

# KA2S0965/KA2S09655

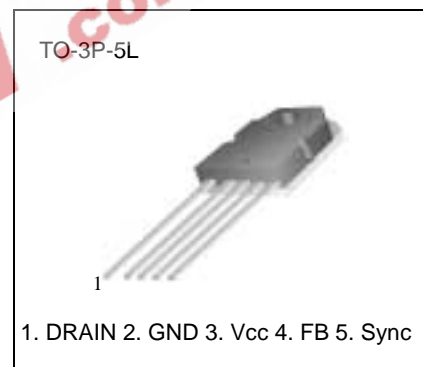
## Fairchild Power Switch(SPS)

### Features

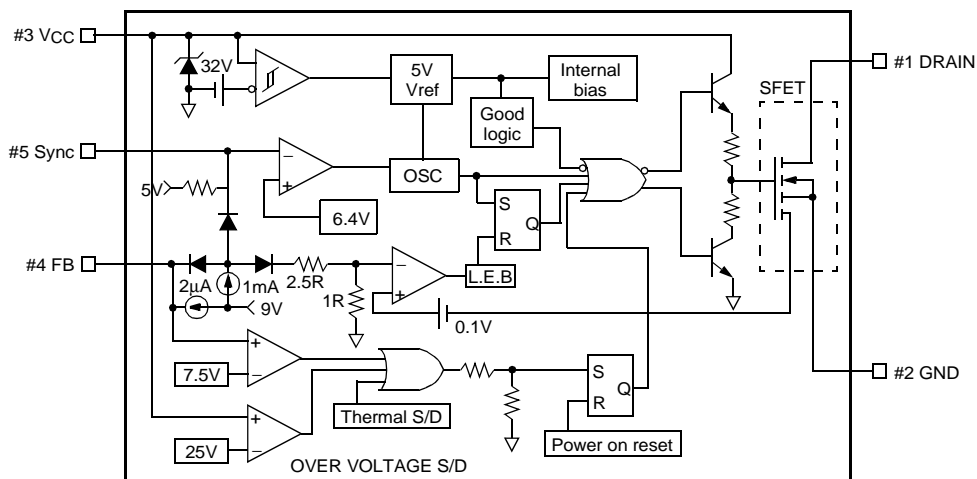
- Wide operating frequency range up to (150kHz)
- Pulse by pulse over current limiting
- Over load protection
- Over voltage protection (Min. 23V)
- Internal thermal shutdown function
- Under voltage lockout
- Internal high voltage sense FET
- External sync terminal
- Latch up Mode

### Description

The SPS product family is specially designed for an offline SMPS with minimal external components. The SPS consist of high voltage power SenseFET and current mode PWM Controller IC. control IC features a trimmed 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 SPS 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 Monitor power supply.



### Internal Block Diagram



## Absolute Maximum Ratings

Characteristic	Symbol	Value	Unit
Drain-source (GND) voltage <sup>(1)</sup>	V <sub>DSS</sub>	650	V
Drain-Gate voltage (R <sub>GS</sub> =1MΩ)	V <sub>DGR</sub>	650	V
Gate-source (GND) voltage	V <sub>GS</sub>	±30	V
Drain current pulsed <sup>(2)</sup>	I <sub>DM</sub>	36.0	ADC
Single pulsed avalanche energy <sup>(3)</sup>	E <sub>AS</sub>	950	mJ
Continuous drain current (T <sub>C</sub> =25°C)	I <sub>D</sub>	9.0	ADC
Continuous drain current (T <sub>C</sub> =100°C)	I <sub>D</sub>	5.8	ADC
Supply voltage	V <sub>CC</sub>	30	V
Analog input voltage range	V <sub>FB</sub>	-0.3 to V <sub>SD</sub>	V
Total power dissipation	P <sub>D</sub>	170	W
	Derating	1.33	W/°C
Operating temperature	T <sub>OPR</sub>	-25 to +85	°C
Storage temperature	T <sub>STG</sub>	-55 to +150	°C

