

TOSHIBA INTELLIGENT GTR MODULE SILICON N CHANNEL IGBT

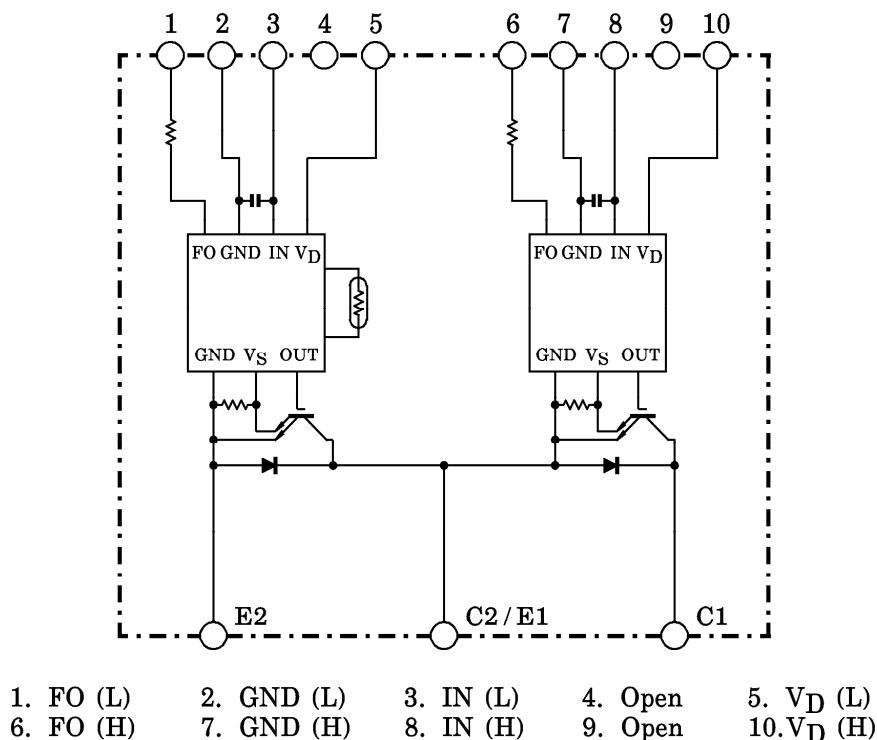
# MIG150Q101H

HIGH POWER SWITCHING APPLICATIONS

MOTOR CONTROL APPLICATIONS

- Integrates Inverter 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.)  
 $t_{off} = 3.8\mu s$  (Max.)  
 $t_{rr} = 0.24\mu s$  (Max.)
- Outline : TOSHIBA 2-121A1A
- Weight : 510g

EQUIVALENT CIRCUIT



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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 | $I_C$     | 150             | A                |
|          | Forward Current             | $T_c = 25^\circ\text{C}$ , DC | $I_F$     | 150             | A                |
|          | Collector Power Dissipation | $T_c = 25^\circ\text{C}$      | $P_C$     | 1200            | 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       | —                             | $T_C$     | $-20 \sim +100$ | $^\circ\text{C}$ |
|          | Storage Temperature Range   | —                             | $T_{stg}$ | $-40 \sim +125$ | $^\circ\text{C}$ |
|          | Isolation Voltage           | AC 1 minute                   | $V_{ISO}$ | 2500            | V                |
|          | Screw Torque                | M6                            | —         | 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            | $I_{CEX}$            | $V_{CEX} = 1200\text{V}$                                                                                                                              | $T_j = 25^\circ\text{C}$  | —    | —    | 2    | mA            |
|                                      |                      |                                                                                                                                                       | $T_j = 125^\circ\text{C}$ | —    | —    | 40   |               |
| Collector-Emitter Saturation Voltage | $V_{CE}(\text{sat})$ | $V_D = 15\text{V}$ , $I_C = 150\text{A}$<br>$V_{IN} = 3\text{V} \rightarrow 0\text{V}$                                                                | $T_j = 25^\circ\text{C}$  | —    | 2.7  | 3.5  | V             |
|                                      |                      |                                                                                                                                                       | $T_j = 125^\circ\text{C}$ | —    | 2.6  | —    |               |
| Forward Voltage                      | $V_F$                | $I_F = 150\text{A}$                                                                                                                                   |                           | —    | 2.0  | 2.5  | V             |
| Switching Time                       | $t_{on}$             | $V_{CC} = 600\text{V}$ , $I_C = 150\text{A}$<br>$V_D = 15\text{V}$ , $V_{IN} = 3\text{V} \leftrightarrow 0\text{V}$<br>Inductive load<br>(Attached 1) |                           | 0.8  | 1.5  | 2.2  | $\mu\text{s}$ |
|                                      | $t_c(\text{on})$     |                                                                                                                                                       |                           | —    | 0.5  | 1.0  |               |
|                                      | $t_{rr}$             |                                                                                                                                                       |                           | —    | 0.16 | 0.24 |               |
|                                      | $t_{off}$            |                                                                                                                                                       |                           | —    | 3.3  | 3.8  |               |
|                                      | $t_c(\text{off})$    |                                                                                                                                                       |                           | —    | 0.4  | 0.8  |               |

