

MITSUBISHI IGBT MODULES

# CM150RL-12NF

HIGH POWER SWITCHING USE

## CM150RL-12NF



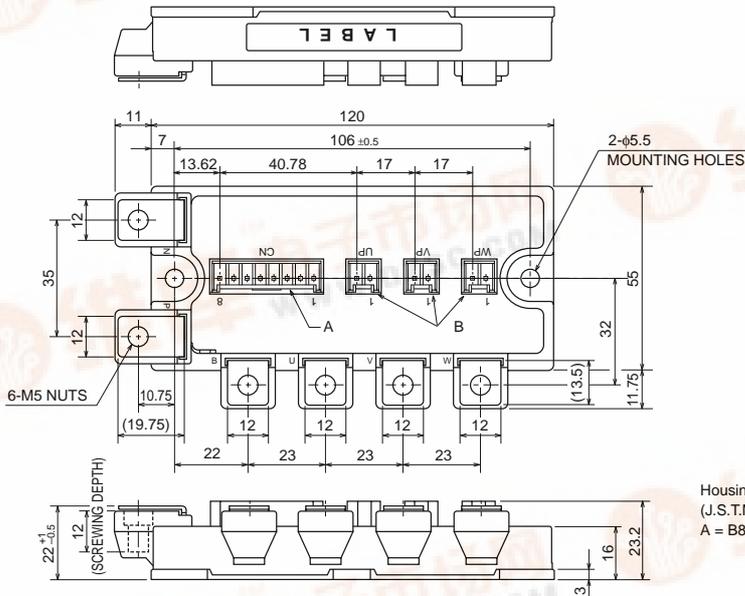
- IC ..... 150A
- VCES ..... 600V
- Insulated Type
- 7-elements in a pack

## APPLICATION

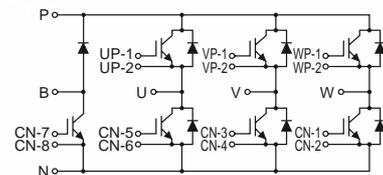
AC drive inverters & Servo controls, etc

## 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



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

## INVERTER PART

Symbol	Parameter	Conditions	Ratings	Unit
VCES	Collector-emitter voltage	G-E Short	600	V
VGES	Gate-emitter voltage	C-E Short	$\pm 20$	V
IC	Collector current	DC, $T_c = 93^\circ\text{C}^{*1}$	150	A
ICM		Pulse (Note 2)	300	A
IE (Note 1)	Emitter current		150	A
IEM (Note 1)		Pulse (Note 2)	300	A
PC (Note 3)	Maximum collector dissipation	$T_c = 25^\circ\text{C}$	730	W

## BRAKE PART

Symbol	Parameter	Conditions	Ratings	Unit
VCES	Collector-emitter voltage	G-E Short	600	V
VGES	Gate-emitter voltage	C-E Short	$\pm 20$	V
IC	Collector current	DC, $T_c = 102^\circ\text{C}^{*1}$	75	A
ICM		Pulse (Note 2)	150	A
PC (Note 3)	Maximum collector dissipation	$T_c = 25^\circ\text{C}$	430	W
VRRM	Repetitive peak reverse voltage	Clamp diode part	600	V
IFM	Forward current	Clamp diode part	75	A

## (COMMON RATING)

Symbol	Parameter	Conditions	Ratings	Unit
$T_j$	Junction temperature		$-40 \sim +150$	$^\circ\text{C}$
$T_{stg}$	Storage temperature		$-40 \sim +125$	$^\circ\text{C}$
$V_{iso}$	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	350	g

