# KA1M0765R/KA1M0765RC

## Fairchild Power Switch(FPS)

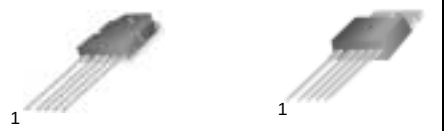
## Features

- Precision fixed operating frequency (67kHz)
- Pulse by pulse current limiting
- Over load protection
- Over voltage protecton (Min. 23V)
- Internal thermal shutdown function
- Under voltage lockout
- Internal high voltage sense FET
- Auto restart
- Soft start

## Description

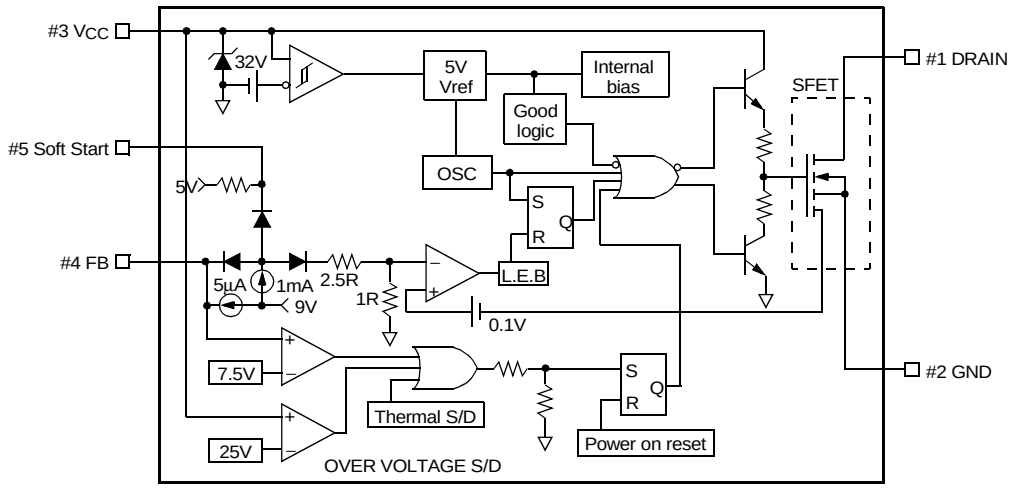
The Fairchild Power Switch(FPS) product family is specially designed for an off line SMPS with minimal external components. The Fairchild Power Switch(FPS) consist of high voltage power SenseFET and current mode PWM controller IC. PWM controller features integrated fixed frequency oscillator, under voltage lock out, leading edge blanking, optimized gate turn-on/turn-off driver, thermal shutdown protection, over voltage protection, temperature compensated precision current sources for loop compensation and fault protection circuit. compared to discrete MOSFET and PWM controller or $R_{CC}$ solution, a Fairchild Power Switch(FPS) can reduce total component count, design size, weight and at the same time increase efficiency, productivity, and system reliability. It has a basic platform well suited for cost effective design in either a flyback converter or a forward converter.

**TO-3P-5L** **TO-220-5L**




1. DRAIN 2. GND 3. Vcc 4. FB 5. S/S

## Internal Block Diagram




Rev.1.0.2

## Absolute Maximum Ratings

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Maximum Drain voltage (1) | $V_{D,MAX}$ | 650 | V |
| Drain-Gate voltage ($R_{GS}$=1MΩ) | $V_{DGR}$ | 650 | V |
| Gate-source (GND) voltage | $V_{GS}$ | ±30 | V |
| Drain current pulsed (2) | $I_{DM}$ | 28.0 | $A_{DC}$ |
| Single pulsed avalanche energy (3) | $E_{AS}$ | 570 | mJ |
| Continuous drain current ($T_C$=25°C) | $I_D$ | 7.0 | $A_{DC}$ |
| Continuous drain current ($T_C$=100°C) | $I_D$ | 5.6 | $A_{DC}$ |
| Maximum Supply voltage | $V_{CC,MAX}$ | 30 | V |
| Input voltage range | $V_{FB}$ | –0.3 to $V_{SD}$ | V |
| Total power dissipation | $P_D$ | 140 | W |
| | Derating | 1.11 | W/°C |
| Operating ambient temperature | $T_A$ | –25 to +85 | °C |
| Storage temperature | $T_{STG}$ | –55 to +150 | °C |

