

<IGBT Modules>

CM100TX-34T/CM100TXP-34T

 HIGH POWER SWITCHING USE
INSULATED TYPE

TX



TXP



sixpack (three-phase bridge)

 Collector current I_c 100 A

 Collector-emitter voltage V_{CES} 1700 V

 Maximum junction temperature T_{vjmax} 175 °C

•Flat base type

•Copper base plate (Nickel-plating)

•RoHS Directive compliant

•Tin-plating pin terminals

 Collector current I_c 100 A

 Collector-emitter voltage V_{CES} 1700 V

 Maximum junction temperature T_{vjmax} 175 °C

•Flat base type

•Copper base plate (Nickel-plating)

•RoHS Directive compliant

•Tin-plating pressfit terminals

•UL Recognized under UL1557, File No. E323585

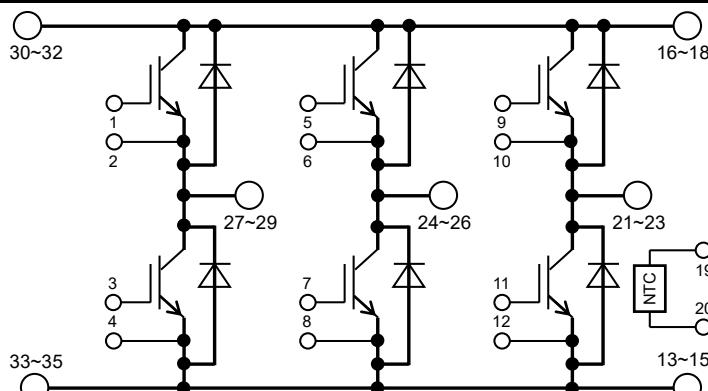
APPLICATION

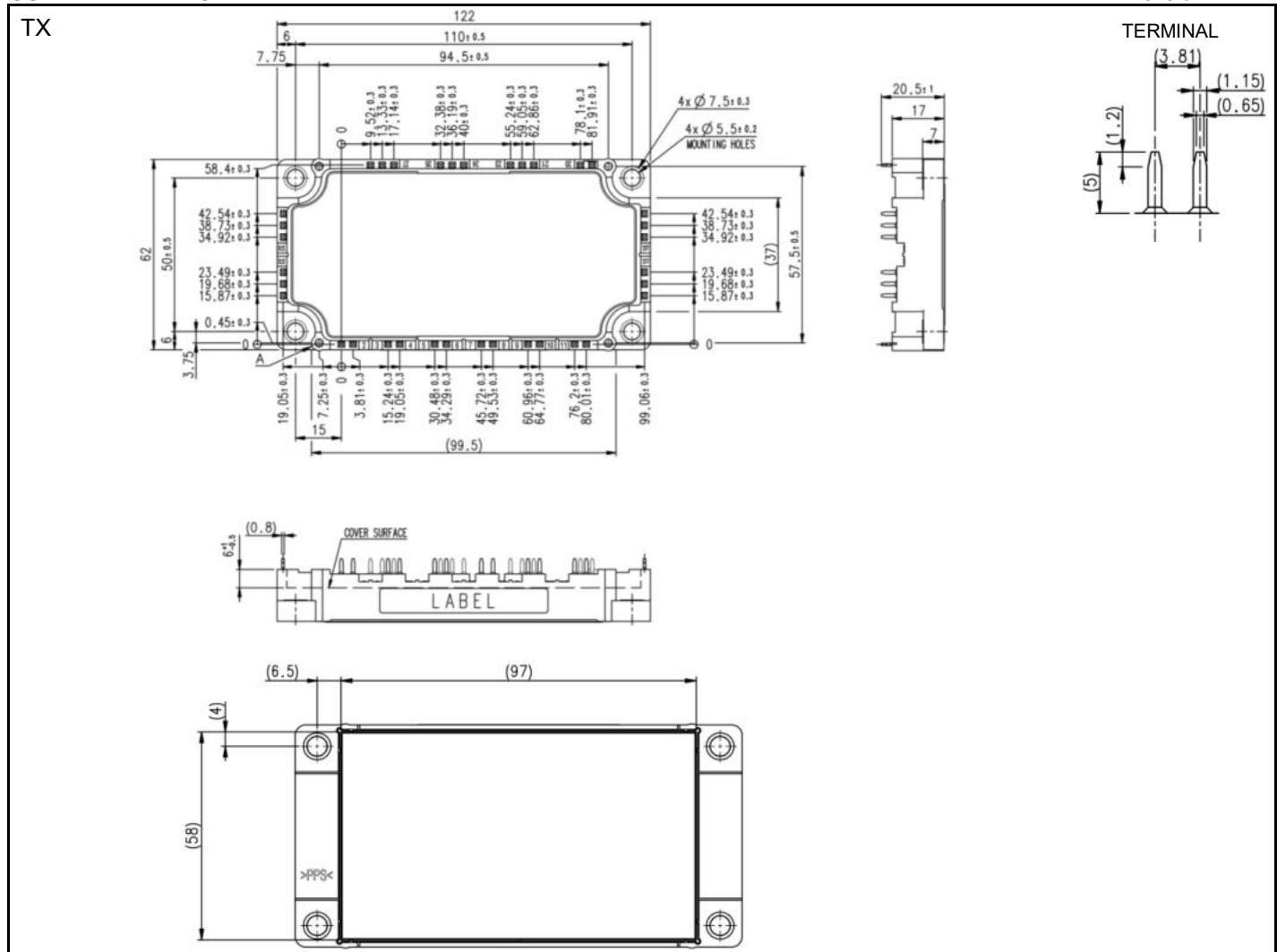
AC Motor Control, Motion/Servo Control, Power supply, etc.

OPTION (Below options are available.)

