

TOSHIBA INTELLIGENT GTR MODULE SILICON N CHANNEL IGBT

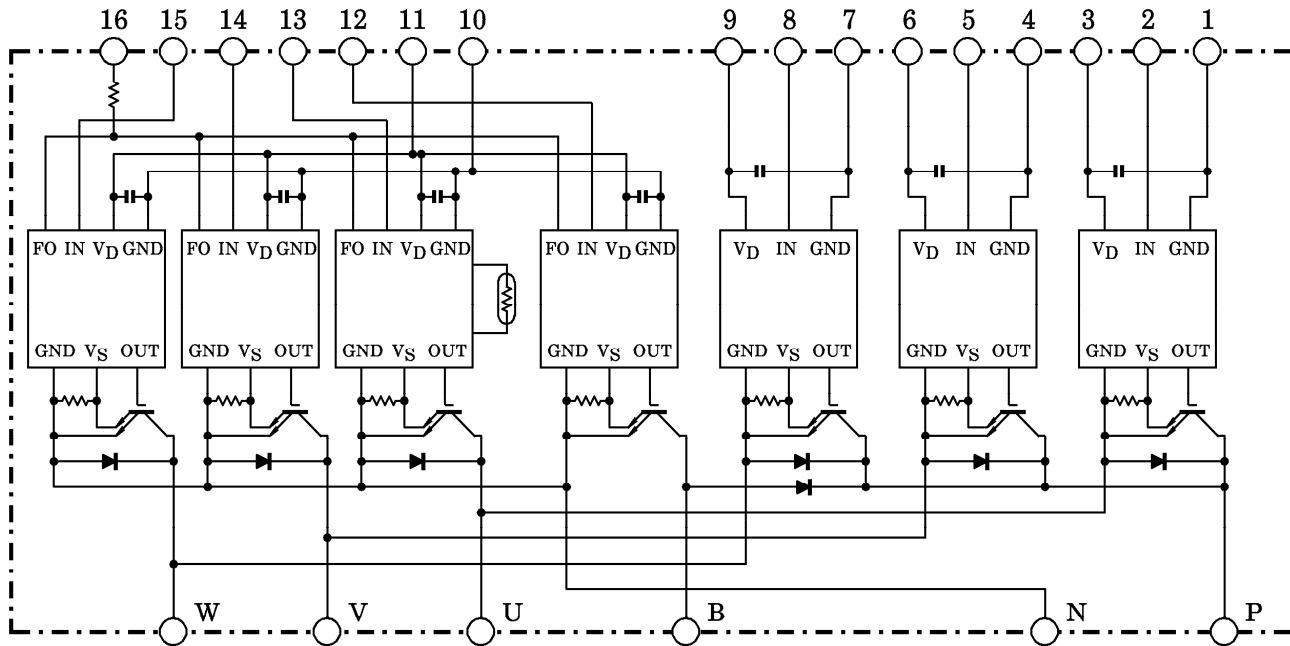
MIG100Q201H

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 : $V_{CE(sat)}=3.5V$ (Max.)
 $t_{off}=2.5\mu s$ (Max.)
 $t_{rr}=0.21\mu s$ (Max.)
- Outline : TOSHIBA 2-136A1A
- Weight :

