

# SPECIFICATION

Device Name : IGBT-IPM

Type Name : 6MBP100NA060-01

Spec. No. : MS6M0277

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Fuji Electric Co.,Ltd.  
Matsumoto Factory

	DATE	NAME	APPROVED	Fuji Electric Co.,Ltd.		
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CHECKED	" " "	N. Terasawa				

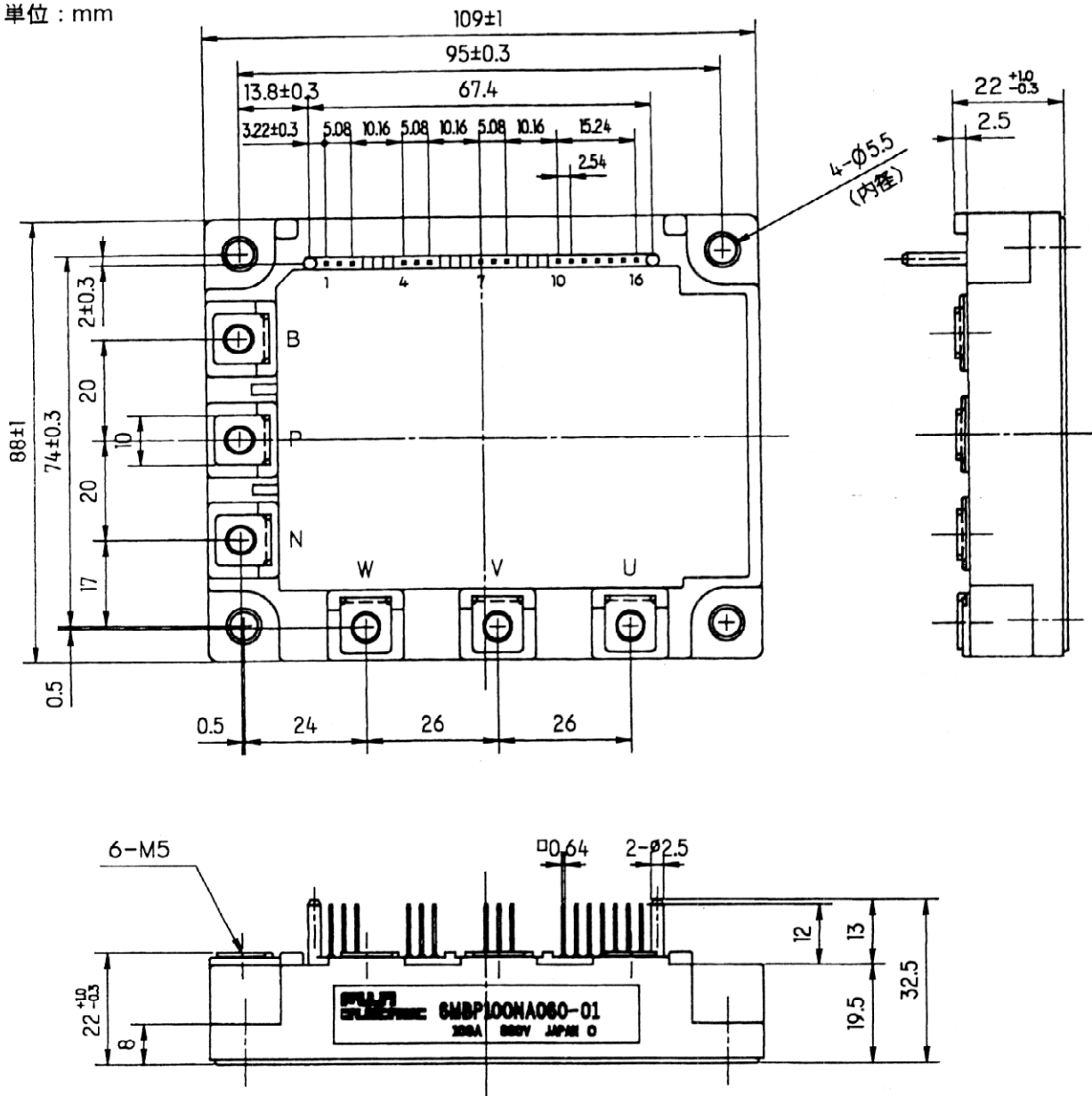


1. Outline Drawing

外形図

Unit : mm

单位 : mm



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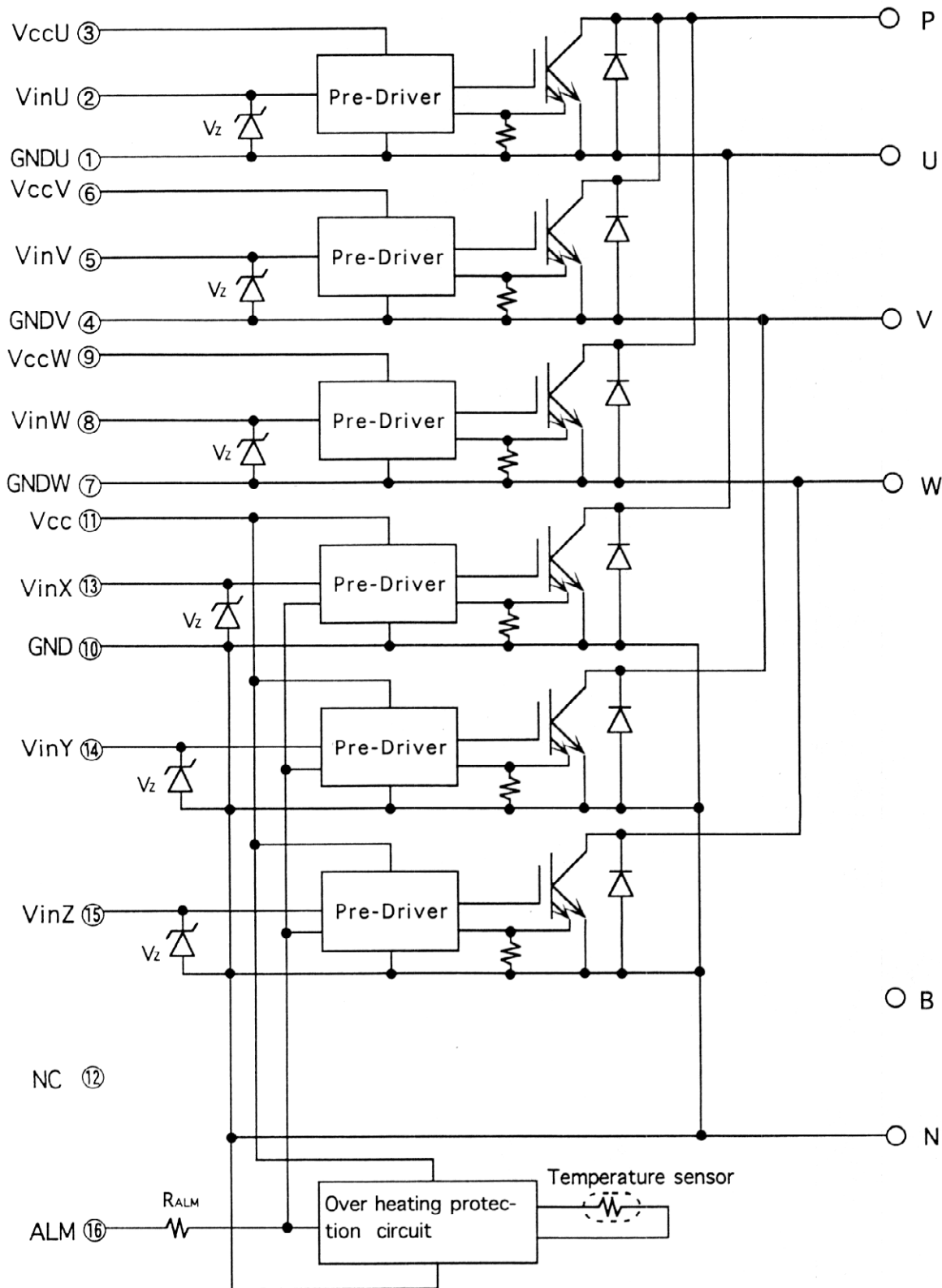
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2 Block Diagram

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°C unless otherwise specified)

Items		Symbols	Ratings		Units	
			Min.	Max.		
DC Bus Voltage		V <sub>DC</sub>	0	450	V	
DC Bus Voltage (surge)		V <sub>DC(SURGE)</sub>	0	500	V	
DC Bus Voltage (short operating)		V <sub>SC</sub>	200	400	V	
Collector-Emitter Voltage		V <sub>CES</sub>	0	600	V	
I N V	Collector Current	DC	I <sub>c</sub>	—	100	A
		1mS	I <sub>cp</sub>	—	200	A
		Duty=42.0%	-I <sub>c</sub>	—	100	A
Collector Power Dissipation One Transistor		P <sub>c</sub>	—	400	W	
Junction Temperature		T <sub>j</sub>		150	°C	
Input Voltage of Power Supply for Pre-Driver		V <sub>CC</sub> ※1	0	20	V	
Input Signal Voltage		V <sub>in</sub> ※2	0	V <sub>Z</sub>	V	
Input Signal Current		I <sub>in</sub>	—	1	mA	
Alarm Signal Voltage		V <sub>ALM</sub> ※3	0	V <sub>CC</sub>	V	
Alarm Signal Current		I <sub>ALM</sub> ※4	—	15	mA	
Storage Temperature		T <sub>stg</sub>	-40	125	°C	
Operating Case Temperature (Fig.1)		T <sub>OP</sub>	-20	100	°C	
Isolation Voltage (Case-Terminal)		V <sub>iso</sub> ※5	—	AC2.5	kV	

