# FS6M07652RTC

## Fairchild Power Switch(FPS)

## Features

- 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

## Application

- LCD Monitor SMPS
- Adaptor

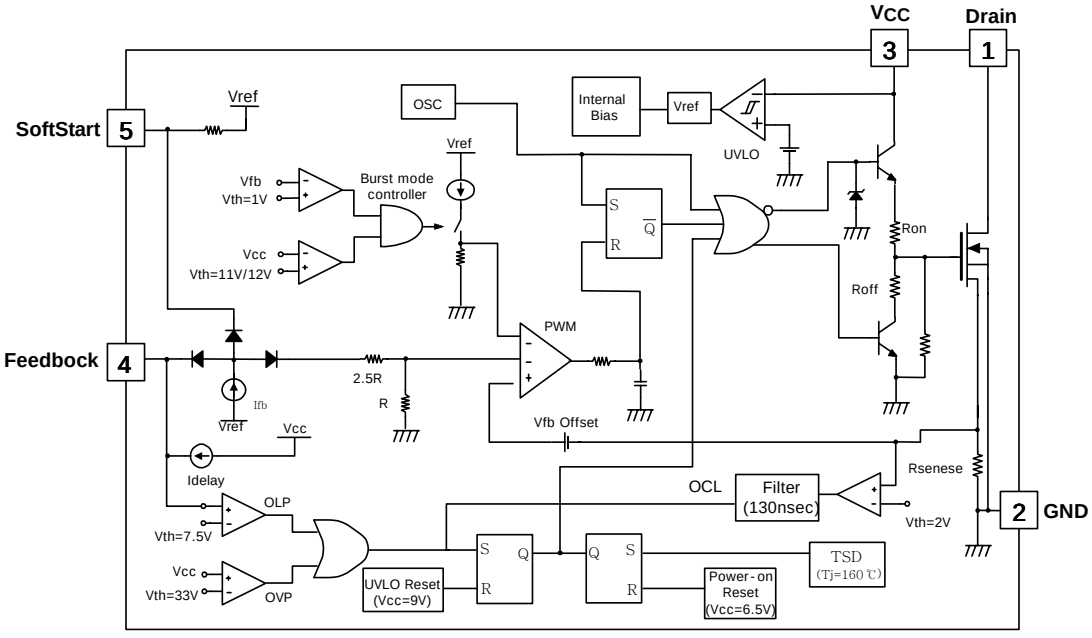
## Description

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 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.

**TO-220F-5L**


1. Drain 2. GND 3. $V_{CC}$
4. Feedback 5. SoftStart

## Internal Block Diagram




Rev.1.0.4

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## 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 | $A_{DC}$ |
| Continuous Drain Current (Tc = 25°C) | $I_D$ | 3.6 | $A_{DC}$ |
| Continuous Drain Current ($T_C$=100°C) | $I_D$ | 2.28 | $A_{DC}$ |
| Single Pulsed Avalanche Current(3)(Energy (2)) | $I_{AS}$($E_{AS}$) | 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 Tj=25°C
3. L=13uH, 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 | $BV_{DSS}$ | $V_{GS}$=0V, $I_D$=250μA | 650 | - | - | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=650V, $V_{GS}$=0V | - | - | 200 | μA |
| | | $V_{DS}$=520V<br>$V_{GS}$=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) | gfs | $V_{DS}$=50V, $I_D$=1.8A | - | 3.3 | - | S |
| Input Capacitance | Ciss | $V_{GS}$=0V, $V_{DS}$=25V,<br>f = 1MHz | - | 1200 | - | pF |
| Output Capacitance | Coss | | - | 125 | - | |
| Reverse Transfer Capacitance | Crss | | - | 23 | - | |
| Turn On Delay Time | td(on) | $V_{DD}$=325V, $I_D$=6.5A<br>(MOSFET switching time is essentially independent of operating temperature) | - | 22 | - | nS |
| Rise Time | tr | | - | 70 | - | |
| Turn Off Delay Time | td(off) | | - | 105 | - | |
| Fall Time | tf | | - | 65 | - | |
| Total Gate Charge<br>(Gate-Source+Gate-Drain) | Qg | $V_{GS}$=10V, $I_D$=6.5A,<br>$V_{DS}$=520V (MOSFET switching time is essentially independent of operating temperature) | - | 40 | - | nC |
| Gate-Source Charge | Qgs | | - | 6.5 | - | |
| Gate-Drain (Miller) Charge | Qgd | | - | 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) | $\Delta F_{OSC}$ | -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 | $V_{OVP}$ | $V_{CC}$ ≥ 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

