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

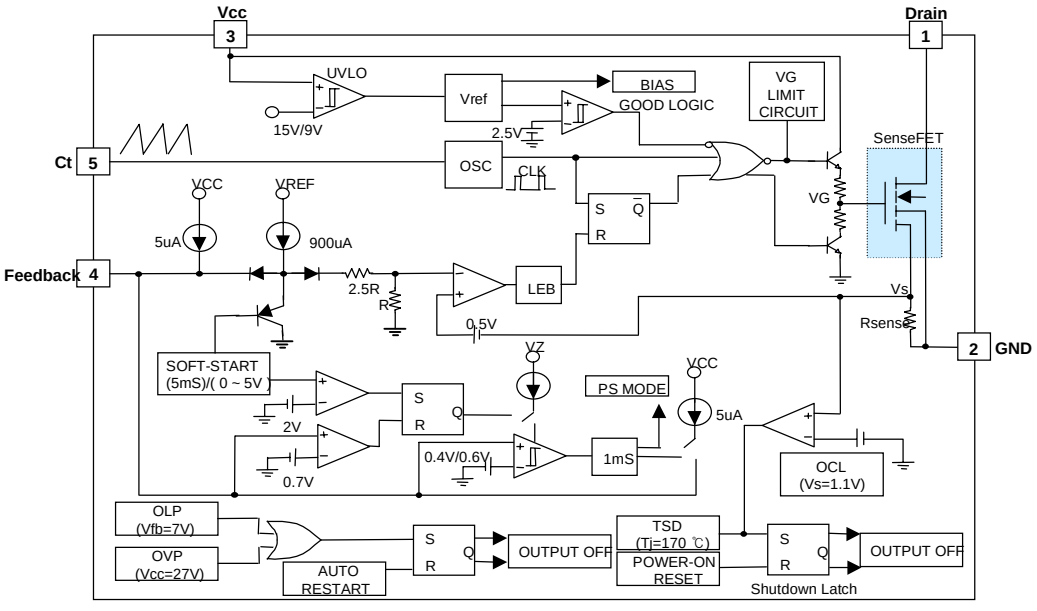
The Fairchild Power Switch(FPS) product family is specially designed for an off-line SMPS with minimal external components. The Fairchild Power Switch(FPS) consist of high voltage power SenseFET and current mode PWM IC. Included PWM controller features integrated fixed oscillator, under voltage lock 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 R_{CC} 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

1. Drain 2. GND 3. V_{CC} 4. FB 5. CT

Internal Block Diagram



Rev.1.0.2

Absolute Maximum Ratings

(Ta=25°C, unless otherwise specified)

Parameter	Symbol	Value	Unit
Maximum Drain voltage (1)	$V_{D,MAX}$	800	V
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
	Derating	1.21	W/°C
Operating ambient temperature	T_A	–25 to +85	°C
Storage temperature	T_{STG}	–55 to +150	°C

Notes:

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 to PKG Breakdown voltage	BV_{PKG}	60Hz AC, Ta=25°C	3500	-	-	V
Drain-source breakdown voltage	BV_{DSS}	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)	gfs	V_{DS}=15V, I_D=4.0A	1.5	2.5	-	S
Input capacitance	Ciss	V_{GS}=0V, V_{DS}=25V, f=1MHz	-	1600	-	pF
Output capacitance	Coss		-	140	-	
Reverse transfer capacitance	Crss		-	42	-	
Turn on delay time	td(on)	V_{DD}=0.5BV_{DSS}, I_D=7.0A (MOSFET switching time are essentially independent of operating temperature)	-	60	-	nS
Rise time	tr		-	150	-	
Turn off delay time	td(off)		-	300	-	
Fall time	tf		-	130	-	
Total gate charge (gate-source+gate-drain)	Qg	V_{GS}=10V, I_D=7.0A, V_{DS}=0.5BV_{DSS} (MOSFET switching time are essentially independent of operating temperature)	-	70	-	nC
Gate-source charge	Qgs		-	16	-	
Gate-drain (Miller) charge	Qgd		-	27	-	

Note:

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

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

Electrical Characteristics (Control part)

(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	Voffset	-	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_{OVP}	Vcc ≥ 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	Istart	Vcc=14V	-	0.1	0.2	mA
Operating Supply Current	I_{OP}	Vcc ≤ 28V	-	10	18	mA

Note:

