

# KA5P0680C

## Fairchild Power Switch(FPS)

### Features

- Adjustable Switching Frequency
- Intelligent Power Saving Mode
- Pulse by Pulse Current Limiting
- Over Current Latch Protection
- Over Voltage Protection
- Internal Thermal Shutdown Function
- Built-in Soft Start Function
- Internal High Voltage Sense FET
- Auto-Restart Mode

### Description

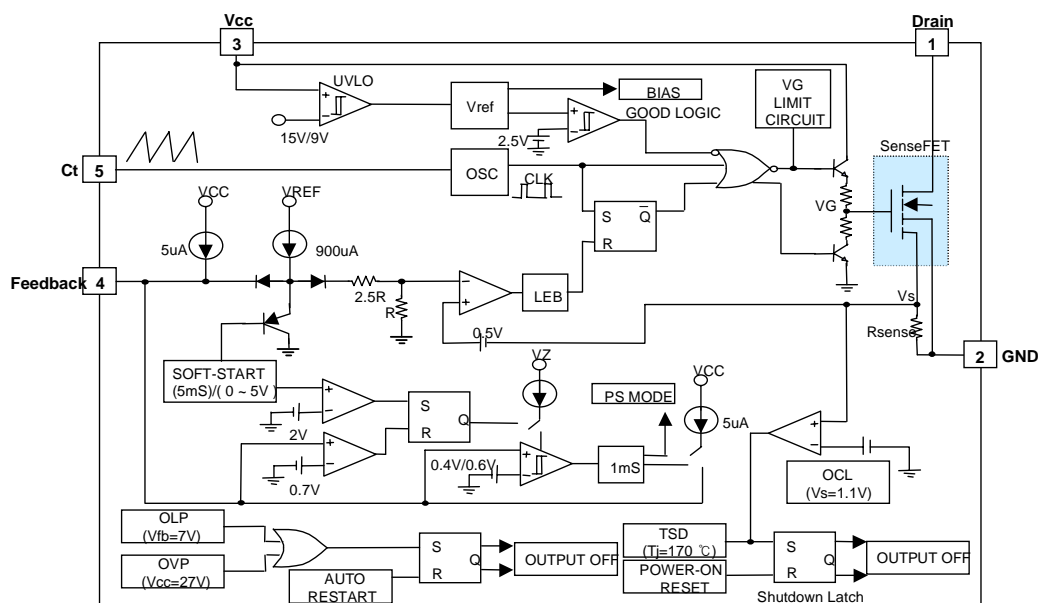
The Fairchild Power Switch(FPS) product family is specially designed for an off-line SMPS with minimal external components. The Fairchild Power Switch(FPS) consist of high voltage power SenseFET and current mode PWM IC. Included PWM controller features integrated fixed oscillator, under voltage lock 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, a Fairchild Power Switch(FPS) can reduce 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 cost effective design in PC SMPS with Power Saving function.

TO-220-5L



1. Drain 2. GND 3. VCC 4. FB 5. CT

### Internal Block Diagram



Rev.1.0.3

## Absolute Maximum Ratings

(Ta=25°C, unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-Gate Voltage (RGS=1MΩ)	VDGR	800	V
Gate-Source (GND) Voltage	VGS	±30	V
Drain Current Pulsed <sup>(2)</sup>	IDM	24.0	ADC
Single Pulsed Avalanche Energy <sup>(3)</sup>	EAS	455	mJ
Avalanche Current <sup>(4)</sup>	IAS	27	A
Continuous Drain Current (TC=25°C)	ID	6.0	ADC
Continuous Drain Current (TC=100°C)	ID	4.0	ADC
Maximum Supply Voltage	VCC,MAX	30	V
Input Voltage Range	VFB	-0.3 to 7V	V
Total Power Dissipation	PD	150	W
	Darting	1.21	W/°C
Operating Ambient Temperature	TA	-25 to +85	°C
Storage Temperature	TSTG	-55 to +150	°C

