

# KA2S0680B

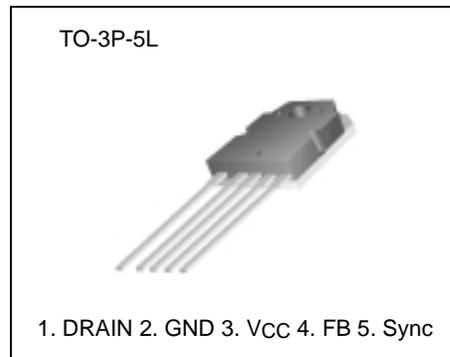
## Fairchild Power Switch(SPS)

### Features

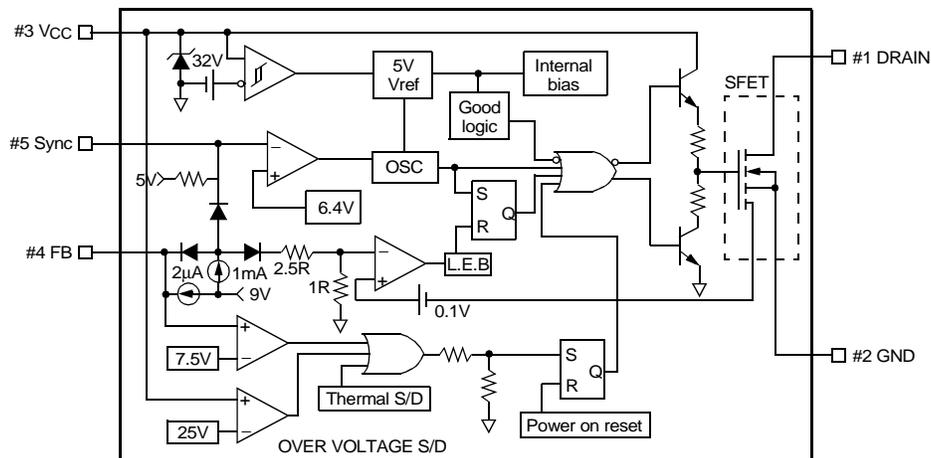
- Wide operating frequency range up to 150KHz
- Pulse by pulse over current limiting
- Over load protection
- Over voltage protection (Min. 23V)
- Internal thermal shutdown function
- Under voltage lockout
- Internal high voltage sense FET
- External sync terminal
- Latch up Mode

### Description

The SPS product family is specially designed for an off-line SMPS with minimal external components. The SPS consist of high voltage power SenseFET and current mode PWM Controller IC. PWM controller features integrated fixed oscillator, under voltage lockout, 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 design in monitor power supply.



### Internal Block Diagram



## Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Maximum Drain voltage <sup>(1)</sup>	V <sub>D,MAX</sub>	800	V
Drain-Gate voltage (R <sub>GS</sub> =1MΩ)	V <sub>DGR</sub>	800	V
Gate-source (GND) voltage	V <sub>GS</sub>	±30	V
Drain current pulsed <sup>(2)</sup>	I <sub>DM</sub>	24.0	ADC
Single pulsed avalanche energy <sup>(3)</sup>	E <sub>AS</sub>	455	mJ
Avalanche current <sup>(4)</sup>	I <sub>AS</sub>	20	A
Continuous drain current (T <sub>C</sub> =25°C)	I <sub>D</sub>	6.0	ADC
Continuous drain current (T <sub>C</sub> =100°C)	I <sub>D</sub>	4.0	ADC
Maximum Supply voltage	V <sub>CC,MAX</sub>	30	V
Input voltage range	V <sub>FB</sub>	-0.3 to V <sub>SD</sub>	V
Total power dissipation	P <sub>D</sub>	150	W
	Derating	1.21	W/°C
Operating ambient temperature	T <sub>A</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=24mH, V<sub>DD</sub>=50V, R<sub>G</sub>=25Ω, starting T<sub>j</sub>=25°C
4. L=13μH, starting T<sub>j</sub>=25°C

