

SPECIFICATION

Device Name : IGBT-IPM

Type Name : 6MBP20RTA060

Spec. No. : MS6M0713

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Fuji Electric Co., Ltd.
Matsumoto Factory

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Revised Records

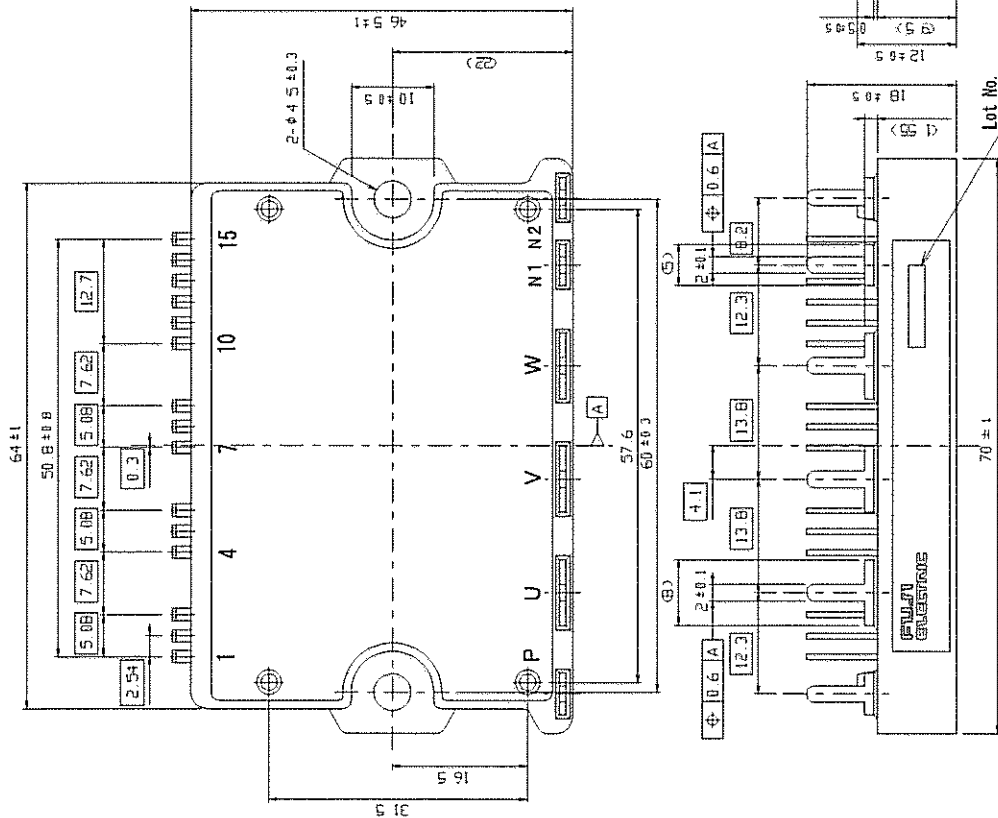
Date	Classification	Ind.	Content	Applied date	Drawn	Checked	Checked	Approved
Mar. 3 2003	Enactment	—	_____	Issued date	N. Nakatada	A. Akihiro	K. Yamada	T. Fujihira
Sep. 29 2003	Revision	a	<ul style="list-style-type: none"> • Block Diagram. • Cautions for design and application • Example of applied circuit • Warning 		T. Kusunoki	T. Miyazaki	K. Yamada	T. Fujihira
Sep. 25, 2007	Revision	b	Changing manufacturer of shunt resistor from KYOCERA to TAIYOSHADENKI.		S. Matahashi	M. Watanabe	T. Kenmutsu	T. Miyazaki

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1. Package Outline Drawings 外形図

Package type : P619



- 注) □は理論寸法を示す。
 "□" means theoretical dimensions.
 2. 端子L'は標準寸法とする。
 The dimensions of the terminals are defined at the bottom.
 3. () 内寸法は、参考値とする。
 The dimensions in () means referential values.
 4. 端子：金めっき(端面は除く)
 Terminals: Gold plating
- Indication of Lot No.
- Ordered No. in monthly
 Manufactured month
 (Jan. ~ Sep. : 1 ~ 9, Oct. : 0, Nov. : N, Dec. : D)
 Last digit of manufactured year

