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# KA5x0165Rxx-SERIES

# KA5H0165R/RN, KA5M0165R/RN, KA5L0165R/RN, KA5H0165RVN

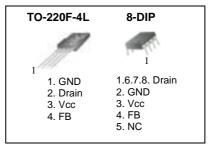
Fairchild Power Switch(FPS)

### **Features**

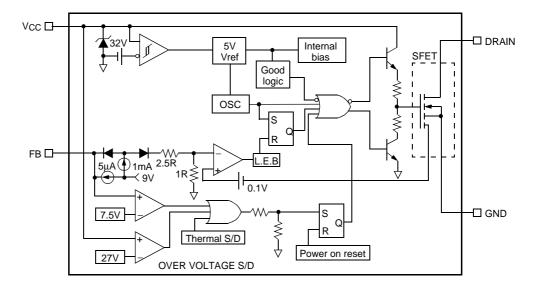
- Precision Fixed Operating Frequency (100/67/50kHz)
- Low Start-up Current (Typ. 100uA)
- Pulse by Pulse Current Limiting
- Over Load Protection
- Over Voltage Protection (Min. 25V)
  - except KA5H0165RVN
- Internal Thermal Shutdown Function
- Under Voltage Lockout
- Internal High Voltage Sense FET
- · 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) consist of high voltage power SenseFET and current mode PWM IC. Included 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, and temperature compensated precision current sources for loop compensation and fault protection circuitry compared to discrete MOSFET and controller or RCC switching converter solution, The Fairchild Power Switch(FPS) can reduce total component count, design size, weight and at the same time increase efficiency, productivity, and system reliability. It is well suited for cost effective design of flyback converters.



## **Internal Block Diagram**



# **Absolute Maximum Ratings**

(Ta=25°C, unless otherwise specified)

Characteristic	Symbol	Value	Unit	
Drain-Gate Voltage (R <sub>GS</sub> =1MΩ)	VDGR	650	V	
Gate-Source (GND) Voltage	VGS	±30	V	
Drain Current Pulsed (1)	IDM	4.0	ADC	
Continuous Drain Current (TC=25°C)	ID	1.0	ADC	
Continuous Drain Current (T <sub>C</sub> =100°C)	ID	0.7	ADC	
Single Pulsed Avalanche Energy (2)	EAS 95		mJ	
Maximum Supply Voltage	VCC,MAX	30	V	
Analog Input Voltage Range	VFB	-0.3 to VSD	V	
Total Power Discipation	PD	40	W	
Total Power Dissipation	Derating	0.32	W/°C	
Operating Junction Temperature.	TJ	+160	°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 (SFET Part)**

(Ta=25°C unless otherwise specified)

Parameter	Symbol	Condition	Min.	Тур.	Max.	Unit
Drain-Source Breakdown Voltage	BVDSS	VGS=0V, ID=50μA	650	-	-	V
	IDSS	VDS=Max. Rating, VGS=0V	-	-	50	μΑ
Zero Gate Voltage Drain Current		V <sub>DS</sub> =0.8Max. Rating, V <sub>GS</sub> =0V, T <sub>C</sub> =125°C	-	-	200	μΑ
Static Drain-Source on Resistance (Note)	RDS(ON)	Vgs=10V, ID=0.5A	-	8	10	Ω
Forward Transconductance (Note)	gfs	VDS=50V, ID=0.5A	0.5	-	-	S
Input Capacitance	Ciss	\\ 0\\ \\ 05\\	-	250	-	
Output Capacitance	Coss	VGS=0V, VDS=25V, f=1MHz	-	25	-	pF
Reverse Transfer Capacitance	Crss	1-111112	-	10	-	
Turn on Delay Time	td(on)	V <sub>DD</sub> =0.5B V <sub>DSS</sub> , I <sub>D</sub> =1.0A	-	12	-	
Rise Time	tr	(MOSFET switching time is	-	4	-	nS
Turn Off Delay Time	td(off)	essentially independent of	-	30	-	113
Fall Time	tf	operating temperature)	-	10	-	
Total Gate Charge (Gate-Source+Gate-Drain)	Qg	V <sub>G</sub> S=10V, I <sub>D</sub> =1.0A, V <sub>D</sub> S=0.5B V <sub>D</sub> SS (MOSFET	-	-	21	
Gate-Source Charge	Qgs	switching time is essentially independent of operating	-	3	-	nC
Gate-Drain (Miller) Charge	Qgd	temperature)	i	9	-	

#### Note:

1. Pulse test: Pulse width  $\leq 300 \mu S,$  duty cycle  $\leq 2\%$ 

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

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

(Ta=25°C unless otherwise specified)