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

Typical Performance Characteristics

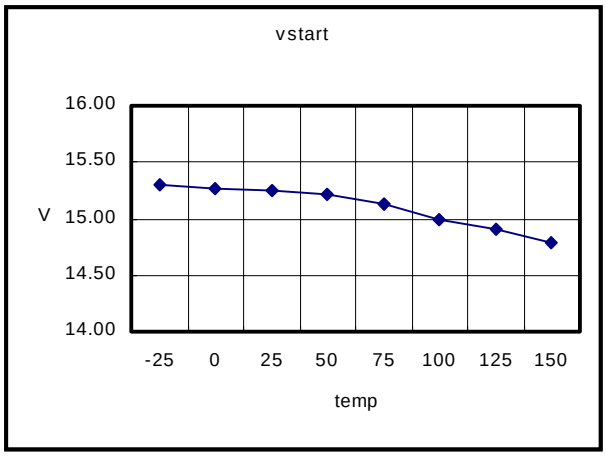


Figure 1. Start Threshhold Voltage

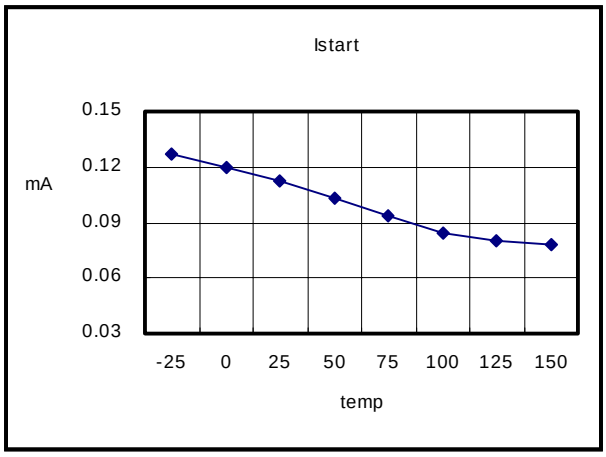


Figure 2. Stop Threshold Voltage

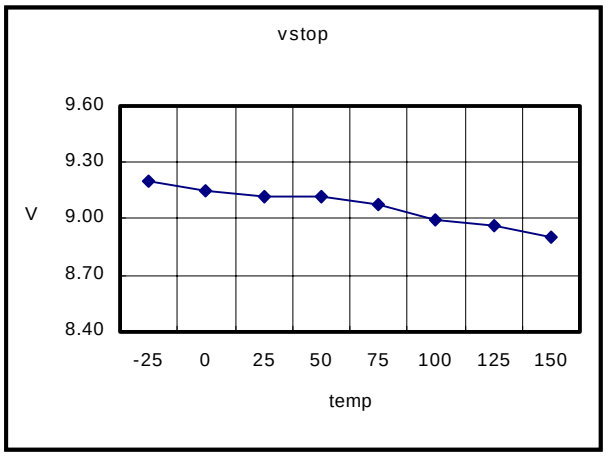