- Note ※ 1 V<sub>CC</sub> shall be applied to the input Voltage between terminal No. 3 and 1 , 6 and 4, 9 and 7, 11 and 10.
- ※ 2 V<sub>in</sub> 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<sub>ALM</sub> shall be applied to the Voltage between terminal No. 16 and 10.
- ※ 4 I<sub>ALM</sub> shall be applied to the input current to terminal No. 16.
- ※ 5 50Hz/60Hz sine wave 1 minute.

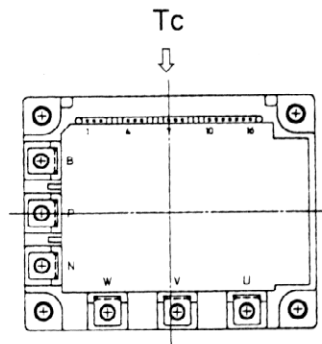


Fig.1 Measurement of case temperature

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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	$V_{CE(sat)}$	$I_c=100\text{A}$	—	—	2.9	V
Forward Voltage of FWD		$V_F$	$-I_c=100\text{A}$	—	—	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%	—	8	18	mA
Power Supply Current of N-Line Side Three Pre-Drivers and Protection Circuits		$I_{CCN}$	$f_{sw}=15\text{kHz}$ Duty=50%	—	24	54	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	130	—	—	A
OC Delay Time (Fig.2)		$t_{DOC}$	$T_j=25^\circ\text{C}$	—	8	—	$\mu\text{S}$
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	—	—	$\mu\text{S}$
Limiting Resistor for Alarm		$R_{ALM}$		1425	1500	1575	$\Omega$

※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	$t_{on}$	$I_c=100\text{A}$		0.3	—	—	$\mu\text{S}$
	$t_{off}$	$V_{bc}=300\text{V}$		—	—	3.6	$\mu\text{S}$
Switching Time (FWD)		$t_{rr}$	$I_F=100\text{A}, V_{DC}=300\text{V}$	—	—	400	nS

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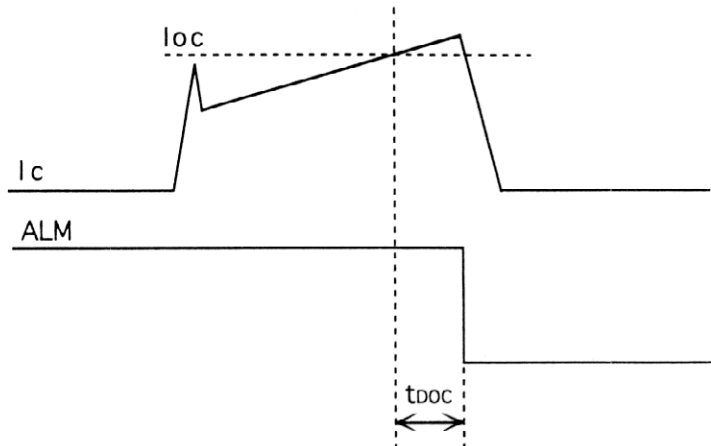


