SPECIFICATION

Device Name : IGBT-IPM

Type Name : 6MBP50NA060-01

Spec. No. : MS6M0275

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Fuji Electric Co.,Ltd.
Matsumoto Factory

	DATE	NAME	APPROVED
DRAWN	Mar.-27-'96	H.Kawakami	
CHECKED	-4-	N.Terasawa	
			T.HOSEN

Fuji Electric Co.,Ltd.

DWG.NO. MS6M0275 1/15

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Revised Records

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

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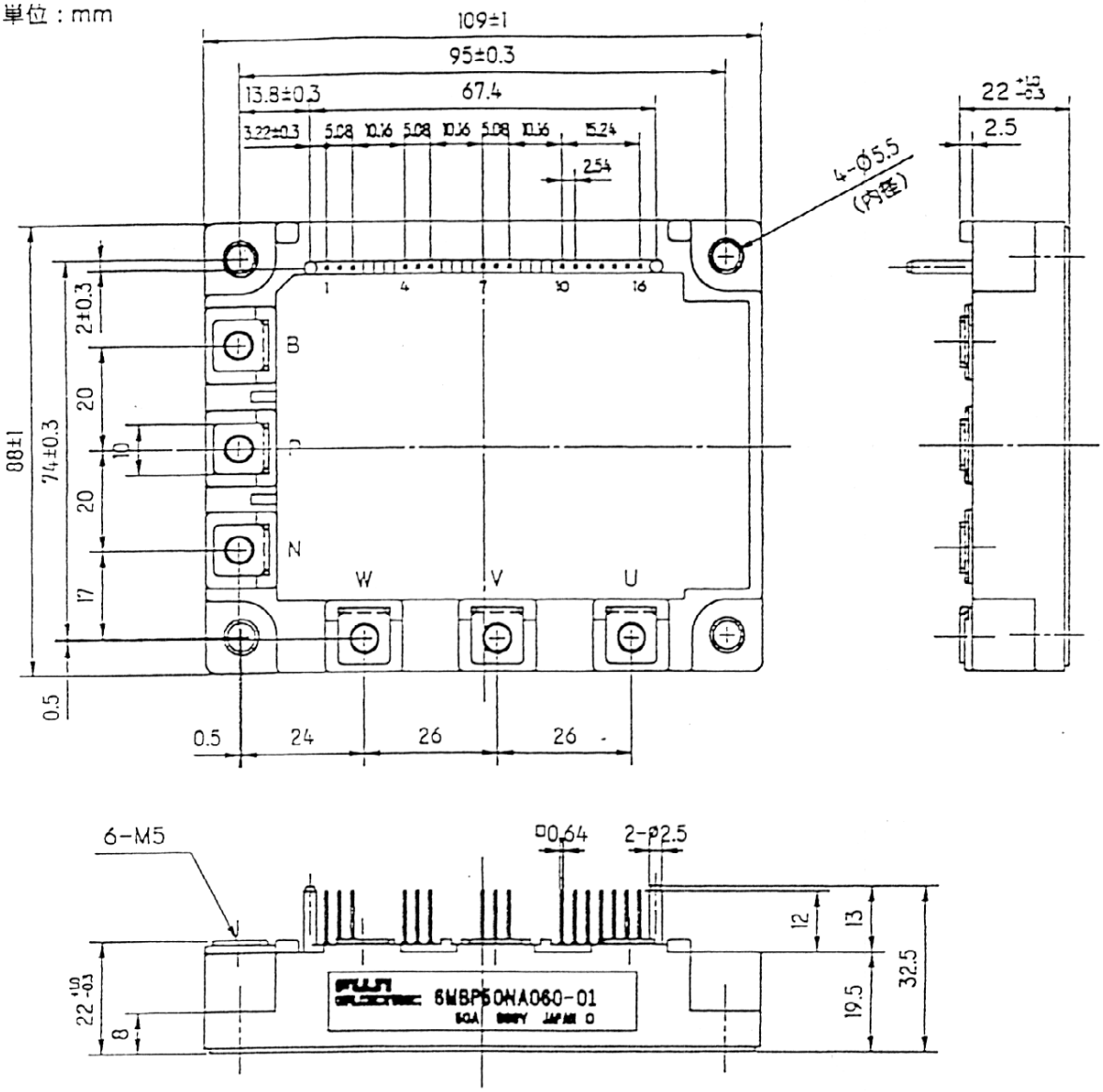
1. Outline Drwing

