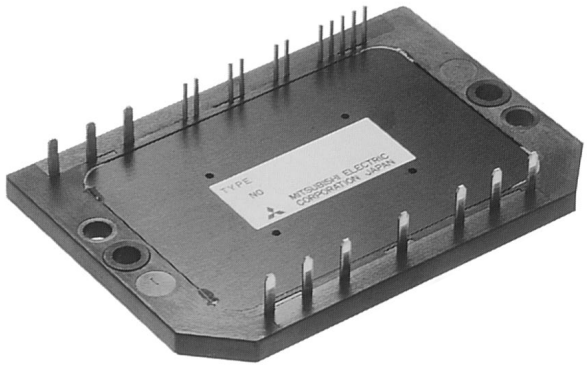
CM10MD-24H

MEDIUM POWER SWITCHING USE
INSULATED TYPE

CM10MD-24H



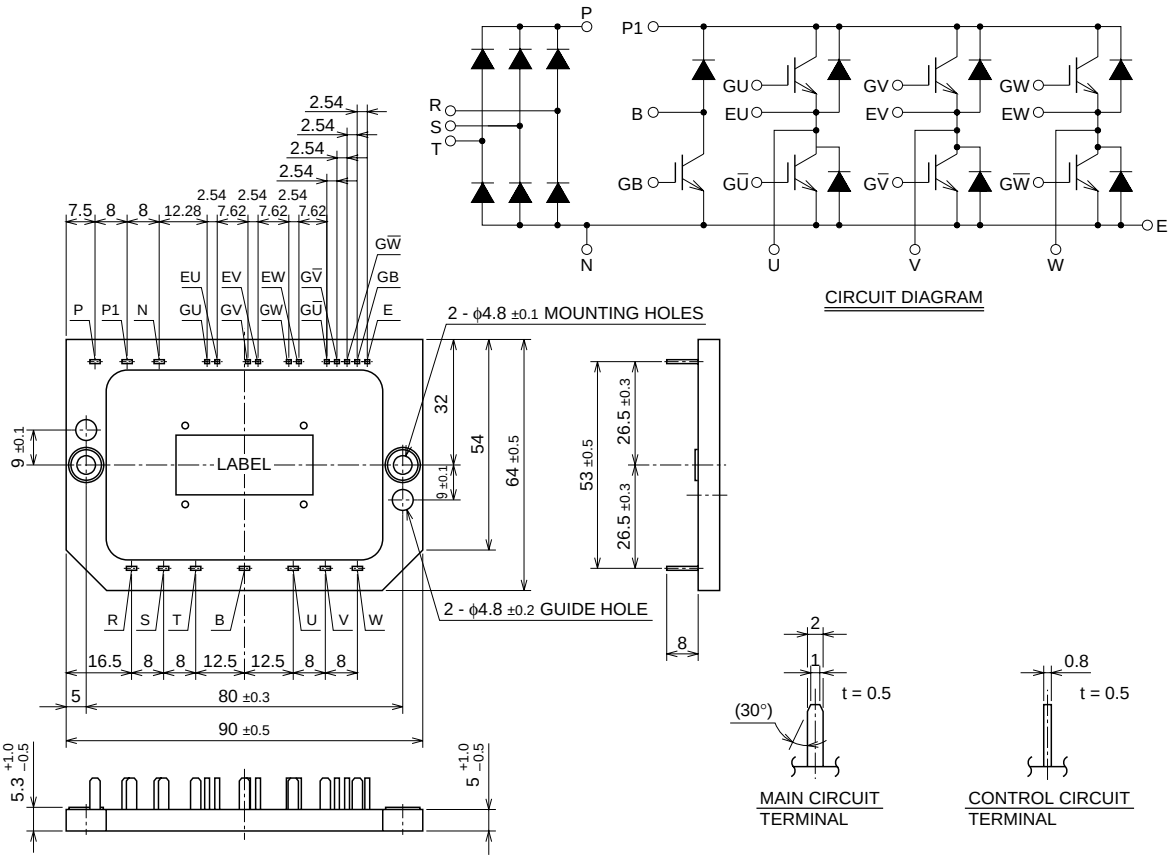
- I_C 10A
- V_{CES} 1200V
- Insulated Type
- CIB Module
  3ϕ Inverter+3ϕ Converter+Brake
- UL Recognized
  Yellow Card No. E80276 (N)
  File No. E80271

APPLICATION

AC & DC motor controls, General purpose inverters, Servo controls, NC, Robotics

OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm



Note. Not use the guiding holes to mount on the cooling fin.

