

KA1M0965R

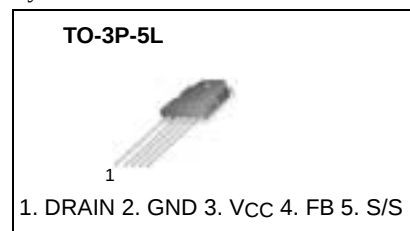
Fairchild Power Switch(FPS)

Features

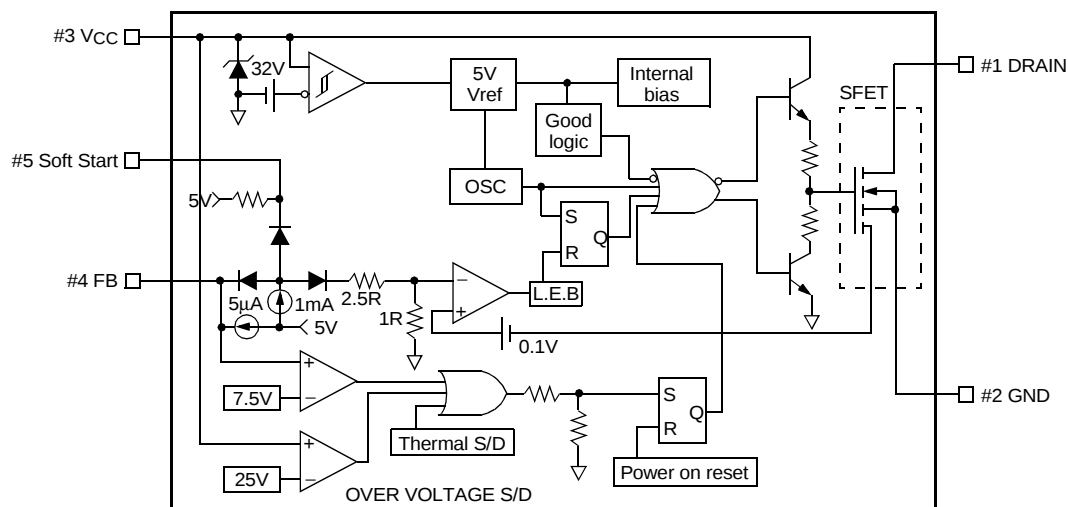
- Precision Fixed Operating Frequency (67kHz)
- Pulse by Pulse Over Current Limiting
- Over Load Protection
- Over Voltage Protection (Min. 23V)
- Internal Thermal Shutdown Function
- Under Voltage Lockout
- Internal High Voltage Sense FET
- Auto Restart
- Soft Start

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) consist of high voltage power SenseFET and current mode PWM controller IC. PWM controller features integrated fixed oscillator, under voltage lock out, leading edge blanking, optimized gate turn-on/turn-off driver, thermal shut down protection, over voltage protection, temperature compensated precision current sources for loop compensation and fault protection circuit. compared to discrete MOSFET and controller or RCC switching converter solution, a Fairchild Power Switch(FPS) can reduce total component count, design size, weight and at the same time increase & efficiency, productivity, and system reliability. It has a basic platform well suited for cost effective design in either a flyback converter or a forward converter.



Internal Block Diagram



Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain Gate Voltage ($R_{GS}=1M\Omega$)	V_{DGR}	650	V
Gate-Source (GND) Voltage	V_{GS}	± 30	V
Drain Current Pulsed ⁽²⁾	I_{DM}	36.0	ADC
Single Pulsed Avalanche Energy ⁽³⁾	EAS	950	mJ
Continuous Drain Current ($T_C=25^\circ\text{C}$)	I_D	9.0	ADC
Continuous Drain Current ($T_C=100^\circ\text{C}$)	I_D	5.8	ADC
Maximum Supply Voltage	$V_{CC,MAX}$	30	V
Input Voltage Range	V_{FB}	-0.3 to V_{SD}	V
Total Power Dissipation	P_D	170	W
	Darting	1.33	W/ $^\circ\text{C}$
Operating Ambient Temperature	T_A	-25 to +85	$^\circ\text{C}$
Storage Temperature	T_{STG}	-55 to +150	$^\circ\text{C}$

Notes:

1. $T_j = 25^\circ\text{C}$ to 150°C
2. Repetitive rating: Pulse width limited by maximum junction temperature
3. $L = 20\text{mH}$, $V_{DD} = 50\text{V}$, $R_G = 27\Omega$, starting $T_j = 25^\circ\text{C}$

Electrical Characteristics (SFET part)

