

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

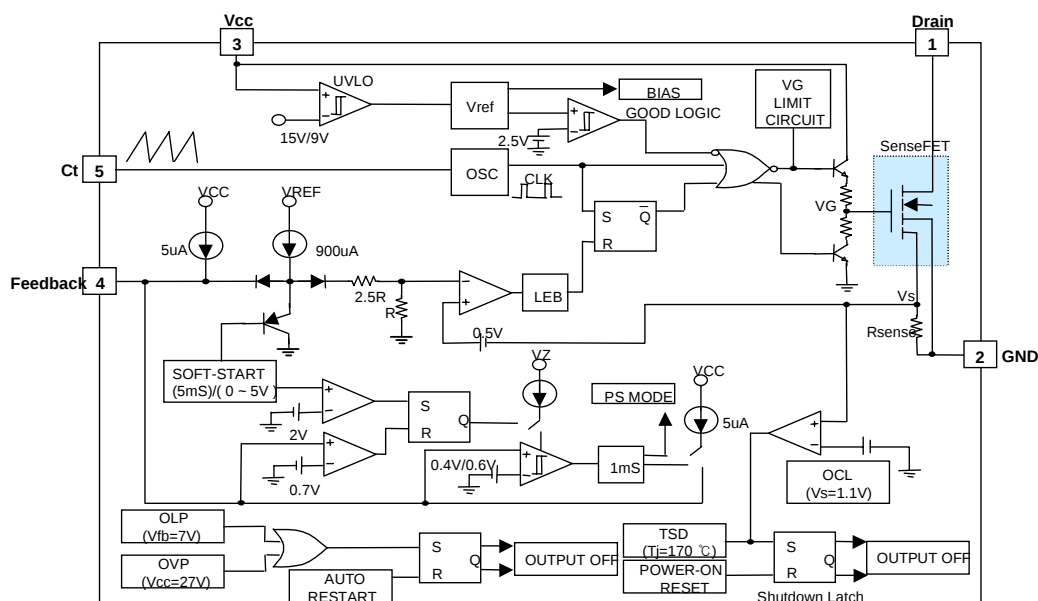
The Fairchild Power Switch(FPS) product family is specially designed for an off-line SMPS with minimal external components. The Fairchild Power Switch(FPS) consist of high voltage power SenseFET and current mode PWM IC. Included PWM controller features integrated fixed oscillator, under voltage lock 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 (R _{GS} =1MΩ)	V _{DGR}	800	V
Gate-Source (GND) Voltage	V _{GS}	±30	V
Drain Current Pulsed ⁽²⁾	I _{DM}	24.0	A _{DC}
Single Pulsed Avalanche Energy ⁽³⁾	E _{AS}	455	mJ
Avalanche Current ⁽⁴⁾	I _{AS}	27	A
Continuous Drain Current (T _C =25°C)	I _D	6.0	A _{DC}
Continuous Drain Current (T _C =100°C)	I _D	4.0	A _{DC}
Maximum Supply Voltage	V _{CC,MAX}	30	V
Input Voltage Range	V _{FB}	-0.3 to 7V	V
Total Power Dissipation	P _D	150	W
	Darting	1.21	W/°C
Operating Ambient Temperature	T _A	-25 to +85	°C
Storage Temperature	T _{STG}	-55 to +150	°C

Note:

