FSDM311

Fairchild Power Switch(FPS)

Features

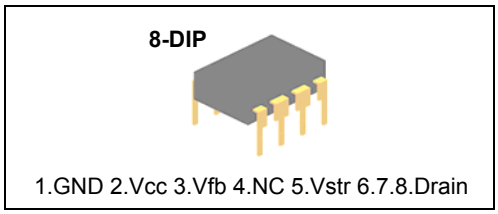
- Internal Avalanche Rugged SenseFET
- Precision Fixed Operating Frequency (67KHz)
- Internal Start-up Switch
- UVLO with Hysteresis (7V/9V)
- Over Load Protection
- Over Voltage Protection
- Internal Thermal Shutdown Function (Hysteresis)
- Auto-Restart Mode
- Secondary Side Regulation
- Low Operating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

Applications

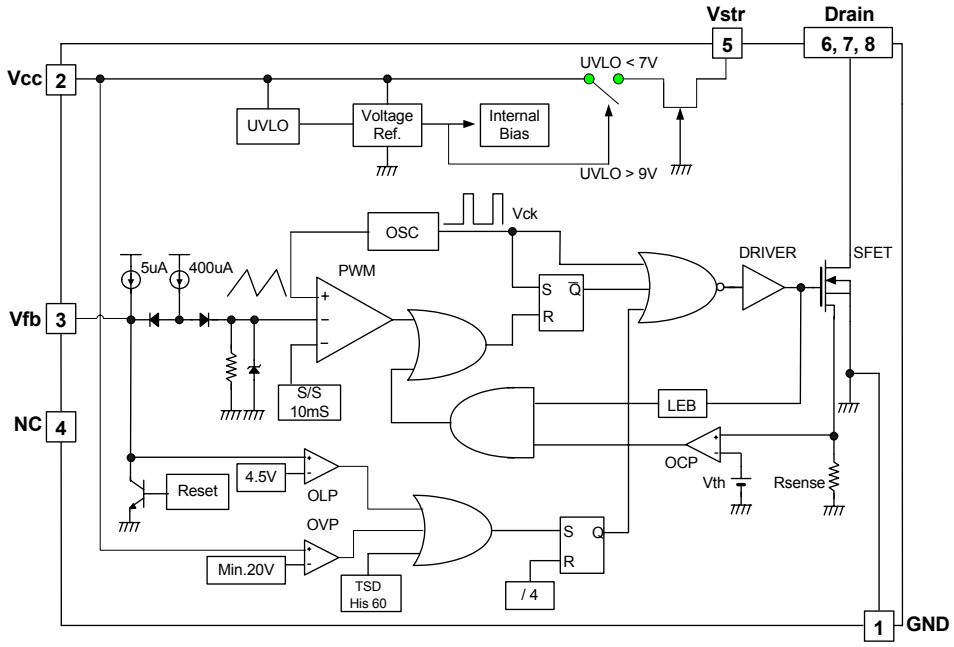
- Charger & Adaptor for Mobile Phone, PDA & MP3
- Auxiliary Power for PC, C-TV & Monitor

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 RCCsolution, 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



Rev.1.0.0

Absolute Maximum Ratings

(Ta=25°C, unless otherwise specified)

Characteristic	Symbol	Value	Unit
FSDM311			
Maximum Vstr Voltage	$V_{STR,MAX}$	650	V
Drain-Gate Voltage (R_{GS}=1MΩ)	V_{DGR}	–	V
Gate-Source (GND) Voltage	V_{GS}	–	V
Drain Current Pulsed (1)	I_{DM}	–	A_{DC}
Single Pulsed Avalanche Energy (2)	E_{AS}	–	mJ
Maximum Supply Voltage	$V_{CC,MAX}$	20	V
Analog Input Voltage Range	V_{FB}	-0.3 to V_{SD}	V
Total Power Dissipation	P_D	–	W
	Derating	–	W/°C
Operating Junction Temperature.	T_J	+150	°C
Operating Ambient Temperature.	T_A	-25 to +85	°C
Storage Temperature Range.	T_{STG}	-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
FSDM310, FSDM311						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_D=50μA	650	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=Max. Rating, V_{GS}=0V	-	-	100	μA
		V_{DS}=0.8Max. Rating, V_{GS}=0V, T_C=125°C	-	-	-	μA
Static Drain-Source on Resistance (Note)	$R_{DS(ON)}$	V_{GS}=10V, I_D=0.5A	-	15	19	Ω
Forward Transconductance (Note)	gfs	V_{DS}=50V, I_D=0.5A	-	-	-	S
Input Capacitance	Ciss	V_{GS}=0V, V_{DS}=25V, f=1MHz	-	-	-	pF
Output Capacitance	Coss		-	-	-	
Reverse Transfer Capacitance	Crss		-	-	-	
Turn on Delay Time	td(on)	V_{DD}=0.5B V_{DSS}, I_D=1.0A (MOSFET switching time is essentially independent of operating temperature)	-	-	-	nS
Rise Time	tr		-	-	-	
Turn Off Delay Time	td(off)		-	-	-	
Fall Time	tf		-	-	-	
Total Gate Charge (Gate-Source+Gate-Drain)	Qg	V_{GS}=10V, I_D=1.0A, V_{DS}=0.5B V_{DSS} (MOSFET switching time is essentially independent of operating temperature)	-	-	-	nC
Gate-Source Charge	Qgs		-	-	-	
Gate-Drain (Miller) Charge	Qgd		-	-	-	