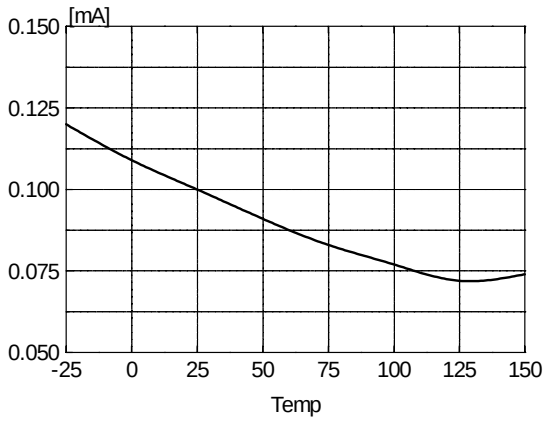



**Figure 1. Start Up Current vs. Temp**

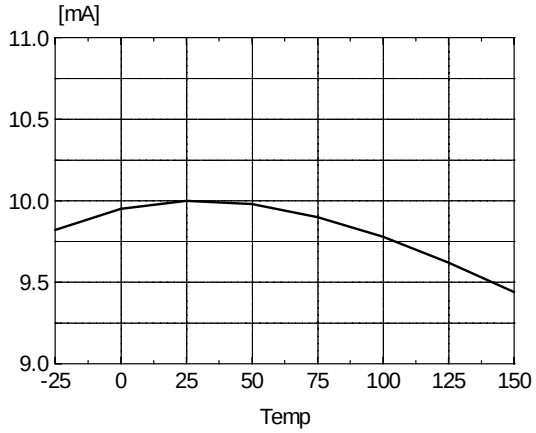



**Figure 2. Operating Current vs. Temp**

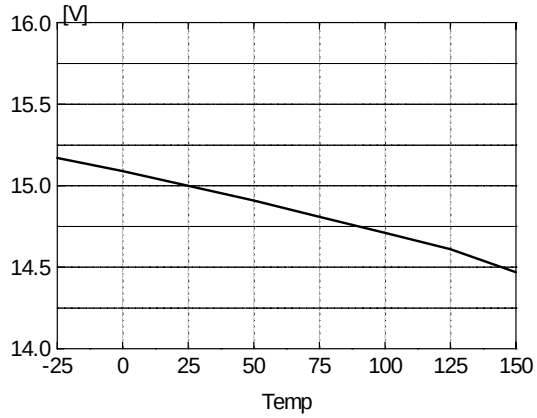



**Figure 3. Start Threshold Voltage vs. Temp**

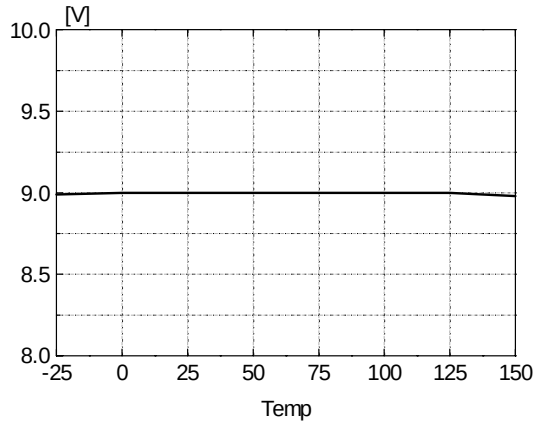



**Figure 4. Stop Threshold Voltage vs. Temp**

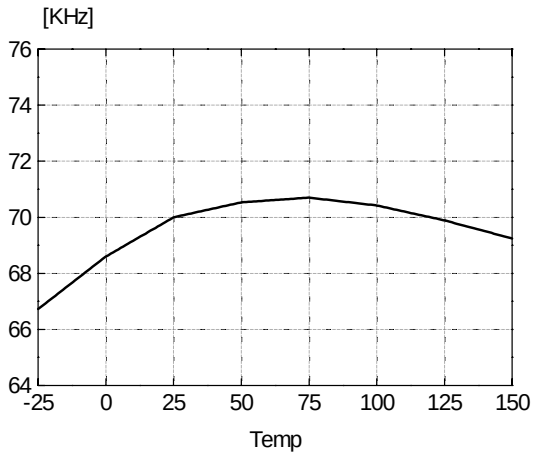



