

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

SSM3K15ACT

Load Switching Applications

- 2.5 V drive
- Low ON-resistance: $R_{DS(ON)} = 3.6 \Omega$ (max) (@ $V_{GS} = 4$ V)
 $R_{DS(ON)} = 6.0 \Omega$ (max) (@ $V_{GS} = 2.5$ V)

Absolute Maximum Ratings (Ta = 25°C)

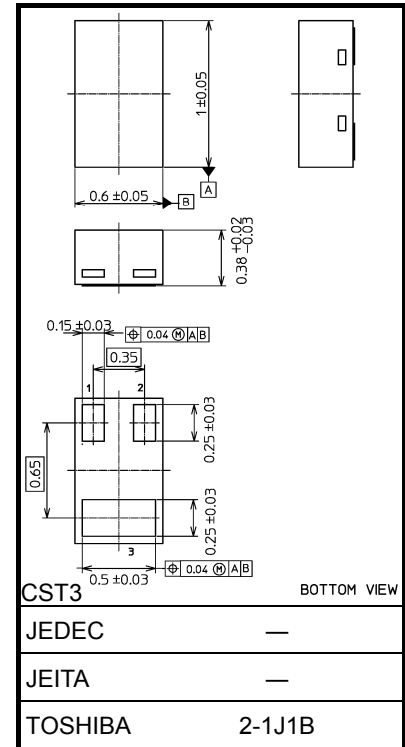
| Characteristics | Symbol | Rating | Unit |
|---------------------------|----------------|------------|------|
| Drain-Source voltage | V_{DSS} | 30 | V |
| Gate-Source voltage | V_{GSS} | ± 20 | V |
| Drain current | DC | I_D | 100 |
| | Pulse | I_{DP} | 400 |
| Power dissipation | P_D (Note 1) | 100 | mW |
| Channel temperature | T_{ch} | 150 | °C |
| Storage temperature range | T_{stg} | -55 to 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).

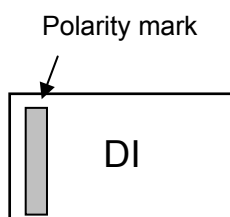
Note 1: Mounted on FR4 board
 (10 mm × 10 mm × 1.0 mm, Cu Pad: 100 mm²)

Unit: mm

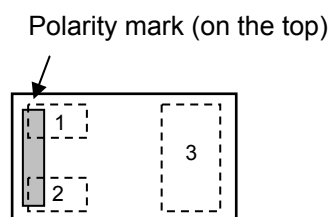


Weight: 0.75 mg (typ.)

Marking (Top View)

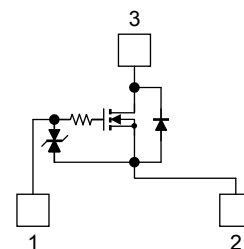


Pin Condition (Top View)



1. Gate
 2. Source
 3. Drain
- *Electrodes: On the bottom

Equivalent Circuit



Electrical characteristics (Ta = 25°C)

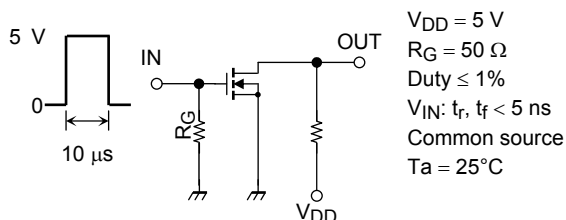
| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|--------------------------------|---------------|---|---|-------|---------|---------------|
| Drain-Source breakdown voltage | $V_{(BR)DSS}$ | $I_D = 0.1 \text{ mA}, V_{GS} = 0 \text{ V}$ | 30 | — | — | V |
| | $V_{(BR)DSX}$ | $I_D = 0.1 \text{ mA}, V_{GS} = -10 \text{ V}$ (Note 3) | 16 | — | — | |
| Drain cut-off current | I_{DSS} | $V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}$ | — | — | 1 | μA |
| Gate leakage current | I_{GSS} | $V_{GS} = \pm 16 \text{ V}, V_{DS} = 0 \text{ V}$ | — | — | ± 1 | μA |
| Gate threshold voltage | V_{th} | $V_{DS} = 3 \text{ V}, I_D = 0.1 \text{ mA}$ | 0.8 | — | 1.5 | V |
| Forward transfer admittance | $ Y_{fs} $ | $V_{DS} = 3 \text{ V}, I_D = 10 \text{ mA}$ (Note 2) | 35 | — | — | mS |
| Drain-Source ON-resistance | $R_{DS(ON)}$ | $I_D = 10 \text{ mA}, V_{GS} = 4 \text{ V}$ (Note 2) | — | 2.3 | 3.6 | Ω |
| | | $I_D = 10 \text{ mA}, V_{GS} = 2.5 \text{ V}$ (Note 2) | — | 3.5 | 6.0 | |
| Input capacitance | C_{iss} | $V_{DS} = 3 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$ | — | 13.5 | — | pF |
| Output capacitance | C_{oss} | | — | 8.0 | — | |
| Reverse transfer capacitance | C_{rss} | | — | 6.5 | — | |
| Switching time | Turn-on time | t_{on} | $V_{DD} = 5 \text{ V}, I_D = 10 \text{ mA}$ | | — | ns |
| | Turn-off time | t_{off} | $V_{GS} = 0 \text{ to } 5 \text{ V}, R_G = 50 \Omega$ | | — | |
| Drain-source forward voltage | V_{DSF} | $I_D = -100 \text{ mA}, V_{GS} = 0 \text{ V}$ (Note 2) | — | -0.85 | -1.2 | V |

