

< IGBT MODULES >

# CM150RX-24S

HIGH POWER SWITCHING USE  
INSULATED TYPE



**sevenpack (3φ Inverter+Chopper Brake)**

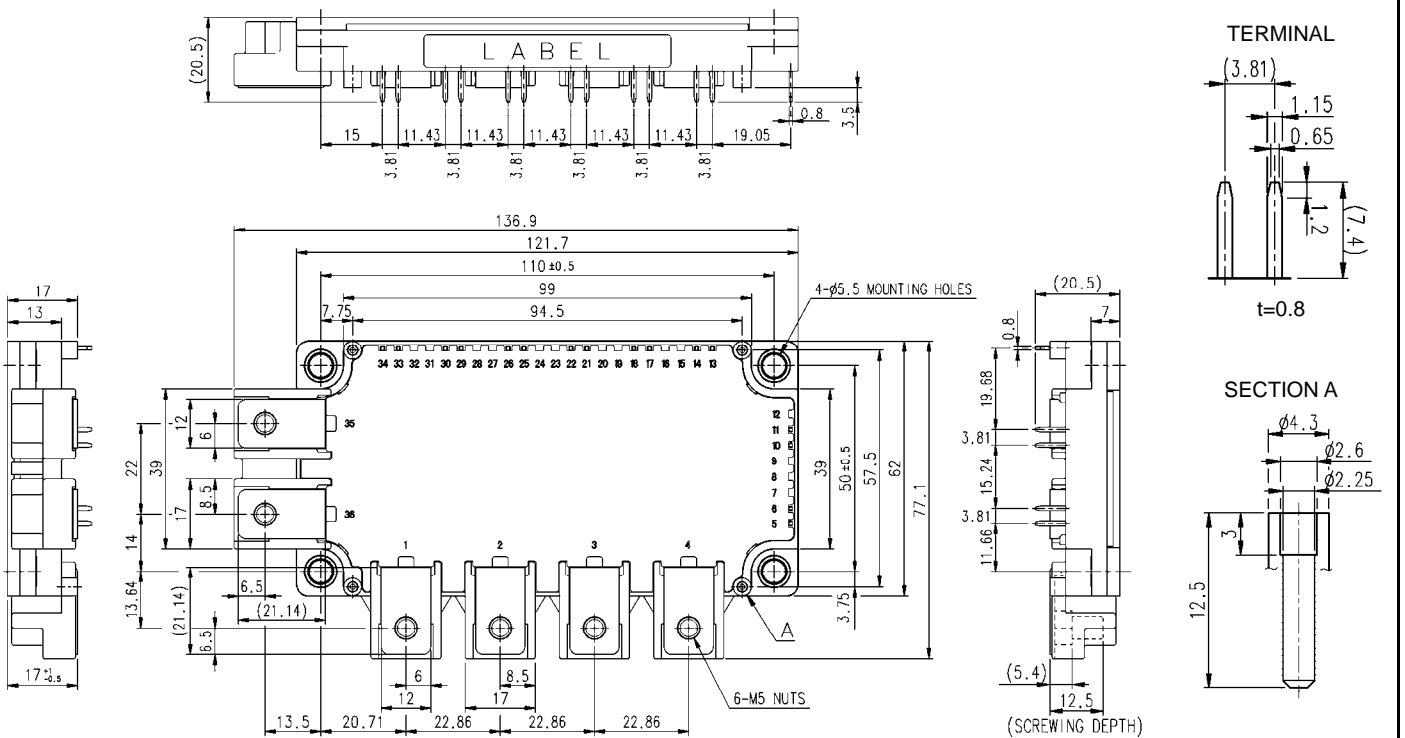
Collector current  $I_C$  ..... **150 A**  
 Collector-emitter voltage  $V_{CES}$  ..... **1200 V**  
 Maximum junction temperature  $T_{jmax}$  ..... **175 °C**

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

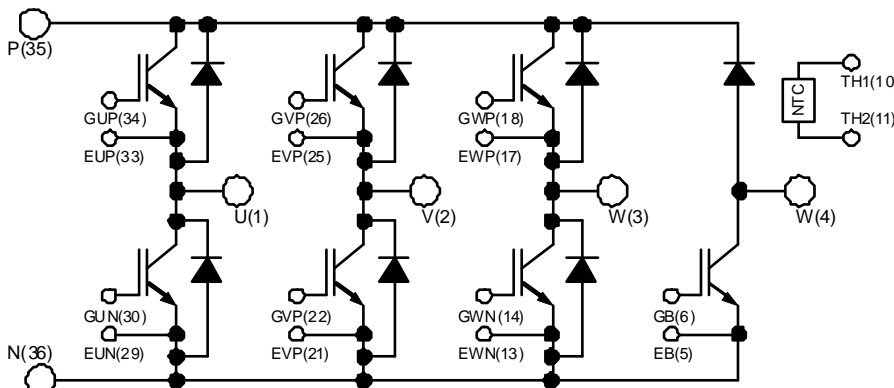
## APPLICATION

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

## OUTLINE DRAWING & INTERNAL CONNECTION



### 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

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

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ABSOLUTE MAXIMUM 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	1200	V
$V_{GES}$	Gate-emitter voltage	C-E short-circuited	$\pm 20$	V
$I_C$	Collector current	DC, $T_C=120\text{ }^\circ\text{C}$ (Note2, 4)	150	A
$I_{CRM}$		Pulse, Repetitive (Note3)	300	
$P_{tot}$	Total power dissipation	$T_C=25\text{ }^\circ\text{C}$ (Note2, 4)	1150	W
$I_E$ (Note1)	Emitter current	(Note2)	150	A
$I_{ERM}$ (Note1)		Pulse, Repetitive (Note3)	300	

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	$\pm 20$	V
$I_C$	Collector current	DC, $T_C=122\text{ }^\circ\text{C}$ (Note2, 4)	75	A
$I_{CRM}$		Pulse, Repetitive (Note3)	150	
$P_{tot}$	Total power dissipation	$T_C=25\text{ }^\circ\text{C}$ (Note2, 4)	600	W
$V_{RRM}$	Repetitive peak reverse voltage	G-E short-circuited	1200	V
$I_F$	Forward current	(Note2)	75	A
$I_{FRM}$		Pulse, Repetitive (Note3)	150	

MODULE

Symbol	Item	Conditions	Rating	Unit
$V_{isol}$	Isolation voltage	Terminals to base plate, RMS, $f=60\text{ Hz}$ , AC 1 min	2500	V
$T_{jmax}$	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/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	$\mu\text{A}$	
$V_{GE(th)}$	Gate-emitter threshold voltage	$I_C=15\text{ mA}$ , $V_{CE}=10\text{ V}$	5.4	6.0	6.6	V	
$V_{CEsat}$	Collector-emitter saturation voltage	$I_C=150\text{ A}$ (Note5), $V_{GE}=15\text{ V}$ , (Terminal)	$T_j=25\text{ }^\circ\text{C}$	-	1.80	2.25	V
			$T_j=125\text{ }^\circ\text{C}$	-	2.00	-	
		$I_C=150\text{ A}$ (Note5), $V_{GE}=15\text{ V}$ , (Chip)	$T_j=25\text{ }^\circ\text{C}$	-	1.70	2.15	V
$T_j=125\text{ }^\circ\text{C}$	-		1.90	-			
$C_{ies}$	Input capacitance	$V_{CE}=10\text{ V}$ , G-E short-circuited	-	-	15	nF	
$C_{oes}$	Output capacitance		-	-	3.0		
$C_{res}$	Reverse transfer capacitance		-	-	0.25		
$Q_G$	Gate charge	$V_{CC}=600\text{ V}$ , $I_C=150\text{ A}$ , $V_{GE}=15\text{ V}$	-	350	-	nC	
$t_{d(on)}$	Turn-on delay time	$V_{CC}=600\text{ V}$ , $I_C=150\text{ A}$ , $V_{GE}=\pm 15\text{ V}$ , $R_G=0\text{ }\Omega$ , Inductive load	-	-	800	ns	
$t_r$	Rise time		-	-	200		
$t_{d(off)}$	Turn-off delay time		-	-	600		
$t_f$	Fall time		-	-	300		

