

# CM50TU-24F

A black, rectangular electronic component, likely a power MOSFET or IGBT module, with multiple pins and a label. The component is shown from a three-quarter perspective. It has a black plastic housing with several silver-colored metal pins protruding from the top and bottom. A white label is affixed to the bottom right corner, featuring the Mitsubishi logo and the text "MITSUBISHI ELECTRIC" and "IGBT". The component is mounted on a white base.

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# CM50TU-24F

## HIGH POWER SWITCHING USE

### MAXIMUM RATINGS (Tj = 25°C)

| Symbol                   | Parameter                     | Conditions                             | Ratings    | Unit  |
|--------------------------|-------------------------------|----------------------------------------|------------|-------|
| V <sub>CES</sub>         | Collector-emitter voltage     | G-E Short                              | 1200       | V     |
| V <sub>GES</sub>         | Gate-emitter voltage          | C-E Short                              | ±20        | V     |
| I <sub>C</sub>           | Collector current             | T <sub>C</sub> = 25°C                  | 50         | A     |
| I <sub>CM</sub>          |                               | Pulse (Note 2)                         | 100        |       |
| I <sub>E</sub> (Note 1)  | Emitter current               | T <sub>C</sub> = 25°C                  | 50         | A     |
| I <sub>EM</sub> (Note 1) |                               | Pulse (Note 2)                         | 100        |       |
| P <sub>C</sub> (Note 3)  | Maximum collector dissipation | T <sub>C</sub> = 25°C                  | 320        | W     |
| T <sub>j</sub>           | Junction temperature          |                                        | −40 ~ +150 | °C    |
| T <sub>stg</sub>         | Storage temperature           |                                        | −40 ~ +125 | °C    |
| V <sub>iso</sub>         | Isolation voltage             | Main terminal to base plate, AC 1 min. | 2500       | V     |
| —                        | Torque strength               | Main Terminal M4                       | 1.3 ~ 1.7  | N • m |
| —                        |                               | Mounting holes M5                      | 2.5 ~ 3.5  | N • m |
| —                        | Weight                        | Typical value                          | 570        | g     |

### ELECTRICAL CHARACTERISTICS (Tj = 25°C)

| Symbol                   | Parameter                            | Test conditions                                                                                                                                                                | Limits |            |          | Unit |
|--------------------------|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------------|----------|------|
|                          |                                      |                                                                                                                                                                                | Min.   | Typ.       | Max.     |      |
| I <sub>CES</sub>         | Collector cutoff current             | V <sub>CE</sub> = V <sub>CES</sub> , V <sub>GE</sub> = 0V                                                                                                                      | —      | —          | 1        | mA   |
| V <sub>GE(th)</sub>      | Gate-emitter threshold voltage       | I <sub>C</sub> = 5.0mA, V <sub>CE</sub> = 10V                                                                                                                                  | 5      | 6          | 7        | V    |
| I <sub>GES</sub>         | Gate leakage current                 | V <sub>GE</sub> = V <sub>CES</sub> , V <sub>CE</sub> = 0V                                                                                                                      | —      | —          | 20       | μA   |
| V <sub>CE(sat)</sub>     | Collector-emitter saturation voltage | T <sub>j</sub> = 25°C<br>T <sub>j</sub> = 125°C<br>I <sub>C</sub> = 50A, V <sub>GE</sub> = 15V                                                                                 | —      | 1.8<br>1.9 | 2.4<br>— | V    |
| C <sub>ies</sub>         | Input capacitance                    | V <sub>CE</sub> = 10V<br>V <sub>GE</sub> = 0V                                                                                                                                  | —      | —          | 20       | nF   |
| C <sub>oes</sub>         | Output capacitance                   |                                                                                                                                                                                | —      | —          | 0.85     |      |
| C <sub>res</sub>         | Reverse transfer capacitance         |                                                                                                                                                                                | —      | —          | 0.5      |      |
| Q <sub>G</sub>           | Total gate charge                    | V <sub>CC</sub> = 600V, I <sub>C</sub> = 50A, V <sub>GE</sub> = 15V                                                                                                            | —      | 550        | —        | nC   |
| t <sub>d(on)</sub>       | Turn-on delay time                   | V <sub>CC</sub> = 600V, I <sub>C</sub> = 50A<br>V <sub>GE1</sub> = V <sub>GE2</sub> = 15V<br>R <sub>G</sub> = 6.3Ω, Inductive load switching operation<br>I <sub>E</sub> = 50A | —      | —          | 100      | ns   |
| t <sub>r</sub>           | Turn-on rise time                    |                                                                                                                                                                                | —      | —          | 50       |      |
| t <sub>d(off)</sub>      | Turn-off delay time                  |                                                                                                                                                                                | —      | —          | 300      |      |
| t <sub>f</sub>           | Turn-off fall time                   |                                                                                                                                                                                | —      | —          | 300      |      |
| t <sub>rr</sub> (Note 1) | Reverse recovery time                |                                                                                                                                                                                | —      | —          | 150      | ns   |
| Q <sub>rr</sub> (Note 1) | Reverse recovery charge              |                                                                                                                                                                                | —      | 2.1        | —        | μC   |
| V <sub>EC</sub> (Note 1) | Emitter-collector voltage            | I <sub>E</sub> = 50A, V <sub>GE</sub> = 0V                                                                                                                                     | —      | —          | 3.2      | V    |
| R <sub>th(j-c)Q</sub>    | Thermal resistance*1                 | IGBT part (1/6 module)                                                                                                                                                         | —      | —          | 0.39     | °C/W |
| R <sub>th(j-c)R</sub>    |                                      | FWDi part (1/6 module)                                                                                                                                                         | —      | —          | 0.70     |      |
| R <sub>th(c-f)</sub>     | Contact thermal resistance           | Case to fin, Thermal compoundapplied*2 (1/6 module)                                                                                                                            | —      | 0.11       | —        |      |
| R <sub>th(j-c')Q</sub>   | Thermal resistance                   | T <sub>C</sub> measured point is just under the chips                                                                                                                          | —      | —          | 0.31*3   |      |
| R <sub>G</sub>           | External gate resistance             |                                                                                                                                                                                | 6.3    | —          | 63       | Ω    |

Note 1. I<sub>E</sub>, V<sub>EC</sub>, t<sub>rr</sub>, Q<sub>rr</sub>, die/dt represent characteristics of the anti-parallel, emitter to collector free-wheel diode. (FWDi).

2. Pulse width and repetition rate should be such that the device junction temp. (T<sub>j</sub>) does not exceed T<sub>jmax</sub> rating.

3. Junction temperature (T<sub>j</sub>) should not increase beyond 150°C.

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

\*1 : T<sub>C</sub> measured point is indicated in OUTLINE DRAWING.

\*2 : Typical value is measured by using Shin-etsu Silicone "G-746".

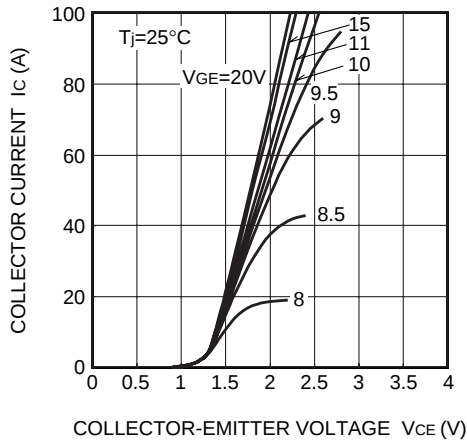
\*3 : If you use this value, R<sub>th(f-a)</sub> should be measured just under the chips.

# CM50TU-24F

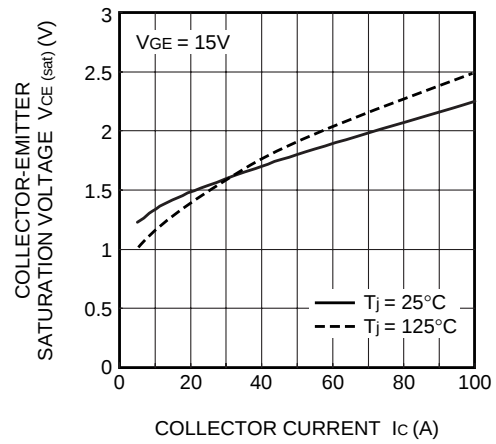
HIGH POWER SWITCHING USE

## PERFORMANCE CURVES

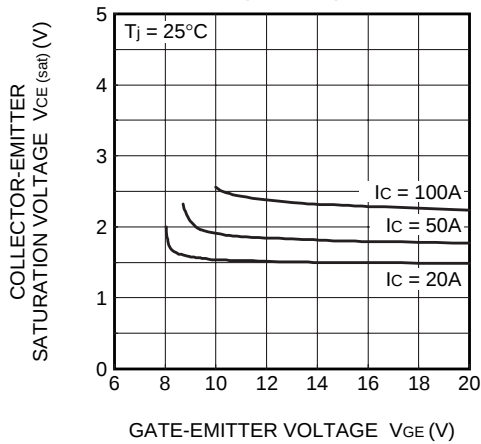
OUTPUT CHARACTERISTICS  
(TYPICAL)



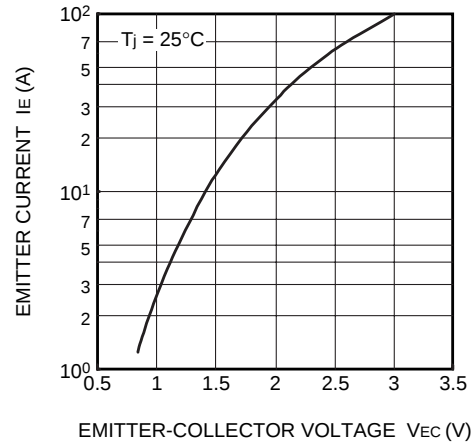
COLLECTOR-EMITTER SATURATION  
VOLTAGE CHARACTERISTICS  
(TYPICAL)



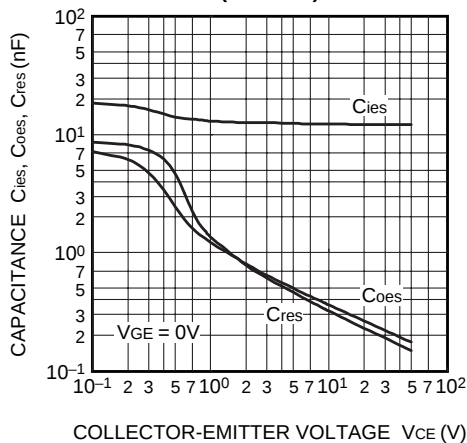
COLLECTOR-EMITTER SATURATION  
VOLTAGE CHARACTERISTICS  
(TYPICAL)



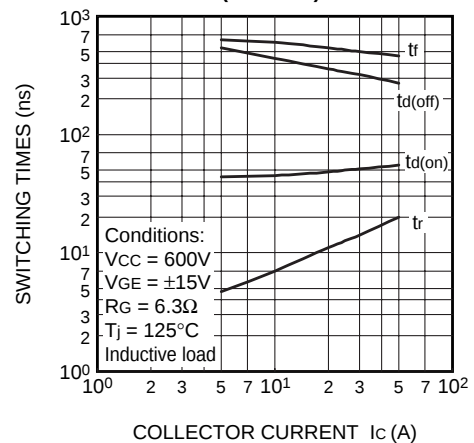
FREE-WHEEL DIODE  
FORWARD CHARACTERISTICS  
(TYPICAL)



CAPACITANCE- $V_{CE}$   
CHARACTERISTICS  
(TYPICAL)



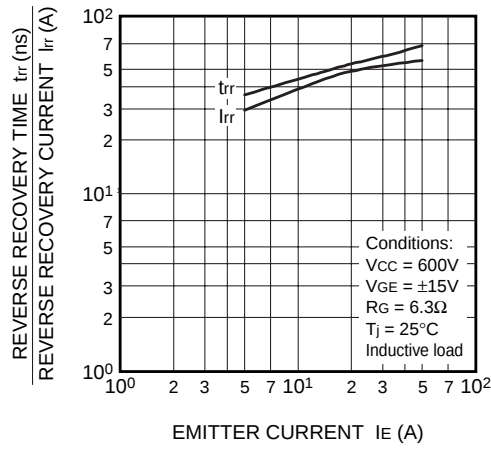
HALF-BRIDGE  
SWITCHING CHARACTERISTICS  
(TYPICAL)



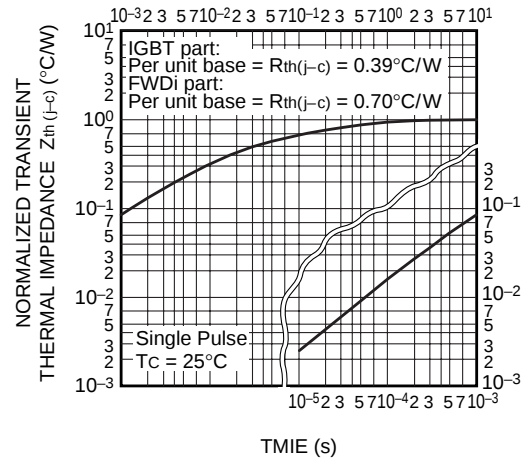
# CM50TU-24F

HIGH POWER SWITCHING USE

REVERSE RECOVERY CHARACTERISTICS  
OF FREE-WHEEL DIODE  
(TYPICAL)



TRANSIENT THERMAL  
IMPEDANCE CHARACTERISTICS  
(IGBT part & FWDi part)



GATE CHARGE  
CHARACTERISTICS  
(TYPICAL)