外形図

Unit : mm

単位 : mm



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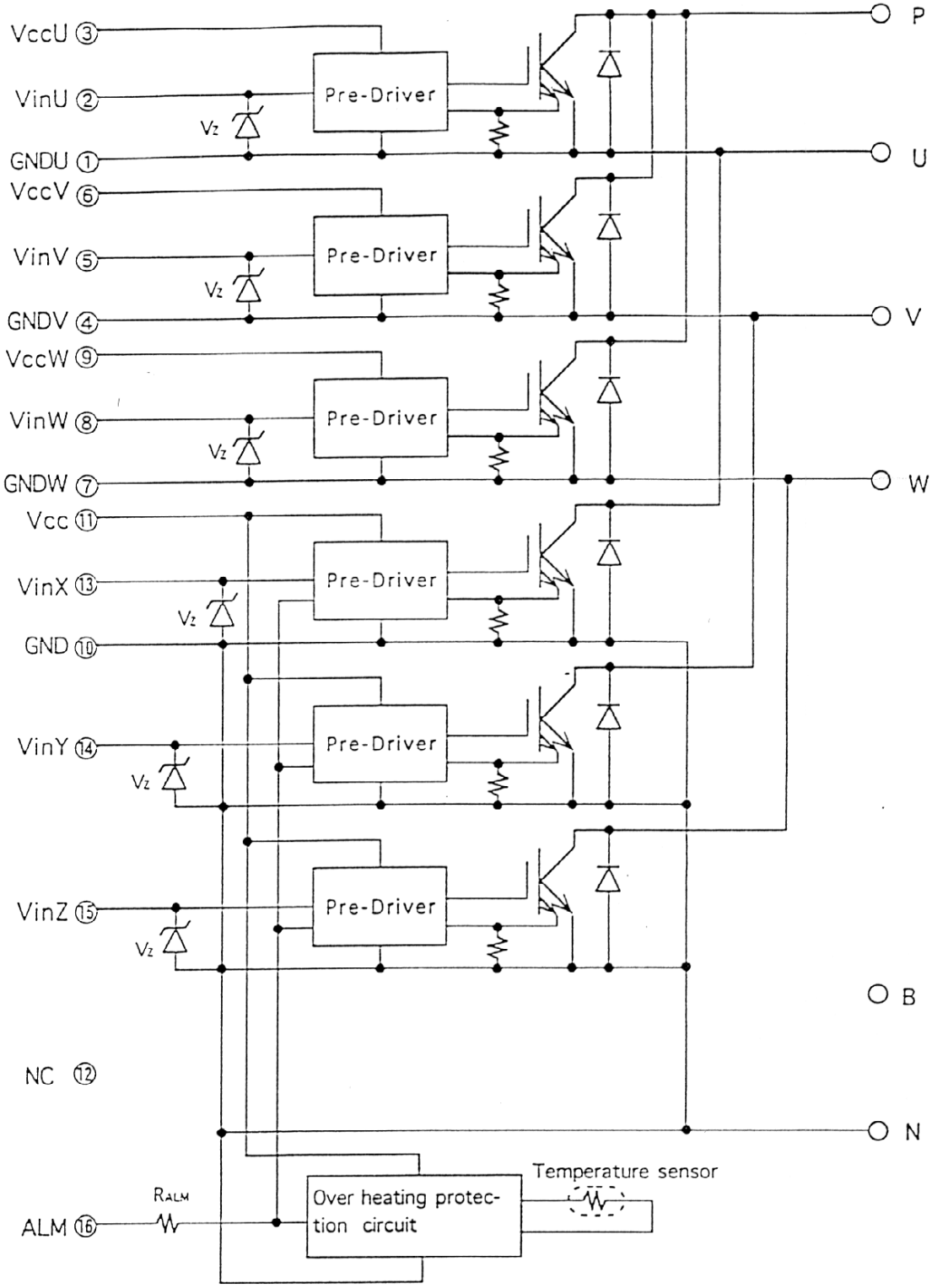
2 Block Diagram

ブロック図



Pre-Drivers include following functions

① Short Circuit Protection Circuit

② Amplifier for Driver

③ Under Voltage Lockout Circuit

④ Over current Protection Circuit

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

Items			Symbols	Ratings Min.	Ratings Max.	Units
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
INV	Collector Current	DC	Ic	—	50	A
		1mS	Icp	—	100	A
		Duty=62.6%	-Ic	—	50	A
	Collector Power Dissipation	One Transistor	Pc	—	198	W
Junction Temperature			Tj	—	150	℃
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	℃
Operating Case Temperature (Fig.1)			T_{OP}	-20	100	℃
Isolation Voltage (Case-Terminal)			Viso ※5	—	AC2.5	kV

Note ※1 Vcc shall be applied to the input Voltage between terminal No. 3 and 1, 6 and 4, 9 and 7, 11 and 10.
※2 Vin 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.

