

SPECIFICATION

Device Name : IGBT-IPM

Type Name : 7MBP50NA060-01

Spec. No. : MS6M0278

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Fuji Electric Co., Ltd.
Matsumoto Factory

	DATE	NAME	APPROVED	Fuji Electric Co., Ltd.	
DRAWN	Mar. 27 '96	H. Kawakami		DWG. NO.	MS6M0278
CHECKED	-/-	N. Terashima			
			T. HOSEN		1 / 16

Revised Records

Date	Classi- fication	Ind.	Content	Applied date	Drawn	Checked	Approved
Mar-27-'96	enactment	—	_____	Issued date	_____	N. Terisawa	T. HOSEN

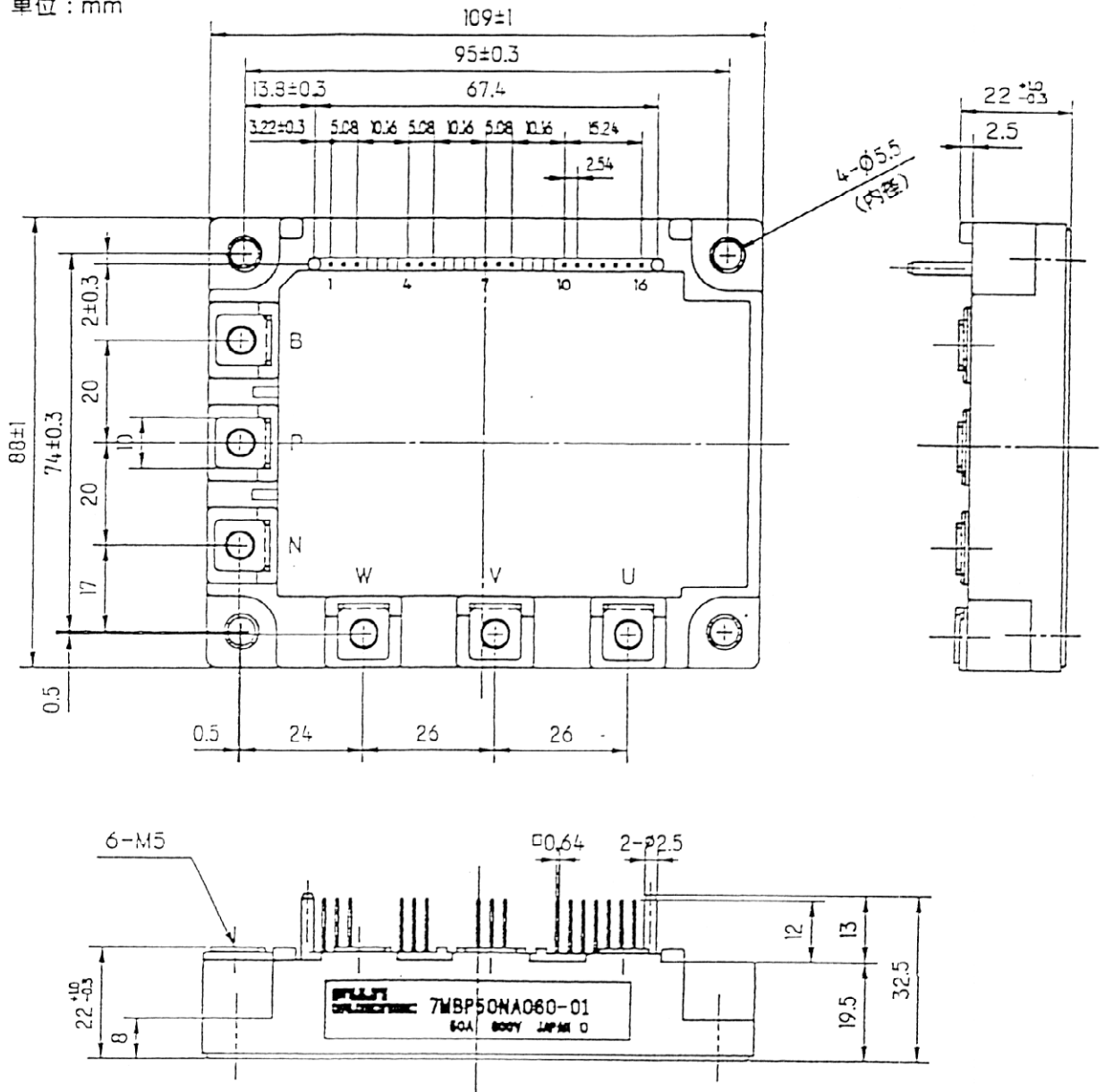
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1. Outline Drawing