Figure 3. Start Up Current

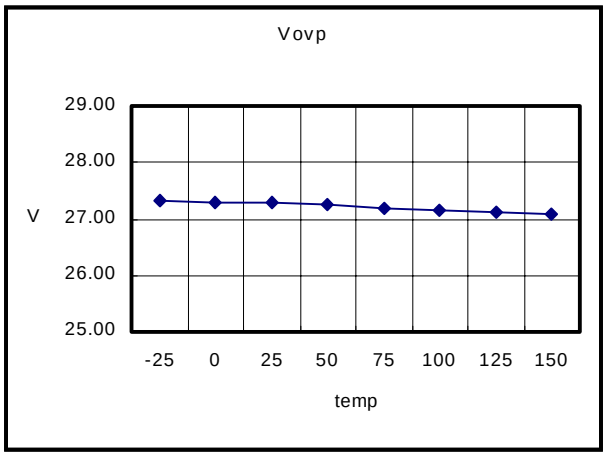


Figure 4. Over Voltage Protection

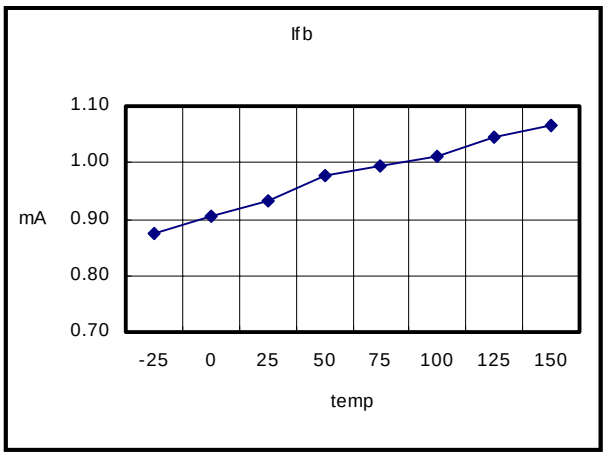


Figure 5. Feedback Source Current

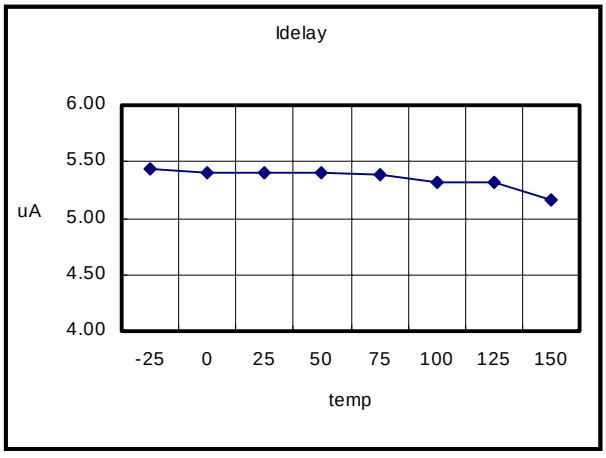


Figure 6. Shutdown Delay Current

Typical Performance Characteristics (Continued)

