

<IGBT Modules>

# CM100MXUD-13T1/CM100MXUDP-13T1

HIGH POWER SWITCHING USE  
INSULATED TYPE

|                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>MXUD</p>   | <p>Collector current <math>I_C</math> ..... <b>1 0 0 A</b></p> <p>Collector-emitter voltage <math>V_{CES}</math> ..... <b>6 5 0 V</b></p> <p>Maximum junction temperature <math>T_{vjmax}</math> ..... <b>1 7 5 °C</b></p> <ul style="list-style-type: none"> <li>•Flat base type</li> <li>•Copper base plate (Nickel-plating)</li> <li>•RoHS Directive compliant</li> <li>•Tin-plating pin terminals</li> </ul>      |
|  <p>MXUDP</p> | <p>Collector current <math>I_C</math> ..... <b>1 0 0 A</b></p> <p>Collector-emitter voltage <math>V_{CES}</math> ..... <b>6 5 0 V</b></p> <p>Maximum junction temperature <math>T_{vjmax}</math> ..... <b>1 7 5 °C</b></p> <ul style="list-style-type: none"> <li>•Flat base type</li> <li>•Copper base plate (Nickel-plating)</li> <li>•RoHS Directive compliant</li> <li>•Tin-plating pressfit terminals</li> </ul> |
| <p><b>CIB (Converter+Inverter+Chopper Brake)</b></p>                                            | <ul style="list-style-type: none"> <li>•UL Recognized under UL1557, File No. E323585</li> </ul>                                                                                                                                                                                                                                                                                                                       |

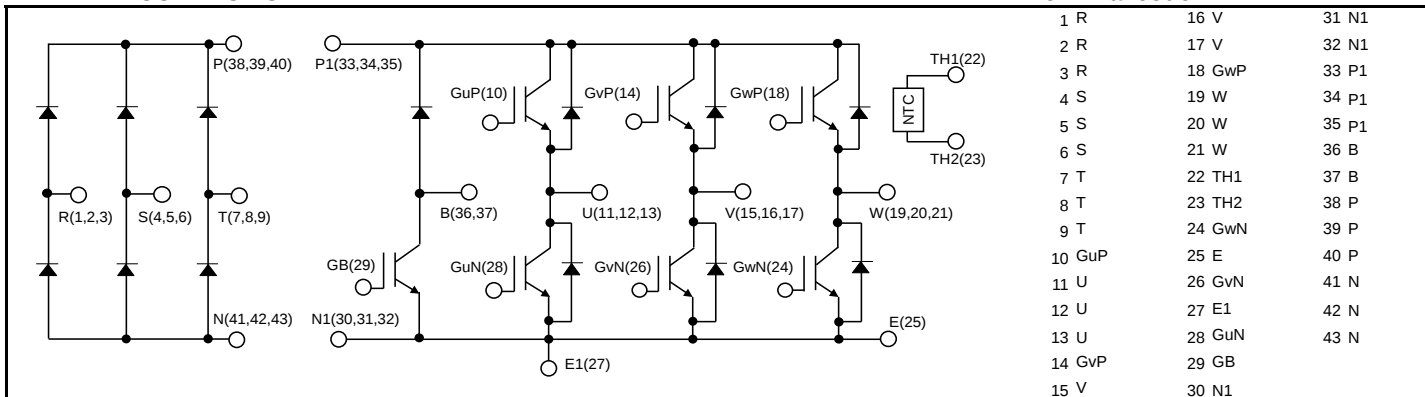
## APPLICATION

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

## OPTION (Below options are available.)

- PC-TIM (Phase Change Thermal Interface Material) pre-apply (Note10)

## INTERNAL CONNECTION



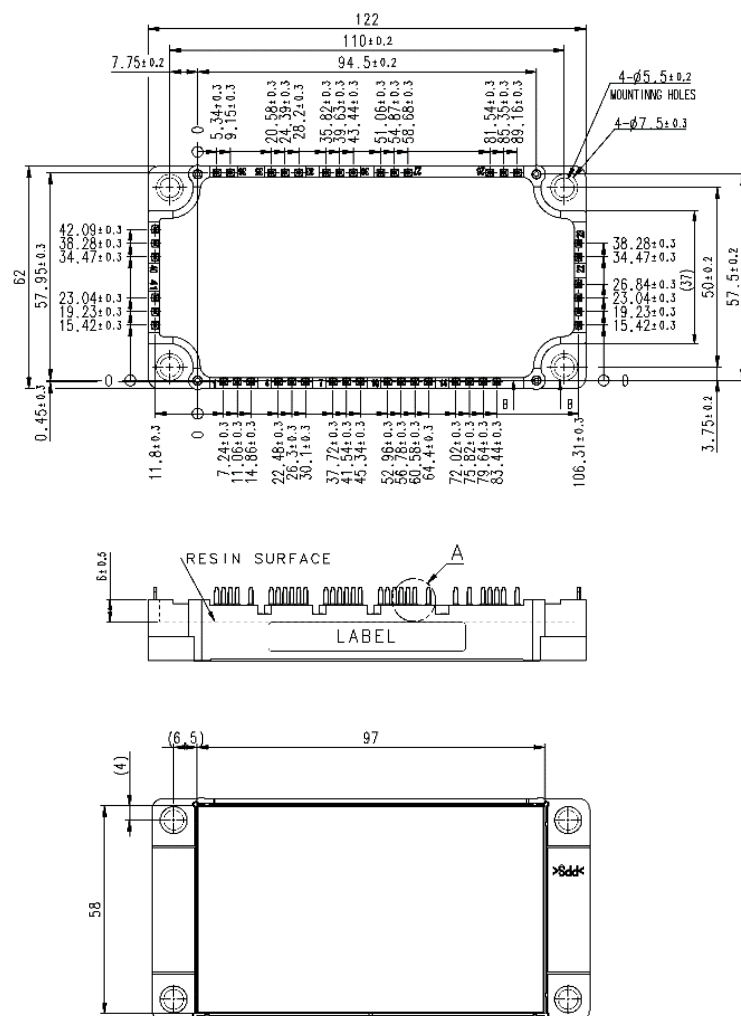
## CM100MXUD-13T1/CM100MXUDP-13T1

HIGH POWER SWITCHING USE

INSULATED TYPE

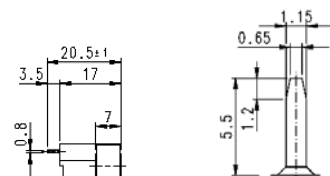
## OUTLINE DRAWING

MXUD

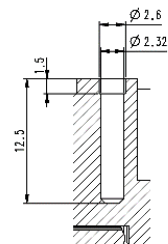


Dimension in mm

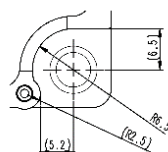
SECTION A



SECTION B



MOUNTING HOLES

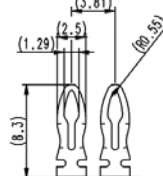
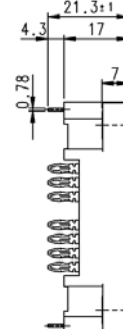


Tolerance otherwise specified

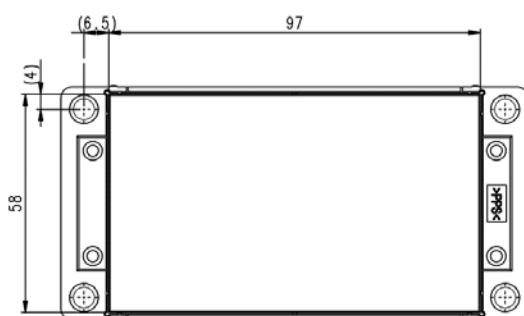
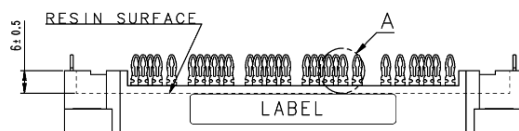
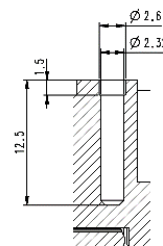
| Division of Dimension | Tolerance |
|-----------------------|-----------|
| 0.5 to 3              | ±0.2      |
| over 3 to 6           | ±0.3      |
| over 6 to 30          | ±0.5      |
| over 30 to 120        | ±0.8      |
| over 120 to 400       | ±1.2      |

MXUDP

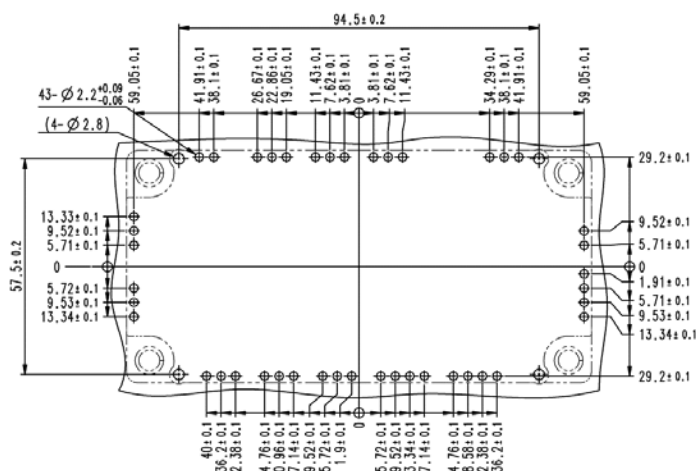
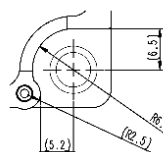
SECTION A



## SECTION B



PCB DRILL HOLE PATTERN



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      |

## CM100MXUD-13T1/CM100MXUDP-13T1

HIGH POWER SWITCHING USE

INSULATED TYPE

MAXIMUM RATINGS ( $T_{vj}=25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

## INVERTER PART IGBT/FWD

| Symbol            | Item                         | Conditions                                      | Rating   | Unit               |
|-------------------|------------------------------|-------------------------------------------------|----------|--------------------|
| $V_{CES}$         | Collector-emitter voltage    | G-E short-circuited                             | 650      | V                  |
| $V_{GES}$         | Gate-emitter voltage         | C-E short-circuited                             | $\pm 20$ | V                  |
| $I_C$             | Collector current            | DC, $T_C=90\text{ }^{\circ}\text{C}$ (Note2, 4) | 100      | A                  |
| $I_{CRM}$         |                              | Pulse, Repetitive (Note3)                       | 200      |                    |
| $P_{tot}$         | Total power dissipation      | $T_C=25\text{ }^{\circ}\text{C}$ (Note2, 4)     | 325      | W                  |
| $I_E$ (Note1)     | Emitter current              | DC (Note2)                                      | 100      | A                  |
| $I_{ERM}$ (Note1) |                              | Pulse, Repetitive (Note3)                       | 200      |                    |
| $T_{vjmax}$       | Maximum junction temperature | Instantaneous event (overload) (Note10)         | 175      | $^{\circ}\text{C}$ |

## BRAKE PART IGBT/DIODE

| Symbol      | Item                            | Conditions                                      | Rating   | Unit               |
|-------------|---------------------------------|-------------------------------------------------|----------|--------------------|
| $V_{CES}$   | Collector-emitter voltage       | G-E short-circuited                             | 650      | V                  |
| $V_{GES}$   | Gate-emitter voltage            | C-E short-circuited                             | $\pm 20$ | V                  |
| $I_C$       | Collector current               | DC, $T_C=96\text{ }^{\circ}\text{C}$ (Note2, 4) | 75       | A                  |
| $I_{CRM}$   |                                 | Pulse, Repetitive (Note3)                       | 150      |                    |
| $P_{tot}$   | Total power dissipation         | $T_C=25\text{ }^{\circ}\text{C}$ (Note2, 4)     | 270      | W                  |
| $V_{RRM}$   | Repetitive peak reverse voltage | G-E short-circuited                             | 650      | V                  |
| $I_F$       | Forward current                 | DC (Note2)                                      | 50       | A                  |
| $I_{FRM}$   |                                 | Pulse, Repetitive (Note3)                       | 100      |                    |
| $T_{vjmax}$ | Maximum junction temperature    | Instantaneous event (overload) (Note10)         | 175      | $^{\circ}\text{C}$ |

