

MITSUBISHI IGBT MODULES  
**CM400DU-12F**

HIGH POWER SWITCHING USE

**CM400DU-12F**



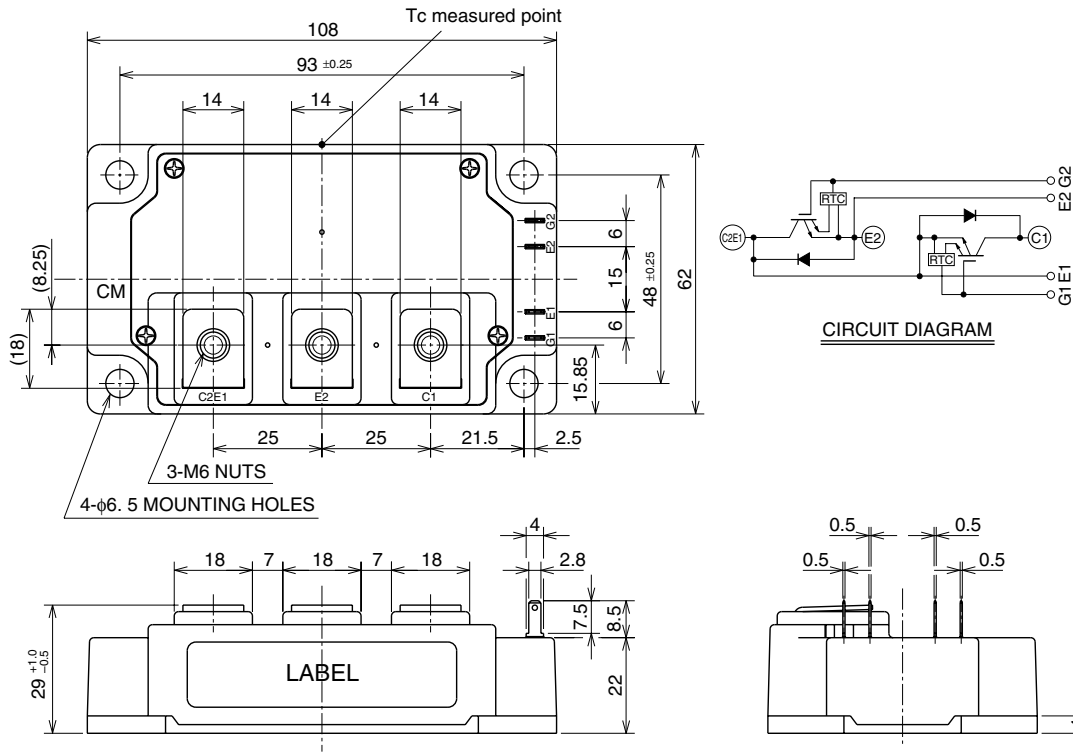
- IC ..... 400A
- VCES ..... 600V
- Insulated Type
- 2-elements in a pack

**APPLICATION**

General purpose inverters & Servo controls, etc

**OUTLINE DRAWING & CIRCUIT DIAGRAM**

Dimensions in mm



Feb. 2009



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

Symbol	Parameter	Conditions	Ratings	Unit
VCES	Collector-emitter voltage	G-E Short	600	V
VGES	Gate-emitter voltage	C-E Short	±20	V
IC	Collector current	Tc = 25°C	400	A
ICM		Pulse (Note 2)	800	
IE (Note 1)	Emitter current	Tc = 25°C	400	A
IEM (Note 1)		Pulse (Note 2)	800	
PC (Note 3)	Maximum collector dissipation	Tc = 25°C	960	W
Tj	Junction temperature		-40 ~ +150	°C
Tstg	Storage temperature		-40 ~ +125	°C
Viso	Isolation voltage	Terminals to base plate, f = 60Hz, AC 1 minute	2500	Vrms
—	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 (Tj = 25°C, unless otherwise specified)

