

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (U-MOS III)

TPCP8201

Portable Equipment Applications
 Motor Drive Applications
 DC-DC Converter Applications

- Lead(Pb)-Free
- Low drain-source ON resistance: $R_{DS(ON)} = 38 \text{ m}\Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 7.0 \text{ S}$ (typ.)
- Low leakage current: $I_{DSS} = 10 \text{ }\mu\text{A}$ ($V_{DS} = 30 \text{ V}$)
- Enhancement mode: $V_{th} = 1.3 \text{ to } 2.5 \text{ V}$ ($V_{DS} = 10 \text{ V}$, $I_D = 1 \text{ mA}$)

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

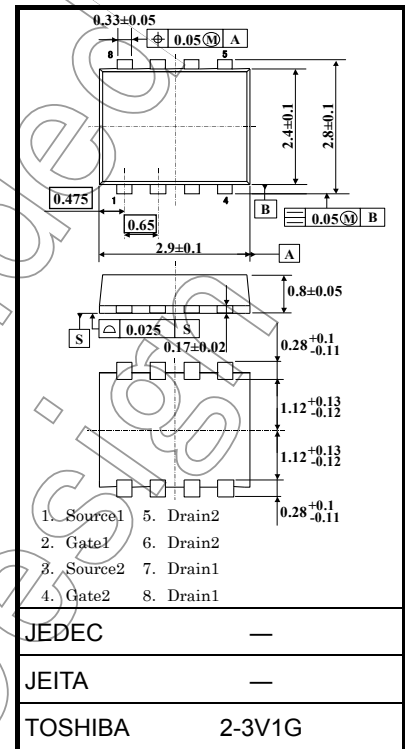
| Characteristics | | Symbol | Rating | Unit |
|---|---|-----------|----------|------------------|
| Drain-source voltage | | V_{DS} | 30 | V |
| Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$) | | V_{DGR} | 30 | V |
| Gate-source voltage | | V_{GSS} | ± 20 | V |
| Drain current | DC (Note 1) | I_D | 4.2 | A |
| | Pulse (Note 1) | I_{DP} | 16.8 | |
| Drain power dissipation ($t = 5 \text{ s}$) (Note 2a) | Single-device operation (Note 3a) | $P_D(1)$ | 1.48 | W |
| | Single-device value at dual operation (Note 3b) | $P_D(2)$ | 1.23 | |
| Drain power dissipation ($t = 5 \text{ s}$) (Note 2b) | Single-device operation (Note 3a) | $P_D(1)$ | 0.58 | W |
| | Single-device value at dual operation (Note 3b) | $P_D(2)$ | 0.36 | |
| Single pulse avalanche energy (Note 4) | | E_{AS} | 2.86 | mJ |
| Avalanche current | | I_{AR} | 2.1 | A |
| Repetitive avalanche energy Single-device value at dual operation (Note 2a, 3b, 5) | | E_{AR} | 0.12 | mJ |
| Channel temperature | | T_{ch} | 150 | $^\circ\text{C}$ |
| Storage temperature range | | T_{stg} | -55~150 | $^\circ\text{C}$ |

Note: For Notes 1 to 6, 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).

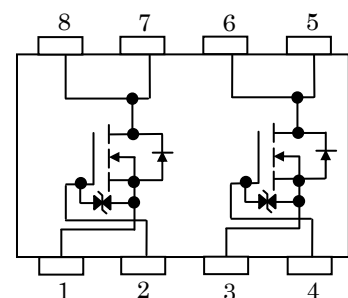
This transistor is an electrostatic-sensitive device. Handle with caution.

Unit: mm

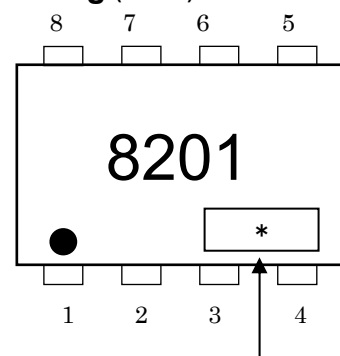


Weight: 0.017 g (typ.)

