

FM400TU-3A

HIGH POWER SWITCHING USE
INSULATED PACKAGE

FM400TU-3A



- ID(rms)200A
- VDSS..... 150V
- Insulated Type
- 6-elements in a pack
- Thermistor inside
- UL Recognized

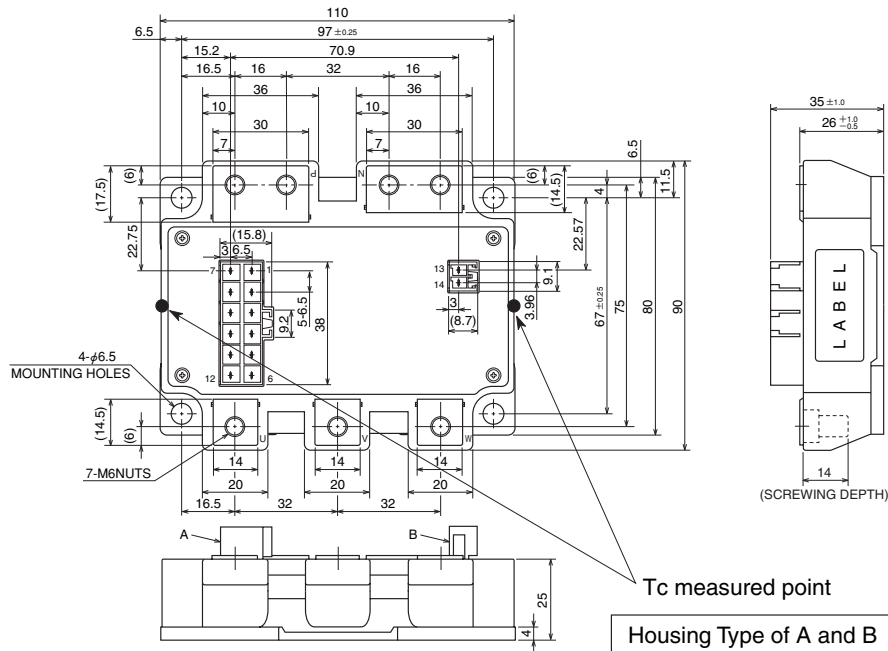
Yellow Card No.E80276
File No.E80271

APPLICATION

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

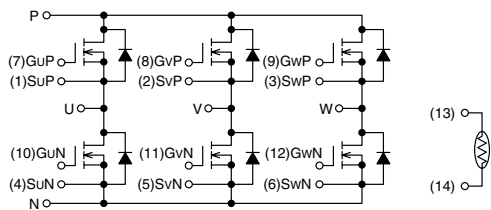
OUTLINE DRAWING & CIRCUIT DIAGRAM

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 |

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ABSOLUTE MAXIMUM RATINGS (T_{ch} = 25°C unless otherwise specified.)

| Symbol | Item | Conditions | Ratings | Unit |
|--------------------|---------------------------|--|------------|-------|
| V _{DSS} | Drain-source voltage | G-S Short | 150 | V |
| V _{GSS} | Gate-source voltage | D-S Short | ±20 | V |
| I _D | Drain current | T _C ' = 112°C*3 | 200 | A |
| I _{DM} | | Pulse*2 | 400 | A |
| I _{DA} | Avalanche current | L = 10μH Pulse*2 | 200 | A |
| I _S *1 | Source current | | 200 | A |
| I _{SM} *1 | | Pulse*2 | 400 | A |
| P _D *4 | Maximum power dissipation | T _C = 25°C | 650 | W |
| P _D *4 | | T _C ' = 25°C*3 | 880 | W |
| T _{ch} | Channel temperature | | -40 ~ +150 | °C |
| T _{stg} | Storage temperature | | -40 ~ +125 | °C |
| V _{iso} | 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_{ch} = 25°C unless otherwise specified.)

