

# FSDM311

## Fairchild Power Switch(FPS)

### Features

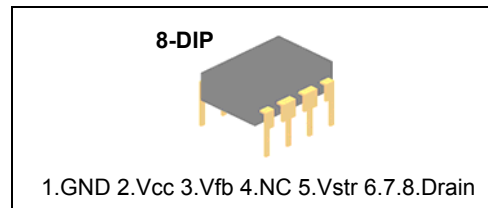
- Internal Avalanche Rugged SenseFET
- Precision Fixed Operating Frequency (67KHz)
- Internal Start-up Switch
- UVLO with Hysteresis (7V/9V)
- Over Load Protection
- Over Voltage Protection
- Internal Thermal Shutdown Function (Hysteresis)
- Auto-Restart Mode
- Secondary Side Regulation
- Low Operating Current (1.5mA)
- Built-in Soft Start
- New 8-DIP Package for Wide Creepage

### Applications

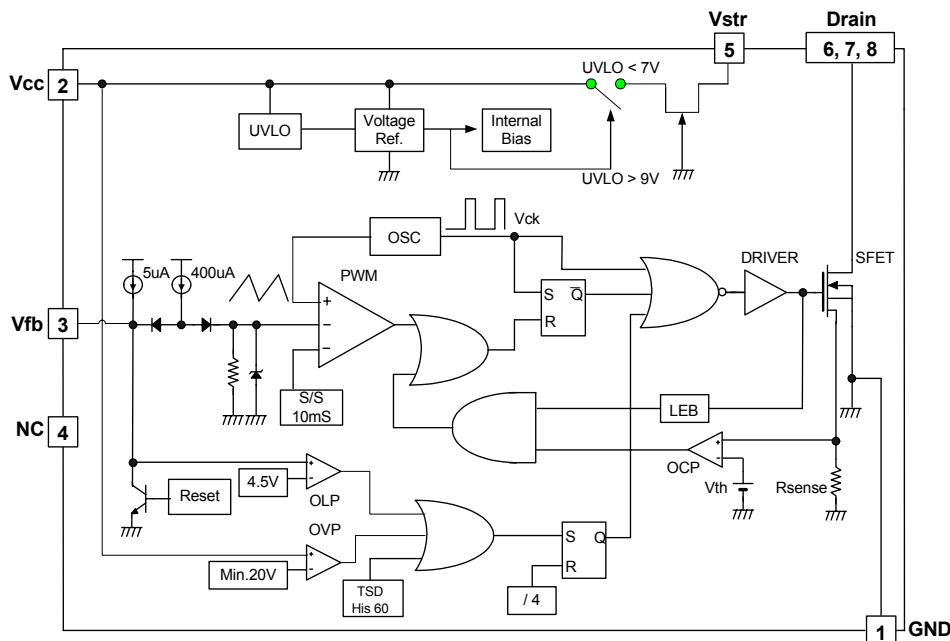
- Charger & Adaptor for Mobile Phone, PDA & MP3
- Auxiliary Power for PC, C-TV & Monitor

### Description

The Fairchild Power Switch(FPS) product family is specially designed for an off-line SMPS with minimal external components. The Fairchild Power Switch(FPS) consists of a high voltage power SenseFET and a voltage mode PWM IC. Included PWM controller integrates the fixed frequency oscillator, the under voltage lock-out, the leading edge blanking, the optimized gate turn-on/turn-off driver, the thermal shutdown protection, the over voltage protection, and the temperature compensated precision current sources for the loop compensation and the fault protection circuitry. Compared to a discrete MOSFET and a PWM controller or an RCC solution, a Fairchild Power Switch(FPS) can reduce the total component count, design size and weight and at the same time increase efficiency, productivity, and system reliability. It is well suited for cost effective design of fly-back converters.



