

SPECIFICATION

Device Name : IGBT-IPM

Type Name : 6MBP20RY060

Spec. No. : MS6M0363

Fuji Electric Co.,Ltd.
Matsumoto Factory

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| | DATE | NAME | APPROVED | Fuji Electric Co.,Ltd. | | | |
|---------|-------------|--------------|----------|------------------------|----------|------|---|
| DRAWN | Jul-3-98 | T. Kajiwara | S.K | DWG.NO. | MS6M0363 | 1/11 | a |
| CHECKED | Jul. 3, '98 | S. Kobayashi | | | | b | |
| | | | | | | | c |

Revised Record

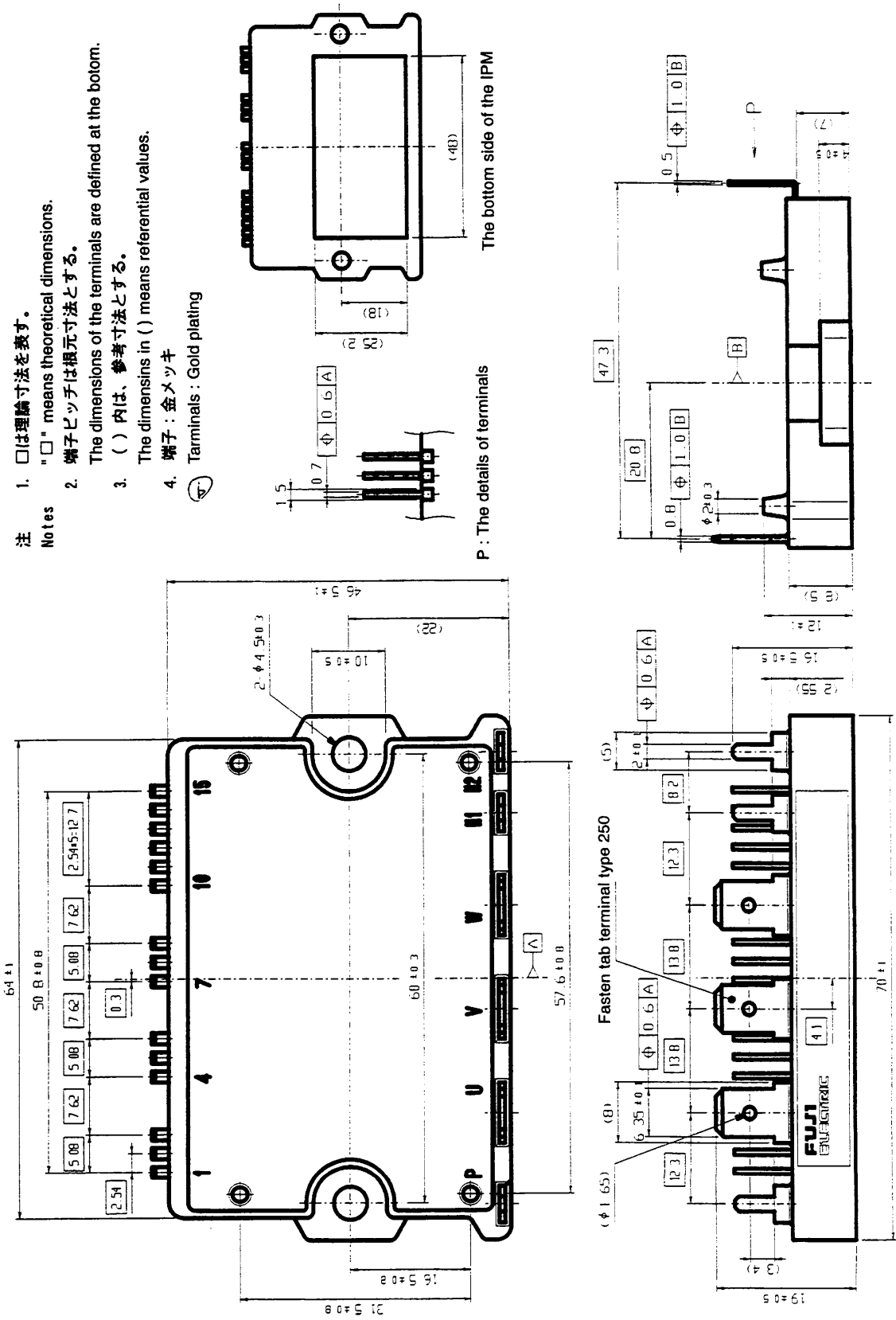
| Date | Classification | Ind. | Content | Applied Date | Drawn | Checked | Approved |
|------------------|----------------|------|--|------------------|-----------|--------------|--------------|
