

TOSHIBA Field Effect Transistor Silicon P Channel MOS Type

SSM6P54TU

- High-Speed Switching Applications
- Power Management Switch Applications

- 1.5 V drive
- Suitable for high-density mounting due to compact package
- Low on-resistance : $R_{ON} = 228 \text{ m}\Omega$ (max) (@ $V_{GS} = -2.5 \text{ V}$)
 : $R_{ON} = 350 \text{ m}\Omega$ (max) (@ $V_{GS} = -1.8 \text{ V}$)
 : $R_{ON} = 555 \text{ m}\Omega$ (max) (@ $V_{GS} = -1.5 \text{ V}$)

Absolute Maximum Ratings (Ta = 25°C)

| Characteristics | Symbol | Rating | Unit |
|---------------------------|----------------|-----------|------|
| Drain-Source voltage | V_{DS} | -20 | V |
| Gate-Source voltage | V_{GSS} | ± 8 | V |
| Drain current | DC | I_D | -1.2 |
| | Pulse | I_{DP} | -2.4 |
| Drain power dissipation | P_D (Note 1) | 500 | mW |
| Channel temperature | T_{ch} | 150 | °C |
| Storage temperature range | T_{stg} | -55 ~ 150 | °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).

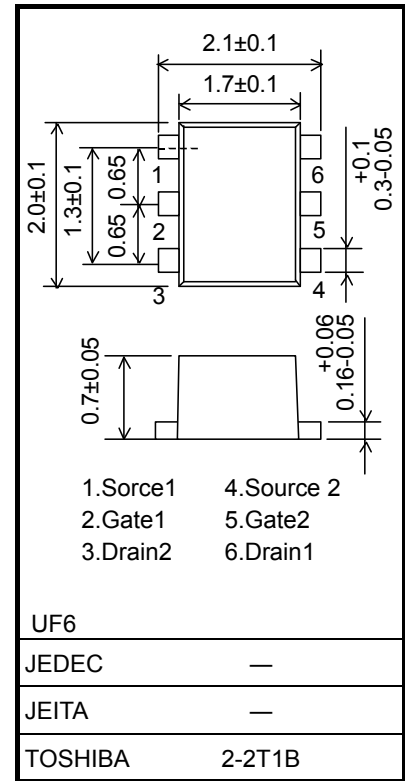
Note 1: Mounted on an FR4 board.
 (25.4 mm × 25.4 mm × 1.6 t, Cu Pad: 645 mm²)

Electrical Characteristics (Ta = 25°C)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|--------------------------------|---------------|---|--|------|---------|------|
| Drain-Source breakdown voltage | $V_{(BR)DSS}$ | $I_D = -1 \text{ mA}, V_{GS} = 0$ | -20 | — | — | V |
| | $V_{(BR)DSX}$ | $I_D = -1 \text{ mA}, V_{GS} = +8 \text{ V}$ | -12 | — | — | |
| Drain cut-off current | I_{DSS} | $V_{DS} = -20 \text{ V}, V_{GS} = 0$ | — | — | -10 | μA |
| Gate leakage current | I_{GSS} | $V_{GS} = \pm 8 \text{ V}, V_{DS} = 0$ | — | — | ± 1 | μA |
| Gate threshold voltage | V_{th} | $V_{DS} = -3 \text{ V}, I_D = -1 \text{ mA}$ | -0.3 | — | -1.0 | V |
| Forward transfer admittance | $ Y_{fs} $ | $V_{DS} = -3 \text{ V}, I_D = -0.6 \text{ A}$ (Note 2) | 1.7 | 3.4 | — | S |
| Drain-Source on-resistance | $R_{DS(ON)}$ | $I_D = -0.6 \text{ A}, V_{GS} = -2.5 \text{ V}$ (Note 2) | — | 162 | 228 | mΩ |
| | | $I_D = -0.6 \text{ A}, V_{GS} = -1.8 \text{ V}$ (Note 2) | — | 212 | 350 | |
| | | $I_D = -0.1 \text{ A}, V_{GS} = -1.5 \text{ V}$ (Note 2) | — | 249 | 555 | |
| Input capacitance | C_{iss} | $V_{DS} = -10 \text{ V}, V_{GS} = 0$ $f = 1 \text{ MHz}$ | — | 331 | — | pF |
| Output capacitance | C_{oss} | | — | 48 | — | |
| Reverse transfer capacitance | C_{rss} | | — | 39 | — | |
| Switching time | Turn-on time | t_{on} | $V_{DD} = -10 \text{ V}, I_D = -0.6 \text{ A}$ | | — | ns |
| | Turn-off time | t_{off} | $V_{GS} = 0 \sim -2.5 \text{ V}, R_G = 4.7 \Omega$ | | — | |
| Total gate charge | Q_g | $V_{DS} = -16 \text{ V}, I_{DS} = -1.2 \text{ A},$ $V_{GS} = -4 \text{ V}$ | — | 7.7 | — | nC |
| Gate-Source charge | Q_{gs} | | — | 4.9 | — | |
| Gate-Drain charge | Q_{gd} | | — | 2.8 | — | |
| Drain-Source forward voltage | V_{DSF} | $I_D = 1.2 \text{ A}, V_{GS} = 0$ (Note 2) | — | 0.8 | 1.2 | V |