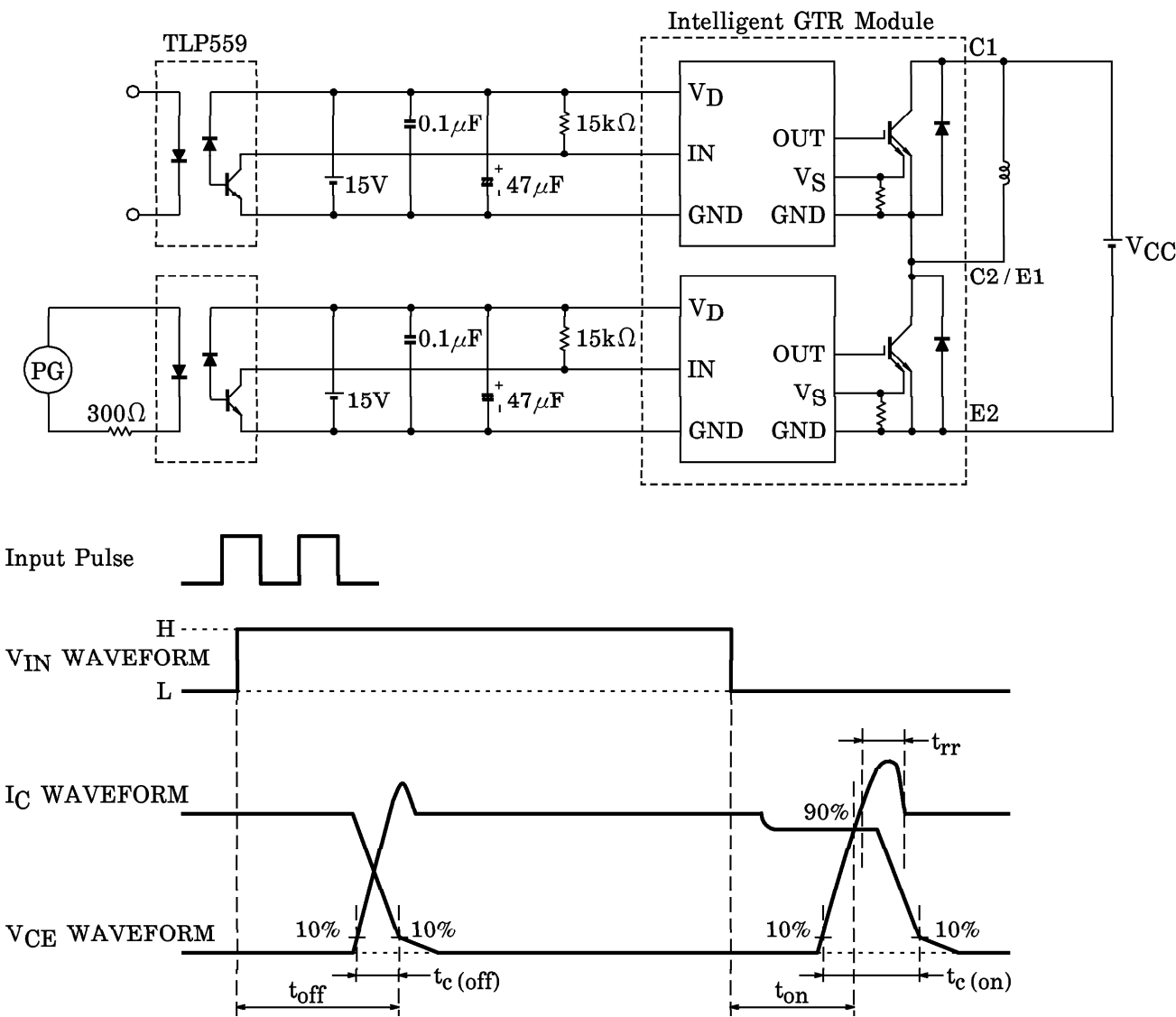
c. Control stage ( $T_j = 25^\circ\text{C}$ )