Circuit Configuration



Marking (Note 6)

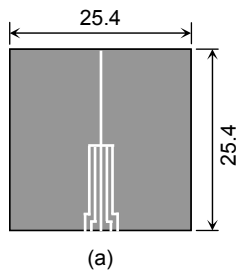


Thermal Characteristics

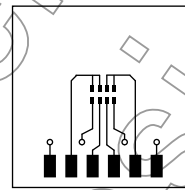
| Characteristics | | Symbol | Max | Unit |
|--|---|----------------------------|-------|------|
| Thermal resistance, channel to ambient (t = 5 s) (Note 2a) | Single-device operation (Note 3a) | R _{th} (ch-a) (1) | 84.5 | °C/W |
| | Single-device value at dual operation (Note 3b) | R _{th} (ch-a) (2) | 101.6 | |
| Thermal resistance, channel to ambient (t = 5 s) (Note 2b) | Single-device operation (Note 3a) | R _{th} (ch-a) (1) | 215.5 | °C/W |
| | Single-device value at dual operation (Note 3b) | R _{th} (ch-a) (2) | 347.2 | |

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)



FR-4
25.4 × 25.4 × 0.8
(Unit: mm)



FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

Note 3: a) The power dissipation and thermal resistance values shown are for a single device. (During single-device operation, power is only applied to one device.)

