

SPECIFICATION

Device Name : IGBT-IPM

Type Name : 4MBP75RA060

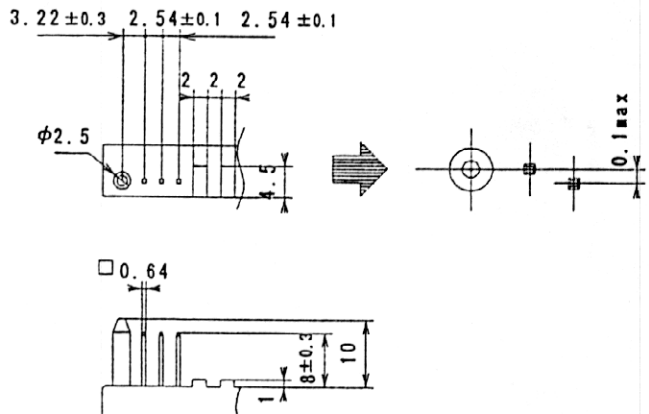
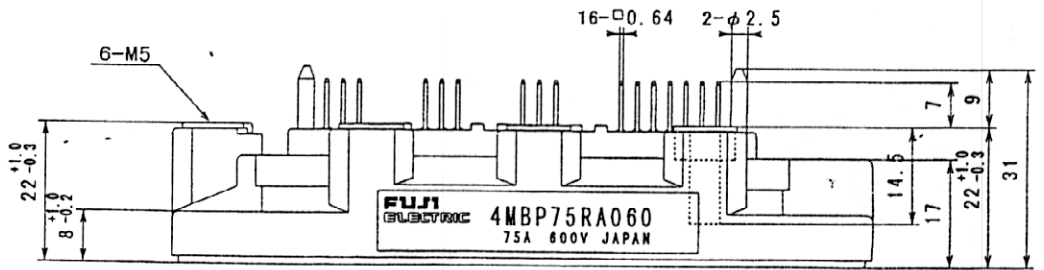
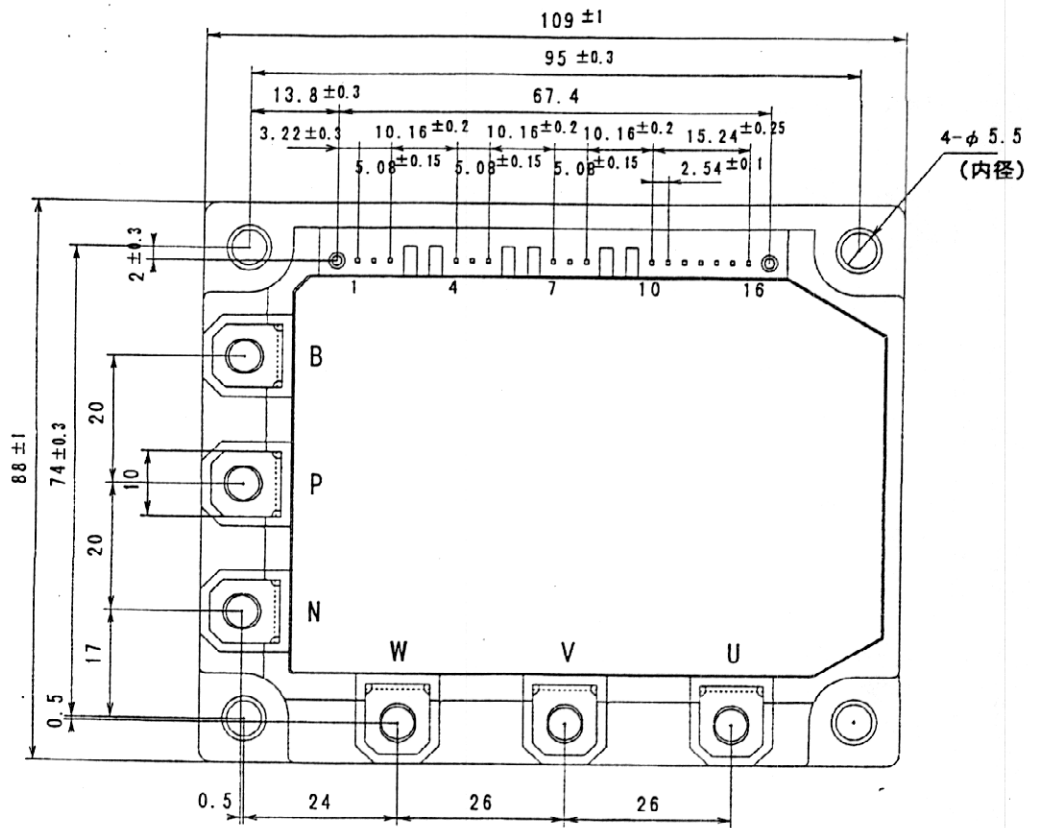
Spec. No. : MS6M 0357

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Fuji Electric Co., Ltd.
Matsumoto Factory

	DATE	NAME	APPROVED	Fuji Electric Co., Ltd.	
DRAWN	'98 - Jun 24	Yamaguchi	S.K	DWG. NO.	MS6M 0357 1/15
CHECKED	'98 - Jun - 24	<i>Mishinaka</i>			