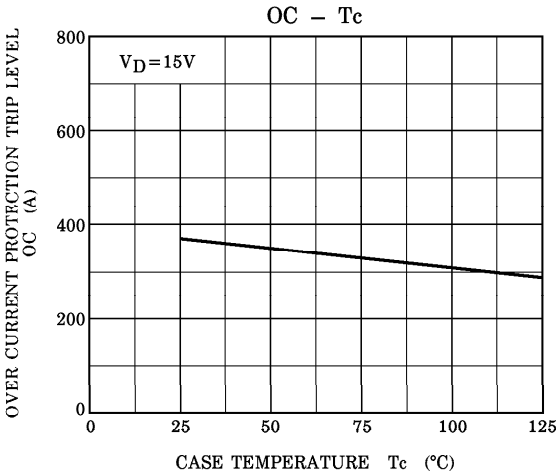
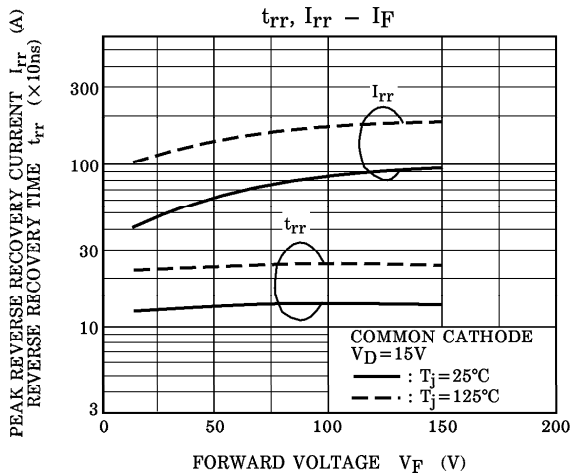
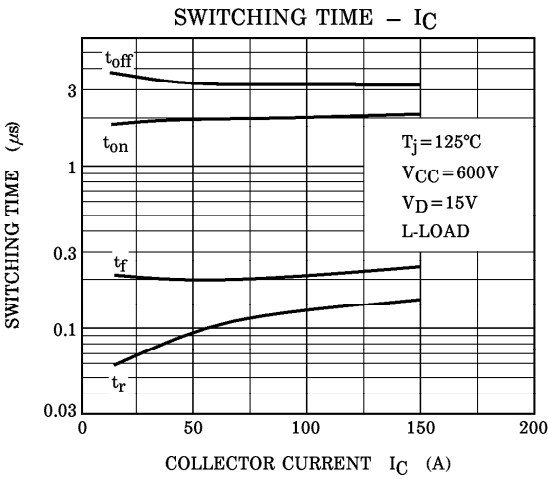
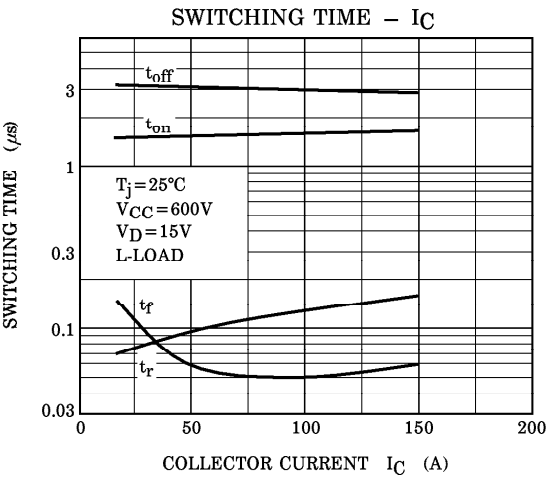
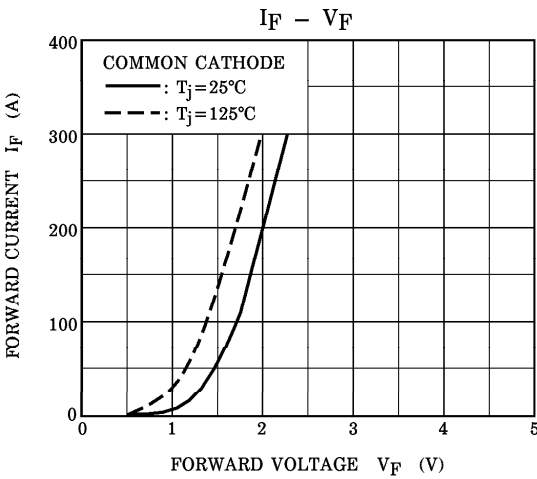
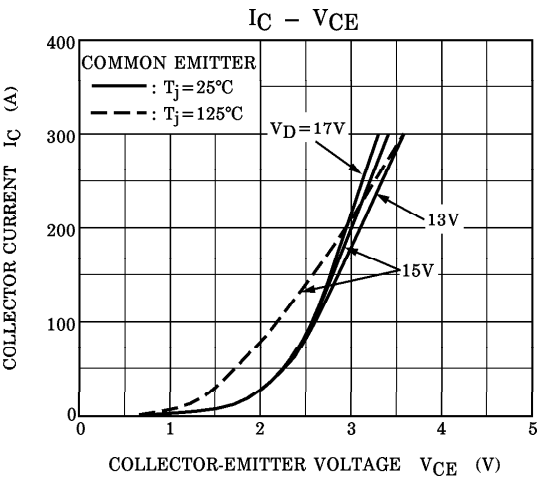
| CHARACTERISTIC                          |             | SYMBOL        | TEST CONDITION                                 | MIN. | TYP. | MAX. | UNIT             |
|-----------------------------------------|-------------|---------------|------------------------------------------------|------|------|------|------------------|
| Control Circuit Current                 |             | $I_D$         | $V_D = 15\text{V}$                             | —    | 20   | 30   | mA               |
| Input On Signal Voltage                 |             | $V_{IN(on)}$  | $V_D = 15\text{V}$ , $I_C = 150\text{mA}$      | 0.9  | 1.1  | 1.3  | V                |
| Fault Output Current                    | Protection  | $I_{FO(on)}$  | $V_D = 15\text{V}$                             | 8    | 10   | 12   | mA               |
|                                         | Normal      | $I_{FO(off)}$ |                                                | —    | —    | 1    |                  |
| Over Current Protection Trip Level      |             | OC            | $V_D = 15\text{V}$ , $T_j = 125^\circ\text{C}$ | 210  | 300  | —    | A                |
| Short Circuit Protection Trip Level     |             | SC            | $V_D = 15\text{V}$ , $T_j = 125^\circ\text{C}$ | 315  | 450  | —    | A                |
| Over Current Cut-Off Time               |             | $t_{off(OC)}$ | $V_D = 15\text{V}$                             | —    | 10   | —    | $\mu\text{s}$    |
| Over Temperature Protection             | Trip Level  | OT            | Case temperature                               | 111  | 118  | 125  | $^\circ\text{C}$ |
|                                         | Reset Level | OTr           |                                                | 93   | 100  | 107  |                  |
| Control Supply Under Voltage Protection | Trip Level  | UV            | —                                              | 11.3 | 12.0 | 12.7 | V                |
|                                         | Reset Level | UVr           |                                                | 11.8 | 12.5 | 13.2 |                  |
| Fault Output Pulse Width                |             | $t_{FO}$      | $V_D = 15\text{V}$                             | 1    | 2    | 3    | ms               |

