

<IGBT Modules>

# CM100DY-34T

HIGH POWER SWITCHING USE  
INSULATED TYPE



dual switch (half-bridge)

Collector current  $I_C$  ..... 1 0 0 A  
Collector-emitter voltage  $V_{CES}$  ..... 1 7 0 0 V  
Maximum junction temperature  $T_{vjmax}$  ..... 1 7 5 °C

- Flat base type
- Nickel-plating tab terminals
- RoHS Directive compliant
- UL Recognized under UL1557, File No.E323585

## APPLICATION

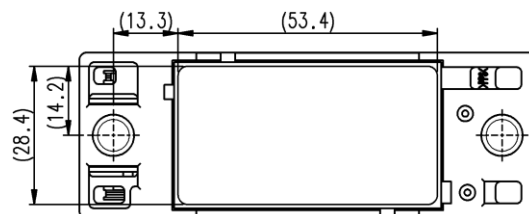
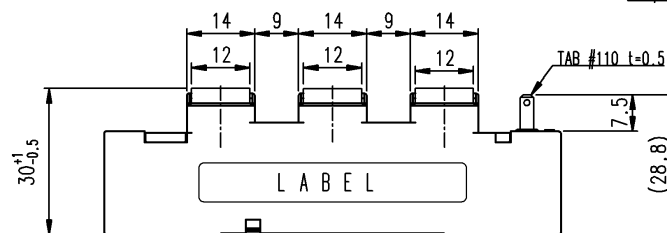
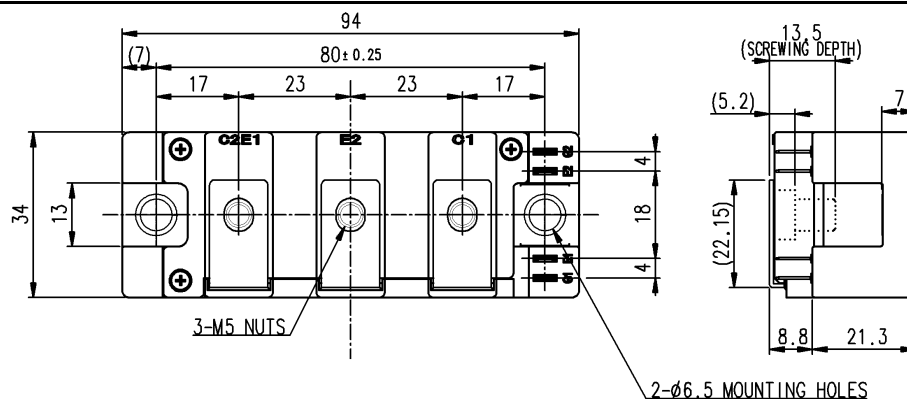
AC Motor Control, Motion/Servo Control, Power supply, etc.

**OPTION** (Below options are available.)

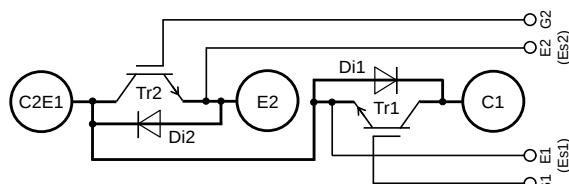
- PC-TIM (Phase Change Thermal Interface Material) pre-apply<sup>(Note8)</sup>

## OUTLINE DRAWING & INTERNAL CONNECTION

Dimension in mm



INTERNAL CONNECTION



Tolerance otherwise specified

| Division of Dimension | Tolerance |
|-----------------------|-----------|
| 0.5 to 3              | ±0.2      |
| over 3 to 6           | ±0.3      |
| over 6 to 30          | ±0.5      |
| over 30 to 120        | ±0.8      |
| over 120 to 400       | ±1.2      |

JIS B 0405 c

## CM100DY-34T

HIGH POWER SWITCHING USE  
INSULATED TYPEMAXIMUM RATINGS (T<sub>vj</sub>=25 °C, unless otherwise specified)

| Symbol                   | Item                           | Conditions                                      | Rating      | Unit |
|--------------------------|--------------------------------|-------------------------------------------------|-------------|------|
| V <sub>CES</sub>         | Collector-emitter voltage      | G-E short-circuited                             | 1700        | V    |
| V <sub>GES</sub>         | Gate-emitter voltage           | C-E short-circuited                             | ± 20        | V    |
| I <sub>C</sub>           | Collector current              | DC, T <sub>C</sub> =134 °C* (Note2, 4)          | 100         | A    |
| I <sub>CRM</sub>         |                                | Pulse, Repetitive (Note3)                       | 200         |      |
| P <sub>tot</sub>         | Total power dissipation        | T <sub>C</sub> =25 °C (Note2, 4)                | 1135        | W    |
| I <sub>E</sub> (Note1)   | Emitter current                | DC (Note2)                                      | 100         | A    |
| I <sub>ERM</sub> (Note1) |                                | Pulse, Repetitive (Note3)                       | 200         |      |
| V <sub>isol</sub>        | Isolation voltage              | Terminals to base plate, RMS, f=60 Hz, AC 1 min | 4000        | V    |
| T <sub>vjmax</sub>       | Maximum junction temperature   | Instantaneous event (overload) (Note8)          | 175         | °C   |
| T <sub>Cmax</sub>        | Maximum case temperature       | (Note4,8)                                       | 150*        |      |
| T <sub>vjop</sub>        | Operating junction temperature | Continuous operation (under switching) (Note8)  | -40 ~ +150  | °C   |
| T <sub>stg</sub>         | Storage temperature            | -                                               | -40 ~ +150* |      |

