

# SPECIFICATION

Device Name : IGBT-IPM

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Type Name : 6MBP15RY060

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Spec. No. : MS6M0362

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Matsumoto Factory

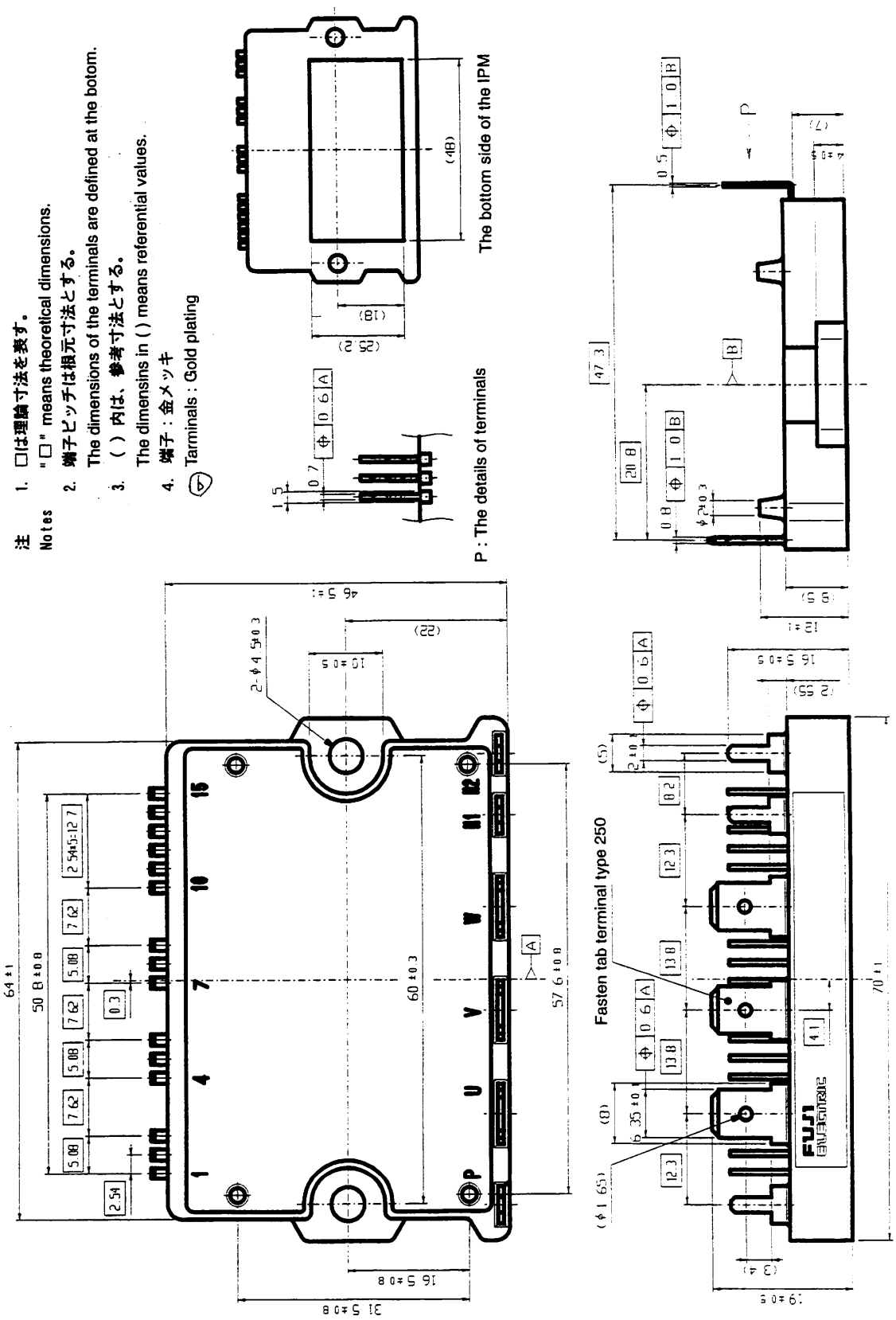
	DATE	NAME	APPROVED	Fuji Electric Co.,Ltd.			
DRAWN	Jul. 13 '98	T. Kajiwara		DWGNO.	MS6M0362	1/11	a
CHECKED	Jul. 13 '98	Mishinaka				b	
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# 1. Outlines (外形図)

