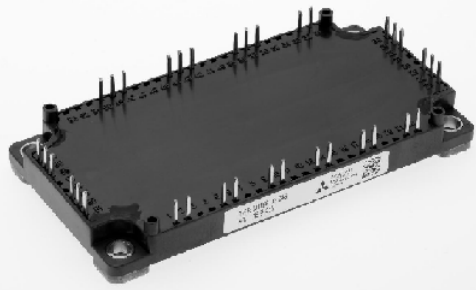


< IGBT MODULES >

CM100TX-24S

HIGH POWER SWITCHING USE
INSULATED TYPE



sixpack (3 ϕ Inverter)

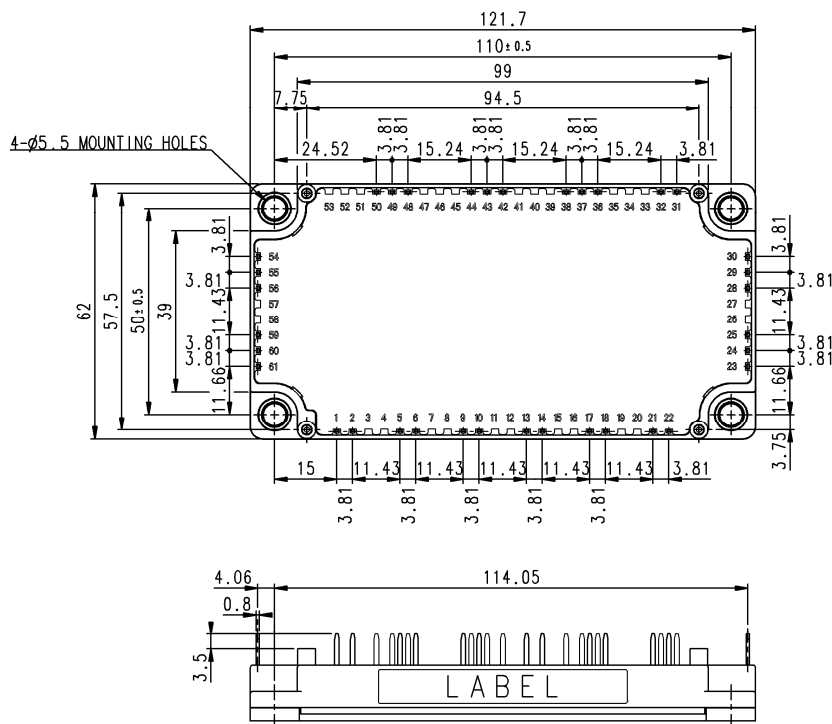
Collector current I_C **1 0 0 A**
 Collector-emitter voltage V_{CES} **1 2 0 0 V**
 Maximum junction temperature T_{jmax} **1 7 5 °C**

- Flat base Type
- Copper base plate (non-plating)
- Tin plating pin terminals
- RoHS Directive compliant
- Recognized under UL1557, File E323585

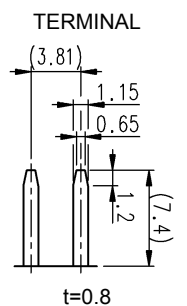
APPLICATION

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

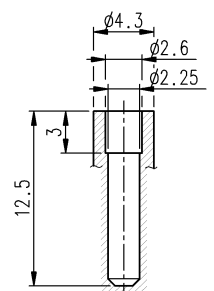
OUTLINE DRAWING & INTERNAL CONNECTION



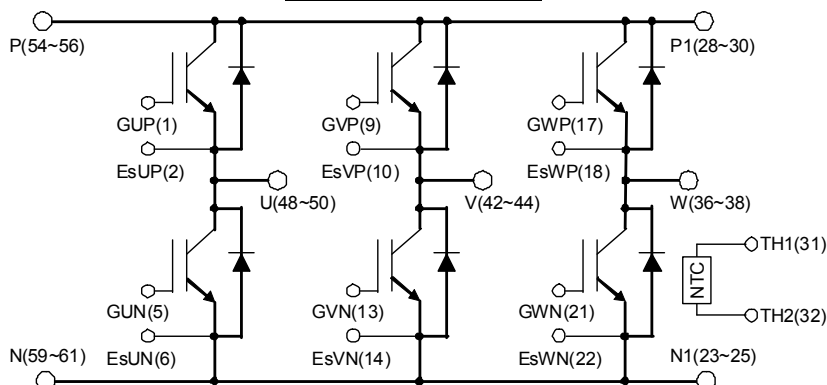
Dimension in mm



SECTION A



INTERNAL CONNECTION



Caution: Each (three) pin terminal of P/N/P1/N1/U/V/W is connected in the module, but should use all each three pins for the external wiring.

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

The tolerance of size between terminals is assumed to be ±0.4.