### Internal Block Diagram



## Absolute Maximum Ratings

(Ta=25°C, unless otherwise specified)

Characteristic	Symbol	Value	Unit
<b>FSDM311</b>			
Maximum Vstr Voltage	VSTR,MAX	650	V
Drain-Gate Voltage (RGS=1MΩ)	VDGR	–	V
Gate-Source (GND) Voltage	VGS	–	V
Drain Current Pulsed <sup>(1)</sup>	IDM	–	ADC
Single Pulsed Avalanche Energy <sup>(2)</sup>	EAS	–	mJ
Maximum Supply Voltage	VCC,MAX	20	V
Analog Input Voltage Range	VFB	-0.3 to VSD	V
Total Power Dissipation	PD	–	W
	Derating	–	W/°C
Operating Junction Temperature.	TJ	+150	°C
Operating Ambient Temperature.	TA	-25 to +85	°C
Storage Temperature Range.	TSTG	-55 to +150	°C

**Note:**

1. Repetitive rating: Pulse width limited by maximum junction temperature
2. L=24mH, starting Tj=25°C

## Electrical Characteristics (SenseFET Part)

(Ta = 25°C unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
<b>FSDM310, FSDM311</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =50μA	650	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =Max. Rating, V <sub>GS</sub> =0V	-	-	100	μA
		V <sub>DS</sub> =0.8Max. Rating, V <sub>GS</sub> =0V, T <sub>C</sub> =125°C	-	-	-	μA
Static Drain-Source on Resistance <sup>(Note)</sup>	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =0.5A	-	15	19	Ω
Forward Transconductance <sup>(Note)</sup>	g <sub>fs</sub>	V <sub>DS</sub> =50V, I <sub>D</sub> =0.5A	-	-	-	S
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1MHz	-	-	-	pF
Output Capacitance	C <sub>oss</sub>		-	-	-	
Reverse Transfer Capacitance	C <sub>rss</sub>		-	-	-	
Turn on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =0.5B V <sub>DSS</sub> , I <sub>D</sub> =1.0A (MOSFET switching time is essentially independent of operating temperature)	-	-	-	nS
Rise Time	t <sub>r</sub>		-	-	-	
Turn Off Delay Time	t <sub>d(off)</sub>		-	-	-	
Fall Time	t <sub>f</sub>		-	-	-	
Total Gate Charge (Gate-Source+Gate-Drain)	Q <sub>g</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =1.0A, V <sub>DS</sub> =0.5B V <sub>DSS</sub> (MOSFET switching time is essentially independent of operating temperature)	-	-	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	-	-	
Gate-Drain (Miller) Charge	Q <sub>gd</sub>		-	-	-	

### Note:

1. Pulse test: Pulse width ≤ 300μS, duty ≤ 2%

2.  $S = \frac{1}{R}$

**Electrical Characteristics (Control Part)** (Continued)

(Ta=25°C unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
<b>UVLO SECTION</b>						
Start Threshold Voltage	VSTART	VFB=GND	8	9	10	V
Stop Threshold Voltage	VSTOP	VFB=GND	6	7	8	V
<b>OSCILLATOR SECTION</b>						
Initial Accuracy	FOSC		61	67	73	kHz
Frequency Change With Temperature <sup>(2)</sup>	$\Delta F/\Delta T$	$-25^{\circ}\text{C} \leq T_a \leq +85^{\circ}\text{C}$	-	$\pm 5$	$\pm 10$	%
Maximum Duty Cycle	Dmax		-	67	-	%
<b>FEEDBACK SECTION</b>						
Feedback Source Current	IFB	Ta=25°C, 0V ≤ Vfb ≤ 3V	0.35	0.40	0.45	mA
Shutdown Feedback Voltage	VSD		4.0	4.5	5.0	V
Shutdown Delay Current	Idelay	Ta=25°C, 3V ≤ Vfb ≤ VSD	-	5	-	μA
<b>REFERENCE SECTION</b>						
Output Voltage <sup>(1)</sup>	Vref	Ta=25°C	4.30	4.50	4.70	V
Temperature Stability <sup>(1)(2)</sup>	Vref/ΔT	$-25^{\circ}\text{C} \leq T_a \leq +85^{\circ}\text{C}$	-	0.3	0.6	mV/°C
<b>CURRENT LIMIT(SELF-PROTECTION)SECTION</b>						
Peak Current Limit	I <sub>OVER</sub>		0.50	0.55	0.60	A
<b>SOFT START SECTION</b>						
Soft Start Time	T <sub>SOFT</sub>		-	10	15	mS
<b>PROTECTION SECTION</b>						
Thermal Shutdown Temperature <sup>(1)</sup>	TSD	-	125	145	-	°C
Thermal Shutdown Hysteresis		-	-	60	-	°C
Over Voltage Protection	VOVP		20	-	-	V
<b>TOTAL STANDBY CURRENT SECTION</b>						
Start-up Current	ISTR	VCC=0V, VSTR=50V	450	550	650	μA
Operating Supply Current (Control Part Only)	IOP	VCC ≤ 16	-	1.5	3.0	mA