**Figure 5. Initial Freqency vs. Temp**

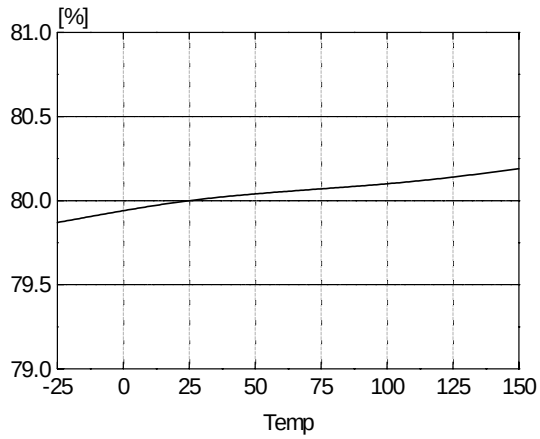



**Figure 6. Maximum Duty vs. Temp**

## Typical Performance Characteristics (Continued)

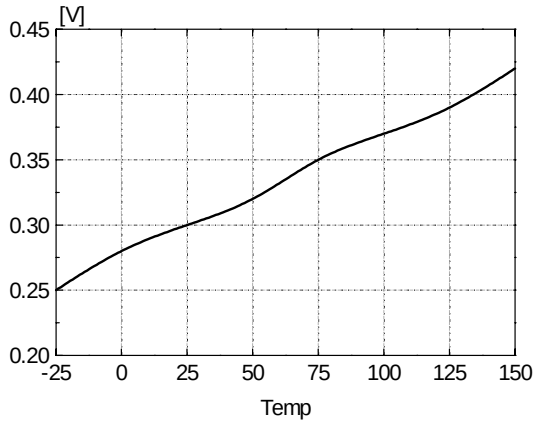



**Figure 7. Feedback Offset Voltage vs. Temp**

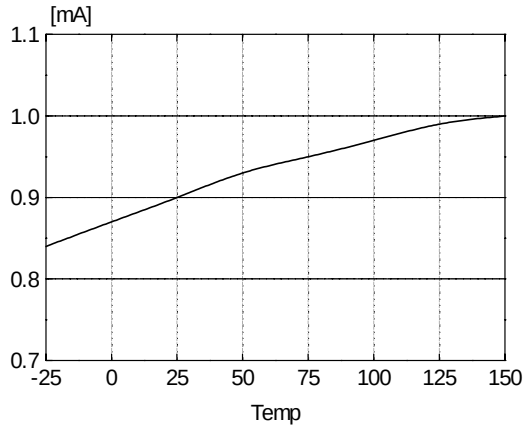



**Figure 8. Feedback Source Current vs. Temp**

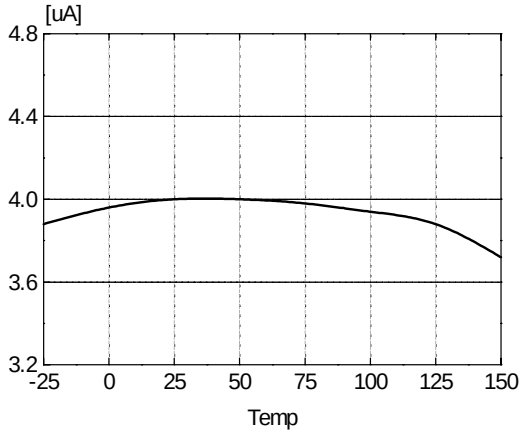



