

<IGBT Modules>

CM150TX-34T/CM150TXP-34T

HIGH POWER SWITCHING USE
INSULATED TYPE

TX		Collector current I_C 1 5 0 A Collector-emitter voltage V_{CES} 1 7 0 0 V Maximum junction temperature T_{vjmax} 1 7 5 °C •Flat base type •Copper base plate (Nickel-plating) •RoHS Directive compliant •Tin-plating pin terminals
TXP		Collector current I_C 1 5 0 A Collector-emitter voltage V_{CES} 1 7 0 0 V Maximum junction temperature T_{vjmax} 1 7 5 °C •Flat base type •Copper base plate (Nickel-plating) •RoHS Directive compliant •Tin-plating pressfit terminals
sixpack (three-phase bridge)		•UL Recognized under UL1557, File No. E323585

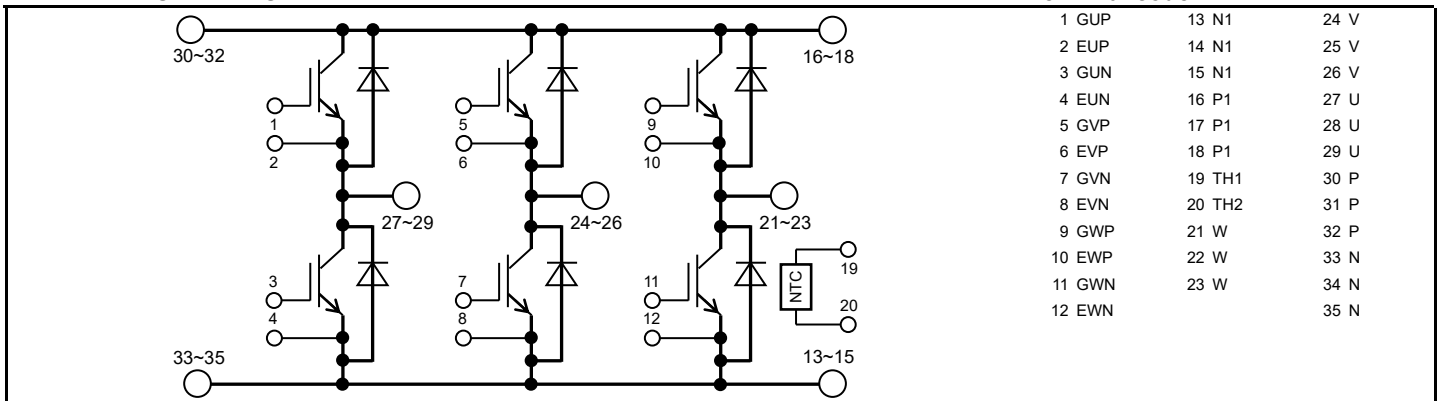
APPLICATION

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

OPTION (Below options are available.)

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

INTERNAL CONNECTION

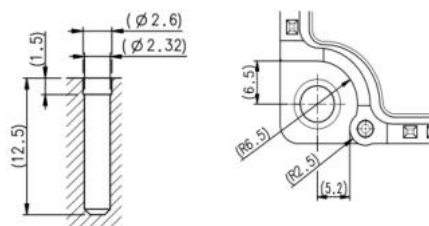


OUTLINE DRAWING

COM.

SECTION A

MOUNTING HOLES



Technical drawing showing a cross-section (SECTION A) and a detail view of a mounting hole. The cross-section shows a hole with a diameter of $\varnothing 2.6$ and a depth of 12.5 . The hole is located in a material with a thickness of 1.5 . The detail view shows a hole with a diameter of $\varnothing 2.32$ and a depth of 5.2 . The detail view also shows a fillet with a radius of $R6.5$ and a fillet with a radius of $R2.5$. The detail view also shows a hole with a diameter of $\varnothing 2.6$ and a depth of 6.5 .