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ELECTRICAL CHARACTERISTICS (cont; T<sub>j</sub>=25 °C, unless otherwise specified)

INVERTER PART IGBT/DIODE

Symbol	Item	Conditions	Limits			Unit	
			Min.	Typ.	Max.		
V <sub>EC</sub> (Note1)	Emitter-collector voltage	I <sub>E</sub> =150 A (Note5), G-E short-circuited, (Terminal)	T <sub>j</sub> =25 °C	-	1.80	2.25	V
			T <sub>j</sub> =125 °C	-	1.80	-	
			T <sub>j</sub> =150 °C	-	1.80	-	
		I <sub>E</sub> =150 A (Note5), G-E short-circuited, (Chip)	T <sub>j</sub> =25 °C	-	1.70	2.15	V
			T <sub>j</sub> =125 °C	-	1.70	-	
			T <sub>j</sub> =150 °C	-	1.70	-	
t <sub>rr</sub> (Note1)	Reverse recovery time	V <sub>CC</sub> =600 V, I <sub>E</sub> =150 A, V <sub>GE</sub> =±15 V,	-	-	300	ns	
Q <sub>rr</sub> (Note1)	Reverse recovery charge	R <sub>G</sub> =0 Ω, Inductive load	-	8.0	-	μC	
E <sub>on</sub>	Turn-on switching energy per pulse	V <sub>CC</sub> =600 V, I <sub>C</sub> =I <sub>E</sub> =150 A,	-	24.2	-	mJ	
E <sub>off</sub>	Turn-off switching energy per pulse	V <sub>GE</sub> =±15 V, R <sub>G</sub> =0 Ω, T <sub>j</sub> =150 °C,	-	16	-		
E <sub>rr</sub> (Note1)	Reverse recovery energy per pulse	Inductive load	-	12.2	-	mJ	
R <sub>CC+EE'</sub>	Internal lead resistance	Main terminals-chip, per switch, T <sub>C</sub> =25 °C (Note4)	-	-	1.8	mΩ	
r <sub>g</sub>	Internal gate resistance	Per switch	-	13	-	Ω	

BRAKE PART IGBT/DIODE

Symbol	Item	Conditions	Limits			Unit	
			Min.	Typ.	Max.		
I <sub>CES</sub>	Collector-emitter cut-off current	V <sub>CE</sub> =V <sub>CES</sub> , G-E short-circuited	-	-	1.0	mA	
I <sub>GES</sub>	Gate-emitter leakage current	V <sub>GE</sub> =V <sub>GES</sub> , C-E short-circuited	-	-	0.5	μA	
V <sub>GE(th)</sub>	Gate-emitter threshold voltage	I <sub>C</sub> =7.5 mA, V <sub>CE</sub> =10 V	5.4	6.0	6.6	V	
V <sub>CEsat</sub>	Collector-emitter saturation voltage	I <sub>C</sub> =75 A (Note5), V <sub>GE</sub> =15 V, (Terminal)	T <sub>j</sub> =25 °C	-	1.80	2.25	V
			T <sub>j</sub> =125 °C	-	2.00	-	
			T <sub>j</sub> =150 °C	-	2.05	-	
		I <sub>C</sub> =75 A (Note5), V <sub>GE</sub> =15 V, (Chip)	T <sub>j</sub> =25 °C	-	1.70	2.15	V
			T <sub>j</sub> =125 °C	-	1.90	-	
			T <sub>j</sub> =150 °C	-	1.95	-	
C <sub>ies</sub>	Input capacitance	V <sub>CE</sub> =10 V, G-E short-circuited	-	-	7.5	nF	
C <sub>oes</sub>	Output capacitance		-	-	1.5		
C <sub>res</sub>	Reverse transfer capacitance		-	-	0.13		
Q <sub>G</sub>	Gate charge	V <sub>CC</sub> =600 V, I <sub>C</sub> =75 A, V <sub>GE</sub> =15 V	-	175	-	nC	
t <sub>d(on)</sub>	Turn-on delay time	V <sub>CC</sub> =600 V, I <sub>C</sub> =75 A, V <sub>GE</sub> =±15 V, R <sub>G</sub> =8.2 Ω, Inductive load	-	-	300	ns	
t <sub>r</sub>	Rise time		-	-	200		
t <sub>d(off)</sub>	Turn-off delay time		-	-	600		
t <sub>f</sub>	Fall time		-	-	300		
I <sub>RRM</sub>	Reverse current	V <sub>R</sub> =V <sub>RRM</sub> , G-E short-circuited	-	-	1.0	mA	
V <sub>F</sub>	Forward voltage	I <sub>E</sub> =75 A (Note5), G-E short-circuited, (Terminal)	T <sub>j</sub> =25 °C	-	1.80	2.25	V
			T <sub>j</sub> =125 °C	-	1.80	-	
			T <sub>j</sub> =150 °C	-	1.80	-	
		I <sub>E</sub> =75 A (Note5), G-E short-circuited, (Chip)	T <sub>j</sub> =25 °C	-	1.70	2.15	V
			T <sub>j</sub> =125 °C	-	1.70	-	
			T <sub>j</sub> =150 °C	-	1.70	-	
t <sub>rr</sub>	Reverse recovery time	V <sub>CC</sub> =600 V, I <sub>E</sub> =75 A, V <sub>GE</sub> =±15 V,	-	-	300	ns	
Q <sub>rr</sub>	Reverse recovery charge	R <sub>G</sub> =8.2 Ω, Inductive load	-	4.0	-	μC	
E <sub>on</sub>	Turn-on switching energy per pulse	V <sub>CC</sub> =600 V, I <sub>C</sub> =I <sub>E</sub> =75 A,	-	7.3	-	mJ	
E <sub>off</sub>	Turn-off switching energy per pulse	V <sub>GE</sub> =±15 V, R <sub>G</sub> =8.2 Ω, T <sub>j</sub> =150 °C,	-	8.0	-		
E <sub>rr</sub>	Reverse recovery energy per pulse	Inductive load	-	6.9	-	mJ	
r <sub>g</sub>	Internal gate resistance	-	-	0	-	Ω	

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**HIGH POWER SWITCHING USE**  
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**ELECTRICAL CHARACTERISTICS (cont; T<sub>j</sub>=25 °C, unless otherwise specified)**

**NTC THERMISTOR PART**

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
R <sub>25</sub>	Zero-power resistance	T <sub>C</sub> =25 °C (Note4)	4.85	5.00	5.15	kΩ
ΔR/R	Deviation of resistance	R <sub>100</sub> =493 Ω, T <sub>C</sub> =100 °C (Note4)	-7.3	-	+7.8	%
B <sub>(25/50)</sub>	B-constant	Approximate by equation (Note7)	-	3375	-	K
P <sub>25</sub>	Power dissipation	T <sub>C</sub> =25 °C (Note4)	-	-	10	mW

**THERMAL RESISTANCE CHARACTERISTICS**

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
R <sub>th(j-c)Q</sub>	Thermal resistance (Note4)	Junction to case, per Inverter IGBT	-	-	0.13	K/W
R <sub>th(j-c)D</sub>		Junction to case, per Inverter DIODE	-	-	0.23	
R <sub>th(j-c)Q</sub>		Junction to case, per Brake IGBT	-	-	0.25	K/W
R <sub>th(j-c)D</sub>		Junction to case, per Brake DIODE	-	-	0.40	
R <sub>th(c-s)</sub>	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 <sub>t</sub>	Mounting torque	Main terminals M 5 screw	2.5	3.0	3.5	N·m
M <sub>s</sub>	Mounting torque	Mounting to heat sink M 5 screw	2.5	3.0	3.5	N·m
d <sub>s</sub>	Creepage distance	Terminal to terminal	10.25	-	-	mm
		Terminal to base plate	12.32	-	-	
d <sub>a</sub>	Clearance	Terminal to terminal	10.28	-	-	mm
		Terminal to base plate	10.85	-	-	
m	mass	-	-	370	-	g
e <sub>c</sub>	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<sub>j</sub>) should not increase beyond T<sub>jmax</sub> rating.
- Pulse width and repetition rate should be such that the device junction temperature (T<sub>j</sub>) dose not exceed T<sub>jmax</sub> rating.
- Case temperature (T<sub>C</sub>) and heat sink temperature (T<sub>s</sub>) 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.