**Figure 9. ShutDown Delay Current vs. Temp**

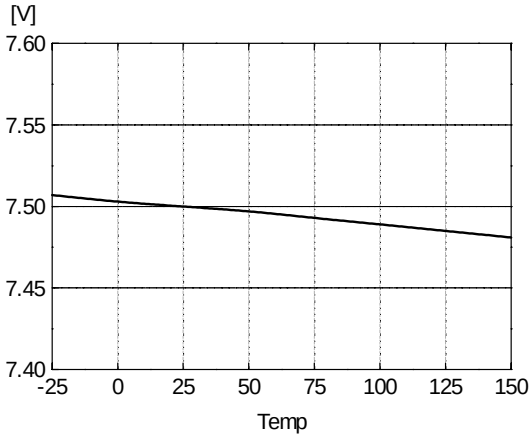



**Figure 10. ShutDown Feedback Voltage vs. Temp**

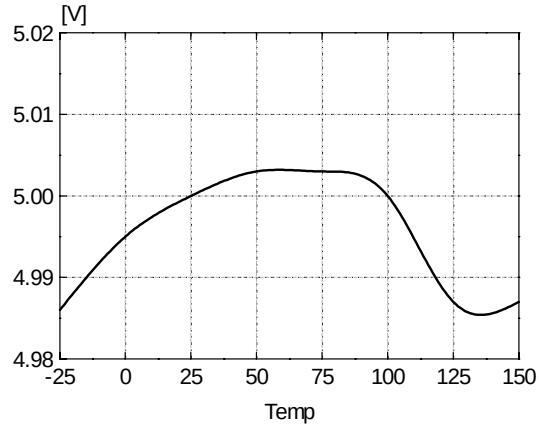



**Figure 11. Softstart Voltage vs. Temp**

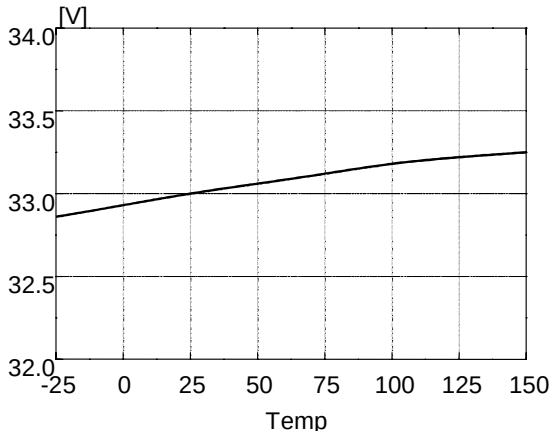



**Figure 12. Over Voltage Protection vs. Temp**

## Typical Performance