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

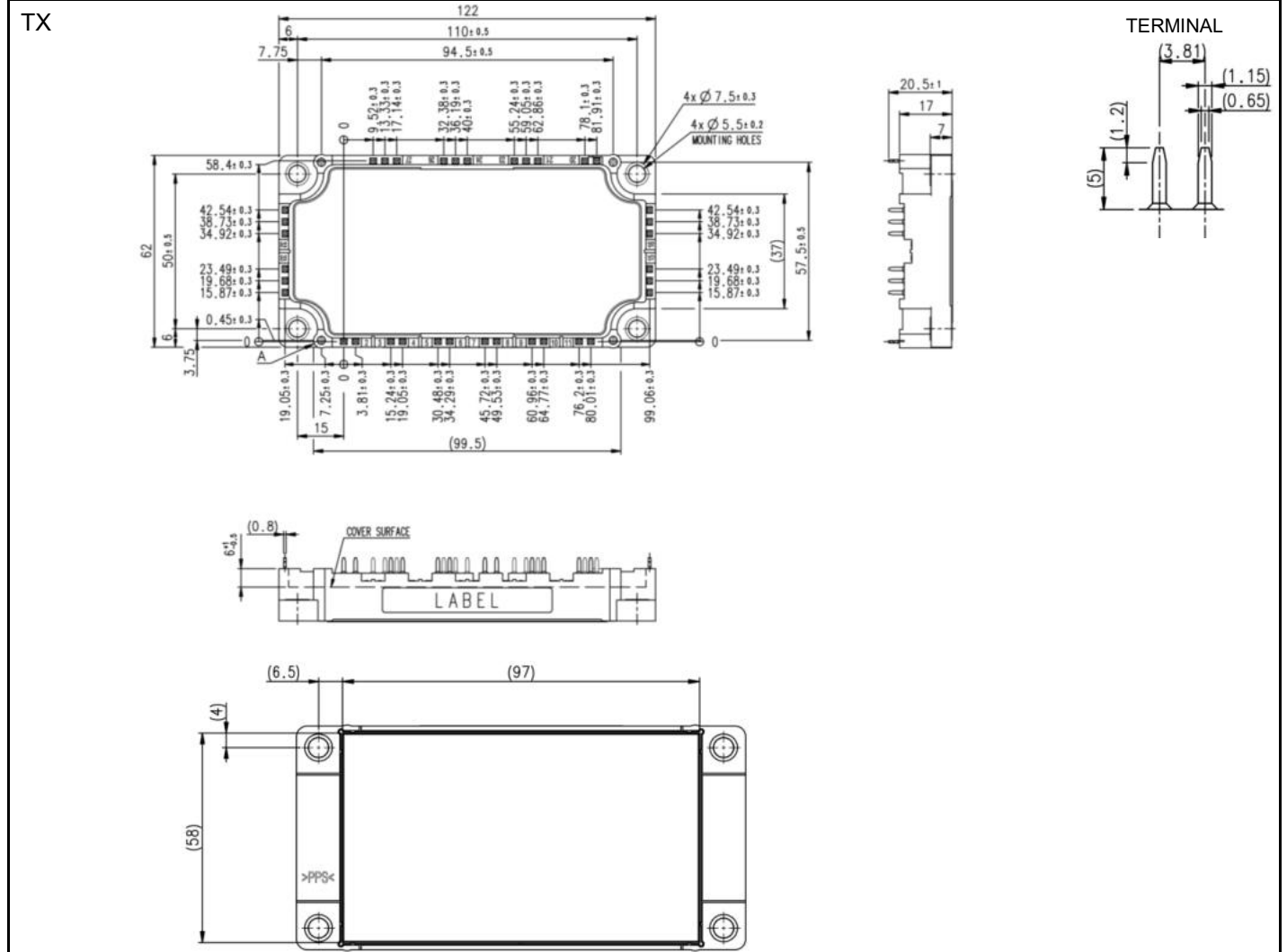
CM150TX-34T/CM150TXP-34T

HIGH POWER SWITCHING USE

INSULATED TYPE

OUTLINE DRAWING

Dimension in mm

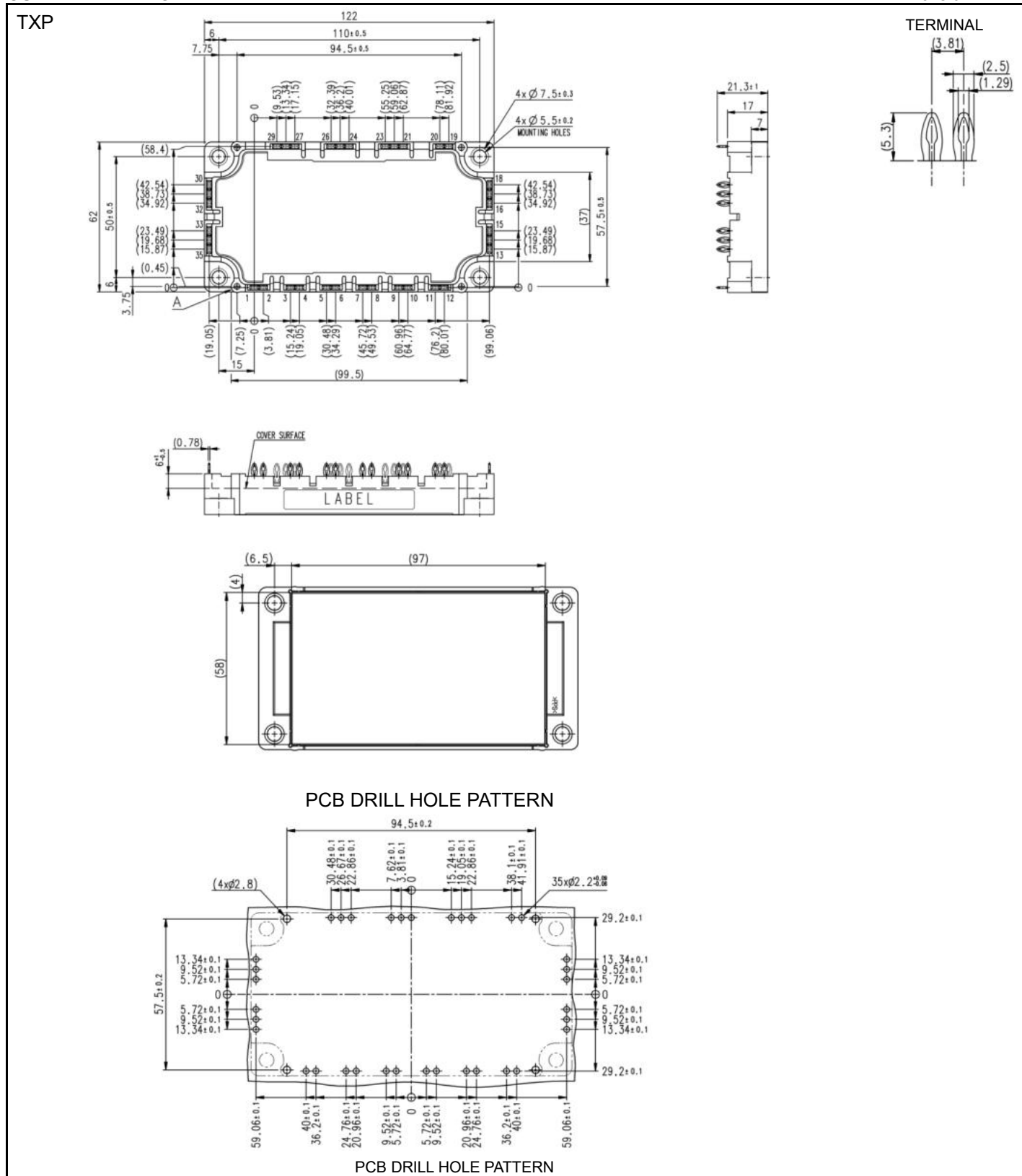


CM150TX-34T/CM150TXP-34T

HIGH POWER SWITCHING USE
INSULATED TYPE

OUTLINE DRAWING

Dimension in mm



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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	1700	V
V_{GES}	Gate-emitter voltage	C-E short-circuited	± 20	V
I_C	Collector current	DC, $T_C=84\text{ }^{\circ}\text{C}$ (Note2, 4)	150	A
I_{CRM}		Pulse, Repetitive (Note3)	300	
P_{tot}	Total power dissipation	$T_C=25\text{ }^{\circ}\text{C}$ (Note2, 4)	740	W
I_E (Note1)	Emitter current	DC (Note2)	150	A
I_{ERM} (Note1)		Pulse, Repetitive (Note3)	300	

MODULE

Symbol	Item	Conditions	Rating	Unit
V_{isol}	Isolation voltage	Terminals to base plate, RMS, f=60 Hz, AC 1 min	4000	V
T_{vjmax}	Maximum junction temperature	Instantaneous event (overload) (Note9)	175	$^{\circ}\text{C}$
T_{Cmax}	Maximum case temperature	(Note4, 9)	125	
T_{vjop}	Operating junction temperature	Continuous operation (under switching) (Note9)	-40 ~ +150	$^{\circ}\text{C}$
T_{stg}	Storage temperature	-	-40 ~ +125	

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 _{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 =15 mA, V _{CE} =10 V		5.4	6.0	6.6	V
V _{CESat} (Terminal)	Collector-emitter saturation voltage	I _C =150 A, V _{GE} =15 V, Refer to the figure of test circuit (Note5)	T _{vj} =25 °C	-	2.00	2.40	V
			T _{vj} =125 °C	-	2.40	-	
			T _{vj} =150 °C	-	2.50	-	
V _{CESat} (Chip)		I _C =150 A, V _{GE} =15 V, (Note5)	T _{vj} =25 °C	-	1.95	2.35	V
			T _{vj} =125 °C	-	2.35	-	
			T _{vj} =150 °C	-	2.45	-	
C _{ies}	Input capacitance	V _{CE} =10 V, G-E short-circuited		-	-	40	nF
C _{oes}	Output capacitance			-	-	1.1	
C _{res}	Reverse transfer capacitance			-	-	0.4	
Q _G	Gate charge	V _{CC} =1000 V, I _C =150 A, V _{GE} =15 V		-	1.18	-	μC
t _{d(on)}	Turn-on delay time	V _{CC} =1000 V, I _C =150 A, V _{GE} =±15 V, R _G =0 Ω, Inductive load		-	-	800	ns
t _r	Rise time			-	-	200	
t _{d(off)}	Turn-off delay time			-	-	800	
t _f	Fall time			-	-	600	
V _{EC} (Note1) (Terminal)	Emitter-collector voltage	I _E =150 A, G-E short-circuited, Refer to the figure of test circuit (Note5)	T _{vj} =25 °C	-	2.70	3.30	V
			T _{vj} =125 °C	-	2.90	-	
			T _{vj} =150 °C	-	2.90	-	
V _{EC} (Note1) (Chip)		I _E =150 A, G-E short-circuited, (Note5)	T _{vj} =25 °C	-	2.65	3.25	V
			T _{vj} =125 °C	-	2.75	-	
			T _{vj} =150 °C	-	2.75	-	
t _{rr} (Note1)	Reverse recovery time	V _{CC} =1000 V, I _E =150 A, V _{GE} =±15 V, R _G =0 Ω, Inductive load		-	-	300	ns
Q _{rr} (Note1)	Reverse recovery charge			-	5.6	-	μC
E _{on}	Turn-on switching energy per pulse	V _{CC} =1000 V, I _C =I _E =150 A,		-	48.7	-	mJ
E _{off}	Turn-off switching energy per pulse	V _{GE} =±15 V, R _G =0 Ω, T _{vj} =150 °C,		-	40.9	-	
E _{rr} (Note1)	Reverse recovery energy per pulse	Inductive load		-	15.5	-	mJ
R _{CC'+EE'}	Internal lead resistance	Main terminals-chip, per switch, T _C =25 °C (Note4)		-	1.8	-	mΩ
r _g	Internal gate resistance	Per switch		-	5.0	-	Ω

