

MITSUBISHI IGBT MODULES  
**CM400DU-12NFH**

HIGH POWER SWITCHING USE

**CM400DU-12NFH**



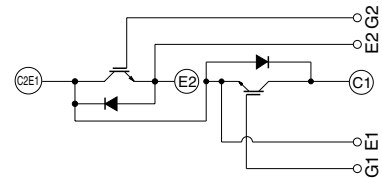
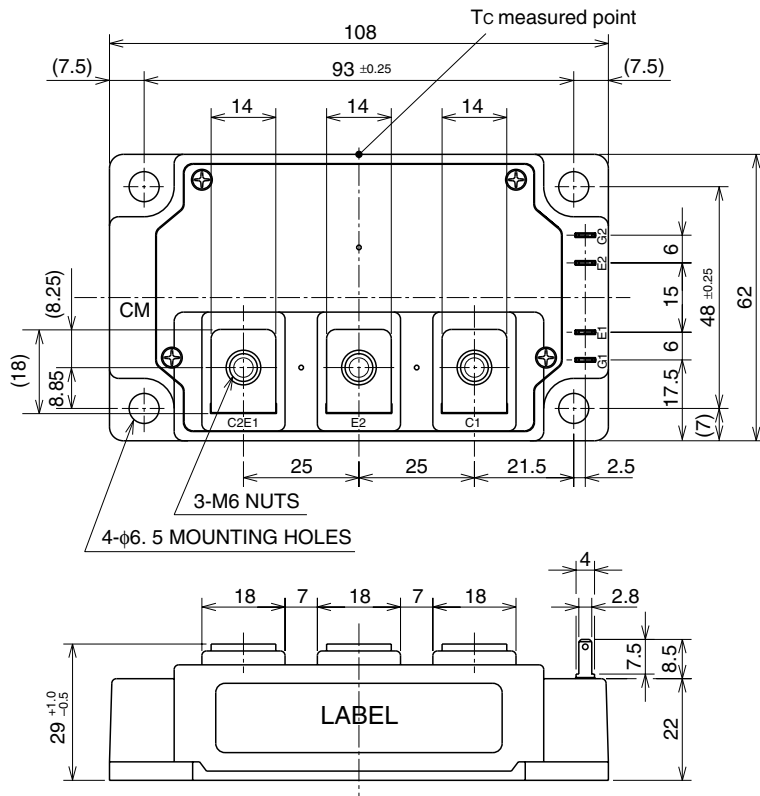
- IC ..... 400A
- VCES ..... 600V
- Insulated Type
- 2-elements in a pack

**APPLICATION**

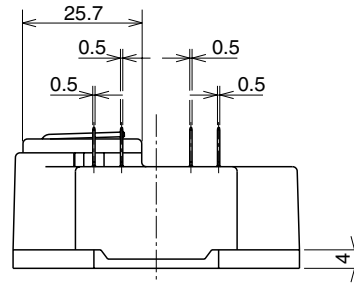
High frequency switching use (30kHz to 60kHz).  
 Gradient amplifier, Induction heating, power supply, etc.

**OUTLINE DRAWING & CIRCUIT DIAGRAM**

Dimensions in mm



CIRCUIT DIAGRAM



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

Symbol	Parameter	Conditions	Ratings	Unit
V <sub>CE</sub> S	Collector-emitter voltage	G-E Short	600	V
V <sub>GE</sub> S	Gate-emitter voltage	C-E Short	±20	V
I <sub>C</sub>	Collector current	Operation	400	A
I <sub>CM</sub>		Pulse (Note 2)	800	A
I <sub>E</sub> (Note 1)	Emitter current	Operation	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	960	W
P <sub>C</sub> ' (Note 3)	Maximum collector dissipation	T <sub>c</sub> ' = 25°C <sup>4</sup>	1640	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	Terminals to base plate, f = 60Hz, AC 1 minute	2500	V <sub>rms</sub>
—	Mounting torque	Main terminals M6 screw	3.5 ~ 4.5	N • m
—		Mounting M6 screw	3.5 ~ 4.5	N • m
—	Weight	Typical value	400	g

