

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

# TPCF8102

Notebook PC Applications  
 Portable Equipment Applications

- Low drain-source ON resistance:  $R_{DS(ON)} = 24 \text{ m}\Omega$  (typ.)
- 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 mode :  $V_{th} = -0.5 \text{ to } -1.2 \text{ V}$   
 ( $V_{DS} = -10 \text{ V}, I_D = -200 \text{ }\mu\text{A}$ )

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

| Characteristics                                      |                 | 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                                  |                 | $V_{GSS}$ | +8      | V                |
| Drain current  | DC (Note 1)     | $I_D$     | -6      | A                |
|  | Pulsed (Note 1) | $I_{DP}$  | -24     |                  |
| Drain power dissipation (t = 5 s)<br>(Note 2a)       |                 | $P_D$     | 2.5     | W                |
| Drain power dissipation (t = 5 s)<br>(Note 2b)       |                 | $P_D$     | 0.7     | W                |
| Single pulse avalanche energy (Note 3)               |                 | $E_{AS}$  | 5.9     | mJ               |
| Avalanche current                                    |                 | $I_{AR}$  | -3      | A                |
| Repetitive avalanche energy (Note 4)                 |                 | $E_{AR}$  | 0.25    | mJ               |
| Channel temperature                                  |                 | $T_{ch}$  | 150     | $^\circ\text{C}$ |
| Storage temperature range                            |                 | $T_{stg}$ | -55~150 | $^\circ\text{C}$ |

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).

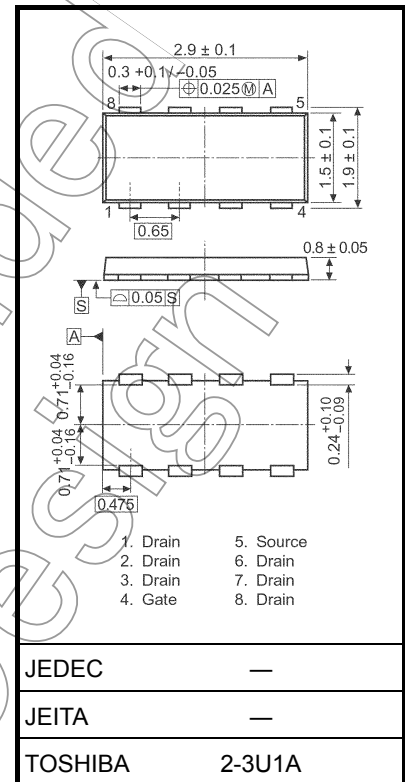
## Thermal Characteristics

| Characteristics   | Symbol         | Max   | Unit               |
|---|----------------|-------|--------------------|
| Thermal resistance, channel to ambient (t = 5 s)<br>(Note 2a) | $R_{th(ch-a)}$ | 50.0  | $^\circ\text{C/W}$ |
| Thermal resistance, channel to ambient (t = 5 s)<br>(Note 2b) | $R_{th(ch-a)}$ | 178.6 | $^\circ\text{C/W}$ |

Note: (Note 1), (Note 2), (Note 3) and (Note 4): See the third page.

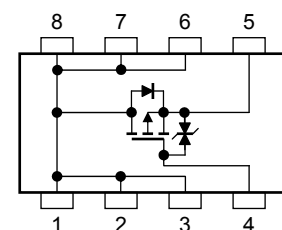
This transistor is an electrostatic-sensitive device. Please handle with caution.

Unit: mm



Weight: 0.011 g (typ.)

## Circuit Configuration



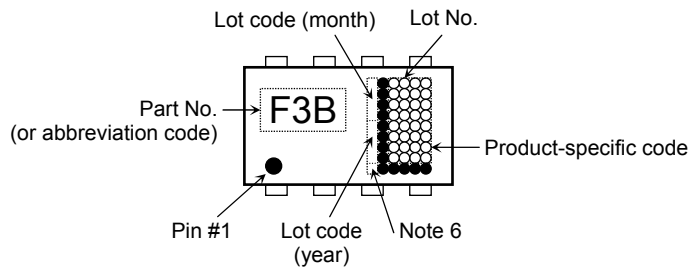
**Electrical Characteristics (Ta = 25°C)**