| Symbol | Item | Conditions | Limits | | | Unit | |
|------------------------|---|---|-------------------------|------|-------|------|----|
| | | | Min. | Typ. | Max. | | |
| I _{DSS} | Drain cutoff current | V _{DS} = V _{DSS} , V _{GS} = 0V | — | — | 1 | mA | |
| V _{GS(th)} | Gate-source threshold voltage | I _D = 20mA, V _{DS} = 10V | 4.7 | 6 | 7.3 | V | |
| I _{GSS} | Gate leakage current | V _{GS} = V _{GSS} , V _{DS} = 0V | — | — | 1.5 | μA | |
| r _{DS(ON)} | Static drain-source (chip) On-state resistance | I _D = 200A V _{GS} = 15V | T _{ch} = 25°C | — | 2.6 | 3.55 | mΩ |
| | | | T _{ch} = 125°C | — | 4.8 | — | |
| V _{DS(ON)} | Static drain-source (chip) On-state voltage | I _D = 200A V _{GS} = 15V | T _{ch} = 25°C | — | 0.52 | 0.71 | V |
| | | | T _{ch} = 125°C | — | 0.96 | — | |
| R _(lead) | Lead resistance | I _D = 200A terminal-chip | T _{ch} = 25°C | — | 0.8 | — | mΩ |
| | | | T _{ch} = 125°C | — | 1.12 | — | |
| C _{iss} | Input capacitance | V _{DS} = 10V V _{GS} = 0V | — | — | 75 | nF | |
| C _{oss} | Output capacitance | | — | — | 10 | | |
| C _{rss} | Reverse transfer capacitance | | — | — | 6 | | |
| Q _G | Total gate charge | V _{DD} = 80V, I _D = 200A, V _{GS} = 15V | — | 1300 | — | nC | |
| t _{d(on)} | Turn-on delay time | V _{DD} = 80V, I _D = 200A, V _{GS1} = V _{GS2} = 15V R _G = 6.3Ω, Inductive load switching operation I _S = 200A | — | — | 400 | ns | |
| t _r | Turn-on rise time | | — | — | 300 | | |
| t _{d(off)} | Turn-off delay time | | — | — | 450 | | |
| t _f | Turn-off fall time | | — | — | 200 | | |
| t _{rr} *1 | Reverse recovery time | | — | — | 200 | | |
| Q _{rr} *1 | Reverse recovery charge | | — | 7.0 | — | | μC |
| V _{SD} *1 | Source-drain voltage | I _S = 200A, V _{GS} = 0V | — | — | 1.3 | V | |
| R _{th(ch-c)} | Thermal resistance | MOSFET part (1/6 module)*7 | — | — | 0.19 | °C/W | |
| R _{th(ch-c')} | | MOSFET part (1/6 module)*3 | — | — | 0.142 | | |
| R _{th(c-f)} | Contact thermal resistance | Case to fin, Thermal grease Applied*8 (1/6 module) | — | 0.1 | — | | |
| R _{th(c'-f)} | | Case to fin, Thermal grease Applied*3, *8 (1/6 module) | — | 0.09 | — | | |

THERMISTOR PART

| Symbol | Parameter | Conditions | Limits | | | Unit |
|--------------------|------------|--|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| R _{TH} *6 | Resistance | T _{TH} = 25°C*5 | — | 100 | — | kΩ |
| B*6 | B Constant | Resistance at T _{TH} = 25°C, 50°C*5 | — | 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_{ch}) does not exceed T_{ch} max rating.

*3: T_C' measured point is just under the chips. If use this value, R_{th(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_{TH} is thermistor temperature.

*6: $B = (\ln R_1 - \ln R_2) / (1/T_1 - 1/T_2)$ R₁: Resistance at T₁(K), R₂: Resistance at T₂(K)