ELECTRICAL CHARACTERISTICS (T<sub>vj</sub>=25 °C, unless otherwise specified)

| Symbol                              | Item                                 | Conditions                                                                                                                               | Limits                  |      |      | Unit |
|-------------------------------------|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|------|------|------|
|                                     |                                      |                                                                                                                                          | Min.                    | Typ. | Max. |      |
| I <sub>CES</sub>                    | Collector-emitter cut-off current    | V <sub>CE</sub> =V <sub>CES</sub> , G-E short-circuited                                                                                  | -                       | -    | 1.0  | mA   |
| I <sub>GES</sub>                    | Gate-emitter leakage current         | V <sub>GE</sub> =V <sub>GES</sub> , C-E short-circuited                                                                                  | -                       | -    | 0.5  | μA   |
| V <sub>GE(th)</sub>                 | Gate-emitter threshold voltage       | I <sub>C</sub> =10 mA, V <sub>CE</sub> =10 V                                                                                             | 5.4                     | 6.0  | 6.6  | V    |
| V <sub>CESat</sub> (Terminal)       | Collector-emitter saturation voltage | I <sub>C</sub> =100 A, V <sub>GE</sub> =15 V,<br>Refer to the figure of test circuit<br>(Note5)                                          | T <sub>vj</sub> =25 °C  | 2.05 | 2.50 | V    |
|                                     |                                      |                                                                                                                                          | T <sub>vj</sub> =125 °C | 2.45 | -    |      |
|                                     |                                      |                                                                                                                                          | T <sub>vj</sub> =150 °C | 2.55 | -    |      |
| V <sub>CESat</sub> (Chip)           |                                      | I <sub>C</sub> =100 A,<br>V <sub>GE</sub> =15 V,<br>(Note5)                                                                              | T <sub>vj</sub> =25 °C  | 1.95 | 2.35 | V    |
|                                     |                                      |                                                                                                                                          | T <sub>vj</sub> =125 °C | 2.35 | -    |      |
|                                     |                                      |                                                                                                                                          | T <sub>vj</sub> =150 °C | 2.45 | -    |      |
| C <sub>ies</sub>                    | Input capacitance                    | V <sub>CE</sub> =10 V, G-E short-circuited                                                                                               | -                       | -    | 27.5 | nF   |
| C <sub>oes</sub>                    | Output capacitance                   |                                                                                                                                          | -                       | -    | 0.7  |      |
| C <sub>res</sub>                    | Reverse transfer capacitance         |                                                                                                                                          | -                       | -    | 0.2  |      |
| Q <sub>G</sub>                      | Gate charge                          | V <sub>CC</sub> =1000 V, I <sub>C</sub> =100 A, V <sub>GE</sub> =15 V                                                                    | -                       | 0.83 | -    | μC   |
| t <sub>d(on)</sub>                  | Turn-on delay time                   | V <sub>CC</sub> =1000 V, I <sub>C</sub> =100 A, V <sub>GE</sub> =±15 V,<br>R <sub>G</sub> =0 Ω, Inductive load                           | -                       | -    | 800  | ns   |
| t <sub>r</sub>                      | Rise time                            |                                                                                                                                          | -                       | -    | 200  |      |
| t <sub>d(off)</sub>                 | Turn-off delay time                  |                                                                                                                                          | -                       | -    | 800  |      |
| t <sub>f</sub>                      | Fall time                            |                                                                                                                                          | -                       | -    | 600  |      |
| V <sub>EC</sub> (Note.1) (Terminal) | Emitter-collector voltage            | I <sub>E</sub> =100 A, G-E short-circuited,<br>Refer to the figure of test circuit<br>(Note5)                                            | T <sub>vj</sub> =25 °C  | 2.70 | 3.30 | V    |
|                                     |                                      |                                                                                                                                          | T <sub>vj</sub> =125 °C | 2.95 | -    |      |
|                                     |                                      |                                                                                                                                          | T <sub>vj</sub> =150 °C | 2.95 | -    |      |
| V <sub>EC</sub> (Note.1) (Chip)     |                                      | I <sub>E</sub> =100 A,<br>G-E short-circuited,<br>(Note5)                                                                                | T <sub>vj</sub> =25 °C  | 2.65 | 3.20 | V    |
|                                     |                                      |                                                                                                                                          | T <sub>vj</sub> =125 °C | 2.75 | -    |      |
|                                     |                                      |                                                                                                                                          | T <sub>vj</sub> =150 °C | 2.75 | -    |      |
| t <sub>rr</sub> (Note1)             | Reverse recovery time                | V <sub>CC</sub> =1000 V, I <sub>E</sub> =100 A, V <sub>GE</sub> =±15 V,<br>R <sub>G</sub> =0 Ω, Inductive load                           | -                       | -    | 300  | ns   |
| Q <sub>rr</sub> (Note1)             | Reverse recovery charge              |                                                                                                                                          | -                       | 5.0  | -    | μC   |
| E <sub>on</sub>                     | Turn-on switching energy per pulse   | V <sub>CC</sub> =1000 V, I <sub>C</sub> =I <sub>E</sub> =100 A,<br>V <sub>GE</sub> =±15 V, R <sub>G</sub> =0 Ω, T <sub>vj</sub> =150 °C, | -                       | 32.2 | -    | mJ   |
| E <sub>off</sub>                    | Turn-off switching energy per pulse  | Inductive load                                                                                                                           | -                       | 30.1 | -    |      |
| E <sub>rr</sub> (Note1)             | Reverse recovery energy per pulse    |                                                                                                                                          | -                       | 9.6  | -    | mJ   |
| R <sub>CC'+EE'</sub>                | Internal lead resistance             | Main terminals-chip, per switch, T <sub>C</sub> =25 °C (Note4)                                                                           | -                       | 0.2  | -    | mΩ   |
| r <sub>g</sub>                      | Internal gate resistance             | Per switch                                                                                                                               | -                       | 7.5  | -    | Ω    |

\*: The value of PC-TIM applied module is limited by the heat resistant temperature of PC-TIM.

