

MITSUBISHI IGBT MODULES

CM50RL-24NF

HIGH POWER SWITCHING USE

CM50RL-24NF



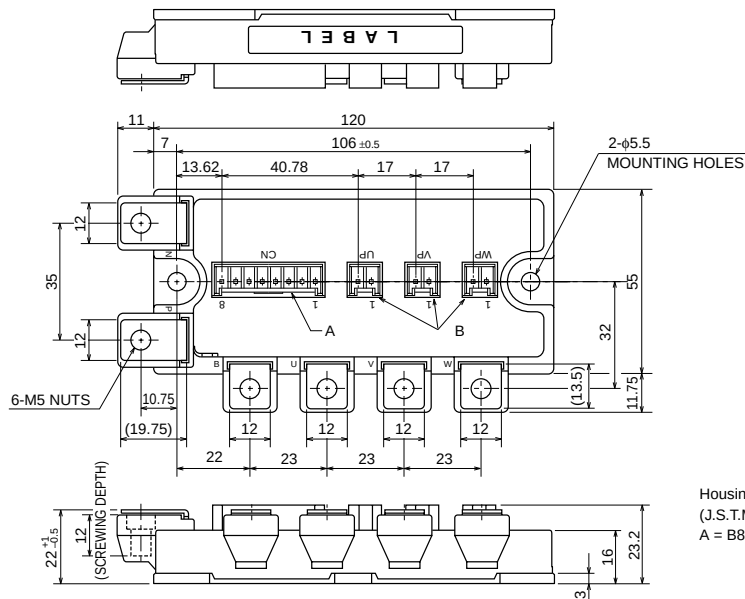
- IC 50A
- VCES 1200V
- Insulated Type
- 7-elements in a pack

APPLICATION

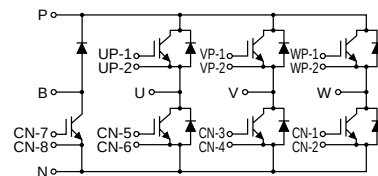
AC drive inverters & Servo controls, etc

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

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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	1200	V
V_{GES}	Gate-emitter voltage	C-E Short	± 20	V
I_C	Collector current	DC, $T_c = 94^\circ\text{C}^{*1}$	50	A
I_{CM}		Pulse (Note 2)	100	A
I_E (Note 1)	Emitter current		50	A
I_{EM} (Note 1)		Pulse (Note 2)	100	A
P_C (Note 3)	Maximum collector dissipation	$T_c = 25^\circ\text{C}$	390	W