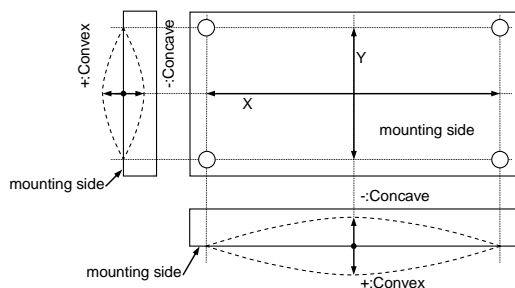
$$6. B_{(25/50)} = \ln\left(\frac{R_{25}}{R_{50}}\right) / \left(\frac{1}{T_{25}} - \frac{1}{T_{50}}\right),$$

R<sub>25</sub>: resistance at absolute temperature T<sub>25</sub> [K]; T<sub>25</sub>=25 [°C]+273.15=298.15 [K]

R<sub>50</sub>: resistance at absolute temperature T<sub>50</sub> [K]; T<sub>50</sub>=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.



9. Use the following screws when mounting the printed circuit board (PCB) on the stand offs.

"φ2.6×10 or φ2.6×12 self tapping screw"

The length of the screw depends on the thickness (t1.6~t2.0) of the PCB.

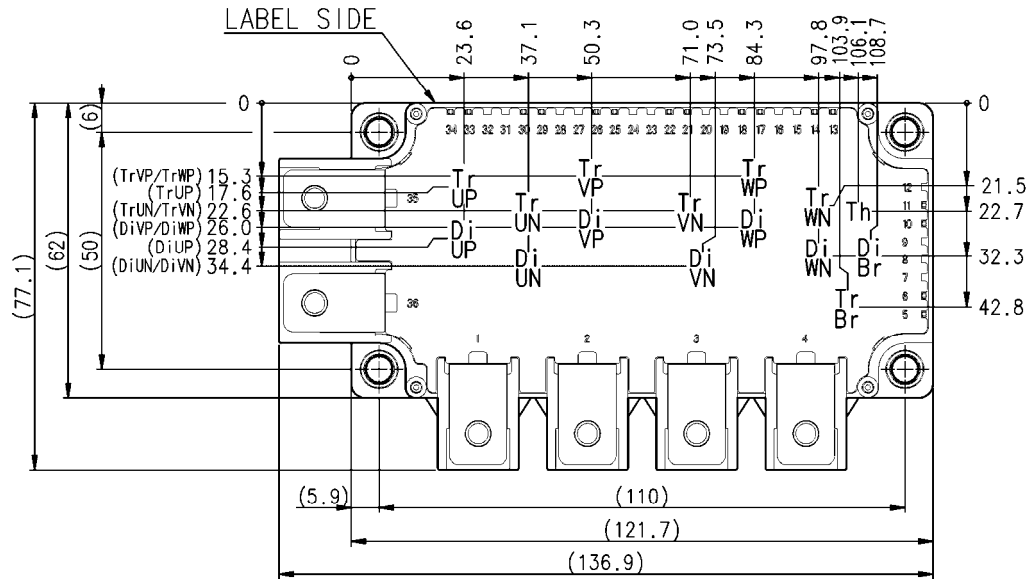
< IGBT MODULES >  
**CM150RX-24S**  
 HIGH POWER SWITCHING USE  
 INSULATED TYPE

**RECOMMENDED OPERATING CONDITIONS**

Symbol	Item	Conditions	Limits			Unit	
			Min.	Typ.	Max.		
$V_{CC}$	(DC) Supply voltage	Applied across P-N terminals	-	600	850	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	0	-	30	$\Omega$
			Brake IGBT	8.2	-	82	

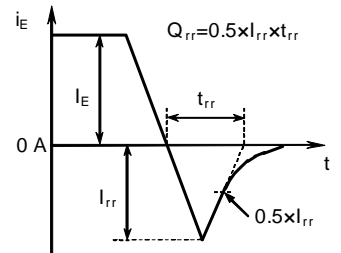
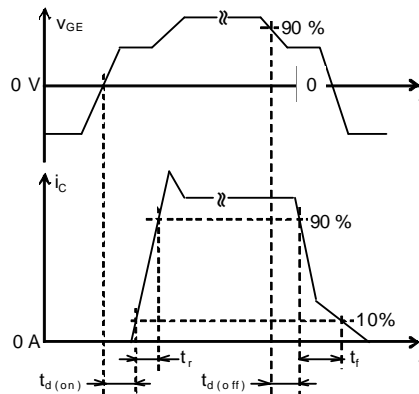
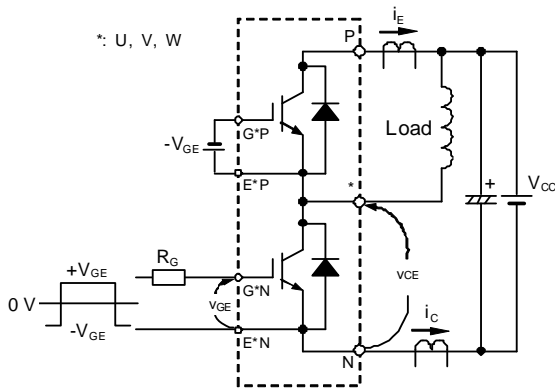
**CHIP LOCATION (Top view)**

Dimension in mm, tolerance:  $\pm 1$  mm



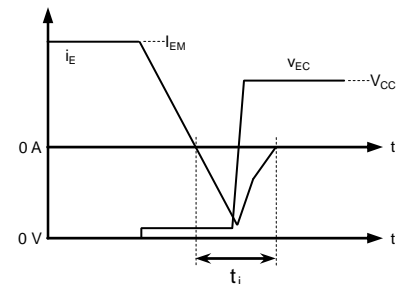
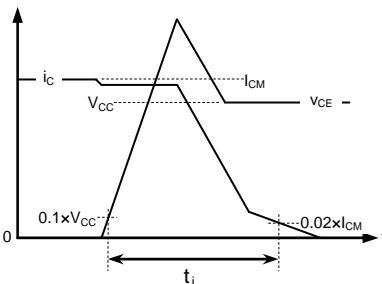
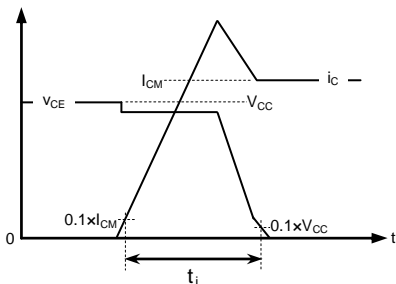
Tr\*P/Tr\*N/TrBr: IGBT, Di\*P/Di\*N: DIODE (\*=U/V/W), DiBr: BRAKE DIODE, Th: NTC thermistor

**TEST CIRCUIT AND WAVEFORMS**



**Switching characteristics test circuit and waveforms**

**$t_{rr}$ ,  $Q_{rr}$  test waveform**



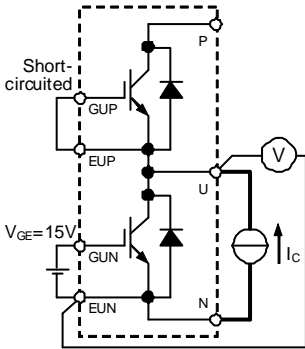
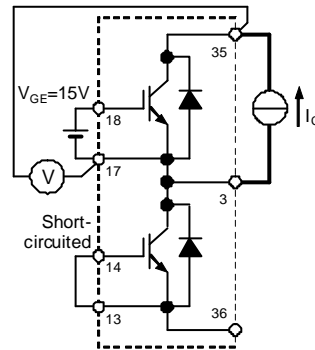
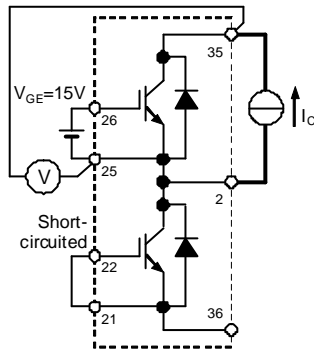
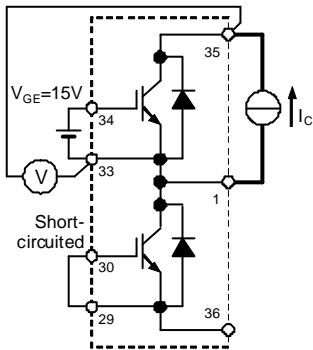
**IGBT Turn-on switching energy**

