

SPECIFICATION

Device Name : IGBT-IPM

Type Name : 6MBP50NA060-01

Spec. No. : MS6M0275

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Fuji Electric Co., Ltd.
Matsumoto Factory

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CHECKED	- 4 -	N. Terasawa			

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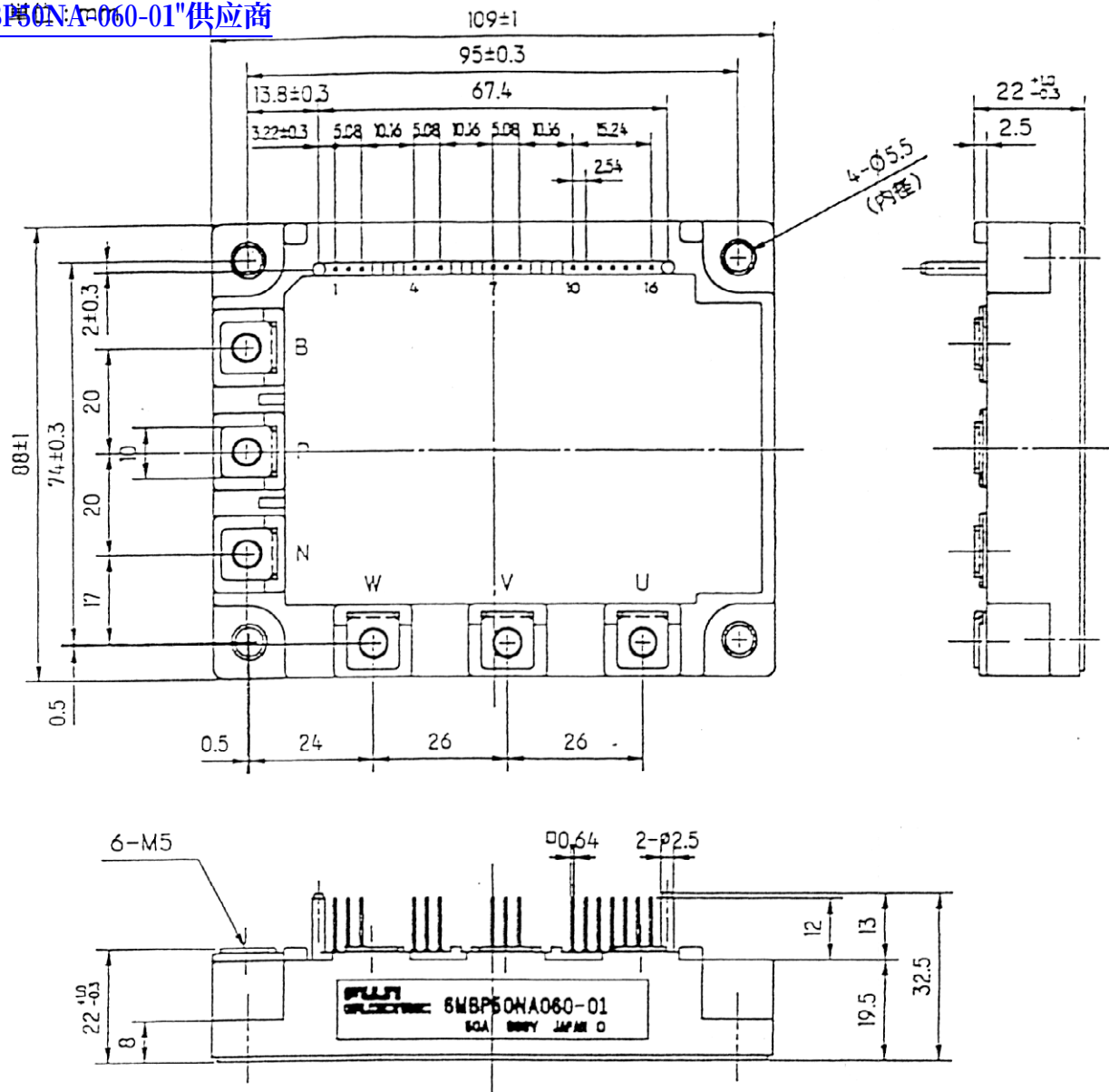
H04-004-06