## Electrical Characteristics (SFET part)

(Ta=25°C unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-source breakdown voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =50μA	800	-	-	V
Zero gate voltage drain current	I <sub>DSS</sub>	V <sub>DS</sub> =Max., Rating, V <sub>GS</sub> =0V	-	-	50	μA
		V <sub>DS</sub> =0.8Max., Rating, V <sub>GS</sub> =0V, T <sub>C</sub> =125°C	-	-	200	μA
Static drain-source on resistance <sup>(note)</sup>	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =4.0A	-	1.6	2.0	Ω
Forward transconductance <sup>(note)</sup>	g <sub>fs</sub>	V <sub>DS</sub> =15V, I <sub>D</sub> =4.0A	1.5	2.5	-	S
Input capacitance	C <sub>iss</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1MHz	-	1600	-	pF
Output capacitance	C <sub>oss</sub>		-	140	-	
Reverse transfer capacitance	C <sub>rss</sub>		-	42	-	
Turn on delay time	t <sub>d(on)</sub>	V <sub>DD</sub> =0.5BV <sub>DSS</sub> , I <sub>D</sub> =6.0A (MOSFET switching time are essentially independent of operating temperature)	-	60	-	nS
Rise time	t <sub>r</sub>		-	150	-	
Turn off delay time	t <sub>d(off)</sub>		-	300	-	
Fall time	t <sub>f</sub>		-	130	-	
Total gate charge (gate-source+gate-drain)	Q <sub>g</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =6.0A, V <sub>DS</sub> =0.5BV <sub>DSS</sub> (MOSFET switching time are essentially independent of operating temperature)	-	70	-	nC
Gate-source charge	Q <sub>gs</sub>		-	16	-	
Gate-drain (Miller) charge	Q <sub>gd</sub>		-	27	-	

### Note:

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

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

## Electrical Characteristics (CONTROL part)

(Ta=25°C unless otherwise specified)

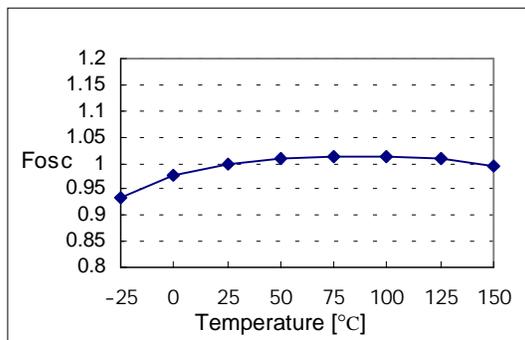
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
<b>UVLO SECTION</b>						
Start threshold voltage	VSTART	-	14	15	16	V
Stop threshold voltage	VSTOP	After turn on	9	10	11	V
<b>OSCILLATOR SECTION</b>						
Initial accuracy	FOSC	Ta=25°C	18	20	22	kHz
Frequency change with temperature <sup>(2)</sup>	$\Delta F/\Delta T$	-25°C≤Ta≤+85°C	-	±5	±10	%
Maximum duty cycle	Dmax	-	92	95	98	%
<b>FEEDBACK SECTION</b>						
Feedback source current	IFB	Ta=25°C, Vfb=GND	0.7	0.9	1.1	mA
Shutdown Feedback voltage	VSD	-	6.9	7.5	8.1	V
Shutdown delay current	Idelay	Ta=25°C, 5V≤Vfb≤VSD	1.4	1.8	2.2	μA
<b>SYNC. &amp; SOFT START SECTION</b>						
Soft start voltage	VSS	VFB=2V	4.7	5.0	5.3	V
Soft start current	ISS	Sync & S/S=GND	0.8	1.0	1.2	mA
Sync threshold voltage <sup>(3)</sup>	VSYTH	Vfb=5V	6.0	6.4	6.8	V
<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>CURRENT LIMIT (SELF-PROTECTION) SECTION</b>						
Peak Current Limit	I <sub>OVER</sub>	Max. inductor current	3.52	4.00	4.48	A
<b>PROTECTION SECTION</b>						
Thermal shutdown temperature (Tj) <sup>(1)</sup>	TSD	-	140	160	-	°C
Over voltage protection voltage	VOVP	-	23	25	28	V
<b>TOTAL DEVICE SECTION</b>						
Start Up current	I <sub>START</sub>	VCC=14V	0.1	0.3	0.55	mA
Operating supply current (control part only)	I <sub>OP</sub>	Ta=25°C	6	12	18	mA
VCC zener voltage	VZ	ICC=20mA	30	32.5	35	V