MITSUBISHI ELECTRIC

MAXIMUM RATINGS (T_j = 25°C)
INVERTER PART

Symbol	Parameter	Condition	Rating	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	T_C = 25°C	10	A
I_{CM}		PULSE (Note. 2)	20	A
I_E (Note. 1)	Emitter Current	T_C = 25°C	10	A
I_{EM} (Note. 1)		PULSE (Note. 2)	20	A
P_C (Note. 3)	Maximum collector dissipation	T_f = 25°C	57	W

BRAKE PART

Symbol	Parameter	Condition	Rating	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	T_C = 25°C	10	A
I_{CM}		PULSE (Note. 2)	20	A
P_C (Note. 3)	Maximum Collector dissipation	T_f = 25°C	57	W
V_{RRM}	Repetitive peak reverse voltage	Clamp diode part	1200	V
I_{FM} (Note. 3)	Forward current	Clamp diode part	10	A

CONVERTER PART

Symbol	Parameter	Condition	Rating	Unit
V_{RRM}	Repetitive peak reverse voltage		1600	V
E_a	Recommended AC input voltage		440	V
I_O	DC output current	3ϕ rectifying circuit	10	A
I_{FSM}	Surge (non-repetitive) forward current	1 cycle at 60Hz, peak value Non-repetitive	100	A
I^2t	I^2t for fusing	Value for one cycle of surge current	42	A^2s

COMMON RATING

Symbol	Parameter	Condition	Rating	Unit
T_j	Junction temperature		–40 ~ +150	°C
T_{stg}	Storage temperature		–40 ~ +125	°C
V_{iso}	Isolation voltage	AC 1 min.	2500	V
—	Mounting torque	Mounting M4 screw	1.47 ~1.96	N·m
—	Weight	Typical value	60	g

ELECTRICAL CHARACTERISTICS (T_j = 25°C)

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 = 1.0mA, V_{CE} = 10V			4.5	6	7.5	V
I_{GES}	Gate-emitter cutoff current	V_{GE} = V_{GES}, V_{CE} = 0V			—	—	0.5	μA
$V_{CE(sat)}$	Collector-emitter saturation voltage	T_j = 25°C	I_C = 10A, V_{GE} = 15V	(Note. 4)	—	2.7	3.4	V
		T_j = 150°C			—	2.45	—	
C_{ies}	Input capacitance	V_{CE} = 10V, V_{GE} = 0V			—	—	2.0	nF
C_{oes}	Output capacitance				—	—	1.5	nF
C_{res}	Reverse transfer capacitance				—	—	0.4	nF
Q_G	Total gate charge	V_{CC} = 600V, I_C = 10A, V_{GE} = 15V			—	50	—	nC
$t_{d(on)}$	Turn-on delay time	V_{CC} = 600V, I_C = 10A, V_{GE1} = V_{GE2} = 15V, R_G = 31Ω, Resistive load			—	—	100	ns
t_r	Turn-on rise time				—	—	200	ns
$t_{d(off)}$	Turn-off delay time				—	—	150	ns
t_f	Turn-off fall time				—	—	350	ns
V_{EC} (Note. 1)	Emitter-collector voltage	I_E = 10A, V_{GE} = 0V			—	—	3.5	V
t_{rr} (Note. 1)	Reverse recovery time	I_E = 10A, V_{GE} = 0V			—	—	250	ns
Q_{rr} (Note. 1)	Reverse recovery charge	die / dt = – 20A / μs			—	0.08	—	μC
$R_{th(j-f)Q}$ (Note. 5)	Thermal resistance	IGBT part, Per 1/6 module			—	—	2.2	°C/W
$R_{th(j-f)R}$ (Note. 5)		FWDi part, Per 1/6 module			—	—	3.1	°C/W