**IGBT Turn-off switching energy**

**DIODE Reverse recovery energy**

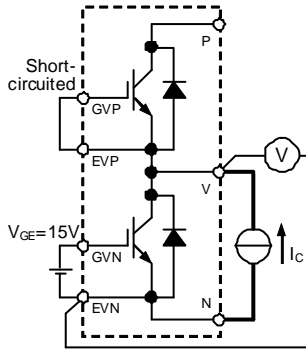
Turn-on / Turn-off switching energy and Reverse recovery energy test waveforms (Integral time instruction drawing)

TEST CIRCUIT



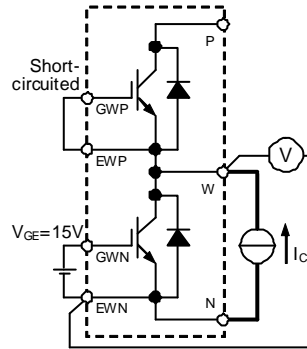
Gate-emitter GVP-EVP, GVN-EVN, short-circuited GWP-EWP, GWN-EWN, GB-EB

UP / UN IGBT



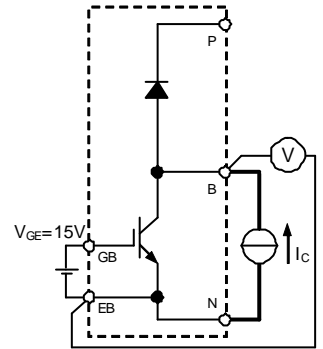
Gate-emitter GUP-EUP, GUN-EUN, short-circuited GWP-EWP, GWN-EWN, GB-EB

VP / VN IGBT



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

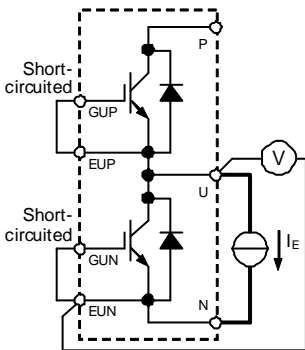
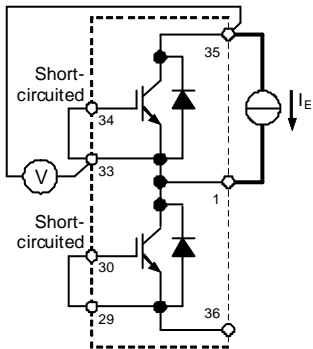
WP / WN IGBT



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

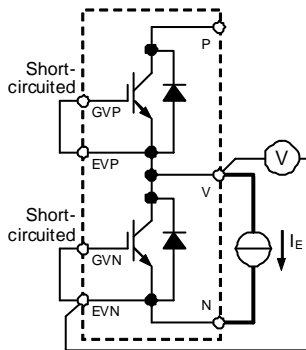
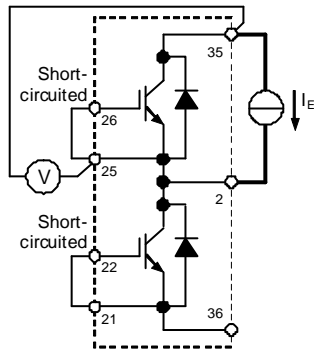
Brake IGBT

V<sub>CEsat</sub> test circuit



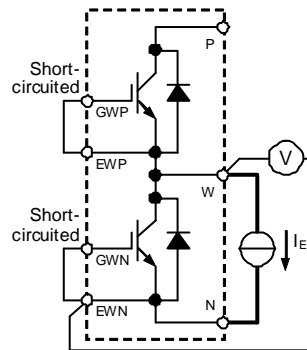
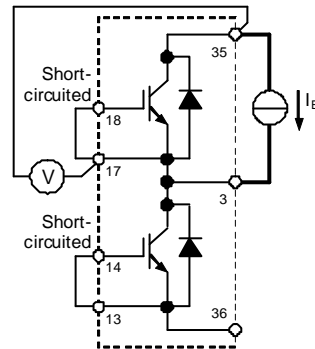
Gate-emitter GVP-EVP, GVN-EVN, short-circuited GWP-EWP, GWN-EWN, GB-EB

UP / UN DIODE



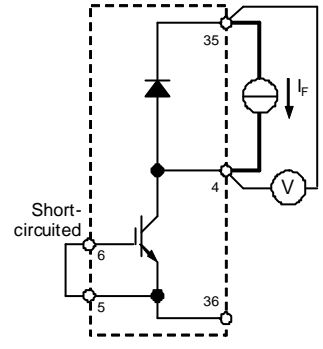
Gate-emitter GUP-EUP, GUN-EUN, short-circuited GWP-EWP, GWN-EWN, GB-EB

VP / VN DIODE



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

WP / WN DIODE



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

Brake DIODE

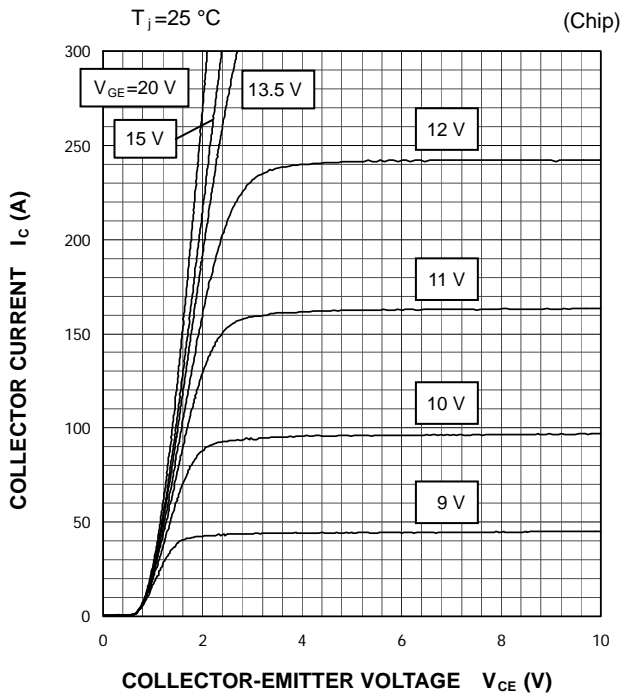
V<sub>EC</sub> / V<sub>F</sub> test circuit