**Note:**

1. These parameters, although guaranteed, are not 100% tested in production
2. These parameters, although guaranteed, are tested in EDS (wafer test) process

## Typical Performance Characteristics

(These characteristic graphs are normalized at  $T_a=25^\circ\text{C}$ )

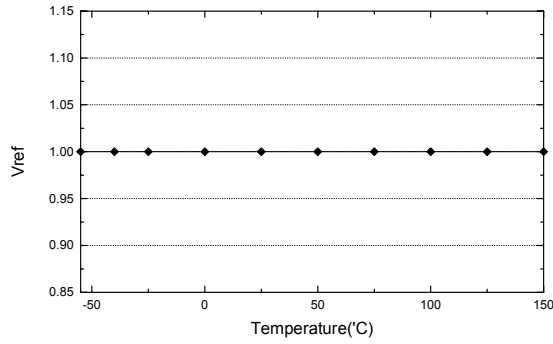


Figure 1. Reference Voltage vs. Temp

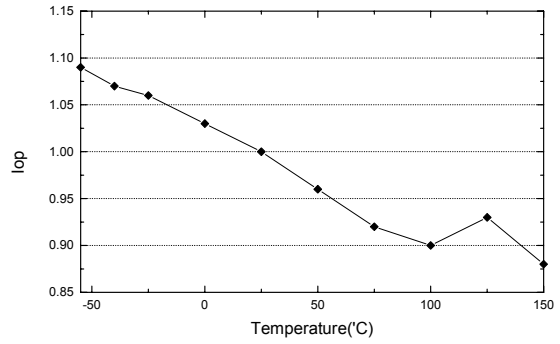


Figure 2. Operating Current vs. Temp

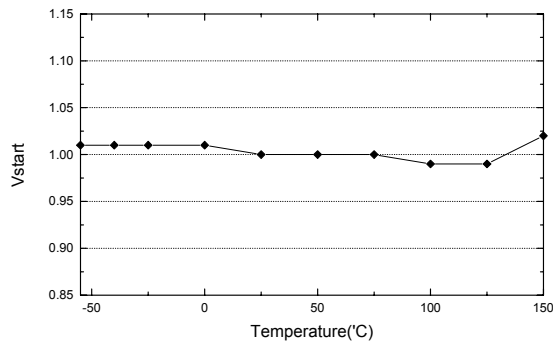


Figure 3. Start Threshold Voltage vs. Temp

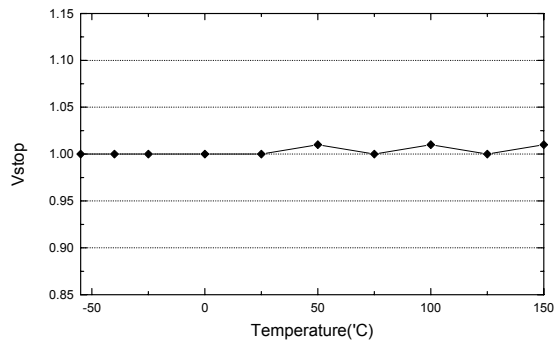


Figure 4. Stop Threshold Voltage vs. Temp

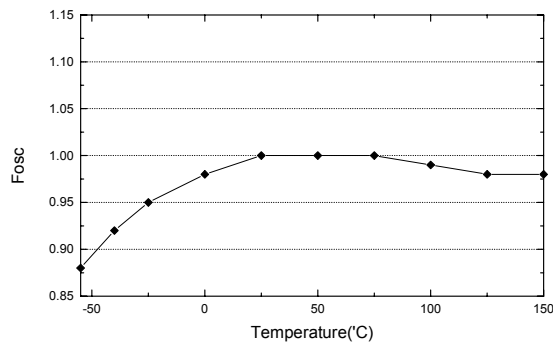


Figure 5. Frequency vs. Temp

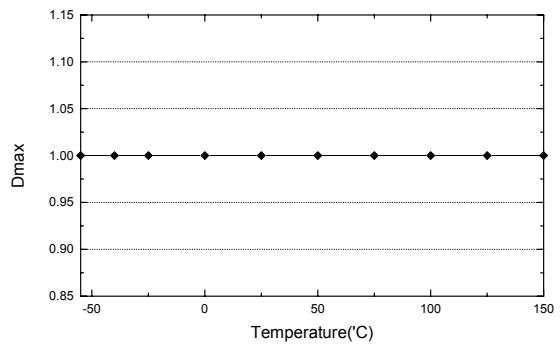


Figure 6. Maximum Duty vs. Temp

### Typical Performance Characteristics (Continued)

(These characteristic graphs are normalized at Ta=25°C)

