

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

SSM3K320T

High-Speed Switching Applications

- 4.5 V drive
- Low ON-resistance : $R_{on} = 77 \text{ m}\Omega$ (max) (@ $V_{GS} = 4.5 \text{ V}$)
: $R_{on} = 50 \text{ m}\Omega$ (max) (@ $V_{GS} = 10 \text{ V}$)

Absolute Maximum Ratings (Ta = 25°C)

| Characteristic | | Symbol | Rating | Unit |
|---------------------------|----------------|------------------|------------|------|
| Drain-Source voltage | | V_{DSS} | 30 | V |
| Gate-Source voltage | | V_{GSS} | ± 20 | V |
| Drain current | DC | I_D (Note1) | 4.2 | A |
| | Pulse | I_{DP} (Note1) | 8.4 | |
| Drain power dissipation | P_D (Note 2) | | 700 | mW |
| | | $t = 5\text{s}$ | 1400 | |
| Channel temperature | | T_{ch} | 150 | °C |
| Storage temperature range | | T_{stg} | -55 to 150 | °C |

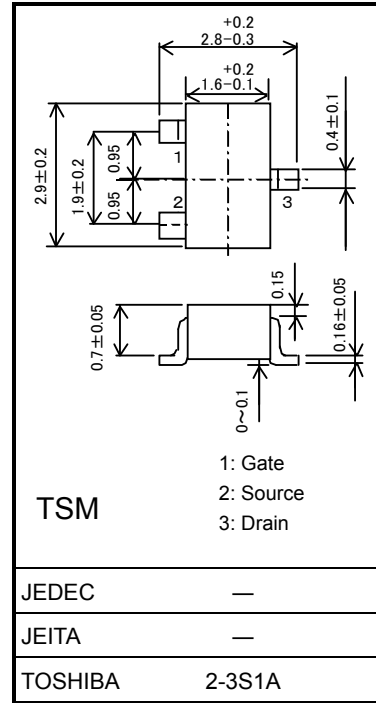
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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: The junction temperature should not exceed 150°C during use.

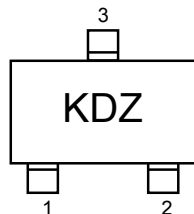
Note 2: Mounted on an FR4 board. (25.4 mm × 25.4 mm × 1.6 mm, Cu Pad: 645 mm²)

Unit: mm

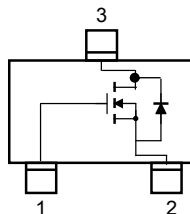


Weight: 10mg (typ.)

Marking



Equivalent Circuit (top view)



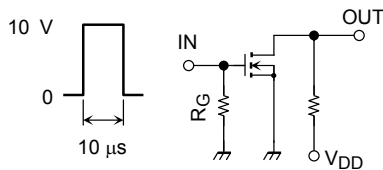
Electrical Characteristics (Ta = 25°C)

| Characteristic | Symbol | Test Conditions | Min | Typ. | Max | Unit | |
|--------------------------------|---------------|---|--|-------|-----------|---------------|----|
| Drain-Source breakdown voltage | $V_{(BR)DSS}$ | $I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}$ | 30 | — | — | V | |
| | $V_{(BR)DSX}$ | $I_D = 10 \text{ mA}, V_{GS} = -20 \text{ V}$ | 10 | — | — | | |
| Drain cut-off current | I_{DSS} | $V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}$ | — | — | 10 | μA | |
| Gate leakage current | I_{GSS} | $V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$ | — | — | ± 0.1 | μA | |
| Gate threshold voltage | V_{th} | $V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA}$ | 1.3 | — | 2.5 | V | |
| Forward transfer admittance | $ Y_{fs} $ | $V_{DS} = 10 \text{ V}, I_D = 2.1 \text{ A}$ (Note 3) | 7.0 | 14.0 | — | S | |
| Drain-source ON-resistance | $R_{DS(ON)}$ | $I_D = 2.1 \text{ A}, V_{GS} = 10 \text{ V}$ (Note 3) | — | 38 | 50 | m Ω | |
| | | $I_D = 2.1 \text{ A}, V_{GS} = 4.5 \text{ V}$ (Note 3) | — | 58 | 77 | | |
| Input capacitance | C_{iss} | $V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$ | — | 190 | — | pF | |
| Output capacitance | C_{oss} | | — | 65 | — | | |
| Reverse transfer capacitance | C_{rss} | | — | 45 | — | | |
| Total Gate Charge | Q_g | $V_{DD} = 24 \text{ V}, I_D = 4.2 \text{ A}, V_{GS} = 10 \text{ V}$ | — | 4.6 | — | nC | |
| Gate-Source Charge | Q_{gs} | | — | 3.2 | — | | |
| Gate-Drain Charge | Q_{gd} | | — | 1.4 | — | | |
| Switching time | Turn-on time | t_{on} | $V_{DD} = 15 \text{ V}, I_D = 2.1 \text{ A},$ $V_{GS} = 0 \text{ to } 10 \text{ V}, R_G = 4.7 \Omega$ | — | 9.0 | — | ns |
| | Turn-off time | t_{off} | | — | 12.0 | — | |
| Drain-Source forward voltage | V_{DSF} | $I_D = -4.2 \text{ A}, V_{GS} = 0 \text{ V}$ (Note 3) | — | -0.90 | -1.2 | V | |