(Ta=25°C unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
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	-	-	50	μA
		V _{DS} =0.8Max., Rating, V _{GS} =0V, T _C =125°C	-	-	200	μA
Static Drain-Source on Resistance ^(Note)	R _{DS(ON)}	V _{GS} =10V, I _D =4.5A	-	0.96	1.2	Ω
Forward Transconductance ^(Note)	g _{fs}	V _{DS} =15V, I _D =4.5A	5.0	-	-	S
Input Capacitance	C _{iss}	V _{GS} =0V, V _{DS} =25V, f=1MHz	-	1750	-	pF
Output Capacitance	C _{oss}		-	190	-	
Reverse Transfer Capacitance	C _{rss}		-	78	-	
Turn on Delay Time	t _{d(on)}	V _{DD} =0.5BV _{DSS} , I _D =9.0A (MOSFET switching time are essentially independent of operating temperature)	-	20	50	nS
Rise Time	t _r		-	23	55	
Turn Off Delay Time	t _{d(off)}		-	85	180	
Fall Time	t _f		-	30	70	
Total Gate Charge (Gate-Source+Gate-Drain)	Q _g	V _{GS} =10V, I _D =9.0A, V _{DS} =0.5BV _{DSS} (MOSFET switching time are essentially independent of operating temperature)	-	74	75	nC
Gate-Source Charge	Q _{gs}		-	12	-	
Gate-Drain (Miller) Charge	Q _{gd}		-	35.4	-	

Note:

1. Pulse test: Pulse width ≤ 300μs, duty cycle ≤ 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}	-	14	15	16	V
Stop Threshold Voltage	V _{STOP}	After turn on	9	10	11	V
OSCILLATOR SECTION						
Initial Accuracy	F _{OSC}	Ta=25°C	61	67	73	kHz
Frequency Change With Temperature ⁽²⁾	$\Delta F/\Delta T$	-25°C ≤ Ta ≤ +85°C	-	±5	±10	%
Maximum Duty Cycle	D _{max}	-	74	77	80	%
FEEDBACK SECTION						
Feedback Source Current	I _{FB}	Ta=25°C, 0V ≤ V _{fb} ≤ 3V	0.7	0.9	1.1	mA
Shutdown Feedback Voltage	V _{SD}	-	6.9	7.5	8.1	V
Shutdown Delay Current	I _{delay}	Ta=25°C, 5V ≤ V _{fb} ≤ V _{SD}	4.0	5.0	6.0	μA
SOFT START SECTION						
Soft Start Voltage	V _{SS}	V _{FB} = 2V	4.7	5.0	5.3	V
Soft Start Current	I _{SS}	Sync & S/S=GND	0.8	1.0	1.2	mA
REFERENCE SECTION						
Output Voltage ⁽¹⁾	V _{ref}	Ta=25°C	4.80	5.00	5.20	V
Temperature Stability ⁽¹⁾⁽²⁾	V _{ref} /ΔT	-25°C ≤ Ta ≤ +85°C	-	0.3	0.6	mV/°C
CURRENT LIMIT (SELF-PROTECTION) SECTION						
Peak Current Limit	I _{OVER}	Max. inductor current	5.28	6.00	6.72	A
PROTECTION SECTION						
Thermal Shutdown Temperature (T _j) ⁽¹⁾	T _{SD}	-	140	160	-	°C
Over Voltage Protection Voltage	V _{OV}	-	23	25	28	V
TOTAL DEVICE SECTION						
Start-Up Current	I _{START}	V _{CC} =14V	0.1	0.3	0.4	mA
Operating Supply Current (Control Part Only)	I _{OP}	Ta=25°C	6	12	18	mA
V _{CC} Zener Voltage	V _Z	I _{CC} =20mA	30	32.5	35	V

Notes:

1. These parameters, although guaranteed, are not 100% tested in production
2. These parameters, although guaranteed, are tested in EDS (wafer test) process
3. The amplitude of the sync. pulse is recommended to be between 2V and 3V for stable sync. function.