## CONVERTER PART DIODE

| Symbol             | Item                            | Conditions                                                              |                         | Rating | Unit             |
|--------------------|---------------------------------|-------------------------------------------------------------------------|-------------------------|--------|------------------|
| V <sub>RRM</sub>   | Repetitive peak reverse voltage | -                                                                       |                         | 800    | V                |
| E <sub>a</sub>     | Recommended AC input voltage    | RMS                                                                     |                         | 220    | V                |
| I <sub>o</sub>     | DC output current               | 3-phase full wave rectifying, T <sub>C</sub> =118 °C <sup>(Note4)</sup> |                         | 100    | A                |
| I <sub>FSM</sub>   | Surge forward current           | The sine half wave 1 cycle peak value,<br>f=60 Hz, non-repetitive       | T <sub>vj</sub> =25 °C  | 900    | A                |
|                    |                                 |                                                                         | T <sub>vj</sub> =150 °C | 720    |                  |
| I <sup>2</sup> t   | Current square time             | Value for one cycle of surge current                                    | T <sub>vj</sub> =25 °C  | 3375   | A <sup>2</sup> s |
|                    |                                 |                                                                         | T <sub>vj</sub> =150 °C | 2160   |                  |
| T <sub>vjmax</sub> | Maximum junction temperature    | Instantaneous event (overload) <sup>(Note10)</sup>                      |                         | 150    | °C               |

## MODULE

| Symbol     | Item                           | Conditions                                                | Rating     | Unit               |
|------------|--------------------------------|-----------------------------------------------------------|------------|--------------------|
| $V_{isol}$ | Isolation voltage              | Terminals to base plate, RMS, $f=60\text{ Hz}$ , AC 1 min | 2500       | V                  |
| $T_{Cmax}$ | Maximum case temperature       | (Note4, 10)                                               | 125        | $^{\circ}\text{C}$ |
| $T_{vjop}$ | Operating junction temperature | Continuous operation (under switching) (Note10)           | -40 ~ +150 | $^{\circ}\text{C}$ |
| $T_{stg}$  | Storage temperature            | -                                                         | -40 ~ +125 |                    |

## CM100MXUD-13T1/CM100MXUDP-13T1

HIGH POWER SWITCHING USE

INSULATED TYPE

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

## INVERTER PART IGBT/FWD

| 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><br>(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  | -      | 1.65 | 2.00 | V    |
|                                       |                                      |                                                                                                                     | T <sub>vj</sub> =125 °C | -      | 1.95 | -    |      |
|                                       |                                      |                                                                                                                     | T <sub>vj</sub> =150 °C | -      | 2.05 | -    |      |
| V <sub>CEsat</sub><br>(Chip)          |                                      | I <sub>C</sub> =100 A,<br>V <sub>GE</sub> =15 V,<br>(Note5)                                                         | T <sub>vj</sub> =25 °C  | -      | 1.45 | 1.70 | V    |
|                                       |                                      |                                                                                                                     | T <sub>vj</sub> =125 °C | -      | 1.50 | -    |      |
|                                       |                                      |                                                                                                                     | T <sub>vj</sub> =150 °C | -      | 1.50 | -    |      |
| C <sub>ies</sub>                      | Input capacitance                    | V <sub>CE</sub> =10 V, G-E short-circuited                                                                          |                         | -      | -    | 10.1 | nF   |
| C <sub>oes</sub>                      | Output capacitance                   |                                                                                                                     |                         | -      | -    | 0.5  |      |
| C <sub>res</sub>                      | Reverse transfer capacitance         |                                                                                                                     |                         | -      | -    | 0.2  |      |
| Q <sub>G</sub>                        | Gate charge                          | V <sub>CC</sub> =300 V, I <sub>C</sub> =100 A, V <sub>GE</sub> =15 V                                                |                         | -      | 0.31 | -    | μC   |
| t <sub>d(on)</sub>                    | Turn-on delay time                   | V <sub>CC</sub> =300 V, I <sub>C</sub> =100 A, V <sub>GE</sub> =±15 V,<br><br>R <sub>G</sub> =6.8 Ω, Inductive load |                         | -      | -    | 400  | ns   |
| t <sub>r</sub>                        | Rise time                            |                                                                                                                     |                         | -      | -    | 200  |      |
| t <sub>d(off)</sub>                   | Turn-off delay time                  |                                                                                                                     |                         | -      | -    | 400  |      |
| t <sub>f</sub>                        | Fall time                            |                                                                                                                     |                         | -      | -    | 600  |      |
| V <sub>EC</sub> (Note1)<br>(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  | -      | 1.80 | 2.20 | V    |
|                                       |                                      |                                                                                                                     | T <sub>vj</sub> =125 °C | -      | 2.00 | -    |      |
|                                       |                                      |                                                                                                                     | T <sub>vj</sub> =150 °C | -      | 2.05 | -    |      |
| V <sub>EC</sub> (Note1)<br>(Chip)     |                                      | I <sub>E</sub> =100 A,<br>G-E short-circuited,<br>(Note5)                                                           | T <sub>vj</sub> =25 °C  | -      | 1.45 | 1.85 | V    |
|                                       |                                      |                                                                                                                     | T <sub>vj</sub> =125 °C | -      | 1.50 | -    |      |
|                                       |                                      |                                                                                                                     | T <sub>vj</sub> =150 °C | -      | 1.50 | -    |      |
| t <sub>rr</sub> (Note1)               | Reverse recovery time                | V <sub>CC</sub> =300 V, I <sub>E</sub> =100 A, V <sub>GE</sub> =±15 V,<br>R <sub>G</sub> =6.8 Ω, Inductive load     |                         | -      | -    | 400  | ns   |
| Q <sub>rr</sub> (Note1)               | Reverse recovery charge              |                                                                                                                     |                         | -      | 6.5  | -    | μC   |
| E <sub>on</sub>                       | Turn-on switching energy per pulse   | V <sub>CC</sub> =300 V, I <sub>C</sub> =I <sub>E</sub> =100 A,                                                      |                         | -      | 2.6  | -    | mJ   |
| E <sub>off</sub>                      | Turn-off switching energy per pulse  | V <sub>GE</sub> =±15 V, R <sub>G</sub> =6.8Ω, T <sub>vj</sub> =150 °C,                                              |                         | -      | 4.8  | -    |      |
| E <sub>rr</sub> (Note1)               | Reverse recovery energy per pulse    | Inductive load                                                                                                      |                         | -      | 5.3  | -    | mJ   |
| r <sub>g</sub>                        | Internal gate resistance             | Per switch                                                                                                          |                         | -      | 0    | -    | Ω    |

## BRAKE PART IGBT/DIODE

| 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> =7.5 mA, V <sub>CE</sub> =10 V                                                                     |                         | 5.4    | 6.0  | 6.6  | V    |
| V <sub>CESat</sub><br>(Terminal) | Collector-emitter saturation voltage | I <sub>C</sub> =75 A, V <sub>GE</sub> =15 V,<br>Refer to the figure of test circuit<br>(Note5)                    | T <sub>vj</sub> =25 °C  | -      | 1.65 | 2.10 | V    |
|                                  |                                      |                                                                                                                   | T <sub>vj</sub> =125 °C | -      | 1.90 | -    |      |
|                                  |                                      |                                                                                                                   | T <sub>vj</sub> =150 °C | -      | 2.00 | -    |      |
| V <sub>CESat</sub><br>(Chip)     |                                      | I <sub>C</sub> =75 A,<br>V <sub>GE</sub> =15 V,<br>(Note5)                                                        | T <sub>vj</sub> =25 °C  | -      | 1.50 | 1.75 | V    |
|                                  |                                      |                                                                                                                   | T <sub>vj</sub> =125 °C | -      | 1.55 | -    |      |
|                                  |                                      |                                                                                                                   | T <sub>vj</sub> =150 °C | -      | 1.55 | -    |      |
| C <sub>ies</sub>                 | Input capacitance                    | V <sub>CE</sub> =10 V, G-E short-circuited                                                                        |                         | -      | -    | 6.7  | nF   |
| C <sub>oes</sub>                 | Output capacitance                   |                                                                                                                   |                         | -      | -    | 0.3  |      |
| C <sub>res</sub>                 | Reverse transfer capacitance         |                                                                                                                   |                         | -      | -    | 0.1  |      |
| Q <sub>G</sub>                   | Gate charge                          | V <sub>CC</sub> =300 V, I <sub>C</sub> =75 A, V <sub>GE</sub> =15 V                                               |                         | -      | 0.21 | -    | μC   |
| t <sub>d(on)</sub>               | Turn-on delay time                   | V <sub>CC</sub> =300 V, I <sub>C</sub> =75 A, V <sub>GE</sub> =±15 V,<br><br>R <sub>G</sub> =10 Ω, Inductive load |                         | -      | -    | 400  | ns   |
| t <sub>r</sub>                   | Rise time                            |                                                                                                                   |                         | -      | -    | 200  |      |
| t <sub>d(off)</sub>              | Turn-off delay time                  |                                                                                                                   |                         | -      | -    | 400  |      |
| t <sub>f</sub>                   | Fall time                            |                                                                                                                   |                         | -      | -    | 600  |      |

## CM100MXUD-13T1/CM100MXUDP-13T1

HIGH POWER SWITCHING USE

INSULATED TYPE

ELECTRICAL CHARACTERISTICS (cont.;  $T_{vj}=25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

## BRAKE PART IGBT/DIODE

| Symbol                       | Item                                | Conditions                                                                                   |                                                          | Limits                                     |      |      | Unit |
|------------------------------|-------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------|--------------------------------------------|------|------|------|
|                              |                                     |                                                                                              |                                                          | Min.                                       | Typ. | Max. |      |
| E <sub>on</sub>              | Turn-on switching energy per pulse  | V <sub>CC</sub> =300 V, V <sub>GE</sub> =±15 V,<br>T <sub>vj</sub> =150 °C, Inductive load   | I <sub>C</sub> =75 A, R <sub>G</sub> =10 Ω               | -                                          | 1.4  | -    | mJ   |
| E <sub>off</sub>             | Turn-off switching energy per pulse |                                                                                              |                                                          | -                                          | 3.1  | -    |      |
| E <sub>rr</sub>              | Reverse recovery energy per pulse   |                                                                                              |                                                          | I <sub>E</sub> =75 A, R <sub>G</sub> =10 Ω | -    | 3.2  |      |
| r <sub>g</sub>               | Internal gate resistance            | -                                                                                            |                                                          | -                                          | 0    | -    | Ω    |
| I <sub>RRM</sub>             | Reverse current                     | V <sub>R</sub> =V <sub>RRM</sub> , G-E short-circuited                                       |                                                          | -                                          | -    | 1.0  | mA   |
| V <sub>F</sub><br>(Terminal) | Forward voltage                     | I <sub>F</sub> =50 A, G-E short-circuited,<br>Refer to the figure of test circuit<br>(Note5) | T <sub>vj</sub> =25 °C                                   | -                                          | 1.70 | 2.30 | V    |
|                              |                                     |                                                                                              | T <sub>vj</sub> =125 °C                                  | -                                          | 1.80 | -    |      |
|                              |                                     |                                                                                              | T <sub>vj</sub> =150 °C                                  | -                                          | 1.85 | -    |      |
| V <sub>F</sub><br>(Chip)     |                                     |                                                                                              | I <sub>F</sub> =50 A,<br>G-E short-circuited,<br>(Note5) | T <sub>vj</sub> =25 °C                     | -    | 1.45 | 1.85 |
|                              |                                     | T <sub>vj</sub> =125 °C                                                                      |                                                          | -                                          | 1.50 | -    |      |
|                              |                                     | T <sub>vj</sub> =150 °C                                                                      |                                                          | -                                          | 1.50 | -    |      |
| t <sub>rr</sub>              | Reverse recovery time               | V <sub>CC</sub> =300 V, I <sub>F</sub> =50 A, V <sub>GE</sub> =±15 V,                        |                                                          | -                                          | -    | 400  | ns   |
| Q <sub>rr</sub>              | Reverse recovery charge             | R <sub>G</sub> =15 Ω, Inductive load                                                         |                                                          | -                                          | 5.0  | -    | μC   |

