

FM400TU-07A

HIGH POWER SWITCHING USE
INSULATED PACKAGE

FM400TU-07A



- ID(rms)200A
- VDSS..... 75V
- Insulated Type
- 6-elements in a pack
- NTC Thermistor inside
- UL Recognized

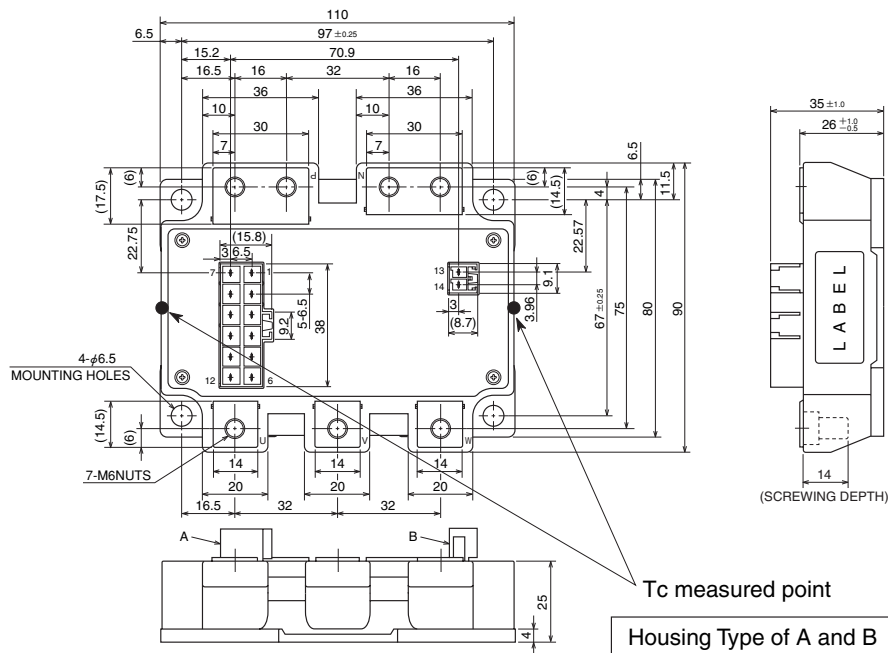
Yellow Card No.E80276
File No.E80271

APPLICATION

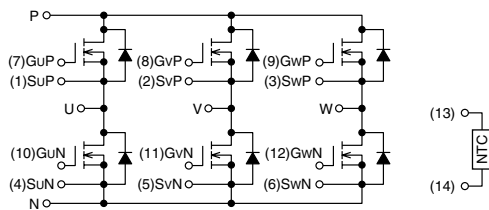
AC motor control of forklift (battery power source), UPS

OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm



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 |

FM400TU-07A

HIGH POWER SWITCHING USE
INSULATED PACKAGE

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

| Symbol | Item | Conditions | Ratings | Unit |
|------------------------------------|---------------------------|--|------------|------------------|
| V _{DSS} | Drain-source voltage | G-S Short | 75 | V |
| V _{GSS} | Gate-source voltage | D-S Short | ±20 | V |
| I _{D(rms)} | Drain current | T _c ' = 139°C* ³ | 200 | A _{rms} |
| I _{DM} | | Pulse* ² | 400 | A |
| I _{DA} | Avalanche current | L = 10μH Pulse* ² | 200 | A |
| I _{S(rms)} * ¹ | Source current | T _c = 25°C | 200 | A _{rms} |
| 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 | Terminals to base plate, f = 60Hz, AC 1 minute | 2500 | V _{rms} |
| — | Mounting torque | Main terminals M6 screw | 3.5 ~ 4.5 | N • m |
| | | Mounting M6 screw | 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 | — | 0.8 | 1.1 | mΩ |
| | | | T _{ch} = 125°C | — | 1.28 | — | |
| V _{DS(ON)} | Static drain-source (chip) On-state voltage | I _D = 200A V _{GS} = 15V | T _{ch} = 25°C | — | 0.16 | 0.22 | V |
| | | | T _{ch} = 125°C | — | 0.26 | — | |
| 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} = 48V, I _D = 200A, V _{GS} = 15V | — | 1100 | — | nC | |
| t _{d(on)} | Turn-on delay time | V _{DD} = 48V, I _D = 200A, V _{GS} ± 15V R _G = 6.3Ω, Inductive load I _S = 200A | — | — | 450 | ns | |
| t _r | Turn-on rise time | | — | — | 500 | | |
| t _{d(off)} | Turn-off delay time | | — | — | 450 | | |
| t _f | Turn-off fall time | | — | — | 400 | | |
| t _{rr} * ¹ | Reverse recovery time | | — | — | 200 | | |
| Q _{rr} * ¹ | Reverse recovery charge | | — | 4.5 | — | | 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 | K/W | |
| R _{th(ch-c')} | | MOSFET part (1/6 module)* ³ | — | — | 0.142 | | |
| R _{th(c-f)} | Contact thermal resistance | Case to heat sink, Thermal grease Applied* ⁸ (1/6 module) | — | 0.1 | — | | |
| R _{th(c'-f)} | | Case to heat sink, Thermal grease Applied* ³ , * ⁸ (1/6 module) | — | 0.09 | — | | |