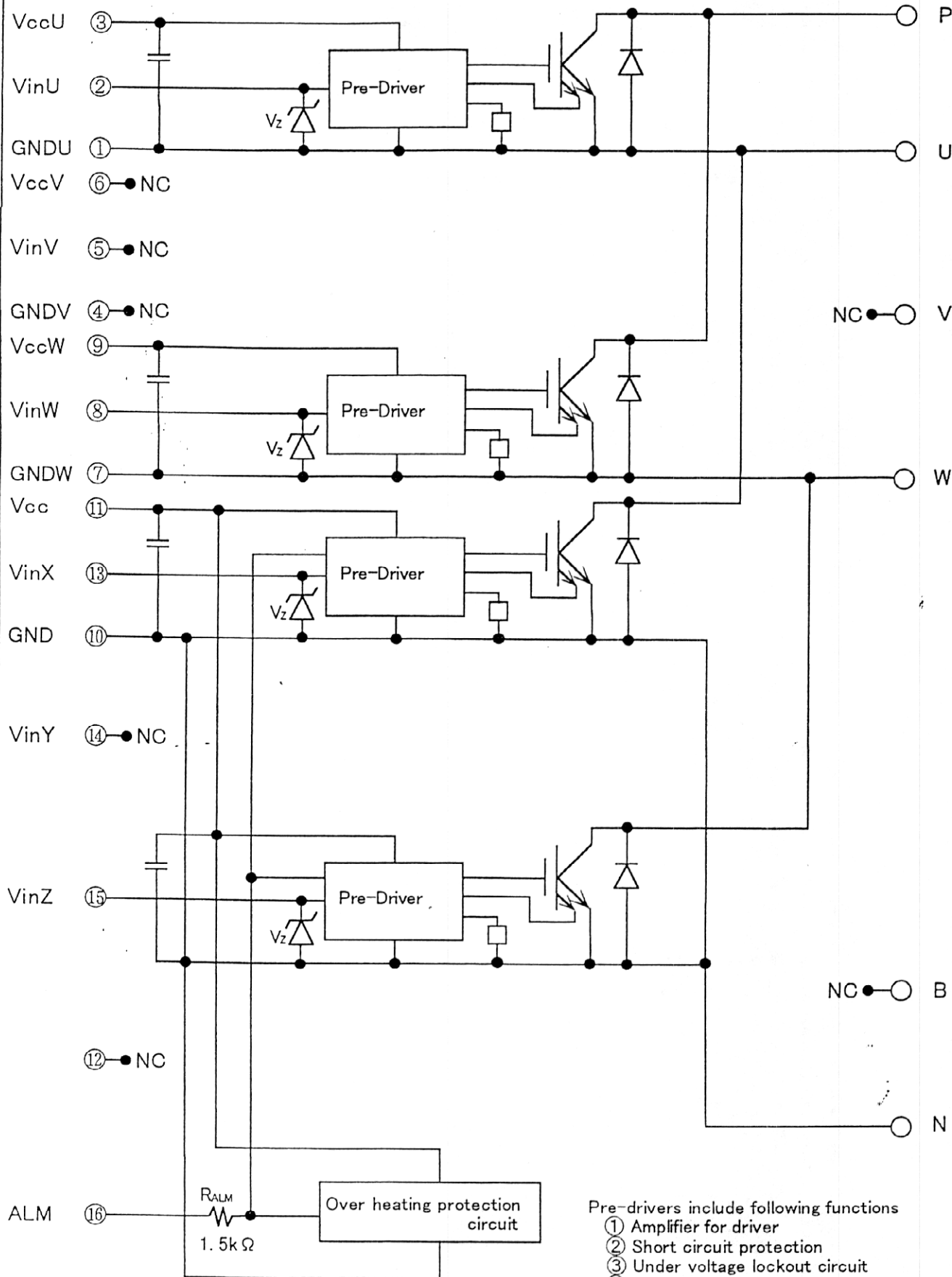
1. Outline



Details of control terminals

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2. Block Diagram



- Pre-drivers include following functions
- ① Amplifier for driver
 - ② Short circuit protection
 - ③ Under voltage lockout circuit
 - ④ Over current protection
 - ⑤ IGBT chip over heating protection

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3. Absolute Maximum Ratings (at $T_c=25^{\circ}\text{C}$ unless otherwise specified)
絶対最大定格

Items		Symbols	Ratings		Unit	
			min.	max.		
DC Bus Voltage		V DC	0	450	V	
DC Bus Voltage (surge)		VDC(surge)	0	500	V	
DC Bus Voltage (short operating)		VSC	200	400	V	
Collector-Emitter Voltage		VCES	0	600	V	
INV	Collector Current	DC	IC	—	75	A
		1 mS	ICP	—	150	A
		Duty=61.7%	-IC	—	75	A
	Collector Power Dissipation	One Transistor	PC	—	320	W
Junction Temperature		Tj	—	150	$^{\circ}\text{C}$	
Input Voltage of Power Supply for Pre-Driver		VCC *1	0	20	V	
Input Signal Voltage		Vin *2	0	Vz	V	
Input Signal Current		Iin	—	1	mA	
Alarm Signal Voltage		V ALM *3	0	Vcc	V	
Alarm Signal Current		I ALM *4	—	15	mA	
Storage Temperature		Tstg	-40	125	$^{\circ}\text{C}$	
Operating Case Temperature		Top	-20	100	$^{\circ}\text{C}$	
Isolating Voltage (Case-Terminal)		Viso *5	—	AC2500	V	
Screw Torque	Mounting(M5)	—	—	3.5 *6	N·m	
	Terminal (M5)	—	—	3.5 *6	N·m	

Note

- *1 : VCC shall be applied to the input voltage between terminal No.3 and 1, 9 and 7, -11 and 10
- *2 : Vin shall be applied to the input voltage between terminal No.2 and 1, 8 and 7, 13,15 and 10.
- *3 : VALM shall be applied to the voltage between terminal No.16 and 10.
- *4 : IALM shall be applied to the input current to terminal No.16.
- *5 : 50Hz/60Hz sine wave 1 minute.
- *6 : Recommendable Value : 2.5~3.0 N·m

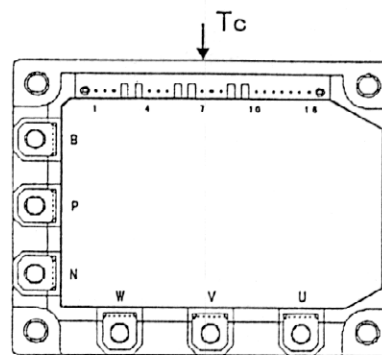


Fig. 1 Measurement of case temperature for TcOH (Tc)

4. Electrical Characteristics 電気的特性

4. 1 Electrical Characteristics of Power Circuit (at $T_c=T_j=25^\circ\text{C}$, $V_{cc}=15\text{V}$)

