

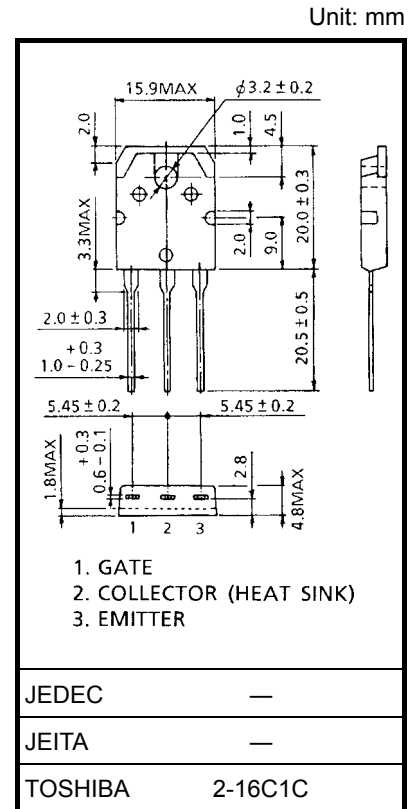
# GT40Q323

## Voltage Resonance Inverter Switching Application

- Enhancement-mode
- High speed:  $t_f = 0.14 \mu s$  (typ.) ( $I_C = 40A$ )
- FRD included between emitter and collector
- 4th generation
- TO-3P (N) (Toshiba package name)

### Absolute Maximum Ratings ( $T_a = 25^\circ C$ )

| Characteristics              | Symbol    | Rating                | Unit       |
|------------------------------|-----------|-----------------------|------------|
| Collector-emitter voltage    | $V_{CES}$ | 1200                  | V          |
| Gate-emitter voltage         | $V_{GES}$ | $\pm 25$              | V          |
| Continuous collector current | $I_C$     | @ $T_c = 100^\circ C$ | 20         |
|                              |           | @ $T_c = 25^\circ C$  | 39         |
| Pulsed collector current     | $I_{CP}$  | 80                    | A          |
| Diode forward current        | DC        | $I_F$                 | 10         |
|                              | Pulsed    | $I_{FP}$              | 80         |
| Collector power dissipation  | $P_C$     | @ $T_c = 100^\circ C$ | 80         |
|                              |           | @ $T_c = 25^\circ C$  | 200        |
| Junction temperature         | $T_j$     | 150                   | $^\circ C$ |
| Storage temperature range    | $T_{stg}$ | -55 to 150            | $^\circ C$ |



Weight: 4.6 g (typ.)

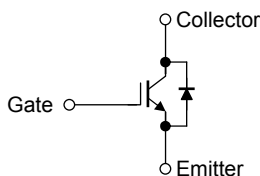
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/Derating Concept and Methods) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

### Thermal Characteristics

| Characteristics            | Symbol        | Max   | Unit         |
|----------------------------|---------------|-------|--------------|
| Thermal resistance (IGBT)  | $R_{th(j-c)}$ | 0.625 | $^\circ C/W$ |
| Thermal resistance (diode) | $R_{th(j-c)}$ | 1.79  | $^\circ C/W$ |