| Jul. 3 '98 | Enactment | — | — | Issued Date | T. Ueyama | S. Kobayashi | S.K |
| Sep. 29 - '98 | Revision | a | Addition, packing spec. 1/4 Revision. outline 3/4 | Sep. 29 - 198 | T. Ueyama | A. Nishimura | S. Kobayashi |
| Nov. 10 - '98 | Correction | b | Correction errors in writing Addition plating spec. | Nov. 10 - 198 | T. Ueyama | A. Nishimura | S.K |
| Feb-23 - '99 | Revision | c | Revision: Size of packing box Correction: Errors in writing | Feb-23 - '99 | T. Ueyama | Nishimura | S.K |
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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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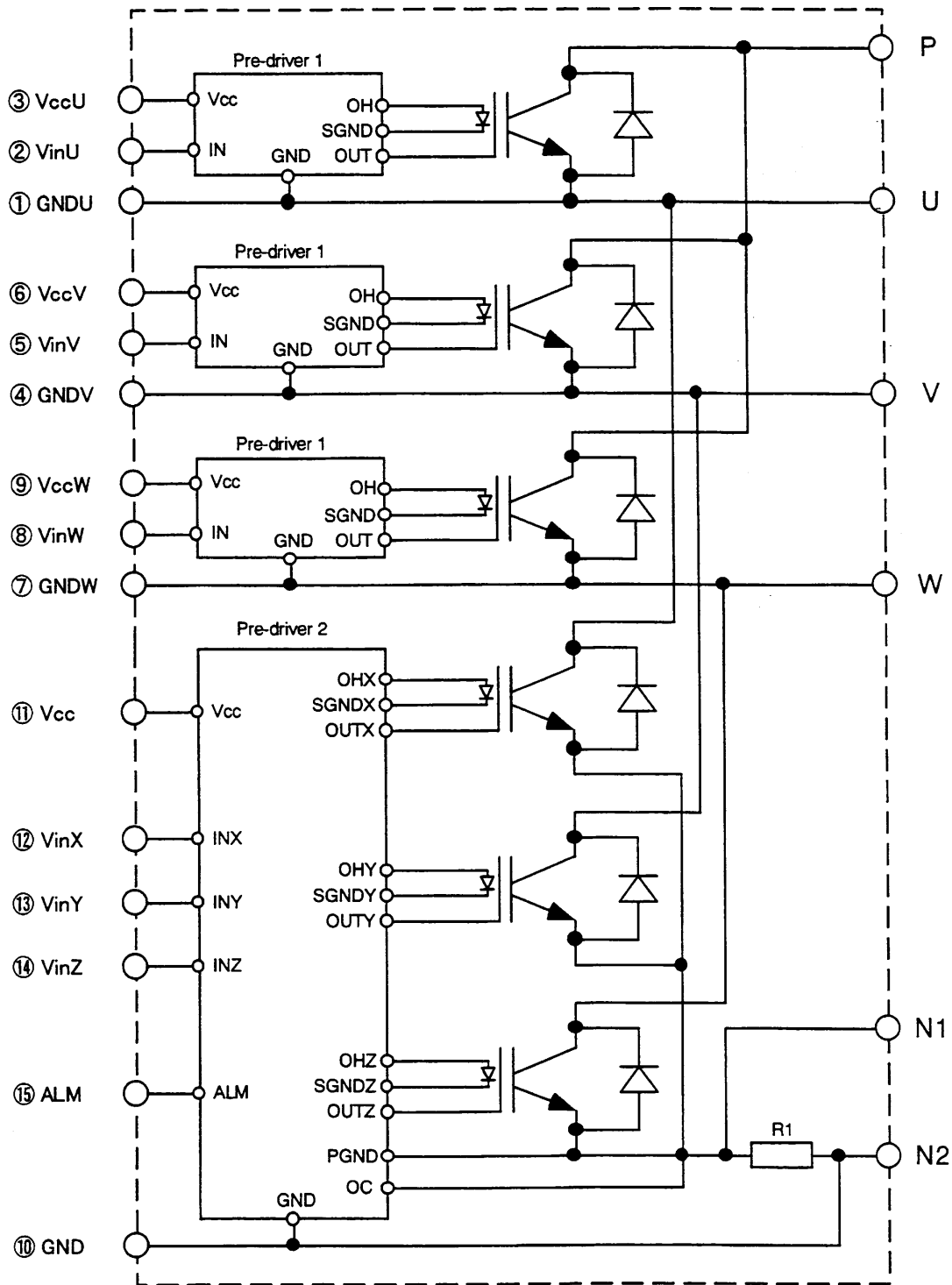
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| | |
|---|--|
| a | |
| b | |
| c | |