外形図

Unit : mm

単位 : mm



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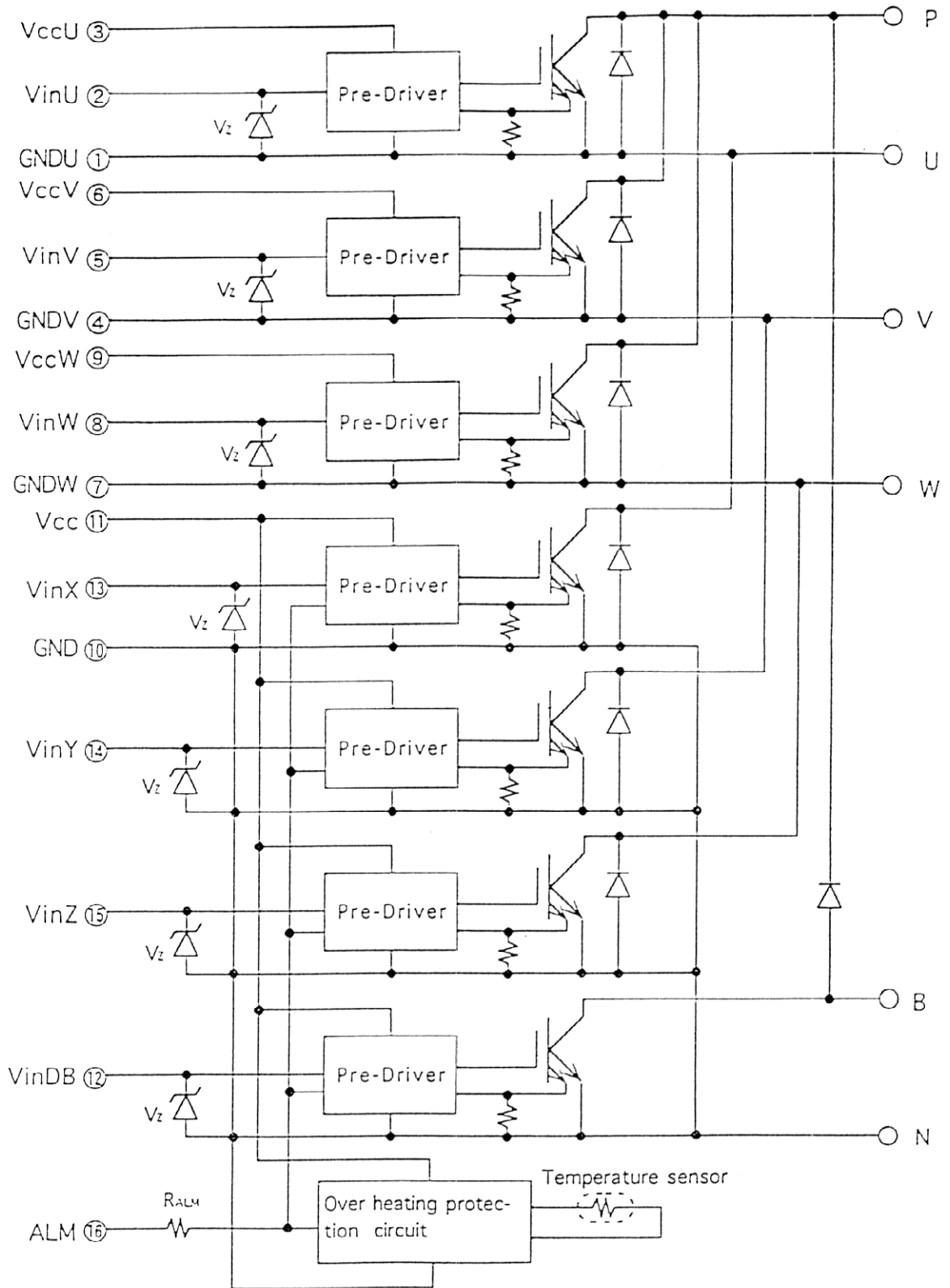
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2 Block Diagram

ブロック図



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Pre-Drivers include following functions

- ① Short Circuit Protection Circuit
- ② Amplifier for Driver
- ③ Under Voltage Lockout Circuit
- ④ Over current Protection Circuit

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

Items		Symbols	Ratings		Units	
			Min.	Max.		
DC Bus Voltage		V_{bc}	0	450	V	
DC Bus Voltage (surge)		$V_{bc(SURGE)}$	0	500	V	
DC Bus Voltage (short operating)		V_{sc}	200	400	V	
Collector-Emitter Voltage		V_{CES}	0	600	V	
I N V	Collector Current	DC	I_c	—	50	A
		1mS	I_{cp}	—	100	A
		Duty=62.6%	$-I_c$	—	50	A
Collector Power Dissipation One Transistor		P_c	—	198	W	
D	Collector Current	DC	I_c	—	30	A
		1mS	I_{cp}	—	60	A
B	Forward Current of Diode	I_F	—	30	A	
	Collector Power Dissipation One Transistor	P_c	—	120	W	
Junction Temperature		T_j	—	150	$^\circ\text{C}$	
Input Voltage of Power Supply for Pre-Driver		$V_{cc} \text{ ※1}$	0	20	V	
Input Signal Voltage		$V_{in} \text{ ※2}$	0	V_z	V	
Input Signal Current		I_{in}	—	1	mA	
Alarm Signal Voltage		$V_{ALM} \text{ ※3}$	0	V_{cc}	V	
Alarm Signal Current		$I_{ALM} \text{ ※4}$	—	15	mA	
Storage Temperature		T_{stg}	-40	125	$^\circ\text{C}$	
Operating Case Temperature (Fig.1)		T_{op}	-20	100	$^\circ\text{C}$	
Isolation Voltage (Case-Terminal)		$V_{iso} \text{ ※5}$	—	AC2.5	kV	

Note ※1 V_{cc} shall be applied to the input Voltage between terminal No. 3 and 1, 6 and 4, 9 and 7, 11 and 10.

※2 V_{in} shall be applied to the input Voltage between terminal No. 2 and 1, 5 and 4, 8 and 7, 12 13 14 15 and 10.

※3 V_{ALM} shall be applied to the Voltage between terminal No. 16 and 10.

※4 I_{ALM} shall be applied to the input current to terminal No. 16.

※5 50Hz/60Hz sine wave 1 minute.

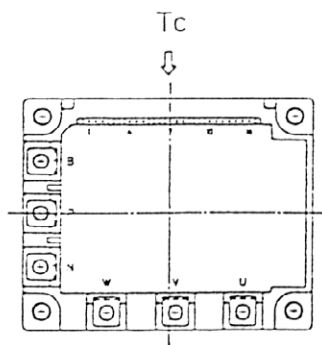


Fig.1 Measurement of case temperature

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4. Electrical Characteristics

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.	Units
I N V	Collector Current at off Signal Input	I_{CES}	$V_{CE}=600\text{V}$	—	—	1.0	mA
	Collector-Emitter Saturation Voltage	$V_{CE}(\text{sat})$	$I_c=50\text{A}$	—	—	2.9	V
	Forward Voltage of FWD	V_f	$-I_c=50\text{A}$	—	—	3.0	V
D B	Collector Current at off Signal Input	I_{CES}	$V_{CE}=600\text{V}$	—	—	1.0	mA
	Collector-Emitter Saturation Voltage	$V_{CE}(\text{sat})$	$I_c=30\text{A}$	—	—	2.9	V
	Forward Voltage of Diode	V_f	$-I_c=30\text{A}$	—	—	3.3	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.	Units
Power Supply Current of P-Line Side Pre-Driver (One Unit)		I_{CCP}	$f_{sw}=15\text{kHz} \times 6$ Duty=50%	—	6	16	mA
Power Supply Current of N-Line Side Three Pre-Drivers and Protection Circuits		I_{CCN}	$f_{sw}=15\text{kHz}$ Duty=50%	—	22	62	mA
Input signal Threshold Voltage		$V_{in}(\text{ON})$	ON	1.00	1.35	1.70	V
		$V_{in}(\text{OFF})$	OFF	1.25	1.60	1.95	
Zener Voltage		V_Z		6.9	—	7.7	V
Over Heating Protection(OH) Level		T_{OH}	$V_{DC}=0\text{V}$, $I_c=0\text{A}$ Case Temperature	100	—	125	$^\circ\text{C}$
OH Hysteresis		T_H		—	20	—	$^\circ\text{C}$
Over Current Protection(OC) Level	INV	I_{OC}	$T_j=125^\circ\text{C}$ Collector Current	65	—	—	A
Over Current Protection(OC) Level	DB	I_{OC}	$T_j=125^\circ\text{C}$ Collector Current	36	—	—	A
OC Delay Time (Fig.2)		t_{DOC}	$T_j=25^\circ\text{C}$	—	8	—	μS
Under Voltage Protection(UV) Level		V_{UVT}		11.0	12.0	12.5	V
UV Hysteresis		V_H		0.2	—	—	V
Alarm Signal Hold Time		t_{ALM}		0.8	2	—	mS
Delay Time of Short Circuit Protection (Fig.3)		t_{SC}		12	—	—	μS
Limiting Resistor for Alarm		R_{ALM}		1425	1500	1575	Ω