BRAKE PART

Symbol	Parameter	Conditions	Ratings	Unit
V_{CES}	Collector-emitter voltage	G-E Short	1200	V
V_{GES}	Gate-emitter voltage	C-E Short	± 20	V
I_C	Collector current	DC, $T_c = 104^\circ\text{C}^{*1}$	30	A
I_{CM}		Pulse (Note 2)	60	A
P_C (Note 3)	Maximum collector dissipation	$T_c = 25^\circ\text{C}$	290	W
V_{RRM}	Repetitive peak reverse voltage	Clamp diode part	1200	V
I_{FM}	Forward current	Clamp diode part	30	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_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 = 5.0mA, VCE = 10V	6	7	8	V
IGES	Gate leakage current	VGE = VGES, VCE = 0V	—	—	0.5	μA
VCE(sat)	Collector-emitter saturation voltage	IC = 50A, VGE = 15V T _j = 25°C T _j = 125°C	— —	2.1 2.4	3.0 —	V
Cies	Input capacitance	VCE = 10V VGE = 0V	—	—	8.5	nF
Coēs	Output capacitance		—	—	0.75	nF
Cres	Reverse transfer capacitance		—	—	0.17	nF
QG	Total gate charge	VCC = 600V, IC = 50A, VGE = 15V	—	250	—	nC
td(on)	Turn-on delay time	VCC = 600V, IC = 50A VGE1 = VGE2 = 15V RG = 6.3Ω, Inductive load switching operation IE = 50A	—	—	100	ns
tr	Turn-on rise time		—	—	50	ns
td(off)	Turn-off delay time		—	—	300	ns
tr	Turn-off fall time		—	—	350	ns
t _{rr} (Note 1)	Reverse recovery time		—	—	100	ns
Q _{rr} (Note 1)	Reverse recovery charge		—	2	—	μC
VEC(Note 1)	Emitter-collector voltage	IE = 50A, VGE = 0V	—	—	3.8	V
R _{th(j-c)Q}	Thermal resistance	IGBT part (1/6 module)*1	—	—	0.32	°C/W
R _{th(j-c)R}		FWDi part (1/6 module)*1	—	—	0.43	°C/W
R _{th(c-f)}	Contact thermal resistance	Case to fin, Thermal compound Applied (1/6 module)*2	—	0.085	—	°C/W
RG	External gate resistance		6.3	—	96	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 = 3.0mA	6	7	8	V
IGES	Gate leakage current	VGE = VGES, VCE = 0V	—	—	0.5	μA
VCE(sat)	Collector-emitter saturation voltage	IC = 30A, VGE = 15V T _j = 25°C T _j = 125°C	— —	2.1 2.4	3.0 —	V
Cies	Input capacitance	VCE = 10V VGE = 0V	—	—	5.1	nF
Coēs	Output capacitance		—	—	0.45	nF
Cres	Reverse transfer capacitance		—	—	0.10	nF
QG	Total gate charge	VCC = 600V, IC = 30A, VGE = 15V	—	150	—	nC
VFM	Forward voltage drop	IF = 30A	—	—	3.8	V
R _{th(j-c)Q}	Thermal resistance	IGBT part*1	—	—	0.43	°C/W
R _{th(j-c)R}		Clamp diode part*1	—	—	0.65	°C/W
RG	External gate resistance		10	—	100	Ω

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

If you use this value, R_{th(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, t_{rr} & Q_{rr} 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.

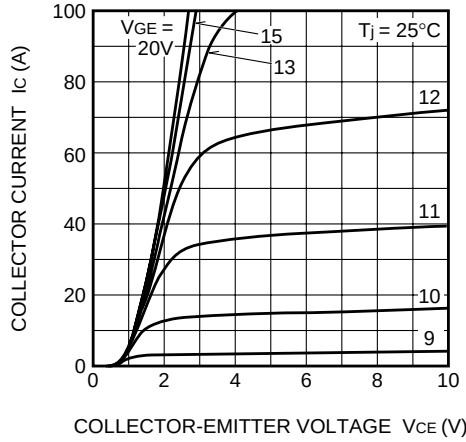
4. Pulse width and repetition rate should be such as to cause negligible temperature rise.

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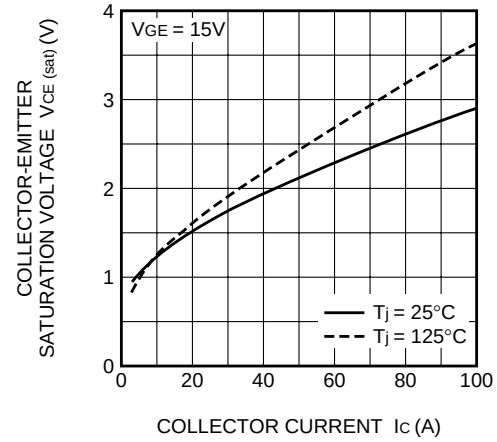
HIGH POWER SWITCHING USE