### Notes:

1. T<sub>j</sub>=25°C to 150°C

2. Repetitive rating: Pulse width limited by maximum junction temperature

3. L=20mH, V<sub>DD</sub>=50V, R<sub>G</sub>=27Ω, starting T<sub>j</sub>=25 °C

## Electrical Characteristics (SFET part)

(Ta = 25°C unless otherwise specified)

Characteristic	Symbol	Test 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=4.5A	–	0.96	1.2	Ω
Forward transconductance <sup>(note)</sup>	gfs	VDS=50V, ID=4.5A	5.0	–	–	S
Input capacitance	Ciss	VGS=0V, VDS=25V, f=1MHz	–	1750	–	pF
Output capacitance	Coss		–	190	–	
Reverse transfer capacitance	Crss		–	78	–	
Turn on delay time	td(on)	VDD=0.5BVDSS, ID=9.0A (MOSFET switching time are essentially independent of operating temperature)	–	20	50	nS
Rise time	tr		–	23	55	
Turn off delay time	td(off)		–	85	180	
Fall time	tf		–	30	70	
Total gate charge (gate-source+gate-drain)	Qg	VGS=10V, ID=9.0A, VDS=0.5BVDSS (MOSFET switching time are essentially independent of operating temperature)	–	74	95	nC
Gate-source charge	Qgs		–	12	–	
Gate-drain (Miller) charge	Qgd		–	35.4	–	

**Note:**

Pulse test: Pulse width ≤ 300μS, duty cycle ≤ 2%

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

## Electrical Characteristics (CONTROL part)

(Ta = 25°C unless otherwise specified)

Characteristic	Symbol	Test condition	Min.	Typ.	Max.	Unit
<b>REFERENCE SECTION</b>						
Output voltage <sup>(1)</sup>	Vref	Ta=25°C	4.80	5.00	5.20	V
Temperature Stability <sup>(1)(2)</sup>	Vref/ΔT	-25°C≤Ta≤+85°C	-	0.3	0.6	mV/°C
<b>OSCILLATOR SECTION</b>						
Initial accuracy	FOSC	Ta=25°C	18	20	22	kHz
Frequency change with temperature <sup>(2)</sup>	ΔF/ΔT	-25°C≤Ta≤+85°C	-	±5	±10	%
Sync threshold voltage <sup>(3)</sup>	VSYTH	Vfb=5V	6.0	6.4	6.8	V
<b>PWM SECTION</b>						
Maximum duty cycle	Dmax	-	92	95	98	%
<b>FEEDBACK SECTION</b>						
Feedback source current	IFB	Ta=25°C, Vfb=GND	0.8	1	1.2	mA
Shutdown delay current	Idelay	Ta=25°C, 5V≤Vfb≤VSD	1.4	1.8	2.2	μA
<b>OVER CURRENT PROTECTION SECTION</b>						
Over current protection	IL(max)	KA2S0965	5.28	6.00	6.72	A
		KA2S09655	4.40	5.00	5.60	
<b>UVLO SECTION</b>						
Start threshold voltage	Vth(H)	-	14	15	16	V
Minimum operating voltage	Vth(L)	After turn on	9	10	11	V
<b>TOTAL STANDBY CURRENT SECTION</b>						
Start current	IST	VCC=14V	0.1	0.3	0.55	mA
Operating supply current (control part only)	IOPR	Ta=25°C	6	12	18	mA
VCC zener voltage	VZ	ICC=20mA	30	32.5	35	V
<b>SHUTDOWN SECTION</b>						
Shutdown Feedback voltage	VSD	-	6.9	7.5	8.1	V
Thermal shutdown temperature (Tj) <sup>(1)</sup>	TSD	-	140	160	-	°C
<b>SOFT START SECTION</b>						
Soft start current	ISS	Sync & S/S=GND	0.8	-	-	mA
Soft start voltage	VSS	VFB=2V	4.7	5.0	5.3	V