## THERMAL RESISTANCE CHARACTERISTICS

| Symbol         | Item                       | Conditions                                                            | Limits |      |       | Unit |
|----------------|----------------------------|-----------------------------------------------------------------------|--------|------|-------|------|
|                |                            |                                                                       | Min.   | Typ. | Max.  |      |
| $R_{th(j-c)Q}$ | Thermal resistance         | Junction to case, per Inverter IGBT (Note4)                           | -      | -    | 132   | K/kW |
| $R_{th(j-c)D}$ |                            | Junction to case, per Inverter FWD (Note4)                            | -      | -    | 192.5 |      |
| $R_{th(c-s)}$  | Contact thermal resistance | Case to heat sink, per 1 module<br>Thermal grease applied (Note4,6,8) | -      | 36.6 | -     | K/kW |

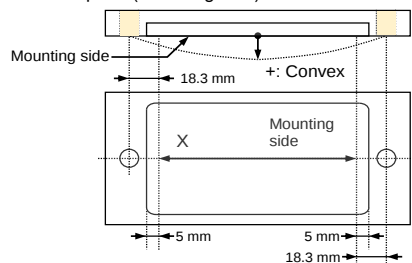
## MECHANICAL CHARACTERISTICS

| Symbol | Item                   | Conditions                      | Limits  |      |      | Unit          |
|--------|------------------------|---------------------------------|---------|------|------|---------------|
|        |                        |                                 | Min.    | Typ. | Max. |               |
| $M_t$  | Mounting torque        | Main terminals M 5 screw        | 2.5     | 3.0  | 3.5  | N·m           |
| $M_s$  | Mounting torque        | Mounting to heat sink M 6 screw | 3.5     | 4.0  | 4.5  | N·m           |
| $d_s$  | Creepage distance      | Terminal to terminal            | 18.4    | -    | -    | mm            |
|        |                        | Terminal to base plate          | 21.1    | -    | -    |               |
| $d_a$  | Clearance              | Terminal to terminal            | 9.6     | -    | -    | mm            |
|        |                        | Terminal to base plate          | 16.7    | -    | -    |               |
| $e_c$  | Flatness of base plate | On the centerline X, Y (Note7)  | $\pm 0$ | -    | +200 | $\mu\text{m}$ |
| $m$    | mass                   | -                               | -       | 120  | -    | g             |

\*. This product is compliant with the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) directive 2011/65/EU and (EU) 2015/863.

Note1. Represent ratings and characteristics of the anti-parallel, emitter-collector free-wheeling diode (FWD).

- Junction temperature ( $T_{vj}$ ) should not increase beyond  $T_{vj\max}$  rating.
- Pulse width and repetition rate should be such that the device junction temperature ( $T_{vj}$ ) dose not exceed  $T_{vj\max}$  rating.
- Case temperature ( $T_c$ ) and heat sink temperature ( $T_s$ ) are defined on the each surface (mounting side) of base plate and heat sink just under the chips.  
Refer to the figure of chip location.
- Pulse width and repetition rate should be such as to cause negligible temperature rise. Refer to the figure of test circuit.
- Typical value is measured by using thermally conductive grease of  $\lambda=3.0 \text{ W}/(\text{m}\cdot\text{K})/D_{(C-S)}=50 \mu\text{m}$ .
- The base plate (mounting side) flatness measurement points (X, Y) are shown in the following figure.



- Long term performance related to thermal conductive grease and PC-TIM (including but not limited to aspects such as the increase of thermal resistance due to pumping out, etc.) should be verified under your specific application conditions. Each temperature condition ( $T_{vj\max}$ ,  $T_{vj\text{op}}$ ,  $T_{c\max}$ ) must be maintained below the maximum rated temperature throughout consideration of the temperature rise even for long term usage.

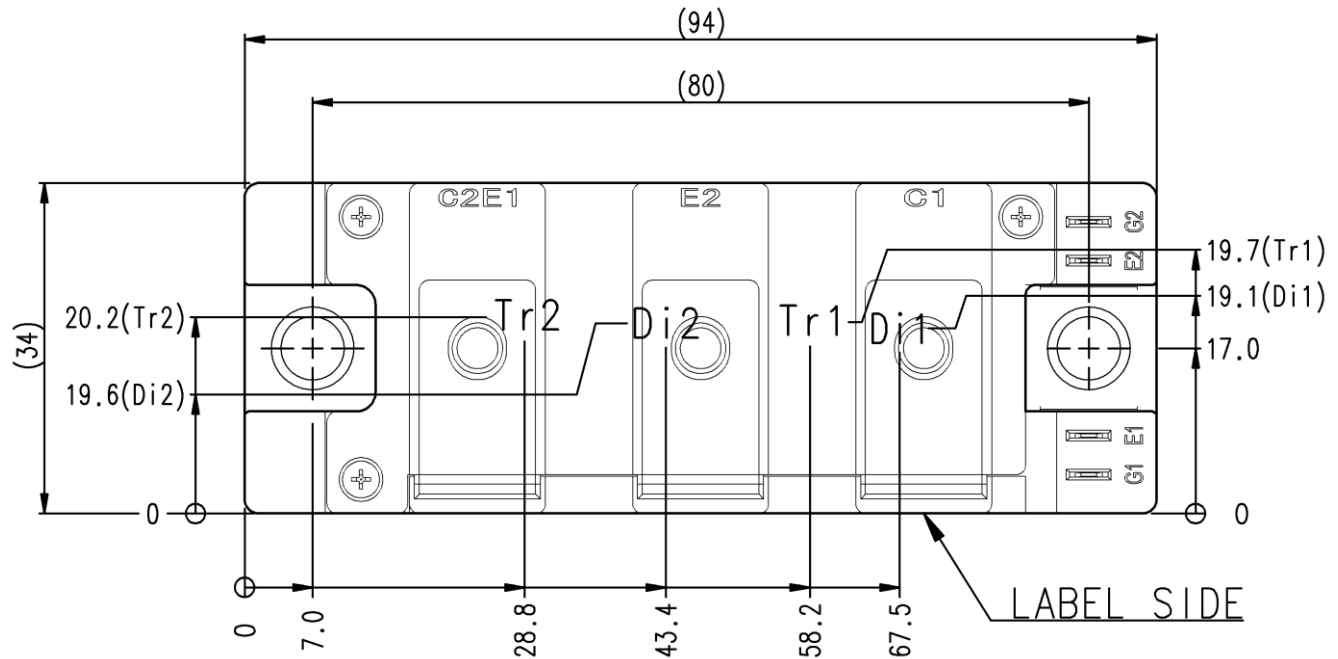
<IGBT Modules>  
**CM100DY-34T**  
HIGH POWER SWITCHING USE  
INSULATED TYPE

