

<IGBT Modules>

CM100RX-12A

HIGH POWER SWITCHING USE
INSULATED TYPE



sevenpack (3φ Inverter + Brake Chopper)

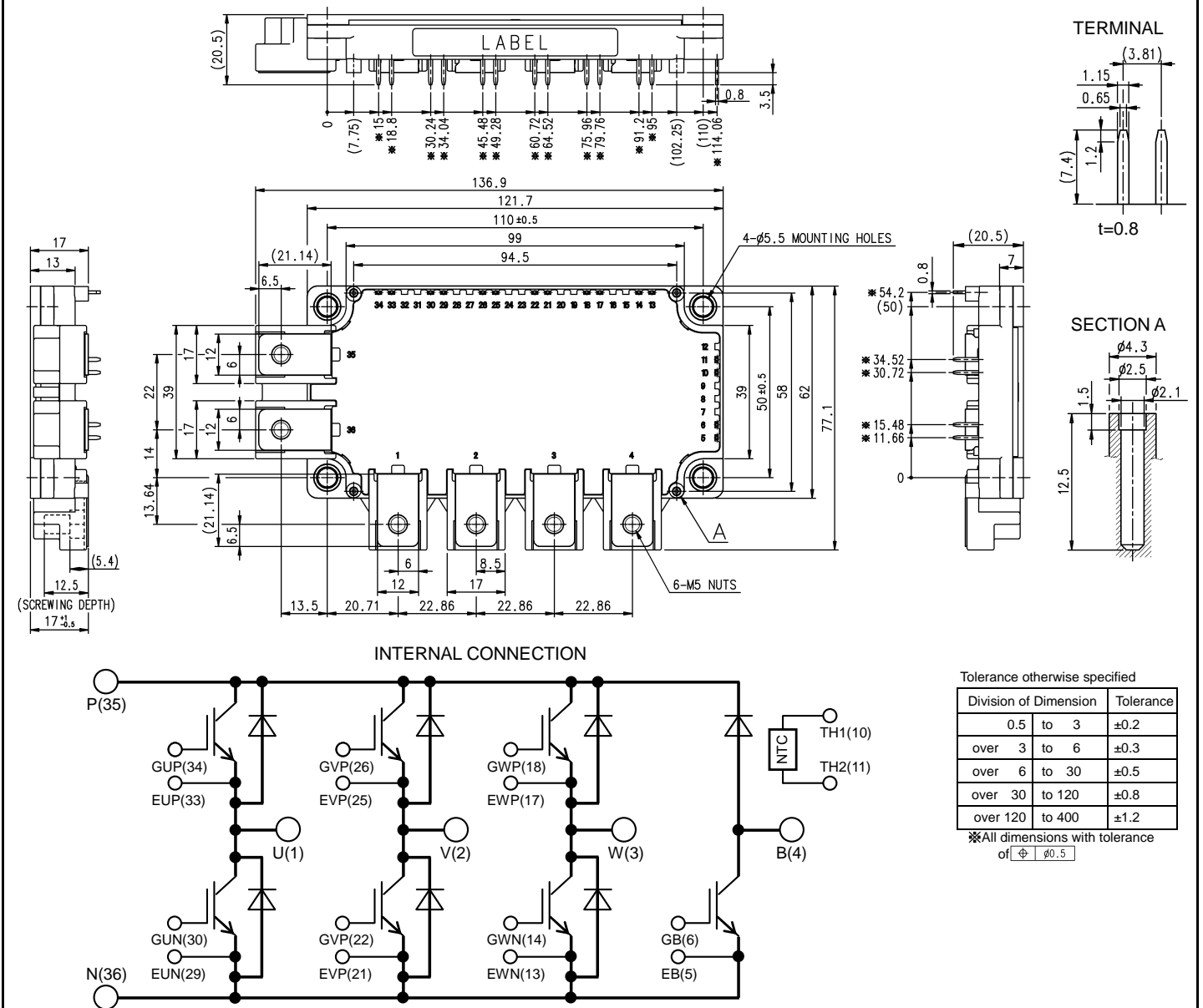
Collector current I_C 1 0 0 A
 Collector-emitter voltage V_{CES} 6 0 0 V
 Maximum junction temperature T_{jmax} 1 5 0 °C

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

APPLICATION

AC Motor Control, Motion/Servo Control, etc.