NTC 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-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: Case Temperature (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: $B = \ln\left(\frac{R_{25}}{R_{50}}\right) \left(\frac{1}{T_{25}} - \frac{1}{T_{50}}\right)$

R₂₅: resistance at absolute temperature T₂₅ [K]: T₂₅ = 25 [°C]+273.15 = 298.15 [K]

R₅₀: resistance at absolute temperature T₅₀ [K]: T₅₀ = 50 [°C]+273.15 = 323.15 [K]

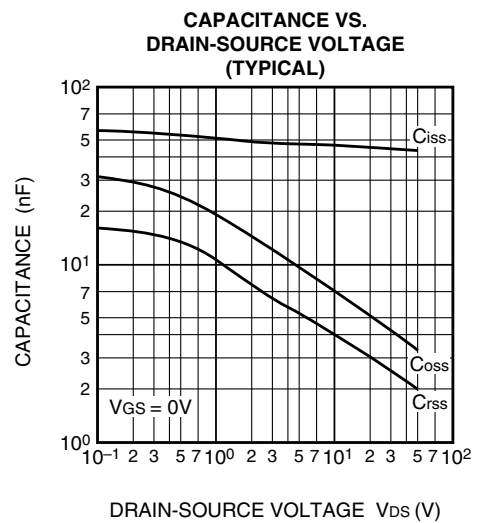
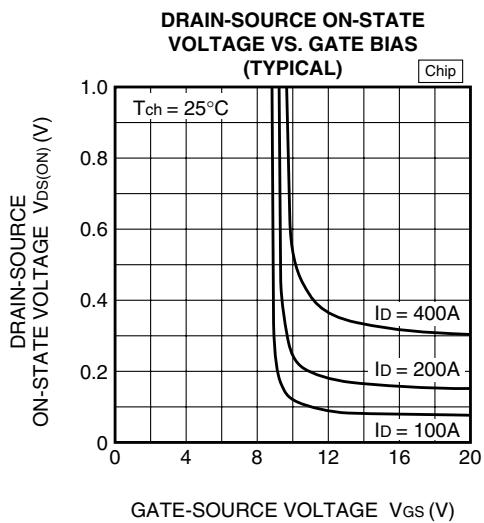
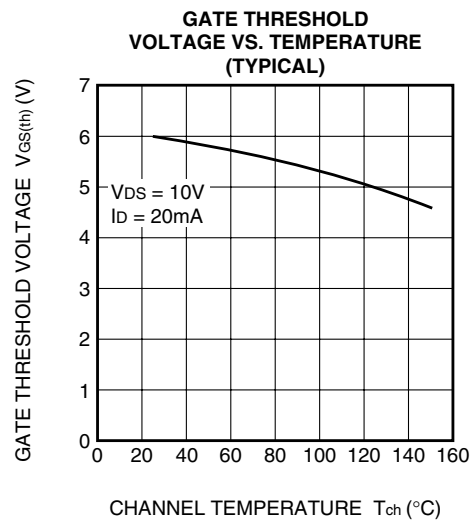
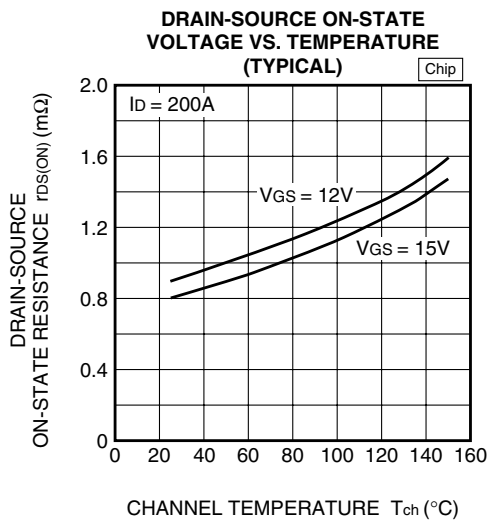
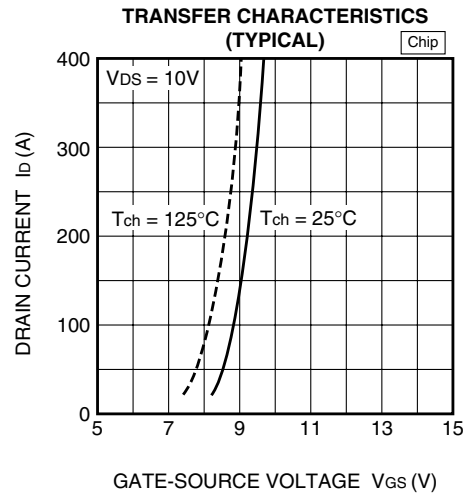
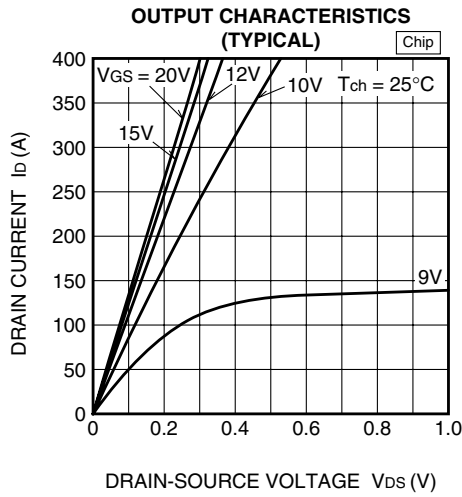
*7: Case Temperature (T_c) measured point is shown in page OUTLINE DRAWING.