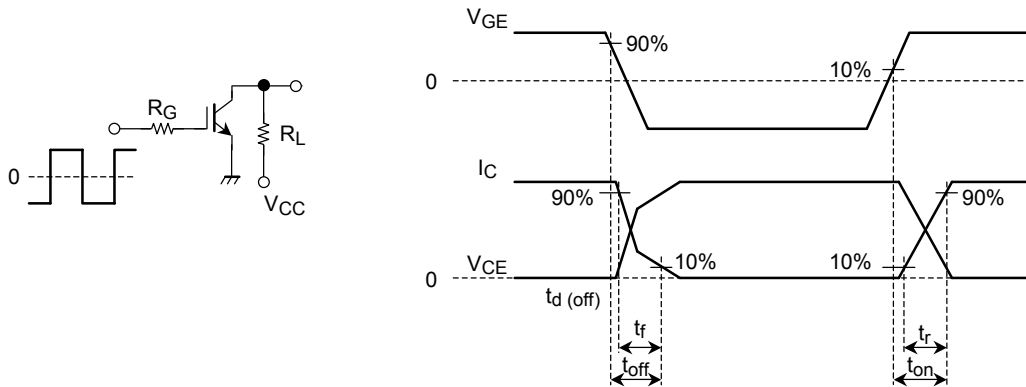
### Equivalent Circuit

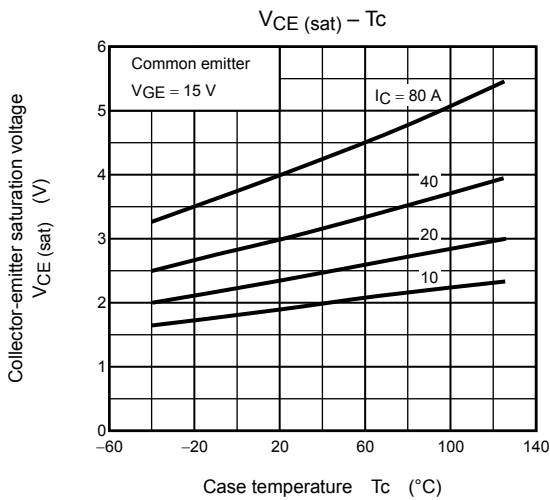
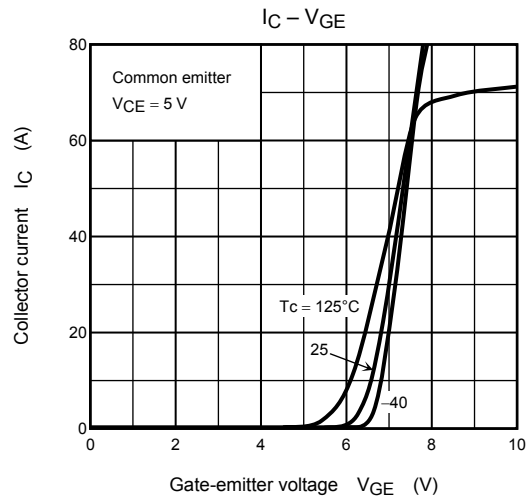
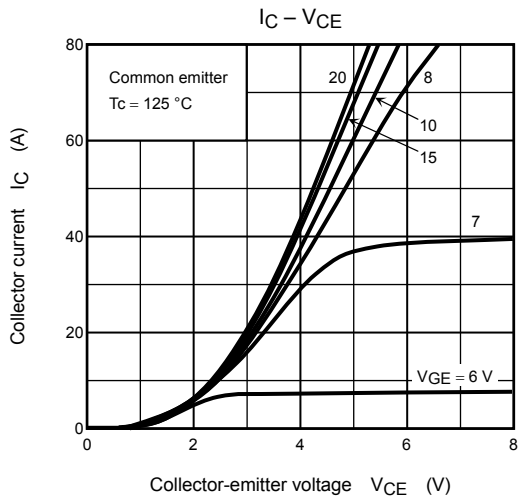
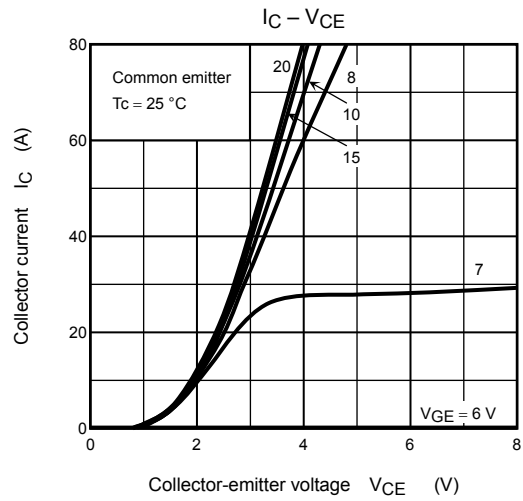
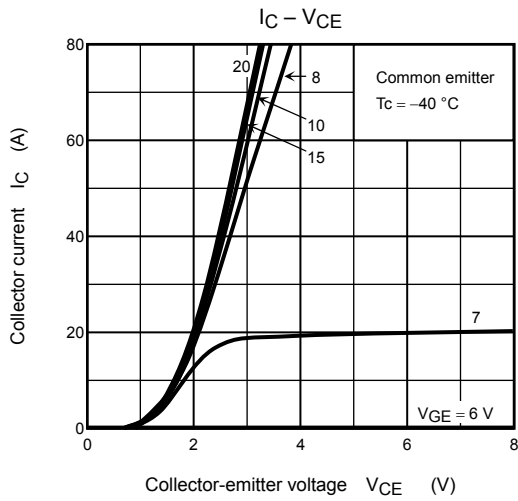