1. T_j = 25°C to 150°C
2. Repetitive rating: Pulse width limited by maximum junction temperature
3. L = 24mH, starting T_j = 25°C
4. L = 13μH, starting T_j = 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 _{GS} =0V, I _D =50μA	800	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =Max., Rating, V _{GS} =0V	-	-	50	μA
		V _{DS} =0.8Max., Rating, V _{GS} =0V, T _C =125°C	-	-	200	μA
Static Drain-Source on Resistance ^(Note)	R _{DS(ON)}	V _{GS} =10V, I _D =4.0A	-	1.6	2.0	Ω
Forward Transconductance ^(Note)	g _{fs}	V _{DS} =15V, I _D =4.0A	1.5	2.5	-	S
Input Capacitance	C _{iss}	V _{GS} =0V, V _{DS} =25V, f=1MHz	-	1600	-	pF
Output Capacitance	C _{oss}		-	140	-	
Reverse Transfer Capacitance	C _{rss}		-	42	-	
Turn on Delay Time	t _{d(on)}	V _{DD} =0.5BVDSS, I _D =7.0A (MOSFET switching time are essentially independent of operating temperature)	-	60	-	nS
Rise Time	t _r		-	150	-	
Turn Off Delay Time	t _{d(off)}		-	300	-	
Fall Time	t _f		-	130	-	
Total Gate Charge (Gate-Source+Gate-Drain)	Q _g	V _{GS} =10V, I _D =7.0A, V _{DS} =0.5BVDSS (MOSFET switching time are essentially independent of operating temperature)	-	70	-	nC
Gate-Source Charge	Q _{gs}		-	16	-	
Gate-Drain (Miller) Charge	Q _{gd}		-	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
UVLO SECTION						
Start Threshold Voltage	V _{START}	-	14	15	16	V
Min. Operating Voltage After Turn On	V _{STOP}	-	8.4	9	9.6	V
OSCILLATOR SECTION						
Initial Frequency	F _{OSC}	CT=2n	61	67	73	kHz
Temperature Stability (Note 1)	ΔF _{OSC}	-25°C ≤ Ta ≤ 85°C	0	±5	±10	%
Maximum Duty Cycle	D _{MAX}	RT=21kΩ	85	88	91	%
Offset Voltage	V _{offset}	-	0.5	0.55	0.6	%
FEEDBACK SECTION						
Feedback Source Current	I _{FB}	V _{SC} = 0V	0.9	1.1	1.3	mA
Shutdown Feedback Voltage	V _{SD}	V _{FB} ≥ 6V	6.3	6.9	7.5	V
Shutdown Delay Current	I _{DELAY}	4V ≤ V _{FB} ≤ V _{SD}	4	5	6	μA
CURRENT LIMIT (SELF-PROTECTION) SECTION						
Peak Current Limit	I _{OVER}	Max. inductor current	3.52	4	4.48	A
PROTECTION SECTION						
Over Voltage Protection	V _{OV} P	V _{CC} ≥ 22V	25	27	29	V
Thermal Shutdown Temp.	T _{SD}	-	150	170	-	°C
POWER-SAVING MODE SECTION						
Power Saving Mode Feedback Volt.	V _{F(PS)}	V _{CC} =16V	0.3	0.4	0.5	V
Power Saving Reset Feedback Volt.	V _{F(RE)}	V _{CC} =16V	0.5	0.6	0.7	V
Power Saving Current	I _{PS}	V _{CC} =16V	-	0.3	0.4	mA
Power Saving Mode Fb Current	I _{pfb}	V _{CC} =16V	3	4	5	uA
TOTAL DEVICE SECTION						
Start Up Current	I _{start}	V _{CC} =14V	-	0.1	0.2	mA
Operating Supply Current	I _{OP}	V _{CC} ≤ 28V	-	10	18	mA

Note:

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

Typical Performance Characteristics

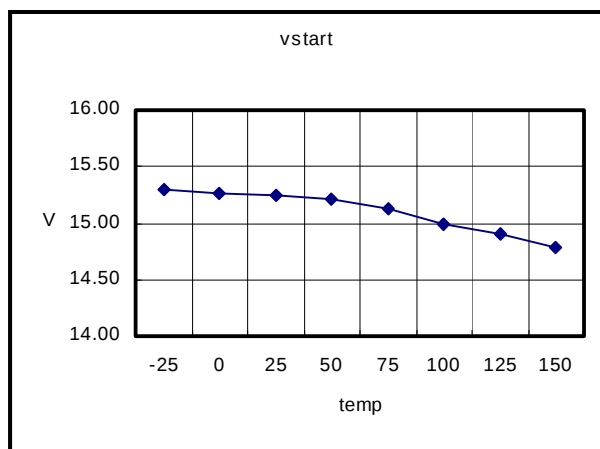


Figure 1. Start Threshold Voltage

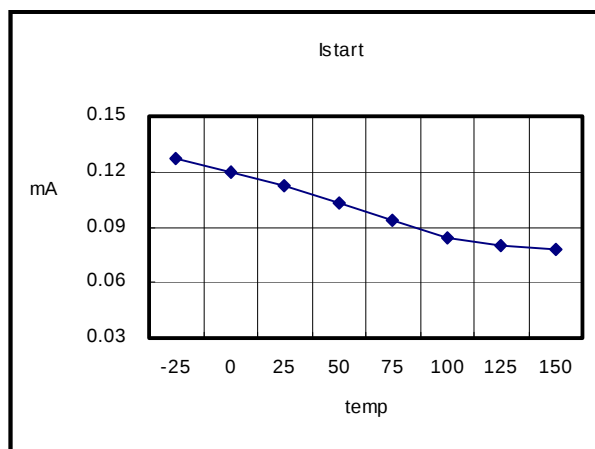


Figure 2. Stop Threshold Voltage

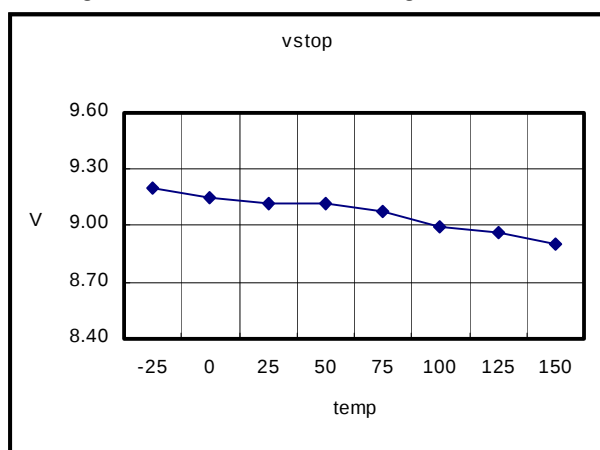