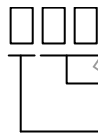
b) The power dissipation and thermal resistance values shown are for a single device. (During dual operation, power is evenly applied to both devices.)

Note 4: V_{DD} = 24 V, T_{ch} = 25°C (initial), L = 0.5 mH, R_G = 25 Ω, I_{AR} = 2.1 A

Note 5: Repetitive rating: pulse width limited by maximum channel temperature.

Note 6: ● on the lower left of the marking indicates Pin 1.

※ Weekly code (3 digits):



Week of manufacture

(01 for the first week of the year, continuing up to 52 or 53)

Year of manufacture

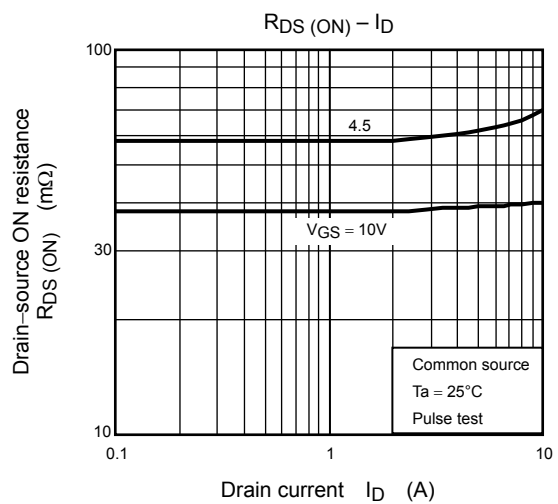
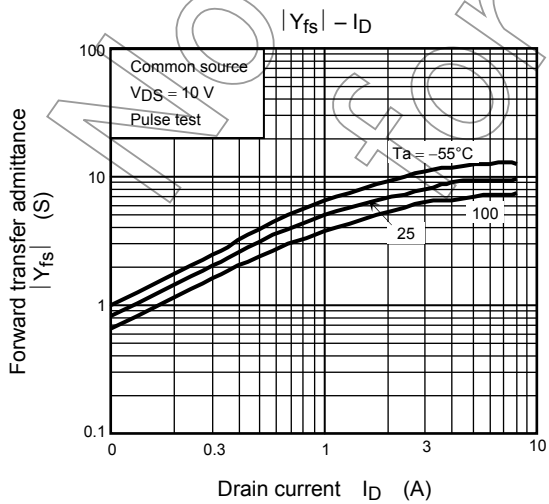
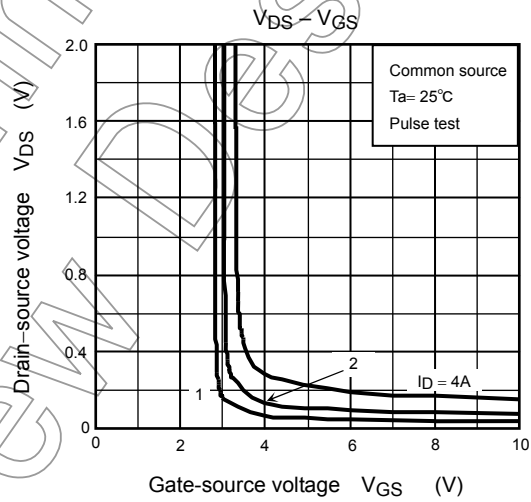
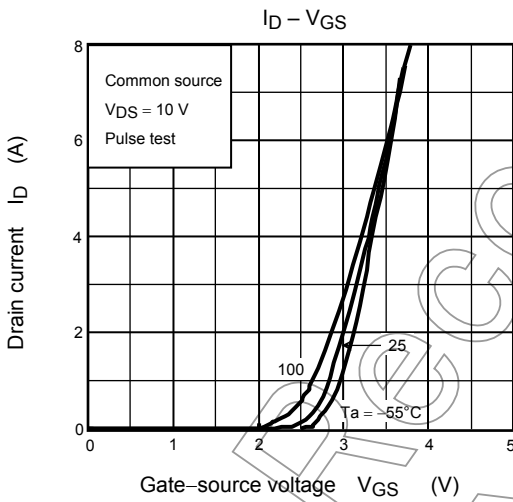
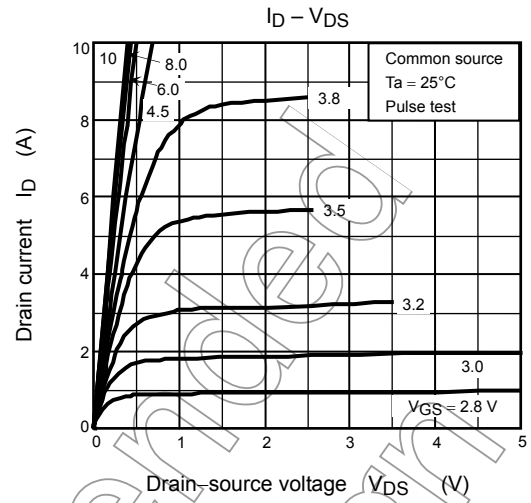
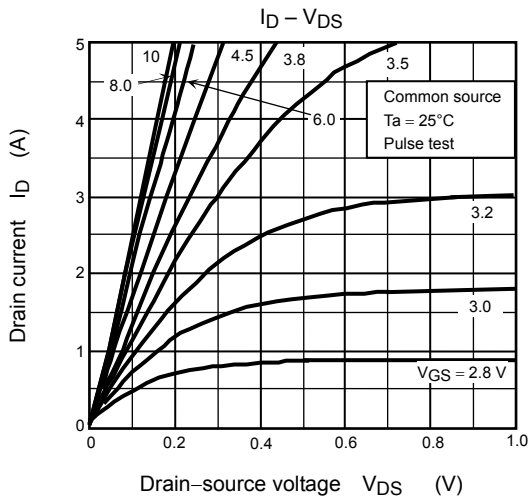
(The last digit of the calendar year)