Note 2: Pulse test

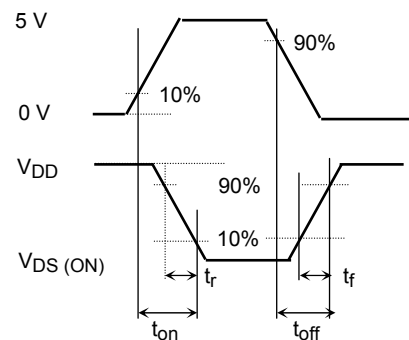
Note 3: If a reverse bias is applied between gate and source, this device enters $V_{(BR)DSX}$ mode. Note that the drain-source breakdown voltage is lowered in this mode.

Switching Time Test Circuit

(a) Test circuit



(b) V_{IN}



(c) V_{OUT}

Precaution

V_{th} can be expressed as voltage between gate and source when low operating current value is $I_D = 0.1 \text{ mA}$ 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: $V_{GS(OFF)} < V_{th} < V_{GS(ON)}$)

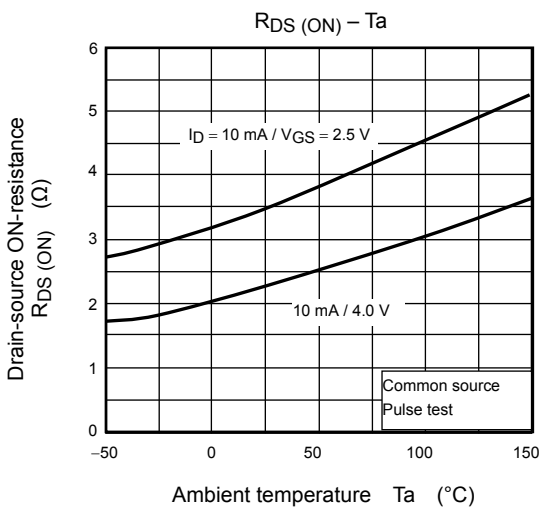
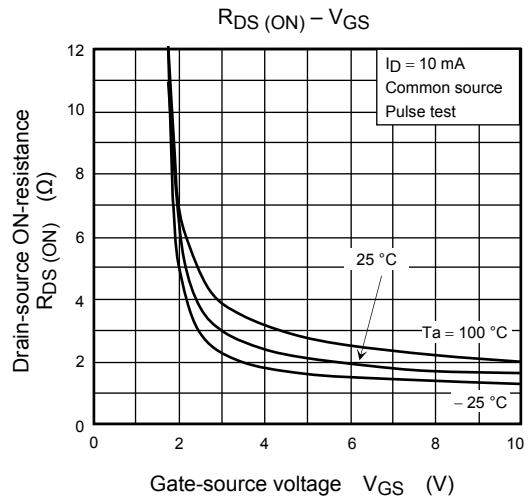
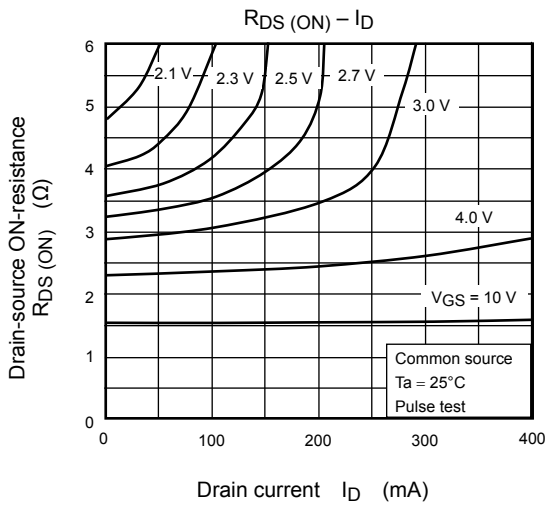
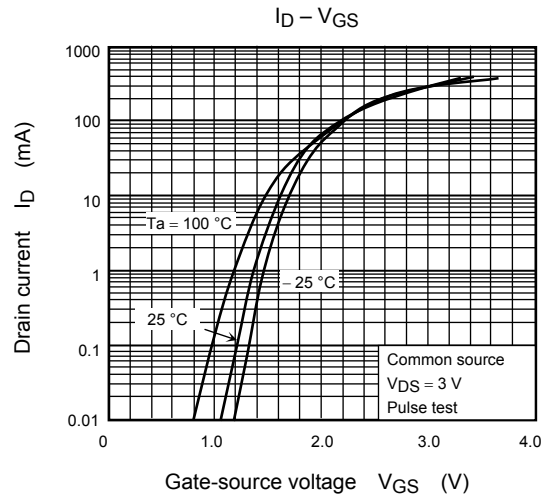
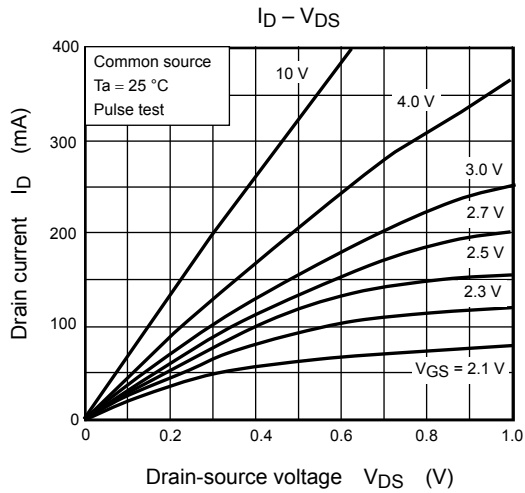
Please take this into consideration for using the device.

