

MITSUBISHI IGBT MODULES

CM50AD00-12H

MEDIUM POWER SWITCHING USE
FLAT BASE, INSULATED TYPE

CM50AD00-12H



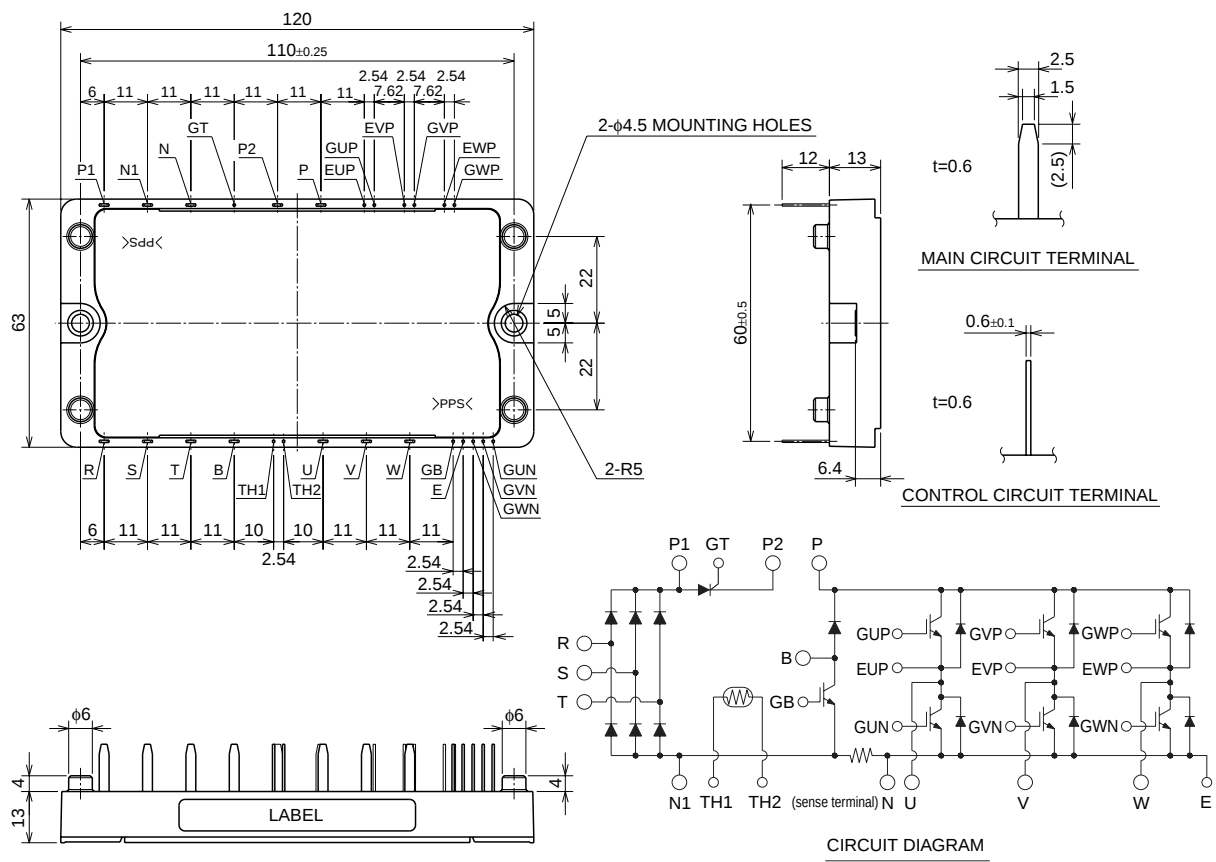
- Ic 50A
 - VCES 600V
 - Insulated Type
 - CIB Module
- 3 ϕ Inverter + 3 ϕ Converter + Brake
Thyristor + Thermistor + Current shunt resistor

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	50	A
I _{CM}		PULSE (Note. 2)	100	A
I _E (Note.1)	Emitter Current	T _c = 25°C	50	A
I _{EM} (Note.1)		PULSE (Note. 2)	100	A
P _C (Note.3)	Maximum collector dissipation	T _c = 25°C	104	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	50	A
I _{CM}		PULSE (Note. 2)	100	A
P _C (Note.3)	Maximum collector dissipation	T _c = 25°C	83	W
V _{RRM}	Repetitive peak reverse voltage	Clamp diode part	600	V
I _{FM} (Note.3)	Forward current	Clamp diode part	50	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	50	A
I _{FSM}	Surge (non-repetitive) forward current	1/2 cycle at 60Hz, peak value, Non-repetitive	500	A
I ² t	I ² t for fusing	Value for one cycle of surge current	1.0 × 10 ³	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	50	A
I _{TSM}	Surge (non-repetitive) on-state current	1/2 cycle at 60Hz, peak value Non-repetitive	500	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	0.98 ~ 1.47	N·m
—	Weight	Typical value	140	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 = 5.0mA, 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	—	2.2	2.8	V
		T _j = 150°C	—	—	—	
Cies	Input capacitance	VCE = 10V VGE = 0V	—	—	5.0	nF
Coes	Output capacitance		—	—	3.8	nF
Cres	Reverse transfer capacitance		—	—	1.0	nF
QG	Total gate charge	VCC = 300V, IC = 50A, VGE = 15V	—	150	—	nC
td(on)	Turn-on delay time	VCC = 300V, IC = 50A	—	—	120	ns
tr	Turn-on rise time	VGE1 = VGE2 = 15V	—	—	300	ns
td(off)	Turn-off delay time	RG = 13Ω	—	—	200	ns
tf	Turn-off fall time	Resistive load	—	—	300	ns
VEC(Notes.1)	Emitter-collector voltage	IE = 50A, VGE = 0V	—	—	2.8	V
trr (Notes.1)	Reverse recovery time	IE = 50A, VGE = 0V	—	—	110	ns
Qrr (Notes.1)	Reverse recovery charge	diE / dt = - 100A / μs	—	0.14	—	μC
Rth(j-c)Q	Thermal resistance	IGBT part, Per 1/6 module	—	—	1.2	°C/W
Rth(j-c)R		FWDi part, Per 1/6 module	—	—	2.2	°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 = 5.0mA, 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	—	2.2	2.8	V
		T _j = 150°C	—	—	—	
Cies	Input capacitance	VCE = 10V VGE = 0V	—	—	5.0	nF
Coes	Output capacitance		—	—	3.8	nF
Cres	Reverse transfer capacitance		—	—	1.0	nF
QG	Total gate charge	VCC = 300V, IC = 50A, VGE = 15V	—	150	—	nC
VFM	Forward voltage drop	IF = 50A, Clamp diode part	—	—	2.8	V
Rth(j-c)Q	Thermal resistance	IGBT part	—	—	1.5	°C/W
Rth(j-c)R		Clamp diode part	—	—	2.4	°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 = 50A	—	—	1.5	V
Rth(j-c)	Thermal resistance	Per 1/6 module	—	—	1.7	°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
I _{RRM}	Repetitive peak reverse current	V _R =800V	—	—	1	mA
I _{TM}	On-state voltage	I _T =50A, instantaneous means	—	—	1.30	V
I _{GT}	Gate trigger current	V _D =6V, I _T =1A	—	—	100	mA
V _{GT}	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		—	—	1.3	°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	—	2.3	—	mΩ
—	Temperature coefficient		—	0.060	—	%/°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)	—	0.035	—	°C/W

Note. 1 I_E, V_{EC}, I_{rr}, Q_{rr}, di_E/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".