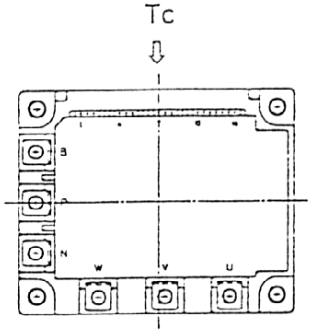

Fig.1 Measurement of case temperature

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4. Electrical Characteristics

4.1 Electrical Characteristics of Power Circuit (at Tc=Tj=25℃,Vcc=15V)

	Items	Symbols	Conditions	Min.	Typ.	Max.	Units
INV	Collector Current at off Signal Input	I_{CES}	VCE=600V	—	—	1.0	mA
INV	Collector-Emitter Saturation Voltage	V_{CE}(sat)	Ic=50A	—	—	2.9	V
INV	Forward Voltage of FWD	V_F	-Ic=50A	—	—	3.0	V

4.2 Electrical Characteristics of Control Circuit (at Tc=Tj=25℃,Vcc=15V)

Items	Symbols	Conditions	Min.	Typ.	Max.	Units
Power Supply Current of P-Line Side Pre-Driver (One Unit)	I_{CCP}	fsw=15kHz ※6 Duty=50%	—	6	16	mA
Power Supply Current of N-Line Side Three Pre-Drivers and Protection Circuits	I_{CCN}	fsw=15kHz Duty=50%	—	18	48	mA
Input signal Threshold Voltage	Vin(ON)	ON	1.00	1.35	1.70	V
	Vin(OFF)	OFF	1.25	1.60	1.95	
Zener Voltage	Vz		6.9	—	7.7	V
Over Heating Protection(OH) Level	T_{OH}	VDC=0V,Ic=0A Case Temperature	100	—	125	℃
OH Hysterisis	T_H		—	20	—	℃
Over Current Protection(OC) Level INV	Ioc	Tj=125℃ Collector Current	65	—	—	A
OC Delay Time (Fig.2)	t_{DOC}	Tj=25℃	—	8	—	μS
Under Voltage Protection(UV) Level	V_{UVT}		11.0	12.0	12.5	V
UV Hysterisis	V_H		0.2	—	—	V
Alarm Signal Hold Time	t_{ALM}		0.8	2	—	mS
Delay Time of Short Circuit Protection (Fig.3)	tsc		12	—	—	μS
Limiting Resistor for Alarm	R_{ALM}		1425	1500	1575	Ω

※6 Switching frequency of IPM

4.3 Dynamic Characteristics (at Tc=Tj=125℃,Vcc=15V)

Items	Symbols	Conditions	Min.	Typ.	Max.	Units
Switching Time Fig.4	ton	Ic=50A	0.3	—	—	μS
	toff	V_{DC}=300V	—	—	3.6	μS
Switching Time (FWD)	trr	IF=50A,V_{DC}=300V	—	—	400	nS

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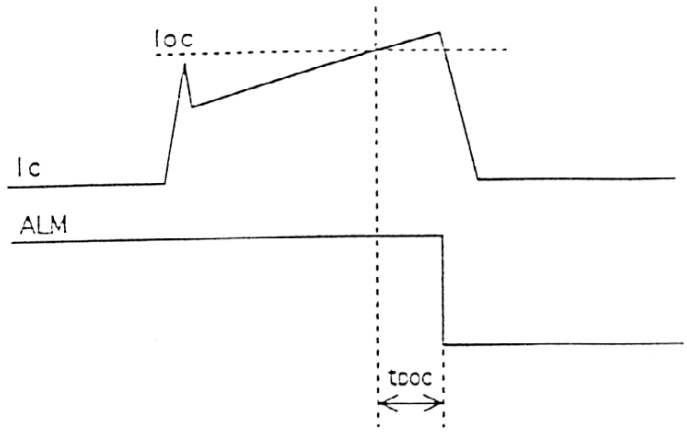