PERFORMANCE CURVES

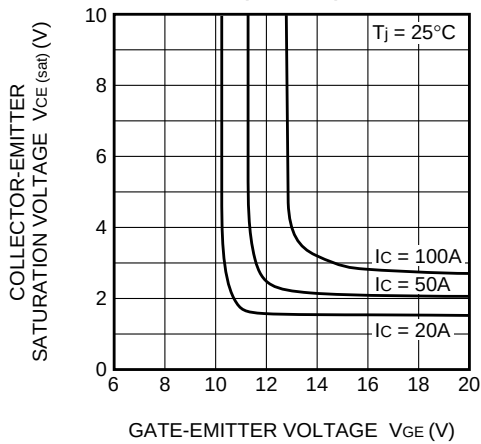
OUTPUT CHARACTERISTICS
(TYPICAL)



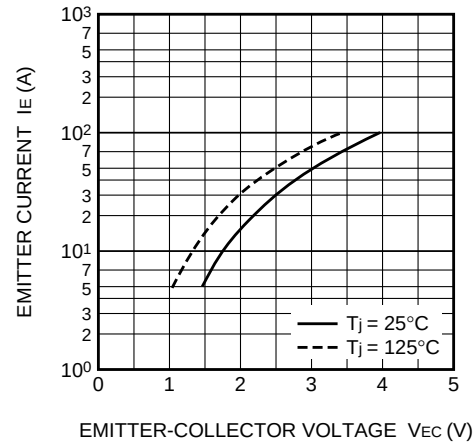
COLLECTOR-EMITTER SATURATION
VOLTAGE CHARACTERISTICS
(TYPICAL)



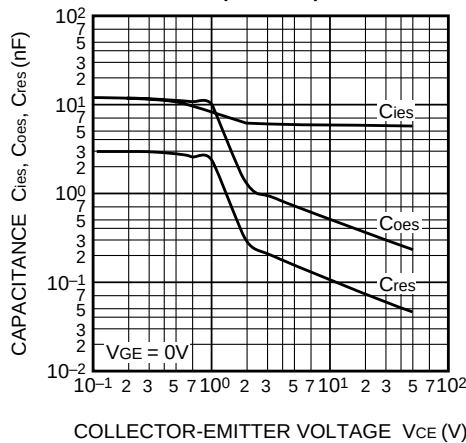
COLLECTOR-EMITTER SATURATION
VOLTAGE CHARACTERISTICS
(TYPICAL)



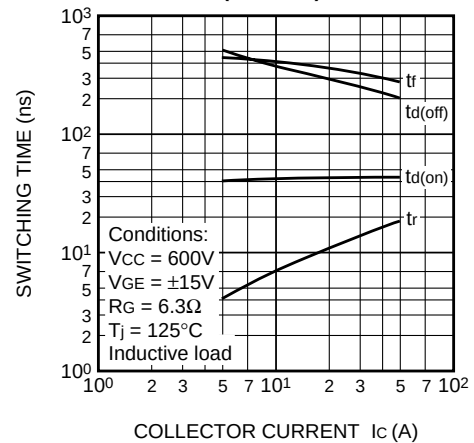
FREE-WHEEL DIODE
FORWARD CHARACTERISTICS
(TYPICAL)



CAPACITANCE- V_{ce}
CHARACTERISTICS
(TYPICAL)



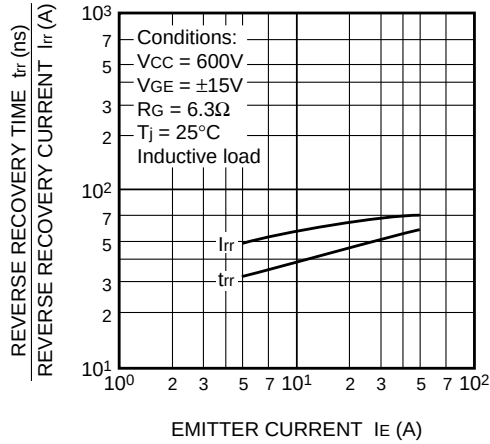
HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)



