



<IGBT Modules>

CM50MXUA-24T1/CM50MXUAP-24T1

HIGH POWER SWITCHING USE
INSULATED TYPE

| | |
|---|---|
|  <p>MXUA</p> | <p>Collector current I_c 50 A Collector-emitter voltage V_{CES} 1200 V Maximum junction temperature T_{vjmax} 175 °C</p> <ul style="list-style-type: none"> • Flat base type • Copper base plate (Nickel-plating) • RoHS Directive compliant • Tin-plating pin terminals |
|  <p>MXUAP</p> | <p>Collector current I_c 50 A Collector-emitter voltage V_{CES} 1200 V Maximum junction temperature T_{vjmax} 175 °C</p> <ul style="list-style-type: none"> • Flat base type • Copper base plate (Nickel-plating) • RoHS Directive compliant • Tin-plating pressfit terminals |
| <p>CIB (Converter+Inverter+Chopper Brake) •UL Recognized under UL1557, File No. E323585</p> | |

APPLICATION

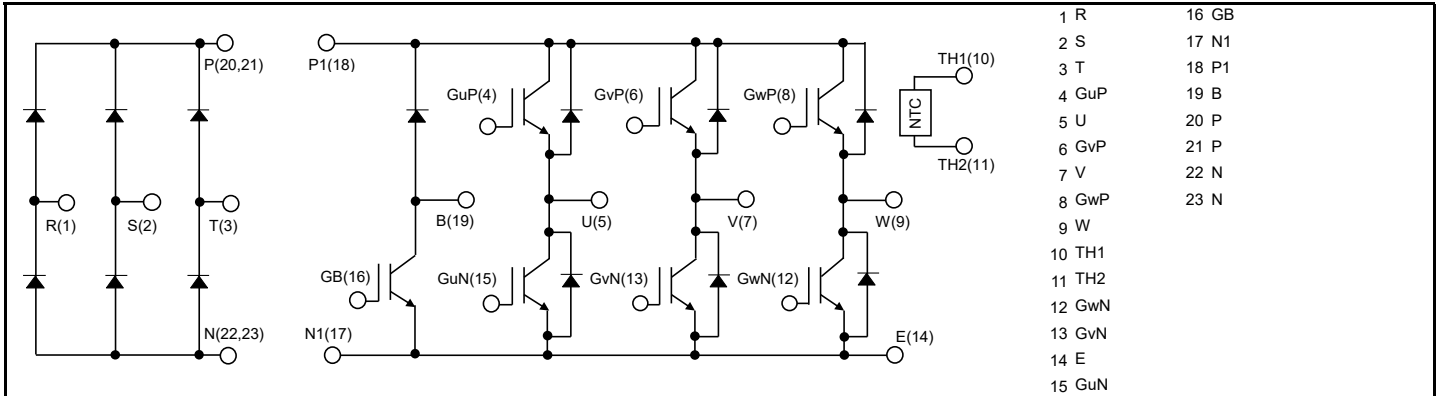
AC Motor Control, Motion/Servo Control, Power supply, etc.

OPTION (Below options are available.)

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

INTERNAL CONNECTION

Terminal code



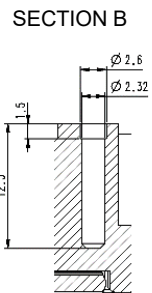
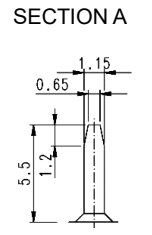
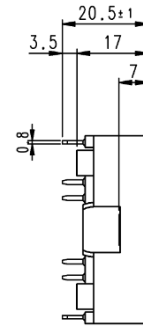
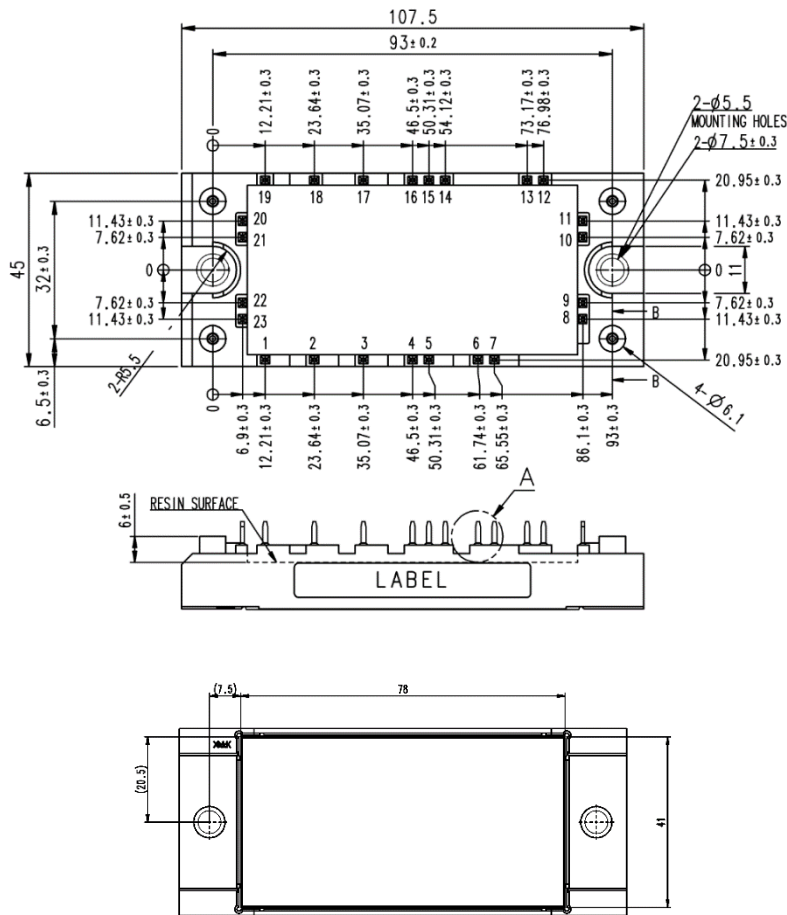
CM50MXUA-24T1/CM50MXUAP-24T1

HIGH POWER SWITCHING USE
INSULATED TYPE

OUTLINE DRAWING

Dimension in mm

MXUA



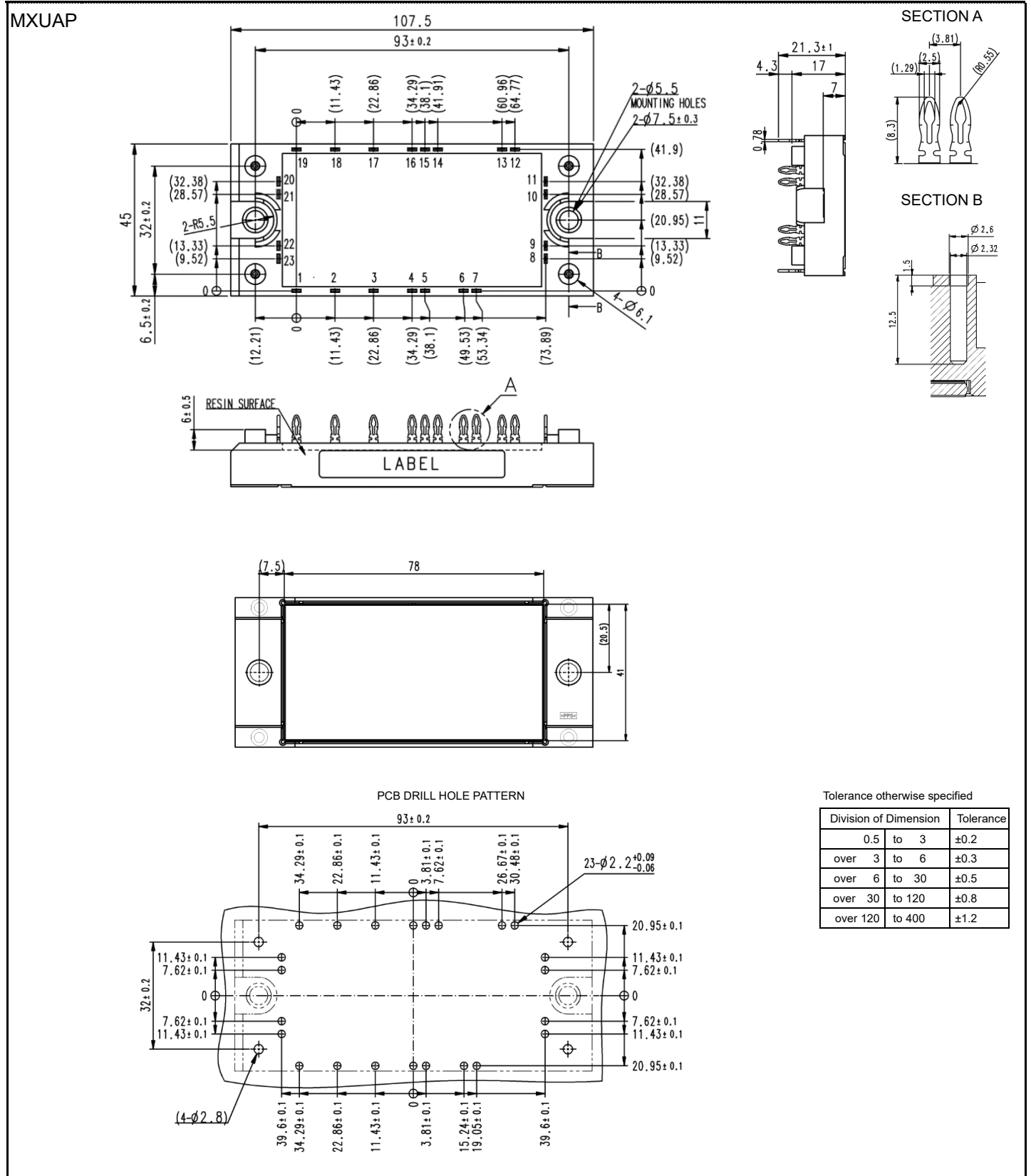
Tolerance otherwise specified

| 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 |

CM50MXUA-24T1/CM50MXUAP-24T1

HIGH POWER SWITCHING USE
INSULATED TYPE

OUTLINE DRAWING



CM50MXUA-24T1/CM50MXUAP-24T1

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 | 1200 | V |
| V_{GES} | Gate-emitter voltage | C-E short-circuited | ± 20 | V |
| I_C | Collector current | DC, $T_C=106\text{ }^{\circ}\text{C}$ (Note2, 4) | 50 | A |
| I_{CRM} | | Pulse, Repetitive (Note3) | 100 | |
| P_{tot} | Total power dissipation | $T_C=25\text{ }^{\circ}\text{C}$ (Note2, 4) | 279 | W |
| I_E (Note1) | Emitter current | DC (Note2) | 50 | A |
| I_{ERM} (Note1) | | Pulse, Repetitive (Note3) | 100 | |
| T_{vjmax} | Maximum junction temperature | Instantaneous event (overload) (Note9) | 175 | $^{\circ}\text{C}$ |