Fig.2 : Definition of OC Delay Time

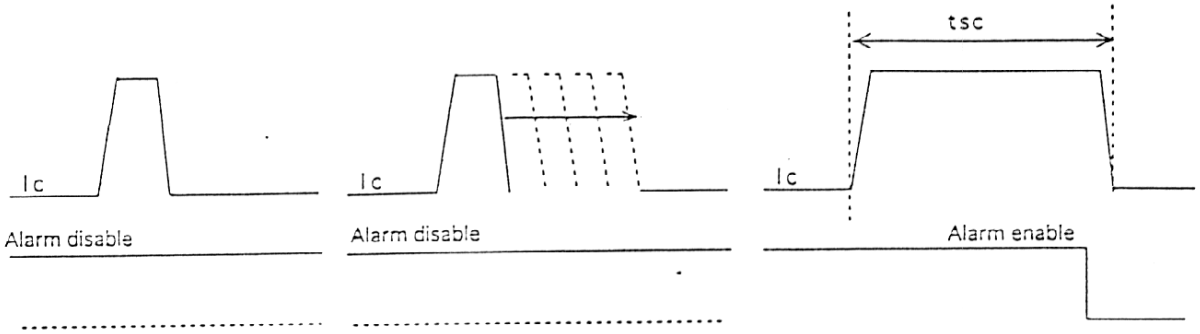

Fig.3 : Definition of tsc

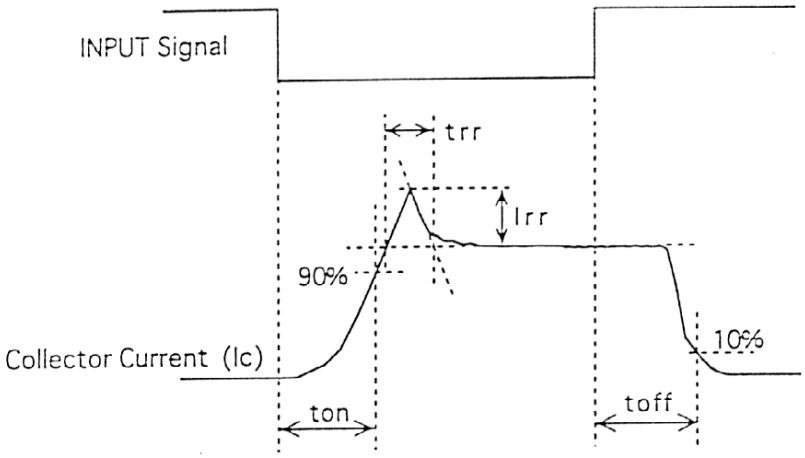

Fig.4 : Definition of switching time

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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
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		V_{DC}		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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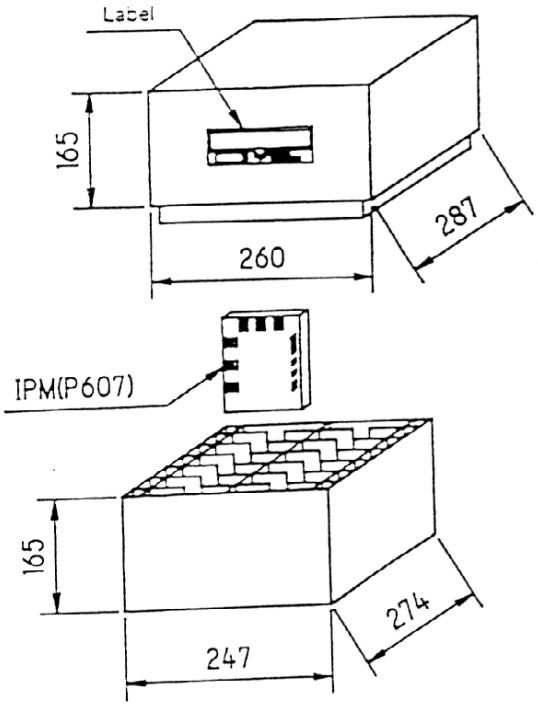
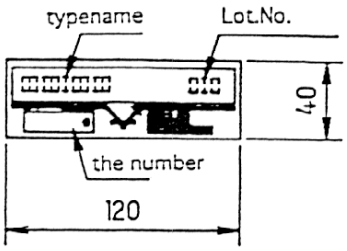
8. Packing and labeling

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 ℃ 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 extermal 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。

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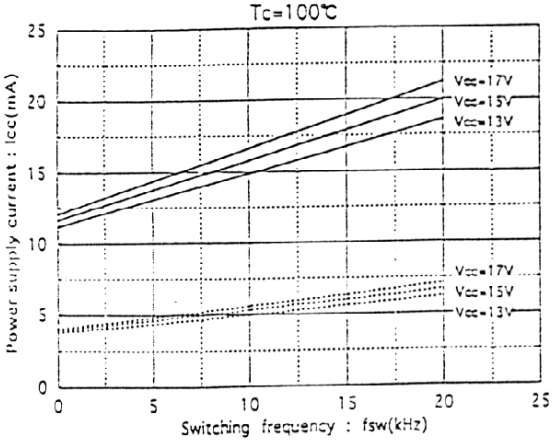
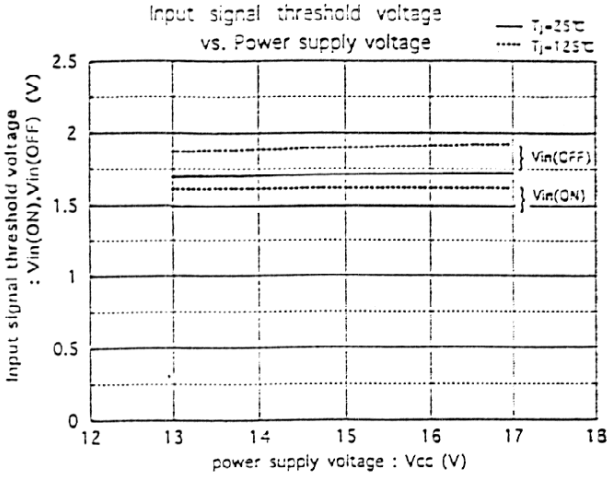
11. Characteristic (Representative)
特性カーブ（代表例）

