

# KA5L0565R

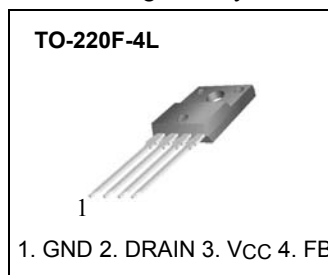
## Fairchild Power Switch(FPS™)

### Features

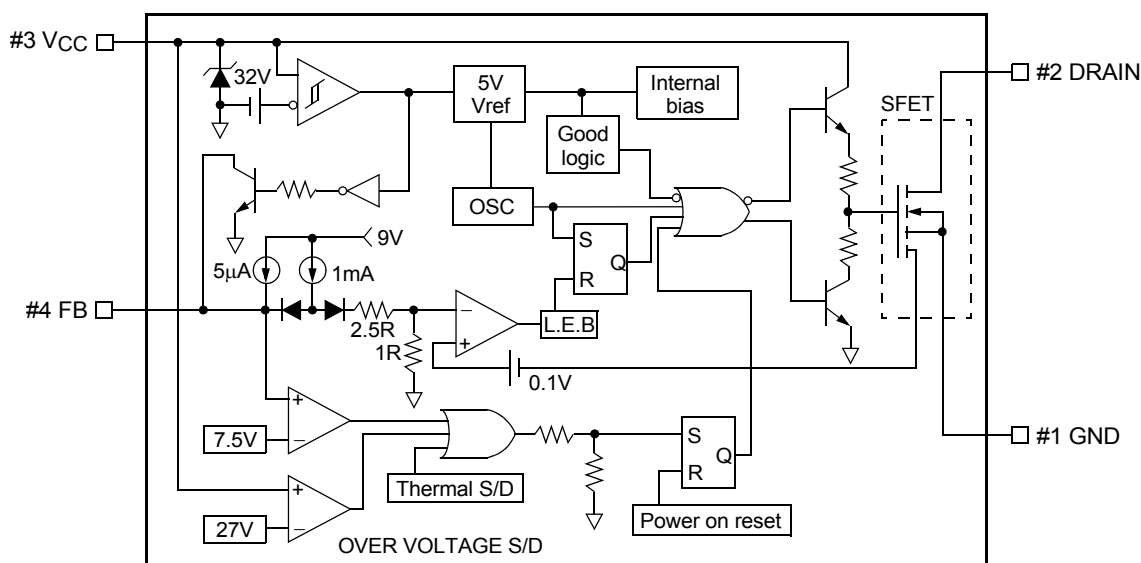
- Precision Fixed Operating Frequency (50kHz)
- Low Start-up Current(Typ. 100uA)
- Pulse by Pulse Current Limiting
- Over Current Protection
- Over Voltage Protection (Min. 25V)
- Internal Thermal Shutdown Function
- Under Voltage Lockout
- Internal High Voltage Sense FET
- Auto-Restart Mode

### 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 current 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 has a basic platform well suited for the cost effective design in a flyback 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	$V_{GS}$	$\pm 30$	V
Drain Current Pulsed <sup>(2)</sup>	$I_{DM}$	20	ADC
Single Pulsed Avalanche Current <sup>(3)</sup> ( Energy <sup>(2)</sup> )	$I_{AS}(EAS)$	13(400)	A(mJ)
Continuous Drain Current ( $T_C=25^\circ C$ )	$I_D$	5.0	ADC
Continuous Drain Current ( $T_C=100^\circ C$ )	$I_D$	3.5	ADC
Maximum Supply Voltage	$V_{CC,MAX}$	30	V
Input Voltage Range	$V_{FB}$	-0.3 to $V_{SD}$	V
Total Power Dissipation	$P_D$	38	W
	Darting	0.3	W/ $^\circ C$
Operating Ambient Temperature	$T_A$	-25 to +85	$^\circ C$
Storage Temperature	$T_{STG}$	-55 to +150	$^\circ C$

### Notes:

- $T_j = 25^\circ C$  to  $150^\circ C$
- Repetitive rating: Pulse width limited by maximum junction temperature
- $L = 30mH$ ,  $V_{DD} = 50V$ ,  $R_G = 27\Omega$ , starting  $T_j = 25^\circ C$

