

TOSHIBA

MIG50J201H

TOSHIBA INTELLIGENT POWER MODULE SILICON N CHANNEL IGBT

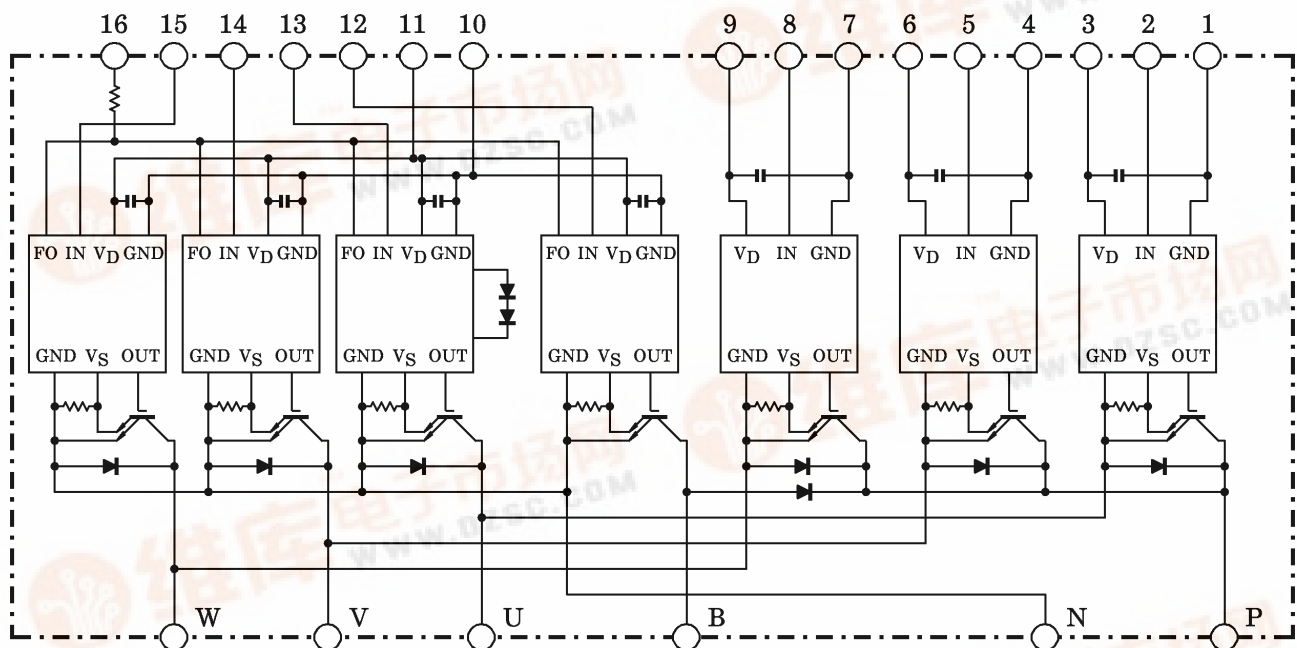
MIG50J201H

HIGH POWER SWITCHING APPLICATIONS

MOTOR CONTROL APPLICATIONS

- Integrates Inverter, Brake Power Circuits & Control Circuits (IGBT drive units, Protection units for Over-Current, Under-Voltage & Over-Temperature) in One Package.
- The Electrodes are Isolated from Case.
- High Speed Type IGBT : $V_{CE(sat)}=2.5V$ (Max.)
 $t_{off}=3.0\mu s$ (Max.)
 $t_{rr}=0.30\mu s$ (Max.)
- Outline : TOSHIBA 2-110A1A
- Weight : 520g

EQUIVALENT CIRCUIT



- | | | | | | |
|------------|------------|-----------------------|-------------|------------------------|-----------------------|
| 1. GND (U) | 2. IN (U) | 3. V _D (U) | 4. GND (V) | 5. IN (V) | 6. V _D (V) |
| 7. GND (W) | 8. IN (W) | 9. V _D (W) | 10. GND (L) | 11. V _D (L) | 12. IN (B) |
| 13. IN (X) | 14. IN (Y) | 15. IN (Z) | 16. FO | | |