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

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	—	—	1	mA	
V <sub>GE(th)</sub>	Gate-emitter threshold voltage	I <sub>C</sub> = 40mA, V <sub>CE</sub> = 10V	5	6	7	V	
I <sub>GES</sub>	Gate leakage current	±V <sub>GE</sub> = V <sub>GES</sub> , V <sub>CE</sub> = 0V	—	—	0.5	μA	
V <sub>CE(sat)</sub>	Collector-emitter saturation voltage	I <sub>C</sub> = 400A, V <sub>GE</sub> = 15V	T <sub>j</sub> = 25°C	—	2.0	2.7	V
			T <sub>j</sub> = 125°C	—	1.95	—	
C <sub>ies</sub>	Input capacitance	V <sub>CE</sub> = 10V V <sub>GE</sub> = 0V	—	—	110	nF	
C <sub>oes</sub>	Output capacitance		—	—	7.2	nF	
C <sub>res</sub>	Reverse transfer capacitance		—	—	4.0	nF	
Q <sub>G</sub>	Total gate charge	V <sub>CC</sub> = 300V, I <sub>C</sub> = 400A, V <sub>GE</sub> = 15V	—	2480	—	nC	
t <sub>d(on)</sub>	Turn-on delay time	V <sub>CC</sub> = 300V, I <sub>C</sub> = 400A V <sub>GE</sub> = ±15V R <sub>G</sub> = 3.1Ω, Inductive load	—	—	400	ns	
t <sub>r</sub>	Turn-on rise time		—	—	200	ns	
t <sub>d(off)</sub>	Turn-off delay time		—	—	700	ns	
t <sub>f</sub>	Turn-off fall time		—	—	150	ns	
t <sub>rr</sub> (Note 1)	Reverse recovery time		I <sub>E</sub> = 400A	—	—	200	ns
Q <sub>rr</sub> (Note 1)	Reverse recovery charge			—	7.7	—	μC
V <sub>EC</sub> (Note 1)	Emitter-collector voltage	I <sub>E</sub> = 400A, V <sub>GE</sub> = 0V	—	—	2.6	V	
R <sub>th(j-c)Q</sub>	Thermal resistance*1	IGBT part (1/2 module)	—	—	0.13	K/W	
R <sub>th(j-c)R</sub>		FWDi part (1/2 module)	—	—	0.18	K/W	
R <sub>th(c-f)</sub>	Contact thermal resistance	Case to heat sink, Thermal compound Applied*2 (1/2 module)	—	0.04	—	K/W	
R <sub>th(j-c)Q</sub>	Thermal resistance	Case temperature measured point is just under the chips (1/2 module)	—	—	0.076*3	K/W	
R <sub>G</sub>	External gate resistance		1.6	—	16	Ω	

\*1 : Case temperature (T<sub>c</sub>) measured point is shown in page 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<sub>th(f-a)</sub> should be measured just under the chips.

\*4 : Case temperature (T<sub>c</sub>) measured point is just under the chips.

Note 1. I<sub>E</sub>, I<sub>EM</sub>, V<sub>EC</sub>, t<sub>rr</sub> & Q<sub>rr</sub> represent characteristics of the anti-parallel, emitter-collector free-wheel diode (FWDi).

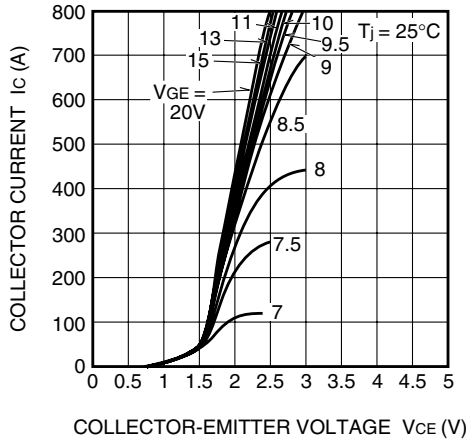
2. Pulse width and repetition rate should be such that the device junction temperature (T<sub>j</sub>) does not exceed T<sub>jmax</sub> rating.

3. Junction temperature (T<sub>j</sub>) should not increase beyond 150°C.

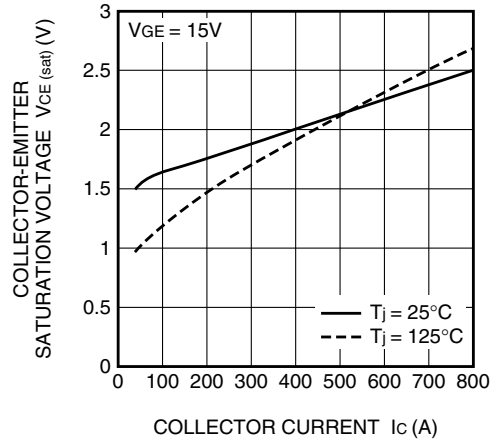
4. No short circuit capability is designed.