## Electrical Characteristics (SenseFET part)

(Ta=25°C unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BVDSS	VGS=0V, ID=50μA	650	-	-	V
Zero Gate Voltage Drain Current	IDSS	VDS=Max., Rating, VGS=0V	-	-	50	μA
		VDS=0.8Max., Rating, VGS=0V, TC=125°C	-	-	200	μA
Static Drain-Source on Resistance <sup>(Note)</sup>	RDS(ON)	VGS=10V, ID=2.5A	-	1.76	2.2	Ω
Forward Transconductance <sup>(Note)</sup>	gfs	VDS=50V, ID=2.5A	2.5	-	-	S
Input Capacitance	Ciss	VGS=0V, VDS=25V, f=1MHz	-	1457	-	pF
Output Capacitance	Coss		-	130	-	
Reverse Transfer Capacitance	Crss		-	38.8	-	
Turn on Delay Time	td(on)	VDD=0.5BVDSS, ID=5.0A (MOSFET switching time are essentially independent of operating temperature)	-	-	60	nS
Rise Time	tr		-	-	150	
Turn Off Delay Time	td(off)		-	-	300	
Fall Time	tf		-	-	130	
Total Gate Charge (Gate-Source+Gate-Drain)	Qg	VGS=10V, ID=5.0A, VDS=0.5BVDSS (MOSFET switching time are essentially independent of operating temperature)	-	-	56	nC
Gate-Source Charge	Qgs		-	10.3	-	
Gate-Drain (Miller) Charge	Qgd		-	22.3	-	

### 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
<b>UVLO SECTION</b>						
Start Threshold Voltage	V <sub>START</sub>	-	14	15	16	V
Stop Threshold Voltage	V <sub>STOP</sub>	After turn on	8.4	9	9.6	V
<b>OSCILLATOR SECTION</b>						
Initial Accuracy	F <sub>OSC</sub>	<b>KA5L0565R</b>	45	50	55	kHz
Frequency Change With Temperature <sup>(2)</sup>	ΔF/ΔT	-25°C ≤ Ta ≤ +85°C	-	±5	±10	%
Maximum Duty Cycle	D <sub>max</sub>	<b>KA5L0565R</b>	72	77	82	%
<b>FEEDBACK SECTION</b>						
Feedback Source Current	I <sub>FB</sub>	Ta=25°C, 0V ≤ V <sub>fb</sub> ≤ 3V	0.7	0.9	1.1	mA
Shutdown Feedback Voltage	V <sub>SD</sub>	-	6.9	7.5	8.1	V
Shutdown Delay Current	I <sub>delay</sub>	Ta=25°C, 5V ≤ V <sub>fb</sub> ≤ V <sub>SD</sub>	4.0	5.0	6.0	μA
<b>REFERENCE SECTION</b>						
Output Voltage <sup>(1)</sup>	V <sub>ref</sub>	Ta=25°C	4.80	5.00	5.20	V
Temperature Stability <sup>(1)(2)</sup>	V <sub>ref</sub> /ΔT	-25°C ≤ Ta ≤ +85°C	-	0.3	0.6	mV/°C
<b>CURRENT LIMIT (SELF-PROTECTION) SECTION</b>						
Peak Current Limit	I <sub>OVER</sub>	Max. inductor current	1.76	2.00	2.24	A
<b>PROTECTION SECTION</b>						
Thermal Shutdown Temperature (T <sub>j</sub> ) <sup>(1)</sup>	T <sub>SD</sub>	-	140	160	-	°C
Over Voltage Protection Voltage	V <sub>OVP</sub>	-	25	27	29	V
<b>TOTAL DEVICE SECTION</b>						
Start Up Current	I <sub>START</sub>	V <sub>CC</sub> =14V	-	100	170	uA
Operating Supply Current (Control Part Only)	I <sub>OP</sub>	Ta=25°C	-	7	12	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  $T_a=25^\circ\text{C}$ )

