

MITSUBISHI IGBT MODULES
CM150RL-12NF

HIGH POWER SWITCHING USE

CM150RL-12NF



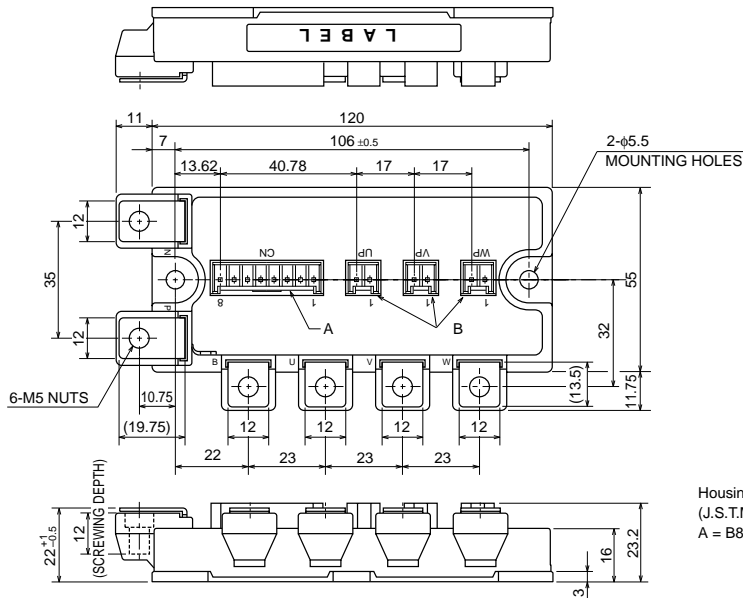
- IC 150A
- VCES 600V
- Insulated Type
- 7-elements in a pack

APPLICATION

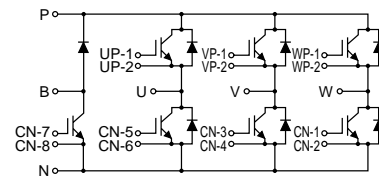
AC drive inverters & Servo controls, etc

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
V _{CES}	Collector-emitter voltage	G-E Short	600	V
V _{GES}	Gate-emitter voltage	C-E Short	±20	V
I _C	Collector current	DC, $T_c = 93^\circ\text{C}^{*1}$	150	A
I _{CM}		Pulse (Note 2)	300	A
I _E (Note 1)	Emitter current		150	A
I _{EM} (Note 1)		Pulse (Note 2)	300	A
P _C (Note 3)	Maximum collector dissipation	$T_c = 25^\circ\text{C}$	730	W

BRAKE PART

Symbol	Parameter	Conditions	Ratings	Unit
V _{CES}	Collector-emitter voltage	G-E Short	600	V
V _{GES}	Gate-emitter voltage	C-E Short	±20	V
I _C	Collector current	DC, $T_c = 102^\circ\text{C}^{*1}$	75	A
I _{CM}		Pulse (Note 2)	150	A
P _C (Note 3)	Maximum collector dissipation	$T_c = 25^\circ\text{C}$	430	W
V _{RRM}	Repetitive peak reverse voltage	Clamp diode part	600	V
I _{FM}	Forward current	Clamp diode part	75	A

(COMMON RATING)

Symbol	Parameter	Conditions	Ratings	Unit
T _j	Junction temperature		-40 ~ +150	°C
T _{stg}	Storage temperature		-40 ~ +125	°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

ELECTRICAL CHARACTERISTICS (T_j = 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	—	1.7	2.2	V
		T _j = 25°C T _j = 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 IE = 150A	—	—	120	ns
tr	Turn-on rise time		—	—	100	ns
td(off)	Turn-off delay time		—	—	300	ns
tf	Turn-off fall time		—	—	300	ns
trr (Note 1)	Reverse recovery time		—	—	150	ns
Qrr (Note 1)	Reverse recovery charge	—	2.5	—	μC	
VEC(Note 1)	Emitter-collector voltage	IE = 150A, VGE = 0V	—	—	2.8	V
Rth(j-c)Q	Thermal resistance	IGBT part (1/6 module) ^{*1}	—	—	0.17	°C/W
Rth(j-c)R		FWDi part (1/6 module) ^{*1}	—	—	0.31	°C/W
Rth(c-f)	Contact thermal resistance	Case to fin, Thermal compound Applied (1/6 module) ^{*2}	—	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	—	1.7	2.2	V
		T _j = 25°C T _j = 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
Rth(j-c)Q	Thermal resistance	IGBT part ^{*1}	—	—	0.29	°C/W
Rth(j-c)R		Clamp diode part ^{*1}	—	—	0.51	°C/W
RG	External gate resistance		8.3	—	83	Ω

*1 : T_c measured point is just under the chips.