| Characteristics                                 |               | Symbol        | Test Condition  | Min  | Typ. | Max      | Unit          |
|---|---------------|---------------|---|------|------|----------|---------------|
| Gate leakage current                            |               | $I_{GSS}$     | $V_{GS} = \pm 8 \text{ V}, V_{DS} = 0 \text{ V}$                            | —    | —    | $\pm 10$ | $\mu\text{A}$ |
| Drain cut-off current                           |               | $I_{DSS}$     | $V_{DS} = -20 \text{ V}, V_{GS} = 0 \text{ V}$                              | —    | —    | -10      | $\mu\text{A}$ |
| Drain-source breakdown voltage                  |               | $V_{(BR)DSS}$ | $I_D = -10 \text{ mA}, V_{GS} = 0 \text{ V}$                                | -20  | —    | —        | V             |
|   |               | $V_{(BR)DSX}$ | $I_D = -10 \text{ mA}, V_{GS} = 8 \text{ V}$                                | -12  | —    | —        |               |
| Gate threshold voltage                          |               | $V_{th}$      | $V_{DS} = -10 \text{ V}, I_D = -200 \mu\text{A}$                            | -0.5 | —    | -1.2     | V             |
| Drain-source ON resistance                      |               | $R_{DS(ON)}$  | $V_{GS} = -1.8 \text{ V}, I_D = -1.5 \text{ A}$                             | —    | 67   | 90       | m $\Omega$    |
|   |               | $R_{DS(ON)}$  | $V_{GS} = -2.5 \text{ V}, I_D = -3.0 \text{ A}$                             | —    | 36   | 41       |               |
|   |               | $R_{DS(ON)}$  | $V_{GS} = -4.5 \text{ V}, I_D = -3.0 \text{ A}$                             | —    | 24   | 30       |               |
| Forward transfer admittance                     |               | $ Y_{fs} $    | $V_{DS} = -10 \text{ V}, I_D = -3.0 \text{ A}$                              | 7    | 14   | —        | S             |
| Input capacitance                               |               | $C_{iss}$     | $V_{DS} = -10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$           | —    | 1550 | —        | pF            |
| Reverse transfer capacitance                    |               | $C_{rss}$     |   | —    | 215  | —        |               |
| Output capacitance                              |               | $C_{oss}$     |   | —    | 265  | —        |               |
| Switching time                                  | Rise time     | $t_r$         |   | —    | 7    | —        | ns            |
|   | Turn-on time  | $t_{on}$      |   | —    | 13   | —        |               |
|   | Fall time     | $t_f$         |   | —    | 21   | —        |               |
|   | Turn-off time | $t_{off}$     |   | —    | 68   | —        |               |
| Total gate charge (gate-source plus gate-drain) |               | $Q_g$         | $V_{DD} \approx -16 \text{ V}, V_{GS} = -5 \text{ V}, I_D = -6.0 \text{ A}$ | —    | 19   | —        | nC            |
| Gate-source charge                              |               | $Q_{gs}$      |   | —    | 14   | —        |               |
| Gate-drain ("miller") charge                    |               | $Q_{gd}$      |   | —    | 5    | —        |               |

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

| Characteristics         |                | Symbol    | Test Condition                                  | Min | Typ. | Max | Unit |
|-------------------------|----------------|-----------|---|-----|------|-----|------|
| Drain reverse current   | Pulse (Note 1) | $I_{DRP}$ | —   | —   | —    | -24 | A    |
| Forward voltage (diode) |                | $V_{DSF}$ | $I_{DR} = -6.0 \text{ A}, V_{GS} = 0 \text{ V}$ | —   | —    | 1.2 | V    |

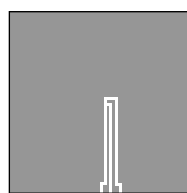
## Marking (Note 5)



Note 1: Ensure that the channel temperature does not exceed 150°C.

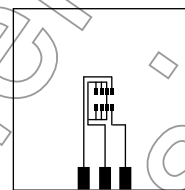
Note 2: (a) Device mounted on a glass-epoxy board (a)

(b) Device mounted on a glass-epoxy board (b)



(a)

FR-4  
25.4 × 25.4 × 0.8  
Unit: (mm)



(b)

FR-4  
25.4 × 25.4 × 0.8  
Unit: (mm)

Note 3:  $V_{DD} = -16\text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 0.5\text{ mH}$ ,  $R_G = 25\ \Omega$ ,  $I_{AR} = -3.0\text{ A}$