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) ^(b)

- (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 | 20 | A |
| | 1ms | ICP | 40 | A |
| | Duty=49.6% | -IC | 20 | A |
| Collector Power Dissipation | One Transistor | Pc | 63 | 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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DWG.NO.

MS6M0363

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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_j=T_c=25°C, V_{cc}=15V)

| Items | Symbols | Conditions | min. | typ. | max. | Unit |
|---------------------------------------|----------|--|------|------|------|------|
| Collector Current at off Signal Input | ICES | VCE=600V, I _{in} =0mA | - | - | 1.0 | mA |
| Collector-Emitter Saturation Voltage | VCE(sat) | I _C =20A, I _{in} =10mA | - | - | 2.7 | V |
| Forward Voltage of FWD | VF | -I _C =20A, I _{in} =0mA | - | - | 3.5 | V |

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

(T_j=T_c=25°C, V_{cc}=15V)

| Items | Symbols | Conditions | min. | typ. | max. | Unit |
|--|-----------------------|-------------------------------------|------|------|------|------|
| Power Supply Current of P-line Pre-driver (one unit) | I _{CCP} | I _{in} =0mA, | - | 2.0 | 5.0 | mA |
| Power Supply Current of N-line Pre-driver | I _{CCN} | I _{in} =0mA, | - | 4.0 | 10.0 | mA |
| Input Signal Threshold Current | I _{in} (th) | Turn-on | - | 1.8 | 2.3 | mA |
| | | Turn-off | 0.8 | 1.3 | - | mA |
| Hysteresis of Input Signal Theshold Current | I _{in} H | - | - | 0.5 | - | mA |
| Input Signal Saturation Voltage | V _{in} (sat) | I _{in} =20mA | - | 0.8 | 2.0 | V |
| Over Heating Protection (過熱保護) | | | | | | |
| IGBT chips Over HeatProtection Temperature Level | T _{JOH} | Surface of IGBT | 150 | - | - | °C |
| Hysteresis | T _{JH} | - | - | 20 | - | °C |
| Over Current Protection (過電流保護) | | | | | | |
| Collector Current Protection Level | I _{OC} | N-side, (N1-N2 open) | 24 | 30 | 36 | A |
| | V _{oc} | Between N1 and N2 | 190 | 200 | 210 | mV |
| OC detecting resistor value | R _{oc} | - | - | 6.6 | - | mΩ |
| Protection Delay time | t _{DOC} | T _j =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 _{UV} | - | 11.0 | - | 12.5 | V |
| Hysteresis | V _H | - | 0.2 | - | 0.8 | V |
| Alarm Signal Output (アラーム信号出力) | | | | | | |
| Alarm Signal Hold Time | t _{ALM} | - | 1.0 | 2.0 | - | ms |

