

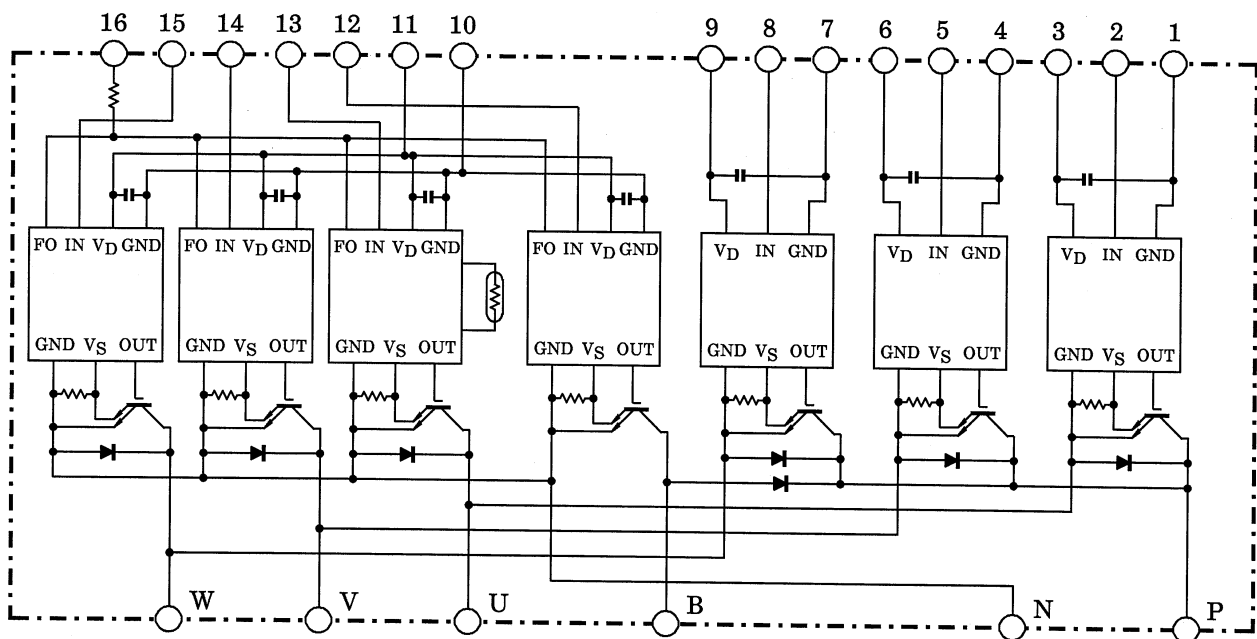
MIG100Q201H

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 : $V_{CE(sat)} = 3.5 \text{ V (Max.)}$
 $t_{off} = 2.5 \mu\text{s (Max.)}$
 $t_{rr} = 0.21 \mu\text{s (Max.)}$
- 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 | | |

Maximum Ratings ($T_j = 25^\circ\text{C}$)

| Stage | Characteristic | Condition | Symbol | Rated | 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 | — | TC | -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 | N·m |

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} | $V_{CE} = 1200\text{ V}$ | $T_j = 25^\circ\text{C}$ | — | — | 1 | mA |
| | | | $T_j = 125^\circ\text{C}$ | — | — | 20 | |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | $V_D = 15\text{ V}$, $I_C = 100\text{ A}$ $V_{IN} = 3\text{ V} \rightarrow 0\text{ V}$ | $T_j = 25^\circ\text{C}$ | — | 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 | |
| | $t_{o(on)}$ | | — | 0.5 | 1.0 | | |
| | t_{rr} | | — | 0.14 | 0.21 | | |
| | t_{off} | | — | 1.5 | 2.5 | | |
| | $t_{c(off)}$ | | — | 0.3 | 0.6 | | |

b. Brake Stage

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit | |
|--------------------------------------|---------------|---|---------------------|------|------|---------|----|
| Collector cut-off current | I_{CEX} | $V_{CE} = 1200V$ | $T_j = 25^\circ C$ | — | — | 1 | mA |
| | | | $T_j = 125^\circ C$ | — | — | 20 | |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | $V_D = 15V, I_C = 50A$ $V_{IN} = 3V \rightarrow 0V$ | $T_j = 25^\circ C$ | — | 2.7 | 3.5 | V |
| | | | $T_j = 125^\circ C$ | — | 2.6 | — | |
| Reverse current | I_R | $V_R = 1200V$ | $T_j = 25^\circ C$ | — | — | 1 | mA |
| | | | $T_j = 125^\circ C$ | — | — | 20 | |
| Forward voltage | V_F | $I_F = 50A$ | — | 2.0 | 2.7 | V | |
| Switching time | t_{on} | $V_{CC} = 600V, I_C = 50A$ $V_D = 15V, V_{IN} = 3V \leftrightarrow 0V$ 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 | | |