Note3: Pulse test

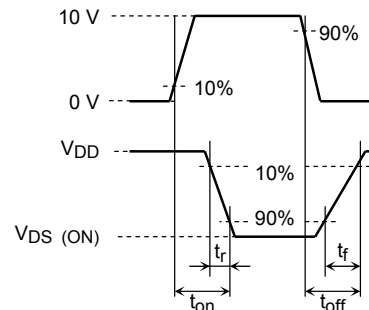
Switching Time Test Circuit

(a) Test Circuit

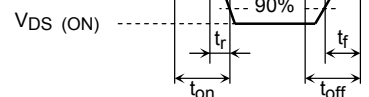


$V_{DD} = 15 \text{ V}$
 $R_G = 4.7 \Omega$
 D.U. $\leq 1\%$
 V_{IN} : $t_r, t_f < 5 \text{ ns}$
 Common Source
 $T_a = 25^\circ\text{C}$

(b) V_{IN}



(c) V_{OUT}



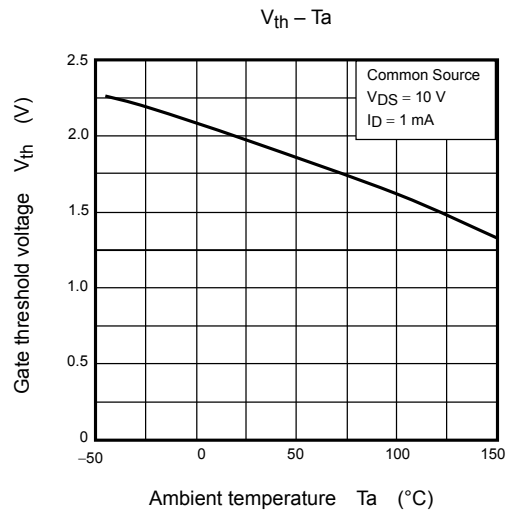
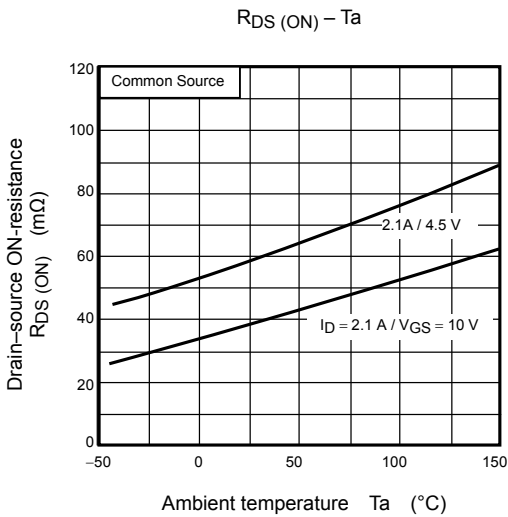
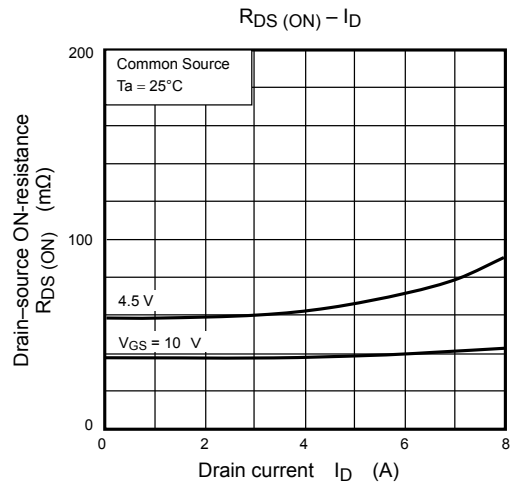
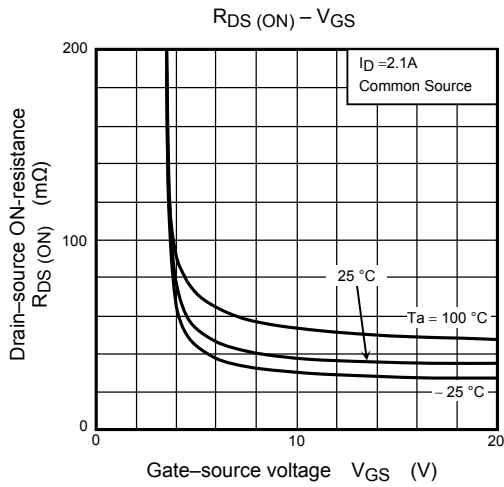
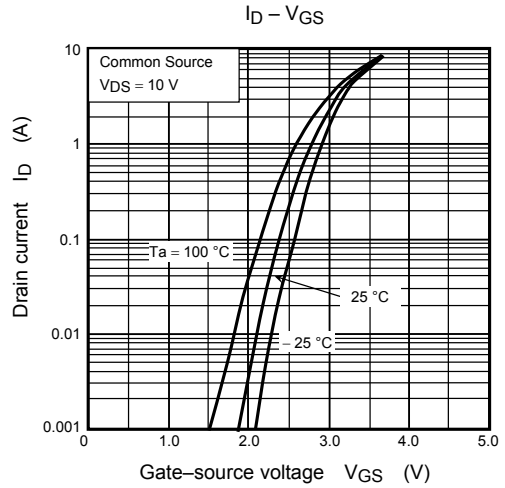
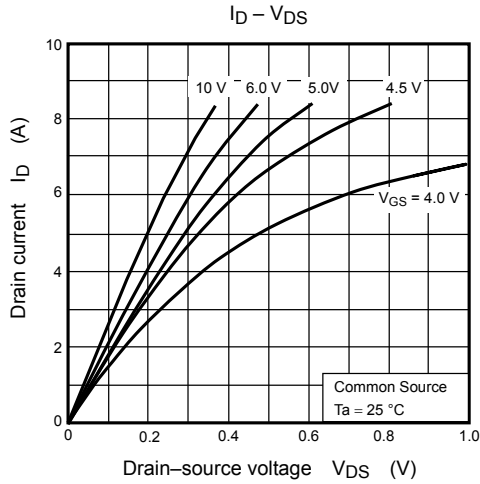
Handling Precaution