※6 Switching frequency of IPM

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

Items	Symbols	Conditions	Min.	Typ.	Max.	Units
Switching Time Fig.4	t_{on}	$I_c=50\text{A}$	0.3	—	—	μS
	t_{off}	$V_{bc}=300\text{V}$	—	—	3.6	μS
Switching Time (FWD)	t_{rr}	$I_F=50\text{A}, V_{bc}=300\text{V}$	—	—	400	nS

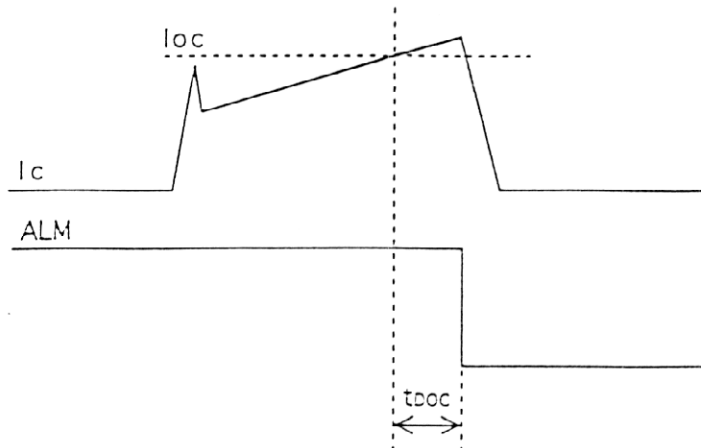


Fig.2 : Definition of OC Delay Time

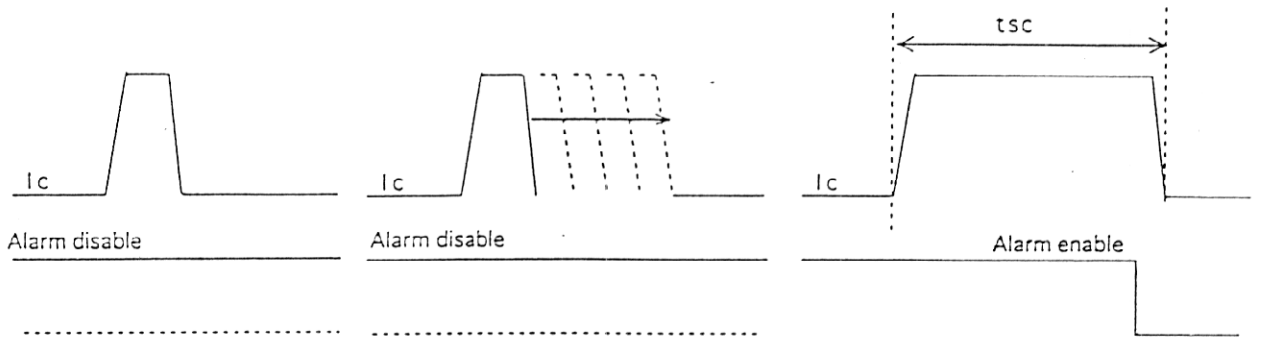


Fig.3 : Definition of tsc

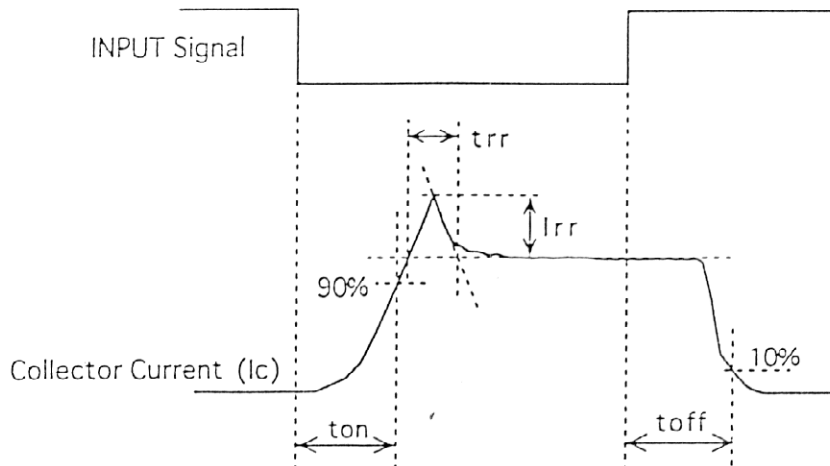


Fig.4 : Definition of switching time

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5. Thermal Characteristics (Tc=25℃)

Items			Symbols	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance	INV	IGBT	Rth(j-c)	—	—	0.63	℃/W
		FWD	Rth(j-c)	—	—	1.33	℃/W
Junction to Case Thermal Resistance	DB	IGBT	Rth(j-c)	—	—	1.04	℃/W
Case to Fin Thermal Resistance with Compound			Rth(c-f)	—	0.05	—	℃/W

6. Mechanical Characteristics

Items		Min.	Typ.	Max.	Units
Screw Torque	Mounting (M5)	—	—	3.5	N·m
	Terminal (M5)	—	—	3.5	N·m
Weight		—	550	—	g