11-1.Control Circuit
制御部

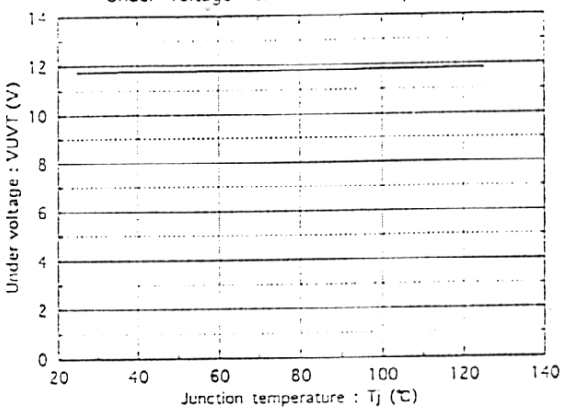
Power supply current vs. Switching frequency
Tc=100℃



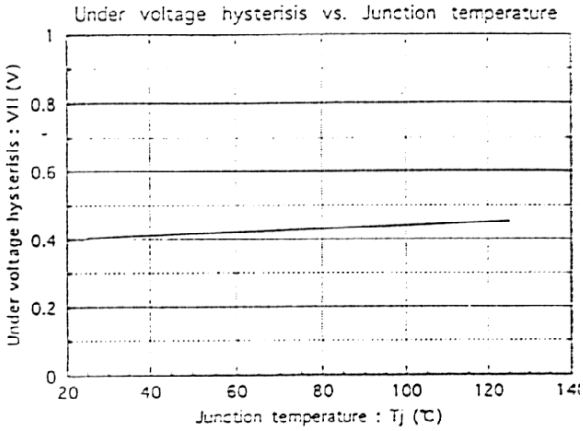
Input signal threshold voltage
vs. Power supply voltage



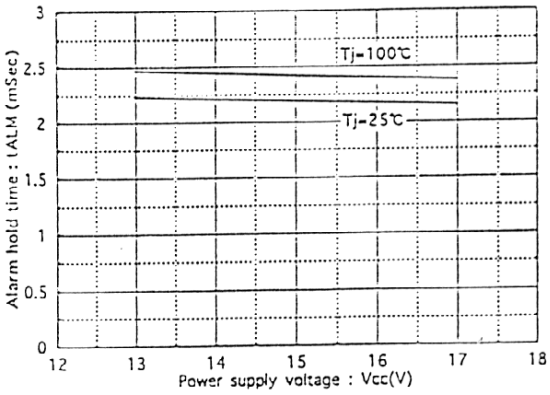
Under voltage vs. Junction temperature



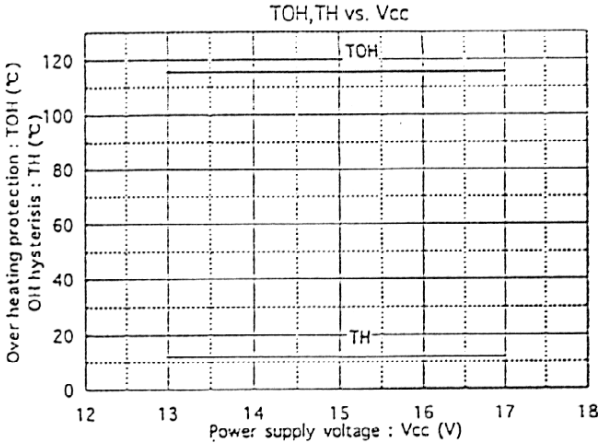
Under voltage hysterisis vs. Junction temperature



Alarm hold time vs. Power supply voltage



Over heating characteristics
TOH,TH vs. Vcc



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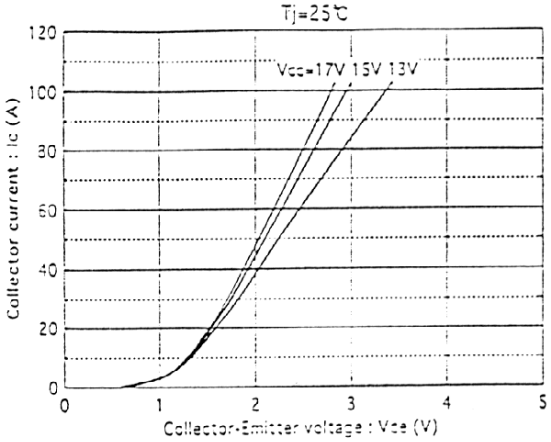
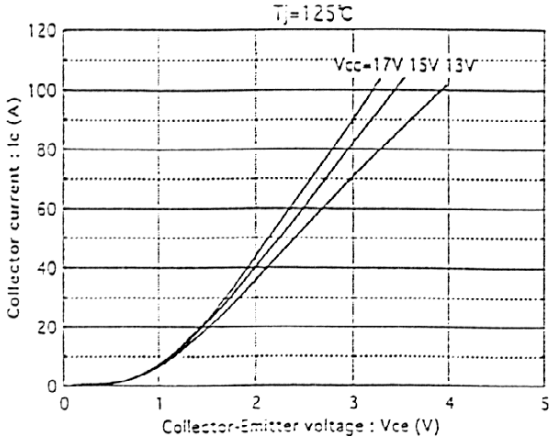
11-2.Inverter
インバータ部