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} | 900 | V |
| | Collector-Emitter Voltage | — | V_{CES} | 1200 | V |
| | Collector Current | $T_c = 25^\circ\text{C}$, DC | I_C | 100 | A |
| | Forward Current | $T_c = 25^\circ\text{C}$, DC | I_F | 100 | A |
| | Collector Power Dissipation | $T_c = 25^\circ\text{C}$ | P_C | 800 | W |
| | Junction Temperature | — | T_j | 150 | $^\circ\text{C}$ |
| Brake | Supply Voltage | P-N power terminal | V_{CC} | 900 | V |
| | Collector-Emitter Voltage | — | V_{CES} | 1200 | V |
| | Collector Current | $T_c = 25^\circ\text{C}$, DC | I_C | 50 | A |
| | Reverse Voltage | — | V_R | 1200 | V |
| | Forward Current | $T_c = 25^\circ\text{C}$, DC | I_F | 50 | A |
| | Collector Power Dissipation | $T_c = 25^\circ\text{C}$ | P_C | 400 | W |
| | Junction Temperature | — | T_j | 150 | $^\circ\text{C}$ |
| Control | 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 |
| | Fault Output Current | FO sink current | I_{FO} | 14 | mA |
| Module | 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} | $V_{CEX} = 1200\text{V}$ | $T_j = 25^\circ\text{C}$ | — | — | 1 | mA |
| | | | $T_j = 125^\circ\text{C}$ | — | — | 20 | |
| Collector-Emitter Saturation Voltage | $V_{CE}(\text{sat})$ | $V_D = 15\text{V}$, $I_C = 100\text{A}$ $V_{IN} = 3\text{V} \rightarrow 0\text{V}$ | $T_j = 25^\circ\text{C}$ | — | 2.7 | 3.5 | V |
| | | | $T_j = 125^\circ\text{C}$ | — | 2.6 | — | |
| Forward Voltage | V_F | $I_F = 100\text{A}$ | — | 2.0 | 2.7 | V | |
| Switching Time | t_{on} | $V_{CC} = 600\text{V}$, $I_C = 100\text{A}$ $V_D = 15\text{V}$, $V_{IN} = 3\text{V} \leftrightarrow 0\text{V}$ Inductive load (Note 1) | 0.8 | 1.5 | 2.2 | μs | |
| | $t_c(\text{on})$ | | — | 0.5 | 1.0 | | |
| | t_{rr} | | — | 0.14 | 0.21 | | |
| | t_{off} | | — | 1.5 | 2.5 | | |
| | $t_c(\text{off})$ | | — | 0.3 | 0.6 | | |

b. Brake stage

| CHARACTERISTIC | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT | |
|--------------------------------------|-----------------------|---|------------------------|------|------|------|----|
| Collector Cut-Off Current | I _{CEX} | V _{CEX} = 1200V | T _j = 25°C | — | — | 1 | mA |
| | | | T _j = 125°C | — | — | 20 | |
| Collector-Emitter Saturation Voltage | V _{CE (sat)} | V _D = 15V, I _C = 50A V _{IN} = 3V → 0V | T _j = 25°C | — | 2.7 | 3.5 | V |
| | | | T _j = 125°C | — | 2.6 | — | |
| Reverse Current | I _R | V _R = 1200V | T _j = 25°C | — | — | 1 | mA |
| | | | T _j = 125°C | — | — | 20 | |
| Forward Voltage | V _F | I _F = 50A | — | 2.0 | 2.7 | V | |
| Switching Time | t _{on} | V _{CC} = 600V, I _C = 50A V _D = 15V, V _{IN} = 3V ↔ 0V Inductive load (Note 1) | 0.8 | 1.5 | 2.2 | μs | |
| | t _{c (on)} | | — | 0.5 | 1.0 | | |
| | t _{rr} | | — | 0.30 | 0.45 | | |
| | t _{off} | | — | 1.5 | 2.5 | | |
| | t _{c (off)} | | — | 0.3 | 0.6 | | |

