

# CM600DU-5F

HIGH POWER SWITCHING USE

## CM600DU-5F



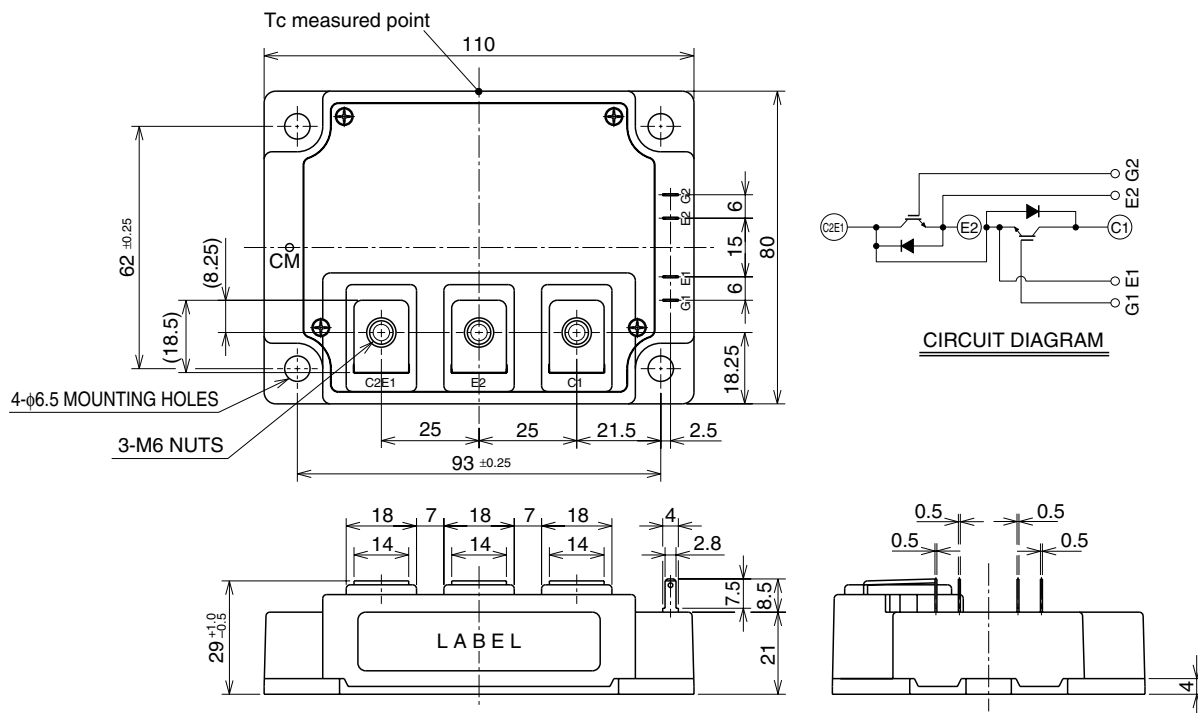
- IC .....600A
- VCES .....250V
- Insulated Type
- 2-elements in a pack

## APPLICATION

AC motor control of forklift (battery power source)

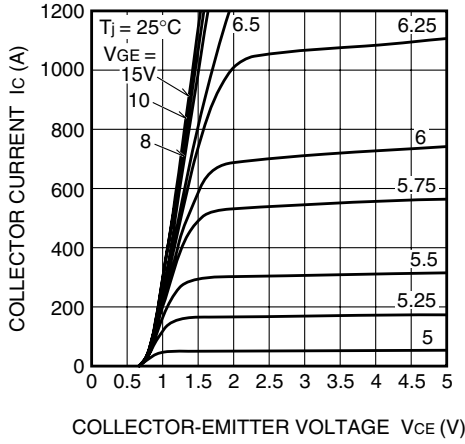
## OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm

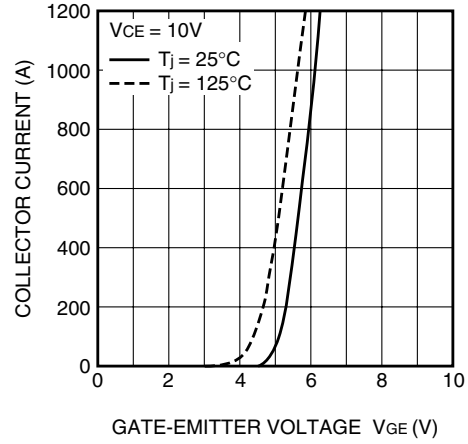


PERFORMANCE CURVES

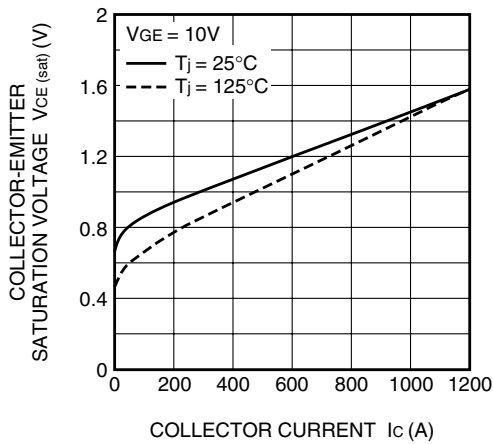
OUTPUT CHARACTERISTICS (TYPICAL)



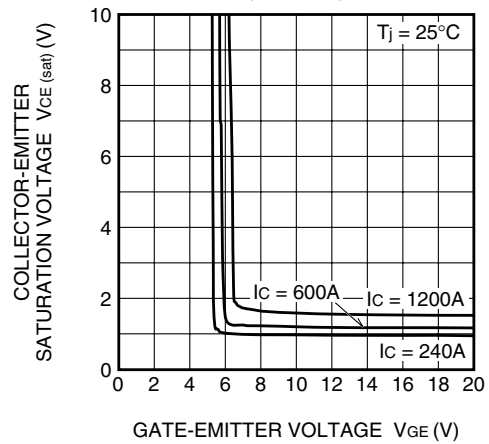
TRANSFER CHARACTERISTICS (TYPICAL)



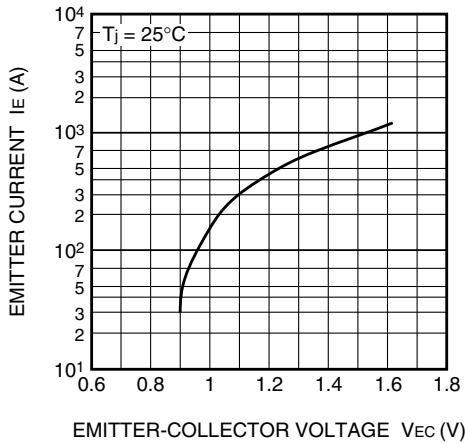
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



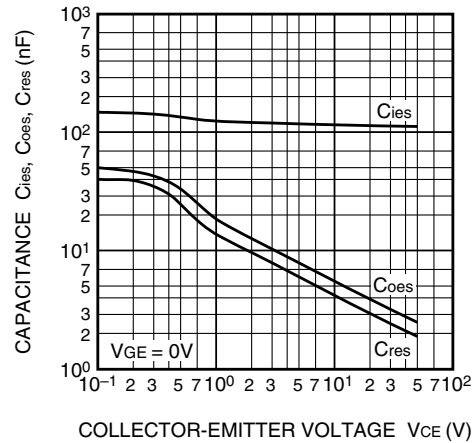
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



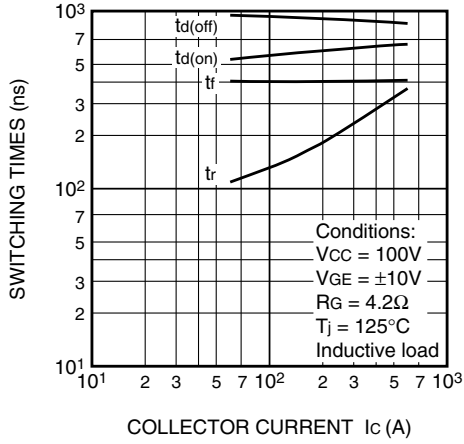
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



