

MITSUBISHI IGBT MODULES  
**CM150RL-24NF**

HIGH POWER SWITCHING USE

**CM150RL-24NF**



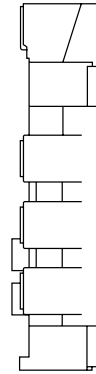
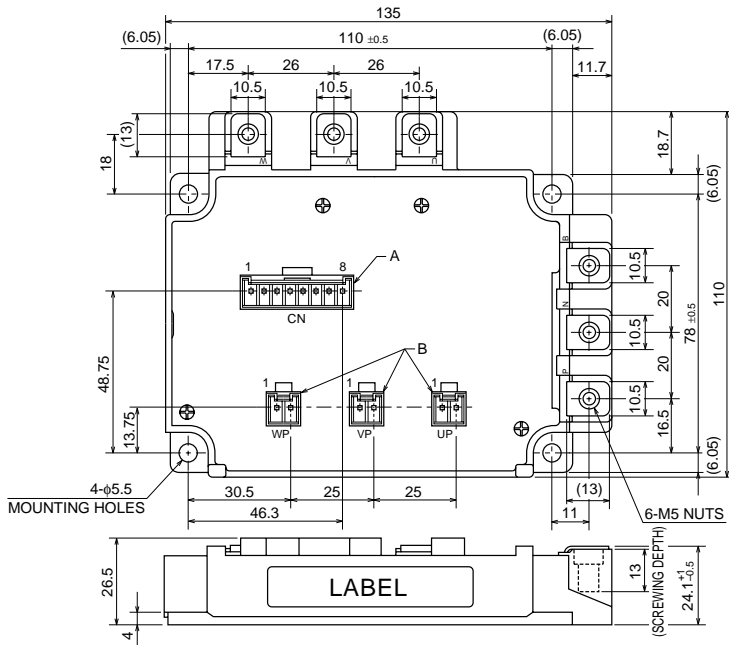
- IC ..... 150A
- VCES ..... 1200V
- Insulated Type
- 7-elements in a pack

**APPLICATION**

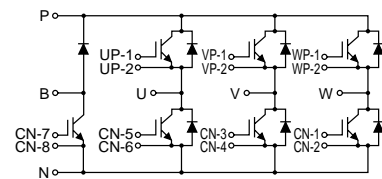
AC drive inverters & Servo controls, etc

**OUTLINE DRAWING & CIRCUIT DIAGRAM**

Dimensions in mm



Housing Type of A and B  
 (J.S.T.Mfg.Co.Ltd)  
 A = B8P-VH-FB-B, B = B2P-VH-FB-B



CIRCUIT DIAGRAM

## CM150RL-24NF

## HIGH POWER SWITCHING USE

**ABSOLUTE MAXIMUM RATINGS ( $T_j = 25^\circ\text{C}$ )**  
**INVERTER PART**

Symbol	Parameter	Conditions	Ratings	Unit
V <sub>CES</sub>	Collector-emitter voltage	G-E Short	1200	V
V <sub>GES</sub>	Gate-emitter voltage	C-E Short	±20	V
I <sub>C</sub>	Collector current	DC, $T_c = 76^\circ\text{C}^{*1}$	150	A
I <sub>CM</sub>		Pulse (Note 2)	300	A
I <sub>E</sub> (Note 1)	Emitter current		150	A
I <sub>EM</sub> (Note 1)		Pulse (Note 2)	300	A
P <sub>C</sub> (Note 3)	Maximum collector dissipation	$T_c = 25^\circ\text{C}$	890	W

**BRAKE PART**

Symbol	Parameter	Conditions	Ratings	Unit
V <sub>CES</sub>	Collector-emitter voltage	G-E Short	1200	V
V <sub>GES</sub>	Gate-emitter voltage	C-E Short	±20	V
I <sub>C</sub>	Collector current	DC, $T_c = 86^\circ\text{C}^{*1}$	75	A
I <sub>CM</sub>		Pulse (Note 2)	150	A
P <sub>C</sub> (Note 3)	Maximum collector dissipation	$T_c = 25^\circ\text{C}$	520	W
V <sub>RRM</sub>	Repetitive peak reverse voltage	Clamp diode part	1200	V
I <sub>FM</sub>	Forward current	Clamp diode part	75	A

**(COMMON RATING)**

Symbol	Parameter	Conditions	Ratings	Unit
T <sub>j</sub>	Junction temperature		-40 ~ +150	°C
T <sub>stg</sub>	Storage temperature		-40 ~ +125	°C
V <sub>iso</sub>	Isolation voltage	Main Terminal to base plate, AC 1 min.	2500	V
—	Torque strength	Main Terminal M5	2.5 ~ 3.5	N • m
—		Mounting holes M5	2.5 ~ 3.5	N • m
—	Weight	Typical value	750	g

