

# FM600TU-3A

HIGH POWER SWITCHING USE  
INSULATED PACKAGE

## FM600TU-3A



- ID(rms) .....300A
- VDSS..... 150V
- Insulated Type
- 6-elements in a pack
- Thermistor inside
- UL Recognized

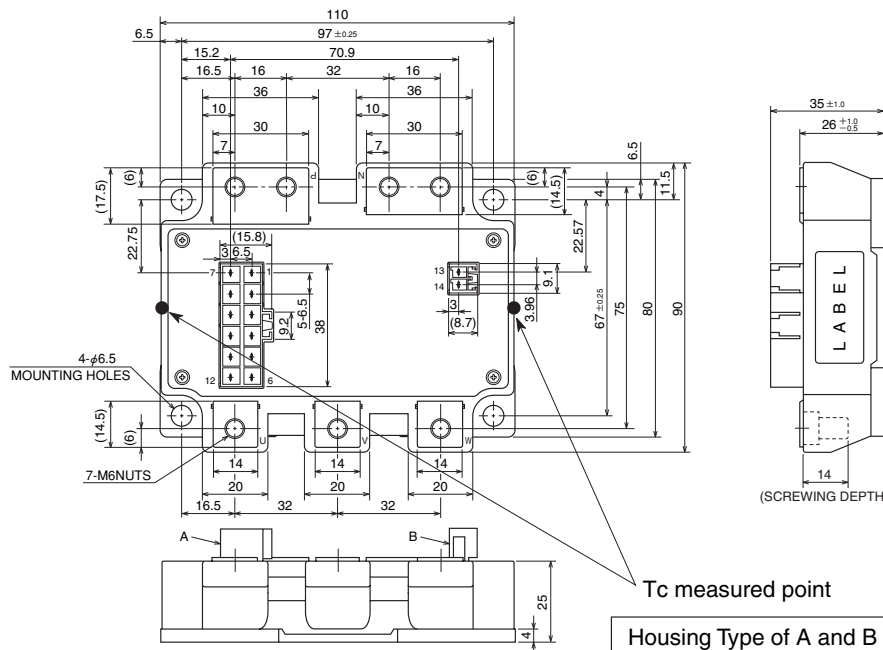
Yellow Card No.E80276  
File No.E80271

## APPLICATION

AC motor control of forklift (battery power source), UPS

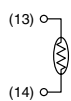
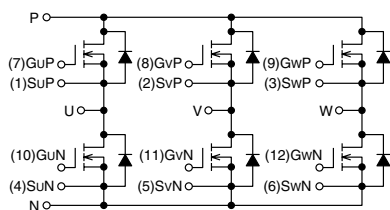
## OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm



Tc measured point  
Housing Type of A and B  
(Tyco Electronics P/N:)  
A: 917353-1  
B: 179838-1

### CIRCUIT DIAGRAM



|         |         |        |         |         |         |   |
|---------|---------|--------|---------|---------|---------|---|
| (1)SuP  | (2)SvP  | (3)SwP | (4)SuN  | (5)SvN  | (6)SwN  | A |
| (7)GuP  | (8)GvP  | (9)GwP | (10)GuN | (11)GvN | (12)GwN | A |
| (13)TH1 | (14)TH2 |        |         |         |         | B |

## FM600TU-3A

HIGH POWER SWITCHING USE  
INSULATED PACKAGEABSOLUTE MAXIMUM RATINGS (T<sub>ch</sub> = 25°C unless otherwise specified.)

| Symbol                         | Item                      | Conditions                             | Ratings    | Unit  |
|--------------------------------|---------------------------|--|------------|-------|
| V <sub>DSS</sub>               | Drain-source voltage      | G-S Short                              | 150        | V     |
| V <sub>GSS</sub>               | Gate-source voltage       | D-S Short                              | ±20        | V     |
| I <sub>D</sub>                 | Drain current             | T <sub>C</sub> ' = 114°C* <sup>3</sup> | 300        | A     |
| I <sub>DM</sub>                |                           | Pulse* <sup>2</sup>                    | 600        | A     |
| I <sub>DA</sub>                | Avalanche current         | L = 10μH Pulse* <sup>2</sup>           | 300        | A     |
| I <sub>S</sub> * <sup>1</sup>  | Source current            |  | 300        | A     |
| I <sub>SM</sub> * <sup>1</sup> |                           | Pulse* <sup>2</sup>                    | 600        | A     |
| P <sub>D</sub> * <sup>4</sup>  | Maximum power dissipation | T <sub>C</sub> = 25°C                  | 960        | W     |
| P <sub>D</sub> * <sup>4</sup>  |                           | T <sub>C</sub> ' = 25°C* <sup>3</sup>  | 1300       | W     |
| T <sub>ch</sub>                | Channel temperature       |  | -40 ~ +150 | °C    |
| T <sub>stg</sub>               | Storage temperature       |  | -40 ~ +125 | °C    |
| V <sub>iso</sub>               | Isolation voltage         | Main terminal to base plate, AC 1 min. | 2500       | V     |
| —                              | Mounting torque           | Main Terminal M6                       | 3.5 ~ 4.5  | N • m |
| —                              |                           | Mounting M6                            | 3.5 ~ 4.5  | N • m |
| —                              | Weight                    | Typical value                          | 600        | g     |

