MITSUBISHI IGBT MODULES

CM400HU-24F

HIGH POWER SWITCHING USE

CM400HU-24F

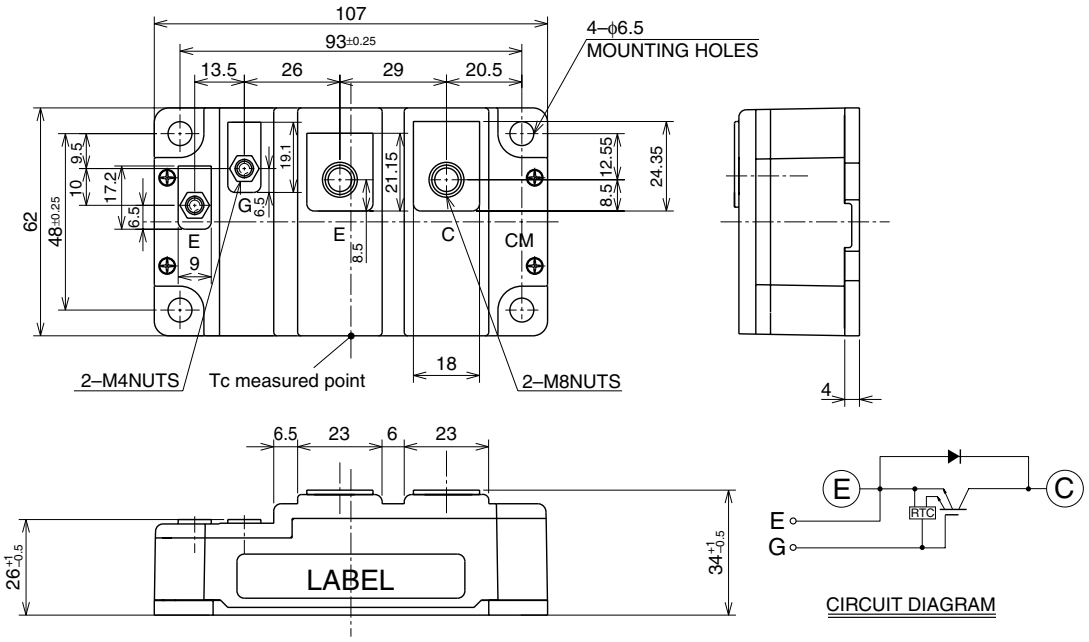
- I_C 400A
- V_{CES} 1200V
- Insulated Type
- 1-elements in a pack

APPLICATION

General purpose inverters & Servo controls, etc

OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm



Feb. 2009

MITSUBISHI ELECTRIC

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

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	T_C = 25°C	400	A
I_{CM}		Pulse (Note 2)	800	
I_E (Note 1)	Emitter current	T_C = 25°C	400	A
I_{EM} (Note 1)		Pulse (Note 2)	800	
P_C (Note 3)	Maximum collector dissipation	T_C = 25°C	1600	W
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 M8 screw	8.8 ~ 10.8	N • m
		Mounting M6 screw	3.5 ~ 4.5	N • m
		G(E) Terminal M4 screw	1.3 ~ 1.7	N • m
—	Weight	Typical value	450	g

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

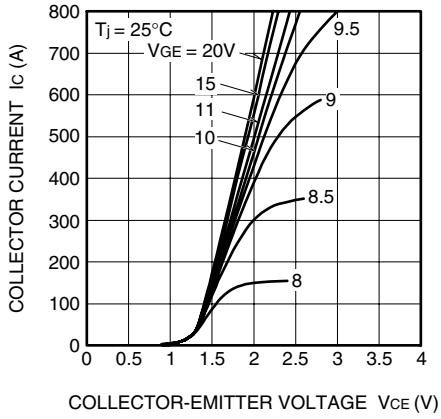
Symbol	Parameter	Test conditions		Limits			Unit
				Min.	Typ.	Max.	
I_{CES}	Collector cutoff current	V_{CE} = V_{CES}, V_{GE} = 0V		—	—	2	mA
$V_{GE(th)}$	Gate-emitter threshold voltage	I_C = 40mA, V_{CE} = 10V		5	6	7	V
I_{GES}	Gate leakage current	±V_{GE} = V_{GES}, V_{CE} = 0V		—	—	80	µA
$V_{CE(sat)}$	Collector-emitter saturation voltage	I_C = 400A, V_{GE} = 15V	T_j = 25°C	—	1.8	2.4	V
			T_j = 125°C	—	1.9	—	
C_{ies}	Input capacitance	V_{CE} = 10V, V_{GE} = 0V		—	—	160	nF
C_{oes}	Output capacitance			—	—	6.8	
C_{res}	Reverse transfer capacitance			—	—	4.0	
Q_G	Total gate charge	V_{CC} = 600V, I_C = 400A, V_{GE} = 15V		—	4400	—	nC
$t_{d(on)}$	Turn-on delay time	V_{CC} = 600V, I_C = 400A, V_{GE} = ±15V, R_G = 0.78Ω, Inductive load, I_E = 400A		—	—	300	ns
t_r	Turn-on rise time			—	—	100	
$t_{d(off)}$	Turn-off delay time			—	—	600	
t_f	Turn-off fall time			—	—	300	
t_{rr} (Note 1)	Reverse recovery time			—	—	350	ns
Q_{rr} (Note 1)	Reverse recovery charge			—	23.6	—	µC
V_{EC}(Note 1)	Emitter-collector voltage	I_E = 400A, V_{GE} = 0V		—	—	3.2	V
$R_{th(j-c)Q}$	Thermal resistance*1	IGBT part		—	—	0.078	K/W
$R_{th(j-c)R}$		FWDi part		—	—	0.09	
$R_{th(c-f)}$	Contact thermal resistance	Case to heat sink, Thermal compound applied*2		—	0.02	—	
$R_{th(j-c')Q}$	Thermal resistance	Case temperature measured point is just under the chips		—	—	0.045*3	
R_G	External gate resistance			0.78	—	7.8	Ω

Note 1. I_E, V_{EC}, t_{rr}, Q_{rr} & die/dt 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.