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

(T_j=T_c=25°C, V_{cc}=15V)

| Items | Symbols | Conditions | min. | typ. | max. | Unit |
|-----------------------|---------|--|------|------|------|------|
| Switching Time (IGBT) | ton | I _c =20A, V _{DC} =300V | 0.5 | - | - | μs |
| | toff | I _{in} =10mA | - | - | 5.0 | μs |
| Switching Time (FWD) | trr | Inductive-Load, Fig. 3 | - | - | 0.5 | μs |

6. Thermal Characteristics (熱特性)

(T_j=T_c=25°C, V_{cc}=15V)

| Items | Symbols | min. | typ. | max. | Unit | |
|--|----------------------|----------------------|------|------|------|------|
| Junction to Case Thermal Resistance | IGBT | R _{th(j-c)} | - | - | 2.0 | °C/W |
| | FWD | R _{th(j-c)} | - | - | 3.6 | °C/W |
| Case to Fin Thermal Resistance with Compound | R _{th(c-f)} | - | 0.05 | - | °C/W | |

7. Recommendable Value (推奨値)

| Items | Symbols | Conditions | min. | typ. | max. | Unit |
|---|-----------------|--------------|------|------|------|------|
| DC Bus Voltage | V _{DC} | - | 200 | - | 400 | V |
| Operating Power Supply Voltage Range of Pre-drive | V _{CC} | - | 13.5 | 15 | 16.5 | V |
| Input Forward Current | I _F | CTR=100~200% | 8 | - | 10 | mA |
| Switching Frequency | f _{sw} | - | 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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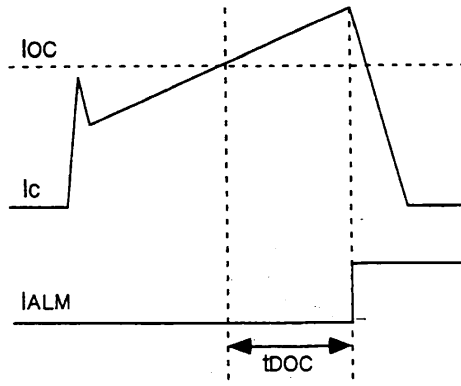


Fig. 1. Definition of OC protection delay time (過電流保護遅れ時間の定義)

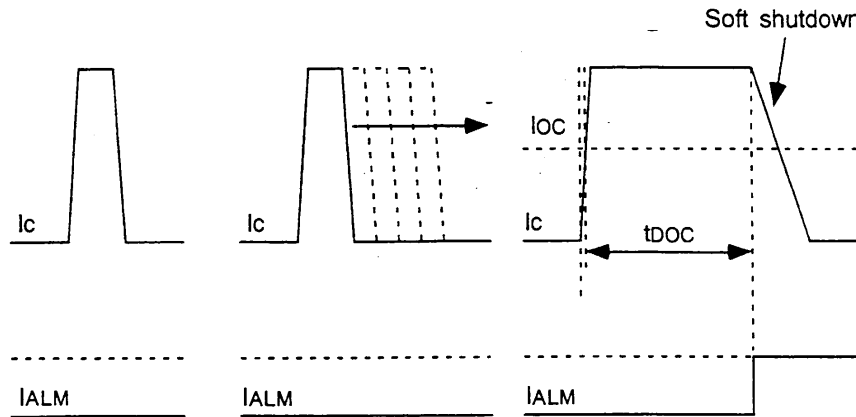


Fig. 2. Definition of protection delay time at short circuit (短絡時保護遅れ時間の定義)