### Notes:

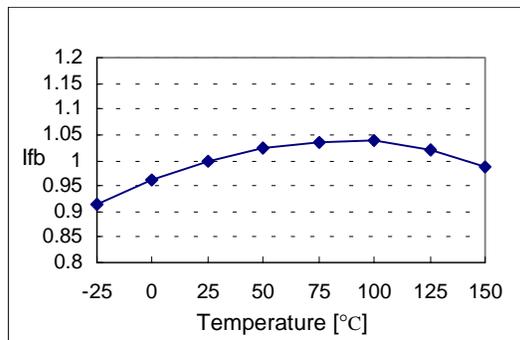
1. These parameters, although guaranteed, are not 100% tested in production
2. These parameters, although guaranteed, are tested in EDS (wafer test) process
3. The amplitude of the sync. pulse is recommended to be between 2V and 3V for stable sync. function.

## Typical Performance Characteristics

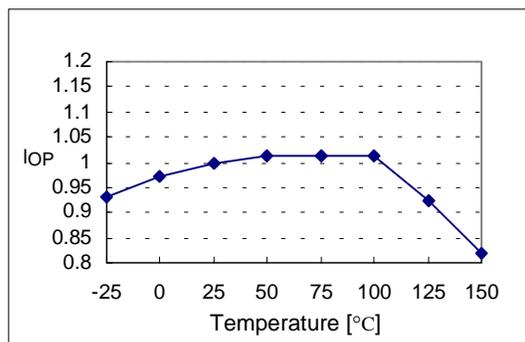
(These characteristic graphs are normalized at  $T_a=25^\circ\text{C}$ )