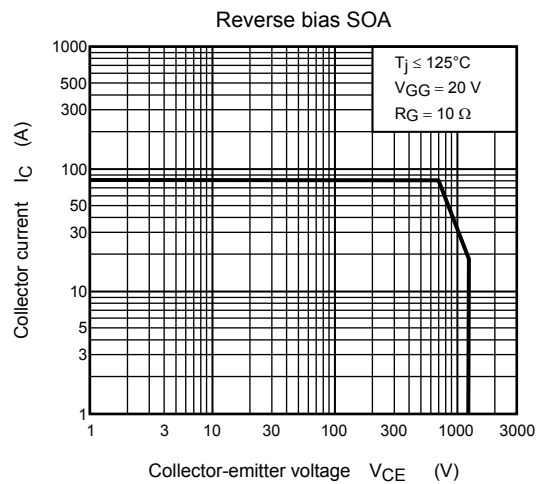
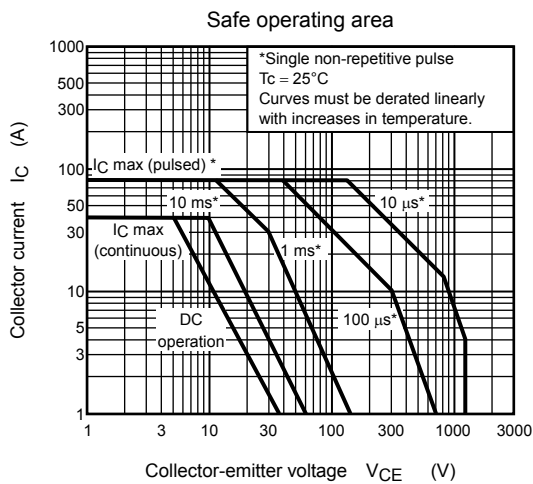
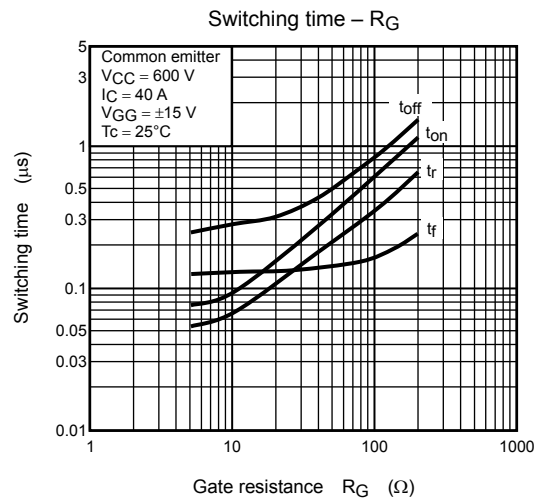
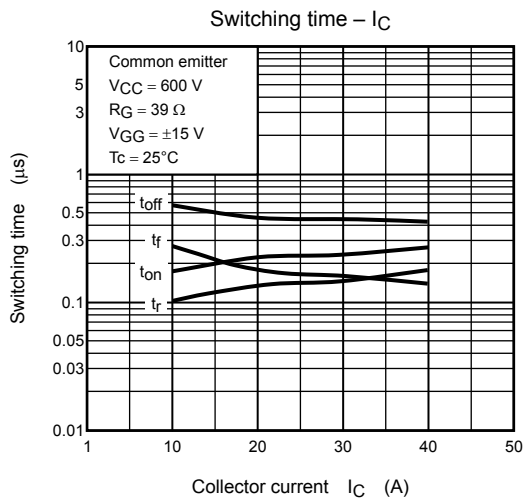
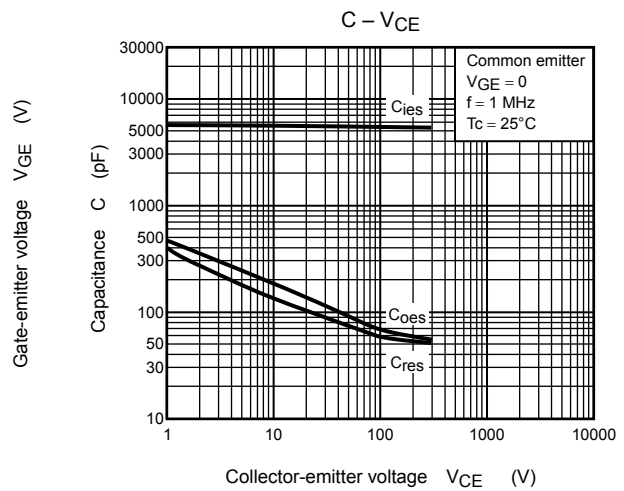
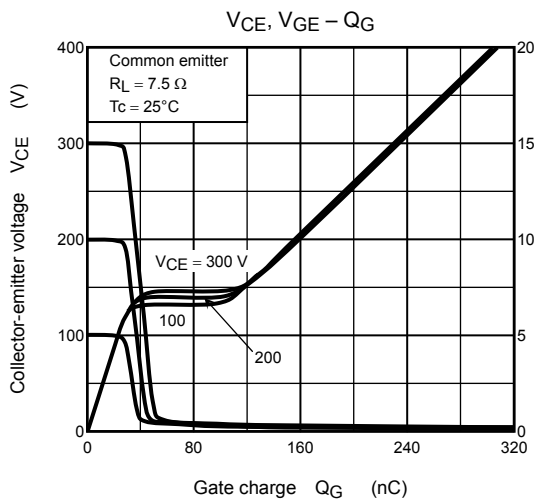
## Electrical Characteristics (Ta = 25°C)

