

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

# TPCP8101

Notebook PC Applications

Portable Equipment Applications

Unit: mm

- Small footprint due to small and thin package
- Low drain-source ON-resistance:  $R_{DS(ON)} = 24 \text{ m}\Omega$  (typ.)  
( $V_{GS} = -4.5 \text{ V}$ )
- High forward transfer admittance:  $|Y_{fs}| = 14 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = -10 \text{ }\mu\text{A}$  (max) ( $V_{DS} = -20 \text{ V}$ )
- Enhancement model:  $V_{th} = -0.5 \text{ to } -1.2 \text{ V}$   
( $V_{DS} = -10 \text{ V}$ ,  $I_D = -200 \text{ }\mu\text{A}$ )

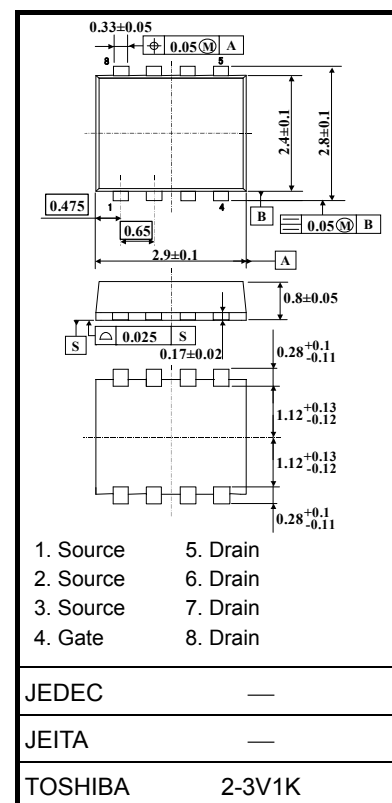
## Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

| Characteristic                                          |                | Symbol    | Rating     | Unit             |
|---------------------------------------------------------|----------------|-----------|------------|------------------|
| Drain-source voltage                                    |                | $V_{DSS}$ | -20        | V                |
| Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )    |                | $V_{DGR}$ | -20        | V                |
| Gate-source voltage                                     |                | $V_{GSS}$ | $\pm 8$    | V                |
| Drain current                                           | DC (Note 1)    | $I_D$     | -5.6       | A                |
|                                                         | Pulse (Note 1) | $I_{DP}$  | -22.4      |                  |
| Drain power dissipation ( $t = 5 \text{ s}$ ) (Note 2a) |                | $P_D$     | 1.68       | W                |
| Drain power dissipation ( $t = 5 \text{ s}$ ) (Note 2b) |                | $P_D$     | 0.84       | W                |
| Single-pulse avalanche energy (Note 3)                  |                | $E_{AS}$  | 20.3       | mJ               |
| Avalanche current                                       |                | $I_{AR}$  | -5.6       | A                |
| Repetitive avalanche energy (Note 4)                    |                | $E_{AR}$  | 0.168      | 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 5, refer to the next page.

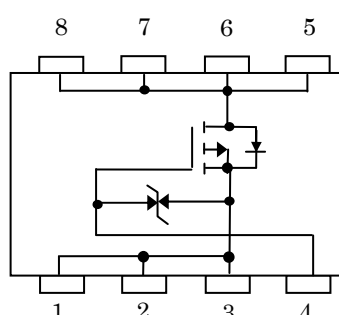
Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within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

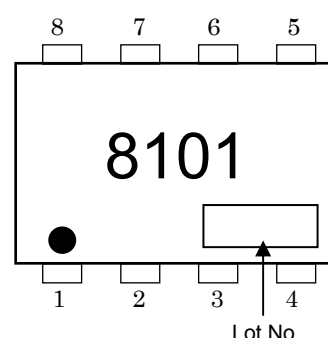


Weight: 0.017 g (typ.)