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
UVLO SECTION						
Start Threshold Voltage	V_{START}	V_{FB}=GND	8	9	10	V
Stop Threshold Voltage	V_{STOP}	V_{FB}=GND	6	7	8	V
OSCILLATOR SECTION						
Initial Accuracy	F_{OSC}		61	67	73	kHz
Frequency Change With Temperature (2)	$\Delta F/\Delta T$	-25°C ≤ Ta ≤ +85°C	-	±5	±10	%
Maximum Duty Cycle	Dmax		-	67	-	%
FEEDBACK SECTION						
Feedback Source Current	I_{FB}	Ta=25°C, 0V ≤ Vfb ≤ 3V	0.35	0.40	0.45	mA
Shutdown Feedback Voltage	V_{SD}		4.0	4.5	5.0	V
Shutdown Delay Current	Idelay	Ta=25°C, 3V ≤ Vfb ≤ V_{SD}	-	5	-	μA
REFERENCE SECTION						
Output Voltage (1)	Vref	Ta=25°C	4.30	4.50	4.70	V
Temperature Stability (1)(2)	Vref/ΔT	-25°C ≤ Ta ≤ +85°C	-	0.3	0.6	mV/°C
CURRENT LIMIT(SELF-PROTECTION)SECTION						
Peak Current Limit	I_{OVER}		0.50	0.55	0.60	A
SOFT START SECTION						
Soft Start Time	T_{SOFT}		-	10	15	mS
PROTECTION SECTION						
Thermal Shutdown Temperature (1)	T_{SD}	-	125	145	-	°C
Thermal Shutdown Hysteresis		-	-	60	-	°C
Over Voltage Protection	V_{OVP}		20	-	-	V
TOTAL STANDBY CURRENT SECTION						
Start-up Current	I_{STR}	V_{CC}=0V, V_{STR}=50V	450	550	650	μA
Operating Supply Current (Control Part Only)	I_{OP}	V_{CC} ≤ 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 Ta=25°C)

