CM150RL-24NF

HIGH POWER SWITCHING USE

CM150RL-24NF

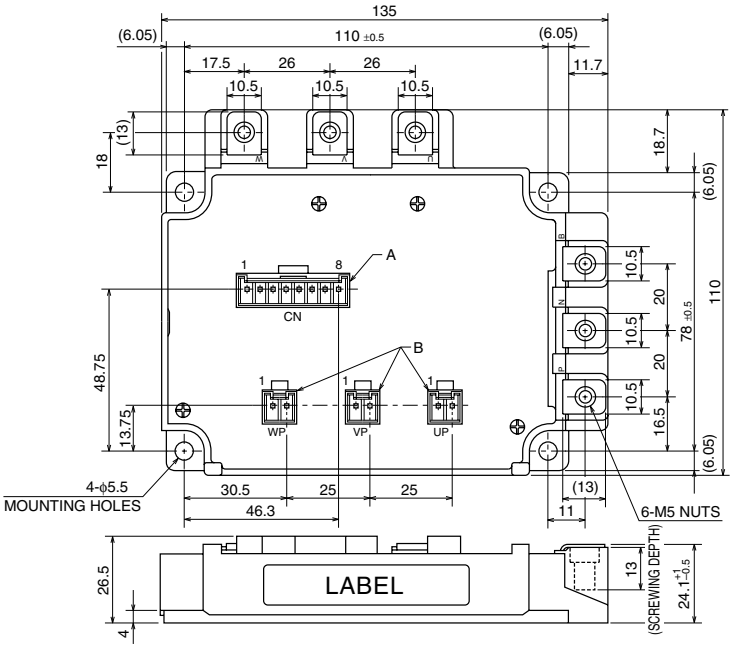
- I_C 150A
- V_{CES} 1200V
- Insulated Type
- 7-elements in a pack

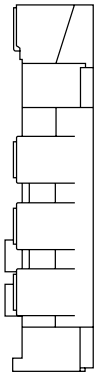
APPLICATION

AC drive inverters & Servo controls, etc

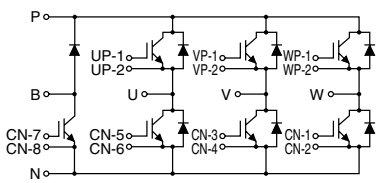
OUTLINE DRAWING & CIRCUIT DIAGRAM

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

MITSUBISHI ELECTRIC

ABSOLUTE MAXIMUM RATINGS (Tj = 25°C, unless otherwise specified)

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 = 76°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°C	890	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 = 86°C*1	75	A
I_{CM}		Pulse (Note 2)	150	A
P_C (Note 3)	Maximum collector dissipation	T_C = 25°C	520	W
V_{RRM}	Repetitive peak reverse voltage	Clamp diode part	1200	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	Terminals to base plate, f = 60Hz, AC 1 minute	2500	Vrms
—	Torque strength	Main terminals M5 screw	2.5 ~ 3.5	N • m
—		Mounting M5 screw	2.5 ~ 3.5	N • m
—	Weight	Typical value	750	g

ELECTRICAL CHARACTERISTICS (Tj = 25°C, unless otherwise specified)

INVERTER PART

Symbol	Parameter	Test conditions		Limits			Unit
				Min.	Typ.	Max.	
I_{CES}	Collector cutoff current	V_{CE} = V_{CES}, V_{GE} = 0V		—	—	1	mA
$V_{GE(th)}$	Gate-emitter threshold voltage	I_C = 15mA, V_{CE} = 10V		6	7	8	V
I_{GES}	Gate leakage current	±V_{GE} = V_{GES}, V_{CE} = 0V		—	—	0.5	μA
$V_{CE(sat)}$	Collector-emitter saturation voltage	I_C = 150A, V_{GE} = 15V	T_j = 25°C	—	2.1	3.0	V
			T_j = 125°C	—	2.4	—	
C_{ies}	Input capacitance	V_{CE} = 10V, V_{GE} = 0V		—	—	23	nF
C_{oes}	Output capacitance			—	—	2	nF
C_{res}	Reverse transfer capacitance			—	—	0.45	nF
Q_G	Total gate charge	V_{CC} = 600V, I_C = 150A, V_{GE} = 15V		—	675	—	nC
$t_{d(on)}$	Turn-on delay time	V_{CC} = 600V, I_C = 150A, V_{GE} = ±15V, R_G = 2.1Ω, Inductive load, I_E = 150A		—	—	130	ns
t_r	Turn-on rise time			—	—	70	ns
$t_{d(off)}$	Turn-off delay time			—	—	400	ns
t_f	Turn-off fall time			—	—	350	ns
t_{rr} (Note 1)	Reverse recovery time			—	—	150	ns
Q_{rr} (Note 1)	Reverse recovery charge			—	5.8	—	μC
V_{EC}(Note 1)	Emitter-collector voltage	I_E = 150A, V_{GE} = 0V		—	—	3.8	V
$R_{th(j-c)Q}$	Thermal resistance	IGBT part (1/6 module)*1		—	—	0.14	K/W
$R_{th(j-c)R}$		FWDi part (1/6 module)*1		—	—	0.23	K/W
$R_{th(c-f)}$	Contact thermal resistance	Case to heat sink, Thermal compound Applied (1/6 module)*2		—	0.051	—	K/W
R_G	External gate resistance			2.1	—	31	Ω