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

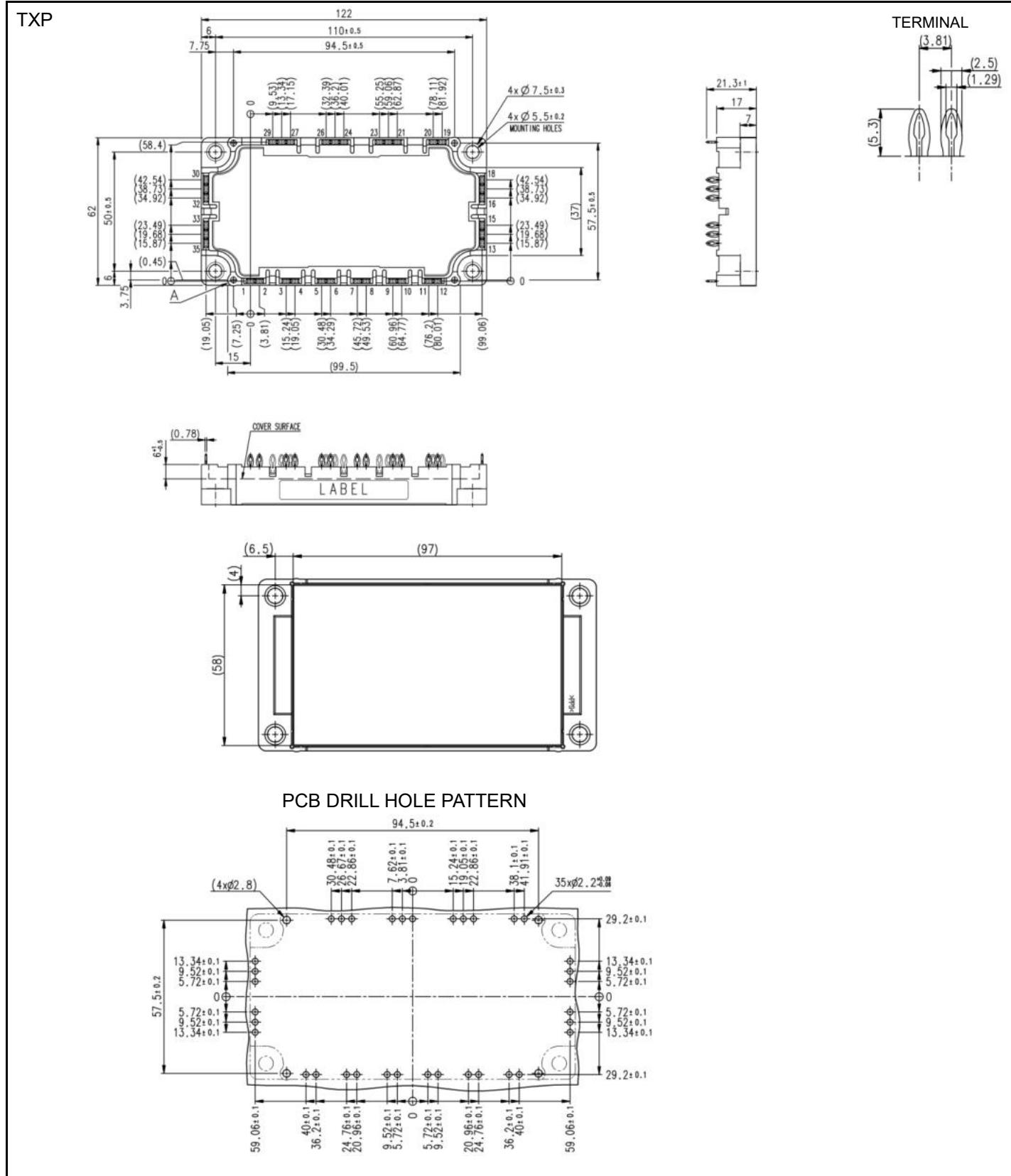
INTERNAL CONNECTION



OUTLINE DRAWING

OUTLINE DRAWING

Dimension in mm



CM100TX-34T/CM100TXP-34T

HIGH POWER SWITCHING USE

INSULATED TYPE

MAXIMUM RATINGS (T_{vj}=25 °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 =98 °C (Note2, 4)	100	A
		Pulse, Repetitive (Note3)	200	
P _{tot}	Total power dissipation	T _C =25 °C (Note2, 4)	590	W
I _E (Note1)	Emitter current	DC (Note2)	100	A
		Pulse, Repetitive (Note3)	200	

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) (Note10)	175	°C
T _{Cmax}	Maximum case temperature	(Note4, 10)	125	
T _{vjop}	Operating junction temperature	Continuous operation (under switching) (Note10)	-40 ~ +150	°C
T _{stg}	Storage temperature	-	-40 ~ +125	

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 =10 mA, V _{CE} =10 V	5.4	6.0	6.6	V
V _{CESat} (Terminal)	Collector-emitter saturation voltage	I _C =100 A, V _{GE} =15 V, Refer to the figure of test circuit (Note5)	T _{vj} =25 °C	-	2.00	2.40
			T _{vj} =125 °C	-	2.40	-
			T _{vj} =150 °C	-	2.50	-
V _{CEsat} (Chip)		I _C =100 A, V _{GE} =15 V, (Note5)	T _{vj} =25 °C	-	1.95	2.35
			T _{vj} =125 °C	-	2.35	-
			T _{vj} =150 °C	-	2.45	-
C _{ies}	Input capacitance	V _{CE} =10 V, G-E short-circuited	-	-	26.7	nF
C _{oes}	Output capacitance		-	-	0.7	
C _{res}	Reverse transfer capacitance		-	-	0.2	
Q _G	Gate charge	V _{CC} =1000 V, I _C =100 A, V _{GE} =15 V	-	0.78	-	µC
t _{d(on)}	Turn-on delay time	V _{CC} =1000 V, I _C =100 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 =100 A, G-E short-circuited, Refer to the figure of test circuit (Note5)	T _{vj} =25 °C	-	2.70	3.30
			T _{vj} =125 °C	-	2.90	-
			T _{vj} =150 °C	-	2.90	-
V _{EC} (Note1) (Chip)		I _E =100 A, G-E short-circuited, (Note5)	T _{vj} =25 °C	-	2.65	3.25
			T _{vj} =125 °C	-	2.75	-
			T _{vj} =150 °C	-	2.75	-
t _{rr} (Note1)	Reverse recovery time	V _{CC} =1000 V, I _E =100 A, V _{GE} =±15 V, R _G =0 Ω, Inductive load	-	-	300	ns
Q _{rr} (Note1)	Reverse recovery charge		-	3.4	-	µC
E _{on}	Turn-on switching energy per pulse	V _{CC} =1000 V, I _C =I _E =100 A, V _{GE} =±15 V, R _G =0 Ω, T _{vj} =150 °C, Inductive load	-	30.8	-	mJ
E _{off}	Turn-off switching energy per pulse		-	29.8	-	
E _{rr} (Note1)	Reverse recovery energy per pulse		-	9.4	-	
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	-	7.5	-	Ω