Fig.2 : Definition of OC Delay Time

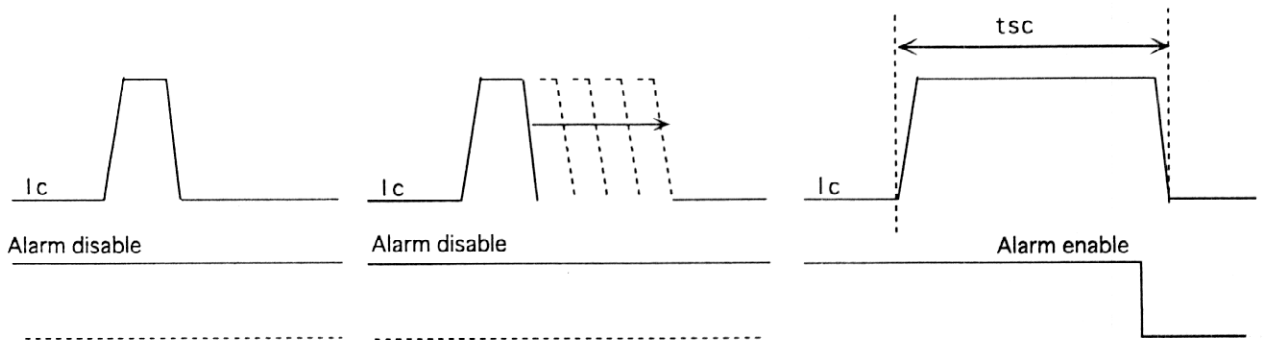


Fig.3 : Definition of tsc

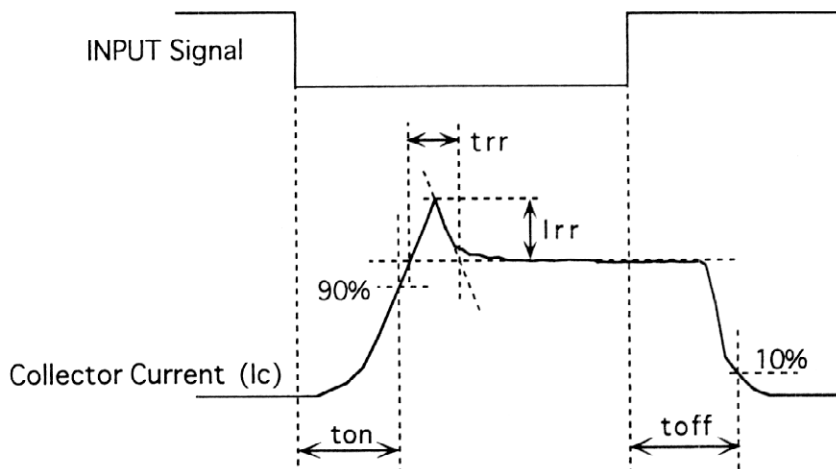


Fig.4 : Definition of switching time


### 5. Thermal Characteristics (Tc=25°C)

Items			Symbols	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance	INV	IGBT	Rth(j-c)	—	—	0.31	°C/W
		FWD	Rth(j-c)	—	—	0.90	°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

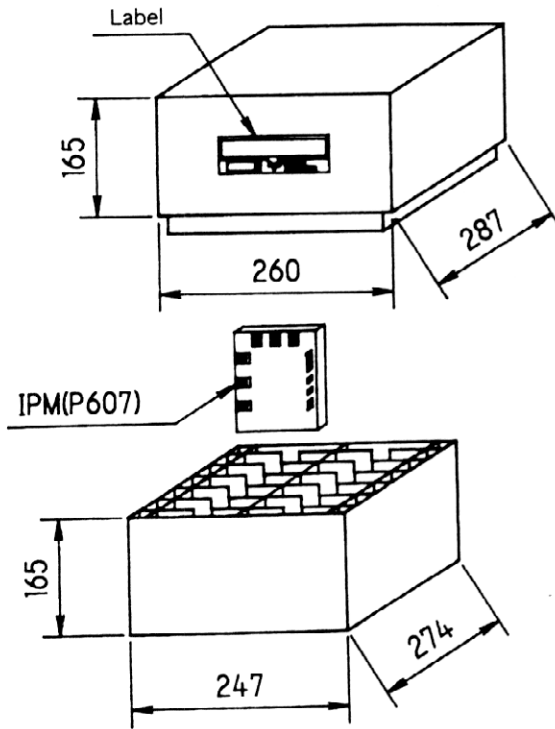
### 7. Recommendable Value

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

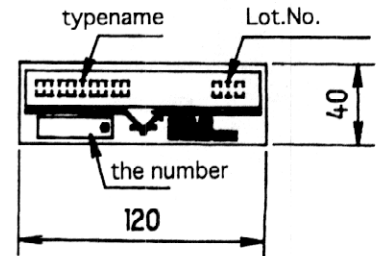
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## 8. Packing and labeling

### 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℃、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 6MBP100NA060-01.

