

MITSUBISHI IGBT MODULES  
**CM400DY-12NF**

HIGH POWER SWITCHING USE

**CM400DY-12NF**



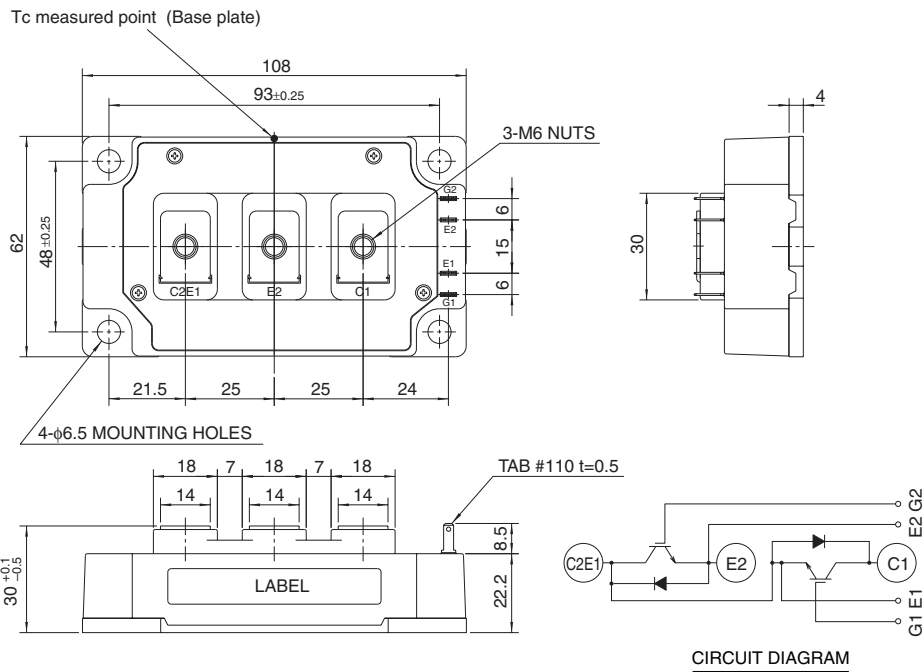
- IC ..... 400A
- VCES ..... 600V
- Insulated Type
- 2-elements in a pack

**APPLICATION**

General purpose inverters & Servo controls, etc

**OUTLINE DRAWING & CIRCUIT DIAGRAM**

Dimensions in mm



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**MAXIMUM RATINGS** (T<sub>j</sub> = 25°C, unless otherwise specified)

Symbol	Parameter	Conditions	Ratings	Unit
V <sub>CES</sub>	Collector-emitter voltage	G-E Short	600	V
V <sub>GES</sub>	Gate-emitter voltage	C-E Short	±20	V
I <sub>C</sub>	Collector current	DC, T <sub>c</sub> ' = 92°C <sup>*3</sup>	400	A
I <sub>CM</sub>		Pulse (Note 2)	800	A
I <sub>E</sub> (Note 1)	Emitter current		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	1130	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>
—	Torque strength	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** (T<sub>j</sub> = 25°C, unless otherwise specified)