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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	—	1.7	2.2	V
			T <sub>j</sub> = 125°C	—	1.7	—	
Cies	Input capacitance	VCE = 10V VGE = 0V	—	—	23	nF	
Coes	Output capacitance		—	—	2.8	nF	
Cres	Reverse transfer capacitance		—	—	0.9	nF	
QG	Total gate charge	VCC = 300V, IC = 150A, VGE = 15V	—	600	—	nC	
td(on)	Turn-on delay time	VCC = 300V, IC = 150A VGE1 = VGE2 = 15V RG = 4.2Ω, Inductive load switching operation	—	—	120	ns	
tr	Turn-on rise time		—	—	100	ns	
td(off)	Turn-off delay time		—	—	300	ns	
tf	Turn-off fall time		—	—	300	ns	
t <sub>rr</sub> (Note 1)	Reverse recovery time		IE = 150A	—	—	150	ns
Q <sub>rr</sub> (Note 1)	Reverse recovery charge		—	2.5	—	μC	
VEC(Note 1)	Emitter-collector voltage	IE = 150A, VGE = 0V	—	—	2.8	V	
R <sub>th(j-c)Q</sub>	Thermal resistance	IGBT part (1/6 module) <sup>*1</sup>	—	—	0.17	°C/W	
R <sub>th(j-c)R</sub>		FWDi part (1/6 module) <sup>*1</sup>	—	—	0.31	°C/W	
R <sub>th(c-f)</sub>	Contact thermal resistance	Case to fin, Thermal compound Applied (1/6 module) <sup>*2</sup>	—	0.085	—	°C/W	
RG	External gate resistance		4.2	—	42	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	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	—	1.7	2.2	V
			T <sub>j</sub> = 125°C	—	1.7	—	
Cies	Input capacitance	VCE = 10V VGE = 0V	—	—	11.3	nF	
Coes	Output capacitance		—	—	1.4	nF	
Cres	Reverse transfer capacitance		—	—	0.45	nF	
QG	Total gate charge	VCC = 300V, IC = 75A, VGE = 15V	—	300	—	nC	
VFM	Forward voltage drop	IF = 75A	—	—	2.8	V	
R <sub>th(j-c)Q</sub>	Thermal resistance	IGBT part <sup>*1</sup>	—	—	0.29	°C/W	
R <sub>th(j-c)R</sub>		Clamp diode part <sup>*1</sup>	—	—	0.51	°C/W	
RG	External gate resistance		8.3	—	83	Ω	

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

If you use this value, R<sub>th(f-a)</sub> should be measured just under the chips.

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

Note 1. IE, VEC, t<sub>rr</sub> & Q<sub>rr</sub> 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.

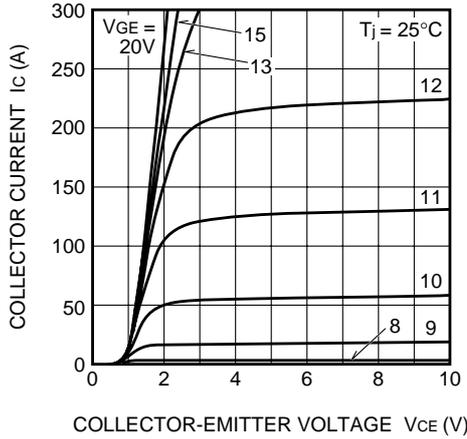
4. Pulse width and repetition rate should be such as to cause negligible temperature rise.

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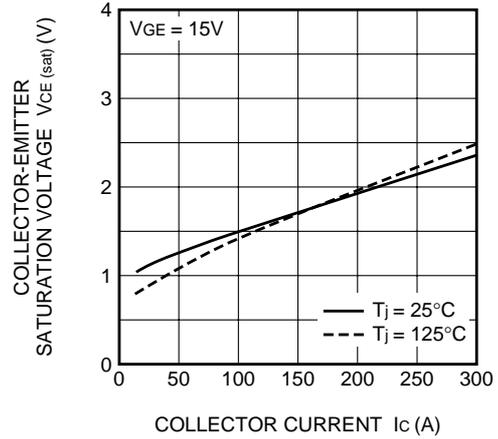
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## PERFORMANCE CURVES