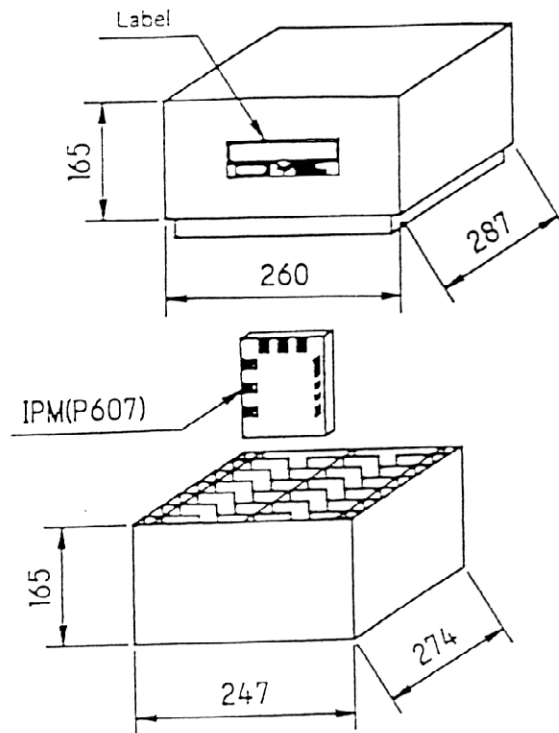
7. Recommendable Value

Items		Symbols	Conditions	Min.	Typ.	Max.	Units
DC Bus Voltage		Vbc		200	—	400	V
Operating Power Supply Voltage Range of Pre-Driver		Vcc		13.5	15	16.5	V
Switching frequency of IPM		f _{sw}		1	—	20	kHz
Screw Torque	Mounting (M5)	—		2.5	—	3.5	N·m
	Terminal (M5)	—		2.5	—	3.5	N·m

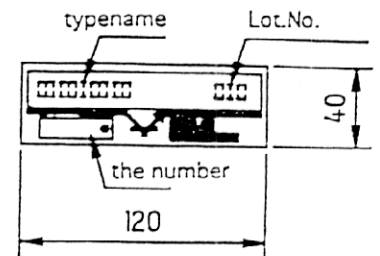
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8. Packing and labeling

梱包箱と表示



material card board
weight 5.5 kg (Max.)
products 10pcs (Max.)



9. 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%.

常温保存が望ましい。(5~35°C、45~75%)

- Store modules in a place with few temperature changes in order to avoid condensation on the module surface.

急激な温度変化の無きこと。(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.

製品に荷重がかからないように十分に注意すること。

- 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。

- Do not drop or otherwise shock the modules when transporting.

製品の運搬時に衝撃を与えたり、落下させたりしないこと。

10. Applicable category (適用範囲)

This specification is applied to IGBT-IPM named 7MBP50NA060-01.

本納入仕様書は、IGBT-IPM 7MBP50NA060-01 に適用する。

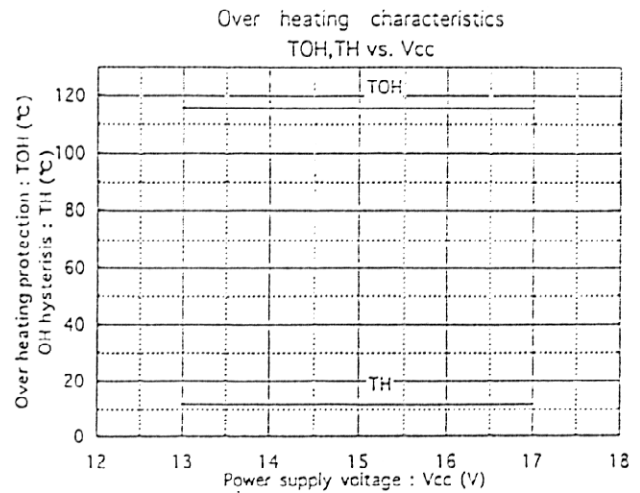
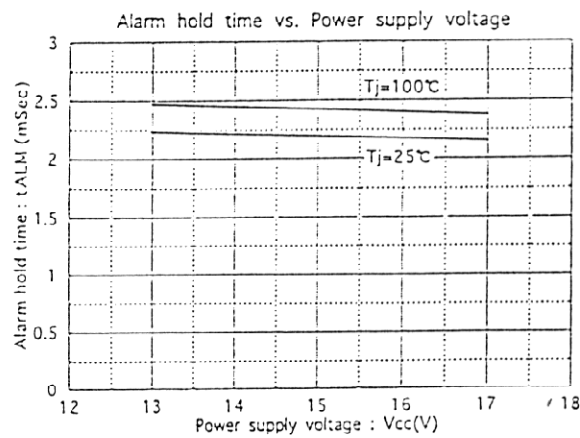
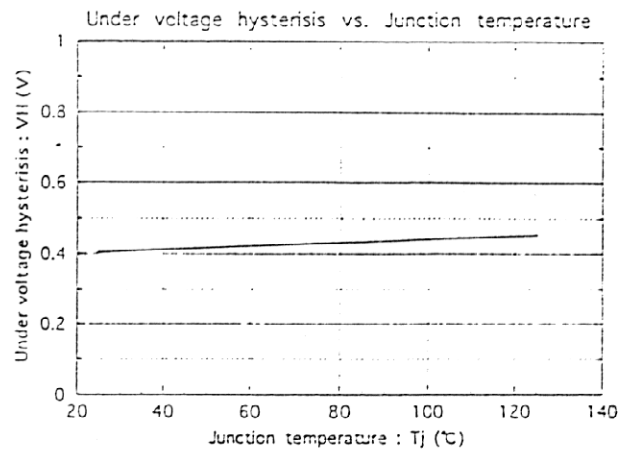
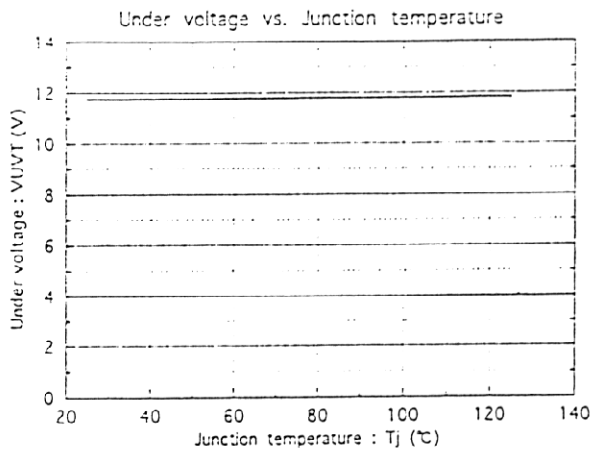
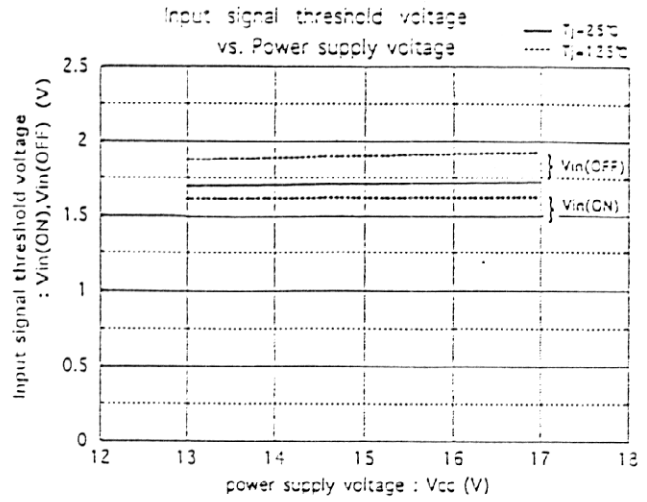
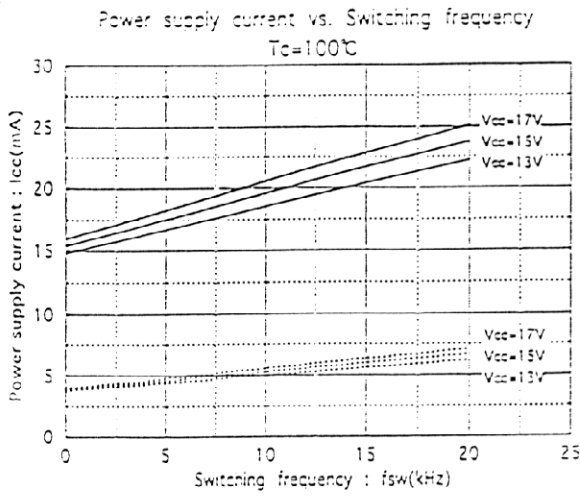
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11. Characteristic (Representative)