### NOTE:

1. These parameters, although guaranteed, are not 100% tested in production
2. These parameters, although guaranteed, are tested in EDS(water 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  $T_a = 25^\circ\text{C}$ )

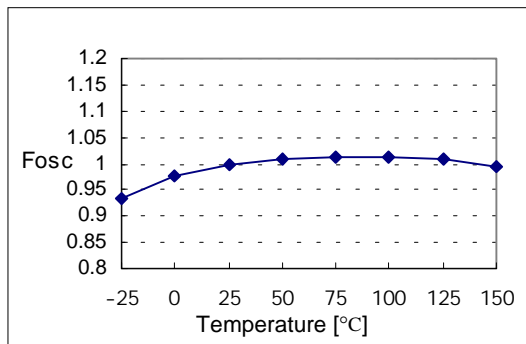


Figure 1. Operating Frequency

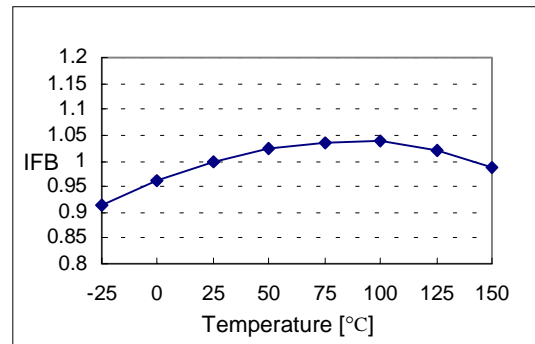


Figure 2. Feedback Source Current

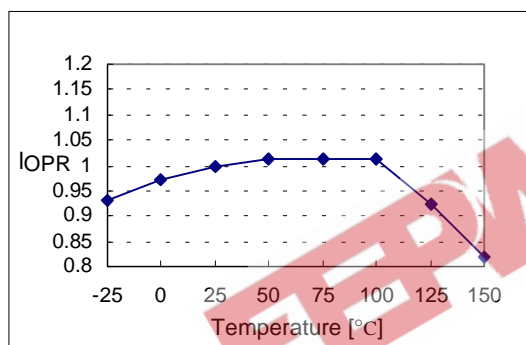


Figure 3. Operating Current

