CM50RL-24NF

HIGH POWER SWITCHING USE

CM50RL-24NF

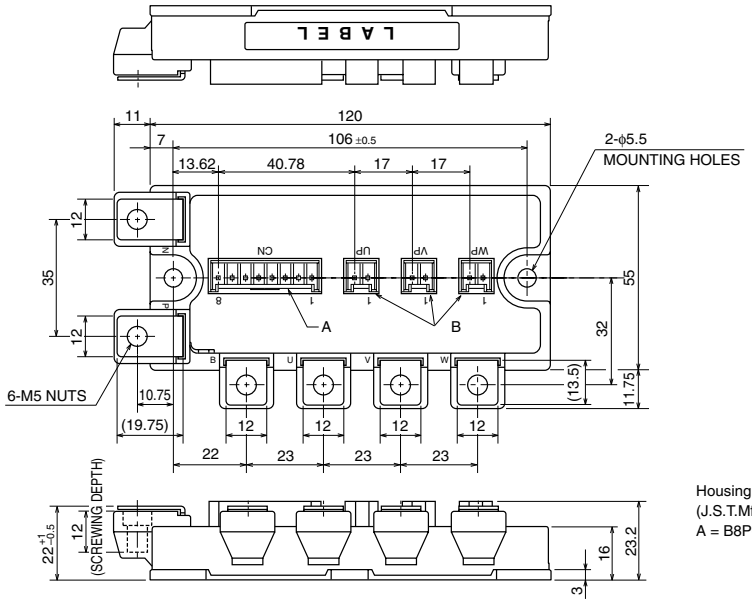
- I_C 50A
- V_{CES} 1200V
- Insulated Type
- 7-elements in a pack

APPLICATION

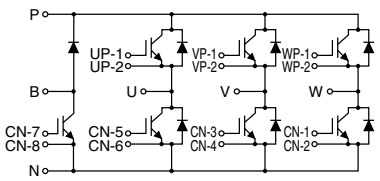
AC drive inverters & Servo controls, etc

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 = 94°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°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°C*1	30	A
I_{CM}		Pulse (Note 2)	60	A
P_C (Note 3)	Maximum collector dissipation	T_C = 25°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 ~ +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	350	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 = 5.0mA, 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 = 50A, 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		—	—	8.5	nF
C_{oes}	Output capacitance			—	—	0.75	nF
C_{res}	Reverse transfer capacitance			—	—	0.17	nF
Q_G	Total gate charge	V_{CC} = 600V, I_C = 50A, V_{GE} = 15V		—	250	—	nC
$t_{d(on)}$	Turn-on delay time	V_{CC} = 600V, I_C = 50A V_{GE} = ±15V R_G = 6.3Ω, Inductive load I_E = 50A		—	—	100	ns
t_r	Turn-on rise time			—	—	50	ns
$t_{d(off)}$	Turn-off delay time			—	—	300	ns
t_f	Turn-off fall time			—	—	350	ns
t_{rr} (Note 1)	Reverse recovery time			—	—	100	ns
Q_{rr} (Note 1)	Reverse recovery charge			—	2	—	μC
V_{EC}(Note 1)	Emitter-collector voltage	I_E = 50A, V_{GE} = 0V		—	—	3.8	V
$R_{th(j-c)Q}$	Thermal resistance	IGBT part (1/6 module)*1		—	—	0.32	K/W
$R_{th(j-c)R}$		FWDi part (1/6 module)*1		—	—	0.43	K/W
$R_{th(c-f)}$	Contact thermal resistance	Case to heat sink, Thermal compound Applied (1/6 module)*2		—	0.085	—	K/W
R_G	External gate resistance			6.3	—	96	Ω

BRAKE PART

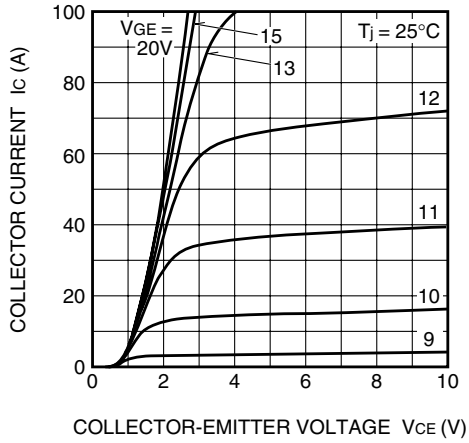
Symbol	Parameter	Test conditions		Limits			Unit
				Min.	Typ.	Max.	
I_{CES}	Collector cutoff current	V_{CE} = V_{CES}, V_{GE} = 0V		—	—	1	mA
$V_{GE(th)}$	Gate-emitter threshold voltage	I_C = 3.0mA		6	7	8	V
I_{GES}	Gate leakage current	±V_{GE} = V_{GES}, V_{CE} = 0V		—	—	0.5	μA
$V_{CE(sat)}$	Collector-emitter saturation voltage	I_C = 30A, 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		—	—	5.1	nF
C_{oes}	Output capacitance			—	—	0.45	nF
C_{res}	Reverse transfer capacitance			—	—	0.10	nF
Q_G	Total gate charge	V_{CC} = 600V, I_C = 30A, V_{GE} = 15V		—	150	—	nC
V_{FM}	Forward voltage drop	I_F = 30A		—	—	3.8	V
$R_{th(j-c)Q}$	Thermal resistance	IGBT part*1		—	—	0.43	K/W
$R_{th(j-c)R}$		Clamp diode part*1		—	—	0.65	K/W
R_G	External gate resistance			10	—	100	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)].

