

Fairchild Power Switch(FPS)

- Fixed Frequency
- Internal Burst Mode Controller for Stand-by Mode
- Pulse By Pulse Over Current Limiting
- Over Current Protection(Auto Restart Mode)
- Over Voltage Protection (Auto Restart Mode)
- Over Load Protection(Auto Restart Mode)
- Internal Thermal Shutdown Function(Latch Mode)
- Under Voltage Lockout
- Internal High Voltage Sense FET
- Soft Start

- LCD Monitor SMPS
- Adaptor

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 a high voltage power SenseFET and a current mode PWM IC. Included PWM controller features integrated fixed oscillator, the under voltage lock out, the leading edge blanking, the optimized gate turn-on/turn-off driver, the thermal shutdown protection, the over voltage protection, and the temperature compensated precision current sources for the loop compensation and a fault protection circuitry. compared with a discrete MOSFET and a controller or a 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 the cost effective LCD monitor power supply.



1. Drain 2. GND 3. VCC
4. Feedback 5. SoftStart

The schematic diagram illustrates a 100W LED driver circuit with the following components and connections:

- Power Input:** Vcc (3) and GND (2).
- SoftStart (5):** A network of resistors and capacitors that controls the initial ramp-up of the LED current.
- Feedback (4):** A feedback loop consisting of a diode, a resistor (2.5R), and a capacitor, used for current regulation.
- UVLO (Under Voltage Lock Out):** A circuit that monitors Vcc and provides a UVLO Reset signal (Vcc=9V) to the PWM controller.
- Control Logic:** Includes a Burst mode controller, a PWM generator, and a UVLO Reset block.
- Power MOSFET:** The main switching transistor, driven by the PWM signal. It has a Ron (on-resistance) and Roff (off-resistance).
- LED Load:** Represented by a diode and a resistor (R) in series.
- Protection:** Includes a TSD (Thermal Shutdown) block (Tj=160°C) and a Power-on Reset block (Vcc=6.5V).
- Other Components:** An oscillator (OSC), an internal bias circuit, a UVLO block, a filter (130nsec), and various resistors (R, Ron, Roff, Rsenese) and capacitors.

Absolute Maximum Ratings

(Ta=25°C, unless otherwise specified)

Characteristic	Symbol	Value	Unit
Drain-Gate Voltage (R _{GS} =1MΩ)	V _{DGR}	650	V
Gate-Source (GND) Voltage	V _{GS}	±30	V
Drain Current Pulsed ⁽¹⁾	I _{DM}	14.4	ADC
Continuous Drain Current (T _c = 25°C)	I _D	3.6	ADC
Continuous Drain Current (T _C =100°C)	I _D	2.28	ADC
Single Pulsed Avalanche Current ⁽³⁾ (Energy ⁽²⁾)	I _{AS} (EAS)	17(570)	A(mJ)
Maximum Supply Voltage	V _{CC, MAX}	35	V
Input Voltage Range	V _{FB}	-0.3 to V _{CC}	V
	V _{SS}	-0.3 to 10	V
Total Power Dissipation	P _D (Watt H/S)	46	W
	Darting	0.37	W/°C
Operating Junction Temperature	T _j	+150	°C
Operating Ambient Temperature	T _A	-25 to +85	°C
Storage Temperature Range	T _{STG}	-55 to +150	°C

Notes:

1. Repetitive rating: Pulse width limited by maximum junction temperature
2. L=81mH, starting T_j=25°C
3. L=13uH, 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 =250μA	650	-	-	V
Zero Gate Voltage Drain Current	IDSS	V _{DS} =650V, V _{GS} =0V	-	-	200	μA
		V _{DS} =520V V _{GS} =0V, T _C =125°C	-	-	300	μA
Static Drain-Source On Resistance ⁽¹⁾	R _{DS(ON)}	V _{GS} =10V, I _D =1.8A	-	1.3	1.6	Ω
Forward Transconductance ⁽²⁾	g _{fs}	V _{DS} =50V, I _D =1.8A	-	3.3	-	S
Input Capacitance	C _{iss}	V _{GS} =0V, V _{DS} =25V, f = 1MHz	-	1200	-	pF
Output Capacitance	C _{oss}		-	125	-	
Reverse Transfer Capacitance	C _{rss}		-	23	-	
Turn On Delay Time	t _{d(on)}	V _{DD} =325V, I _D =6.5A (MOSFET switching time is essentially independent of operating temperature)	-	22	-	nS
Rise Time	t _r		-	70	-	
Turn Off Delay Time	t _{d(off)}		-	105	-	
Fall Time	t _f		-	65	-	
Total Gate Charge (Gate-Source+Gate-Drain)	Q _g	V _{GS} =10V, I _D =6.5A, V _{DS} =520V (MOSFET switching time is essentially independent of operating temperature)	-	40	-	nC
Gate-Source Charge	Q _{gs}		-	6.5	-	
Gate-Drain (Miller) Charge	Q _{gd}		-	18	-	