1. Outline Drawing

外形図

Unit : mm

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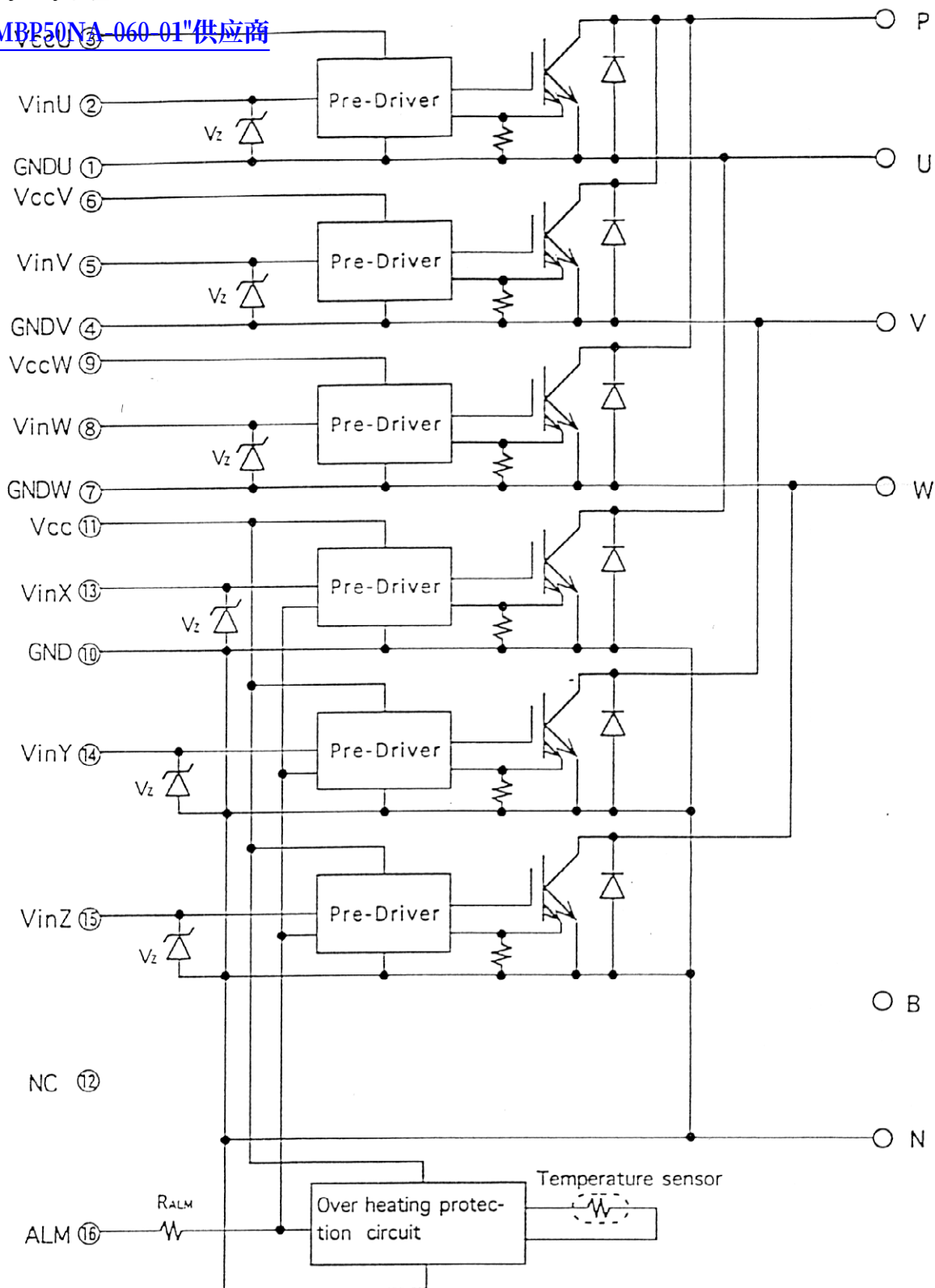
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H04-004-03

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 Tc=25℃ unless otherwise specified)

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3. Absolute Maximum Ratings (at Tc=25°C unless otherwise specified)

Items			Symbols	Ratings		Units
				Min.	Max.	
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DC Bus Voltage			V _{DC}	0	450	V
DC Bus Voltage (surge)			V _{DC} (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
Junction Temperature			T _j	—	150	℃
Input Voltage of Power Supply for Pre-Driver			V _{CC} ※1	0	20	V
Input Signal Voltage			V _{in} ※2	0	V _Z	V
Input Signal Current			I _{in}	—	1	mA
Alarm Signal Voltage			V _{ALM} ※3	0	V _{CC}	V
Alarm Signal Current			I _{ALM} ※4	—	15	mA
Storage Temperature			T _{stg}	-40	125	℃
Operating Case Temperature (Fig.1)			T _{OP}	-20	100	℃
Isolation Voltage (Case-Terminal)			V _{iso} ※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.