P: The details of terminals
 Dimensions in mm

2. Pin Descriptions 端子定義

Main circuit 主回路

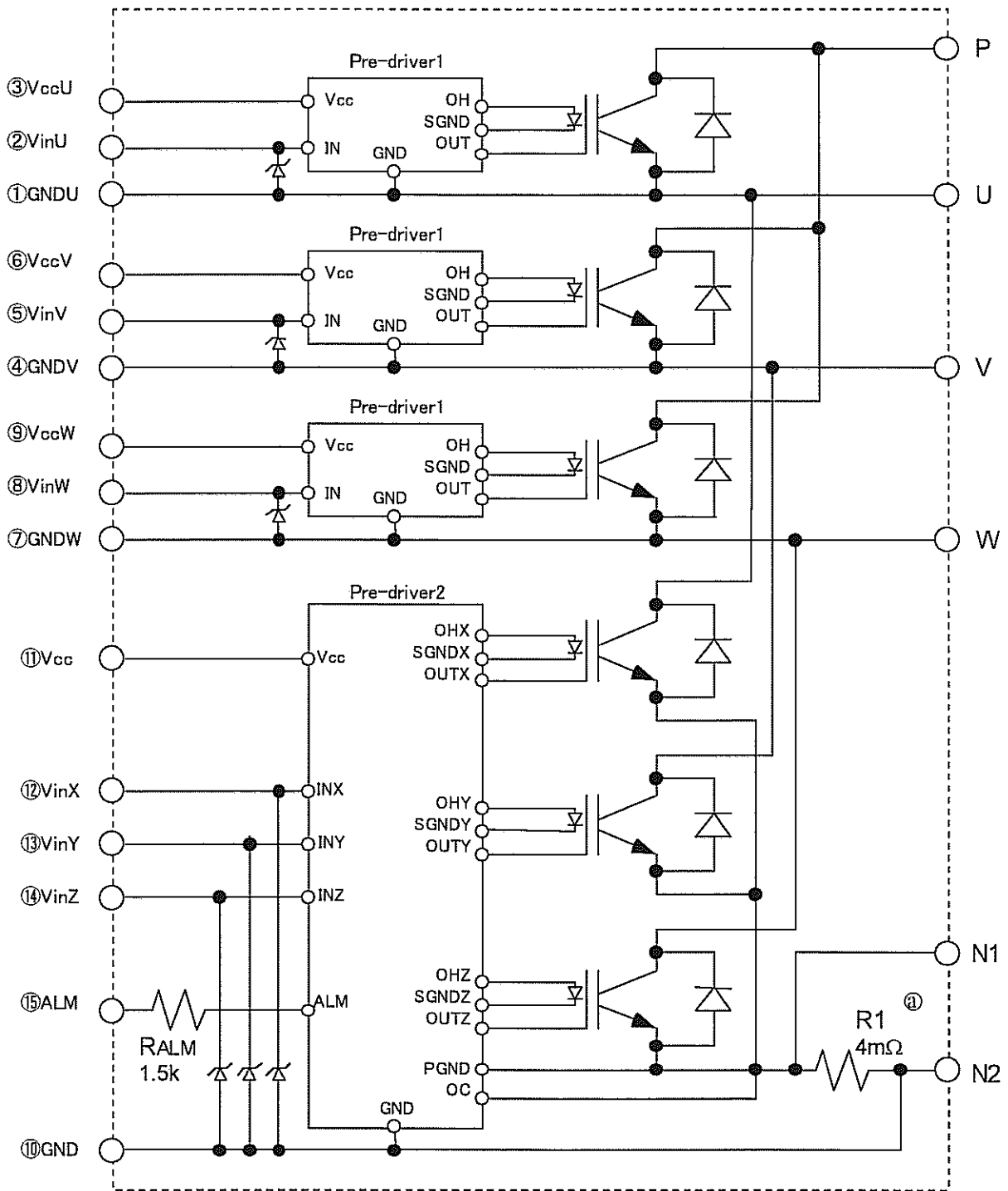
Symbol	Description
P	Positive input supply voltage.
U	Output (U).
V	Output (V).
W	Output (W).
N1	(For connection an external shunt-resistor)
N2	Negative input supply voltage.

Control circuit 制御回路

No.	Symbol	Description
①	GNDU	High side ground (U).
②	VinU	Logic input for IGBT gate drive (U).
③	VccU	High side supply voltage (U).
④	GNDV	High side ground (V).
⑤	VinV	Logic input for IGBT gate drive (V).
⑥	VccV	High side supply voltage (V).
⑦	GNDW	High side ground (W).
⑧	VinW	Logic input for IGBT gate drive (W).
⑨	VccW	High side supply voltage (W).
⑩	GND	Low side ground.
⑪	Vcc	Low side supply voltage.
⑫	VinX	Logic input for IGBT gate drive (X).
⑬	VinY	Logic input for IGBT gate drive (Y).
⑭	VinZ	Logic input for IGBT gate drive (Z).
⑮	ALM	Low side alarm signal output.

