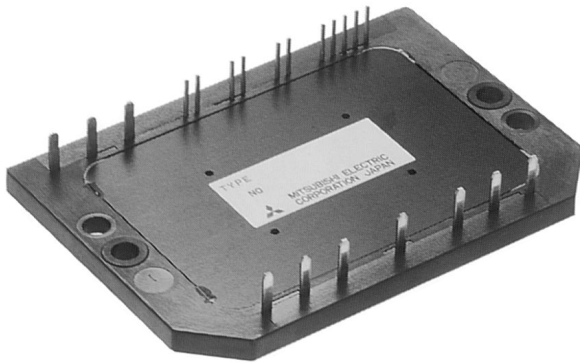


CM10MD-12H

MEDIUM POWER SWITCHING USE
INSULATED TYPE

CM10MD-12H



- IC 10A
- VCES 600V
- Insulated Type
- CIB Module
- 3φ Inverter+3φ Converter+Brake
- UL Recognized

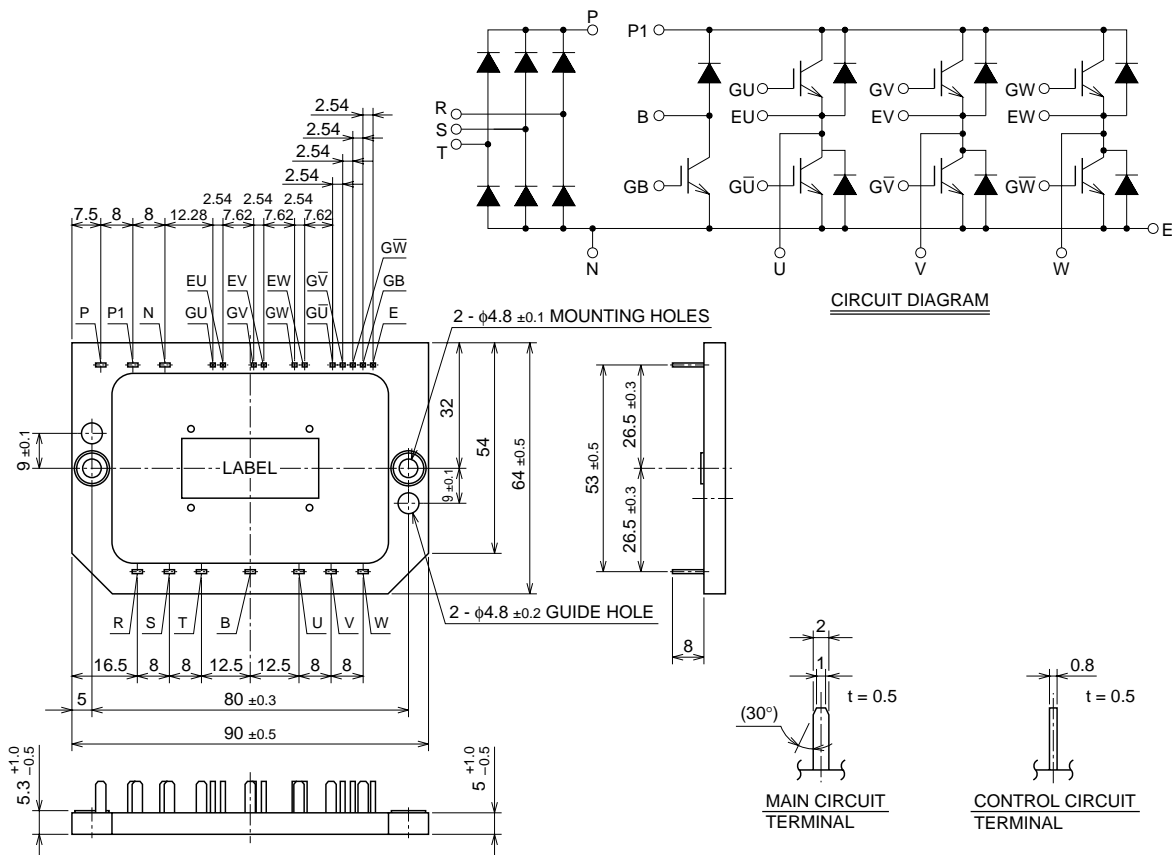
Yellow Card No. E80276 (N)
File No. E80271

APPLICATION

AC & DC motor controls, General purpose inverters, Servo controls, NC, Robotics

OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm



Note. Not use the guiding holes to mount on the cooling fin.