CM100TX-34T/CM100TXP-34THIGH POWER SWITCHING USE
INSULATED TYPE**ELECTRICAL CHARACTERISTICS (cont.; $T_{vj}=25^{\circ}\text{C}$, unless otherwise specified)****NTC THERMISTOR PART**

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
R_{25}	Zero-power resistance	$T_c=25^{\circ}\text{C}$ (Note4)	4.85	5.00	5.15	k Ω
$\Delta R/R$	Deviation of resistance	$R_{100}=493\Omega$, $T_c=100^{\circ}\text{C}$ (Note4)	-7.3	-	+7.8	%
$B_{(25/50)}$	B-constant	Approximate by equation (Note6)	-	3375	-	K
P_{25}	Power dissipation	$T_c=25^{\circ}\text{C}$ (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)	-	-	254	K/kW
$R_{th(j-c)D}$		Junction to case, per Inverter FWD (Note4)	-	-	429	
$R_{th(c-s)}$	Contact thermal resistance	Case to heat sink, per 1 module	Thermal grease applied (Note4, 7, 10)	-	11.5	K/kW
			PC-TIM applied (Note4, 8, 10)	-	3.1	

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	-	-
			Terminal to base plate	18.5	-	-
		Pressfit pin type (TXP)	Terminal to terminal	19.0	-	-
			Terminal to base plate	18.6	-	-
d_a	Clearance	Solder pin type (TX)	Terminal to terminal	10.2	-	-
			Terminal to base plate	9.0	-	-
		Pressfit pin type (TXP)	Terminal to terminal	8.9	-	-
			Terminal to base plate	9.0	-	-
e_c	Flatness of base plate	On the centerline X, Y (Note9)	± 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).

2. Junction temperature (T_{vj}) should not increase beyond $T_{vj\max}$ rating.
3. Pulse width and repetition rate should be such that the device junction temperature (T_{vj}) dose not exceed $T_{vj\max}$ rating.
4. 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.
5. Pulse width and repetition rate should be such as to cause negligible temperature rise. Refer to the figure of test circuit.

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

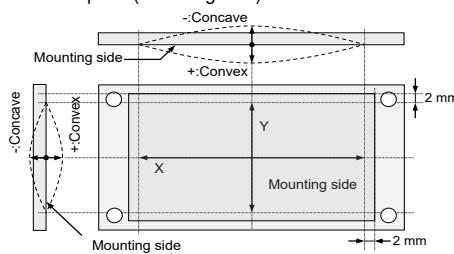
R_{25} : resistance at absolute temperature T_{25} [K]; $T_{25}=25^{\circ}\text{C}+273.15=298.15$ [K]

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

7. Typical value is measured by using thermally conductive grease of $\lambda=0.9\text{ W}/(\text{m}\cdot\text{K})/D_{(C-S)}=50\mu\text{m}$.

8. Typical value is measured by using PC-TIM of $\lambda=3.4\text{ W}/(\text{m}\cdot\text{K})/D_{(C-S)}=50\mu\text{m}$.

9. The base plate (mounting side) flatness measurement points (X, Y) are shown in the following figure.



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

CM100TX-34T/CM100TXP-34T

HIGH POWER SWITCHING USE

INSULATED TYPE

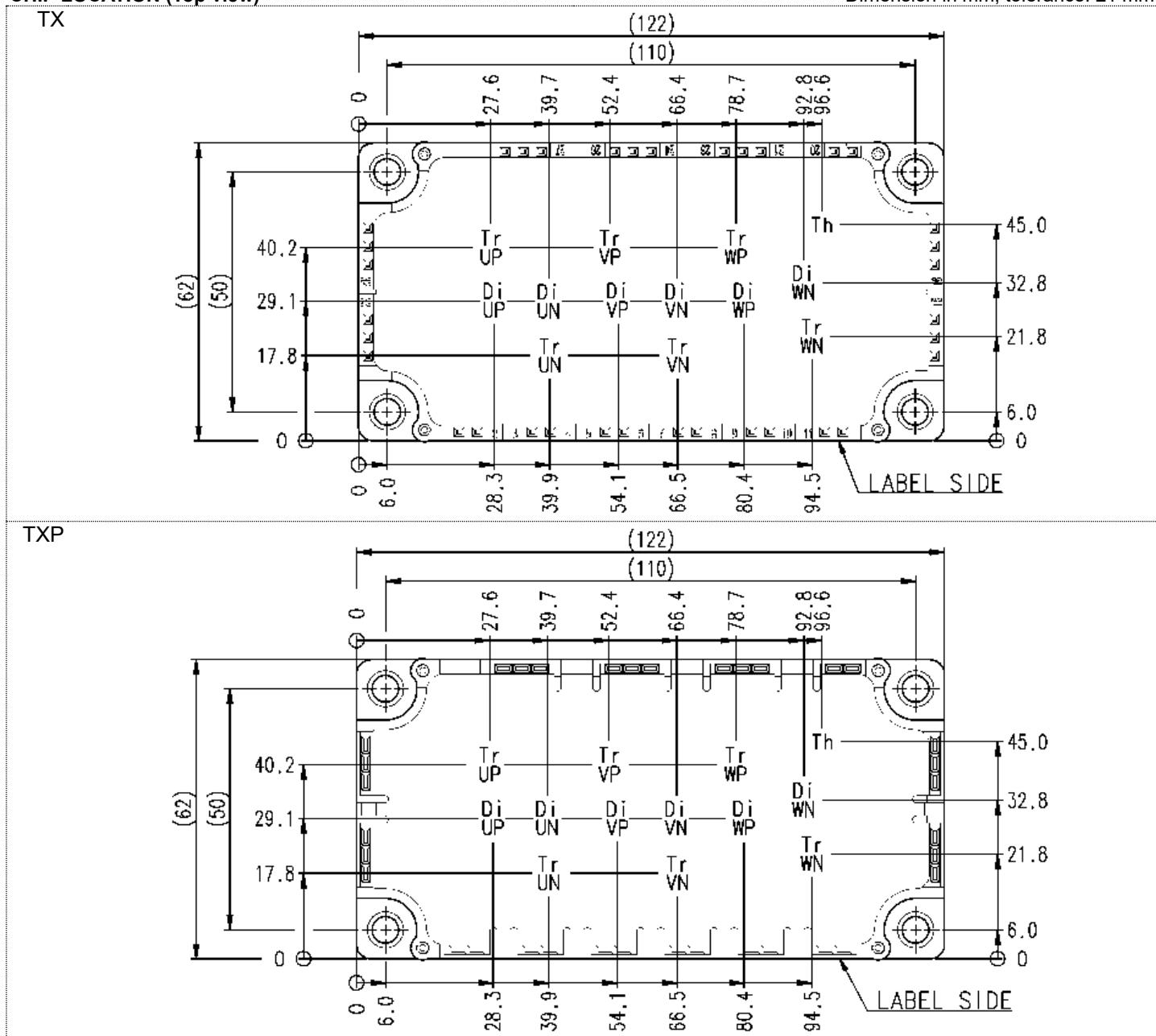
Note11. Use the following screws when mounting the printed circuit board (PCB) on the standoffs.