Note:

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

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

Electrical Characteristics (Continued)

(Ta=25°C unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
UVLO SECTION						
Start Threshold Voltage	V _{START}	V _{FB} = GND	14	15	16	V
Stop Threshold Voltage	V _{STOP}	V _{FB} = GND	8	9	10	V
OSCILLATOR SECTION						
Initial Frequency	F _{OSC}	-	63	70	77	kHz
Voltage Stability	F _{STABLE}	12V ≤ V _{CC} ≤ 23V	0	1	3	%
Temperature Stability (2)	ΔF _{OSC}	-25°C ≤ Ta ≤ 85°C	0	±5	±10	%
Maximum Duty Cycle	D _{MAX}	-	75	80	85	%
Minimum Duty Cycle	D _{MIN}	-	-	-	0	%
FEEDBACK SECTION						
Feedback Source Current	I _{FB}	V _{FB} = GND	0.7	0.9	1.1	mA
Shutdown Feedback Voltage	V _{SD}	V _{FB} ≥ 6.9V	6.9	7.5	8.1	V
Shutdown Delay Current	I _{DELAY}	V _{FB} = 5V	3.2	4.0	4.8	μA
SOFTSTART SECTION						
Softstart Voltage	V _{SS}	V _{FB} = 2	4.7	5.0	5.3	V
Softstart Current	I _{SS}	V _{SS} = V	0.8	1.0	1.2	mA
BURST MODE SECTION						
Burst Mode Low Threshold Voltage	V _{BURL}	V _{FB} = 0V	10.4	11.0	11.6	V
Burst Mode High Threshold Voltage	V _{BURH}	V _{FB} = 0V	11.4	12.0	12.6	V
Burst Mode Enable Feedback Voltage	V _{BEN}	V _{CC} = 10.5V	0.7	1.0	1.3	V
Burst Mode Peak Current Limit (4)	I _{BURPK}	V _{CC} = 10.5V, V _{FB} = 0V	0.38	0.5	0.62	A
Burst Mode Frequency	F _{BUR}	V _{CC} = 10.5V, V _{FB} = 0V	63	70	77	kHz
CURRENT LIMIT(SELF-PROTECTION)SECTION						
Peak Current Limit (4)	I _{OVER}	-	1.76	2.0	2.24	A
PROTECTION SECTION						
Over Voltage Protection	V _{OV} P	V _{CC} ≥ 29V	29	33	37	V
Over Current Latch Voltage (3)	V _{OCL}	-	1.8	2.0	2.2	V
Thermal Shutdown Temp (2)	T _{SD}	-	140	160	-	°C
TOTAL DEVICE SECTION						
Start Up Current	I _{START}	V _{FB} = GND, V _{CC} = 14V	-	0.1	0.17	mA
Operating Supply Current (1)	I _{OP}	V _{FB} = GND, V _{CC} = 16V	-	10	15	mA
	I _{OP(MIN)}	V _{FB} = GND, V _{CC} = 12V				
	I _{OP(MAX)}	V _{FB} = GND, V _{CC} = 30V				

Notes:

1. These parameters are the current flowing in the control IC.
2. These parameters, although guaranteed at the design, are not 100% tested in production.
3. These parameters, although guaranteed, are tested in EDS(wafer test) process.
4. These parameters indicate inductor current.

