

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type

SSM3K01T

High Speed Switching Applications

- Small Package
- Low on Resistance: $R_{on} = 120 \text{ m}\Omega$ (max) (@ $V_{GS} = 4 \text{ V}$)
 $R_{on} = 150 \text{ m}\Omega$ (max) (@ $V_{GS} = 2.5 \text{ V}$)
- Low Gate Threshold Voltage: $V_{th} = 0.6\sim 1.1 \text{ V}$
(@ $V_{DS} = 3 \text{ V}$, $I_D = 0.1 \text{ mA}$)

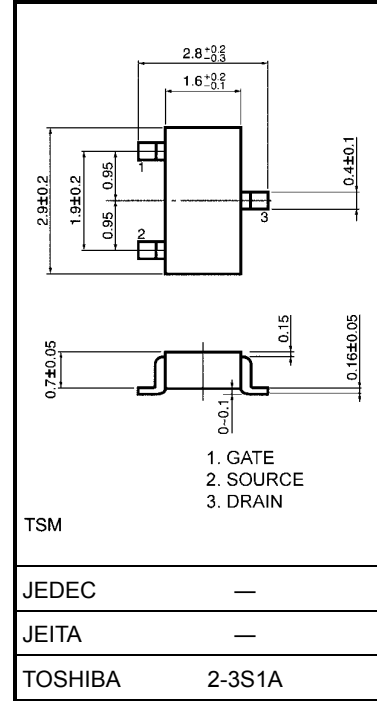
Maximum Ratings (Ta = 25°C)

| Characteristic | Symbol | Rating | Unit |
|-------------------------------------|------------------|---------------------|------|
| Drain-Source voltage | V_{DS} | 30 | V |
| Gate-Source voltage | V_{GSS} | ± 10 | V |
| Drain current | DC | I_D | 3.2 |
| | Pulse | I_{DP} (Note2) | 6.4 |
| Drain power dissipation (Ta = 25°C) | P_D (Note1) | 1250 | mW |
| Channel temperature | T_{ch} | 150 | °C |
| Storage temperature range | T_{stg} | -55~150 | °C |

Note1: Mounted on FR4 board
(25.4 mm × 25.4 mm × 1.6 t, Cu pad: 645 mm², t = 10 s)

Note2: The pulse width limited by max channel temperature.

Unit: mm



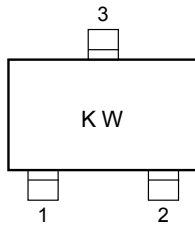
Weight: 10 mg (typ.)

Handling Precaution

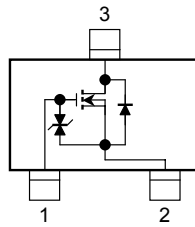
When handling individual devices (which are not yet mounted on a circuit board), be sure that the environment is protected against electrostatic electricity. Operators should wear anti-static clothing, and containers and other objects that come into direct contact with devices should be made of anti-static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

The Channel-to-Ambient thermal resistance $R_{th(ch-a)}$ and the drain power dissipation P_D vary according to the board material, board area, board thickness and pad area, and are also affected by the environment in which the product is used. When using this device, please take heat dissipation fully into account.

Marking



Equivalent Circuit



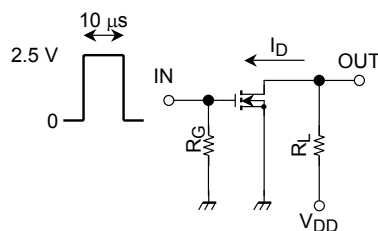
Electrical Characteristics (Ta = 25°C)