PCB thickness : t1.6

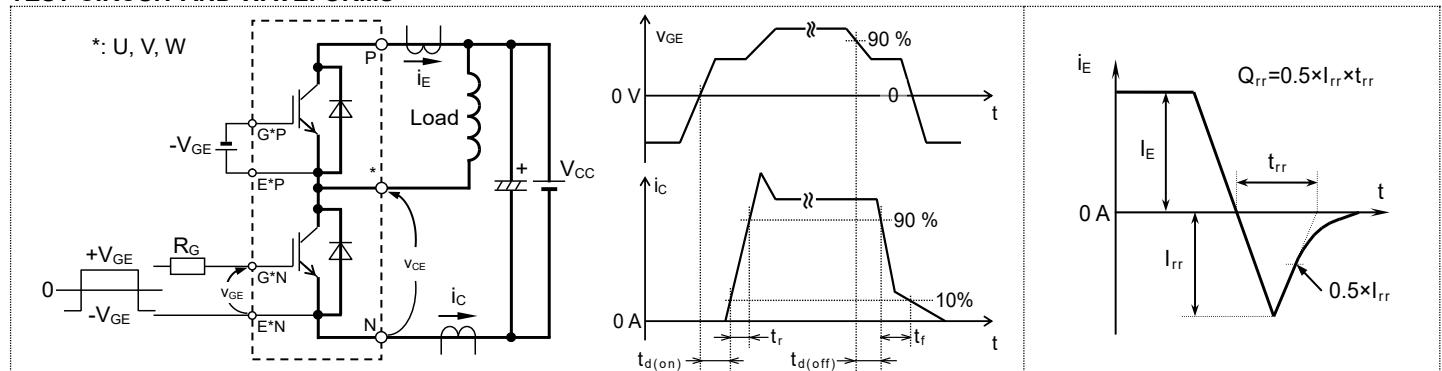
Type	Manufacturer	Size	Tightening torque (N·m)	Recommended tightening method
(1) PT®	EJOT	K25×8	0.55 ± 0.055	by handwork (equivalent to 30 rpm by mechanical screw driver) ~ 600 rpm (by mechanical screw driver)
(2) PT®		K25×10	0.75 ± 0.075	
(3) DELTA PT®		25×8	0.55 ± 0.055	
(4) DELTA PT®		25×10	0.75 ±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

RECOMMENDED OPERATING CONDITIONS

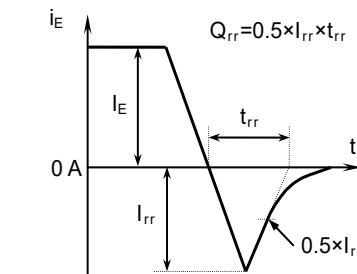
Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
V_{CC}	(DC) Supply voltage	Applied across P-N terminals	-	1000	1200	V
V_{GEon}	Gate (-emitter drive) voltage	Applied across G*P-E*P/G*N-E*N terminals (*=U,V,W)	13.5	15.0	16.5	V
R_G	External gate resistance	Per switch	0	-	91	Ω

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

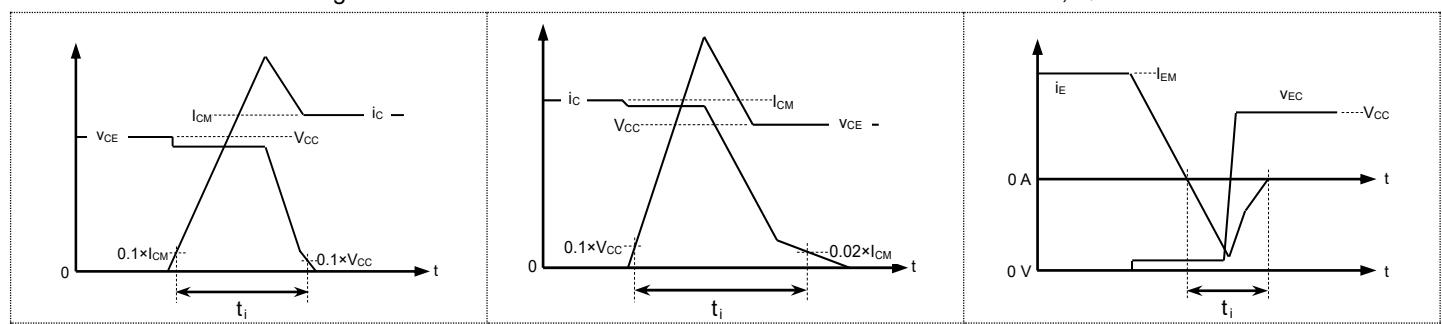
Tr*P/Tr*N: IGBT, Di*P/Di*N: FWD (*=U,V,W), Th: NTC thermistor