< IGBT MODULES >

CM100TX-24S

HIGH POWER SWITCHING USE
INSULATED TYPEABSOLUTE MAXIMUM RATINGS ($T_J=25\text{ }^{\circ}\text{C}$, unless otherwise specified)

INVERTER PART IGBT/FWDi

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)	100	A
I_{CRM}		Pulse, Repetitive (Note3)	200	
P_{tot}	Total power dissipation	$T_C=25\text{ }^{\circ}\text{C}$ (Note2, 4)	750	W
I_E (Note1)	Emitter current	(Note2)	100	A
I_{ERM} (Note1)		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	2500	V
T_{jmax}	Maximum junction temperature	Instantaneous event (overload)	175	$^{\circ}\text{C}$
T_{Cmax}	Maximum case temperature	(Note4)	125	$^{\circ}\text{C}$
T_{jop}	Operating junction temperature	Continuous operation (under switching)	-40 ~ +150	$^{\circ}\text{C}$
T_{stg}	Storage temperature	-	-40 ~ +125	

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

INVERTER PART IGBT/FWDi

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	$I_C=10\text{ mA}$, $V_{CE}=10\text{ V}$	5.4	6.0	6.6	V
V_{CESat}	Collector-emitter saturation voltage	$I_C=100\text{ A}$ (Note5), $T_J=25\text{ }^{\circ}\text{C}$	-	1.80	2.25	V
		$V_{GE}=15\text{ V}$, $T_J=125\text{ }^{\circ}\text{C}$	-	2.00	-	
		(Terminal) $T_J=150\text{ }^{\circ}\text{C}$	-	2.05	-	
		$I_C=100\text{ A}$ (Note5), $T_J=25\text{ }^{\circ}\text{C}$	-	1.70	2.15	V
		$V_{GE}=15\text{ V}$, $T_J=125\text{ }^{\circ}\text{C}$	-	1.90	-	
		(Chip) $T_J=150\text{ }^{\circ}\text{C}$	-	1.95	-	
C_{ies}	Input capacitance	$V_{CE}=10\text{ V}$, G-E short-circuited	-	-	10	nF
C_{oes}	Output capacitance		-	-	2.0	
C_{res}	Reverse transfer capacitance		-	-	0.17	
Q_G	Gate charge	$V_{CC}=600\text{ V}$, $I_C=100\text{ A}$, $V_{GE}=15\text{ V}$	-	233	-	nC
$t_{d(on)}$	Turn-on delay time	$V_{CC}=600\text{ V}$, $I_C=100\text{ A}$, $V_{GE}=\pm 15\text{ V}$, $R_G=6.2\text{ }\Omega$, Inductive load	-	-	300	ns
t_r	Rise time		-	-	200	
$t_{d(off)}$	Turn-off delay time		-	-	600	
t_f	Fall time		-	-	300	
V_{EC} (Note1)	Emitter-collector voltage	$I_E=100\text{ A}$ (Note5), $T_J=25\text{ }^{\circ}\text{C}$	-	1.80	2.25	V
		G-E short-circuited, $T_J=125\text{ }^{\circ}\text{C}$	-	1.80	-	
		(Terminal) $T_J=150\text{ }^{\circ}\text{C}$	-	1.80	-	
		$I_E=100\text{ A}$ (Note5), $T_J=25\text{ }^{\circ}\text{C}$	-	1.70	2.15	V
		G-E short-circuited, $T_J=125\text{ }^{\circ}\text{C}$	-	1.70	-	
		(Chip) $T_J=150\text{ }^{\circ}\text{C}$	-	1.70	-	
t_{rr} (Note1)	Reverse recovery time	$V_{CC}=600\text{ V}$, $I_E=100\text{ A}$, $V_{GE}=\pm 15\text{ V}$, $R_G=6.2\text{ }\Omega$, Inductive load	-	-	300	ns
Q_{rr} (Note1)	Reverse recovery charge	$R_G=6.2\text{ }\Omega$, Inductive load	-	5.3	-	μC
E_{on}	Turn-on switching energy per pulse	$V_{CC}=600\text{ V}$, $I_C=I_E=100\text{ A}$, $V_{GE}=\pm 15\text{ V}$, $R_G=6.2\text{ }\Omega$, $T_J=150\text{ }^{\circ}\text{C}$, Inductive load	-	8.6	-	mJ
E_{off}	Turn-off switching energy per pulse		-	10.7	-	
E_{rr} (Note1)	Reverse recovery energy per pulse		-	10.2	-	mJ
$R_{CC'+EE'}$	Internal lead resistance	Main terminals-chip, per switch, $T_C=25\text{ }^{\circ}\text{C}$ (Note4)	-	-	3.5	m Ω
r_g	Internal gate resistance	Per switch	-	0	-	Ω

