

MITSUBISHI IGBT MODULES  
**CM600DU-5F**

HIGH POWER SWITCHING USE

**CM600DU-5F**



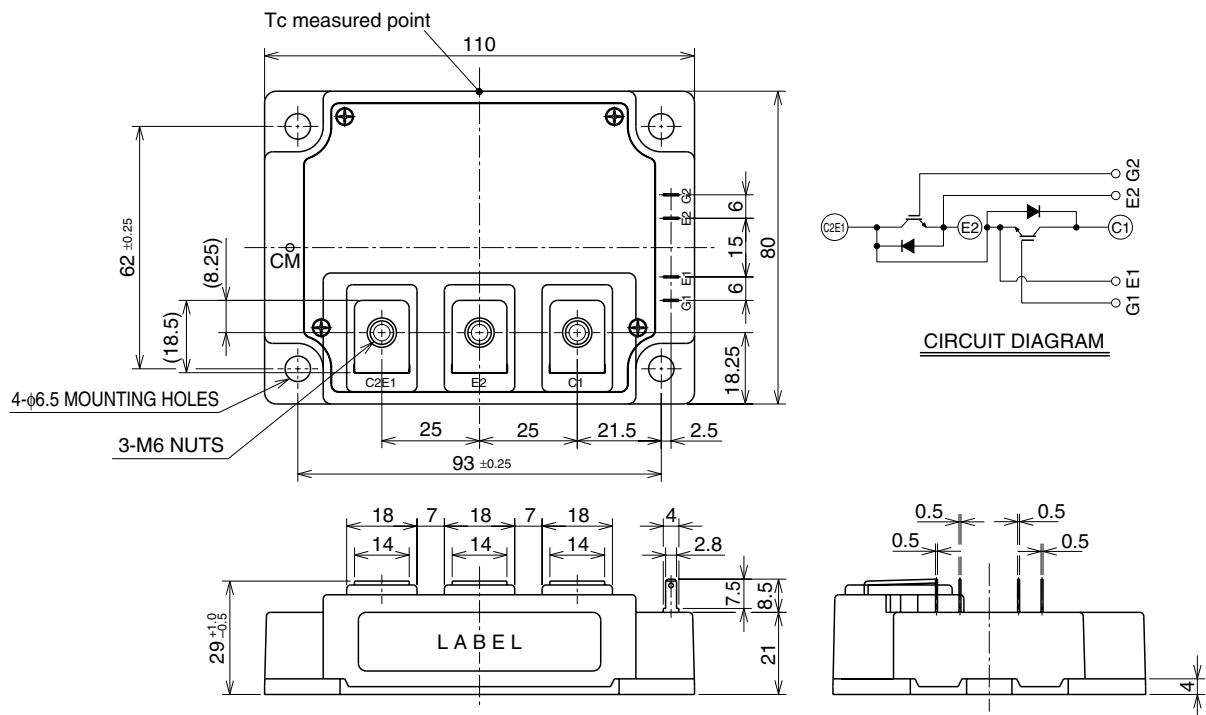
- Ic ..... 600A
- VCES ..... 250V
- Insulated Type
- 2-elements in a pack

**APPLICATION**

AC motor control of forklift (battery power source)

**OUTLINE DRAWING & CIRCUIT DIAGRAM**

Dimensions in mm



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

Symbol	Parameter	Conditions	Ratings	Unit
V <sub>CES</sub>	Collector-emitter voltage	G-E Short	250	V
V <sub>GES</sub>	Gate-emitter voltage	C-E Short	±20	V
I <sub>C</sub>	Collector current	T <sub>C</sub> = 25°C	600	A
I <sub>C(rms)</sub>			350	A <sub>(rms)</sub>
I <sub>CM</sub>		Pulse (Note 2)	1200	A
I <sub>E</sub> (Note 1)	Emitter current	T <sub>C</sub> = 25°C	600	A
I <sub>E(rms)</sub> (Note 1)			350	A <sub>(rms)</sub>
I <sub>EM</sub> (Note 1)		Pulse (Note 2)	1200	A
P <sub>C</sub> (Note 3)	Maximum collector dissipation	T <sub>C</sub> = 25°C	1100	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	580	g