TEST CIRCUIT AND WAVEFORMS

Switching characteristics test circuit and waveforms



trr, Qrr characteristics test waveform

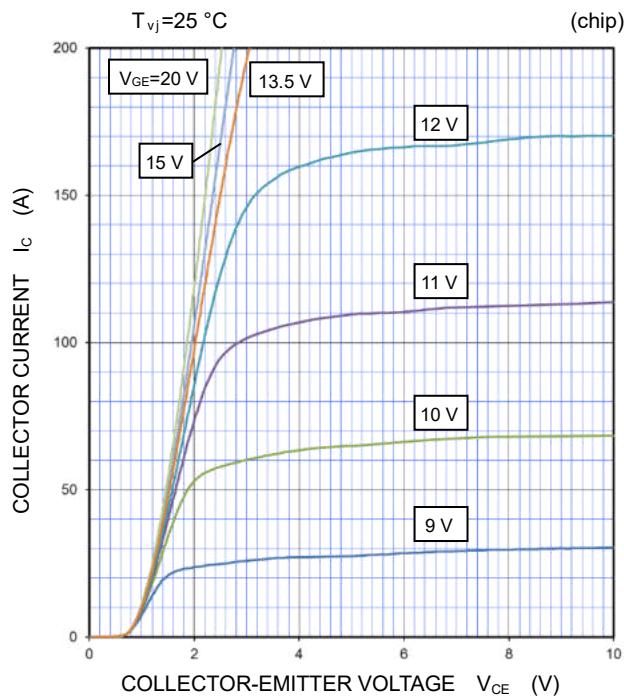
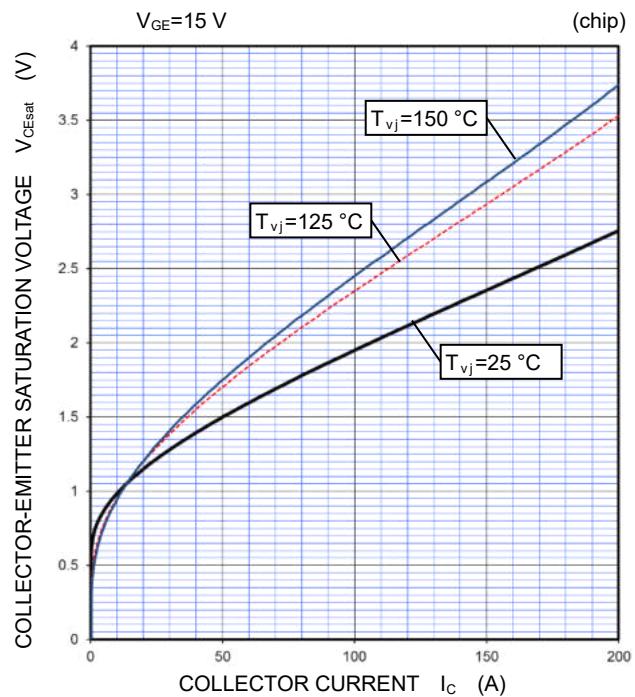
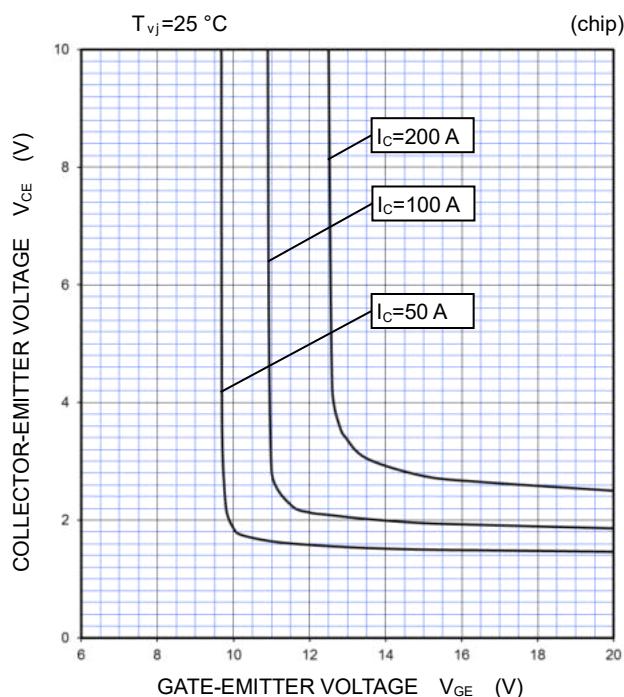
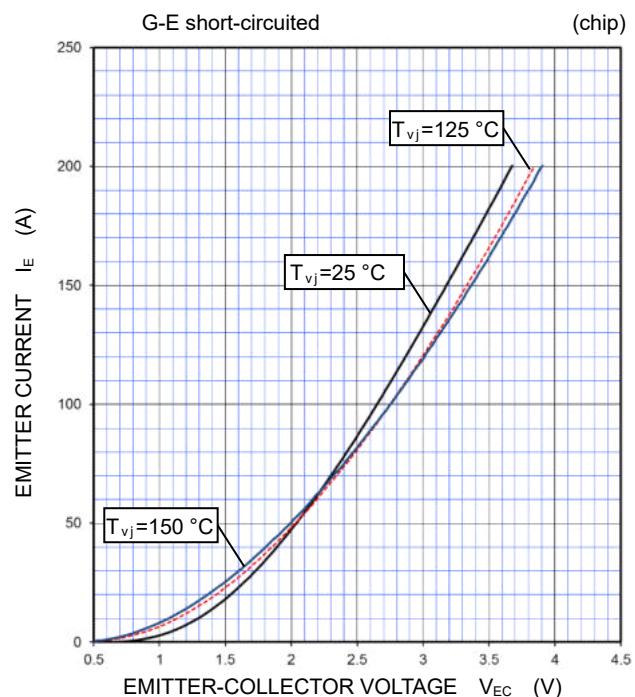