ELECTRICAL CHARACTERISTICS (T<sub>ch</sub> = 25°C unless otherwise specified.)

| Symbol                         | Item  | Conditions  | Limits                  |      |       | Unit |    |
|--------------------------------|---|---|-------------------------|------|-------|------|----|
|                                |   |   | Min.                    | Typ. | Max.  |      |    |
| I <sub>DSS</sub>               | Drain cutoff current                              | V <sub>D</sub> S = V <sub>DSS</sub> , V <sub>G</sub> S = 0V   | —                       | —    | 1     | mA   |    |
| V <sub>G</sub> S(th)           | Gate-source threshold voltage                     | I <sub>D</sub> = 30mA, V <sub>D</sub> S = 10V   | 4.7                     | 6    | 7.3   | V    |    |
| I <sub>G</sub> SS              | Gate leakage current                              | V <sub>G</sub> S = V <sub>GSS</sub> , V <sub>D</sub> S = 0V   | —                       | —    | 1.5   | μA   |    |
| r <sub>D</sub> S(ON)           | Static drain-source<br>(chip) On-state resistance | I <sub>D</sub> = 300A<br>V <sub>G</sub> S = 15V   | T <sub>ch</sub> = 25°C  | —    | 1.6   | 2.2  | mΩ |
|                                |   |   | T <sub>ch</sub> = 125°C | —    | 3.0   | —    |    |
| V <sub>D</sub> S(ON)           | Static drain-source<br>(chip) On-state voltage    | I <sub>D</sub> = 300A<br>V <sub>G</sub> S = 15V   | T <sub>ch</sub> = 25°C  | —    | 0.48  | 0.66 | V  |
|                                |   |   | T <sub>ch</sub> = 125°C | —    | 0.91  | —    |    |
| R <sub>(lead)</sub>            | Lead resistance                                   | I <sub>D</sub> = 300A<br>terminal-chip  | T <sub>ch</sub> = 25°C  | —    | 0.7   | —    | mΩ |
|                                |   |   | T <sub>ch</sub> = 125°C | —    | 1.0   | —    |    |
| C <sub>iss</sub>               | Input capacitance                                 | V <sub>D</sub> S = 10V<br>V <sub>G</sub> S = 0V   | —                       | —    | 110   | nF   |    |
| C <sub>oss</sub>               | Output capacitance                                |   | —                       | —    | 15    |      |    |
| C <sub>r</sub> SS              | Reverse transfer capacitance                      |   | —                       | —    | 10    |      |    |
| Q <sub>G</sub>                 | Total gate charge                                 | V <sub>DD</sub> = 80V, I <sub>D</sub> = 300A, V <sub>G</sub> S = 15V  | —                       | 1950 | —     | nC   |    |
| t <sub>d</sub> (on)            | Turn-on delay time                                | V <sub>DD</sub> = 80V, I <sub>D</sub> = 300A, V <sub>G</sub> S1 = V <sub>G</sub> S2 = 15V<br>R <sub>G</sub> = 4.2Ω, Inductive load switching operation<br>I <sub>S</sub> = 300A | —                       | —    | 400   | ns   |    |
| t <sub>r</sub>                 | Turn-on rise time                                 |   | —                       | —    | 400   |      |    |
| t <sub>d</sub> (off)           | Turn-off delay time                               |   | —                       | —    | 500   |      |    |
| t <sub>f</sub>                 | Turn-off fall time                                |   | —                       | —    | 400   |      |    |
| t <sub>rr</sub> * <sup>1</sup> | Reverse recovery time                             |   | —                       | —    | 200   |      |    |
| Q <sub>rr</sub> * <sup>1</sup> | Reverse recovery charge                           |   | —                       | 8.0  | —     |      | μC |
| V <sub>S</sub> D* <sup>1</sup> | Source-drain voltage                              | I <sub>S</sub> = 300A, V <sub>G</sub> S = 0V  | —                       | —    | 1.3   | V    |    |
| R <sub>th</sub> (ch-c)         | Thermal resistance                                | MOSFET part (1/6 module)* <sup>7</sup>  | —                       | —    | 0.13  | °C/W |    |
| R <sub>th</sub> (ch-c')        |   | MOSFET part (1/6 module)* <sup>3</sup>  | —                       | —    | 0.096 |      |    |
| R <sub>th</sub> (c-f)          | Contact thermal resistance                        | Case to fin, Thermal grease Applied* <sup>8</sup> (1/6 module)  | —                       | 0.1  | —     |      |    |
| R <sub>th</sub> (c'-f)         |   | Case to fin, Thermal grease Applied* <sup>3, 8</sup> (1/6 module)   | —                       | 0.09 | —     |      |    |