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
ICES	Collector cutoff current	VCE = VCES, VGE = 0V	—	—	1	mA
VGE(th)	Gate-emitter threshold voltage	IC = 40mA, VCE = 10V	5	6	7	V
IGES	Gate leakage current	±VGE = VGES, VCE = 0V	—	—	40	µA
VCE(sat)	Collector-emitter saturation voltage	IC = 400A, VGE = 15V	Tj = 25°C	1.6	2.2	V
			Tj = 125°C	—	1.6	
Cies	Input capacitance	VCE = 10V VGE = 0V	—	—	110	nF
Coes	Output capacitance		—	—	7.2	
Cres	Reverse transfer capacitance		—	—	4.0	
QG	Total gate charge	VCC = 300V, IC = 400A, VGE = 15V	—	2480	—	nC
td(on)	Turn-on delay time	VCC = 300V, IC = 400A VGE = ±15V RG = 3.1Ω, Inductive load IE = 400A	—	—	400	ns
tr	Turn-on rise time		—	—	200	
td(off)	Turn-off delay time		—	—	700	
tf	Turn-off fall time		—	—	250	
trr (Note 1)	Reverse recovery time		—	—	200	
Qrr (Note 1)	Reverse recovery charge		—	7.7	—	
VEC(Note 1)	Emitter-collector voltage	IE = 400A, VGE = 0V	—	—	2.6	V
Rth(j-c)Q	Thermal resistance*1	IGBT part (1/2 module)	—	—	0.13	K/W
Rth(j-c)R		FWDi part (1/2 module)	—	—	0.18	
Rth(c-f)	Contact thermal resistance	Case to heat sink, Thermal compound applied*2 (1/2 module)	—	0.04	—	
Rth(j-c)Q	Thermal resistance	Case temperature measured point is just under the chips	—	—	0.076*3	
RG	External gate resistance		3.1	—	31	Ω

Note 1. IE, VEC, trr, Qrr & 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 (Tj) does not exceed Tjmax rating.

3. Junction temperature (Tj) should not increase beyond 150°C.

4. Pulse width and repetition rate should be such as to cause negligible temperature rise.

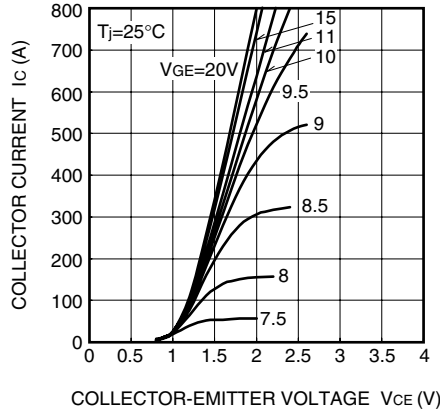
\*1 : Case temperature (Tc) measured point is indicated in OUTLINE DRAWING.

\*2 : Typical value is measured by using thermally conductive grease of λ = 0.9[W/(m • K)].

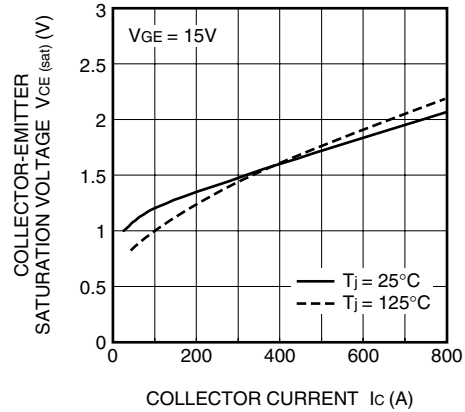
\*3 : If you use this value, Rth(f-a) should be measured just under the chips.