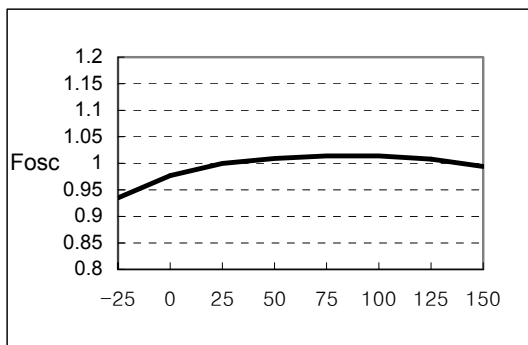


Figure 1. Operating Frequency

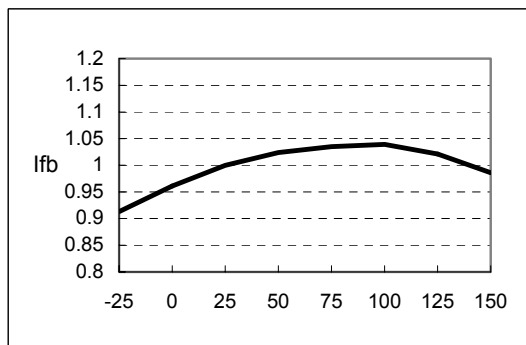


Figure 2. Feedback Source Current

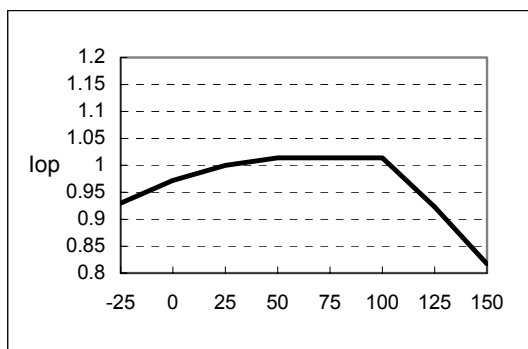


Figure 3. Operating Supply Current

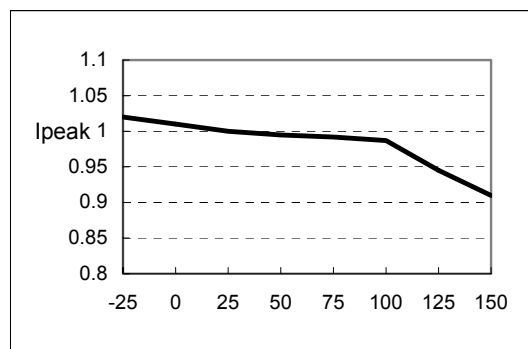


Figure 4. Peak Current Limit

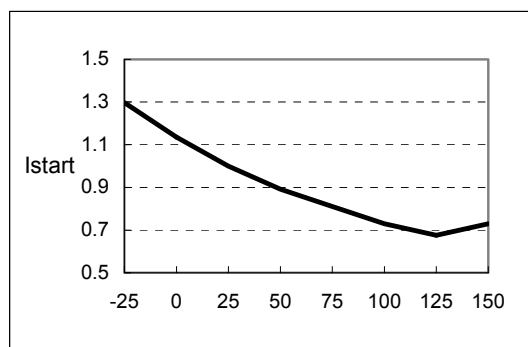


Figure 5. Start up Current

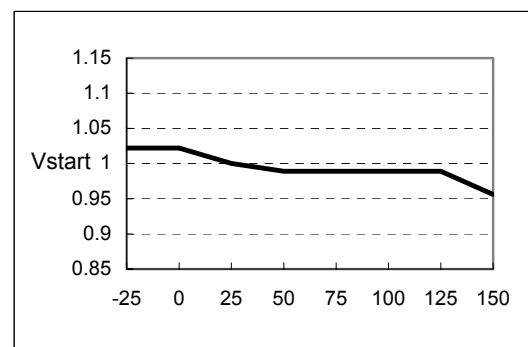


Figure 6. Start Threshold Voltage

## Typical Performance Characteristics (Continued)

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