## THERMISTOR PART

| Symbol                         | Parameter  | Conditions   | Limits |      |      | Unit |
|--------------------------------|------------|--|--------|------|------|------|
|                                |            |  | Min.   | Typ. | Max. |      |
| R <sub>TH</sub> * <sup>6</sup> | Resistance | T <sub>TH</sub> = 25°C* <sup>5</sup>                     | —      | 100  | —    | kΩ   |
| B* <sup>6</sup>                | B Constant | Resistance at T <sub>TH</sub> = 25°C, 50°C* <sup>5</sup> | —      | 4000 | —    | K    |

\*1: It is characteristics of the anti-parallel, source to drain free-wheel diode (FWDi).

\*2: Pulse width and repetition rate should be such that the device channel temperature (T<sub>ch</sub>) does not exceed T<sub>ch</sub> max rating.\*3: T<sub>C</sub>' measured point is just under the chips. If use this value, R<sub>th</sub>(f-a) should be measured just under the chips.

\*4: Pulse width and repetition rate should be such as to cause negligible temperature rise.

\*5: T<sub>TH</sub> is thermistor temperature.

\*6: B = (lnR1 - lnR2)/(1/T1 - 1/T2) R1: Resistance at T1(K), R2: Resistance at T2(K)

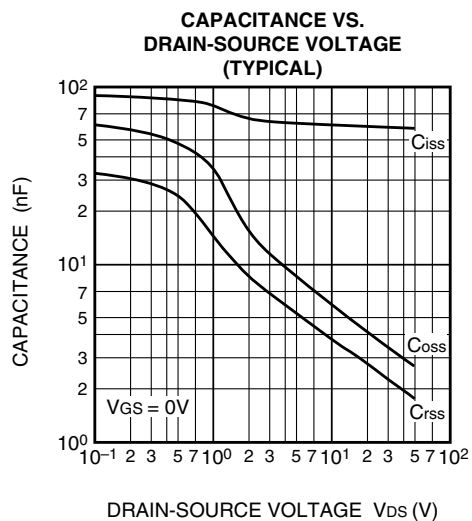
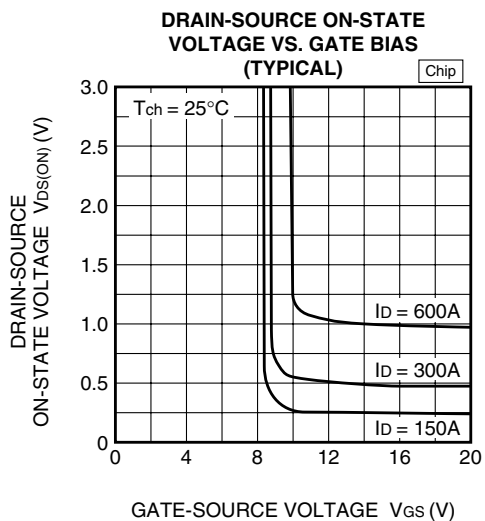
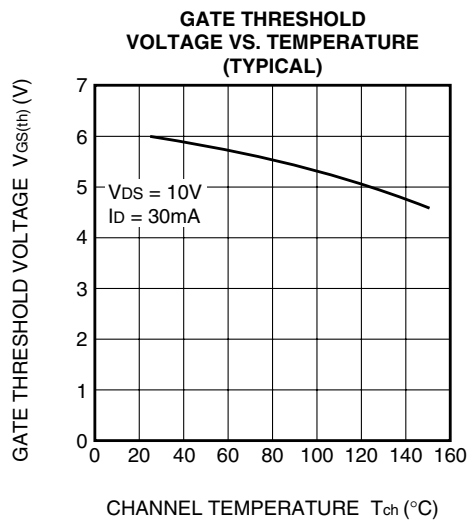
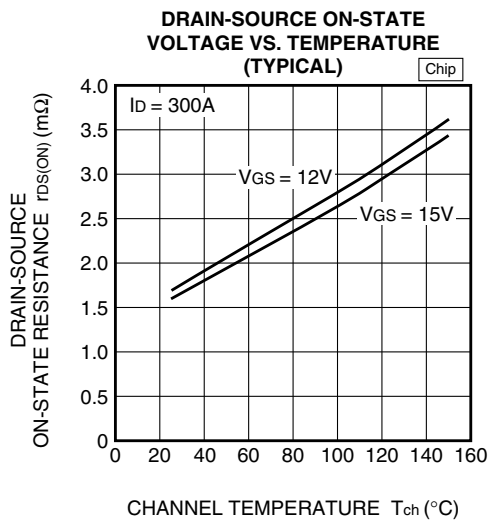
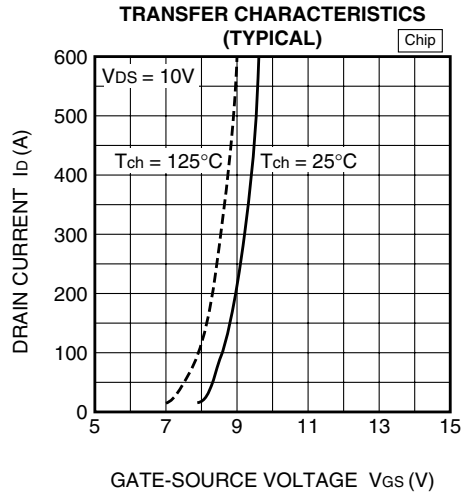
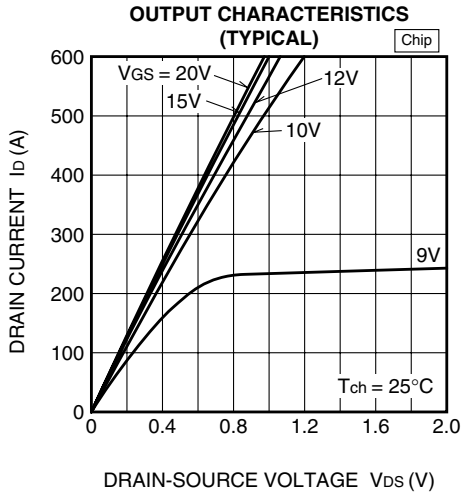
\*7: T<sub>C</sub> measured point is shown in page OUTLINE DRAWING.

\*8: Typical value is measured by using Shin-Etsu Chemical Co., Ltd "G-746".

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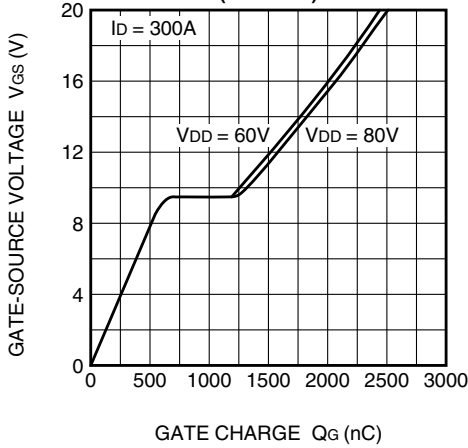
## PERFORMANCE CURVES



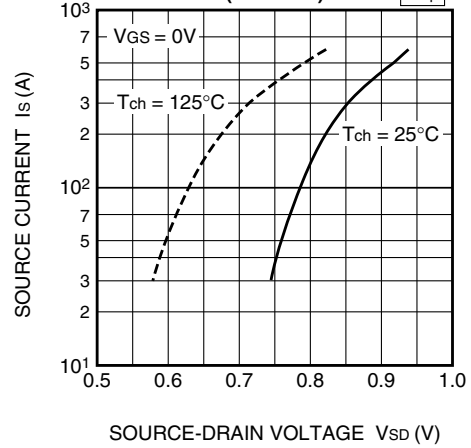
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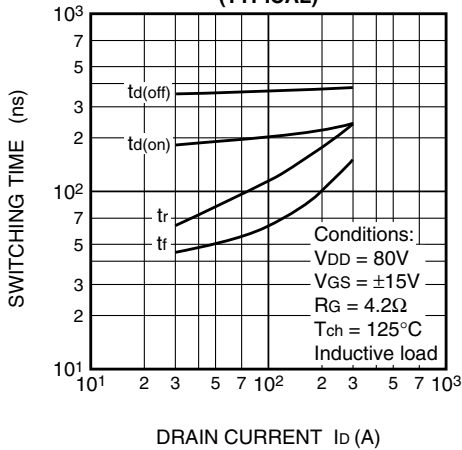
**GATE CHARGE CHARACTERISTICS (TYPICAL)**