**Notes:**

1. Tj=25°C to 150°C
2. Repetitive rating: Pulse width limited by maximum junction temperature
3. L=24mH, $V_{DD}$=50V, $R_G$=25Ω, starting Tj=25°C

## Electrical Characteristics (SFET part)

(Ta = 25°C unless otherwise specified)

| Characteristic | Symbol | Test condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Drain-source breakdown voltage | $BV_{DSS}$ | $V_{GS}$=0V, $I_D$=50μA | 650 | - | - | 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 | mA |
| Static drain-source on resistance (note) | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=4.0A | - | 1.25 | 1.6 | W |
| Forward transconductance (note) | gfs | $V_{DS}$=15V, $I_D$=4.0A | 3.0 | - | - | S |
| Input capacitance | Ciss | $V_{GS}$=0V, $V_{DS}$=25V, f=1MHz | - | 1600 | - | pF |
| Output capacitance | Coss | | - | 310 | - | |
| Reverse transfer capacitance | Crss | | - | 120 | - | |
| Turn on delay time | $t_{d(on)}$ | $V_{DD}$=0.5$BV_{DSS}$, $I_D$=7.0A (MOSFET switching time are essentially independent of operating temperature) | - | 25 | - | nS |
| Rise time | tr | | - | 55 | - | |
| Turn off delay time | $t_{d(off)}$ | | - | 80 | - | |
| Fall time | tf | | - | 50 | - | |
| Total gate charge (gate-source+gate-drain) | Qg | $V_{GS}$=10V, $I_D$=7.0A, $V_{DS}$=0.5$BV_{DSS}$ (MOSFET switching time are essentially independent of operating temperature) | - | - | 72 | nC |
| Gate source charge | Qgs | | - | 9.3 | - | |
| Gate drain (Miller) charge | Qgd | | - | 29.3 | - | |

**Note:**

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

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

## Electrical Charcteristics (CONTROL part)

(Ta = 25°C unless otherwise specified)

| Characteristic | Symbol | Test condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **UVLO SECTION** | | | | | | |
| Start threshold voltage | $V_{START}$ | - | 14 | 15 | 16 | V |
| Stop threshold voltage | $V_{STOP}$ | After turn on | 9 | 10 | 11 | V |
| **OSCILLATOR SECTION** | | | | | | |
| Initial accuracy | $F_{OSC}$ | Ta=25°C | 61 | 67 | 73 | kHz |
| Frequency change with temperature (2) | $\Delta F/\Delta T$ | –25°C ≤ Ta ≤ +85°C | - | ±5 | ±10 | % |
| Maximum duty cycle | Dmax | - | 74 | 77 | 80 | % |
| **FEEDBACK SECTION** | | | | | | |
| Feedback source current | $I_{FB}$ | Ta=25°C, 0V ≤Vfb ≤ 3V | 0.7 | 0.9 | 1.1 | mA |
| Shutdown Feedback voltage | $V_{SD}$ | - | 6.9 | 7.5 | 8.1 | V |
| Shutdown delay current | Idelay | Ta=25°C, 5V ≤ Vfb ≤ $V_{SD}$ | 4.0 | 5.0 | 6.0 | µA |
| **SOFT START SECTION** | | | | | | |
| Soft Start Voltage | $V_{SS}$ | $V_{FB}$ =2V | 4.7 | 5.0 | 5.3 | V |
| Soft Start Current | $I_{SS}$ | Sync & S/S=GND | 0.8 | 1.0 | 1.2 | mA |
| **REFERENCE SECTION** | | | | | | |
| Output voltage (1) | Vref | Ta = 25°C | 4.80 | 5.00 | 5.20 | V |
| Temperature Stability (1)(2) | Vref/ΔT | –25°C ≤ Ta ≤ +85°C | - | 0.3 | 0.6 | mV/°C |
| **CURRENT LIMIT (SELF-PROTECTION) SECTION** | | | | | | |
| Peak Current Limit | $I_{OVER}$ | Max. inductor current | 4.40 | 5.00 | 5.60 | A |
| **PROTECTION SECTION** | | | | | | |
| Thermal shutdown temperature (Tj) (1) | $T_{SD}$ | - | 140 | 160 | - | °C |
| Over voltage protection voltage | $V_{OVP}$ | - | 23 | 25 | 28 | V |
| **TOTAL DEVICE SECTION** | | | | | | |
| Start Up current | $I_{START}$ | $V_{CC}$=14V | 0.1 | 0.3 | 0.4 | mA |
| Operating supply current (control part only) | $I_{OP}$ | Ta=25°C | 6 | 12 | 18 | mA |
| $V_{CC}$ zener voltage | $V_Z$ | $I_{CC}$=20mA | 30 | 32.5 | 35 | V |