*8: Typical value is measured by using thermally conductive grease of λ = 0.9[W/(m • K)].

FM400TU-07A

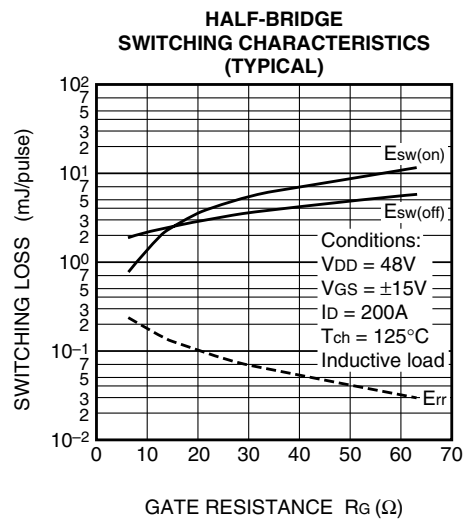
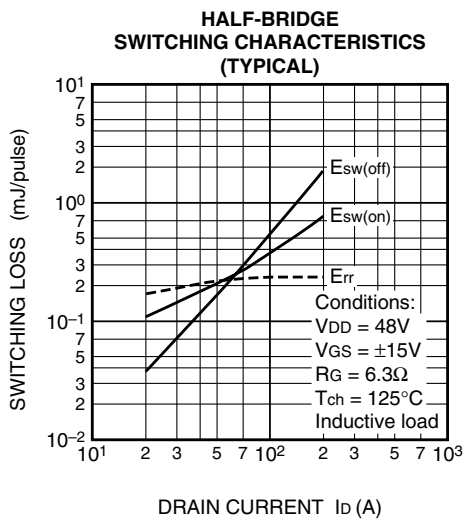
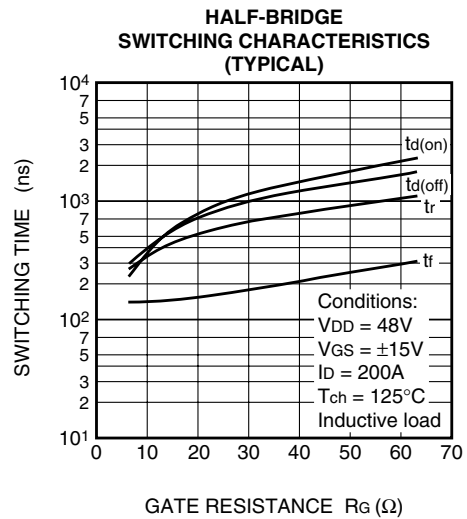
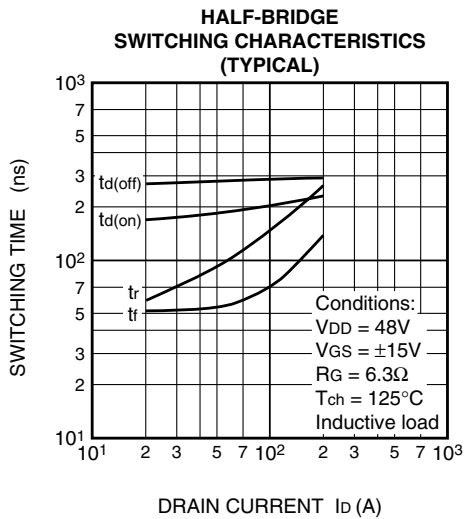
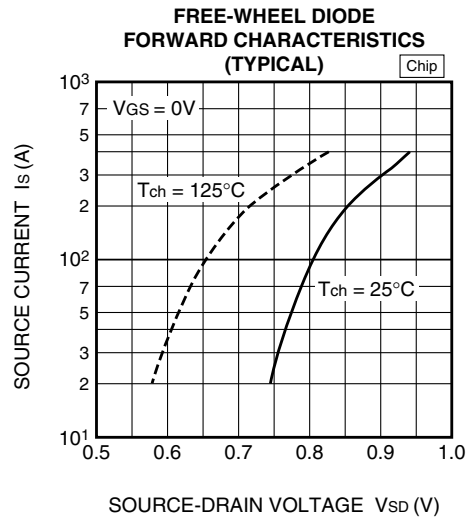
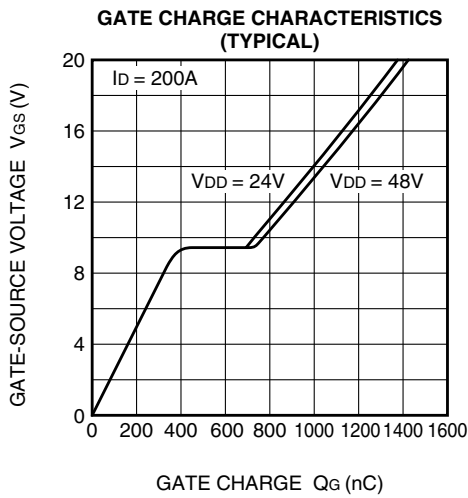
HIGH POWER SWITCHING USE
