

TOSHIBA Field Effect Transistor Silicon N-Channel MOS Type (Ultra-High-Speed U-MOSIII)

TPCA8022-H

Switching Regulator Applications

Motor Drive Applications

DC/DC Converter Applications

- Small footprint due to a small and thin package
- High speed switching
- Low drain-source ON-resistance
: $R_{DS(ON)} = 17 \text{ m}\Omega$ (typ.) ($V_{GS}=10\text{V}$, $I_D=11\text{A}$)
- High forward transfer admittance: $|Y_{fs}| = 46 \text{ S}$ (typ.)
- Low leakage current: $I_{DSS} = 10 \text{ }\mu\text{A}$ (max) ($V_{DS} = 100 \text{ V}$)
- Enhancement mode: $V_{th} = 2.0$ to 4.0 V ($V_{DS} = 10 \text{ V}$, $I_D = 1 \text{ mA}$)

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

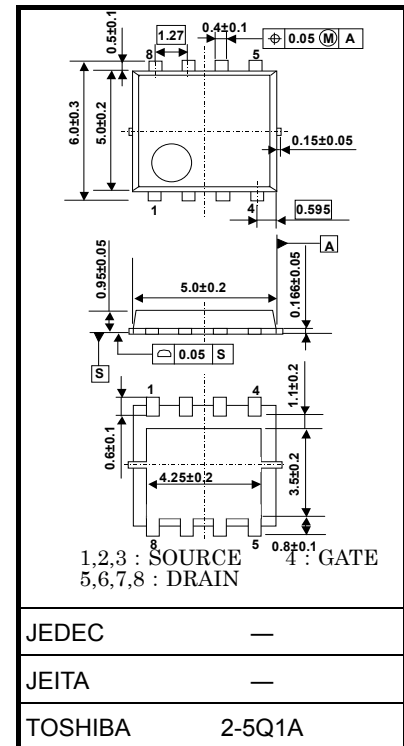
| Characteristic | | Symbol | Rating | Unit |
|--|-------------------------------------|-----------|------------|------------------|
| Drain-source voltage | | V_{DSS} | 100 | V |
| Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$) | | V_{DGR} | 100 | V |
| Gate-source voltage | | V_{GSS} | ± 20 | V |
| Drain current | DC (Note 1) | I_D | 22 | A |
| | Pulsed (Note 1) | I_{DP} | 66 | |
| Drain power dissipation | ($T_c=25^\circ\text{C}$) | P_D | 45 | W |
| Drain power dissipation | ($t = 10 \text{ s}$) (Note 2a) | P_D | 2.8 | W |
| Drain power dissipation | ($t = 10 \text{ s}$) (Note 2b) | P_D | 1.6 | W |
| Single-pulse avalanche energy | (Note 3) | E_{AS} | 197 | mJ |
| Avalanche current | | I_{AR} | 22 | A |
| Repetitive avalanche energy (Note 2a) (Note 4) | | E_{AR} | 3.8 | mJ |
| Channel temperature | | T_{ch} | 150 | $^\circ\text{C}$ |
| Storage temperature range | | T_{stg} | -55 to 150 | $^\circ\text{C}$ |

Note: For Notes 1 to 4, refer to the next page.

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.).

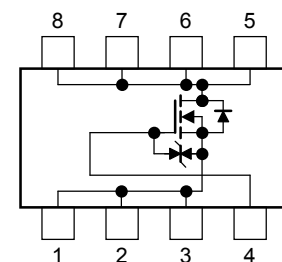
This transistor is an electrostatic-sensitive device. Handle with care.

Unit: mm



Weight: 0.069 g (typ.)

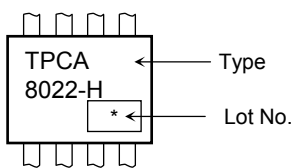
Circuit Configuration



Thermal Characteristics

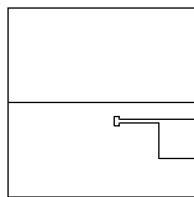
| Characteristic | Symbol | Max | Unit |
|---|----------------|------|---------------------------|
| Thermal resistance, channel to case ($T_c=25^\circ\text{C}$) | $R_{th}(ch-c)$ | 2.78 | $^\circ\text{C}/\text{W}$ |
| Thermal resistance, channel to ambient ($t = 10\text{ s}$) (Note 2a) | $R_{th}(ch-a)$ | 44.6 | $^\circ\text{C}/\text{W}$ |
| Thermal resistance, channel to ambient ($t = 10\text{ s}$) (Note 2b) | $R_{th}(ch-a)$ | 78.1 | $^\circ\text{C}/\text{W}$ |

Marking (Note 5)



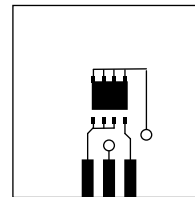
Note 1: The channel temperature should not exceed 150°C during use.