BRAKE PART IGBT/DIODE

| Symbol | Item | Conditions | Rating | Unit |
|-------------|---------------------------------|--|----------|--------------------|
| V_{CES} | Collector-emitter voltage | G-E short-circuited | 1200 | V |
| V_{GES} | Gate-emitter voltage | C-E short-circuited | ± 20 | V |
| I_C | Collector current | DC, $T_C=119\text{ }^{\circ}\text{C}$ (Note2, 4) | 35 | A |
| I_{CRM} | | Pulse, Repetitive (Note3) | 70 | |
| P_{tot} | Total power dissipation | $T_C=25\text{ }^{\circ}\text{C}$ (Note2, 4) | 235 | W |
| V_{RRM} | Repetitive peak reverse voltage | G-E short-circuited | 1200 | V |
| I_F | Forward current | DC (Note2) | 35 | A |
| I_{FRM} | | Pulse, Repetitive (Note3) | 70 | |
| T_{vjmax} | Maximum junction temperature | Instantaneous event (overload) (Note9) | 175 | $^{\circ}\text{C}$ |

CONVERTER PART DIODE

| Symbol | Item | Conditions | Rating | Unit | |
|-------------|---------------------------------|---|--------------------------------------|--------------------|-----------------------|
| V_{RRM} | Repetitive peak reverse voltage | - | 1600 | V | |
| E_a | Recommended AC input voltage | RMS | 440 | V | |
| I_o | DC output current | 3-phase full wave rectifying, $T_C=125\text{ }^{\circ}\text{C}$ (Note4) | 50 | A | |
| I_{FSM} | Surge forward current | The sine half wave 1 cycle peak value, $f=60\text{ Hz}$, non-repetitive | $T_{vj}=25\text{ }^{\circ}\text{C}$ | 532 | A |
| | | | $T_{vj}=150\text{ }^{\circ}\text{C}$ | 426 | |
| $I^2 t$ | Current square time | Value for one cycle of surge current | $T_{vj}=25\text{ }^{\circ}\text{C}$ | 1179 | $\text{A}^2\text{ s}$ |
| | | | $T_{vj}=150\text{ }^{\circ}\text{C}$ | 756 | |
| T_{vjmax} | Maximum junction temperature | Instantaneous event (overload) (Note9) | 150 | $^{\circ}\text{C}$ | |

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, 9) | 125 | $^{\circ}\text{C}$ |
| T_{vjop} | Operating junction temperature | Continuous operation (under switching) (Note9) | -40 ~ +150 | $^{\circ}\text{C}$ |
| T_{stg} | Storage temperature | - | -40 ~ +125 | |

CM50MXUA-24T1/CM50MXUAP-24T1

HIGH POWER SWITCHING USE
INSULATED TYPE**ELECTRICAL CHARACTERISTICS (T_{vj}=25 °C, unless otherwise specified)**
INVERTER PART IGBT/FWD

| Symbol | Item | Conditions | Limits | | | Unit | |
|---------------------------------------|--|---|-------------------------|------|------|------|---|
| | | | Min. | Typ. | Max. | | |
| I _{CES} | Collector-emitter cut-off current | V _{CE} =V _{CES} , G-E short-circuited | - | - | 1.0 | mA | |
| I _{GES} | Gate-emitter leakage current | V _{GE} =V _{GES} , C-E short-circuited | - | - | 0.5 | μA | |
| V _{GE(th)} | Gate-emitter threshold voltage | I _C =5.0 mA, V _{CE} =10 V | 5.4 | 6.0 | 6.6 | V | |
| V _{CEsat} (Terminal) | Collector-emitter saturation voltage | I _C =50 A, V _{GE} =15 V, Refer to the figure of test circuit (Note5) | T _{vj} =25 °C | - | 1.95 | 2.45 | V |
| V _{CEsat} (Chip) | | | T _{vj} =125 °C | - | 2.30 | - | |
| | | | T _{vj} =150 °C | - | 2.40 | - | |
| | T _{vj} =25 °C | - | 1.85 | 2.15 | V | | |
| V _{CEsat} (Chip) | I _C =50 A, V _{GE} =15 V, (Note5) | T _{vj} =125 °C | - | 2.10 | | - | |
| | | T _{vj} =150 °C | - | 2.15 | | - | |
| | | T _{vj} =150 °C | - | 2.15 | - | | |
| C _{ies} | Input capacitance | V _{CE} =10 V, G-E short-circuited | - | - | 8.5 | nF | |
| C _{oes} | Output capacitance | | - | - | 0.2 | | |
| C _{res} | Reverse transfer capacitance | | - | - | 0.1 | | |
| Q _G | Gate charge | V _{CC} =600 V, I _C =50 A, V _{GE} =15 V | - | 0.26 | - | μC | |
| t _{d(on)} | Turn-on delay time | V _{CC} =600 V, I _C =50 A, V _{GE} =±15 V, R _G =18 Ω, Inductive load | - | - | 300 | ns | |
| t _r | Rise time | | - | - | 150 | | |
| t _{d(off)} | Turn-off delay time | | - | - | 500 | | |
| t _f | Fall time | | - | - | 400 | | |
| V _{EC} (Note1) (Terminal) | Emitter-collector voltage | I _E =50 A, G-E short-circuited, Refer to the figure of test circuit (Note5) | T _{vj} =25 °C | - | 2.00 | 2.60 | V |
| V _{EC} (Note1) (Chip) | | | T _{vj} =125 °C | - | 2.25 | - | |
| | | | T _{vj} =150 °C | - | 2.30 | - | |
| | T _{vj} =25 °C | - | 1.90 | 2.35 | V | | |
| V _{EC} (Note1) (Chip) | I _E =50 A, G-E short-circuited, (Note5) | T _{vj} =125 °C | - | 1.90 | | - | |
| | | T _{vj} =150 °C | - | 1.90 | | - | |
| | | T _{vj} =150 °C | - | 1.90 | - | | |
| t _{rr} (Note1) | Reverse recovery time | V _{CC} =600 V, I _E =50 A, V _{GE} =±15 V, | - | - | 500 | ns | |
| Q _{rr} (Note1) | Reverse recovery charge | R _G =18 Ω, Inductive load | - | 3.6 | - | μC | |
| E _{on} | Turn-on switching energy per pulse | V _{CC} =600 V, I _C =I _E =50 A, | - | 7.1 | - | mJ | |
| E _{off} | Turn-off switching energy per pulse | V _{GE} =±15 V, R _G =18Ω, T _{vj} =150 °C, | - | 5.0 | - | | |
| E _{rr} (Note1) | Reverse recovery energy per pulse | Inductive load | - | 2.2 | - | mJ | |
| r _g | Internal gate resistance | Per switch | - | 0 | - | Ω | |

BRAKE PART IGBT/DIODE

| Symbol | Item | Conditions | Limits | | | Unit | |
|----------------------------------|--|---|-------------------------|------|------|------|---|
| | | | Min. | Typ. | Max. | | |
| I _{CES} | Collector-emitter cut-off current | V _{CE} =V _{CES} , G-E short-circuited | - | - | 1.0 | mA | |
| I _{GES} | Gate-emitter leakage current | V _{GE} =V _{GES} , C-E short-circuited | - | - | 0.5 | μA | |
| V _{GE(th)} | Gate-emitter threshold voltage | I _C =3.5 mA, V _{CE} =10 V | 5.4 | 6.0 | 6.6 | V | |
| V _{CEsat} (Terminal) | Collector-emitter saturation voltage | I _C =35 A, V _{GE} =15 V, Refer to the figure of test circuit (Note5) | T _{vj} =25 °C | - | 1.90 | 2.40 | V |
| V _{CEsat} (Chip) | | | T _{vj} =125 °C | - | 2.25 | - | |
| | | | T _{vj} =150 °C | - | 2.35 | - | |
| | T _{vj} =25 °C | - | 1.85 | 2.15 | V | | |
| V _{CEsat} (Chip) | I _C =35 A, V _{GE} =15 V, (Note5) | T _{vj} =125 °C | - | 2.10 | | - | |
| | | T _{vj} =150 °C | - | 2.15 | | - | |
| | | T _{vj} =150 °C | - | 2.15 | - | | |
| C _{ies} | Input capacitance | V _{CE} =10 V, G-E short-circuited | - | - | 6.1 | nF | |
| C _{oes} | Output capacitance | | - | - | 0.2 | | |
| C _{res} | Reverse transfer capacitance | | - | - | 0.1 | | |
| Q _G | Gate charge | V _{CC} =600 V, I _C =35 A, V _{GE} =15 V | - | 0.19 | - | μC | |
| t _{d(on)} | Turn-on delay time | V _{CC} =600 V, I _C =35 A, V _{GE} =±15 V, R _G =27 Ω, Inductive load | - | - | 300 | ns | |
| t _r | Rise time | | - | - | 150 | | |
| t _{d(off)} | Turn-off delay time | | - | - | 500 | | |
| t _f | Fall time | | - | - | 400 | | |

CM50MXUA-24T1/CM50MXUAP-24T1

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_{on} | Turn-on switching energy per pulse | $V_{CC}=600\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $T_{vj}=150\text{ }^{\circ}\text{C}$, Inductive load | $I_C=35\text{ A}$, $R_G=27\text{ }\Omega$ | - | 4.4 | - | mJ | |
| E_{off} | Turn-off switching energy per pulse | | | - | 3.3 | - | | |
| E_{rr} | Reverse recovery energy per pulse | | | $I_E=35\text{ A}$, $R_G=27\text{ }\Omega$ | - | 1.2 | | - |
| r_g | Internal gate resistance | - | - | 0 | - | Ω | | |
| I_{RRM} | Reverse current | $V_R=V_{RRM}$, G-E short-circuited | - | - | 1.0 | mA | | |
| V_F (Terminal) | Forward voltage | $I_F=35\text{ A}$, G-E short-circuited, Refer to the figure of test circuit (Note5) | | $T_{vj}=25\text{ }^{\circ}\text{C}$ | - | 1.95 | 2.55 | V |
| | | | | $T_{vj}=125\text{ }^{\circ}\text{C}$ | - | 2.20 | - | |
| | | | | $T_{vj}=150\text{ }^{\circ}\text{C}$ | - | 2.25 | - | |
| V_F (Chip) | Forward voltage | $I_F=35\text{ A}$, G-E short-circuited, (Note5) | | $T_{vj}=25\text{ }^{\circ}\text{C}$ | - | 1.90 | 2.35 | V |
| | | | | $T_{vj}=125\text{ }^{\circ}\text{C}$ | - | 1.90 | - | |
| | | | | $T_{vj}=150\text{ }^{\circ}\text{C}$ | - | 1.90 | - | |
| t_{rr} | Reverse recovery time | $V_{CC}=600\text{ V}$, $I_F=35\text{ A}$, $V_{GE}=\pm 15\text{ V}$, | - | - | 500 | ns | | |
| Q_{rr} | Reverse recovery charge | $R_G=27\text{ }\Omega$, Inductive load | - | 2.2 | - | μC | | |

CONVERTER PART DIODE

| Symbol | Item | Conditions | Limits | | | Unit | | |
|---------------------|---------------------------------|--|--------|--------------------------------------|------|------|------|---|
| | | | Min. | Typ. | Max. | | | |
| I_{RRM} | Repetitive peak reverse current | $V_R=V_{RRM}$, $T_{vj}=150\text{ }^{\circ}\text{C}$ | - | - | 20 | mA | | |
| V_F (Terminal) | Forward voltage | $I_F=50\text{ A}$ | | $T_{vj}=25\text{ }^{\circ}\text{C}$ | - | 1.30 | 1.75 | V |
| | | | | $T_{vj}=150\text{ }^{\circ}\text{C}$ | - | 1.20 | - | |
| V_F (chip) | | | | $T_{vj}=25\text{ }^{\circ}\text{C}$ | - | 1.20 | 1.45 | |
| | | | | $T_{vj}=150\text{ }^{\circ}\text{C}$ | - | 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 Ω |
| $\Delta R/R$ | 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) | - | - | 536 | K/kW |
| $R_{th(j-c)D}$ | | Junction to case, per Inverter FWD (Note4) | - | - | 1070 | |
| $R_{th(j-c)Q}$ | | Junction to case, Brake IGBT (Note4) | - | - | 627 | |
| $R_{th(j-c)D}$ | | Junction to case, Brake DIODE (Note4) | - | - | 1393 | |
| $R_{th(j-c)D}$ | | Junction to case, per Converter DIODE (Note4) | - | - | 995 | |
| $R_{th(c-s)}$ | Contact thermal resistance | Case to heat sink, per 1 module, Thermal grease applied (Note4, 7, 9) | - | 20.2 | - | K/kW |