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HIGH POWER SWITCHING USE

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

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)	-	-	202	K/kW
$R_{th(j-c)D}$		Junction to case, per Inverter FWD (Note4)	-	-	312	
$R_{th(c-s)}$	Contact thermal resistance	Case to heat sink, per 1 module, Thermal grease applied (Note4, 7, 9)	-	11.5	-	K/kW

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 (TX)	Terminal to terminal		16.4	mm
			Terminal to base plate		18.5	
		Pressfit pin type (TXP)	Terminal to terminal		19.0	mm
			Terminal to base plate		18.6	
d_a	Clearance	Solder pin type (TX)	Terminal to terminal		10.2	mm
			Terminal to base plate		9.0	
		Pressfit pin type (TXP)	Terminal to terminal		8.9	mm
			Terminal to base plate		9.0	
e_c	Flatness of base plate	On the centerline X, Y (Note8)	± 0	-	+200	μm
m	mass	-	-	270	-	g

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

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

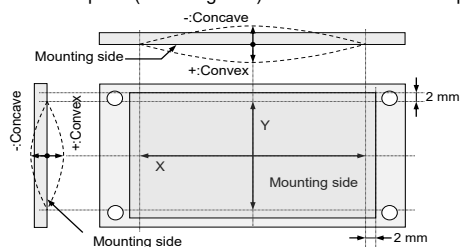
- Junction temperature (T_{vj}) should not increase beyond $T_{vj\max}$ rating.
- Pulse width and repetition rate should be such that the device junction temperature (T_{vj}) dose not exceed $T_{vj\max}$ rating.
- Case temperature (T_C) and heat sink temperature (T_s) are defined on the each surface (mounting side) of base plate and heat sink just under the chips.
Refer to the figure of chip location.
- Pulse width and repetition rate should be such as to cause negligible temperature rise. Refer to the figure of test circuit.

$$6. B_{(25/50)} = \ln\left(\frac{R_{25}}{R_{50}}\right) / \left(\frac{1}{T_{25}} - \frac{1}{T_{50}}\right)$$

R_{25} : resistance at absolute temperature T_{25} [K]; $T_{25}=25\text{ }^{\circ}\text{C}+273.15=298.15$ [K]

R_{50} : resistance at absolute temperature T_{50} [K]; $T_{50}=50\text{ }^{\circ}\text{C}+273.15=323.15$ [K]

- Reference value. Thermally conductive grease of thermal conductivity $\lambda=0.9\text{ W/(m}\cdot\text{K)}$ and thickness $D_{(c-s)}=50\text{ }\mu\text{m}$.
- The base plate (mounting side) flatness measurement points (X, Y) are shown in the following figure.



- Long term performance related to thermal conductive grease (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 ($T_{vj\max}$, $T_{vj\text{op}}$, $T_{C\max}$) must be maintained below the maximum rated temperature throughout consideration of the temperature rise even for long term usage.

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Note10. 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	
(3) DELTA PT®		25×8	0.55 ± 0.055	
(4) DELTA PT®		25×10	0.75 ± 0.075	
(5) B1 tapping screw	-	φ2.6×10	0.75 ± 0.075	
		φ2.6×12		

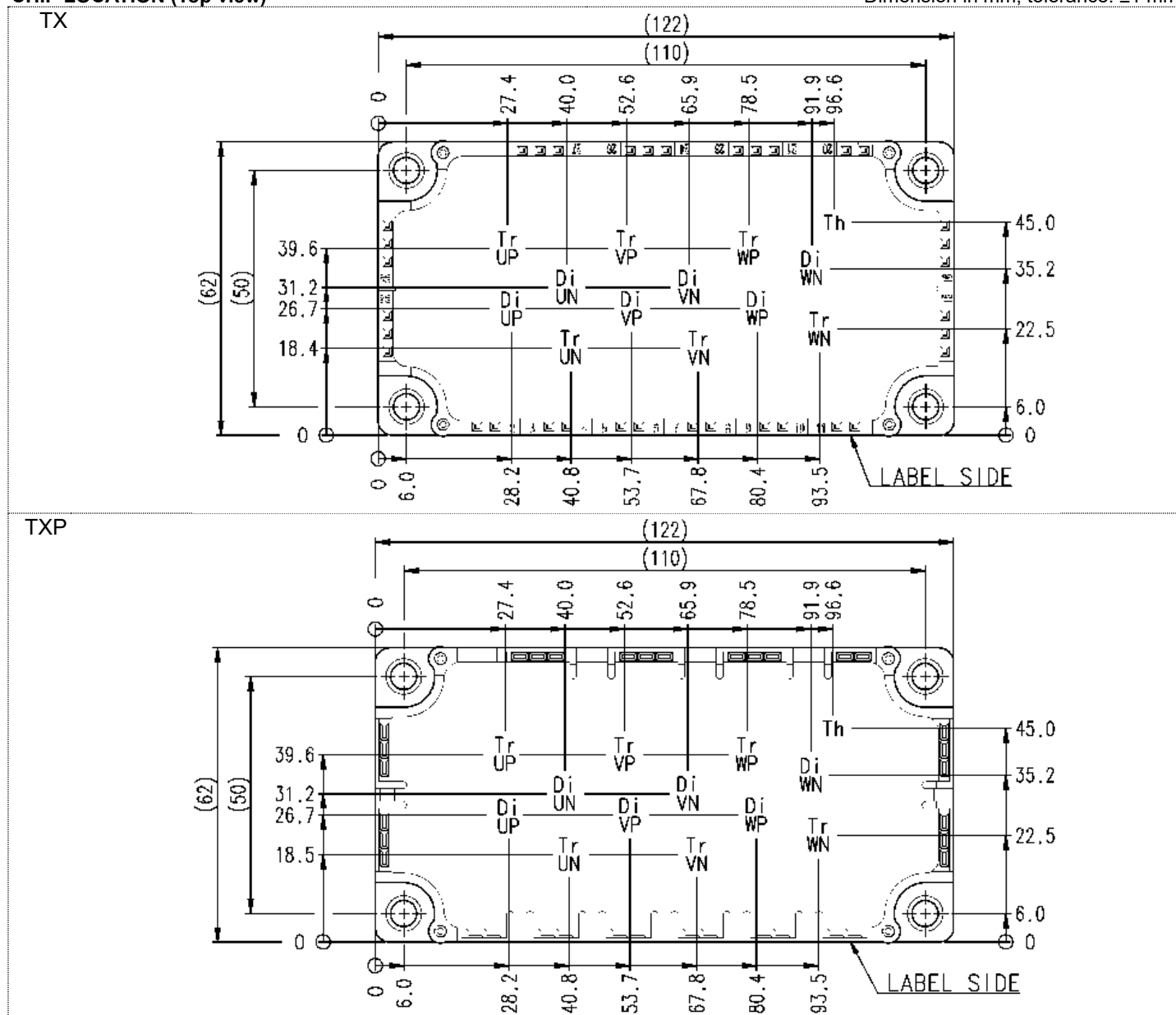
RECOMMENDED OPERATING CONDITIONS

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
V_{CC}	(DC) Supply voltage	Applied across P-N terminals	-	1000	1200	V
V_{GEon}	Gate (-emitter drive) voltage	Applied across G*P-E*P/G*N-E*N terminals (*=U,V,W)	13.5	15.0	16.5	V
R_G	External gate resistance	Per switch	0	-	56	Ω

