CM20AD00-12H

MEDIUM POWER SWITCHING USE
FLAT BASE, INSULATED TYPE

CM20AD00-12H

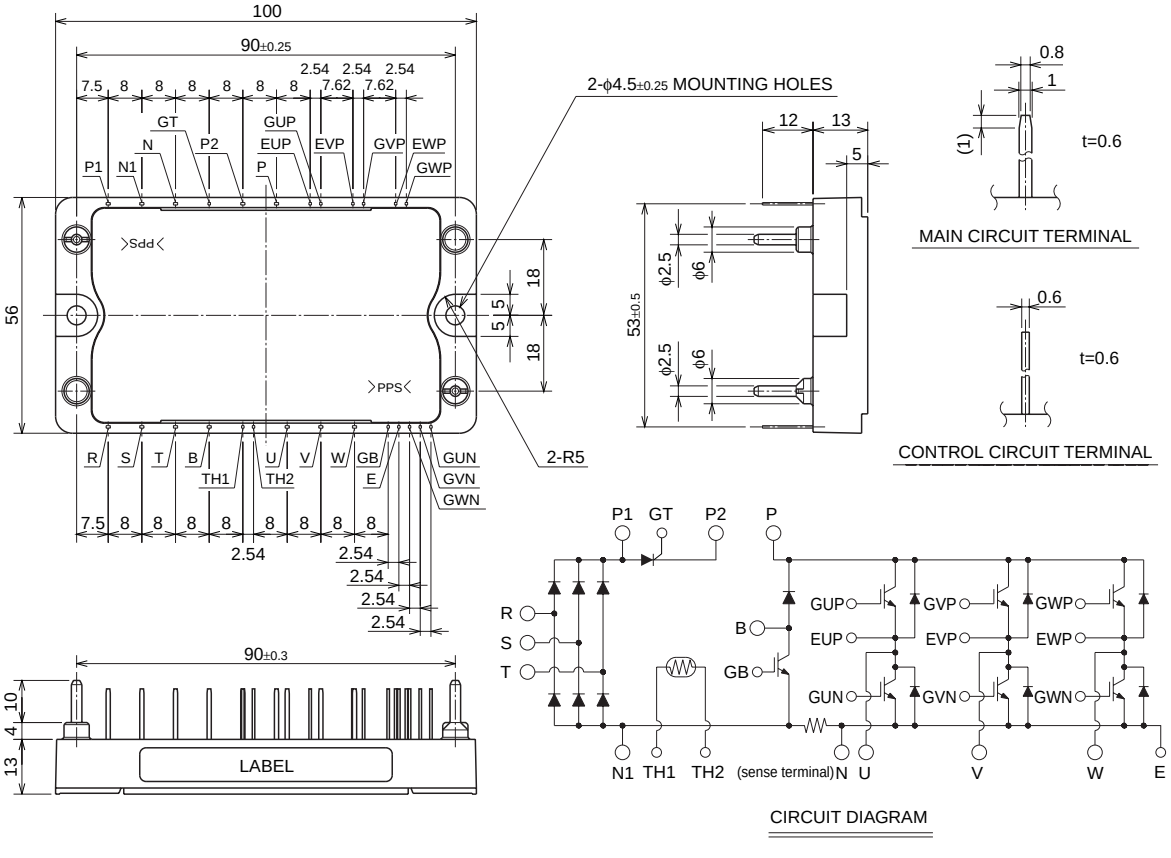
- I_C 20A
- V_{CES} 600V
- Insulated Type
- CIB Module
  3ϕ Inverter + 3ϕ Converter + Brake Thyristor + Thermistor + Current shunt resistor

APPLICATION

AC & DC motor controls, General purpose inverters

OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm



MITSUBISHI ELECTRIC

CM20AD00-12H

MEDIUM POWER SWITCHING USE
FLAT BASE, INSULATED TYPE

MAXIMUM RATINGS (Tj = 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	Tc = 25°C	20	A
I_{CM}		PULSE (Note. 2)	40	A
I_E (Note.1)	Emitter Current	Tc = 25°C	20	A
I_{EM} (Note.1)		PULSE (Note. 2)	40	A
P_C (Note.3)	Maximum collector dissipation	Tc = 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	Tc = 25°C	20	A
I_{CM}		PULSE (Note. 2)	40	A
P_C (Note.3)	Maximum collector dissipation	Tc = 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
Ea	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^2t	I^2t for fusing	Value for one cycle of surge current	165	A^2s

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

ELECTRICAL CHARACTERISTICS (Tj = 25°C)