Dimensions in mm



- 注 1. □は理論寸法を表す。  
 Notes "□" means theoretical dimensions.  
 2. 端子ピッチは根元寸法とする。  
 The dimensions of the terminals are defined at the bottom.  
 3. ( )内は、参考寸法とする。  
 The dimensions in ( ) means referential values.  
 4. 端子：金メッキ  
 Terminals : Gold plating

P : The details of terminals  
 The bottom side of the IPM

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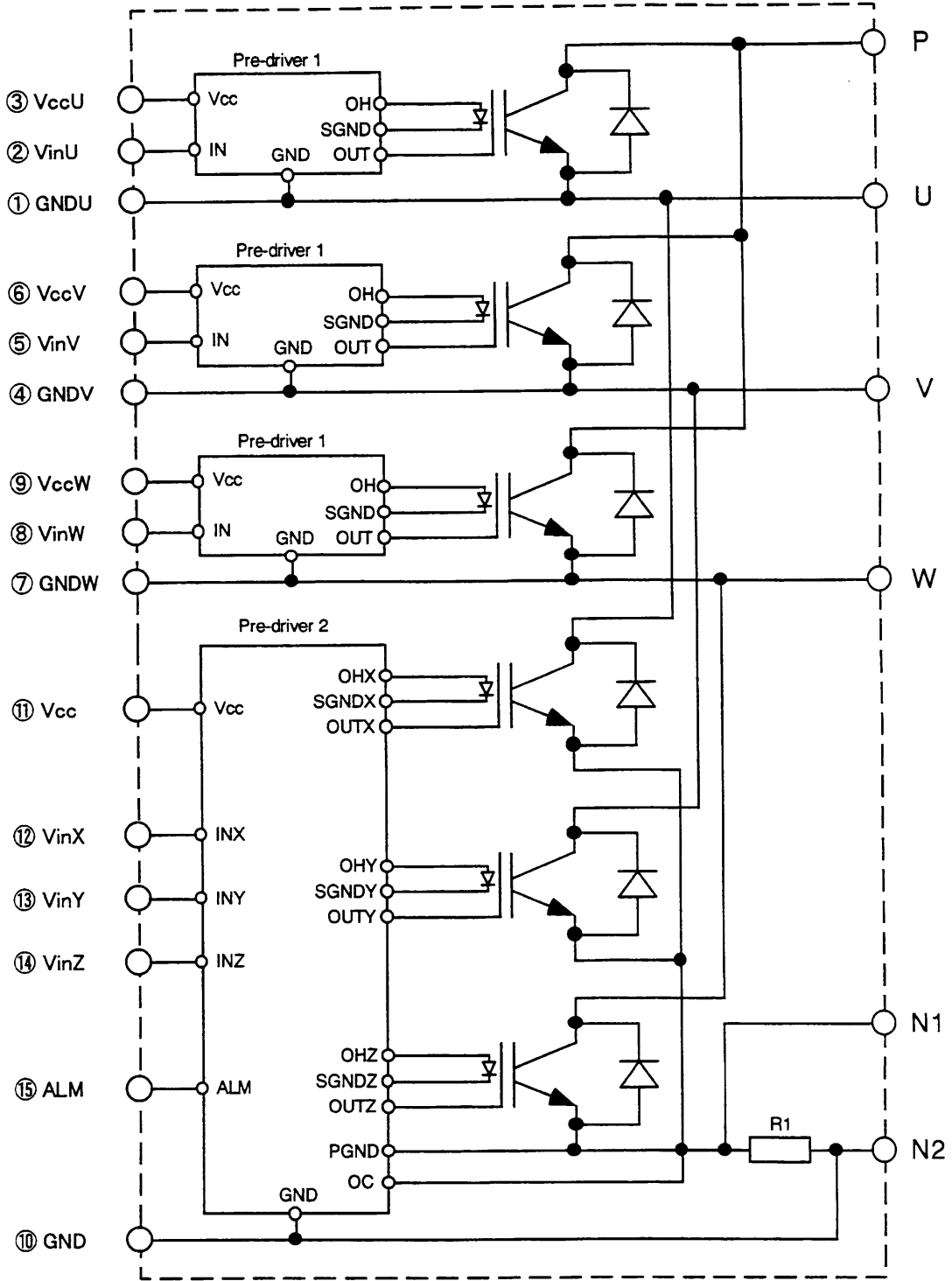
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## 2. Block Diagram (ブロック図)