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**CM150RX-24S**  
 HIGH POWER SWITCHING USE  
 INSULATED TYPE

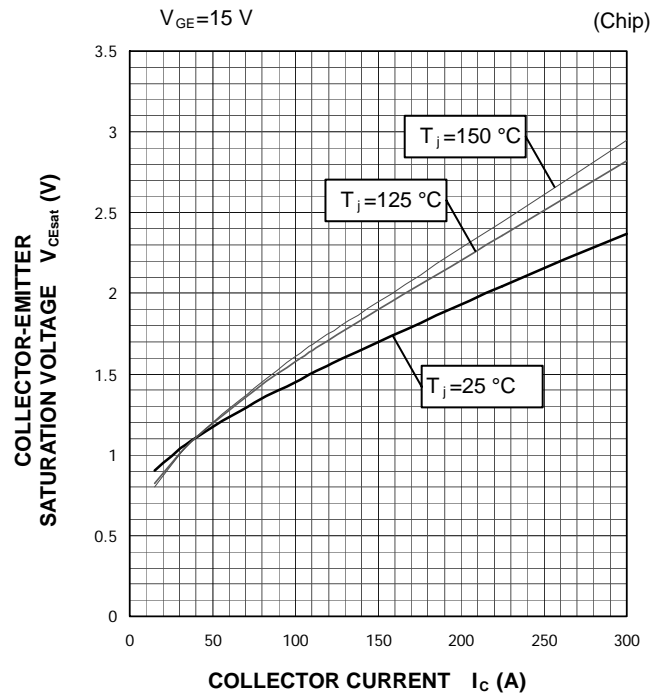
PERFORMANCE CURVES

INVERTER PART

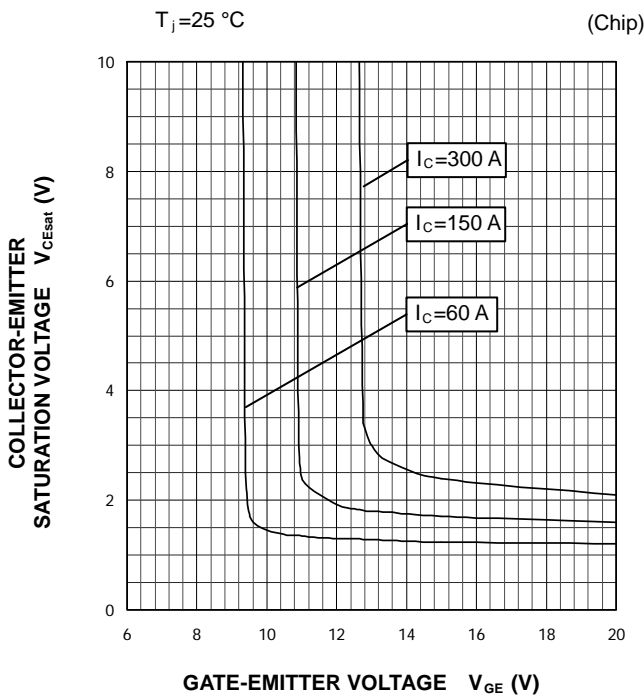
OUTPUT CHARACTERISTICS  
 (TYPICAL)



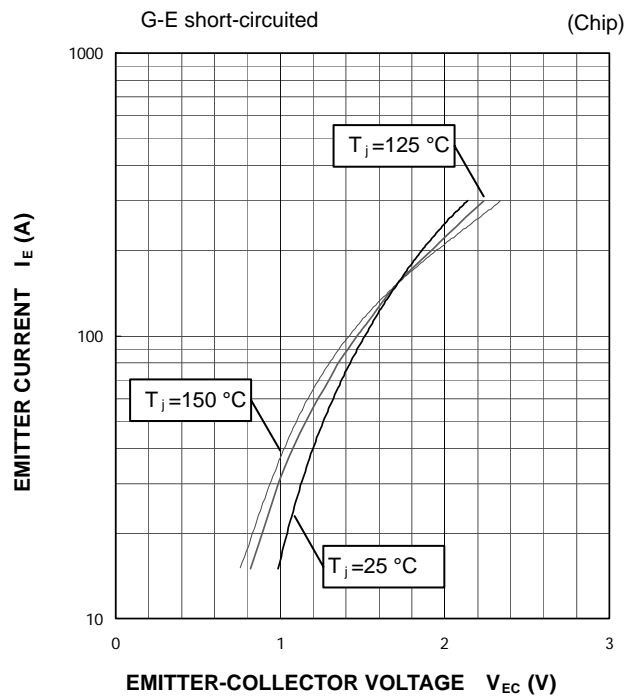
COLLECTOR-EMITTER SATURATION VOLTAGE  
 CHARACTERISTICS  
 (TYPICAL)



COLLECTOR-EMITTER SATURATION VOLTAGE  
 CHARACTERISTICS  
 (TYPICAL)



FREE WHEELING DIODE  
 FORWARD CHARACTERISTICS  
 (TYPICAL)



< IGBT MODULES >  
**CM150RX-24S**

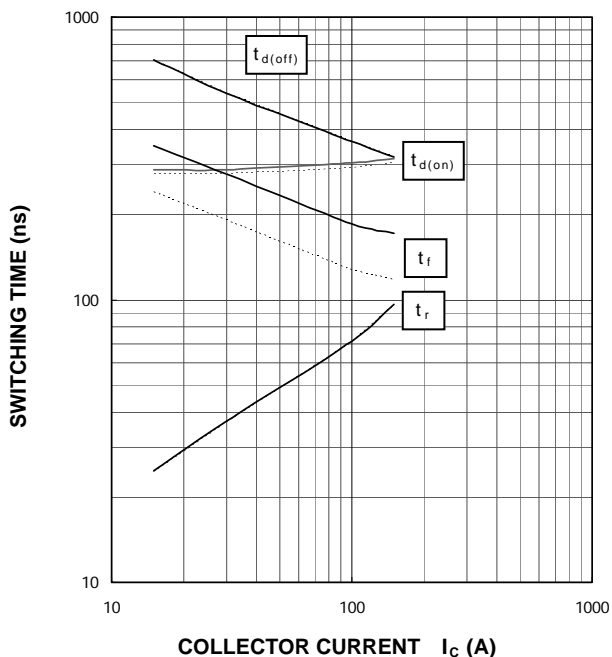
**HIGH POWER SWITCHING USE**  
**INSULATED TYPE**

**PERFORMANCE CURVES**

**INVERTER PART**

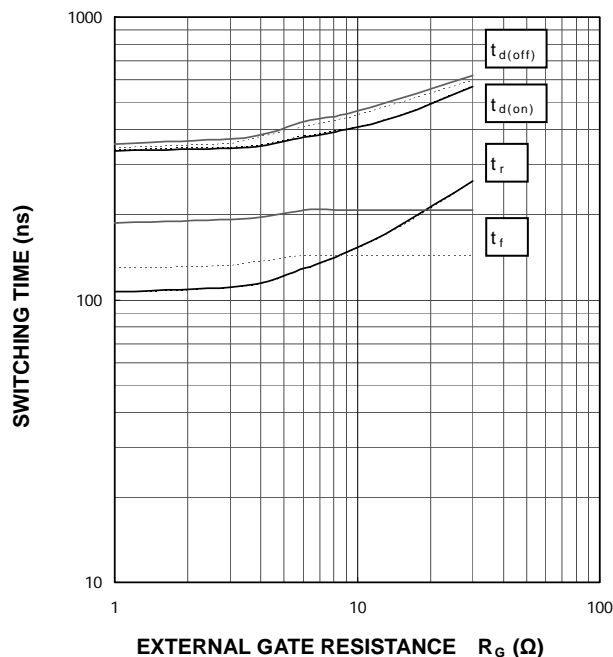
**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**

$V_{CC}=600\text{ V}$ ,  $V_{GE}=\pm 15\text{ V}$ ,  $R_G=0\ \Omega$ , INDUCTIVE LOAD  
 —:  $T_j=150\text{ }^\circ\text{C}$ , - - - -:  $T_j=125\text{ }^\circ\text{C}$



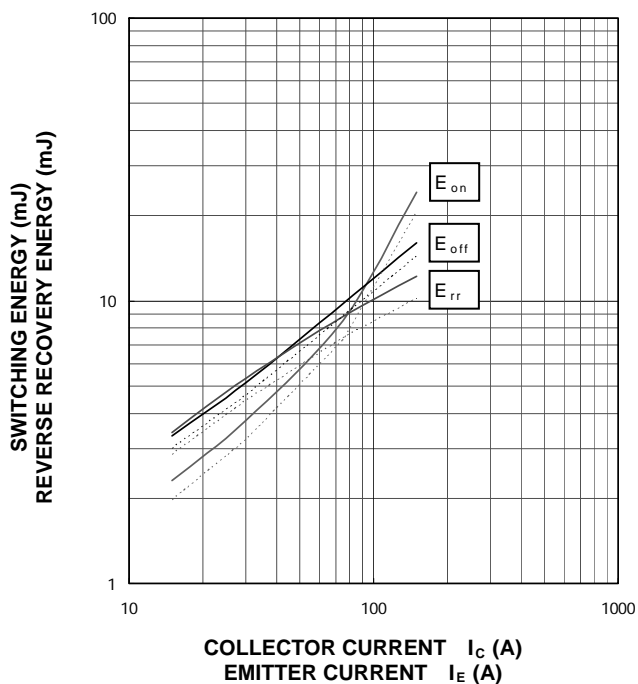
**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**