Typical Performance Characteristics

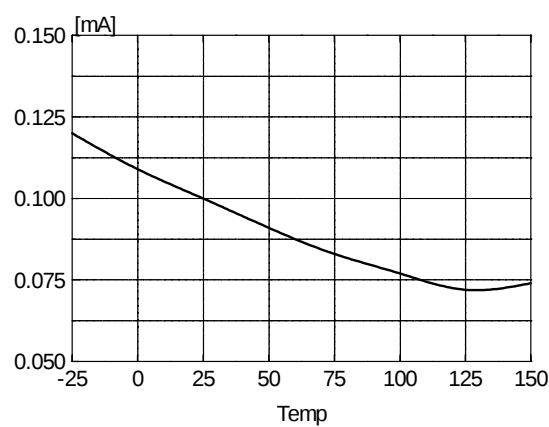


Figure 1. Start Up Current vs. Temp

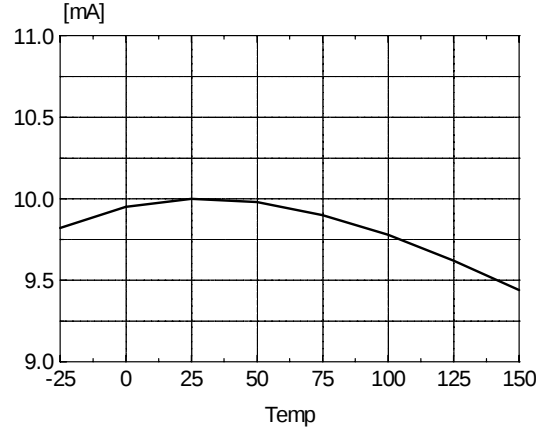


Figure 2. Operating Current vs. Temp

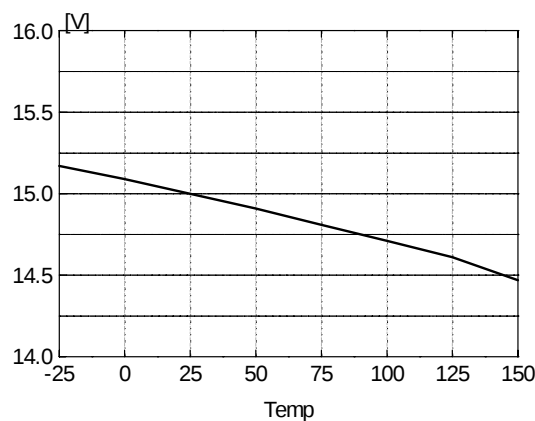


Figure 3. Start Threshold Voltage vs. Temp

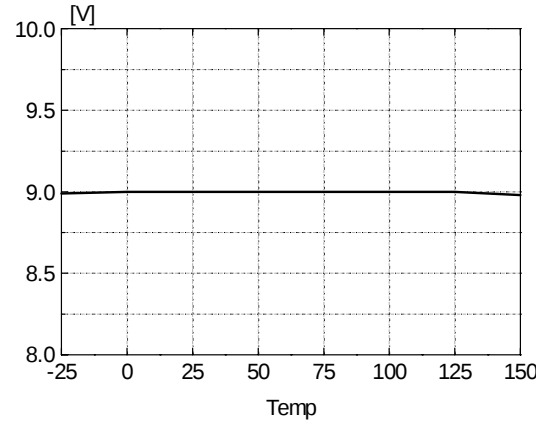


Figure 4. Stop Threshold Voltage vs. Temp

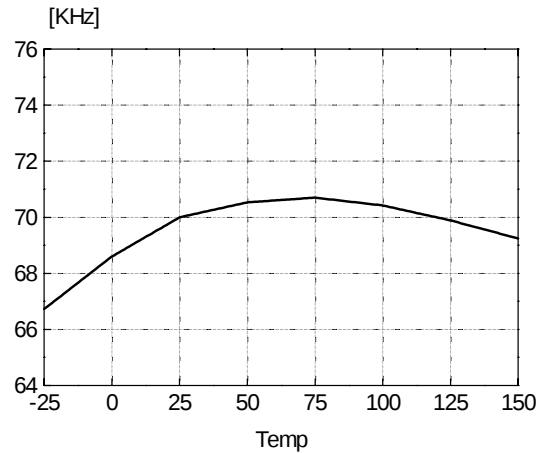


Figure 5. Initial Frequency vs. Temp

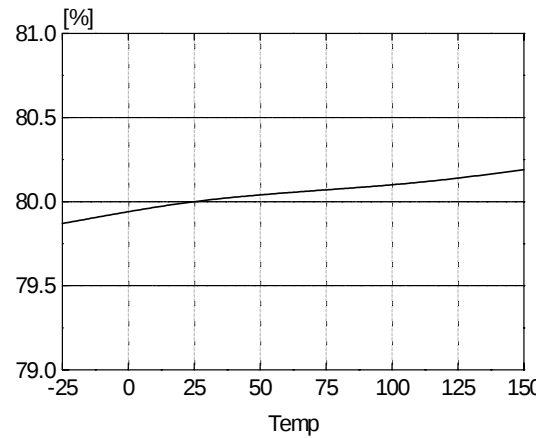


Figure 6. Maximum Duty vs. Temp

Typical Performance Characteristics (Continued)