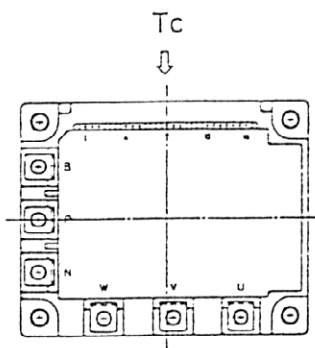


Fig.1 Measurement of case temperature

4. Electrical Characteristics

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

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		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	$V_{CE(sat)}$	$I_c=50\text{A}$	—	—	2.9	V
	Forward Voltage of FWD	V_F	$-I_c=50\text{A}$	—	—	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.	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%	—	18	48	mA
Input signal Threshold Voltage		$V_{in(ON)}$	ON	1.00	1.35	1.70	V
		$V_{in(OFF)}$	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
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

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}	$V_{DC}=300\text{V}$	—	—	3.6	μS
Switching Time (FWD)		t_{rr}	$I_F=50\text{A}$, $V_{DC}=300\text{V}$	—	—	400	nS

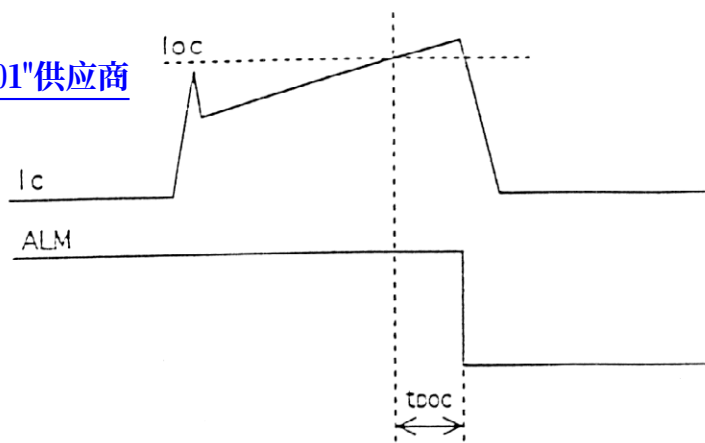


Fig.2 : Definition of OC Delay Time

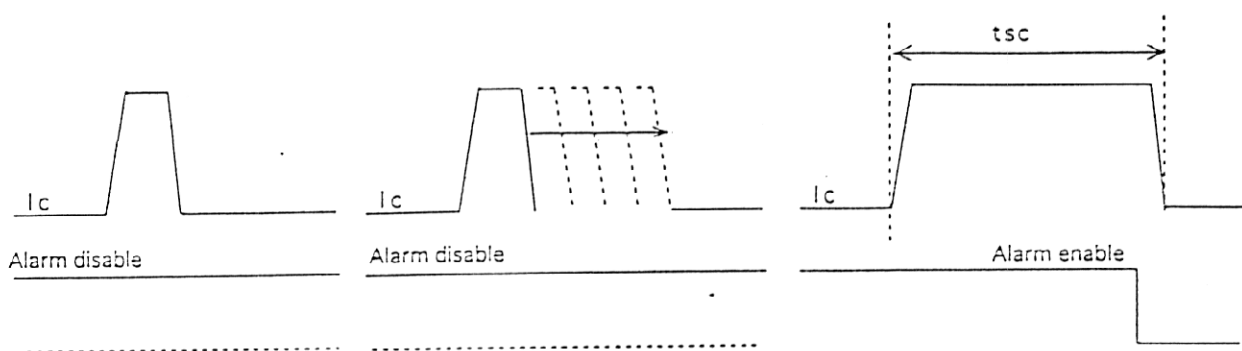


Fig.3 : Definition of tsc

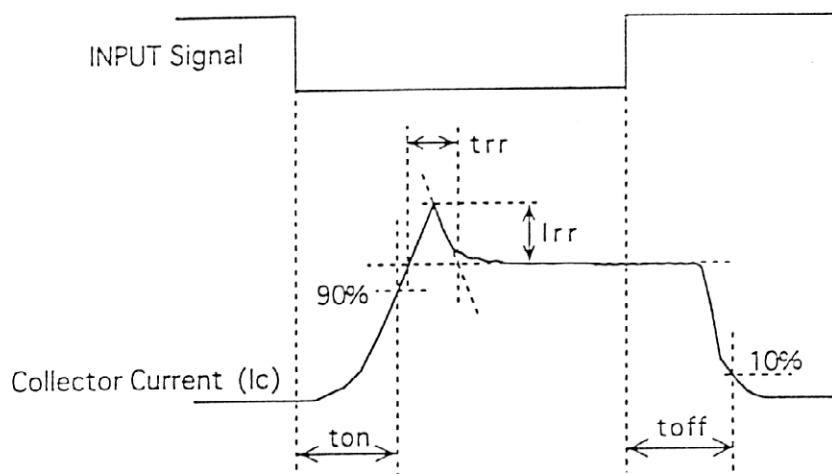


Fig.4 : Definition of switching time

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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	°C/W
		FWD	Rth(j-c)	—	—	1.33	°C/W
Case to Fin Thermal Resistance with Compound			Rth(c-f)	—	0.05	—	°C/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