BRAKE PART

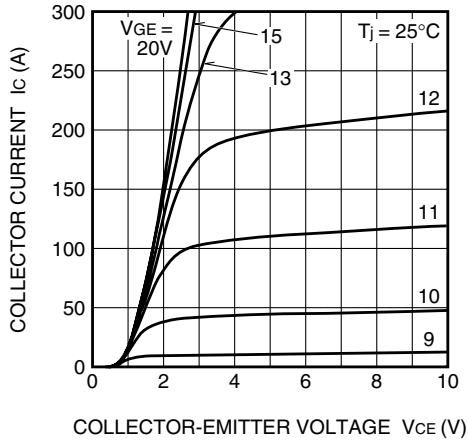
Symbol	Parameter	Test conditions		Limits			Unit
				Min.	Typ.	Max.	
I_{CES}	Collector cutoff current	V_{CE} = V_{CES}, V_{GE} = 0V		—	—	1	mA
$V_{GE(th)}$	Gate-emitter threshold voltage	I_C = 7.5mA, V_{CE} = 10V		6	7	8	V
I_{GES}	Gate leakage current	±V_{GE} = V_{GES}, V_{CE} = 0V		—	—	0.5	μA
$V_{CE(sat)}$	Collector-emitter saturation voltage	I_C = 75A, V_{GE} = 15V	T_j = 25°C	—	2.1	3.0	V
			T_j = 125°C	—	2.4	—	
C_{ies}	Input capacitance	V_{CE} = 10V, V_{GE} = 0V		—	—	11.5	nF
C_{oes}	Output capacitance			—	—	1.0	nF
C_{res}	Reverse transfer capacitance			—	—	0.23	nF
Q_G	Total gate charge	V_{CC} = 600V, I_C = 75A, V_{GE} = 15V		—	338	—	nC
V_{FM}	Forward voltage drop	I_F = 75A		—	—	3.8	V
$R_{th(j-c)Q}$	Thermal resistance	IGBT part*1		—	—	0.24	K/W
$R_{th(j-c)R}$		Clamp diode part*1		—	—	0.36	K/W
R_G	External gate resistance			4.2	—	42	Ω

*1 : Case temperature (Tc) 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 thermally conductive grease of λ = 0.9[W/(m • K)].

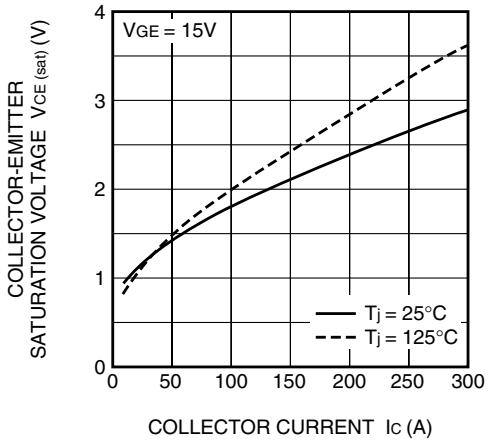
Note 1. I_E, V_{EC}, t_{rr} & Q_{rr} represent characteristics of the anti-parallel, emitter-collector free-wheel diode (FWDi).
2. Pulse width and repetition rate should be such that the device junction temperature (T_j) does not exceed T_{jmax} rating.
3. Junction temperature (T_j) should not increase beyond 150°C.
4. Pulse width and repetition rate should be such as to cause negligible temperature rise.