Items		Symbols	Conditions	min.	typ.	max.	Unit
INV	Collector Current at off Signal Input	I_{CES}	$V_{CE}=600\text{V}$ Input Terminal Open	—	—	1.0	mA
	Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_c=75\text{A}$	—	—	2.8	V
	Forward Voltage of FWD	V_F	$-I_c=75\text{A}$	—	—	3.0	V

4. 2 Electrical Characteristics of Control Circuit (at $T_c=T_j=25^\circ\text{C}$, $V_{cc}=15\text{V}$)

Items		Symbols	Conditions	min.	typ.	max.	Unit
Power Supply Current of P-line Side Pre-driver (one unit)		I_{CCP}	$f_{sw}=0\sim 15\text{kHz} *7$ $T_c=-20\sim 100^\circ\text{C}$	3	—	18	mA
Power Supply Current of N-line Side three Pre-driver		I_{CCN}	$f_{sw}=0\sim 15\text{kHz} *7$ $T_c=-20\sim 100^\circ\text{C}$	6	—	36	mA
Input Signal Threshold Voltage (on/off)		$V_{in(th)}$	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

*7 : Switching frequency of IPM

Over Heating Protective Section ($V_{cc}=15\text{V}$)

Items		Symbols	Conditions	min.	typ.	max.	Unit
Over Heating Protection Temperature Level		T_{COH}	$V_{DC}=0\text{V}$, $I_c=0\text{A}$ Case Temperature	110	—	125	$^\circ\text{C}$
Hysteresis		T_{CH}	—	—	20	—	$^\circ\text{C}$
IGBT chips Over Heating Protection Temperature Level		T_{JOH}	surface of IGBT chips	150	—	—	$^\circ\text{C}$
Hysteresis		T_{JH}	—	—	20	—	$^\circ\text{C}$

Over Current Protection Section ($V_{cc}=15\text{V}$)

Items		Symbols	Conditions	min.	typ.	max.	Unit
INV	Collector Current Protection Level	I_{OC}	$T_j=125^\circ\text{C}$	113	—	—	A
	Protection Delay time	t_{BOC}	Fig.2 $T_j=25^\circ\text{C}$	—	10	—	μS
SC Protection Delay time	t_{SC}	Fig.3 $T_j=25^\circ\text{C}$	—	—	12		

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Alarm Signal Output Section (at $T_j=T_c=25^\circ\text{C}$, $V_{cc}=15\text{V}$)

Items	Symbols	Conditions	min.	typ.	max.	Unit
Alarm Signal Hold Time	t_{ALM}	—	1.5	2	—	mS
Limiting resistor for Alarm	R_{ALM}	—	1425	1500	1575	Ω

Under Voltage Lockout Section (at $T_j=T_c=25^\circ\text{C}$, $V_{cc}=15\text{V}$)

Items	Symbols	Conditions	min.	typ.	max.	Unit
Under Voltage Protection Level	V_{UV}	—	11.0	—	12.5	V
Hysteresis	V_{H}	—	0.2	—	—	V

5. Dynamic Characteristics (at $T_c=T_j=125^\circ\text{C}$, $V_{CC}=15\text{V}$)

スイッチング特性

Items	Symbols	Conditions	min.	typ.	max.	Unit
Switching Time (IGBT)	t_{on}	$I_c=75\text{A}$, $V_{\text{DC}}=300\text{V}$	0.3	—	—	μS
	t_{off}		—	—	3.6	
Switching Time (FWD)	t_{rr}	$I_F=75\text{A}$, $V_{\text{DC}}=300\text{V}$	—	—	0.4	

6. Thermal Characteristics ($T_c=25^\circ\text{C}$)

熱特性

Items	Symbols		min.	typ.	max.	Unit
Junction to Case Thermal Resistance	INV	IGBT	$R_{\text{th}(j-c)}$	—	—	0.39
		FWD	$R_{\text{th}(j-c)}$	—	—	0.90
Case to Fin Thermal Resistance with Compound			$R_{\text{th}(c-f)}$	—	0.05	—

7. Recommendable Value

推奨値

Items	Symbols	Conditions	min.	typ.	max.	Unit
DC Bus Voltage	V_{DC}	—	200	—	400	V
Operating Power Supply Voltage Range of Pre-driver	V_{CC}	—	13.5	15	16.5	V
Switching frequency of IPM	f_{sw}	—	1	—	20	kHz
Screw torque	Mounting(M5)	—	—	—	—	—
	Terminal (M5)	—	—	—	—	—
			2.5	—	3.0	N·m
			2.5	—	3.0	N·m

8. Weight

重量

Items	min.	typ.	max.	Unit
Weight	—	440	—	g

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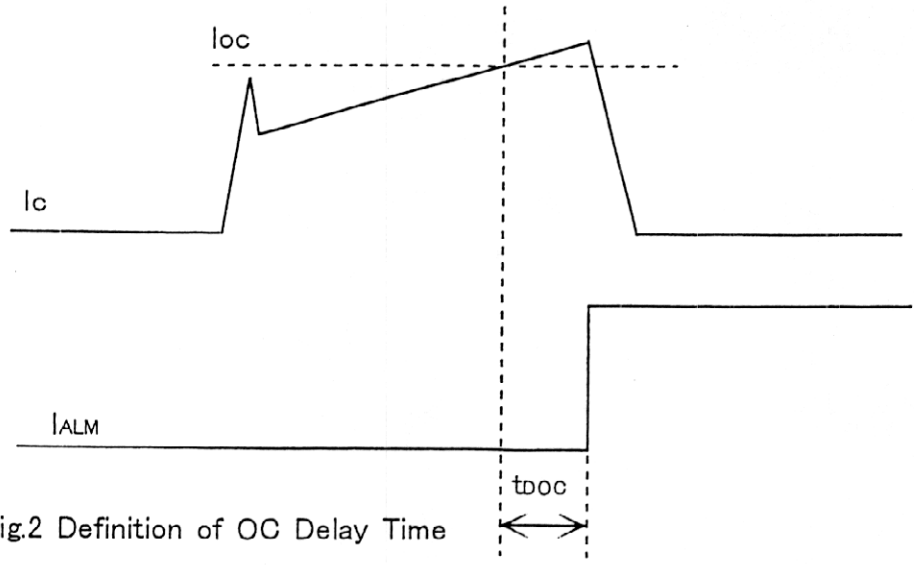


