

FM400TU-2A

HIGH POWER SWITCHING USE
INSULATED PACKAGE

FM400TU-2A



- ID(rms)200A
- VDSS.....100V
- Insulated Type
- 6-elements in a pack
- Thermistor inside
- UL Recognized

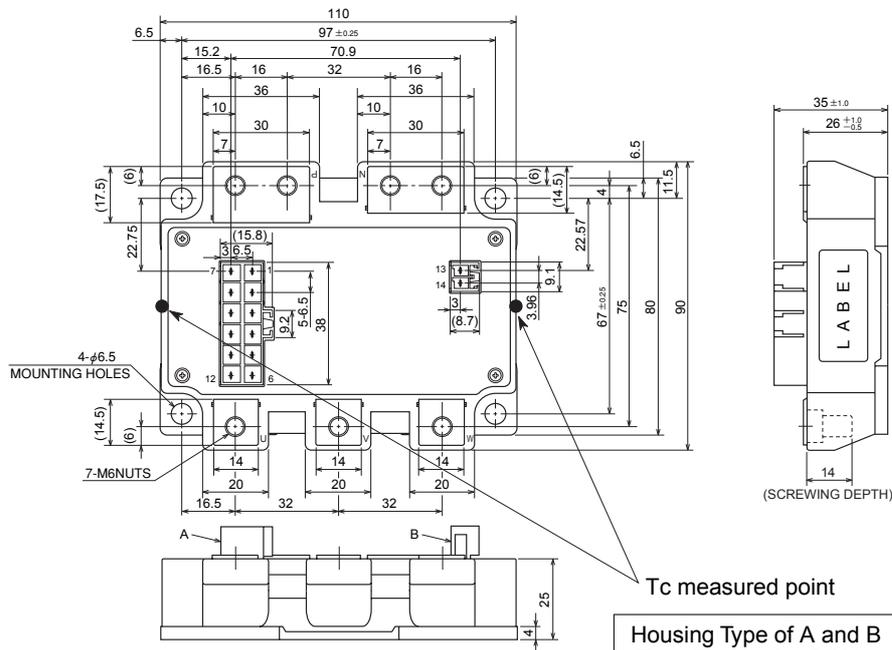
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APPLICATION

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

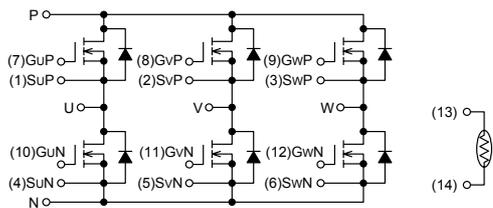
OUTLINE DRAWING & CIRCUIT DIAGRAM

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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HIGH POWER SWITCHING USE
INSULATED PACKAGEABSOLUTE MAXIMUM RATINGS (T_j = 25°C unless otherwise specified.)

| Symbol | Item | Conditions | Rating | Unit |
|--------------------------------|---------------------------|--|------------|-------|
| V _{DSS} | Drain-source voltage | G-S Short | 100 | V |
| V _{GSS} | Gate-source voltage | D-S Short | ±20 | V |
| I _D | Drain current | T _c ' = 130°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 _{isol} | Isolation voltage | Main terminal to base plate, AC 1 min, f=60Hz, RMS | 2500 | V |
| — | Mounting torque | Main Terminal M6 | 3.5 ~ 4.5 | N • m |
| | | Mounting to heat sink M6 | 3.5 ~ 4.5 | N • m |
| — | Weight | Typical value | 600 | g |