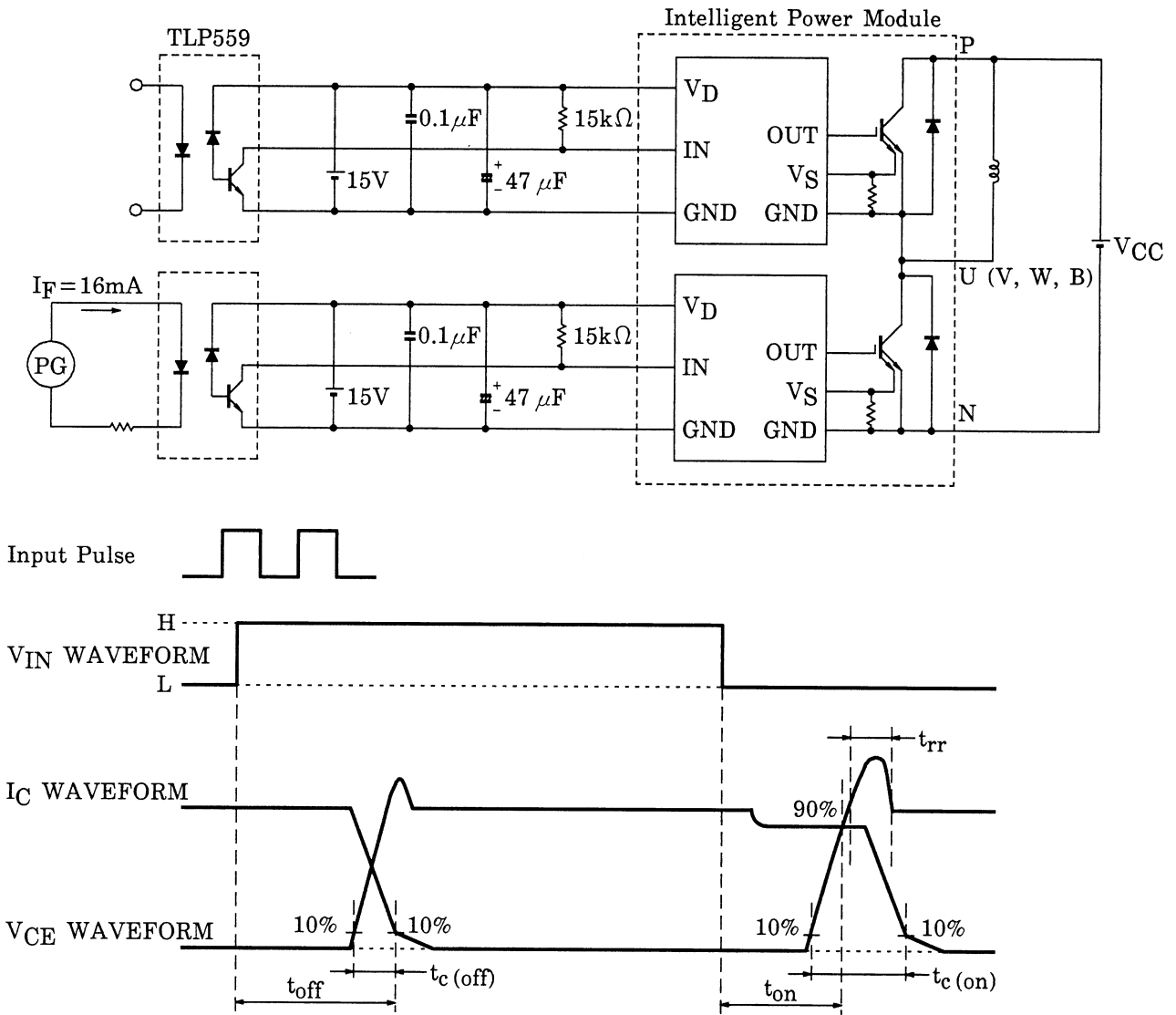
c. Control Stage ($T_j = 25^\circ C$)