OUTLINE DRAWING & INTERNAL CONNECTION



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

※All dimensions with tolerance of ± 0.5

CM100RX-12AHIGH POWER SWITCHING USE
INSULATED TYPEMAXIMUM RATINGS ($T_J=25\text{ }^\circ\text{C}$, unless otherwise specified)

INVERTER PART IGBT/DIODE

Symbol	Item	Conditions	Rating	Unit
V_{CES}	Collector-emitter voltage	G-E short-circuited	600	V
V_{GES}	Gate-emitter voltage	C-E short-circuited	± 20	V
I_C	Collector current	DC, $T_C=75\text{ }^\circ\text{C}$ (Note2, 4)	100	A
I_{CRM}		Pulse, Repetitive (Note3)	200	
P_{tot}	Total power dissipation	$T_C=25\text{ }^\circ\text{C}$ (Note2, 4)	400	W
I_E (Note1)	Emitter current	DC (Note2)	100	A
I_{ERM} (Note1)		Pulse, Repetitive (Note3)	200	

BRAKE PART IGBT/DIODE

Symbol	Item	Conditions	Rating	Unit
V_{CES}	Collector-emitter voltage	G-E short-circuited	600	V
V_{GES}	Gate-emitter voltage	C-E short-circuited	± 20	V
I_C	Collector current	DC, $T_C=97\text{ }^\circ\text{C}$ (Note2, 4)	50	A
I_{CRM}		Pulse, Repetitive (Note3)	100	
P_{tot}	Total power dissipation	$T_C=25\text{ }^\circ\text{C}$ (Note2, 4)	280	W
V_{RRM}	Repetitive peak reverse voltage	G-E short-circuited	600	V
I_F	Forward current	DC (Note2)	50	A
I_{FRM}		Pulse, Repetitive (Note3)	100	

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_J	Junction temperature	-	-40 ~ +150	$^\circ\text{C}$
T_{stg}	Storage temperature	-	-40 ~ +125	
T_{Cmax}	Maximum case temperature	(Note4)	125	$^\circ\text{C}$

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

INVERTER 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	$I_C=10\text{ mA}$, $V_{CE}=10\text{ V}$	5	6	7	V
V_{CEsat}	Collector-emitter saturation voltage	$I_C=100\text{ A}$, $V_{GE}=15\text{ V}$ (Note5)	-	1.7	2.1	V
		Refer to the figure of test circuit				
		$I_C=100\text{ A}$, $V_{GE}=15\text{ V}$, chip (Note5)	-	1.6	-	
C_{ies}	Input capacitance	$V_{CE}=10\text{ V}$, G-E short-circuited	-	-	13.3	nF
C_{oes}	Output capacitance		-	-	1.4	
C_{res}	Reverse transfer capacitance		-	-	0.45	
Q_G	Gate charge		$V_{CC}=300\text{ V}$, $I_C=100\text{ A}$, $V_{GE}=15\text{ V}$	-	270	
$t_{d(on)}$	Turn-on delay time	$V_{CC}=300\text{ V}$, $I_C=100\text{ A}$, $V_{GE}=\pm 15\text{ V}$, $R_G=6.2\text{ }\Omega$, Inductive load	-	-	100	ns
t_r	Rise time		-	-	100	
$t_{d(off)}$	Turn-off delay time		-	-	300	
t_f	Fall time		-	-	600	
r_g	Internal gate resistance	Per switch	-	0	-	Ω

CM100RX-12A

HIGH POWER SWITCHING USE
INSULATED TYPEELECTRICAL CHARACTERISTICS (cont.; T_j=25 °C, unless otherwise specified)
INVERTER PART IGBT/DIODE

Symbol	Item	Conditions	Limits			Unit	
			Min.	Typ.	Max.		
V _{EC} (Note1)	Emitter-collector voltage	I _E =100 A, G-E short-circuited (Note5)	T _j =25 °C	-	2.0	2.8	V
		Refer to the figure of test circuit		T _j =125 °C	-	1.95	
		I _E =100 A, G-E short-circuited, chip (Note5)	-	1.9	-		
t _{rr} (Note1)	Reverse recovery time	V _{CC} =300 V, I _E =100 A, V _{GE} =±15 V,	-	-	200	ns	
Q _{rr} (Note1)	Reverse recovery charge	R _G =6.2 Ω, Inductive load	-	3.6	-	μC	
E _{on}	Turn-on switching energy per pulse	V _{CC} =300 V, I _C =I _E =100 A,	-	1.6	-	mJ	
E _{off}	Turn-off switching energy per pulse	V _{GE} =±15 V, R _G =6.2 Ω, T _j =125 °C,	-	5.2	-		
E _{rr} (Note1)	Reverse recovery energy per pulse	Inductive load	-	1.1	-	mJ	

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 =5 mA, V _{CE} =10 V	5	6	7	V	
V _{CESat}	Collector-emitter saturation voltage	I _C =50 A, V _{GE} =15 V (Note5)	T _j =25 °C	-	1.7	2.1	V
		Refer to the figure of test circuit		T _j =125 °C	-	1.9	
		I _C =50 A, V _{GE} =15 V, chip (Note5)	-	1.6	-		
C _{ies}	Input capacitance	V _{CE} =10 V, G-E short-circuited	-	-	9.3	nF	
C _{oes}	Output capacitance		-	-	1.0		
C _{res}	Reverse transfer capacitance		-	-	0.3		
Q _G	Gate charge	V _{CC} =300 V, I _C =50 A, V _{GE} =15 V	-	200	-	nC	
I _{RRM}	Repetitive peak reverse current	V _R =V _{RRM} , G-E short-circuited	-	-	1.0	mA	
V _F	Forward voltage	I _F =50 A, G-E short-circuited (Note5)	T _j =25 °C	-	2.0	2.8	V
		Refer to the figure of test circuit		T _j =125 °C	-	1.95	
		I _F =50 A, G-E short-circuited, chip (Note5)	-	1.9	-		
r _g	Internal gate resistance	-	-	0	-	Ω	