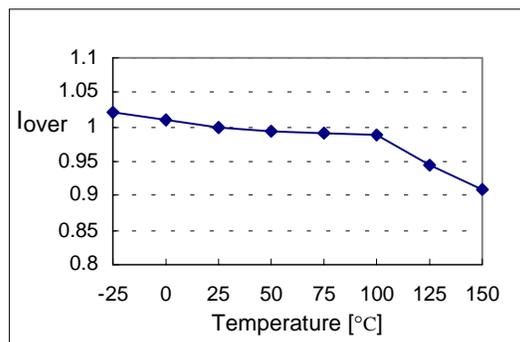
**Figure 1. Operating Frequency**



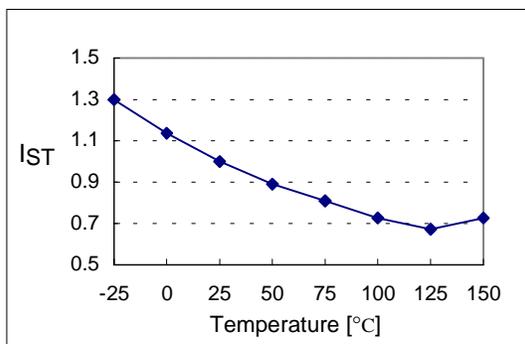
**Figure 2. Feedback Source Current**



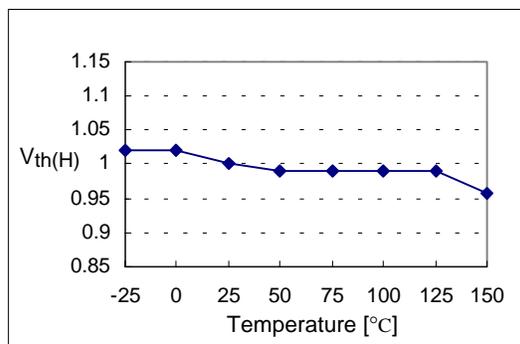
**Figure 3. Operating Supply Current**



**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 Ta=25°C)

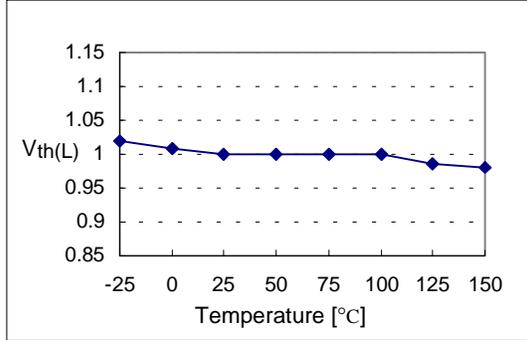


Figure 7. Stop Threshold Voltage

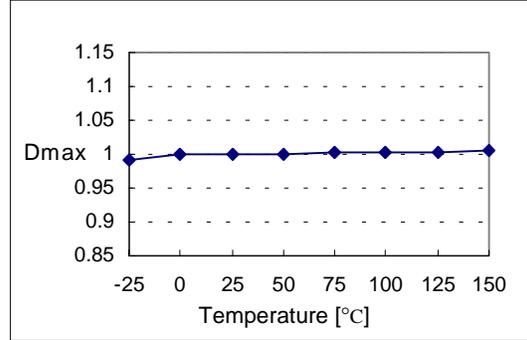


Figure 8. Maximum Duty Cycle

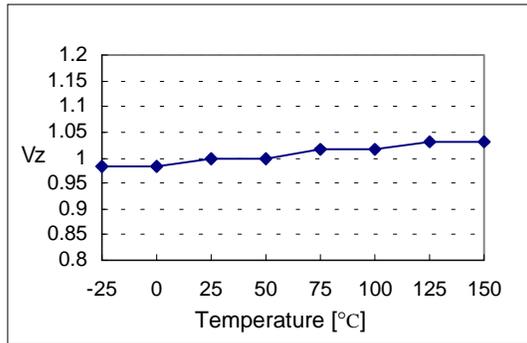


Figure 9. VCC Zener Voltage