CM50MXUA-24T1/CM50MXUAP-24T1

HIGH POWER SWITCHING USE
INSULATED TYPE

MECHANICAL CHARACTERISTICS

| Symbol | Item | Conditions | Limits | | | Unit | |
|----------------|------------------------|------------------------------------|------------------------|------|------|------|----|
| | | | Min. | Typ. | Max. | | |
| M _s | Mounting torque | Mounting to heat sink M 5 screw | 2.5 | 3.0 | 3.5 | N·m | |
| d _s | Creepage distance | Solder pin type(MXUA) | Terminal to terminal | 14.7 | - | - | mm |
| | | | Terminal to base plate | 18.3 | - | - | |
| | | Pressfit pin type(MXUAP) | Terminal to terminal | 9.0 | - | - | |
| | | | Terminal to base plate | 16.1 | - | - | |
| d _a | Clearance | Solder pin type(MXUA) | Terminal to terminal | 10.3 | - | - | mm |
| | | | Terminal to base plate | 13.1 | - | - | |
| | | Pressfit pin type(MXUAP) | Terminal to terminal | 8.8 | - | - | |
| | | | Terminal to base plate | 16.1 | - | - | |
| e _c | Flatness of base plate | On the centerline X, Y (Note6) | ±0 | - | +200 | µm | |
| m | mass | - | - | 165 | - | g | |

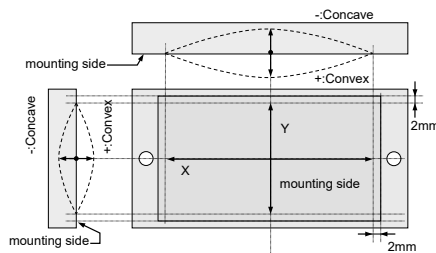
RECOMMENDED OPERATING CONDITIONS

| Symbol | Item | Conditions | Limits | | | Unit |
|-------------------|-------------------------------|---|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| V _{CC} | (DC) Supply voltage | Applied across P-N(P1-N1) terminals | - | 600 | 850 | V |
| V _{GEon} | Gate (-emitter drive) voltage | Applied across G*P-*/G*N-E/GB-E terminals (*=U,V,W) (Note11) | 13.5 | 15.0 | 16.5 | V |
| R _G | External gate resistance | Inverter IGBT, Per switch | 18 | - | 180 | Ω |
| | | Brake IGBT | 27 | - | 270 | |

*: 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_{vjmax} rating.
- Pulse width and repetition rate should be such that the device junction temperature (T_{vj}) dose not exceed T_{vjmax} 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.
- $B_{(25/50)} = \ln\left(\frac{R_{25}}{R_{50}}\right) \left(\frac{1}{T_{25}} - \frac{1}{T_{50}}\right)$
R₂₅: resistance at absolute temperature T₂₅ [K]; T₂₅=25 [°C]+273.15=298.15 [K]
R₅₀: resistance at absolute temperature T₅₀ [K]; T₅₀=50 [°C]+273.15=323.15 [K]
- Reference value. Thermally conductive grease of thermal conductivity λ=0.9 W/(m·K) and thickness D_(c-s)=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 (including but not limited to aspects such as the increase of thermal resistance due to pumping out, etc.) should be verified under user's specific application conditions. Each temperature condition (T_{vjmax}, T_{vjop}, T_{Cmax}) must be maintained below the maximum rated temperature throughout consideration of the temperature rise even for long term usage.
- Use the following screws when mounting the printed circuit board (PCB) on the standoffs.

PCB thickness : t1.6

| Type | Manufacturer | Size | Tightening torque (N·m) | Recommended tightening method |
|----------------------|--------------|--------------------|-------------------------|--|
| (1) PT® | EJOT | K25×8 | 0.55 ± 0.055 | by handwork (equivalent to 30 rpm by mechanical screw driver) ~ 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 tapping screw | - | φ2.6×10 φ2.6×12 | 0.75 ± 0.075 N·m | |

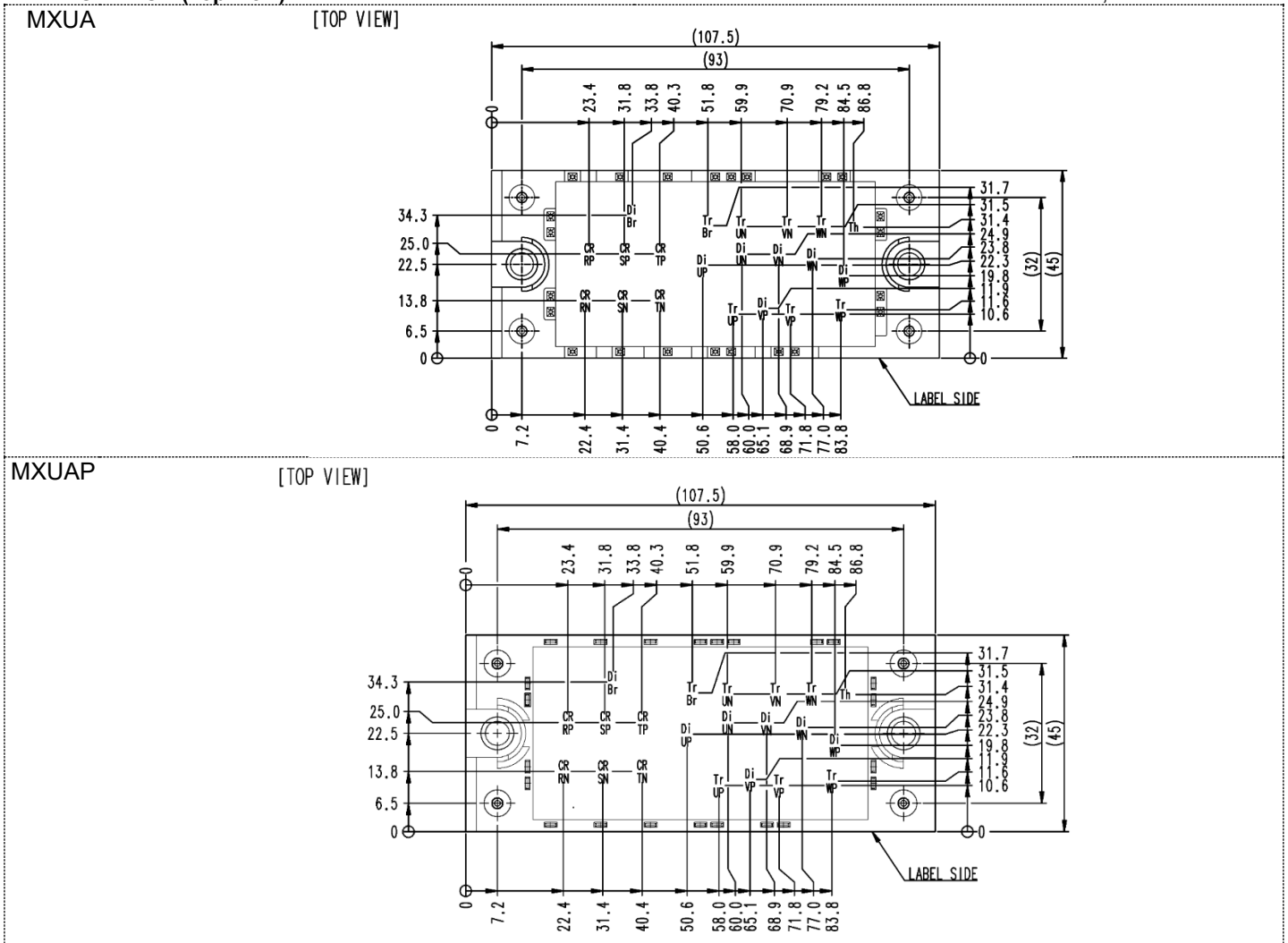
11. V_{GEon}=15V is necessary for IGBT to operate at I_{CRM}.

CM50MXUA-24T1/CM50MXUAP-24T1

HIGH POWER SWITCHING USE
INSULATED TYPE

CHIP LOCATION (Top view)

Dimension in mm, tolerance: ±1 mm

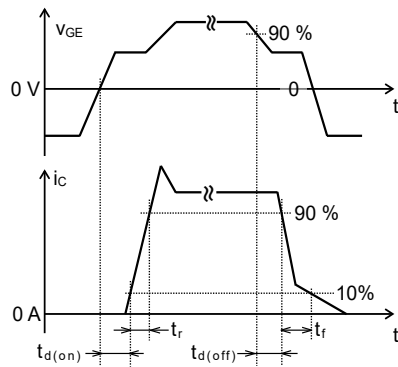
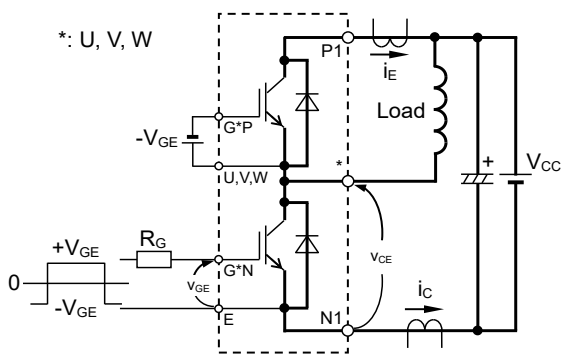


Tr*P/Tr*N/TrBr: IGBT, Di*P/Di*N: DIODE (*=U/V/W), DiBr: BRAKE DIODE,
CR*P/CR*N: CONVERTER DIODE (*=R/S/T), Th: NTC thermistor

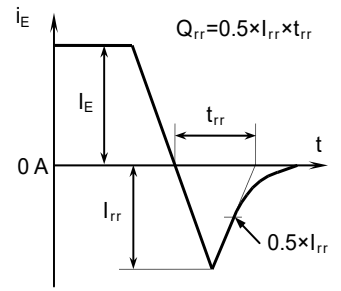
CM50MXUA-24T1/CM50MXUAP-24T1

HIGH POWER SWITCHING USE
INSULATED TYPE

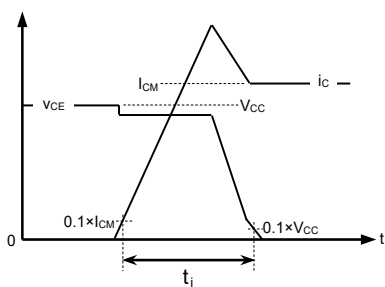
TEST CIRCUIT AND WAVEFORMS



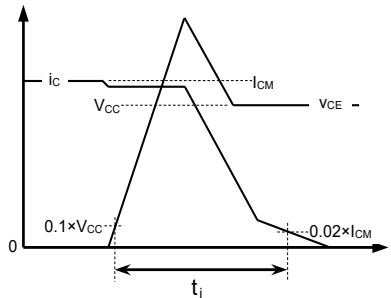
Switching characteristics test circuit and waveforms