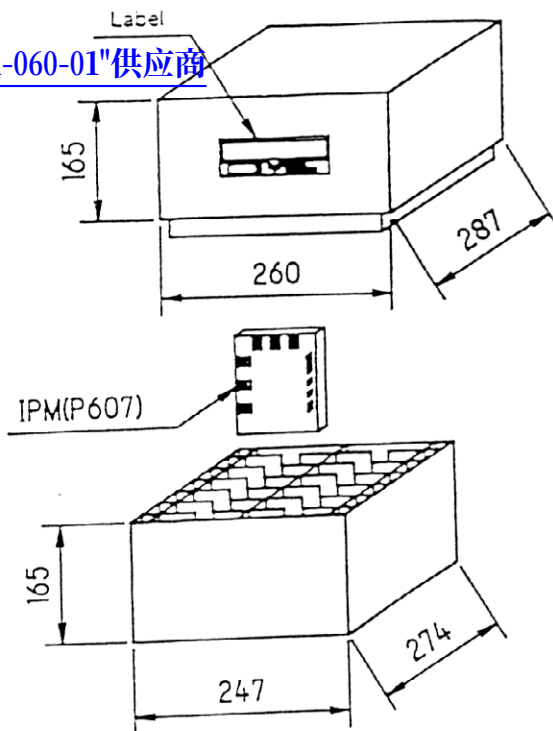
Items		Symbols	Conditions	Min.	Typ.	Max.	Units
DC Bus Voltage		V _{dc}		200	—	400	V
Operating Power Supply Voltage Range of Pre-Driver		V _{cc}		13.5	15	16.5	V
Switching frequency of IPM		f _{sw}		1	—	20	kHz
Screw Torque	Mounting (M5)	—		2.5	—	3.5	N·m
	Terminal (M5)	—		2.5	—	3.5	N·m

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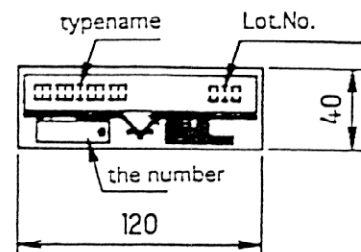
8. Packing and labeling

梱包箱と表示

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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℃、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 6MBP50NA060-01.

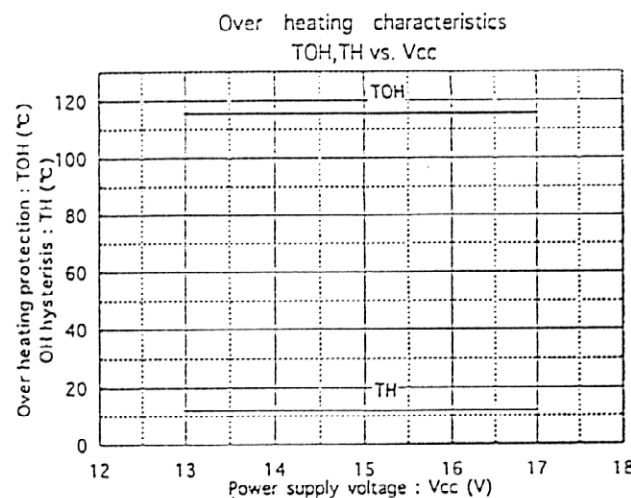
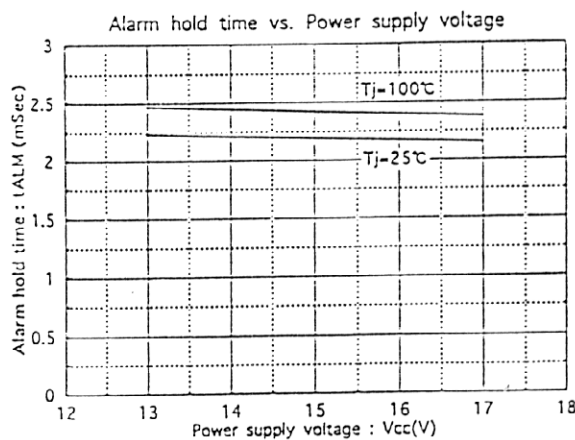
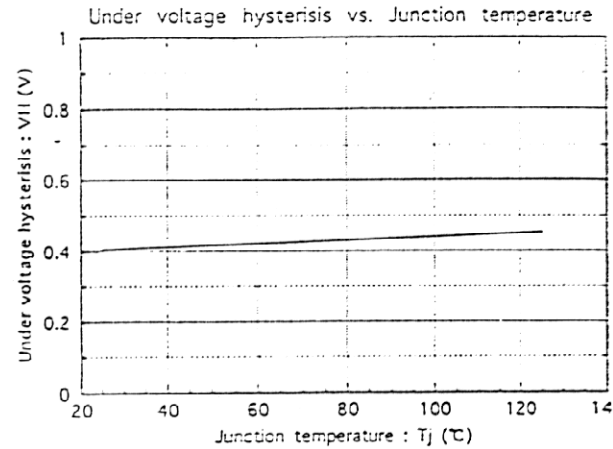
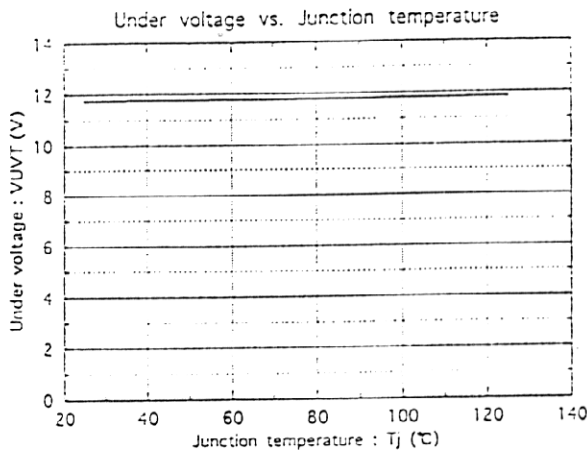
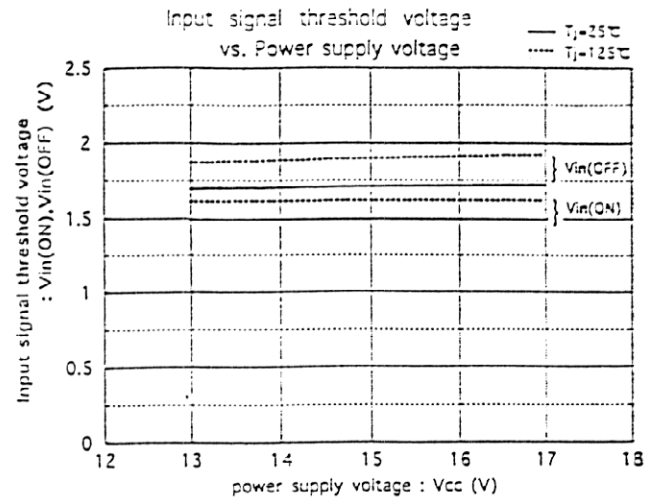
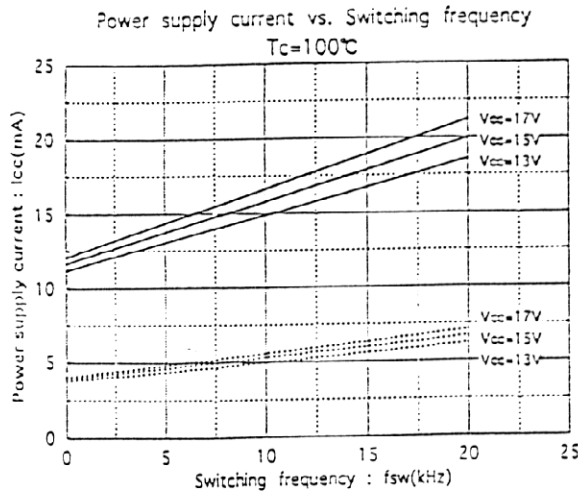
本納入仕様書は、IGBT-IPM 6MBP50NA060-01 に適用する。