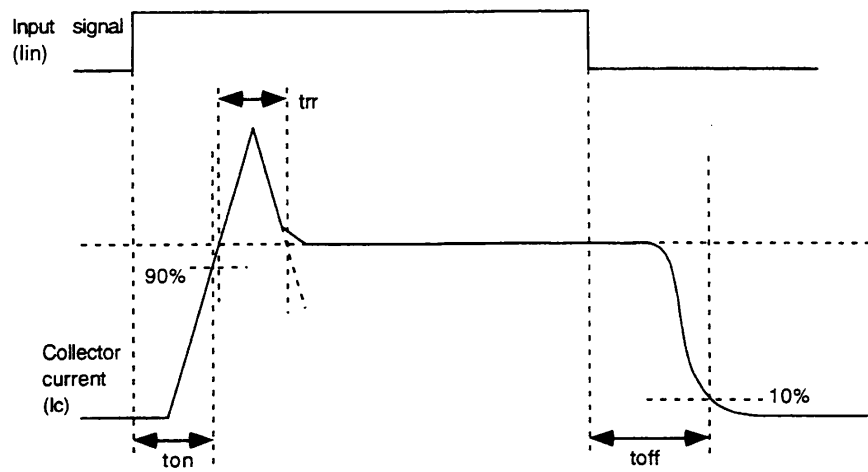
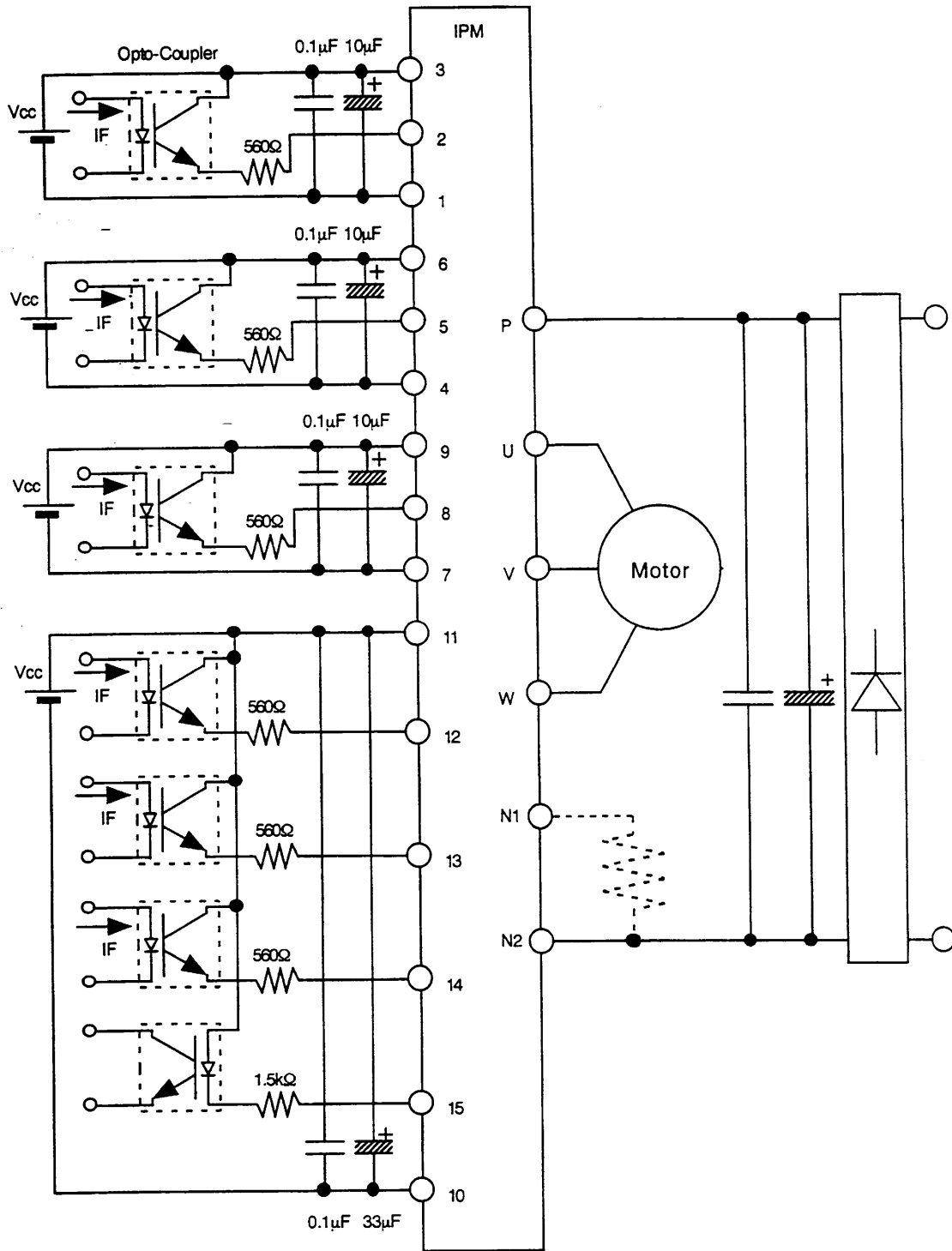