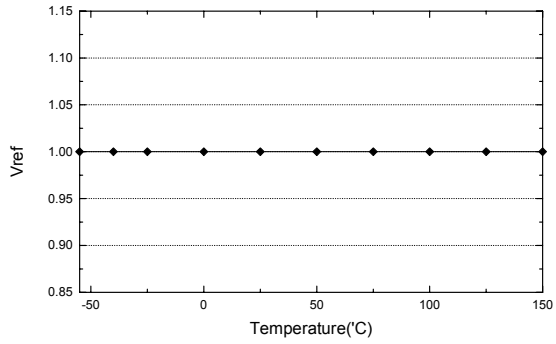


Figure 1. Reference Voltage vs. Temp

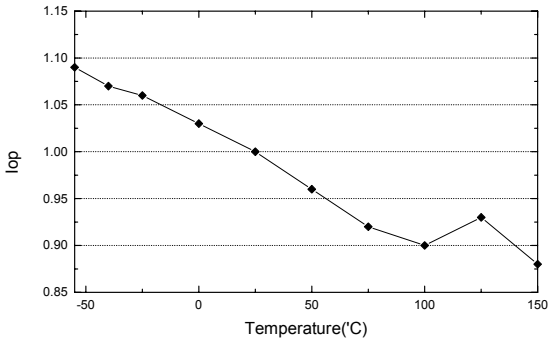


Figure 2. Operating Current vs. Temp

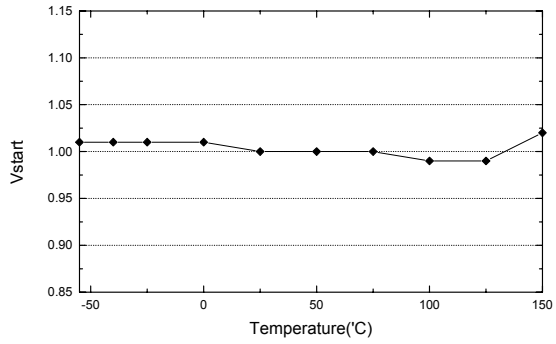


Figure 3. Start Threshold Voltage vs. Temp

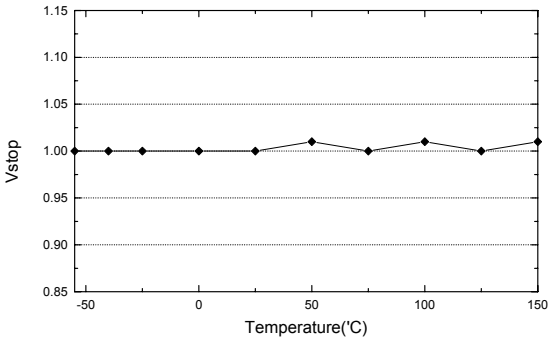


Figure 4. Stop Threshold Voltage vs. Temp

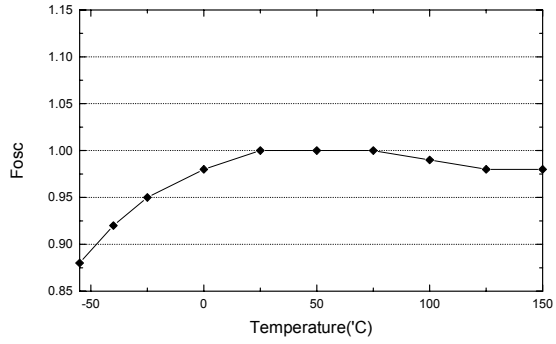


Figure 5. Freqency vs. Temp

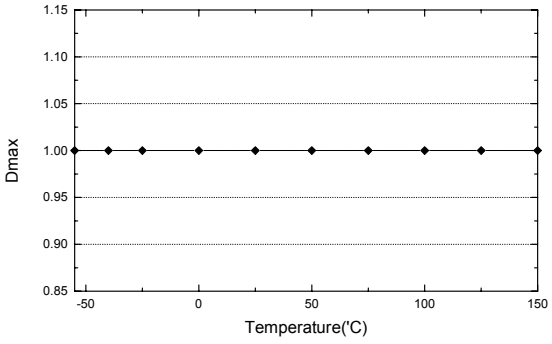


Figure 6. Maximum Duty vs. Temp

Typical Performance Characteristics (Continued)