CM10MD-12H

MEDIUM POWER SWITCHING USE
INSULATED TYPE**MAXIMUM RATINGS** ($T_j = 25^\circ\text{C}$)
INVERTER PART

| Symbol | Parameter | Condition | Rating | Unit |
|---------------------------|-------------------------------|-----------------------|--------|------|
| V _{CES} | Collector-emitter voltage | G – E Short | 600 | V |
| V _{GES} | Gate-emitter voltage | C – E Short | ±20 | V |
| I _C | Collector Current | T _C = 25°C | 10 | A |
| I _{CM} | | PULSE (Note. 2) | 20 | A |
| I _E (Note. 1) | Emitter Current | T _C = 25°C | 10 | A |
| I _{EM} (Note. 1) | | PULSE (Note. 2) | 20 | A |
| P _C (Note. 3) | Maximum collector dissipation | T _f = 25°C | 36 | W |

BRAKE PART

| Symbol | Parameter | Condition | Rating | Unit |
|---------------------------|---------------------------------|-----------------------|--------|------|
| V _{CES} | Collector-emitter voltage | G – E Short | 600 | V |
| V _{GES} | Gate-emitter voltage | C – E Short | ±20 | V |
| I _C | Collector Current | T _C = 25°C | 10 | A |
| I _{CM} | | PULSE (Note. 2) | 20 | A |
| P _C (Note. 3) | Maximum Collector dissipation | T _f = 25°C | 36 | W |
| V _{RRM} | Repetitive peak reverse voltage | Clamp diode part | 600 | V |
| I _{FM} (Note. 3) | Forward current | Clamp diode part | 10 | A |

CONVERTER PART

| Symbol | Parameter | Condition | Rating | Unit |
|------------------|----------------------------------------|--------------------------------------------|--------|------------------|
| V _{RRM} | Repetitive peak reverse voltage | | 800 | V |
| E _a | Recommended AC input voltage | | 220 | V |
| I _O | DC output current | 3 ϕ rectifying circuit | 10 | A |
| I _{FSM} | Surge (non-repetitive) forward current | 1 cycle at 60Hz, peak value Non-repetitive | 100 | A |
| I ² t | I ² t for fusing | Value for one cycle of surge current | 42 | A ² s |

COMMON RATING

| Symbol | Parameter | Condition | Rating | Unit |
|------------------|----------------------|-------------------|-------------|-------|
| T _j | Junction temperature | | -40 ~ +150 | °C |
| T _{stg} | Storage temperature | | -40 ~ +125 | °C |
| V _{iso} | Isolation voltage | AC 1 min. | 2500 | V |
| — | Mounting torque | Mounting M4 screw | 1.47 ~ 1.96 | N · m |
| — | Weight | Typical value | 60 | g |