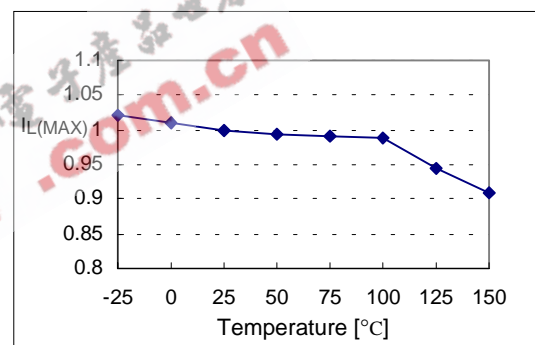


Figure 4. Max. Inductor Current

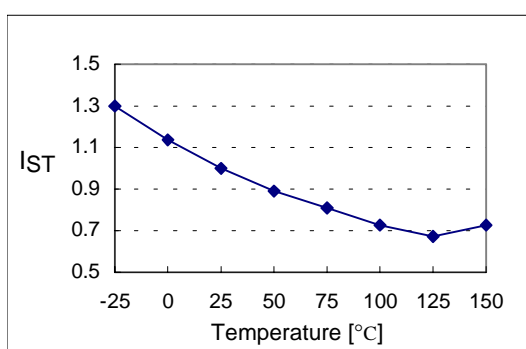


Figure 5. Start up Current

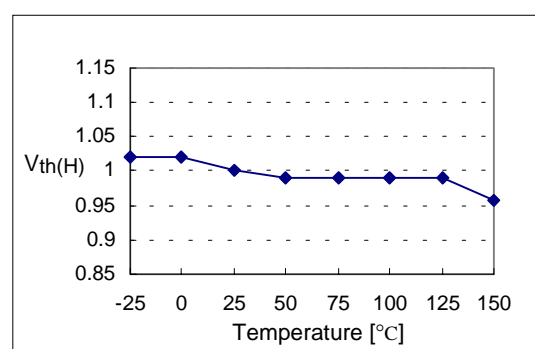
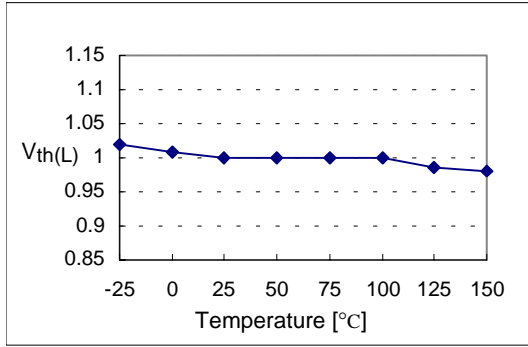


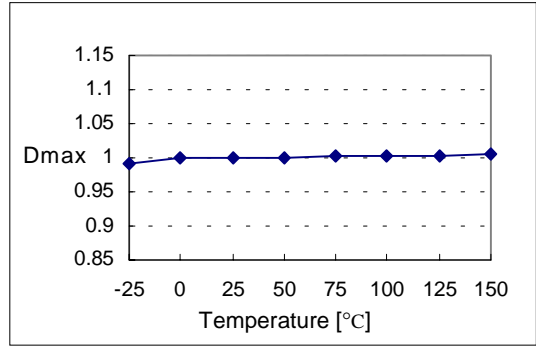
Figure 6. Start Threshold Voltage

**Typical Performance Characteristics** (Continued)

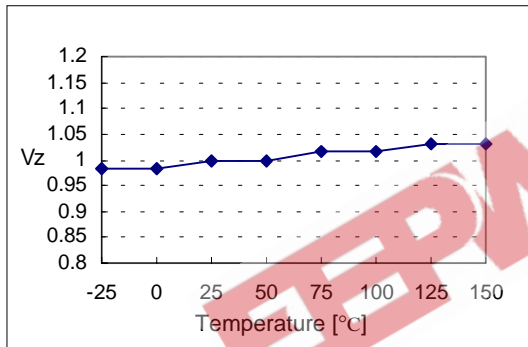
(These characteristic graphs are normalized at  $T_a = 25^\circ\text{C}$ )