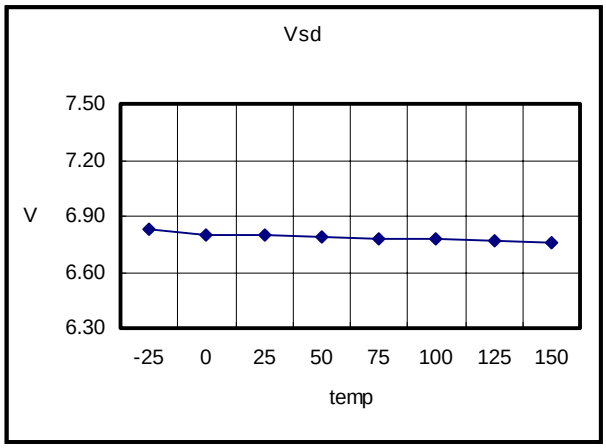


Figure 7. Shutdown Feedback Voltage

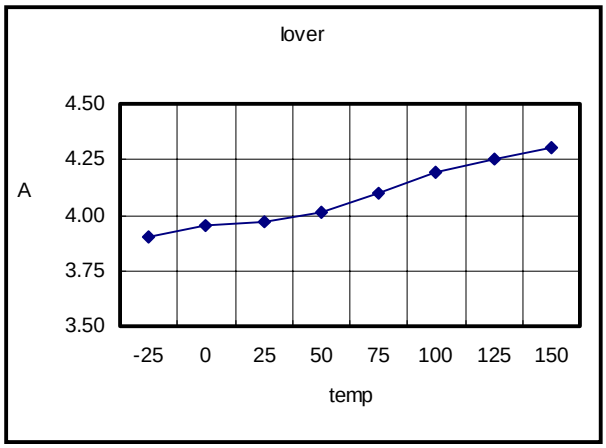


Figure 9. Peak Current Limit

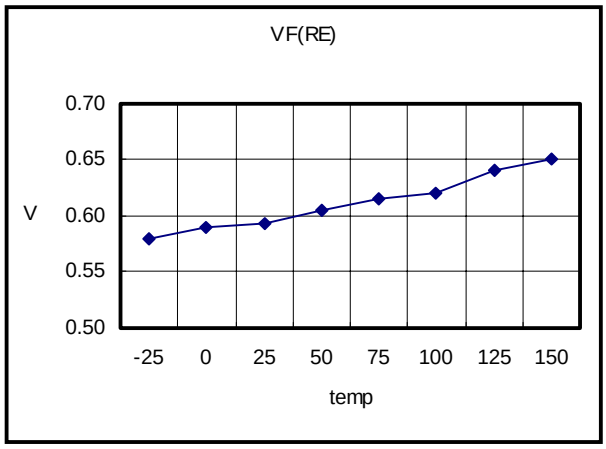


Figure 9. Power-Saving Reset Feedback Voltage

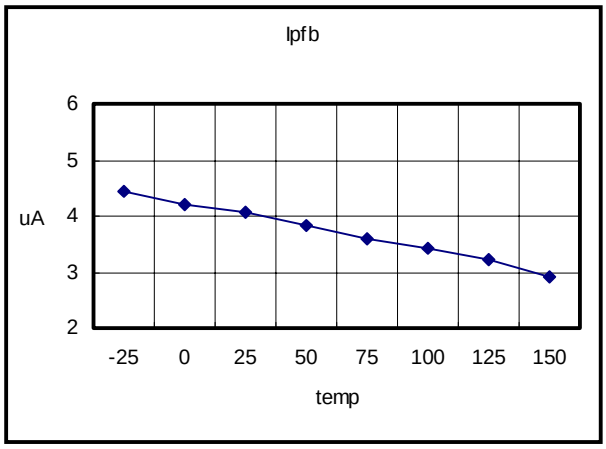


Figure 10. Power-Saving Mode Feedback Current

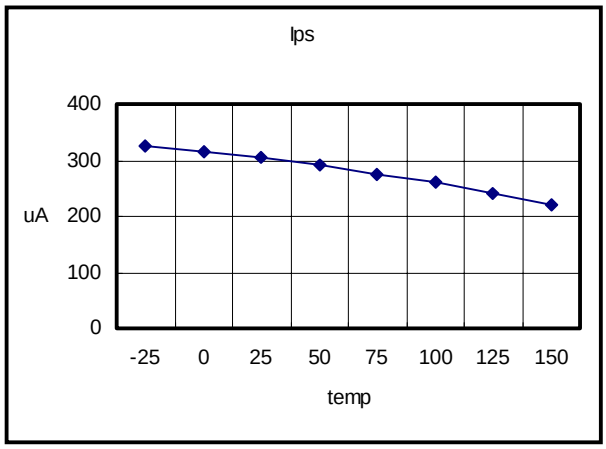


Figure 11. Power-Saving Current

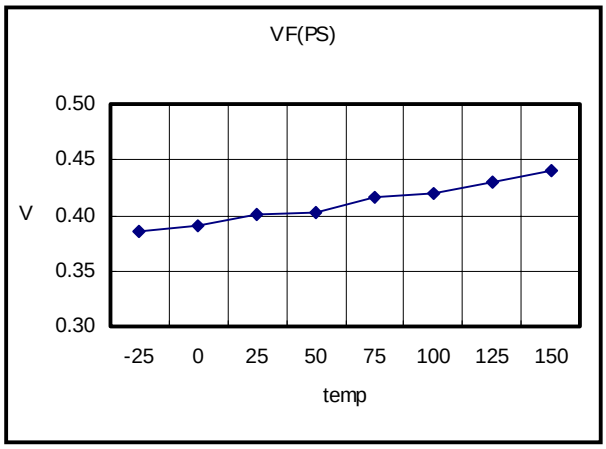


Figure 12. Power-Saving Mode Feedback Voltage

Typical Performance Characteristics (Continued)