ELECTRICAL CHARACTERISTICS (cont; $T_j=25\text{ }^{\circ}\text{C}$, 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 (Note7)	-	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 (Note4)	Junction to case, per Inverter IGBT	-	-	0.20	K/W
$R_{th(j-c)D}$		Junction to case, per Inverter FWDi	-	-	0.29	
$R_{th(c-s)}$	Contact thermal resistance (Note4)	Case to heat sink, per 1 module, Thermal grease applied (Note7)	-	15	-	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	Terminal to terminal	10.28	-	-	mm
		Terminal to base plate	14.27	-	-	
d_a	Clearance	Terminal to terminal	10.28	-	-	mm
		Terminal to base plate	12.33	-	-	
m	Weight	-	-	300	-	g
e_c	Flatness of base plate	On the centerline X, Y (Note8)	± 0	-	+100	μm

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

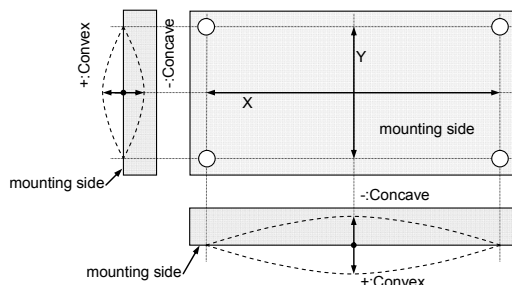
- Junction temperature (T_j) should not increase beyond $T_{j\text{max}}$ rating.
- Pulse width and repetition rate should be such that the device junction temperature (T_j) dose not exceed $T_{j\text{max}}$ rating.
- Case temperature (T_c) and heat sink temperature (T_s) are defined on the each surface (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]

- Typical value is measured by using thermally conductive grease of $\lambda=0.9\text{ W/(m}\cdot\text{K)}$.
- The base plate (mounting side) flatness measurement points (X, Y) are as follows of the following figure.



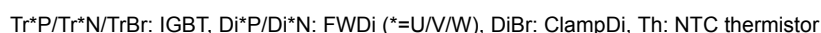
- Use the following screws when mounting the printed circuit board (PCB) on the stand offs.
"ST2.6×10 or ST2.6×12 self tapping screw"
The length of the screw depends on the thickness of the PCB.

CM100TX-24S

RECOMMENDED OPERATING CONDITIONS

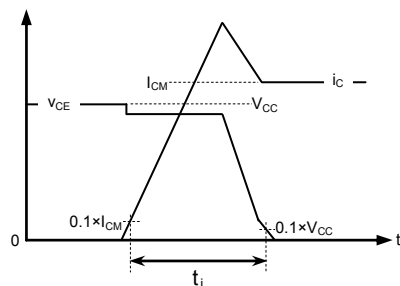
CHIP LOCATION (Top view)

Dimension in mm, tolerance: ± 1 mm

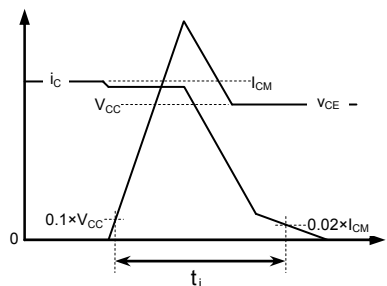


Switching characteristics test circuit and waveforms

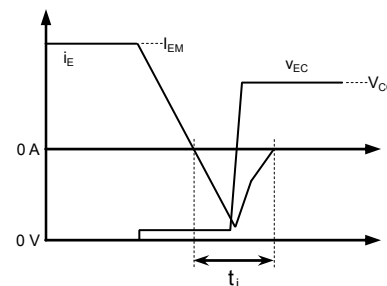
t_{rr}, Q_{rr} test waveform



IGBT Turn-on switching energy



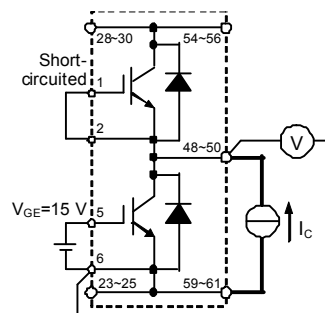
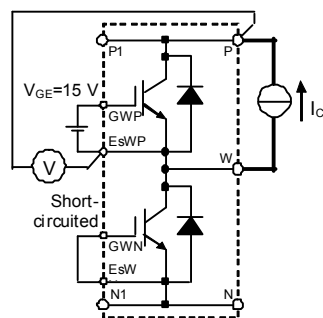
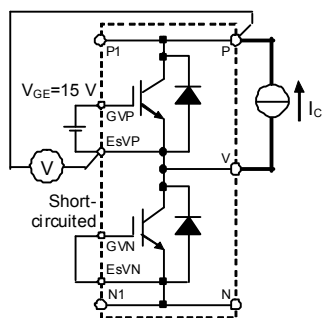
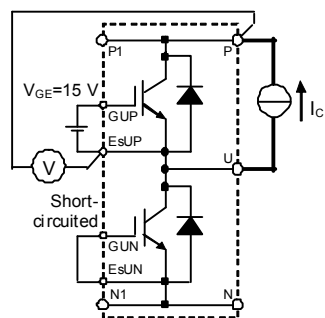
IGBT Turn-off switching energy