## CM150RL-24NF

## HIGH POWER SWITCHING USE

ELECTRICAL CHARACTERISTICS (T<sub>j</sub> = 25°C)

## INVERTER PART

Symbol	Parameter	Test conditions	Limits			Unit	
			Min.	Typ.	Max.		
ICES	Collector cutoff current	VCE = VCES, VGE = 0V	—	—	1	mA	
VGE(th)	Gate-emitter threshold voltage	IC = 15mA, VCE = 10V	6	7	8	V	
IGES	Gate leakage current	VGE = VGES, VCE = 0V	—	—	0.5	μA	
VCE(sat)	Collector-emitter saturation voltage	IC = 150A, VGE = 15V	T <sub>j</sub> = 25°C	—	2.1	3.0	V
			T <sub>j</sub> = 125°C	—	2.4	—	
Cies	Input capacitance	VCE = 10V VGE = 0V	—	—	23	nF	
Coes	Output capacitance		—	—	2	nF	
Cres	Reverse transfer capacitance		—	—	0.45	nF	
QG	Total gate charge	VCC = 600V, IC = 150A, VGE = 15V	—	675	—	nC	
td(on)	Turn-on delay time	VCC = 600V, IC = 150A VGE1 = VGE2 = 15V RG = 2.1Ω, Inductive load switching operation IE = 150A	—	—	130	ns	
tr	Turn-on rise time		—	—	70	ns	
td(off)	Turn-off delay time		—	—	400	ns	
tf	Turn-off fall time		—	—	350	ns	
trr (Note 1)	Reverse recovery time		—	—	150	ns	
Qrr (Note 1)	Reverse recovery charge	—	5.8	—	μC		
VEC(Note 1)	Emitter-collector voltage	IE = 150A, VGE = 0V	—	—	3.8	V	
Rth(j-c)Q	Thermal resistance	IGBT part (1/6 module) <sup>*1</sup>	—	—	0.14	°C/W	
Rth(j-c)R		FWDi part (1/6 module) <sup>*1</sup>	—	—	0.23	°C/W	
Rth(c-f)	Contact thermal resistance	Case to fin, Thermal compound Applied (1/6 module) <sup>*2</sup>	—	0.051	—	°C/W	
RG	External gate resistance		2.1	—	31	Ω	

## BRAKE PART

Symbol	Parameter	Test conditions	Limits			Unit	
			Min.	Typ.	Max.		
ICES	Collector cutoff current	VCE = VCES, VGE = 0V	—	—	1	mA	
VGE(th)	Gate-emitter threshold voltage	IC = 7.5mA, VCE = 10V	6	7	8	V	
IGES	Gate leakage current	VGE = VGES, VCE = 0V	—	—	0.5	μA	
VCE(sat)	Collector-emitter saturation voltage	IC = 75A, VGE = 15V	T <sub>j</sub> = 25°C	—	2.1	3.0	V
			T <sub>j</sub> = 125°C	—	2.4	—	
Cies	Input capacitance	VCE = 10V VGE = 0V	—	—	11.5	nF	
Coes	Output capacitance		—	—	1.0	nF	
Cres	Reverse transfer capacitance		—	—	0.23	nF	
QG	Total gate charge	VCC = 600V, IC = 75A, VGE = 15V	—	338	—	nC	
VFM	Forward voltage drop	IF = 75A	—	—	3.8	V	
Rth(j-c)Q	Thermal resistance	IGBT part <sup>*1</sup>	—	—	0.24	°C/W	
Rth(j-c)R		Clamp diode part <sup>*1</sup>	—	—	0.36	°C/W	
RG	External gate resistance		4.2	—	42	Ω	

\*1 : T<sub>c</sub> measured point is just under the chips.

If you use this value, Rth(i-a) should be measured just under the chips.

\*2 : Typical value is measured by using Shin-etsu Silicone "G-746".

Note 1. IE, VEC, trr & Qrr represent characteristics of the anti-parallel, emitter to collector free-wheel diode (FWDi).

2. Pulse width and repetition rate should be such that the device junction temp. (T<sub>j</sub>) does not exceed T<sub>jmax</sub> rating.