### Note:

1. Tj = 25°C to 150°C
2. Repetitive rating: Pulse width limited by maximum junction temperature
3. L = 24mH, starting Tj = 25°C
4. L = 13μH, starting Tj = 25°C

## Electrical Characteristics (SFET Part)

(Ta=25°C unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BVDSS	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> =0.5BVDSS, I <sub>D</sub> =7.0A (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> =7.0A, V <sub>DS</sub> =0.5BVDSS (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:

1. Pulse test: Pulse width ≤ 300μS, duty ≤ 2%

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

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

(Ta=25°C unless otherwise specified)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
<b>UVLO SECTION</b>						
Start Threshold Voltage	VSTART	-	14	15	16	V
Min. Operating Voltage After Turn On	VSTOP	-	8.4	9	9.6	V
<b>OSCILLATOR SECTION</b>						
Initial Frequency	FOSC	CT=2n	61	67	73	kHz
Temperature Stability (Note 1)	ΔFOSC	-25°C ≤ Ta ≤ 85°C	0	±5	±10	%
Maximum Duty Cycle	DMAX	RT=21kΩ	85	88	91	%
Offset Voltage	Voffset	-	0.5	0.55	0.6	%
<b>FEEDBACK SECTION</b>						
Feedback Source Current	IFB	Vsc = 0V	0.9	1.1	1.3	mA
Shutdown Feedback Voltage	Vsd	Vfb ≥ 6V	6.3	6.9	7.5	V
Shutdown Delay Current	IDELAY	4V ≤ Vfb ≤ Vsd	4	5	6	μA
<b>CURRENT LIMIT (SELF-PROTECTION) SECTION</b>						
Peak Current Limit	I <sub>OVER</sub>	Max. inductor current	3.52	4	4.48	A
<b>PROTECTION SECTION</b>						
Over Voltage Protection	VOVP	Vcc ≥ 22V	25	27	29	V
Thermal Shutdown Temp.	TSD	-	150	170	-	°C
<b>POWER-SAVING MODE SECTION</b>						
Power Saving Mode Feedback Volt.	VF(PS)	VCC=16V	0.3	0.4	0.5	V
Power Saving Reset Feedback Volt.	VF(RE)	VCC=16V	0.5	0.6	0.7	V
Power Saving Current	IPS	VCC=16V	-	0.3	0.4	mA
Power Saving Mode Fb Current	I <sub>pfb</sub>	VCC=16V	3	4	5	uA
<b>TOTAL DEVICE SECTION</b>						
Start Up Current	Istart	Vcc=14V	-	0.1	0.2	mA
Operating Supply Current	IOP	Vcc ≤ 28V	-	10	18	mA