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Pre-driver 1 includes following functions. (P-side)

- (1) Amplifier for drive
- (2) Power supply under voltage protection
- (3) IGBT chip over heating protection

Pre-driver 2 includes following functions. (N-side) <sup>(b)</sup>

- (1) Amplifier for drive
- (2) Power supply under voltage protection
- (3) IGBT chip over heating protection
- (4) Over current protection
- (5) Alarm signal output

### 3. Maximum Ratings ( 最大定格 )

(Tc=25°C unless otherwise specified)

Items		Symbols	Ratings	Unit
DC Bus Voltage		VDC	450	V
DC Bus Voltage (surge)		VDC(surge)	500	V
DC Bus Voltage (short operating)		VSC	400	V
Collector-Emitter Voltage		VCES	600	V
Collector Current	DC	IC	15	A
	1ms	ICP	30	A
	Duty=44.1%	-IC	15	A
Collector Power Dissipation	One Transistor	Pc	40	W
Junction Temperature		Tj	150	°C
Input Voltage of Power Supply for Pre-Driver		VCC	-0.3~20	V
Input Signal Current		Iin	20	mA
Alarm Signal Voltage		VALM	Vcc	V
Alarm Signal Current		IALM	15	mA
Storage Temperature		Tstg	-40~125	°C
Operating Case Temperature		Tcop	-20~100	°C
Isolating Voltage (Terminal to base,50/60Hz sine wave 1min.)		Viso	AC 2500	V
Screw Torque		Mounting (M4)	2.0	N·m

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#### 4. Electrical Characteristics (電気的特性)

##### 4.1 Electrical Characteristics of Power Circuit (主回路部電気的特性)

(T<sub>j</sub>=T<sub>c</sub>=25°C, V<sub>cc</sub>=15V)

Items	Symbols	Conditions	min.	typ.	max.	Unit
Collector Current at off Signal Input	ICES	VCE=600V, I <sub>in</sub> =0mA	-	-	1.0	mA
Collector-Emitter Saturation Voltage	VCE(sat)	IC=15A, I <sub>in</sub> =10mA	-	-	2.7	V
Forward Voltage of FWD	VF	-IC=15A, I <sub>in</sub> =0mA	-	-	3.5	V

##### 4.2 Electrical Characteristics of Control Circuit (制御部電気的特性)

(T<sub>j</sub>=T<sub>c</sub>=25°C, V<sub>cc</sub>=15V)