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MAXIMUM RATINGS ($T_j = 25^\circ\text{C}$)

| STAGE | CHARACTERISTIC | CONDITION | SYMBOL | RATINGS | UNIT |
|----------|-----------------------------|-------------------------------|-----------|----------|------------------|
| Inverter | Supply Voltage | P-N power terminal | V_{CC} | 450 | V |
| | Collector-Emitter Voltage | — | V_{CES} | 600 | V |
| | Collector Current | $T_c = 25^\circ\text{C}$, DC | I_C | 50 | A |
| | Forward Current | $T_c = 25^\circ\text{C}$, DC | I_F | 50 | A |
| | Collector Power Dissipation | $T_c = 25^\circ\text{C}$ | P_C | 150 | W |
| | Junction Temperature | — | T_j | 150 | $^\circ\text{C}$ |
| Brake | Supply Voltage | P-N power terminal | V_{CC} | 450 | V |
| | Collector-Emitter Voltage | — | V_{CES} | 600 | V |
| | Collector Current | $T_c = 25^\circ\text{C}$, DC | I_C | 30 | A |
| | Reverse Voltage | — | V_R | 600 | V |
| | Forward Current | $T_c = 25^\circ\text{C}$, DC | I_F | 30 | A |
| | Collector Power Dissipation | $T_c = 25^\circ\text{C}$ | P_C | 80 | W |
| Control | Junction Temperature | — | T_j | 150 | $^\circ\text{C}$ |
| | Control Supply Voltage | V_D -GND terminal | V_D | 20 | V |
| | Input Voltage | IN-GND terminal | V_{IN} | 20 | V |
| | Fault Output Voltage | FO-GND (L) terminal | V_{FO} | 20 | V |
| Module | Fault Output Current | FO sink current | I_{FO} | 14 | mA |
| | Operating Temperature | — | T_C | -20~+100 | $^\circ\text{C}$ |
| | Storage Temperature Range | — | T_{stg} | -40~+125 | $^\circ\text{C}$ |
| | Isolation Voltage | AC 1 minute | V_{ISO} | 2500 | V |
| | Screw Torque | M5 | — | 3 | Nm |

ELECTRICAL CHARACTERISTICS ($T_j = 25^\circ\text{C}$)

a. Inverter stage

| CHARACTERISTIC | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT | |
|--------------------------------------|----------------------|---|---------------------------|------|------|---------------|----|
| Collector Cut-Off Current | I_{CEX} | $V_{CEX} = 600\text{V}$ | $T_j = 25^\circ\text{C}$ | — | — | 1 | mA |
| | | | $T_j = 125^\circ\text{C}$ | — | — | 20 | |
| Collector-Emitter Saturation Voltage | $V_{CE}(\text{sat})$ | $V_D = 15\text{V}$, $I_C = 50\text{A}$ $V_{IN} = 15\text{V} \rightarrow 0\text{V}$ | $T_j = 25^\circ\text{C}$ | — | 2.0 | 2.5 | V |
| | | | $T_j = 125^\circ\text{C}$ | — | 2.0 | — | |
| Forward Voltage | V_F | $I_F = 50\text{A}$ | — | 2.1 | 3.0 | V | |
| Switching Time | t_{on} | $V_{CC} = 300\text{V}$, $I_C = 50\text{A}$ $V_D = 15\text{V}$, $V_{IN} = 15\text{V} \leftrightarrow 0\text{V}$ Inductive load (Note 1) | — | 0.8 | 2.0 | μs | |
| | t_{off} | | — | 1.2 | 3.0 | | |
| | t_f | | — | 0.25 | 0.5 | | |
| | t_{rr} | | — | 0.1 | 0.3 | | |

b. Brake stage

| CHARACTERISTIC | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT | |
|--------------------------------------|-----------------------|--|------------------------|------|------|------|----|
| Collector Cut-Off Current | I _{CEX} | V _{CEX} = 600V | T _j = 25°C | — | — | 1 | mA |
| | | | T _j = 125°C | — | — | 20 | |
| Collector-Emitter Saturation Voltage | V _{CE} (sat) | V _D = 15V, I _C = 30A V _{IN} = 15V → 0V | T _j = 25°C | — | 1.7 | 2.7 | V |
| | | | T _j = 125°C | — | 1.6 | — | |
| Reverse Current | I _R | V _R = 600V | T _j = 25°C | — | — | 1 | mA |
| | | | T _j = 125°C | — | — | 20 | |
| Forward Voltage | V _F | I _F = 30A | — | 2.0 | 2.5 | V | |
| Switching Time | t _{on} | V _{CC} = 300V, I _C = 30A | — | 0.9 | 2.0 | μs | |
| | t _{off} | V _D = 15V, V _{IN} = 15V ↔ 0V | — | 1.7 | 1.0 | | |
| | t _f | Inductive load | — | 0.25 | 0.5 | | |
| | t _{rr} | (Note 1) | — | 0.15 | 0.3 | | |