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



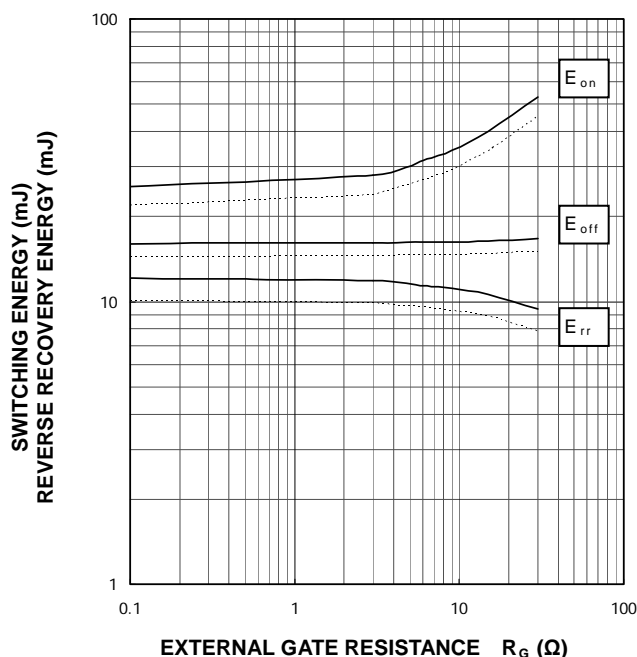
**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**

$V_{CC}=600\text{ V}$ ,  $V_{GE}=\pm 15\text{ V}$ ,  $R_G=0\ \Omega$ ,  
 INDUCTIVE LOAD, PER PULSE  
 —:  $T_j=150\text{ }^\circ\text{C}$ , - - - -:  $T_j=125\text{ }^\circ\text{C}$



**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**

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





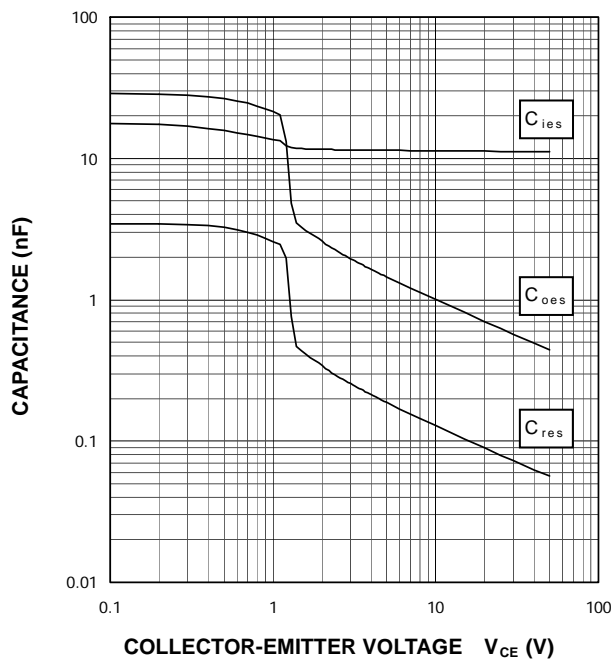
< IGBT MODULES >  
**CM150RX-24S**  
 HIGH POWER SWITCHING USE  
 INSULATED TYPE

PERFORMANCE CURVES

INVERTER PART

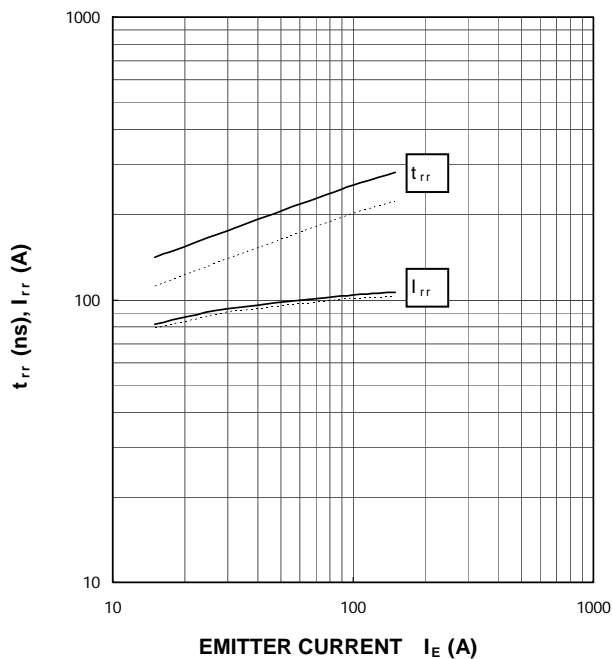
**CAPACITANCE CHARACTERISTICS (TYPICAL)**

G-E short-circuited,  $T_j=25\text{ }^\circ\text{C}$



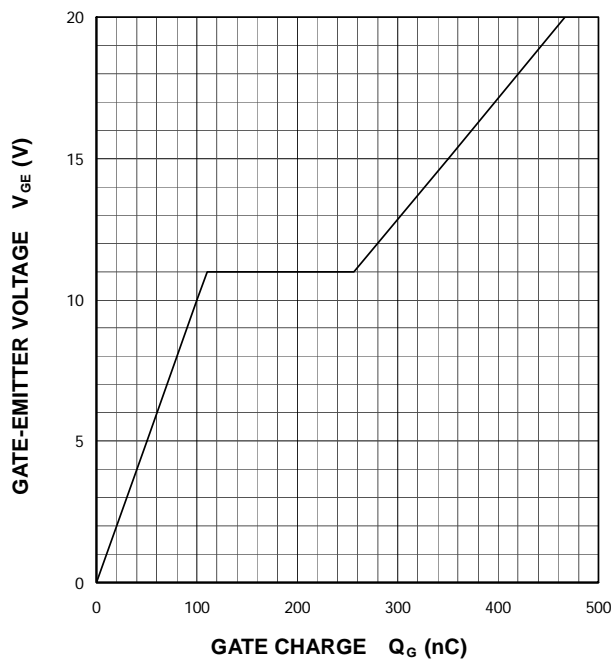
**FREE WHEELING DIODE REVERSE RECOVERY CHARACTERISTICS (TYPICAL)**

$V_{CC}=600\text{ V}$ ,  $V_{GE}=\pm 15\text{ V}$ ,  $R_G=0\ \Omega$ , INDUCTIVE LOAD  
 —:  $T_j=150\text{ }^\circ\text{C}$ , - - - -:  $T_j=125\text{ }^\circ\text{C}$



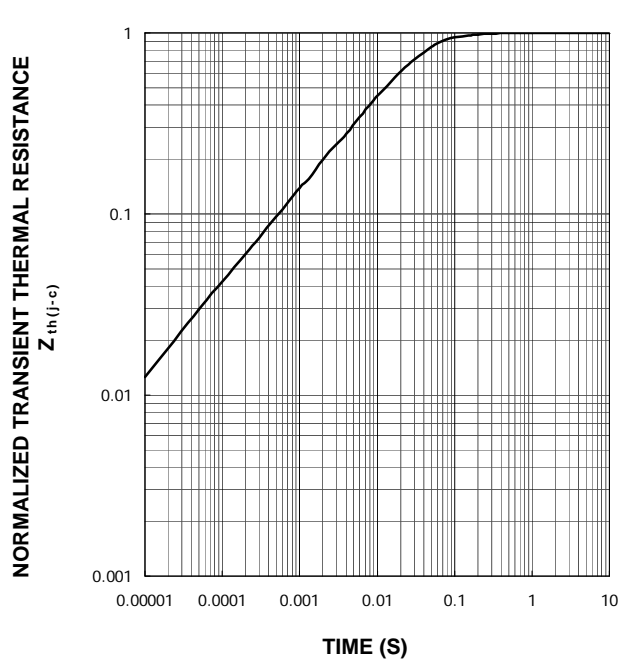
**GATE CHARGE CHARACTERISTICS (TYPICAL)**