Parameter	Symbol	Condition	Min.	Тур.	Max.	Unit		
UVLO SECTION								
Start Threshold Voltage	VSTART	V <sub>FB</sub> =GND	14	15	16	V		
Stop Threshold Voltage	VSTOP	V <sub>FB</sub> =GND	8.2	8.8	9.4	V		
OSCILLATOR SECTION								
Initial Accuracy	Fosc	KA5H0165Rxx	90	100	110	kHz		
Initial Accuracy	Fosc	KA5M0165Rx	61	67	73	kHz		
Initial Accuracy	Fosc	KA5L0165Rx	45	50	55	kHz		
Frequency Change With Temperature (2)	ΔF/ΔΤ	-25°C ≤ Ta ≤ +85°C	-	±5	±10	%		
Maximum Duty Cycle	Dmax	KA5H0165Rxx	62	67	72	%		
Maximum Duty Cycle	Dmax	KA5M0165Rx KA5L0165Rx	72	77	82	%		
FEEDBACK SECTION								
Feedback Source Current	IFB	Ta=25°C, 0V ≤ Vfb ≤ 3V	0.7	0.9	1.1	mA		
Shutdown Feedback Voltage	VsD	Vfb ≥ 6.5V	6.9	7.5	8.1	V		
Shutdown Delay Current	Idelay	Ta=25°C, 3V ≤ Vfb ≤ V <sub>SD</sub>	4	5	6	μΑ		
REFERENCE SECTION				•	•			
Output Voltage (1)	Vref	Ta=25°C	4.80	5.00	5.20	V		
Temperature Stability (1)(2)	Vref/∆T	-25°C ≤ Ta ≤ +85°C	-	0.3	0.6	mV/°C		
CURRENT LIMIT(SELF-PROTECTION)S	ECTION			•	•			
Peak Current Limit	lover	Max. inductor current	0.53	0.6	0.67	Α		
PROTECTION SECTION								
Thermal Shutdown Temperature (1)	T <sub>SD</sub>	-	140	160	-	°C		
Over Voltage Protection	Vovp	except KA5H0165RVN	25	27	29	V		
TOTAL STANDBY CURRENT SECTION								
Start-up Current	ISTART	V <sub>CC</sub> =14V	-	100	170	μΑ		
Operating Supply Current (Control Part Only)	ЮР	VCC ≤ 28	-	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 Ta=25°C)