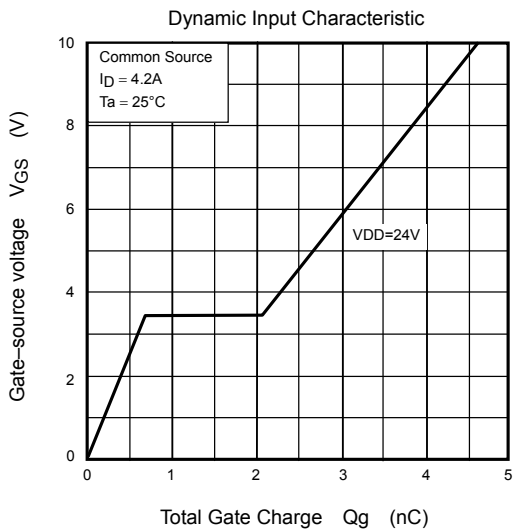
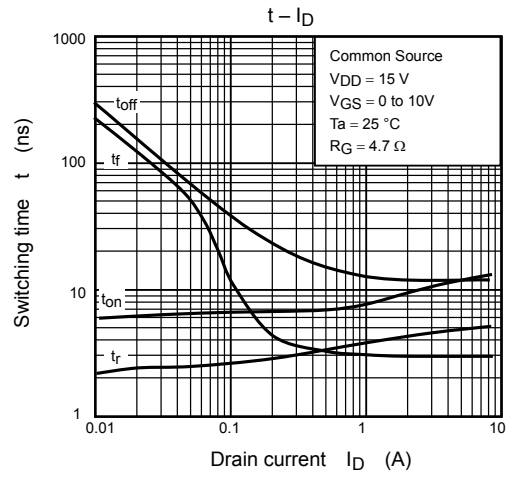
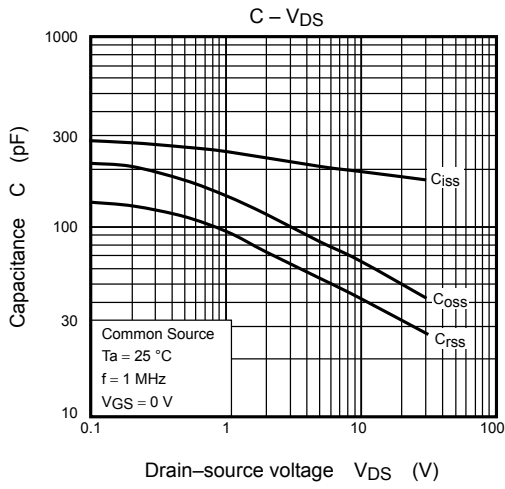
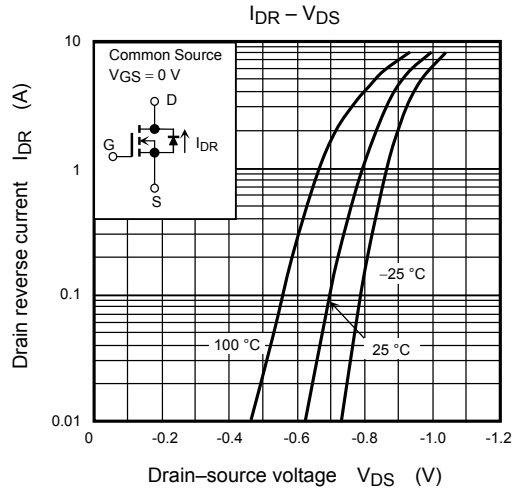
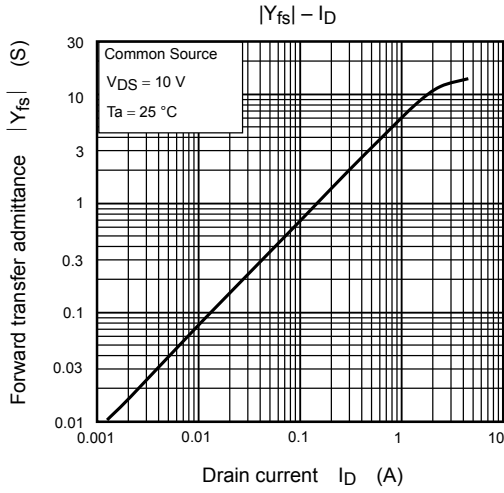
When handling individual devices that are not yet mounted on a circuit board, make sure that the environment is protected against electrostatic discharge. Operators should wear antistatic clothing, and containers and other objects that come into direct contact with devices should be made of antistatic materials.

