

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type

# SSM3K16FS

High Speed Switching Applications

Analog Switch Applications

- Suitable for high-density mounting due to compact package
- Low on resistance:  $R_{on} = 3.0 \Omega$  (max) (@ $V_{GS} = 4 V$ )  
 :  $R_{on} = 4.0 \Omega$  (max) (@ $V_{GS} = 2.5 V$ )  
 :  $R_{on} = 15 \Omega$  (max) (@ $V_{GS} = 1.5 V$ )

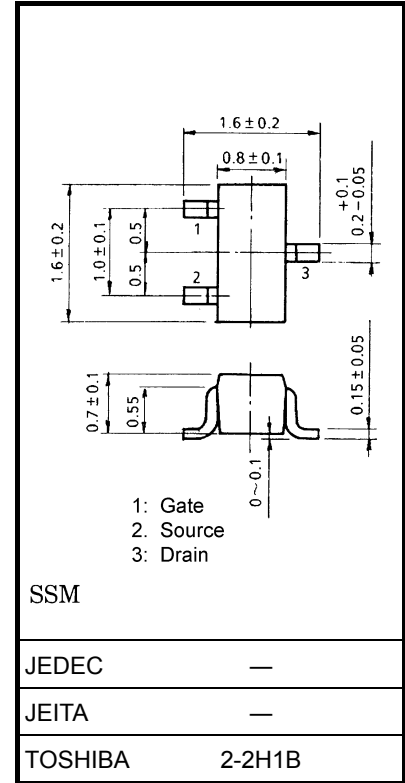
## Absolute Maximum Ratings (Ta = 25°C)

| Characteristics                     | Symbol    | Rating   | Unit |
|-------------------------------------|-----------|----------|------|
| Drain-Source voltage                | $V_{DS}$  | 20       | V    |
| Gate-Source voltage                 | $V_{GSS}$ | $\pm 10$ | V    |
| Drain current                       | DC        | $I_D$    | 100  |
|                                     | Pulse     | $I_{DP}$ | 200  |
| Drain power dissipation (Ta = 25°C) | $P_D$     | 100      | 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.

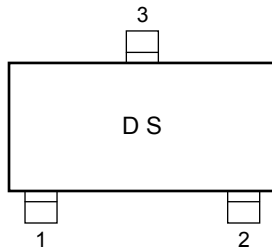
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Unit: mm

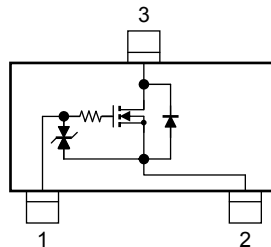


Weight: 2.4 mg (typ.)

## Marking



## Internal connections



## Handling Precaution

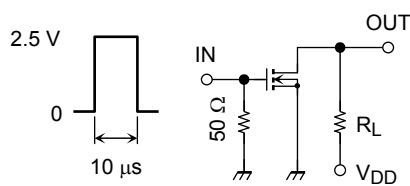
When handling individual devices (which are not yet mounting on a circuit board), be sure that the environment is protected against electrostatic electricity. Operators should wear anti-static clothing, and containers and other objects that come into direct contact with devices should be made of anti-static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

## Electrical Characteristics (Ta = 25°C)

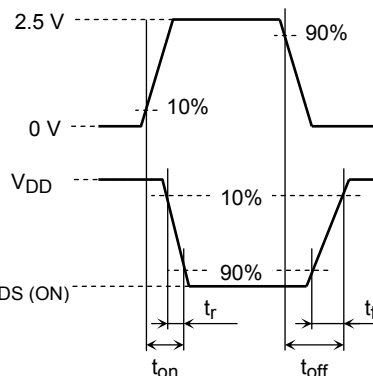
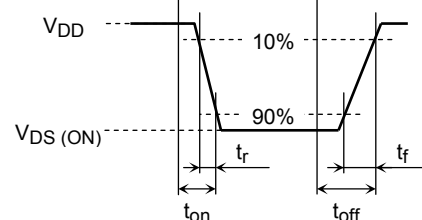
| Characteristics                | Symbol        | Test Condition  | Min | Typ. | Max     | Unit          |
|--------------------------------|---------------|---|-----|------|---------|---------------|
| Gate leakage current           | $I_{GSS}$     | $V_{GS} = \pm 10 \text{ V}, V_{DS} = 0$               | —   | —    | $\pm 1$ | $\mu\text{A}$ |
| Drain-Source breakdown voltage | $V_{(BR)DSS}$ | $I_D = 0.1 \text{ mA}, V_{GS} = 0$                    | 20  | —    | —       | V             |
| Drain cut-off current          | $I_{DSS}$     | $V_{DS} = 20 \text{ V}, V_{GS} = 0$                   | —   | —    | 1       | $\mu\text{A}$ |
| 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} $    | $V_{DS} = 3 \text{ V}, I_D = 10 \text{ mA}$           | 40  | —    | —       | mS            |
| Drain-Source ON resistance     | $R_{DS(ON)}$  | $I_D = 10 \text{ mA}, V_{GS} = 4 \text{ V}$           | —   | 1.5  | 3.0     | $\Omega$      |
|                                |               | $I_D = 10 \text{ mA}, V_{GS} = 2.5 \text{ V}$         | —   | 2.2  | 4.0     |               |
|                                |               | $I_D = 1 \text{ mA}, V_{GS} = 1.5 \text{ V}$          | —   | 5.2  | 15      |               |
| Input capacitance              | $C_{iss}$     | $V_{DS} = 3 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$ | —   | 9.3  | —       | pF            |
| Reverse transfer capacitance   | $C_{rss}$     | $V_{DS} = 3 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$ | —   | 4.5  | —       | pF            |
| Output capacitance             | $C_{oss}$     | $V_{DS} = 3 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$ | —   | 9.8  | —       | pF            |
| Switching time                 | Turn-on time  | $t_{on}$  | —   | 70   | —       | ns            |
|                                | Turn-off time | $t_{off}$   |     | 125  |         |               |