## CONVERTER PART DIODE

| Symbol                       | Item                            | Conditions                                                 |                         | Limits |      |      | Unit |
|------------------------------|---------------------------------|------------------------------------------------------------|-------------------------|--------|------|------|------|
|                              |                                 |                                                            |                         | Min.   | Typ. | Max. |      |
| I <sub>RRM</sub>             | Repetitive peak reverse current | V <sub>R</sub> =V <sub>RRM</sub> , T <sub>vj</sub> =150 °C |                         | -      | -    | 20   | mA   |
| V <sub>F</sub><br>(Terminal) | Forward voltage                 | I <sub>F</sub> =100A                                       | T <sub>vj</sub> =25 °C  | -      | 1.35 | 1.80 | V    |
| V <sub>F</sub><br>(chip)     |                                 |                                                            | T <sub>vj</sub> =150 °C | -      | 1.30 | -    |      |
|                              |                                 |                                                            | T <sub>vj</sub> =25 °C  | -      | 1.20 | 1.45 |      |
|                              |                                 |                                                            | T <sub>vj</sub> =150 °C | -      | 1.15 | -    |      |

## NTC THERMISTOR PART

| Symbol        | Item                    | Conditions                                                              | Limits |      |      | Unit       |
|---------------|-------------------------|-------------------------------------------------------------------------|--------|------|------|------------|
|               |                         |                                                                         | Min.   | Typ. | Max. |            |
| $R_{25}$      | Zero-power resistance   | $T_C=25\text{ }^{\circ}\text{C}$ (Note4)                                | 4.85   | 5.00 | 5.15 | k $\Omega$ |
| $\Delta R/R$  | Deviation of resistance | $R_{100}=493\text{ }\Omega$ , $T_C=100\text{ }^{\circ}\text{C}$ (Note4) | -7.3   | -    | +7.8 | %          |
| $B_{(25/50)}$ | B-constant              | Approximate by equation (Note6)                                         | -      | 3375 | -    | K          |
| $P_{25}$      | Power dissipation       | $T_C=25\text{ }^{\circ}\text{C}$ (Note4)                                | -      | -    | 10   | mW         |

## 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)   | -                                     | -    | 458  | K/kW |
| $R_{th(j-c)D}$ |                            | Junction to case, per Inverter FWD (Note4)    | -                                     | -    | 594  |      |
| $R_{th(j-c)Q}$ |                            | Junction to case, Brake IGBT (Note4)          | -                                     | -    | 554  |      |
| $R_{th(j-c)D}$ |                            | Junction to case, Brake DIODE (Note4)         | -                                     | -    | 1346 |      |
| $R_{th(j-c)D}$ |                            | Junction to case, per Converter DIODE (Note4) | -                                     | -    | 650  |      |
| $R_{th(c-s)}$  | Contact thermal resistance | Case to heat sink,<br>per 1 module,           | Thermal grease applied (Note4, 7, 10) |      | -    | K/kW |
|                |                            |                                               | PC-TIM applied (Note4, 8, 10)         |      | -    |      |

## CM100MXUD-13T1/CM100MXUDP-13T1

HIGH POWER SWITCHING USE  
INSULATED TYPE

## MECHANICAL CHARACTERISTICS

| Symbol         | Item                   | Conditions                         |                        | Limits |      |      | Unit |
|----------------|------------------------|------------------------------------|------------------------|--------|------|------|------|
|                |                        |                                    |                        | Min.   | Typ. | Max. |      |
| M <sub>s</sub> | Mounting torque        | Mounting to heat sink<br>M 5 screw |                        | 2.5    | 3.0  | 3.5  | N·m  |
| d <sub>s</sub> | Creepage distance      | Solder pin type(MXUD)              | Terminal to terminal   | 11.7   | -    | -    | mm   |
|                |                        |                                    | Terminal to base plate | 18.3   | -    | -    |      |
|                |                        | Pressfit pin type(MXUDP)           | Terminal to terminal   | 5.1    | -    | -    |      |
|                |                        |                                    | Terminal to base plate | 15.8   | -    | -    |      |
| d <sub>a</sub> | Clearance              | Solder pin type(MXUD)              | Terminal to terminal   | 6.5    | -    | -    |      |
|                |                        |                                    | Terminal to base plate | 18.1   | -    | -    |      |
|                |                        | Pressfit pin type(MXUDP)           | Terminal to terminal   | 5.0    | -    | -    |      |
|                |                        |                                    | Terminal to base plate | 15.8   | -    | -    |      |
| e <sub>c</sub> | Flatness of base plate | On the centerline X, Y (Note9)     |                        | ±0     | -    | +200 | μm   |
| m              | mass                   | -                                  |                        | -      | 270  | -    | g    |

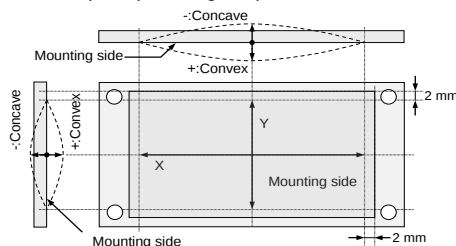
## RECOMMENDED OPERATING CONDITIONS

| Symbol            | Item                          | Conditions                                                        | Limits |      |      | Unit |
|-------------------|-------------------------------|-------------------------------------------------------------------|--------|------|------|------|
|                   |                               |                                                                   | Min.   | Typ. | Max. |      |
| V <sub>CC</sub>   | (DC) Supply voltage           | Applied across P-N(P1-N1) terminals                               | -      | 300  | 450  | V    |
| V <sub>GEon</sub> | Gate (-emitter drive) voltage | Applied across<br>G*P-*/G*N-E/GB-E terminals (*=U, V, W) (Note12) | 13.5   | 15.0 | 16.5 | V    |
| R <sub>G</sub>    | External gate resistance      | Inverter IGBT, Per switch                                         | 6.8    | -    | 68   | Ω    |
|                   |                               | Brake IGBT                                                        | 10     | -    | 100  |      |

\*: 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<sub>vj</sub>) should not increase beyond T<sub>vj max</sub> rating.
- Pulse width and repetition rate should be such that the device junction temperature (T<sub>vj</sub>) dose not exceed T<sub>vj max</sub> rating.
- Case temperature (T<sub>c</sub>) and heat sink temperature (T<sub>s</sub>) 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.
- $B_{(25/50)} = \ln\left(\frac{R_{25}}{R_{50}}\right) / \left(\frac{1}{T_{25}} - \frac{1}{T_{50}}\right)$   
R<sub>25</sub>: resistance at absolute temperature T<sub>25</sub> [K]; T<sub>25</sub>=25 [°C]+273.15=298.15 [K]  
R<sub>50</sub>: resistance at absolute temperature T<sub>50</sub> [K]; T<sub>50</sub>=50 [°C]+273.15=323.15 [K]
- Typical value is measured by using thermally conductive grease of λ=0.9 W/(m·K)/D<sub>(C-S)</sub>=50 μm.
- Typical value is measured by using PC-TIM of λ=3.4 W/(m·K)/D<sub>(C-S)</sub>=50 μm.
- 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<sub>vj max</sub>, T<sub>vj op</sub>, T<sub>c max</sub>) must be maintained below the maximum rated temperature throughout consideration of the temperature rise even for long term usage.

**CM100MXUD-13T1/CM100MXUDP-13T1**

HIGH POWER SWITCHING USE

INSULATED TYPE

11. Use the following screws when mounting the printed circuit board (PCB) on the standoffs.

PCB thickness : t1.6

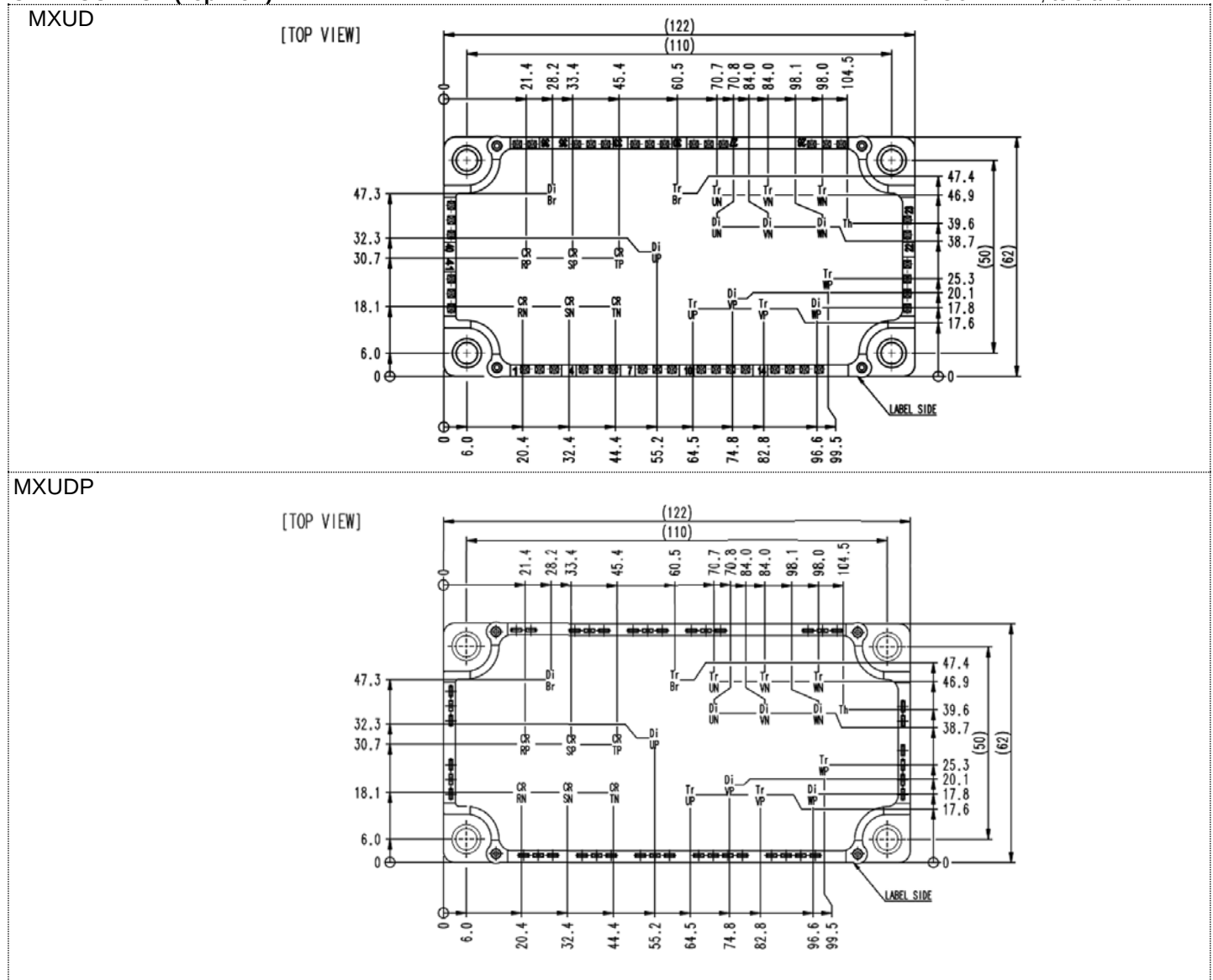
| Type                    | Manufacturer | Size               | Tightening torque<br>(N·m) | Recommended tightening method                                                                              |
|-------------------------|--------------|--------------------|----------------------------|------------------------------------------------------------------------------------------------------------|
| (1) PT®                 | EJOT         | K25×8              | 0.55 ± 0.055               | by handwork (equivalent to 30 rpm<br>by mechanical screw driver)<br>~ 600 rpm (by mechanical screw driver) |
| (2) PT®                 |              | K25×10             | 0.75 ± 0.075 N·m           |                                                                                                            |
| (3) DELTA PT®           |              | 25×8               | 0.55 ± 0.055 N·m           |                                                                                                            |
| (4) DELTA PT®           |              | 25×10              | 0.75 ± 0.075 N·m           |                                                                                                            |
| (5) B1<br>tapping screw | -            | φ2.6×10<br>φ2.6×12 | 0.75 ± 0.075 N·m           |                                                                                                            |

12.  $V_{GEon}=15V$  is necessary for IGBT to operate at  $I_{CRM}$ .