特性カーブ (代表例)

11-1. Control Circuit

制御部

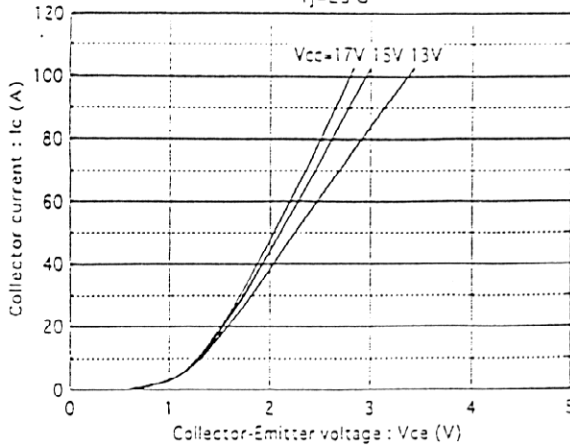


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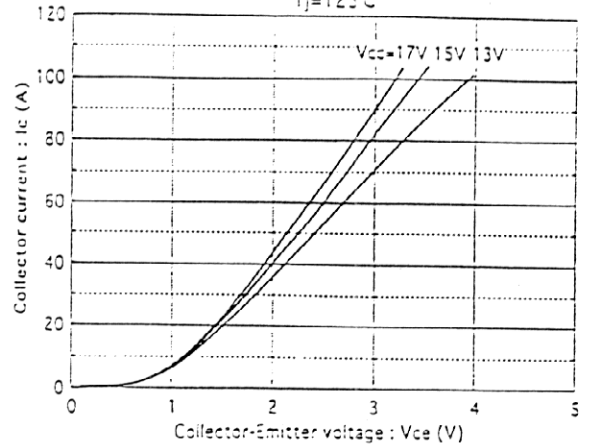
11-2. Inverter

インバータ部

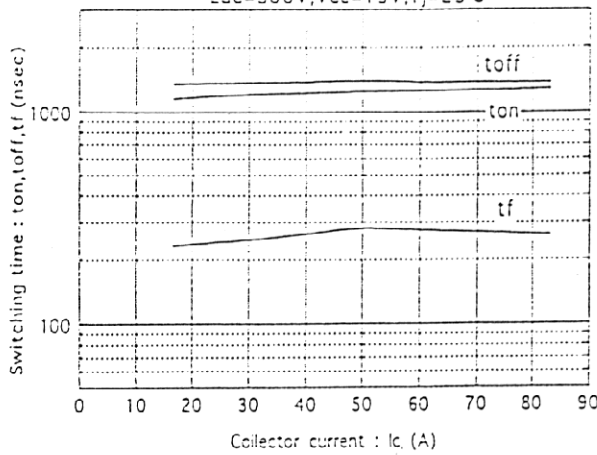
Collector current vs. Collector-Emitter voltage
T_j=25°C



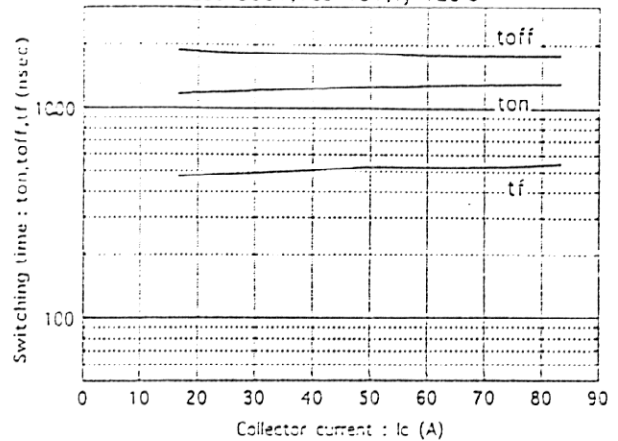
Collector current vs. Collector-Emitter voltage
T_j=125°C



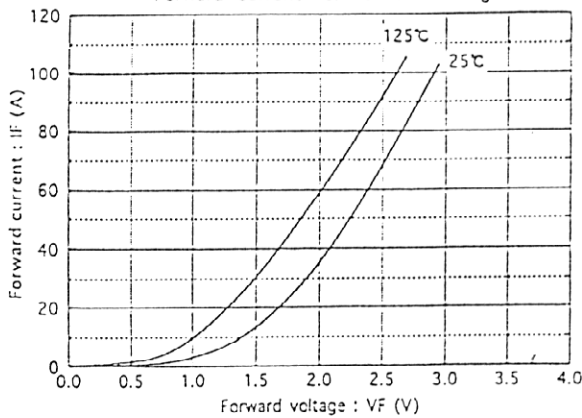
Switching time vs. Collector current
E_{dc}=300V, V_{cc}=15V, T_j=25°C



