

# CM50TU-24H

MEDIUM POWER SWITCHING USE  
INSULATED TYPE

## CM50TU-24H



- Ic ..... 50A
- VCES ..... 1200V
- Insulated Type
- 6-elements in a pack
- UL Recognized

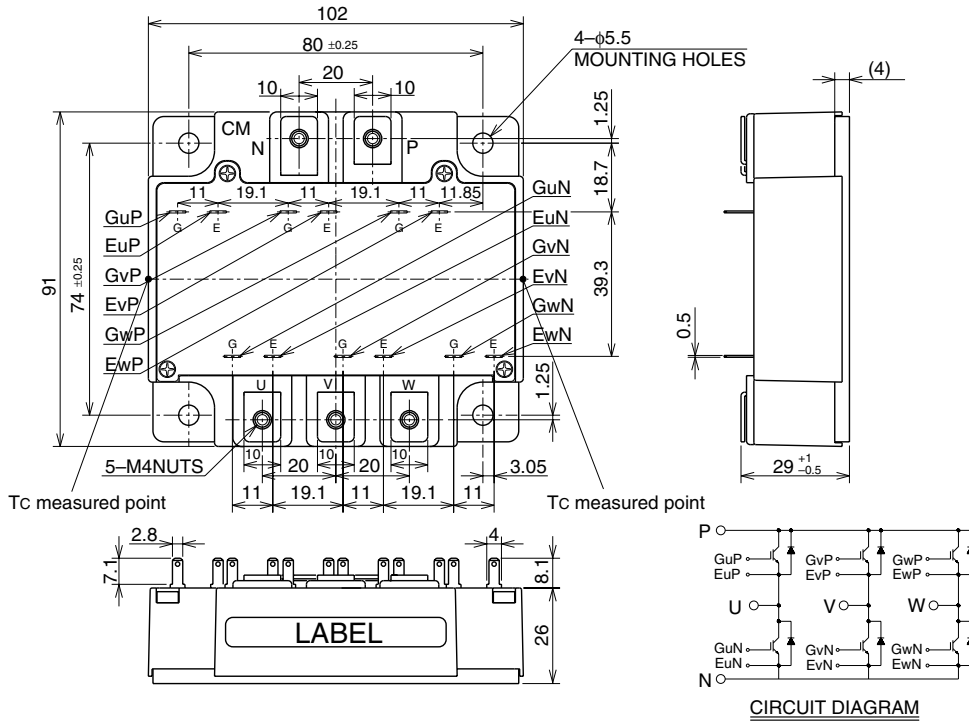
Yellow Card No. E80276  
File No. E80271

## APPLICATION

UPS, NC machine, AC-Drive control, Servo, Welders

## OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm



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INSULATED TYPEMAXIMUM RATINGS ( $T_j = 25^\circ\text{C}$ , unless otherwise specified)

| Symbol       | Item                          | Conditions  | Ratings         | Unit             |
|--------------|-------------------------------|---|-----------------|------------------|
| VCES         | Collector-emitter voltage     | $V_{GE} = 0\text{V}$  | 1200            | V                |
| VGES         | Gate-emitter voltage          | $V_{CE} = 0\text{V}$  | $\pm 20$        | V                |
| IC           | Collector current             | $T_C = 25^\circ\text{C}$                                    | 50              | A                |
| ICM          |                               | Pulse (Note 1)  | 100             | A                |
| IE (Note 2)  | Emitter current               | $T_C = 25^\circ\text{C}$                                    | 50              | A                |
| IEM (Note 2) |                               | Pulse (Note 1)  | 100             | A                |
| PC (Note 3)  | Maximum collector dissipation | $T_C = 25^\circ\text{C}$                                    | 400             | W                |
| Tj           | Junction temperature          | —   | $-40 \sim +150$ | $^\circ\text{C}$ |
| Tstg         | Storage temperature           | —   | $-40 \sim +125$ | $^\circ\text{C}$ |
| Viso         | Isolation voltage             | Charged part to base plate, $f = 60\text{Hz}$ , AC 1 minute | 2500            | Vrms             |
| —            | Mounting torque               | Main terminals M4 screw                                     | 1.3 ~ 1.7       | N·m              |
| —            |                               | Mounting M5 screw   | 2.5 ~ 3.5       | N·m              |
| —            | Weight                        | Typical value   | 570             | g                |

ELECTRICAL CHARACTERISTICS ( $T_j = 25^\circ\text{C}$ , unless otherwise specified)

| Symbol                   | Item                                 | Test Conditions  | Limits |      |      | Unit          |
|--------------------------|--------------------------------------|--|--------|------|------|---------------|
|                          |                                      |  | Min    | Typ  | Max  |               |
| ICES                     | Collector cutoff current             | $V_{CE} = V_{CES}$ , $V_{GE} = 0\text{V}$                              | —      | —    | 1    | mA            |
| VGE(th)                  | Gate-emitter threshold voltage       | $I_C = 5\text{mA}$ , $V_{CE} = 10\text{V}$                             | 4.5    | 6    | 7.5  | V             |
| IGES                     | Gate-leakage current                 | $\pm V_{GE} = V_{GES}$ , $V_{CE} = 0\text{V}$                          | —      | —    | 0.5  | $\mu\text{A}$ |
| VCE(sat)                 | Collector-emitter saturation voltage | $I_C = 50\text{A}$ , $V_{GE} = 15\text{V}$ (Note 4)                    | —      | 2.9  | 3.7  | V             |
|                          |                                      | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$                  | —      | 2.85 | —    |               |
| Cies                     | Input capacitance                    | $V_{CE} = 10\text{V}$  | —      | —    | 7.5  | nF            |
| Coes                     | Output capacitance                   | $V_{GE} = 0\text{V}$   | —      | —    | 2.6  | nF            |
| Cres                     | Reverse transfer capacitance         |  | —      | —    | 1.5  | nF            |
| QG                       | Total gate charge                    | $V_{CC} = 600\text{V}$ , $I_C = 50\text{A}$ , $V_{GE} = 15\text{V}$    | —      | 187  | —    | nC            |
| td(on)                   | Turn-on delay time                   | $V_{CC} = 600\text{V}$ , $I_C = 50\text{A}$                            | —      | —    | 80   | ns            |
| tr                       | Turn-on rise time                    | $V_{GE} = \pm 15\text{V}$  | —      | —    | 200  | ns            |
| td(off)                  | Turn-off delay time                  | $R_G = 6.3\Omega$  | —      | —    | 150  | ns            |
| tf                       | Turn-off fall time                   | Resistive load   | —      | —    | 350  | ns            |
| VEC(Note 2)              | Emitter-collector voltage            | $I_E = 50\text{A}$ , $V_{GE} = 0\text{V}$                              | —      | —    | 3.2  | V             |
| t <sub>rr</sub> (Note 2) | Reverse recovery time                | $I_E = 50\text{A}$ ,   | —      | —    | 300  | ns            |
| Q <sub>rr</sub> (Note 2) | Reverse recovery charge              | $di_e / dt = -100\text{A} / \mu\text{s}$                               | —      | 0.28 | —    | $\mu\text{C}$ |
| Rth(j-c)Q                | Thermal resistance (Note 5)          | Junction to case, IGBT part (Per 1/6 module)                           | —      | —    | 0.31 | K/W           |
| Rth(j-c)R                |                                      | Junction to case, FWDi part (Per 1/6 module)                           | —      | —    | 0.7  | K/W           |
| Rth(c-f)                 | Contact thermal resistance           | Case to heat sink, conductive grease applied (Per 1/6 module) (Note 6) | —      | 0.11 | —    | K/W           |

Note 1. Pulse width and repetition rate should be such that the device junction temperature ( $T_j$ ) does not exceed  $T_{j\text{max}}$  rating.

2.  $I_E$ ,  $V_{EC}$ ,  $t_{rr}$ ,  $Q_{rr}$  &  $di_e/dt$  represent characteristics of the anti-parallel, emitter-collector free-wheel diode.

3. Junction temperature ( $T_j$ ) should not increase beyond  $150^\circ\text{C}$ .

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

5. Case temperature ( $T_c$ ) measured point is shown in page OUTLINE DRAWING.

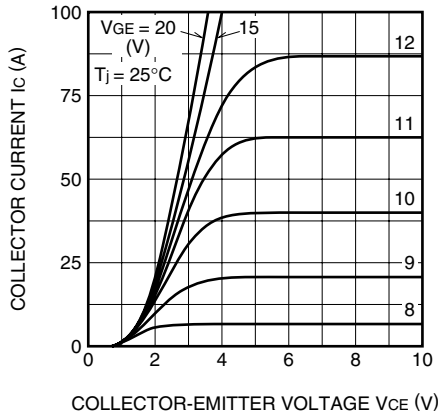
6. Typical value is measured by using thermally conductive grease of  $\lambda = 0.9[\text{W}/(\text{m} \cdot \text{K})]$ .

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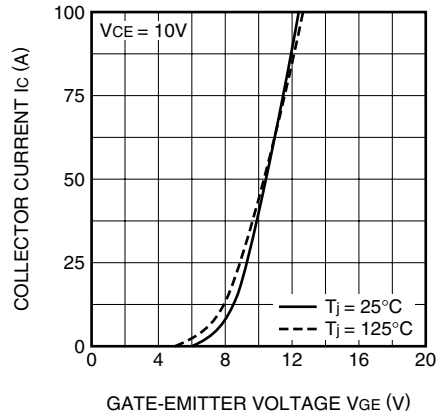
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## PERFORMANCE CURVES

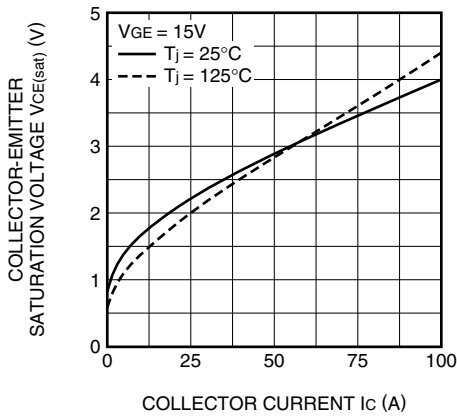
**OUTPUT CHARACTERISTICS (TYPICAL)**



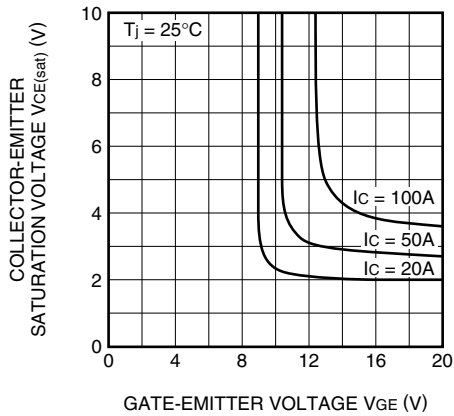
**TRANSFER CHARACTERISTICS (TYPICAL)**



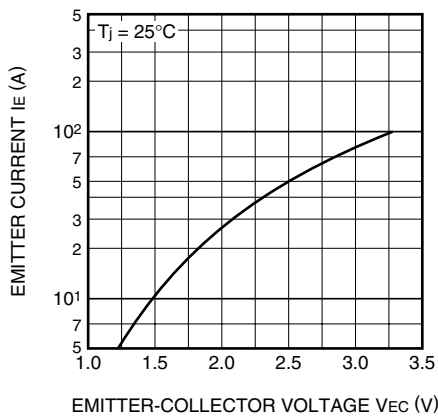
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



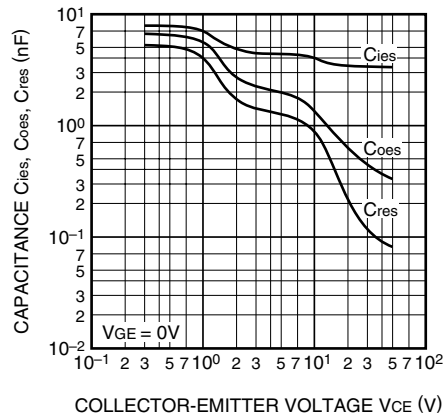
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



**FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)**



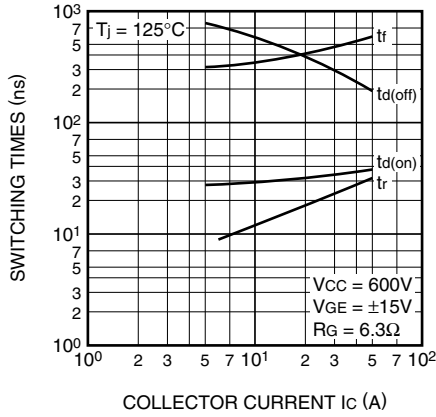
**CAPACITANCE CHARACTERISTICS (TYPICAL)**



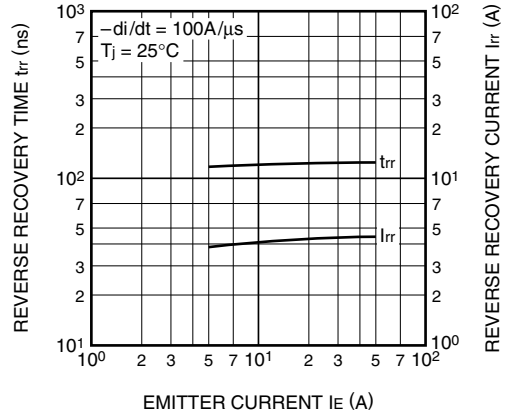
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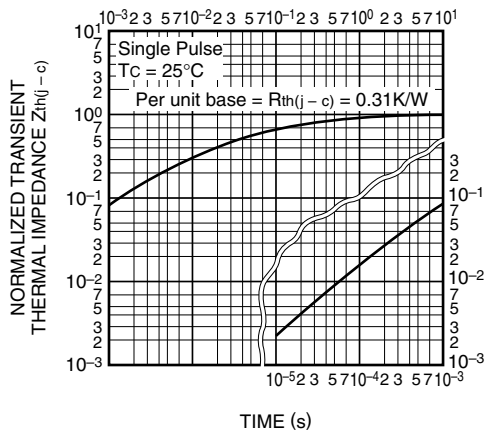
**HALF-BRIDGE SWITCHING TIME CHARACTERISTICS (TYPICAL)**



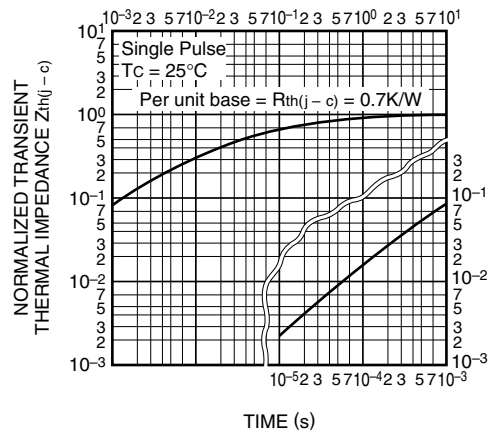
**REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT part)**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWDi part)**



**GATE CHARGE CHARACTERISTICS (TYPICAL)**