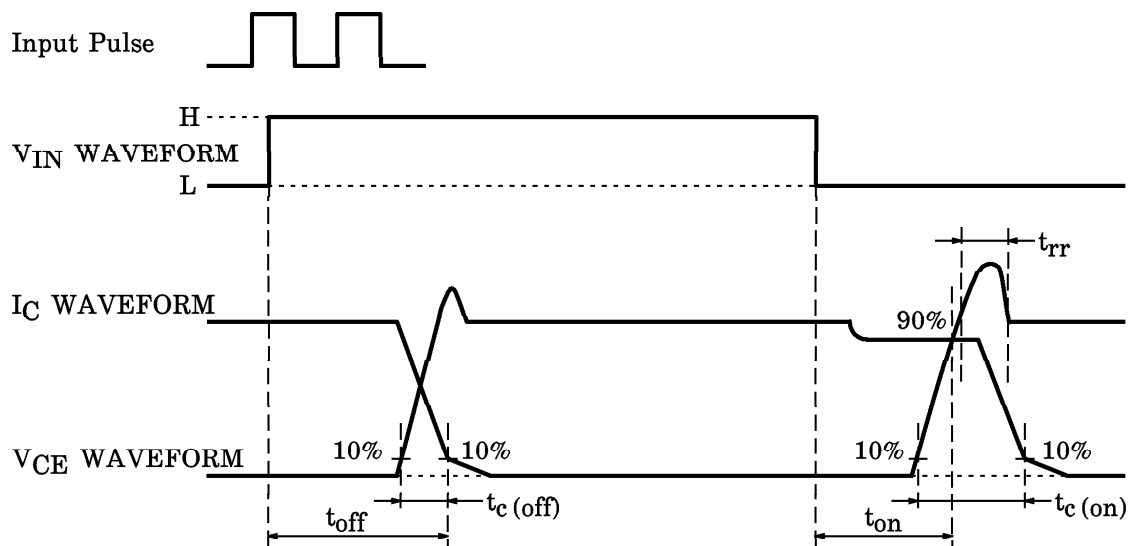
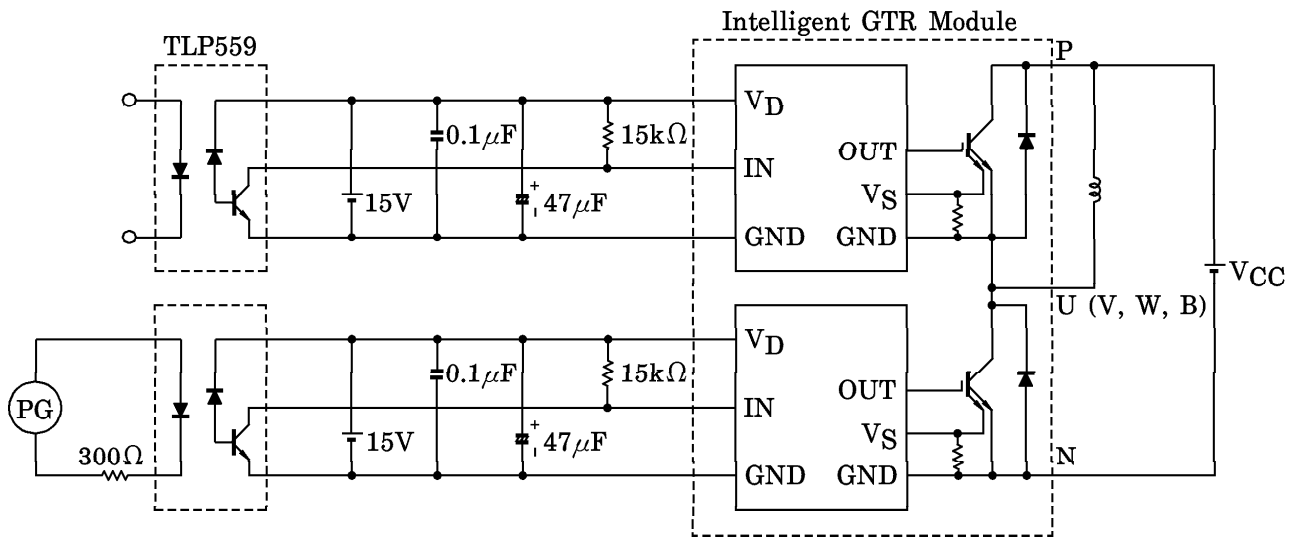
c. Control stage (T_j = 25°C)