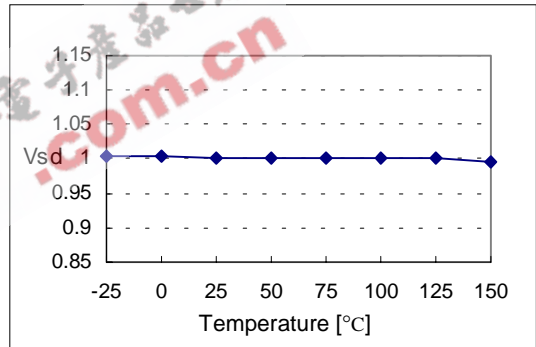
**Figure 7. Stop Threshold Voltage**



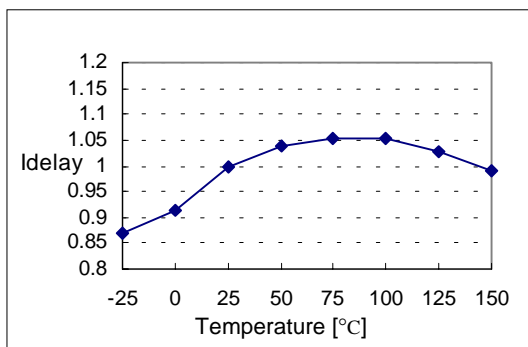
**Figure 8. Maximum Duty Cycle**



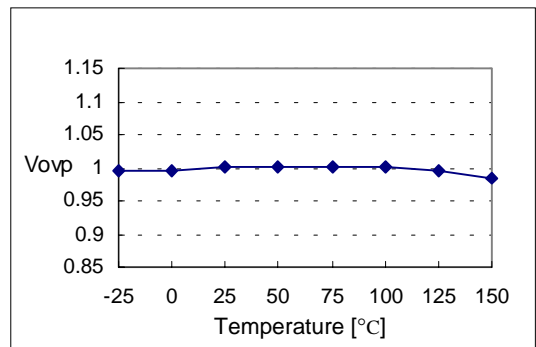
**Figure 9. V<sub>CC</sub> Zener Voltage**



**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  $T_a = 25^\circ\text{C}$ )

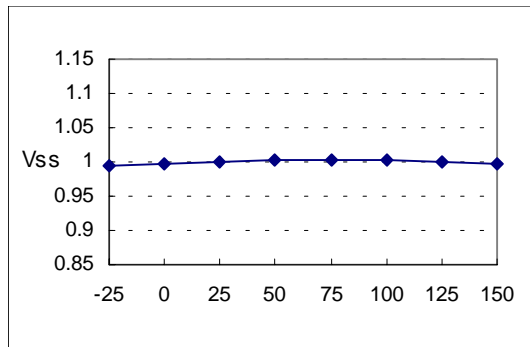


Figure 13. Soft Start Voltage

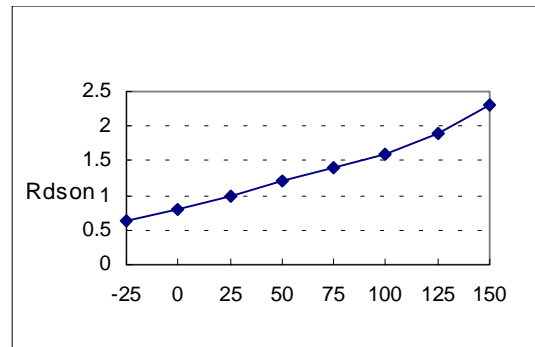
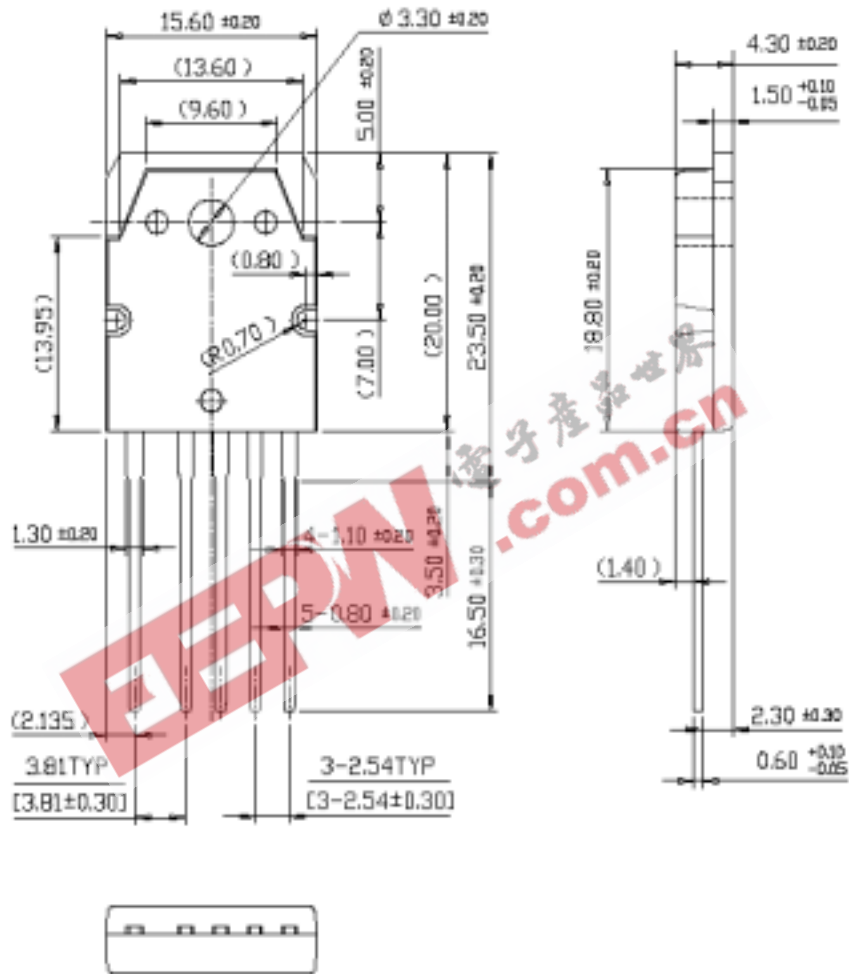