Characteristics (Continued)

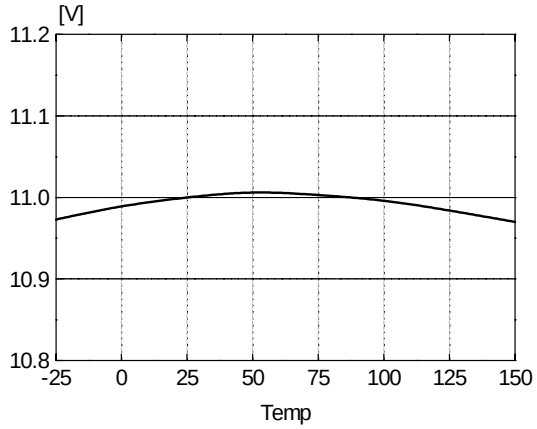



**Figure 13. Burst Mode Low Voltage vs. Temp**

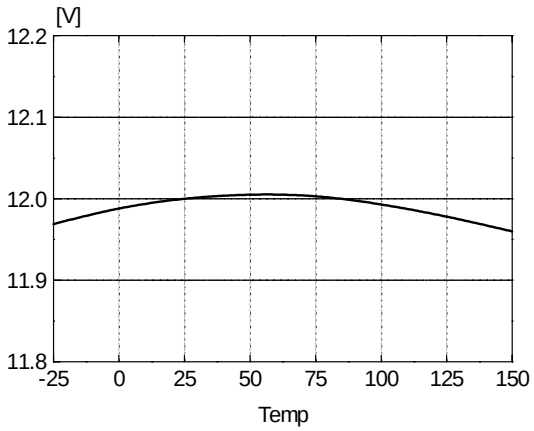



**Figure 14. Burst Mode High Voltage vs. Temp**

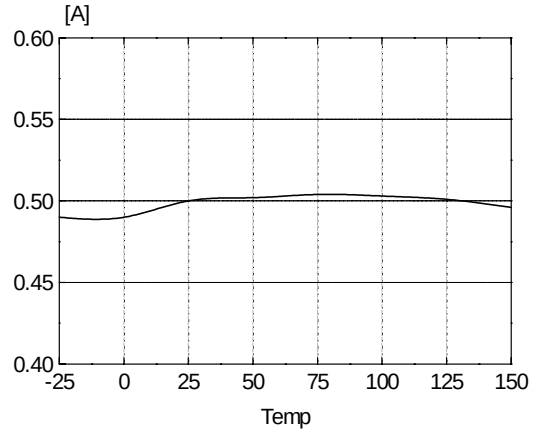



**Figure 15. Burst Mode Peak Current vs. Temp**

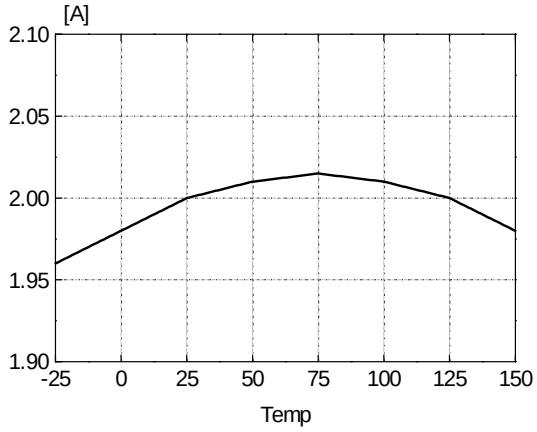
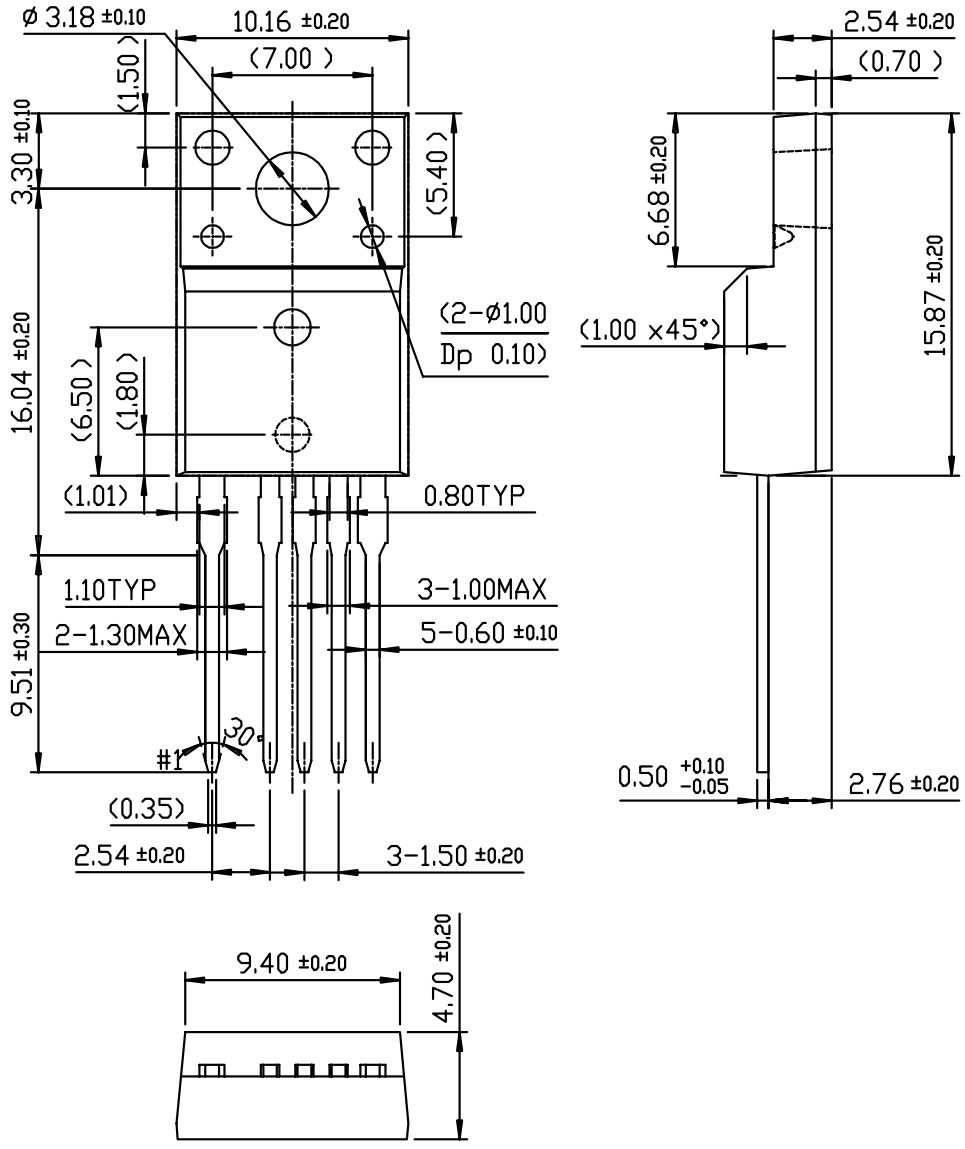