**Note:**

1. These parameters, although guaranteed, are not 100% tested in production
2. These parameters, although guaranteed, are tested in EDS(water test) process
3.The amplitude of the sync. pulse is recommended to be between 2V and 3V for stable sync. function.

## Typical Performance Characteristics

(These characteristic graphs are normalized at Ta = 25°C)

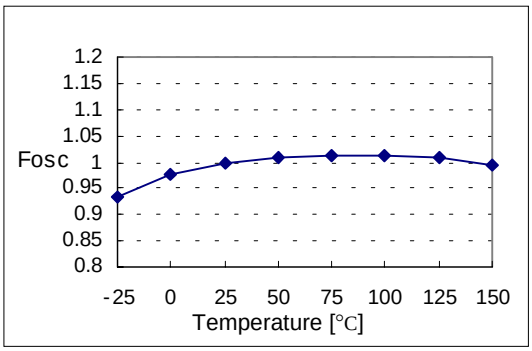



**Figure 1. Operating Frequency**

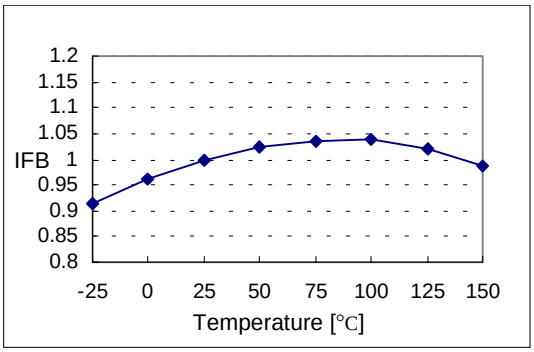



**Figure 2. Feedback Source Current**

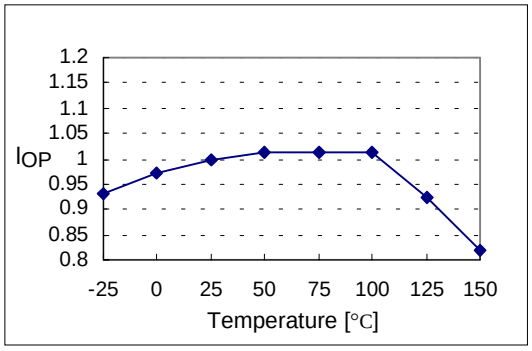



**Figure 3. Operating Supply Current**

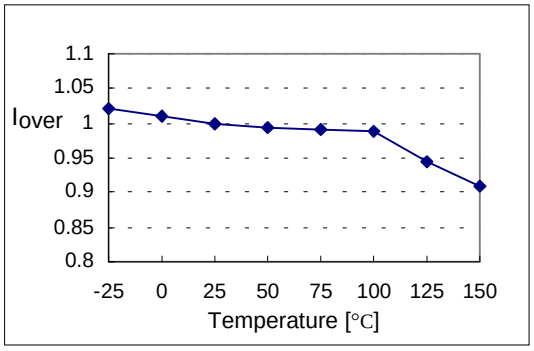



**Figure 4. Peak Current Limit**

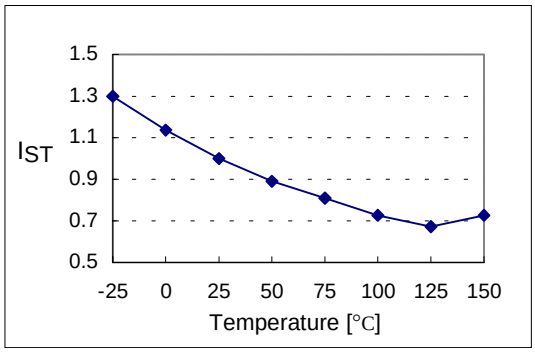



**Figure 5. Start up Current**

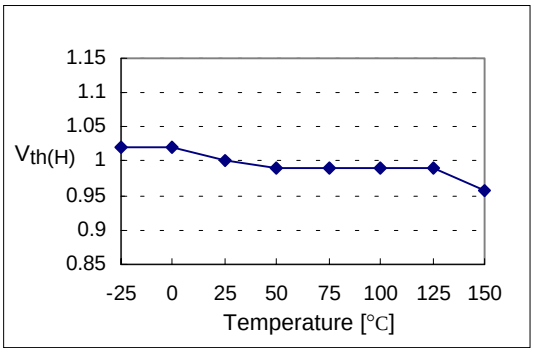



**Figure 6. Start Threshold Voltage**

## Typical Performance Characteristics (Continued)

(These characteristic graphs are normalized at Ta = 25°C)