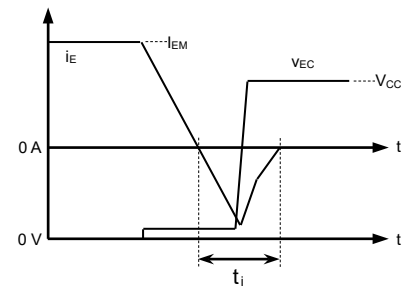
t_{rr} , Q_{rr} characteristics test waveform



IGBT Turn-on switching energy



IGBT Turn-off switching energy



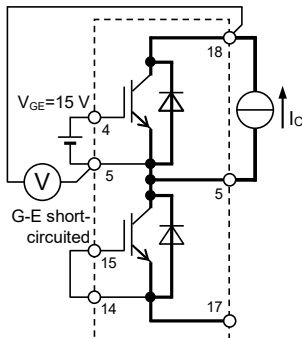
FWD Reverse recovery energy

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

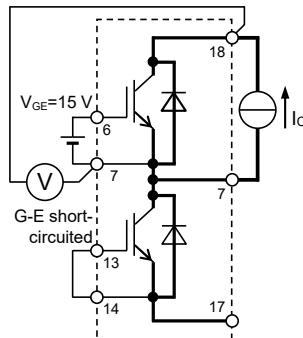
CM50MXUA-24T1/CM50MXUAP-24T1

HIGH POWER SWITCHING USE
INSULATED TYPE

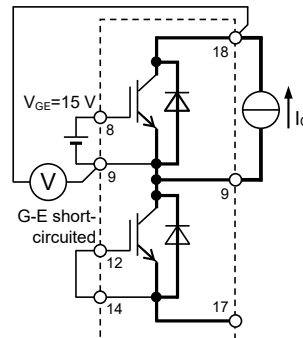
TEST CIRCUIT



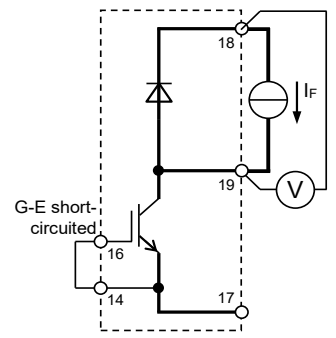
TrUP



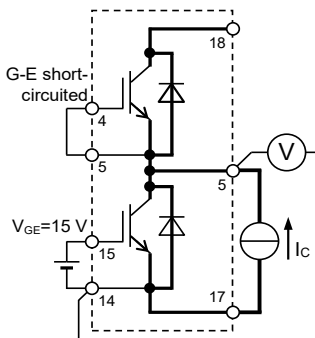
TrVP



TrWP

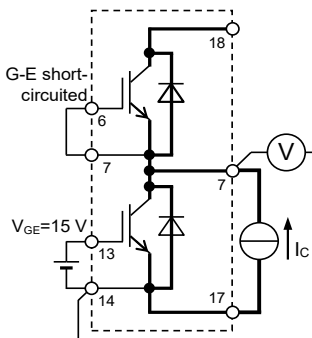


Brake DIODE



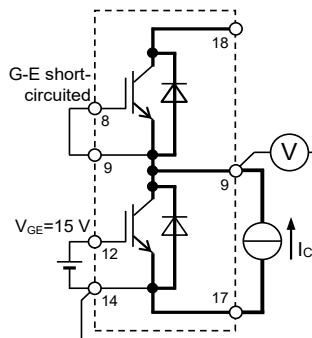
TrUN

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



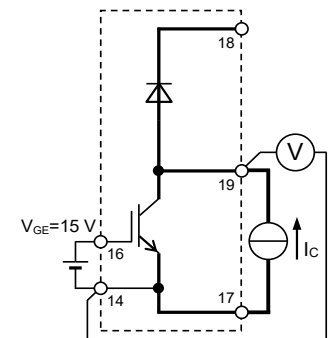
TrVN

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



TrWN

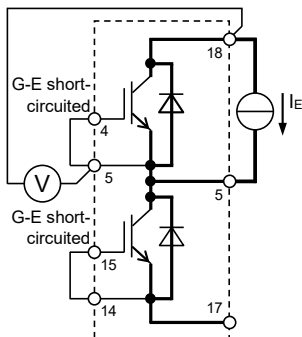
Gate-emitter GUP-U, GUN-E,
short-circuited GVP-V, GVN-E
GB-E



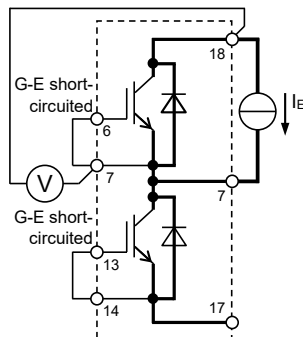
Brake IGBT

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

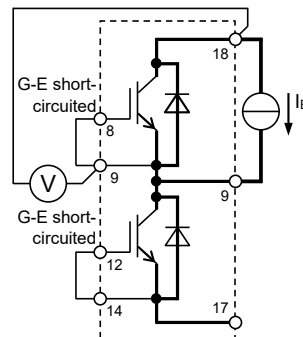
V_{CEsat} / BRAKE DIODE V_F characteristics test circuit



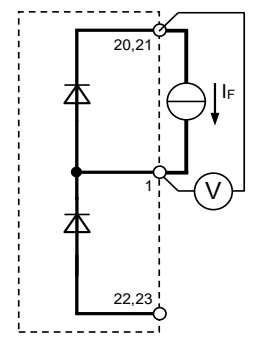
DiUP



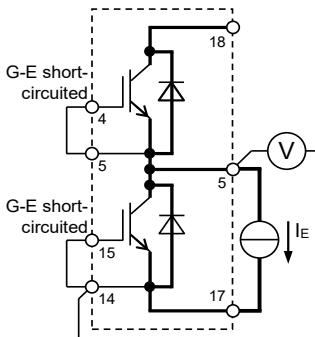
DiVP



DiWP

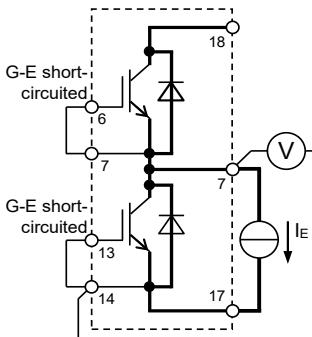


CONVERTER DIODE (ex.phase-R)



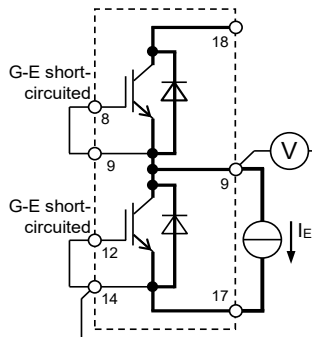
DiUN

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



DiVN

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



DiWN

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

V_{EC} / CONVERTER DIODE V_F characteristics test circuit

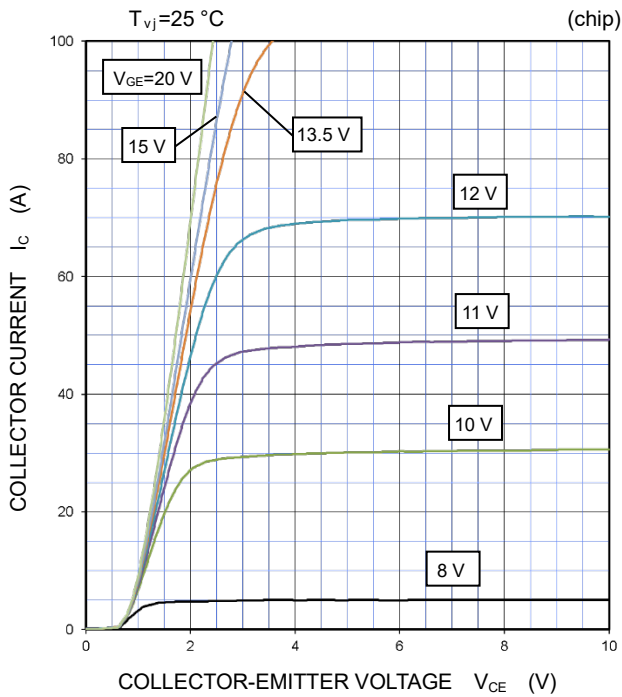
CM50MXUA-24T1/CM50MXUAP-24T1

HIGH POWER SWITCHING USE
INSULATED TYPE

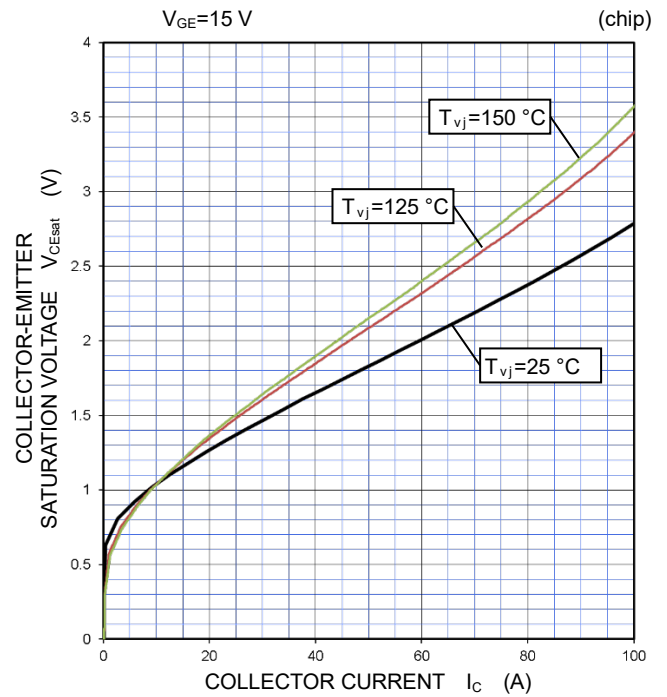
PERFORMANCE CURVES

INVERTER PART

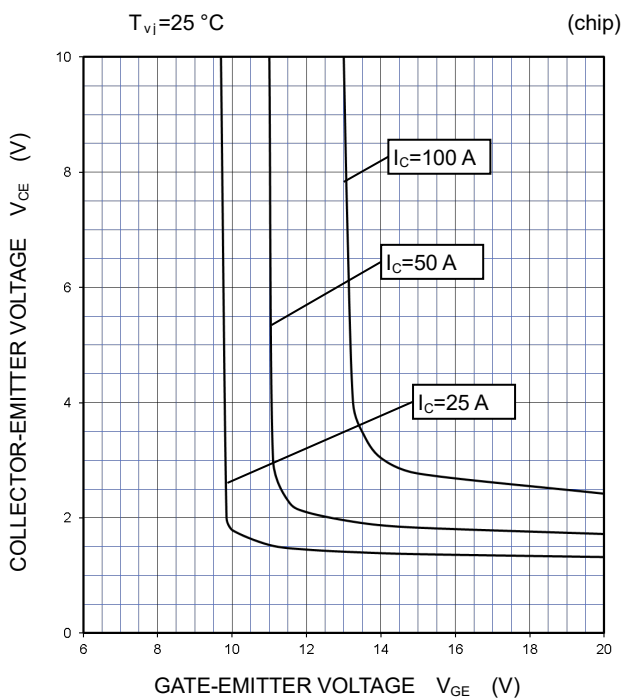
OUTPUT CHARACTERISTICS
(TYPICAL)