NTC THERMISTOR PART

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
R ₂₅	Zero-power resistance	T _C =25 °C (Note4)	4.85	5.00	5.15	kΩ
ΔR/R	Deviation of resistance	R ₁₀₀ =493 Ω, T _C =100 °C (Note4)	-7.3	-	+7.8	%
B _(25/50)	B-constant	Approximate by equation (Note6)	-	3375	-	K
P ₂₅	Power dissipation	T _C =25 °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)	-	-	0.31	K/W
R _{th(j-c)D}		Junction to case, per Inverter DIODE (Note4)	-	-	0.59	
R _{th(j-c)Q}		Junction to case, Brake IGBT (Note4)	-	-	0.44	K/W
R _{th(j-c)D}		Junction to case, Brake DIODE (Note4)	-	-	0.85	
R _{th(c-s)}	Contact thermal resistance	Case to heat sink, per 1 module, Thermal grease applied (Note4, 7)	-	15	-	K/kW

CM100RX-12A

HIGH POWER SWITCHING USE
INSULATED TYPE

MECHANICAL CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
M _t	Mounting torque	Main terminals M 5 screw	2.5	3.0	3.5	N·m
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	12.46	-	-	
d _a	Clearance	Terminal to terminal	9.88	-	-	mm
		Terminal to base plate	10.12	-	-	
m	mass	-	-	350	-	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 (DIODE).

- Junction temperature (T_j) should not increase beyond T_{jmax} rating.
- Pulse width and repetition rate should be such that the device junction temperature (T_j) dose not exceed T_{jmax} 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.

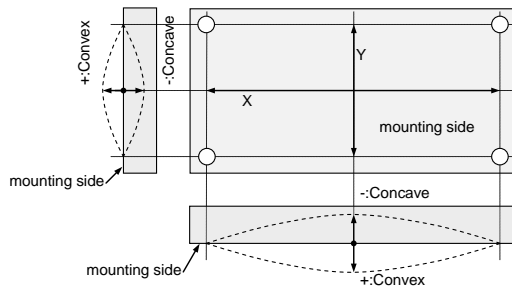
$$6. B_{(25/50)} = \ln\left(\frac{R_{25}}{R_{50}}\right) / \left(\frac{1}{T_{25}} - \frac{1}{T_{50}}\right),$$

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]

7. Typical value is measured by using thermally conductive grease of λ=0.9 W/(m·K).

8. 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 standoffs.
"φ2.3×10 or φ2.3×12, B1 tapping screw"
The length of the screw depends on the thickness (t1.6~t2.0) of the PCB.

RECOMMENDED OPERATING CONDITIONS

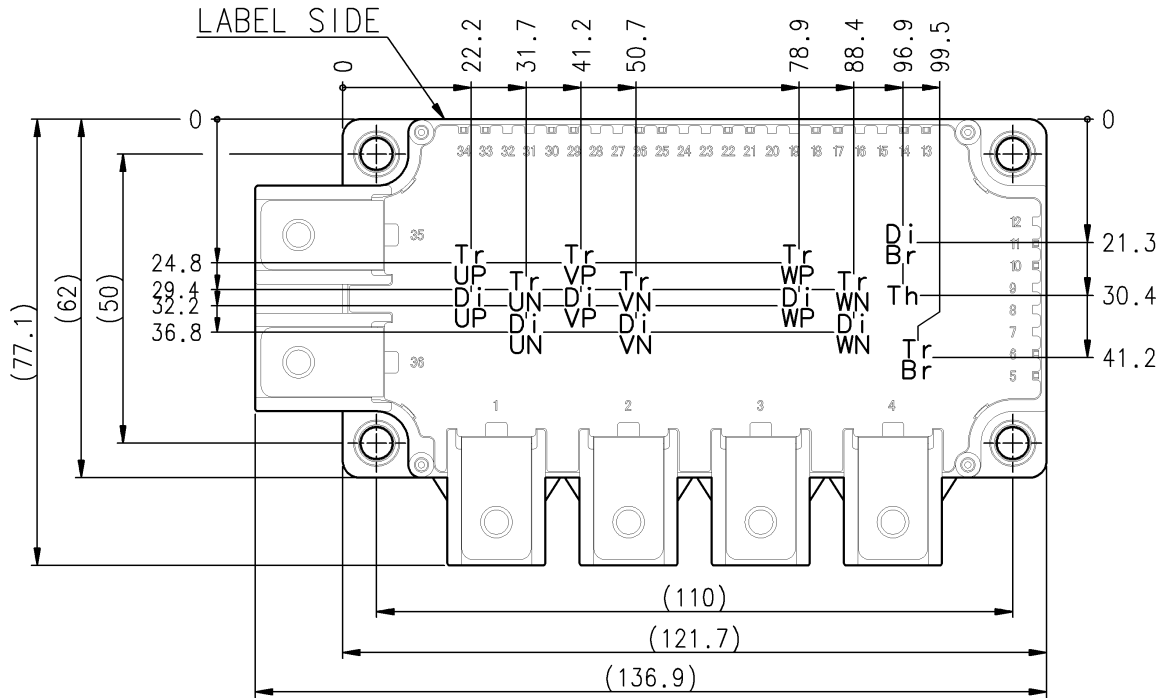
Symbol	Item	Conditions	Limits			Unit	
			Min.	Typ.	Max.		
V _{CC}	(DC) Supply voltage	Applied across P-N terminals	-	300	400	V	
V _{GEon}	Gate (-emitter drive) voltage	Applied across GB-EB / G*P-E*P / G*N-E*N (*=U, V, W) terminals	13.5	15.0	16.5	V	
R _G	External gate resistance	Per switch	Inverter IGBT	6.0	-	62	Ω
			Brake IGBT	13	-	125	