**Figure 16. Over Current Limit vs. Temp**

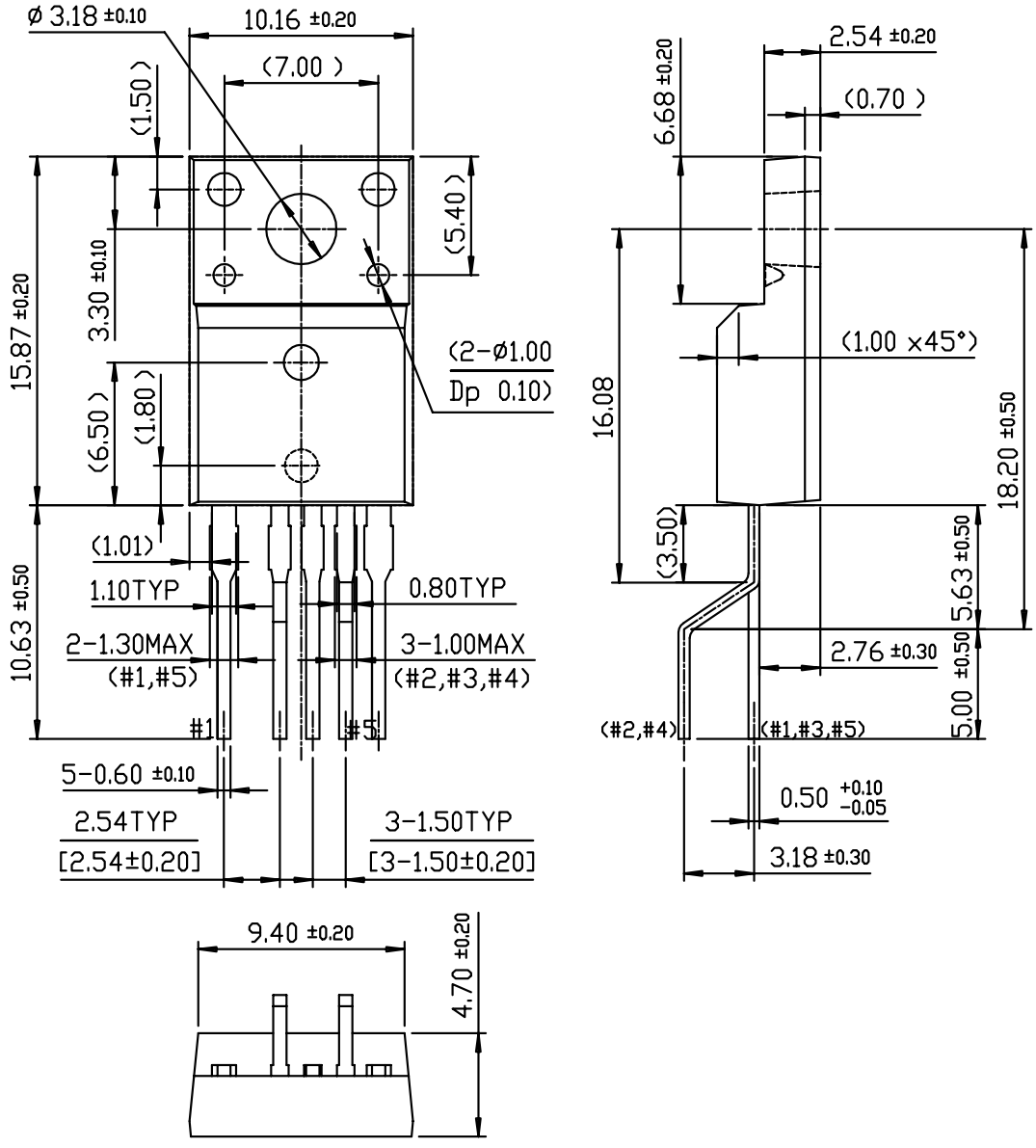
## Package Dimensions

# 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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