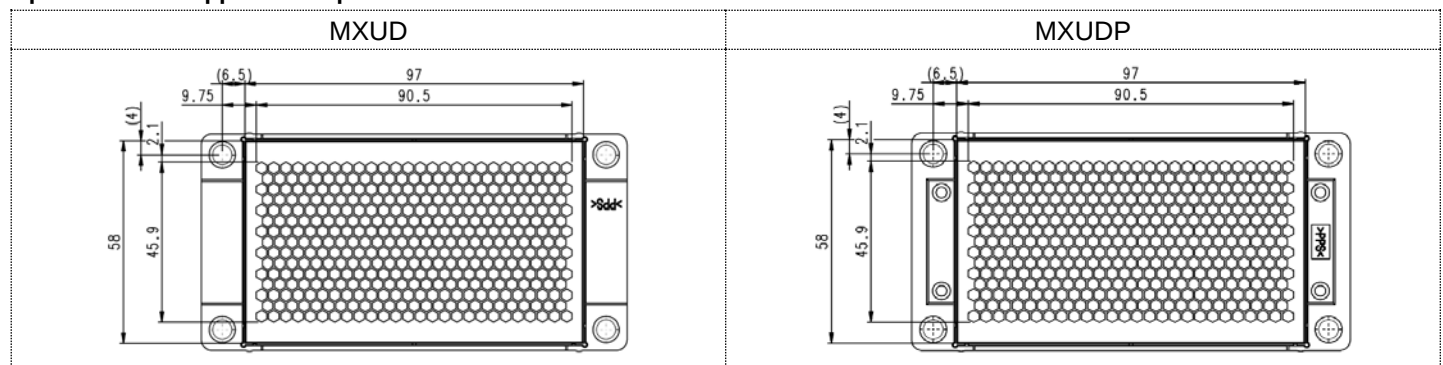
**CM100MXUD-13T1/CM100MXUDP-13T1**

HIGH POWER SWITCHING USE

INSULATED TYPE

**CHIP LOCATION (Top view)**Dimension in mm, tolerance:  $\pm 1$  mm

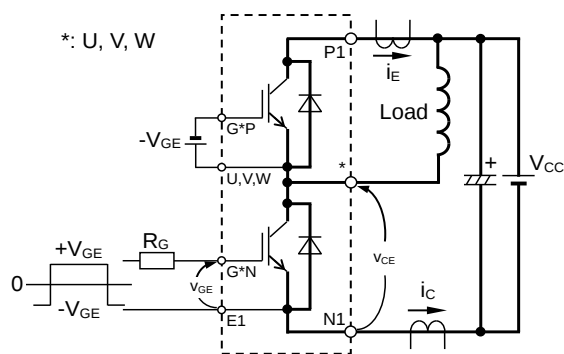
Tr\*P/Tr\*N/TrBr: IGBT, Di\*P/Di\*N: DIODE (\*=U/V/W), DiBr: BRAKE DIODE,  
CR\*P/CR\*N: CONVERTER DIODE (\*=R/S/T), Th: NTC thermistor

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

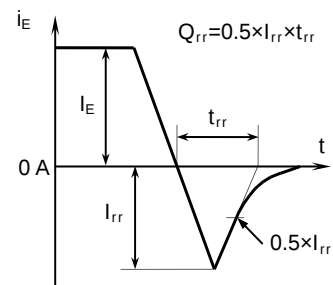
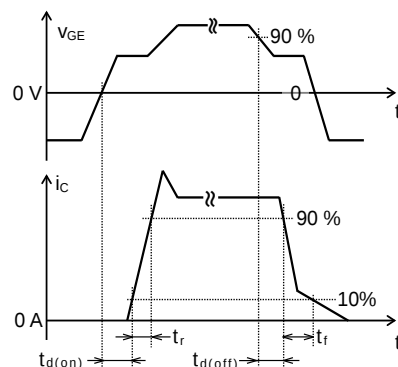
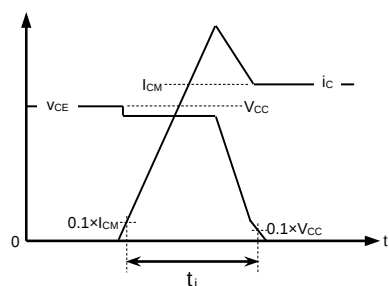
**CM100MXUD-13T1/CM100MXUDP-13T1**

HIGH POWER SWITCHING USE

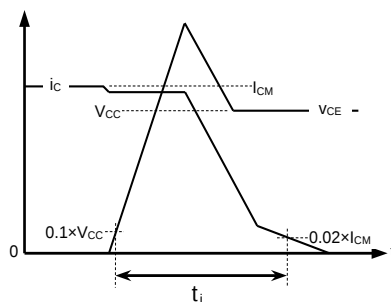
INSULATED TYPE

**TEST CIRCUIT AND WAVEFORMS**

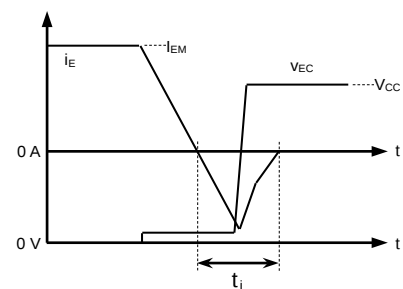
Switching characteristics test circuit and waveforms

 $t_{rr}$ ,  $Q_{rr}$  characteristics test waveform

IGBT Turn-on switching energy



IGBT Turn-off switching energy



FWD Reverse recovery energy

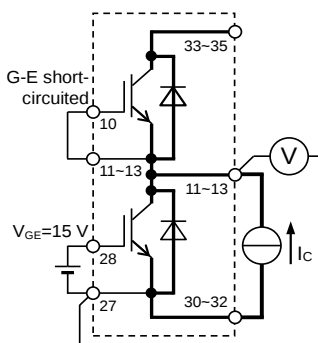
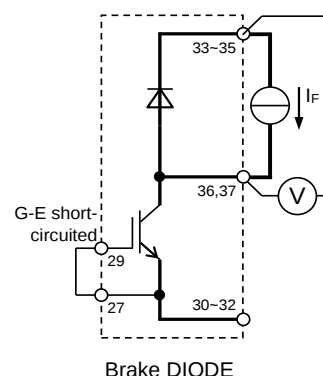
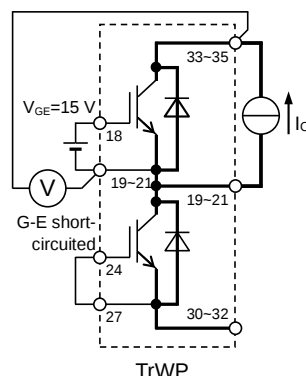
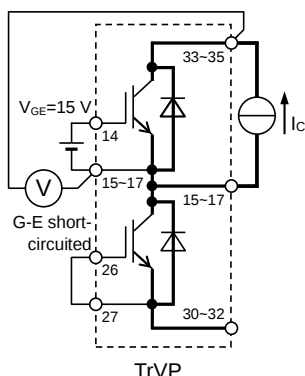
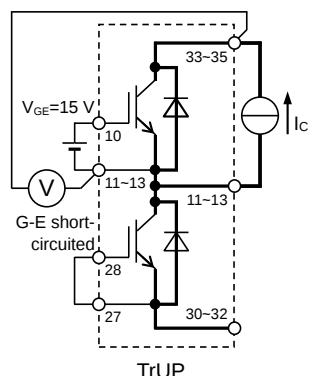
Switching energy and Reverse recovery energy test waveforms (Integral time instruction drawing)

## CM100MXUD-13T1/CM100MXUDP-13T1

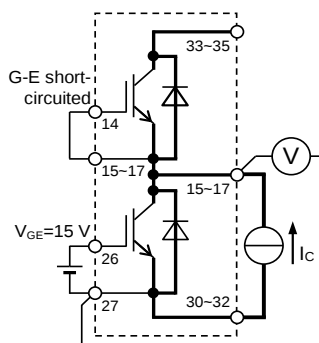
HIGH POWER SWITCHING USE

INSULATED TYPE

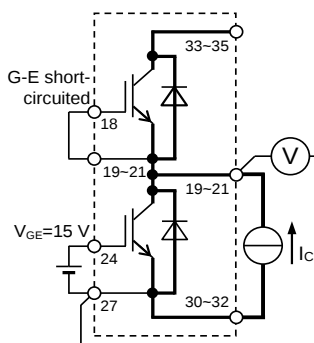
## TEST CIRCUIT



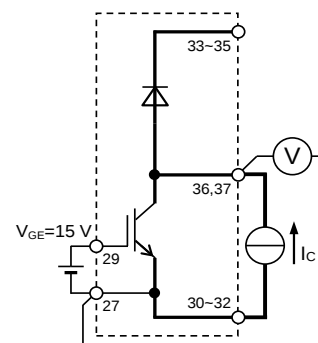
Gate-emitter GVP-V, GVN-E1,  
short-circuited GWP-W, GWN-E1  
GB-E1



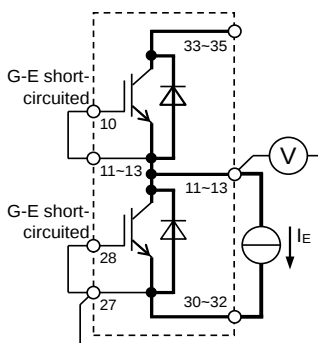
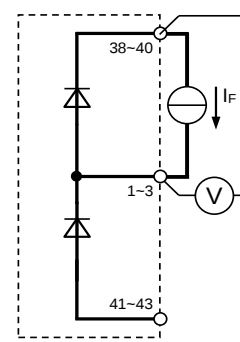
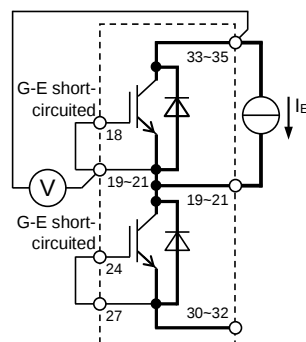
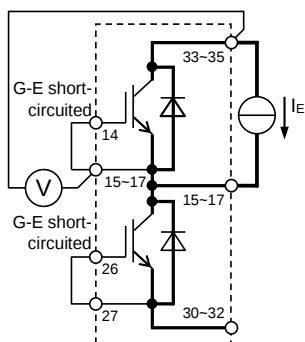
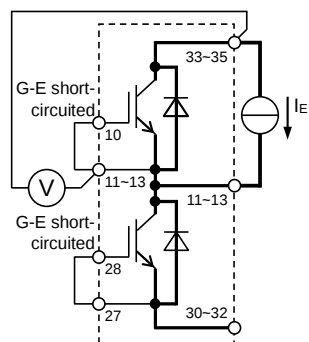
Gate-emitter GUP-U, GUN-E1,  
short-circuited GWP-W, GWN-E1  
GB-E1



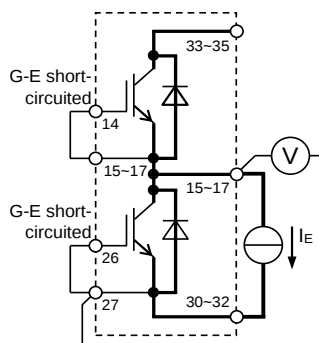
Gate-emitter GUP-U, GUN-E1,  
short-circuited GVP-V, GVN-E1  
GB-E1



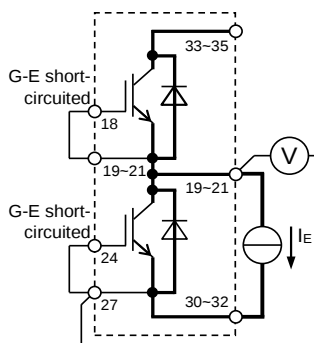
Gate-emitter GUP-U, GUN-E1,  
short-circuited GVP-V, GVN-E1,  
GWP-W, GWN-E1