**RECMENDED OPERATING CONDITIONS**

| Symbol     | Item                          | Conditions                             | Limits |      |      | Unit     |
|------------|-------------------------------|----------------------------------------|--------|------|------|----------|
|            |                               |                                        | Min.   | Typ. | Max. |          |
| $V_{CC}$   | (DC) Supply voltage           | Applied across C1-E2 terminals         | -      | 1000 | 1200 | V        |
| $V_{GEon}$ | Gate (-emitter drive) voltage | Applied across G1-Es1/G2-Es2 terminals | 13.5   | 15.0 | 16.5 | V        |
| $R_G$      | External gate resistance      | Per switch                             | 0      | -    | 91   | $\Omega$ |

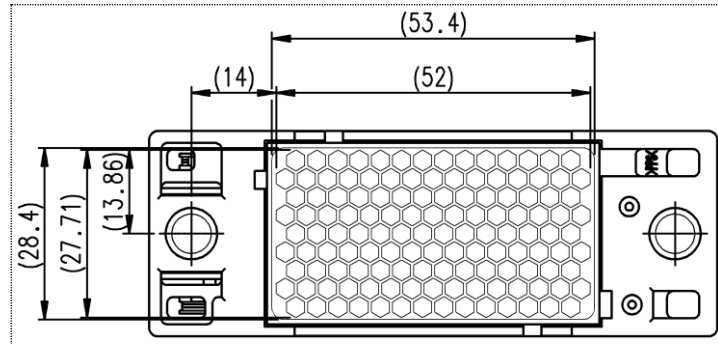
**CHIP LOCATION (Top view)**

Dimension in mm, tolerance:  $\pm 1$  mm

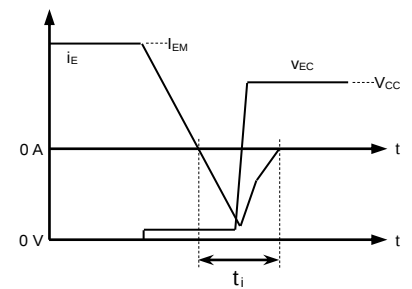
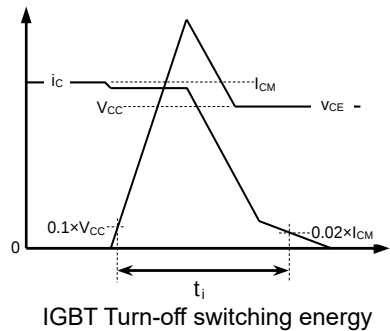
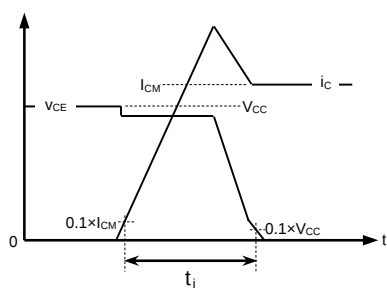
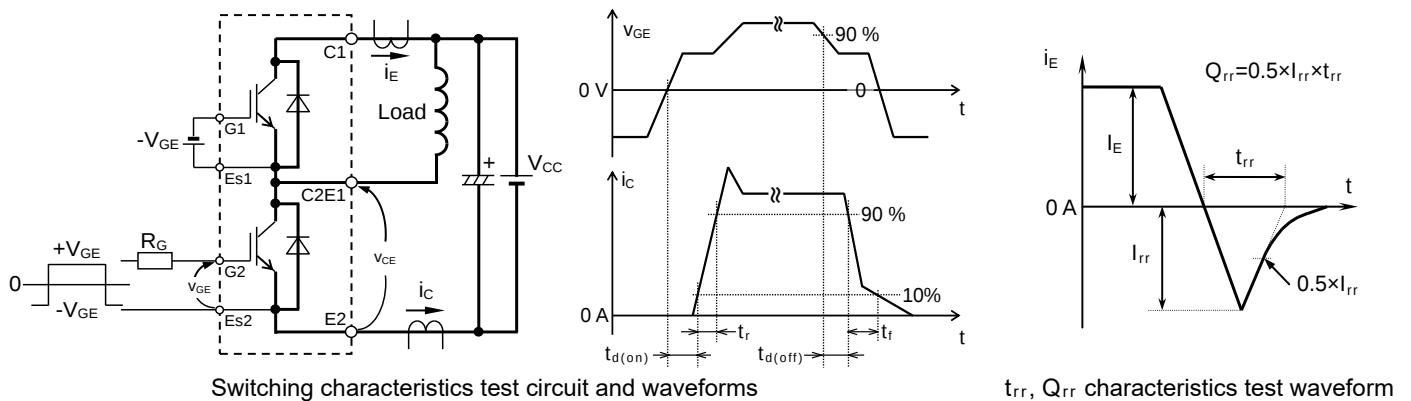