IGBT Turn-on switching energy

IGBT Turn-off switching energy

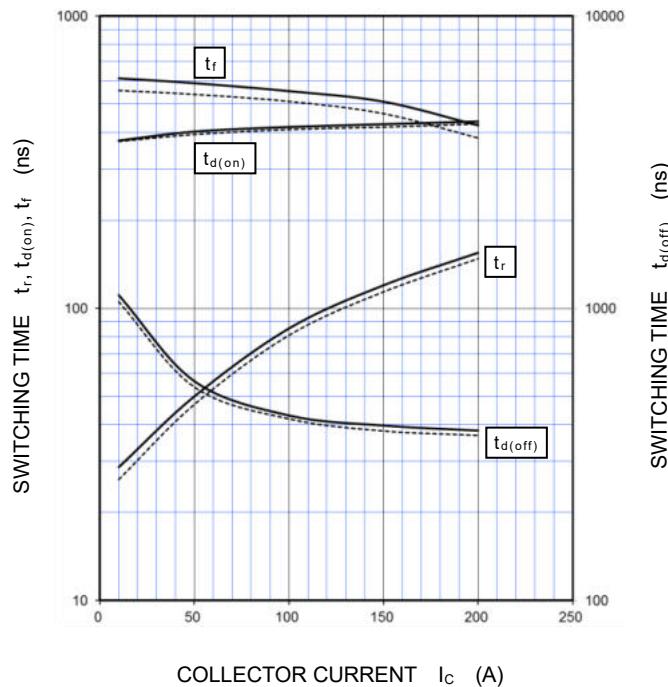
FWD Reverse recovery energy

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

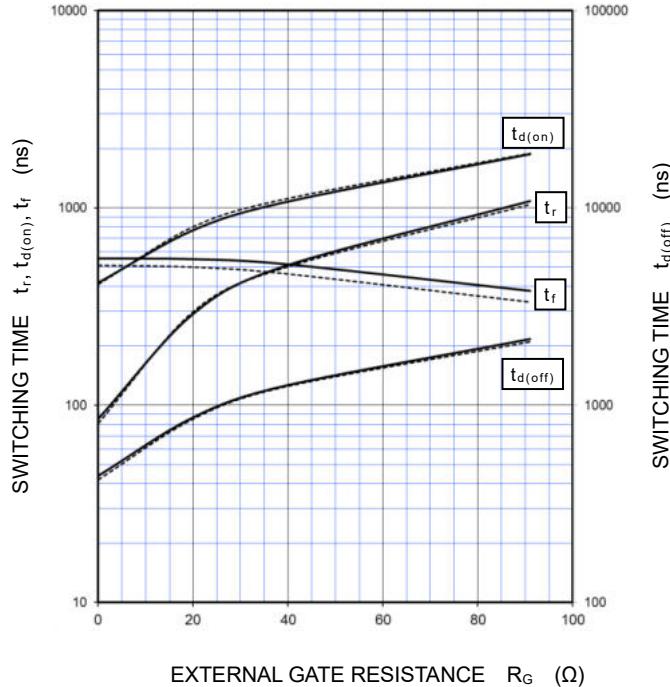
PERFORMANCE CURVES**INVERTER PART****OUTPUT CHARACTERISTICS
(TYPICAL)****COLLECTOR-EMITTER SATURATION VOLTAGE
CHARACTERISTICS
(TYPICAL)****COLLECTOR-EMITTER VOLTAGE CHARACTERISTICS
(TYPICAL)****FREE WHEELING DIODE
FORWARD CHARACTERISTICS
(TYPICAL)**

PERFORMANCE CURVES**INVERTER PART****HALF-BRIDGE SWITCHING CHARACTERISTICS
(TYPICAL)**

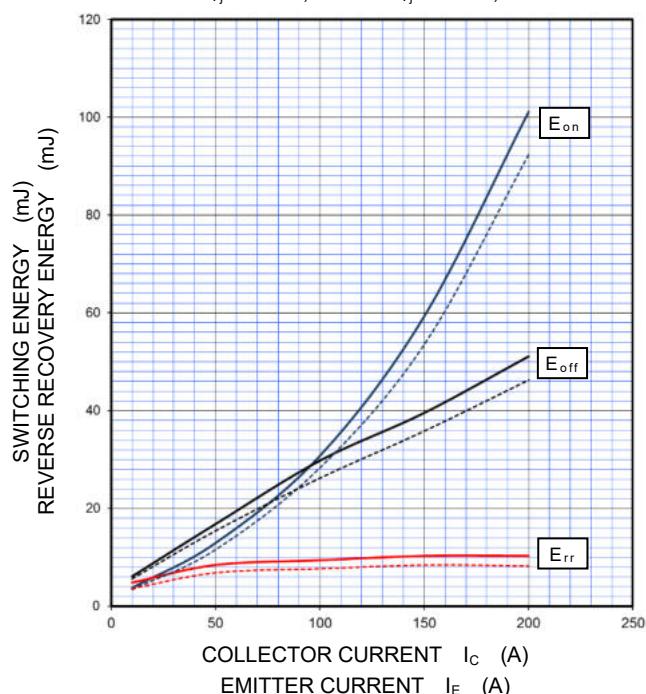
$V_{CC}=1000$ V, $R_G=0$ Ω, $V_{GE}=\pm 15$ V, INDUCTIVE LOAD
 ———: $T_{vj}=150$ °C, - - - - : $T_{vj}=125$ °C