CM150TX-34T/CM150TXP-34T

HIGH POWER SWITCHING USE

INSULATED TYPE

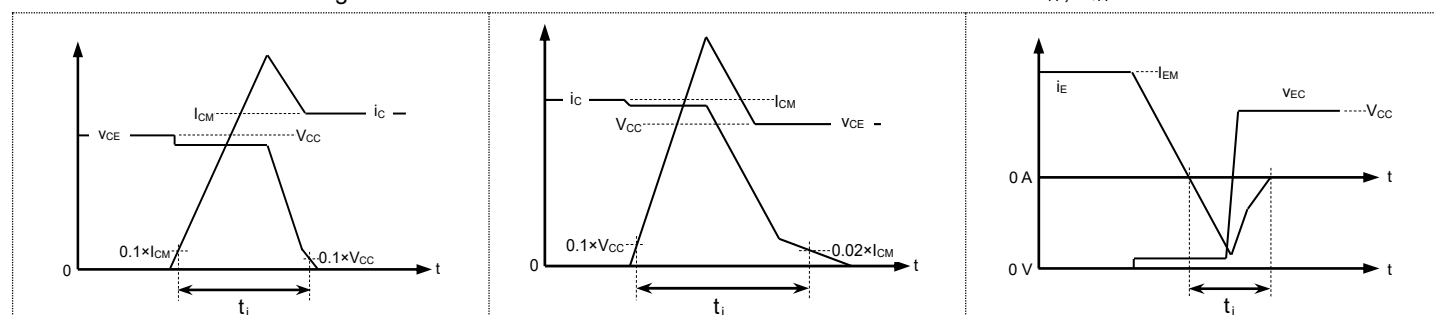
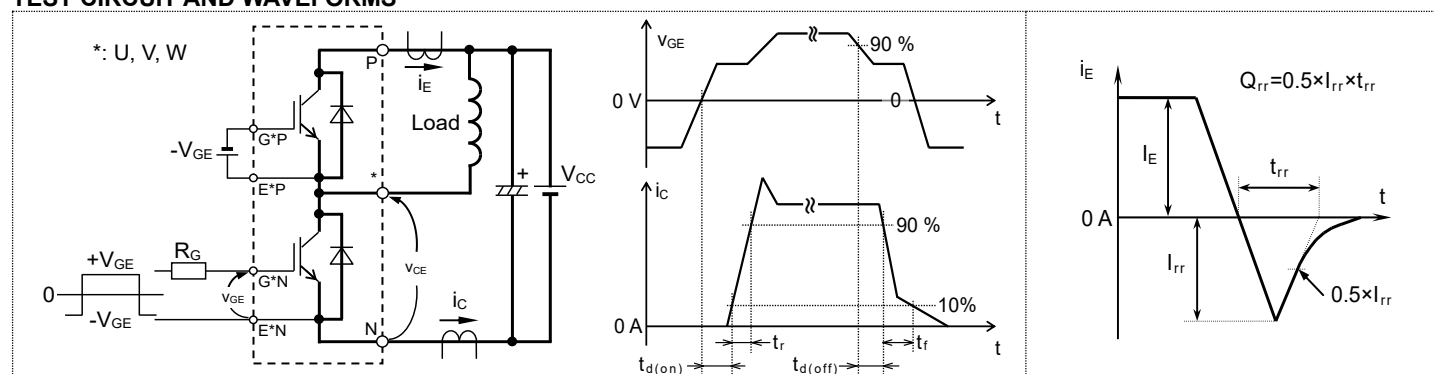
CHIP LOCATION (Top view)Dimension in mm, tolerance: ± 1 mm

Tr*P/Tr*N: IGBT, Di*P/Di*N: FWD (*=U,V,W), Th: NTC thermistor

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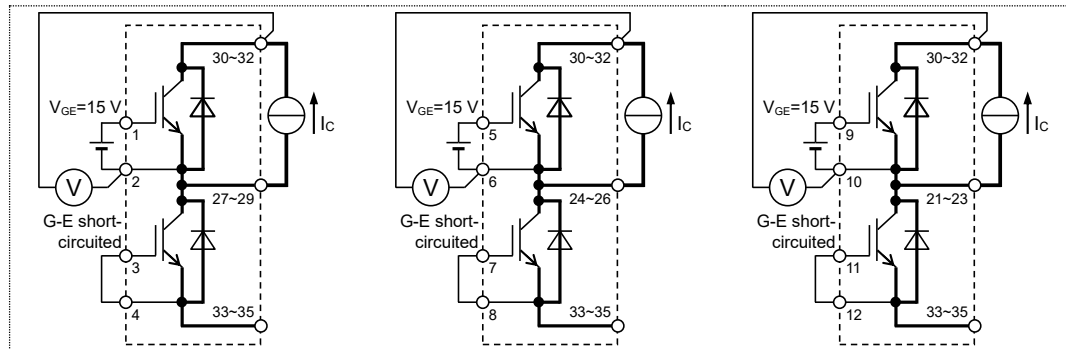
HIGH POWER SWITCHING USE