PERFORMANCE CURVES

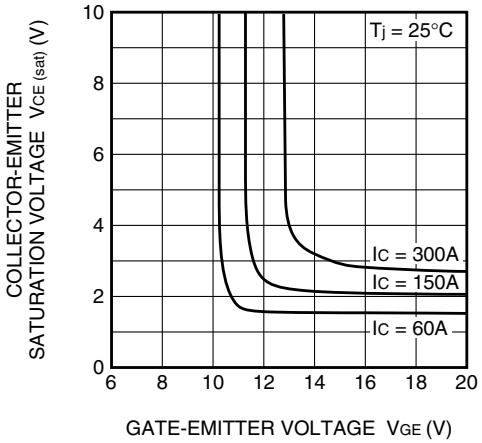
OUTPUT CHARACTERISTICS (TYPICAL)



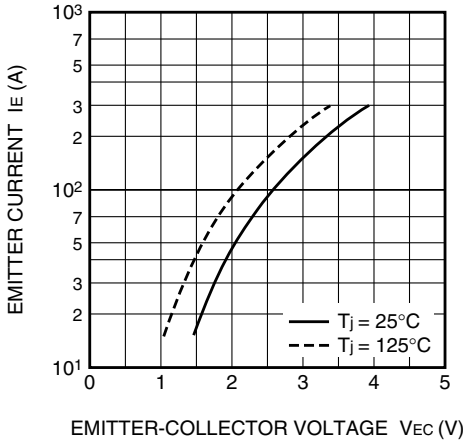
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



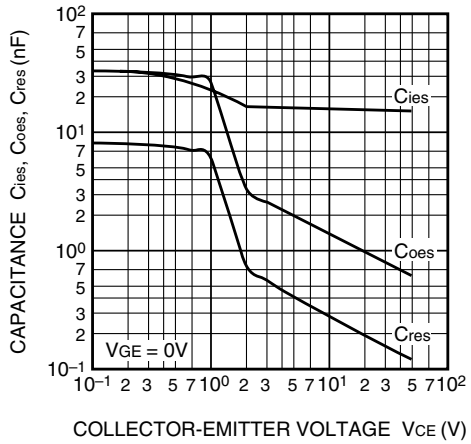
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



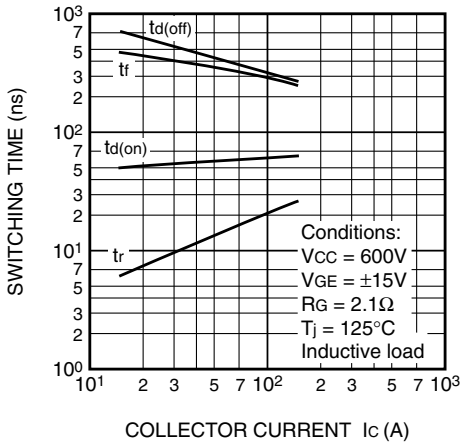
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



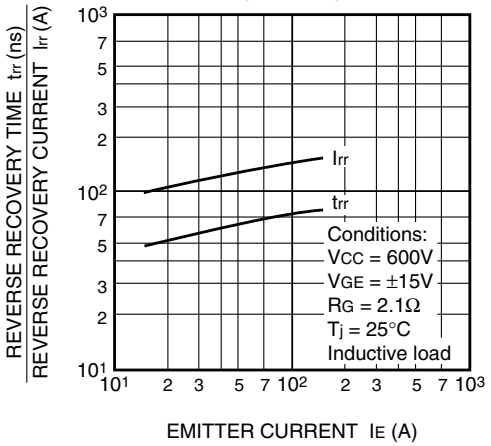
CAPACITANCE–VCE CHARACTERISTICS (TYPICAL)



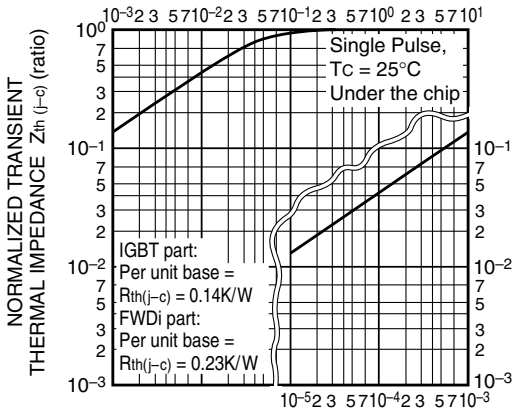
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