ELECTRICAL CHARACTERISTICS (T_j = 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 _j = 25°C | — | 1.45 | 2.0 | mΩ |
| | | | T _j = 125°C | — | 2.5 | — | |
| V _{DS(on)} | Static drain-source (chip) On-state voltage | I _D = 200A V _{Gs} = 15V | T _j = 25°C | — | 0.29 | 0.40 | V |
| | | | T _j = 125°C | — | 0.50 | — | |
| R _{DD-SS'} | Internal lead resistance | I _D = 200A terminal-chip | T _j = 25°C | — | 0.8 | — | mΩ |
| | | | T _j = 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 | — | 1200 | — | nC | |
| t _{d(on)} | Turn-on delay time | V _{DD} = 48V, I _D = 200A, V _{Gs1} = V _{Gs2} = 15V R _G = 6.3Ω, Inductive load switching operation I _S = 200A | — | — | 400 | ns | |
| t _r | Rise time | | — | — | 400 | | |
| t _{d(off)} | Turn-off delay time | | — | — | 450 | | |
| t _f | Fall time | | — | — | 300 | | |
| t _{rr} * ¹ | Reverse recovery time | | — | — | 250 | | |
| Q _{rr} * ¹ | Reverse recovery charge | | — | 6.0 | — | | μC |
| V _{SD} * ¹ | Source-drain voltage | | I _S = 200A, V _{Gs} = 0V | — | — | | 1.3 |
| R _{th(j-c)} | Thermal resistance | MOSFET part (1/6 module)* ⁷ | — | — | 0.19 | K/W | |
| R _{th(j-c')} | | MOSFET part (1/6 module)* ³ | — | — | 0.142 | | |
| R _{th(c-s)} | Contact thermal resistance | Case to fin, Thermal grease Applied* ⁸ (1/6 module) | — | 0.1 | — | | |
| R _{th(c-s')} | | Case to fin, Thermal grease Applied* ^{3, 8} (1/6 module) | — | 0.09 | — | | |

NTC THERMISTOR PART

| Symbol | Parameter | Conditions | Limits | | | Unit |
|--------------------------------|------------|--|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| R ₂₅ * 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 junction temperature (T_j) does not exceed T_j max rating.*3: T_c' measured point is just under the chips. If use this value, R_{th(s-a)} should be measured just under the chips.