INSULATED TYPE

TEST CIRCUIT AND WAVEFORMS

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

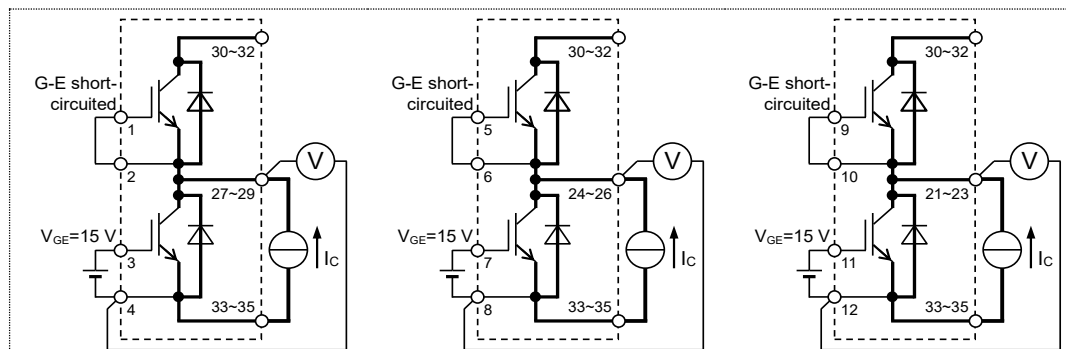
TEST CIRCUIT



TrUP

TrVP

TrWP



TrUN

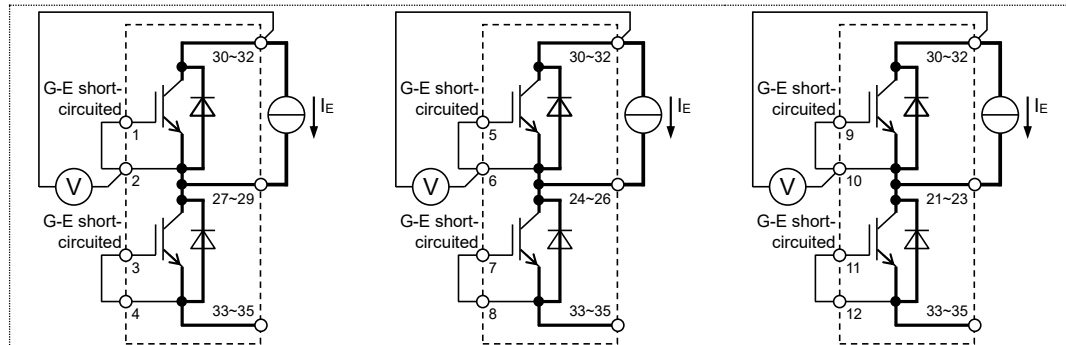
TrVN

TrWN

Gate-emitter GVP-EVP, GVN-EVN,
short-circuited GWP-EWP, GWN-EWN

Gate-emitter GUP-EUP, GUN-EUN,
short-circuited GWP-EWP, GWN-EWN

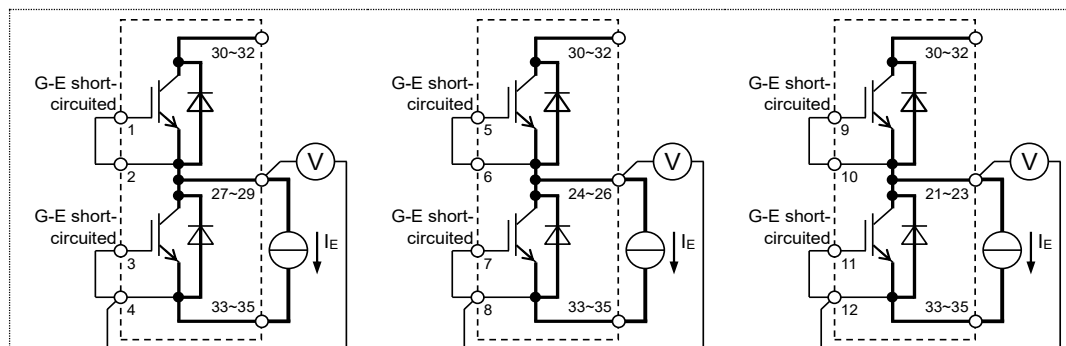
Gate-emitter GUP-EUP, GUN-EUN,
short-circuited GVP-EVP, GVN-EVN

 V_{CEsat} characteristics test circuit

DiUP

DiVP

DiWP



DiUN

DiVN

DiWN

Gate-emitter GVP-EVP, GVN-EVN,
short-circuited GWP-EWP, GWN-EWN

Gate-emitter GUP-EUP, GUN-EUN,
short-circuited GWP-EWP, GWN-EWN

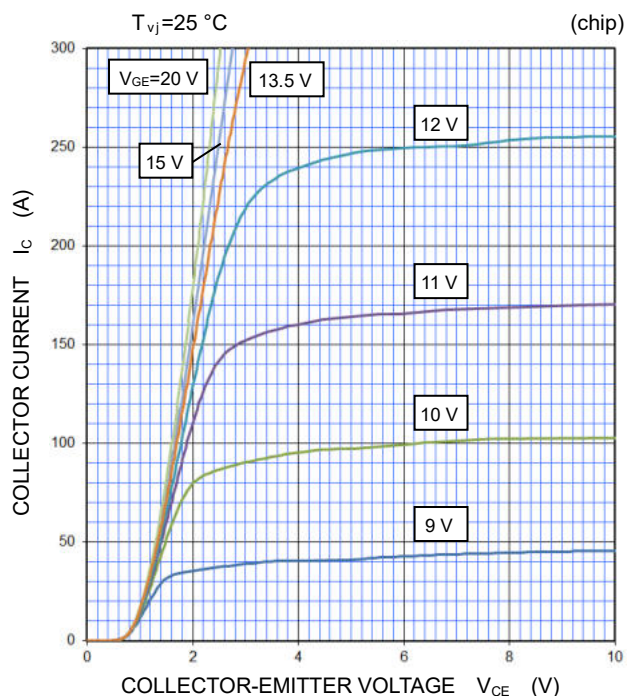
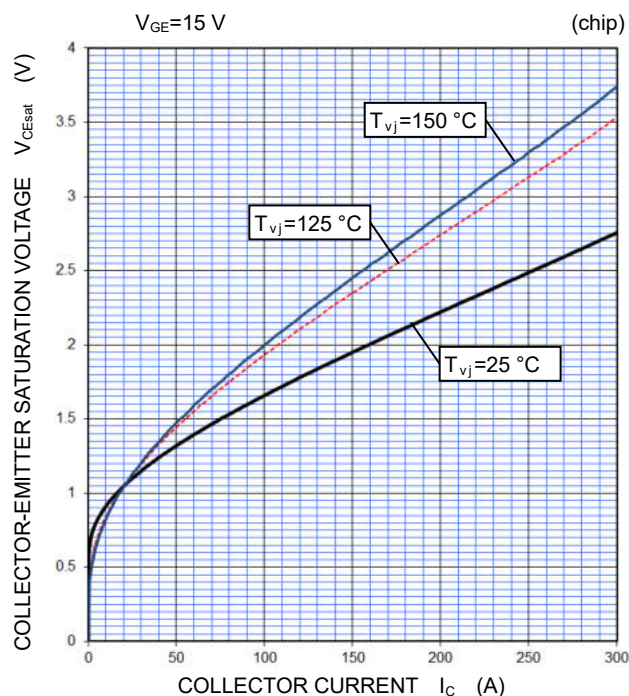
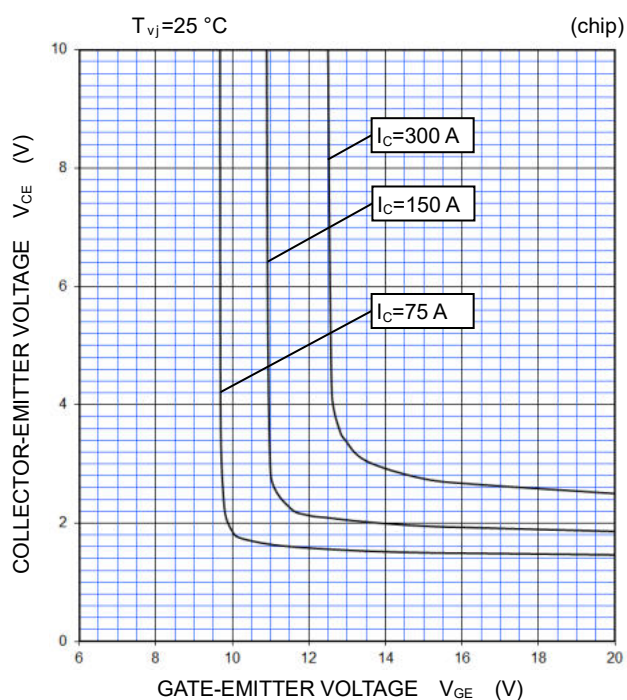
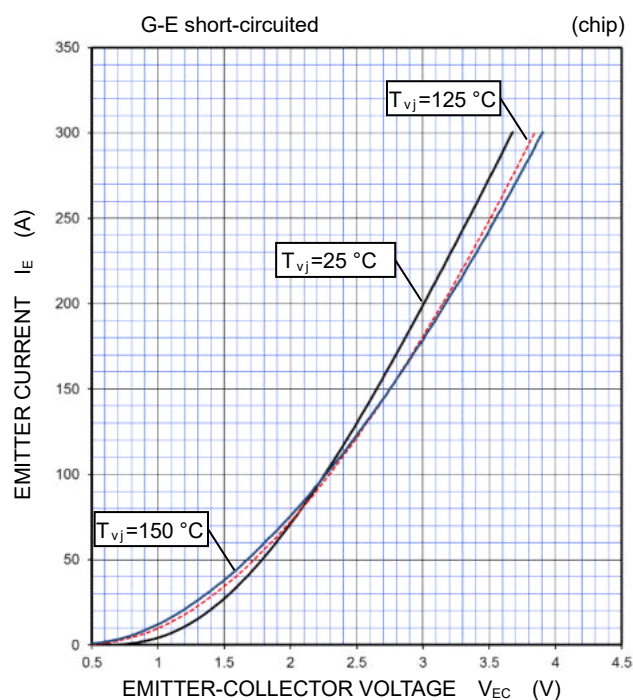
Gate-emitter GUP-EUP, GUN-EUN,
short-circuited GVP-EVP, GVN-EVN