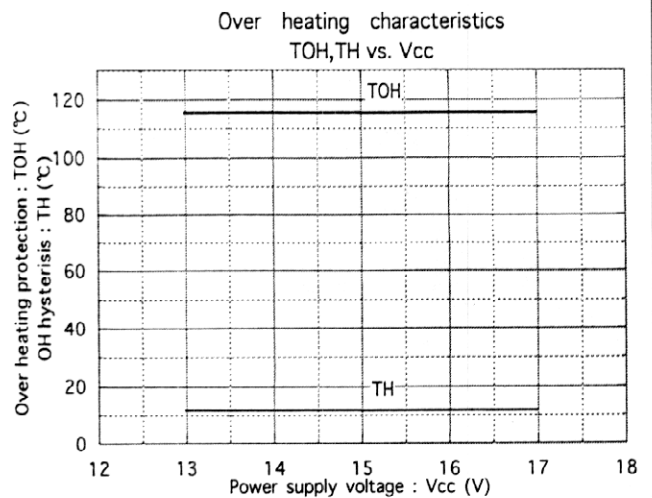
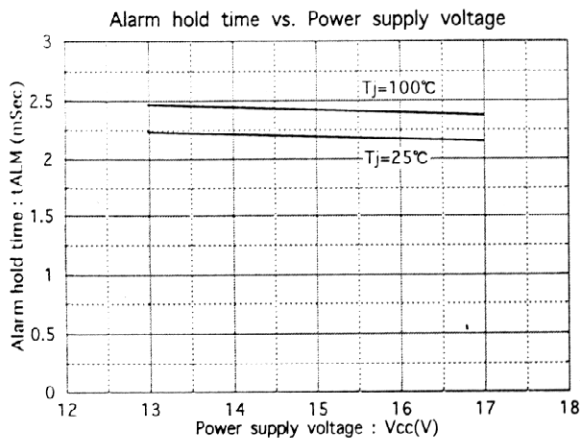
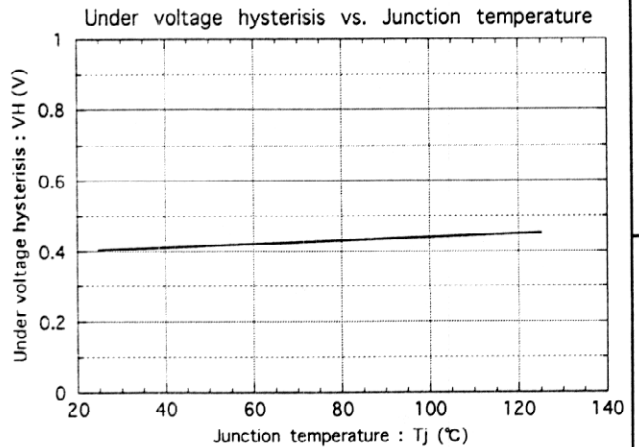
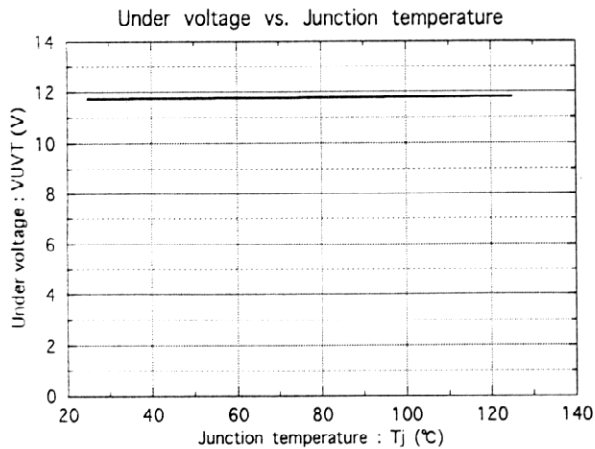
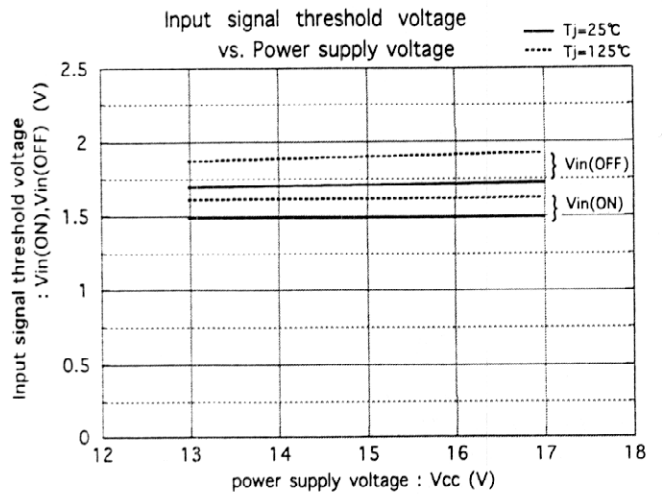
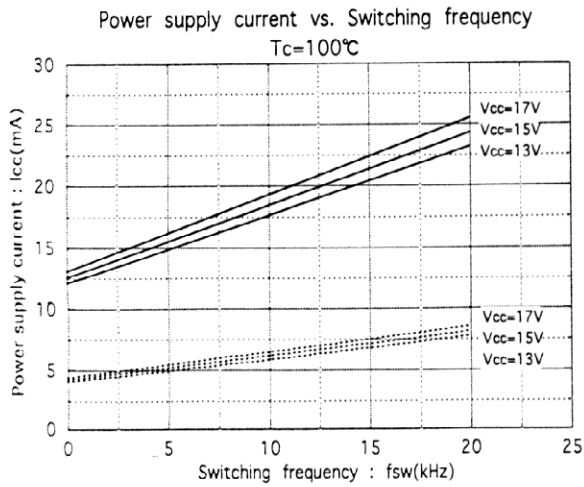
本納入仕様書は、IGBT-IPM 6MBP100NA060-01 に適用する。