11. Characteristic (Representative)

特性カーブ (代表例)

11-1. Control Circuit

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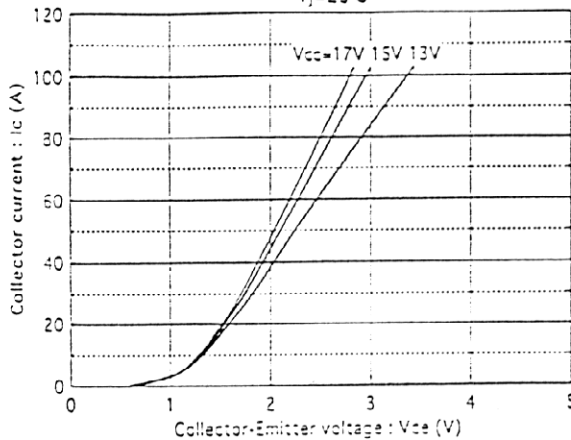
11-2. Inverter

インバータ部

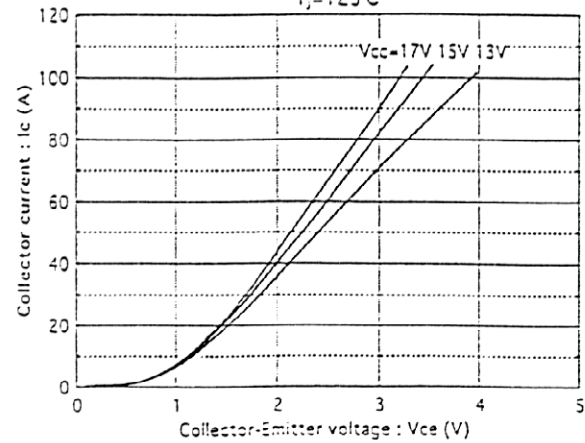
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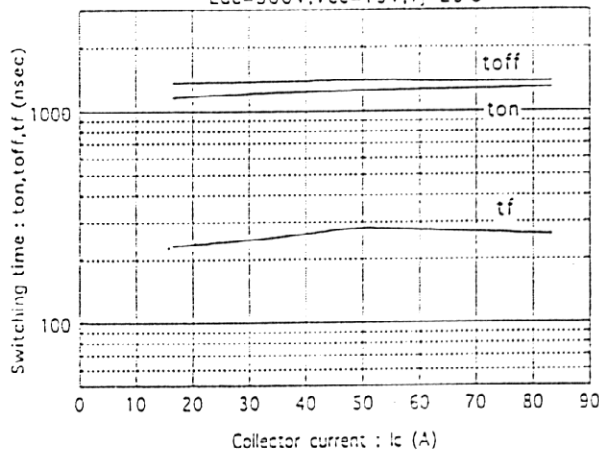
Collector current vs. Collector-Emitter voltage
 $T_j = 25^\circ\text{C}$



