FAIRCHILD SEMICONDUCTOR®

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FSDM311
Green Mode Fairchild Power Switch (FPS™)

Features

- Internal Avalanche Rugged SenseFET
- Precision Fixed Operating Frequency (67KHz)
- Advanced Burst-Mode Operation (power consumption < 0.1W at 265VAC, no-load condition)
- Internal Start-up Circuit
- Pulse-by-Pulse Current Limit
- Over-Voltage Protection (OVP)
- Over-Load Protection (OLP)
- Internal Thermal Shutdown Function (TSD)
- Auto-Restart Mode
- Under-Voltage Lockout (UVLO) with Hysteresis
- Built-in Soft-Start

Applications

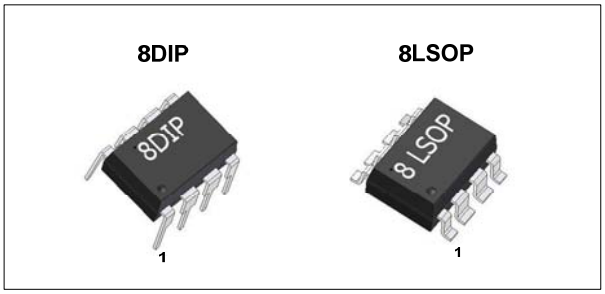
- Charger & Adapter for Mobile Phone, PDA & MP3
- Auxiliary Power for White Goods, PC, C-TV & Monitor

Related Application Notes

- AN-4137, AN-4141, AN-4147 (Flyback)
- AN-4134 (Forward)
- AN-4138 (Charger)

Description

The FSDM311, consisting of integrated Pulse-Width Modulator (PWM) and SenseFET, is specifically designed for high-performance, off-line Switch Mode Power Supplies (SMPS) with minimal external components. This device is an integrated high-voltage, power-switching regulator which combines a VDMOS SenseFET with a voltage mode PWM control block. The integrated PWM controller features include: a fixed oscillator, Under-Voltage Lockout (UVLO) protection, Leading Edge Blanking (LEB), an optimized gate turn-on/turn-off driver, Thermal Shutdown (TSD) protection, and temperature-compensated, precision-current sources for loop-compensation and fault-protection circuitry. When compared to a discrete MOSFET and controller or RCC switching converter solution, the FSDM311 device reduces total component count and design size and weight; while increasing efficiency, productivity, and system reliability. This device provides a basic platform that is well suited for the design of cost-effective flyback converters.



Ordering Information

Product Number	Package	Marking Code	BV_{DSS}	f_{OSC}	$R_{DS\ (ON)}$
FSDM311	8DIP	DM311	650V	67KHz	14Ω
FSDM311L	8LSOP	DM311	650V	67KHz	14Ω

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Typical Application & Output Power Table

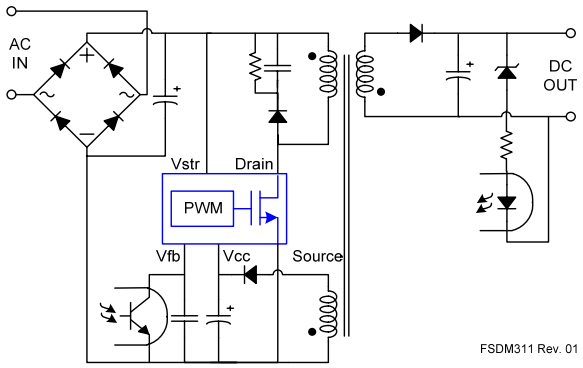

Figure 1 Typical Flyback Application

OUTPUT POWER TABLE		
Product	**Open Frame(1)**	
	230VAC±15%(2)	**85~265VAC**
FSDM311	13W	8W
FSDM311L	13W	8W

Notes:
1. Maximum practical continuous power in open-frame design with sufficient drain pattern as a heat sink, at 50°C ambient.
2. 230VAC or 100/115VAC with doubler.