## Circuit Configuration



## Marking (Note 5)

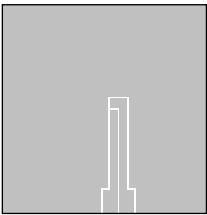


Thermal Characteristics

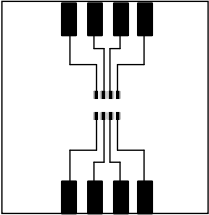
| Characteristics                                               | Symbol          | Max   | Unit |
|---------------------------------------------------------------|-----------------|-------|------|
| Thermal resistance, channel to ambient (t = 5 s)<br>(Note 2a) | $R_{th (ch-a)}$ | 74.4  | °C/W |
| Thermal resistance, channel to ambient (t = 5 s)<br>(Note 2b) | $R_{th (ch-a)}$ | 148.8 | °C/W |

Note 1: Ensure that the channel temperature does not exceed 150°C during use of the device.

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



(a)



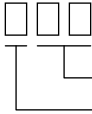
(b)

Note 3:  $V_{DD} = -16\text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 0.5\text{ mH}$ ,  $R_G = 25\ \Omega$ ,  $I_{AR} = -5.6\text{ A}$

Note 4: Repetitive rating: pulse width limited by maximum channel temperature.

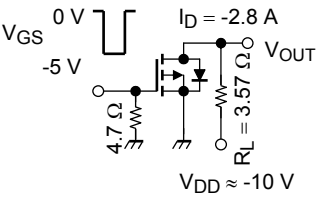
Note 5: • on the lower left of the marking indicates Pin 1.

\* Weekly code (three digits):