$V_{CC}=600\text{ V}$ ,  $I_C=150\text{ A}$ ,  $T_j=25\text{ }^\circ\text{C}$



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (MAXIMUM)**

Single pulse,  $T_C=25\text{ }^\circ\text{C}$   
 $R_{th(j-c)Q}=0.13\text{ K/W}$ ,  $R_{th(j-c)D}=0.23\text{ K/W}$

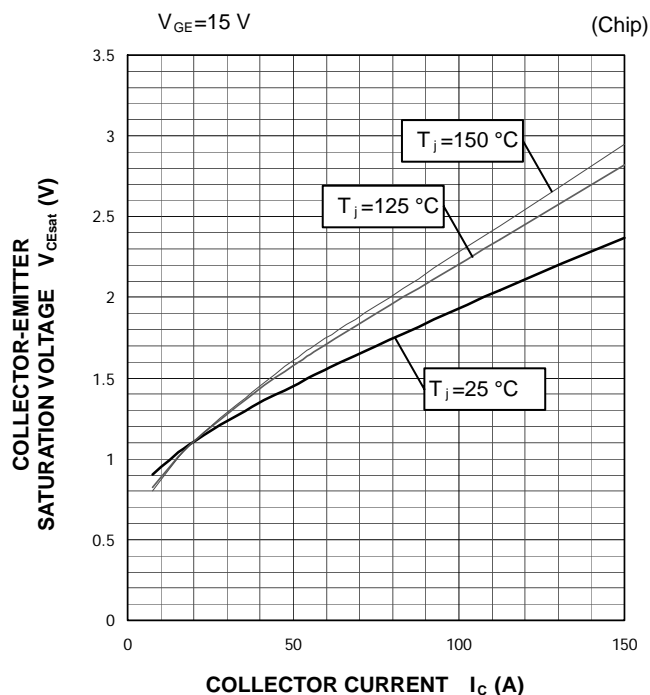


< IGBT MODULES >  
**CM150RX-24S**  
 HIGH POWER SWITCHING USE  
 INSULATED TYPE

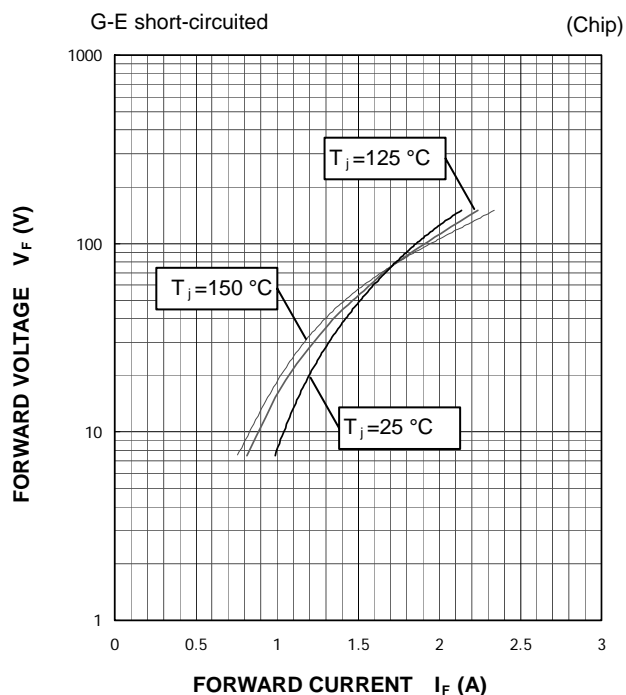
**PERFORMANCE CURVES**

**BRAKE PART**

**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**

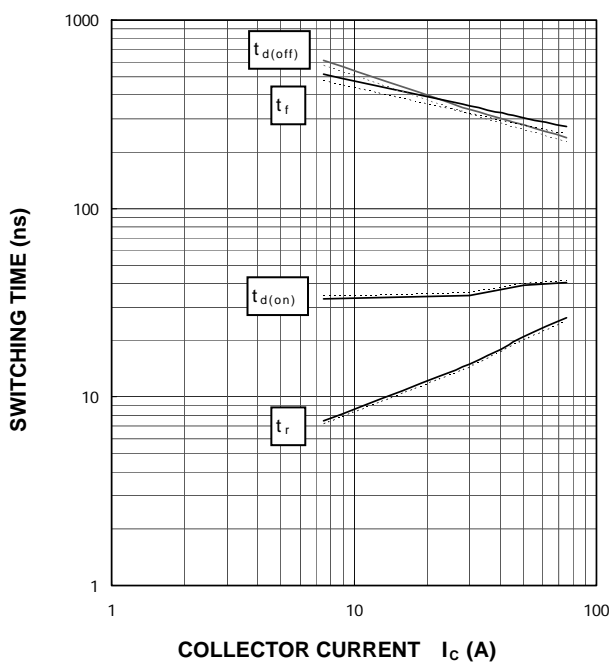


**CLAMP DIODE FORWARD CHARACTERISTICS (TYPICAL)**



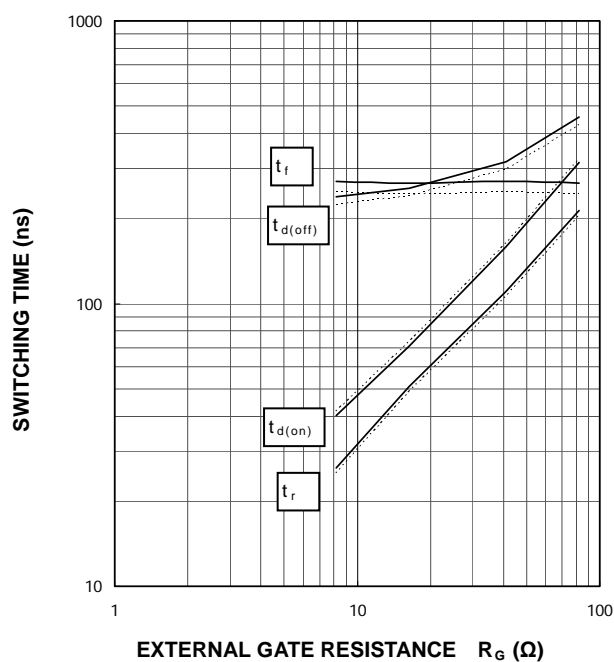
**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**

$V_{CC}=600\text{ V}$ ,  $V_{GE}=\pm 15\text{ V}$ ,  $R_G=8.2\ \Omega$ , INDUCTIVE LOAD  
 —:  $T_j=150\text{ }^\circ\text{C}$ , - - - -:  $T_j=125\text{ }^\circ\text{C}$



**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**

$V_{CC}=600\text{ V}$ ,  $I_C=75\text{ A}$ ,  $V_{GE}=\pm 15\text{ V}$ , INDUCTIVE LOAD  
 —:  $T_j=150\text{ }^\circ\text{C}$ , - - - -:  $T_j=125\text{ }^\circ\text{C}$