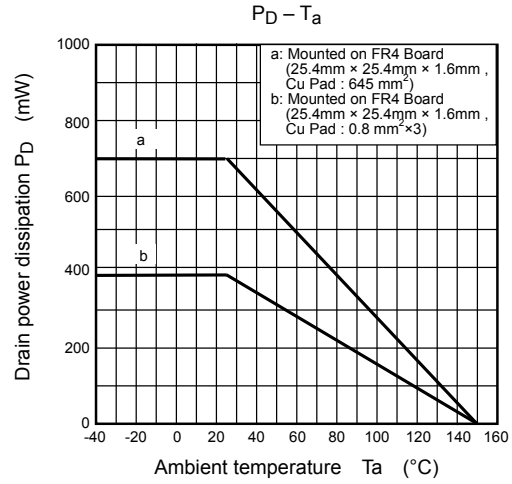
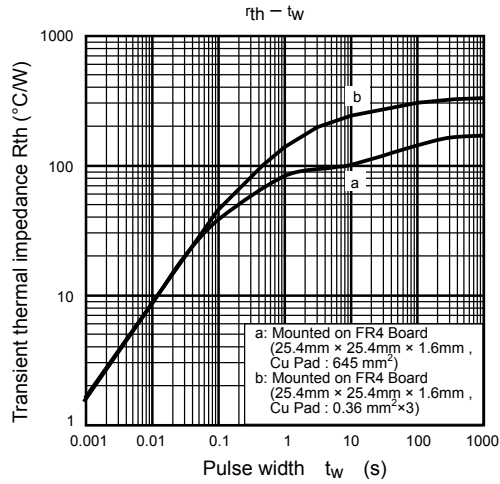
Notice on Usage

V_{th} can be expressed as the voltage between 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: $V_{GS(OFF)} < V_{th} < V_{GS(ON)}$.)

Take this into consideration when using the device.







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