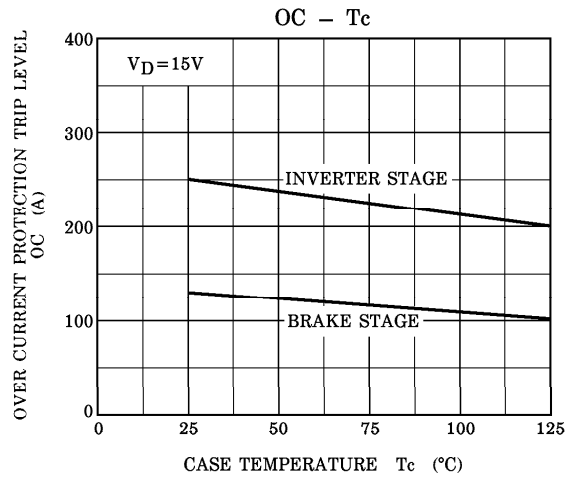
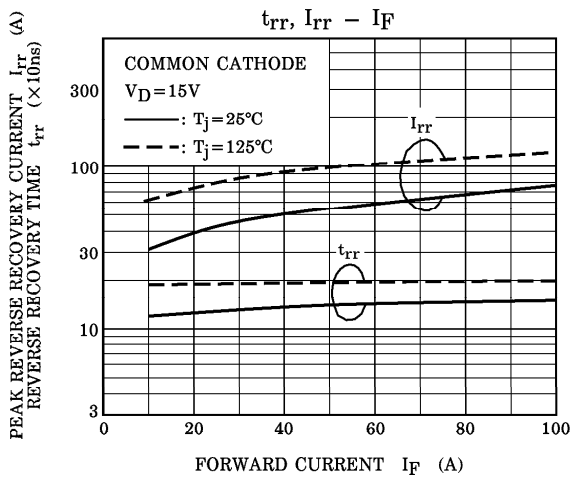
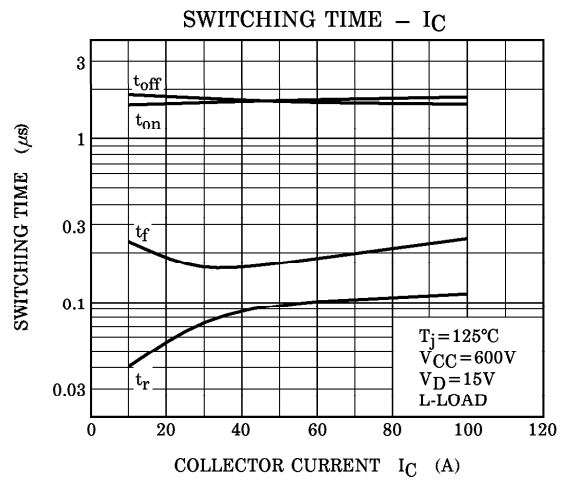
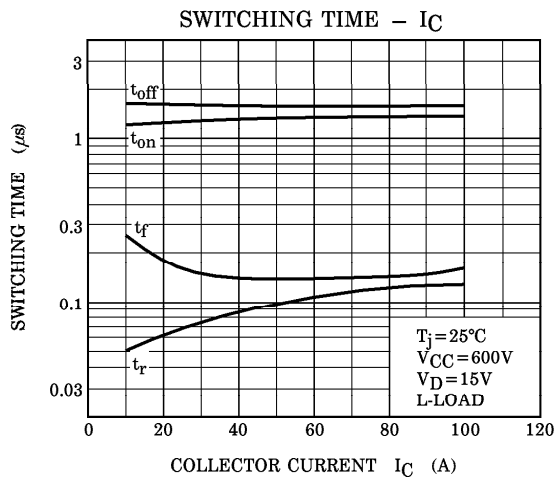
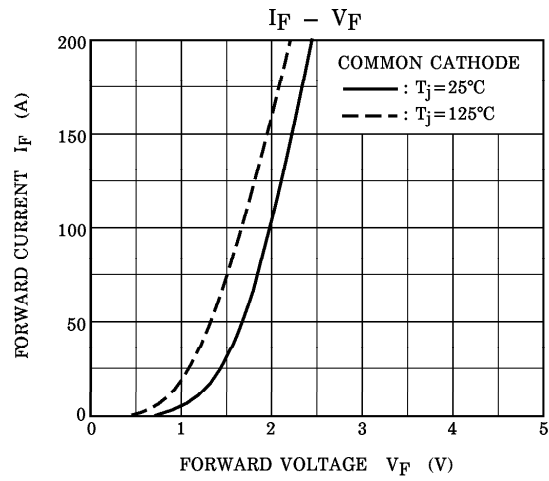
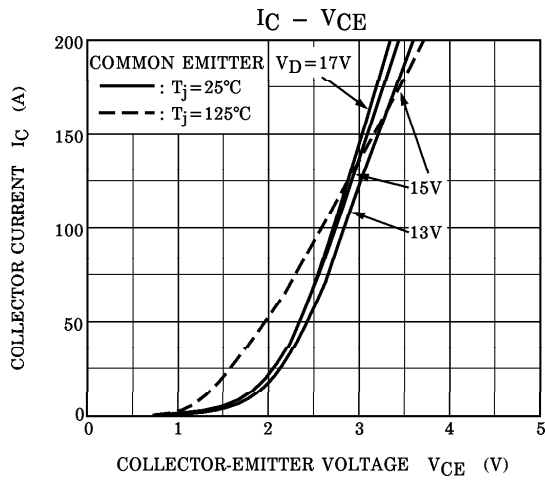
| CHARACTERISTIC | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT | |
|---|-----------------------|--|--|--------------------|------|------|----|
| Control Circuit Current | High Side | I _{D (H)} | V _D = 15V | — | 20 | 30 | mA |
| | Low Side | | | I _{D (L)} | — | 80 | |
| Input On Signal Voltage | V _{IN (on)} | V _D = 15V, I _C = 100mA | 0.9 | 1.1 | 1.3 | V | |
| Fault Output Current | Protection | I _{FO (on)} | 8 | 10 | 12 | mA | |
| | Normal | I _{FO (off)} | — | — | 1 | | |
| Over Current Protection Trip Level | Inverter | OC | V _D = 15V, T _j = 125°C | 160 | 200 | — | A |
| | Brake | | | 70 | 100 | — | |
| Short Circuit Protection Trip Level | Inverter | SC | V _D = 15V, T _j = 125°C | 240 | 300 | — | A |
| | Brake | | | 105 | 150 | — | |
| Over Current Cut-Off Time | t _{off (OC)} | V _D = 15V | — | 10 | — | μs | |
| Over Temperature Protection | Trip Level | OT | Case temperature | 111 | 118 | 125 | °C |
| | Reset Level | | | OTr | 93 | 100 | |
| Control Supply Under Voltage Protection | Trip Level | UV | — | 11.3 | 12.0 | 12.7 | V |
| | Reset Level | | | UVr | 11.8 | 12.5 | |
| Fault Output Pulse Width | t _{FO} | V _D = 15V | 1 | 2 | 3 | ms | |