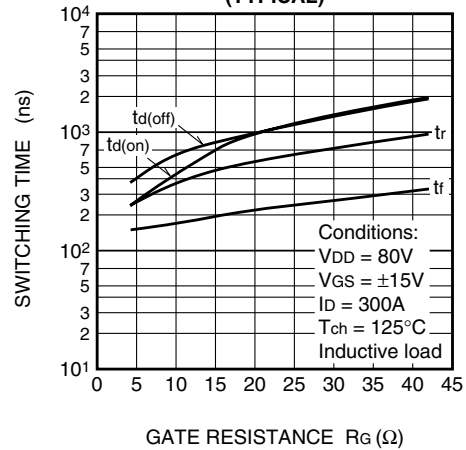
**FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)**



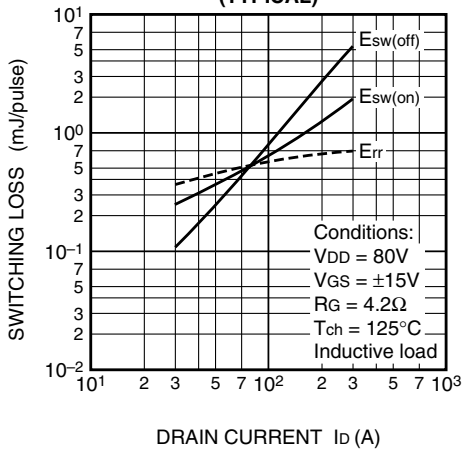
**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**



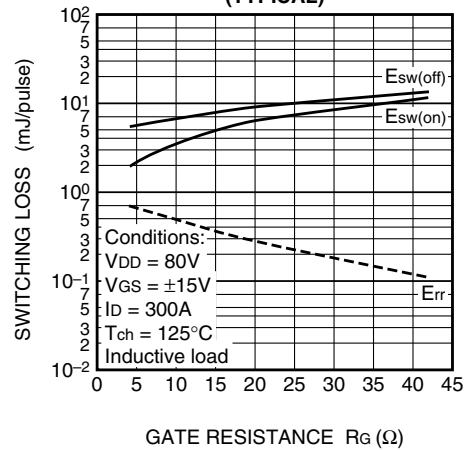
**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**



**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**



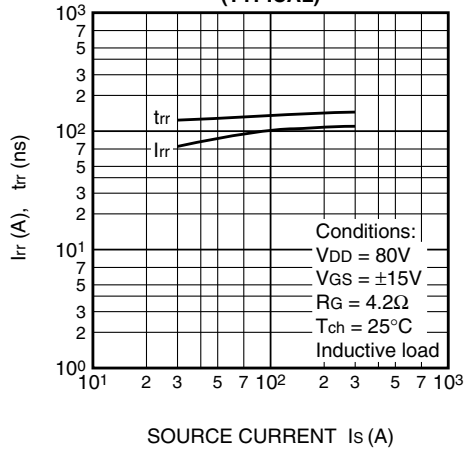
**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**



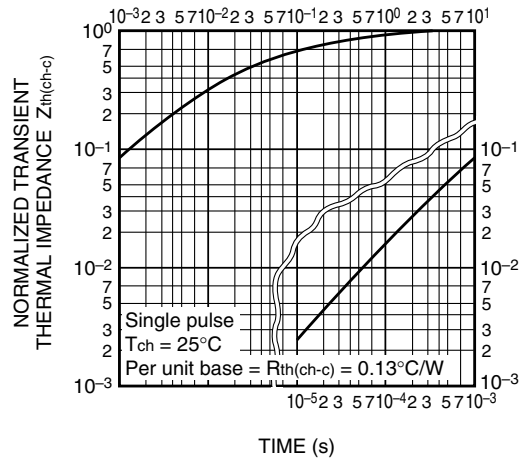
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HIGH POWER SWITCHING USE  
INSULATED PACKAGE

REVERSE RECOVERY CHARACTERISTICS  
OF FREE-WHEEL DIODE  
(TYPICAL)



TRANSIENT THERMAL  
IMPEDANCE CHARACTERISTICS



## CHIP LAYOUT