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

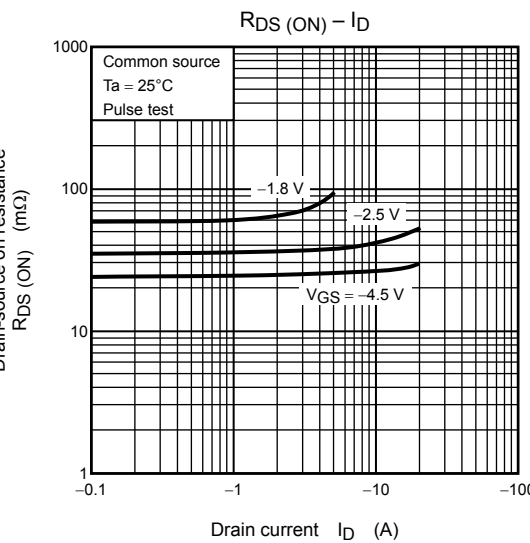
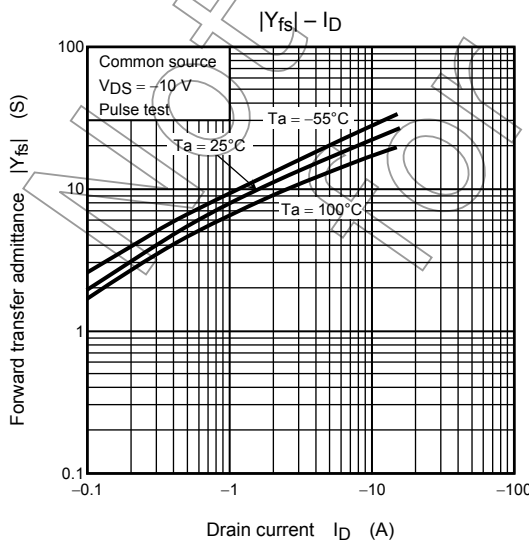
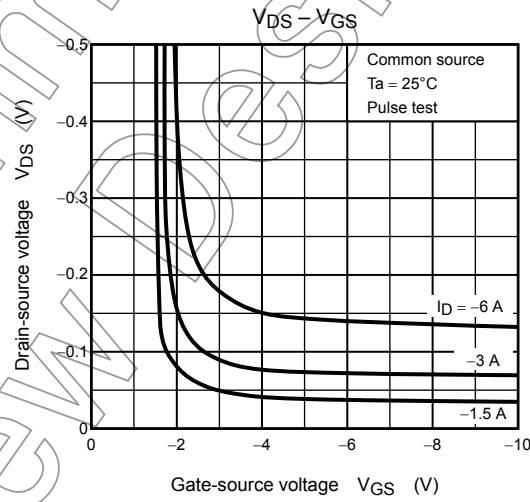
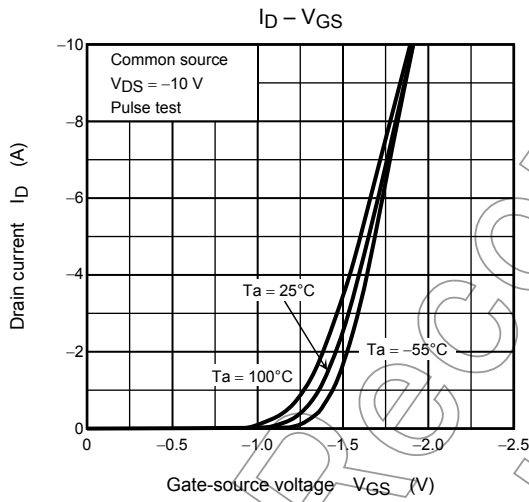
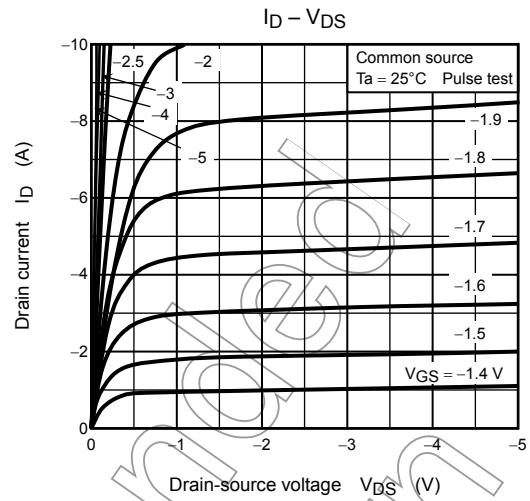
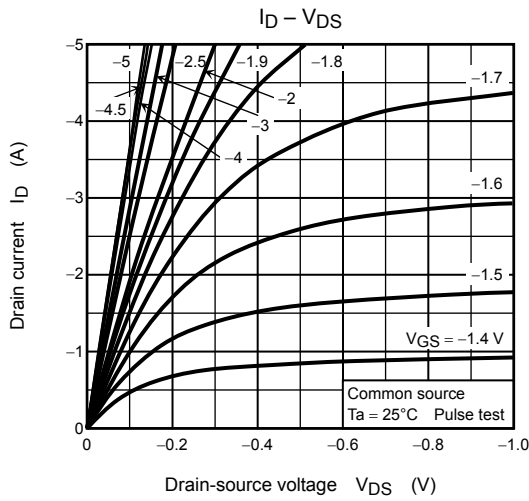
Note 5: A dot on the lower left of the marking indicates Pin 1.