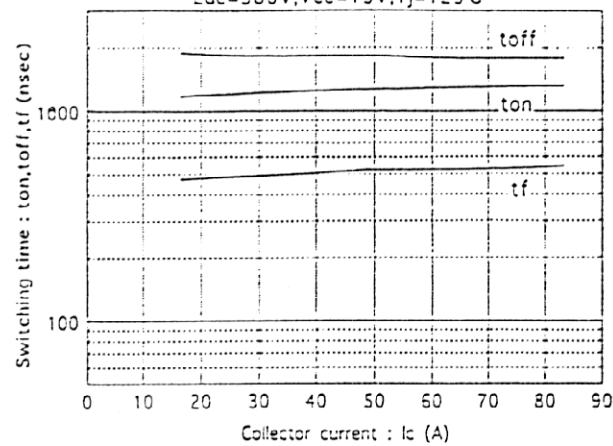
Collector current vs. Collector-Emitter voltage
 $T_j = 125^\circ\text{C}$



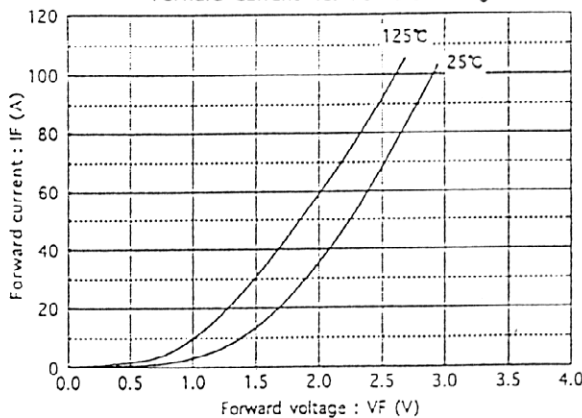
Switching time vs. Collector current
 $E_{dc} = 300\text{V}, V_{cc} = 15\text{V}, T_j = 25^\circ\text{C}$



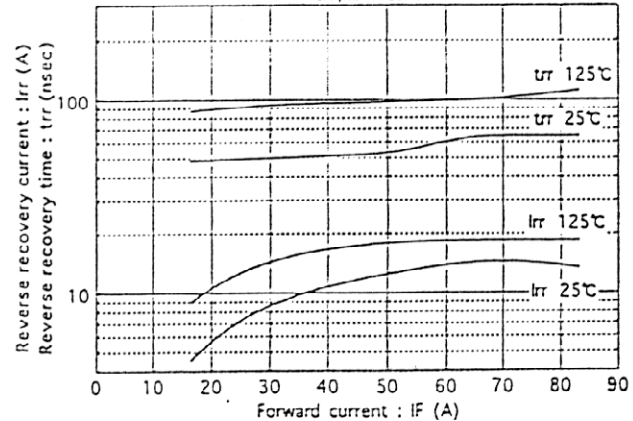
Switching time vs. Collector current
 $E_{dc} = 300\text{V}, V_{cc} = 15\text{V}, T_j = 125^\circ\text{C}$