3. Junction temperature (T<sub>j</sub>) should not increase beyond 150°C.

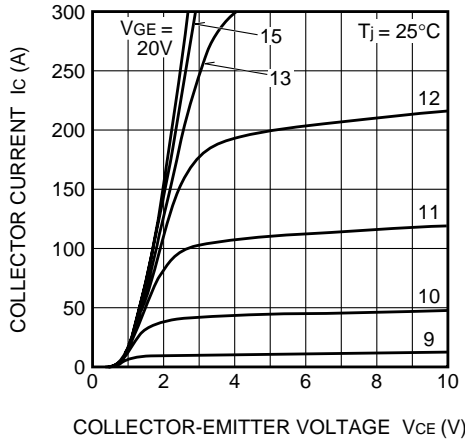
4. Pulse width and repetition rate should be such as to cause negligible temperature rise.

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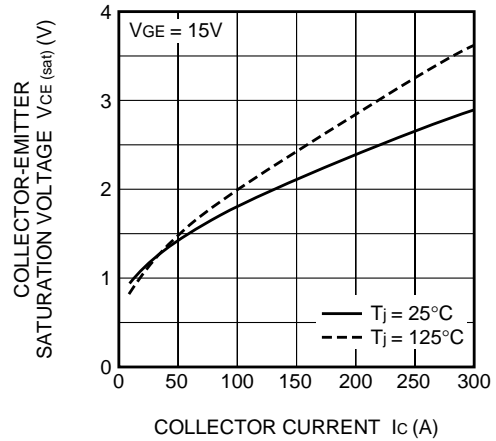
HIGH POWER SWITCHING USE

## PERFORMANCE CURVES

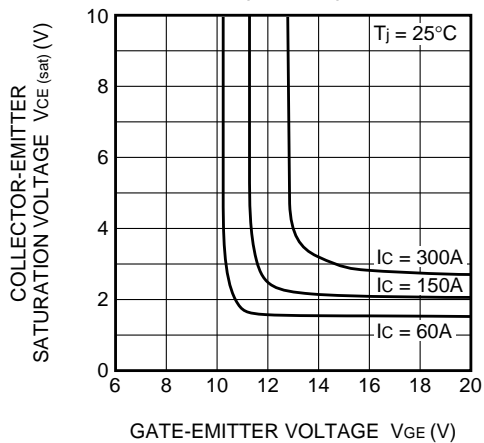
**OUTPUT CHARACTERISTICS (TYPICAL)**



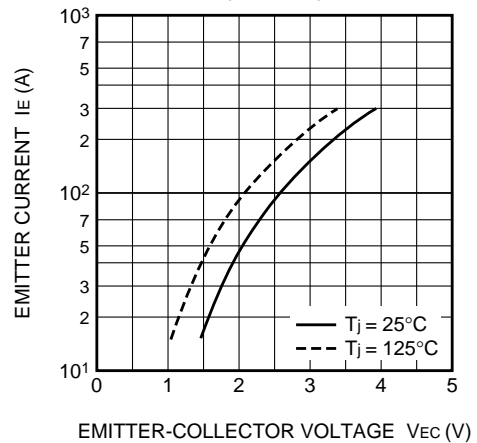
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



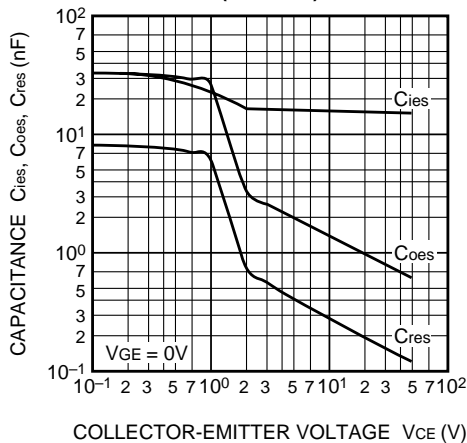
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



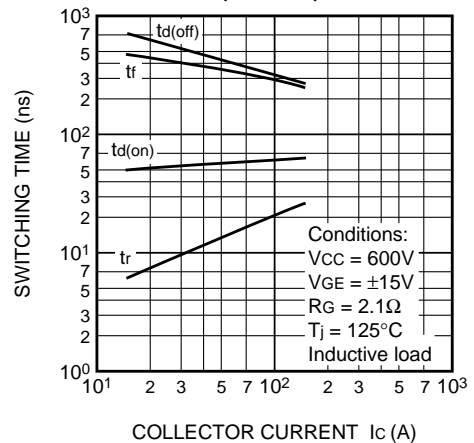
**FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)**