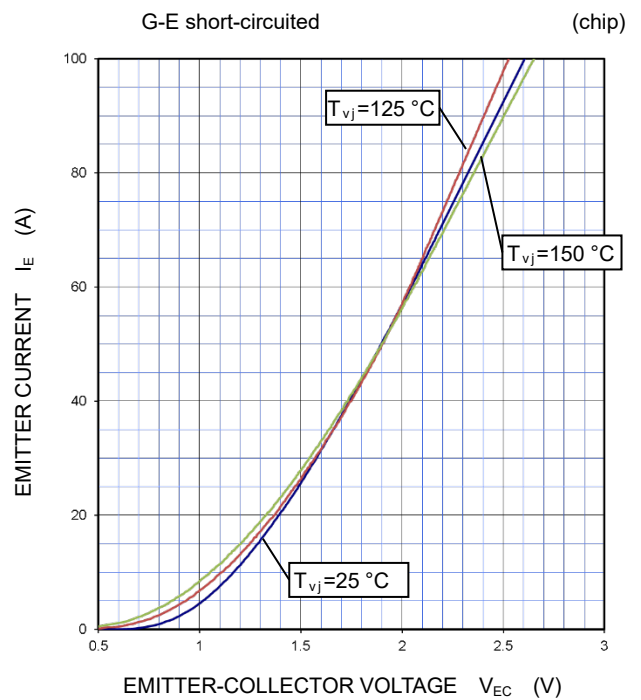
COLLECTOR-EMITTER SATURATION VOLTAGE
CHARACTERISTICS
(TYPICAL)



COLLECTOR-EMITTER VOLTAGE CHARACTERISTICS
(TYPICAL)



FREE WHEELING DIODE
FORWARD CHARACTERISTICS
(TYPICAL)



CM50MXUA-24T1/CM50MXUAP-24T1

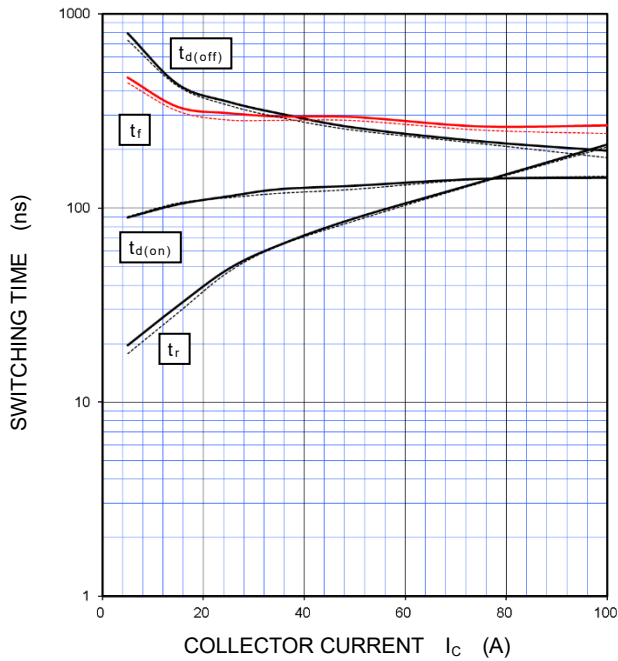
HIGH POWER SWITCHING USE
INSULATED TYPE

PERFORMANCE CURVES

INVERTER PART

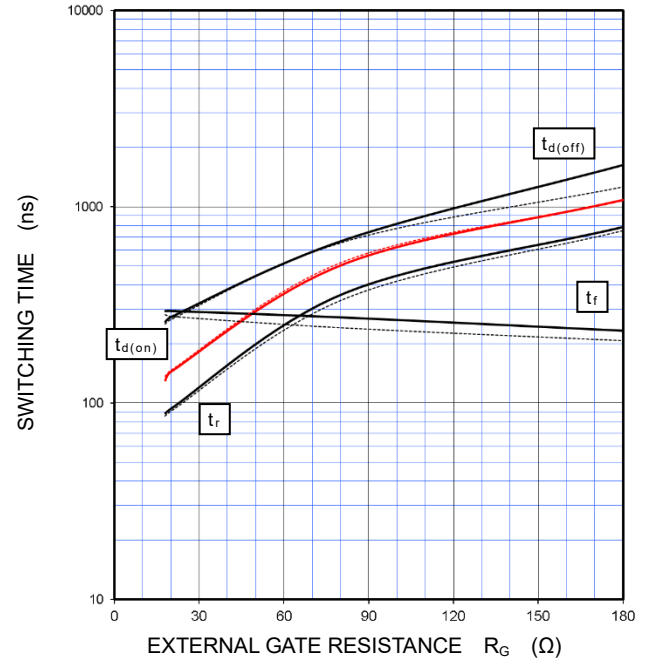
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)

$V_{CC}=600\text{ V}$, $R_G=18\ \Omega$, $V_{GE}=\pm 15\text{ V}$, INDUCTIVE LOAD
 —: $T_{vj}=150\text{ }^\circ\text{C}$, - - - -: $T_{vj}=125\text{ }^\circ\text{C}$



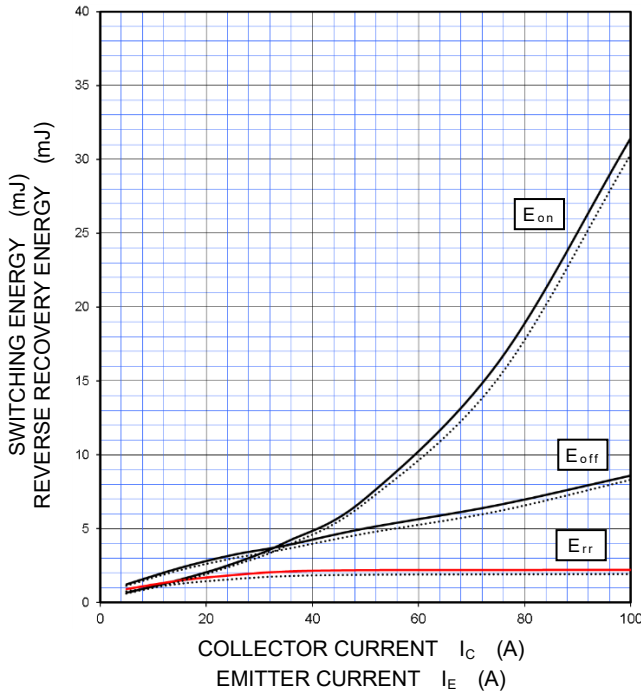
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)

$V_{CC}=600\text{ V}$, $I_c=50\text{ A}$, $V_{GE}=\pm 15\text{ V}$, INDUCTIVE LOAD
 —: $T_{vj}=150\text{ }^\circ\text{C}$, - - - -: $T_{vj}=125\text{ }^\circ\text{C}$



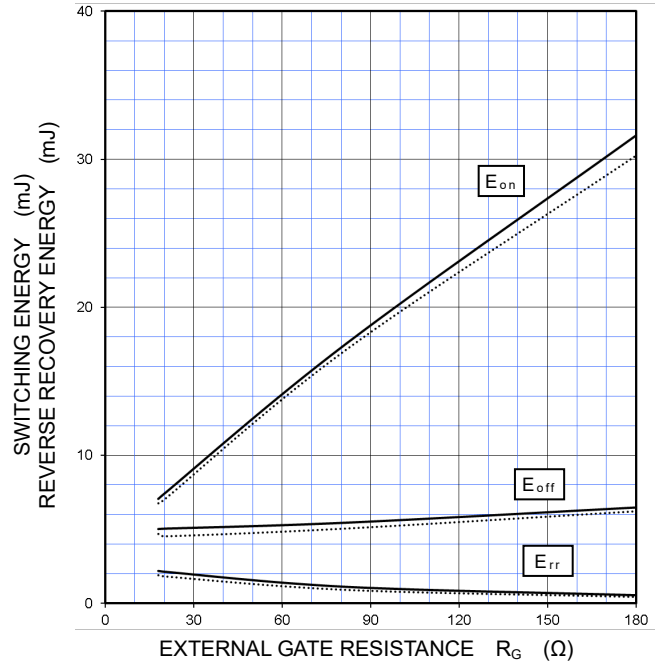
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)

$V_{CC}=600\text{ V}$, $R_G=18\ \Omega$, $V_{GE}=\pm 15\text{ V}$, INDUCTIVE LOAD, PER PULSE
 —: $T_{vj}=150\text{ }^\circ\text{C}$, - - - -: $T_{vj}=125\text{ }^\circ\text{C}$



HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)

$V_{CC}=600\text{ V}$, $I_c/I_e=50\text{ A}$, $V_{GE}=\pm 15\text{ V}$, INDUCTIVE LOAD, PER PULSE
 —: $T_{vj}=150\text{ }^\circ\text{C}$, - - - -: $T_{vj}=125\text{ }^\circ\text{C}$