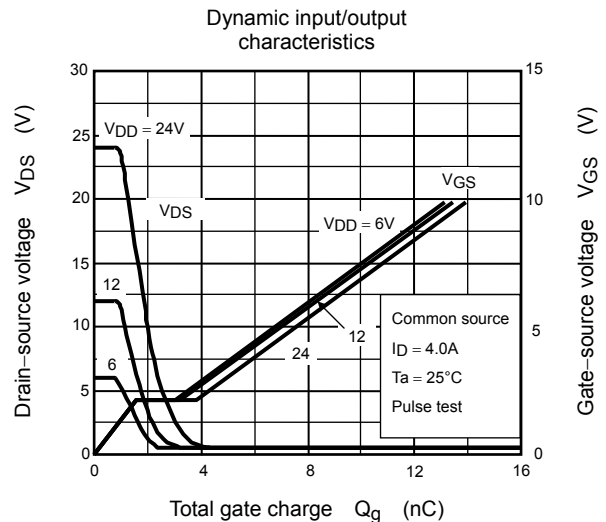
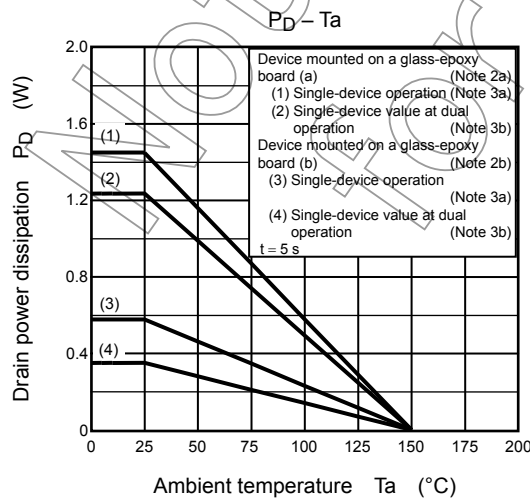
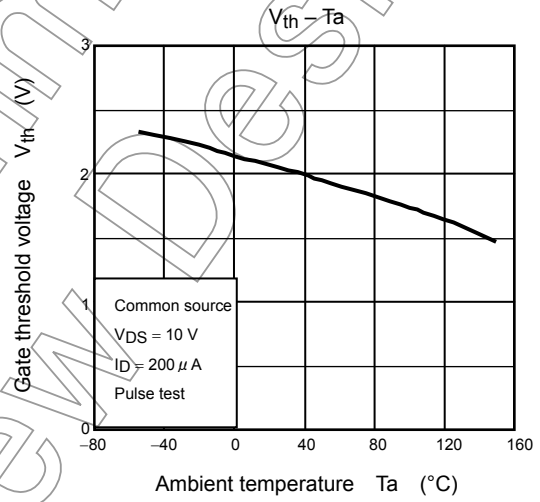
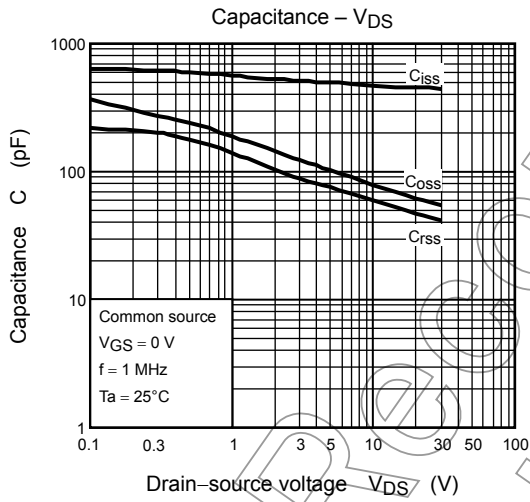
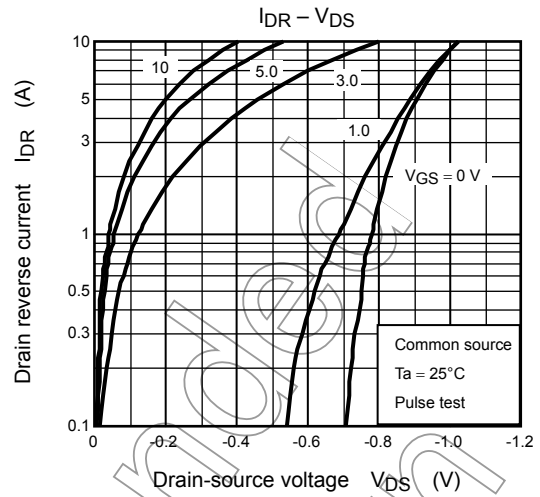
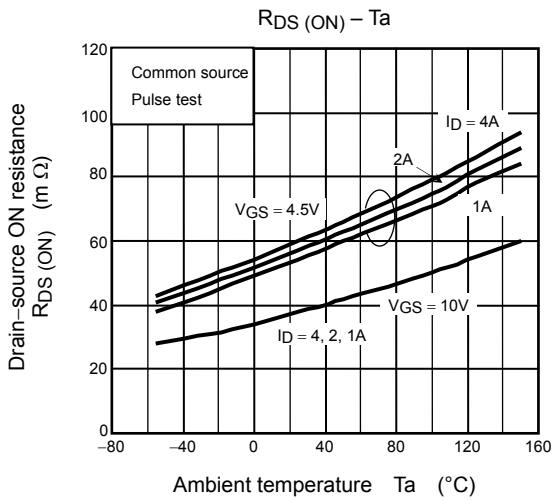
Electrical Characteristics (Ta = 25°C)

