

TOSHIBA INTELLIGENT GTR MODULE SILICON N CHANNEL IGBT

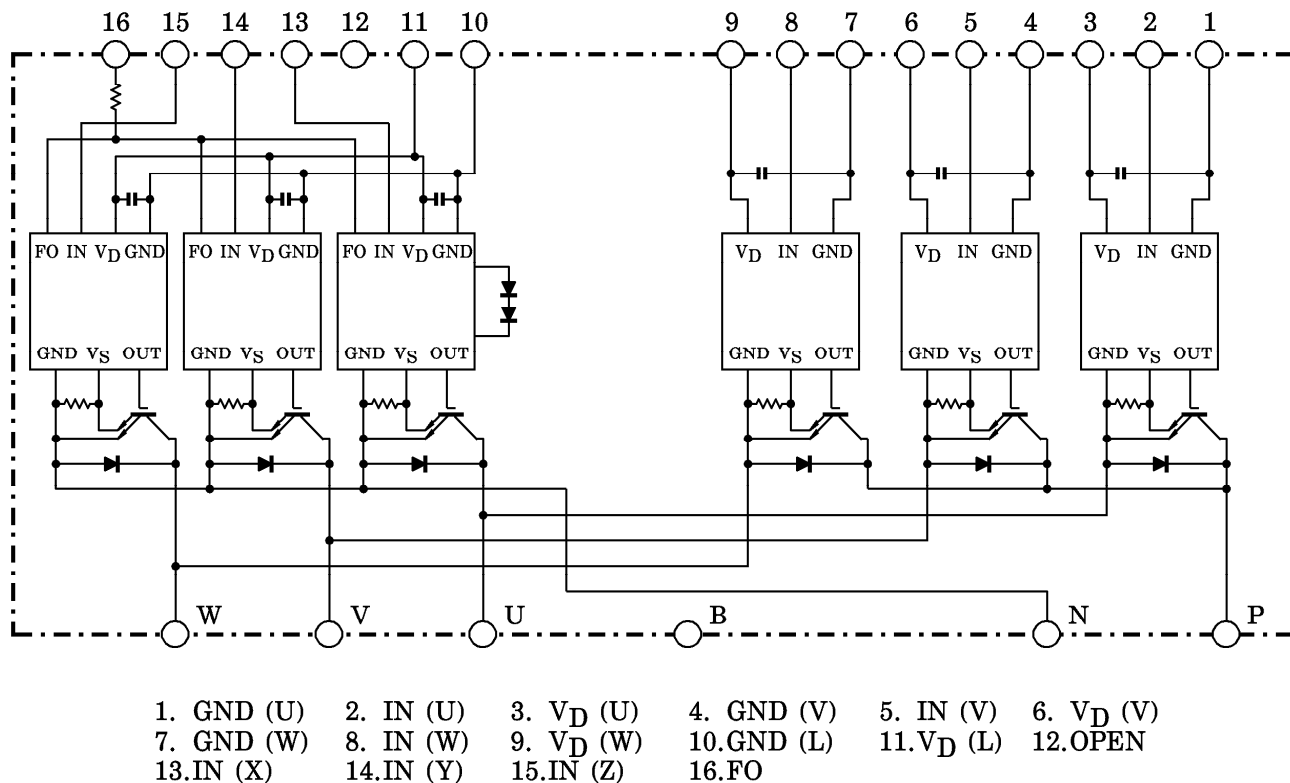
# MIG75J101H

HIGH POWER SWITCHING APPLICATIONS

MOTOR CONTROL APPLICATIONS

- Integrates Inverter & 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



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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 | $I_C$     | 75              | A                |
|          | Forward Current             | $T_c = 25^\circ\text{C}$ , DC | $I_F$     | 75              | A                |
|          | Collector Power Dissipation | $T_c = 25^\circ\text{C}$      | $P_C$     | 235             | 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                | 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 | $V_{CE}(\text{sat})$ | $V_D = 15\text{V}$ , $I_C = 75\text{A}$<br>$V_{IN} = 15\text{V} \rightarrow 0\text{V}$                                                            | $T_j = 25^\circ\text{C}$  | —    | 2.0  | 2.5  | V             |
|                                      |                      |                                                                                                                                                   | $T_j = 125^\circ\text{C}$ | —    | 2.0  | —    |               |
| Forward Voltage                      | $V_F$                | $I_F = 75\text{A}$                                                                                                                                |                           | —    | 2.1  | 3.0  | V             |
| Switching Time                       | $t_{on}$             | $V_{CC} = 300\text{V}$ , $I_C = 75\text{A}$<br>$V_D = 15\text{V}$ , $V_{IN} = 15\text{V} \leftrightarrow 0\text{V}$<br>Inductive load<br>(Note 1) |                           | —    | 1.0  | 2.0  | $\mu\text{s}$ |
|                                      | $t_{off}$            |                                                                                                                                                   |                           | —    | 1.2  | 3.0  |               |
|                                      | $t_f$                |                                                                                                                                                   |                           | —    | 0.2  | 0.5  |               |
|                                      | $t_{rr}$             |                                                                                                                                                   |                           | —    | 0.1  | 0.3  |               |