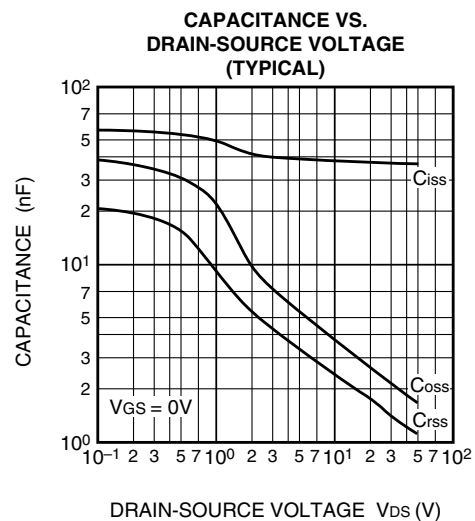
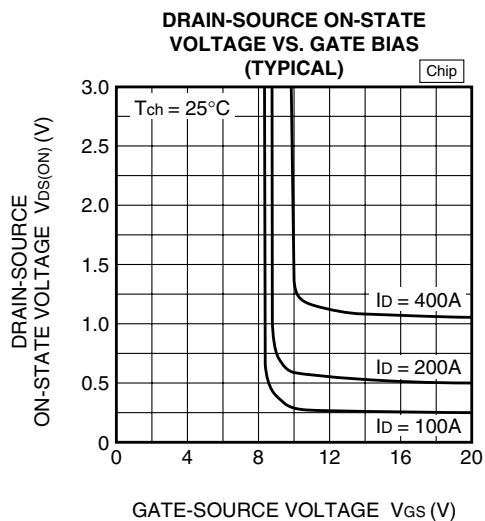
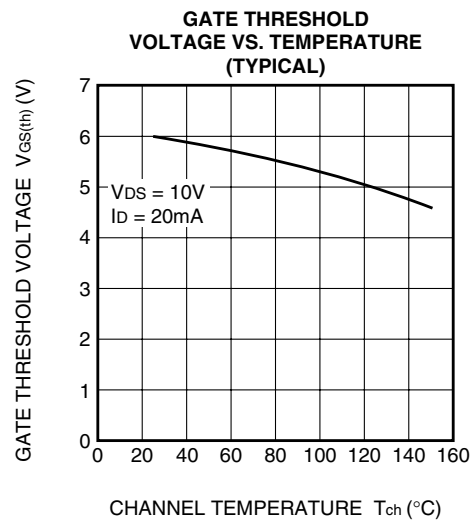
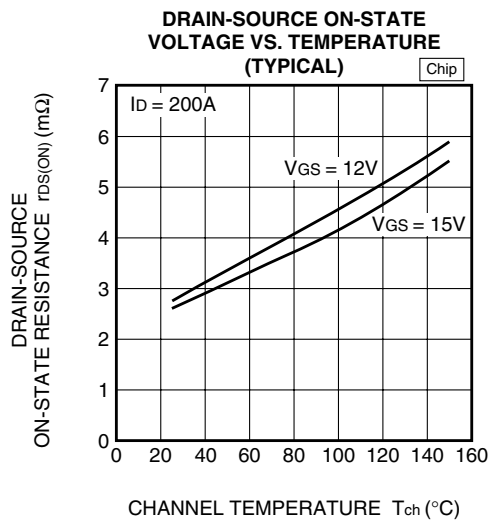
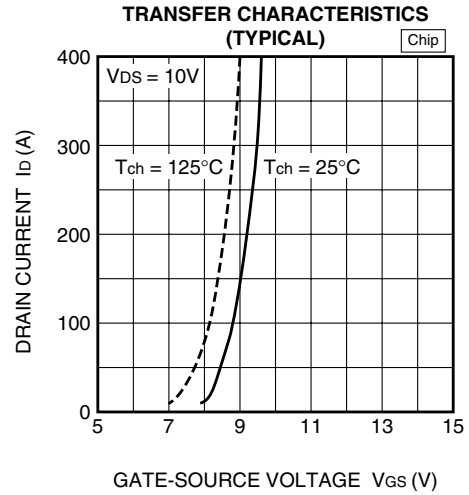
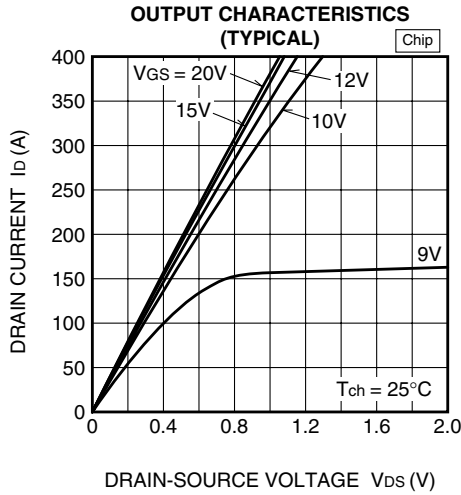
*7: T_C measured point is shown in page OUTLINE DRAWING.

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

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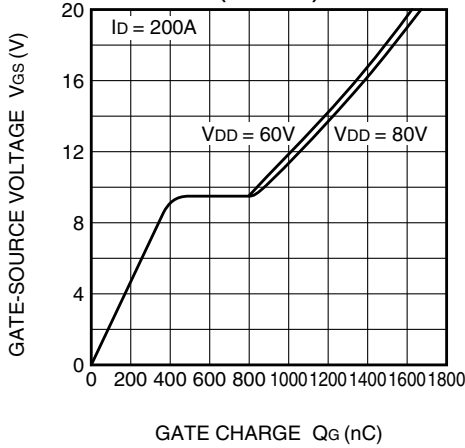
PERFORMANCE CURVES