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|--------------------------------|---------------|--|-----|------|---------|------------------|
| Gate leakage current | I_{GSS} | $V_{GS} = \pm 10\text{ V}, V_{DS} = 0$ | — | — | ± 1 | μA |
| Drain-Source breakdown voltage | $V_{(BR)DSS}$ | $I_D = 1\text{ mA}, V_{GS} = 0$ | 30 | — | — | V |
| Drain Cut-off current | I_{DSS} | $V_{DS} = 30\text{ V}, V_{GS} = 0$ | — | — | 1 | μA |
| Gate threshold voltage | V_{th} | $V_{DS} = 3\text{ V}, I_D = 0.1\text{ mA}$ | 0.6 | — | 1.1 | V |
| Forward transfer admittance | $ Y_{fs} $ | $V_{DS} = 3\text{ V}, I_D = 1.6\text{ A}$ (Note3) | 2.6 | 5.2 | — | S |
| Drain-Source ON resistance | $R_{DS(ON)}$ | $I_D = 1.6\text{ A}, V_{GS} = 4\text{ V}$ (Note3) | — | 85 | 120 | $\text{m}\Omega$ |
| Drain-Source ON resistance | $R_{DS(ON)}$ | $I_D = 1.3\text{ A}, V_{GS} = 2.5\text{ V}$ (Note3) | — | 115 | 150 | $\text{m}\Omega$ |
| Input capacitance | C_{iss} | $V_{DS} = 10\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$ | — | 152 | — | pF |
| Reverse transfer capacitance | C_{rss} | $V_{DS} = 10\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$ | — | 41 | — | pF |
| Output capacitance | C_{oss} | $V_{DS} = 10\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$ | — | 102 | — | pF |
| Switching time | Turn-on time | t_{on} | — | | 45 | nS |
| | Turn-off time | t_{off} | — | | 69 | |

Note3: Pulse test

Switching Time Test Circuit

(a) Test circuit



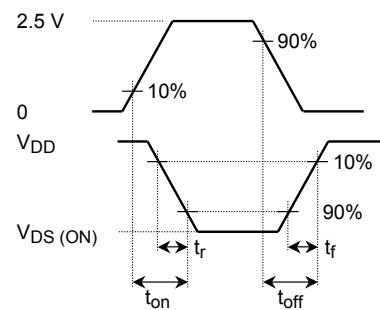
$V_{DD} = 15\text{ V}$
 $R_G = 4.7\ \Omega$
 $D.U. \leq 1\%$
 $V_{IN}: t_r, t_f < 5\text{ ns}$
 COMMON SOURCE
 $T_a = 25^\circ\text{C}$