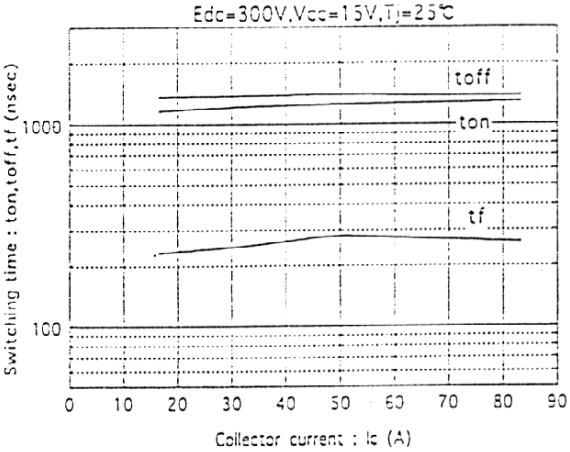
Collector current vs. Collector-Emitter voltage
Tj=25℃



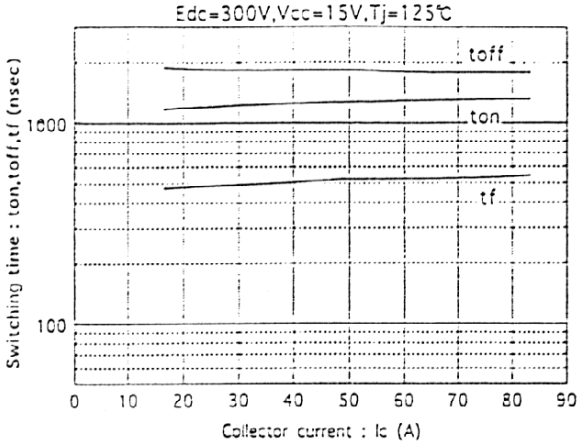
Collector current vs. Collector-Emitter voltage
Tj=125℃



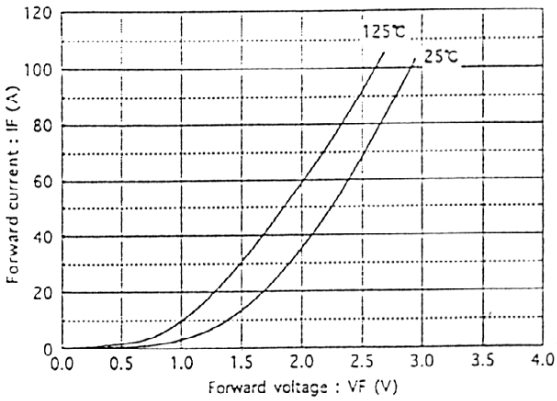
Switching time vs. Collector current
Edc=300V,Vcc=15V,Tj=25℃



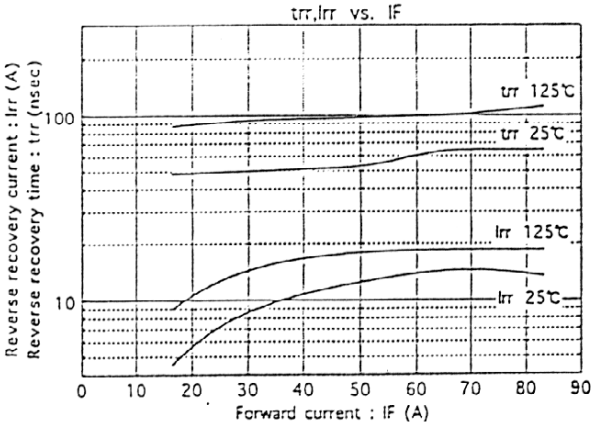
Switching time vs. Collector current
Edc=300V,Vcc=15V,Tj=125℃