Fig.2 Definition of OC Delay Time

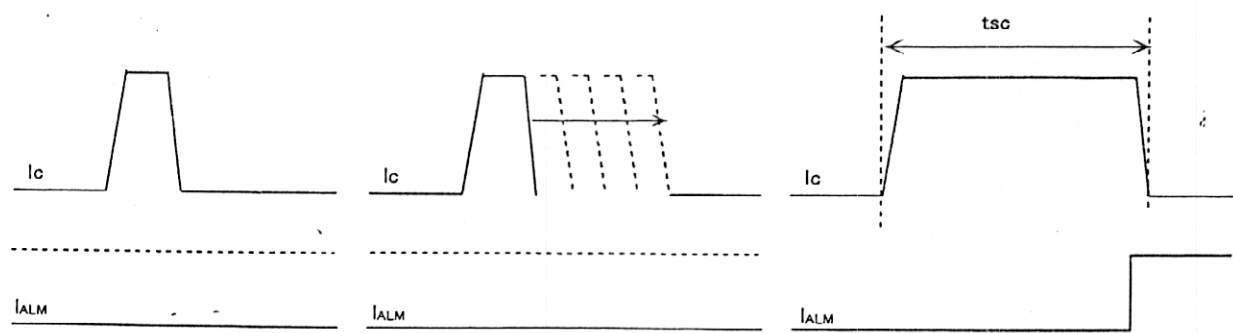


Fig.3 Definition of tsc

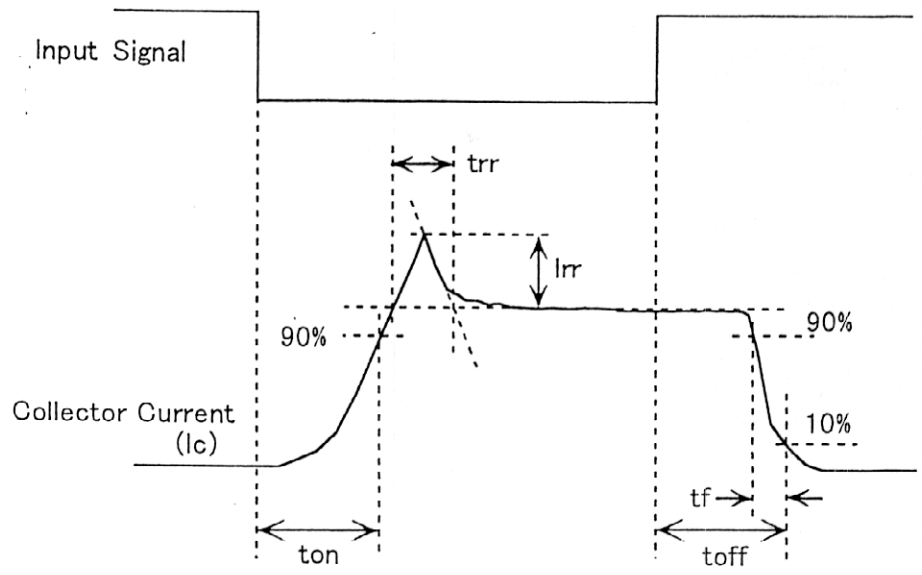
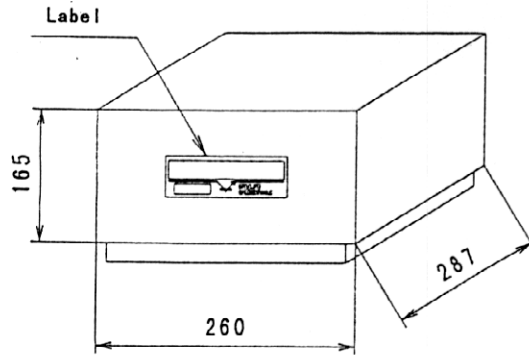


Fig.4 Definition of Switching Time

9. Packing and labeling (梱包箱と表示)

Outer carton (外箱)



material: corrugated cardboard

材料 ダンボール

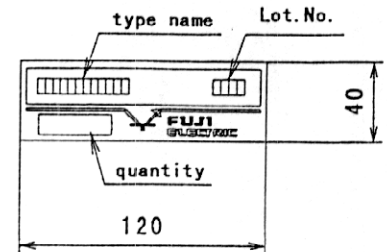
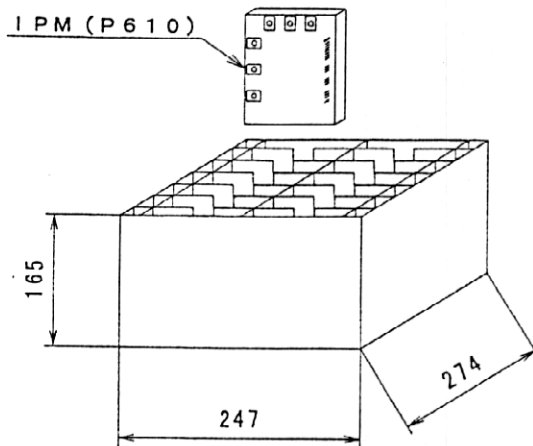
weight : 5.0kg(max.)

総重量 約5.0kg(最大)

products: 10pcs(max.)