INVERTER PART

Symbol	Parameter	Test conditions			Limits			Unit
					Min.	Typ.	Max.	
I_{CES}	Collector cutoff current	$V_{CE} = V_{CES}$, $V_{GE} = 0V$			—	—	1	mA
$V_{GE(th)}$	Gate-emitter threshold voltage	$I_C = 2.0mA$, $V_{CE} = 10V$			4.5	6	7.5	V
I_{GES}	Gate-emitter cutoff current	$V_{GE} = V_{GES}$, $V_{CE} = 0V$			—	—	0.5	μA
$V_{CE(sat)}$	Collector-emitter saturation voltage	$T_j = 25°C$	$I_C = 20A$, $V_{GE} = 15V$	(Note.4)	—	2.1	2.8	V
		$T_j = 150°C$			—	2.15	—	
C_{ies}	Input capacitance	$V_{CE} = 10V$, $V_{GE} = 0V$			—	—	2.0	nF
C_{oes}	Output capacitance				—	—	1.5	nF
C_{res}	Reverse transfer capacitance				—	—	0.4	nF
Q_G	Total gate charge	$V_{CC} = 300V$, $I_C = 20A$, $V_{GE} = 15V$			—	60	—	nC
$t_{d(on)}$	Turn-on delay time	$V_{CC} = 300V$, $I_C = 20A$, $V_{GE1} = V_{GE2} = 15V$, $R_G = 31\Omega$, Resistive load			—	—	120	ns
t_r	Turn-on rise time				—	—	300	ns
$t_{d(off)}$	Turn-off delay time				—	—	200	ns
t_f	Turn-off fall time				—	—	300	ns
V_{EC} (Note.1)	Emitter-collector voltage	$I_E = 20A$, $V_{GE} = 0V$			—	—	2.8	V
t_{rr} (Note.1)	Reverse recovery time	$I_E = 20A$, $V_{GE} = 0V$			—	—	110	ns
Q_{rr} (Note.1)	Reverse recovery charge	$di_E / dt = -40A / \mu s$			—	0.05	—	μC
$R_{th(j-c)Q}$	Thermal resistance	IGBT part, Per 1/6 module			—	—	2.0	°C/W
$R_{th(j-c)R}$		FWDi part, Per 1/6 module			—	—	3.1	°C/W

BRAKE PART

Symbol	Parameter	Test conditions			Limits			Unit
					Min.	Typ.	Max.	
I_{CES}	Collector cutoff current	$V_{CE} = V_{CES}$, $V_{GE} = 0V$			—	—	1	mA
$V_{GE(th)}$	Gate-emitter threshold voltage	$I_C = 2.0mA$, $V_{CE} = 10V$			4.5	6	7.5	V
I_{GES}	Gate-emitter cutoff current	$V_{GE} = V_{GES}$, $V_{CE} = 0V$			—	—	0.5	μA
$V_{CE(sat)}$	Collector-emitter saturation voltage	$T_j = 25°C$	$I_C = 20A$, $V_{GE} = 15V$	(Note.4)	—	2.1	2.8	V
		$T_j = 150°C$			—	2.15	—	
C_{ies}	Input capacitance	$V_{CE} = 10V$, $V_{GE} = 0V$			—	—	2.0	nF
C_{oes}	Output capacitance				—	—	1.5	nF
C_{res}	Reverse transfer capacitance				—	—	0.4	nF
Q_G	Total gate charge	$V_{CC} = 300V$, $I_C = 20A$, $V_{GE} = 15V$			—	60	—	nC
V_{FM}	Forward voltage drop	$I_F = 20A$, Clamp diode part			—	—	2.8	V
$R_{th(j-c)Q}$	Thermal resistance	IGBT part			—	—	2.1	°C/W
$R_{th(j-c)R}$		Clamp diode part			—	—	3.2	°C/W

CONVERTER PART

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
I_{RRM}	Repetitive reverse current	$V_R = V_{RRM}$, $T_j = 150°C$	—	—	8	mA
V_{FM}	Forward voltage drop	$I_F = 20A$	—	—	1.5	V
$R_{th(j-c)}$	Thermal resistance	Per 1/6 module	—	—	3.1	°C/W

THYRISTOR PART

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
I_{DRM}	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=20A, instantaneous means	—	—	1.55	V
I_{GT}	Gate trigger current	V_D=6V, I_T=1A	—	—	50	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		—	—	1.75	°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}, 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 $B = (\ln R_1 - \ln R_2)/(1/T_1 - 1/T_2)$ R_1 : Resistance at T_1(K)
R_2 : Resistance at T_2(K)

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