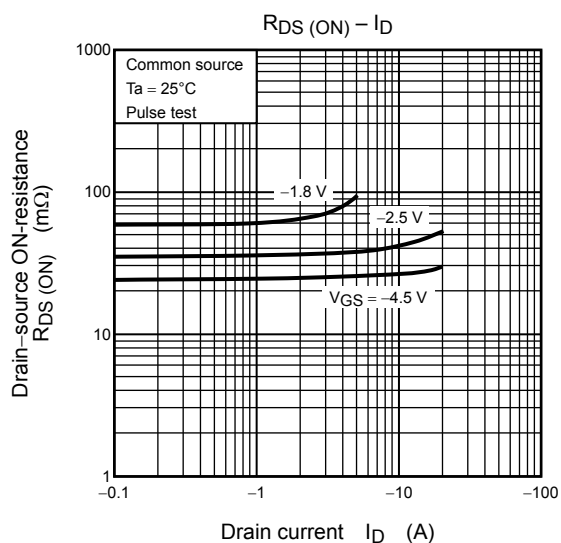
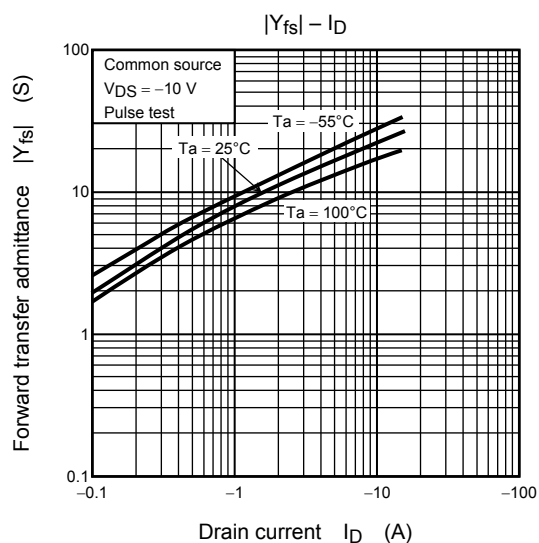
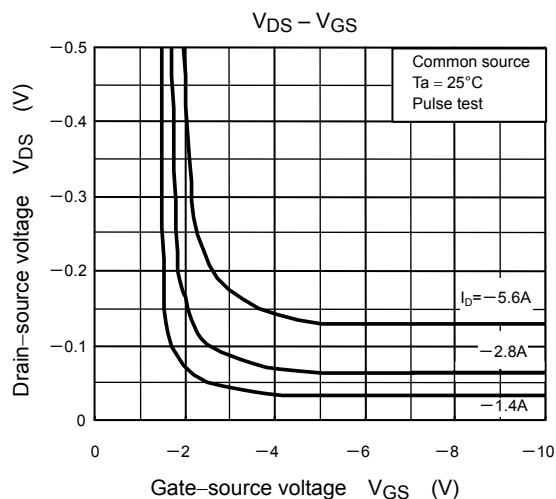
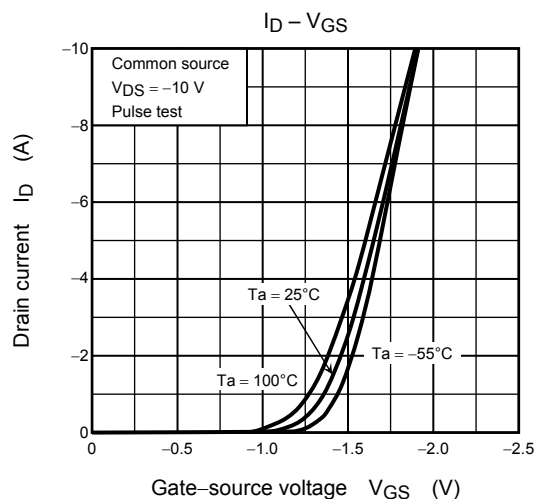
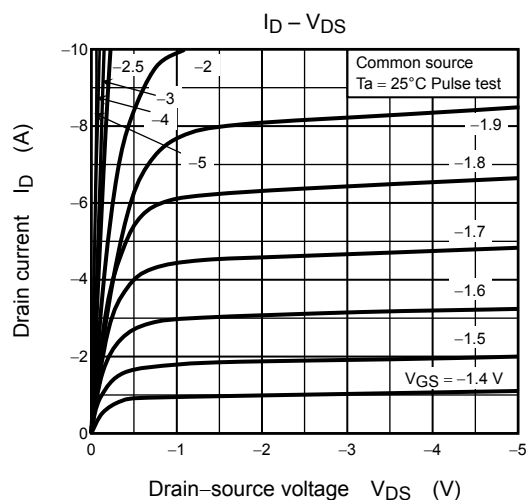
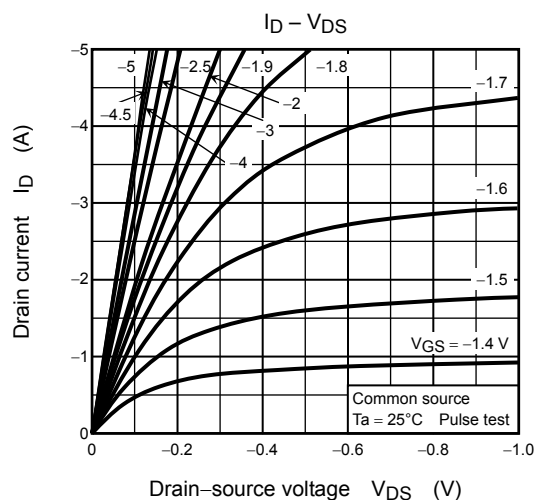
Week of manufacture  
(01 for the first week of the year, continuing up to 52 or 53)  
Year of manufacture  
(The last digit of the calendar year)