Forward current vs. Forward voltage



Reverse recovery characteristics
trr,Irr vs. IF



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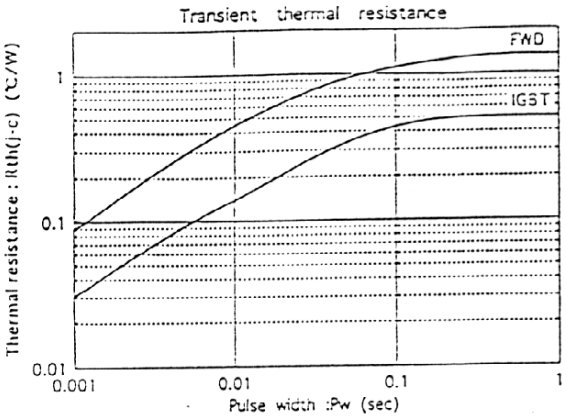
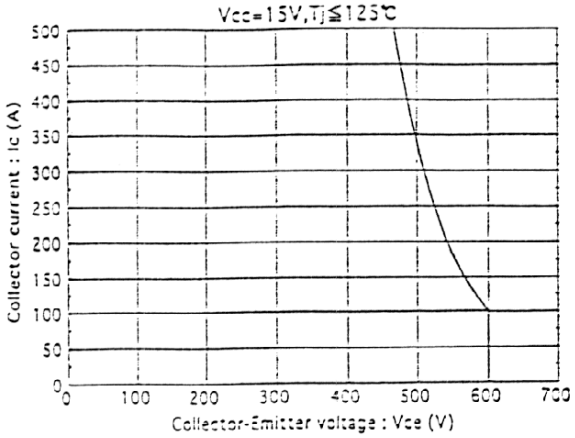
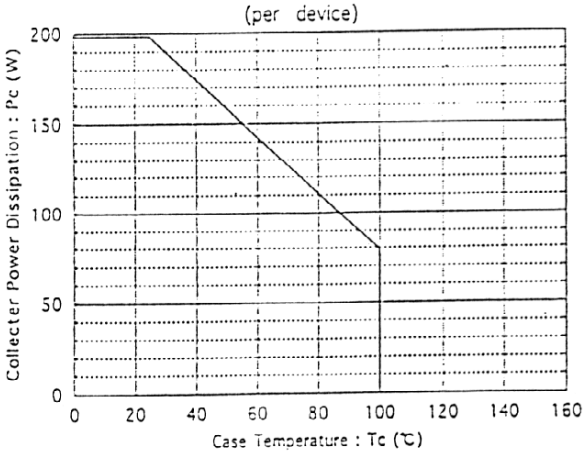
Transient thermal resistance



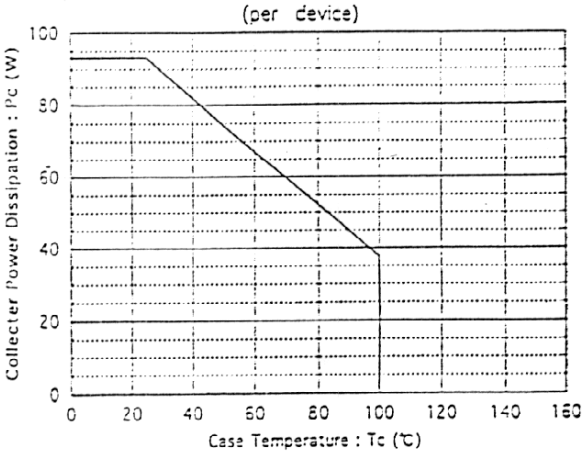
Reversed biased safe operating area
Vcc=15V,Tj≦125℃



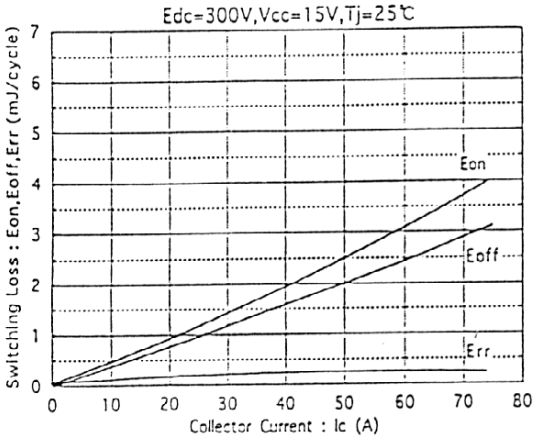
Power derating for IGBT
(per device)



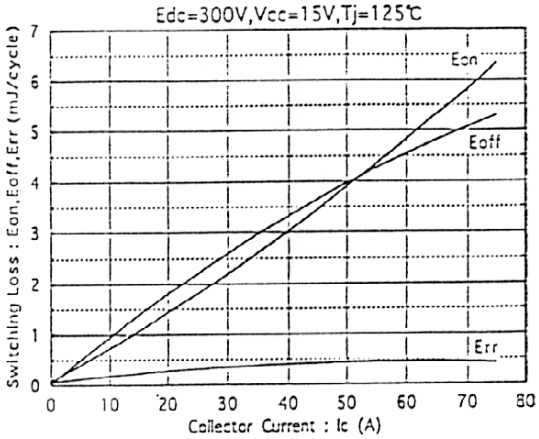
Power derating for FWD
(per device)



Switching Loss vs. Collector Current
Edc=300V,Vcc=15V,Tj=25℃



Switching Loss vs. Collector Current
Edc=300V,Vcc=15V,Tj=125℃



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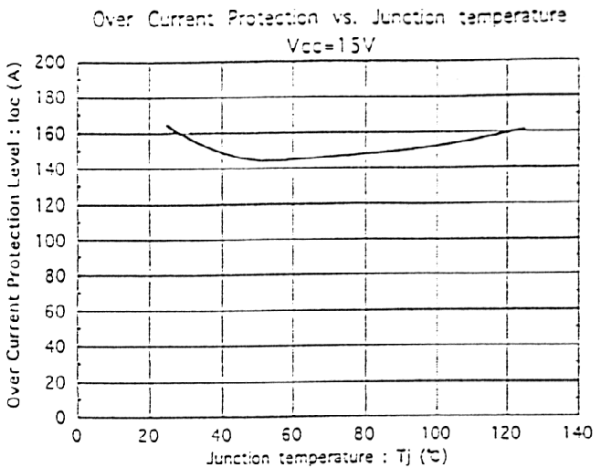