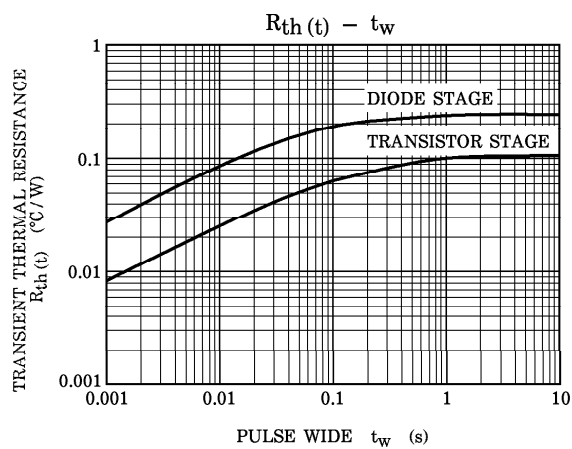
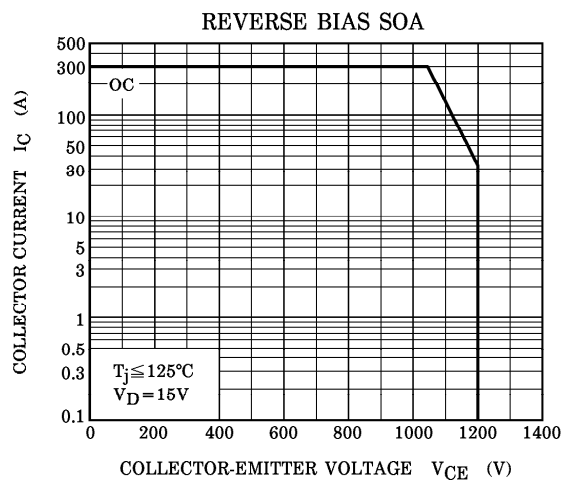
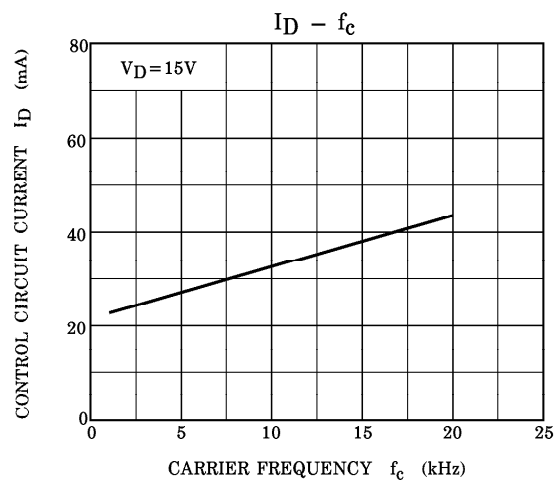
d. Thermal resistance ( $T_j = 25^\circ\text{C}$ )