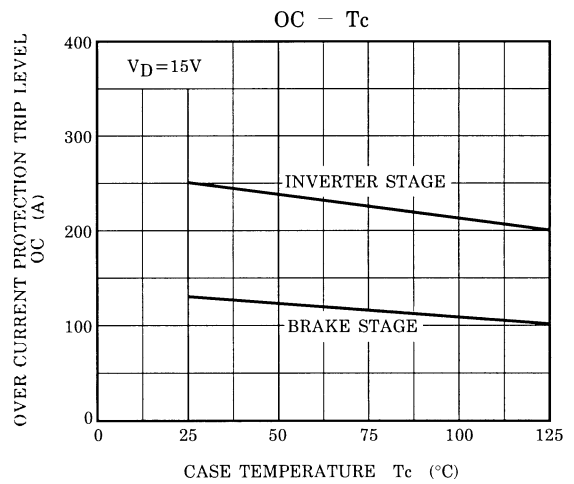
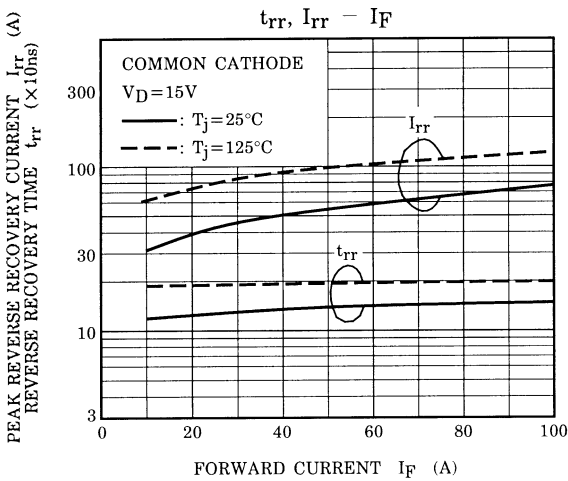
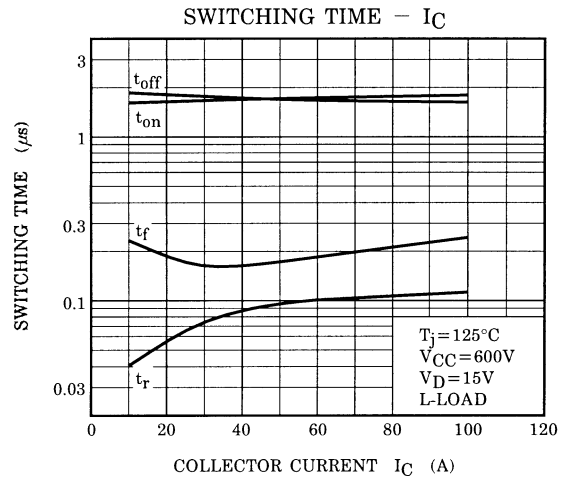
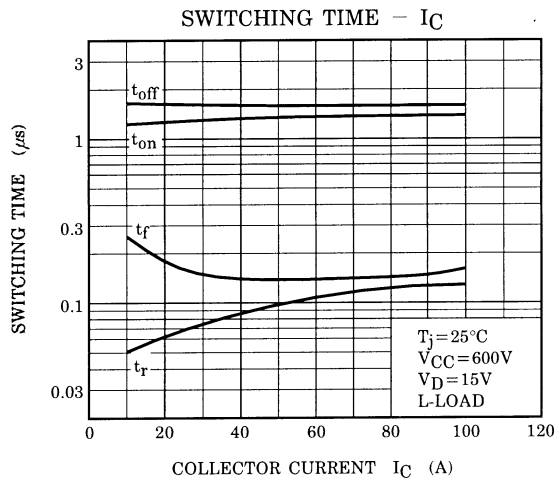
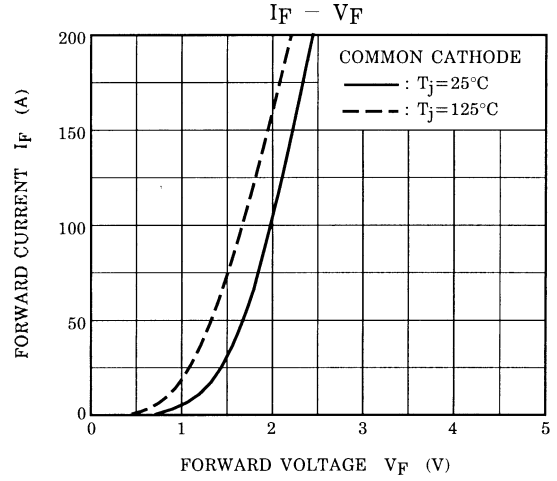
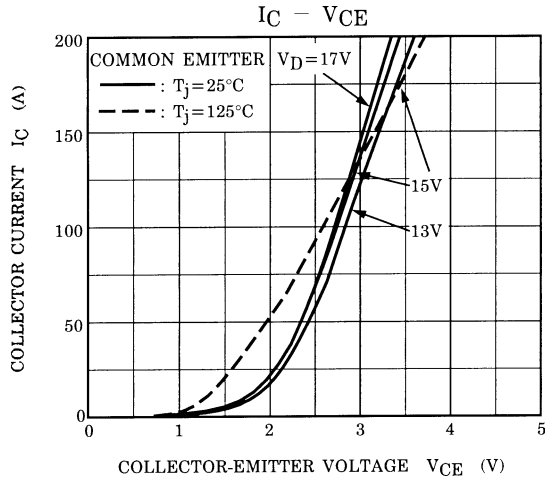
| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit | |
|---|---------------|--------------------------|--------------------------------|---------------|------|---------|------------|
| Control circuit current | High side | $I_D(H)$ | $V_D = 15V$ | — | 20 | 30 | mA |
| | Low side | | | $I_D(L)$ | — | 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 | $I_{FO(on)}$ | $V_D = 15V$ | 8 | 10 | 12 | mA |
| | Normal | | | $I_{FO(off)}$ | — | — | |
| Over current protection trip level | Inverter | OC | $V_D = 15V, T_j = 125^\circ C$ | 160 | 200 | — | A |
| | Brake | | | 70 | 100 | — | |
| Short current protection trip level | Inverter | SC | $V_D = 15V, T_j = 125^\circ C$ | 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 | $^\circ C$ |
| | 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 | |