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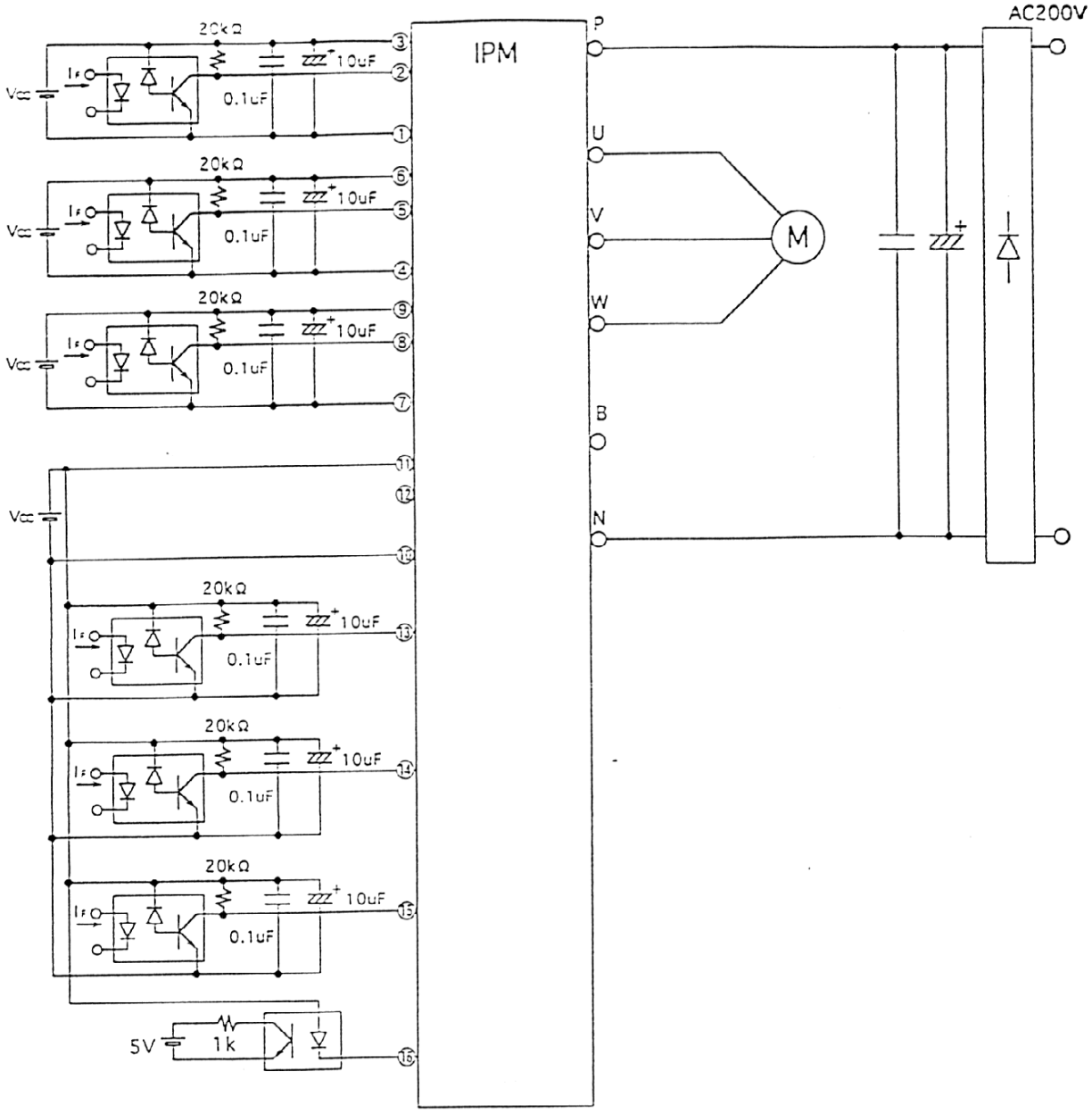
12.Example of applied circuit（応用回路例）



- 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.
  ホトカプラとIPMの入力端子間配線は、できるだけ短くしホトカプラの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.
  高速ホトカプラの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 ： tPLH,tPHL ≦ 0.8us, high CMR type. (Example ： HCPL-4504)
  高速ホトカプラ：tPLH,tPHL ≦ 0.8 μs，高CMRタイプをご使用下さい。(例 HPCL-4504)
- Low-speed opto-coupler ： CTR ≧ 100%
  低速ホトカプラ：CTR ≧ 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。

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