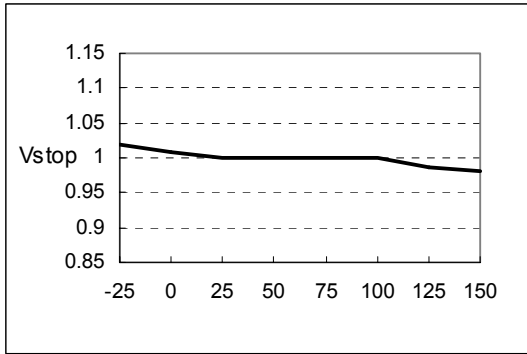


Figure 7. Stop Threshold Voltage

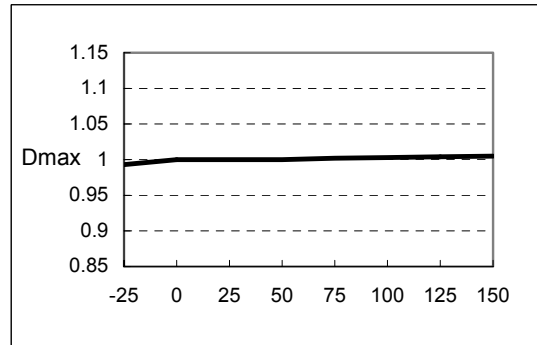


Figure 8. Maximum Duty Cycle

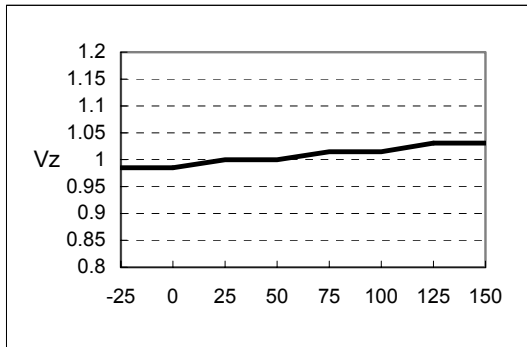


Figure 9. VCC Zener Voltage

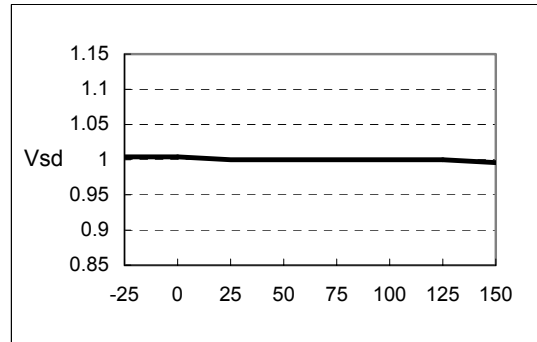


Figure 10. Shutdown Feedback Voltage

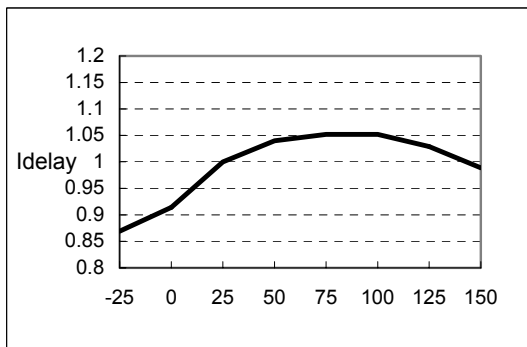


Figure 11. Shutdown Delay Current

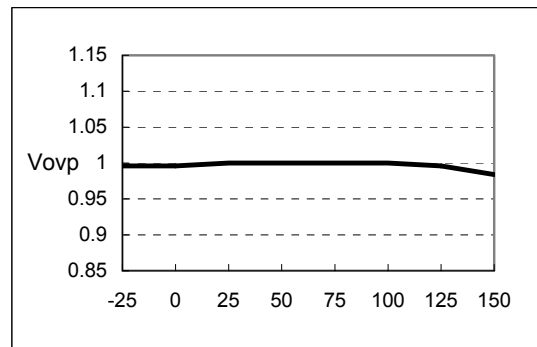
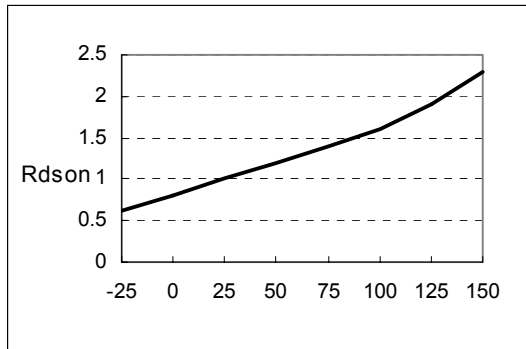