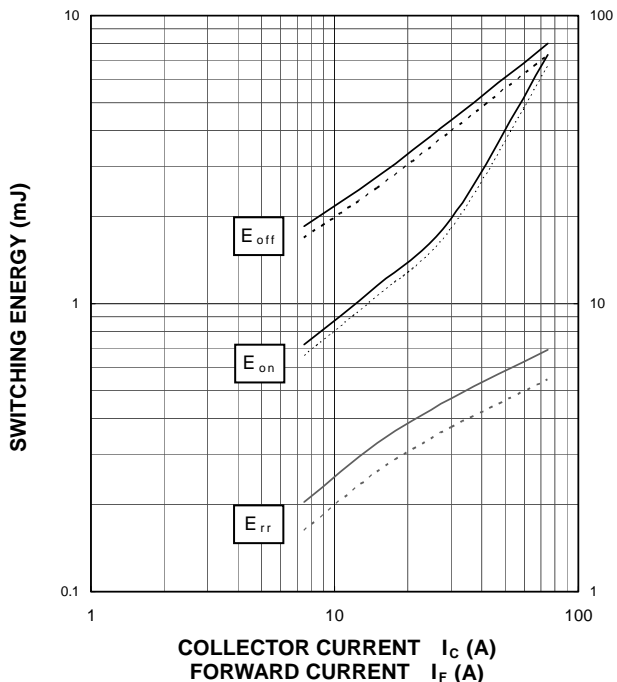
< IGBT MODULES >  
**CM150RX-24S**  
 HIGH POWER SWITCHING USE  
 INSULATED TYPE

**PERFORMANCE CURVES**

**BRAKE PART**

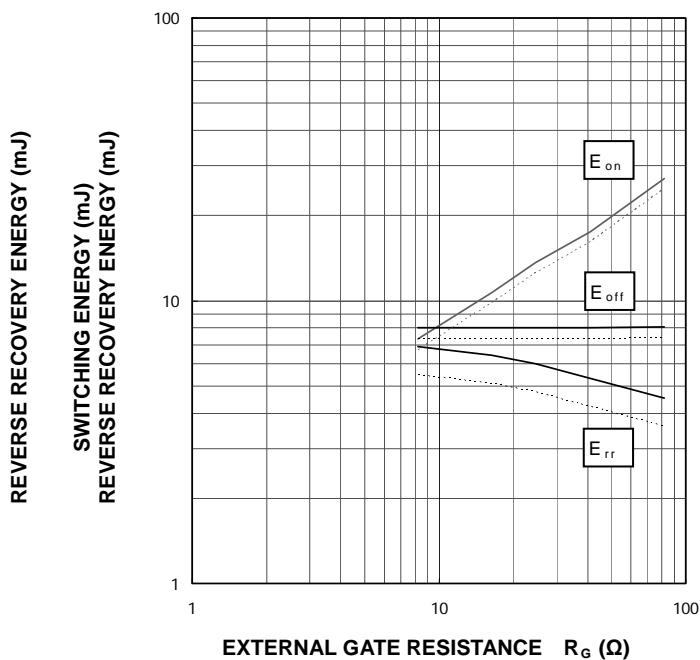
**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**

$V_{CC}=600\text{ V}$ ,  $V_{GE}=\pm 15\text{ V}$ ,  $R_G=8.2\ \Omega$ ,  
 INDUCTIVE LOAD, PER PULSE  
 —:  $T_j=150\text{ }^\circ\text{C}$ , - - - - -:  $T_j=125\text{ }^\circ\text{C}$



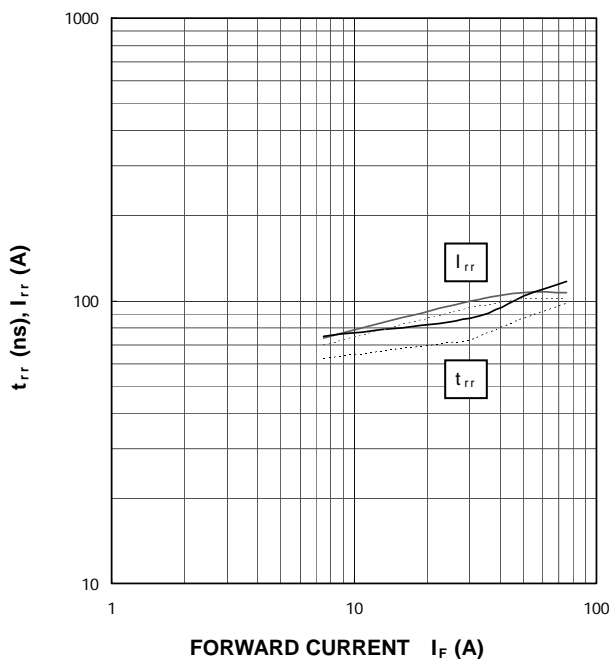
**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**

$V_{CC}=600\text{ V}$ ,  $I_C/I_F=75\text{ A}$ ,  $V_{GE}=\pm 15\text{ V}$ ,  
 INDUCTIVE LOAD, PER PULSE  
 —:  $T_j=150\text{ }^\circ\text{C}$ , - - - - -:  $T_j=125\text{ }^\circ\text{C}$



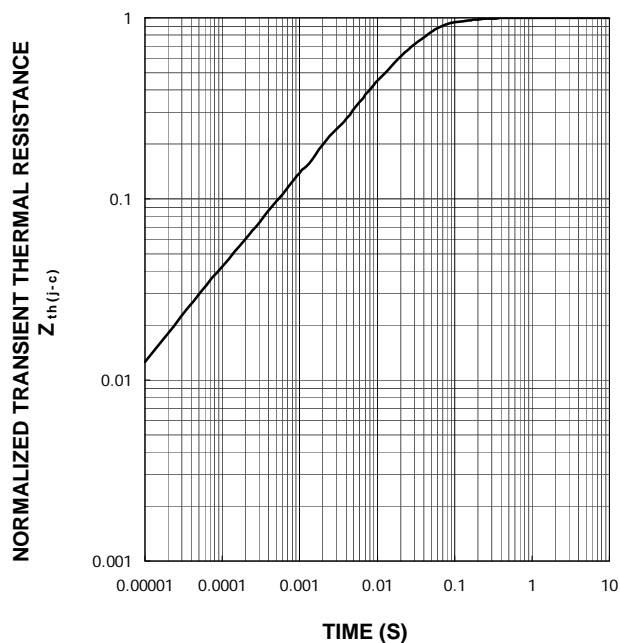
**CLAMP DIODE REVERSE RECOVERY CHARACTERISTICS (TYPICAL)**

$V_{CC}=600\text{ V}$ ,  $V_{GE}=\pm 15\text{ V}$ ,  $R_G=8.2\ \Omega$ , INDUCTIVE LOAD  
 —:  $T_j=150\text{ }^\circ\text{C}$ , - - - - -:  $T_j=125\text{ }^\circ\text{C}$



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (MAXIMUM)**

Single pulse,  $T_C=25\text{ }^\circ\text{C}$   
 $R_{th(j-c)Q}=0.25\text{ K/W}$ ,  $R_{th(j-c)D}=0.40\text{ K/W}$



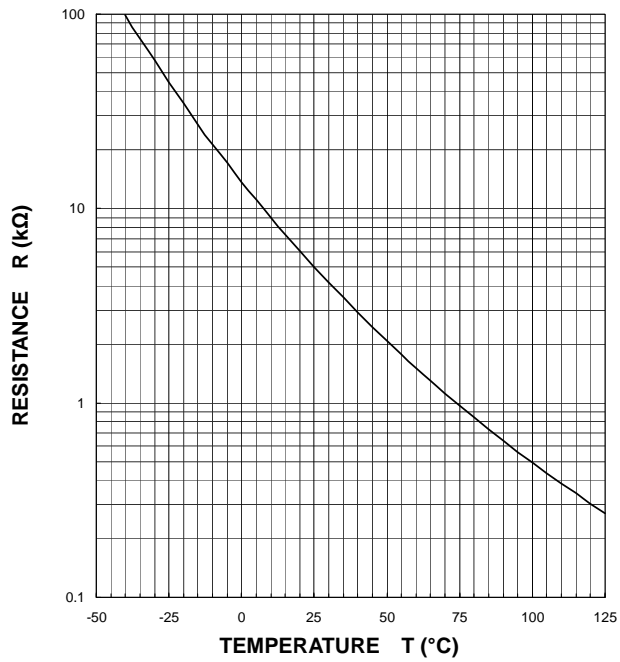
< IGBT MODULES >  
CM150RX-24S  
HIGH POWER SWITCHING USE  
INSULATED TYPE

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PERFORMANCE CURVES

NTC thermistor part

TEMPERATURE CHARACTERISTICS  
(TYPICAL)



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