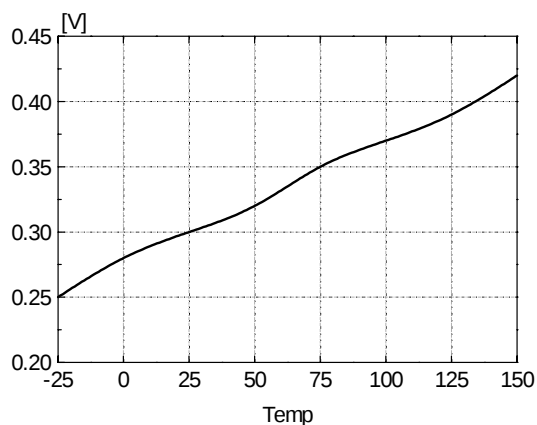


Figure 7. Feedback Offset Voltage vs. Temp

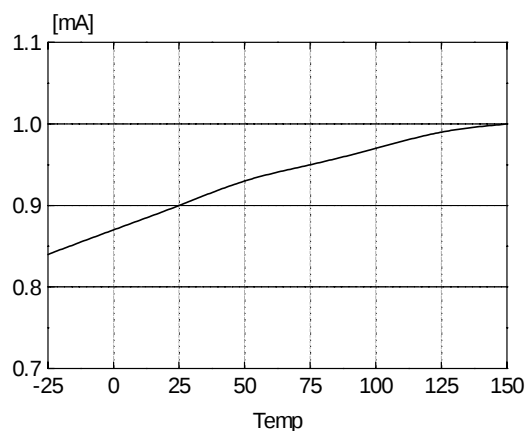


Figure 8. Feedback Source Current vs. Temp

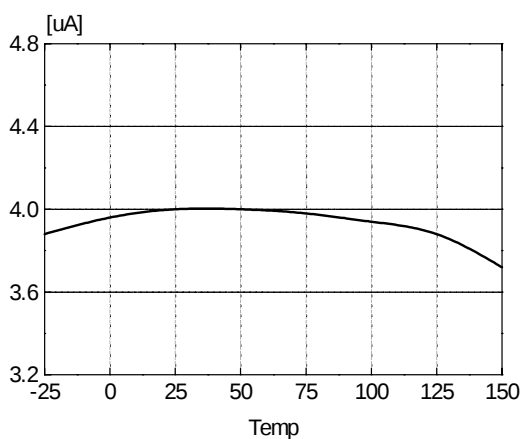


Figure 9. ShutDown Delay Current vs. Temp

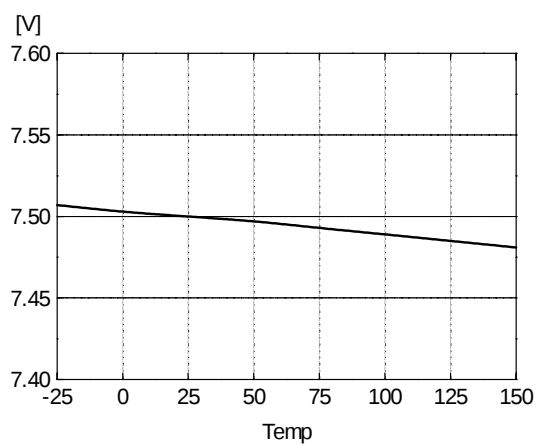


Figure 10. ShutDown Feedback Voltage vs. Temp

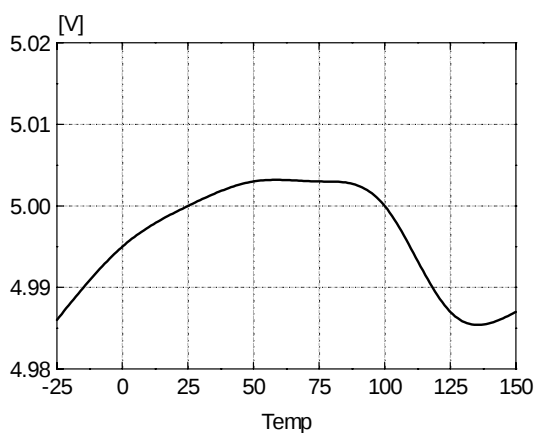


Figure 11. Softstart Voltage vs. Temp

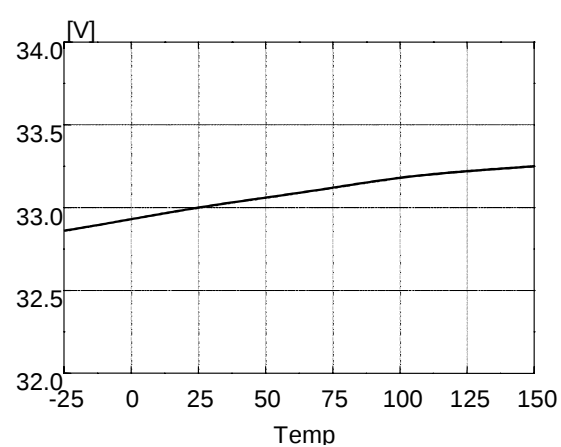


Figure 12. Over Voltage Protection vs. Temp

Typical Performance Characteristics (Continued)