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3. Block Diagram ブロック図



Pre-driver1 includes following functions.

(P-side)

1. Amplifier for driver
2. Under voltage lockout circuit
3. IGBT chip over heating protection

Pre-driver2 includes following functions.

(N-side)

1. Amplifier for driver
2. Under voltage lockout circuit
3. IGBT chip over heating protection
4. Over current protection
5. Alarm signal output

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4. Absolute Maximum Ratings 絶対最大定格

Tc=25°C unless otherwise specified.

Items		Symbol	Min.	Max.	Units
Bus Voltage (Between terminal P and N)	DC	V _{dc}	0	450	V
	Surge	V _{DC(surge)}	0	500	V
	Short operating	V _{sc}	200	400	V
Collector-Emitter Voltage *1		V _{ces}	0	600	V
Collector Current	DC	I _c	—	20	A
	1ms	I _{cp}	—	40	A
	Duty=89% *2	-I _c	—	20	A
Collector Power Dissipation	One transistor *3	P _c	—	103	W
Supply Voltage of Pre-Driver *4		V _{cc}	-0.5	20	V
Input Signal Voltage *5		V _{in}	-0.5	V _{cc} +0.5	V
Input Signal Current		I _{in}	—	1	mA
Alarm Signal Voltage *6		V _{ALM}	-0.5	V _{cc}	V
Alarm Signal Current *7		I _{ALM}	—	20	mA
Junction Temperature		T _j	—	150	°C
Operating Case Temperature		T _{opr}	-20	100	°C
Storage Temperature		T _{stg}	-40	125	°C
Solder Temperature *8		T _{sol}	—	260	°C
Isolating Voltage (Terminal to base, 50/60Hz sine wave 1min.)		V _{iso}	—	AC2500	V
Screw Torque	Mounting (M4)	—	—	2.0	Nm

Note 注意

- *1 : V_{ces} shall be applied to the input voltage between terminal P and U or V or W, N and U or V or W.
- *2 : Duty= 125°C/FWD R_{th(j-c)}/(I_c × V_F MAX)=125/2.7/(20 × 2.6) × 100=89%
- *3 : P_c=125°C/IGBT R_{th(j-c)}=125/1.21=103W
- *4 : V_{cc} shall be applied to the input voltage between terminal No.3 and 1, No.6 and 4, No.9 and 7, No.11 and 10.
- *5 : V_{in} shall be applied to the input voltage between terminal No.2 and 1, No.5 and 4, No.8 and 7, No.12,13,14 and 10.
- *6 : V_{ALM} shall be applied to the voltage between terminal No15 and 10.
- *7 : I_{ALM} shall be applied to the input current to terminal No.15.
- *8 : Immersion time 10±1sec.

5. Electrical Characteristics 電気的特性

$T_j=25^{\circ}\text{C}$, $V_{cc}=15\text{V}$ unless otherwise specified.

5.1 Main circuit 主回路

Item	Symbol	Conditions	Min.	Typ.	Max.	Units	
Collector Current at off signal input	I_{ces}	$V_{ce}=600\text{V}$ V_{in} terminal open.	-	-	1.0	mA	
Collector-Emitter saturation voltage	$V_{CE(sat)}$	$I_c=20\text{A}$	Terminal	-	-	2.2	V
			Chip	-	1.75	-	V
Forward voltage of FWD	V_F	$-I_c=20\text{A}$	Terminal	-	-	2.6	V
			Chip	-	1.6	-	V
Turn-on time	t_{on}	$V_{DC}=300\text{V}$, $T_j=125^{\circ}\text{C}$	1.2	-	-	us	
Turn-off time	t_{off}	$I_c=20\text{A}$ Fig.1, Fig.6	-	-	3.6	us	
Reverse recovery time	t_{rr}	$V_{DC}=300\text{V}$ $I_F=20\text{A}$ Fig.1, Fig.6	-	-	0.3	us	
Maximum Avalanche Energy (A non-repetition)	PAV	Internal wiring inductance= 56nH Main circuit wiring inductance= 179nH	20	-	-	mJ	