 $V_{CEsat}$  / BRAKE DIODE  $V_F$  characteristics test circuit

Gate-emitter GVP-V, GVN-E1,  
short-circuited GWP-W, GWN-E1  
GB-E1



Gate-emitter GUP-U, GUN-E1,  
short-circuited GWP-W, GWN-E1  
GB-E1



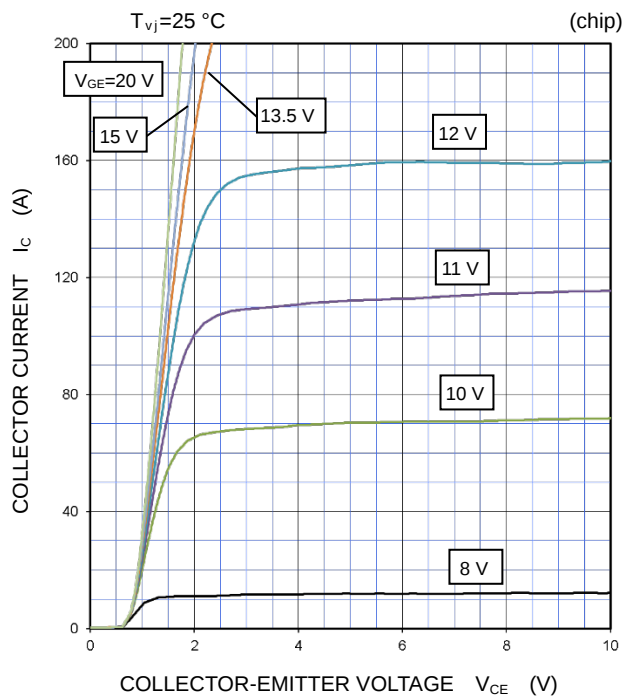
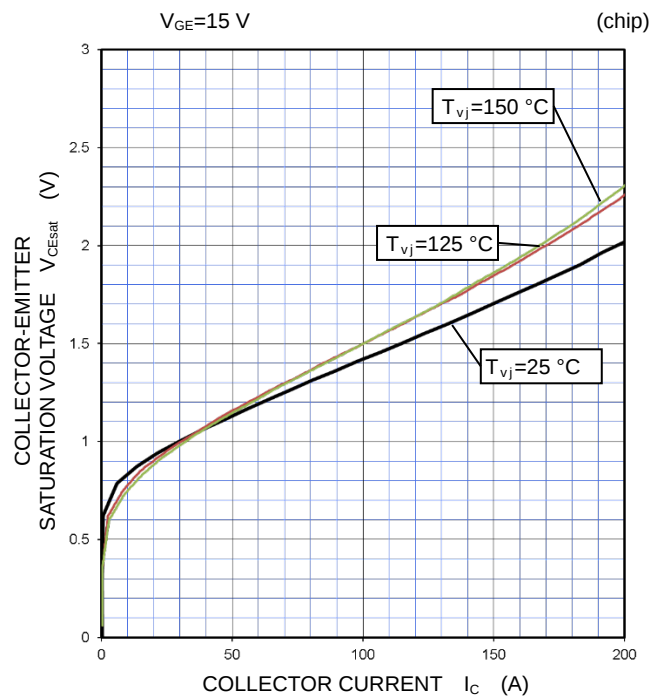
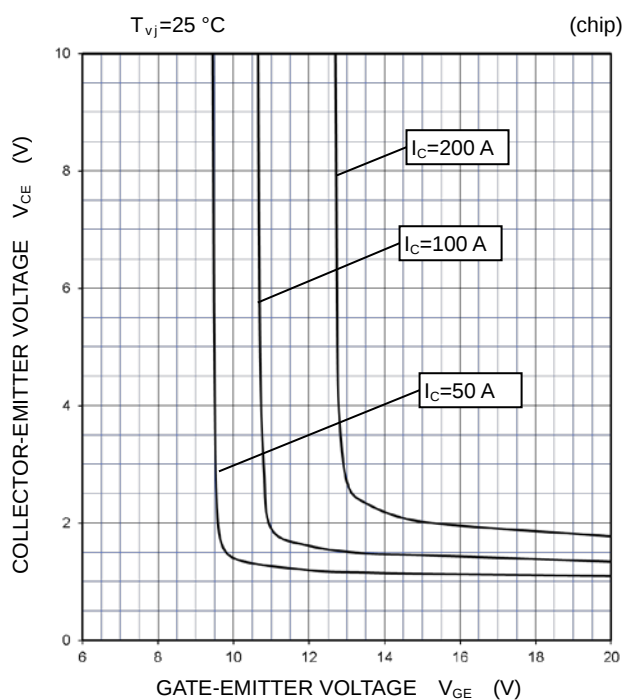
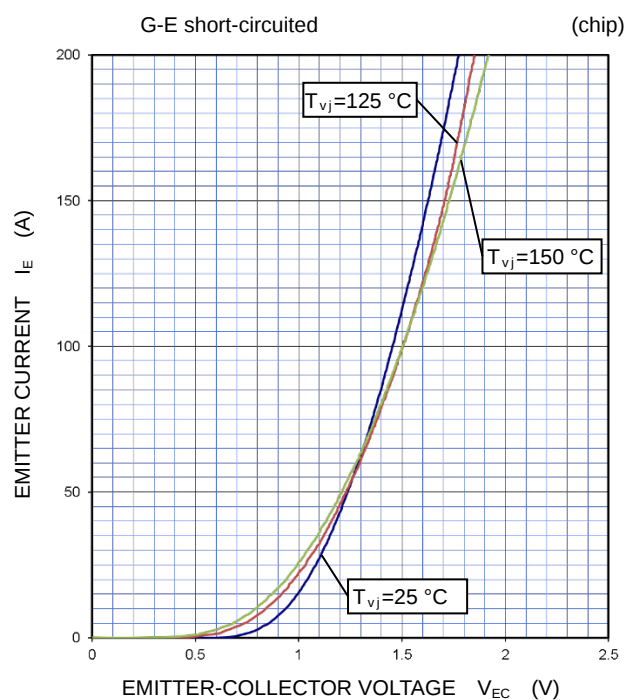
Gate-emitter GUP-U, GUN-E1,  
short-circuited GVP-V, GVN-E1  
GB-E1

 $V_{EC}$  / CONVERTER DIODE  $V_F$  characteristics test circuit

**CM100MXUD-13T1/CM100MXUDP-13T1**

HIGH POWER SWITCHING USE

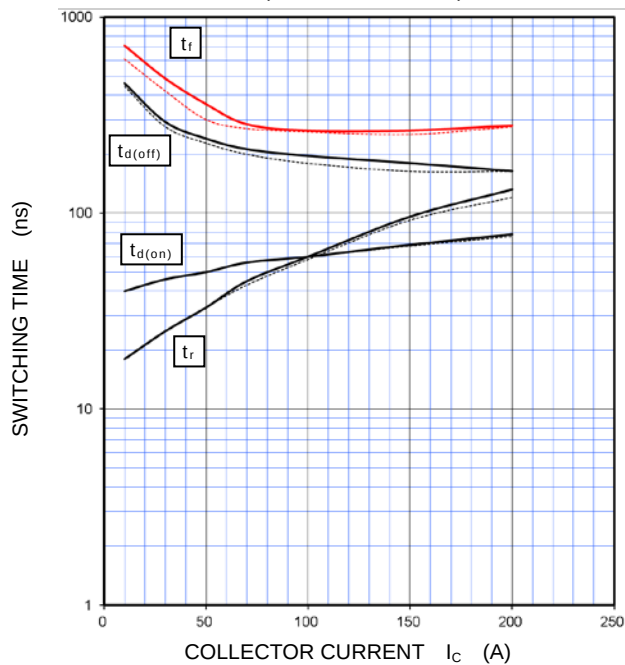
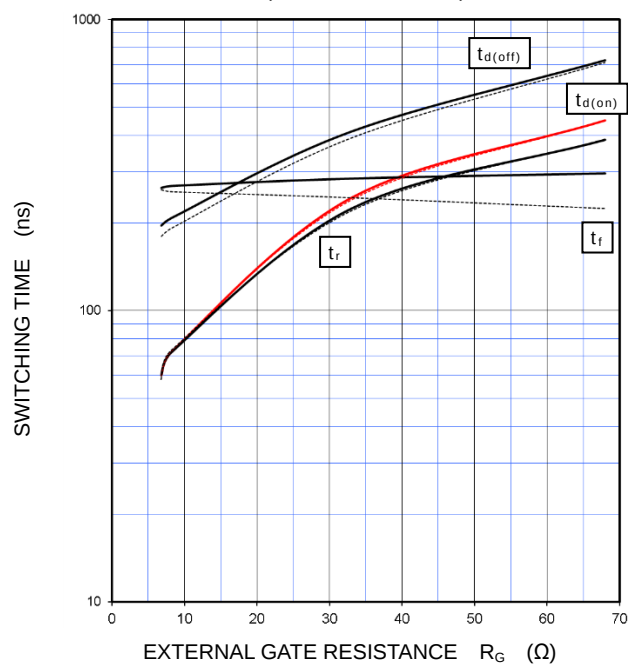
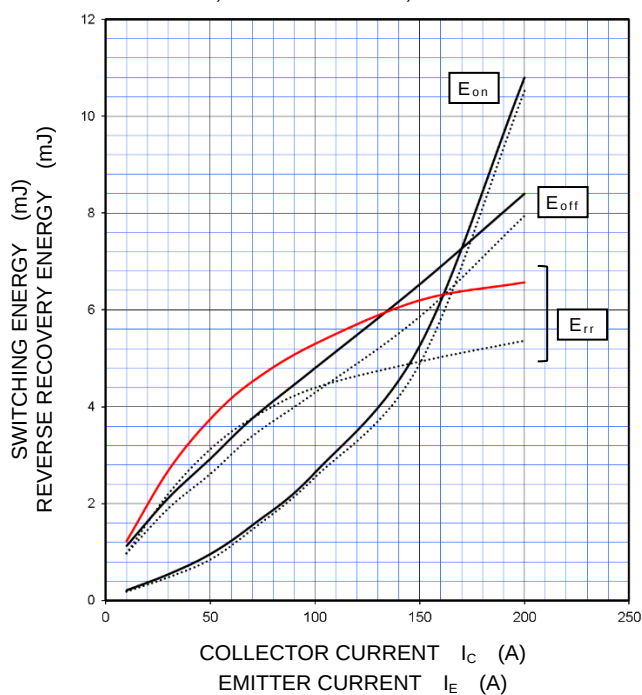
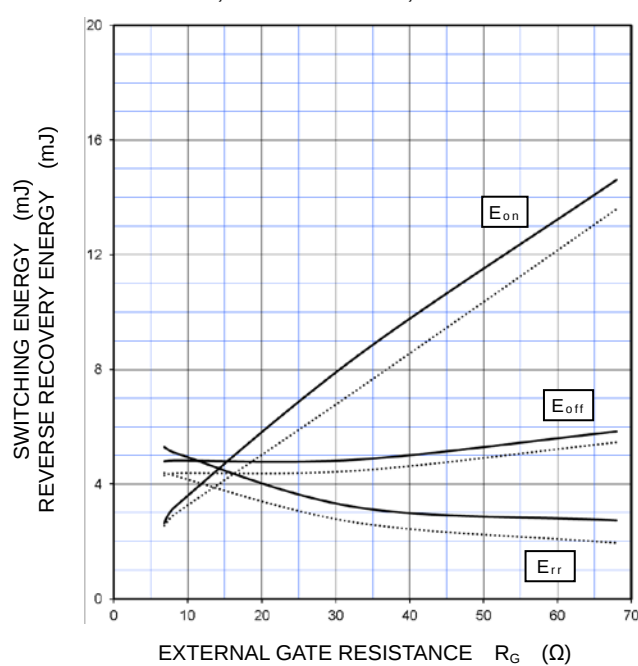
INSULATED TYPE