Figure 3. Start Up Current

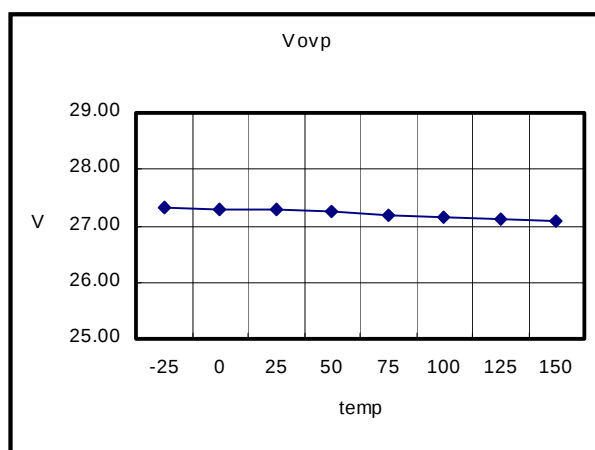


Figure 4. Over Voltage Protection

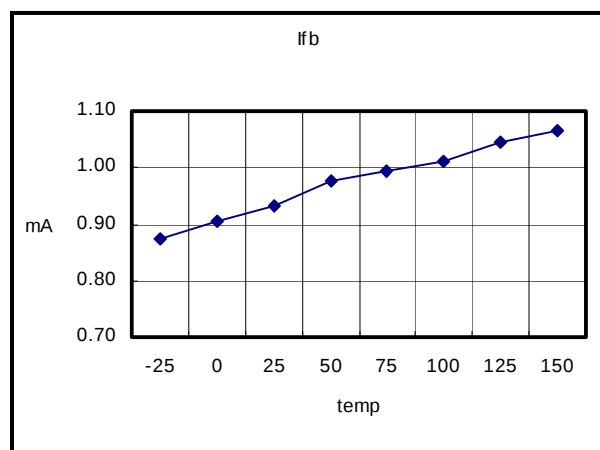


Figure 5. Feedback Source Current

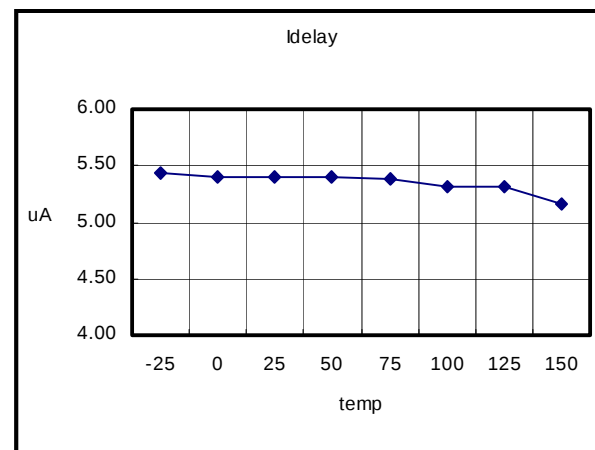


Figure 6. Shutdown Delay Current

Typical Performance Characteristics (Continued)