5.2 Control circuit 制御回路

Item	Symbol	Conditions	Min.	Typ.	Max.	Units	
Supply current of P-side pre-driver (one unit)	I_{ccp}	Switching Frequency: $0\sim 6\text{kHz}$	0.5	-	9	mA	
Supply current of N-side pre-driver	I_{ccn}	$T_c=-20\sim 100^{\circ}\text{C}$ Fig.7	0.8	-	28		
Input signal threshold voltage	$V_{in(th)}$	ON	1.00	1.35	1.70	V	
		OFF	1.25	1.60	1.95		
Input Zener Voltage	V_z	$R_{in}=20\text{k}\Omega$	-	8.0	-	V	
Alarm Signal Hold Time	t_{ALM}	Fig.2	$T_c=-20^{\circ}\text{C}$	1.1	-	-	ms
			$T_c=25^{\circ}\text{C}$	-	2.0	-	
			$T_c=125^{\circ}\text{C}$	-	-	4.0	
Current Limit Resistor	R_{ALM}	Alarm terminal	1425	1500	1575	Ω	
Shunt-Resistor for over current sense	R_1	Between terminal N1 and N2	-	4.0	-	$\text{m}\Omega$	

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5.3 Protection Section 保護部 (Vcc=15V)

Item	Symbol	Conditions	Min.	Typ.	Max.	Units
Over Current Protection Level of Inverter circuit	Ioc	Tj=125°C	30	40	-	A
Over Current Protection Delay time	tdoc	Tj=125°C	-	5	-	us
IGBT Chips Over Heating Protection Temperature Level	TjOH	Surface of IGBT Chips	150	-	-	°C
Over Heating Protection Hysteresis	TjH		-	20	-	
Under Voltage Protection Level	VUV		11.0	-	12.5	V
Under Voltage Protection Hysteresis	VH		0.2	0.5	-	

6. Thermal Characteristics 熱特性 (Tc=25°C)

Item	Symbol	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance *10	IGBT Rth(j-c)	-	-	1.21	°C/W
	FWD Rth(j-c)	-	-	2.70	
Case to Fin Thermal Resistance with Compound	Rth(c-f)	-	0.05	-	

*10:(For 1device , Case is under the device)

7. Noise Immunity ノイズ耐量 (Vdc=300V, Vcc=15V, Test Circuit Fig 5.)

Item	Conditions	Min.	Typ.	Max.	Units
Common mode rectangular noise	Pulse width 1us,polarity ±,10 minutes Judge:no over-current, no miss operating	±2.0	-	-	kV
Common mode lightning surge	Rise time 1.2us, Fall time 50us Interval 20s, 10 times Judge:no over-current, no miss operating	±5.0	-	-	kV

8. Recommended Operating Conditions 推奨動作条件

Item	Symbol	Min.	Typ.	Max.	Units
DC Bus Voltage	VDC	-	-	400	V
Power Supply Voltage of Pre-Driver	Vcc	13.5	15.0	16.5	V
Screw Torque (M4)	-	1.3	-	1.7	Nm

9. Weight 質量

Item	Symbol	Min.	Typ.	Max.	Units
Weight	Wt	-	85	-	g

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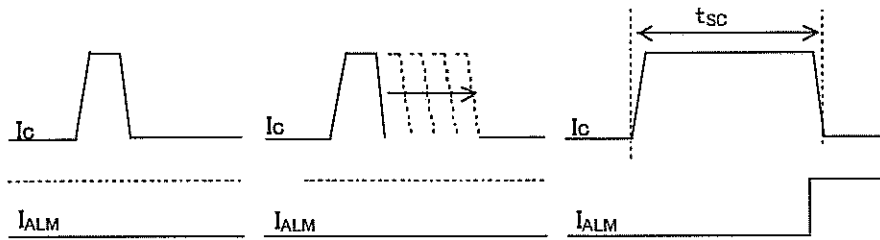