Symbol	Parameter	Test conditions	Limits			Unit	
			Min.	Typ.	Max.		
I <sub>CES</sub>	Collector cutoff current	V <sub>CE</sub> = V <sub>CES</sub> , 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	7.5	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	—	1.7	2.2	V
			T <sub>j</sub> = 125°C	—	1.7	—	
C <sub>ies</sub>	Input capacitance	V <sub>CE</sub> = 10V V <sub>GE</sub> = 0V	—	—	60	nF	
C <sub>oes</sub>	Output capacitance		—	—	7.3	nF	
C <sub>res</sub>	Reverse transfer capacitance		—	—	2.4	nF	
Q <sub>G</sub>	Total gate charge	V <sub>CC</sub> = 300V, I <sub>C</sub> = 400A, V <sub>GE</sub> = 15V	—	1600	—	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 I <sub>E</sub> = 400A	—	—	300	ns	
t <sub>r</sub>	Turn-on rise time		—	—	200	ns	
t <sub>d(off)</sub>	Turn-off delay time		—	—	450	ns	
t <sub>f</sub>	Turn-off fall time		—	—	300	ns	
t <sub>rr</sub> (Note 1)	Reverse recovery time		—	—	250	ns	
Q <sub>rr</sub> (Note 1)	Reverse recovery charge		—	6.8	—	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 <sup>*1</sup>	IGBT part (1/2 module)	—	—	0.11	K/W	
R <sub>th(j-c)R</sub>		FWDi part (1/2 module)	—	—	0.19	K/W	
R <sub>th(c-f)</sub>	Contact thermal resistance	Case to heat sink, Thermal compound Applied <sup>*2</sup> (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	—	—	0.066 <sup>*3</sup>	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 : Case temperature (T<sub>c</sub>) measured point is just under the chips.

If you use this value, R<sub>th(f-a)</sub> should be measured just under the chips.

Note 1. I<sub>E</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.

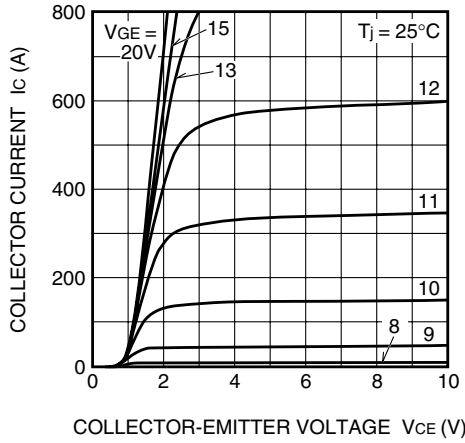
3. Junction temperature (T<sub>j</sub>) should not increase beyond 150°C.

# CM400DY-12NF

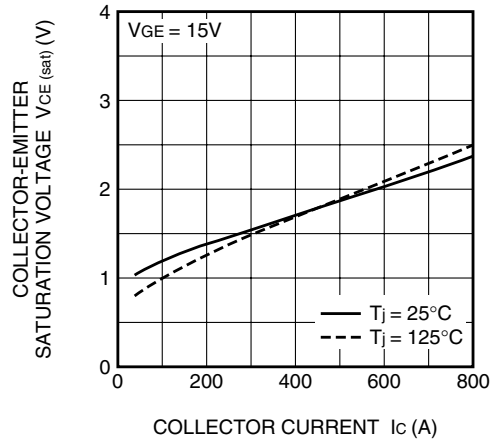
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## PERFORMANCE CURVES

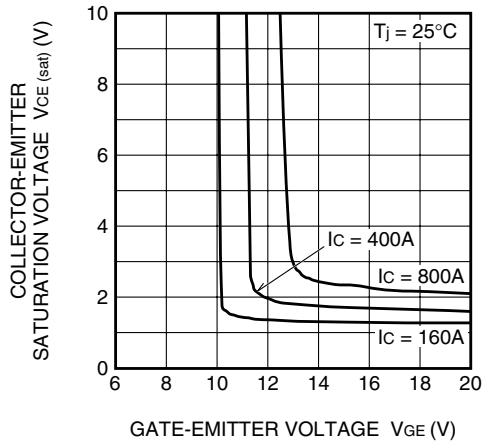
**OUTPUT CHARACTERISTICS (TYPICAL)**



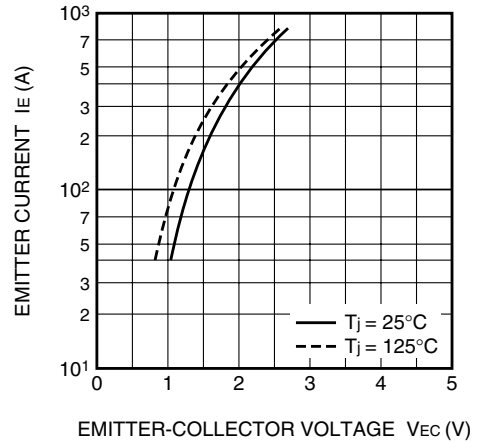
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