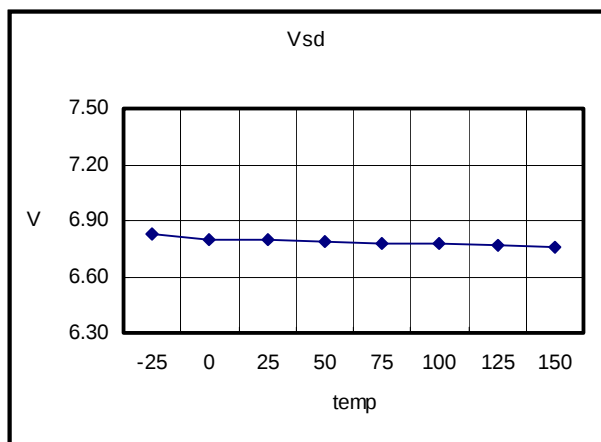


Figure 7. Shutdown Feedback Voltage

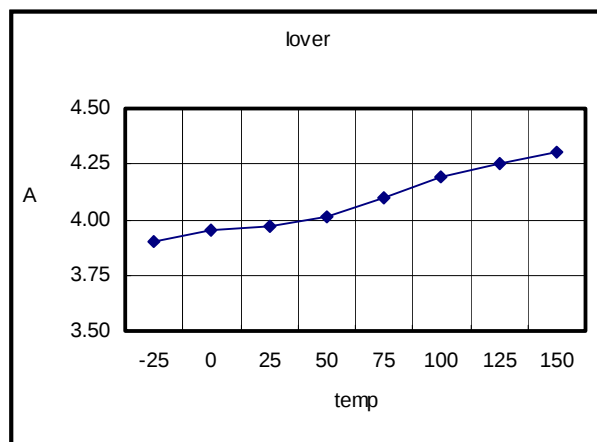


Figure 9. Peak Current Limit

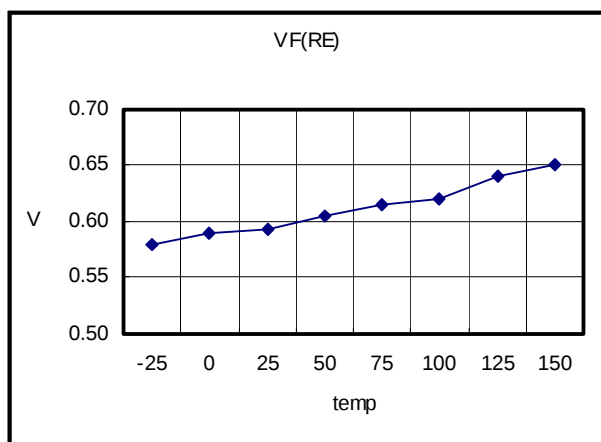


Figure 9. Power-Saving Reset Feedback Voltage

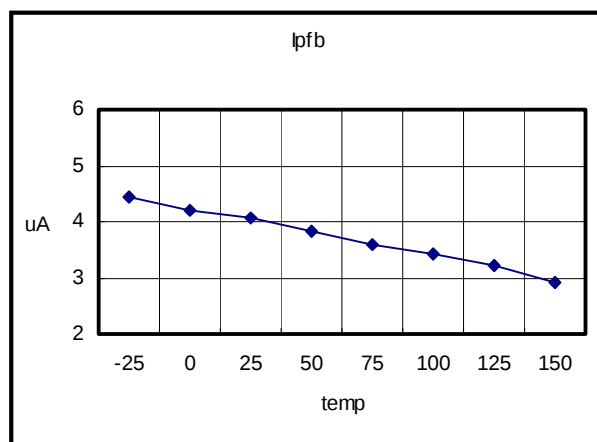


Figure 10. Power-Saving Mode Feedback Current

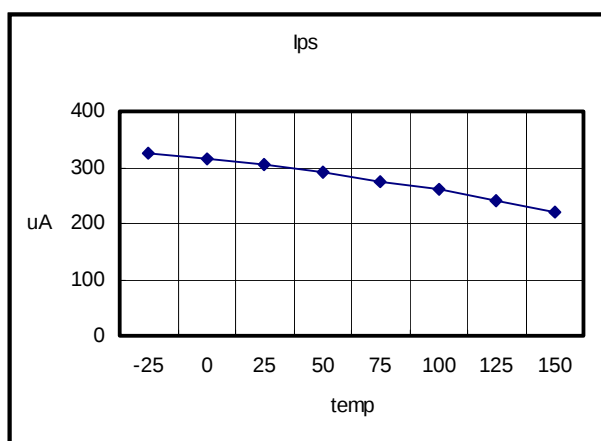


Figure 11. Power-Saving Current

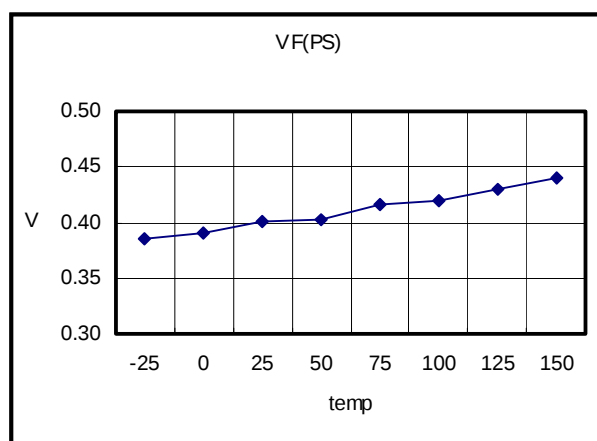


Figure 12. Power-Saving Mode Feedback Voltage

Typical Performance Characteristics (Continued)