**CAPACITANCE-VCE CHARACTERISTICS (TYPICAL)**



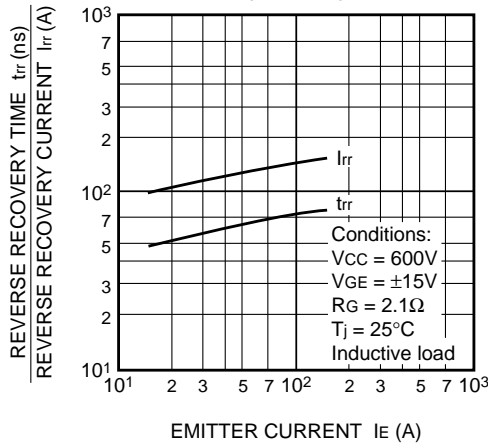
**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**



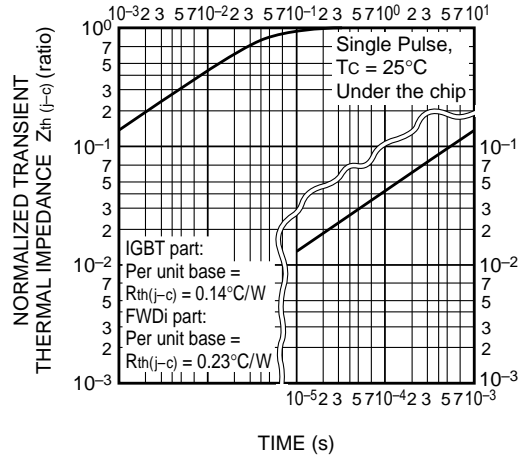
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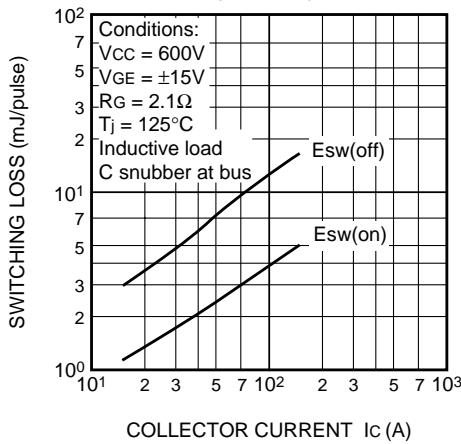
REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)



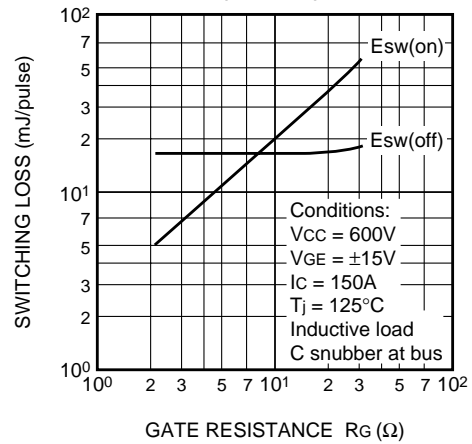
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT part & FWDi part)



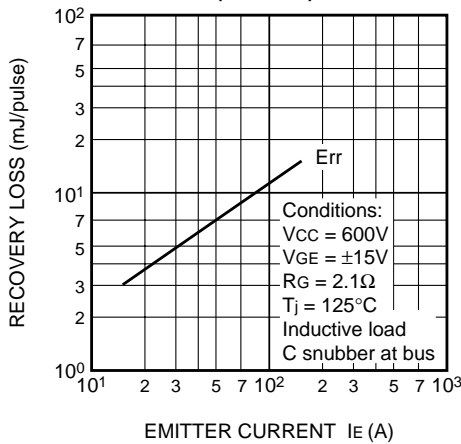
SWITCHING LOSS vs. COLLECTOR CURRENT (TYPICAL)



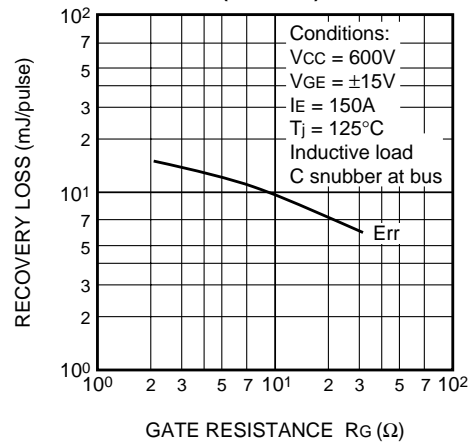
SWITCHING LOSS vs. GATE RESISTANCE (TYPICAL)



RECOVERY LOSS vs. IE (TYPICAL)



RECOVERY LOSS vs. GATE RESISTANCE (TYPICAL)



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