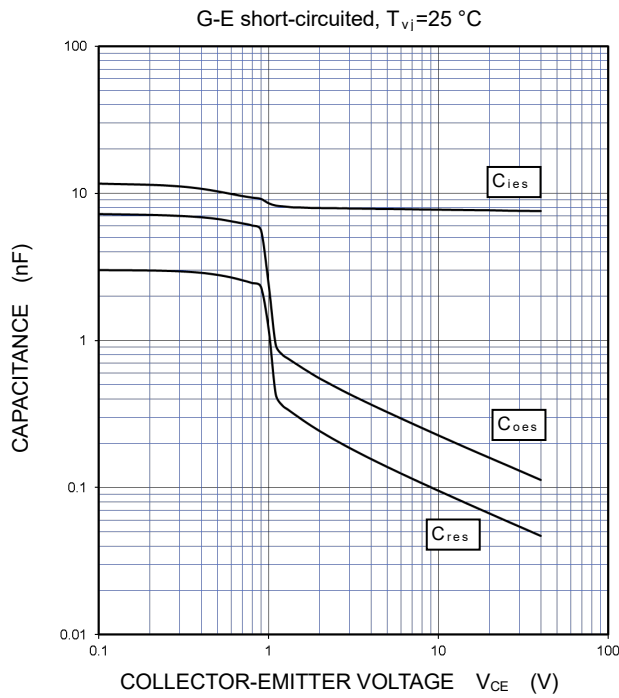
CM50MXUA-24T1/CM50MXUAP-24T1

HIGH POWER SWITCHING USE
INSULATED TYPE

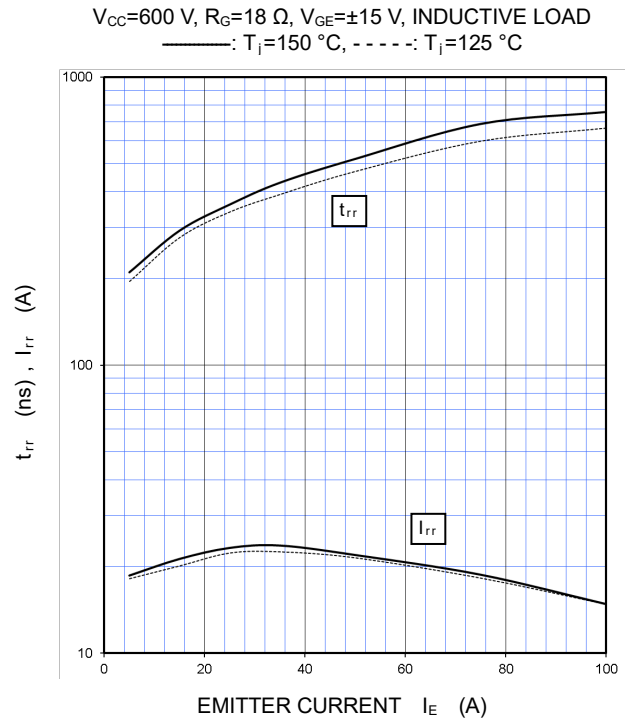
PERFORMANCE CURVES

INVERTER PART

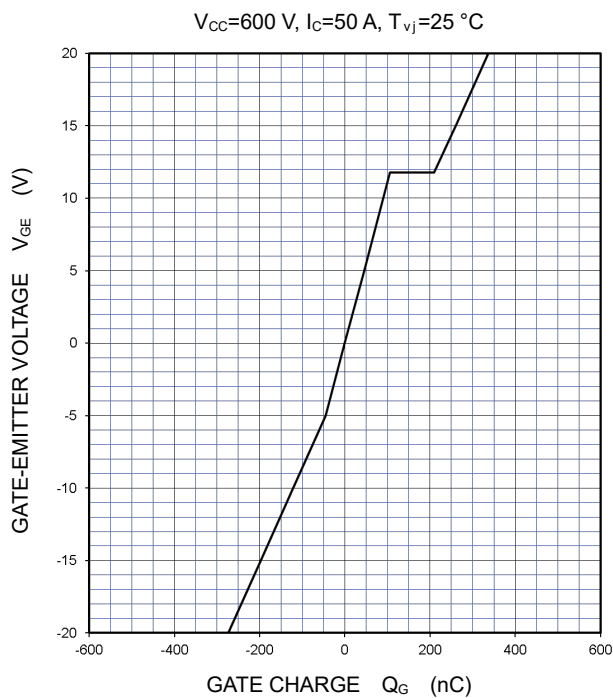
CAPACITANCE CHARACTERISTICS (TYPICAL)



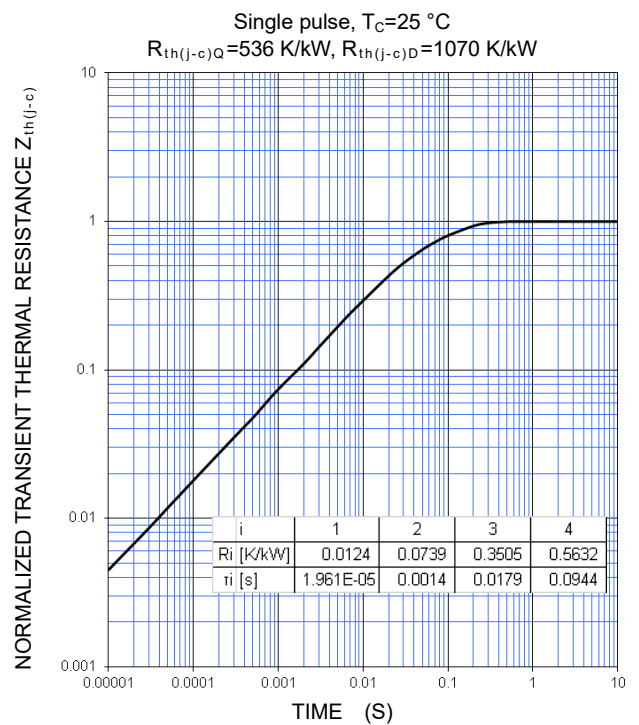
FREE WHEELING DIODE REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



GATE CHARGE CHARACTERISTICS (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (MAXIMUM)



CM50MXUA-24T1/CM50MXUAP-24T1

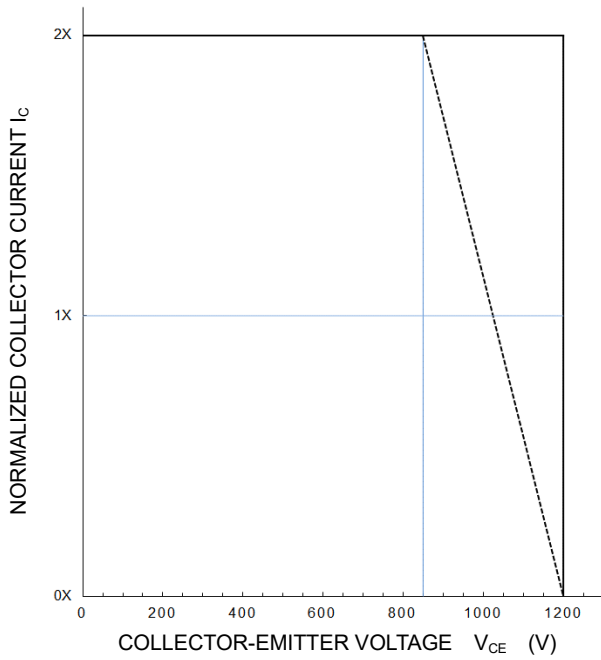
HIGH POWER SWITCHING USE
INSULATED TYPE

PERFORMANCE CURVES

INVERTER PART

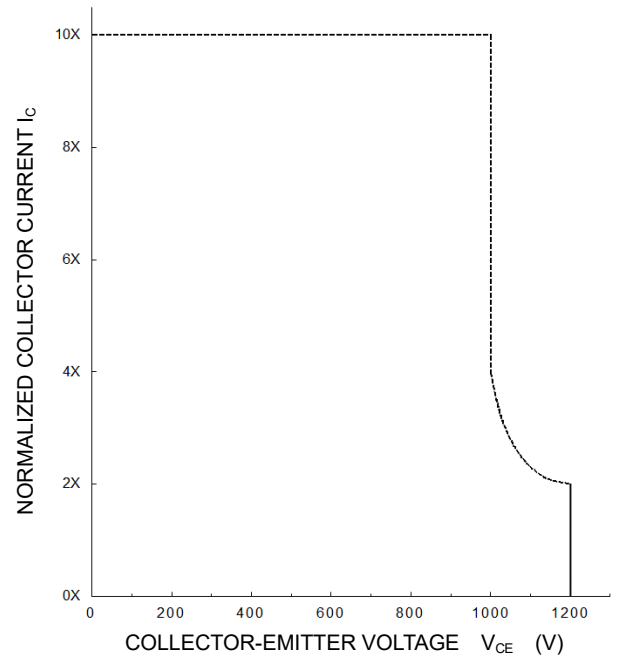
**TURN-OFF SWITCHING SAFE OPERATING AREA
(REVERSE BIAS SAFE OPERATING AREA)
(MAXIMUM)**

$V_{CC} \leq 850 \text{ V}$, $R_G = 18 \sim 180 \ \Omega$, $V_{GE} = \pm 15 \text{ V}$,
——: $T_{vj} = 25 \sim 150 \text{ }^\circ\text{C}$ (Normal load operations (Continuous))
-----: $T_{vj} = 175 \text{ }^\circ\text{C}$ (Unusual load operations (Limited period))



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

$V_{CC} \leq 800 \text{ V}$, $R_G = 18 \sim 180 \ \Omega$, $V_{GE} = \pm 15 \text{ V}$,
 $T_{vj} = 25 \sim 150 \text{ }^\circ\text{C}$, $t_W \leq 8 \ \mu\text{s}$, Non-Repetitive



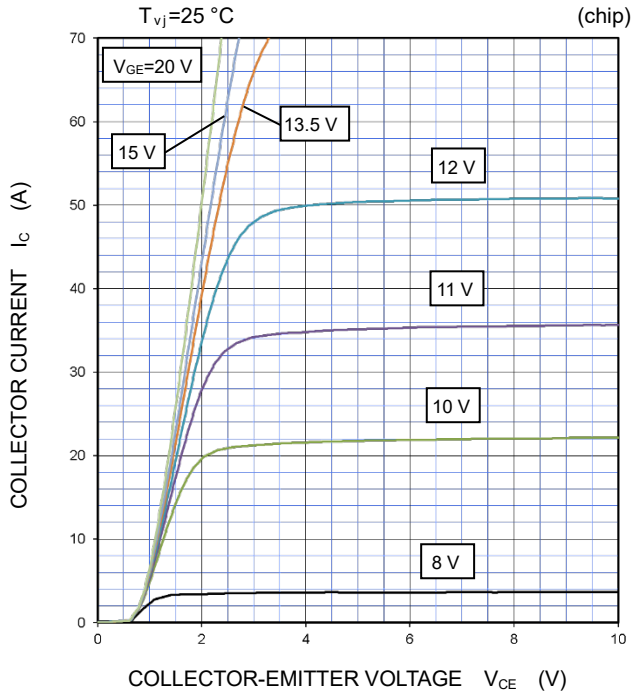
CM50MXUA-24T1/CM50MXUAP-24T1

HIGH POWER SWITCHING USE
INSULATED TYPE

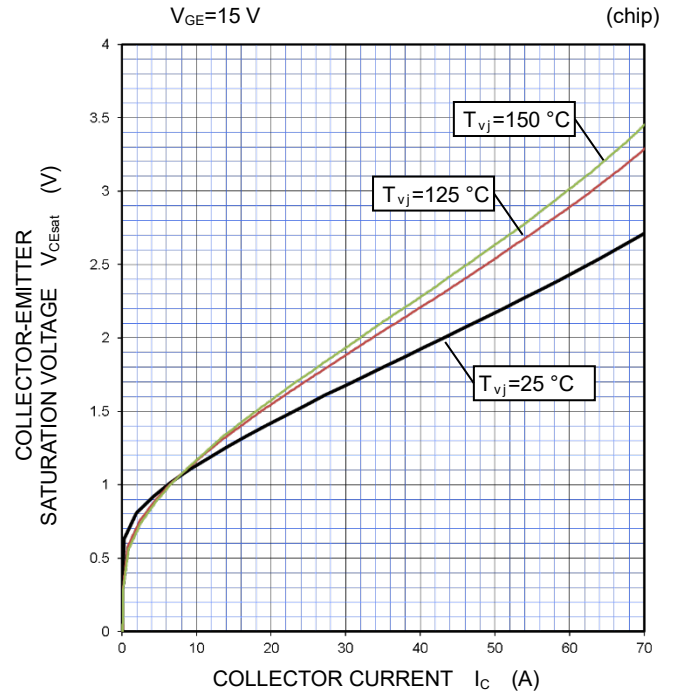
PERFORMANCE CURVES

BRAKE PART

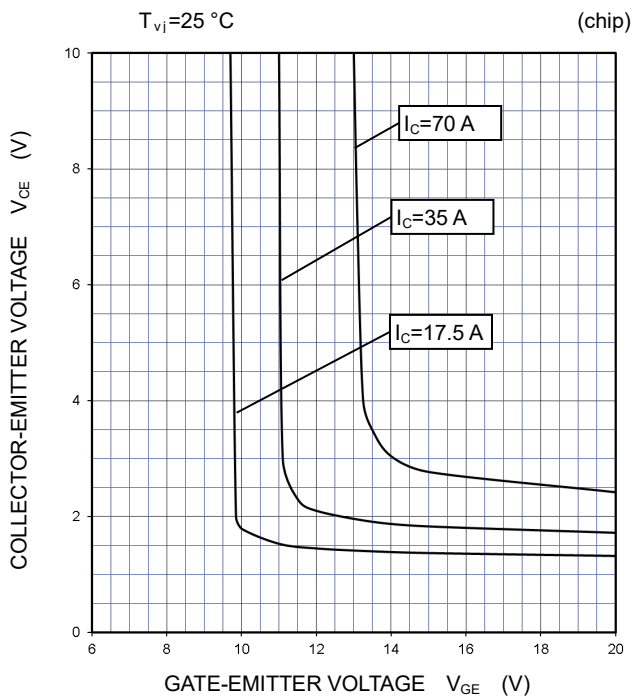
OUTPUT CHARACTERISTICS
(TYPICAL)