# 11. Characteristic (Representative)

## 特性カーブ (代表例)

### 11-1. Control Circuit

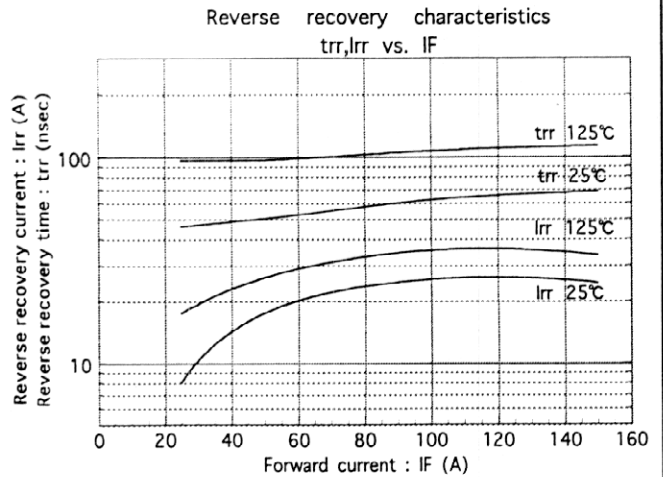
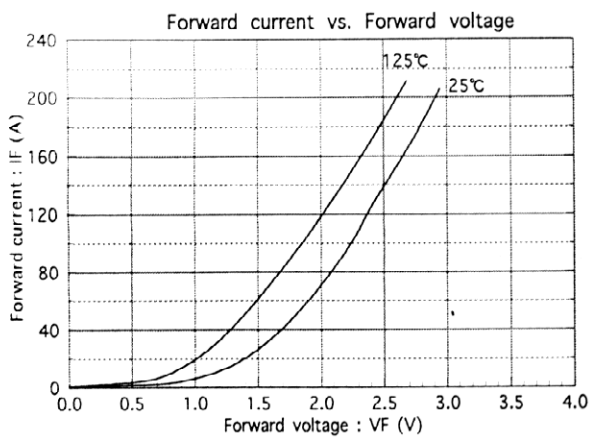
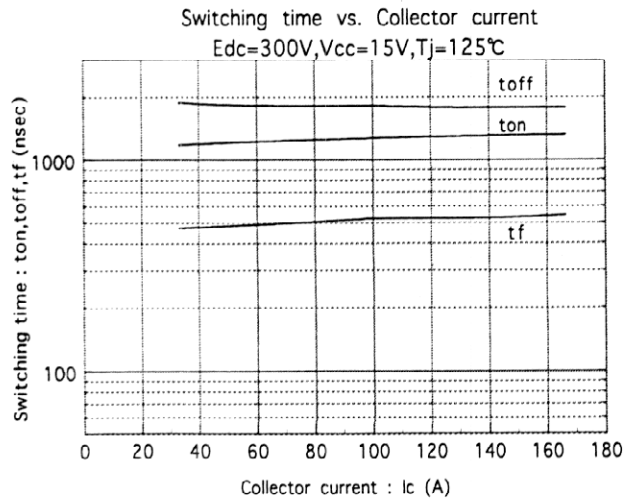
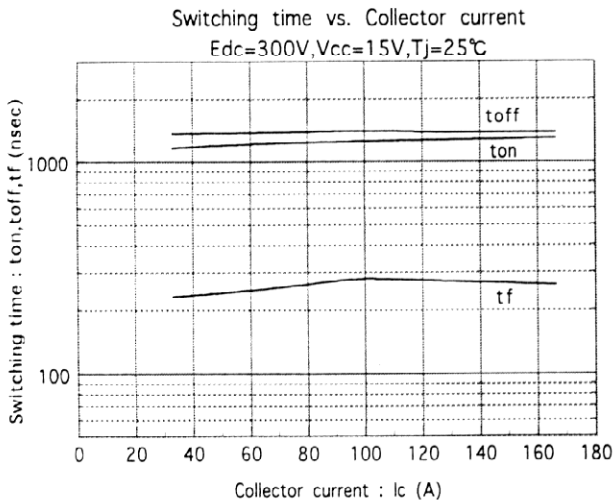
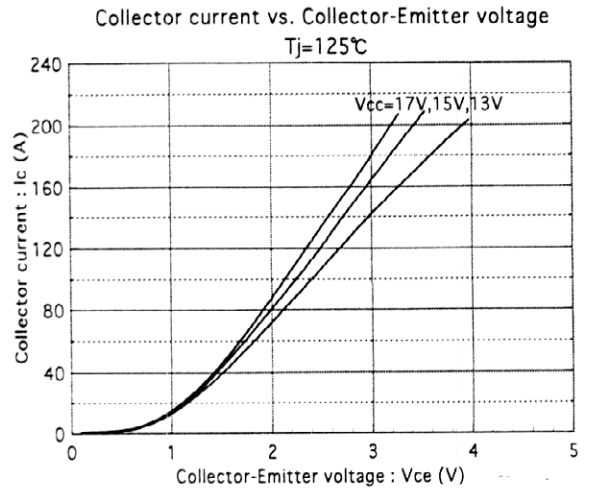
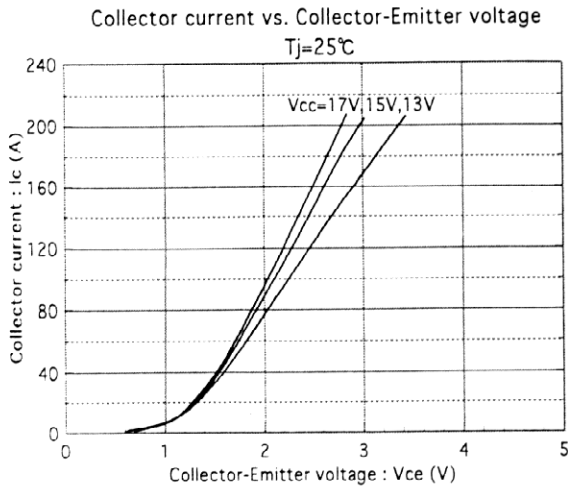
#### 制御部