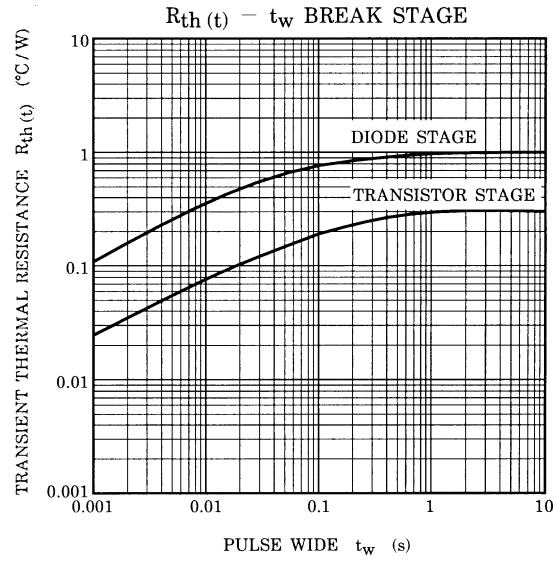
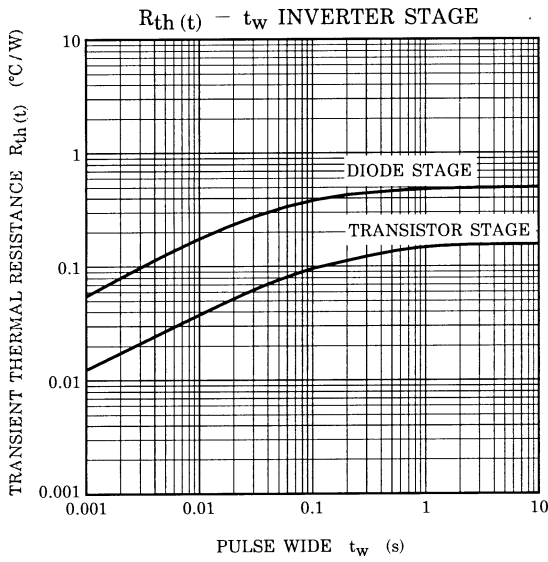
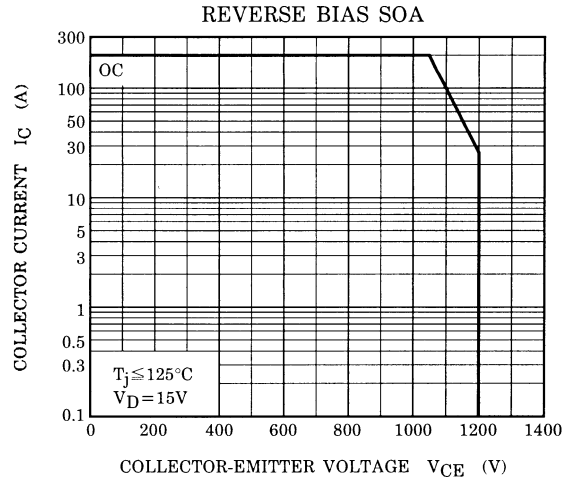
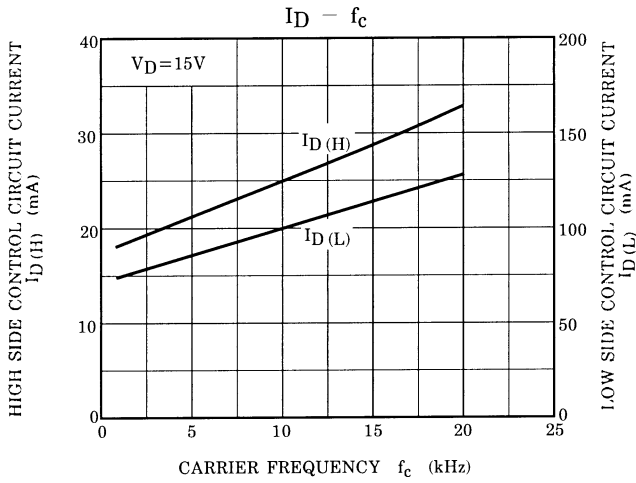
d. Thermal Resistance ($T_j = 25^\circ\text{C}$)