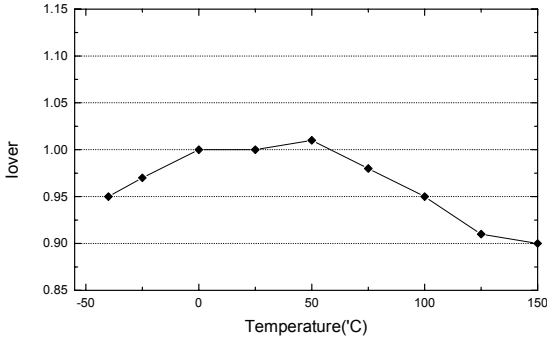


Figure 7. Peak Current Limit vs. Temp

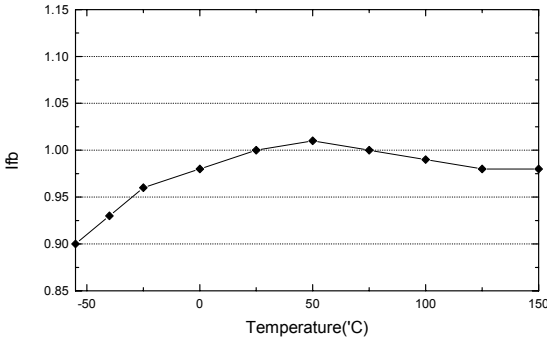


Figure 8. Feedback Source Current vs. Temp

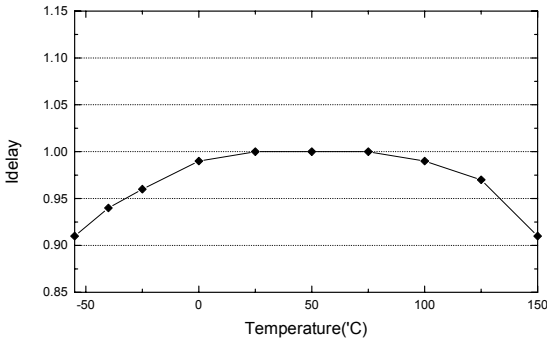


Figure 9. ShutDown Delay Current vs. Temp

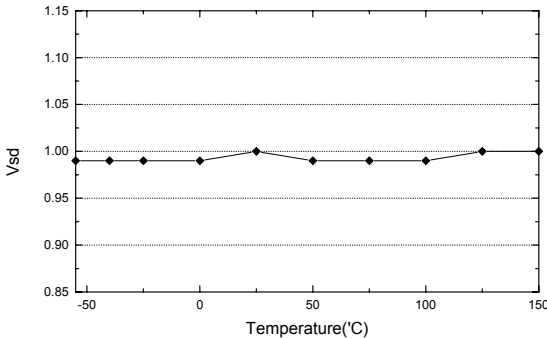


Figure 10. ShutDown Feedback Voltage vs. Temp