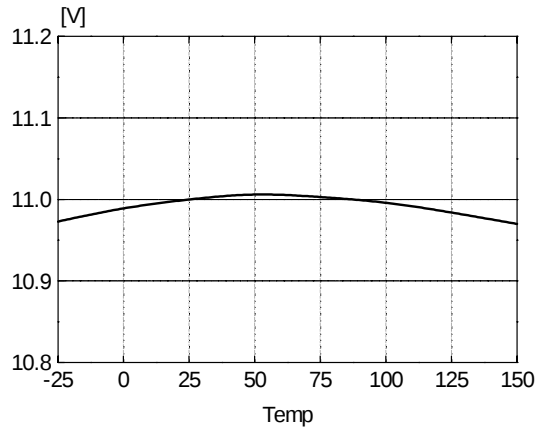


Figure 13. Burst Mode Low Voltage vs. Temp

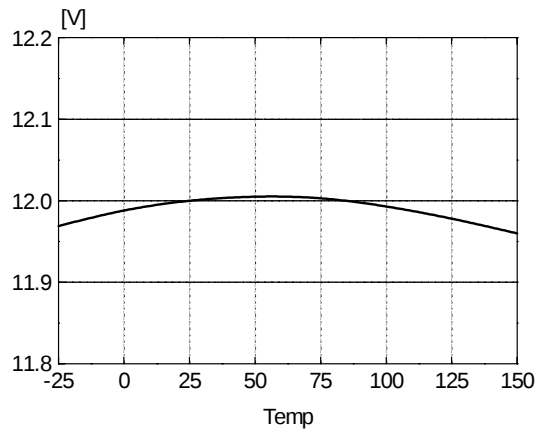


Figure 14. Burst Mode High Voltage vs. Temp