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

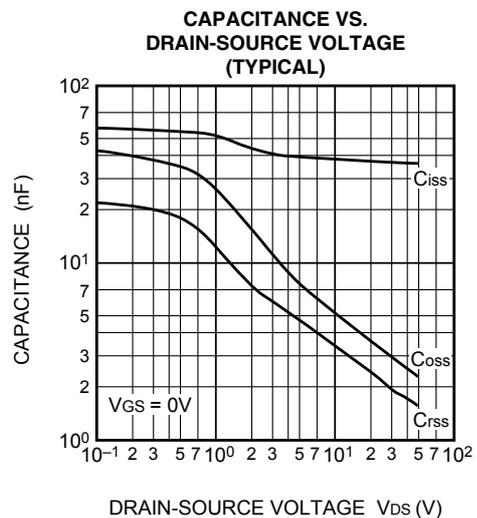
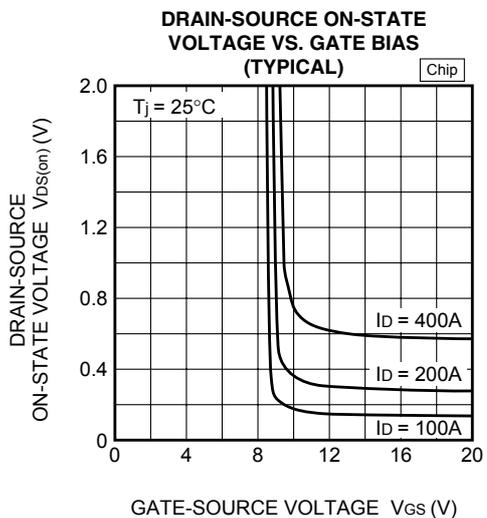
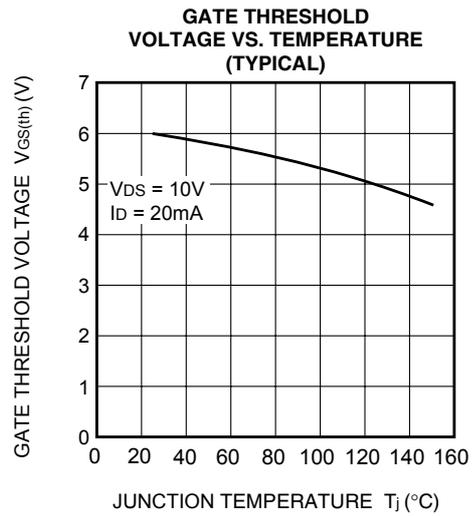
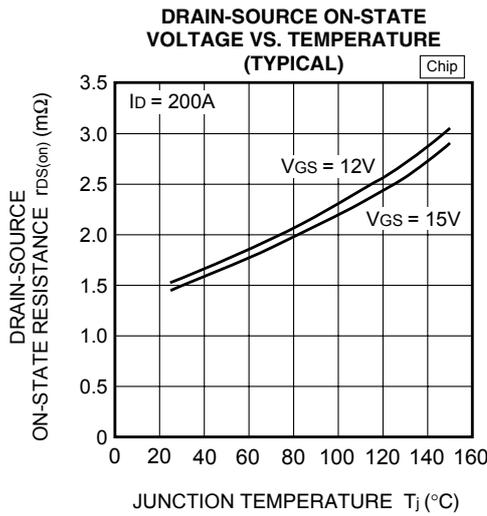
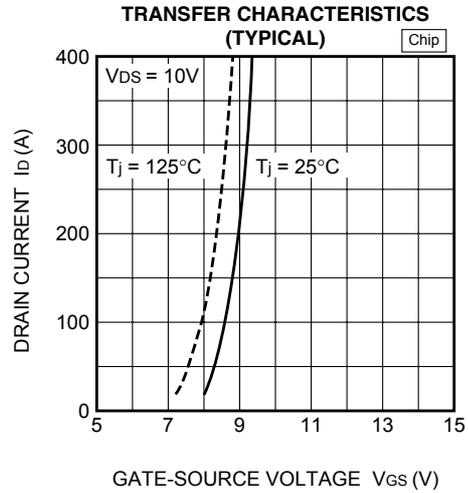
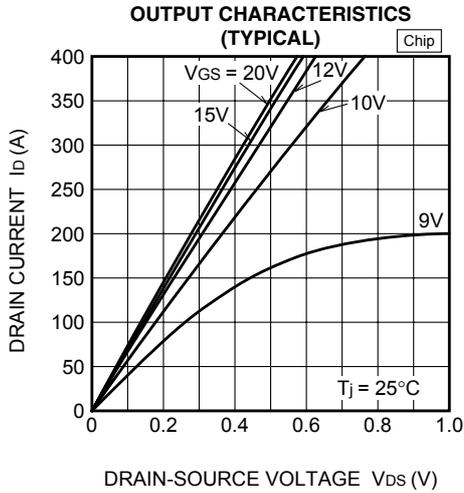
*5: T_{TH} is thermistor temperature.*6: B = (lnR₁-lnR₂)/(1/T₁-1/T₂) R₁: Resistance at T₁(K), R₂: Resistance at T₂(K)*7: T_c measured point is shown in page OUTLINE DRAWING.

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

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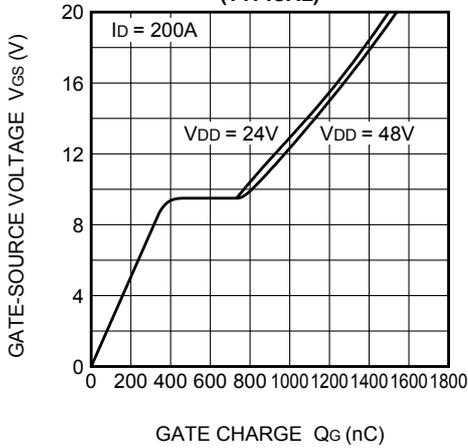
PERFORMANCE CURVES