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

**CM100MXUD-13T1/CM100MXUDP-13T1**

HIGH POWER SWITCHING USE

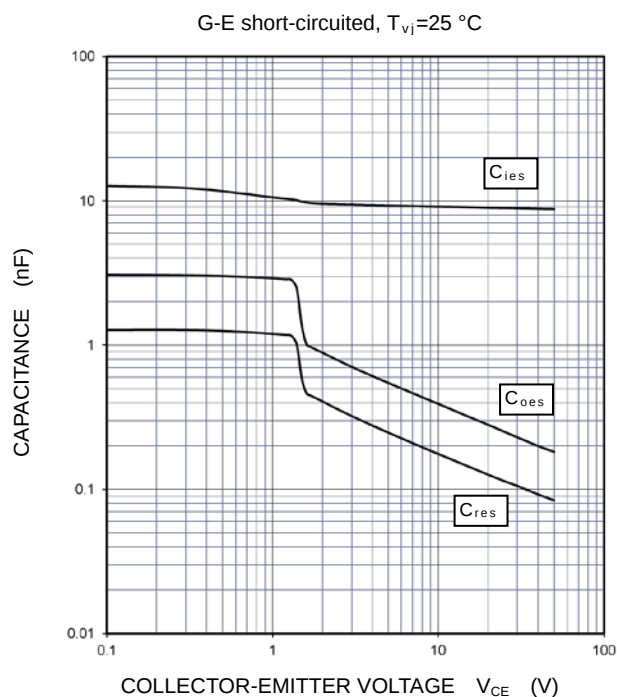
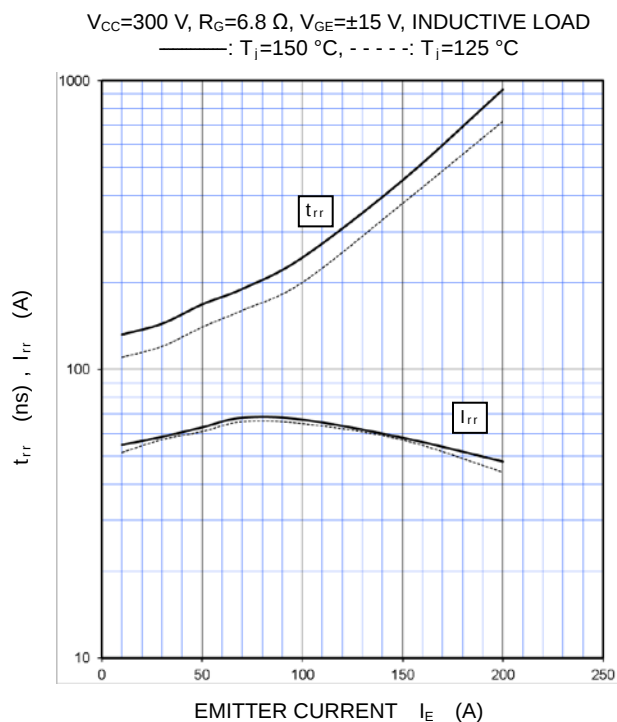
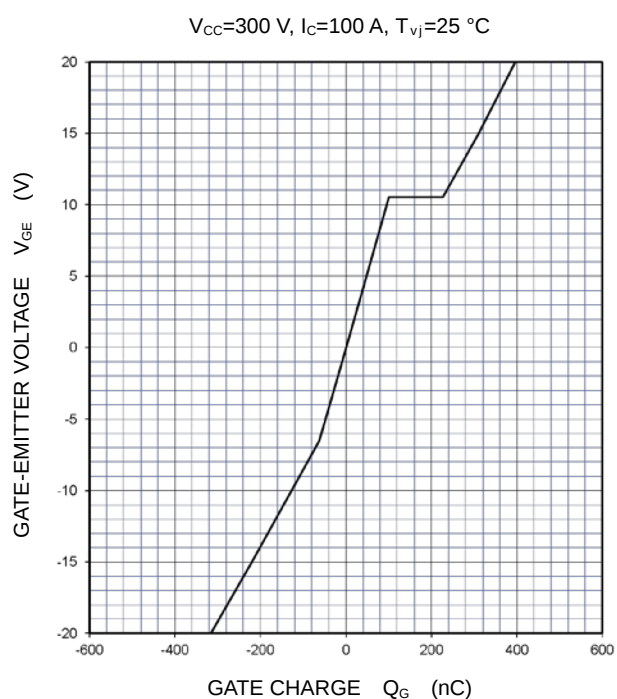
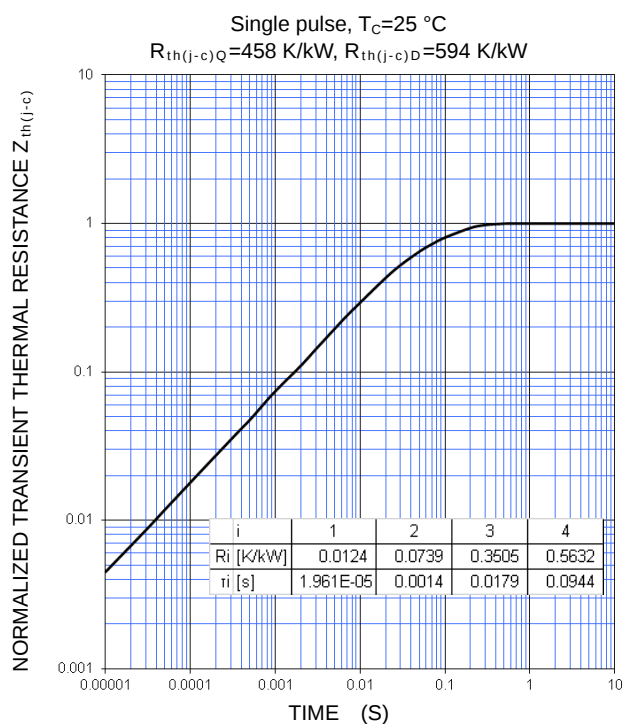
INSULATED TYPE

**PERFORMANCE CURVES****INVERTER PART****HALF-BRIDGE SWITCHING CHARACTERISTICS  
(TYPICAL)** $V_{CC}=300\text{ V}$ ,  $R_G=6.8\ \Omega$ ,  $V_{GE}=\pm 15\text{ V}$ , INDUCTIVE LOAD  
—:  $T_{vj}=150\text{ }^\circ\text{C}$ , - - - -:  $T_{vj}=125\text{ }^\circ\text{C}$ **HALF-BRIDGE SWITCHING CHARACTERISTICS  
(TYPICAL)** $V_{CC}=300\text{ V}$ ,  $I_C=100\text{ A}$ ,  $V_{GE}=\pm 15\text{ V}$ , INDUCTIVE LOAD  
—:  $T_{vj}=150\text{ }^\circ\text{C}$ , - - - -:  $T_{vj}=125\text{ }^\circ\text{C}$ **HALF-BRIDGE SWITCHING CHARACTERISTICS  
(TYPICAL)** $V_{CC}=300\text{ V}$ ,  $R_G=6.8\ \Omega$ ,  $V_{GE}=\pm 15\text{ V}$ , INDUCTIVE LOAD,  
—:  $T_{vj}=150\text{ }^\circ\text{C}$ , - - - -:  $T_{vj}=125\text{ }^\circ\text{C}$ , PER PULSE**HALF-BRIDGE SWITCHING CHARACTERISTICS  
(TYPICAL)** $V_{CC}=300\text{ V}$ ,  $I_C/I_E=100\text{ A}$ ,  $V_{GE}=\pm 15\text{ V}$ , INDUCTIVE LOAD,  
—:  $T_{vj}=150\text{ }^\circ\text{C}$ , - - - -:  $T_{vj}=125\text{ }^\circ\text{C}$ , PER PULSE

**CM100MXUD-13T1/CM100MXUDP-13T1**

HIGH POWER SWITCHING USE

INSULATED TYPE

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

# CM100MXUD-13T1/CM100MXUDP-13T1

HIGH POWER SWITCHING USE

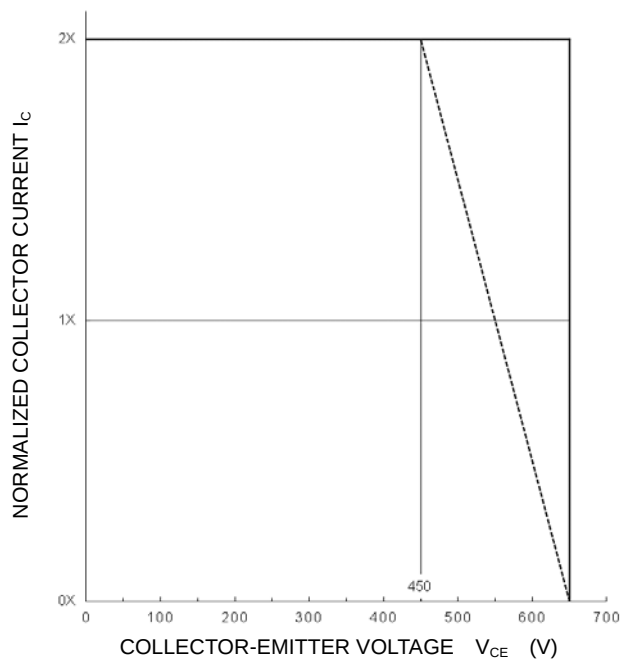
INSULATED TYPE

## PERFORMANCE CURVES

### INVERTER PART

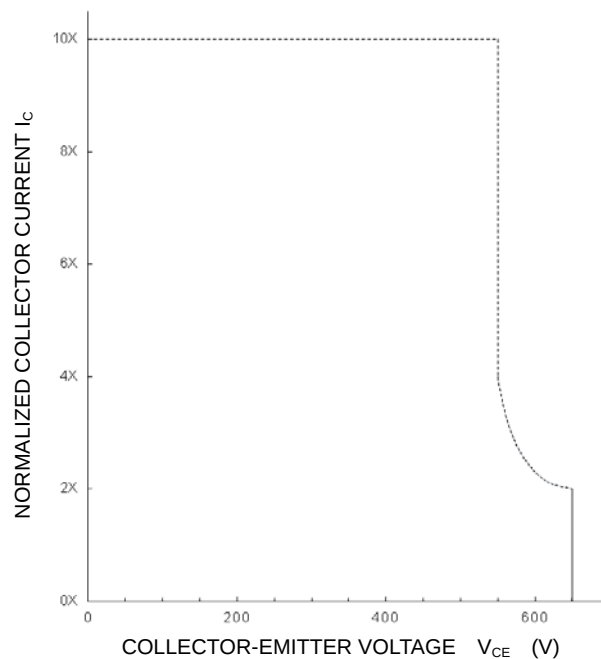
#### TURN-OFF SWITCHING SAFE OPERATIONG AREA (REVERSE BIAS SAFE OPERATING AREA) (MAXIMUM)

$V_{CC} \leq 450 \text{ V}$ ,  $R_G = 6.8 \sim 68 \ \Omega$ ,  $V_{GE} = \pm 15 \text{ V}$ ,  
——:  $T_{vj} = 25 \sim 150 \text{ }^\circ\text{C}$  (Normal load operations (Continuous))  
-----:  $T_{vj} = 175 \text{ }^\circ\text{C}$  (Unusual load operations (Limited period))