**Note:**

1. These parameters, although guaranteed, are not 100% tested in production

## Typical Performance Characteristics

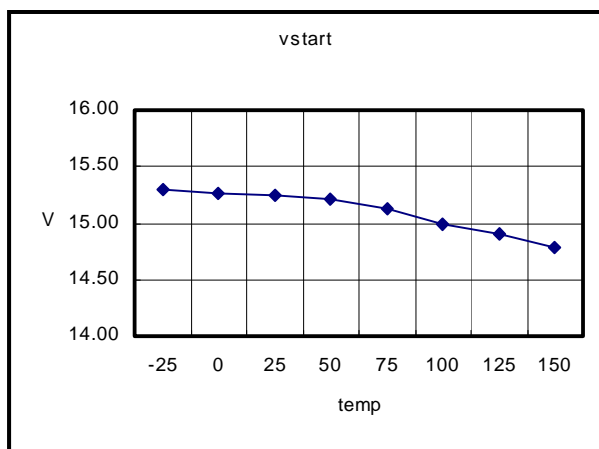


Figure 1. Start Threshold Voltage

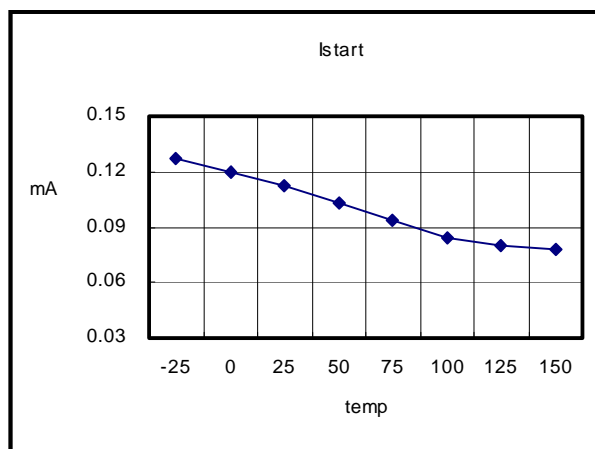


Figure 2. Stop Threshold Voltage

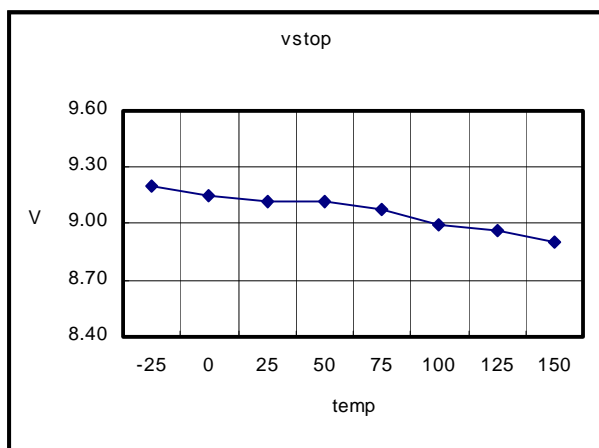


Figure 3. Start Up Current

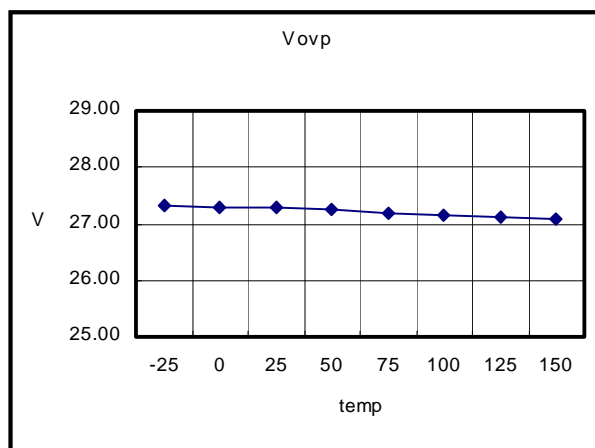


Figure 4. Over Voltage Protection

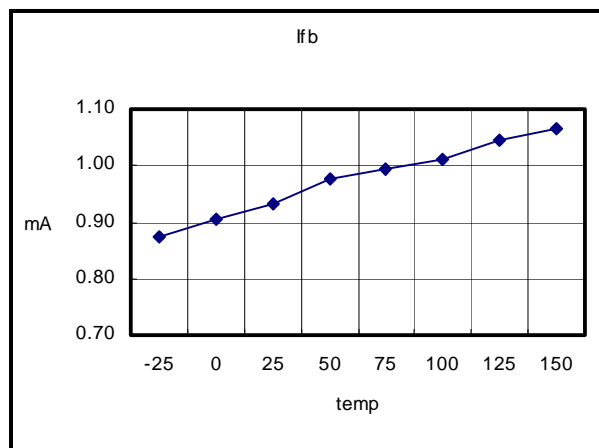


Figure 5. Feedback Source Current

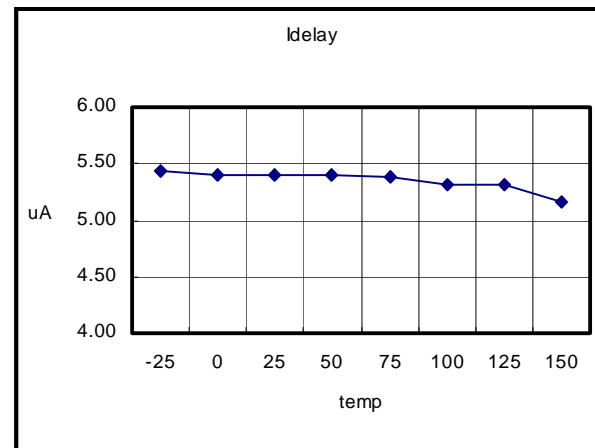


Figure 6. Shutdown Delay Current

## Typical Performance Characteristics (Continued)

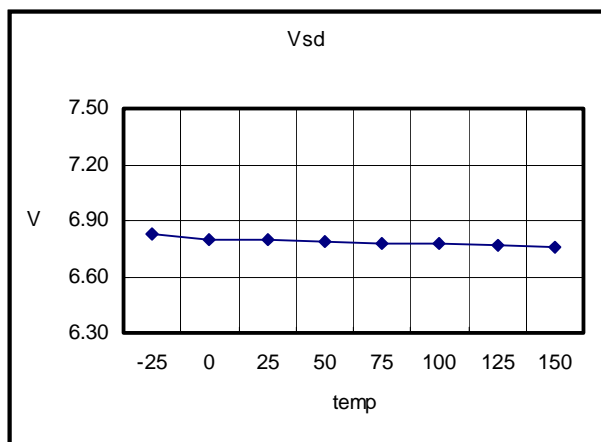


Figure 7. Shutdown Feedback Voltage

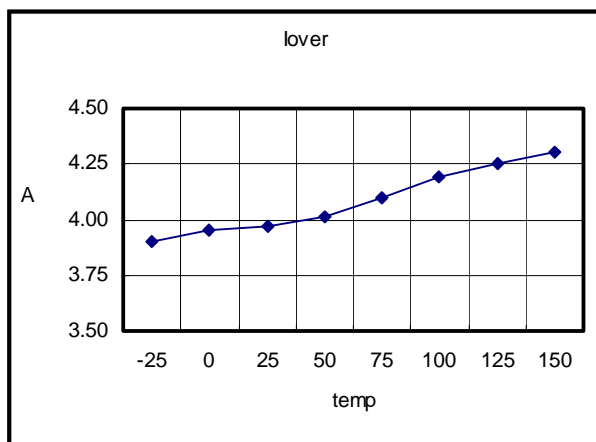


Figure 9. Peak Current Limit

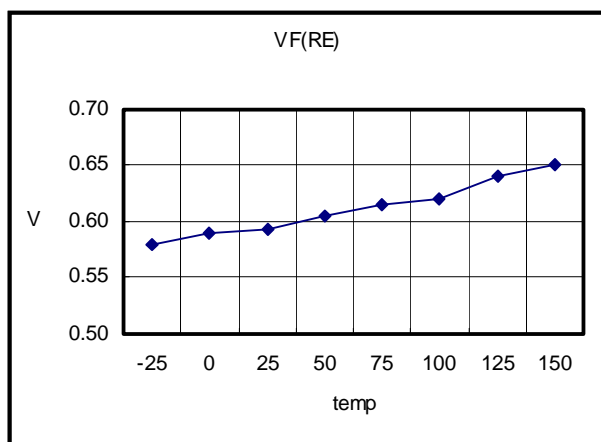


Figure 9. Power-Saving Reset Feedback Voltage

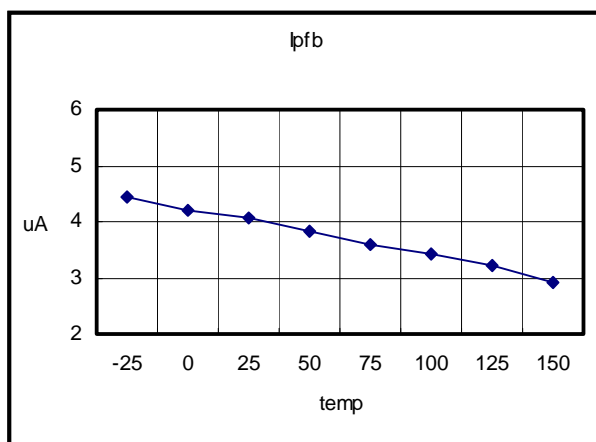


Figure 10. Power-Saving Mode Feedback Current

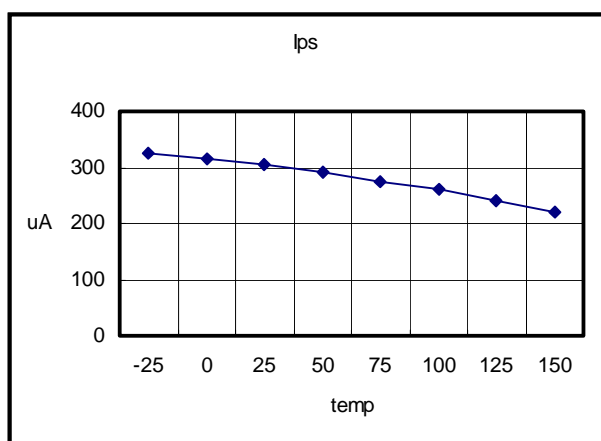


Figure 11. Power-Saving Current

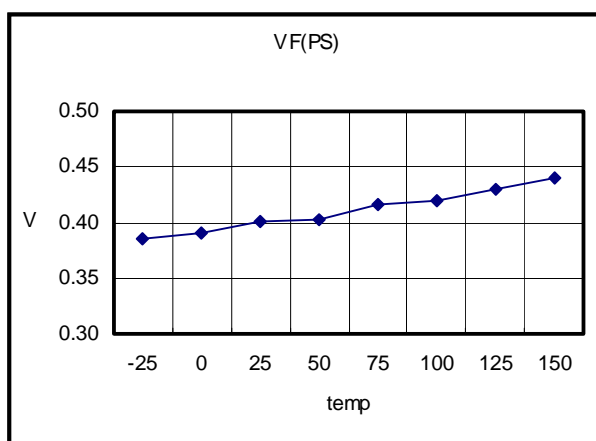


Figure 12. Power-Saving Mode Feedback Voltage

Typical Performance Characteristics (Continued)

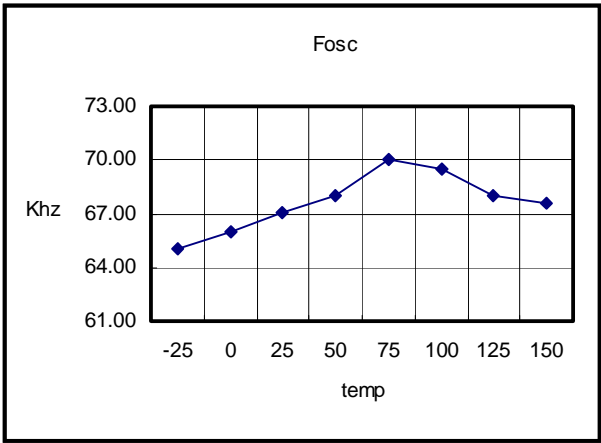


Figure 13. Operating Frequency

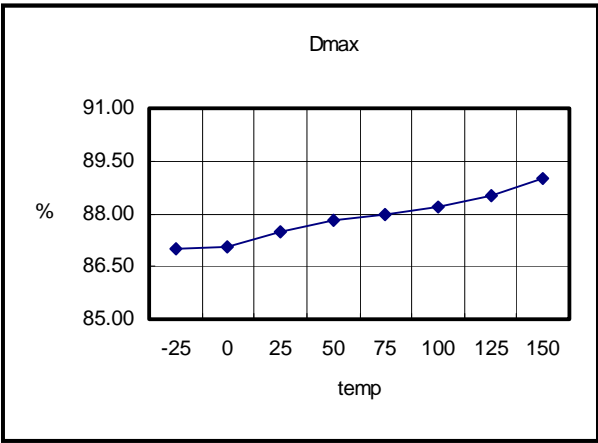
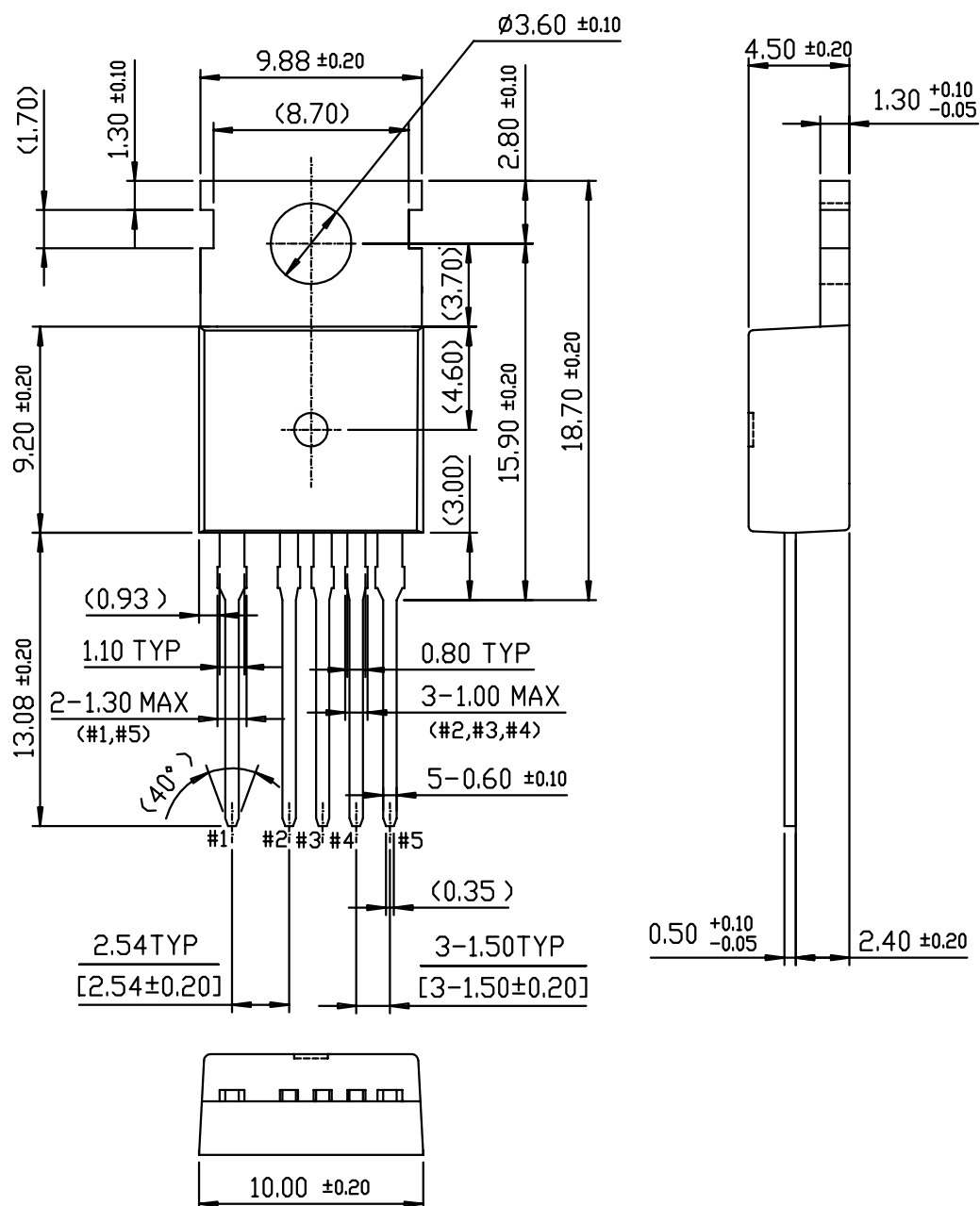


Figure 14. Maximum Duty Cycle

# Package Dimensions

## TO-220-5L





Technical drawing of a 5-pin connector showing front, side, and top views with dimensions in millimeters.