Items	Symbols	Conditions	min.	typ.	max.	Unit
Power Supply Current of P-line Pre-driver (one unit)	ICCP	I <sub>in</sub> =0mA,	-	2.0	5.0	mA
Power Supply Current of N-line Pre-driver	ICCN	I <sub>in</sub> =0mA,	-	4.0	10.0	mA
Input Signal Threshold Current	I <sub>in</sub> (th)	Turn-on	-	1.8	2.3	mA
		Turn-off	0.8	1.3	-	mA
Hysteresis of Input Signal Theshold Current	I <sub>in</sub> H	-	-	0.5	-	mA
Input Signal Saturation Voltage	V <sub>in</sub> (sat)	I <sub>in</sub> =20mA	-	0.8	2.0	V
Over Heating Protection (過熱保護)						
IGBT chips Over HeatProtection Temperature Level	T <sub>jOH</sub>	Surface of IGBT	150	-	-	°C
Hysteresis	T <sub>jH</sub>	-	-	20	-	°C
Over Current Protection (過電流保護)						
Collector Current Protection Level	I <sub>OC</sub>	N-side, (N1-N2 open)	18	22	26	A
	V <sub>oc</sub>	Between N1 and N2	190	200	210	mV
OC detecting resistance value	R <sub>oc</sub>		-	9.0	-	mΩ
Protection Delay time	t <sub>DOC</sub>	T <sub>j</sub> =25°C Fig. 1, Fig. 2	-	5.0	7.0	μs
Power Supply Under Voltage Protection (電源電圧低下保護)						
Under Voltage Protection Level	V <sub>UV</sub>	-	11.0	-	12.5	V
Hysteresis	V <sub>H</sub>	-	0.2	-	0.8	V
Alarm Signal Output (アラーム信号出力)						
Alarm Signal Hold Time	t <sub>ALM</sub>	-	1.0	2.0	-	ms

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### 5. Switching Characteristics (スイッチング特性)

(T<sub>j</sub>=T<sub>c</sub>=25°C, V<sub>cc</sub>=15V)

Items	Symbols	Conditions	min.	typ.	max.	Unit
Switching Time (IGBT)	ton	I <sub>c</sub> =15A, V <sub>DC</sub> =300V	0.5	-	-	μs
	toff	I <sub>in</sub> =10mA	-	-	5.0	μs
Switching Time (FWD)	trr	Inductive-Load, Fig. 3	-	-	0.5	μs

### 6. Thermal Characteristics (熱特性)

(T<sub>j</sub>=T<sub>c</sub>=25°C, V<sub>cc</sub>=15V)

Items		Symbols	min.	typ.	max.	Unit
Junction to Case Thermal Resistance	IGBT	R <sub>th(j-c)</sub>	-	-	3.1	°C/W
	FWD	R <sub>th(j-c)</sub>	-	-	5.4	°C/W
Case to Fin Thermal Resistance with Compound		R <sub>th(c-f)</sub>	-	0.05	-	°C/W

### 7. Recommendable Value (推奨値)

Items	Symbols	Conditions	min.	typ.	max.	Unit
DC Bus Voltage	V <sub>DC</sub>	-	200	-	400	V
Operating Power Supply Voltage Range of Pre-drive	V <sub>CC</sub>	-	13.5	15	16.5	V
Input Signal Current	I <sub>F</sub>	CTR=100~200%	8	-	10	mA
Switching Frequency	f <sub>sw</sub>	-	1	3	5	kHz
Flatness of heat sink		-	-100	-	100	μm
Mounting Screw Torque (M4)		-	1.3	-	1.7	N·m

### 8. Weight (重量)

Items	Symbols	Conditions	min.	typ.	max.	Unit
Weight	-	-	-	50	-	g

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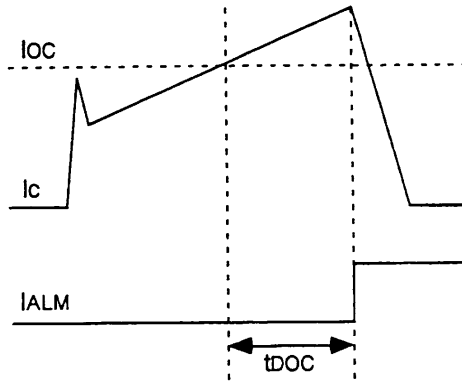


Fig. 1. Definition of OC protection delay time (過電流保護遅れ時間の定義)