Internal Block Diagram

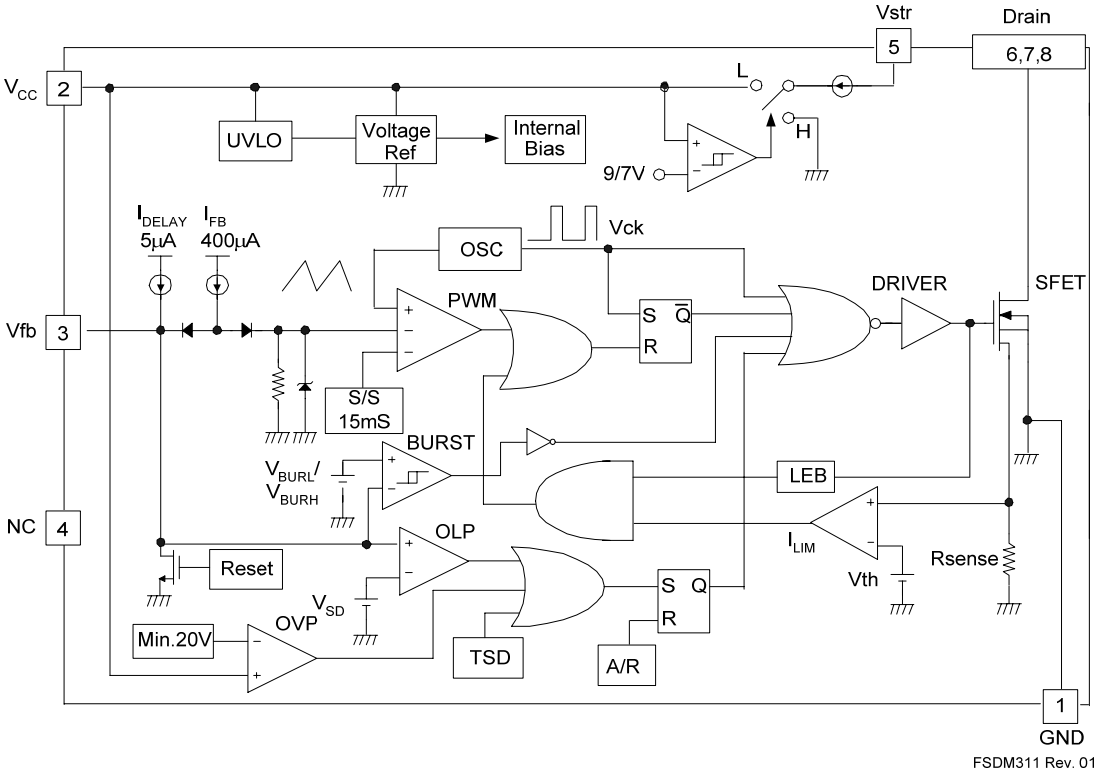

Figure 2 Functional Block Diagram of FSDM311

Pin Assignments

8DIP
8LSOP

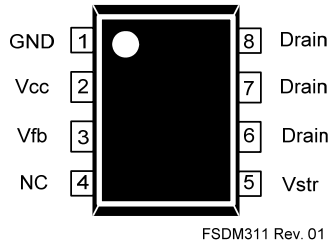

Figure 3 Pin Configuration (Top View)

Pin Definitions

Pin Number	Pin Name	Pin Function Description
1	GND	**Ground.** SenseFET source terminal on primary side and internal control ground.
2	V_{CC}	**Positive supply voltage input.** Although connected to an auxiliary transformer winding, current is supplied from pin 5 (Vstr) via an internal switch during start-up (see Internal Block Diagram section). When V_{CC} reaches the UVLO upper threshold (9V), the internal start-up switch opens and device power is supplied by the auxiliary transformer winding.
3	Vfb	**Feedback.** Inverting input to the PWM comparator with its normal input level between 0.5V and 2.5V. It has a 0.4mA current source connected internally, while a capacitor and opto-coupler are typically connected externally. A feedback voltage of 4.5V triggers overload protection (OLP). There is a time delay while charging the external capacitor Cfb from 3V to 4.5V using an internal 5μA current source. This time delay prevents false triggering under transient conditions, but allows the protection mechanism to operate under true overload conditions.
4	NC	**No Connection**.
5	Vstr	**Start-up.** This pin connects directly to the rectified AC line voltage source. At start-up, the internal switch supplies internal bias and charges an external storage capacitor placed between the V_{CC} pin and ground. Once the V_{CC} reaches 9V, the internal switch stops charging the capacitor.
6,7,8	Drain	**SenseFET Drain.** The drain pins are designed to connect directly to the primary lead of the transformer and are capable of switching a maximum of 650V. Minimizing the length of the trace connecting these pins to the transformer is recommended to decrease leakage inductance.

Absolute Maximum Ratings

The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings.

T_A=25°C, unless otherwise specified.

Symbol	Parameter	Value	Unit
V_{DRAIN}	Drain Pin Voltage	650	V
V_{STR}	Vstr Pin Voltage	650	V
V_{DG}	Drain-Gate Voltage	650	V
V_{GS}	Gate-Source Voltage	±20	V
I_{DM}	Drain Current Pulsed(3)	1.5	A
I_D	Continuous Drain Current (Tc=25°C)	0.5	A
I_D	Continuous Drain Current (Tc=100°C)	0.32	A
E_{AS}	Single Pulsed Avalanche Energy(4)	10	mJ
V_{CC}	Supply Voltage	20	V
V_{FB}	Feedback Voltage Range	-0.3 to V_{STOP}	V
P_D	Total Power Dissipation	1.40	W
T_J	Operating Junction Temperature	Internally limited	°C
T_A	Operating Ambient Temperature	-25 to +85	°C
T_{STG}	Storage Temperature	-55 to +150	°C

Notes:

3. Repetitive rating: Pulse width is limited by maximum junction temperature.
4. L = 24mH, starting TJ = 25°C.

Thermal Impedance

FSDM311 8DIP. T_A=25°C, unless otherwise specified.

Symbol	Parameter	Value	Unit
θ_{JA}	Junction-to-Ambient Thermal Impedance(5)	88.84	°C/W
θ_{JC}	Junction-to-Case Thermal Impedance(6)	13.94	°C/W

Notes:

5. Free standing with no heat sink, without copper clad. (Measurement Condition – Just before junction temperature T_J enters into OTP.)
6. Measured on the DRAIN pin close to plastic interface.

All items are tested with the standards JESD 51-2 and 51-10 (DIP).