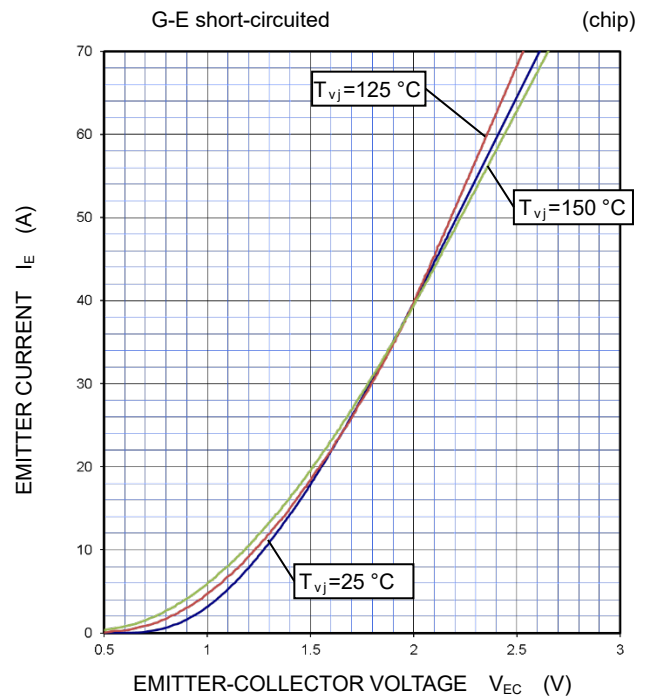
COLLECTOR-EMITTER SATURATION VOLTAGE
CHARACTERISTICS
(TYPICAL)



COLLECTOR-EMITTER VOLTAGE CHARACTERISTICS
(TYPICAL)



DIODE
FORWARD CHARACTERISTICS
(TYPICAL)



CM50MXUA-24T1/CM50MXUAP-24T1

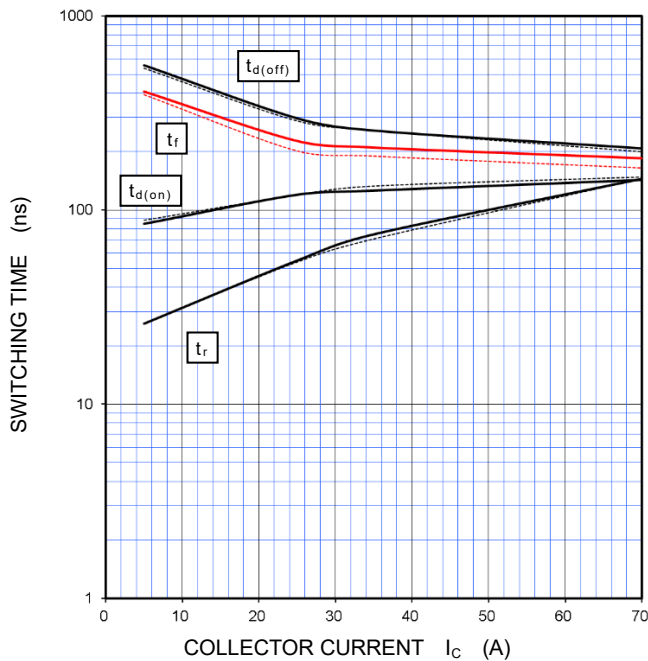
HIGH POWER SWITCHING USE
INSULATED TYPE

PERFORMANCE CURVES

BRAKE PART

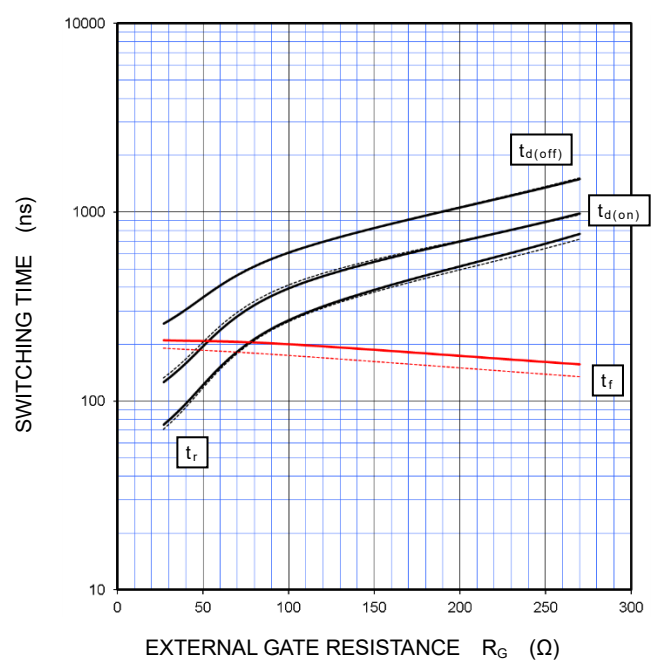
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)

$V_{CC}=600\text{ V}$, $R_G=27\ \Omega$, $V_{GE}=\pm 15\text{ V}$, INDUCTIVE LOAD
 —: $T_{vj}=150\text{ }^\circ\text{C}$, - - - -: $T_{vj}=125\text{ }^\circ\text{C}$



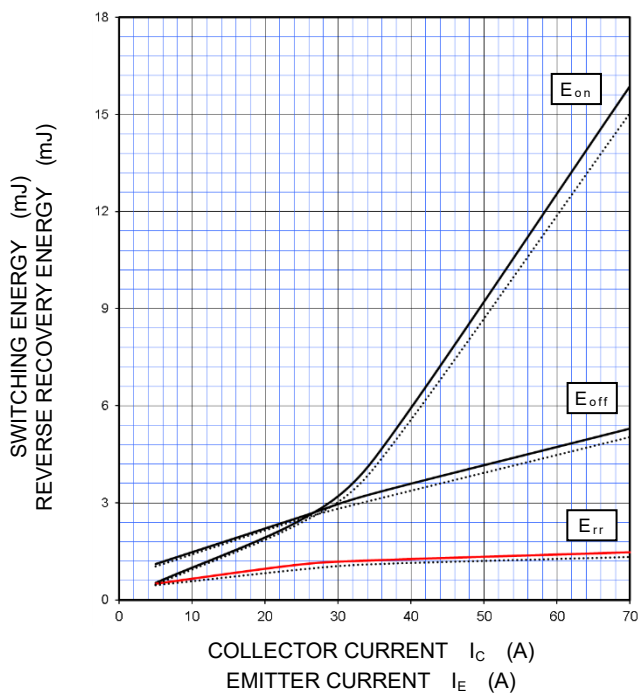
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)

$V_{CC}=600\text{ V}$, $I_C=35\text{ A}$, $V_{GE}=\pm 15\text{ V}$, INDUCTIVE LOAD
 —: $T_{vj}=150\text{ }^\circ\text{C}$, - - - -: $T_{vj}=125\text{ }^\circ\text{C}$



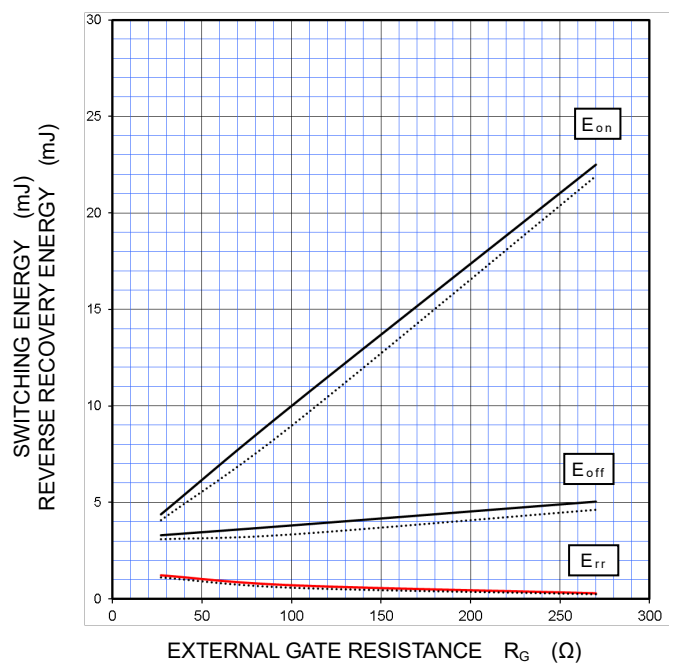
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)

$V_{CC}=600\text{ V}$, $R_G=27\ \Omega$, $V_{GE}=\pm 15\text{ V}$, INDUCTIVE LOAD, PER PULSE
 —: $T_{vj}=150\text{ }^\circ\text{C}$, - - - -: $T_{vj}=125\text{ }^\circ\text{C}$



HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)

$V_{CC}=600\text{ V}$, $I_C/I_E=35\text{ A}$, $V_{GE}=\pm 15\text{ V}$, INDUCTIVE LOAD, PER PULSE
 —: $T_{vj}=150\text{ }^\circ\text{C}$, - - - -: $T_{vj}=125\text{ }^\circ\text{C}$