Typical Performance Characteristics

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

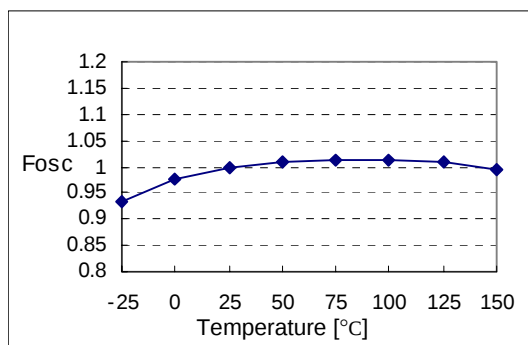


Figure 1. Operating Frequency

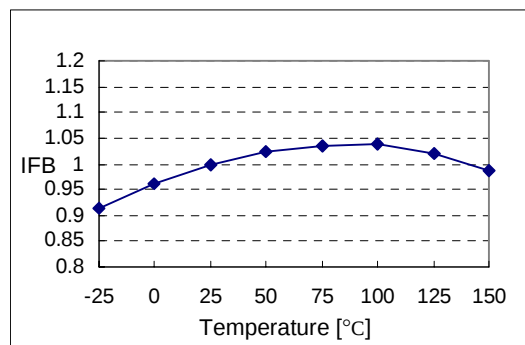


Figure 2. Feedback Source Current

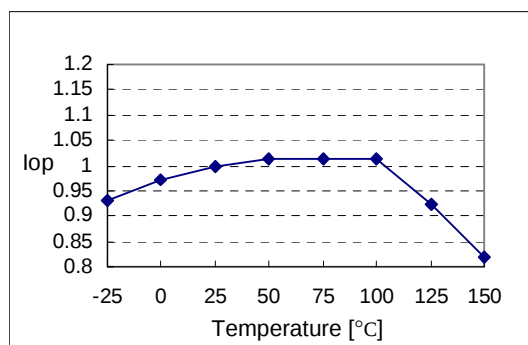


Figure 3. Operating Supply Current

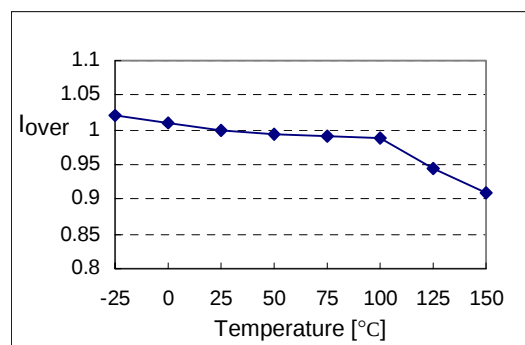


Figure 4. Peak Current Limit

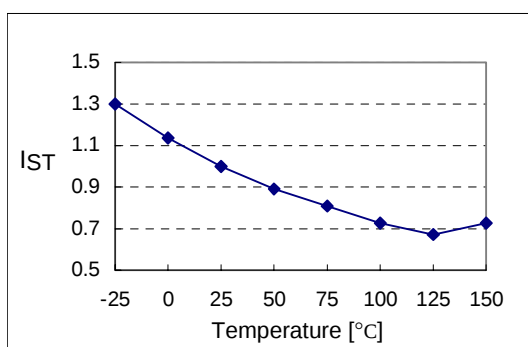


Figure 5. Start up Current

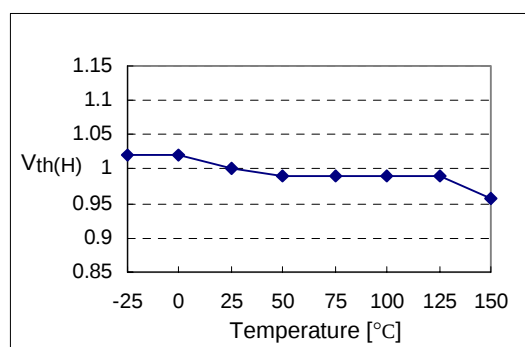


Figure 6. Start Threshold Voltage

Typical Performance Characteristics (Continued)