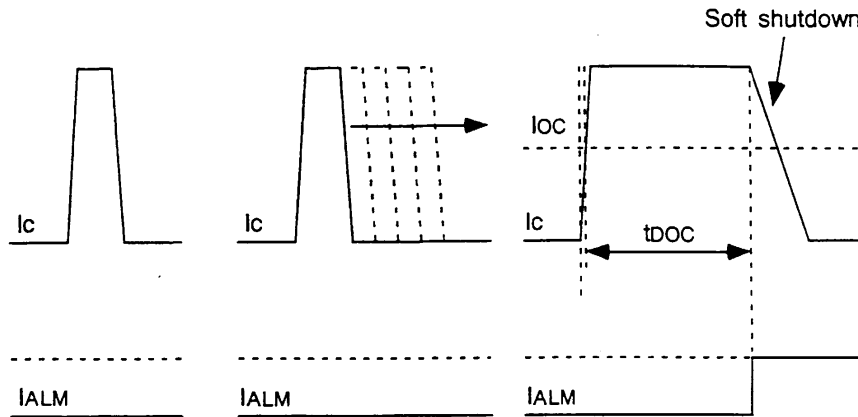


Fig. 2. Definition of protection delay time at short circuit (短絡時保護遅れ時間の定義)

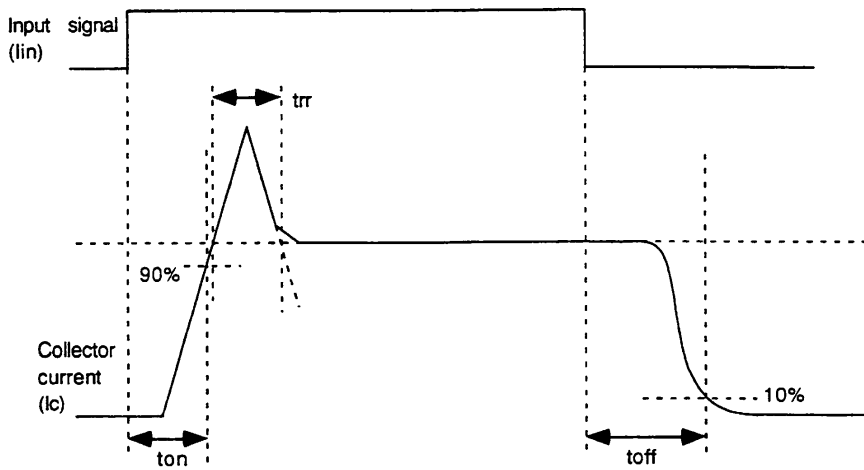
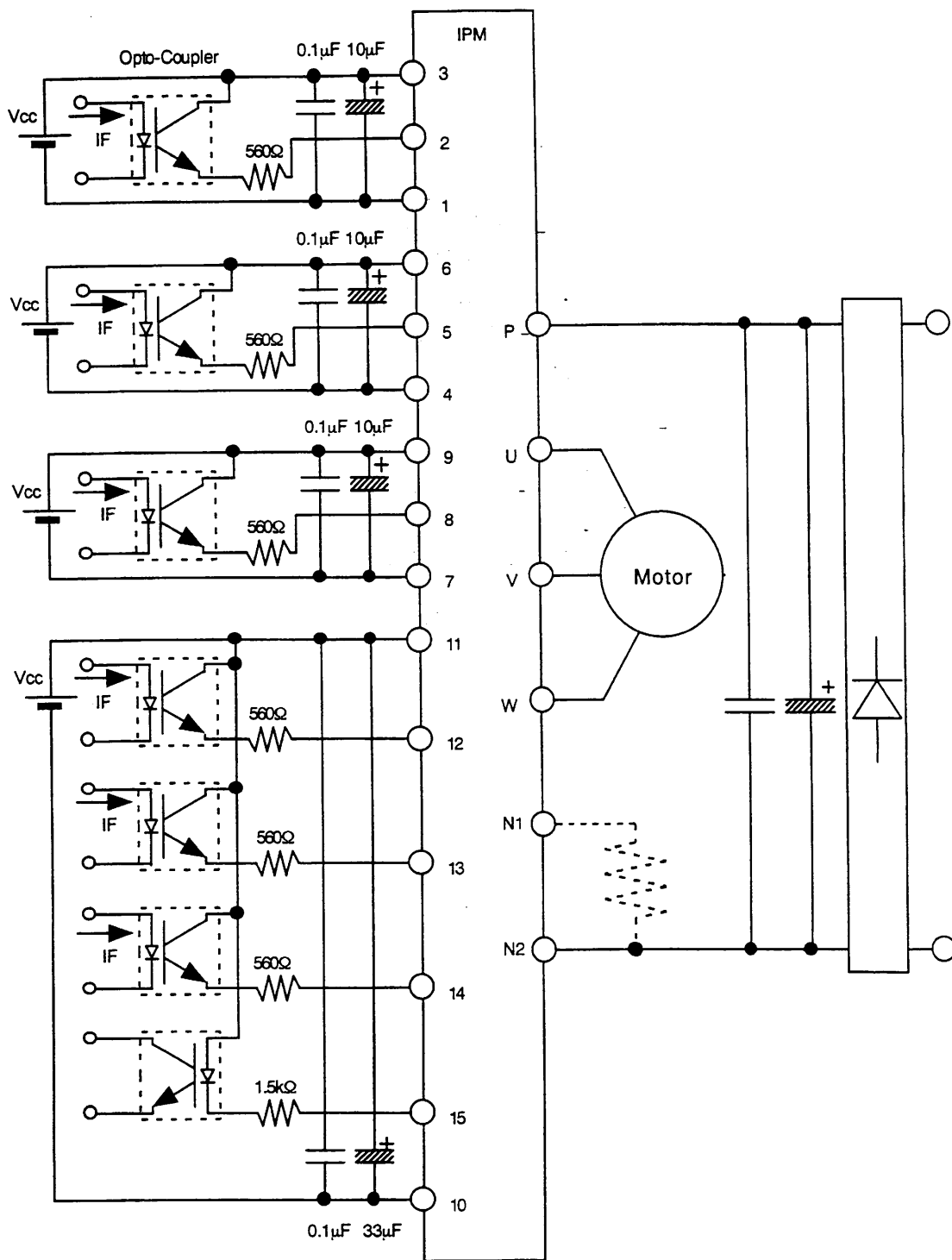