CM100RX-12A

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INSULATED TYPE

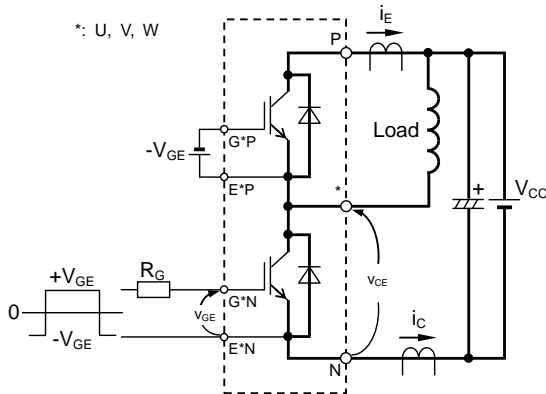
CHIP LOCATION (Top view)

Dimension in mm, tolerance: ±1 mm

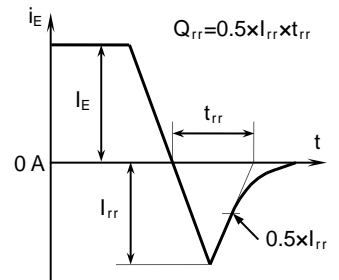
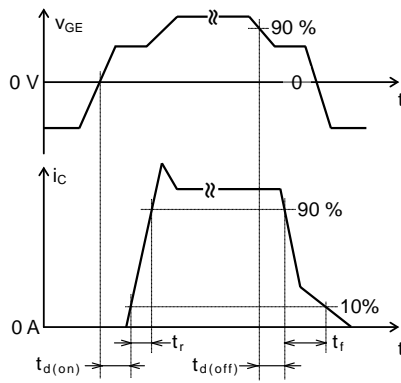


Tr*P/Tr*N/TrBr: IGBT, Di*P/Di*N: DIODE (*=U/V/W), DiBr: BRAKE DIODE, Th: NTC thermistor

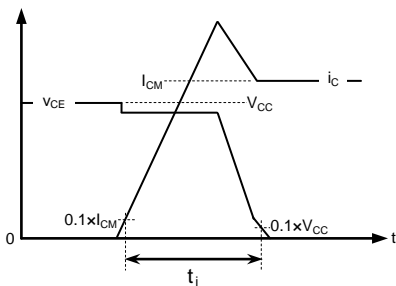
TEST CIRCUIT AND WAVEFORMS



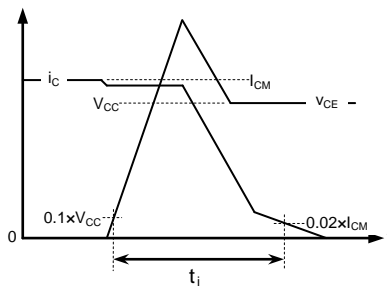
Switching test circuit and waveforms (ex. lower arm switching)



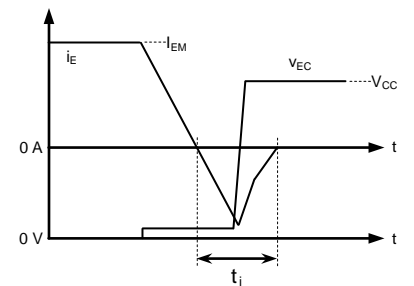
t_{rr} , Q_{rr} test waveform



IGBT Turn-on switching energy



IGBT Turn-off switching energy



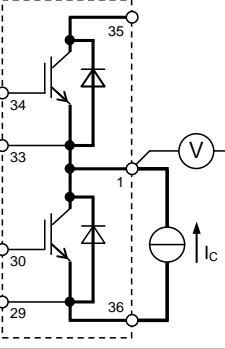
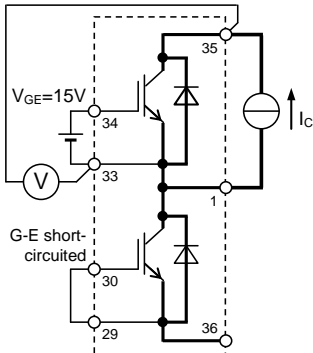
DIODE Reverse recovery energy