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

| CHARACTERISTIC                          |             | SYMBOL        | TEST CONDITION                              | MIN. | TYP. | MAX. | UNIT             |
|-----------------------------------------|-------------|---------------|---------------------------------------------|------|------|------|------------------|
| Control Circuit Current                 | High Side   | $I_D(H)$      | $V_D = 15\text{V}$                          | —    | 8    | —    | mA               |
|                                         | Low Side    | $I_D(L)$      |                                             | —    | 24   | —    |                  |
| Input-On Signal Voltage                 |             | $V_{IN(on)}$  | $V_D = 15\text{V}, I_C = 75\text{mA}$       | 1.3  | 1.5  | 1.7  | V                |
| Input-Off Signal Voltage                |             | $V_{IN(off)}$ | $V_D = 15\text{V}, I_C = 75\text{mA}$       | 2.2  | 2.5  | 2.8  | 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      | Inverter    | OC            | $V_D = 15\text{V}, T_j = 125^\circ\text{C}$ | 105  | 150  | —    | A                |
|                                         | Brake       |               |                                             | 40   | —    | —    |                  |
| Short Circuit Protection Trip Level     | Inverter    | SC            | $V_D = 15\text{V}, T_j = 125^\circ\text{C}$ | 157  | 225  | —    | A                |
|                                         | Brake       |               |                                             | 60   | —    | —    |                  |
| Over Current Cut-Off Time               |             | $t_{off(OC)}$ | $V_D = 15\text{V}$                          | —    | 5    | —    | $\mu\text{s}$    |
| Over Temperature Protection             | Trip Level  | OT            | Case temperature                            | 110  | 118  | 125  | $^\circ\text{C}$ |
|                                         | 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                |             | $t_{FO}$      | $V_D = 15\text{V}$                          | 1    | 2    | 3    | ms               |