 V_{EC} characteristics test circuit

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HIGH POWER SWITCHING USE

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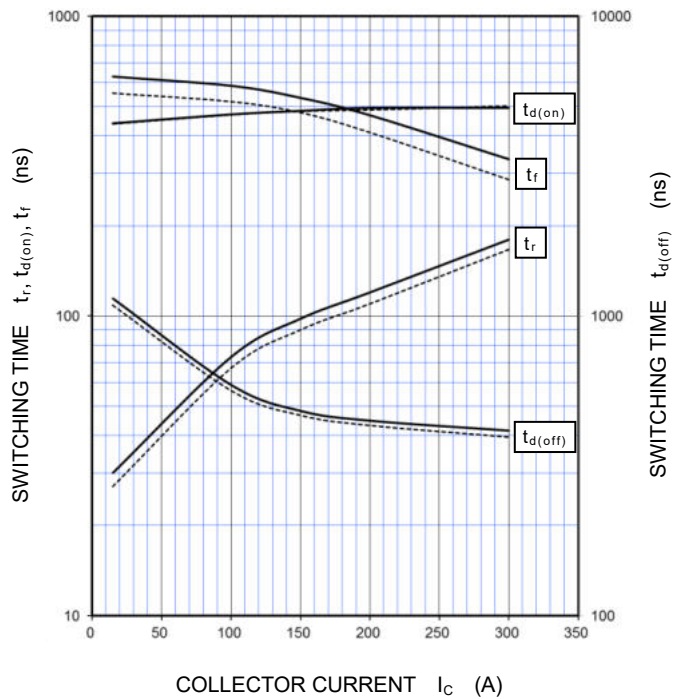
PERFORMANCE CURVES**INVERTER PART****OUTPUT CHARACTERISTICS
(TYPICAL)****COLLECTOR-EMITTER SATURATION VOLTAGE
CHARACTERISTICS
(TYPICAL)****COLLECTOR-EMITTER VOLTAGE CHARACTERISTICS
(TYPICAL)****FREE WHEELING DIODE
FORWARD CHARACTERISTICS
(TYPICAL)**

PERFORMANCE CURVES

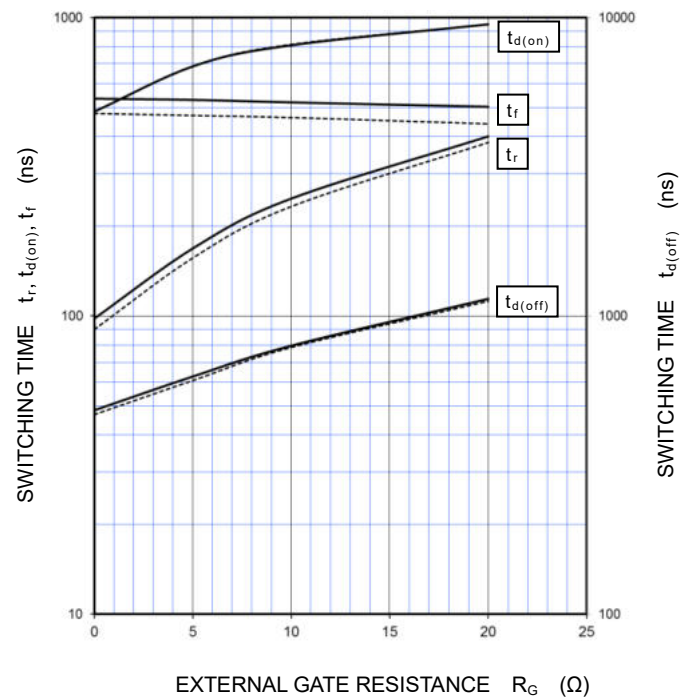
INVERTER PART

HALF-BRIDGE SWITCHING CHARACTERISTICS
(TYPICAL)

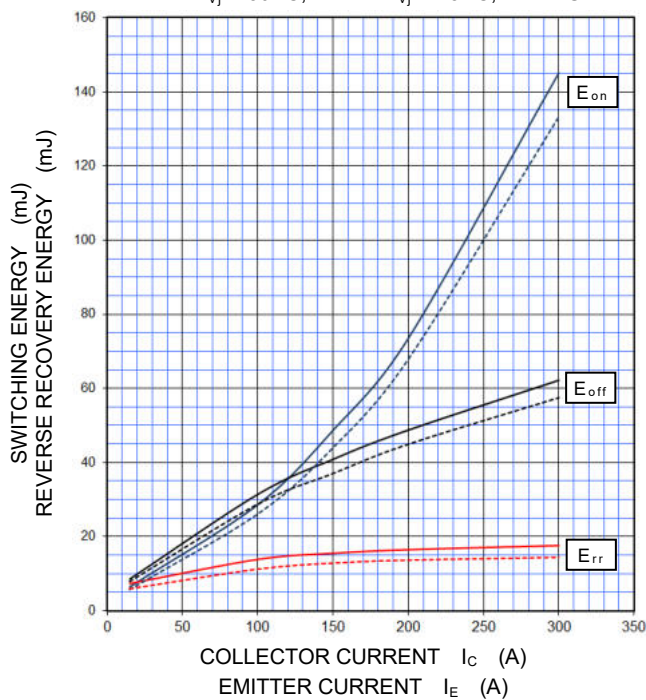
$V_{CC}=1000\text{ V}$, $R_G=0\ \Omega$, $V_{GE}=\pm 15\text{ V}$, INDUCTIVE LOAD
 —: $T_{vj}=150\text{ }^\circ\text{C}$, - - - - -: $T_{vj}=125\text{ }^\circ\text{C}$

HALF-BRIDGE SWITCHING CHARACTERISTICS
(TYPICAL)