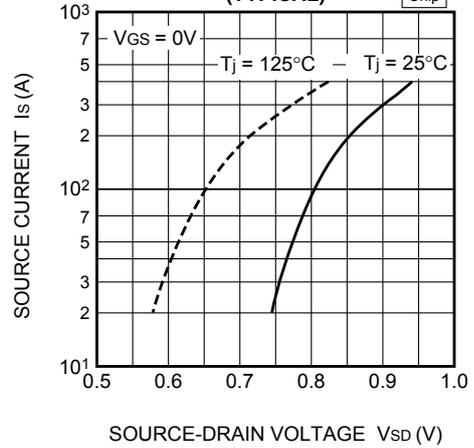
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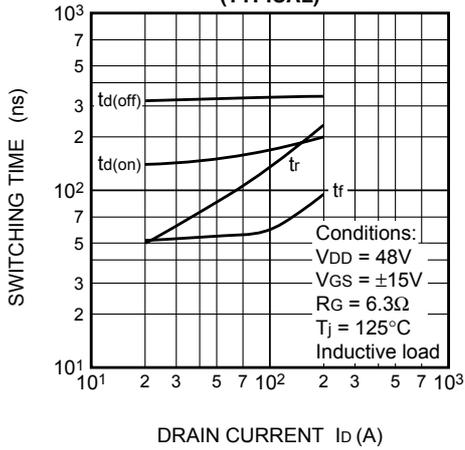
GATE CHARGE CHARACTERISTICS (TYPICAL)



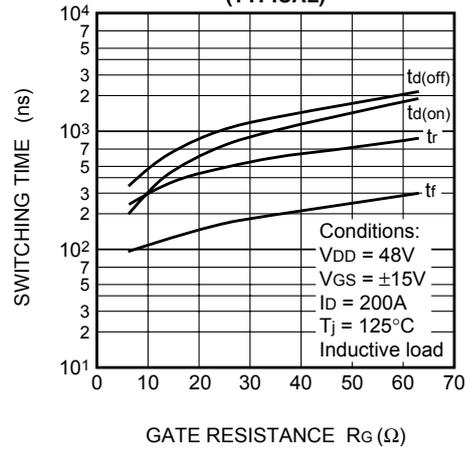
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



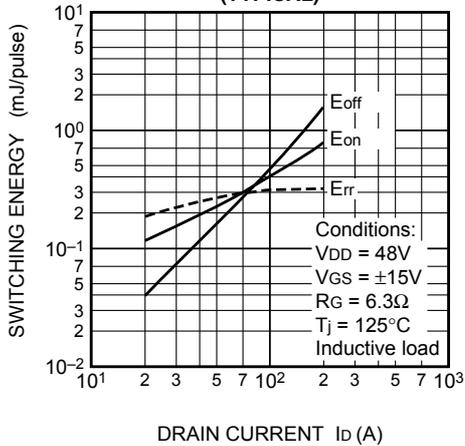
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



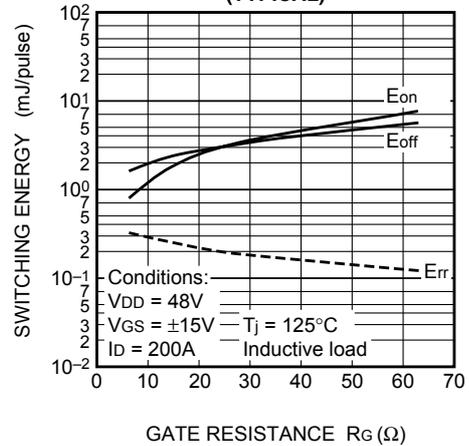
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



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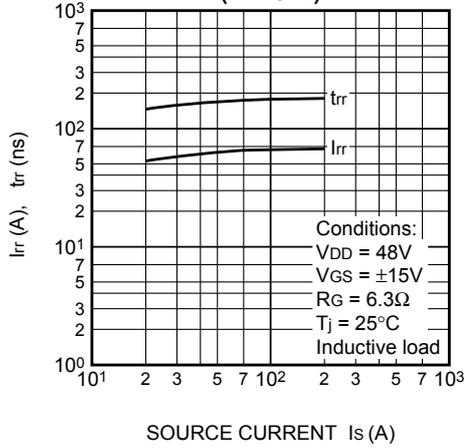
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