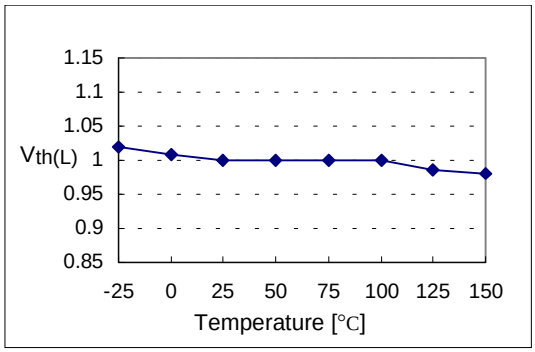



**Figure 7. Stop Threshold Voltage**

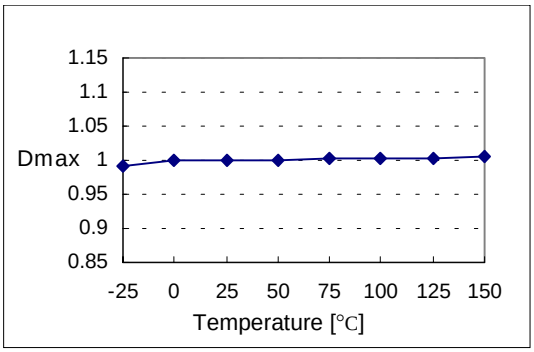



**Figure 8. Maximum Duty Cycle**

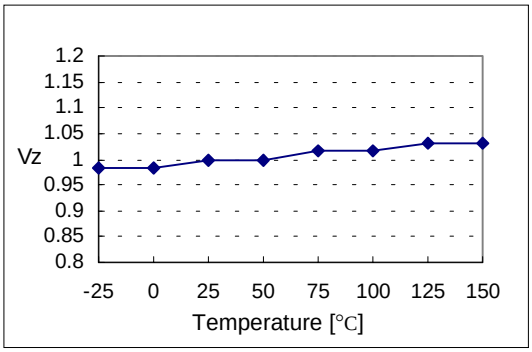



**Figure 9. $V_{CC}$ Zener Voltage**

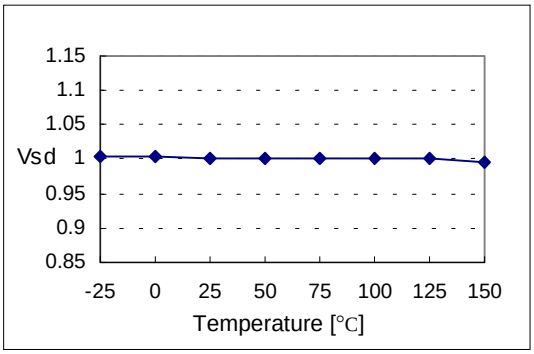



**Figure 10. Shutdown Feedback Voltage**

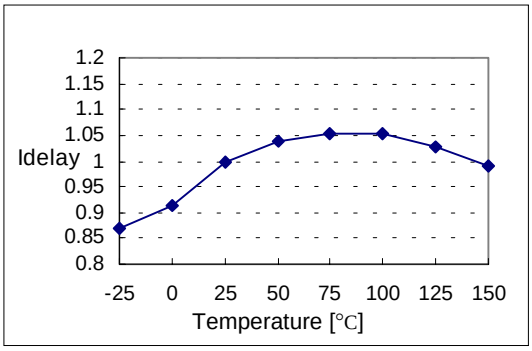