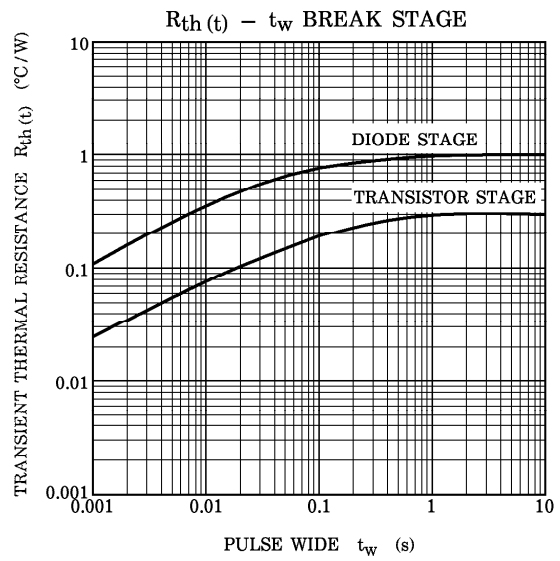
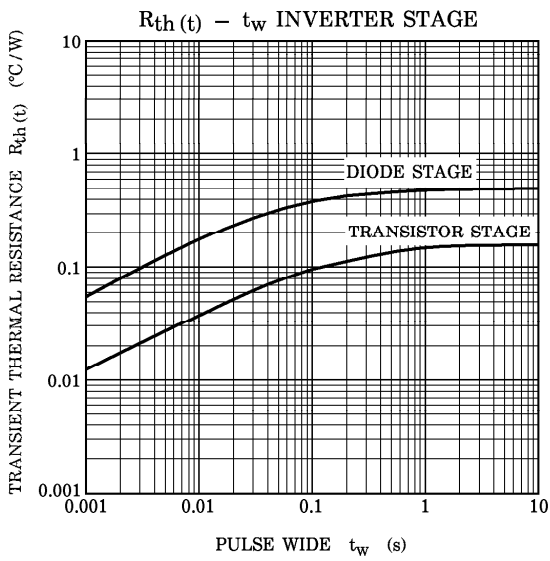
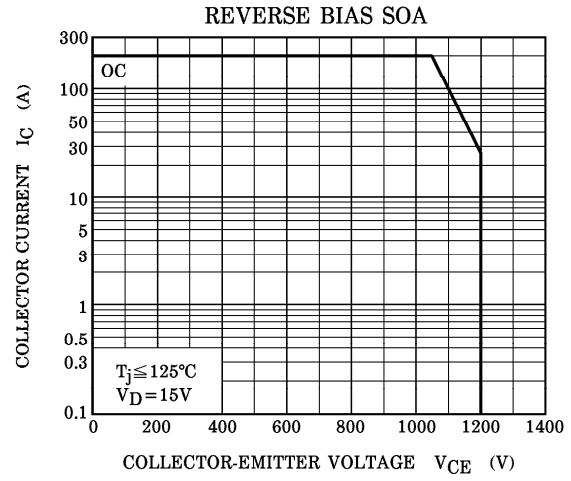
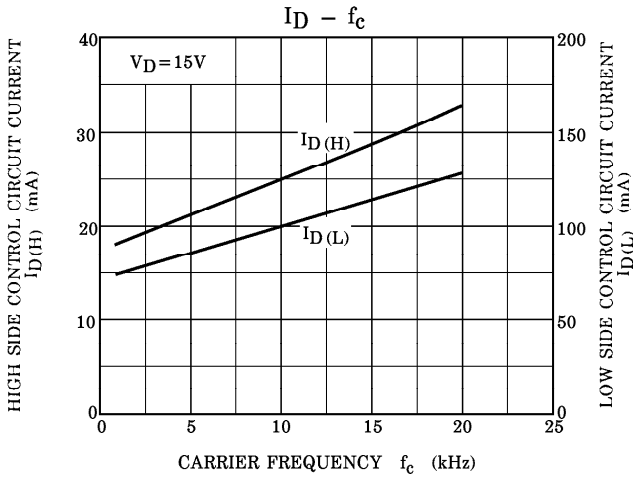
d. Thermal resistance ($T_j = 25^\circ\text{C}$)