PERFORMANCE CURVES

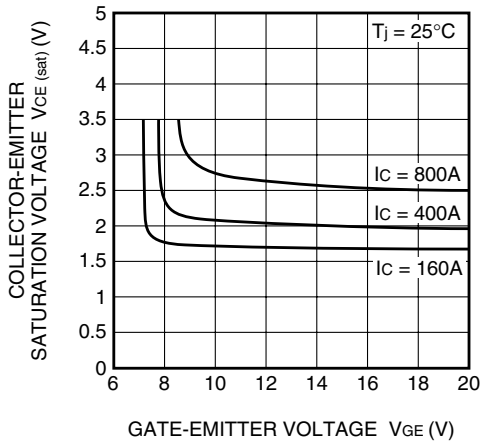
OUTPUT CHARACTERISTICS (TYPICAL)



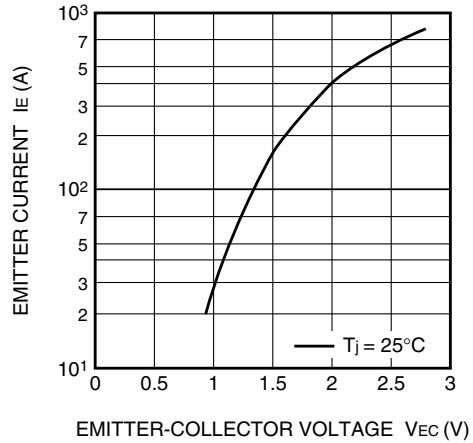
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



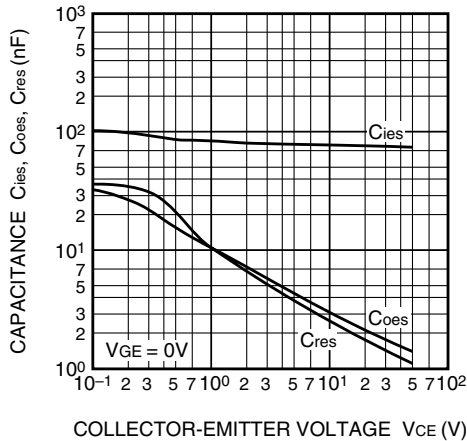
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



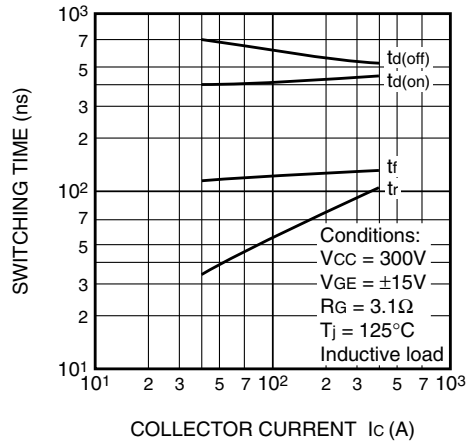
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



CAPACITANCE-Vce CHARACTERISTICS (TYPICAL)



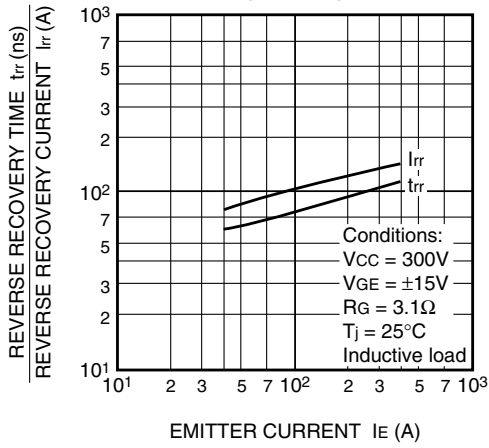
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



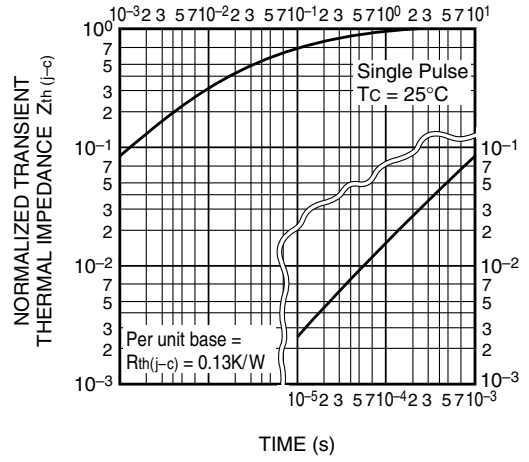
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HIGH POWER SWITCHING USE

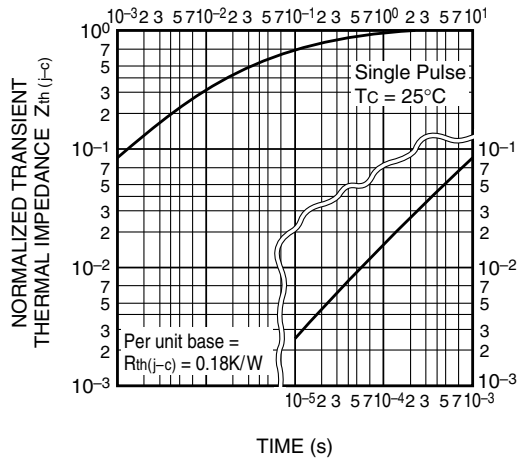
REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT part)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWDi part)



GATE CHARGE CHARACTERISTICS (TYPICAL)