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

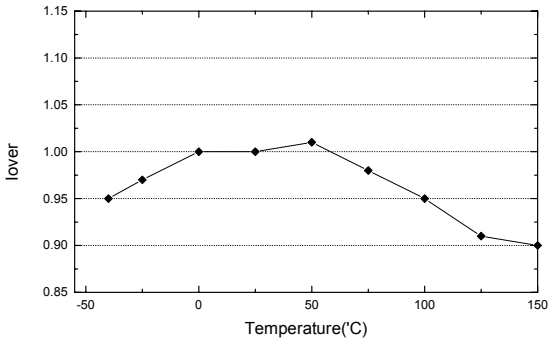


Figure 7. Peak Current Limit vs. Temp

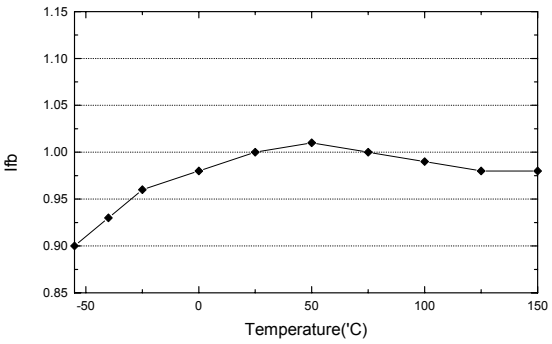


Figure 8. Feedback Source Current vs. Temp

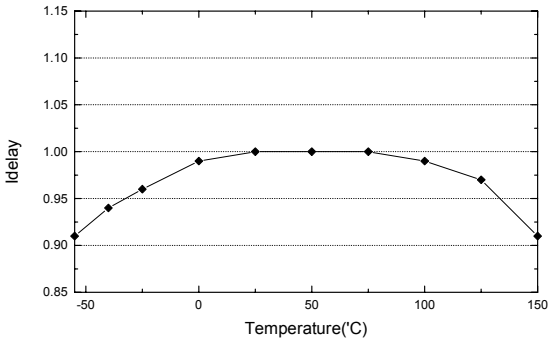


Figure 9. ShutDown Delay Current vs. Temp

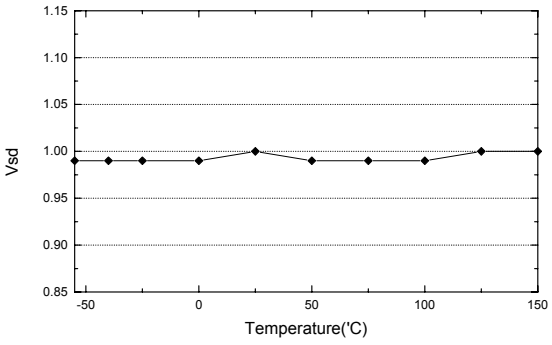


Figure 10. ShutDown Feedback Voltage vs. Temp

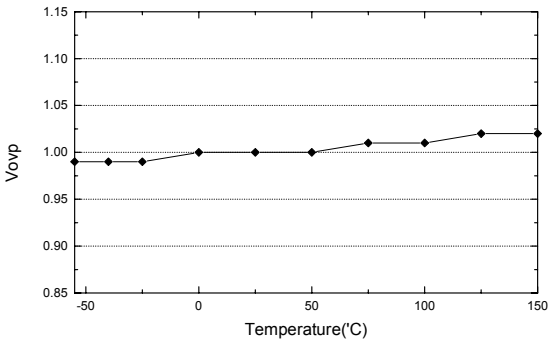
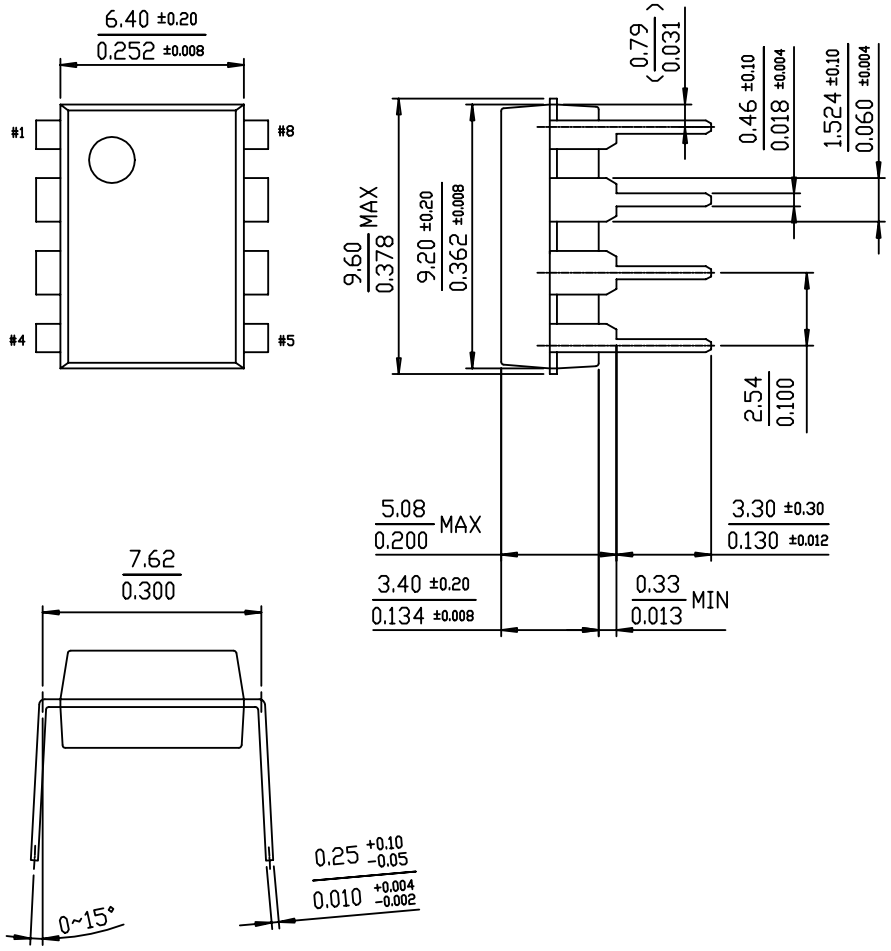


Figure 11. Over Voltage Protection vs. Temp

Package Dimensions

8-DIP



Ordering Information

Product Number	Package	Marking Code	BV_{DSS}	F_{OSC}	$R_{DS(on)}$
FSDM311	8-DIP	DM311	650V	67kHz	15Ω