(b) V_{IN}

V_{GS}

(c) V_{OUT}

V_{DS}



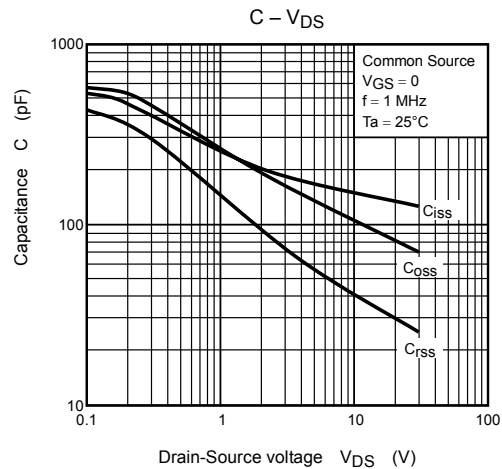
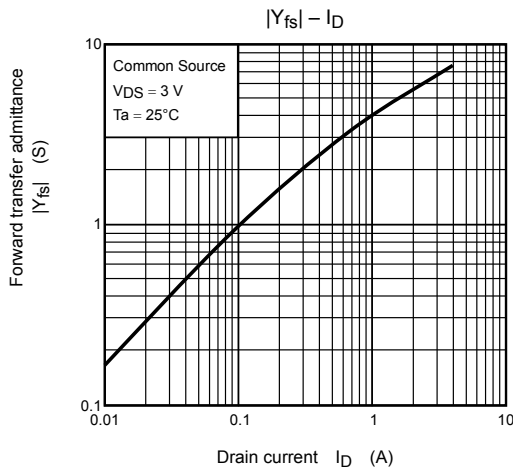
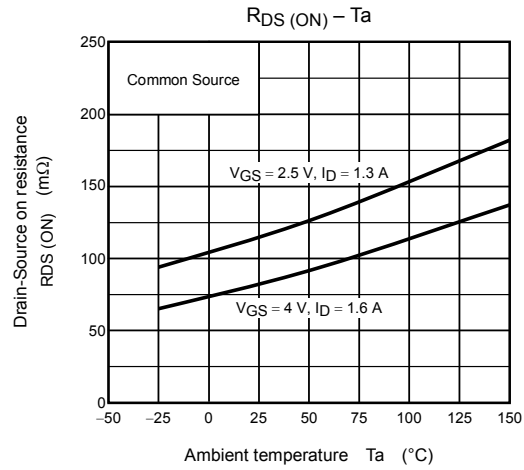
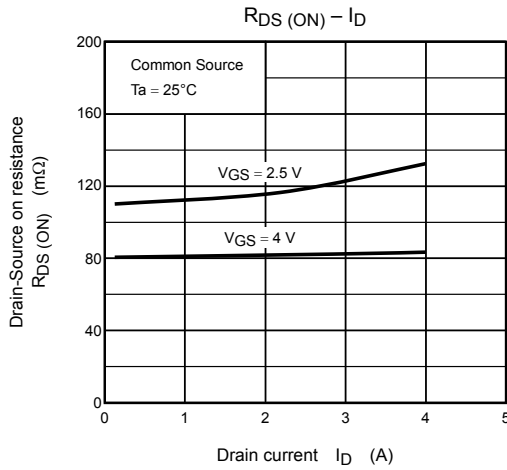
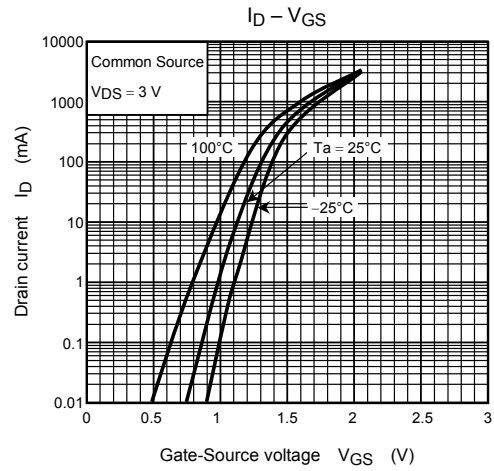
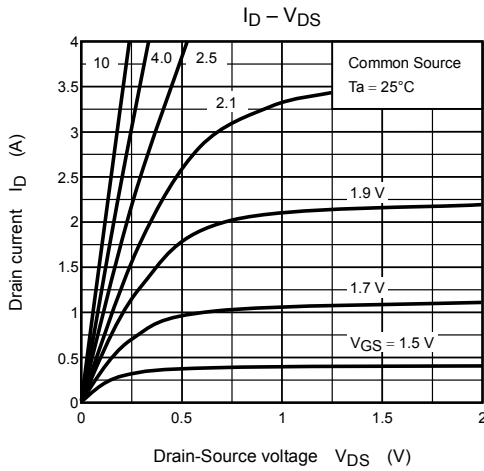
Precaution