Fig. 3. Definition of switching time (スイッチング時間の定義)



### 9. Typical Application Circuit ( 応用回路例 )



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#### - Recommendable condition of Opto-coupler ( 推奨ホトカブラ使用条件 )

CTR Classification	Input Forward Current of Opto-Coupler (IF)
100 - 200 %	8 - 10 mA
80 - 160 %	10 - 12.5 mA

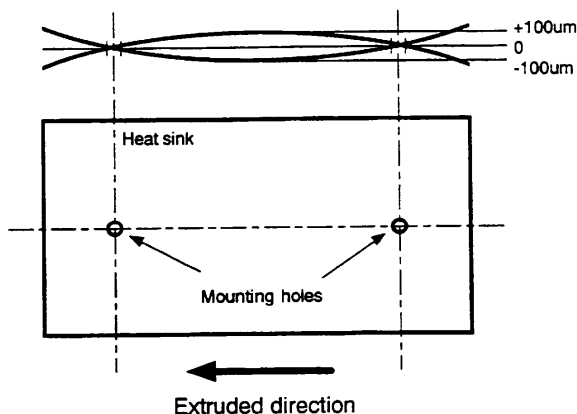
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## 10. Application Guideline (適用時の注意事項)

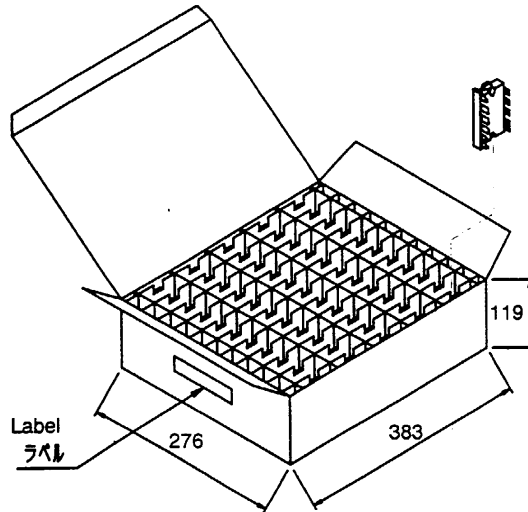
- The wiring between the opto-couplers and the input terminals of the IPM should be as short as possible. The stray capacitance between primary and secondary side of the opto-couplers should not be increased by pattern lay-out of the control circuits.  
 フォトカプラとIPMの入力端子間配線はできるだけ短くし、フォトカプラの1次・2次間の浮遊容量を増加させないパターンレイアウトとしてください。
- Capacitors should be connected between Vcc and GND terminals of the opto-coupler as closely as possible.  
 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ください。
- Each power supplies for drive circuits should not have transient voltage fluctuation. Four power supplies which are isolated should be applied individually.  
 各制御電源は瞬時電圧変動の少ない、絶縁されたものを4個独立に使用してください。
- In order to prevent noise from AC line, connect capacitor (approx. 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、3相各線—アース間に4.7nF程度のコンデンサを接続してください。
- Do not connect N2-terminal of main circuit to ground (GND) of the control circuit.  
 入力回路のグラウンド(GND)と主回路N2端子を接続しないでください。

## 11. Heat sink mounting precautions (IPMの取り付け方法)

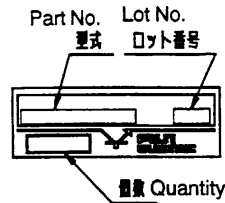
- A mounting surface of a heat sink should be finished to a roughness below  $10\mu\text{m}$  and a flatness between screw holes below  $100\mu\text{m}$ . If the flatness is below  $-100\mu\text{m}$ , a thermal resistance between an IPM and a heat sink is increased. If the flatness is over  $+100\mu\text{m}$ , there is the danger of the isolation failure.  
 IPMを取り付けるヒートシンク面の仕上げは、粗さ $10\mu\text{m}$ 以下、ネジ位置間での面の平坦度(反り) $100\mu\text{m}$ 以内にして下さい。平坦度が $-100\mu\text{m}$ 以下の場合、ヒートシンクへの接触熱抵抗が増加します。また、平坦度が $+100\mu\text{m}$ 以上の場合、絶縁破壊を起こす危険性があります。
- Apply a thermal compound between an IPM and a heat sink to reduce a contact thermal resistance.  
 接触熱抵抗を小さくするために、IPMとヒートシンクの間にはサーマルコンパウンドを塗布して下さい。
- Mount an IPM in parallel with extruded direction of a heat sink to reduce an influence of a change of a heat sink, when a heat sink which is made by an extruder is applied.  
 押し出し機によって作られたヒートシンクを使用する場合は、ヒートシンクの変形の影響を小さくするためにIPMをヒートシンクの押し出し方向と平行に取り付けて下さい。



## 12. Packing and indication ( 梱包と表示 ) C



Material	: Corrugated cardboard
材料	ダンボール
Weight	: Approx. 3.1kg (max.)
重量	約3.1kg (最大)
Quantity	: 50pcs (max.)
数量	50個 (最大)



## 13. 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 modules.

半導体製品に荷重がかからないように注意すること。

- 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 and shock the modules during transportation.

運搬時に衝撃を与えたり落下させないこと。

## 14. 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。

## 15. Applicable category ( 適用範囲 )

- This specification is applied to the IGBT-IPM named 6MBP15RY060.

本仕様書は、IGBT-IPM ( 型式: 6MBP15RY060 ) に適用する。 C

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