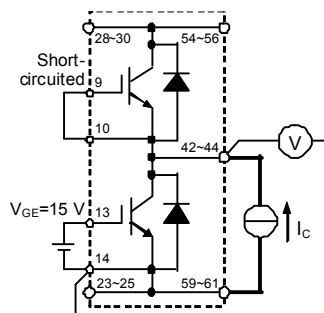
FWDi Reverse recovery energy

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

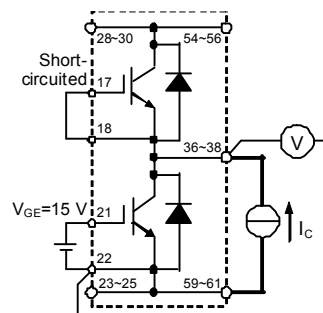
TEST CIRCUIT



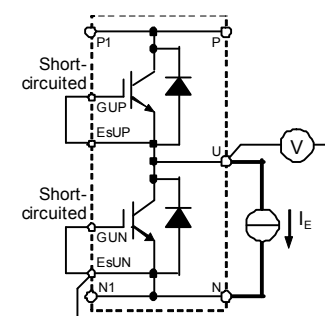
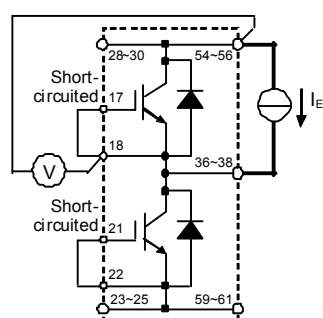
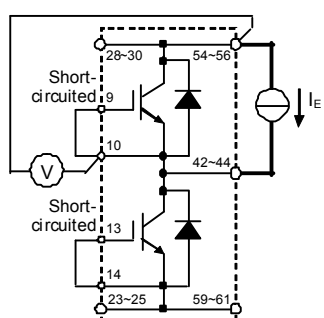
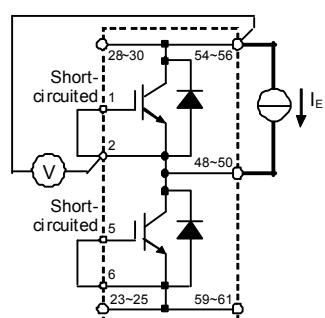
Gate-emitter GVP-EsVP, GVN-EsVP,
short-circuited GWP-EsWN, GWN-EsWN
UP / UN IGBT



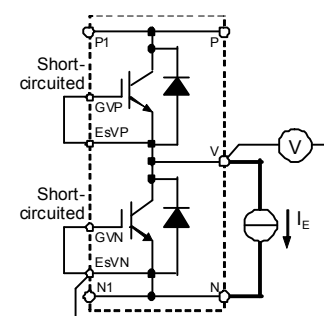
Gate-emitter GUP-EsUP, GUN-EsUN,
short-circuited GWP-EsWP, GWN-EsWN
VP / VN IGBT



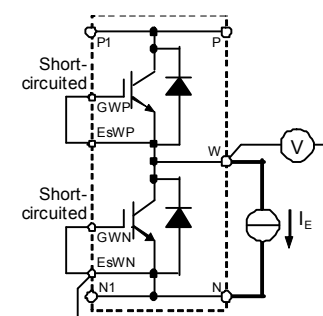
Gate-emitter GUP-EsUP, GUN-EsUN,
short-circuited GWP-EsWP, GVN-EsVN
WP / WN IGBT