製品 10個(最大)

Inner carton (内装箱)



10. Storage and transportation notes (保管、運搬上の注意事項)

- The IGBT-IPM should be stored at a standard temperature of 5 to 35°C and humidity of 45 to 75%.
室内で常温常湿保存が望ましい。(5~35°C、45~75%)
- Store modules in a place with few temperature changes in order to avoid condensation on the module surface.
急激な温度変化がないこと。(モジュール表面が結露しないこと)
- Avoid exposure to corrosive gases and dust.
腐食性ガスの発生場所、塵埃の多い場所は避けること。
- Avoid excessive external force on the module.
半導体製品に荷重がかからない様に注意すること。
- Store modules with unprocessed terminals.
モジュールの端子は未加工の状態での保管すること。
- Don't drop or otherwise shock the modules when transporting.
運搬時に衝撃を与えたり落下させないこと。

11. Operation environment (使用環境)

Avoid exposure to corrosive gases.
腐食性ガスの雰囲気での使用は避けること。

12. Applicable category (適用範囲)

This specification is applied to IGBT-IPM named 4MBP75RA060.
本仕様書は、IGBT-IPM(型式:4MBP75RA060)に適用する。

13. UL approval (準拠安全規格)

UL840 (Operating condition: Table 6. 1—Operating voltage 500V, Pollution degree 2, Material group III)
(適用条件: 表6. 1—動作電圧500V、汚れ度2、材料グループⅢa)

UL94V-0

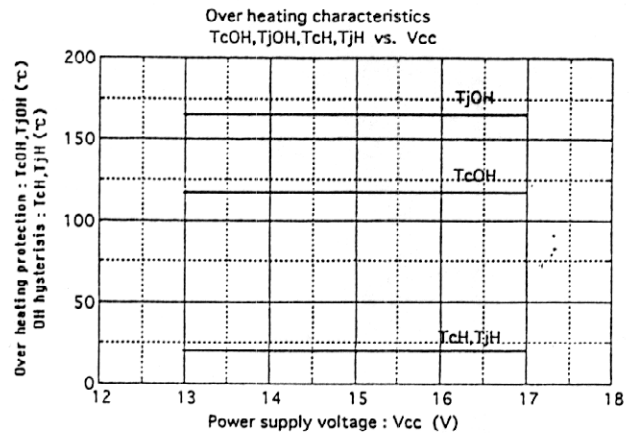
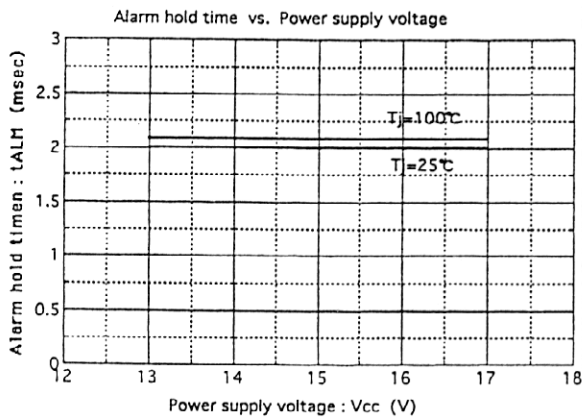
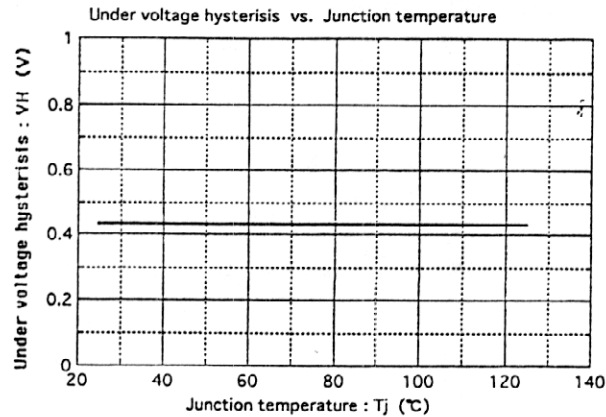
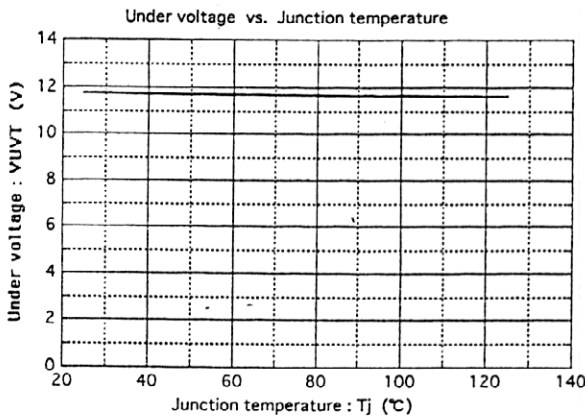
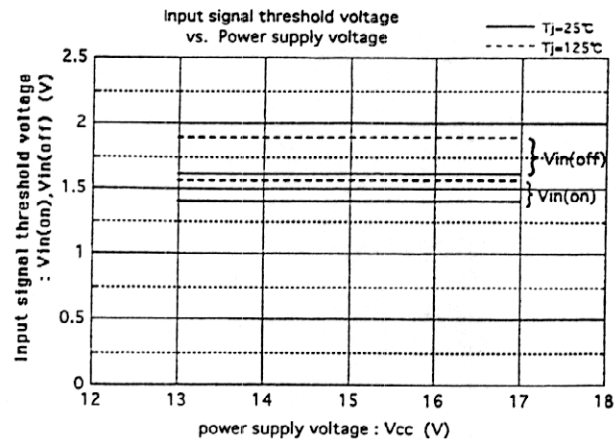
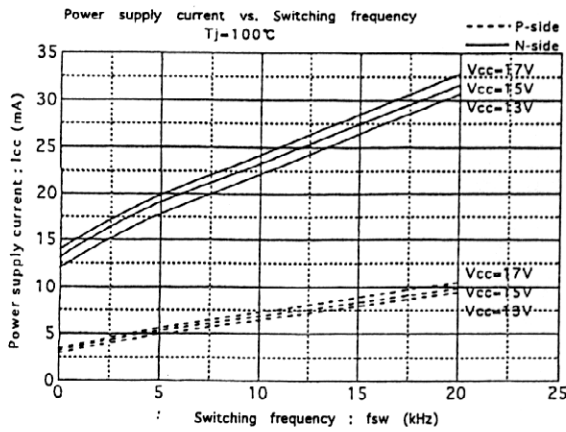
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14.Characteristics(Representative)