Note 2: (a) Device mounted on a glass-epoxy board (a) (b) Device mounted on a glass-epoxy board (b)



(a)

FR-4
 $25.4 \times 25.4 \times 0.8$
 (Unit: mm)



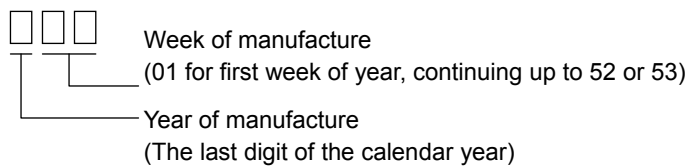
(b)

FR-4
 $25.4 \times 25.4 \times 0.8$
 (Unit: mm)

Note 3: $V_{DD} = 50\text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 0.5\text{ mH}$, $R_G = 25\ \Omega$, $I_{AR} = 22\text{ A}$

Note 4: Repetitive rating: pulse width limited by max channel temperature

Note 5: * Weekly code: (Three digits)

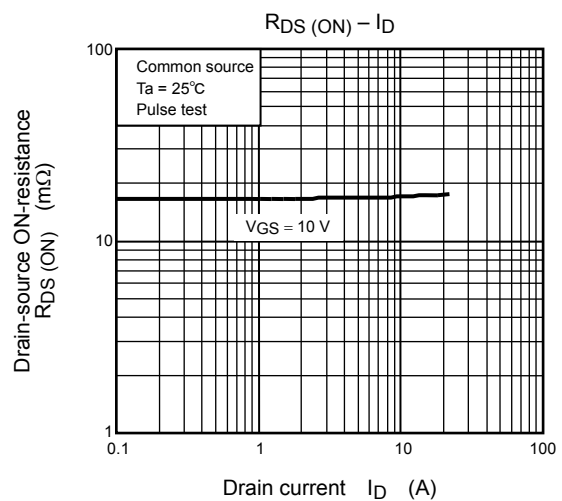
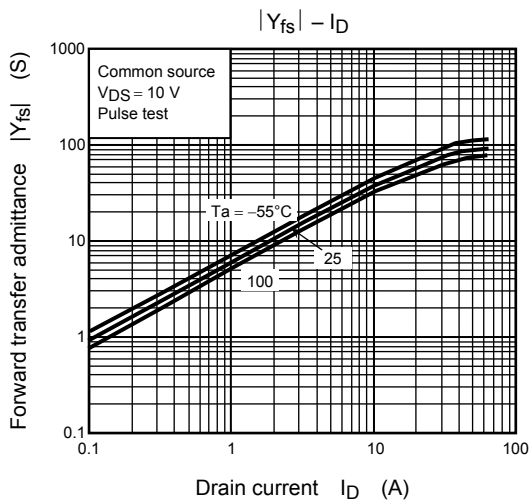
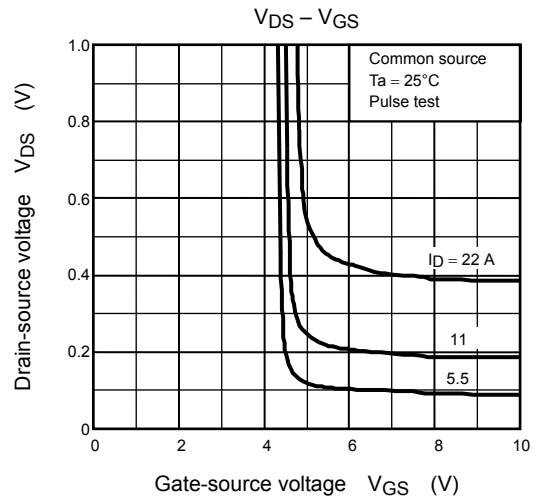
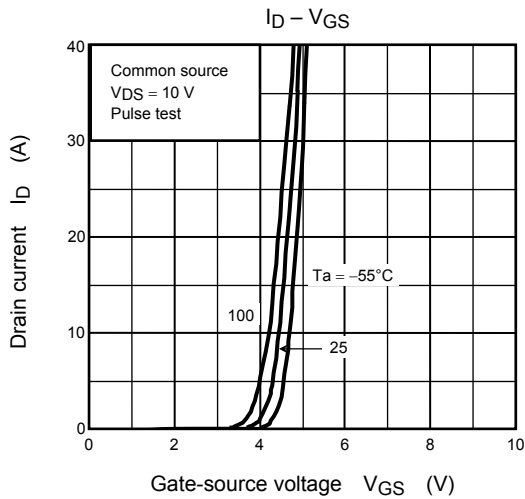
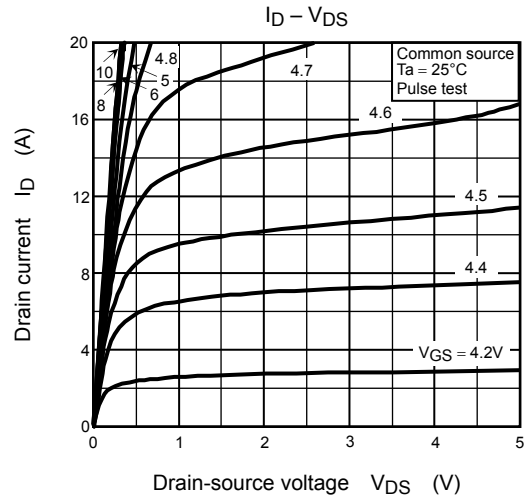
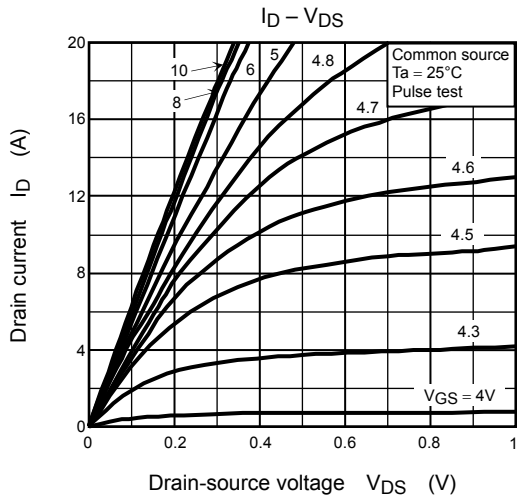