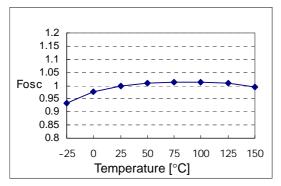


Figure 1. Operating Frequency

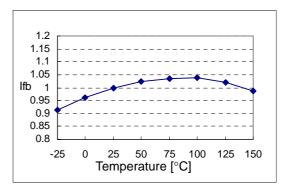


Figure 2. Feedback Source Current

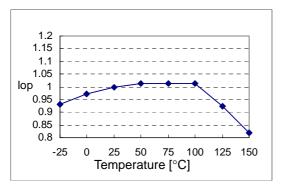


Figure 3. Operating Supply Current

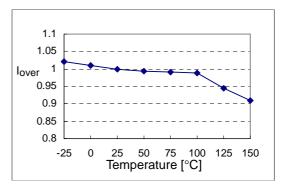


Figure 4. Peak Current Limit

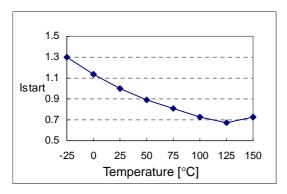


Figure 5. Start up Current

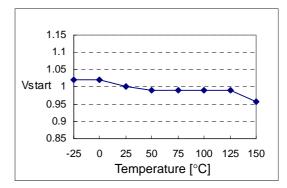


Figure 6. Start Threshold Voltage

## **Typical Performance Characteristics** (Continued)

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

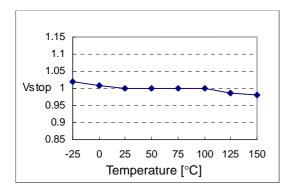


Figure 7. Stop Threshold Voltage

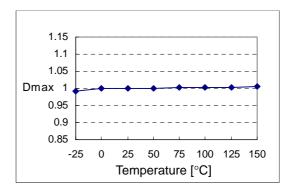


Figure 8. Maximum Duty Cycle

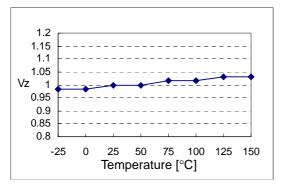


Figure 9. VCC Zener Voltage

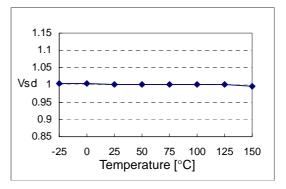


Figure 10. Shutdown Feedback Voltage

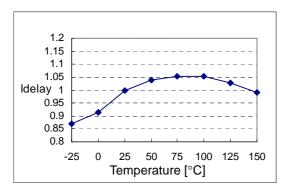


Figure 11. Shutdown Delay Current

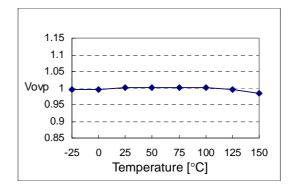


Figure 12. Over Voltage Protection

# **Typical Performance Characteristics** (Continued)

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

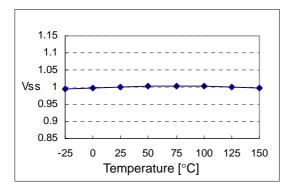


Figure 13. Soft Start Voltage

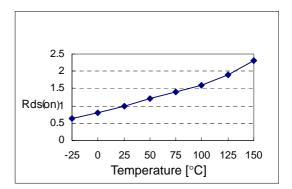
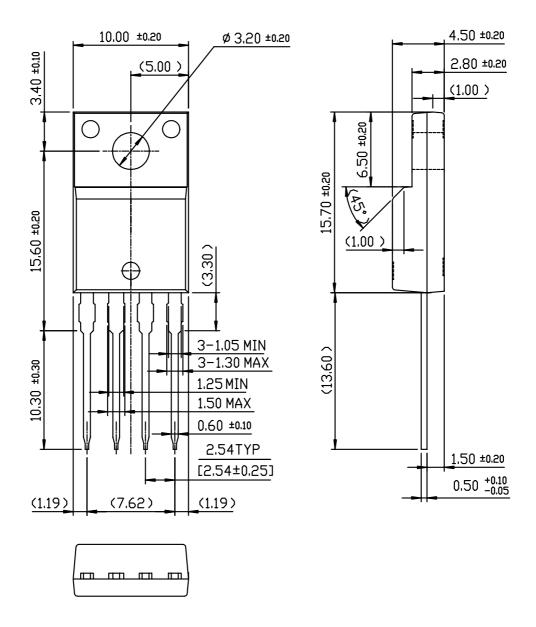


Figure 14. Static Drain-Source on Resistance

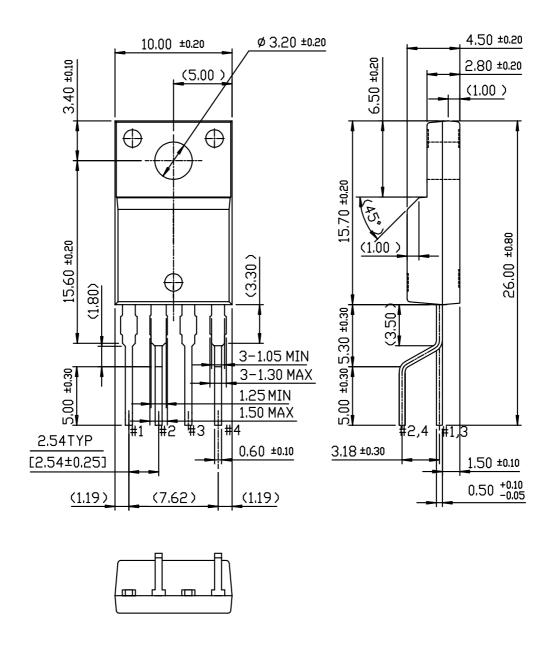
## **Package Dimensions**

TO-220F-4L



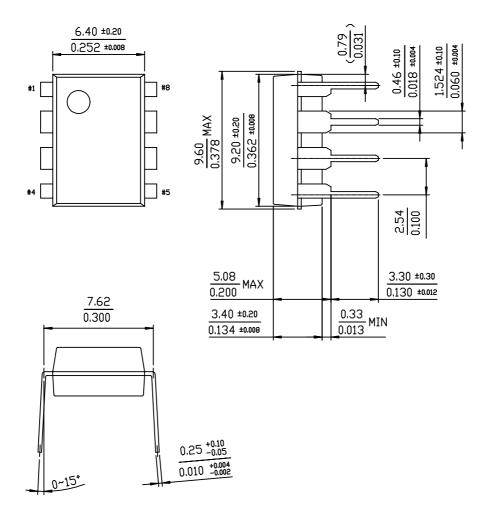
## Package Dimensions (Continued)

# TO-220F-4L(Forming)



## Package Dimensions (Continued)

8-DIP



# **Ordering Information**

Product Number	Package	Marking Code	BVDSS	Fosc	RDS(on)
KA5H0165RTU	TO-220F-4L	5H0165R	650V	100kHz	8Ω
KA5H0165RYDTU	TO-220F-4L(Forming)	3H0103K			052
KA5M0165RTU	TO-220F-4L	5M0165P	M0165R 650V	67kHz	8Ω
KA5M0165RYDTU	TO-220F-4L(Forming)	3101010310			052
KA5L0165RTU	TO-220F-4L	51.0165P	5L0165R 650V	50kHz	8Ω
KA5L0165RYDTU	TO-220F-4L(Forming)	3L0103K			052
KA5H0165RN	8-DIP	5H0165R	650V	100kHz	8Ω
KA5M0165RN	8-DIP	5M0165R	650V	67kHz	8Ω
KA5L0165RN	8-DIP	5L0165R	650V	50kHz	8Ω

Product Number	Package	Marking Code	BVDSS	Fosc	RDS(on)
KA5H0165RVN	8-DIP	5H0165RV	650V	100kHz	8Ω

TU: Non Forming Type YDTU: Forming Type

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Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: ocean@oceanchips.ru

Web: http://oceanchips.ru/

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А