

TENTATIVE**FM400TU-07A****A**

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|------|------------|-----|---|--|
| Pre. | M.Koura | Rev | F | <i>M. Koura, T. Hiramoto, H. Hashimoto.</i> <i>J. Gotoh 26 Nov. '04</i> |
| Apr. | 9-Feb.-'04 | | | |

HIGH POWER SWITCHING USE

Notice : This is not a final specification. Some parametric limits are subject to change.

FM400TU-07A

- $I_{D(rms)}$ 200A
- V_{DSS} 75V
- Insulated Type
- 6-elements in a pack

APPLICATION

AC motor control of forklift (battery power source)
 ABSOLUTE MAXIMUM RATINGS ($T_{ch} = 25\text{ }^{\circ}\text{C}$)

| 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 | $T_c = 139\text{ }^{\circ}\text{C}$ | 200 | $A_{(rms)}$ |
| I_{DM} | | Pulse ② | 400 | A |
| I_{DA} | Avalanche current | $L = 10\text{ }\mu\text{H}$ Pulse ② | 200 | A |
| $I_{S(rms)}$ ① | Source current | $T_c = 25\text{ }^{\circ}\text{C}$ | 200 | $A_{(rms)}$ |
| I_{SM} ① | | Pulse ② | 400 | A |
| P_D ③ | Maximum power dissipation | $T_c = 25\text{ }^{\circ}\text{C}$ | 650 | W |
| P_D ③ | Maximum power dissipation | $T_c = 25\text{ }^{\circ}\text{C}$ | 880 ^{*)} | W |
| T_{ch} | Channel temperature | | $-40 \sim +150$ | $^{\circ}\text{C}$ |
| T_{stg} | Storage temperature | | $-40 \sim +125$ | $^{\circ}\text{C}$ |
| V_{iso} | Isolation voltage | Main terminal to base plate, AC 1 min. | 2500 | V |
| — | Mounting torque | Main Terminal M 6 | 3.5~4.5 | N·m |
| — | | Mounting M 6 | 3.5~4.5 | N·m |
| — | Weight | Typical value | 600 | g |

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HIGH POWER SWITCHING USE

ELECTRICAL CHARACTERISTICS ($T_{ch} = 25\text{ }^{\circ}\text{C}$) F

| Symbol | Item | Conditions | Min. | Typ. | Max. | Unit | | |
|------------------------|---|--|--------------------------------------|------|---------------------|----------------------|---|---|
| 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 | C | |
| I_{GSS} | Gate leakage current | $V_{GS}=V_{GSS}, V_{DS}=0V$ | — | — | 1.5 | μA | F | |
| $r_{DS(ON)}$ (chip) | Static drain-source On-state resistance | $I_D=200A$ $V_{GS}=15V$ | $T_{ch}=25\text{ }^{\circ}\text{C}$ | — | 0.8 | 1.1 | m Ω | A |
| | | | $T_{ch}=125\text{ }^{\circ}\text{C}$ | — | 1.28 | — | | C E |
| $V_{DS(ON)}$ (chip) | Static drain-source On-state voltage | $I_D=200A$ $V_{GS}=15V$ | $T_{ch}=25\text{ }^{\circ}\text{C}$ | — | 0.16 | 0.22 | V | A |
| | | | $T_{ch}=125\text{ }^{\circ}\text{C}$ | — | 0.26 | — | | C |
| $R_{(lead)}$ | lead resistance | $I_D=200A$ terminal-chip | $T_{ch}=25\text{ }^{\circ}\text{C}$ | — | 0.8 | — | m Ω | A |
| | | | $T_{ch}=125\text{ }^{\circ}\text{C}$ | — | 1.12 | — | | C |
| C_{iss} | Input capacitance | $V_{DS}=10V$ $V_{GS}=0V$ | — | — | 75 | nF | A | |
| 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 | $V_{DD}=48V, I_D=200A$ $V_{GS1}=V_{GS2}=15V$ $R_G=6.3\Omega$, Inductive load switching operation | — | — | 450 | ns | C | |
| 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 | $I_S=200A$ | — | — | 200 | ns | C | |
| Q_{rr} ① | Reverse recovery charge | | — | 4.5 | — | μC | D | |
| V_{SD} ① | Source-drain voltage | $I_S=200A, V_{GS}=0V$ | — | — | 1.3 | V | C | |
| $R_{th(ch-c)}$ | Thermal resistance | MOSFET part(1/6 module) | — | — | 0.19 | $^{\circ}\text{C/W}$ | C | |
| $R_{th(ch-e)}$ | | MOSFET part(1/6 module) | — | — | 0.142 ^{*1} | | A | |
| $R_{th(c-f)}$ | Contact thermal resistance | Case to fin, Thermal compound Applied ^{*2} (1/6 module) | — | 0.1 | — | | C | |