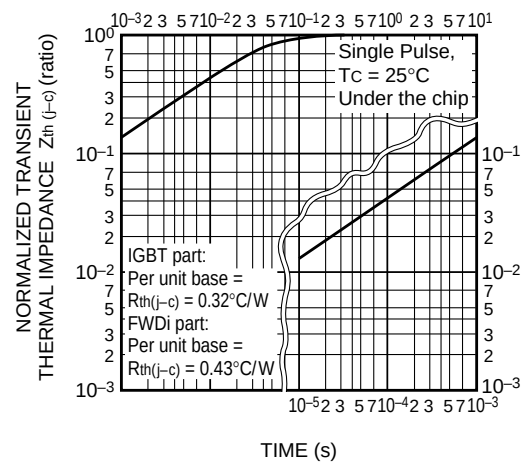
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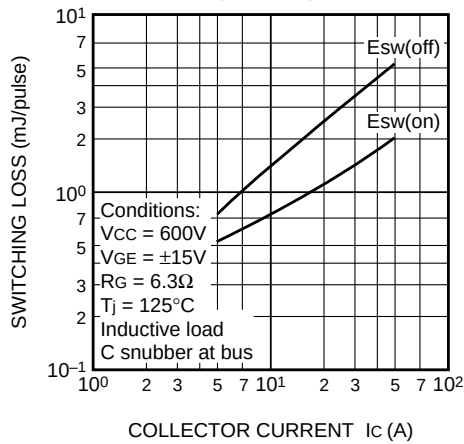
**REVERSE RECOVERY CHARACTERISTICS
OF FREE-WHEEL DIODE
(TYPICAL)**



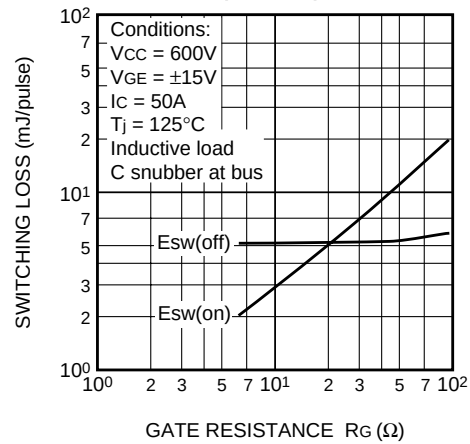
**TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(IGBT part & FWDi part)**



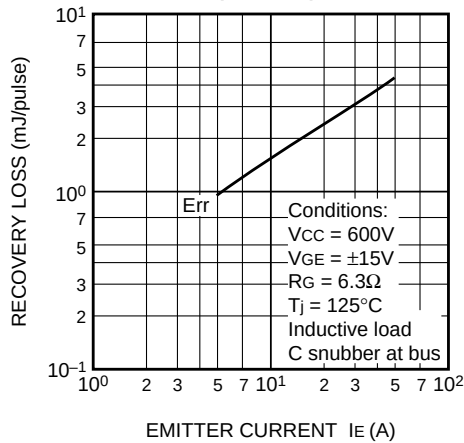
**SWITCHING LOSS vs.
COLLECTOR CURRENT
(TYPICAL)**



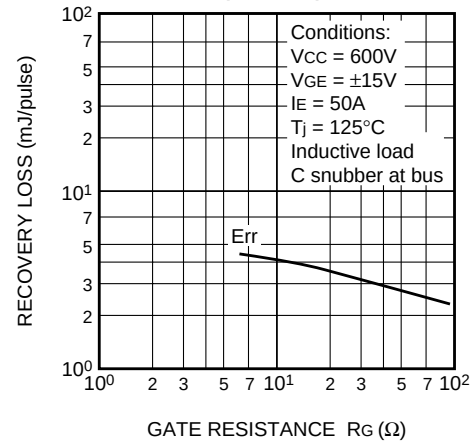
**SWITCHING LOSS vs.
GATE RESISTANCE
(TYPICAL)**



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



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



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