PERFORMANCE CURVES

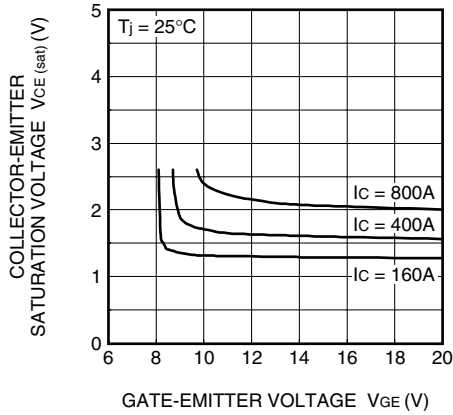
OUTPUT CHARACTERISTICS (TYPICAL)



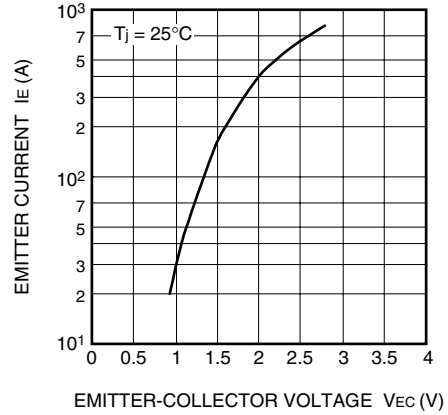
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



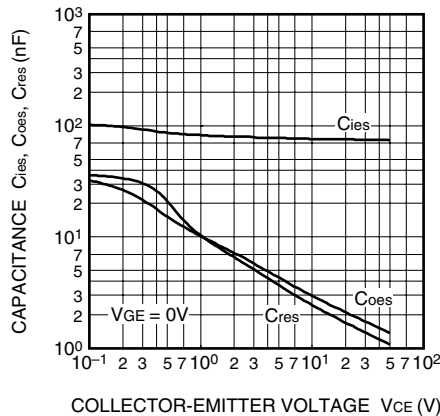
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



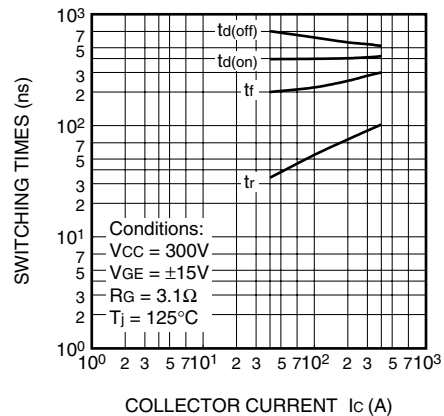
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



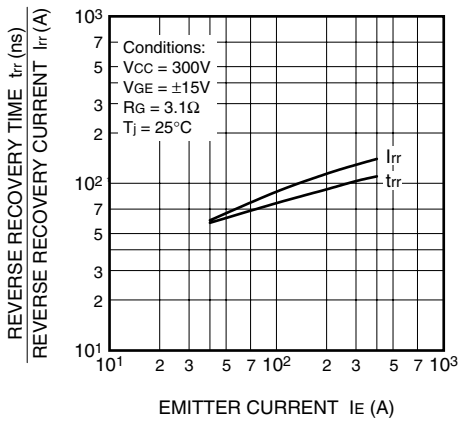
CAPACITANCE- $V_{ce}$  CHARACTERISTICS (TYPICAL)



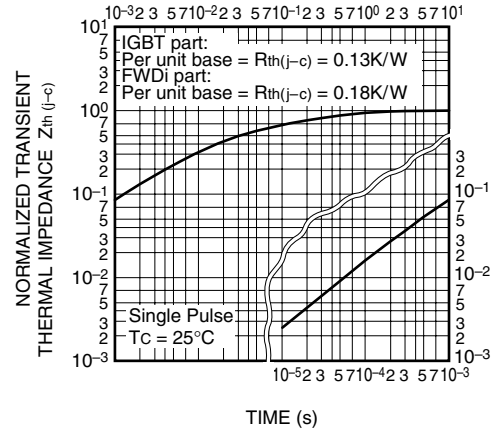
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT part & FWDi part)



GATE CHARGE CHARACTERISTICS (TYPICAL)

