

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

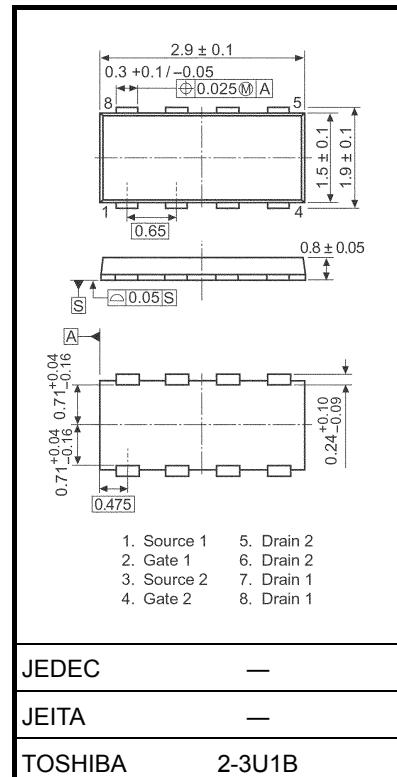
TPCF8304

Notebook PC Applications

Portable Equipment Applications

Unit: mm

- Low drain-source ON resistance: $R_{DS(ON)} = 60 \text{ m}\Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 5.9 \text{ S}$ (typ.)
- Low leakage current: $I_{DSS} = -10 \mu\text{A}$ (max) ($V_{DS} = -30 \text{ V}$)
- Enhancement model: $V_{th} = -0.8$ to -2.0 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} | -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 | A |
| | Pulse (Note 1) | I_{DP} | |
| Drain power dissipation ($t = 5 \text{ s}$) (Note 2a) | Single-device operation (Note 3a) | $P_D(1)$ | W |
| | Single-device value at dual operation (Note 3b) | $P_D(2)$ | |
| Drain power dissipation ($t = 5 \text{ s}$) (Note 2b) | Single-device operation (Note 3a) | $P_D(1)$ | |
| | Single-device value at dual operation (Note 3b) | $P_D(2)$ | |
| Single-pulse avalanche energy (Note 4) | E_{AS} | 0.67 | mJ |
| Avalanche current | I_{AR} | -1.6 | A |
| Repetitive avalanche energy Single-device value at dual operation (Note 2a, 3b, 5) | E_{AR} | 0.11 | mJ |
| Channel temperature | T_{ch} | 150 | °C |
| Storage temperature range | T_{stg} | -55~150 | °C |

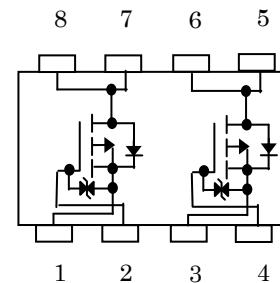
Note: For Notes 1 to 5, see the next page.

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).

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

Weight: 0.011 g (typ.)

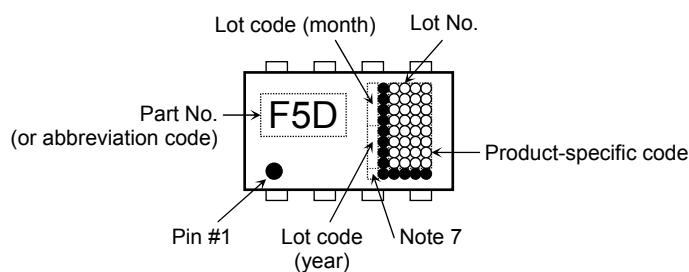
Circuit Configuration



Thermal Characteristics

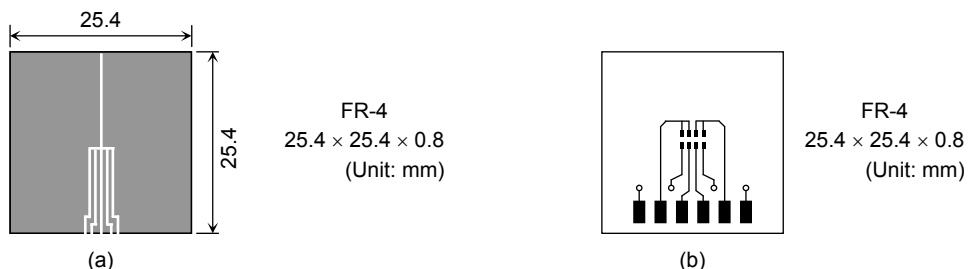
| Characteristic | Symbol | Max | Unit |
|---------------------------------------------------------------|------------------------------------------------------------------------|-------|------|
| Thermal resistance, channel to ambient ($t = 5$ s) (Note 2a) | Single-device operation (Note 3a) R_{th} (ch-a) (1) | 92.6 | °C/W |
| | Single-device value at dual operation (Note 3b) R_{th} (ch-a) (2) | 111.6 | |
| Thermal resistance, channel to ambient ($t = 5$ s) (Note 2b) | Single-device operation (Note 3a) R_{th} (ch-a) (1) | 235.8 | °C/W |
| | Single-device value at dual operation (Note 3b) R_{th} (ch-a) (2) | 378.8 | |