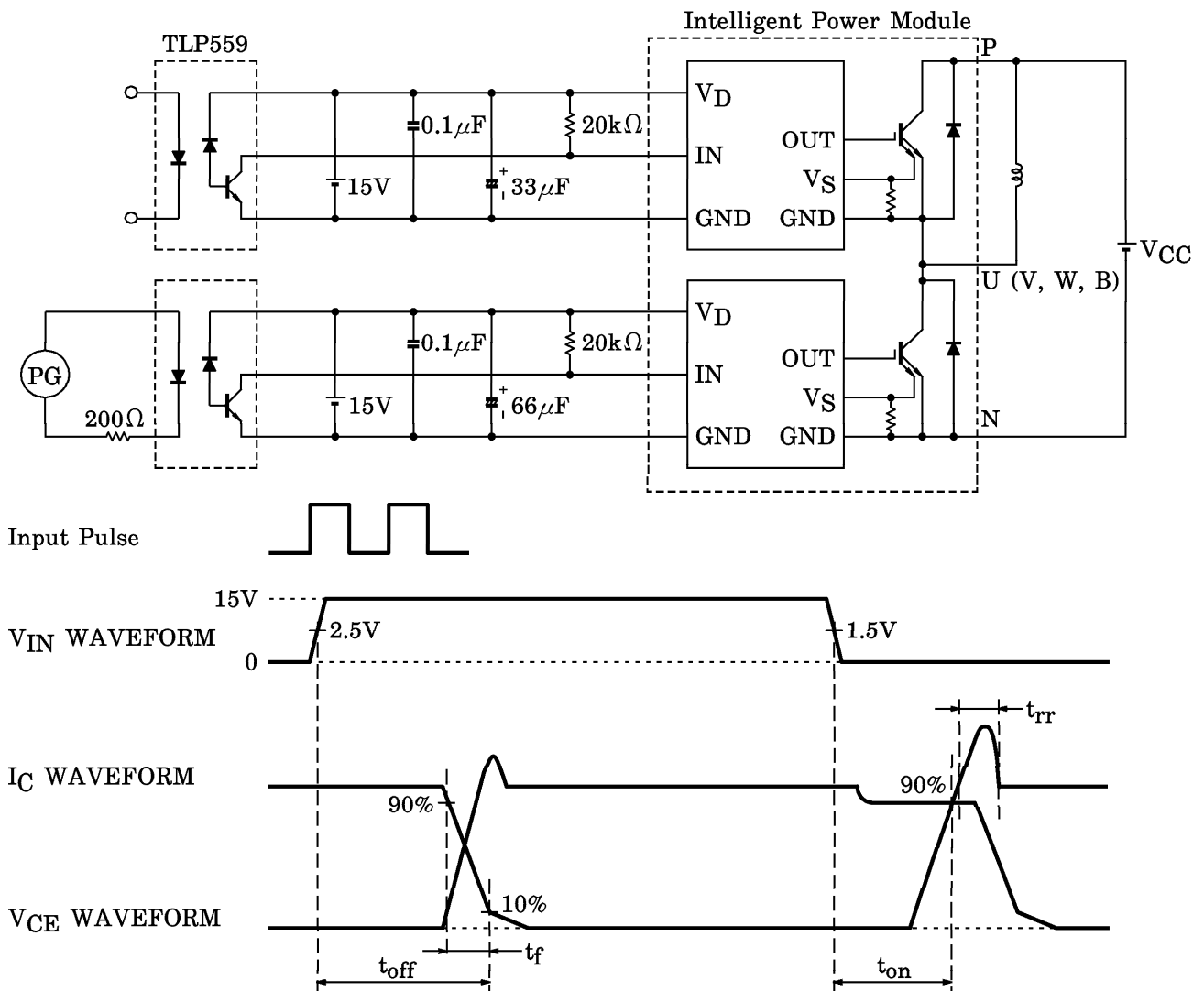
c. Control stage (T_j = 25°C)