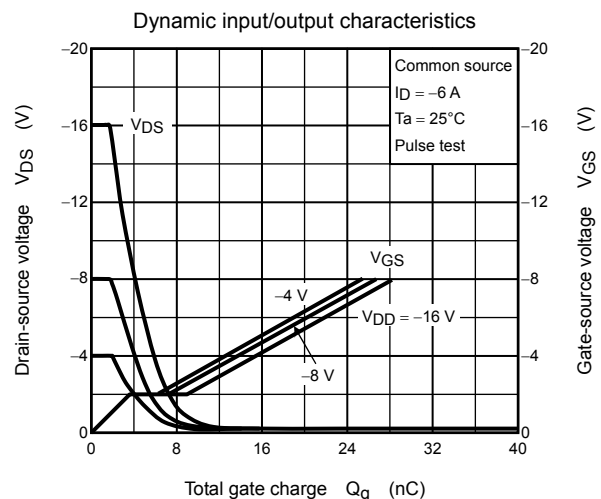
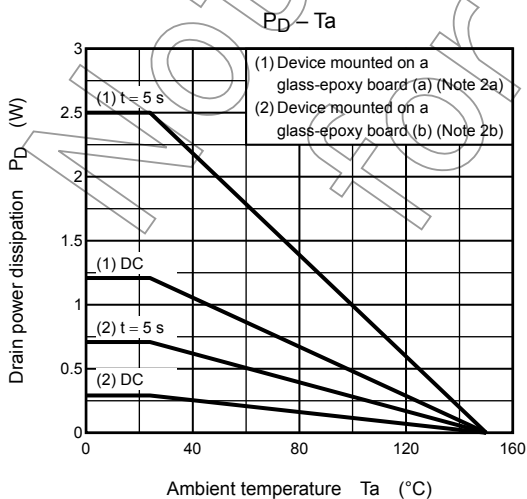
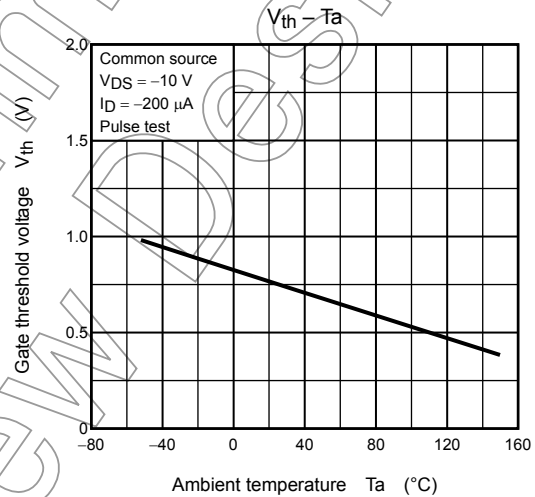
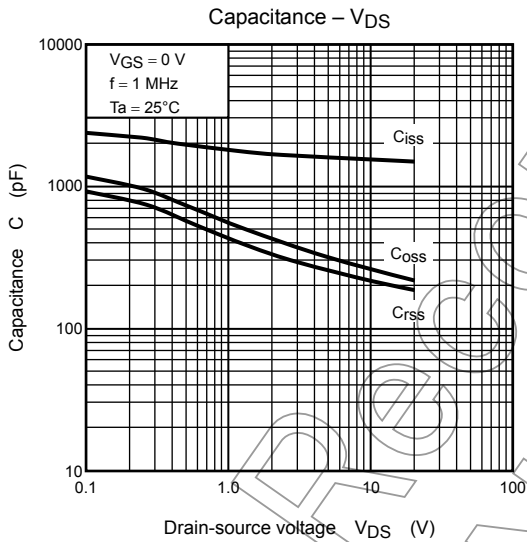
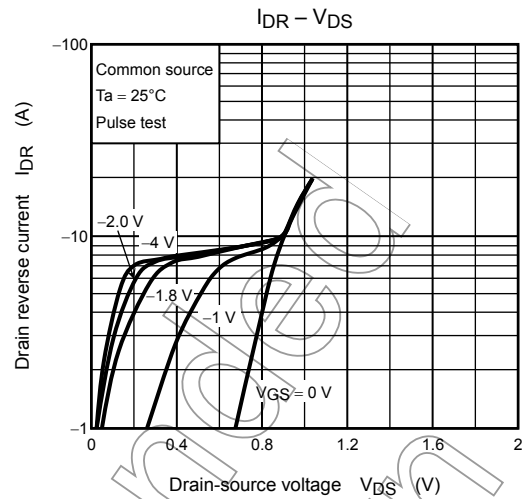
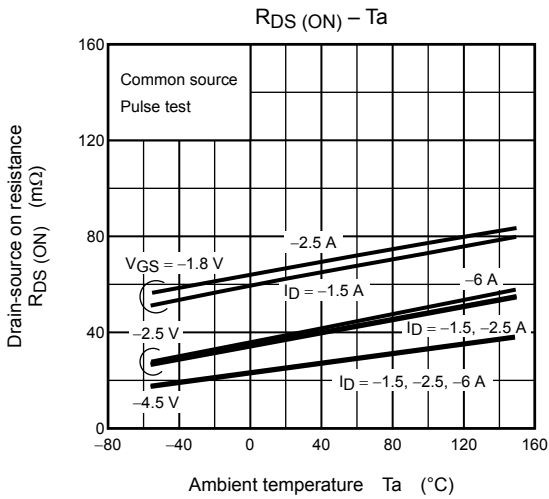
Note 6: A dot marking for identifying the indication of product Labels.