If you use this value, Rth(f-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_j) does not exceed T_{jmax} rating.

3. Junction temperature (T_j) should not increase beyond 150°C.

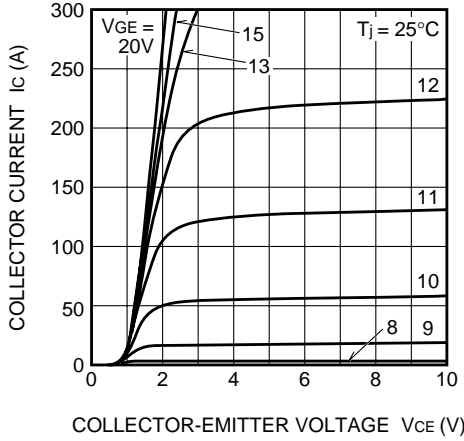
4. Pulse width and repetition rate should be such as to cause negligible temperature rise.

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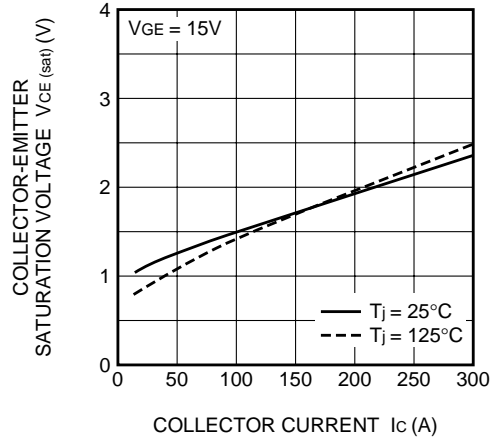
HIGH POWER SWITCHING USE

PERFORMANCE CURVES

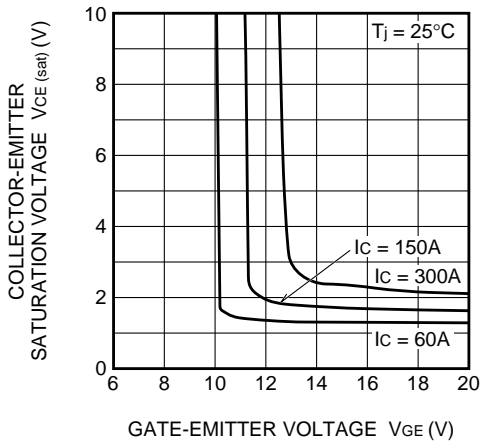
OUTPUT CHARACTERISTICS (TYPICAL)



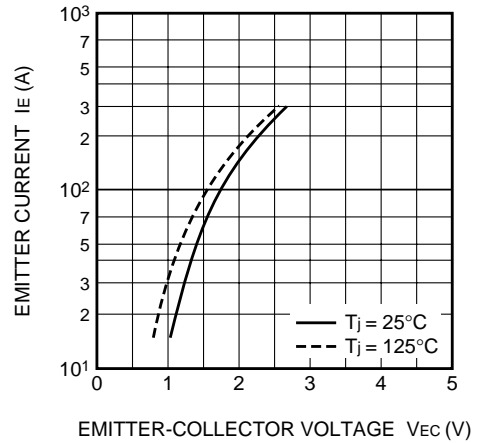
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



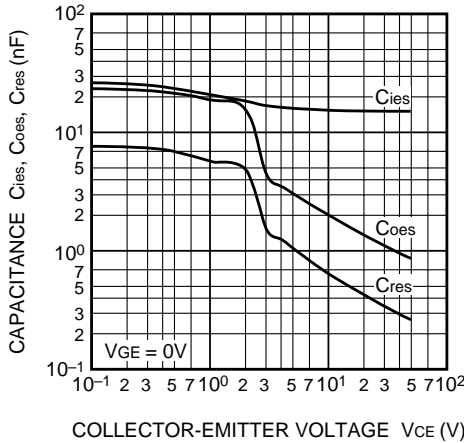
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



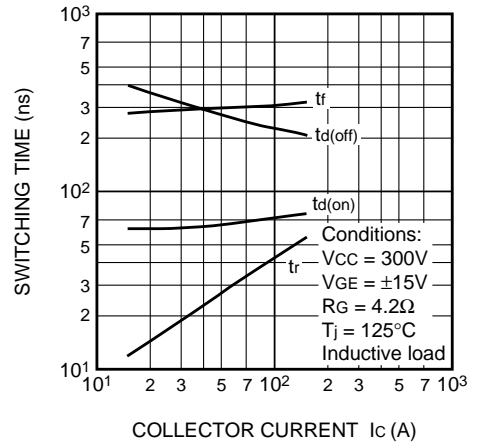
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