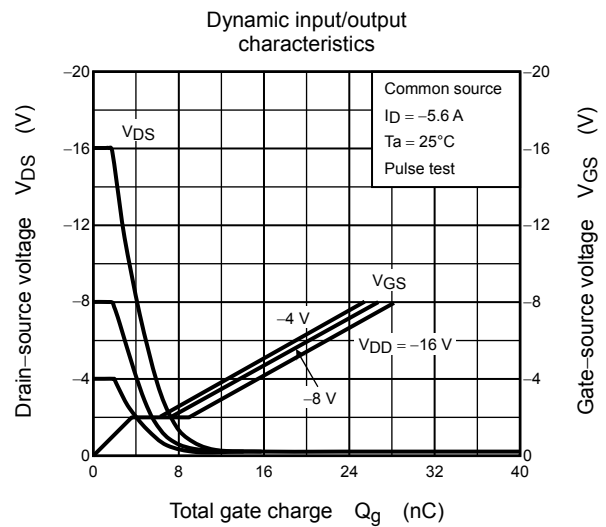
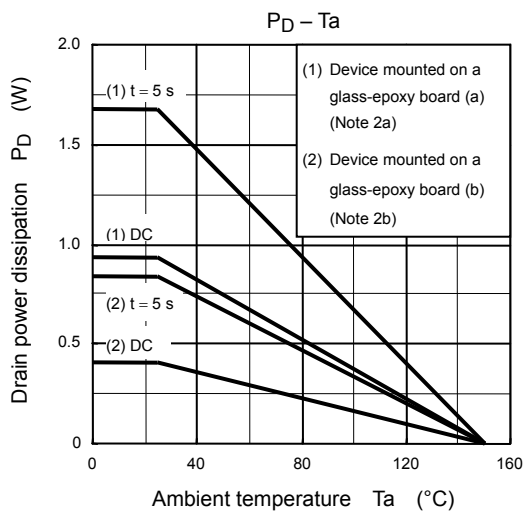
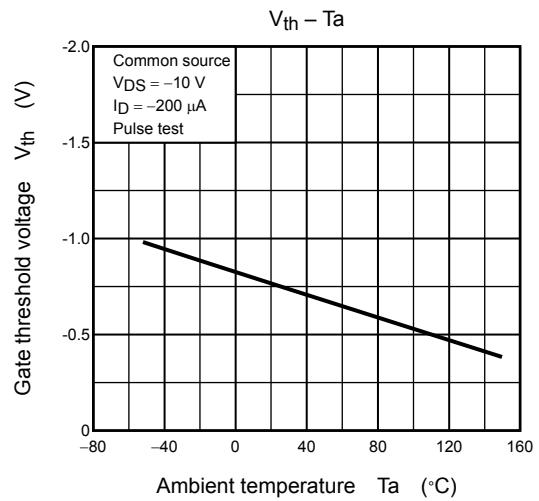
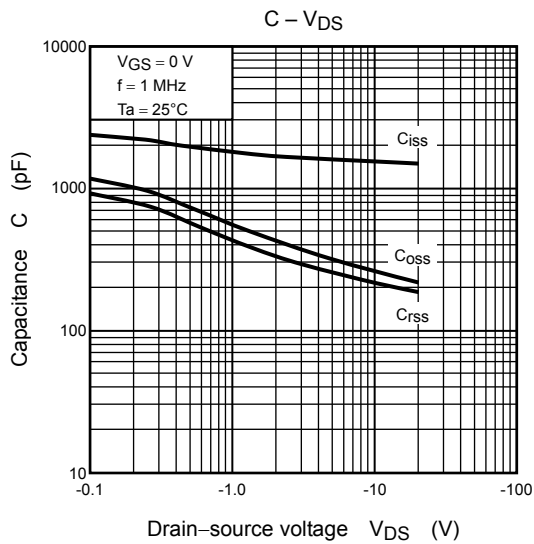
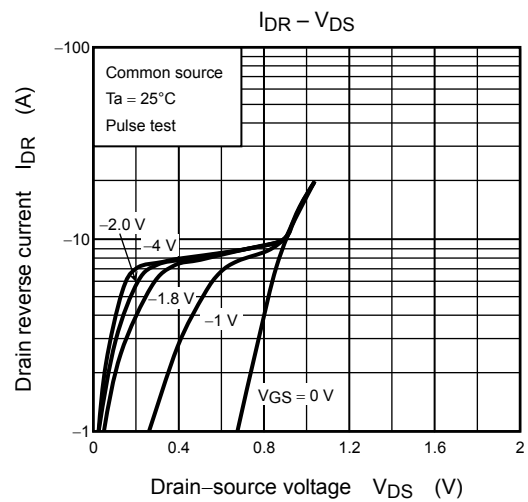
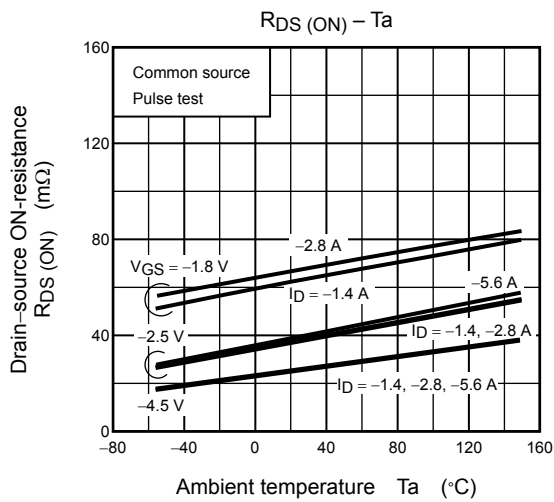
## Electrical Characteristics (Ta = 25°C)