Thermistors part

| Symbol | Parameter | Condition | Min. | Typ. | Max. | Unit | |
|------------|------------|--|------|------|------|------------|---|
| R_{TH} ④ | Resistance | $T_C=25^{\circ}\text{C}$ | — | 100 | — | k Ω | A |
| B ④ | B Constant | Resistance at $25^{\circ}\text{C}, 50^{\circ}\text{C}$ | — | 4000 | — | K | |

- ① I_S, V_{SD}, t_{rr} & Q_{rr} represent characteristics of the anti-parallel, source to drain free-wheel diode(FWD).
- ② Pulse width and repetition rate should be such that the device channel temp. (T_{ch}) dose not exceed T_{ch} max rating.
- ③ Channel temperature (T_{ch}) should not increase beyond 150°C .
- ④ $B = (\ln R_1 - \ln R_2) / (1/T_1 - 1/T_2)$ R_1 : Resistance at $T_1(K)$, R_2 : Resistance at $T_2(K)$
- *1: T_c' measured point is just under the chips. If you use this value, $R_{th}(f-a)$ should be measured just under the chips.
- *2: Typical value is measured by using Shin-etsu Silicone "G-746".
- *3: T_c measured point is shown in page "3-3".

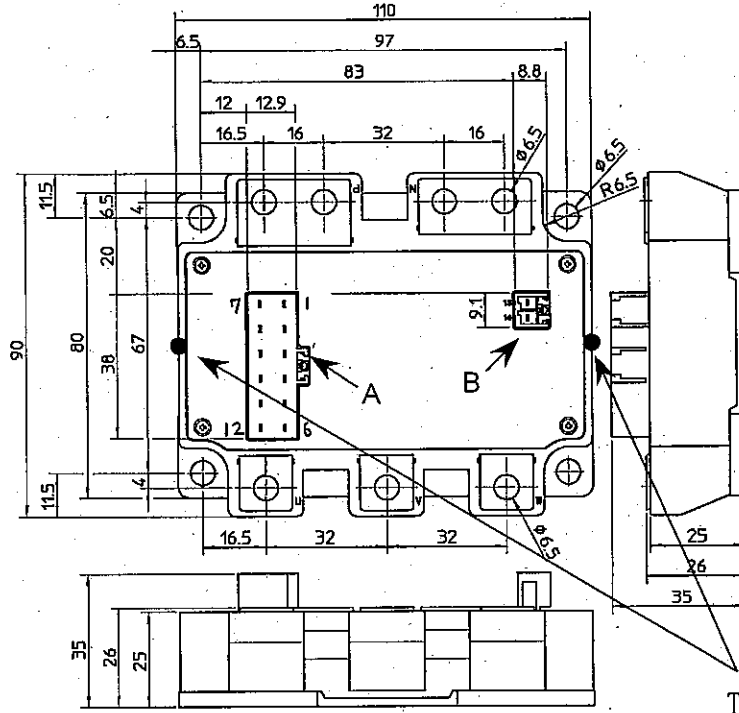
TENTATIVE

FM400TU-07A

HIGH POWER SWITCHING USE

OUTLINE DRAWING

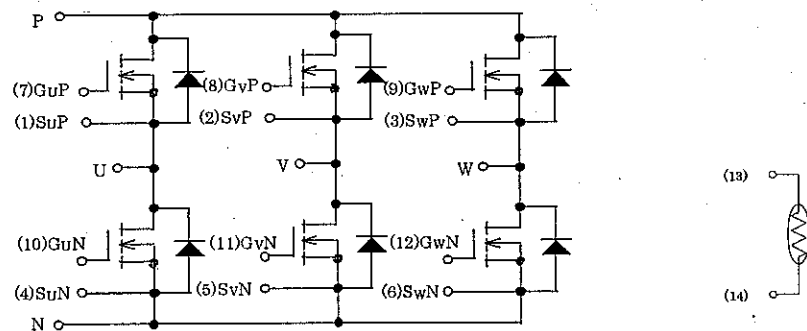
Dimensions in mm



Tc measured point

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

CIRCUIT DIAGRAM



| | | | | | | |
|---------------------|---------------------|---------------------|----------------------|----------------------|----------------------|---|
| (1) S _{UP} | (2) S _{VP} | (3) S _{WP} | (4) S _{UN} | (5) S _{VN} | (6) S _{WN} | A |
| (7) G _{UP} | (8) G _{VP} | (9) G _{WP} | (10) G _{UN} | (11) G _{VN} | (12) G _{WN} | |
| (13) TH1 | (14) TH2 | | | | | B |