Marking (Note 6)



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)



Note 3: a) The power dissipation and thermal resistance values shown are for a single device.

(During single-device operation, power is applied to one device only.)

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, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 0.2$ mH, $R_G = 25 \Omega$, $I_{AR} = -1.6$ A

Note 5: Repetitive rating; pulse width limited by max channel s temperature

Note 6: ● to the lower left of the Part No. indicates Pin 1.

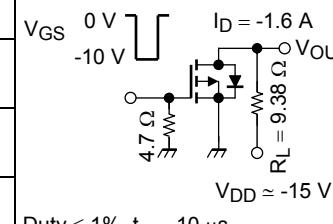
Note 7: A dot marking identifies the indication of product Labels.

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

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

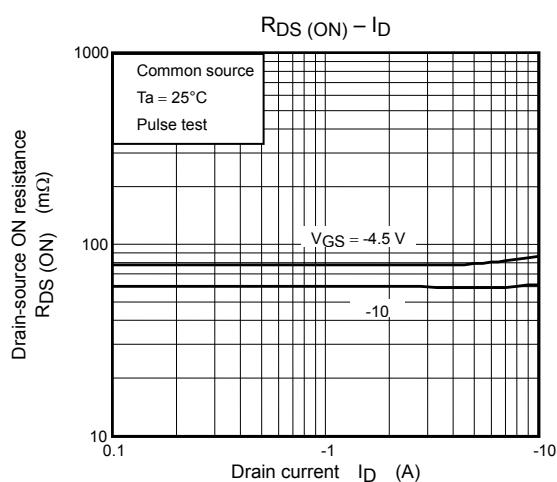
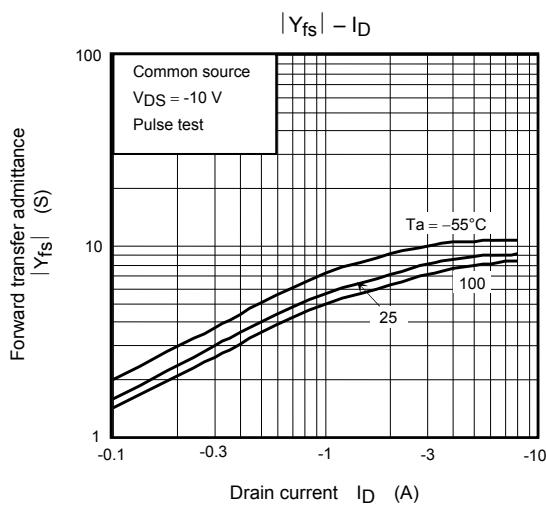
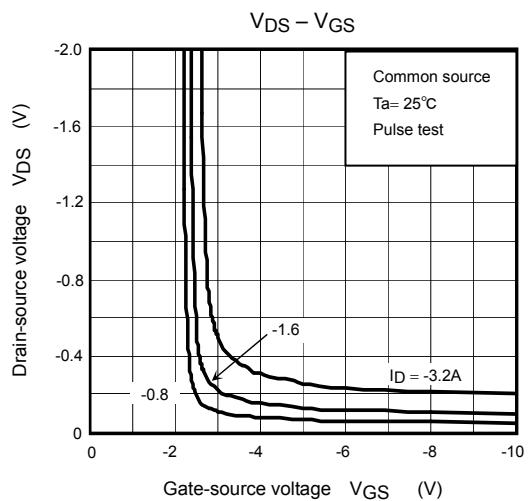
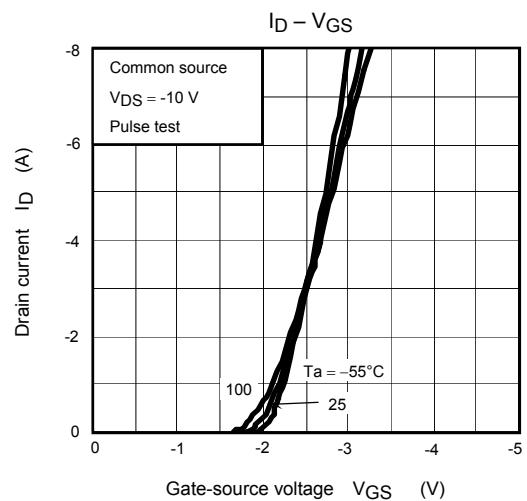