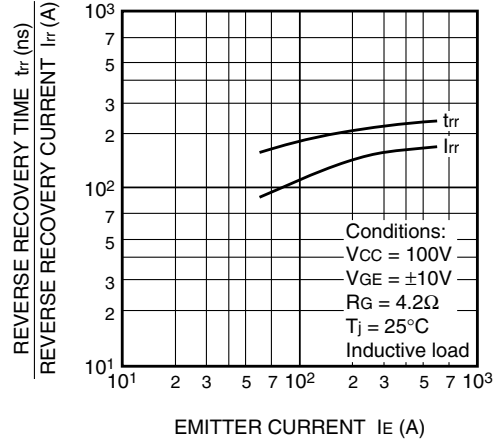
CAPACITANCE-Vce CHARACTERISTICS (TYPICAL)



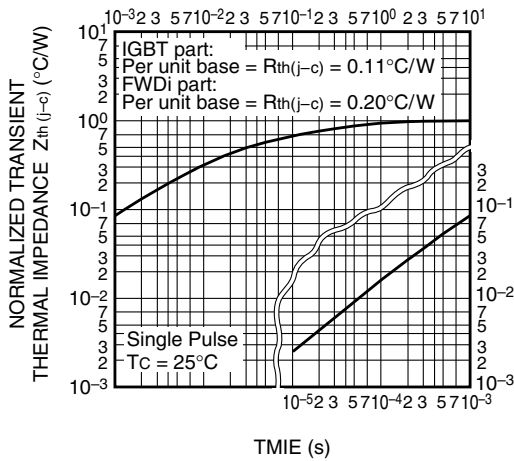
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



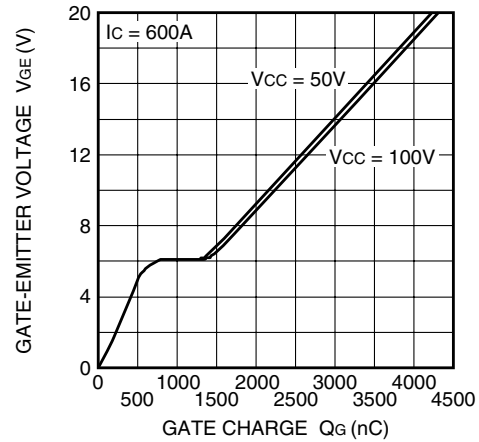
REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT part & FWDi part)



GATE CHARGE CHARACTERISTICS (TYPICAL)



MAXIMUM RATINGS (T<sub>j</sub> = 25°C)

| Symbol                       | Parameter                     | Conditions                             | Ratings        | Unit               |
|------------------------------|-------------------------------|--|----------------|--------------------|
| V <sub>CE</sub> S            | Collector-emitter voltage     | G-E Short                              | 250            | V                  |
| V <sub>GE</sub> S            | Gate-emitter voltage          | C-E Short                              | ±20            | V                  |
| I <sub>C</sub>               | Collector current             | T <sub>c</sub> = 25°C                  | 600            | A                  |
| I <sub>C(rms)</sub>          |                               |  | 350            | A <sub>(rms)</sub> |
| I <sub>CM</sub>              |                               |  | Pulse (Note 2) | 1200               |
| I <sub>E</sub> (Note 1)      | Emitter current               | T <sub>c</sub> = 25°C                  | 600            | A                  |
| I <sub>E(rms)</sub> (Note 1) |                               |  | 350            | A <sub>(rms)</sub> |
| I <sub>EM</sub> (Note 1)     |                               |  | Pulse (Note 2) | 1200               |
| P <sub>C</sub> (Note 3)      | Maximum collector dissipation | T <sub>c</sub> = 25°C                  | 1100           | 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                  |
| —                            | Mounting torque               | Main Terminal M6                       | 3.5 ~ 4.5      | N • m              |
| —                            |                               | Mounting holes M6                      | 3.5 ~ 4.5      | N • m              |
| —                            | Weight                        | Typical value                          | 580            | g                  |