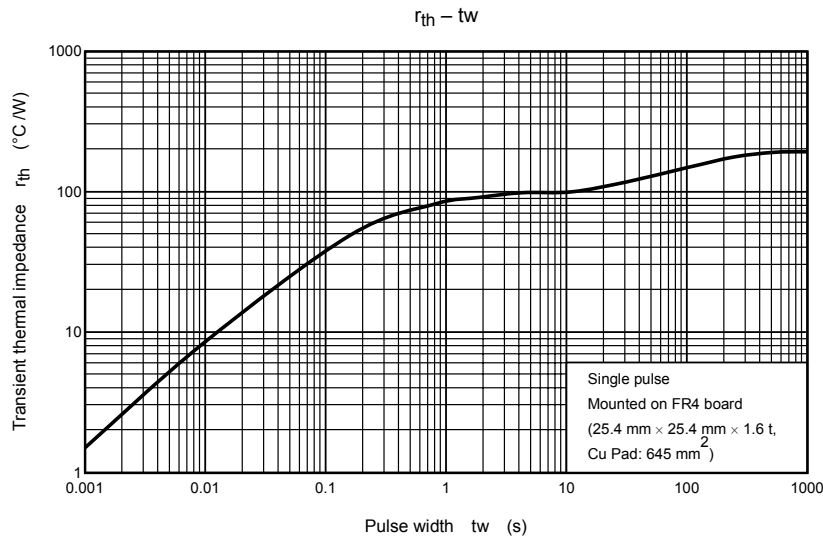
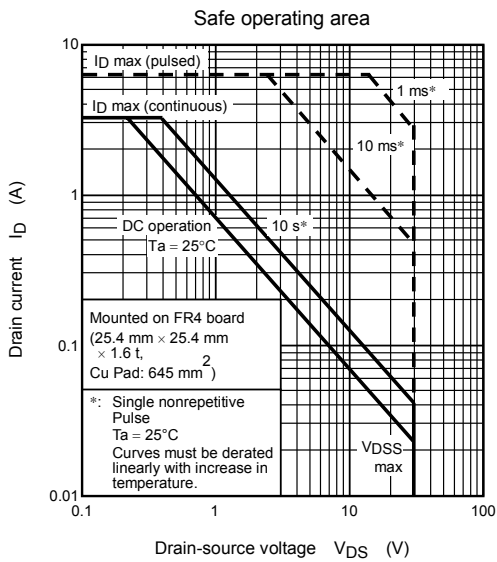
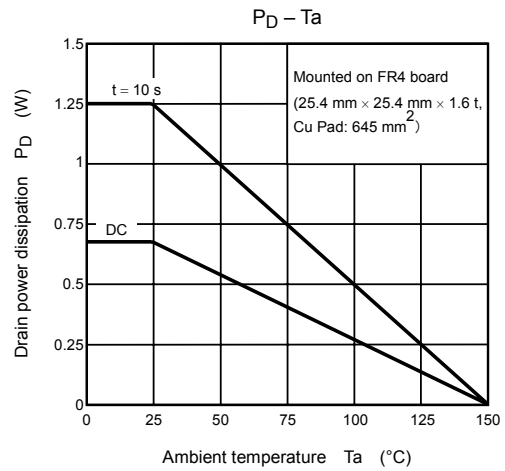
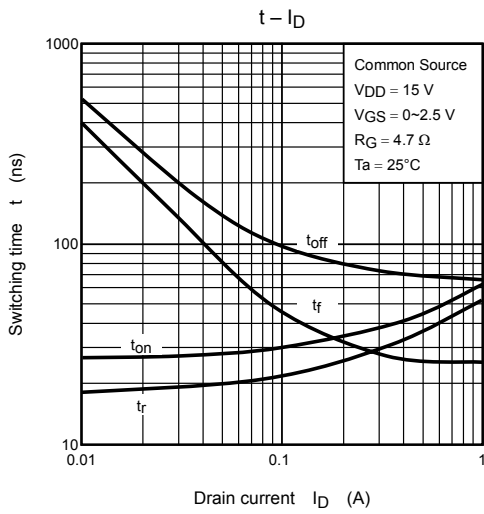
V_{th} can be expressed as voltage between gate and source when low operating current value is $I_D = 100\ \mu\text{A}$ for this product. For normal switching operation, $V_{GS(on)}$ requires higher voltage than V_{th} and $V_{GS(off)}$ requires lower voltage than V_{th} .

(relationship can be established as follows: $V_{GS(off)} < V_{th} < V_{GS(on)}$)

Please take this into consideration for using the device.

V_{GS} recommended voltage of 2.5 V or higher to turn on this product.





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