**Figure 11. Shutdown Delay Current**

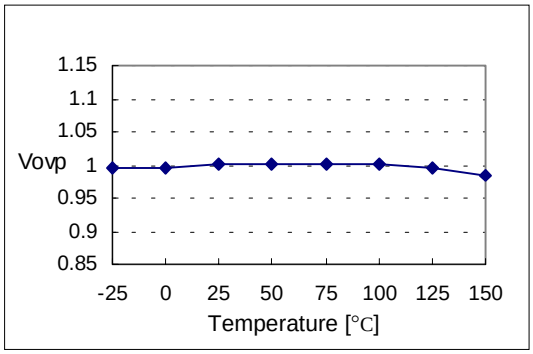



**Figure 12. Over Voltage Protection**

## Typical Performance Characteristics (Continued)

(These characteristic graphs are normalized at Ta = 25°C)

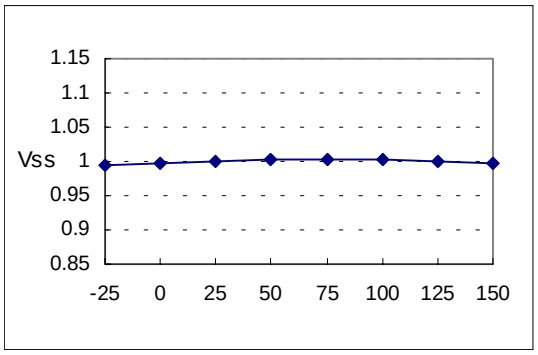



**Figure13. Soft Start Voltage**

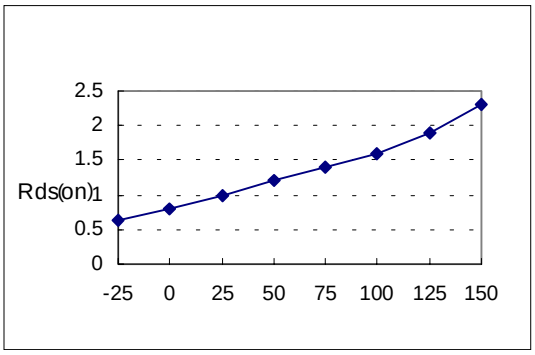
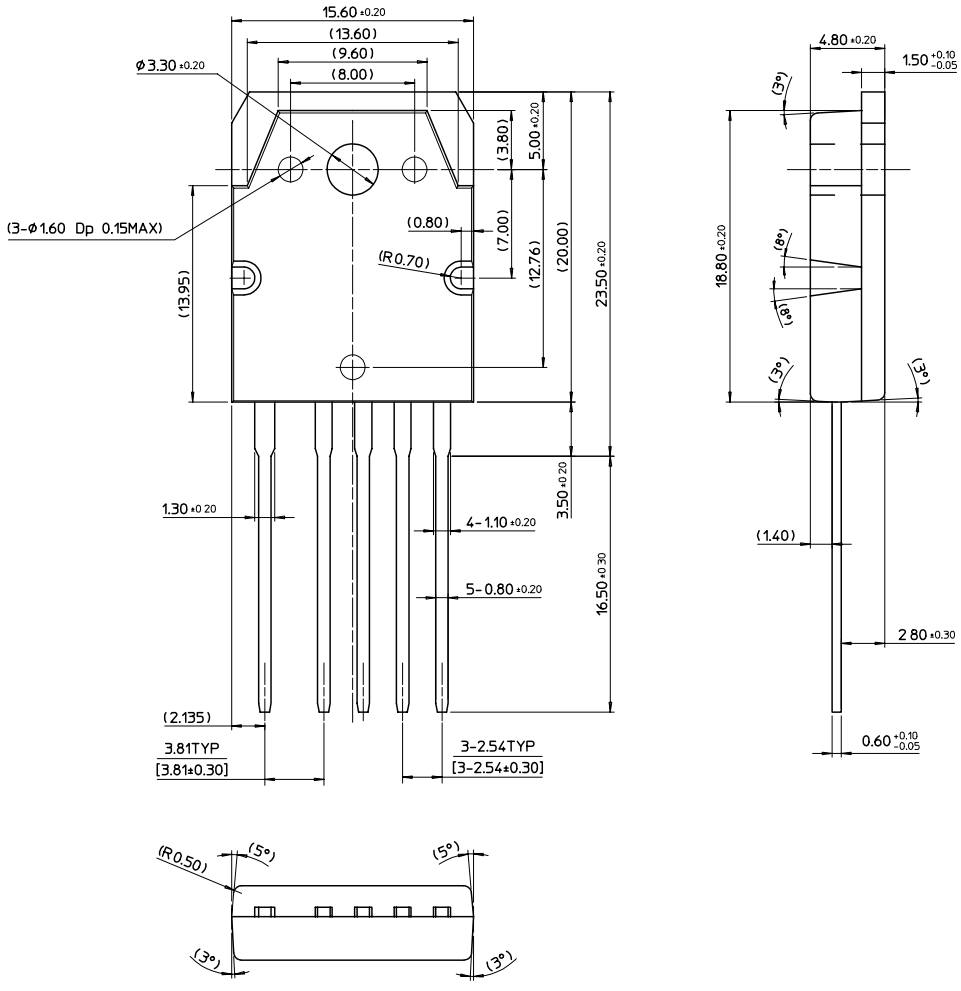