Figure 12. Over Voltage Protection

**Typical Performance Characteristics** (Continued)

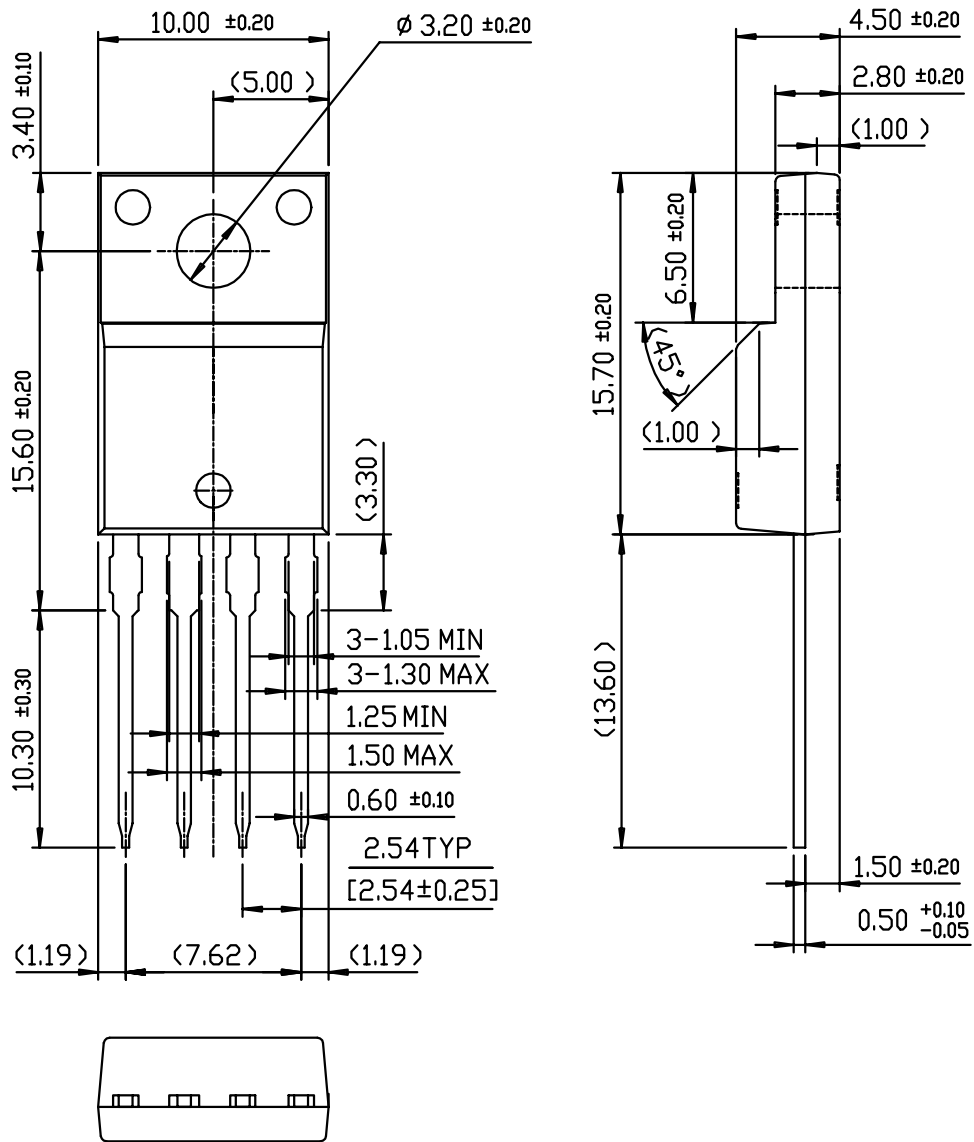
(These characteristic graphs are normalized at  $T_a=25^\circ\text{C}$ )



**Figure 13. Static Drain-Source on Resistance**

Package Dimensions

TO-220F-4L







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## Ordering Information

Product Number	Package	Rating	Fosc
KA5L0565RTU	TO-220F-4L	650V, 5A	50kHz
KA5L0565RYDTU	TO-220F-4L(Forming)		

TU : Non Forming Type

YDTU : Forming Type

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