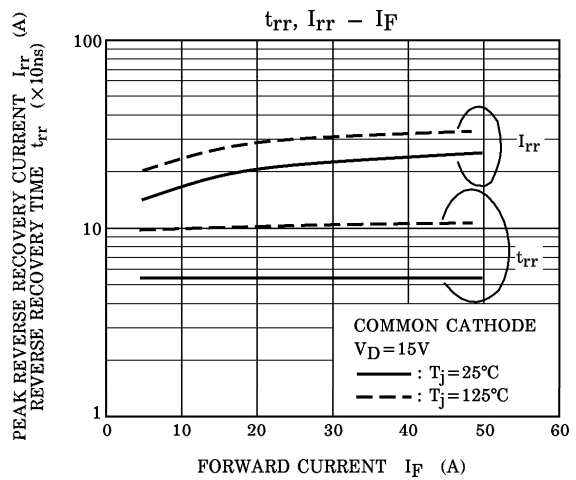
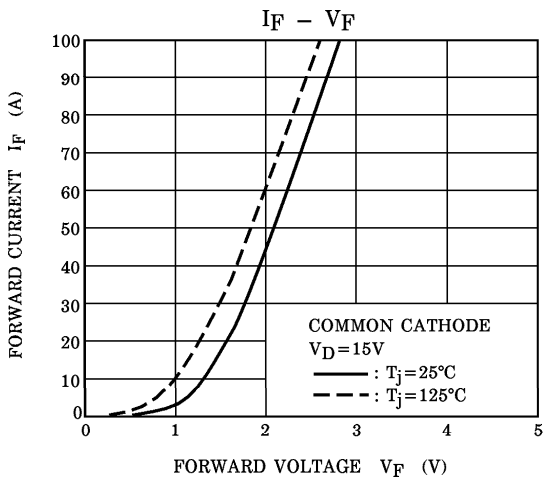
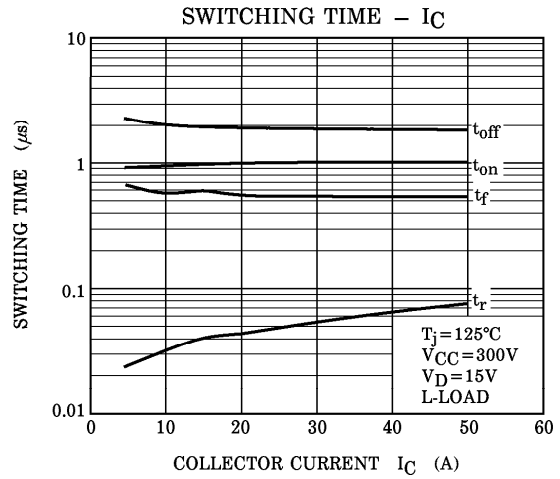
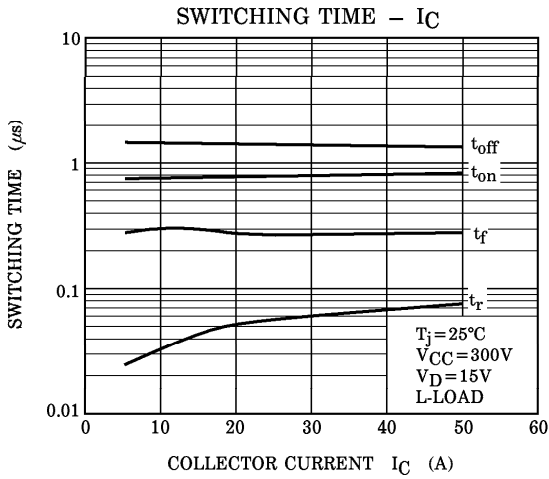
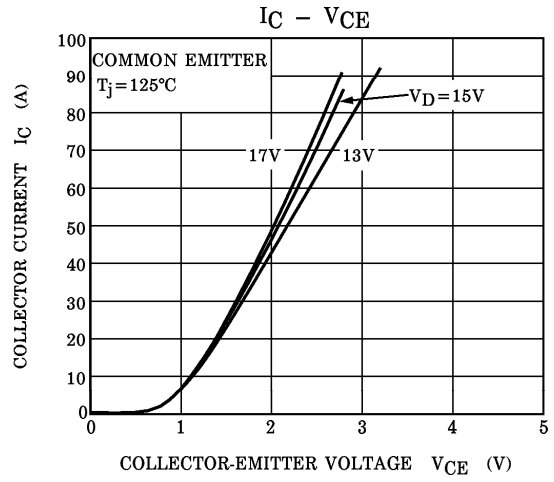
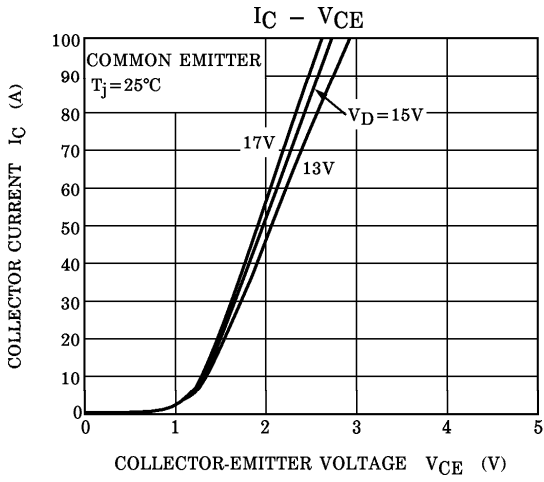
| CHARACTERISTIC | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|-----------------------|--|-----------------------|------|------|------|
| Control Circuit Current | High Side | I _D (H) V _D = 15V | — | 8 | — | mA |
| | Low Side | | I _D (L) | — | 32 | |
| Input-On Signal Voltage | V _{IN} (on) | V _D = 15V, I _C = 50mA | 1.3 | 1.5 | 1.7 | V |
| Input-Off Signal Voltage | V _{IN} (off) | V _D = 15V, I _C = 50mA | 2.2 | 2.5 | 2.8 | V |
| Fault Output Current | Protection | I _{FO} (on) V _D = 15V | 8 | 10 | 12 | mA |
| | Normal | | I _{FO} (off) | — | — | |
| Over Current Protection Trip Level | Inverter | OC V _D = 15V, T _j = 125°C | 75 | 100 | — | A |
| | Brake | | 40 | — | — | |
| Short Circuit Protection Trip Level | Inverter | SC V _D = 15V, T _j = 125°C | 110 | 150 | — | A |
| | Brake | | 60 | — | — | |
| Over Current Cut-Off Time | t _{off} (OC) | V _D = 15V | — | 5 | — | μs |
| Over Temperature Protection | Trip Level | OT Case temperature | 110 | 118 | 125 | °C |
| | Reset Level | | OTr | — | 98 | |
| Control Supply Under Voltage Protection | Trip Level | UV — | 11.0 | 12.0 | 12.5 | V |
| | Reset Level | | UVr | — | 12.5 | |
| Fault Output Pulse Width | t _{FO} | V _D = 15V | 1 | 2 | 3 | ms |