INSULATED PACKAGE

PERFORMANCE CURVES



FM400TU-07A

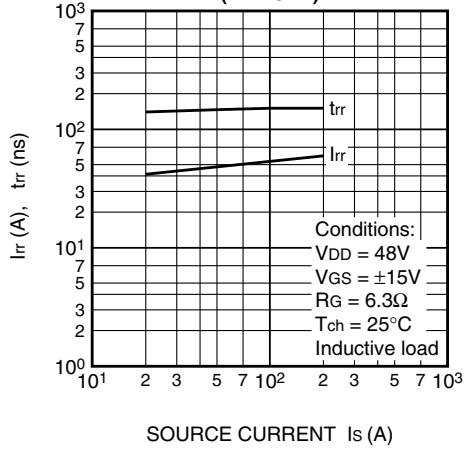
HIGH POWER SWITCHING USE
INSULATED PACKAGE



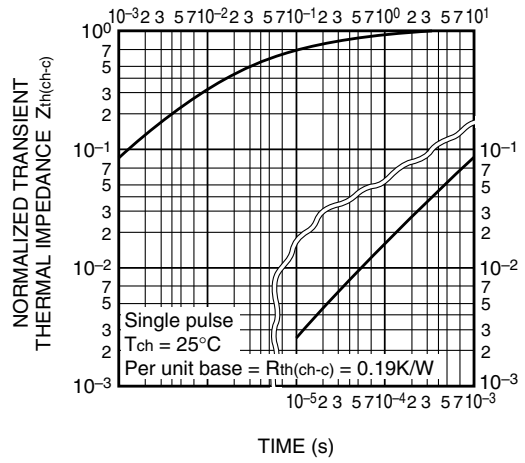
FM400TU-07A

HIGH POWER SWITCHING USE
INSULATED PACKAGE

**REVERSE RECOVERY CHARACTERISTICS
OF FREE-WHEEL DIODE
(TYPICAL)**



**TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS**



CHIP LAYOUT