Note 2: Pulse test

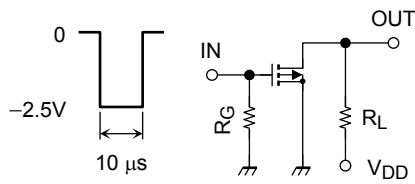
Unit : mm



Weight: 7.0 mg (typ.)

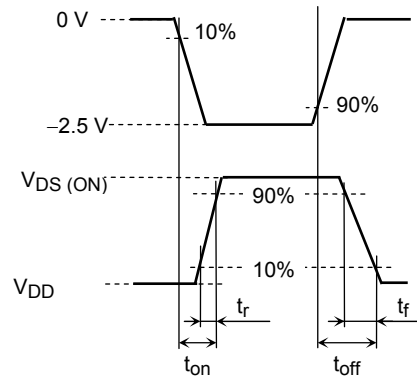
Switching Time Test Circuit

(a) Test Circuit



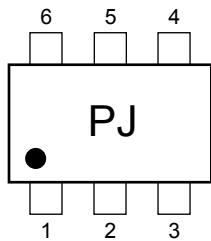
$V_{DD} = -10\text{ V}$
 $R_G = 4.7\ \Omega$
 $D.U. \leq 1\%$
 V_{IN} : $t_r, t_f < 5\text{ ns}$
 Common Source
 $T_a = 25\text{ }^\circ\text{C}$

(b) V_{IN}

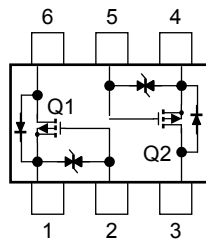


(c) V_{OUT}

Marking



Equivalent Circuit (top view)