Tr1/Tr2: IGBT, Di1/Di2: FWD

**Option: PC-TIM applied baseplate outline**

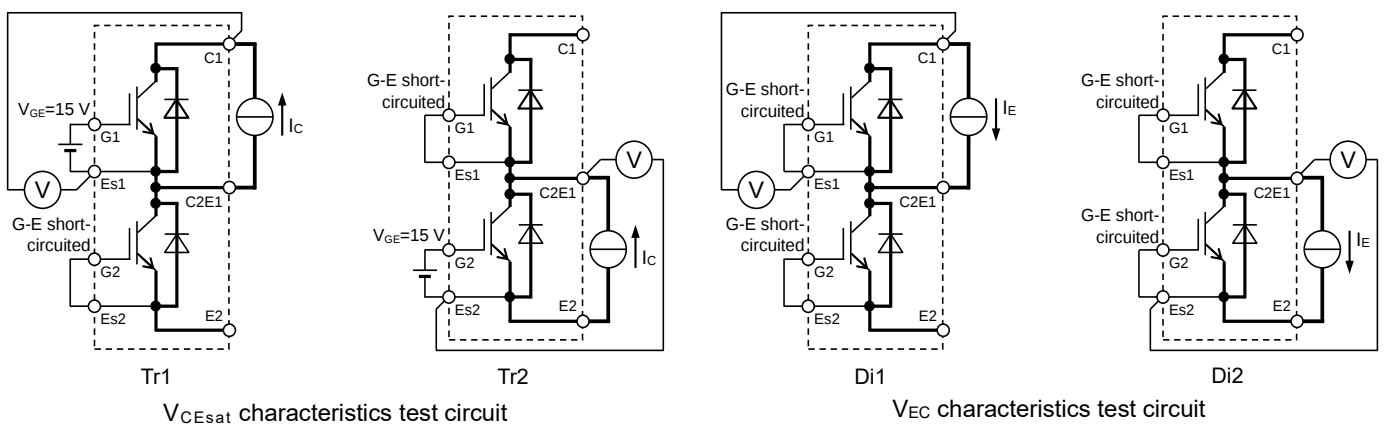


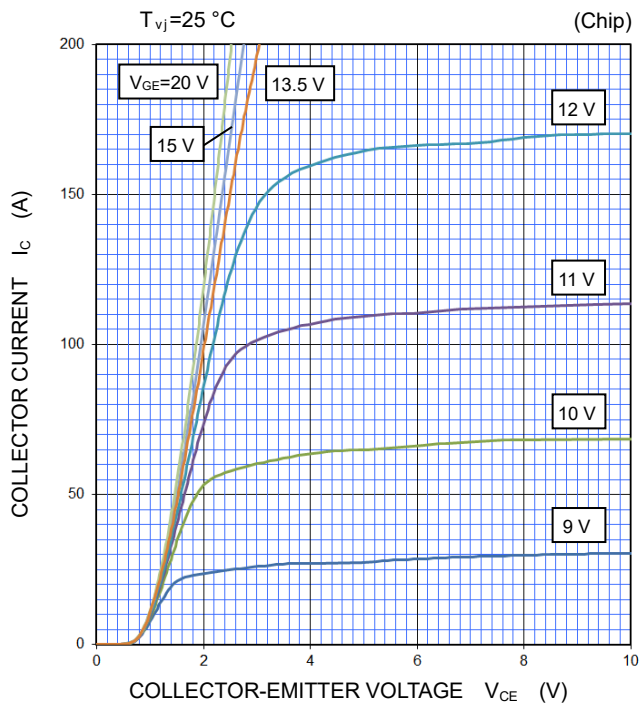
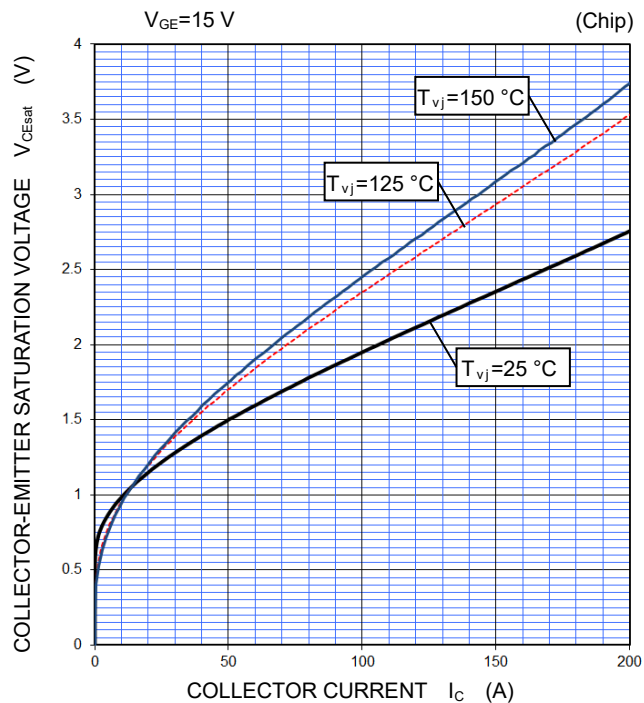
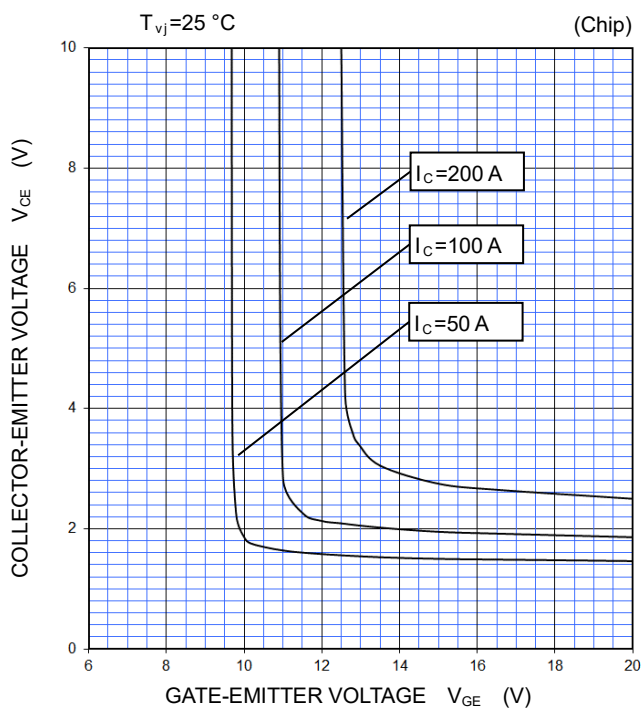
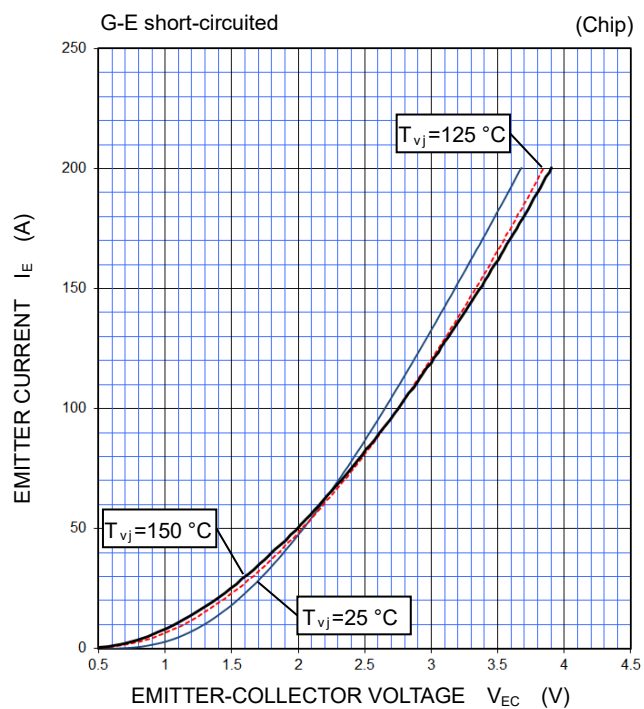
## TEST CIRCUIT AND WAVEFORMS