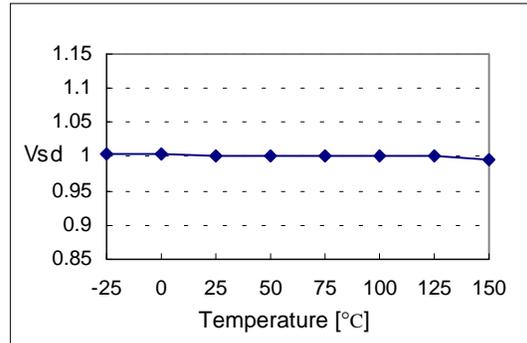


Figure 10. Shutdown Feedback Voltage

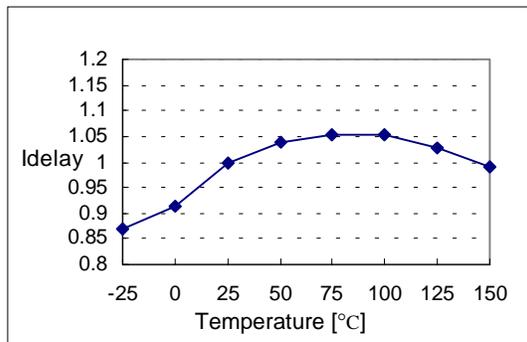


Figure 11. Shutdown Delay Current

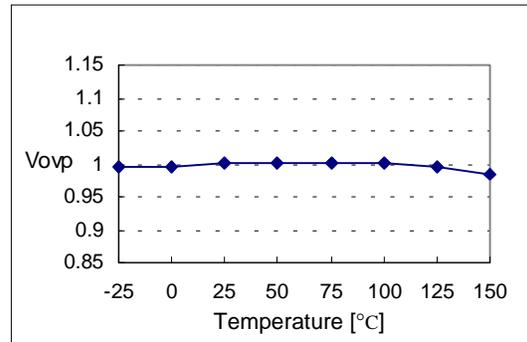


Figure 12. Over Voltage Protection

## Typical Performance Characteristics (Continued)

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

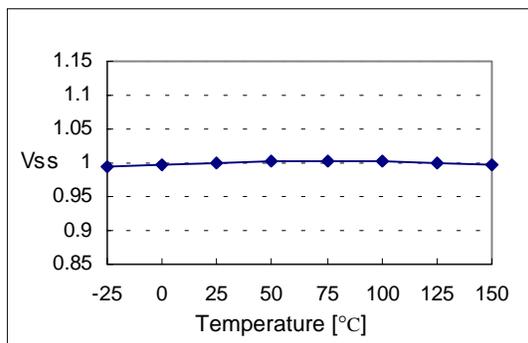


Figure 13. Soft Start Voltage

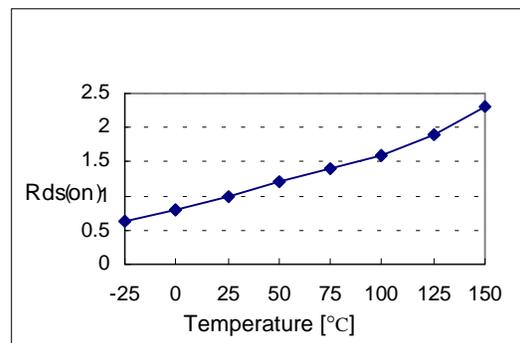
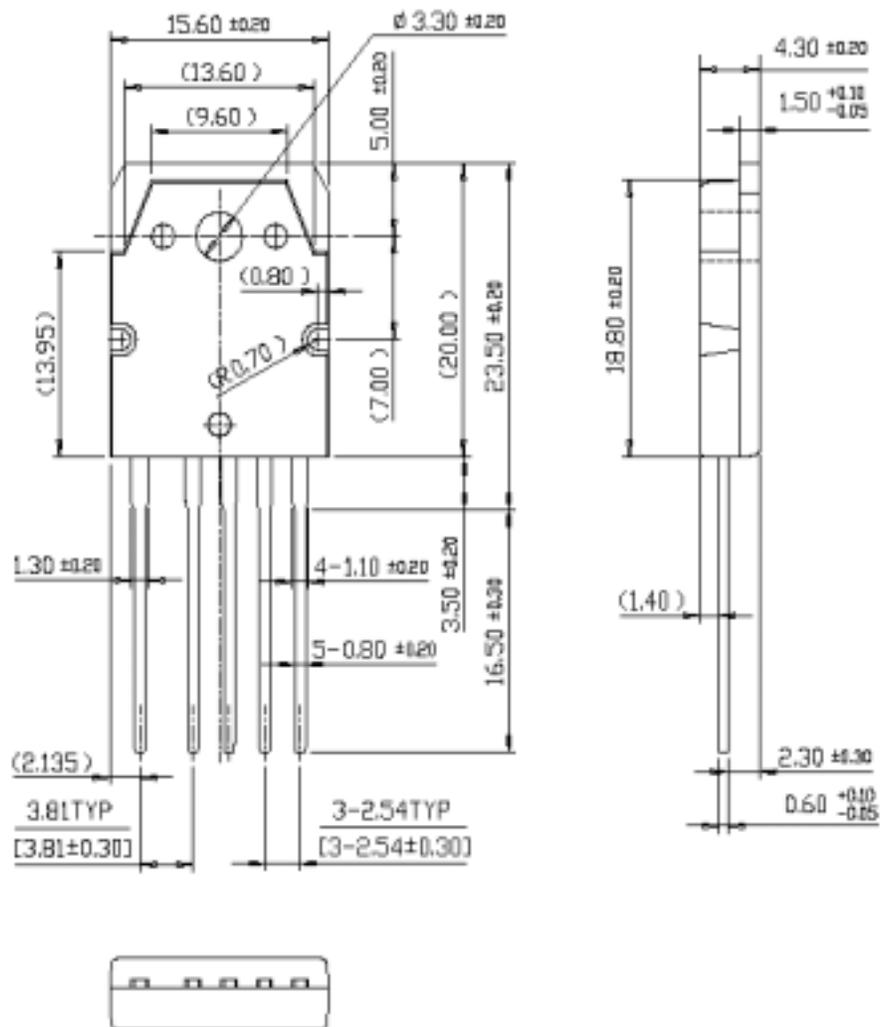