BRAKE PART

Symbol	Parameter	Condition			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 = 1.0mA, V_{CE} = 10V			4.5	6	7.5	V
I_{GES}	Gate-emitter cutoff current	V_{GE} = V_{GES}, V_{CE} = 0V			—	—	0.5	μA
$V_{CE(sat)}$	Collector-to-emitter saturation voltage	T_j = 25°C	I_C = 10A, V_{GE} = 15V	(Note. 4)	—	2.7	3.4	V
		T_j = 150°C			—	2.45	—	
C_{ies}	Input capacitance	V_{CE} = 10V, V_{GE} = 0V			—	—	2.0	nF
C_{oes}	Output capacitance				—	—	1.5	nF
C_{res}	Reverse transfer capacitance				—	—	0.4	nF
Q_G	Total gate charge	V_{CC} = 600V, I_C = 10A, V_{GE} = 15V			—	50	—	nC
V_{FM}	Forward voltage drop	I_F = 10A, Clamp diode part			—	—	1.7	V
$R_{th(j-f)Q}$ (Note. 5)	Thermal resistance	IGBT part			—	—	2.2	°C/W
$R_{th(j-f)R}$ (Note. 5)		Clamp diode part			—	—	2.7	°C/W

CONVERTER PART

Symbol	Parameter	Condition	Limits			Unit
			Min.	Typ.	Max.	
I_{RRM}	Repetitive reverse current	V_R = V_{RRM}, T_j = 150°C	—	—	8	mA
V_{FM}	Forward voltage drop	I_F = 10A	—	—	1.7	V
$R_{th(j-f)}$ (Note. 5)	Thermal resistance	Per 1/6 module	—	—	2.7	°C/W

Note 1. I_E, V_{EC}, t_{rr}, Q_{rr} & die/dt represent characteristics of the anti-parallel, emitter to collector free-wheel diode.
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.
5. Thermal resistance is specified under following conditions.
   • The conductive greese applied, between module and fin.
   • Al plate is used as fin.

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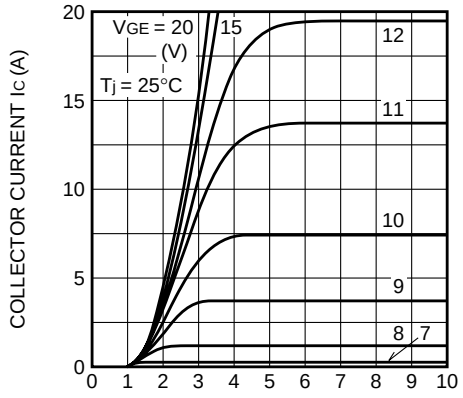
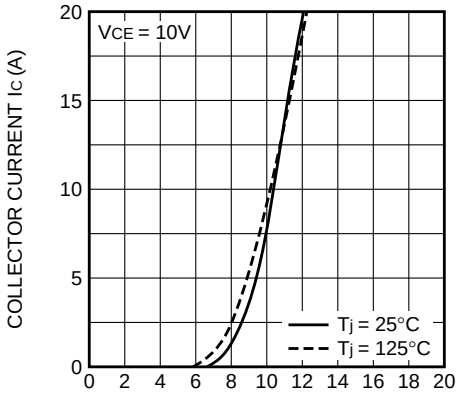
MEDIUM POWER SWITCHING USE
INSULATED TYPE

PERFORMANCE CURVES

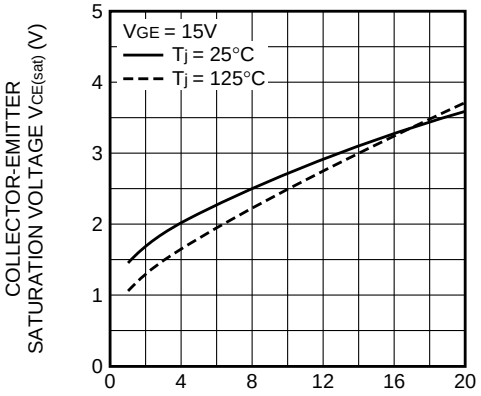
OUTPUT CHARACTERISTICS (TYPICAL)



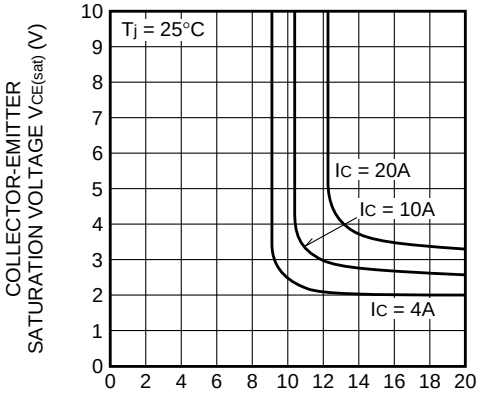
TRANSFER CHARACTERISTICS (TYPICAL)