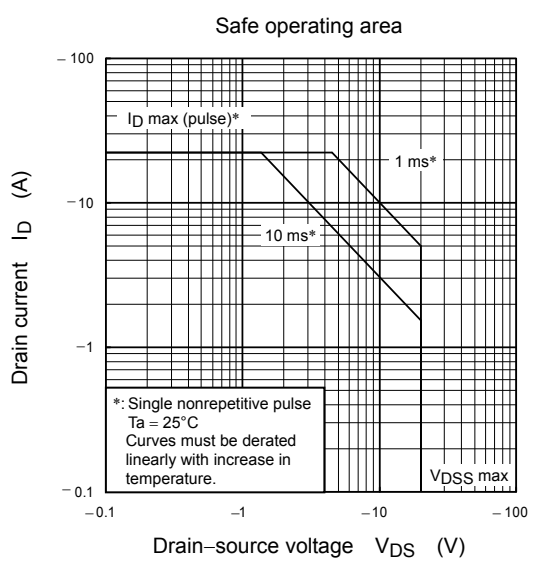
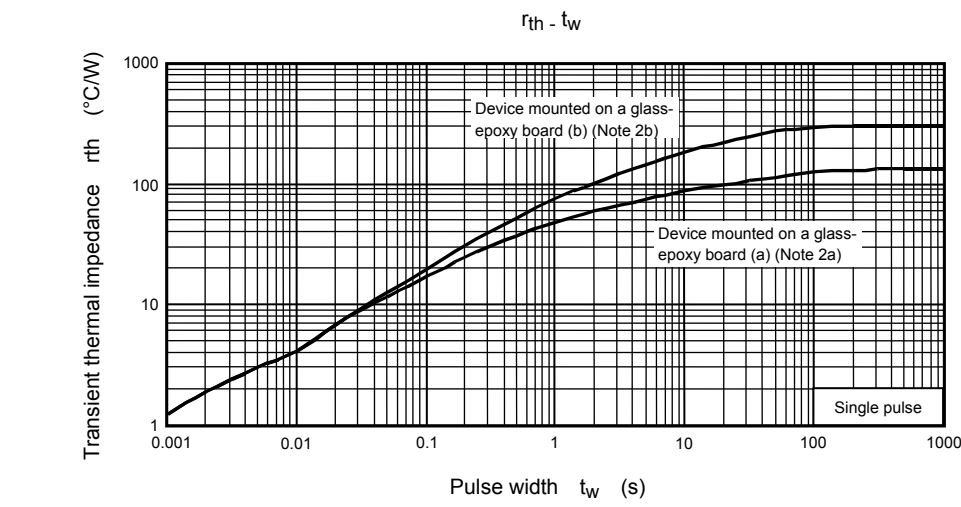
| Characteristic                                  |               | Symbol                | Test Condition                                                                      | Min  | Typ. | Max  | Unit |
|-------------------------------------------------|---------------|-----------------------|-------------------------------------------------------------------------------------|------|------|------|------|
| Gate leakage current                            |               | I <sub>GSS</sub>      | V <sub>GS</sub> = ±8 V, V <sub>DS</sub> = 0 V                                       | —    | —    | ±10  | μA   |
| Drain cutoff current                            |               | I <sub>DSS</sub>      | V <sub>DS</sub> = -20 V, V <sub>GS</sub> = 0 V                                      | —    | —    | -10  | μA   |
| Drain-source breakdown voltage                  |               | V <sub>(BR)</sub> DSS | I <sub>D</sub> = -10 mA, V <sub>GS</sub> = 0 V                                      | -20  | —    | —    | V    |
|                                                 |               | V <sub>(BR)</sub> DSX | I <sub>D</sub> = -10 mA, V <sub>GS</sub> = 8 V                                      | -12  | —    | —    |      |
| Gate threshold voltage                          |               | V <sub>th</sub>       | V <sub>DS</sub> = -10 V, I <sub>D</sub> = -200 μA                                   | -0.5 | —    | -1.2 | V    |
| Drain-source ON-resistance                      |               | R <sub>DS</sub> (ON)  | V <sub>GS</sub> = -1.8 V, I <sub>D</sub> = -1.4 A                                   | —    | 67   | 90   | mΩ   |
|                                                 |               |                       | V <sub>GS</sub> = -2.5 V, I <sub>D</sub> = -2.8 A                                   | —    | 36   | 41   |      |
|                                                 |               |                       | V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -2.8 A                                   | —    | 24   | 30   |      |
| Forward transfer admittance                     |               | Y <sub>fs</sub>       | V <sub>DS</sub> = -10 V, I <sub>D</sub> = -2.8 A                                    | 7    | 14   | —    | S    |
| Input capacitance                               |               | C <sub>iss</sub>      | V <sub>DS</sub> = -10 V, V <sub>GS</sub> = 0 V, f = 1 MHz                           | —    | 1550 | —    | pF   |