 V_{CEsat} test circuit

Gate-emitter GVP-EsVP, GVN-EsVP,
short-circuited GWP-EsWN, GWN-EsWN
UP / UN FWDi



Gate-emitter GUP-EsUP, GUN-EsUN,
short-circuited GWP-EsWP, GWN-EsWN
VP / VN FWDi



Gate-emitter GUP-EsUP, GUN-EsUN,
short-circuited GWP-EsWP, GVN-EsVN
WP / WN FWDi

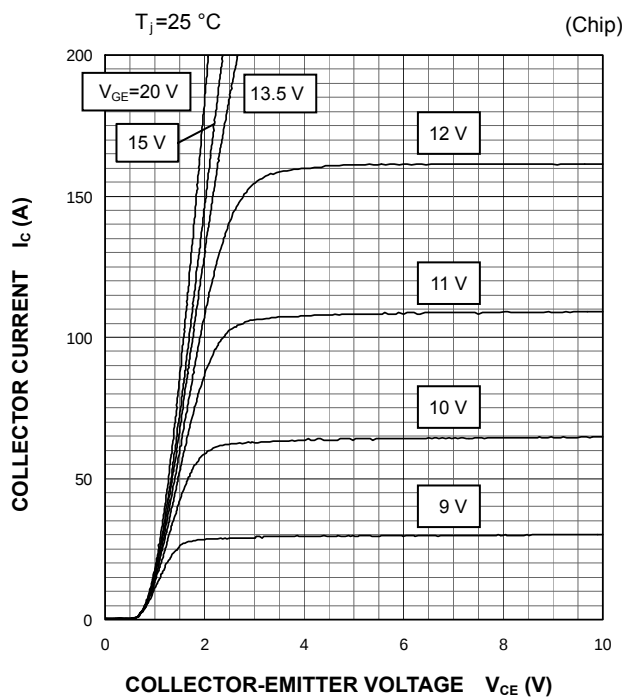
 V_{EC} / V_F test circuit

< IGBT MODULES >
CM100TX-24S
 HIGH POWER SWITCHING USE
 INSULATED TYPE

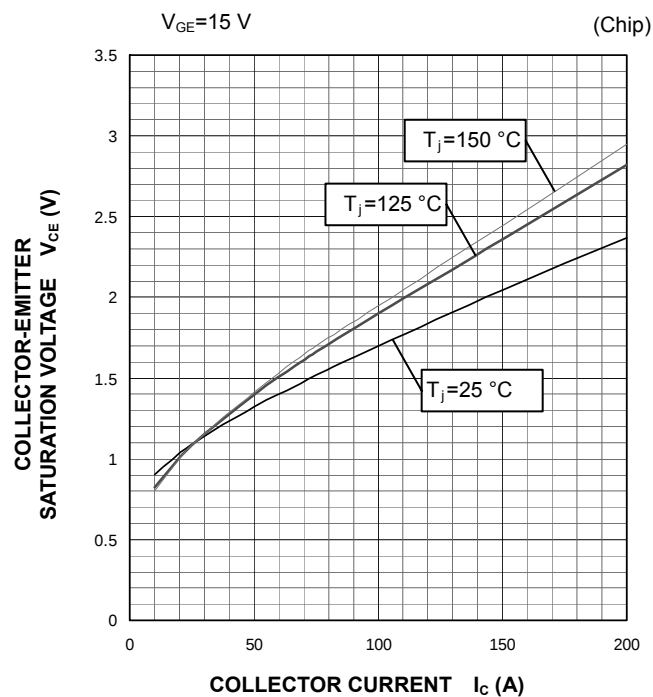
PERFORMANCE CURVES

INVERTER PART

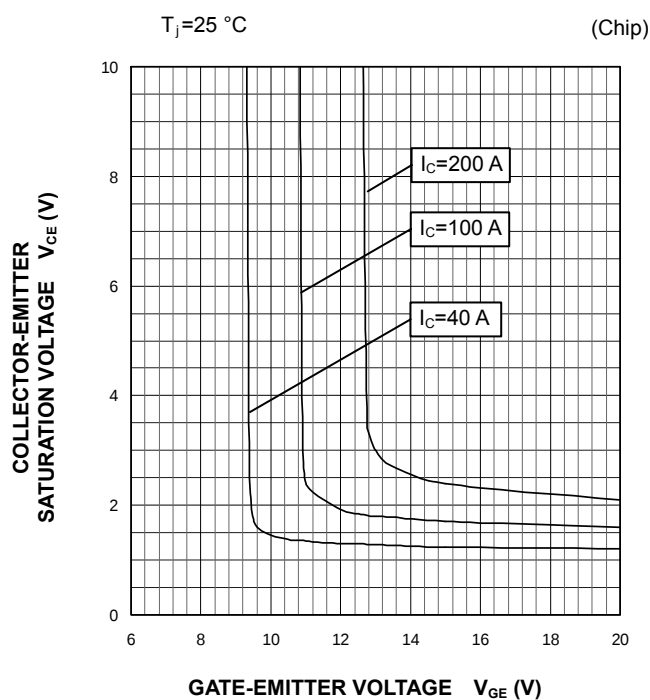
OUTPUT CHARACTERISTICS
(TYPICAL)



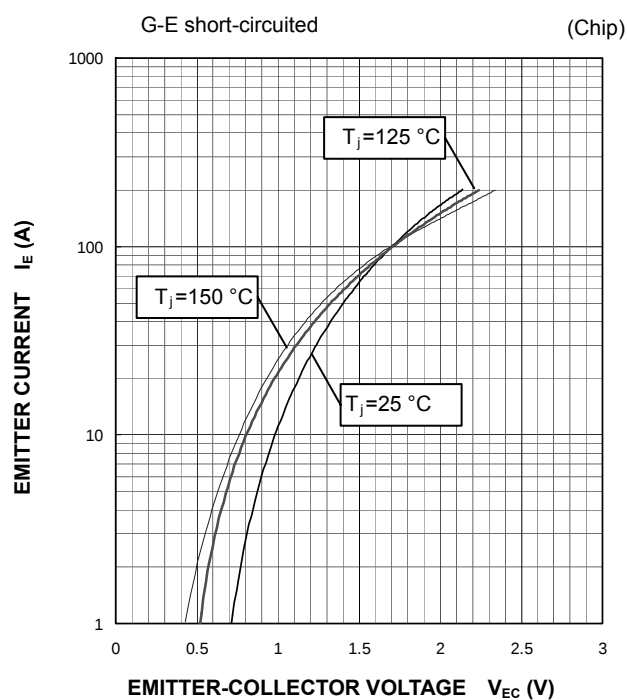
COLLECTOR-EMITTER SATURATION VOLTAGE
CHARACTERISTICS
(TYPICAL)