ELECTRICAL CHARACTERISTICS (T<sub>j</sub> = 25°C)

| Symbol                   | Parameter                               | Test conditions   | Limits                |      |      | Unit |
|--------------------------|---|---|-----------------------|------|------|------|
|                          |   |   | Min.                  | Typ. | Max. |      |
| I <sub>CE</sub> S        | Collector cutoff current                | V <sub>CE</sub> = V <sub>CE</sub> S, V <sub>GE</sub> = 0V   | —                     | —    | 1    | mA   |
| V <sub>GE(th)</sub>      | Gate-emitter threshold voltage          | I <sub>C</sub> = 60mA, V <sub>CE</sub> = 10V  | 3.0                   | 4.0  | 5.0  | V    |
| I <sub>GE</sub> S        | Gate leakage current                    | V <sub>GE</sub> = V <sub>CE</sub> S, V <sub>CE</sub> = 0V   | —                     | —    | 0.5  | μA   |
| V <sub>CE(sat)</sub>     | Collector to emitter saturation voltage | T <sub>j</sub> = 25°C   | —                     | 1.2  | 1.7  | V    |
|                          |   | T <sub>j</sub> = 125°C  | —                     | 1.1  | —    |      |
| C <sub>ies</sub>         | Input capacitance                       | V <sub>CE</sub> = 10V<br>V <sub>GE</sub> = 0V   | —                     | —    | 170  | nF   |
| C <sub>oes</sub>         | Output capacitance                      |   | —                     | —    | 11   |      |
| C <sub>res</sub>         | Reverse transfer capacitance            |   | —                     | —    | 5.7  |      |
| Q <sub>G</sub>           | Total gate charge                       | V <sub>CC</sub> = 100V, I <sub>C</sub> = 600A, V <sub>GE</sub> = 10V  | —                     | 2200 | —    | nC   |
| t <sub>d(on)</sub>       | Turn-on delay time                      | V <sub>CC</sub> = 100V, I <sub>C</sub> = 600A<br>V <sub>GE1</sub> = V <sub>GE2</sub> = 10V<br>R <sub>G</sub> = 4.2Ω, Inductive load switching operation | —                     | —    | 850  | ns   |
| t <sub>r</sub>           | Turn-on rise time                       |   | —                     | —    | 600  |      |
| t <sub>d(off)</sub>      | Turn-off delay time                     |   | —                     | —    | 1100 |      |
| t <sub>f</sub>           | Turn-off fall time                      |   | —                     | —    | 500  |      |
| t <sub>rr</sub> (Note 1) | Reverse recovery time                   |   | I <sub>E</sub> = 600A | —    | —    |      |
| Q <sub>rr</sub> (Note 1) | Reverse recovery charge                 |   | —                     | 20.0 | —    | μC   |
| V <sub>EC</sub> (Note 1) | Emitter-collector voltage               | I <sub>E</sub> = 600A, V <sub>GE</sub> = 0V   | —                     | —    | 2    | V    |
| R <sub>th(j-c)Q</sub>    | Thermal resistance*1                    | IGBT part (1/2 module)  | —                     | —    | 0.11 | °C/W |
| R <sub>th(j-c)R</sub>    |   | FWDi part (1/2 module)  | —                     | —    | 0.20 |      |
| R <sub>th(c-f)</sub>     | Contact thermal resistance              | Case to fin, Thermal compound applied*2 (1/2 module)  | —                     | 0.02 | —    |      |
| R <sub>th(j-c)Q</sub>    | Thermal resistance*3                    | T <sub>c</sub> measured point is just under the chips   | —                     | —    | 0.05 |      |

Note 1. I<sub>E</sub>, V<sub>EC</sub>, t<sub>rr</sub>, Q<sub>rr</sub> and 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.