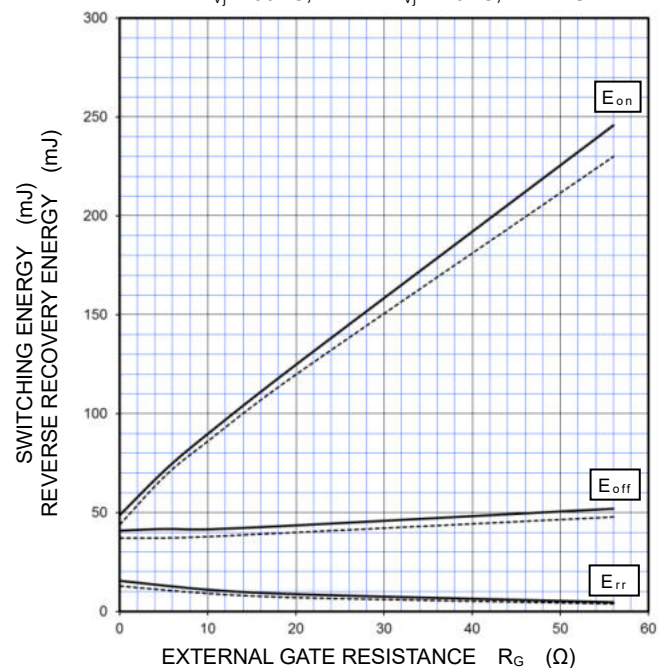
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 —: $T_{vj}=150\text{ }^\circ\text{C}$, - - - - -: $T_{vj}=125\text{ }^\circ\text{C}$

HALF-BRIDGE SWITCHING CHARACTERISTICS
(TYPICAL)

$V_{CC}=1000\text{ V}$, $R_G=0\ \Omega$, $V_{GE}=\pm 15\text{ V}$, INDUCTIVE LOAD,
 —: $T_{vj}=150\text{ }^\circ\text{C}$, - - - - -: $T_{vj}=125\text{ }^\circ\text{C}$, PER PULSE

HALF-BRIDGE SWITCHING CHARACTERISTICS
(TYPICAL)

$V_{CC}=1000\text{ V}$, $I_C/I_E=150\text{ A}$, $V_{GE}=\pm 15\text{ V}$, INDUCTIVE LOAD,
 —: $T_{vj}=150\text{ }^\circ\text{C}$, - - - - -: $T_{vj}=125\text{ }^\circ\text{C}$, PER PULSE

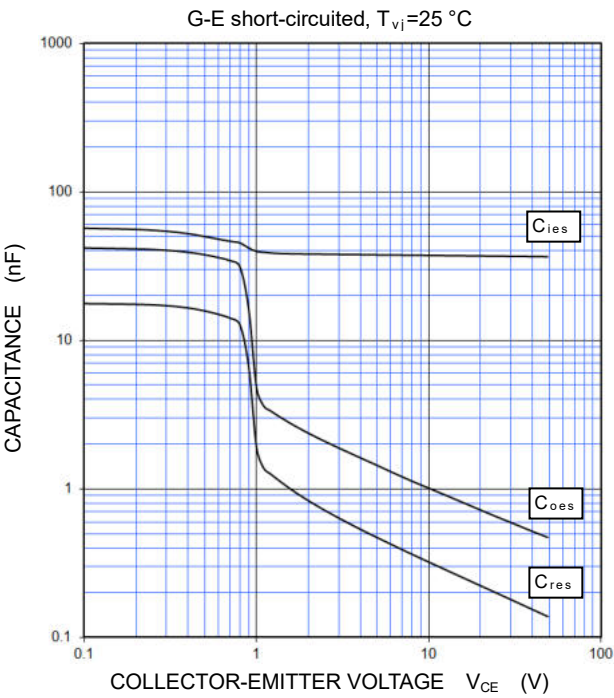


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INSULATED TYPE

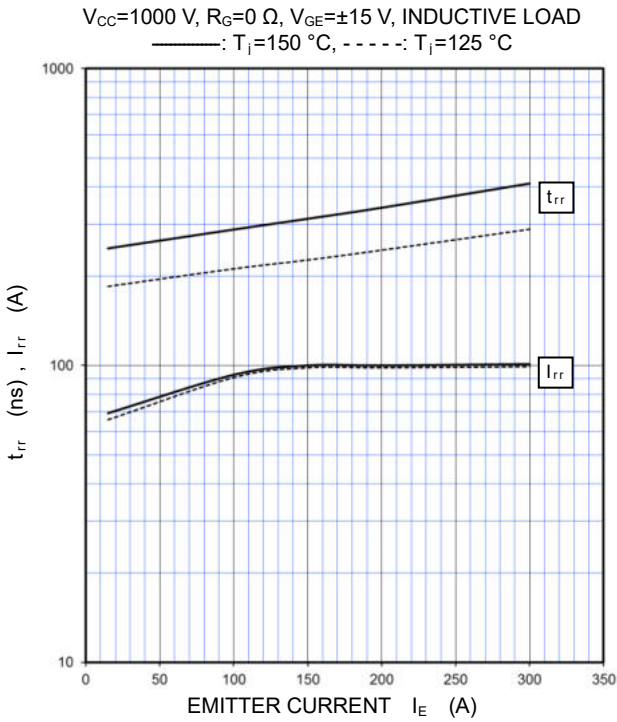
PERFORMANCE CURVES

INVERTER PART

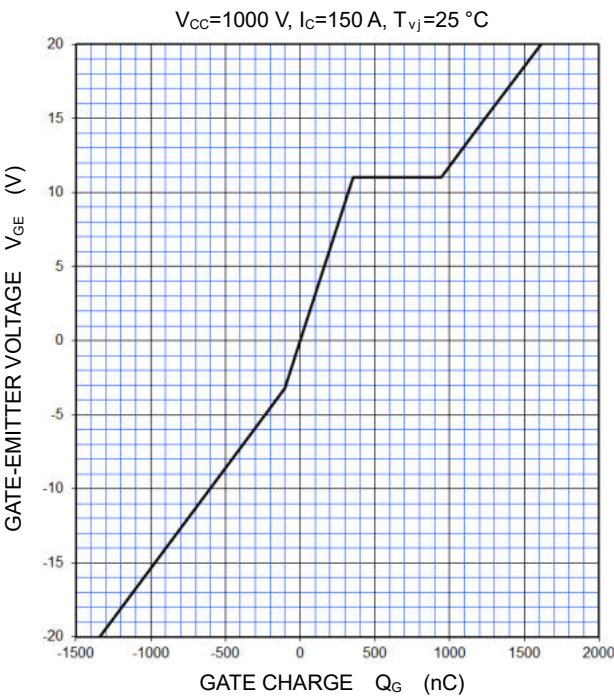
CAPACITANCE CHARACTERISTICS
(TYPICAL)