COLLECTOR-EMITTER SATURATION VOLTAGE
CHARACTERISTICS
(TYPICAL)



FREE WHEELING DIODE
FORWARD CHARACTERISTICS
(TYPICAL)

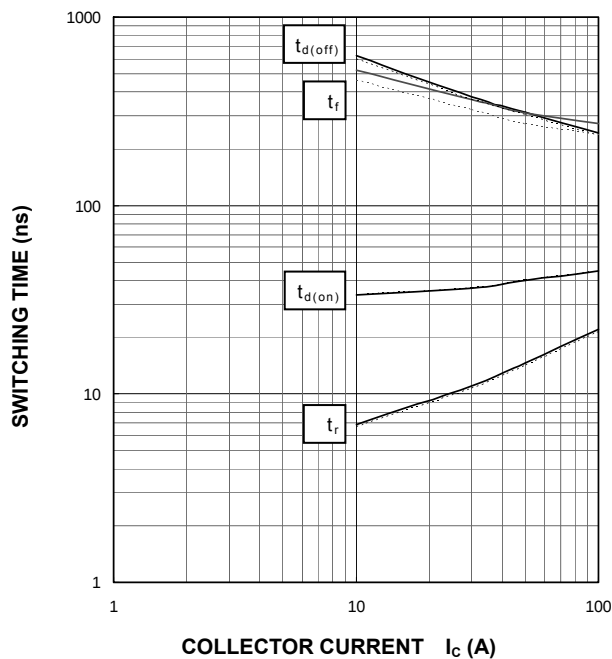


PERFORMANCE CURVES

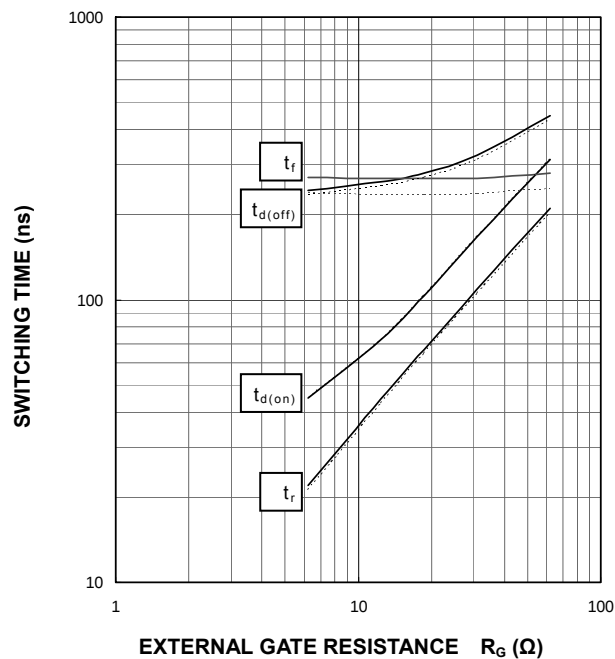
INVERTER PART

HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)

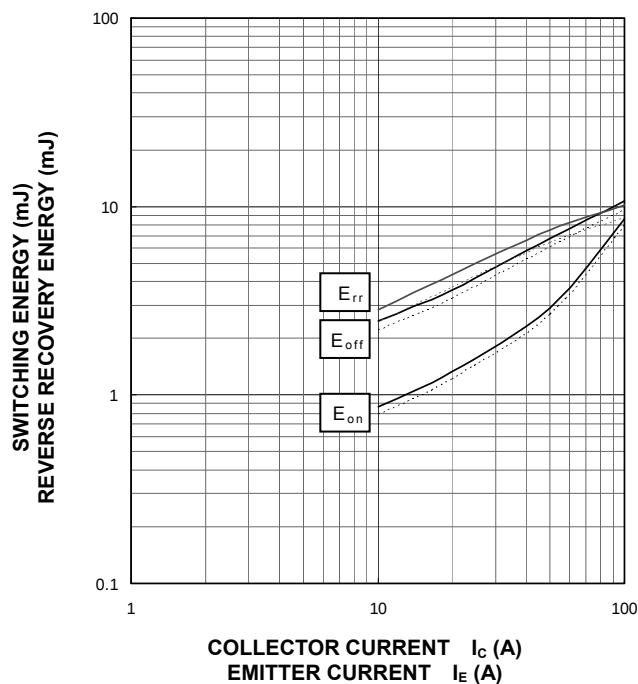
$V_{CC}=600\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $R_G=6.2\ \Omega$, INDUCTIVE LOAD
 —: $T_J=150\text{ }^\circ\text{C}$, - - - - -: $T_J=125\text{ }^\circ\text{C}$

HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)