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# 11-2. Inverter

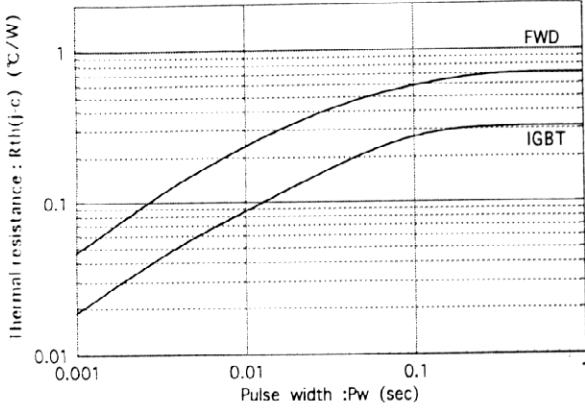
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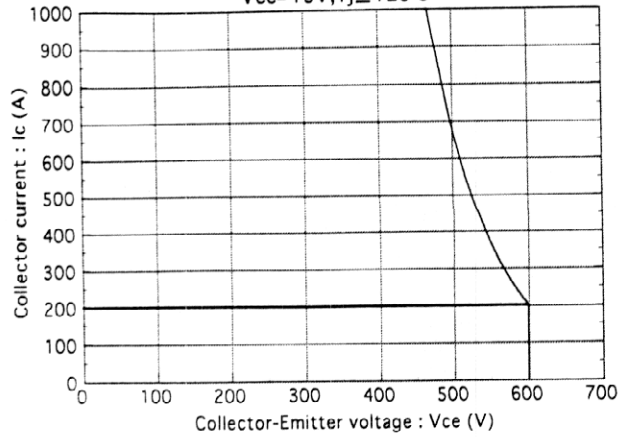
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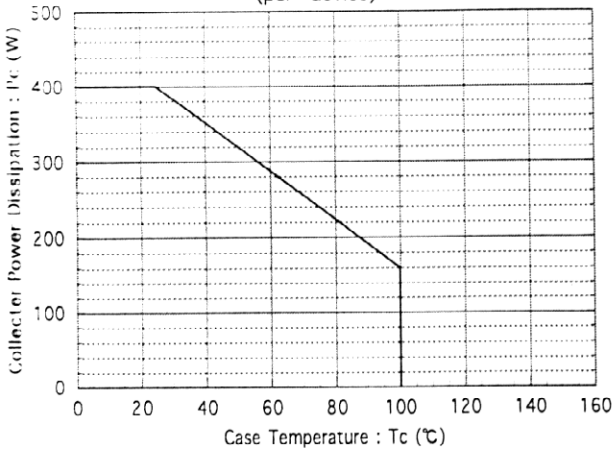
Transient thermal resistance