CM10MD-12H

MEDIUM POWER SWITCHING USE
INSULATED TYPEELECTRICAL CHARACTERISTICS ($T_j = 25^\circ\text{C}$)
INVERTER PART

| Symbol | Parameter | Test conditions | Limits | | | Unit | |
|--------------------------|--------------------------------------|------------------------------------------|---------------------------|------|------|--------------------|---|
| | | | Min. | Typ. | Max. | | |
| ICES | Collector cutoff current | $V_{CE} = V_{CES}, V_{GE} = 0V$ | — | — | 1 | mA | |
| $V_{GE(th)}$ | Gate-emitter threshold voltage | $I_C = 1mA, V_{CE} = 10V$ | 4.5 | 6 | 7.5 | V | |
| IGES | Gate-emitter cutoff current | $V_{GE} = V_{GES}, V_{CE} = 0V$ | — | — | 0.5 | μA | |
| $V_{CE(sat)}$ | Collector-emitter saturation voltage | $I_C = 10A, V_{GE} = 15V$ (Note. 4) | $T_j = 25^\circ\text{C}$ | — | 2.1 | 2.8 | V |
| | | | $T_j = 150^\circ\text{C}$ | — | 2.15 | — | |
| C_{ies} | Input capacitance | $V_{CE} = 10V$ $V_{GE} = 0V$ | — | — | 1.0 | nF | |
| C_{oes} | Output capacitance | | — | — | 0.9 | nF | |
| C_{res} | Reverse transfer capacitance | | — | — | 0.2 | nF | |
| QG | Total gate charge | $V_{CC} = 300V, I_C = 10A, V_{GE} = 15V$ | — | 30 | — | nC | |
| $t_d(on)$ | Turn-on delay time | $V_{CC} = 300V, I_C = 10A$ | — | — | 120 | ns | |
| t_r | Turn-on rise time | $V_{GE1} = V_{GE2} = 15V$ | — | — | 300 | ns | |
| $t_d(off)$ | Turn-off delay time | $R_G = 63\Omega$ | — | — | 200 | ns | |
| t_f | Turn-off fall time | Resistive load | — | — | 300 | ns | |
| V_{EC} (Note. 1) | Emitter-collector voltage | $I_E = 10A, V_{GE} = 0V$ | — | — | 2.8 | V | |
| t_{rr} (Note. 1) | Reverse recovery time | $I_E = 10A, V_{GE} = 0V$ | — | — | 110 | ns | |
| Q_{rr} (Note. 1) | Reverse recovery charge | $di_e / dt = -20A / \mu s$ | — | 0.03 | — | μC | |
| $R_{th(j-f)Q}$ (Note. 5) | Thermal resistance | IGBT part, Per 1/6 module | — | — | 3.5 | $^\circ\text{C/W}$ | |
| $R_{th(j-f)R}$ (Note. 5) | | FWDi part, Per 1/6 module | — | — | 4 | $^\circ\text{C/W}$ | |

BRAKE PART

| Symbol | Parameter | Condition | Limits | | | Unit | |
|--------------------------|-----------------------------------------|------------------------------------------|---------------------------|------|------|--------------------|---|
| | | | Min. | Typ. | Max. | | |
| ICES | Collector cutoff current | $V_{CE} = V_{CES}, V_{GE} = 0V$ | — | — | 1 | mA | |
| $V_{GE(th)}$ | Gate-emitter threshold voltage | $I_C = 1mA, V_{CE} = 10V$ | 4.5 | 6 | 7.5 | V | |
| IGES | Gate-emitter cutoff current | $V_{GE} = V_{GES}, V_{CE} = 0V$ | — | — | 0.5 | μA | |
| $V_{CE(sat)}$ | Collector-to-emitter saturation voltage | $I_C = 10A, V_{GE} = 15V$ (Note. 4) | $T_j = 25^\circ\text{C}$ | — | 2.1 | 2.8 | V |
| | | | $T_j = 150^\circ\text{C}$ | — | 2.15 | — | |
| C_{ies} | Input capacitance | $V_{CE} = 10V$ $V_{GE} = 0V$ | — | — | 1 | nF | |
| C_{oes} | Output capacitance | | — | — | 0.9 | nF | |
| C_{res} | Reverse transfer capacitance | | — | — | 0.2 | nF | |
| QG | Total gate charge | $V_{CC} = 300V, I_C = 10A, V_{GE} = 15V$ | — | 30 | — | nC | |
| VFM | Forward voltage drop | $I_F = 10A$, Clamp diode part | — | — | 1.5 | V | |
| $R_{th(j-f)Q}$ (Note. 5) | Thermal resistance | IGBT part | — | — | 3.5 | $^\circ\text{C/W}$ | |
| $R_{th(j-f)R}$ (Note. 5) | | Clamp diode part | — | — | 3.6 | $^\circ\text{C/W}$ | |

CONVERTER PART

| Symbol | Parameter | Condition | Limits | | | Unit |
|-------------------------|----------------------------|------------------------------------------|--------|------|------|--------------------|
| | | | Min. | Typ. | Max. | |
| IRRM | Repetitive reverse current | $V_R = V_{RRM}, T_j = 150^\circ\text{C}$ | — | — | 8 | mA |
| VFM | Forward voltage drop | $I_F = 10A$ | — | — | 1.5 | V |
| $R_{th(j-f)}$ (Note. 5) | Thermal resistance | Per 1/6 module | — | — | 3.6 | $^\circ\text{C/W}$ |

Note 1. I_E , V_{EC} , t_{rr} , Q_{rr} & di_e/dt represent characteristics of the anti-parallel, emitter to collector free-wheel diode.2. Pulse width and repetition rate should be such that the device junction temp. (T_j) does not exceed T_{jmax} rating.3. Junction temperature (T_j) should not increase beyond 150°C .