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

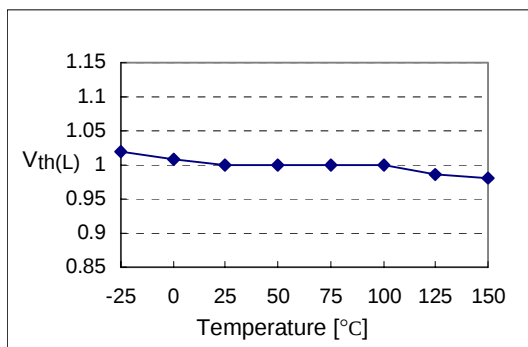


Figure 7. Stop Threshold Voltage

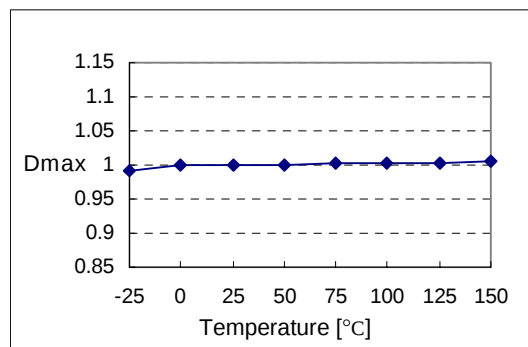


Figure 8. Maximum Duty Cycle

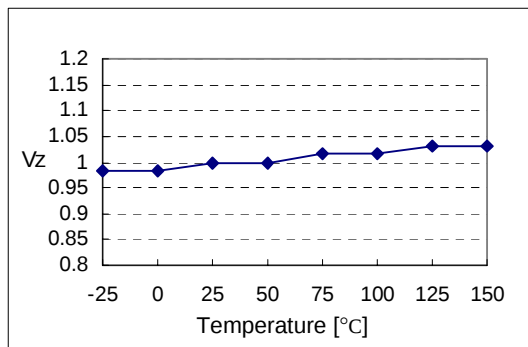


Figure 9. VCC Zener Voltage

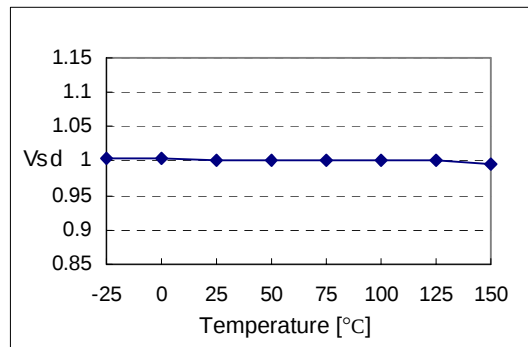


Figure 10. Shutdown Feedback Voltage

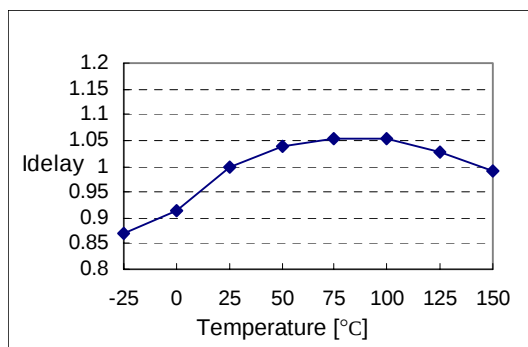


Figure 11. Shutdown Delay Current

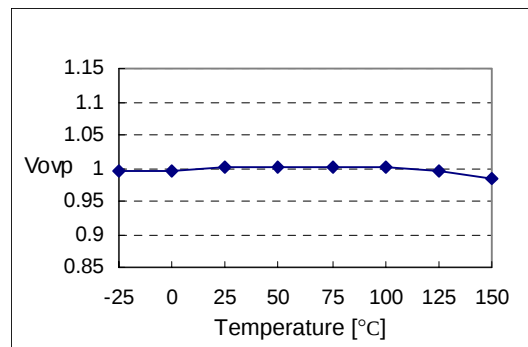


Figure 12. Over Voltage Protection

Typical Performance Characteristics (Continued)

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

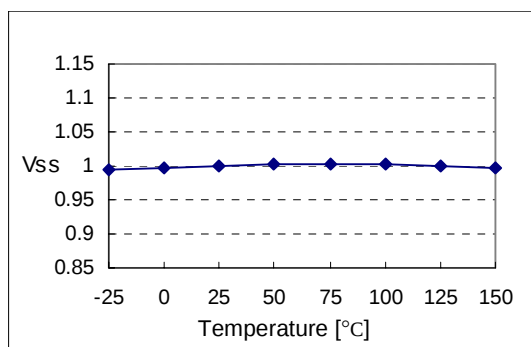


Figure 13. Soft Start Voltage

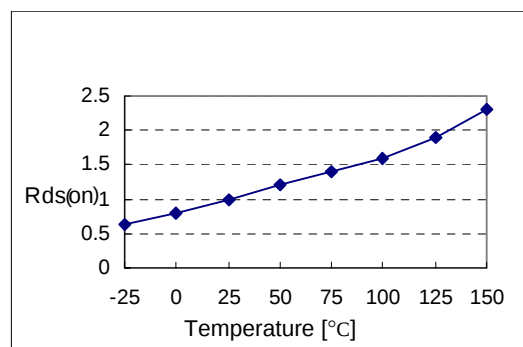


Figure 14. Static Drain Source on Resistance

TO-3P-5L



Ordering Information

Product Number	Package	Rating	Operating Temperature
KA1M0965RTU	TO-3P-5L	650V, 9A	-25°C to +85°C
KA1M0965RYDTU	TO-3P-5L(Forming)		

TU : Non Forming Type

YDTU : Forming Type

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.