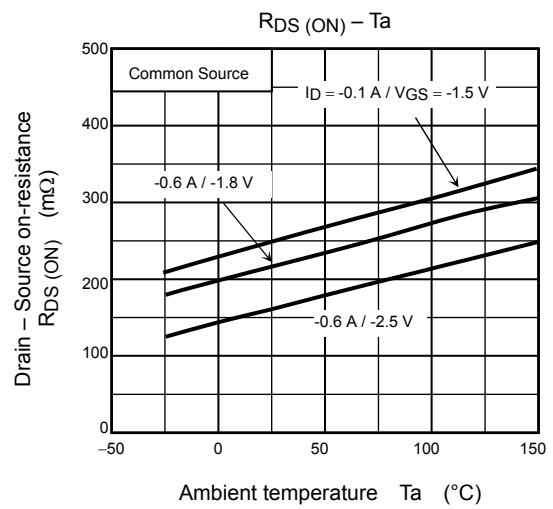
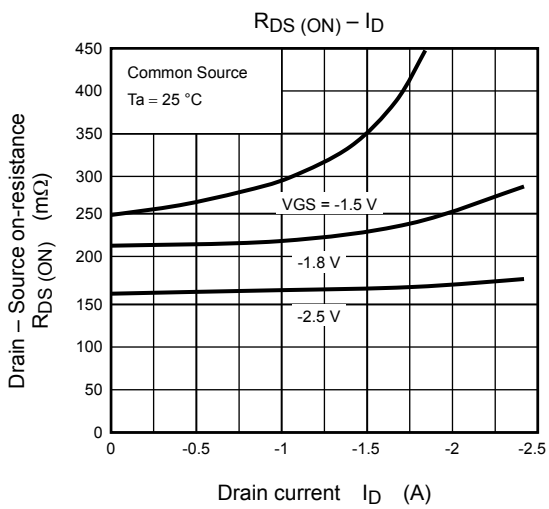
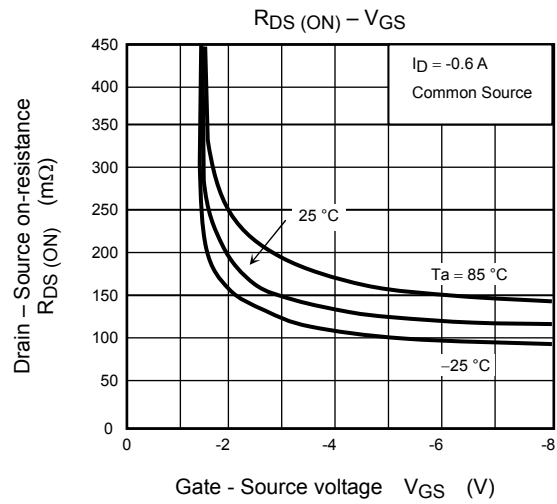
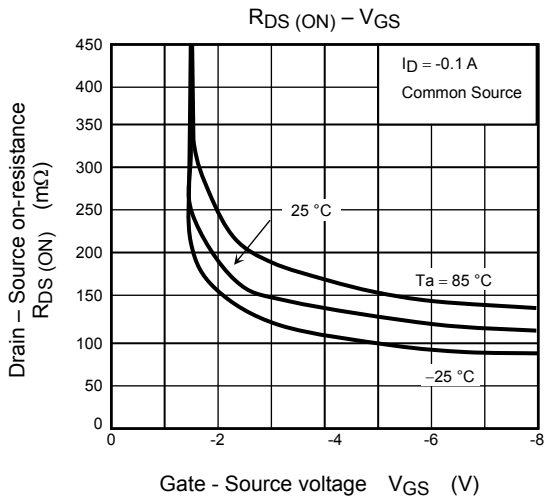
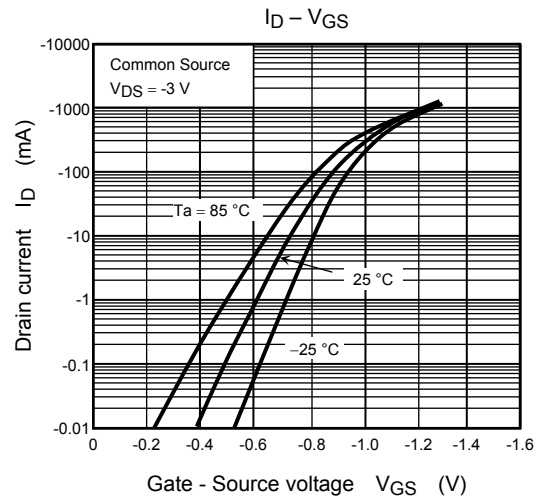
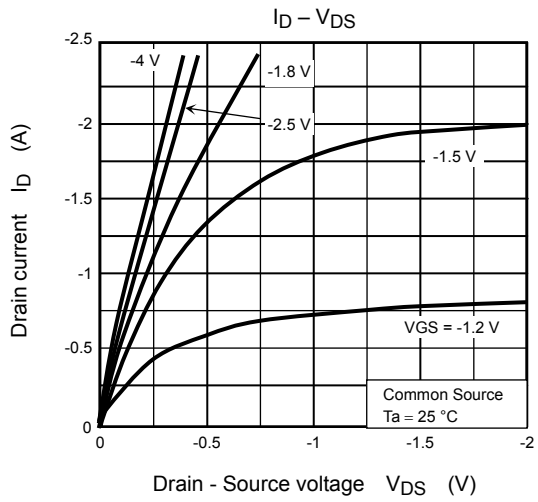
Precaution