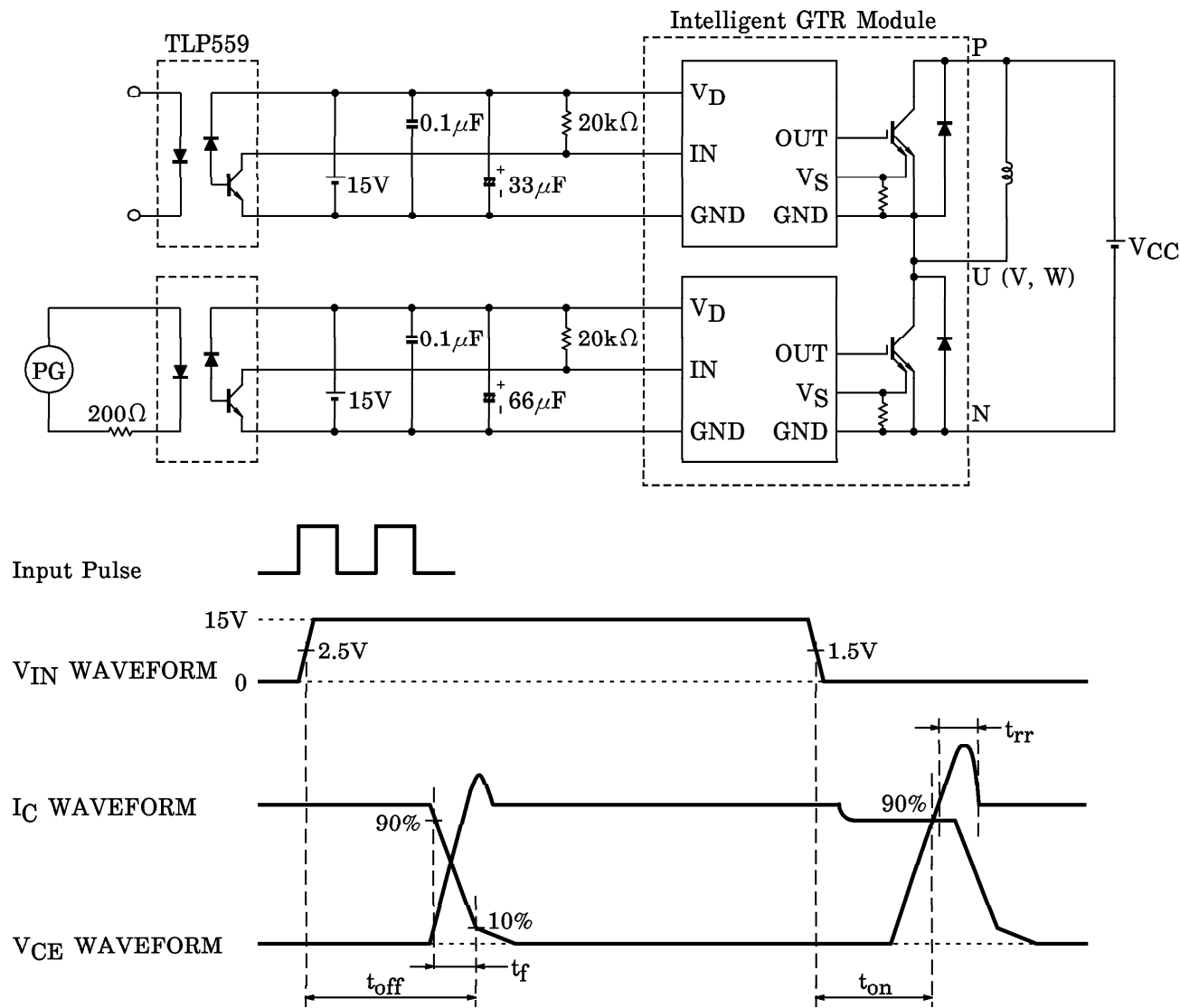
(\*1) Duty = 50%

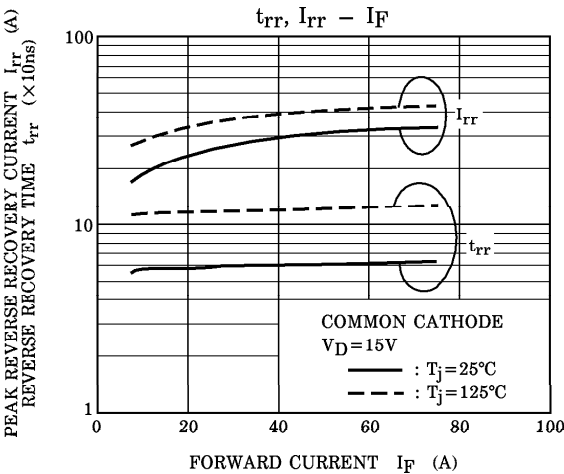
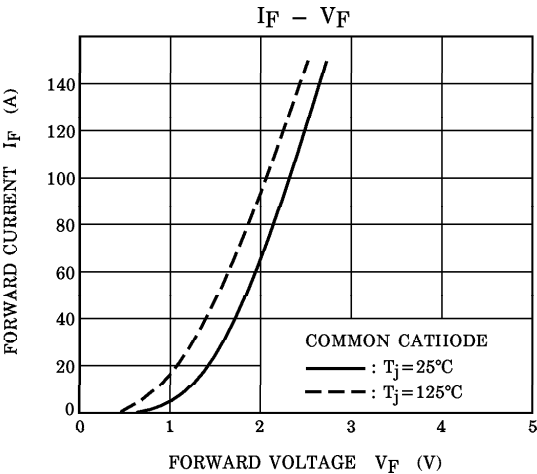
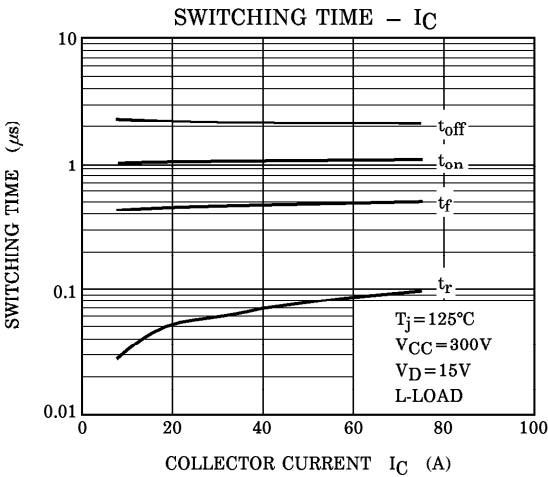