Fig. 3. Definition of switching time (スイッチング時間の定義)

9. Typical Application Circuit (応用回路例)



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- Recommendale condition of Opto-coupler (推奨ホトカプラ使用条件)

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

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)

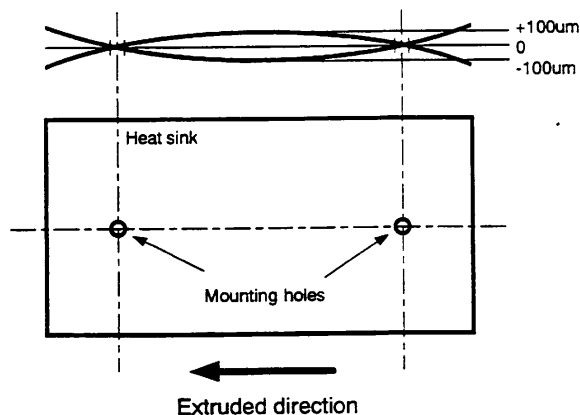
- A mounting surface of a heat sink should be finished to a roughness below 10 μ m and a flatness between screw holes below 100 μ m. If the flatness is below -100 μ m, a thermal resistance between an IPM and a heat sink is increased. If the flatness is over +100 μ m, there is the danger of the isolation failure.

IPMを取り付けるヒートシンク面の仕上げは、粗さ100 μ m以下、ネジ位置間での面の平坦度(反り)100 μ m以内にして下さい。平坦度が-100 μ 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 μ 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.

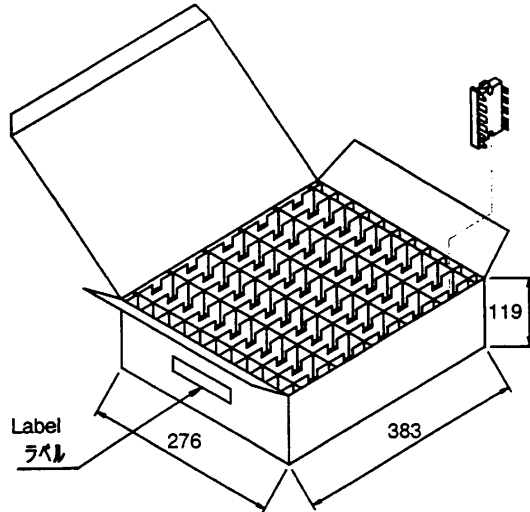
押し出し機によって作られたヒートシンクを使用する場合は、ヒートシンクの変形の影響を小さくするためにIPMをヒートシンクの押し出し方向と平行に取り付けて下さい。



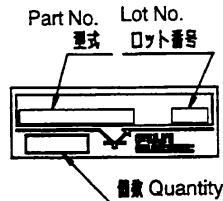
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12. Packing and indication (梱包と表示) C



| | |
|----------|------------------------|
| 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) |



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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 6MBP20RY060.

本仕様書は、IGBT-IPM(型式: 6MBP20RY060) に適用する。 C