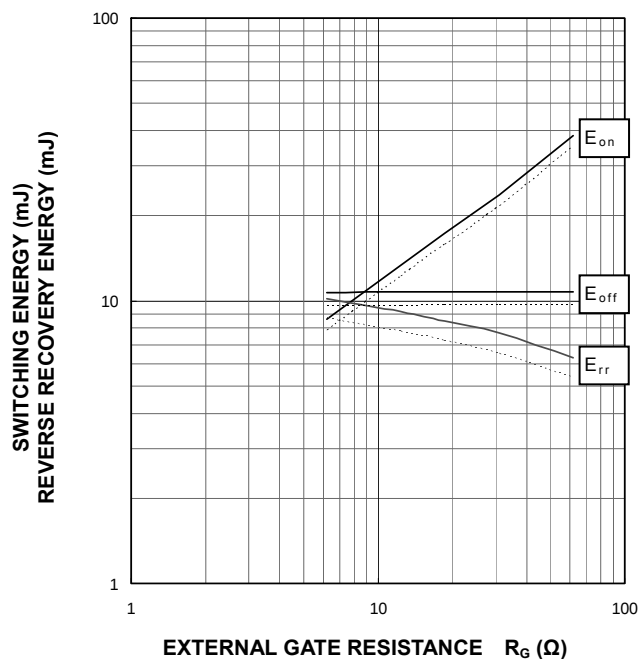
$V_{CC}=600\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $I_C=100\text{ A}$, INDUCTIVE LOAD
 —: $T_J=150\text{ }^\circ\text{C}$, - - - - -: $T_J=125\text{ }^\circ\text{C}$

HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)

$V_{CC}=600\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $R_G=6.2\ \Omega$,
INDUCTIVE LOAD, PER PULSE
 —: $T_J=150\text{ }^\circ\text{C}$, - - - - -: $T_J=125\text{ }^\circ\text{C}$

HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)

$V_{CC}=600\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $I_C/I_E=100\text{ A}$,
INDUCTIVE LOAD, PER PULSE
 —: $T_J=150\text{ }^\circ\text{C}$, - - - - -: $T_J=125\text{ }^\circ\text{C}$