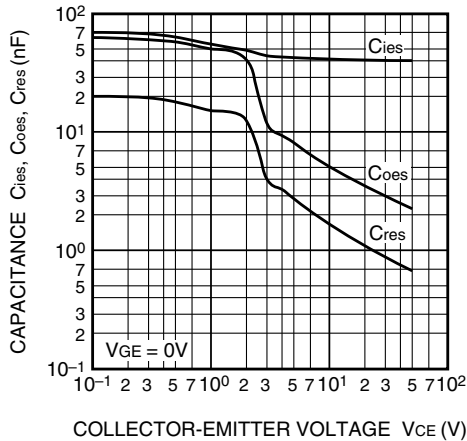
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



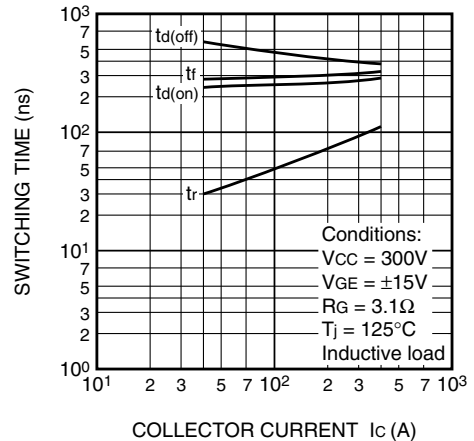
**FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)**



**CAPACITANCE-VCE CHARACTERISTICS (TYPICAL)**



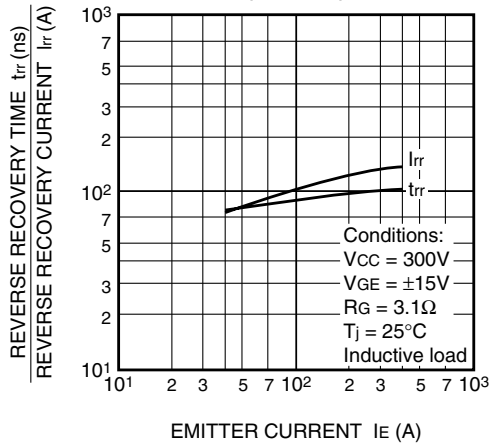
**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**



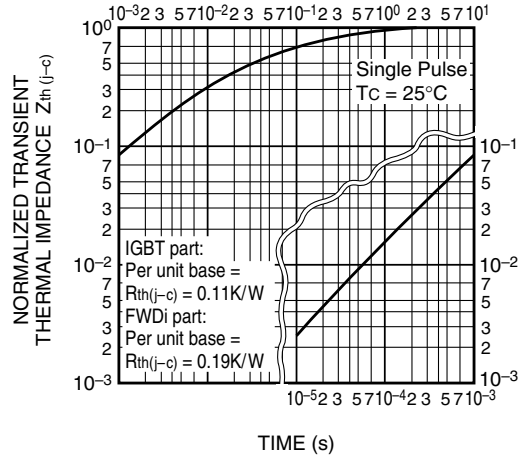
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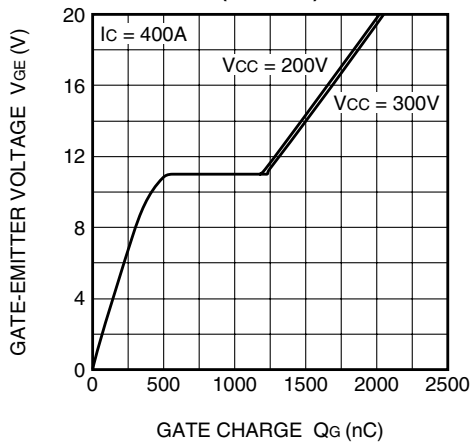
REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT part & FWDi part)



GATE CHARGE CHARACTERISTICS (TYPICAL)



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