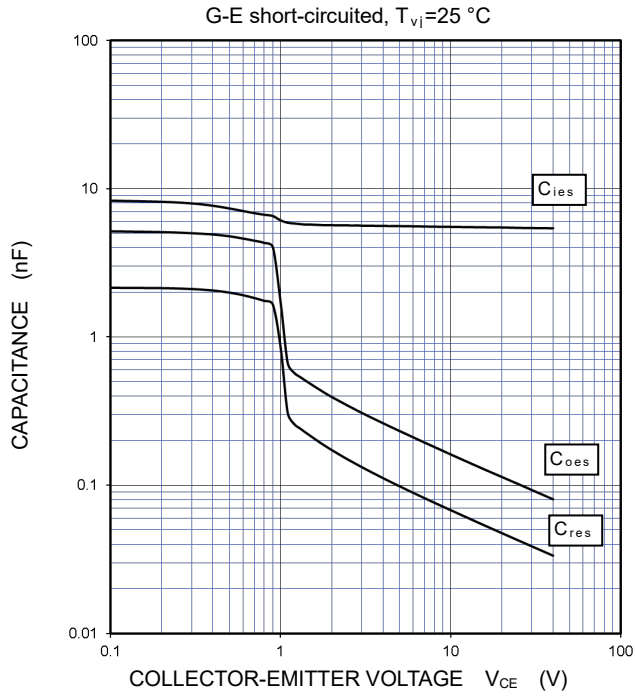
CM50MXUA-24T1/CM50MXUAP-24T1

HIGH POWER SWITCHING USE
INSULATED TYPE

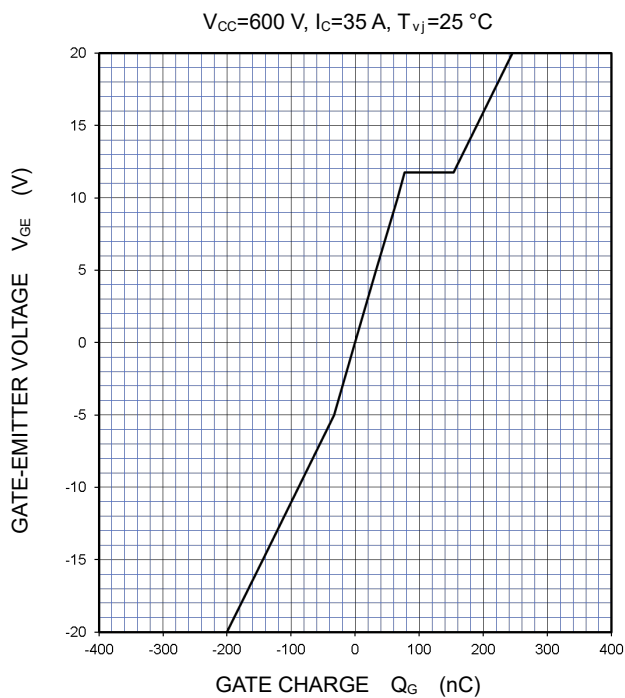
PERFORMANCE CURVES

BRAKE PART

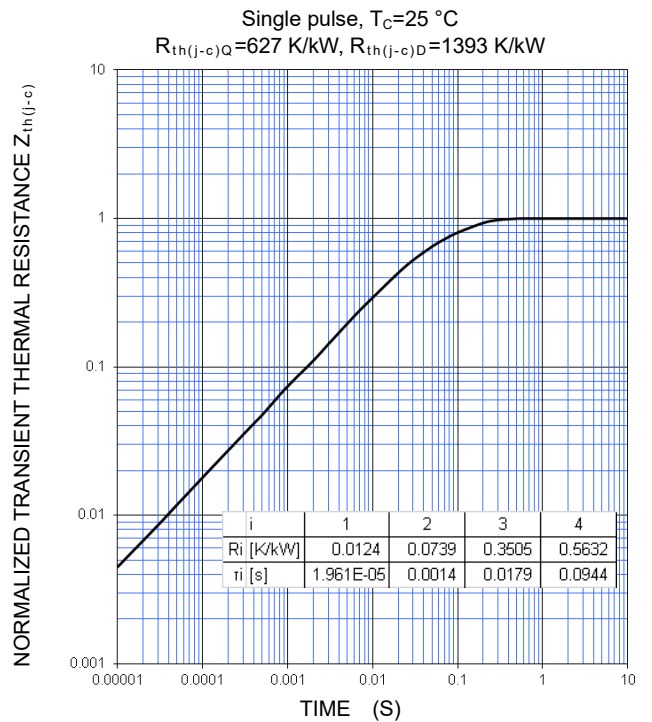
CAPACITANCE CHARACTERISTICS (TYPICAL)



GATE CHARGE CHARACTERISTICS (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (MAXIMUM)



CM50MXUA-24T1/CM50MXUAP-24T1

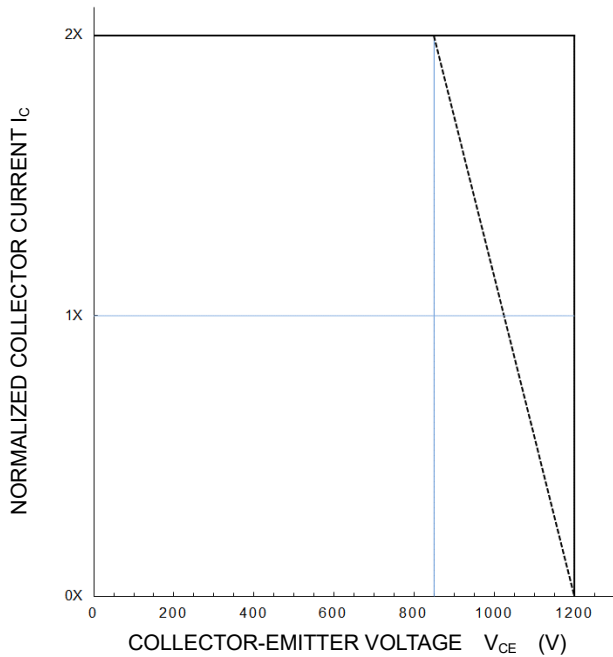
HIGH POWER SWITCHING USE
INSULATED TYPE

PERFORMANCE CURVES

BRAKE PART

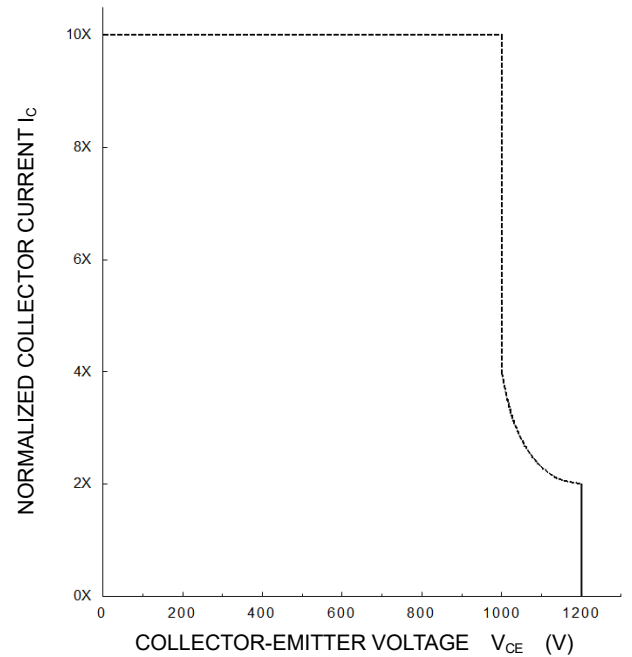
**TURN-OFF SWITCHING SAFE OPERATING AREA
(REVERSE BIAS SAFE OPERATING AREA)
(MAXIMUM)**

$V_{CC} \leq 850 \text{ V}$, $R_G = 27 \sim 270 \ \Omega$, $V_{GE} = \pm 15 \text{ V}$,
 ———: $T_{vj} = 25 \sim 150 \text{ }^\circ\text{C}$ (Normal load operations (Continuous))
 - - - - -: $T_{vj} = 175 \text{ }^\circ\text{C}$ (Unusual load operations (Limited period))



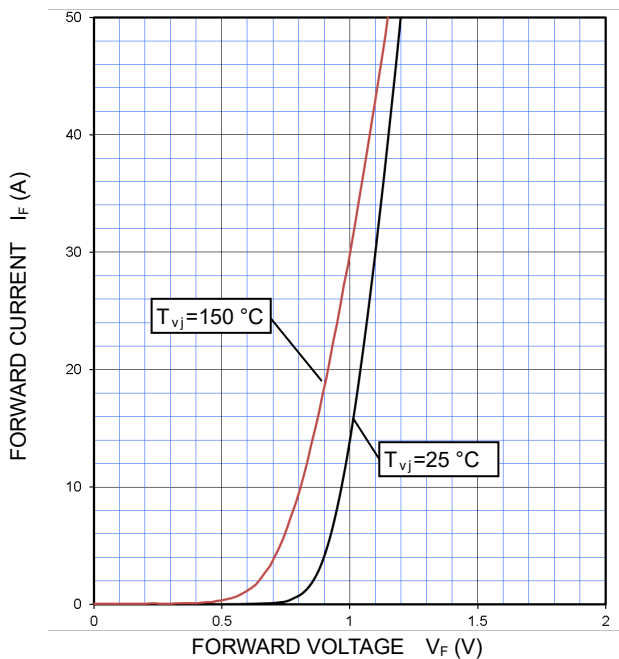
**SHORT-CIRCUIT SAFE OPERATING AREA
(MAXIMUM)**

$V_{CC} \leq 800 \text{ V}$, $R_G = 27 \sim 270 \ \Omega$, $V_{GE} = \pm 15 \text{ V}$,
 $T_{vj} = 25 \sim 150 \text{ }^\circ\text{C}$, $t_W \leq 8 \ \mu\text{s}$, Non-Repetitive



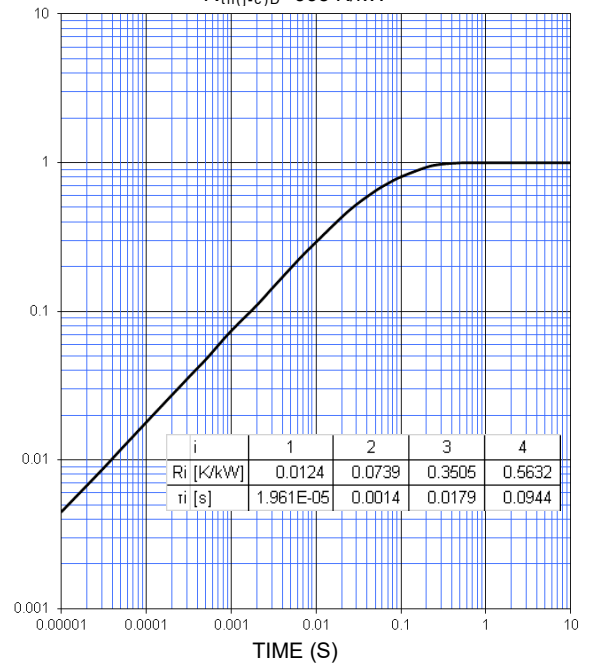
CONVERTER PART

**CONVERTER DIODE
FORWARD CHARACTERISTICS
(TYPICAL)**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS
(MAXIMUM)**

Single pulse, $T_C = 25 \text{ }^\circ\text{C}$
 $R_{th(j-c)D} = 995 \text{ K/kW}$



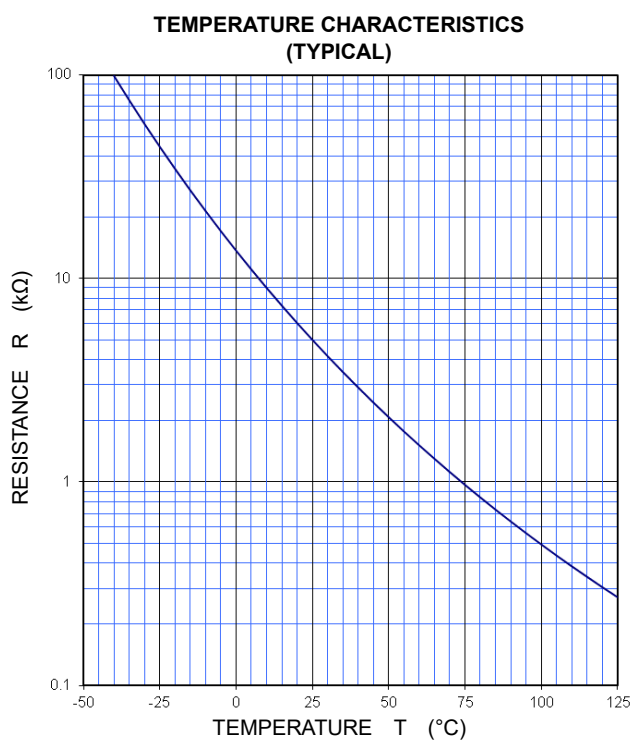
CM50MXUA-24T1/CM50MXUAP-24T1

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.

CM50MXUA-24T1/CM50MXUAP-24T1

HIGH POWER SWITCHING USE
INSULATED TYPE

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CM50MXUA-24T1/CM50MXUAP-24T1

HIGH POWER SWITCHING USE
INSULATED TYPE

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