#### SHORT-CIRCUIT SAFE OPERATING AREA (MAXIMUM)

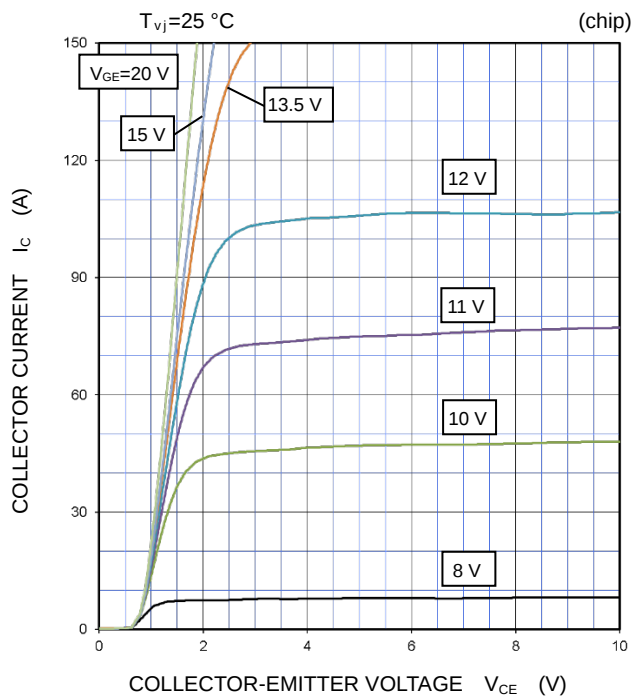
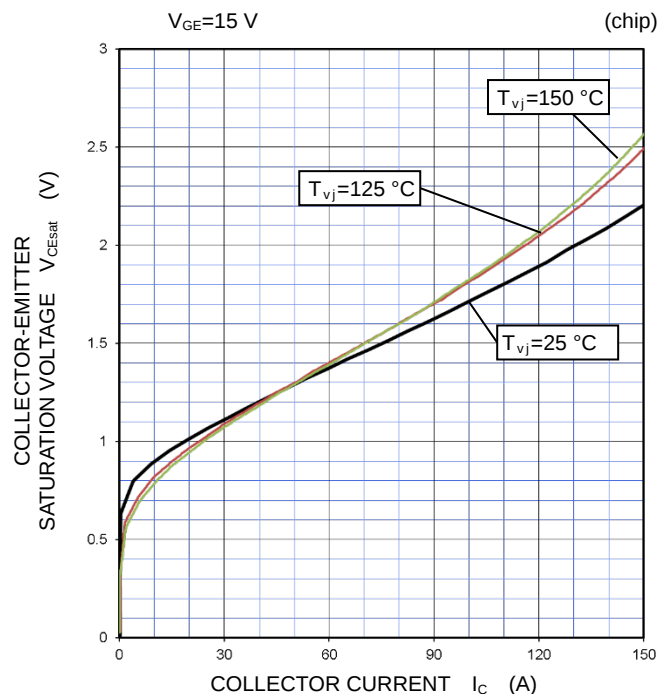
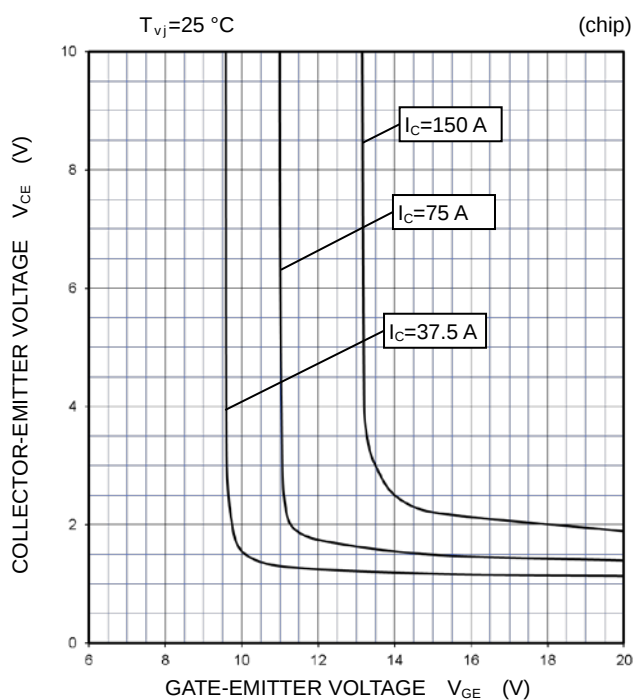
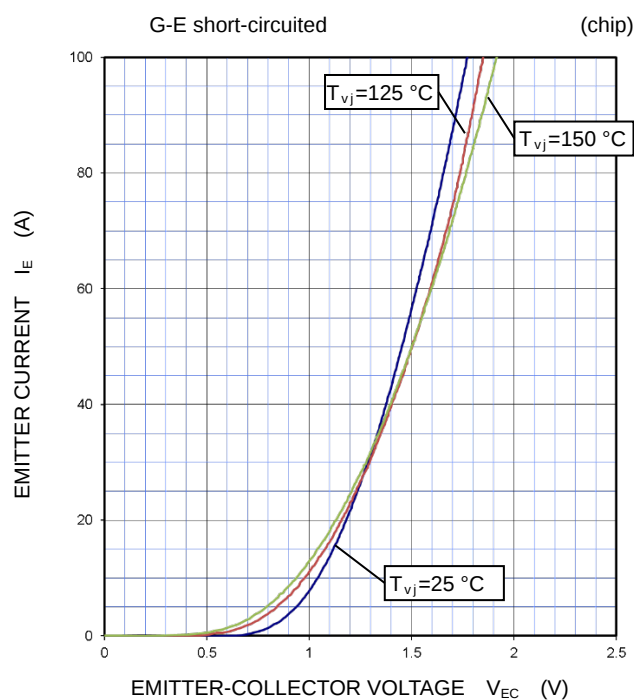
$V_{CC} \leq 400 \text{ V}$ ,  $R_G = 6.8 \sim 68 \ \Omega$ ,  $V_{GE} = \pm 15 \text{ V}$ ,  
 $T_{vj} = 25 \sim 150 \text{ }^\circ\text{C}$ ,  $t_W \leq 8 \ \mu\text{s}$ , Non-Repetitive



**CM100MXUD-13T1/CM100MXUDP-13T1**

HIGH POWER SWITCHING USE

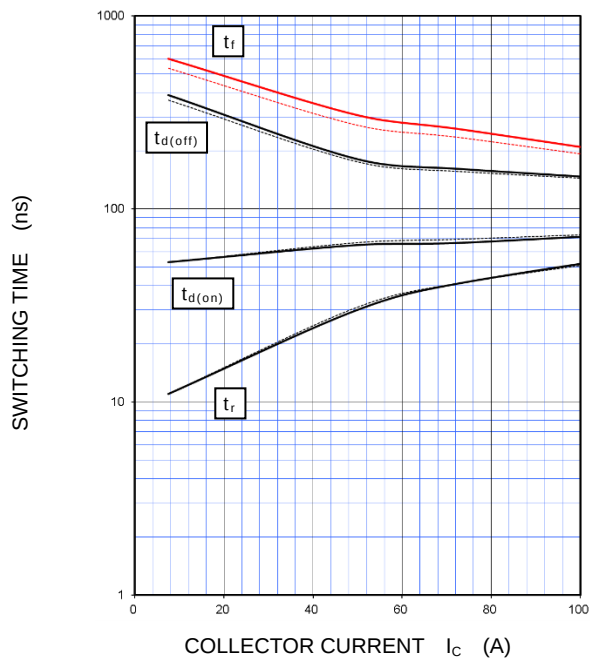
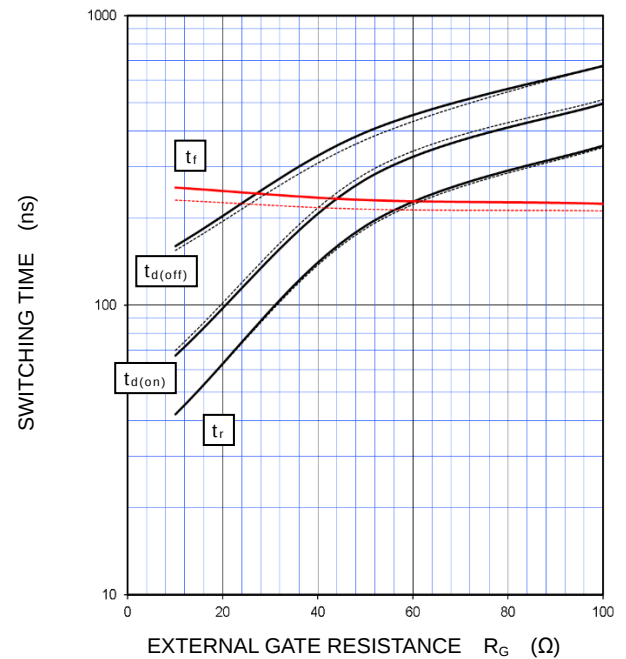
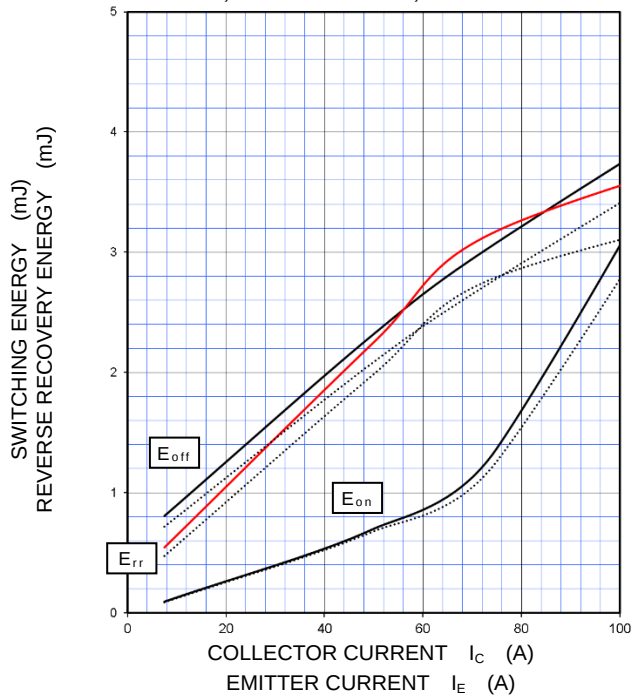
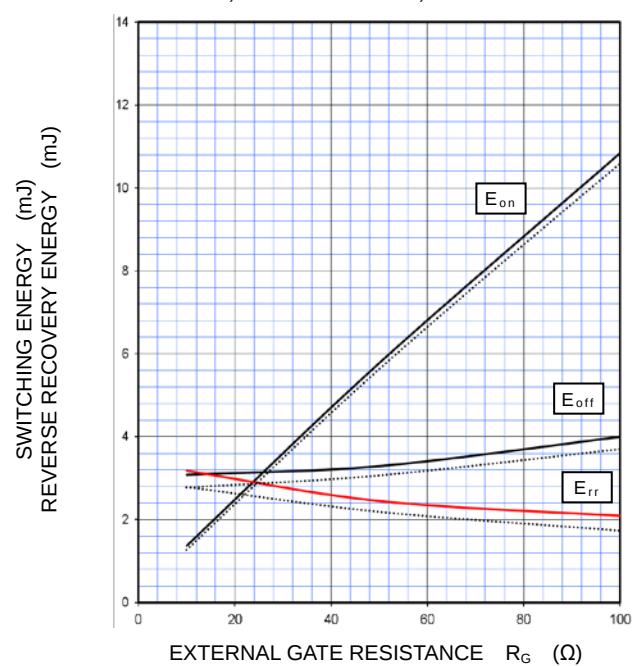
INSULATED TYPE

**PERFORMANCE CURVES****BRAKE PART****OUTPUT CHARACTERISTICS  
(TYPICAL)****COLLECTOR-EMITTER SATURATION VOLTAGE  
CHARACTERISTICS  
(TYPICAL)****COLLECTOR-EMITTER VOLTAGE CHARACTERISTICS  
(TYPICAL)****DIODE  
FORWARD CHARACTERISTICS  
(TYPICAL)**

**CM100MXUD-13T1/CM100MXUDP-13T1**

HIGH POWER SWITCHING USE

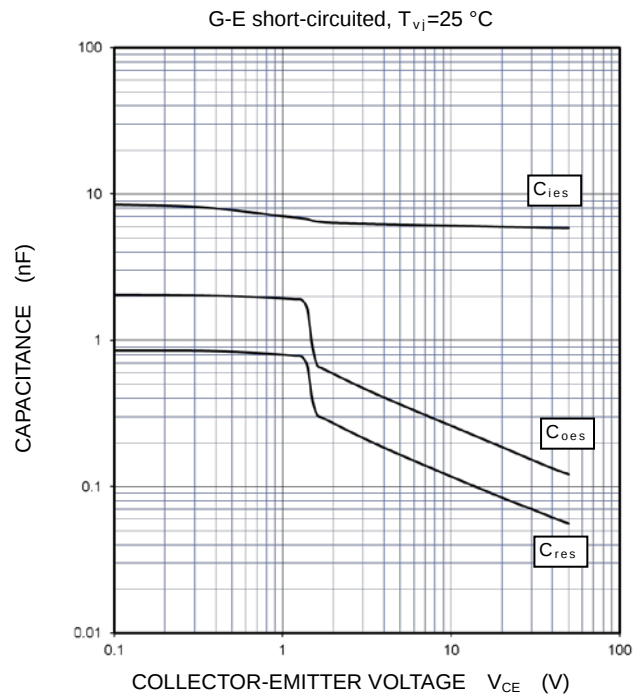
INSULATED TYPE

**PERFORMANCE CURVES****BRAKE PART****HALF-BRIDGE SWITCHING CHARACTERISTICS  
(TYPICAL)** $V_{CC}=300\text{ V}$ ,  $R_G=10\ \Omega$ ,  $V_{GE}=\pm 15\text{ V}$ , INDUCTIVE LOAD  
—:  $T_{vj}=150\text{ }^\circ\text{C}$ , - - - - -:  $T_{vj}=125\text{ }^\circ\text{C}$ **HALF-BRIDGE SWITCHING CHARACTERISTICS  
(TYPICAL)** $V_{CC}=300\text{ V}$ ,  $I_C=75\text{ A}$ ,  $V_{GE}=\pm 15\text{ V}$ , INDUCTIVE LOAD  
—:  $T_{vj}=150\text{ }^\circ\text{C}$ , - - - - -:  $T_{vj}=125\text{ }^\circ\text{C}$ **HALF-BRIDGE SWITCHING CHARACTERISTICS  
(TYPICAL)** $V_{CC}=300\text{ V}$ ,  $R_G=10\ \Omega$ ,  $V_{GE}=\pm 15\text{ V}$ , INDUCTIVE LOAD,  
—:  $T_{vj}=150\text{ }^\circ\text{C}$ , - - - - -:  $T_{vj}=125\text{ }^\circ\text{C}$ , PER PULSE**HALF-BRIDGE SWITCHING CHARACTERISTICS  
(TYPICAL)** $V_{CC}=300\text{ V}$ ,  $I_C/I_E=75\text{ A}$ ,  $V_{GE}=\pm 15\text{ V}$ , INDUCTIVE LOAD,  
—:  $T_{vj}=150\text{ }^\circ\text{C}$ , - - - - -:  $T_{vj}=125\text{ }^\circ\text{C}$ , PER PULSE