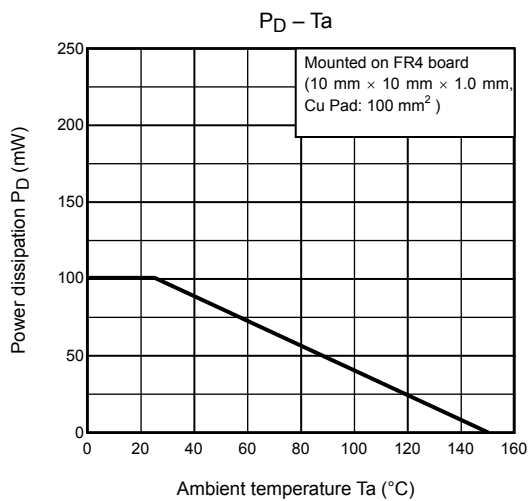
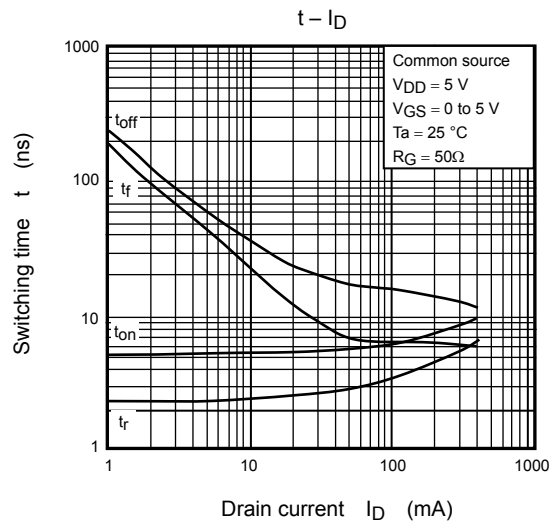
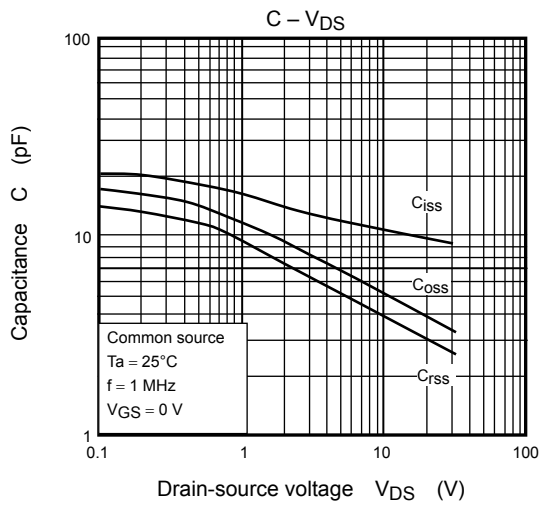
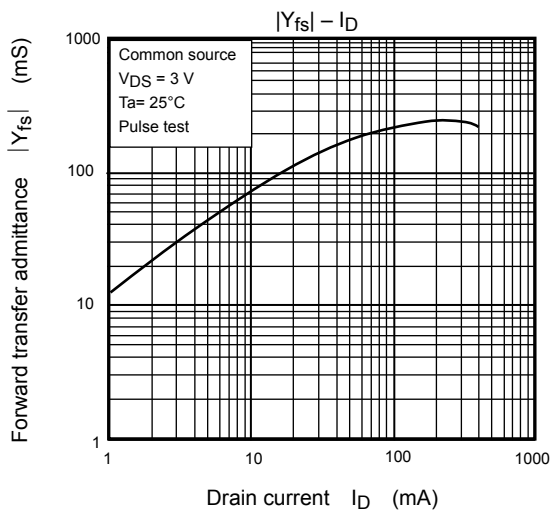
Do not use this device under avalanche mode. It may cause the device to break down.

Handling Precaution

When handling individual devices (which are not yet mounting 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.

Thermal resistance $R_{th(ch-a)}$ and power dissipation P_D vary depending on board material, board area, board thickness and pad area. When using this device, please take heat dissipation into consideration





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