

**PRELIMINARY**  
 Notice: This is not a final specification.  
 Some parametric limits are subject to change.

MITSUBISHI HVIGBT MODULES

# CM400DY-50H

HIGH POWER SWITCHING USE  
 INSULATED TYPE

HVIGBT (High Voltage Insulated Gate Bipolar Transistor) Modules

## CM400DY-50H



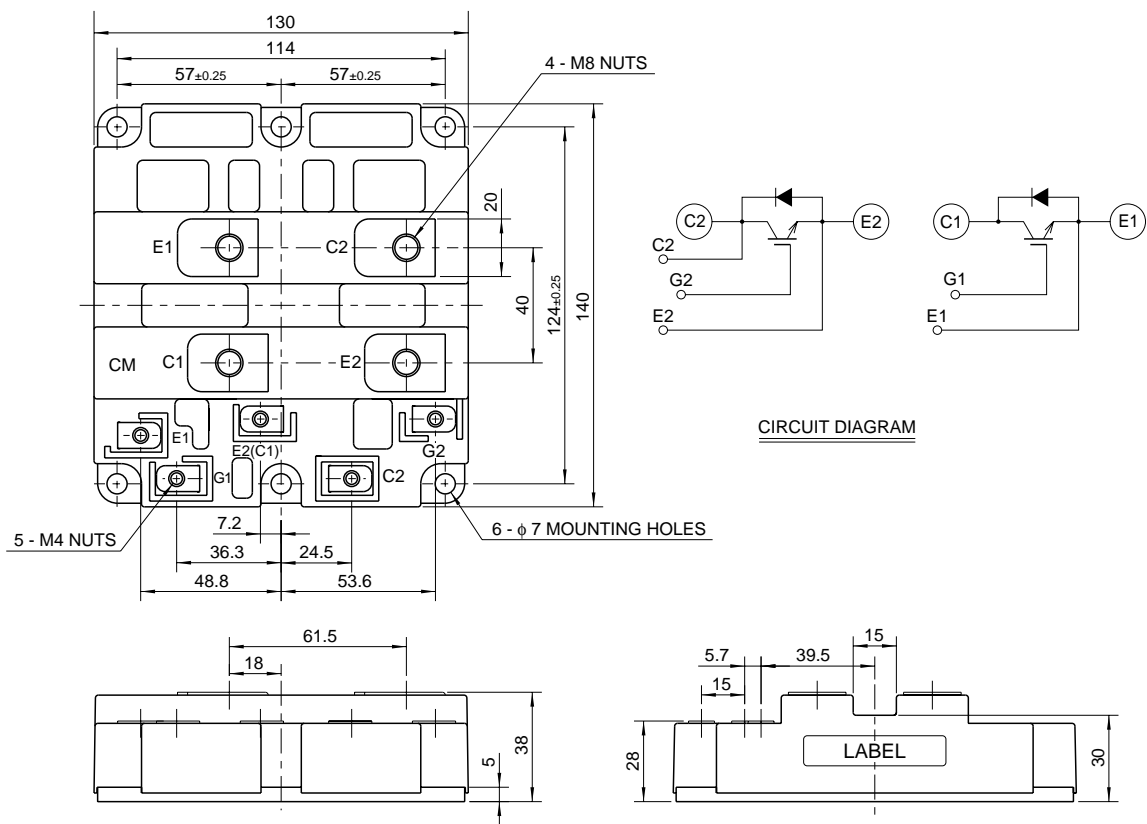
- Ic ..... 400A
- VCES ..... 2500V
- Insulated Type
- 2-elements in a pack

## APPLICATION

Inverters, Converters, DC choppers, Induction heating, DC to DC converters.

## OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm



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Aug.1998

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**MAXIMUM RATINGS (T<sub>j</sub> = 25°C)**

Symbol	Parameter	Conditions	Ratings	Unit
V <sub>CE</sub> S	Collector-emitter voltage	G-E Short	2500	V
V <sub>GE</sub> S	Gate-emitter voltage	C-E Short	±20	V
I <sub>C</sub>	Collector current	T <sub>C</sub> = 25°C	400	A
I <sub>CM</sub>		Pulse (Note 2)	800	A
I <sub>E</sub> (Note 1)	Emitter current	T <sub>C</sub> = 25°C	400	A
I <sub>EM</sub> (Note 1)		Pulse (Note 2)	800	A
P <sub>C</sub> (Note 3)	Maximum collector dissipation	T <sub>C</sub> = 25°C	3470	W
T <sub>j</sub>	Junction temperature		-40 ~ +150	°C
T <sub>stg</sub>	Storage temperature		-40 ~ +125	°C
V <sub>iso</sub>	Isolation voltage	Main terminal to Base, AC for 1 minute	6000	V
—	Mounting torque	Main terminals screw M8	6.67 ~ 8.24	N·m
		Mounting screw M6	2.84 ~ 3.43	N·m
		Auxiliary terminals screw M4	0.88 ~ 1.08	N·m
—	Weight	Typical value	1.5	kg

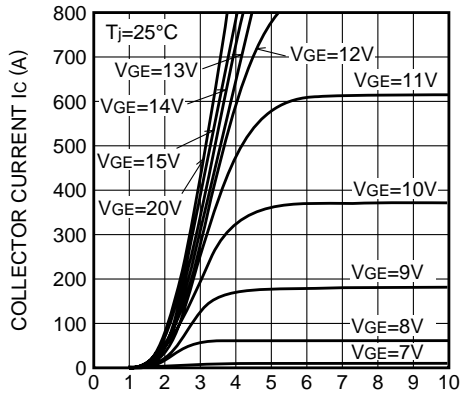
**ELECTRICAL CHARACTERISTICS (T<sub>j</sub> = 25°C)**