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

CM100RX-12A

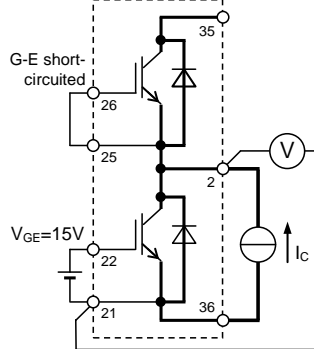
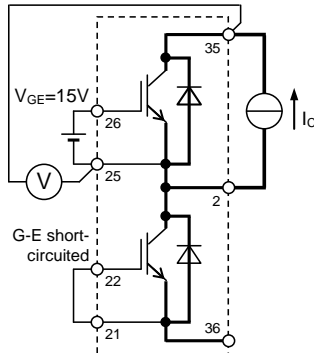
HIGH POWER SWITCHING USE
INSULATED TYPE

TEST CIRCUIT



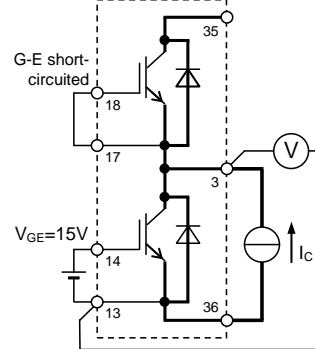
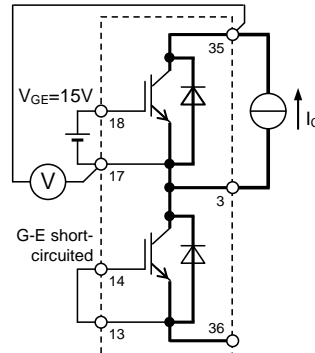
Gate-emitter GVP-EVP, GVN-EVN, short-circuited GWP-EWP, GWN-EWN, GB-EB

UP / UN IGBT



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

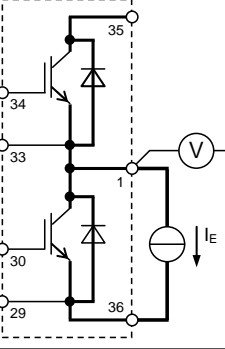
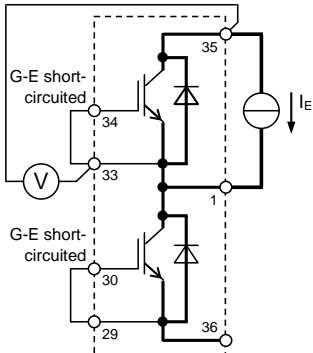
VP / VN IGBT



Gate-emitter GUP-EUP, GUN-EUN, short-circuited GVP-EVP, GVN-EVN, GWP-EWP, GWN-EWN, GB-EB

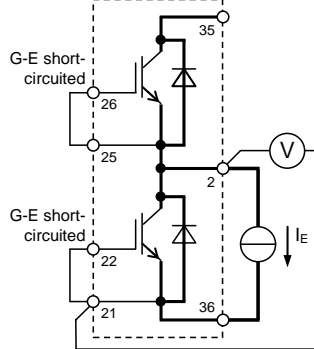
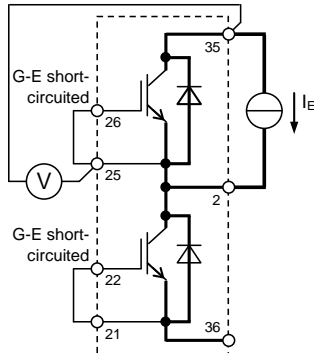
Brake IGBT

V_{CEsat} characteristics test circuit



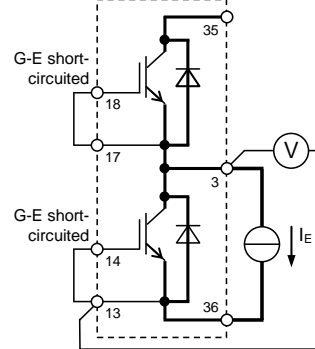
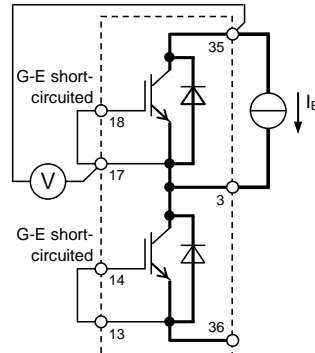
Gate-emitter GVP-EVP, GVN-EVN, short-circuited GWP-EWP, GWN-EWN, GB-EB

UP / UN DIODE



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

VP / VN DIODE



Gate-emitter GUP-EUP, GUN-EUN, short-circuited GVP-EVP, GVN-EVN, GWP-EWP, GWN-EWN