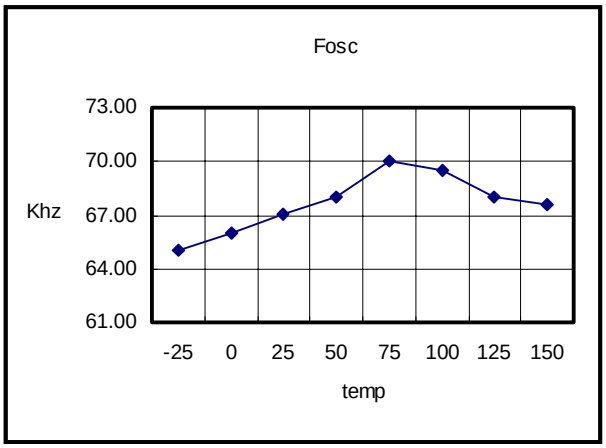


Figure 13. Operating Freguency

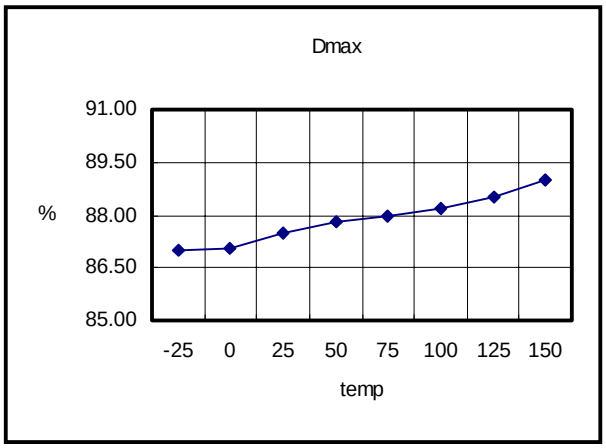
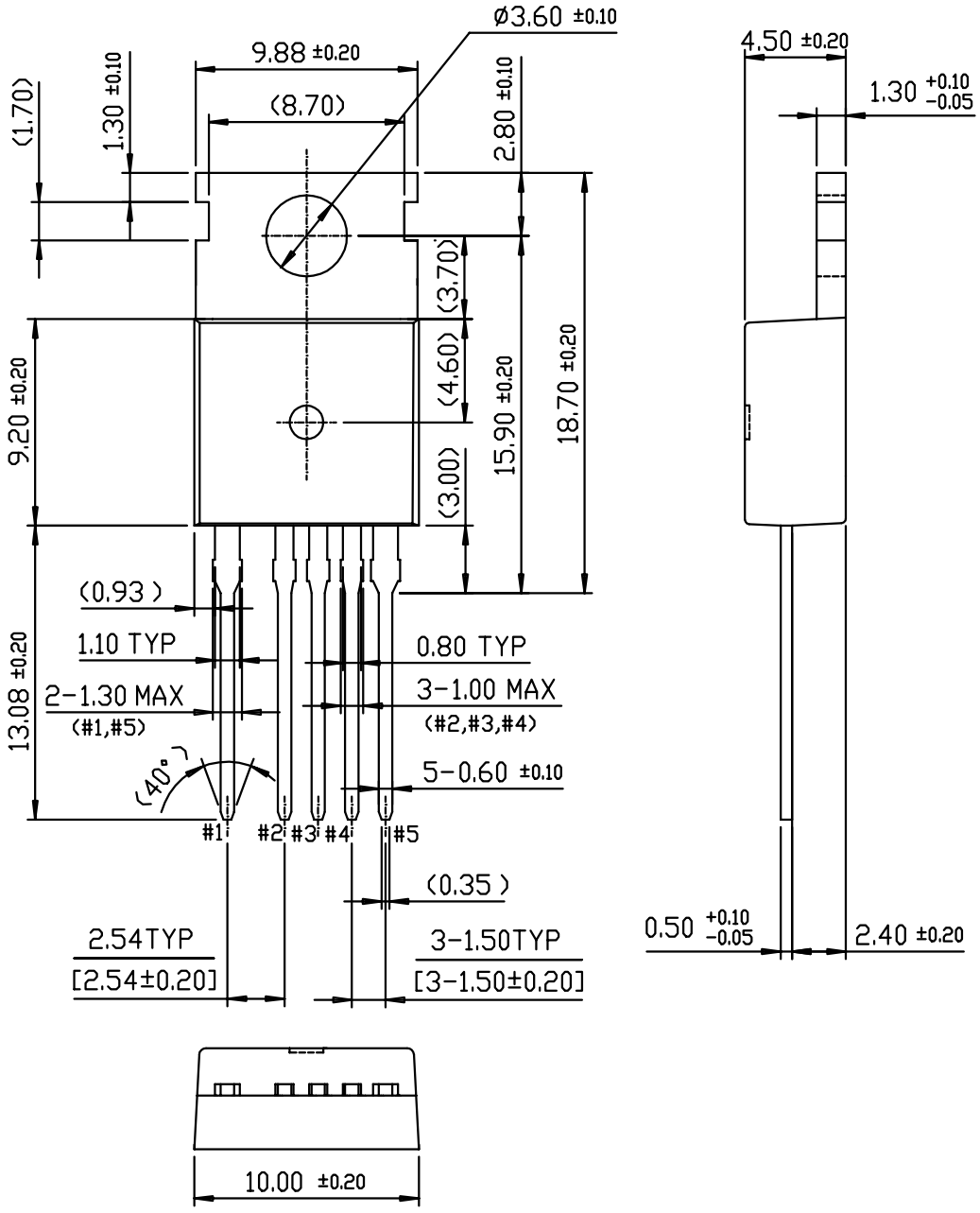