| CHARACTERISTIC | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|-------------------------------------|---------------|---------------------|------|------|-------|--------------------|
| Junction to Case Thermal Resistance | $R_{th(j-c)}$ | Inverter IGBT | — | — | 0.156 | $^\circ\text{C/W}$ |
| | | Inverter FRD | — | — | 0.50 | |
| | | Brake IGBT | — | — | 0.312 | |
| | | Brake FRD | — | — | 1.00 | |
| Case to Fin Thermal Resistance | $R_{th(c-f)}$ | Compound is applied | — | 0.04 | — | $^\circ\text{C/W}$ |

Attached 1 : Switching time test circuit & timing chart

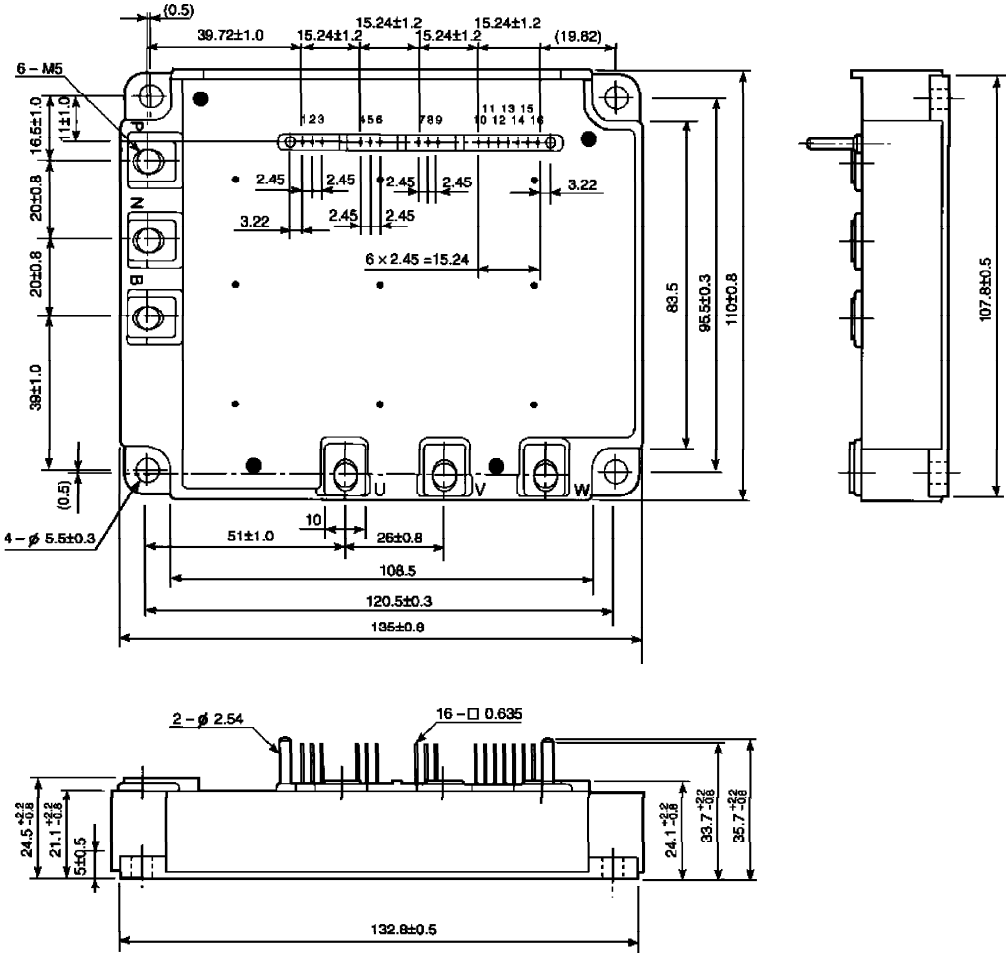






OUTLINE : TOSHIBA

Unit : mm



- 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