**Front View Dimensions:**

- Overall width:  $9.88 \pm 0.20$
- Pin pitch:  $2.80 \pm 0.10$
- Pin diameter:  $\phi 3.60 \pm 0.10$
- Pin length:  $15.90 \pm 0.20$
- Overall height:  $18.70 \pm 0.20$
- Pin #1 height:  $1.30 \pm 0.10$
- Pin #2 height:  $1.30 \pm 0.10$
- Pin #3 height:  $1.30 \pm 0.10$
- Pin #4 height:  $1.30 \pm 0.10$
- Pin #5 height:  $1.30 \pm 0.10$
- Pin #1 width:  $0.93$
- Pin #2 width:  $1.10$  TYP
- Pin #3 width:  $0.80$  TYP
- Pin #4 width:  $0.80$  TYP
- Pin #5 width:  $0.80$  TYP
- Pin #1 length:  $2-1.30$  MAX (#1,#5)
- Pin #2 length:  $3-1.00$  MAX (#2,#3,#4)
- Pin #3 length:  $5-0.60 \pm 0.10$
- Pin #4 length:  $3-1.50$  TYP
- Pin #5 length:  $3-1.50$  TYP
- Pin #1 width:  $2.54$  TYP
- Pin #2 width:  $2.54$  TYP
- Pin #3 width:  $2.54$  TYP
- Pin #4 width:  $2.54$  TYP
- Pin #5 width:  $2.54$  TYP
- Pin #1 length:  $2.54 \pm 0.20$
- Pin #2 length:  $2.54 \pm 0.20$
- Pin #3 length:  $2.54 \pm 0.20$
- Pin #4 length:  $2.54 \pm 0.20$
- Pin #5 length:  $2.54 \pm 0.20$

**Side View Dimensions:**

- Overall height:  $26.00 \pm 0.80$
- Pin #1 height:  $4.50 \pm 0.20$
- Pin #2 height:  $1.30 \pm 0.10$
- Pin #3 height:  $1.30 \pm 0.10$
- Pin #4 height:  $1.30 \pm 0.10$
- Pin #5 height:  $1.30 \pm 0.10$
- Pin #1 width:  $0.93$
- Pin #2 width:  $1.10$  TYP
- Pin #3 width:  $0.80$  TYP
- Pin #4 width:  $0.80$  TYP
- Pin #5 width:  $0.80$  TYP
- Pin #1 length:  $2-1.30$  MAX (#1,#5)
- Pin #2 length:  $3-1.00$  MAX (#2,#3,#4)
- Pin #3 length:  $5-0.60 \pm 0.10$
- Pin #4 length:  $3-1.50$  TYP
- Pin #5 length:  $3-1.50$  TYP
- Pin #1 width:  $2.54$  TYP
- Pin #2 width:  $2.54$  TYP
- Pin #3 width:  $2.54$  TYP
- Pin #4 width:  $2.54$  TYP
- Pin #5 width:  $2.54$  TYP
- Pin #1 length:  $2.54 \pm 0.20$
- Pin #2 length:  $2.54 \pm 0.20$
- Pin #3 length:  $2.54 \pm 0.20$
- Pin #4 length:  $2.54 \pm 0.20$
- Pin #5 length:  $2.54 \pm 0.20$

**Top View Dimensions:**

- Overall width:  $10.00 \pm 0.20$

## Ordering Information

Product Number	Package	Rating	Topr (°C)
KA5P0680CTU	TO-220-5L	800V, 6A	-25°C to +85°C
KA5P0680CYDTU	TO-220-5L(Forming)		

TU : Non Forming Type

YDTU : Forming Type

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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.