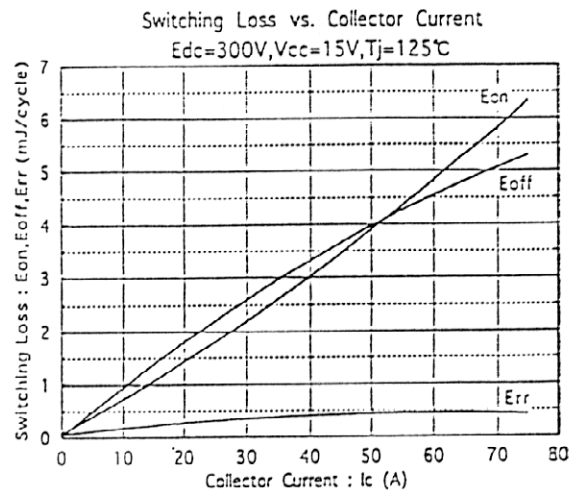
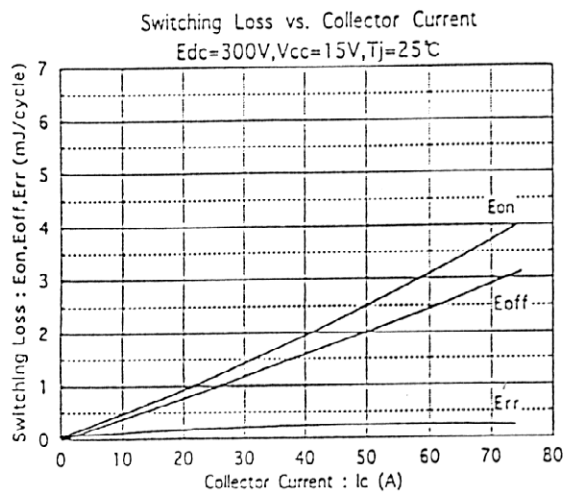
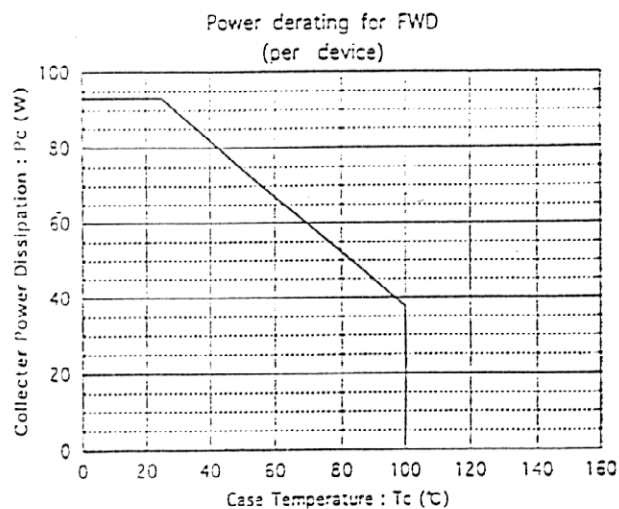
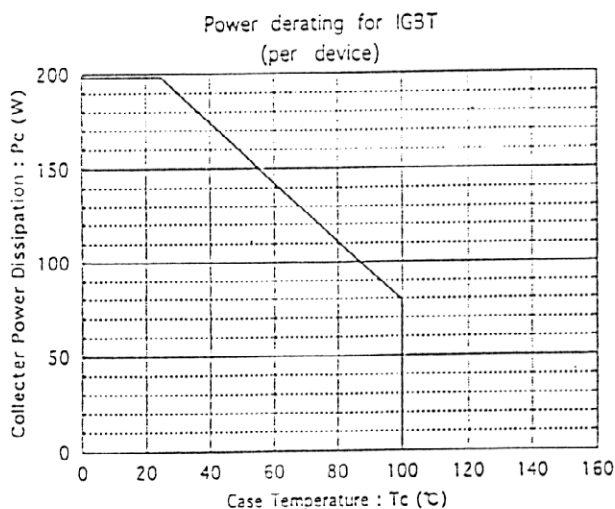
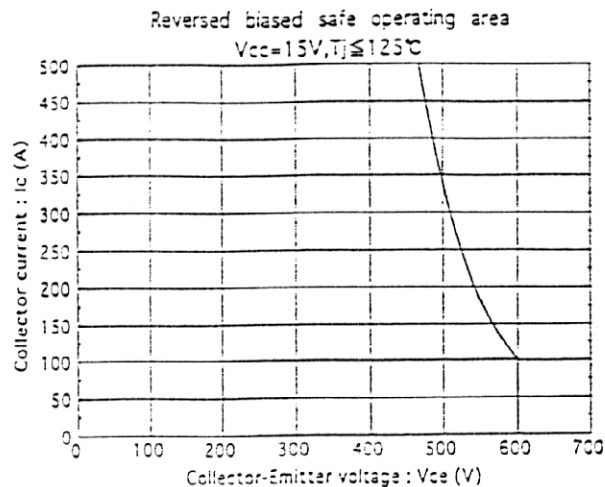
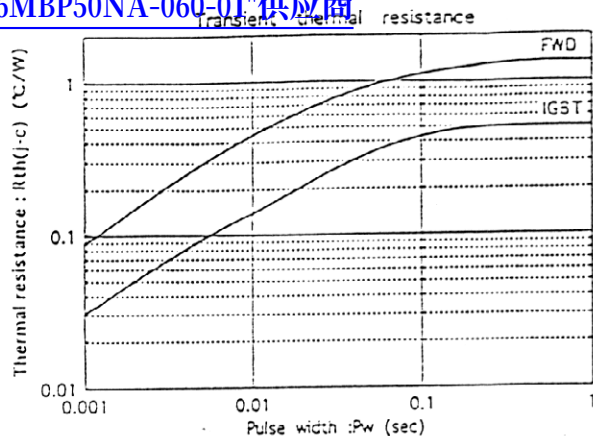