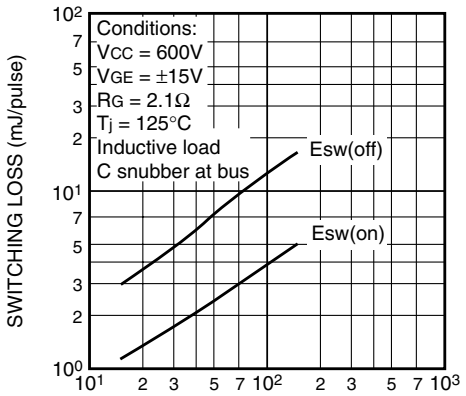
REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)



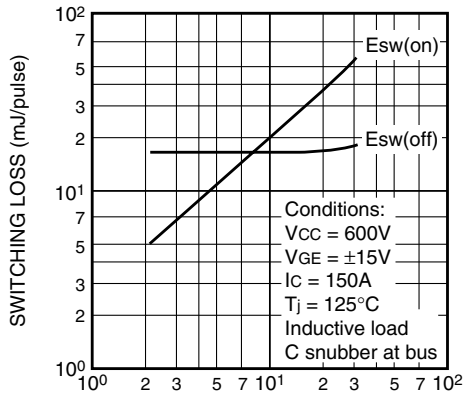
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT part & FWDi part)



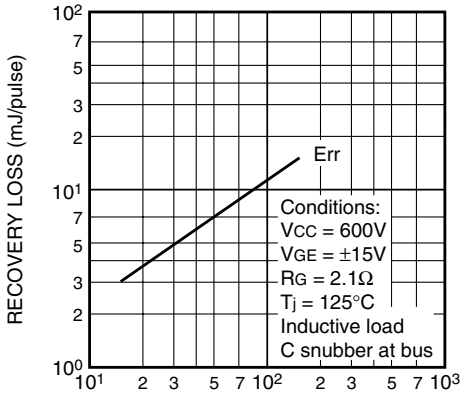
SWITCHING LOSS vs. COLLECTOR CURRENT (TYPICAL)



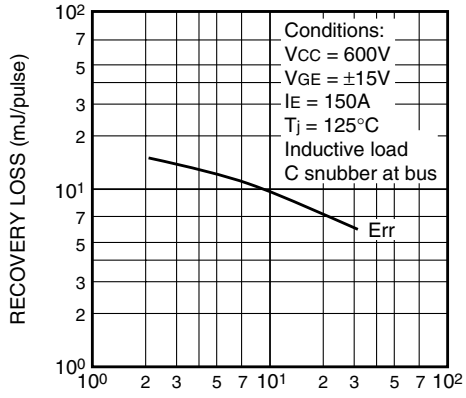
SWITCHING LOSS vs. GATE RESISTANCE (TYPICAL)

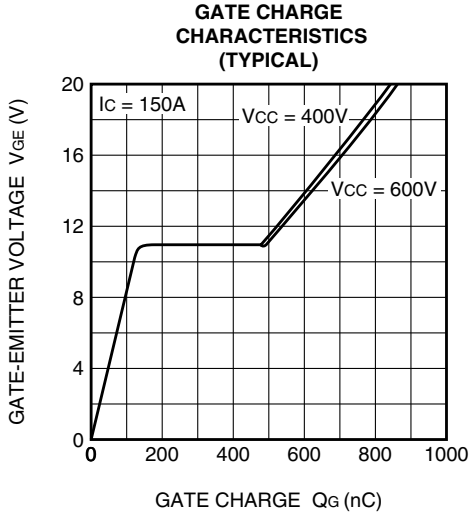


RECOVERY LOSS vs. IE (TYPICAL)



RECOVERY LOSS vs. GATE RESISTANCE (TYPICAL)




GATE CHARGE
CHARACTERISTICS
(TYPICAL)
IC = 150A
VCC = 400V
VCC = 600V
GATE-EMITTER VOLTAGE VGE (V)
20
16
12
8
4
0
0
200
400
600
800
1000
GATE CHARGE QG (nC)