特性カーブ (代表例)

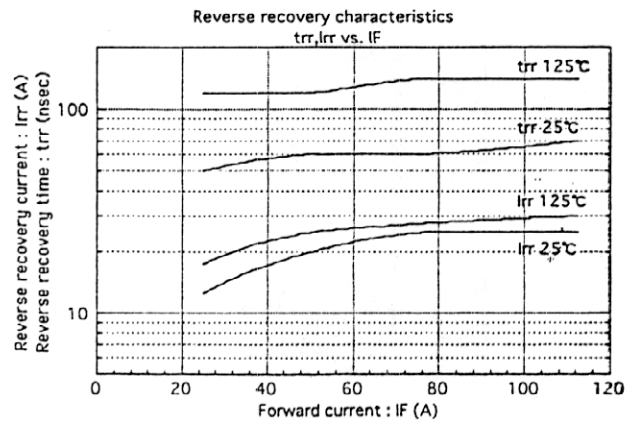
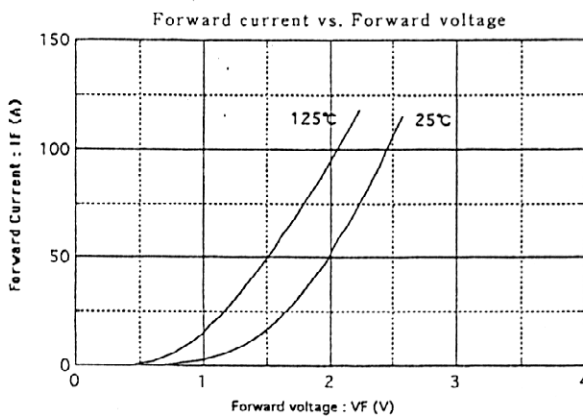
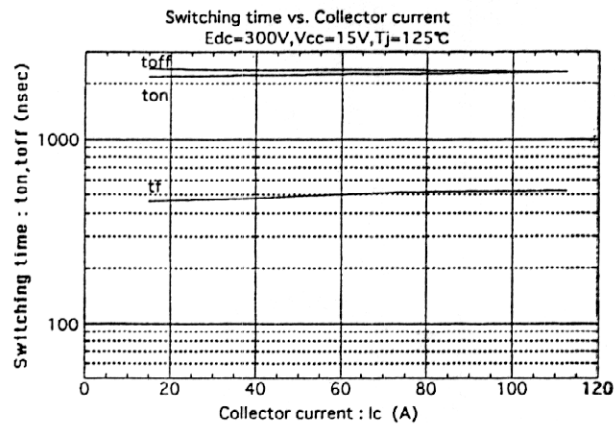
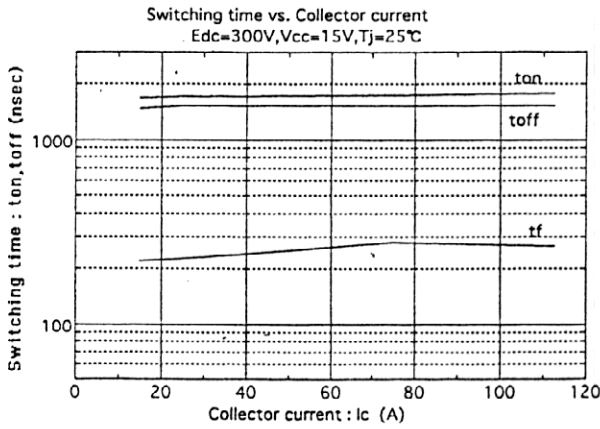
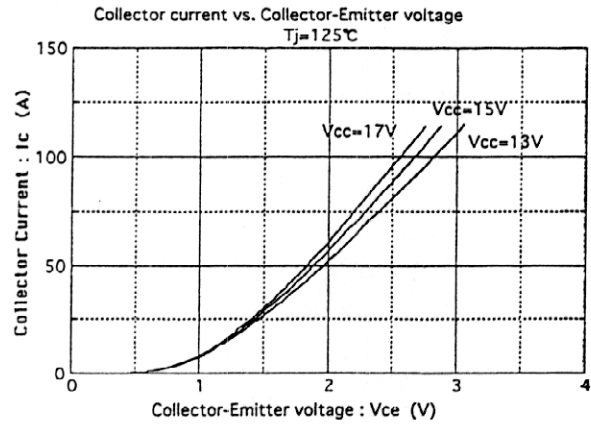
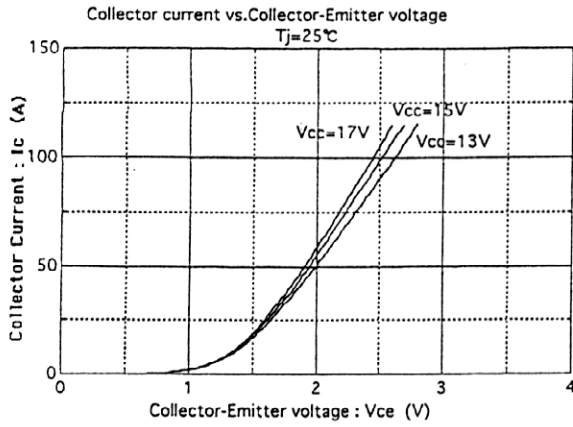
14-1.Control Circuit