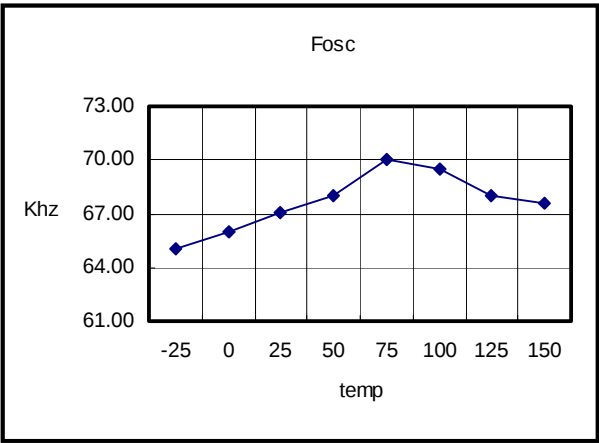


Figure 13. Operating Frequency

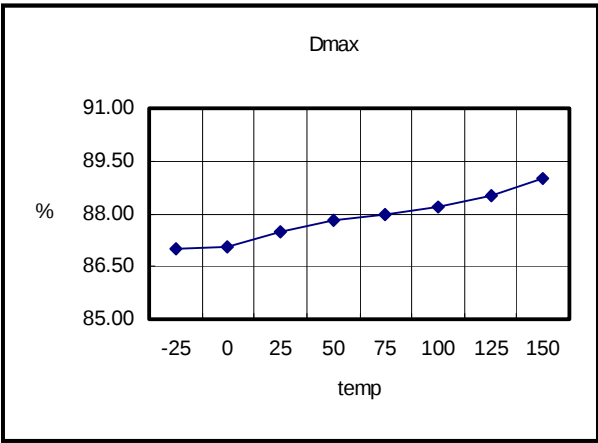
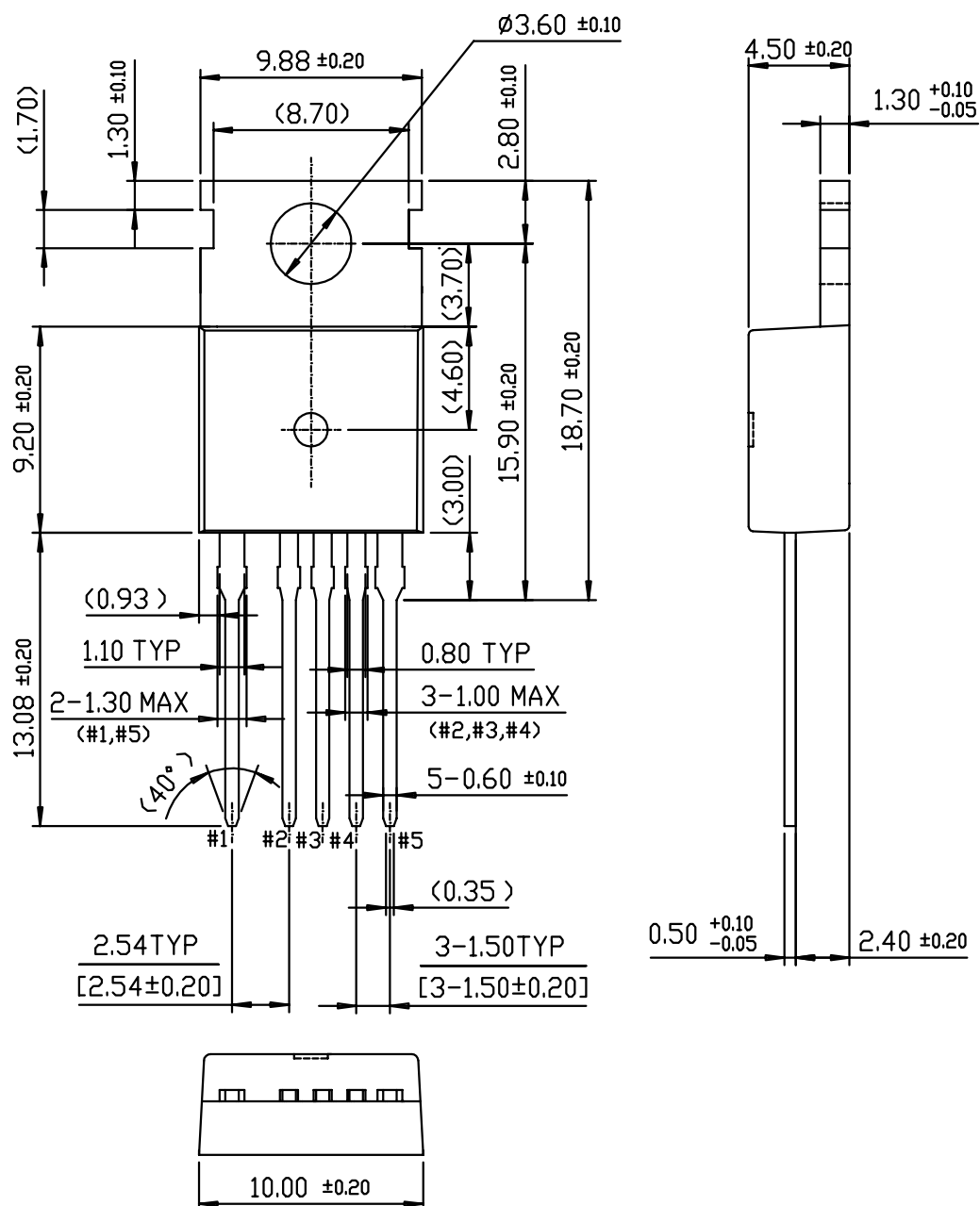


Figure 14. Maximum Duty Cycle

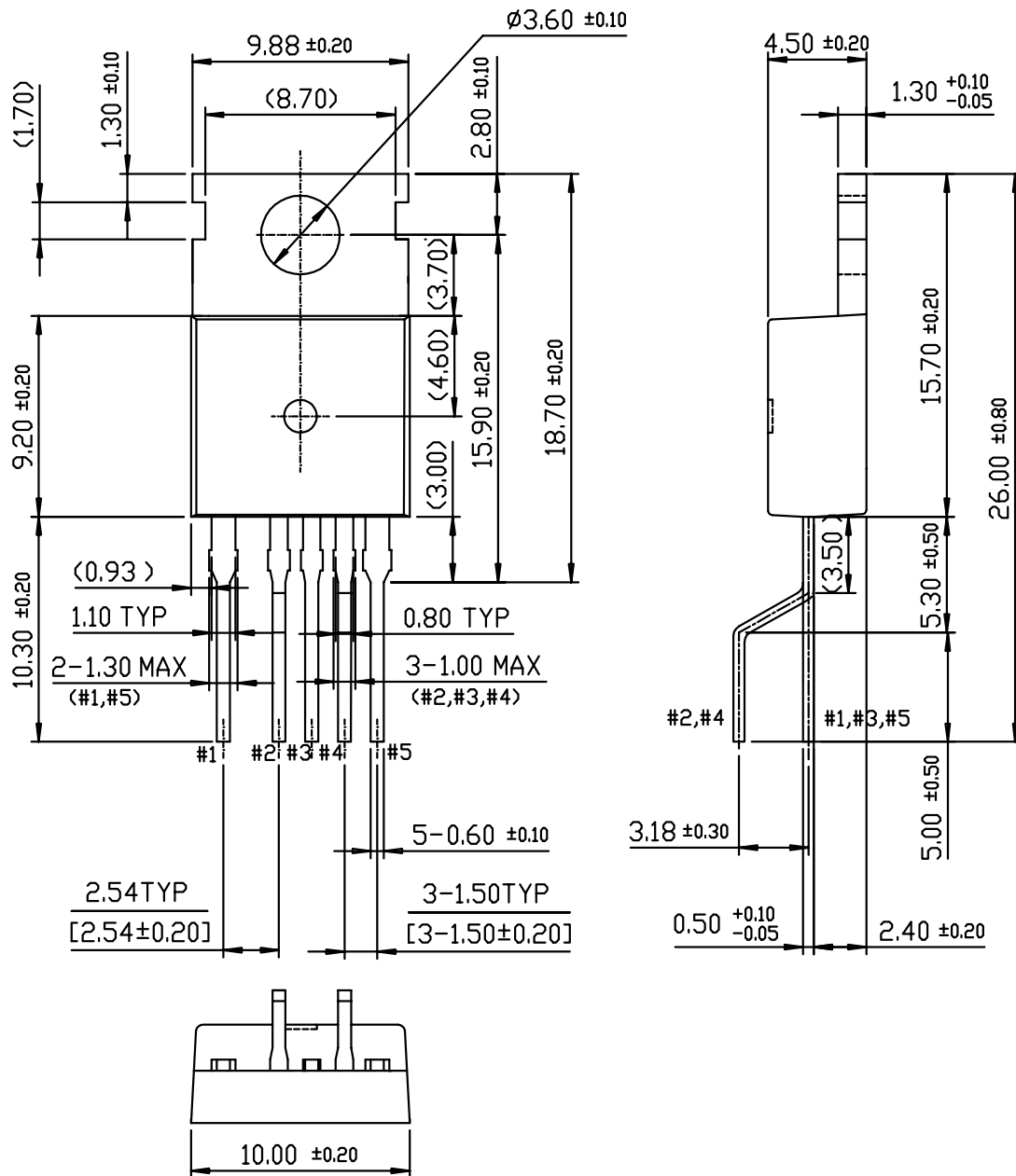
Package Dimensions

TO-220-5L



Package Dimensions (Continued)

TO-220-5L(Forming)



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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