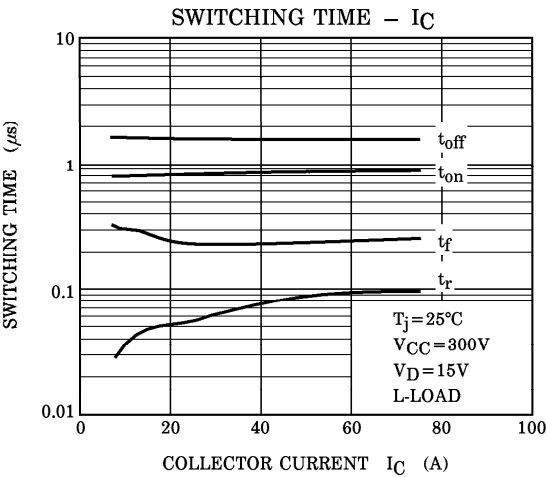
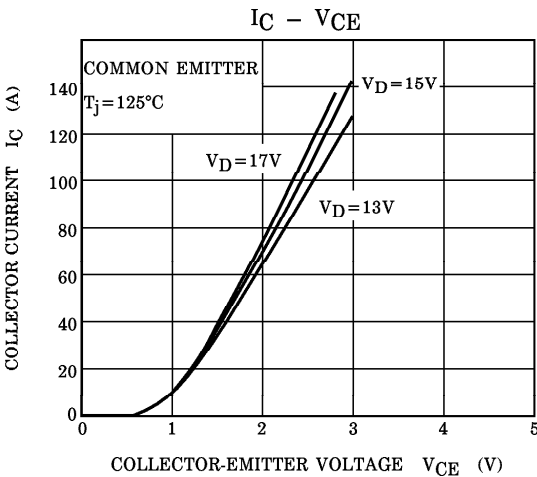
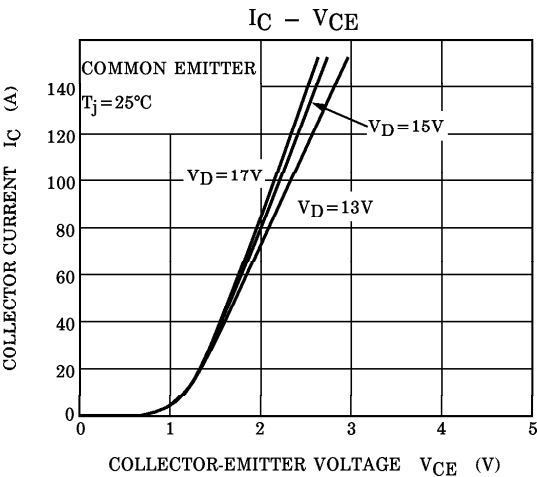
(\*2) Duty = 50% (All Elements) &amp; Fault Output Current (Sink)