Figure.4 Definition of tsc

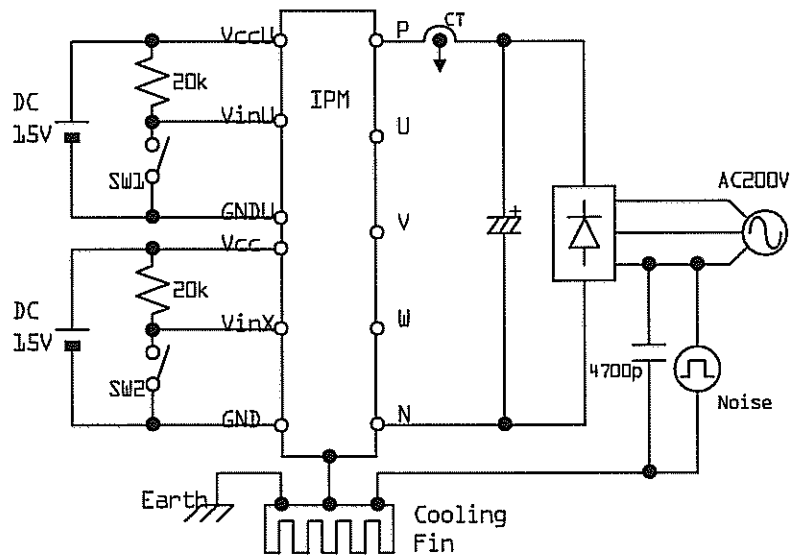


Figure 5. Noise Test Circuit

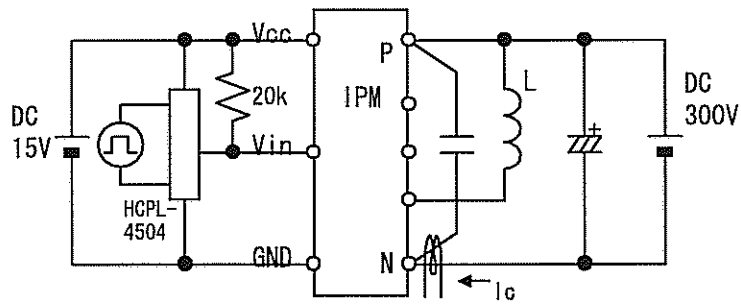


Figure 6. Switching Characteristics Test Circuit

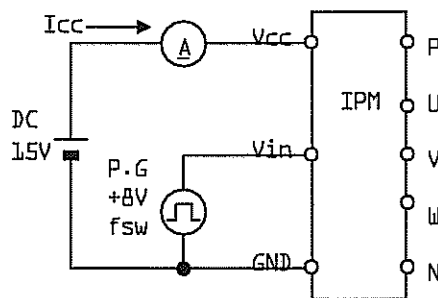
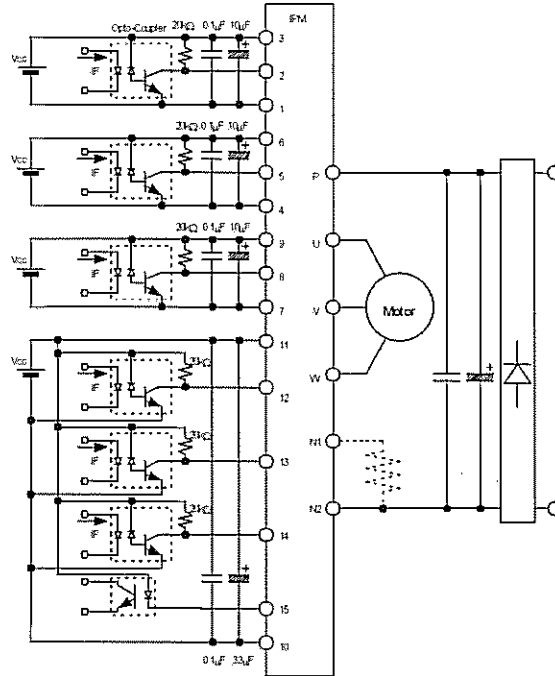


Figure 7. Icc Test Circuit

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12. Example of applied circuit 応用回路例 ㊂



13. Package and Marking 梱包仕様

Please see the MT6M04140 that is packing specification.

梱包仕様書 MT6M04140 を御参照ください。

14. Cautions for storage and transportation 保管、運搬上の注意

- Store the modules at the normal temperature and humidity (5 to 35°C, 45 to 75%).
常温常湿(5~35°C、45~75%)で保存して下さい。
- Avoid a sudden change in ambient temperature to prevent condensation on the module surfaces.
モジュールの表面が結露しないよう、急激な温度変化を避けて下さい。
- Avoid places where corrosive gas generates or much dust exists.
腐食性ガスの発生場所、粉塵の多い場所は避けて下さい。
- Store the module terminals under unprocessed conditions
モジュールの端子は未加工の状態での保管すること。
- Avoid physical shock or falls during the transportation.
運搬時に衝撃を与えたり落下させないで下さい。

15. Scope of application 適用範囲

This specification is applied to the IGBT-IPM (type: 6MBP20RTA060).

本仕様書は、IGBT-IPM (型式: 6MBP20RTA060) に適用する。

16. Based safety standards 準拠安全規格

UL1557