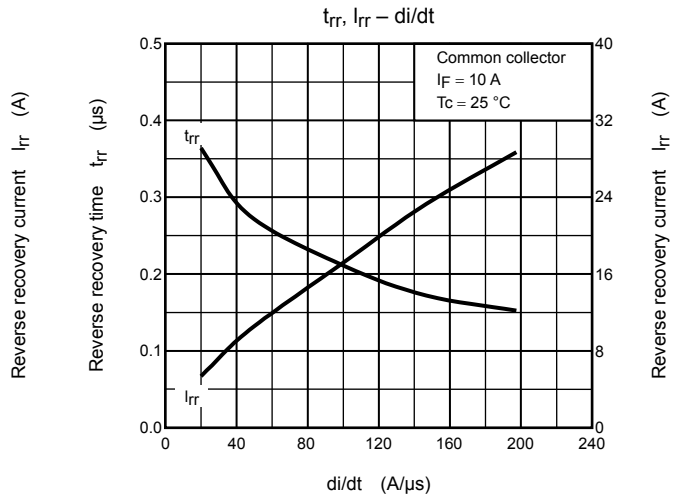
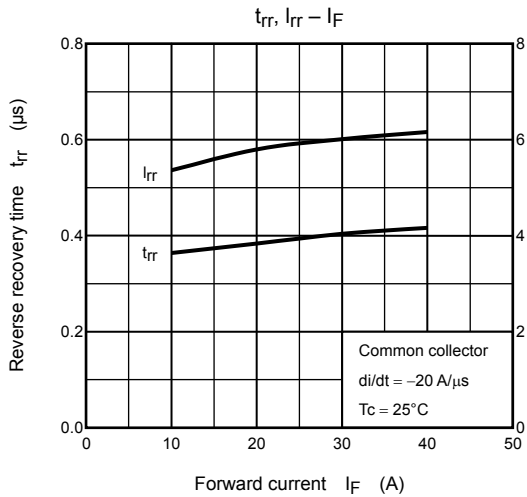
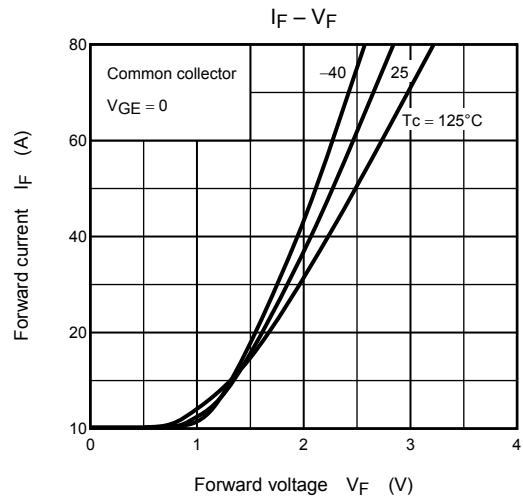
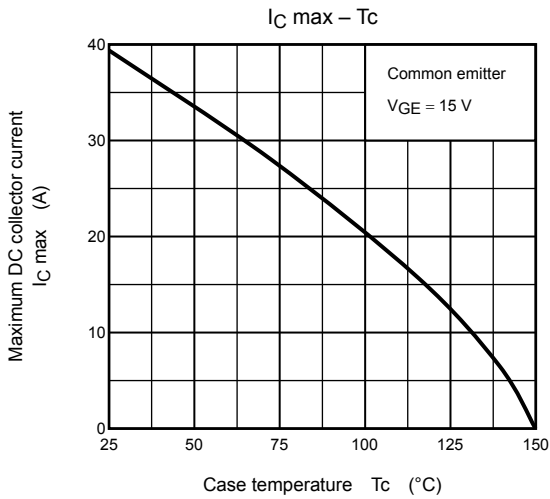
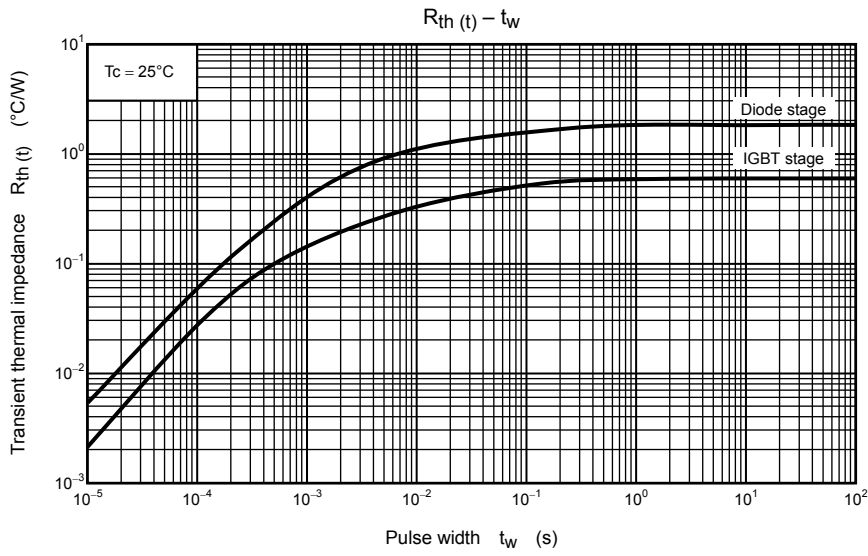
| Characteristics                      |               | Symbol        | Test Condition   | Min | Typ. | Max       | Unit          |
|--------------------------------------|---------------|---------------|--|-----|------|-----------|---------------|
| Gate leakage current                 |               | $I_{GES}$     | $V_{GE} = \pm 25\text{ V}, V_{CE} = 0$   | —   | —    | $\pm 500$ | nA            |
| Collector cut-off current            |               | $I_{CES}$     | $V_{CE} = 1200\text{ V}, V_{GE} = 0$   | —   | —    | 5.0       | mA            |
| Gate-emitter cut-off voltage         |               | $V_{GE(OFF)}$ | $I_C = 40\text{ mA}, V_{CE} = 5\text{ V}$  | 4.0 | —    | 7.0       | V             |
| Collector-emitter saturation voltage |               | $V_{CE(sat)}$ | $I_C = 40\text{ A}, V_{GE} = 15\text{ V}$  | —   | 3.0  | 3.7       | V             |
| Input capacitance                    |               | $C_{ies}$     | $V_{CE} = 10\text{ V}, V_{GE} = 0, f = 1\text{ MHz}$   | —   | 5550 | —         | pF            |
| Switching time                       | Rise time     | $t_r$         | Resistive Load<br>$V_{CC} = 600\text{ V}, I_C = 40\text{ A}$<br>$V_{GG} = \pm 15\text{ V}, R_G = 39\ \Omega$<br><br>(Note 1) | —   | 0.18 | —         | $\mu\text{s}$ |
|                                      | Turn-on time  | $t_{on}$      |  | —   | 0.26 | —         |               |
|                                      | Fall time     | $t_f$         |  | —   | 0.14 | 0.21      |               |
|                                      | Turn-off time | $t_{off}$     |  | —   | 0.43 | —         |               |
| Diode forward voltage                |               | $V_F$         | $I_F = 10\text{ A}, V_{GE} = 0$  | —   | —    | 2.1       | V             |
| Reverse recovery time                |               | $t_{rr}$      | $I_F = 10\text{ A}, di/dt = -20\text{ A}/\mu\text{s}$  | —   | 0.4  | —         | $\mu\text{s}$ |

Note 1: Switching time measurement circuit and input/output waveforms









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