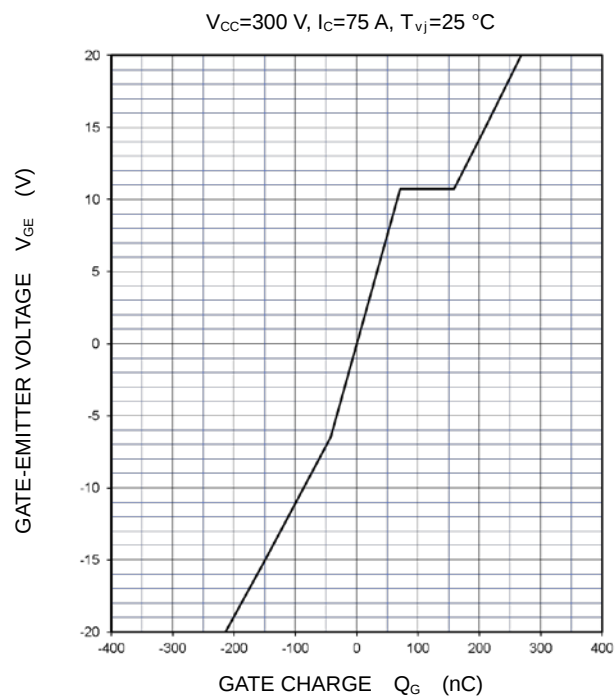
PERFORMANCE CURVES

BRAKE PART

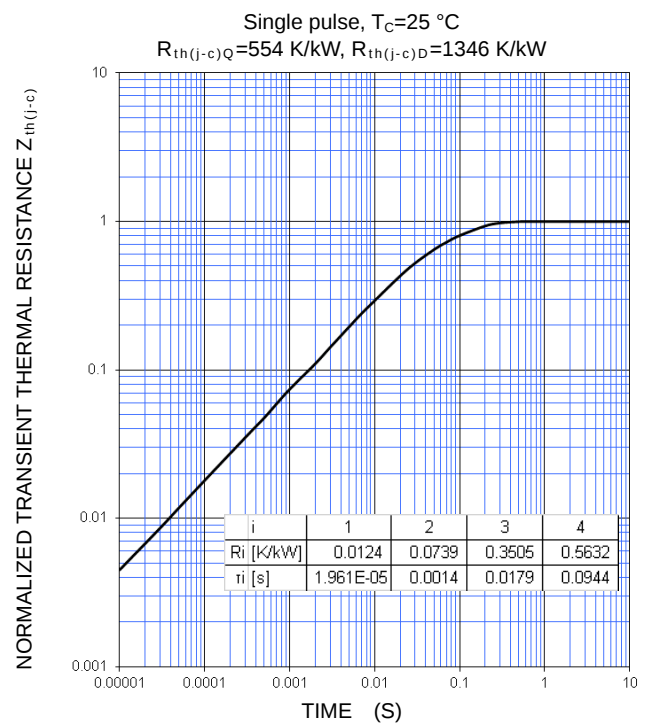
CAPACITANCE CHARACTERISTICS  
(TYPICAL)



GATE CHARGE CHARACTERISTICS  
(TYPICAL)



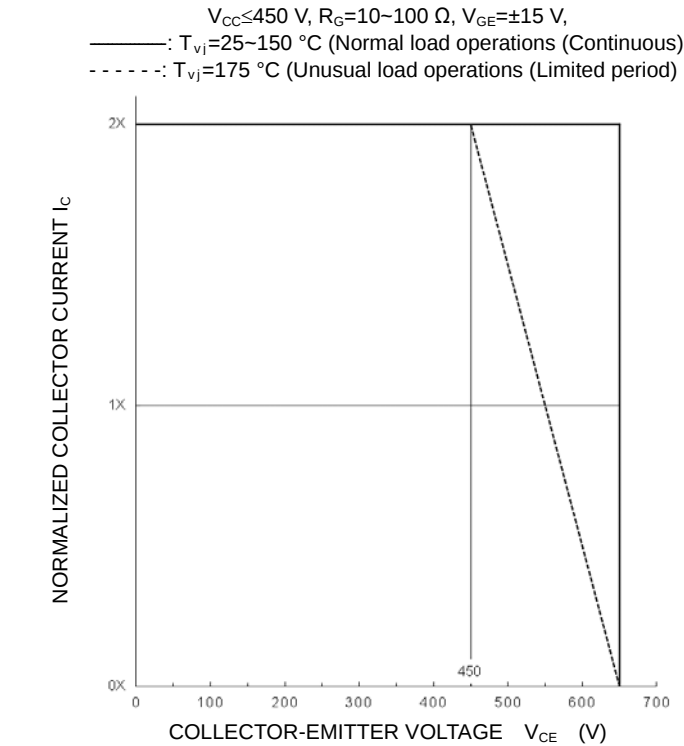
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS  
(MAXIMUM)



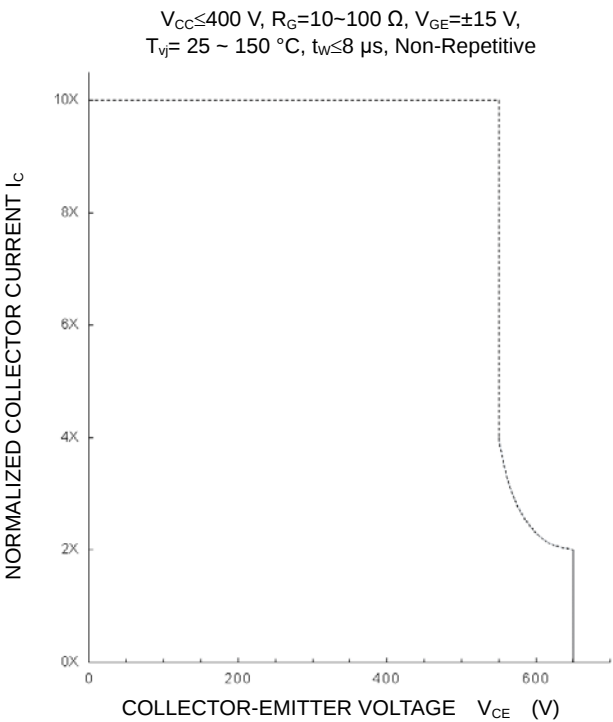
PERFORMANCE CURVES

BRAKE PART

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

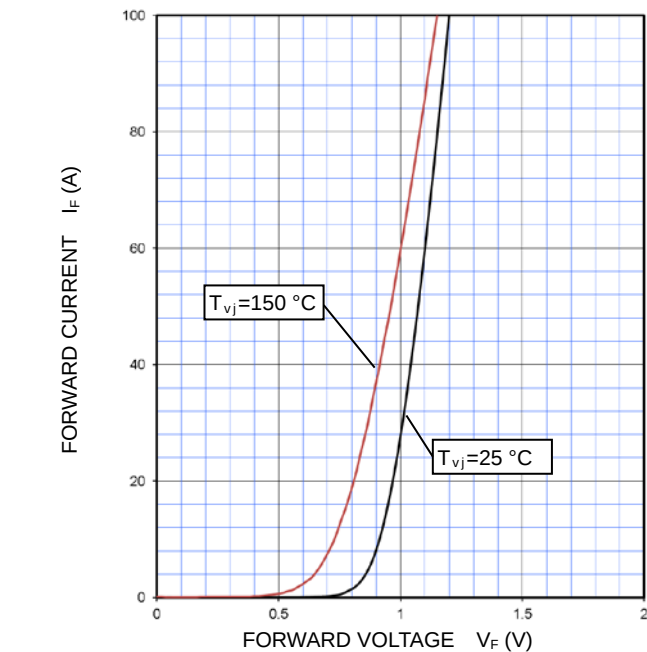


SHORT-CIRCUIT SAFE OPERATING AREA  
(MAXIMUM)

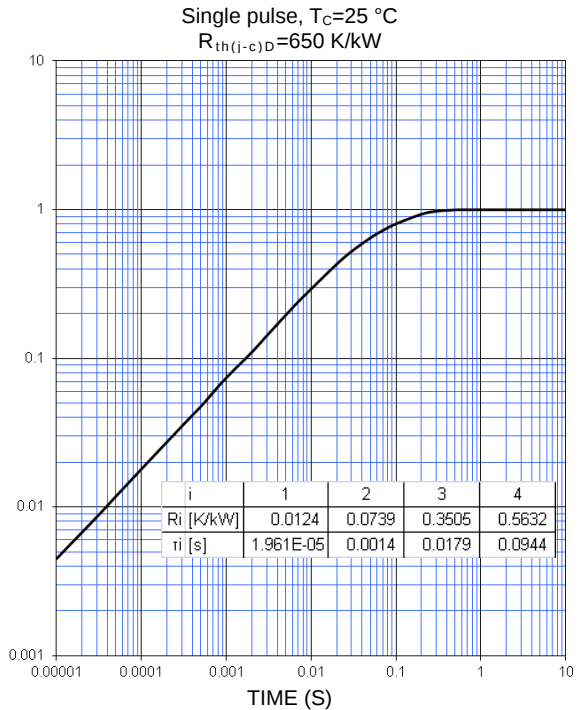


CONVERTER PART

CONVERTER DIODE  
FORWARD CHARACTERISTICS  
(TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS  
(MAXIMUM)



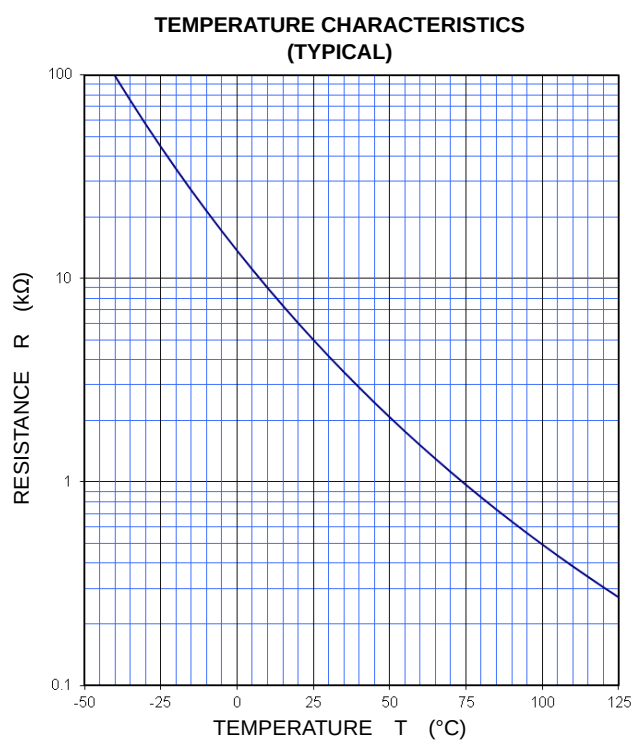
## CM100MXUD-13T1/CM100MXUDP-13T1

HIGH POWER SWITCHING USE

INSULATED TYPE

### PERFORMANCE CURVES

NTC thermistor part



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

## CM100MXUD-13T1/CM100MXUDP-13T1

HIGH POWER SWITCHING USE

INSULATED TYPE

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