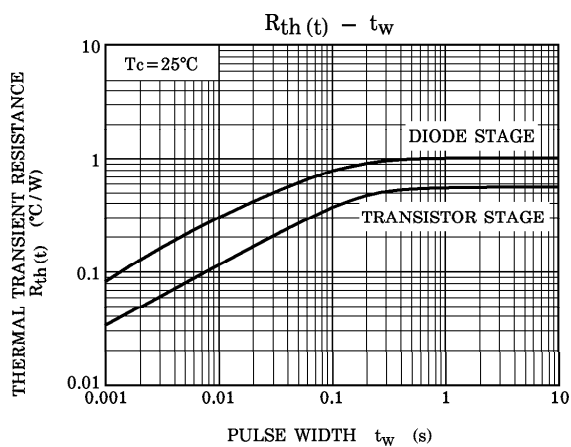
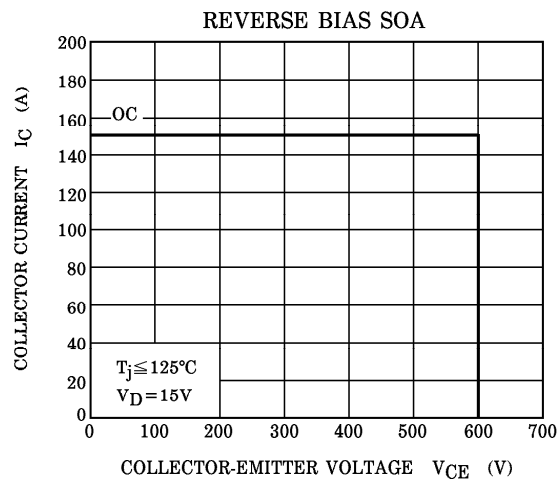
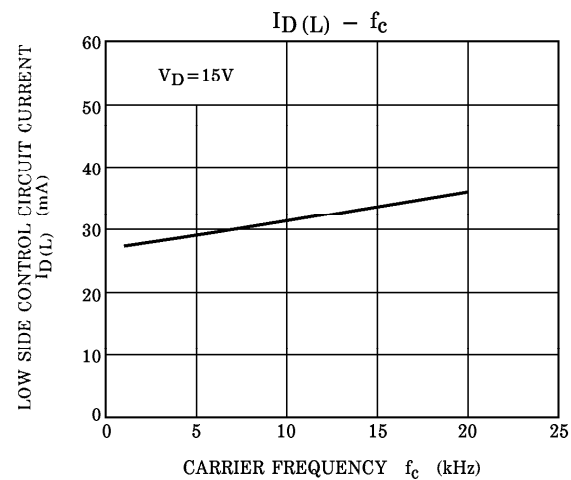
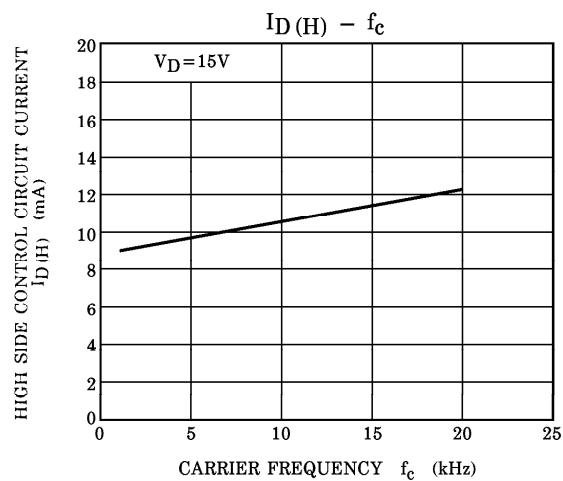
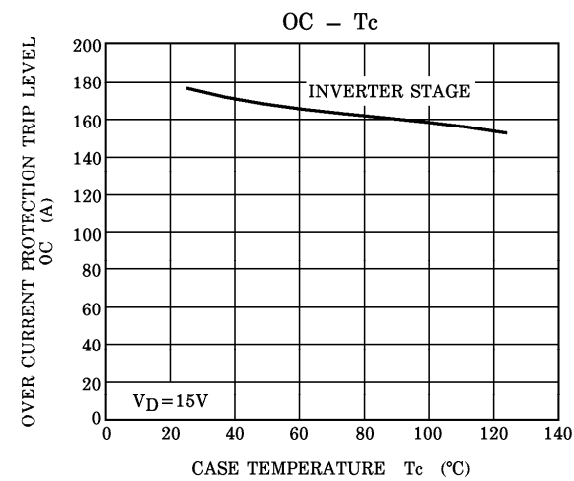
d. Thermal resistance ( $T_j = 25^{\circ}\text{C}$ )

| CHARACTERISTIC                      | SYMBOL        | TEST CONDITION      | MIN. | TYP. | MAX.  | UNIT                          |
|-------------------------------------|---------------|---------------------|------|------|-------|-------------------------------|
| Junction to Case Thermal Resistance | $R_{th(j-c)}$ | Inverter IGBT stage | —    | —    | 0.553 | $^{\circ}\text{C} / \text{W}$ |
|                                     |               | Inverter FRD stage  | —    | —    | 1.000 |                               |
|                                     |               | —                   | —    | —    | —     |                               |
|                                     |               | —                   | —    | —    | —     |                               |
| Case to Fin Thermal Resistance      | $R_{th(c-f)}$ | Compound is applied | —    | 0.05 | —     | $^{\circ}\text{C} / \text{W}$ |

Note 1 : Switching time test circuit & timing chart







OUTLINE

Unit : mm