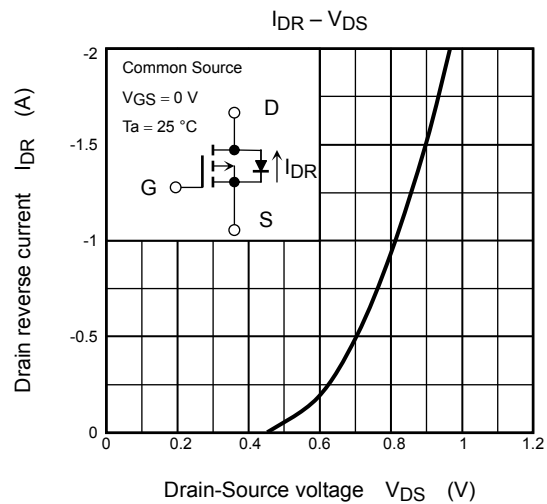
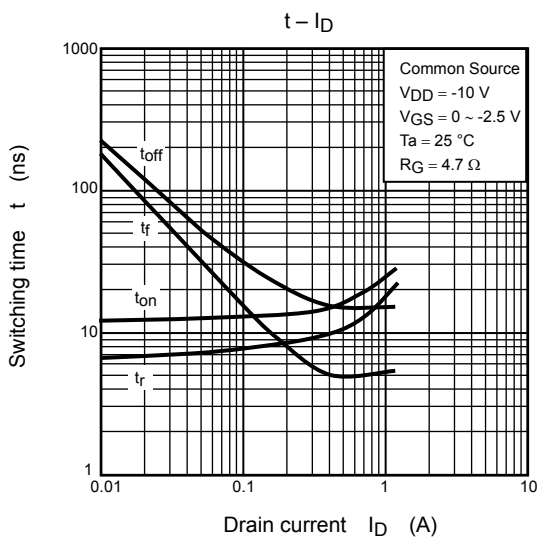
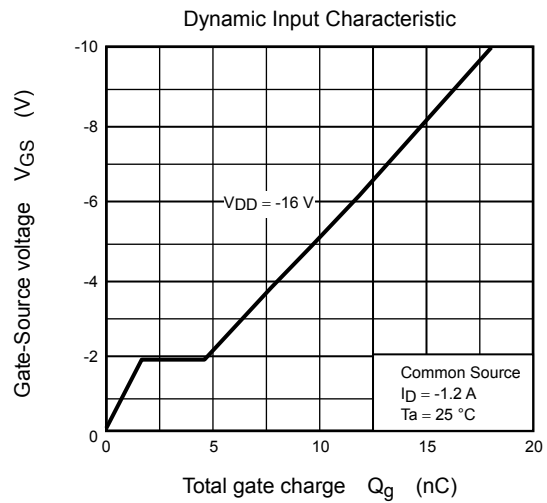
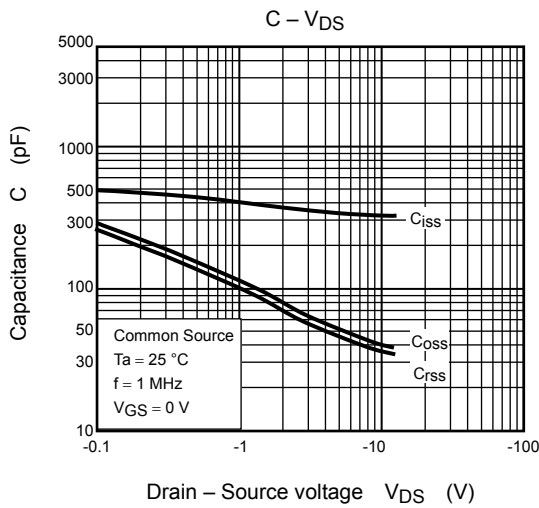
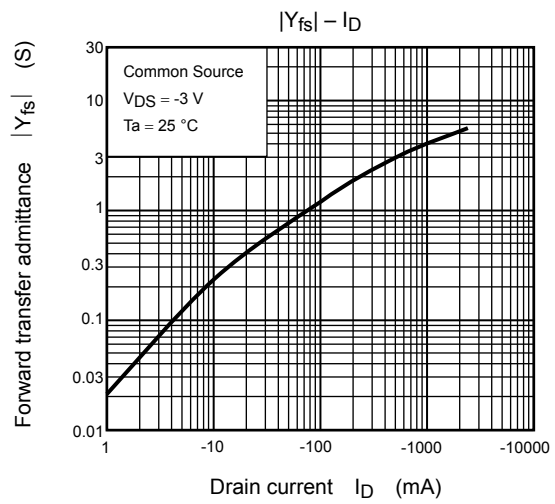
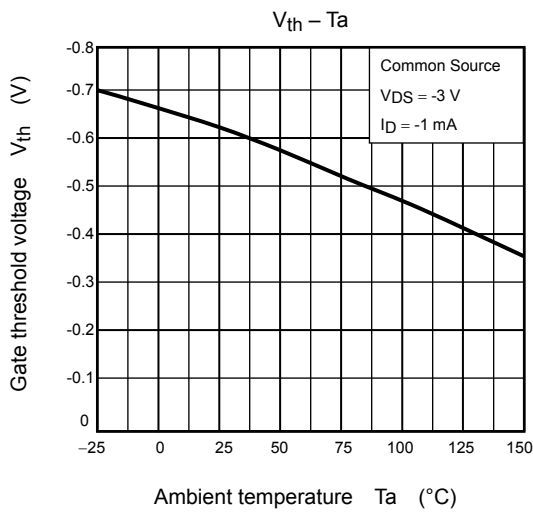
V_{th} can be expressed as the voltage between the gate and source when the low operating current value is $I_D = -1\text{ mA}$ for this product. For normal switching operation, $V_{GS(ON)}$ requires a higher voltage than V_{th} and $V_{GS(OFF)}$ requires a lower voltage than V_{th} . (The relationship can be established as follows: $V_{GS(OFF)} < V_{th} < V_{GS(ON)}$.)

