

MITSUBISHI IGBT MODULES
CM20AD00-12H

MEDIUM POWER SWITCHING USE
 FLAT BASE, INSULATED TYPE

CM20AD00-12H



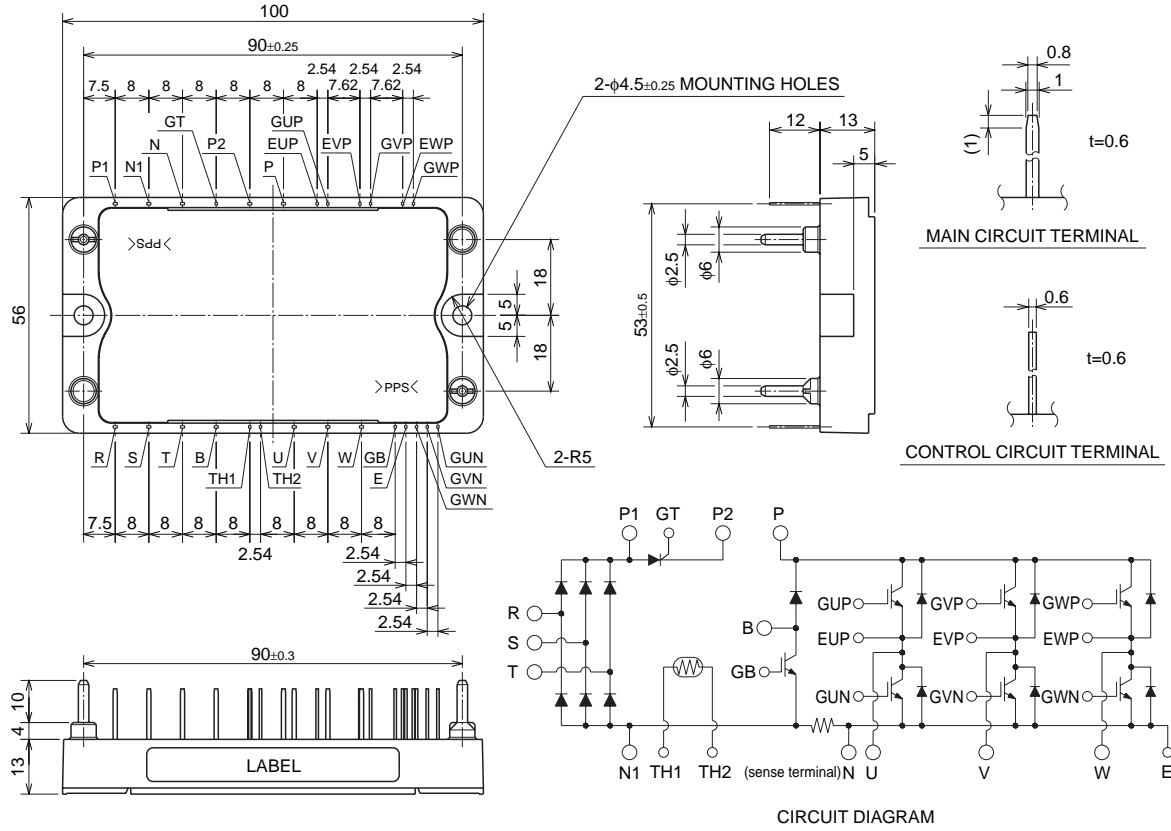
- IC 20A
 - VCES 600V
 - Insulated Type
 - CIB Module
- 3φ Inverter + 3φ Converter + Brake
 Thyristor + Thermistor + Current shunt resistor

APPLICATION

AC & DC motor controls, General purpose inverters

OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm



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MAXIMUM RATINGS (T_J = 25°C)

INVERTER PART

Symbol	Parameter	Conditions	Rating	Unit
V _{CES}	Collector-emitter voltage	G-E Short	600	V
V _{GES}	Gate-emitter voltage	C-E Short	±20	V
I _C	Collector Current	T _C = 25°C	20	A
I _{CM}		PULSE (Note. 2)	40	A
I _E (Note.1)	Emitter Current	T _C = 25°C	20	A
I _{EM} (Note.1)		PULSE (Note. 2)	40	A
P _C (Note.3)	Maximum collector dissipation	T _C = 25°C	62	W

BRAKE PART

Symbol	Parameter	Conditions	Rating	Unit
V _{CES}	Collector-emitter voltage	G-E Short	600	V
V _{GES}	Gate-emitter voltage	C-E Short	±20	V
I _C	Collector Current	T _C = 25°C	20	A
I _{CM}		PULSE (Note. 2)	40	A
P _C (Note.3)	Maximum collector dissipation	T _C = 25°C	59	W
V _{RRM}	Repetitive peak reverse voltage	Clamp diode part	600	V
I _{FM} (Note.3)	Forward current	Clamp diode part	20	A

CONVERTER PART

Symbol	Parameter	Conditions	Rating	Unit
V _{RRM}	Repetitive peak reverse voltage		800	V
E _a	Recommended AC input voltage		220	V
I _O	DC output current	3φ rectifying circuit	20	A
I _{FSM}	Surge (non-repetitive) forward current	1/2 cycle at 60Hz, peak value, Non-repetitive	200	A
I ² t	I ² t for fusing	Value for one cycle of surge current	165	A ² s