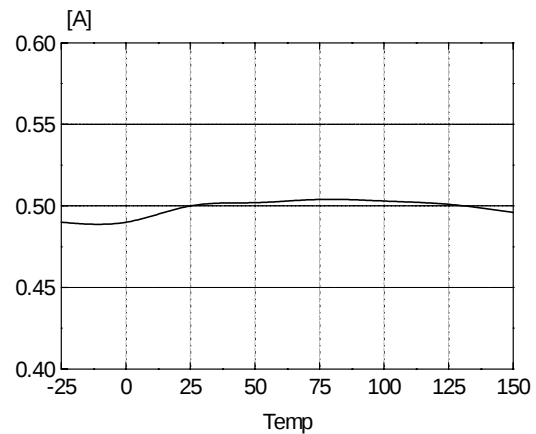


Figure 15. Burst Mode Peak Current vs. Temp

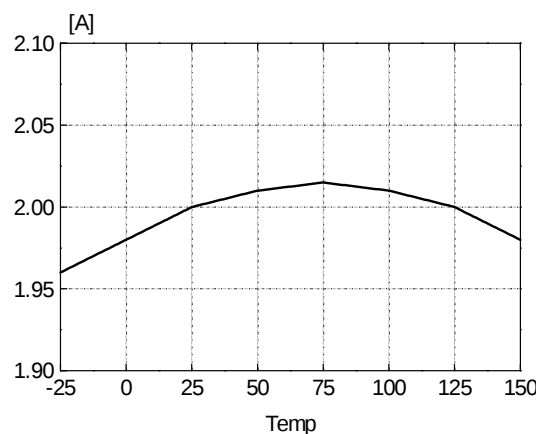
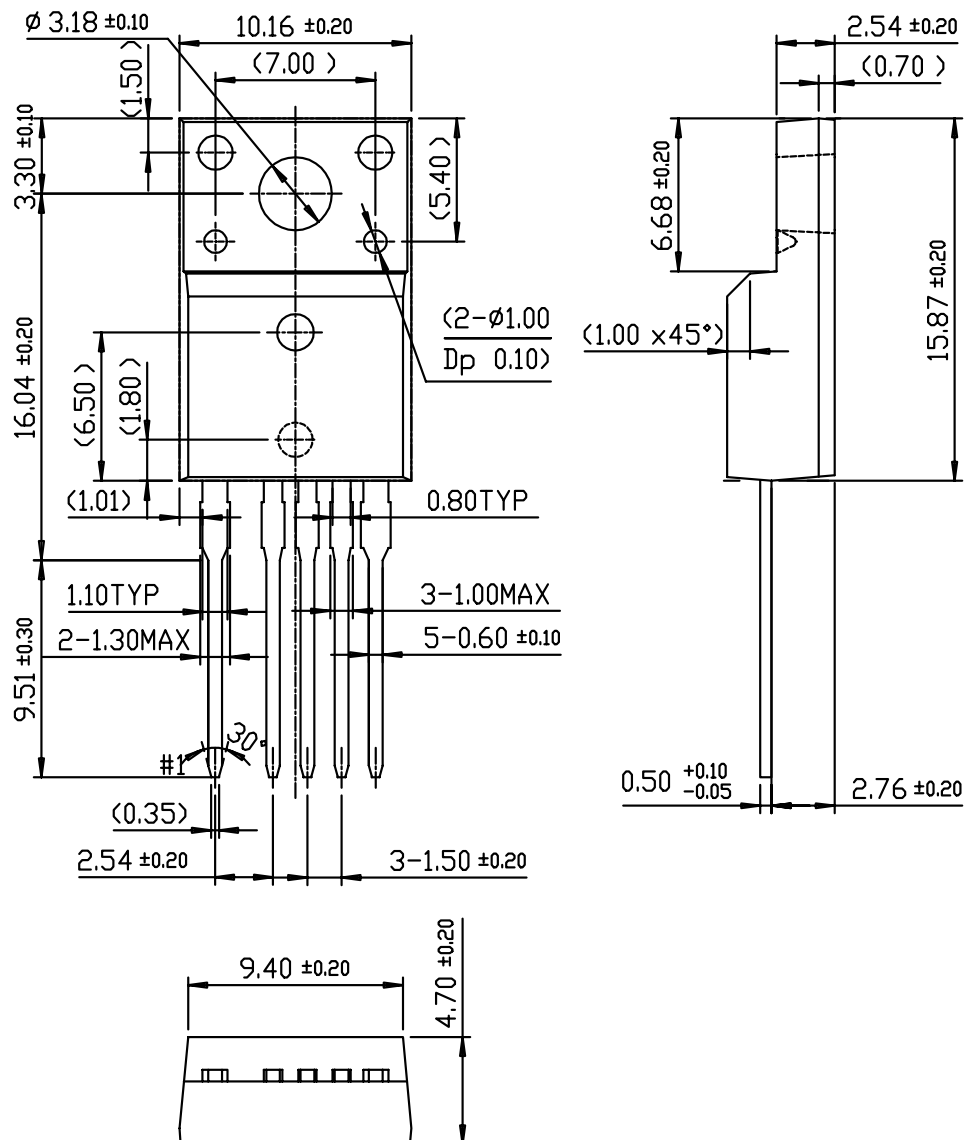