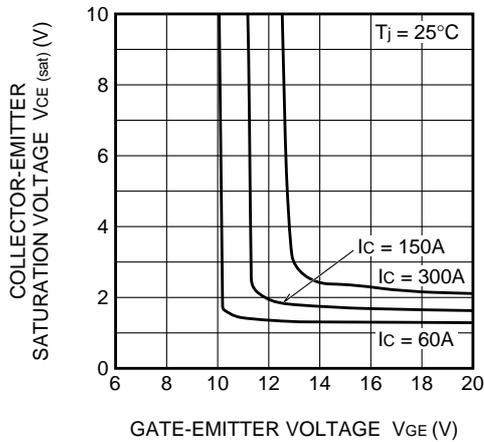
**OUTPUT CHARACTERISTICS (TYPICAL)**



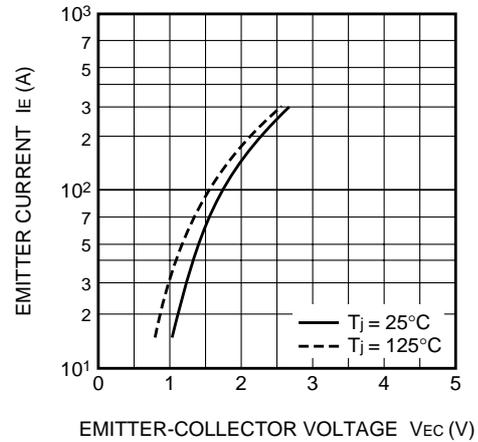
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



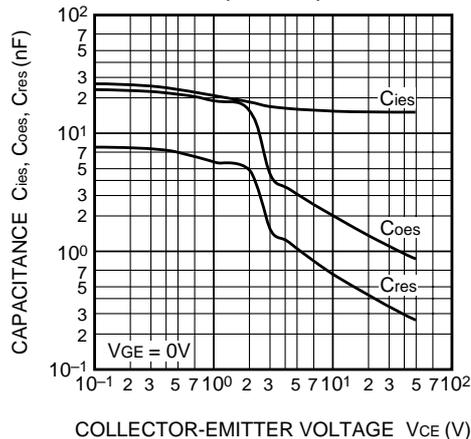
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



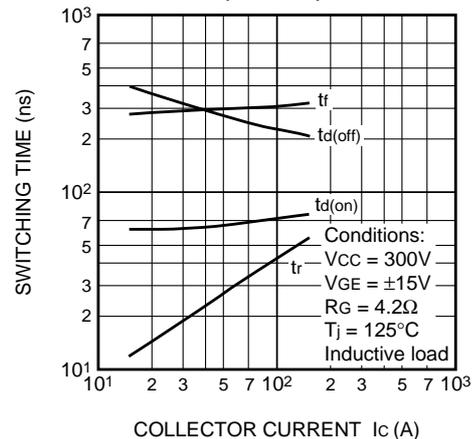
**FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)**



**CAPACITANCE-VCE CHARACTERISTICS (TYPICAL)**



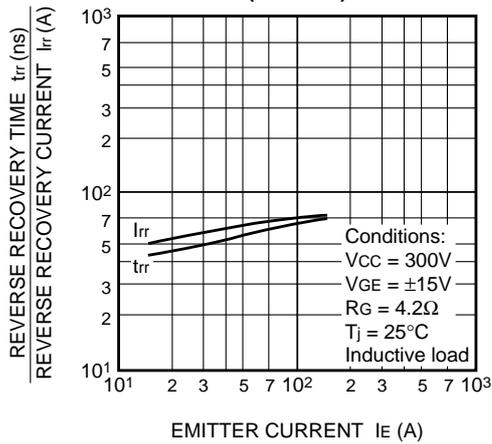
**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**