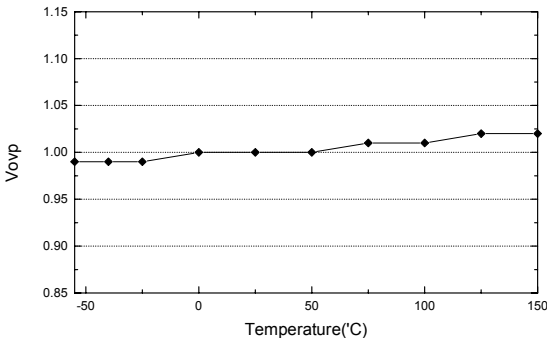
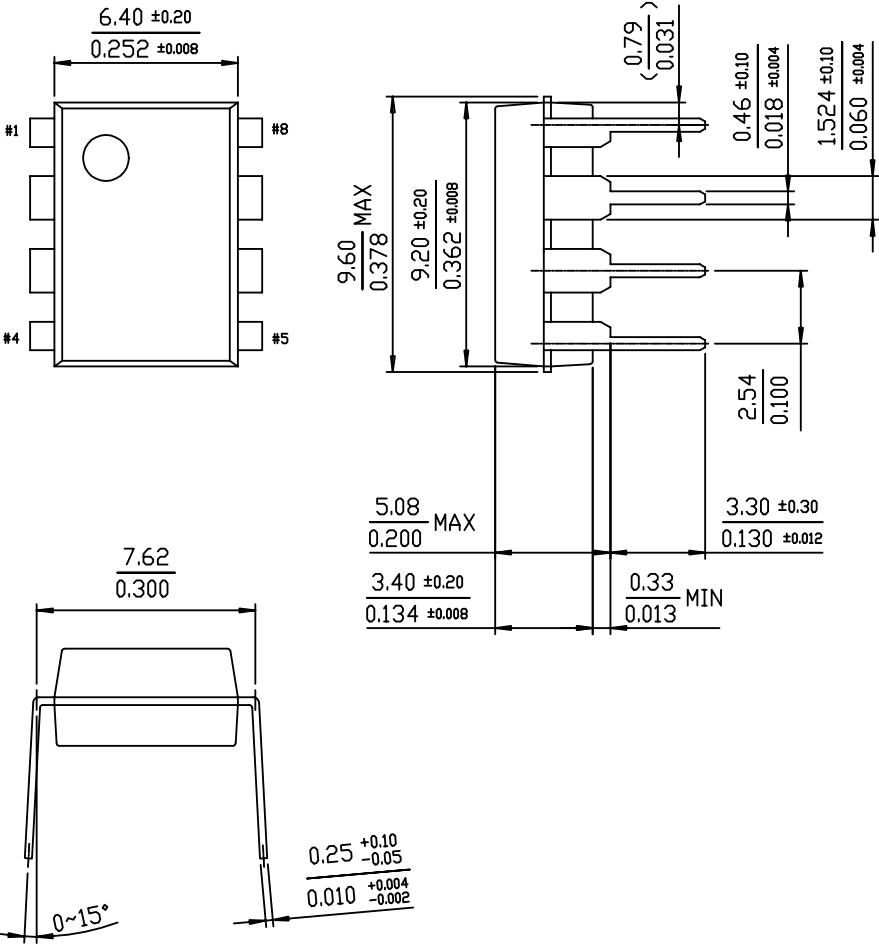


Figure 11. Over Voltage Protection vs. Temp

# Package Dimensions

## 8-DIP



## Ordering Information

Product Number	Package	Marking Code	BVDSS	FOSC	RDS(on)
FSDM311	8-DIP	DM311	650V	67kHz	15Ω

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