Figure 16. Over Current Limit vs. Temp

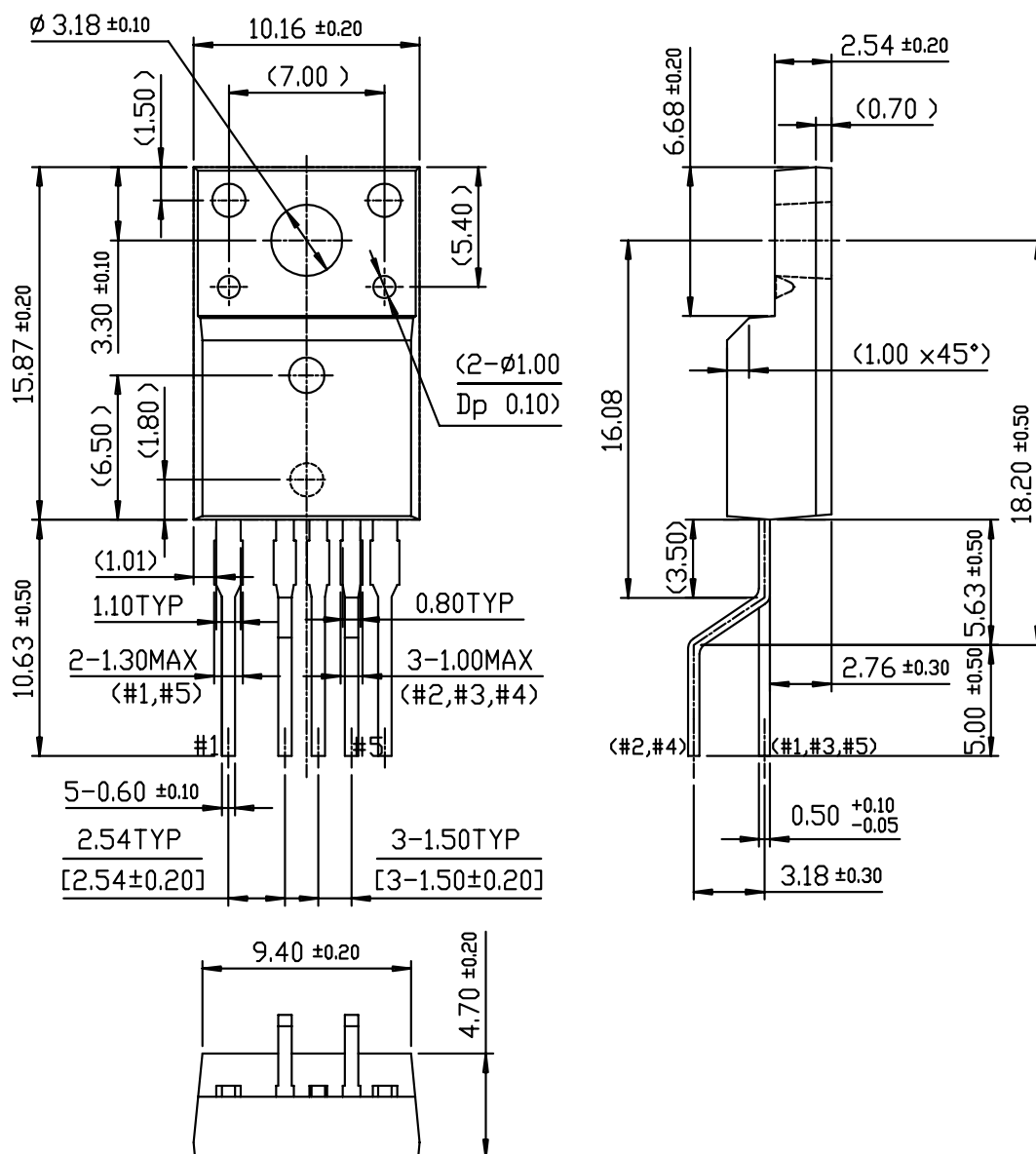
Package Dimensions

TO-220F-5L



Package Dimensions (Continued)

TO-220F-5L(Forming)



Ordering Information

Product Number	Package	Marking Code	BVdss	Rds(on)
FS6M07652RTCTU	TO-220F-5L	6M07652R C	650V	1.6
FS6M07652RTCYDT	TO-220F-5L(Forming)			

TU : Non Forming Type

YDT : Forming Type

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