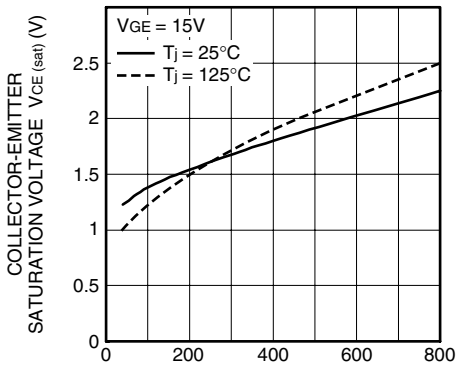
*1 : Case temperature (Tc) measured point is indicated in OUTLINE DRAWING.
*2 : Typical value is measured by using thermally conductive grease of λ = 0.9[W/(m • K)].
*3 : If you use this value, $R_{th(f-a)}$ should be measured just under the chips.

PERFORMANCE CURVES

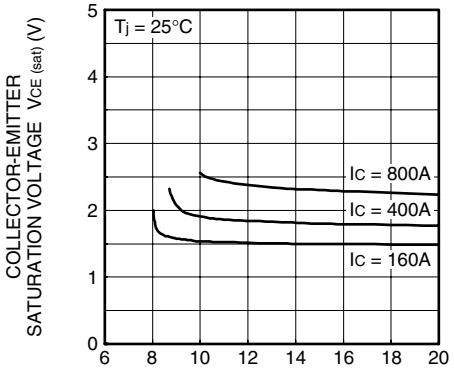
OUTPUT CHARACTERISTICS (TYPICAL)



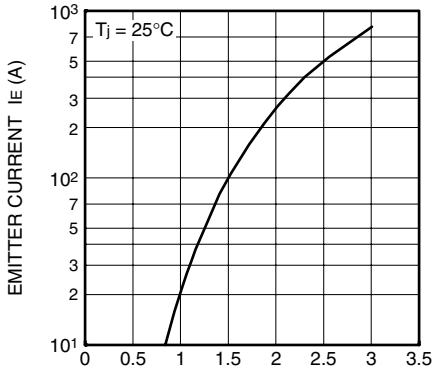
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



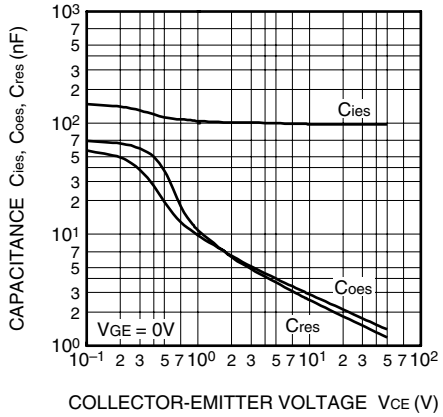
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



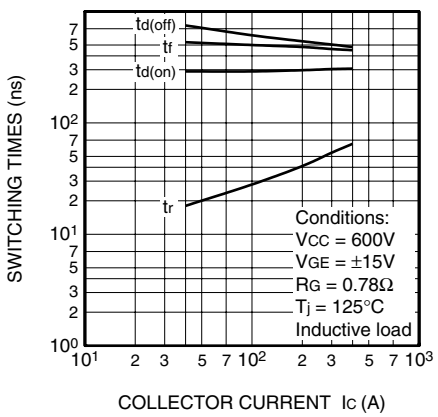
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



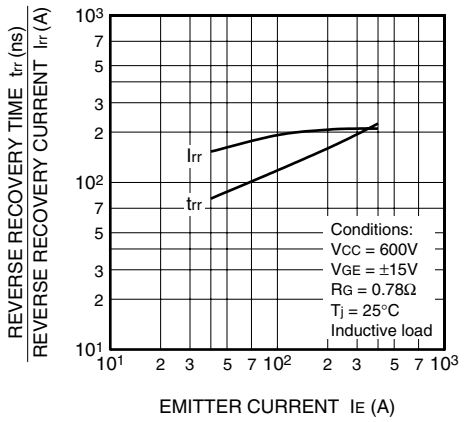
CAPACITANCE–VCE CHARACTERISTICS (TYPICAL)



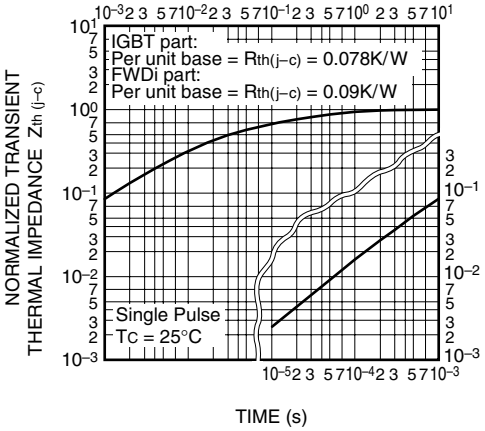
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT part & FWDi part)



GATE CHARGE CHARACTERISTICS (TYPICAL)