| CHARACTERISTIC                      | SYMBOL        | TEST CONDITION      | MIN. | TYP. | MAX.  | UNIT               |
|-------------------------------------|---------------|---------------------|------|------|-------|--------------------|
| Junction to Case Thermal Resistance | $R_{th(j-c)}$ | IGBT                | —    | —    | 0.104 | $^\circ\text{C/W}$ |
|                                     |               | FRD                 | —    | —    | 0.25  |                    |
| Case to Fin Thermal Resistance      | $R_{th(c-f)}$ | Compound is applied | —    | 0.03 | —     | $^\circ\text{C/W}$ |

Note 1 : Switching time test circuit & timing chart

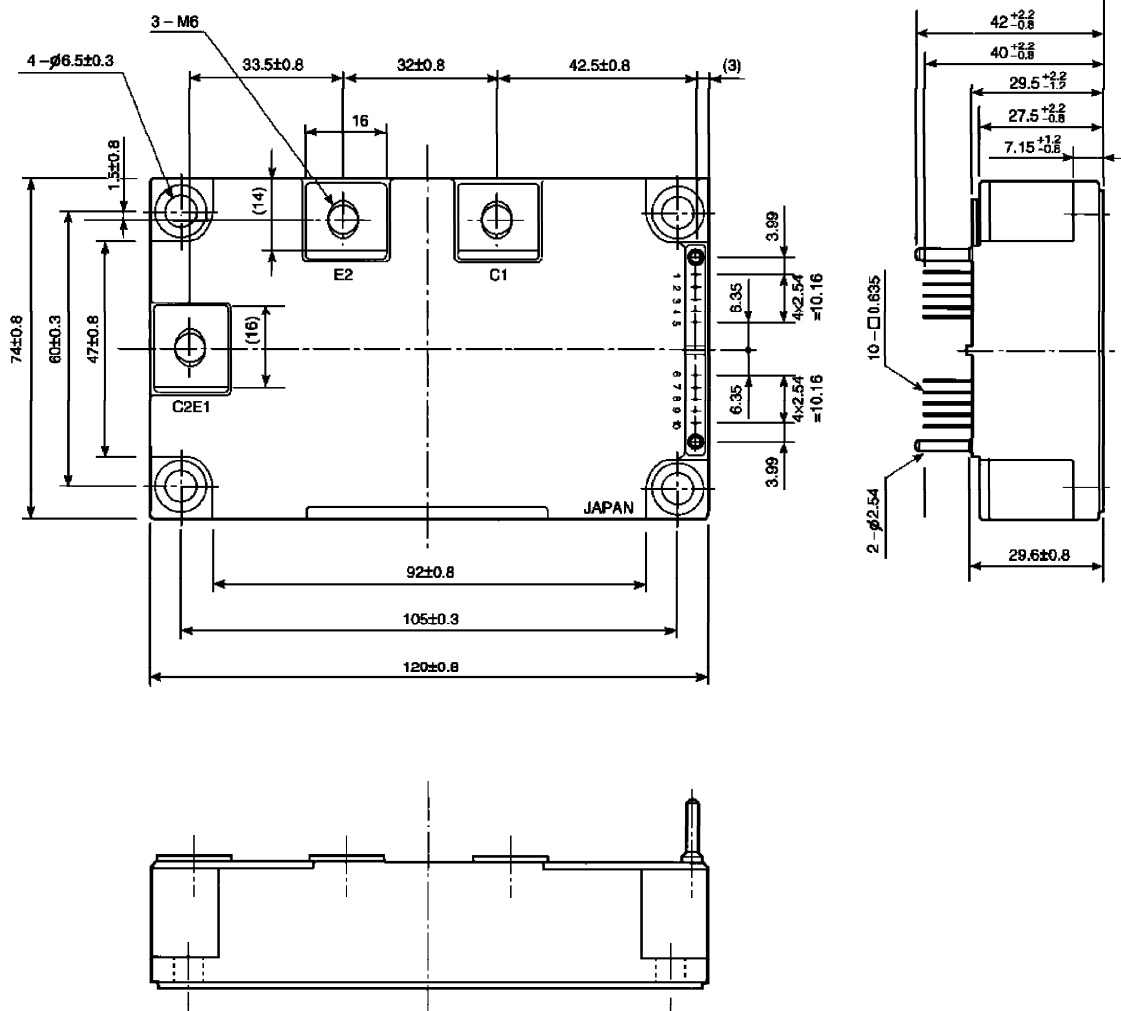






OUTLINE : TOSHIBA

Unit : mm



- |           |            |           |         |                        |
|-----------|------------|-----------|---------|------------------------|
| 1. FO (L) | 2. GND (L) | 3. IN (L) | 4. Open | 5. V <sub>D</sub> (L)  |
| 6. FO (H) | 7. GND (H) | 8. IN (H) | 9. Open | 10. V <sub>D</sub> (H) |