Figure 14. Maximum Duty Cycle

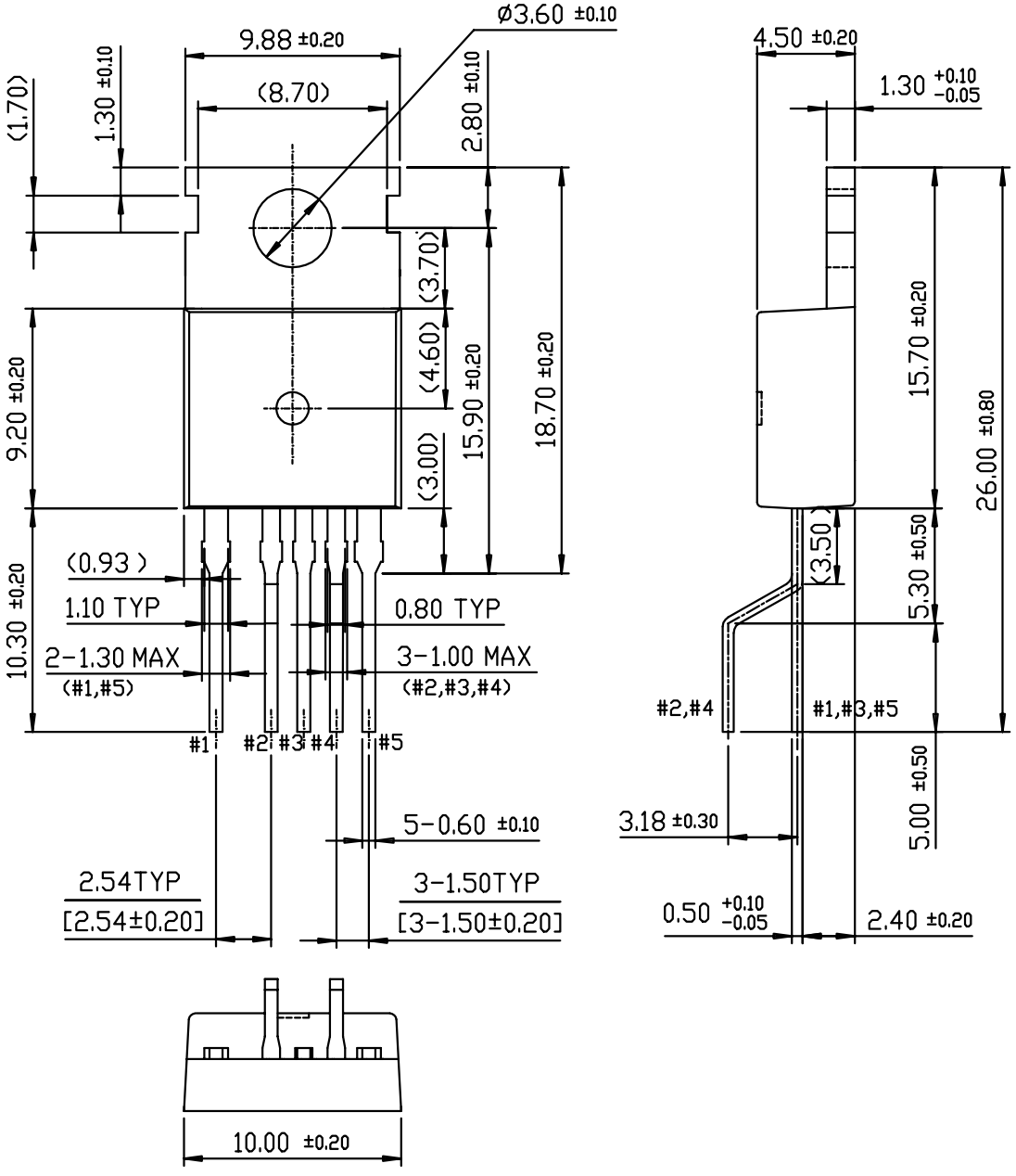
Package Dimensions

TO-220-5L



Package Dimensions (Continued)

TO-220-5L(Forming)



Ordering Information

Product Number	Package	Rating	Topr (°C)
KA5P0680C-TU	TO-220-5L	800V, 6A	–25°C to +85°C
KA5P0680C-YDTU	TO-220-5L(Forming)		

TU : Non Forming Type
YDTU : Forming Type

10/17/01 0.0m 001
Stock#DSxxxxxxxx