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

5. Thermal resistance is specified under following conditions.

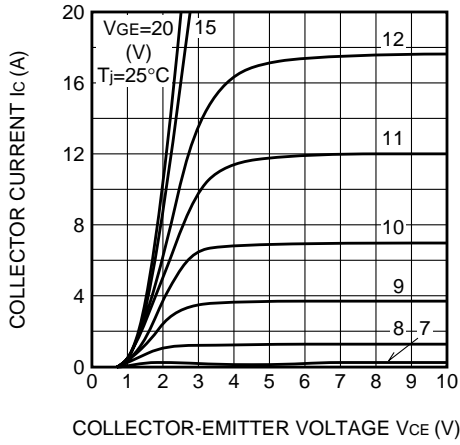
- The conductive grease applied, between module and fin.
- Al plate is used as fin.

CM10MD-12H

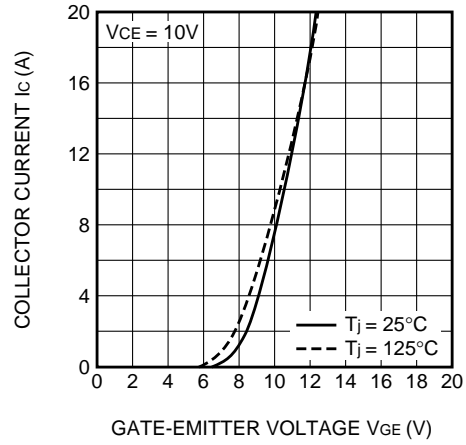
MEDIUM POWER SWITCHING USE
INSULATED TYPE

PERFORMANCE CURVES

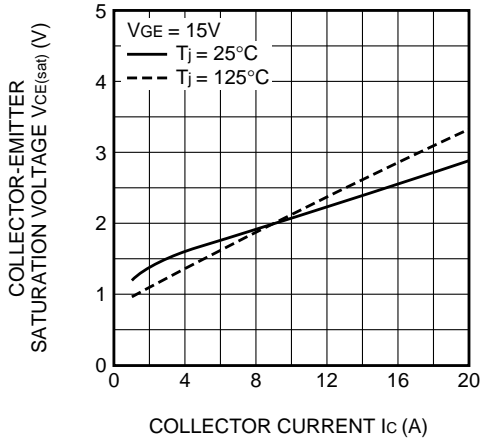
OUTPUT CHARACTERISTICS (TYPICAL)



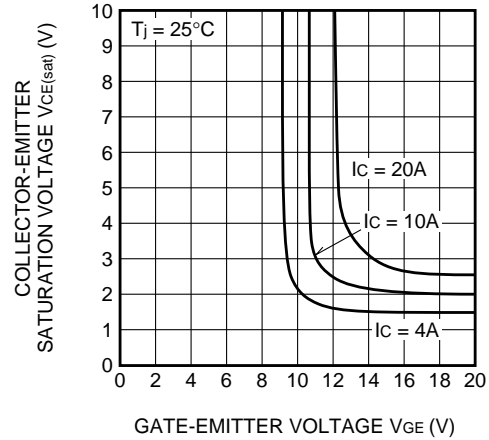
TRANSFER CHARACTERISTICS (TYPICAL)



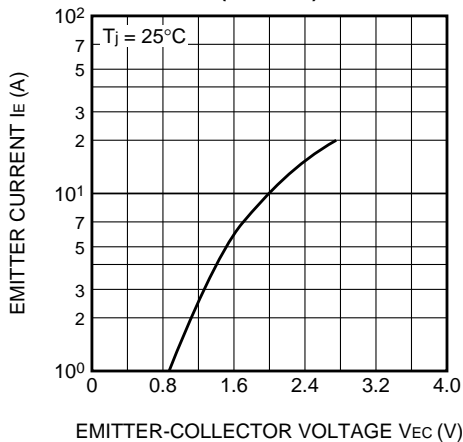
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