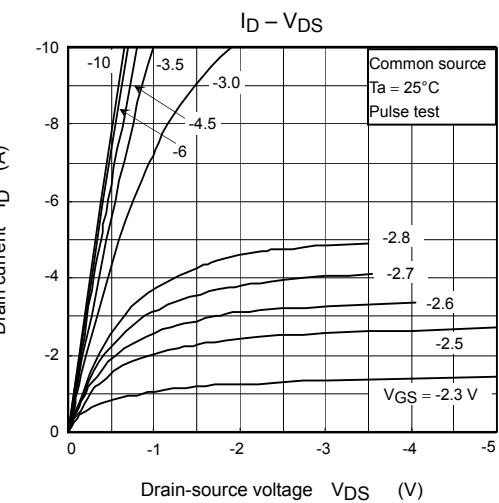
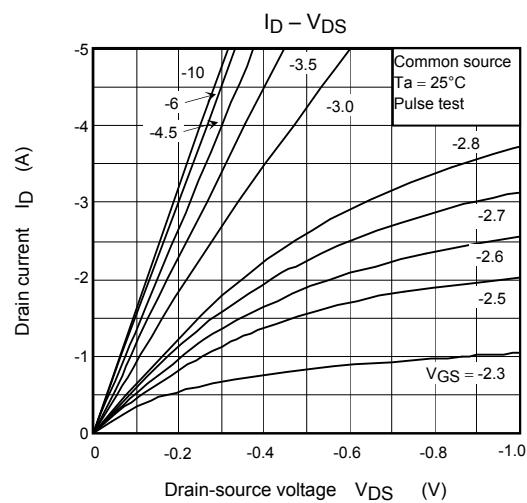
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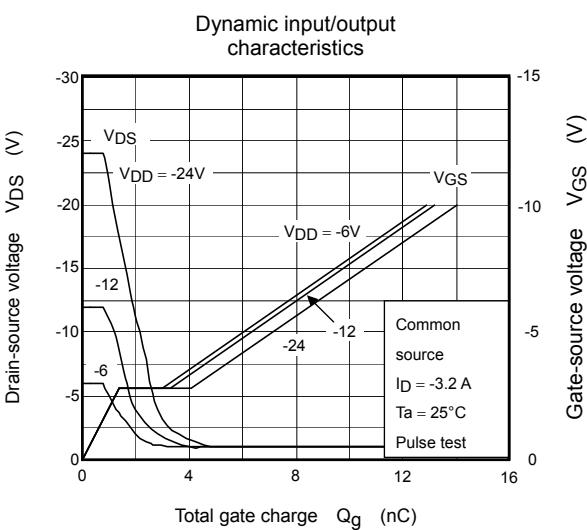
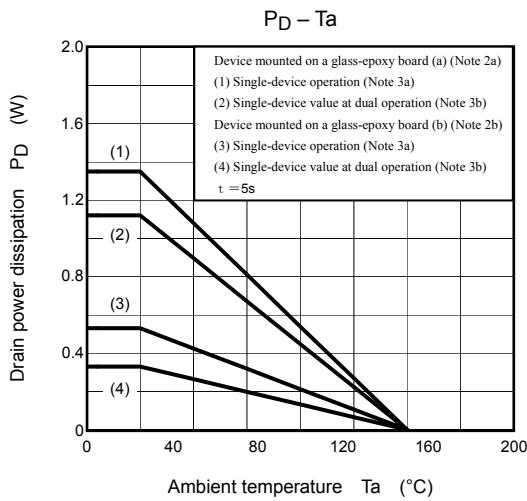
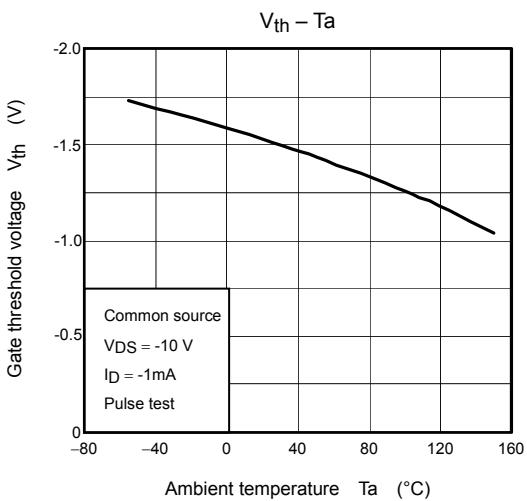
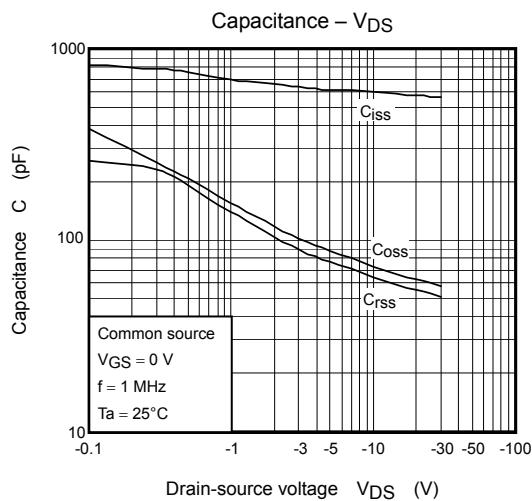
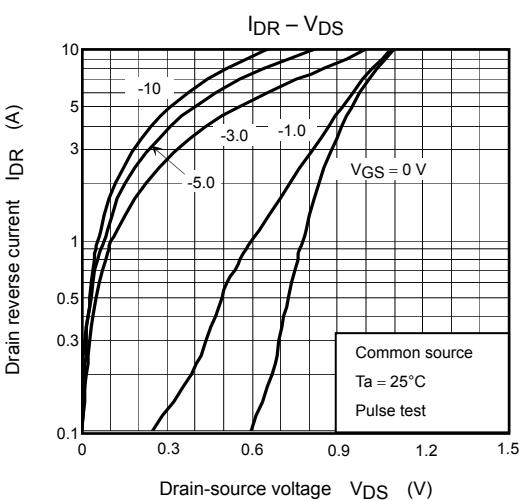
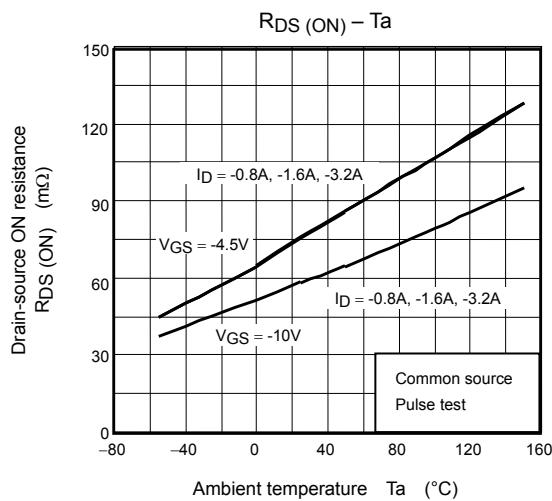
Electrical Characteristics ($T_a = 25^\circ\text{C}$)