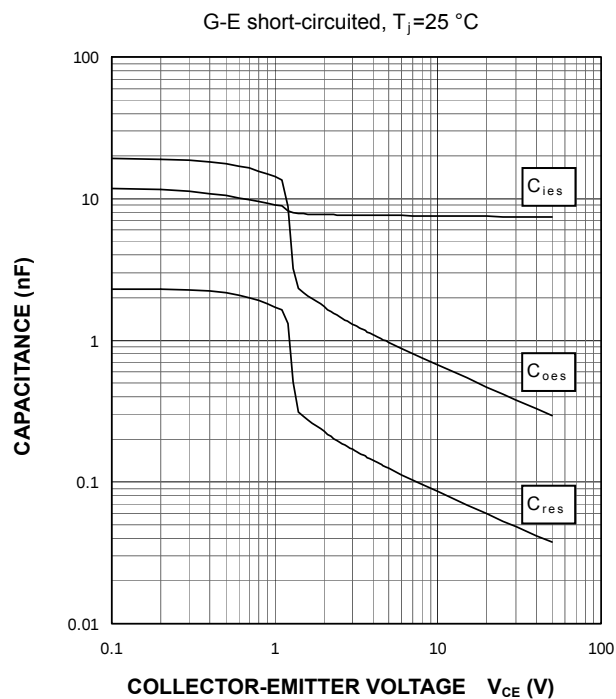


< IGBT MODULES >
CM100TX-24S
HIGH POWER SWITCHING USE
INSULATED TYPE

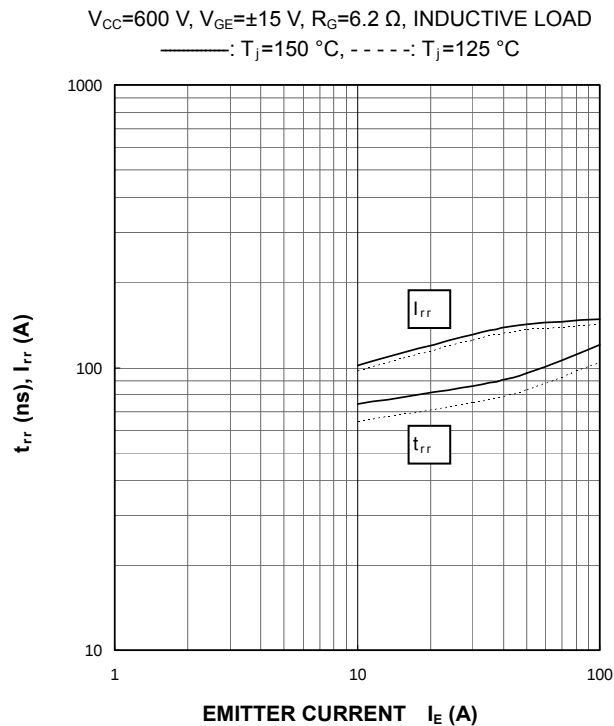
PERFORMANCE CURVES

INVERTER PART

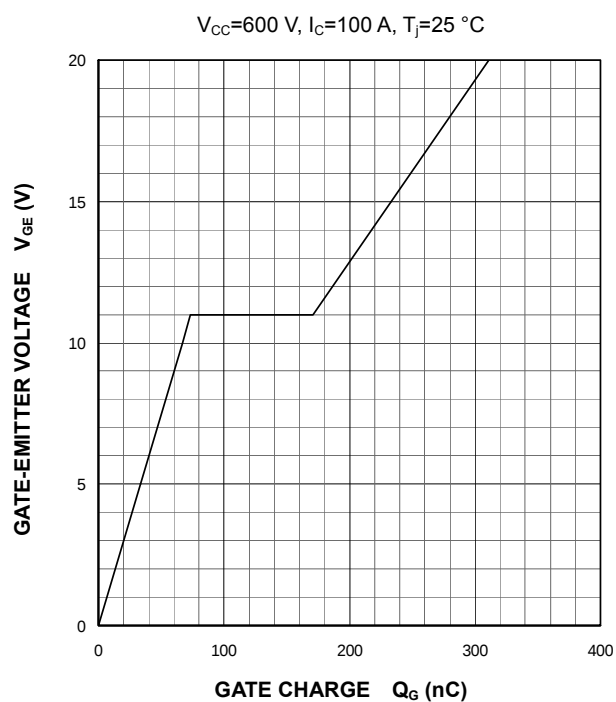
CAPACITANCE CHARACTERISTICS
(TYPICAL)



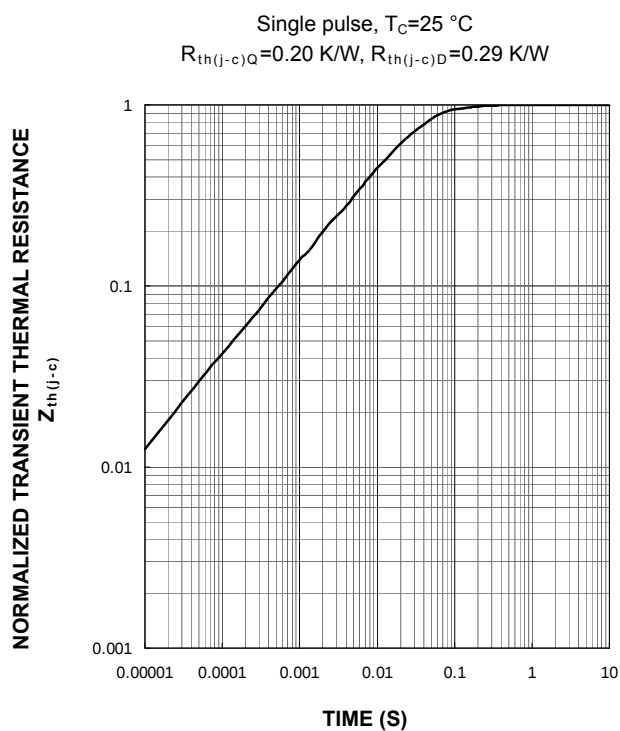
FREE WHEELING DIODE
REVERSE RECOVERY CHARACTERISTICS
(TYPICAL)



GATE CHARGE CHARACTERISTICS
(TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS
(MAXIMUM)

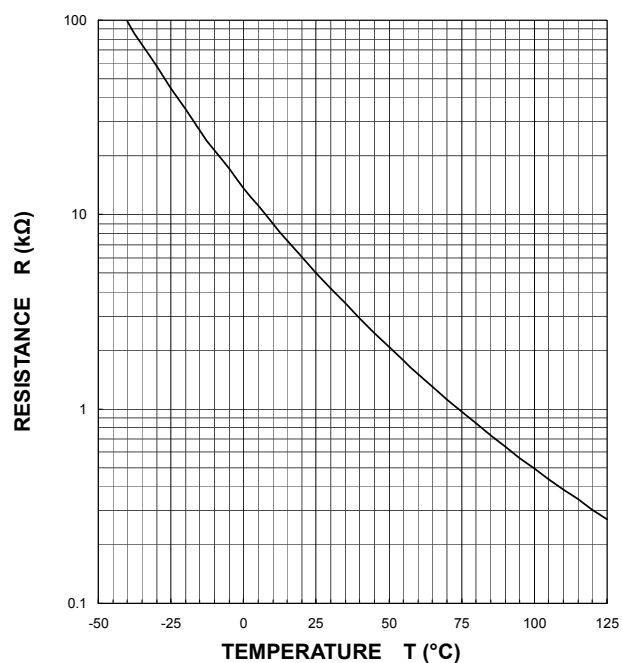


< IGBT MODULES >
CM100TX-24S
HIGH POWER SWITCHING USE
INSULATED TYPE

PERFORMANCE CURVES

NTC thermistor part

TEMPERATURE CHARACTERISTICS
(TYPICAL)



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