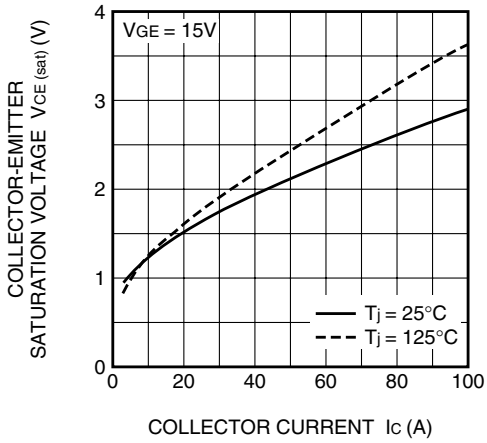
Note 1. I_E, V_{EC}, t_{rr} & Q_{rr} represent characteristics of the anti-parallel, emitter-collector free-wheel diode (FWDi).
2. Pulse width and repetition rate should be such that the device junction temperature (T_j) does not exceed T_{jmax} rating.
3. Junction temperature (T_j) should not increase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

PERFORMANCE CURVES

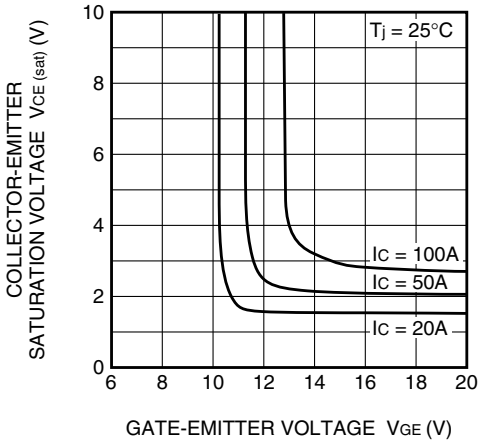
OUTPUT CHARACTERISTICS (TYPICAL)



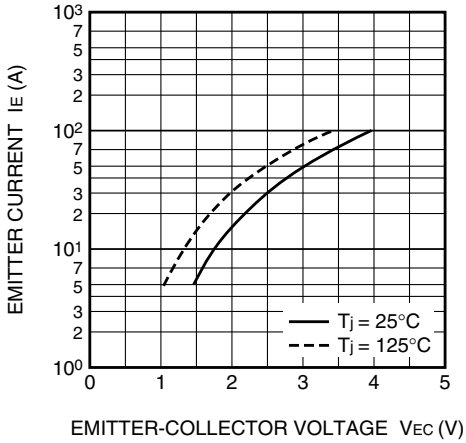
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



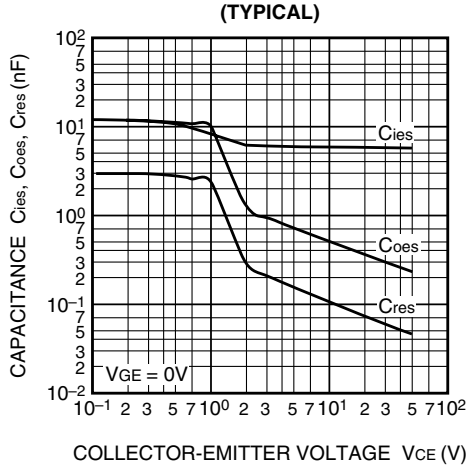
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



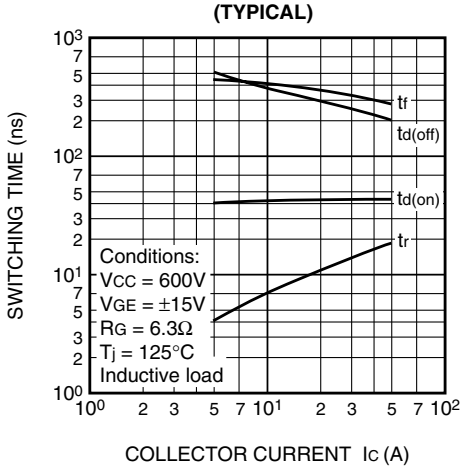
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



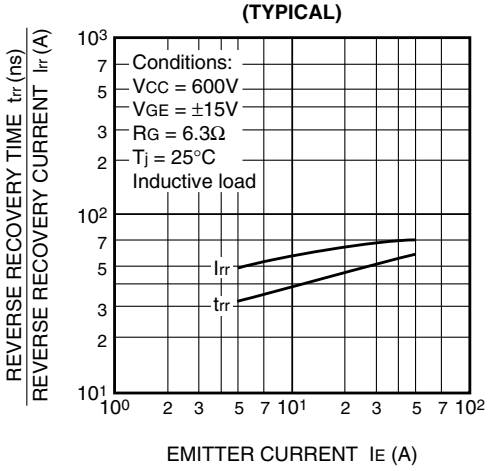
CAPACITANCE–VCE CHARACTERISTICS (TYPICAL)