| Reverse transfer capacitance                    |               | C <sub>rss</sub>      |                                                                                     | —    | 215  | —    |      |
| Output capacitance                              |               | C <sub>oss</sub>      |                                                                                     | —    | 265  | —    |      |
| Switching time                                  | Rise time     | t <sub>r</sub>        |  | —    | 7    | —    | ns   |
|                                                 | Turn-on time  | t <sub>on</sub>       |                                                                                     | —    | 13   | —    |      |
|                                                 | Fall time     | t <sub>f</sub>        |                                                                                     | —    | 21   | —    |      |
|                                                 | Turn-off time | t <sub>off</sub>      |                                                                                     | —    | 68   | —    |      |
| Total gate charge (gate-source plus gate-drain) |               | Q <sub>g</sub>        | V <sub>DD</sub> ≈ -16 V, V <sub>GS</sub> = -5 V, I <sub>D</sub> = -5.6 A            | —    | 19   | —    | nC   |
| Gate-source charge                              |               | Q <sub>gs</sub>       |                                                                                     | —    | 14   | —    |      |
| Gate-drain ("Miller") charge                    |               | Q <sub>gd</sub>       |                                                                                     | —    | 5    | —    |      |

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

| Characteristic          |                | Symbol    | Test Condition                                  | Min | Typ. | Max   | Unit |
|-------------------------|----------------|-----------|-------------------------------------------------|-----|------|-------|------|
| Drain reverse current   | Pulse (Note 1) | $I_{DRP}$ | —                                               | —   | —    | -22.4 | A    |
| Forward voltage (diode) |                | $V_{DSF}$ | $I_{DR} = -5.6 \text{ A}, V_{GS} = 0 \text{ V}$ | —   | —    | 1.2   | V    |







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