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
I <sub>CE</sub> S	Collector cutoff current	V <sub>CE</sub> = V <sub>CE</sub> S, V <sub>GE</sub> = 0V	—	—	5	mA
V <sub>GE(th)</sub>	Gate-emitter threshold voltage	I <sub>C</sub> = 40mA, V <sub>CE</sub> = 10V	4.5	6.0	7.5	V
I <sub>GE</sub> S	Gate-leakage current	V <sub>GE</sub> = V <sub>GE</sub> S, V <sub>CE</sub> = 0V	—	—	0.5	μA
V <sub>CE(sat)</sub>	Collector-emitter saturation voltage	T <sub>j</sub> = 25°C	—	3.20	4.16	V
		T <sub>j</sub> = 125°C	—	3.60	—	
C <sub>ies</sub>	Input capacitance	V <sub>CE</sub> = 10V V <sub>GE</sub> = 0V	—	43	—	nF
C <sub>oes</sub>	Output capacitance		—	2	—	nF
C <sub>res</sub>	Reverse transfer capacitance		—	1	—	nF
Q <sub>G</sub>	Total gate charge	V <sub>CC</sub> = 1250V, I <sub>C</sub> = 400A, V <sub>GE</sub> = 15V	—	3.3	—	μC
t <sub>d(on)</sub>	Turn-on delay time	V <sub>CC</sub> = 1250V, I <sub>C</sub> = 400A	—	—	1.00	μs
t <sub>r</sub>	Turn-on rise time	V <sub>GE1</sub> = V <sub>GE2</sub> = 15V	—	—	2.00	μs
t <sub>d(off)</sub>	Turn-off delay time	R <sub>G</sub> = 7.5Ω	—	—	2.00	μs
t <sub>f</sub>	Turn-off fall time	Resistive load switching operation	—	—	1.00	μs
V <sub>EC</sub> (Note 1)	Emitter-collector voltage	I <sub>E</sub> = 400A, V <sub>GE</sub> = 0V	—	2.90	3.77	V
t <sub>rr</sub> (Note 1)	Reverse recovery time	I <sub>E</sub> = 400A	—	—	1.20	μs
Q <sub>rr</sub> (Note 1)	Reverse recovery charge	die / dt = -800A / μs	—	85	—	μC
R <sub>th(j-c)Q</sub>	Thermal resistance	IGBT part (Per 1/2 module)	—	—	0.036	°C/W
R <sub>th(j-c)R</sub>		FWDi part (Per 1/2 module)	—	—	0.072	°C/W
R <sub>th(c-f)</sub>	Contact thermal resistance	Case to fin, conductive grease applied (Per 1/2 module)	—	0.016	—	°C/W

- Note 1. I<sub>E</sub>, V<sub>EC</sub>, t<sub>rr</sub>, Q<sub>rr</sub> & 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<sub>j</sub>) does not exceed T<sub>jmax</sub> rating.  
 3. Junction temperature (T<sub>j</sub>) should not increase beyond 150°C.  
 4. Pulse width and repetition rate should be such as to cause negligible temperature rise.

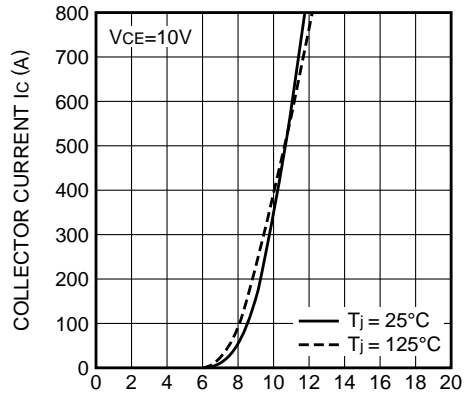
**PERFORMANCE CURVES**

**OUTPUT CHARACTERISTICS  
 (TYPICAL)**



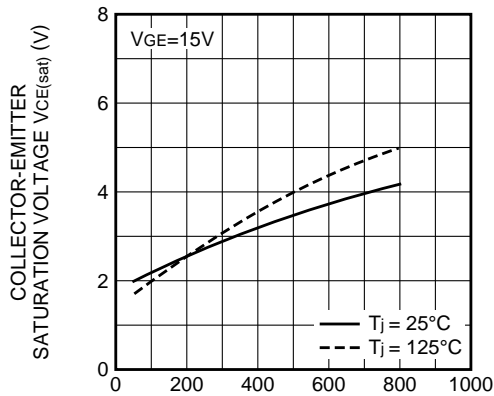
COLLECTOR-EMITTER SATURATION VOLTAGE  $V_{CE(sat)}$  (V)

**TRANSFER CHARACTERISTICS  
 (TYPICAL)**



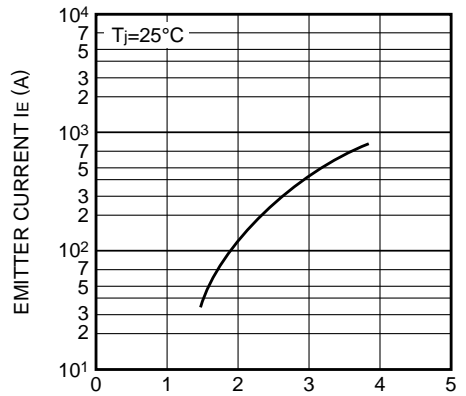
GATE-EMITTER VOLTAGE  $V_{GE}$  (V)

**COLLECTOR-EMITTER SATURATION  
 VOLTAGE CHARACTERISTICS  
 (TYPICAL)**



COLLECTOR CURRENT  $I_c$  (A)

**FREE-WHEEL DIODE  
 FORWARD CHARACTERISTICS  
 (TYPICAL)**



EMITTER-COLLECTOR VOLTAGE  $V_{ec}$  (V)