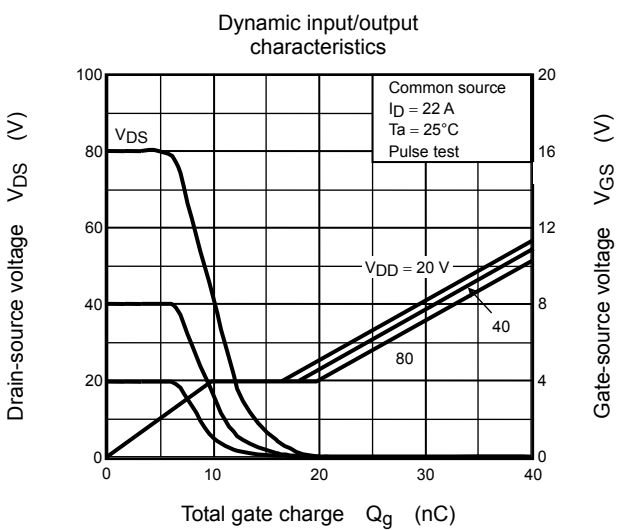
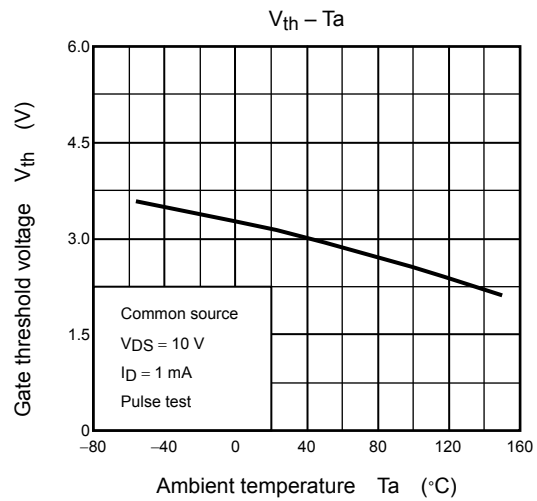
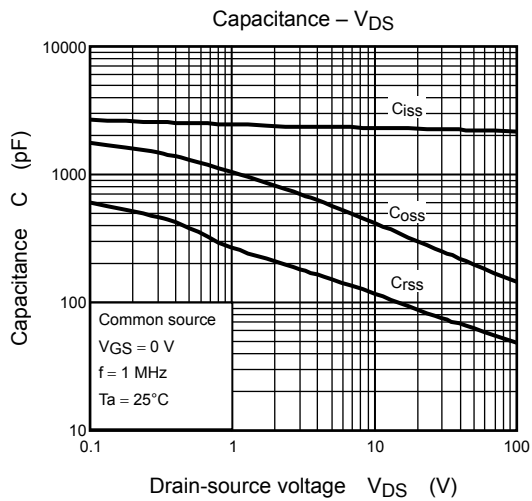
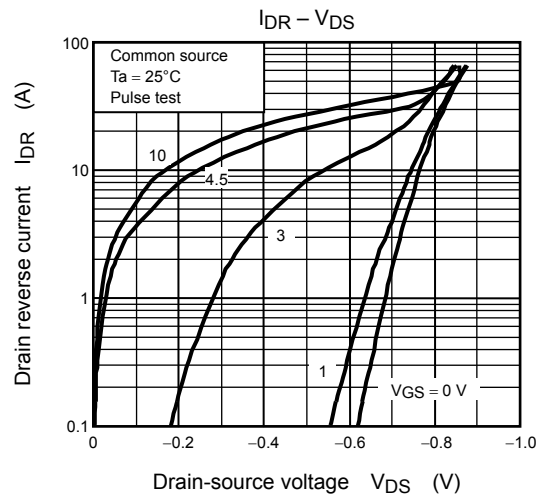
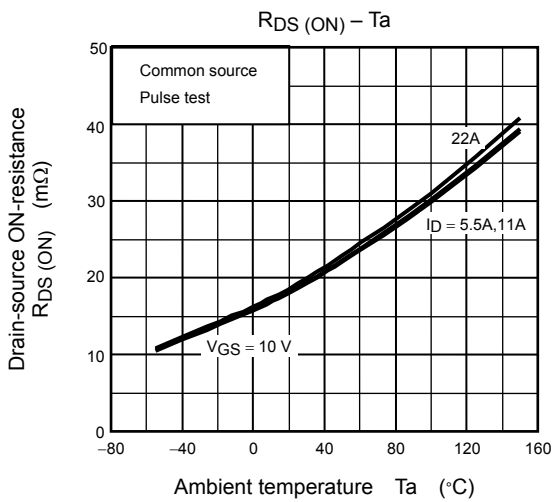
Electrical Characteristics (Ta = 25°C)