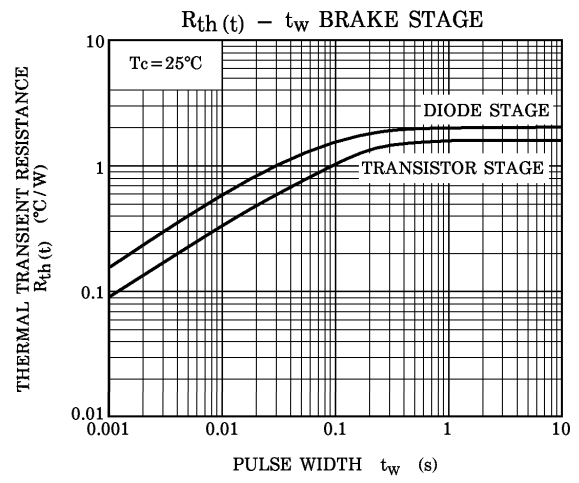
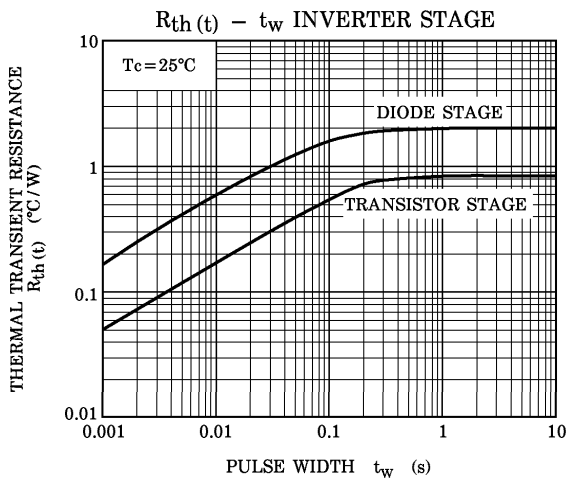
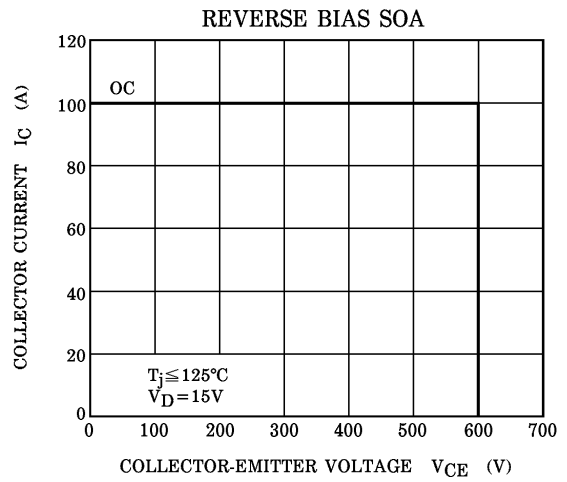
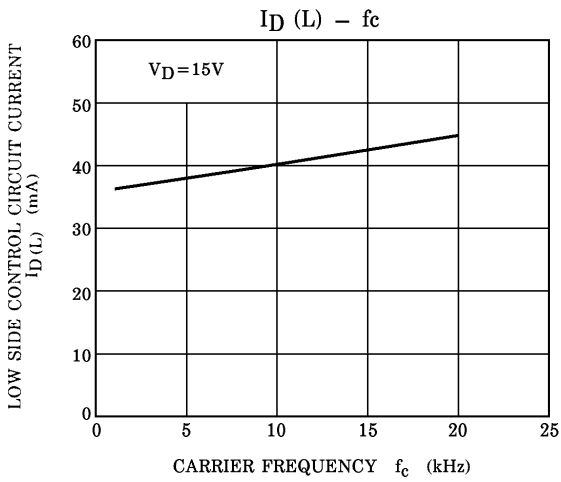
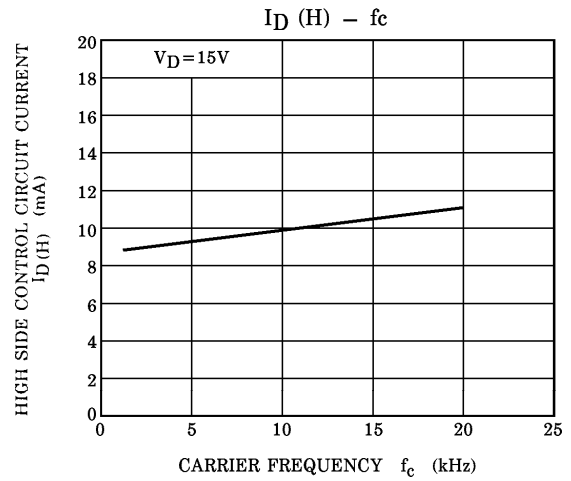
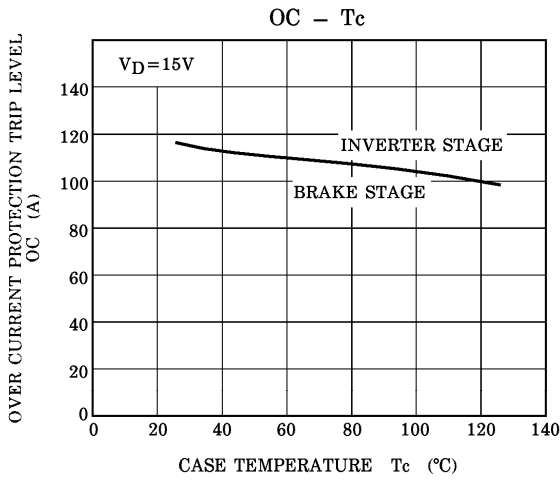
d. Thermal resistance ($T_j = 25^\circ\text{C}$)