Brake DIODE

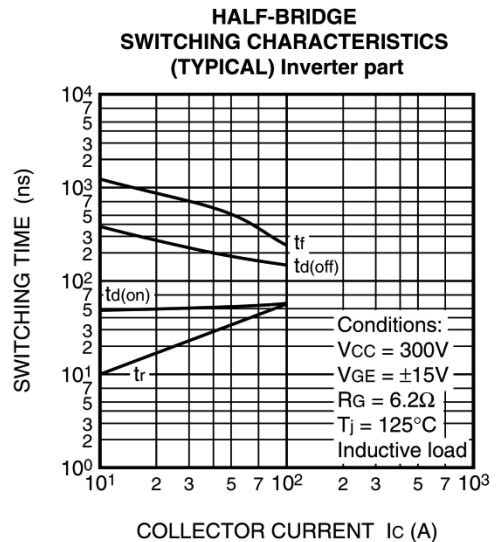
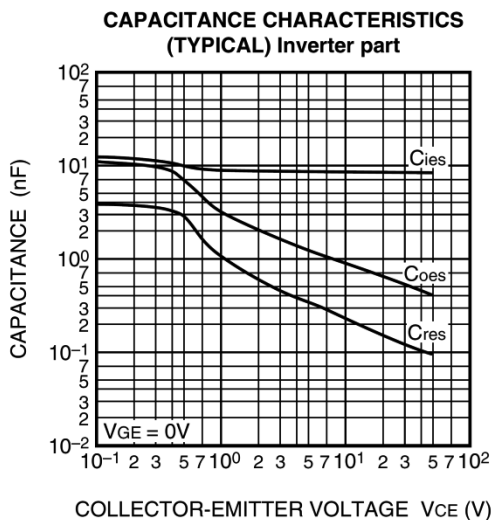
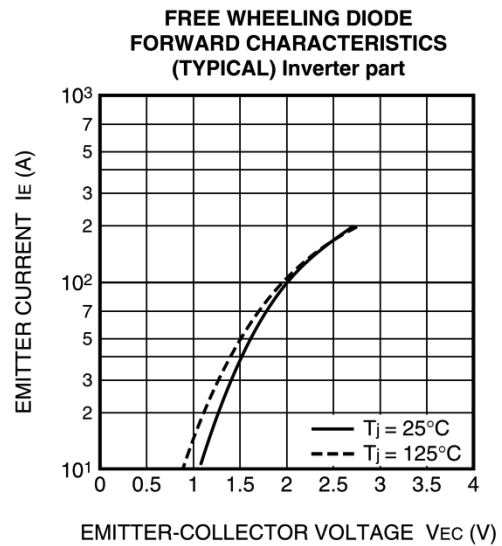
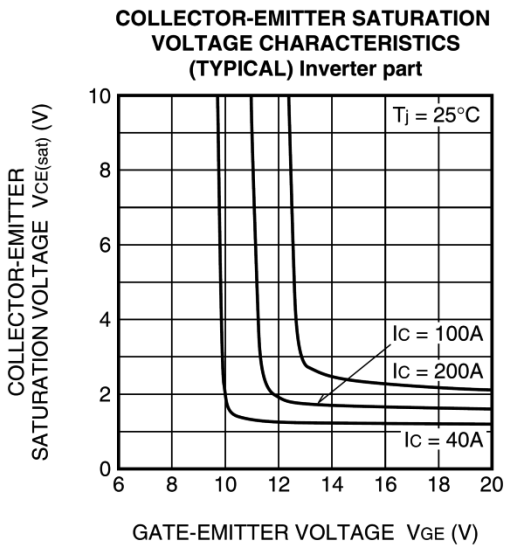
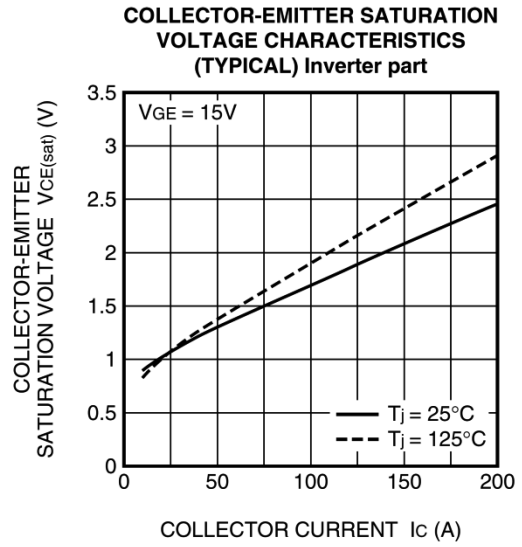
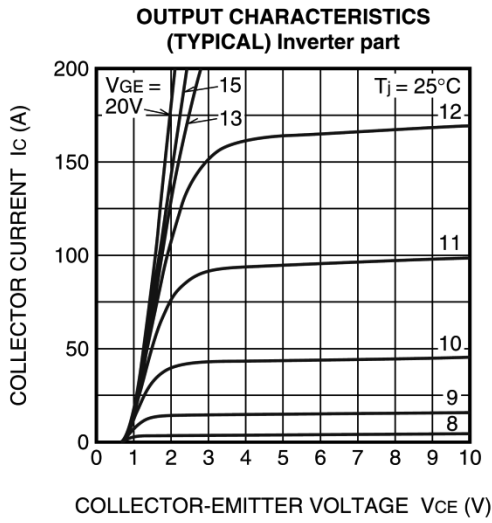
V_{EC} / Brake diode V_f characteristics test circuit

CM100RX-12A

HIGH POWER SWITCHING USE
INSULATED TYPE

PERFORMANCE CURVES

INVERTER PART

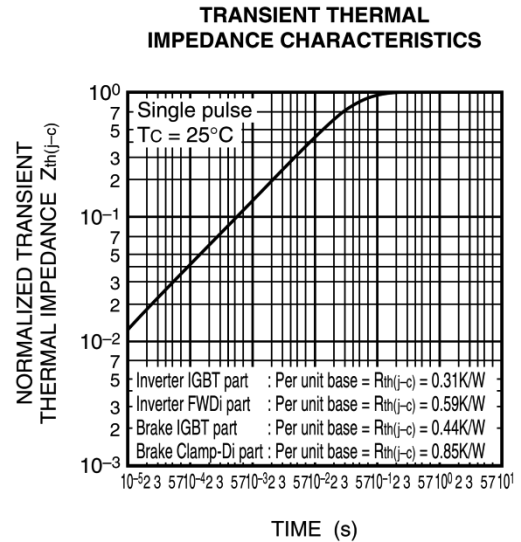
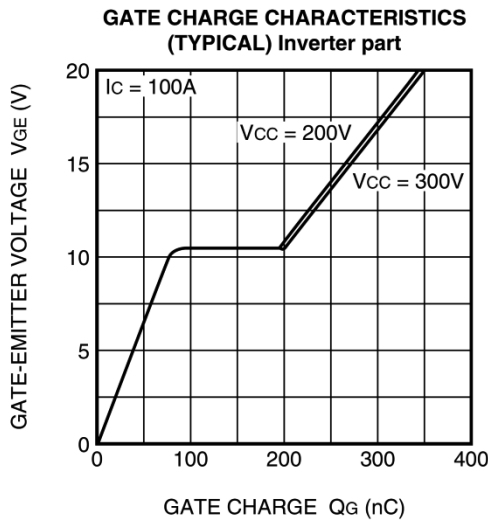
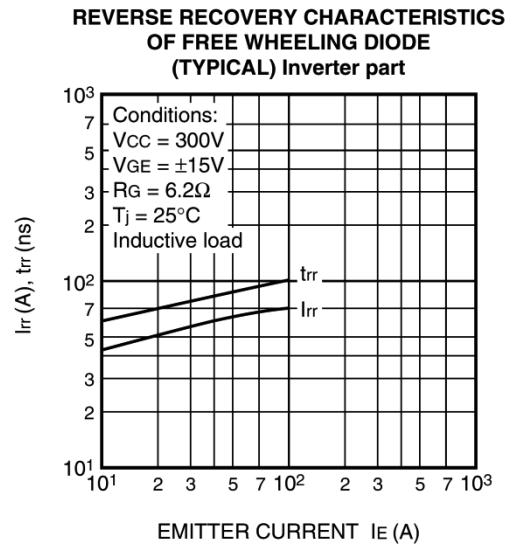
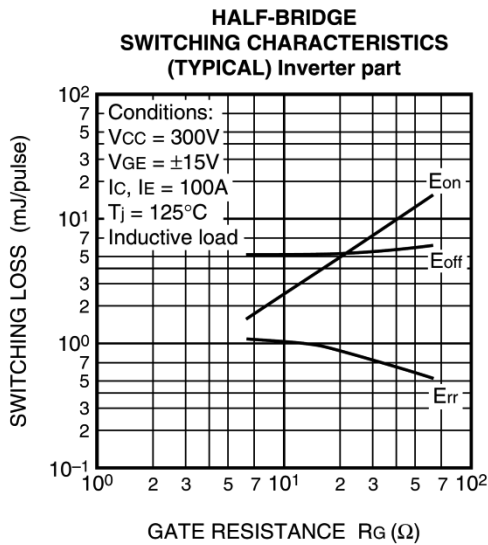
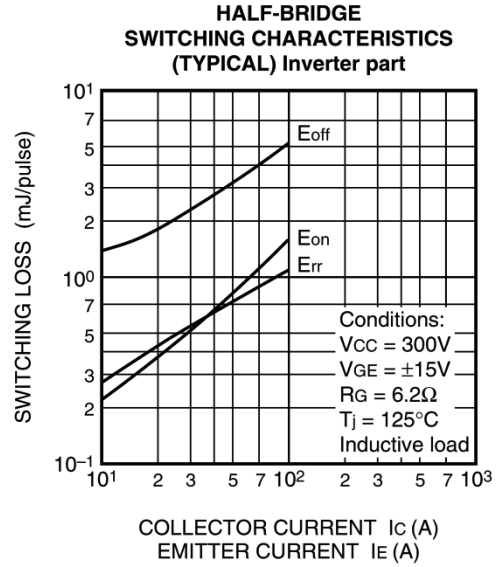
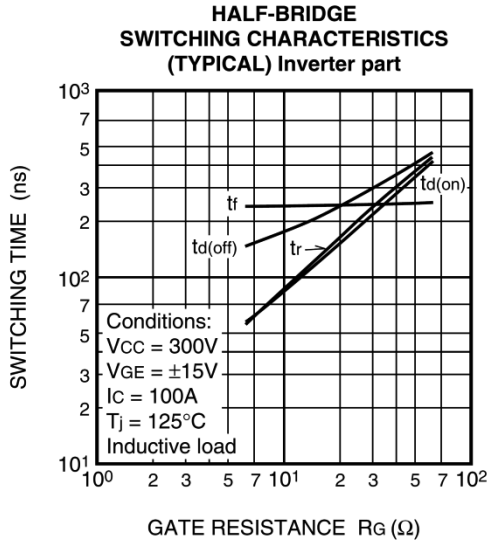


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PERFORMANCE CURVES

INVERTER PART



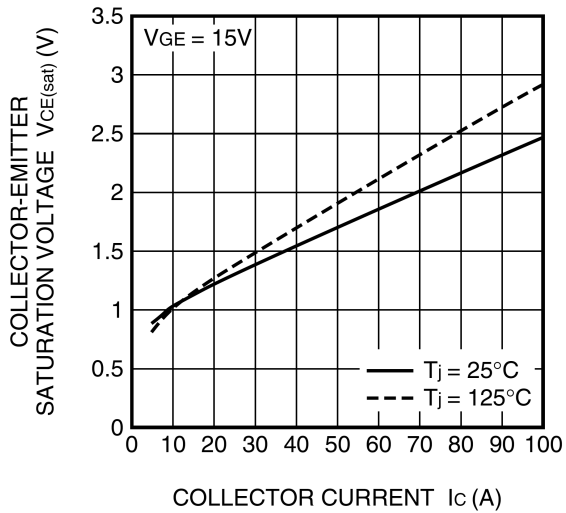
CM100RX-12A

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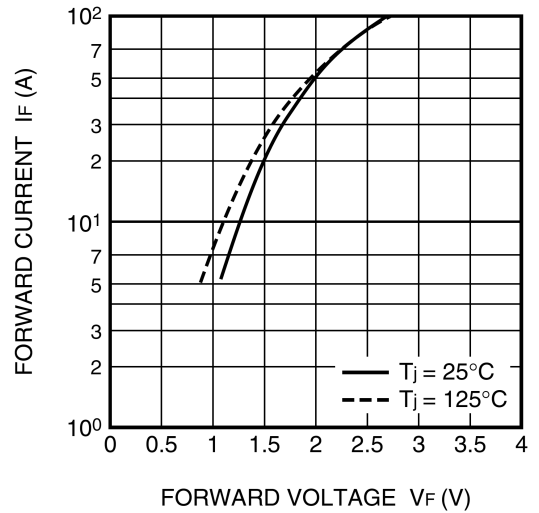
PERFORMANCE CURVES

BRAKE PART

COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL) Brake part

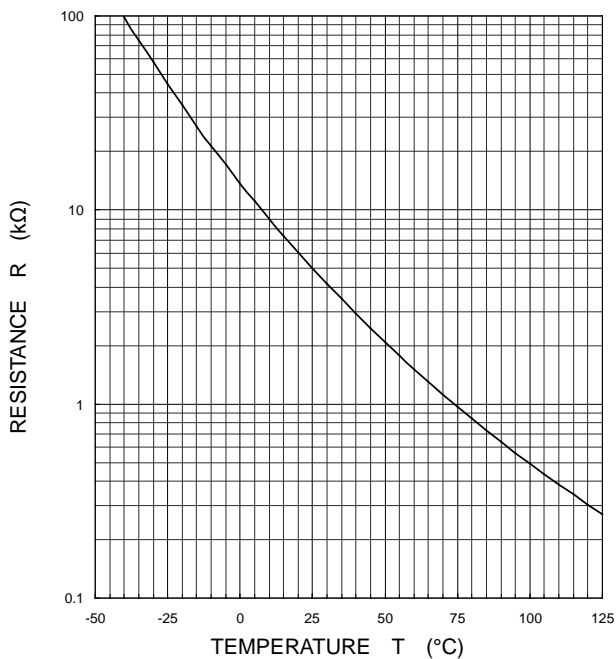


CLAMP DIODE FORWARD CHARACTERISTICS (TYPICAL) Brake part



NTC thermistor part

TEMPERATURE CHARACTERISTICS (TYPICAL)



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