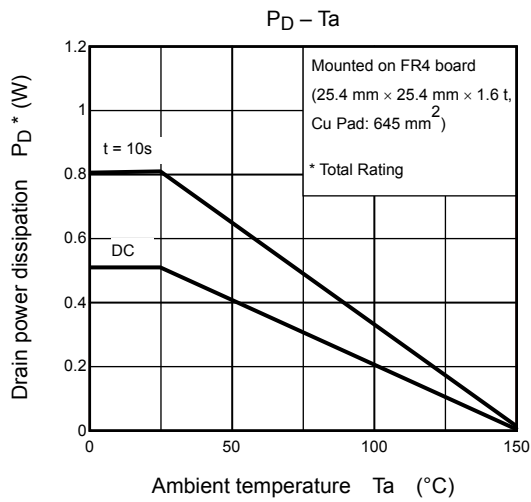
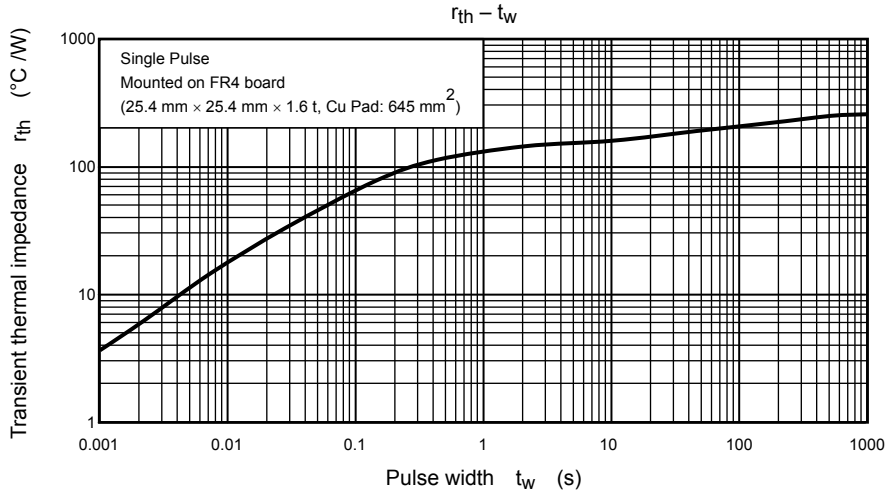
Be sure to take this into consideration when using the device.

Handling Precaution

When handling individual devices (which are not yet mounted on a circuit board), ensure that the environment is protected against static electricity. Operators should wear anti-static clothing, and containers and other objects that come into direct contact with devices should be made of anti-static materials.







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