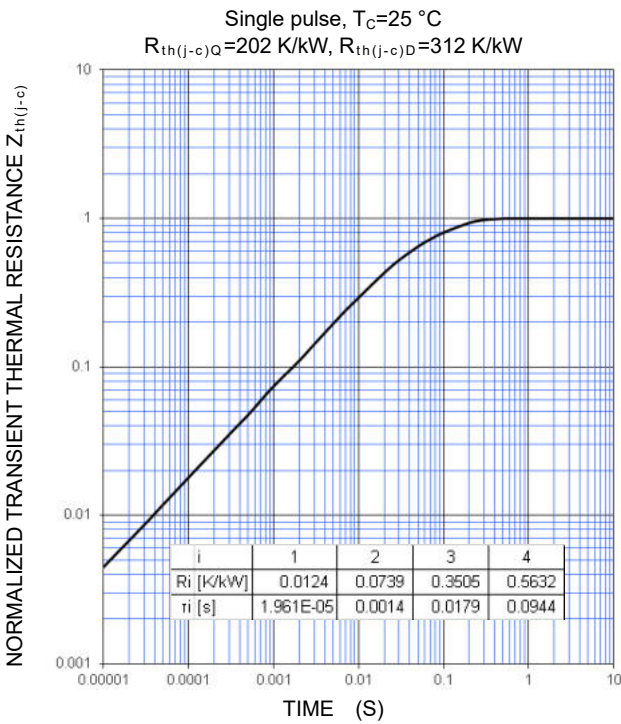
FREE WHEELING DIODE
REVERSE RECOVERY CHARACTERISTICS
(TYPICAL)



GATE CHARGE CHARACTERISTICS
(TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS
(MAXIMUM)



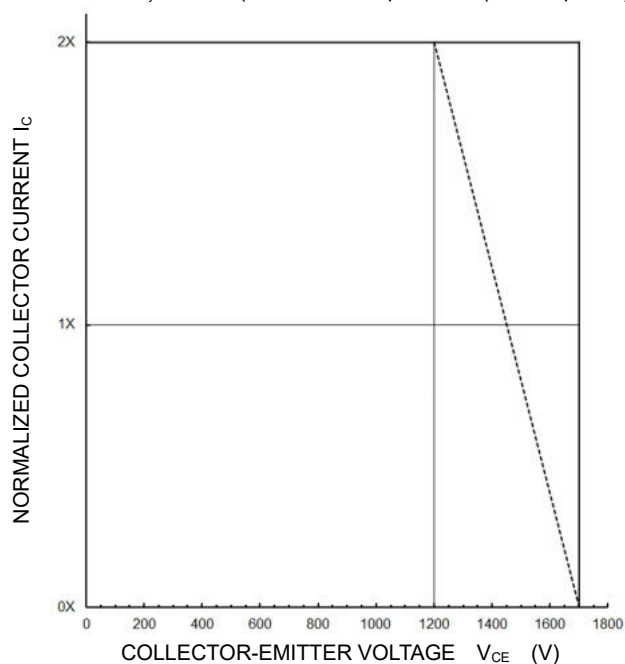
CM150TX-34T/CM150TXP-34T

HIGH POWER SWITCHING USE

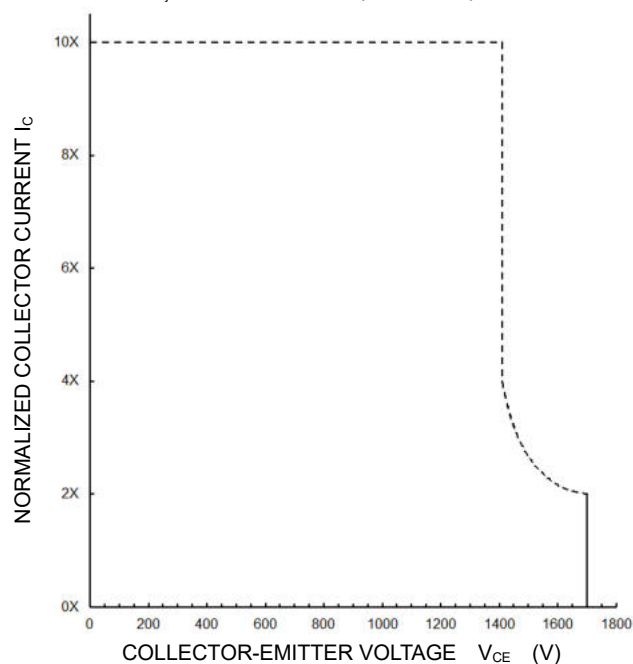
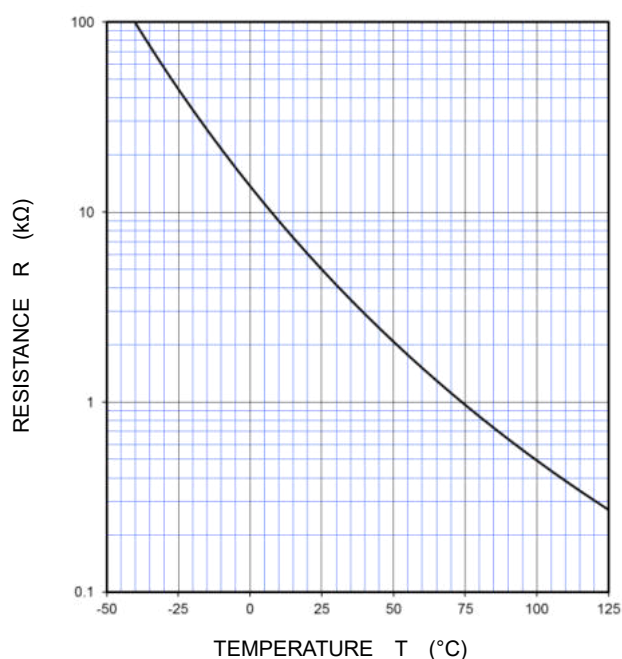
INSULATED TYPE

PERFORMANCE CURVES**INVERTER PART****TURN-OFF SWITCHING SAFE OPERATING AREA
(REVERSE BIAS SAFE OPERATING AREA)
(MAXIMUM)**

$V_{CC} \leq 1200 \text{ V}$, $R_G = 0 \sim 56 \text{ } \Omega$, $V_{GE} = \pm 15 \text{ V}$,
 —: $T_{vj} = 25 \sim 150 \text{ } ^\circ\text{C}$ (Normal load operations (Continuous))
 - - - - -: $T_{vj} = 175 \text{ } ^\circ\text{C}$ (Unusual load operations (Limited period))

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

$V_{CC} \leq 1200 \text{ V}$, $R_G = 0 \sim 56 \text{ } \Omega$, $V_{GE} = \pm 15 \text{ V}$,
 $T_{vj} = 25 \sim 150 \text{ } ^\circ\text{C}$, $t_W \leq 8 \text{ } \mu\text{s}$, Non-Repetitive

**NTC thermistor part****TEMPERATURE CHARACTERISTICS
(TYPICAL)**

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

Important Notice

The information contained in this datasheet shall in no event be regarded as a guarantee of conditions or characteristics. This product has to be used within its specified maximum ratings, and is subject to customer's compliance with any applicable legal requirement, norms and standards.

Except as otherwise explicitly approved by Mitsubishi Electric Corporation in a written document signed by authorized representatives of Mitsubishi Electric Corporation, our products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.

In usage of power semiconductor, there is always the possibility that trouble may occur with them by the reliability lifetime such as Power Cycle, Thermal Cycle or others, or when used under special circumstances (e.g. condensation, high humidity, dusty, salty, highlands, environment with lots of organic matter / corrosive gas / explosive gas, or situations which terminals of semiconductor products receive strong mechanical stress). Therefore, please pay sufficient attention to such circumstances. Further, depending on the technical requirements, our semiconductor products may contain environmental regulation substances, etc. If there is necessity of detailed confirmation, please contact our nearest sales branch or distributor.

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Keep safety first in your circuit designs!

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Notes regarding these materials

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