Forward current vs. Forward voltage

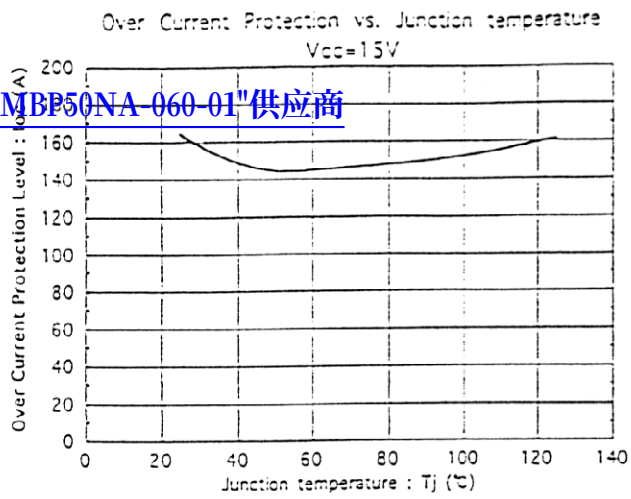


Reverse recovery characteristics
 t_{rr}, I_{rr} vs. I_F





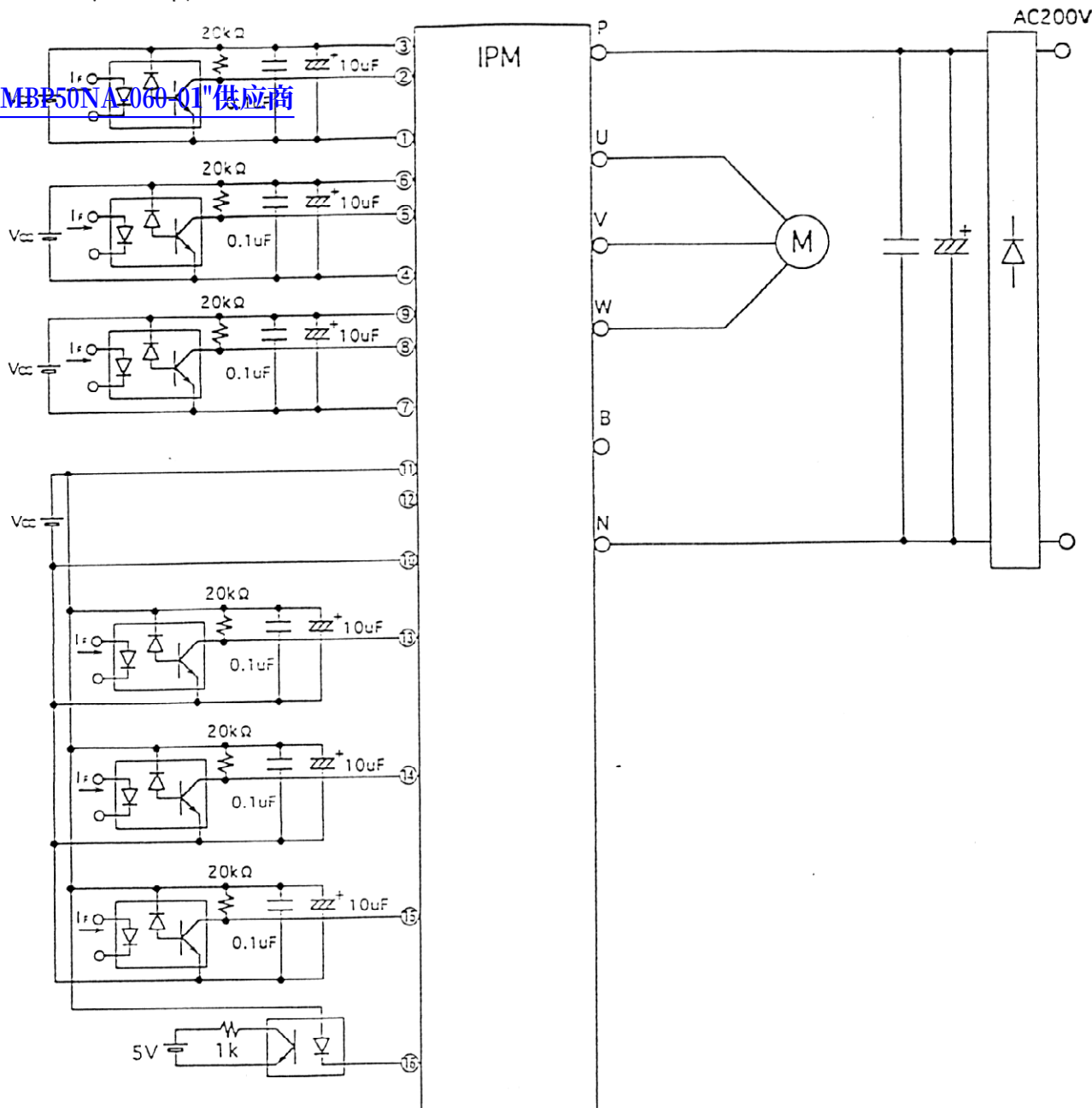
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12.Example of applied circuit (応用回路例)

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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 HPCL-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 4.7uF) 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4.7nF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 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。