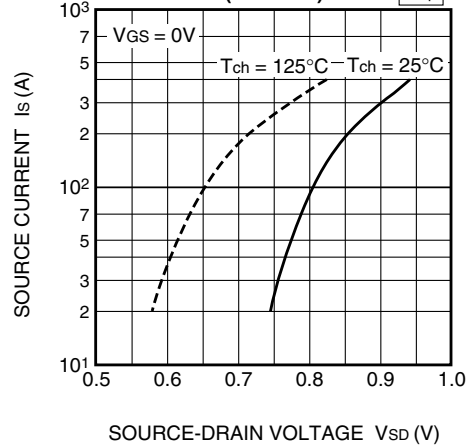
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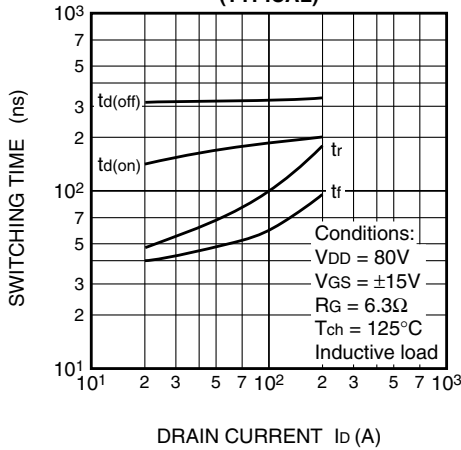
GATE CHARGE CHARACTERISTICS (TYPICAL)



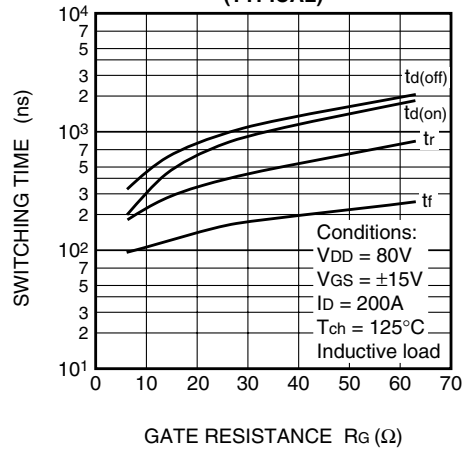
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



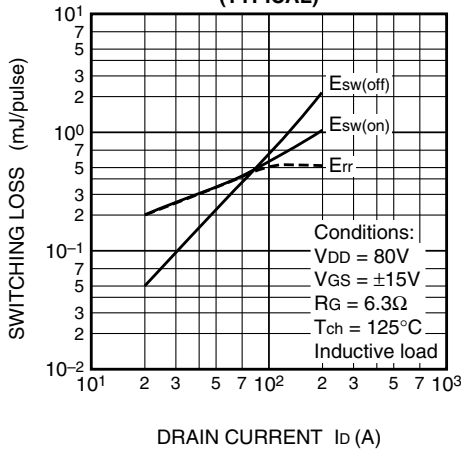
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



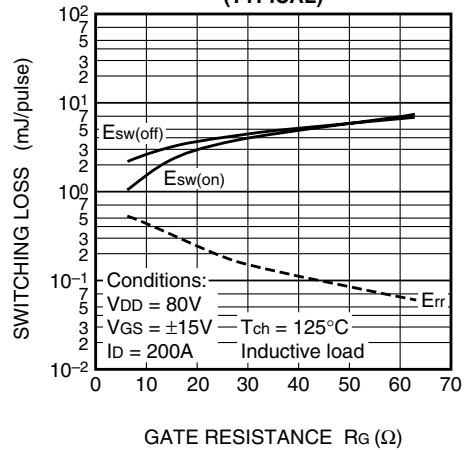
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



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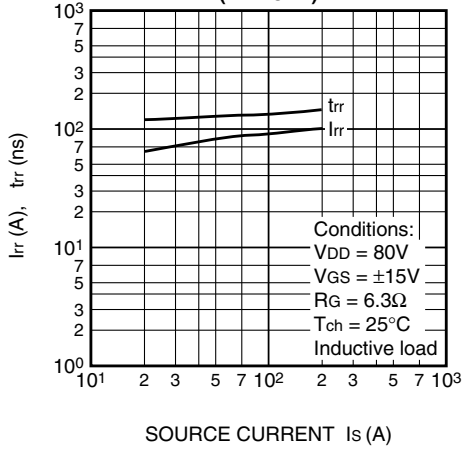
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



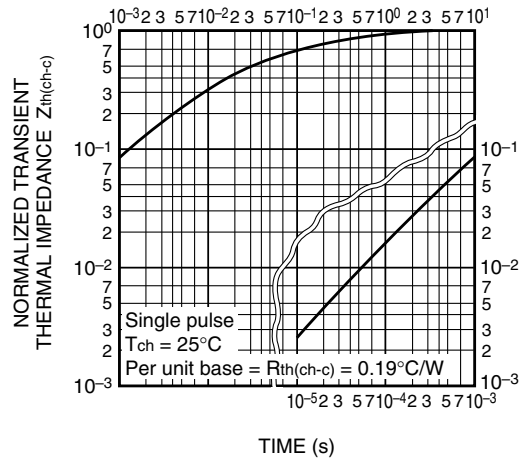
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REVERSE RECOVERY CHARACTERISTICS
OF FREE-WHEEL DIODE
(TYPICAL)



TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS



CHIP LAYOUT