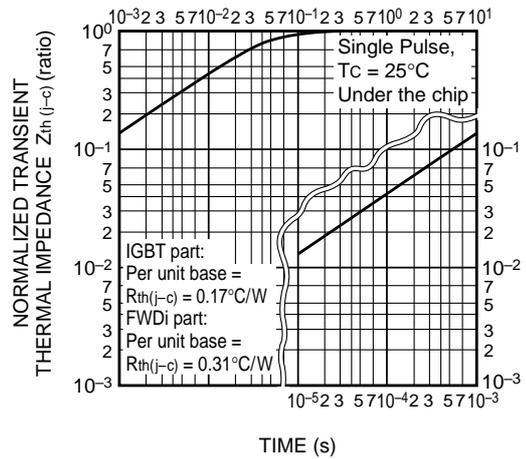
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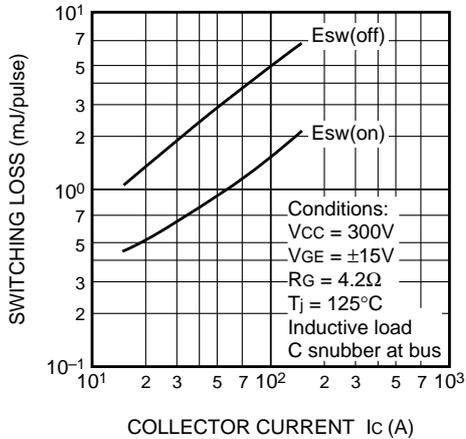
**REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)**



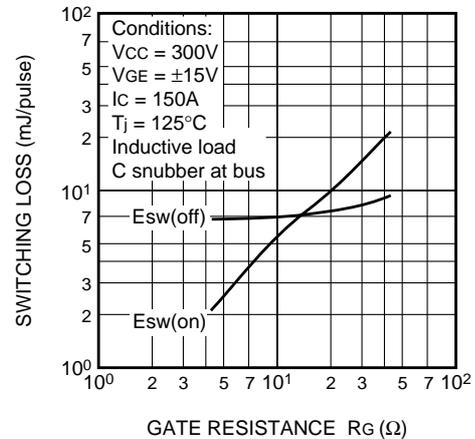
**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT part & FWDi part)**



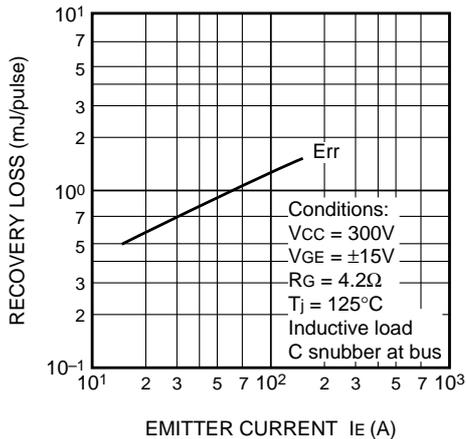
**SWITCHING LOSS vs. COLLECTOR CURRENT (TYPICAL)**



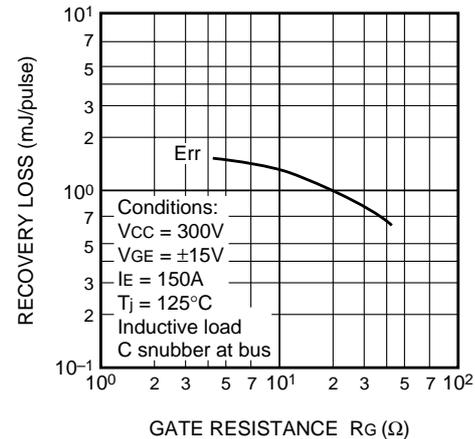
**SWITCHING LOSS vs. GATE RESISTANCE (TYPICAL)**



**RECOVERY LOSS vs. IE (TYPICAL)**



**RECOVERY LOSS vs. GATE RESISTANCE (TYPICAL)**



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