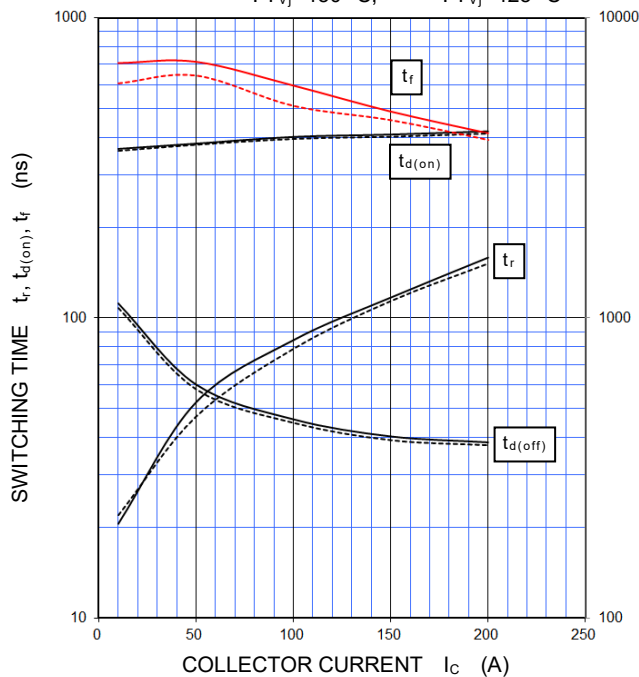
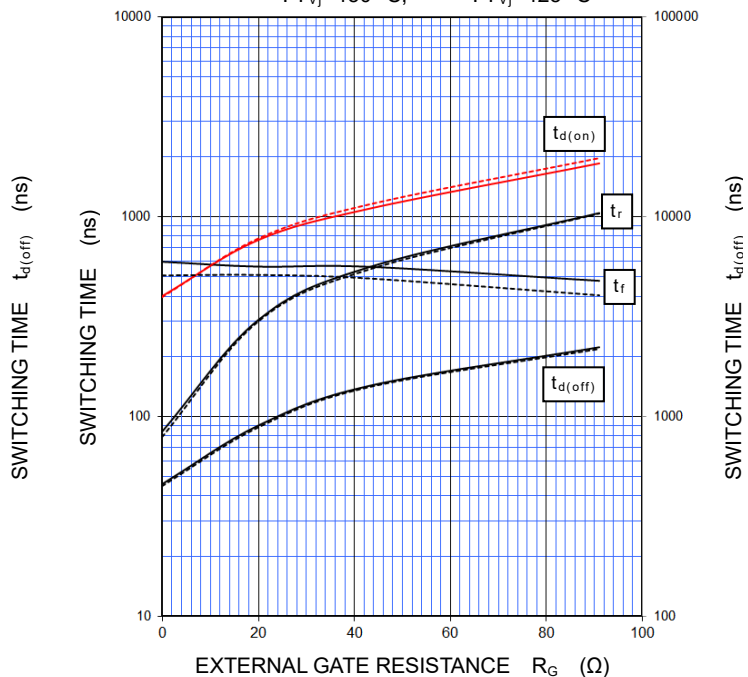
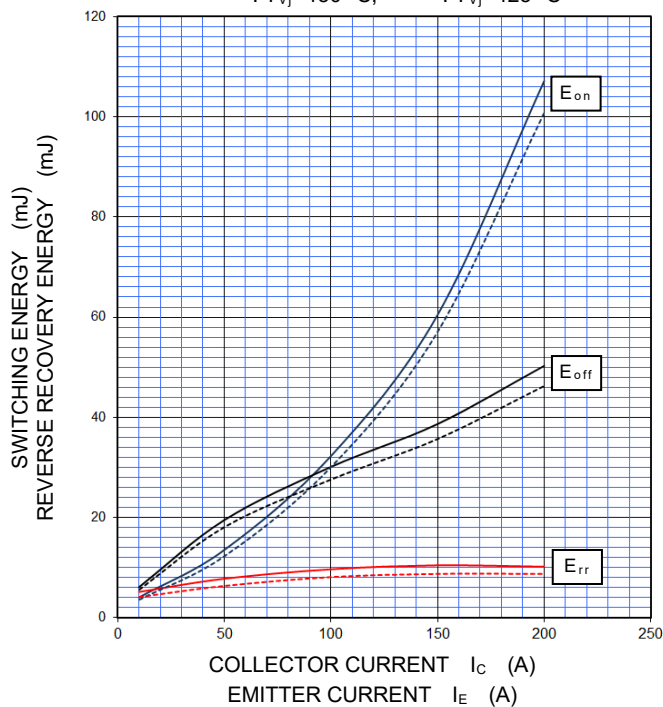
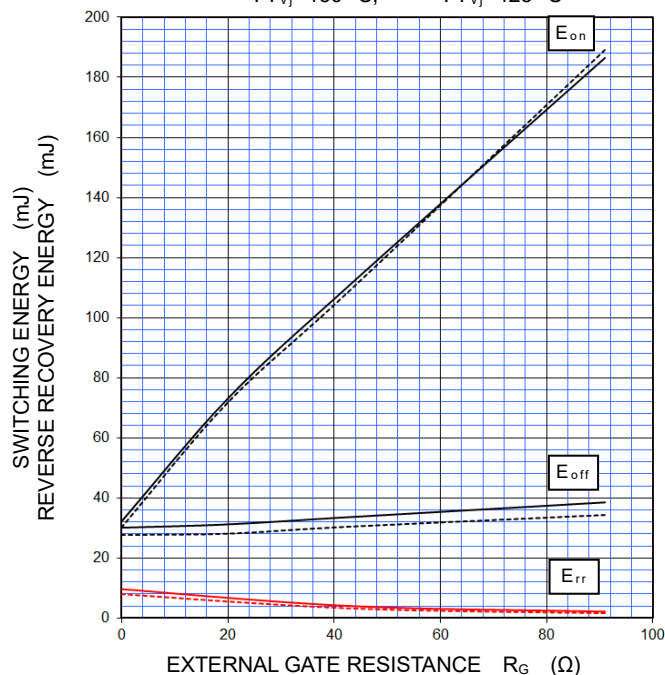
Turn-on / Turn-off switching energy and Reverse recovery energy test waveforms (Integral time instruction drawing)