CAPACITANCE-VCE CHARACTERISTICS (TYPICAL)



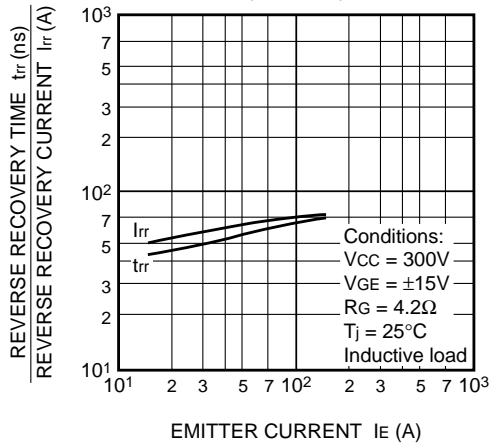
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



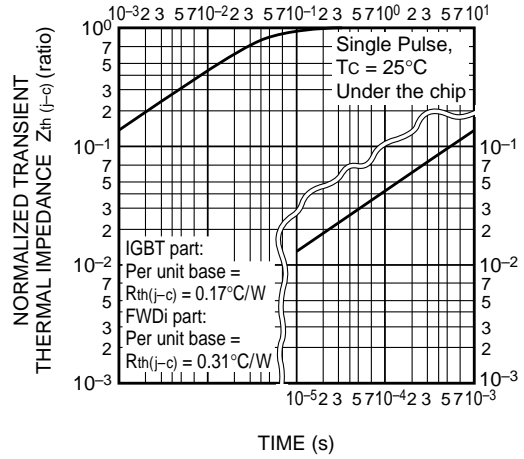
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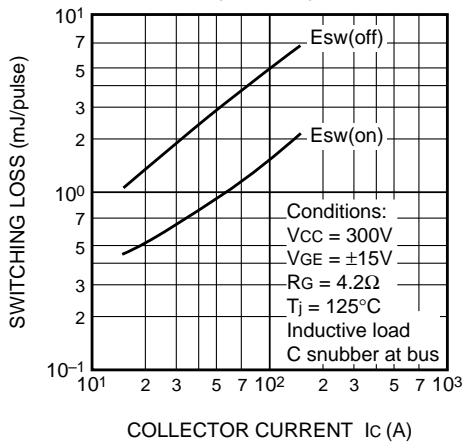
REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)



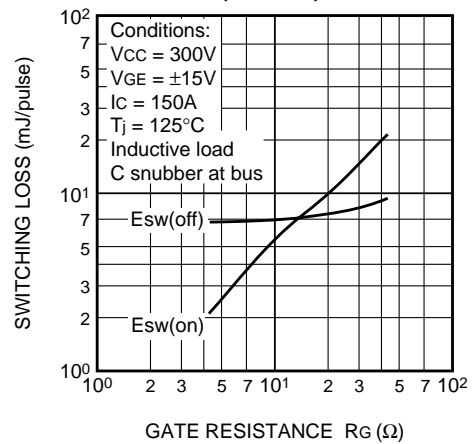
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT part & FWDi part)



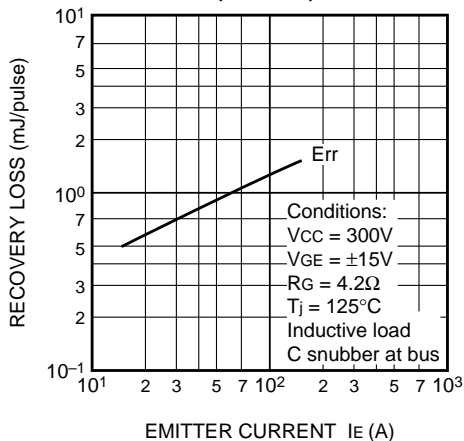
SWITCHING LOSS vs. COLLECTOR CURRENT (TYPICAL)



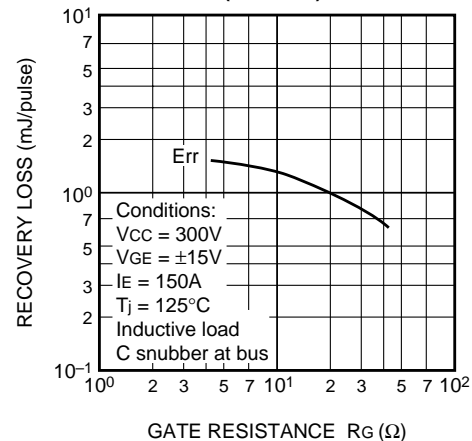
SWITCHING LOSS vs. GATE RESISTANCE (TYPICAL)



RECOVERY LOSS vs. IE (TYPICAL)



RECOVERY LOSS vs. GATE RESISTANCE (TYPICAL)



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