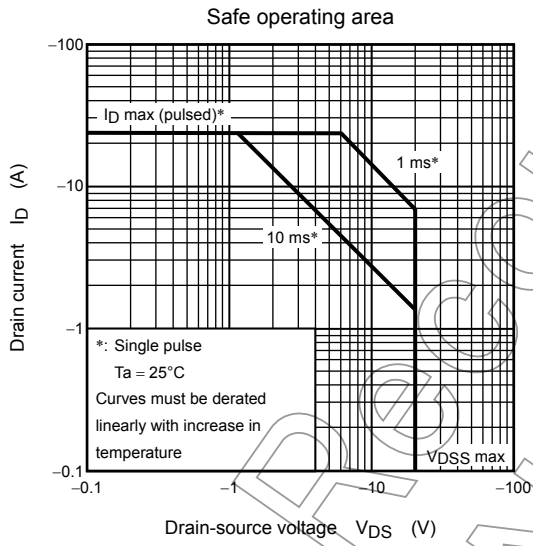
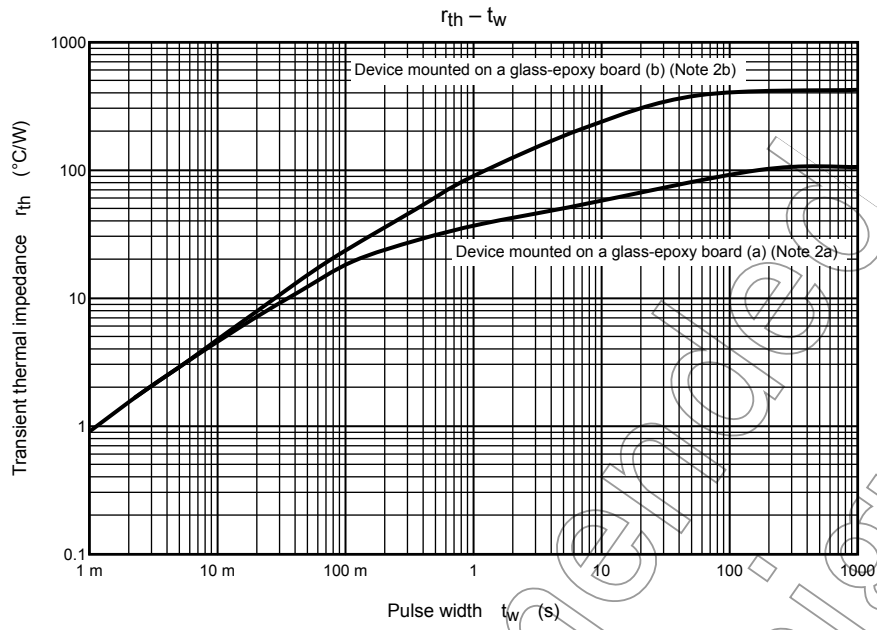
Without a dot: [[Pb]]/INCLUDES > MCV

With a dot: [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

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