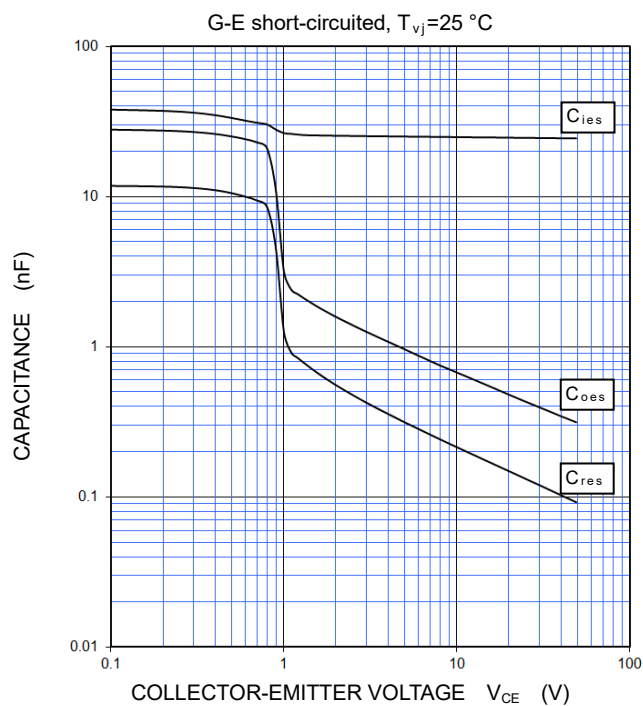
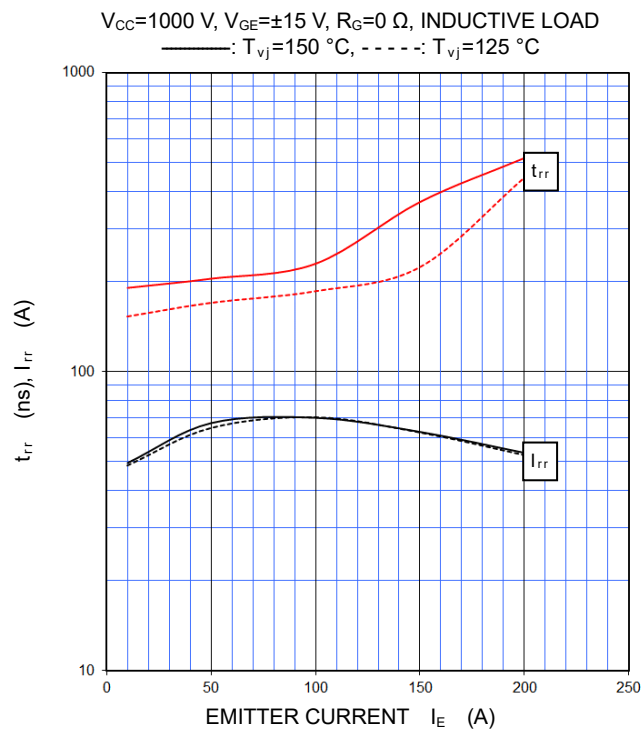
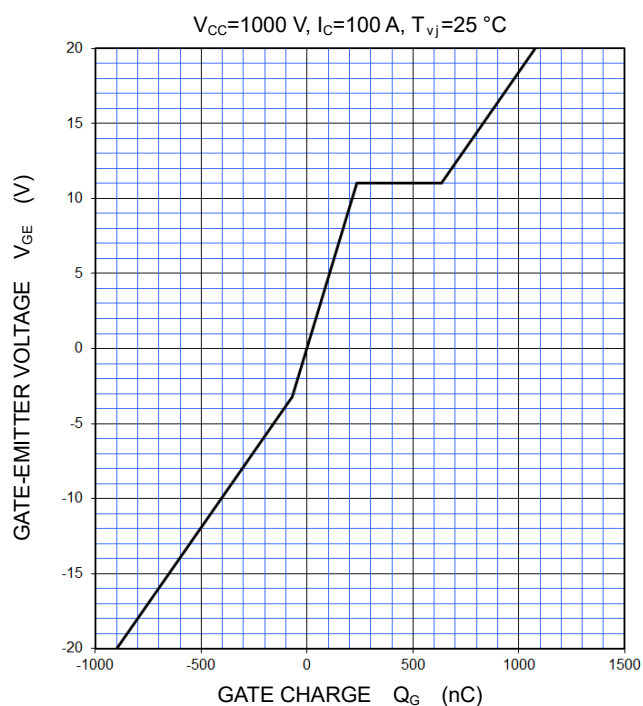
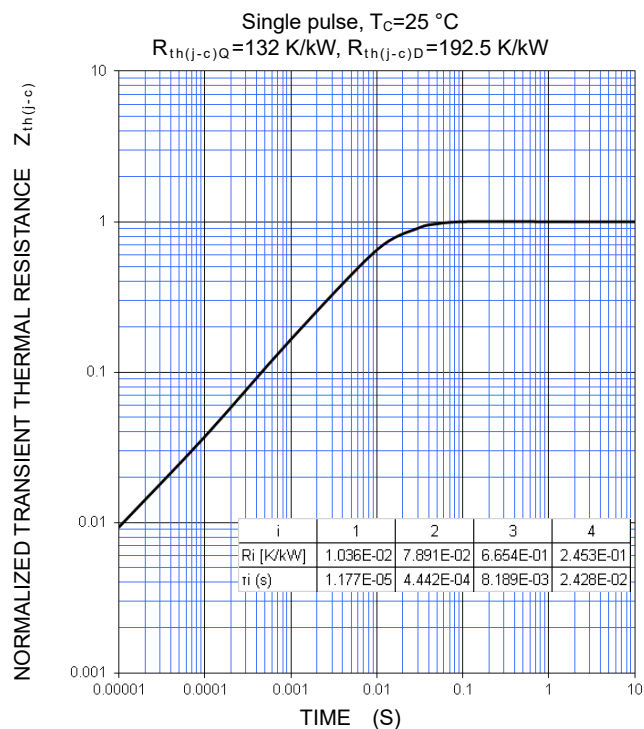
## TEST CIRCUIT