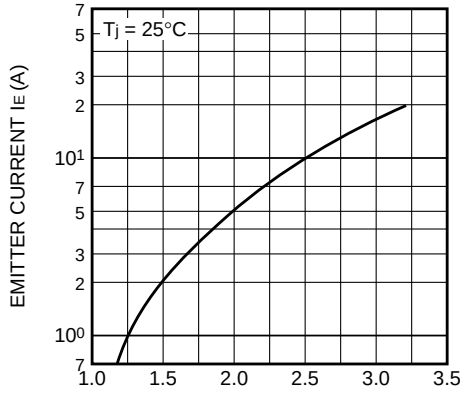
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



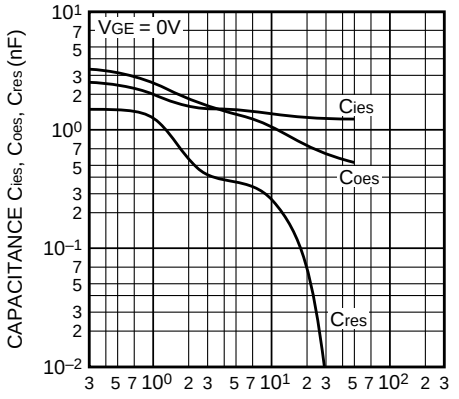
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



FREE-WHEEL DIODE FORWARD CHARACTERISITICS (TYPICAL)

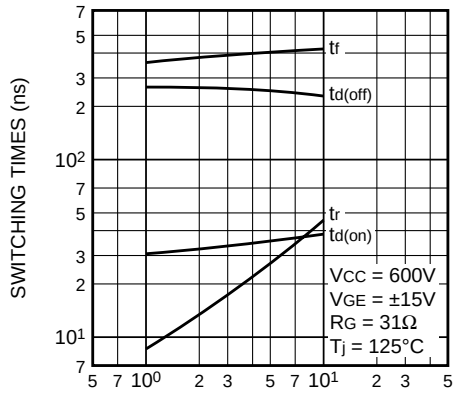


CAPACITANCE VS. VCE (TYPICAL)

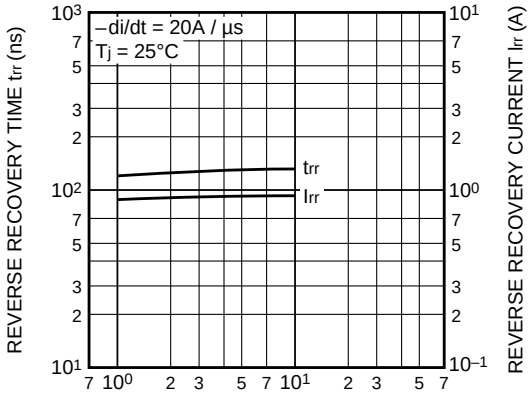


MITSUBISHI ELECTRIC

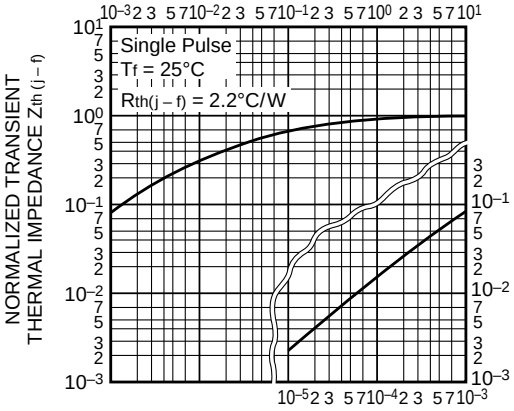
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



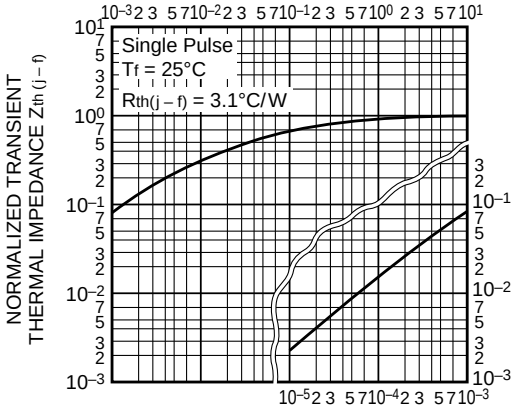
REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT part)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWDi part)



VGE – GATE CHARGE (TYPICAL)