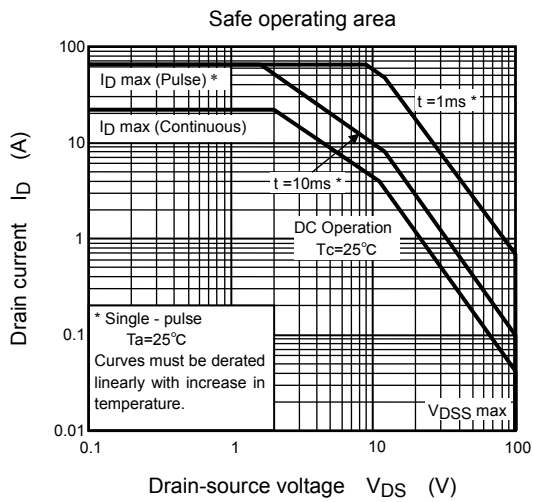
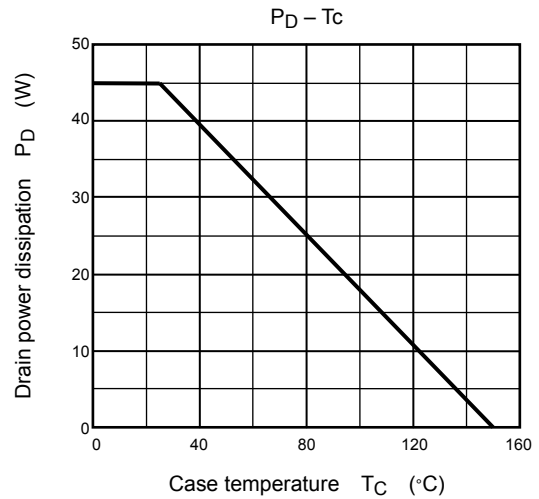
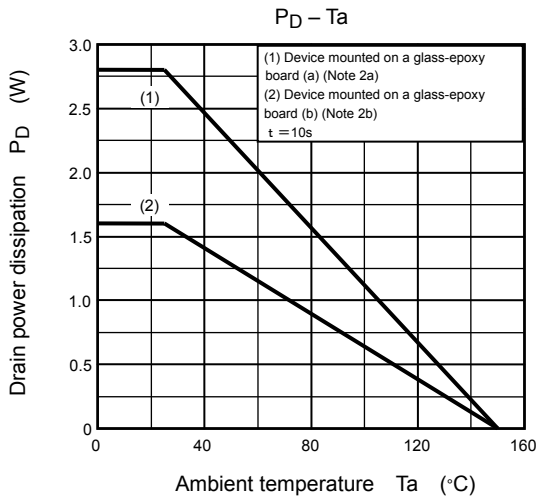
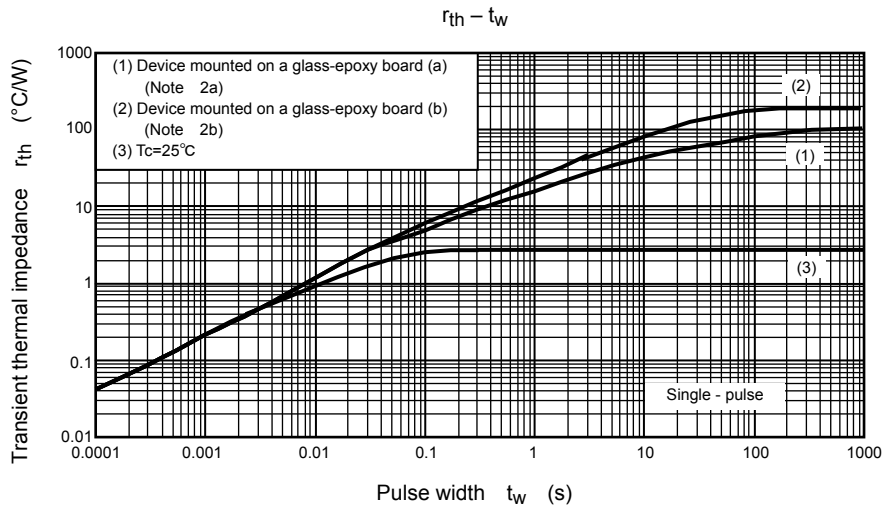
| Characteristic | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---------------|---------------|--|-----|------|----------|------------------|
| Gate leakage current | | I_{GSS} | $V_{GS} = \pm 16 \text{ V}, V_{DS} = 0 \text{ V}$ | — | — | ± 10 | μA |
| Drain cutoff current | | I_{DSS} | $V_{DS} = 100 \text{ V}, V_{GS} = 0 \text{ V}$ | — | — | 10 | μA |
| Drain-source breakdown voltage | | $V_{(BR)DSS}$ | $I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}$ | 100 | — | — | V |
| Gate threshold voltage | | V_{th} | $V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA}$ | 2.0 | — | 4.0 | V |
| Drain-source ON-resistance | | $R_{DS(ON)}$ | $V_{GS} = 10 \text{ V}, I_D = 11 \text{ A}$ | — | 17 | 26 | $\text{m}\Omega$ |
| Forward transfer admittance | | $ Y_{fs} $ | $V_{DS} = 10 \text{ V}, I_D = 11 \text{ A}$ | 23 | 46 | — | S |
| Input capacitance | | C_{iss} | $V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$ | — | 2330 | — | pF |
| Reverse transfer capacitance | | C_{rss} | | — | 110 | — | |
| Output capacitance | | C_{oss} | | — | 420 | — | |
