package Dimensions

Table 3. SOP8 mechanical data

Dimensions / Symbol	Min.(mm)	Mid.(mm)	Max.(mm)	Dimensions / Symbol	Min.(mm)	Mid.(mm)	Max.(mm)
A	1.35	1.55	1.75	L	0.45	0.60	0.80
A1	0.10	0.15	0.25	L1	1.04REF		
A2	1.25	1.40	1.65	L2	0.25BSC		
A3	0.50	0.60	0.70	R	0.07	—	—
b	0.38	—	0.51	R1	0.07	—	—
b1	0.37	0.42	0.47	h	0.30	0.40	0.50
c	0.17	—	0.25	θ	0°	—	8°
c1	0.17	0.20	0.23	θ1	15°	17°	19°
D	4.80	4.90	5.00	θ2	11°	13°	15°
E	5.80	6.00	6.20	θ3	15°	17°	19°
E1	3.80	3.90	4.00	θ4	11°	13°	15°
e	1.270（BSC）						

Figure 1. Package dimensions
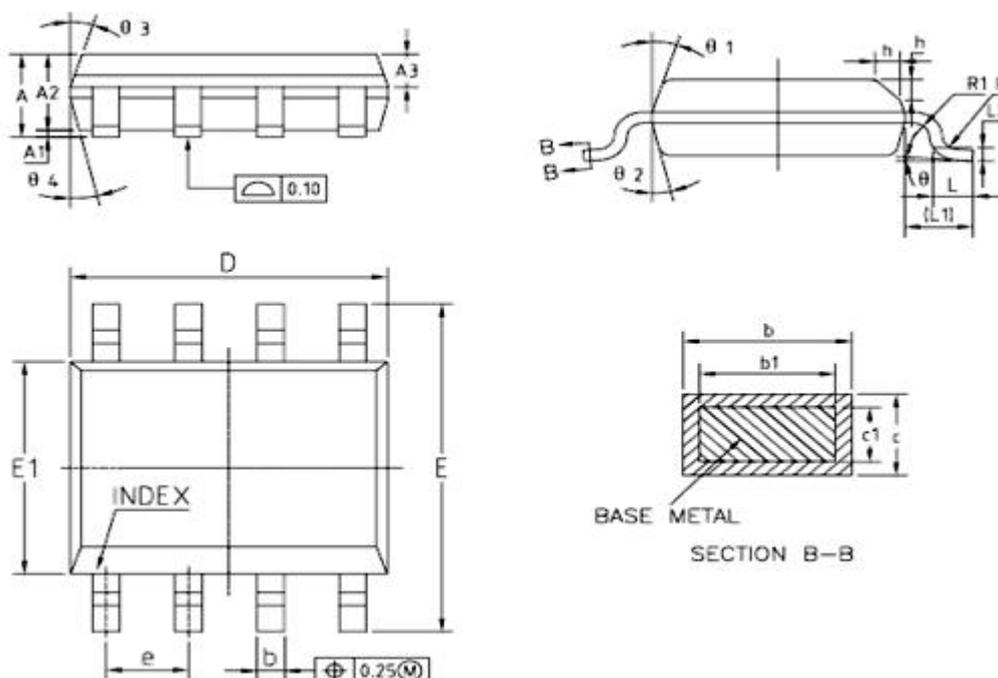
TOP MARK	Package
PN8313 YWWXXXXX	SOP8

Note: YY: Year Code; WW: Week Code; XXXXX: Internal Code