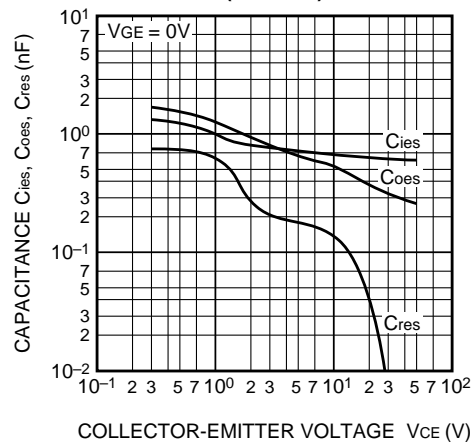
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



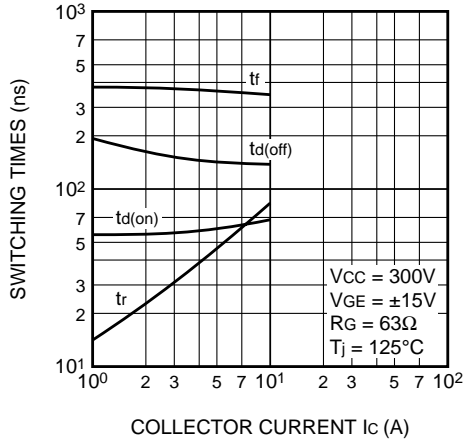
CAPACITANCE VS. Vce (TYPICAL)



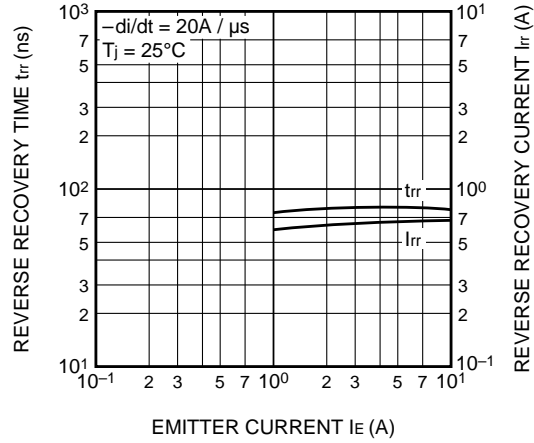
CM10MD-12H

MEDIUM POWER SWITCHING USE
INSULATED TYPE

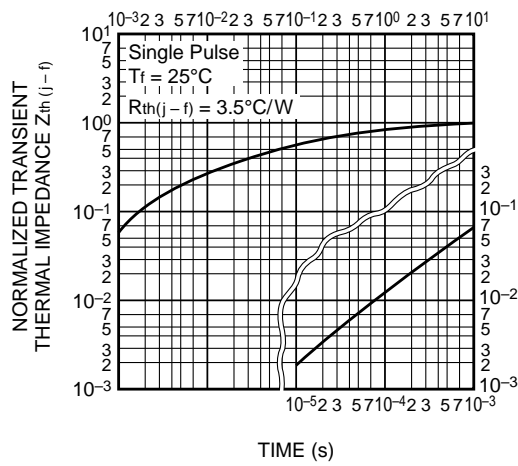
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



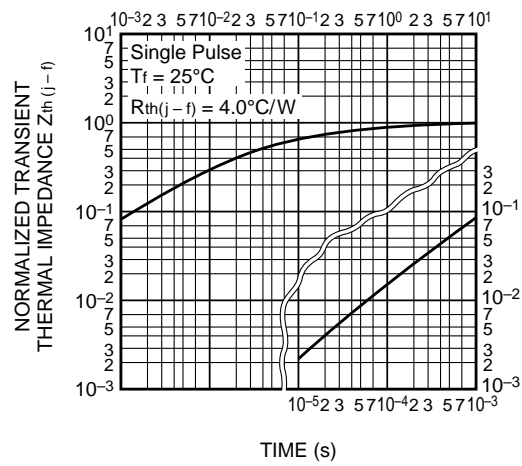
REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT part)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWDi part)



VGE - GATE CHARGE (TYPICAL)