| CHARACTERISTIC | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|-------------------------------------|---------------|---------------------|------|------|-------|--------------------|
| Junction to Case Thermal Resistance | $R_{th(j-c)}$ | Inverter IGBT stage | — | — | 0.833 | $^\circ\text{C/W}$ |
| | | Inverter FRD stage | — | — | 2.000 | |
| | | Brake IGBT stage | — | — | 1.562 | |
| | | Brake FRD stage | — | — | 2.000 | |
| Case to Fin Thermal Resistance | $R_{th(c-f)}$ | Compound is applied | — | 0.05 | — | $^\circ\text{C/W}$ |

Note 1 : Switching time test circuit & timing chart

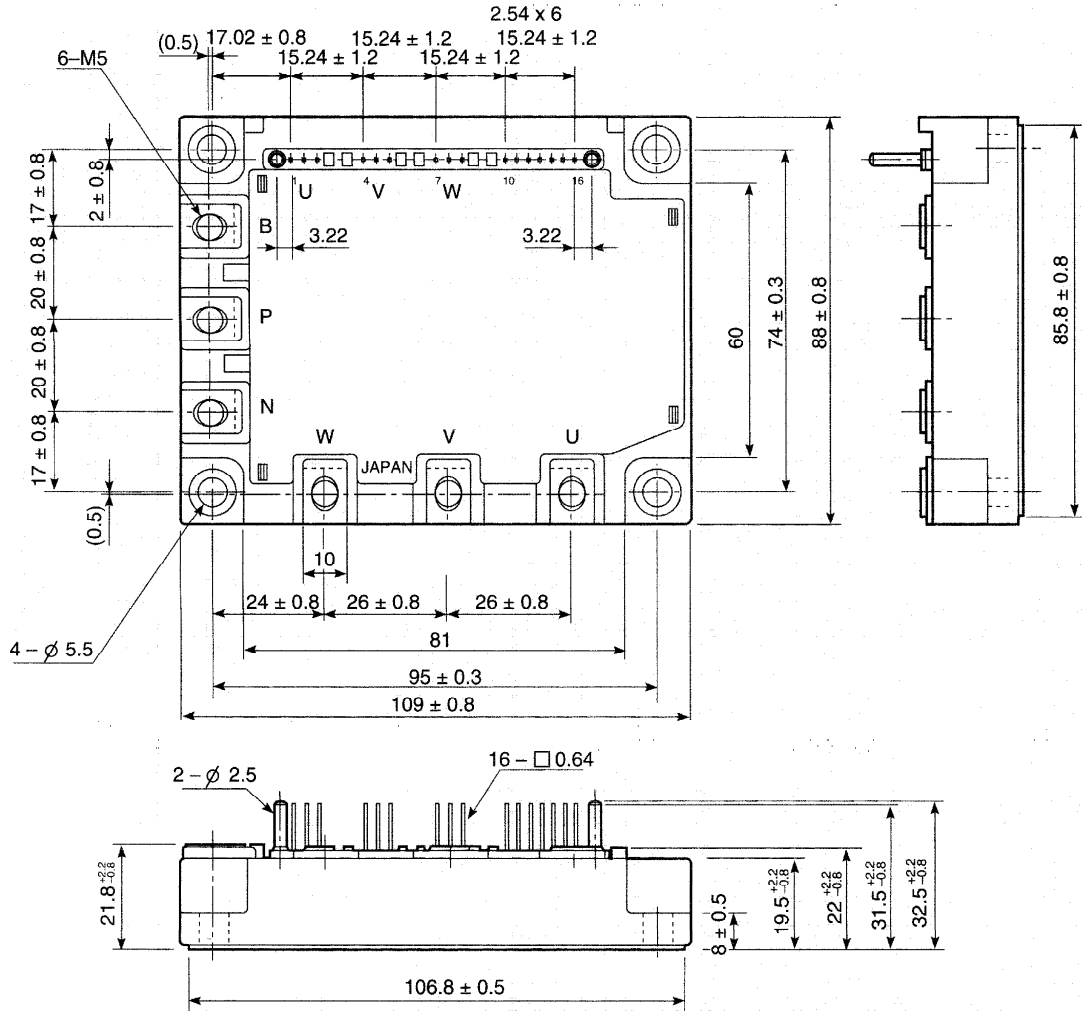






OUTLINE

Unit : mm



| | GND | IN | VD | GND | IN | VD | GND | VD | IN | IN | IN | IN | IN | FO | | |
|-----------------|-----|----|----|-----|----|----|-----|----|----|-----|-----|-----|-----|----|----|----|
| | (U) | | | (V) | | | (W) | | | (B) | (X) | (Y) | (Z) | | | |
| Signal Terminal | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |