

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

TPC6104

Notebook PC Applications
 Portable Equipment Applications

- Low drain-source ON resistance: $R_{DS(ON)} = 33 \text{ m}\Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 12 \text{ S}$ (typ.)
- Low leakage current: $I_{DSS} = -10 \text{ }\mu\text{A}$ (max) ($V_{DS} = -20 \text{ V}$)
- Enhancement mode: $V_{th} = -0.5 \text{ to } -1.2 \text{ V}$
 ($V_{DS} = -10 \text{ V}$, $I_D = -200 \text{ }\mu\text{A}$)

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 | -5.5 | A |
| | Pulse (Note 1) | I_{DP} | -22 | |
| Drain power dissipation (t = 5 s) (Note 2a) | | P_D | 2.2 | W |
| Drain power dissipation (t = 5 s) (Note 2b) | | P_D | 0.7 | W |
| Single pulse avalanche energy (Note 3) | | E_{AS} | 4.9 | mJ |
| Avalanche current | | I_{AR} | -2.75 | A |
| Repetitive avalanche energy (Note 4) | | E_{AR} | 0.22 | mJ |
| Channel temperature | | T_{ch} | 150 | $^\circ\text{C}$ |
| Storage temperature range | | T_{stg} | -55~150 | $^\circ\text{C}$ |

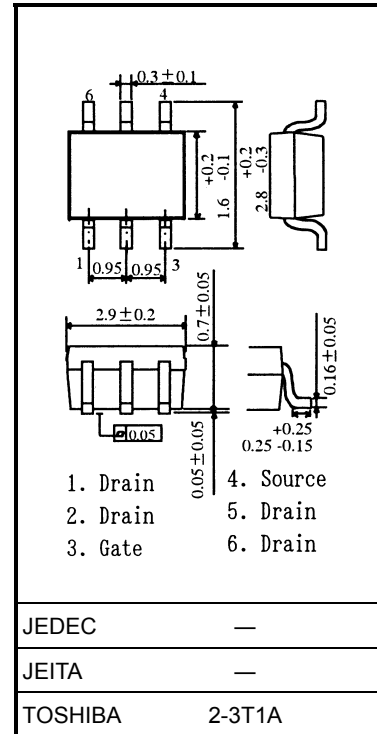
Thermal Characteristics

| Characteristics | Symbol | Max | Unit |
|--|----------------|-------|--------------------|
| Thermal resistance, channel to ambient (t = 5 s) (Note 2a) | $R_{th(ch-a)}$ | 56.8 | $^\circ\text{C/W}$ |
| Thermal resistance, channel to ambient (t = 5 s) (Note 2b) | $R_{th(ch-a)}$ | 178.5 | $^\circ\text{C/W}$ |

Note: Note 1, Note 2, Note 3, Note 4 and Note 5: See the next page.

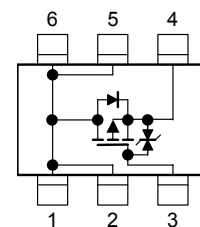
This transistor is an electrostatic-sensitive device. Please handle with caution.

Unit: mm



Weight: 0.011 g (typ.)

Circuit Configuration



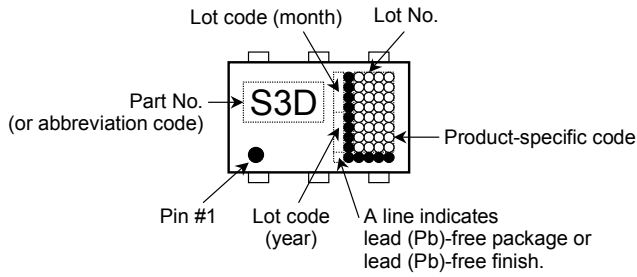
Electrical Characteristics (Ta = 25°C)

| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---------------|---------------|--|------|------|----------|---------------|
| Gate leakage current | | I_{GSS} | $V_{GS} = \pm 8 \text{ V}, V_{DS} = 0 \text{ V}$ | — | — | ± 10 | μA |
| Drain cut-off current | | I_{DSS} | $V_{DS} = -20 \text{ V}, V_{GS} = 0 \text{ V}$ | — | — | -10 | μA |
| Drain-source breakdown voltage | | $V_{(BR)DSS}$ | $I_D = -10 \text{ mA}, V_{GS} = 0 \text{ V}$ | -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 | | $R_{DS(ON)}$ | $V_{GS} = -1.8 \text{ V}, I_D = -1.4 \text{ A}$ | — | 78 | 120 | m Ω |
| | | $R_{DS(ON)}$ | $V_{GS} = -2.5 \text{ V}, I_D = -2.8 \text{ A}$ | — | 49 | 60 | |
| | | $R_{DS(ON)}$ | $V_{GS} = -4.5 \text{ V}, I_D = -2.8 \text{ A}$ | — | 33 | 40 | |
| Forward transfer admittance | | $ Y_{fs} $ | $V_{DS} = -10 \text{ V}, I_D = -2.8 \text{ A}$ | 6 | 12 | — | S |
| Input capacitance | | C_{iss} | $V_{DS} = -10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$ | — | 1430 | — | pF |
| Reverse transfer capacitance | | C_{rss} | | — | 200 | — | |
| Output capacitance | | C_{oss} | | — | 240 | — | |
| Switching time | Rise time | t_r | <p>$V_{GS} = 0 \text{ V}$ $V_{GS} = -5 \text{ V}$ $I_D = -2.8 \text{ A}$ V_{OUT} 4.7Ω $R_L = 3.6 \Omega$ $V_{DD} \approx -10 \text{ V}$ Duty $\leq 1\%$, $t_w = 10 \mu\text{s}$</p> | — | 8.5 | — | ns |
| | Turn-on time | t_{on} | | — | 15 | — | |
| | Fall time | t_f | | — | 20 | — | |
| | Turn-off time | t_{off} | | — | 66 | — | |
| Total gate charge (gate-source plus gate-drain) | | Q_g | $V_{DD} \approx -16 \text{ V}, V_{GS} = -5 \text{ V}, I_D = -5.5 \text{ A}$ | — | 19 | — | nC |
| Gate-source charge | | Q_{gs} | | — | 14 | — | |
| Gate-drain ("miller") charge | | Q_{gd} | | — | 5 | — | |

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

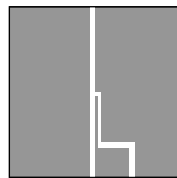
| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-----------------------|-------------------------|-----------|---|-----|------|-----|------|
| Drain reverse current | Pulse (Note 1) | I_{DRP} | — | — | — | -22 | A |
| | Forward voltage (diode) | V_{DSF} | $I_{DR} = -5.5 \text{ A}, V_{GS} = 0 \text{ V}$ | — | — | 1.2 | V |

Marking (Note 5)



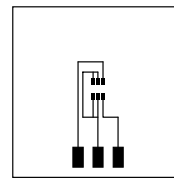
Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2: (a) Device mounted on a glass-epoxy board (a) (t = 5 s)
 (b) Device mounted on a glass-epoxy board (b) (t = 5 s)



(a)

FR-4
 25.4 × 25.4 × 0.8
 Unit: (mm)



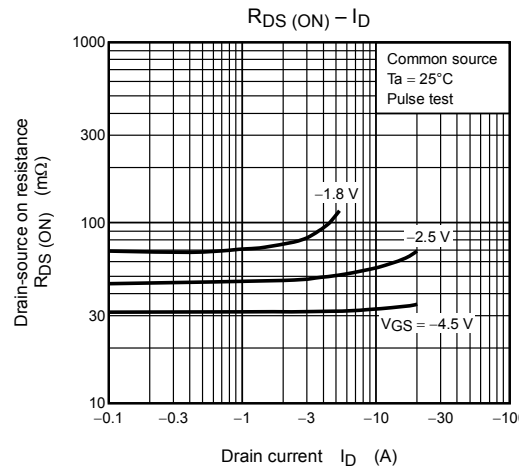
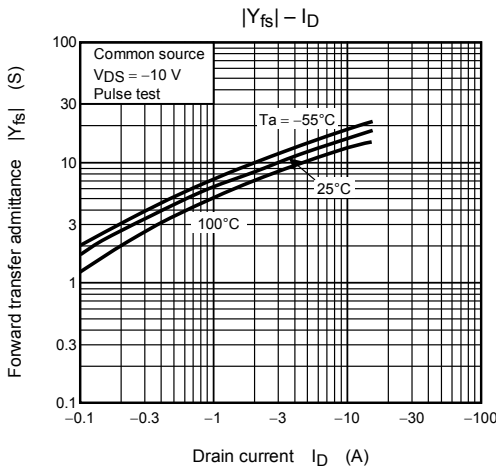
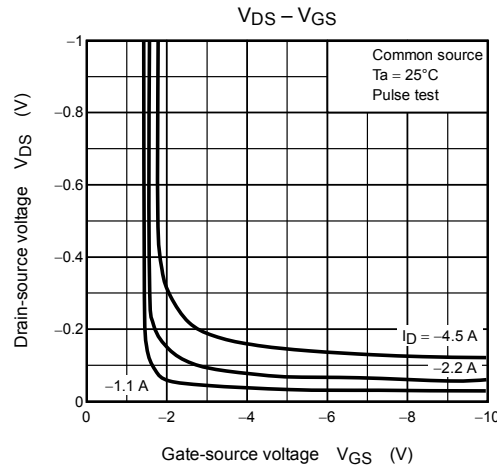
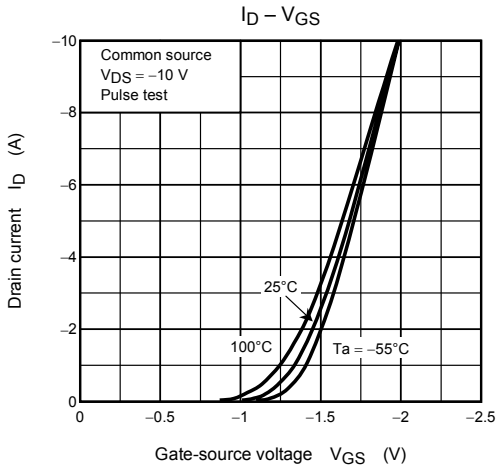
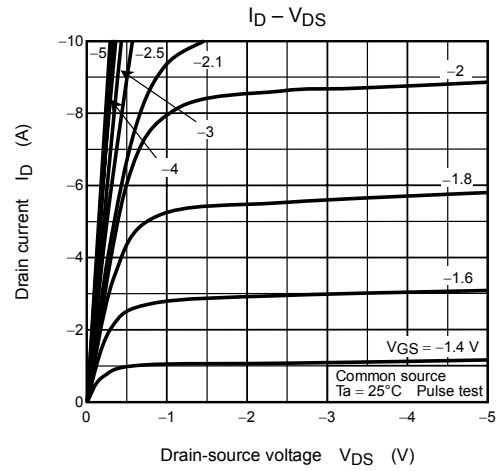
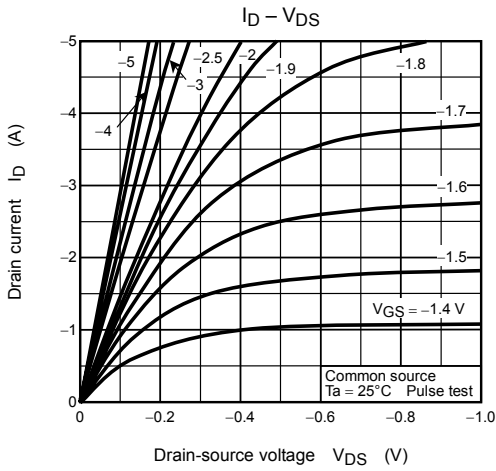
(b)

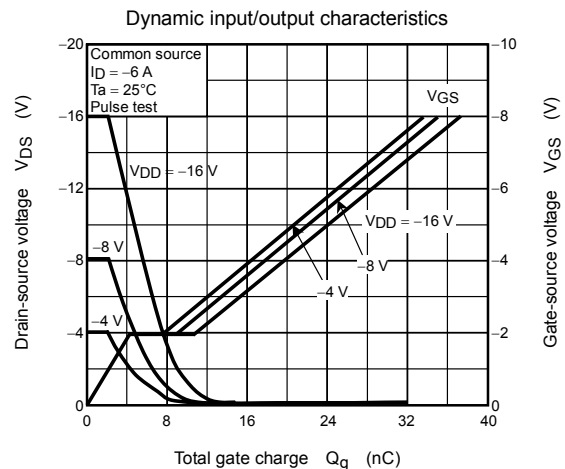
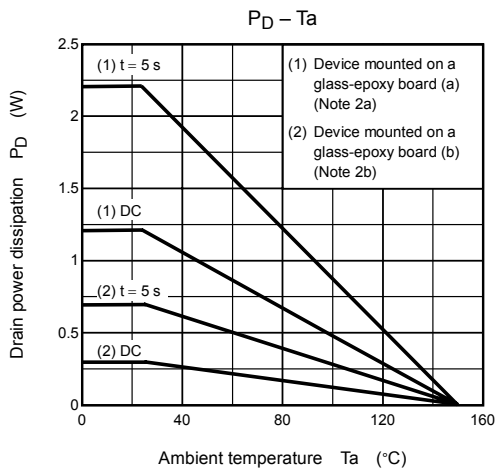
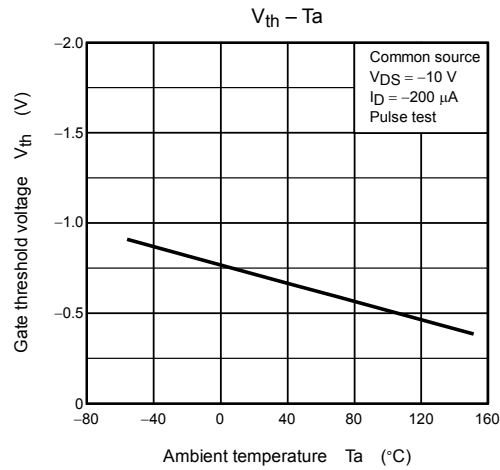
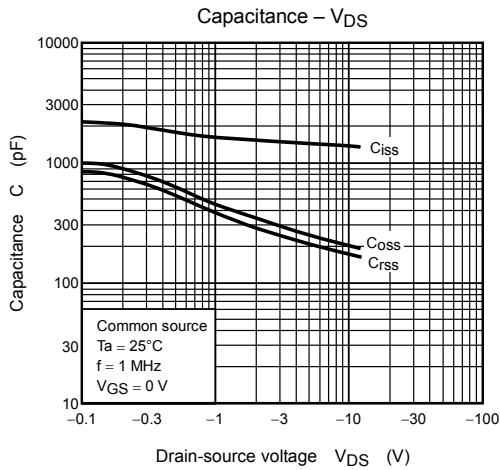
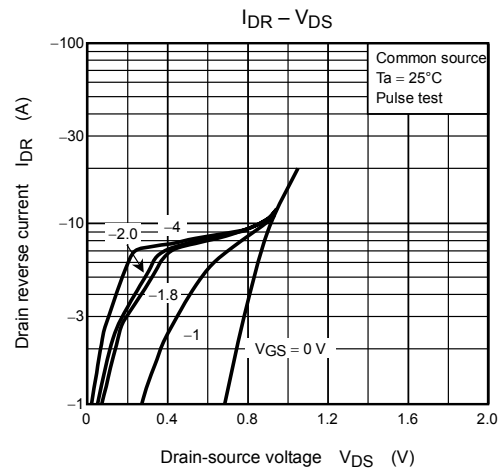
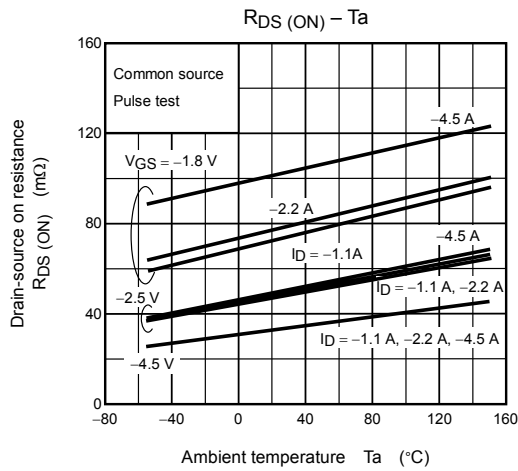
FR-4
 25.4 × 25.4 × 0.8
 Unit: (mm)

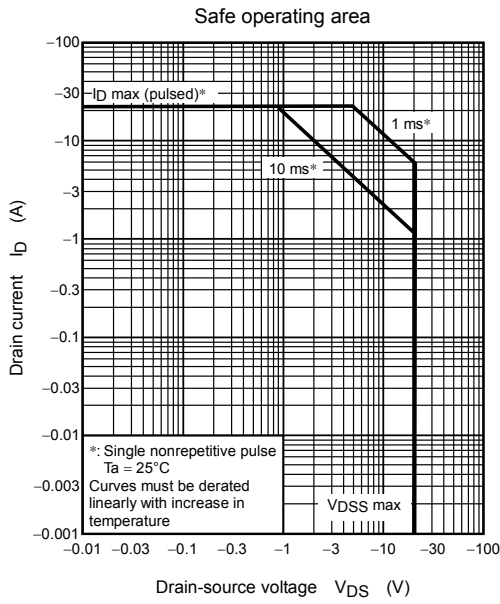
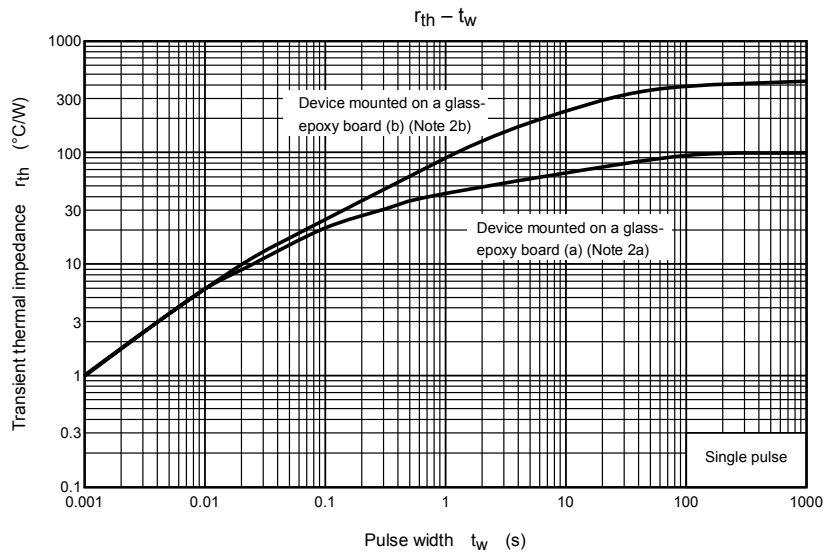
Note 3: $V_{DD} = -16 \text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 0.5 \text{ mH}$, $R_G = 25 \Omega$, $I_{AR} = -2.75 \text{ A}$

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

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







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