**Figure 14. Static Drain-Source on Resistance**

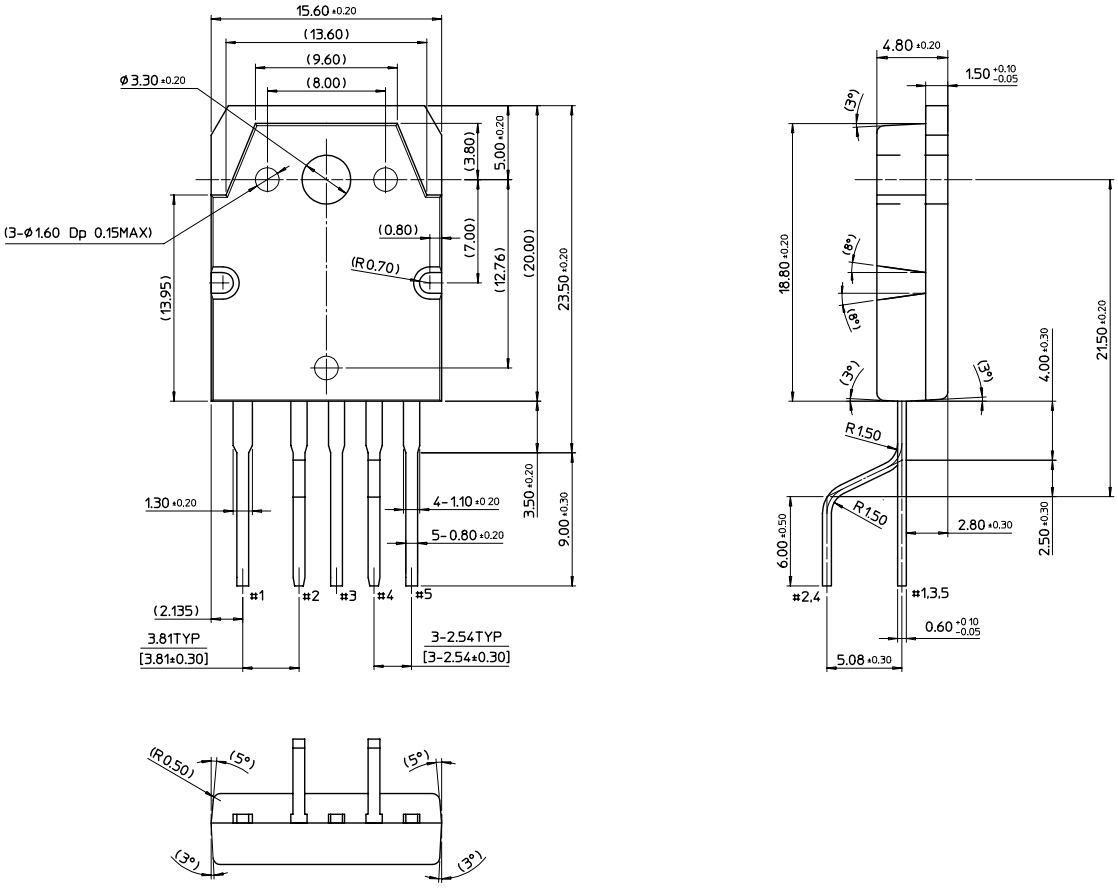