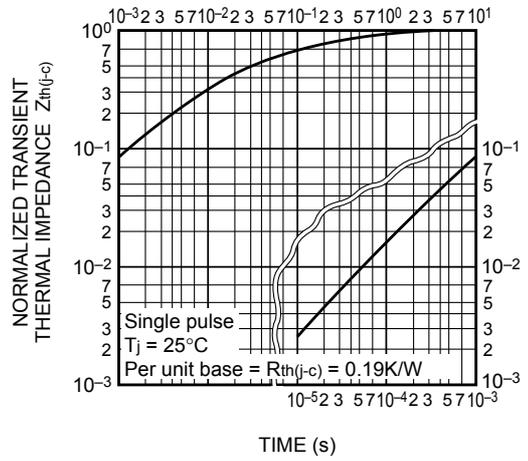
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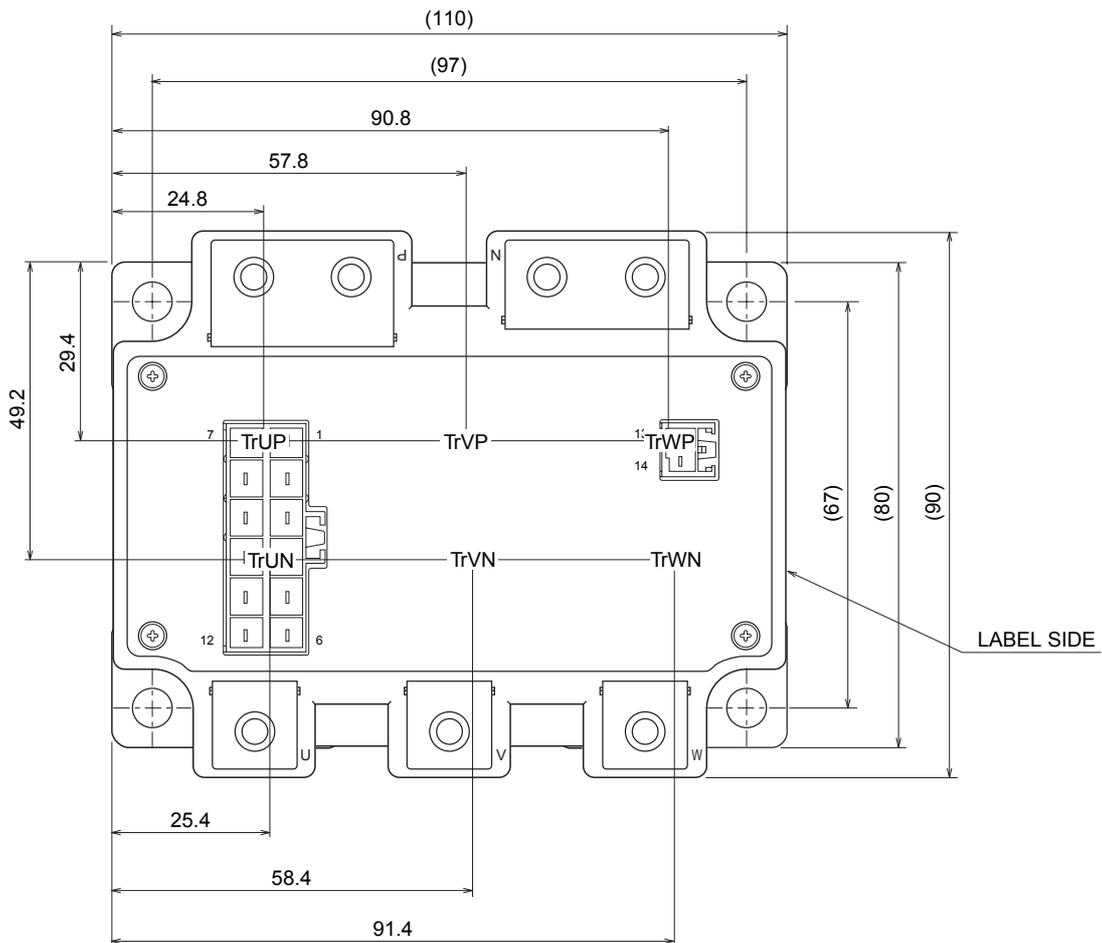
REVERSE RECOVERY CHARACTERISTICS
OF FREE-WHEEL DIODE
(TYPICAL)



TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS



CHIP LAYOUT



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