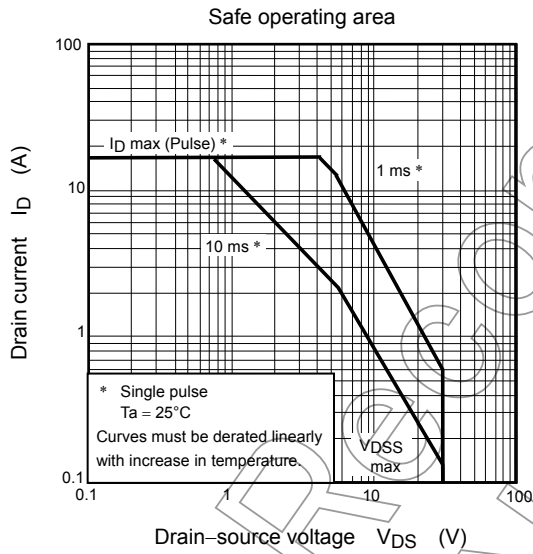
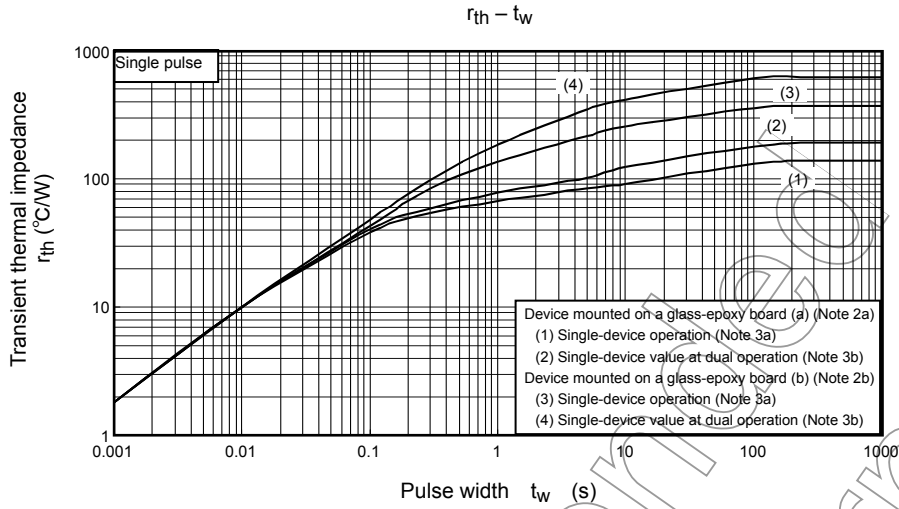
| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---------------|---------------|--|--|------|----------|---------------|
| Gate leakage current | | I_{GSS} | $V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$ | — | — | ± 10 | μA |
| Drain cut-off current | | I_{DSS} | $V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$ | — | — | 10 | μA |
| Drain-source breakdown voltage | | $V_{(BR)DSS}$ | $I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$ | 30 | — | — | V |
| | | $V_{(BR)DSX}$ | $I_D = 10\text{ mA}, V_{GS} = -20\text{ V}$ | 15 | — | — | |
| Gate threshold voltage | | V_{th} | $V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$ | 1.3 | — | 2.5 | V |
| Drain-source ON resistance | | $R_{DS(ON)}$ | $V_{GS} = 4.5\text{ V}, I_D = 2.1\text{ A}$ | — | 58 | 77 | m Ω |
| | | | $V_{GS} = 10\text{ V}, I_D = 2.1\text{ A}$ | — | 38 | 50 | |
| Forward transfer admittance | | $ Y_{fs} $ | $V_{DS} = 10\text{ V}, I_D = 2.1\text{ A}$ | 3.5 | 7.0 | — | S |
| Input capacitance | | C_{iss} | $V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ | — | 470 | — | pF |
| Reverse transfer capacitance | | C_{rss} | | — | 60 | — | |
| Output capacitance | | C_{oss} | | — | 80 | — | |
| Switching time | Rise time | t_r | | — | 5.2 | — | ns |
| | Turn-on time | t_{on} | | — | 8.3 | — | |
| | Fall time | t_f | | — | 4.0 | — | |
| | Turn-off time | t_{off} | | Duty $\leq 1\%$, $t_w \geq 10\ \mu\text{s}$ | — | 22 | |
| Total gate charge (gate-source plus gate-drain) | | Q_g | $V_{DD} \approx 24\text{ V}, V_{GS} = 10\text{ V}, I_D = 4.2\text{ A}$ | — | 10 | — | nC |
| Gate-source charge 1 | | Q_{gs1} | | — | 1.7 | — | |
| Gate-drain ("miller") charge | | Q_{gd} | | — | 2.4 | — | |

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

| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------------|----------------|-----------|--|-----|------|------|------|
| Drain reverse current | Pulse (Note 1) | I_{DRP} | — | — | — | 16.8 | A |
| Forward voltage (diode) | | V_{DSF} | $I_{DR} = 4.2\text{ A}, V_{GS} = 0\text{ V}$ | — | — | -1.2 | V |







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