制御部



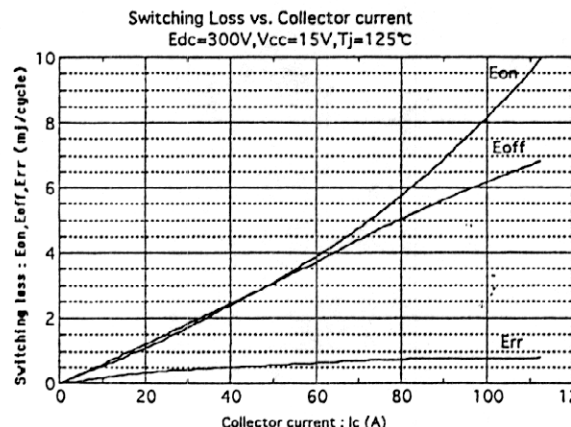
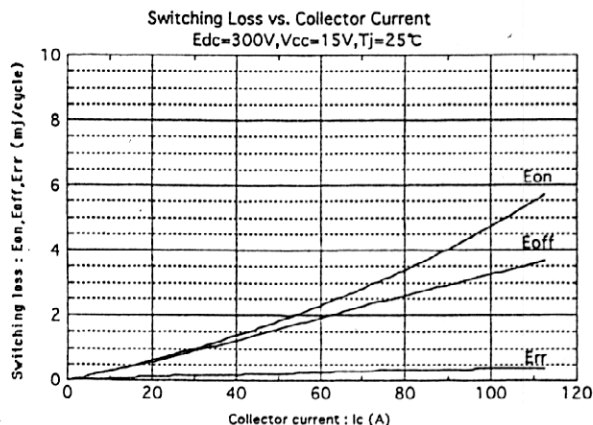
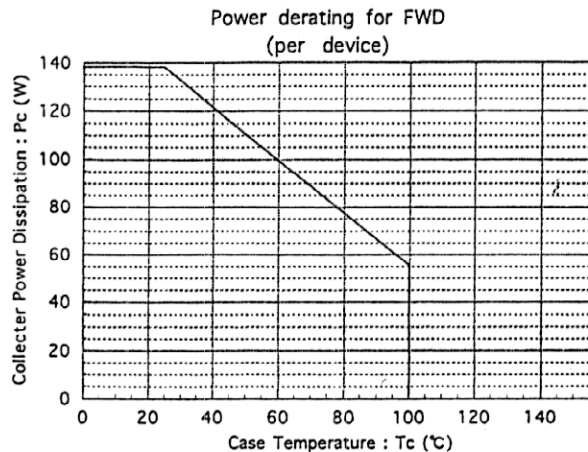
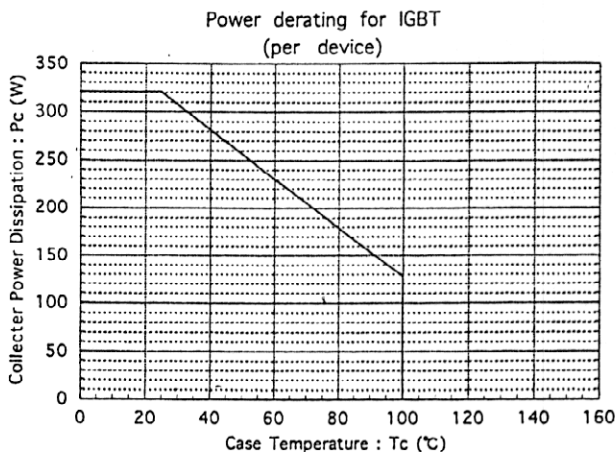
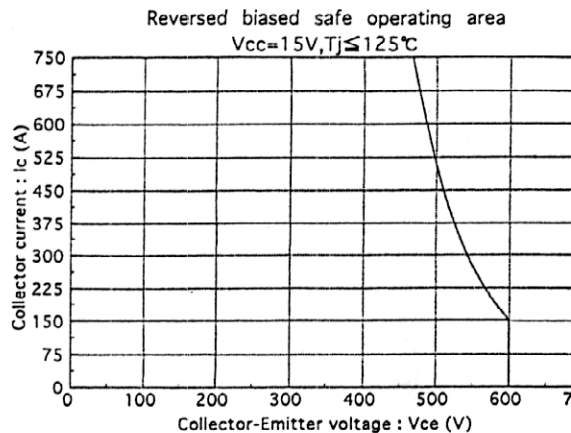
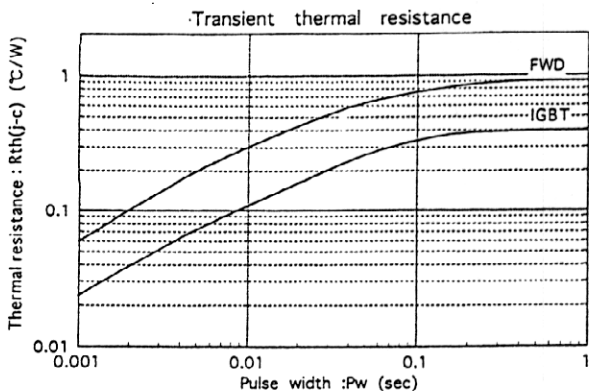
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14-2. Inverter インバータ部