COLLECTOR CURRENT I_C (A)**HALF-BRIDGE SWITCHING CHARACTERISTICS
(TYPICAL)**

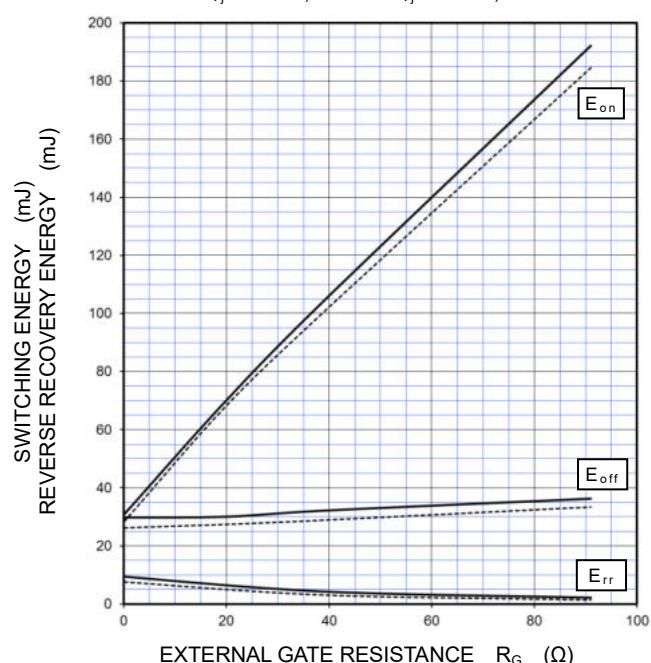
$V_{CC}=1000$ V, $I_C=100$ A, $V_{GE}=\pm 15$ V, INDUCTIVE LOAD
 ———: $T_{vj}=150$ °C, - - - - : $T_{vj}=125$ °C

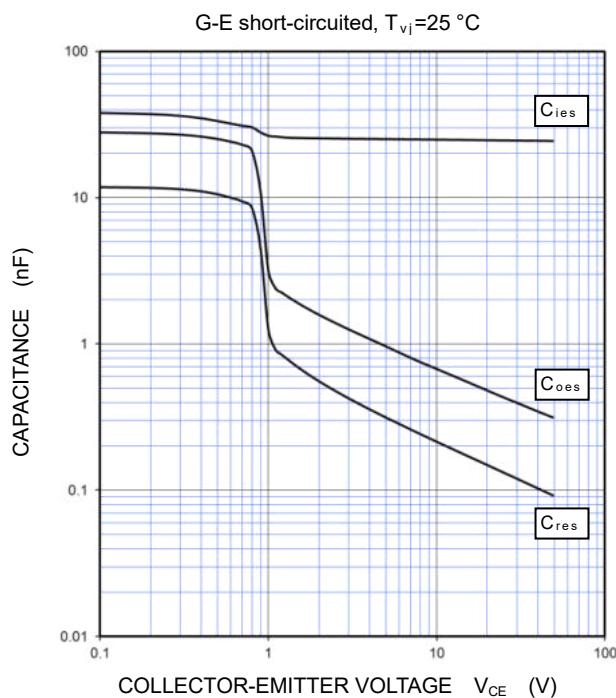
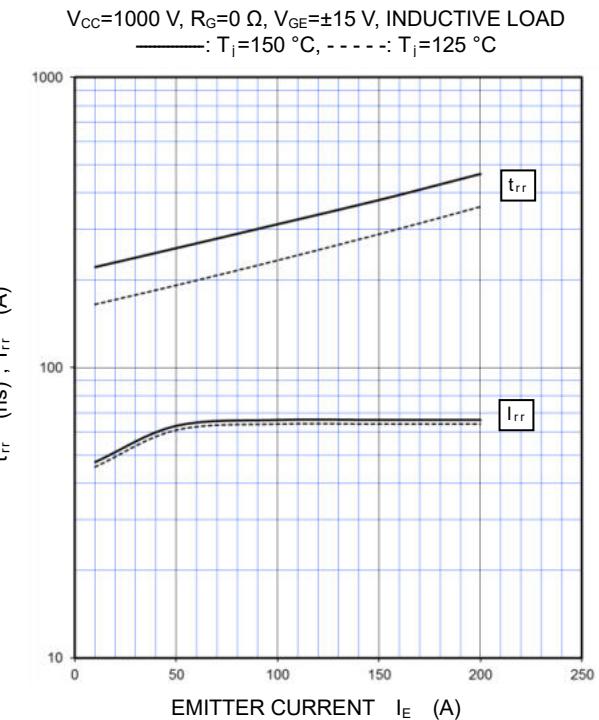
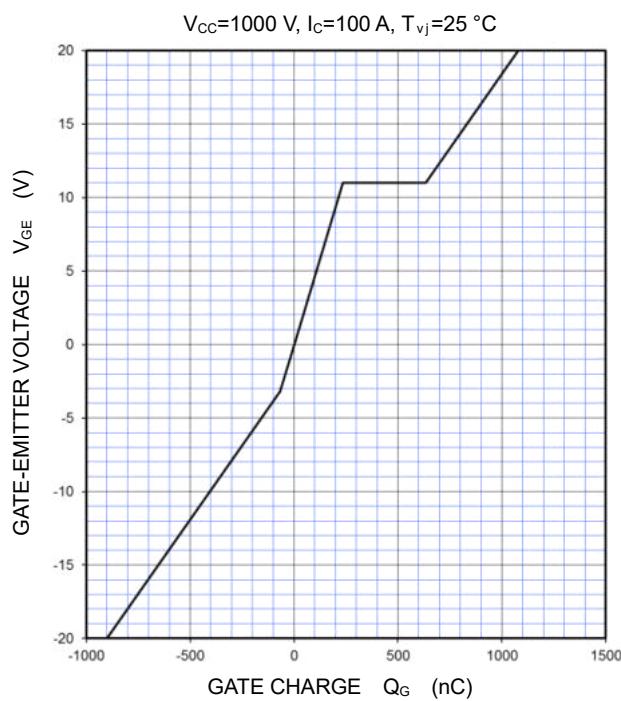
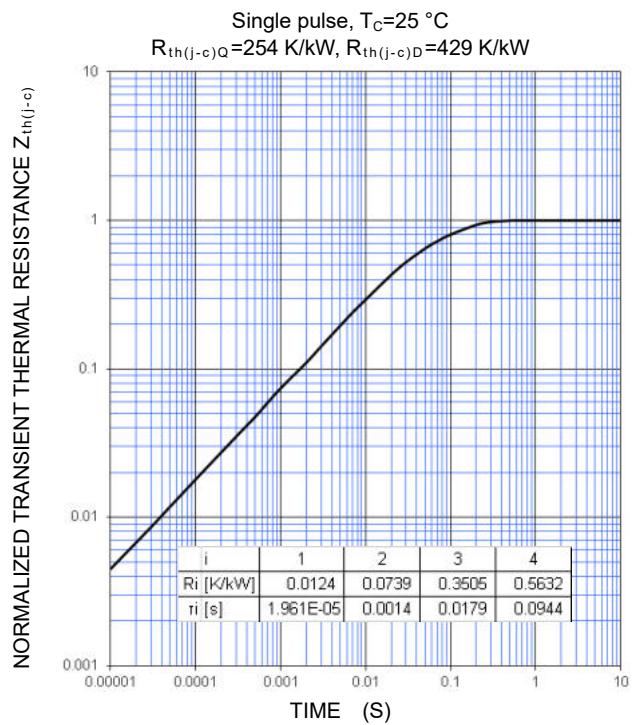
EXTERNAL GATE RESISTANCE R_G (Ω)**HALF-BRIDGE SWITCHING CHARACTERISTICS
(TYPICAL)**