**ELECTRICAL CHARACTERISTICS (Tj = 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> = 60mA, V <sub>CE</sub> = 10V	3.0	4.0	5.0	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> = 600A, V <sub>GE</sub> = 10V	T <sub>j</sub> = 25°C	—	1.2	1.7	V
			T <sub>j</sub> = 125°C	—	1.1	—	
C <sub>ies</sub>	Input capacitance	V <sub>CE</sub> = 10V V <sub>GE</sub> = 0V	—	—	170	nF	
C <sub>oes</sub>	Output capacitance		—	—	11		
C <sub>res</sub>	Reverse transfer capacitance		—	—	5.7		
Q <sub>G</sub>	Total gate charge	V <sub>CC</sub> = 100V, I <sub>C</sub> = 600A, V <sub>GE</sub> = 10V	—	2200	—	nC	
t <sub>d(on)</sub>	Turn-on delay time	V <sub>CC</sub> = 100V, I <sub>C</sub> = 600A V <sub>GE</sub> = ±10V R <sub>G</sub> = 4.2Ω, Inductive load I <sub>E</sub> = 600A	—	—	850	ns	
t <sub>r</sub>	Turn-on rise time		—	—	600		
t <sub>d(off)</sub>	Turn-off delay time		—	—	1100		
t <sub>f</sub>	Turn-off fall time		—	—	500		
t <sub>rr</sub> (Note 1)	Reverse recovery time		—	—	300		
Q <sub>rr</sub> (Note 1)	Reverse recovery charge		—	20.0	—		μC
V <sub>EC</sub> (Note 1)	Emitter-collector voltage	I <sub>E</sub> = 600A, V <sub>GE</sub> = 0V	—	—	2	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)	—	—	0.20		
R <sub>th(c-f)</sub>	Contact thermal resistance	Case to heat sink, Thermal compound applied <sup>*2</sup> (1/2 module)	—	0.02	—		
R <sub>th(j-c)Q</sub>	Thermal resistance <sup>*3</sup>	Case temperature measured point is just under the chips	—	—	0.05		

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

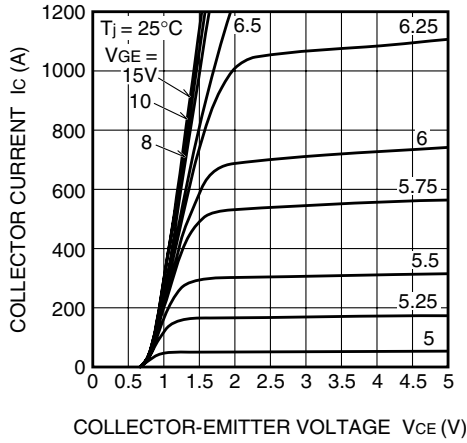
\*1 : Case temperature (T<sub>c</sub>) measured point is indicated in OUTLINE DRAWING.

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

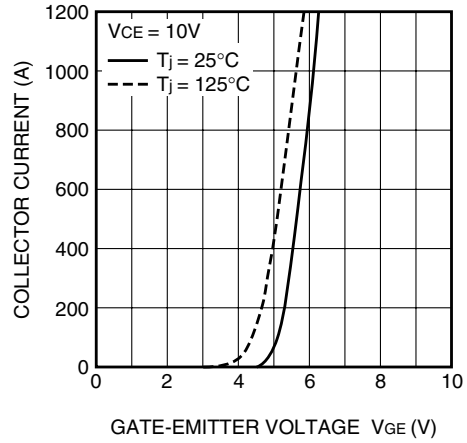
\*3 : If you use this value, R<sub>th(f-a)</sub> should be measured just under the chips.

PERFORMANCE CURVES

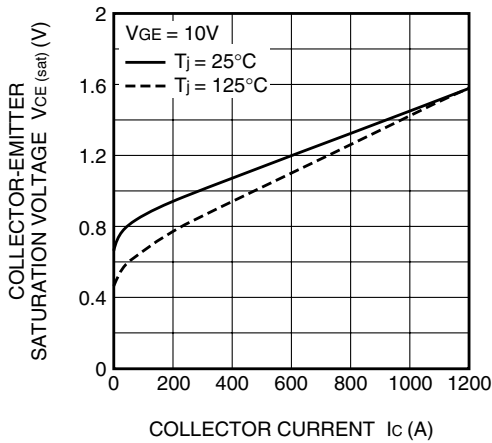
OUTPUT CHARACTERISTICS (TYPICAL)



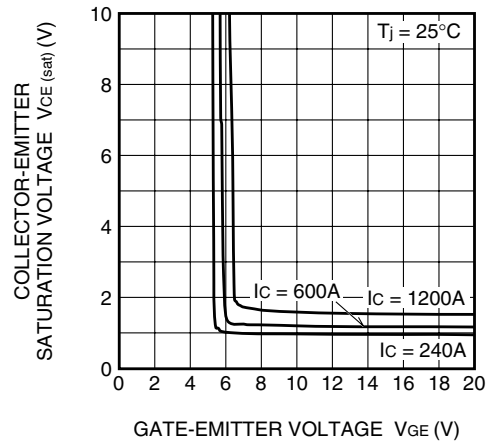
TRANSFER CHARACTERISTICS (TYPICAL)