## Package Dimensions

# TO-3P-5L



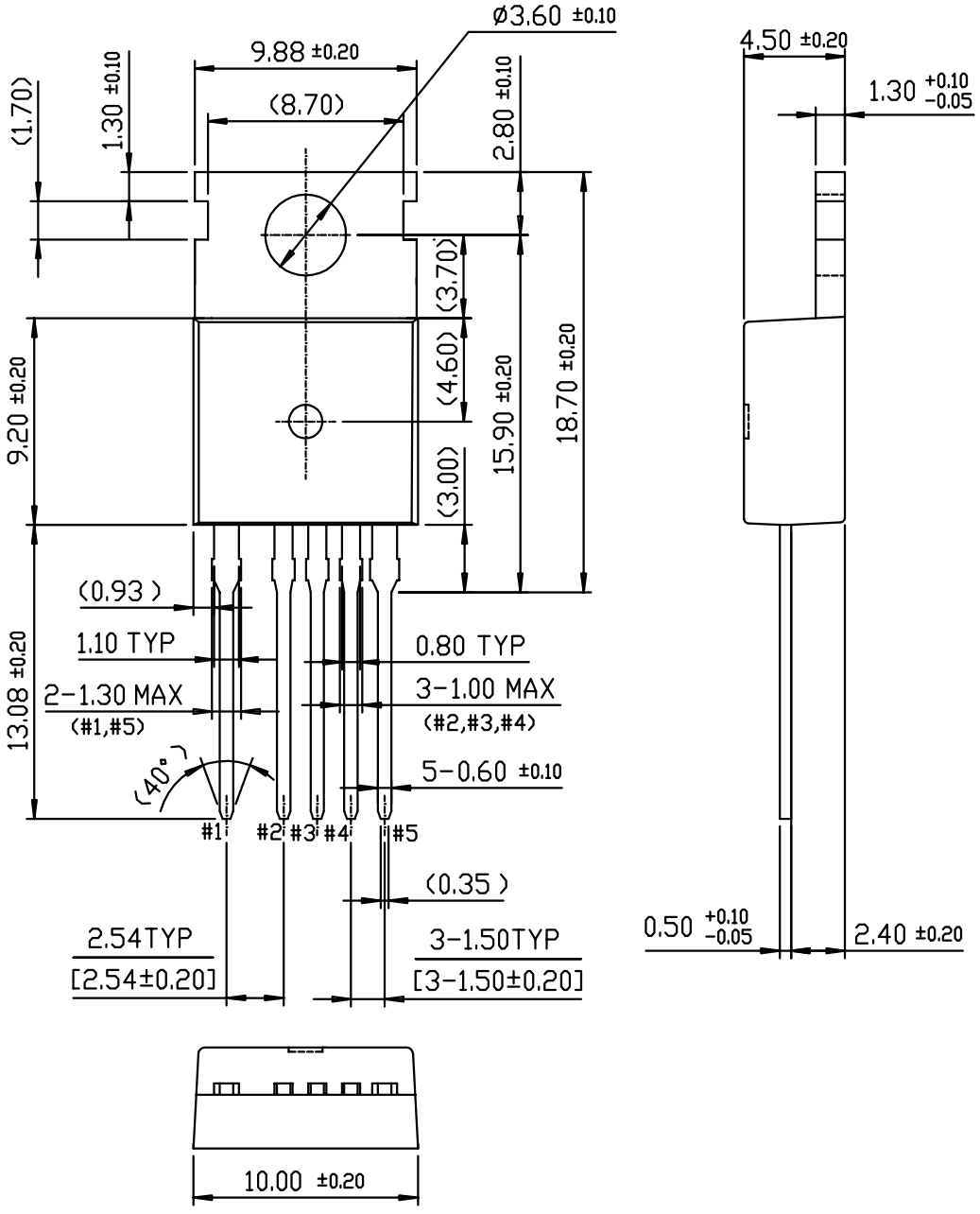
## Package Dimensions (Continued)