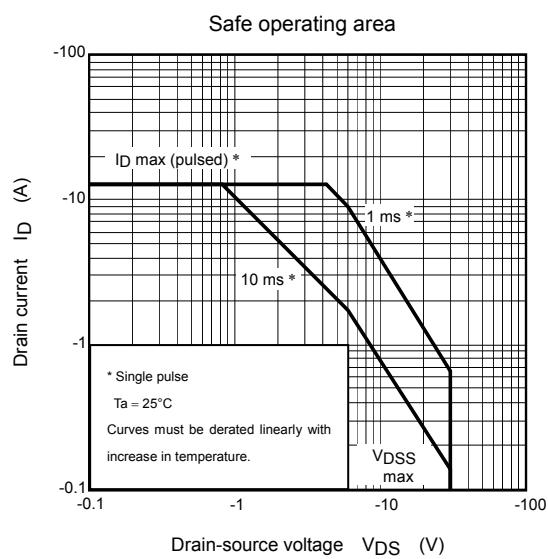
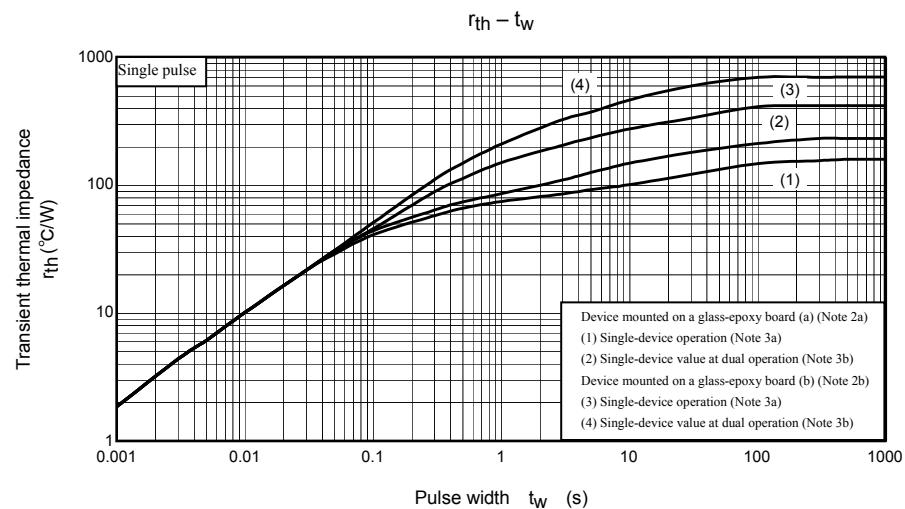
| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit | |
|-------------------------------------------------|-----------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|------------------|----|
| Gate leakage current | I_{GSS} | $V_{GS} = \pm 16 \text{ V}$, $V_{DS} = 0 \text{ V}$ | — | — | ± 10 | μA | |
| Drain cut-off current | I_{DSS} | $V_{DS} = -30 \text{ V}$, $V_{GS} = 0 \text{ V}$ | — | — | -10 | μA | |
| Drain-source breakdown voltage | $V_{(\text{BR})\text{DSS}}$ | $I_D = -10 \text{ mA}$, $V_{GS} = 0 \text{ V}$ | -30 | — | — | V | |
| | $V_{(\text{BR})\text{DSX}}$ | $I_D = -10 \text{ mA}$, $V_{GS} = 20 \text{ V}$ | -15 | — | — | | |
| Gate threshold voltage | V_{th} | $V_{DS} = -10 \text{ V}$, $I_D = -1 \text{ mA}$ | -0.5 | — | -1.2 | V | |
| Drain-source ON resistance | $R_{DS(\text{ON})}$ | $V_{GS} = -4.5 \text{ V}$, $I_D = -1.6 \text{ A}$ | — | 80 | 105 | $\text{m}\Omega$ | |
| | $R_{DS(\text{ON})}$ | $V_{GS} = -10 \text{ V}$, $I_D = -1.6 \text{ A}$ | — | 60 | 72 | | |
| Forward transfer admittance | $ Y_{fs} $ | $V_{DS} = -10 \text{ V}$, $I_D = -1.6 \text{ A}$ | 2.9 | 5.9 | — | S | |
| Input capacitance | C_{iss} | $V_{DS} = -10 \text{ V}$, $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$ | — | 600 | — | pF | |
| Reverse transfer capacitance | C_{rss} | | — | 60 | — | | |
| Output capacitance | C_{oss} | | — | 70 | — | | |
| Switching time | Rise time | t_r |  V_{GS} 0 V -10 V $I_D = -1.6 \text{ A}$ V_{OUT} C_{iss} 4.7 pF C_{oss} 9.38 pF $V_{DD} \approx -15 \text{ V}$ Duty $\leq 1\%$, $t_w = 10 \mu\text{s}$ | — | 5.3 | — | ns |
| | Turn-on time | t_{on} | | — | 12 | — | |
| | Fall time | t_f | | — | 8.4 | — | |
| | Turn-off time | t_{off} | | — | 34 | — | |
| Total gate charge (gate-source plus gate-drain) | Q_g | $V_{DD} \approx -24 \text{ V}$, $V_{GS} = -10 \text{ V}$, $I_D = -3.2 \text{ A}$ | — | 14 | — | nC | |
| Gate-source charge 1 | Q_{gs1} | | — | 1.4 | — | | |
| Gate-drain ("Miller") charge | Q_{gd} | | — | 2.7 | — | | |

Source-Drain Ratings and Characteristics ($T_a = 25^\circ\text{C}$)

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------------|-----------|----------------------------------------------------|-----|------|-------|------|
| Drain reverse current | I_{DRP} | Pulse (Note 1) | — | — | -12.8 | A |
| Forward voltage (diode) | V_{DSF} | $I_{DR} = -3.2 \text{ A}$, $V_{GS} = 0 \text{ V}$ | — | — | 1.2 | V |







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