THYRISTOR PART

Symbol	Parameter	Conditions	Rating	Unit
V _{DRM}	Repetitive peak off-state voltage		800	V
V _{RRM}	Repetitive peak reverse voltage		800	V
I _{T(AV)}	Average on-state current	Single-phase, half-wave 180° conduction	20	A
I _{TSM}	Surge (non-repetitive) on-state current	1/2 cycle at 60Hz, peak value Non-repetitive	200	A
P _{GM}	Peak gate power dissipation		10	W
P _{G(AV)}	Average gate power dissipation		1	W
I _{FGM}	Peak gate forward current		3	A
V _{FGM}	Peak gate forward voltage		10	V
V _{RGM}	Peak gate reverse voltage		5	V
di/dt	Critical rate of rise of on-state Current	I _G =100mA, V _D =400V, dI _G /dt=1A/μs	100	A/μs

COMMON RATING

Symbol	Parameter	Conditions	Rating	Unit
T _j	Junction temperature	Inverter, brake, converter part	-40 ~ +150	°C
T _j	Junction temperature	Thyristor part	-40 ~ +125	°C
T _{stg}	Storage temperature		-40 ~ +125	°C
V _{iso}	Isolation voltage	AC 1 min.	2500	V
—	Mounting torque	Mounting M4 screw	1.47 ~ 1.96	N·m
—	Weight	Typical value	120	g

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**ELECTRICAL CHARACTERISTICS (T_j = 25°C)
INVERTER PART**

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 = 2.0mA, VCE = 10V	4.5	6	7.5	V		
IGES	Gate-emitter cutoff current	VGE = VGES, VCE = 0V	—	—	0.5	μA		
VCE(sat)	Collector-emitter saturation voltage	T _j = 25°C T _j = 150°C	IC = 20A, VGE = 15V	(Note.4)	—	2.1	2.8	V
					—	2.15	—	
Cies	Input capacitance	VCE = 10V VGE = 0V	—	—	2.0	nF		
Coes	Output capacitance		—	—	1.5	nF		
Cres	Reverse transfer capacitance		—	—	0.4	nF		
QG	Total gate charge	VCC = 300V, IC = 20A, VGE = 15V	—	60	—	nC		
td(on)	Turn-on delay time	VCC = 300V, IC = 20A	—	—	120	ns		
tr	Turn-on rise time	VGE1 = VGE2 = 15V	—	—	300	ns		
td(off)	Turn-off delay time	RG = 31Ω	—	—	200	ns		
tf	Turn-off fall time	Resistive load	—	—	300	ns		
VEC(Note.1)	Emitter-collector voltage	IE = 20A, VGE = 0V	—	—	2.8	V		
trr (Note.1)	Reverse recovery time	IE = 20A, VGE = 0V	—	—	110	ns		
Qrr (Note.1)	Reverse recovery charge	diE / dt = - 40A / μs	—	0.05	—	μC		
Rth(j-c)Q	Thermal resistance	IGBT part, Per 1/6 module	—	—	2.0	°C/W		
Rth(j-c)R		FWDi part, Per 1/6 module	—	—	3.1	°C/W		

BRAKE PART

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 = 2.0mA, VCE = 10V	4.5	6	7.5	V		
IGES	Gate-emitter cutoff current	VGE = VGES, VCE = 0V	—	—	0.5	μA		
VCE(sat)	Collector-emitter saturation voltage	T _j = 25°C T _j = 150°C	IC = 20A, VGE = 15V	(Note.4)	—	2.1	2.8	V
					—	2.15	—	
Cies	Input capacitance	VCE = 10V VGE = 0V	—	—	2.0	nF		
Coes	Output capacitance		—	—	1.5	nF		
Cres	Reverse transfer capacitance		—	—	0.4	nF		
QG	Total gate charge	VCC = 300V, IC = 20A, VGE = 15V	—	60	—	nC		
VFM	Forward voltage drop	IF = 20A, Clamp diode part	—	—	2.8	V		
Rth(j-c)Q	Thermal resistance	IGBT part	—	—	2.1	°C/W		
Rth(j-c)R		Clamp diode part	—	—	3.2	°C/W		

CONVERTER PART

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
IRRM	Repetitive reverse current	VR = VRRM, T _j = 150°C	—	—	8	mA
VFM	Forward voltage drop	IF = 20A	—	—	1.5	V
Rth(j-c)	Thermal resistance	Per 1/6 module	—	—	3.1	°C/W

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THYRISTOR PART

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
IDRM	Repetitive peak off-state current	V _D =800V	—	—	1	mA
IRRM	Repetitive peak reverse current	V _R =800V	—	—	1	mA
ITM	On-state voltage	I _T =20A, instantaneous means	—	—	1.55	V
IGT	Gate trigger current	V _D =6V, I _T =1A	—	—	50	mA
VGT	Gate trigger voltage	V _D =6V, I _T =1A	—	—	3	V
dv/dt	Critical rate of rise of off-state Voltage	T _j =125°C, V _D =540V, exp. waveform	500	—	—	V/μs
I _H	Holding current		—	50	—	mA
R _{th(j-c)}	Thermal resistance		—	—	1.75	°C/W

THERMISTOR PART

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
R _{TH}	Resistance	T _c = 25°C	—	100	—	kΩ
B	B Constant	Resistance at 25°C, 50°C (Note.5)	—	4000	—	K

RESISTOR PART

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
R	Resistance	Measured between N-N1	—	3.4	—	mΩ
—	Temperature coefficient		—	0.079	—	%/°C

COMMON RATING

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
R _{th(c-f)}	Contact thermal resistance	Case to fin, Thermal compound applied*1 (1 module)	—	0.05	—	°C/W

Note. 1 I_E, V_{EC}, t_{rr}, Q_{rr}, 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_j) does not exceed T_{jmax} rating.

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

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

5 $B = (\ln R_1 - \ln R_2) / (1/T_1 - 1/T_2)$ R₁: Resistance at T₁(K)

R₂: Resistance at T₂(K)

*1 : Typical value is measured by using Shin-etsu Silicone "G-746".