# TO-3P-5L (Forming)



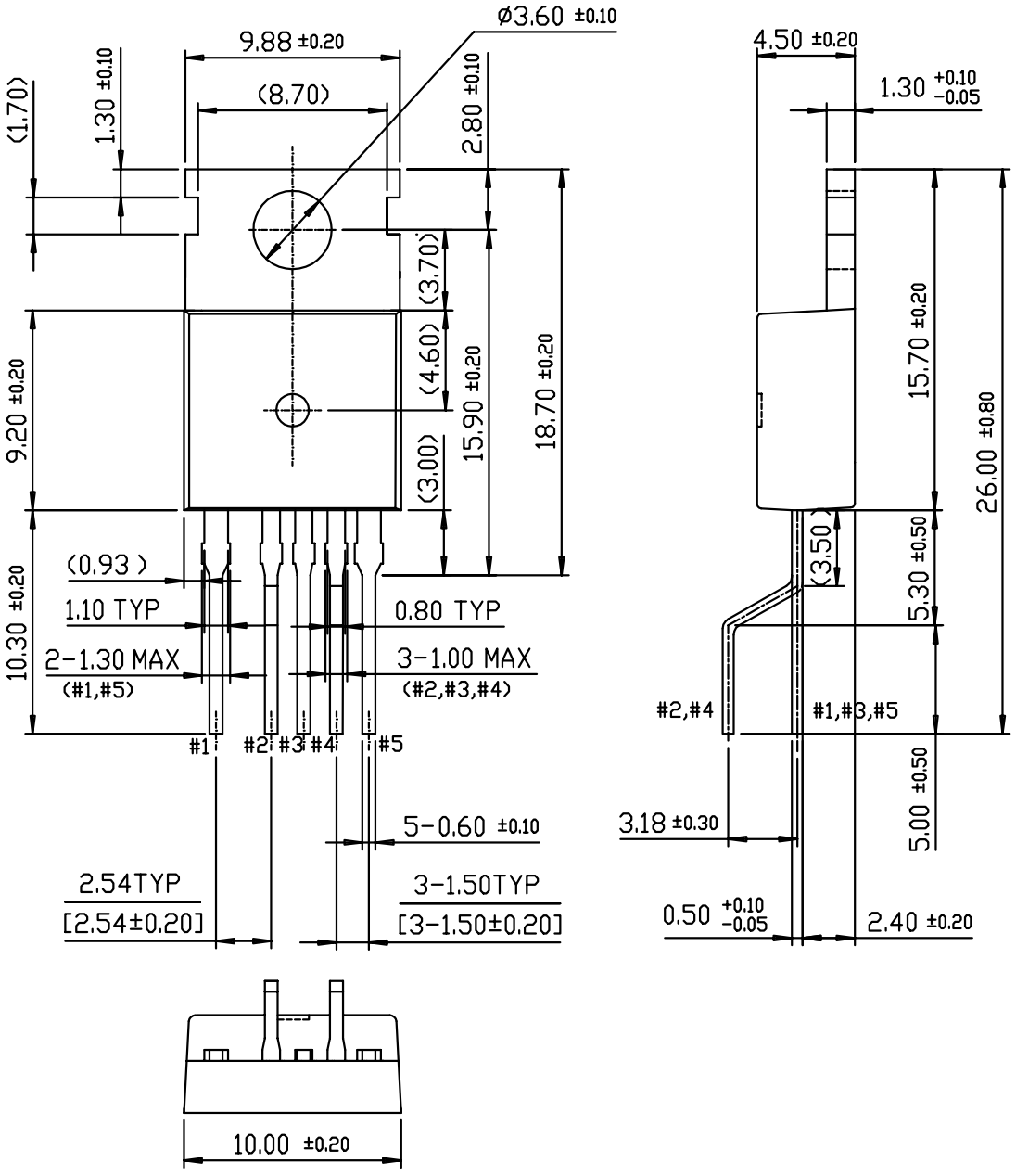
## Package Dimensions (Continued)

# TO-220-5L



## Package Dimensions (Continued)

# TO-220-5L(Forming)



## Ordering Information

| Product Number | Package | Rating | Fosc |
|---|---|---|---|
| KA1M0765R-TU | TO-3P-5L | 650V, 7A | 67kHz |
| KA1M0765R-YDTU | TO-3P-5L(Forming) | | |
| KA1M0765RC-TU | TO-220-5L | 650V, 7A | 67kHz |
| KA1M0765RC-YDTU | TO-220-5L(Forming) | | |

TU : Non Forming Type
YDTU : Forming Type





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Stock#DSxxxxxxxx