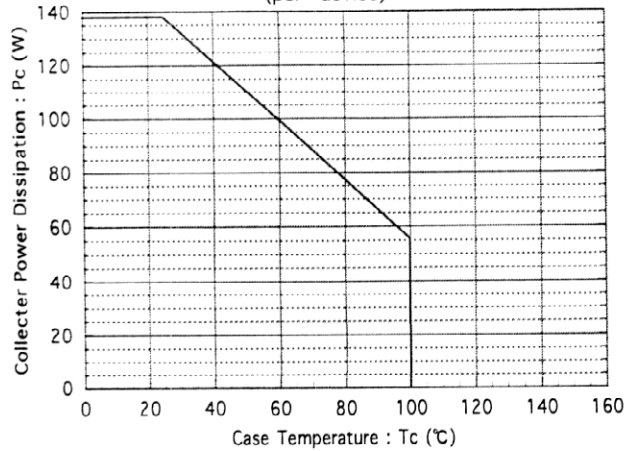
Reversed biased safe operating area  
 $V_{cc}=15V, T_j \leq 125^\circ C$



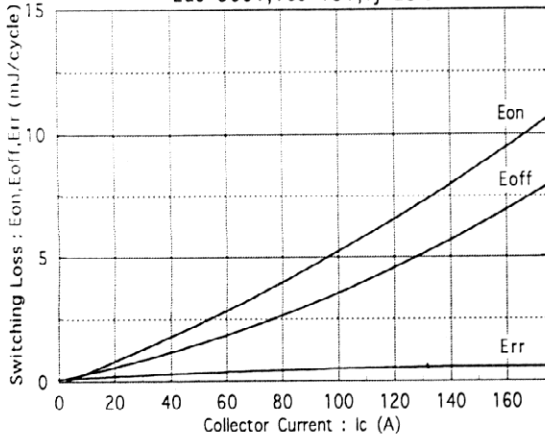
Power derating for IGBT  
(per device)



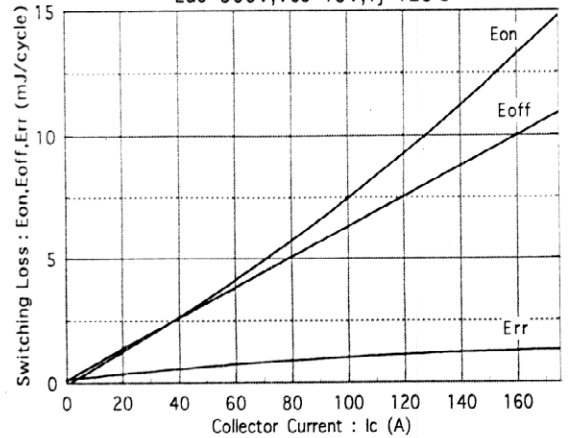
Power derating for FWD  
(per device)



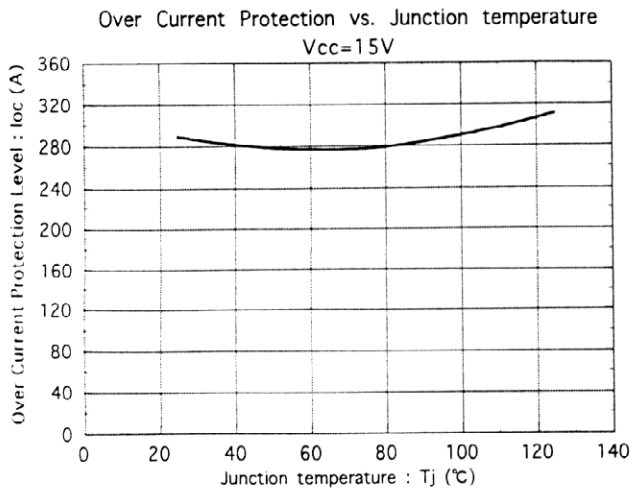
Switching Loss vs. Collector Current  
 $E_{dc}=300V, V_{cc}=15V, T_j=25^\circ C$



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



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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 $\mu$ 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4.7nF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。