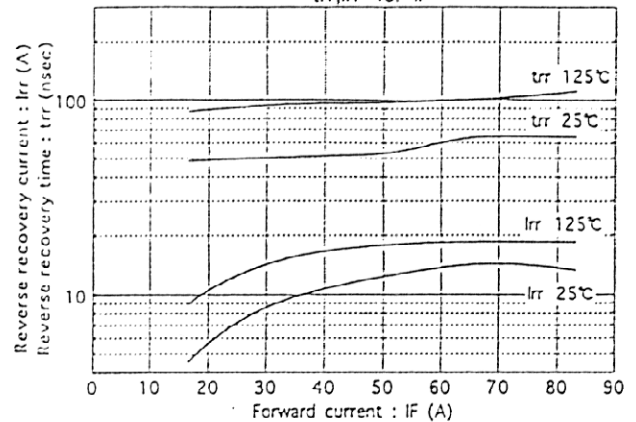
Switching time vs. Collector current
E_{dc}=300V, V_{cc}=15V, T_j=125°C



Forward current vs. Forward voltage

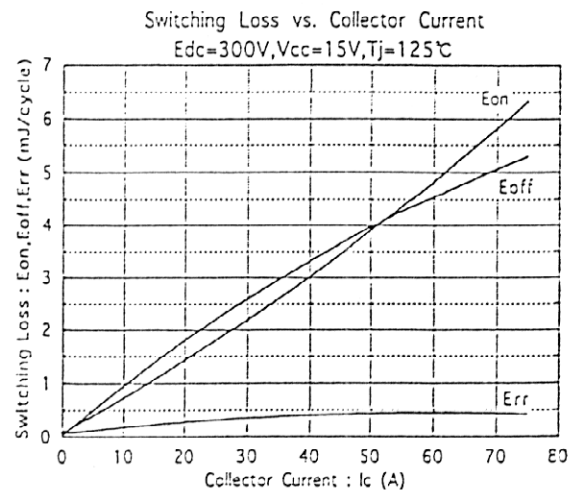
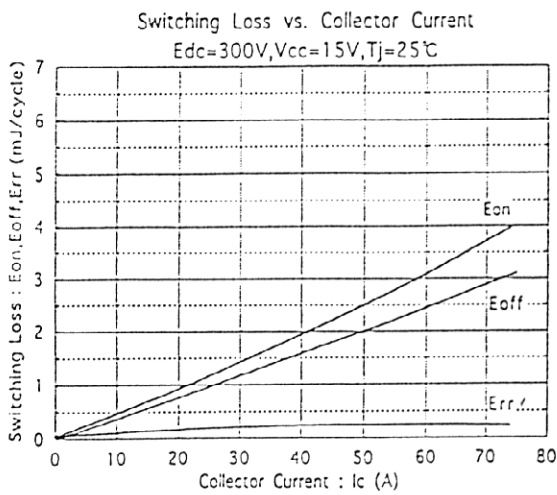
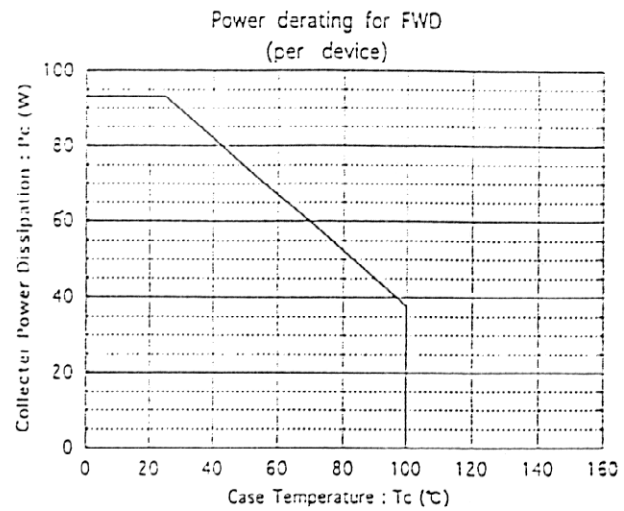
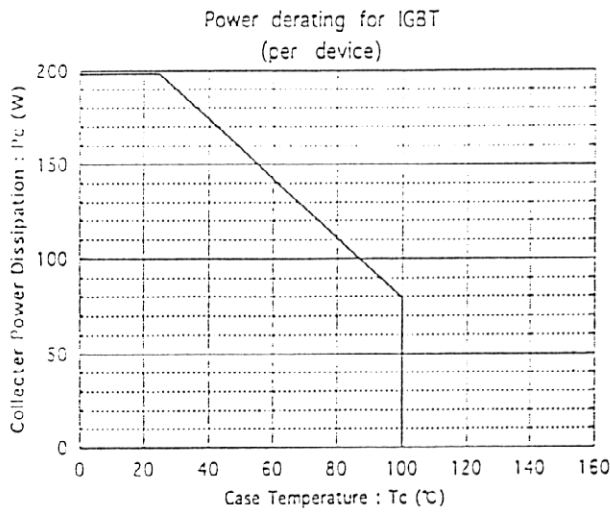
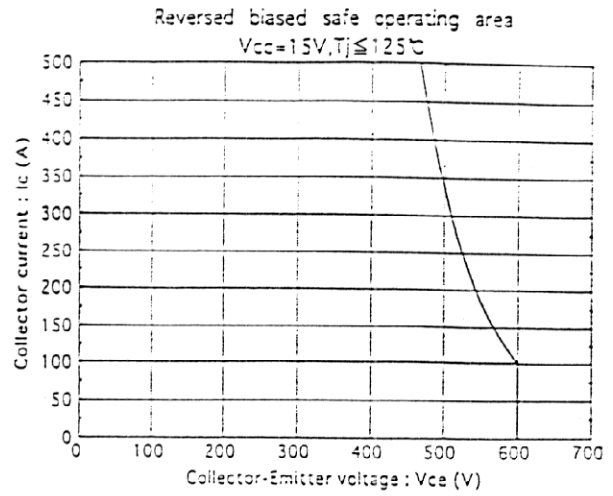
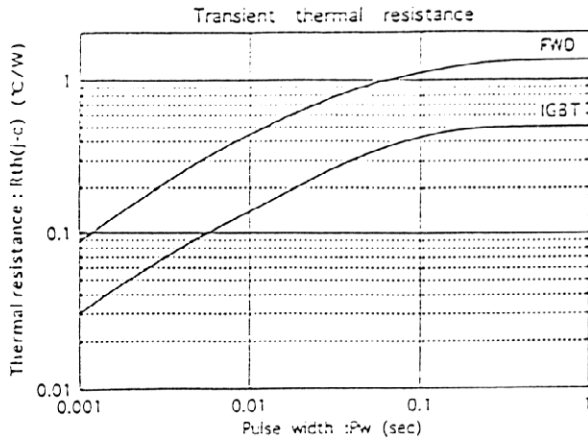