| Gate-Resistance | | R_g | | — | 1.5 | — | |
| Switching time | Rise time | t_r | <p>$V_{GS} = 10 \text{ V}, 0 \text{ V}$ $I_D = 11 \text{ A}$ $R_L = 4.5\Omega$ $V_{DD} \approx 50 \text{ V}$ $\text{Duty} \leq 1\%, t_w = 10 \mu\text{s}$</p> | — | 4.8 | — | ns |
| | Turn-on time | t_{on} | | — | 14 | — | |
| | Fall time | t_f | | — | 6.7 | — | |
| | Turn-off time | t_{off} | | — | 42 | — | |
| Total gate charge (gate-source plus gate-drain) | | Q_g | $V_{DD} \approx 80 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 22 \text{ A}$ | — | 38 | — | nC |
| Gate-source charge 1 | | Q_{gs1} | | — | 9.8 | — | |
| Gate-drain ("Miller") charge | | Q_{gd} | | — | 10 | — | |
| Gate switch charge | | Q_{sw} | | — | 14 | — | |

Source-Drain Ratings and Characteristics (Ta = 25°C)

| Characteristic | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------------|-------|-----------|---|-----|------|------|------|
| Drain reverse current | Pulse | I_{DRP} | — | — | — | 66 | A |
| Forward voltage (diode) | | V_{DSF} | $I_{DR} = 22 \text{ A}, V_{GS} = 0 \text{ V}$ | — | — | -1.2 | V |







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20070701-EN

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