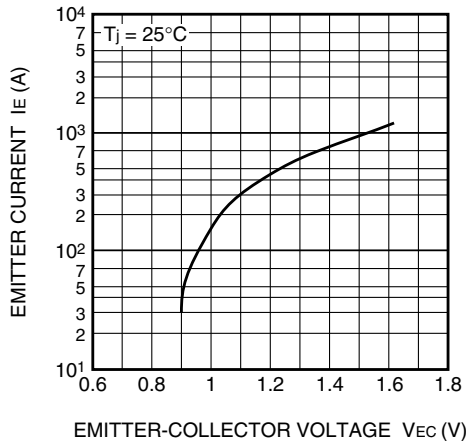
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



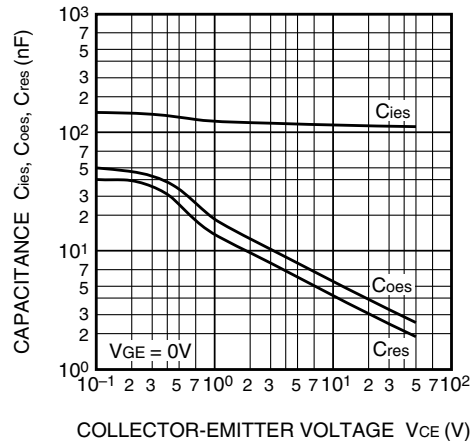
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



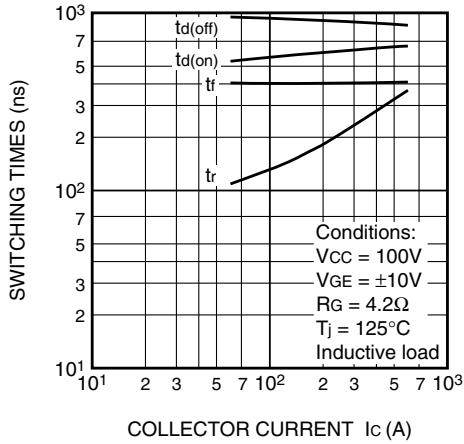
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



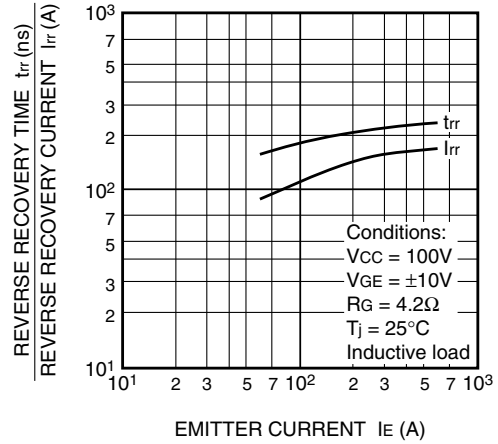
CAPACITANCE-VCE CHARACTERISTICS (TYPICAL)



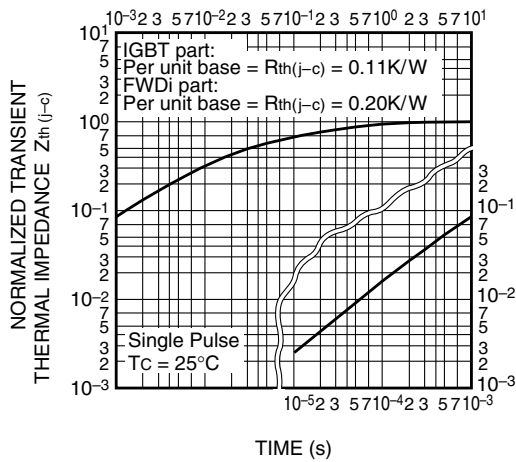
**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**



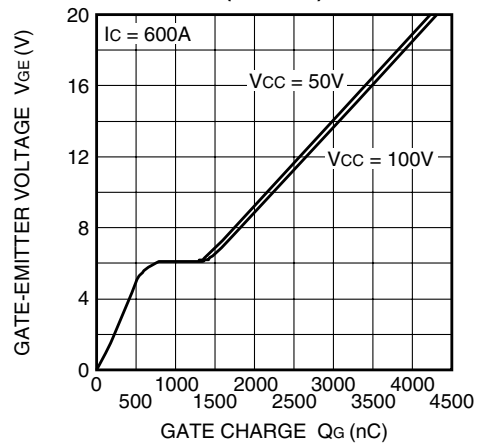
**REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT part & FWDi part)**



**GATE CHARGE CHARACTERISTICS (TYPICAL)**



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