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

COLLECTOR CURRENT I_C (A)
EMITTER CURRENT I_E (A)**HALF-BRIDGE SWITCHING CHARACTERISTICS
(TYPICAL)**

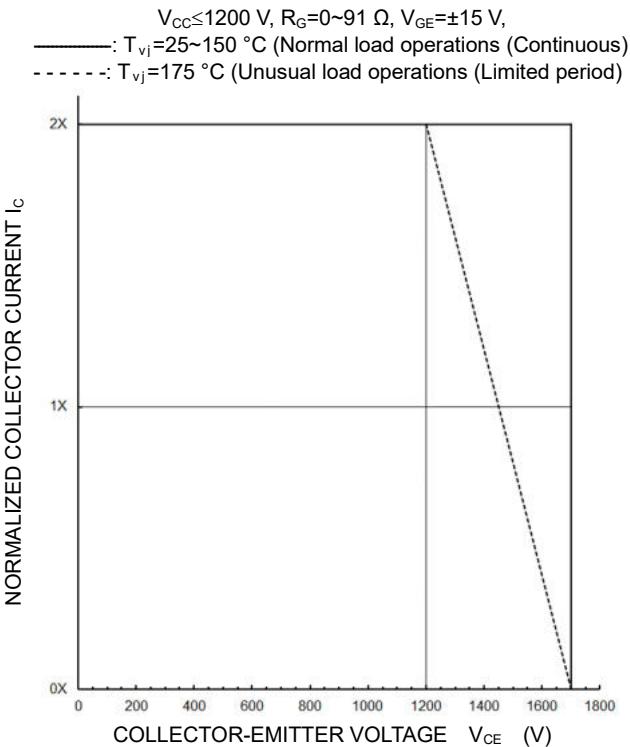
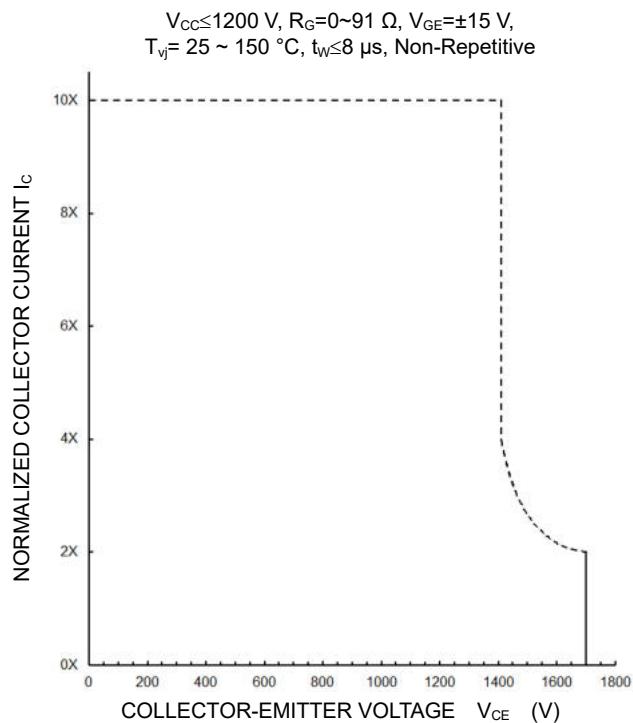
$V_{CC}=1000$ V, $I_C/I_E=100$ A, $V_{GE}=\pm 15$ V, INDUCTIVE LOAD,
 ———: $T_{vj}=150$ °C, - - - - : $T_{vj}=125$ °C, PER PULSE

EXTERNAL GATE RESISTANCE R_G (Ω)

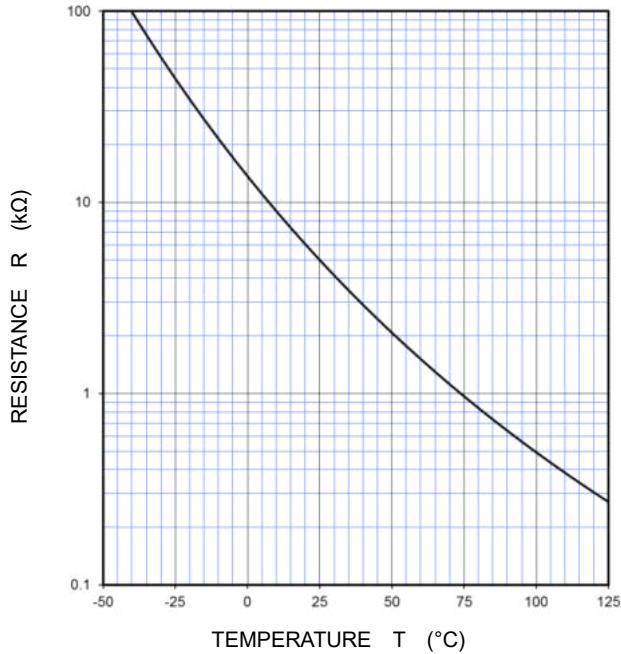
PERFORMANCE CURVES**INVERTER PART****CAPACITANCE CHARACTERISTICS
(TYPICAL)****FREE WHEELING DIODE
REVERSE RECOVERY CHARACTERISTICS
(TYPICAL)****GATE CHARGE CHARACTERISTICS
(TYPICAL)****TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS
(MAXIMUM)**

PERFORMANCE CURVES

INVERTER PART

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

NTC thermistor part

TEMPERATURE CHARACTERISTICS
(TYPICAL)

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

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