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------------------------|---------------|---------------------|-----|------|-------|-----------------------------|
| Junction to case thermal resistance | $R_{th(j-c)}$ | Inverter IGBT | — | — | 0.156 | $^\circ\text{C} / \text{W}$ |
| | | 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 | — | $^\circ\text{C} / \text{W}$ |

Note 1 : Switching time test circuit & timing chart

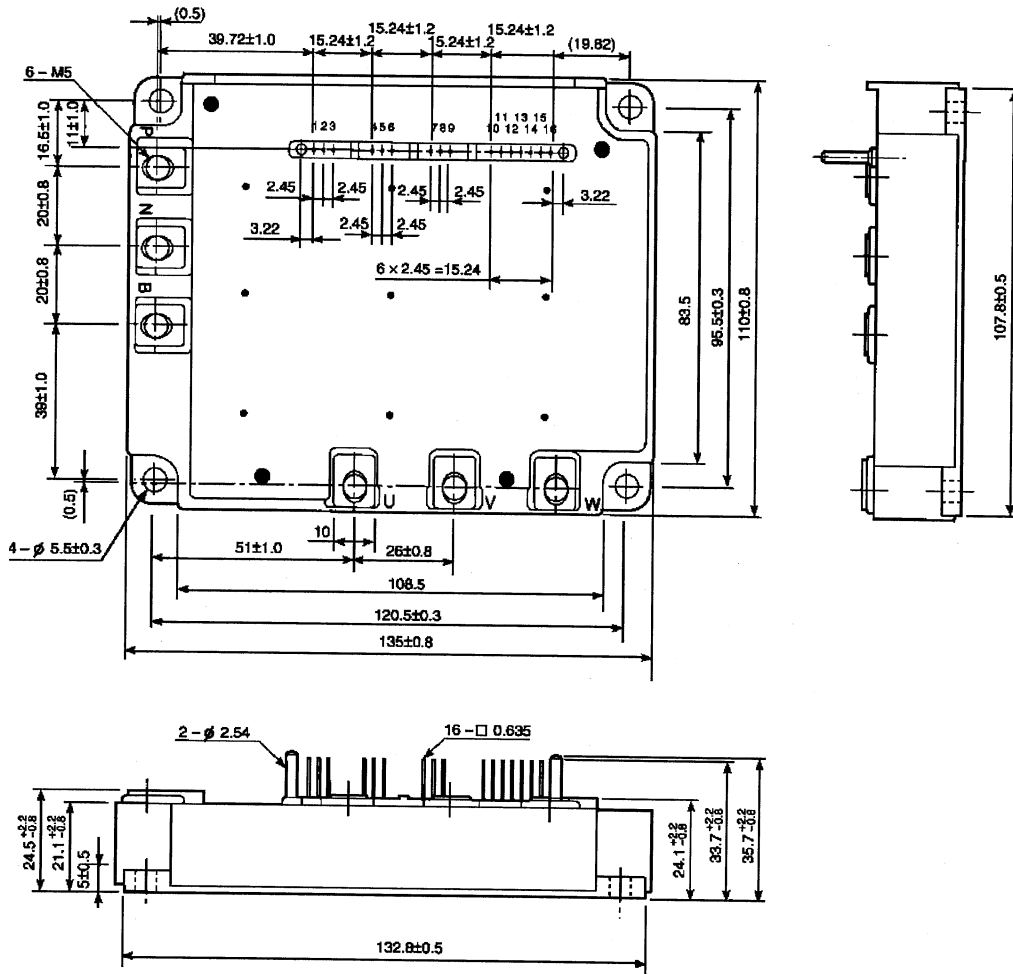






Package Dimensions: TOSHIBA 2-136A1A

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 | | |

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