**PERFORMANCE CURVES****OUTPUT CHARACTERISTICS  
(TYPICAL)****COLLECTOR-EMITTER SATURATION VOLTAGE  
CHARACTERISTICS  
(TYPICAL)****COLLECTOR-EMITTER VOLTAGE CHARACTERISTICS  
(TYPICAL)****FREE WHEELING DIODE  
FORWARD CHARACTERISTICS  
(TYPICAL)**

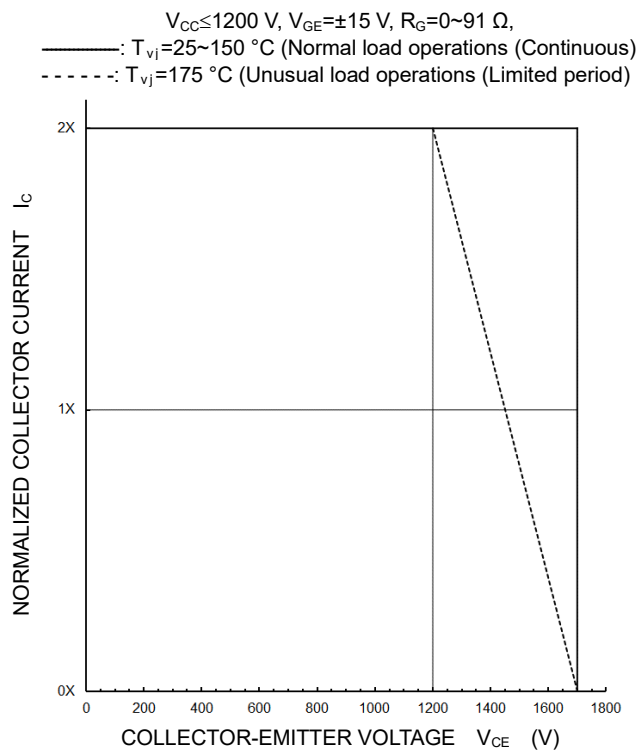
## PERFORMANCE CURVES

HALF-BRIDGE SWITCHING CHARACTERISTICS  
(TYPICAL) $V_{CC}=1000\text{ V}$ ,  $V_{GE}=\pm 15\text{ V}$ ,  $R_G=0\ \Omega$ , INDUCTIVE LOAD  
—:  $T_{vj}=150\text{ }^\circ\text{C}$ , - - - -:  $T_{vj}=125\text{ }^\circ\text{C}$ HALF-BRIDGE SWITCHING CHARACTERISTICS  
(TYPICAL) $V_{CC}=1000\text{ V}$ ,  $V_{GE}=\pm 15\text{ V}$ ,  $I_C=100\text{ A}$ , INDUCTIVE LOAD  
—:  $T_{vj}=150\text{ }^\circ\text{C}$ , - - - -:  $T_{vj}=125\text{ }^\circ\text{C}$ HALF-BRIDGE SWITCHING CHARACTERISTICS  
(TYPICAL) $V_{CC}=1000\text{ V}$ ,  $V_{GE}=\pm 15\text{ V}$ ,  $R_G=0\ \Omega$ , INDUCTIVE LOAD  
—:  $T_{vj}=150\text{ }^\circ\text{C}$ , - - - -:  $T_{vj}=125\text{ }^\circ\text{C}$ HALF-BRIDGE SWITCHING CHARACTERISTICS  
(TYPICAL) $V_{CC}=1000\text{ V}$ ,  $V_{GE}=\pm 15\text{ V}$ ,  $I_C=100\text{ A}$ , INDUCTIVE LOAD  
—:  $T_{vj}=150\text{ }^\circ\text{C}$ , - - - -:  $T_{vj}=125\text{ }^\circ\text{C}$ 

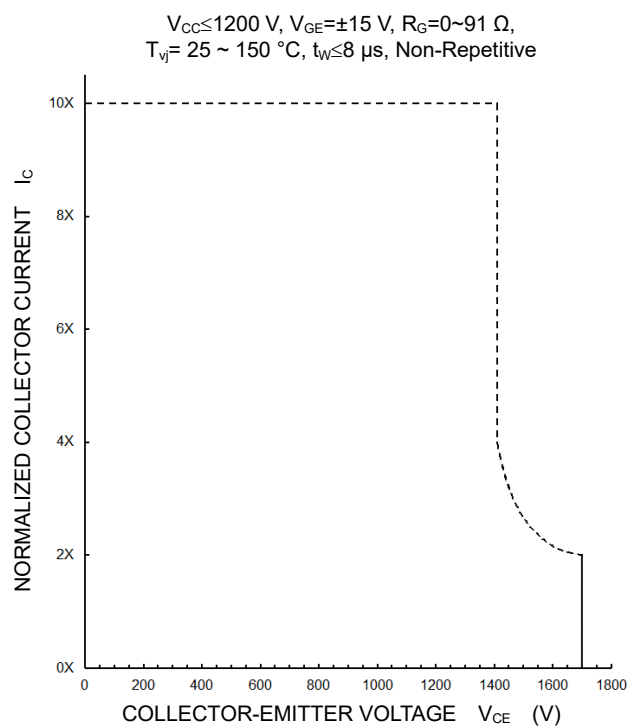
**PERFORMANCE CURVES****CAPACITANCE CHARACTERISTICS  
(TYPICAL)****FREE WHEELING DIODE  
REVERSE RECOVERY CHARACTERISTICS  
(TYPICAL)****GATE CHARGE CHARACTERISTICS  
(TYPICAL)****TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS  
(MAXIMUM)**

## PERFORMANCE CURVES

TURN-OFF SWITCHING SAFE OPERATING AREA  
(REVERSE BIAS SAFE OPERATING AREA)  
(MAXIMUM)



SHORT-CIRCUIT SAFE OPERATING AREA  
(MAXIMUM)



Note: The characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

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