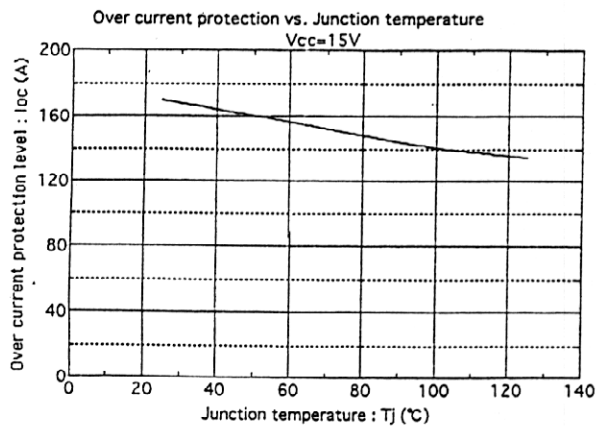


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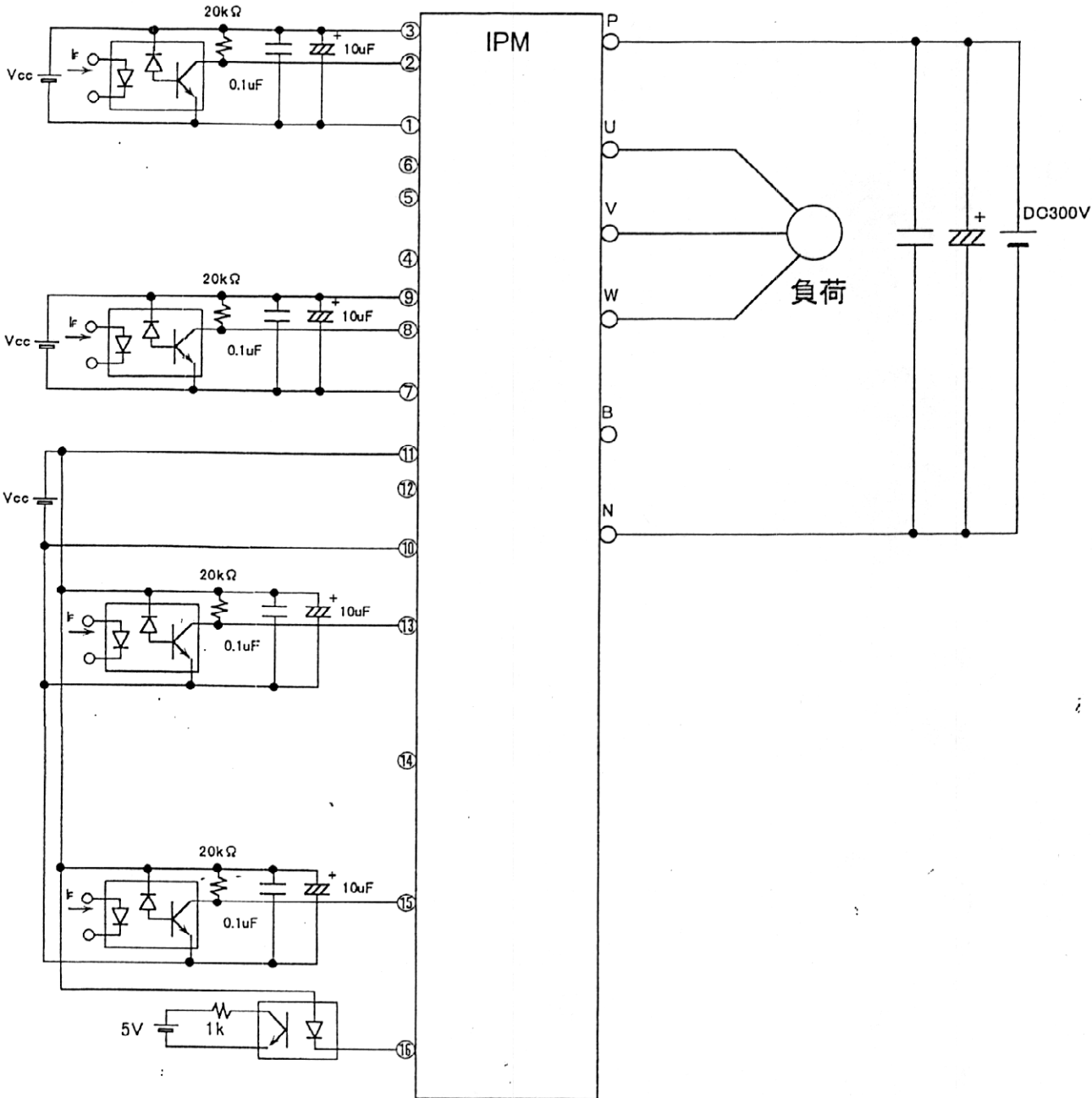
DWG. NO.

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H04-004-03

15. Example of applied circuit

応用回路例



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- The wiring between opto-coupler and input terminals of IPM should be shorter as much as possible. The stray-capacitance between primary and secondary side of opto-coupler should not be increased by a pattern lay-out.

フォトカプラとIPMの入力端子間配線はできるだけ短くし、フォトカプラの1次・2次間の浮遊容量を増加させないパターンレイアウトとして下さい。

- Capacitor should be installed to Vcc-GND terminal of high-speed opto-coupler closely as much as possible.

高速フォトカプラのVcc-GND間には、コンデンサをできるだけ近接して取り付けて下さい。

- Use high-speed opto-coupler : $t_{PHL}, t_{PLH} \leq 0.8 \mu S$, high CMR type. (Example: HCPL-4504)

高速フォトカプラ: $t_{PHL}, t_{PLH} \leq 0.8 \mu S$, 高CMRタイプをご使用下さい。(例: HCPL-4504)

- Use Low-speed opto-coupler for alarm output : $CTR \geq 100\%$

アラーム出力用の低速フォトカプラ: $CTR \geq 100\%$ タイプをご使用下さい。

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- Each power supply for drive circuit should not have transient voltage fluctuation.
Power supplies which are isolated should be supplied individually.
各制御用電源は瞬時電圧変動の少ない、絶縁されたものを独立に使用して下さい。
- The DC bus lines to the P-N terminals should have lower inductance as much as possible, such as connecting capacitor to P-N terminals, in order to reduce surge voltage.
P-N間の直流母線はできるだけ低インダクタンス化し、P-N端子間にコンデンサを接続するなしてサージ電圧を低減して下さい。
- In order to avoid noise from AC line, connect capacitor (about 4.7nF) between three-phase line and earth.
ACラインからのノイズの侵入を防ぐため、2相各線-大地間に4.7nF程度のコンデンサを接続して下さい。
- Do not connect N-terminal of main circuit to ground (GND) of input circuit.
入力回路のグランド(GND)と主回路N端子を接続しないで下さい。
- In case of using connector for connection to control terminal, it must be Au-plated electrode and 2.54mm of pitch.
制御端子との接続にコネクタを用いる場合は、金メッキ電極・2.54mmピッチのものをご使用下さい。
- When capacitors are connected between input and GND terminals, pay attention to longer delay time after signals inputted to primary side of opto-coupler.
入力端子-GND間にコンデンサを接続するとフォトカプラ1次側入力信号に対する応答時間が長くなりますのでご注意下さい。