Reverse recovery characteristics
trr, Irr vs. IF

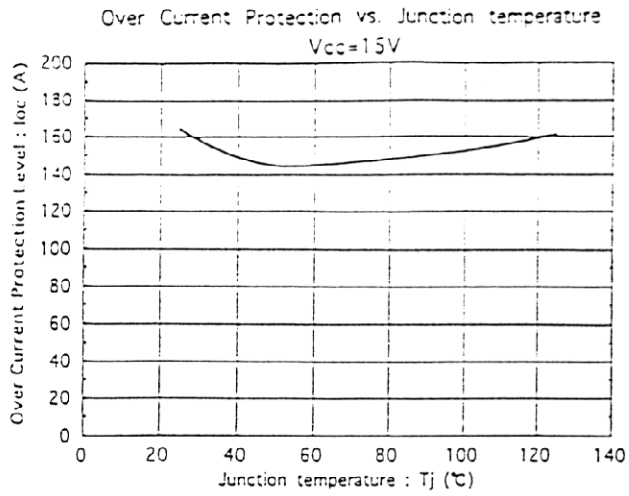


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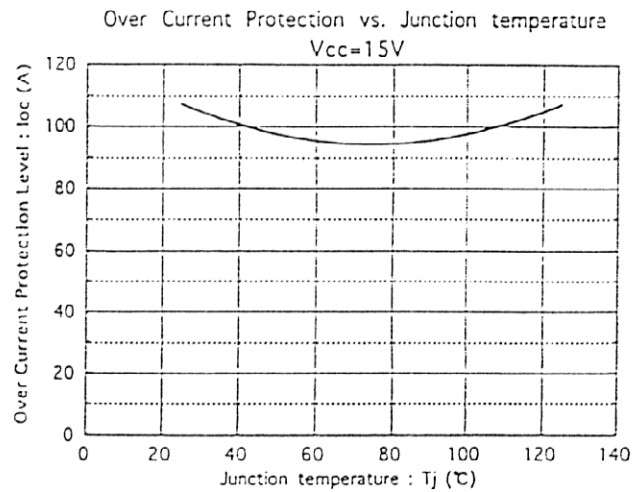
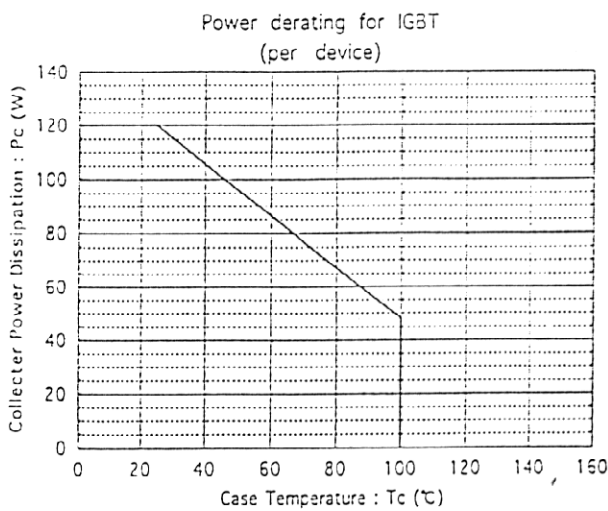
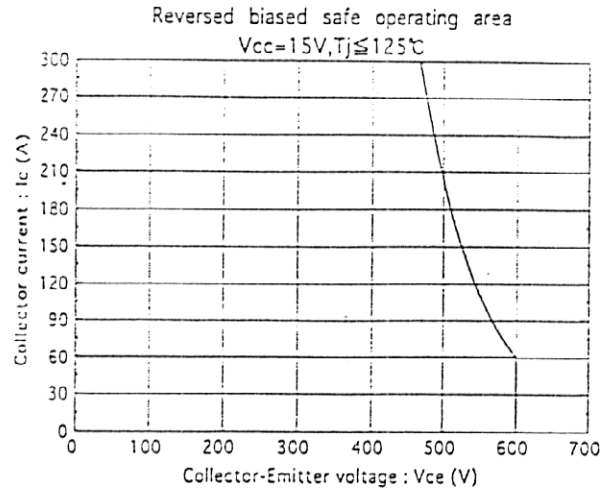
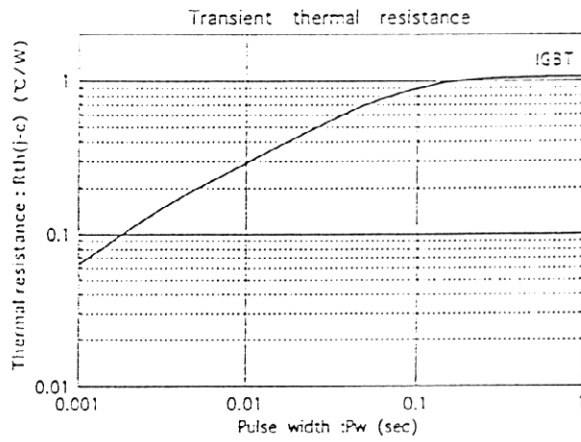
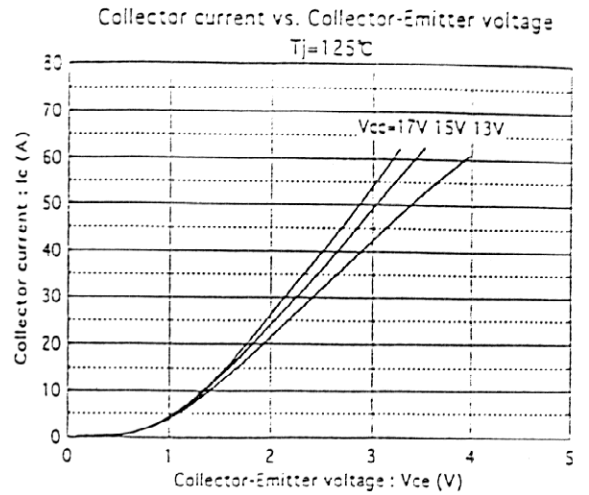
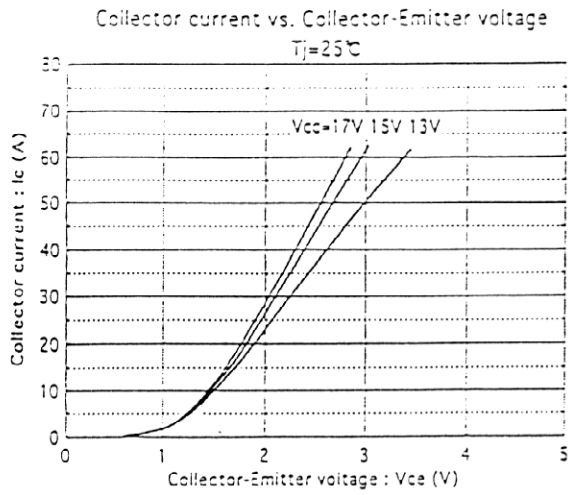
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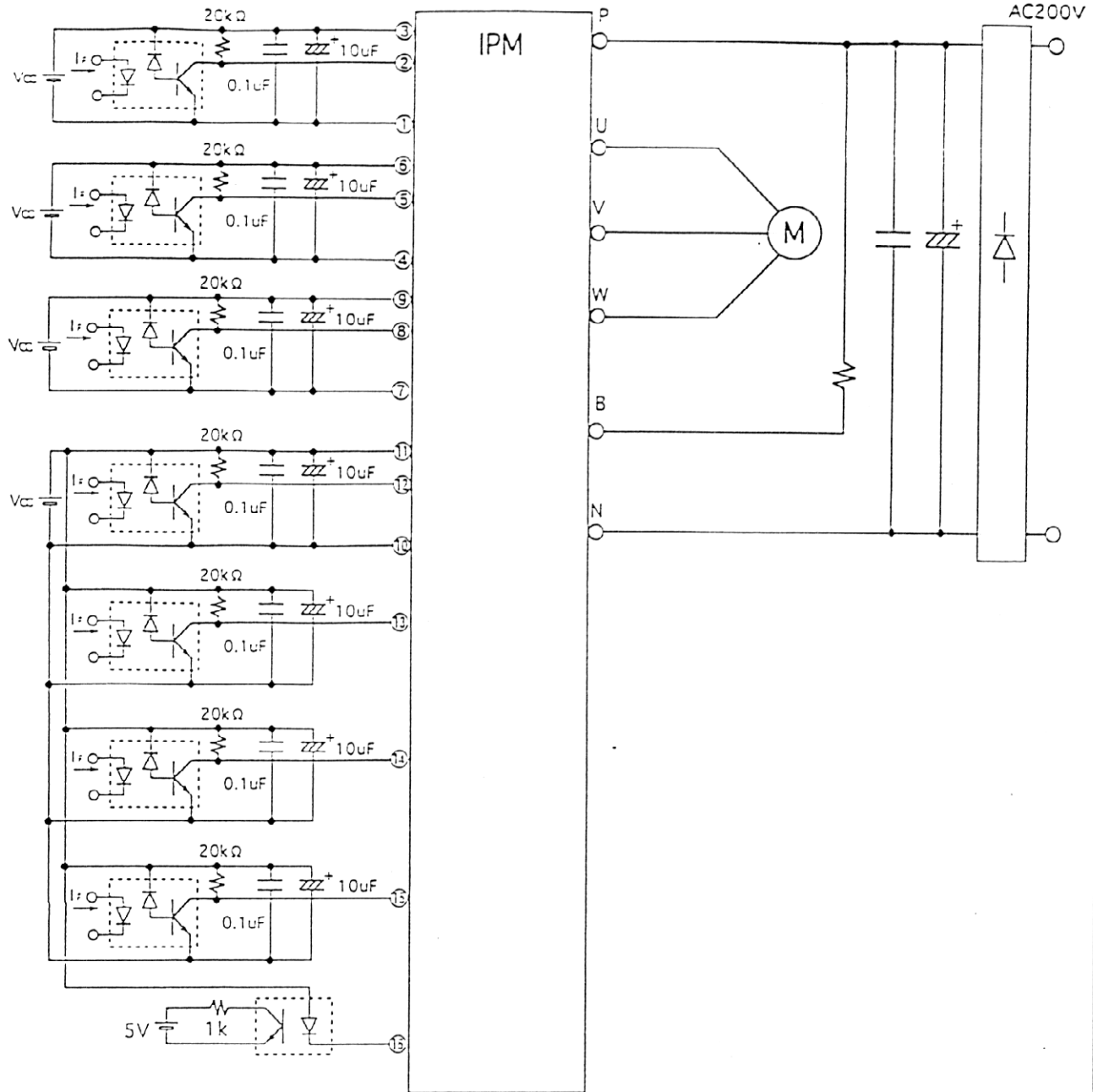
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12.Example of applied circuit (応用回路例)



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- The wiring between opto-coupler and input terminal 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 pattern lay-out.
 ホトカブラとIPMの入力端子間配線は、できるだけ短くしホトカブラの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.
 高速ホトカブラのVcc-GND間には、コンデンサをできるだけ近接して取り付けして下さい。
- Use high-speed opto-coupler : $t_{PLH}, t_{PHL} \leq 0.8\mu s$, high CMR type. (Example : HCPL-4504)
 高速ホトカブラ : $t_{PLH}, t_{PHL} \leq 0.8\mu s$, 高CMRタイプをご使用下さい。(例 HCPL-4504)
- Low-speed opto-coupler : $CTR \geq 100\%$
 低速ホトカブラ : $CTR \geq 100\%$

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- Each power supply for drive circuit should not have transient voltage fluctuation. Four 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、絶縁したものを4個独立にして供給して下さい。
- The DC bus line to the P-N terminal should have lower inductance as much as possible, such as connecting capacitor to P-N terminal, 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ど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 4.7 μ F) between three-phase line and earth.
ACラインからのノイズ侵入を防ぐため、三相各線-大地間に4.7 μ F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.
入力回路のグラウンド (GND) と主回路N端子をIPMの外側で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 capacitor is connected between input and GND terminal, pay attention to longer delay time after signal 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ホトカブラ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。