Figure 14. Static Drain-Source on Resistance

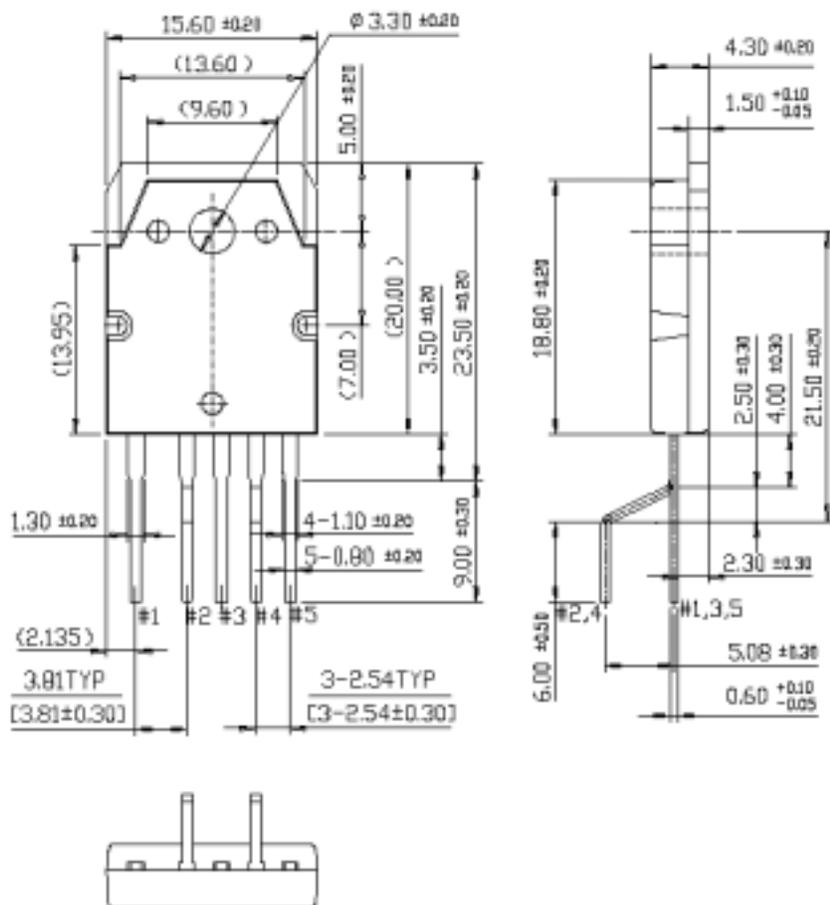
## Package Dimensions

## TO-3P-5L



## Package Dimensions (Continued)

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



**Ordering Information**

<b>Product Number</b>	<b>Package</b>	<b>Rating</b>	<b>Operating Temperature</b>
KA2S0680B-TU	TO-3P-5L	800V,6A	-25°C to +85°C
KA2S0680B-YDTU	TO-3P-5L(Forming)		

TU : Non Forming Type

YDTU : Forming Type



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