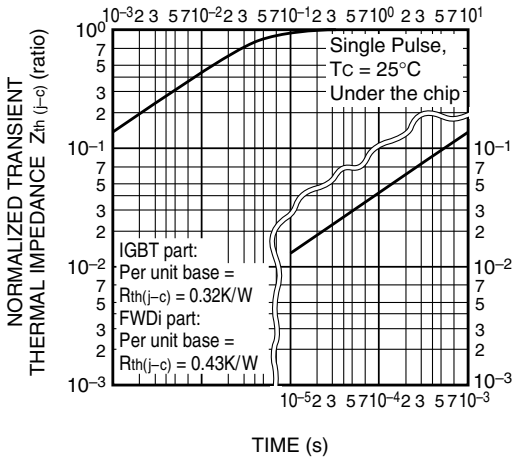
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



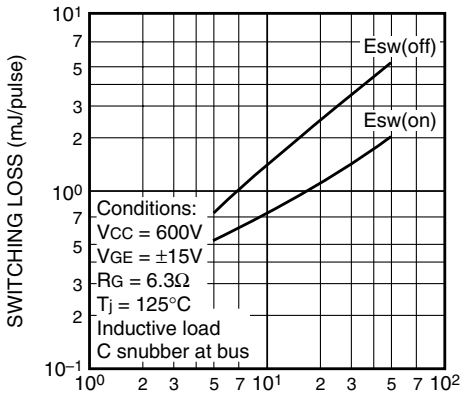
REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)



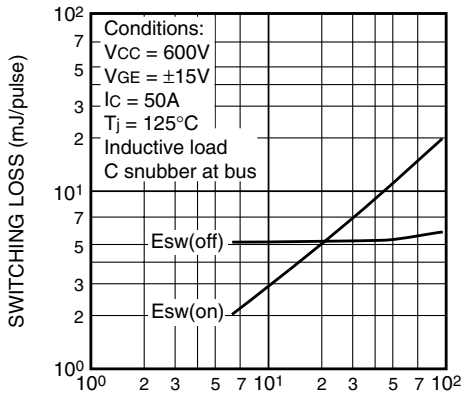
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT part & FWDi part)



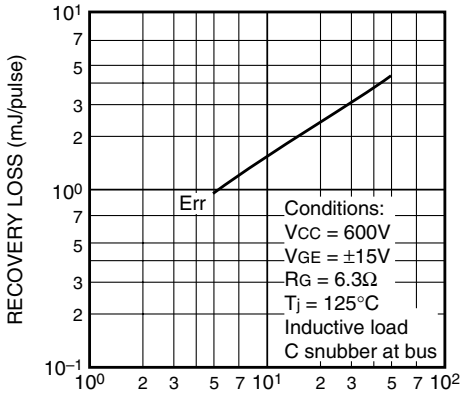
SWITCHING LOSS vs. COLLECTOR CURRENT (TYPICAL)



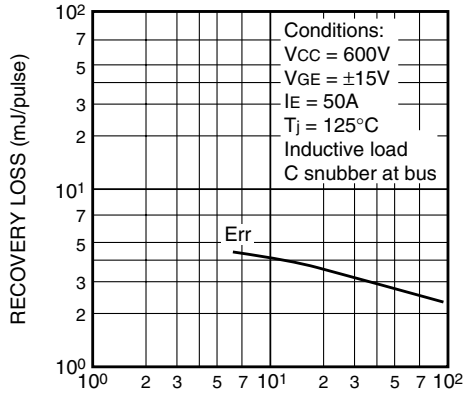
SWITCHING LOSS vs. GATE RESISTANCE (TYPICAL)

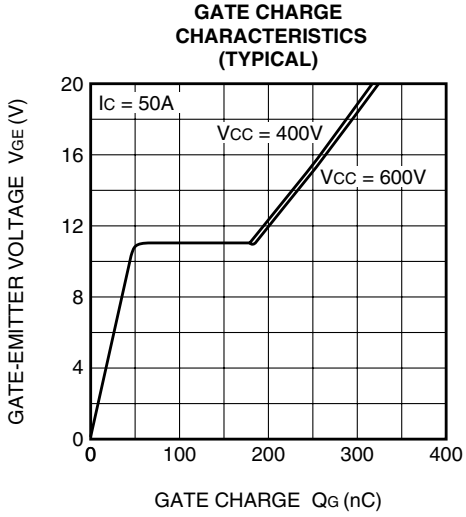


RECOVERY LOSS vs. IE (TYPICAL)



RECOVERY LOSS vs. GATE RESISTANCE (TYPICAL)




GATE CHARGE
CHARACTERISTICS
(TYPICAL)
IC = 50A
VCC = 400V
VCC = 600V
GATE-EMITTER VOLTAGE VGE (V)
20
16
12
8
4
0
0
100
200
300
400
GATE CHARGE QG (nC)