Figure 14. Drain Source Turn-on Resistance

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Package Dimensions

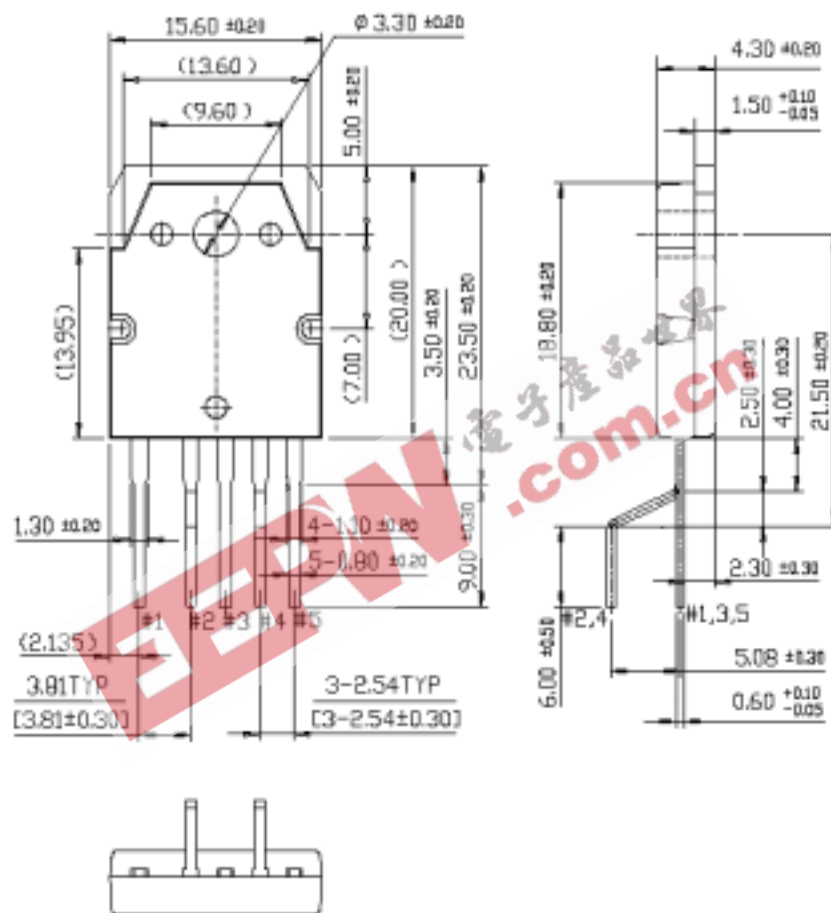
TO-3P-5L





## Package Dimensions (Continued)

### TO-3P-5L (Forming)



**Ordering Information**

Product Number	Package	Rating	Over current protection
KA2S0965-TU	TO-3P-5L	650V, 9A	6A
KA2S0965-YDTU	TO-3P-5L(Forming)		
KA2S09655-TU	TO-3P-5L	650V, 9A	5A
KA2S09655-YDTU	TO-3P-5L(Forming)		

TU : Non Forming Type

YDTU : Forming Type

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