## Switching Time Test Circuit

## (a) Test circuit



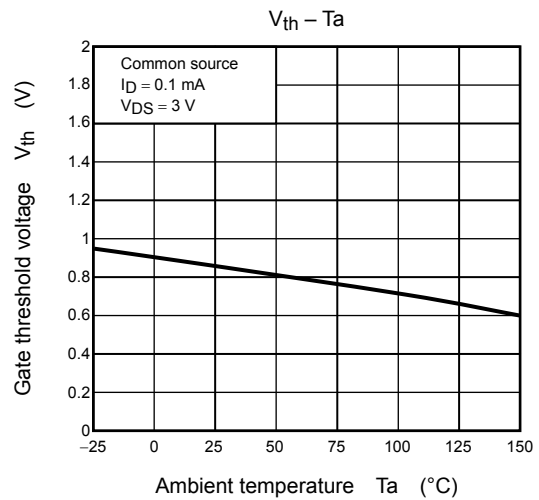
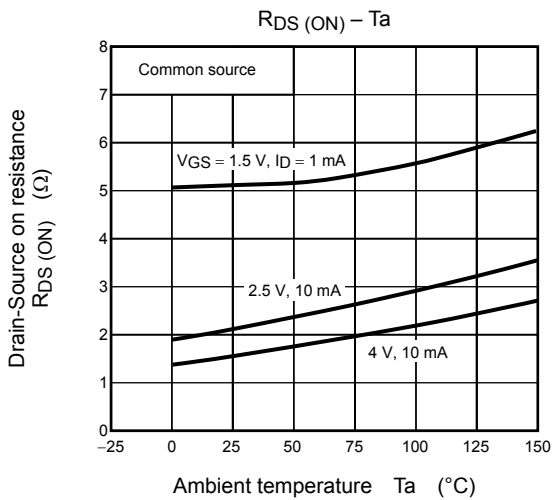
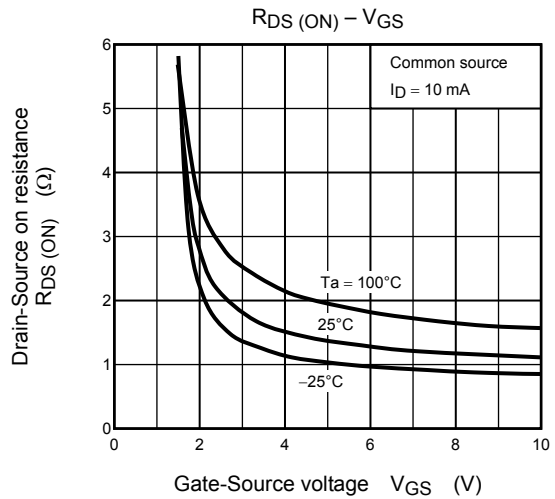
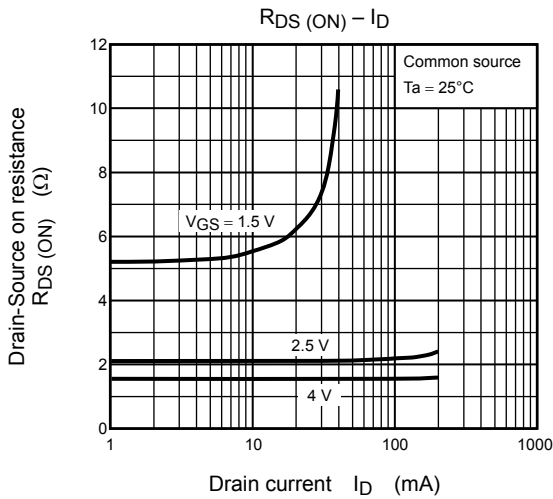
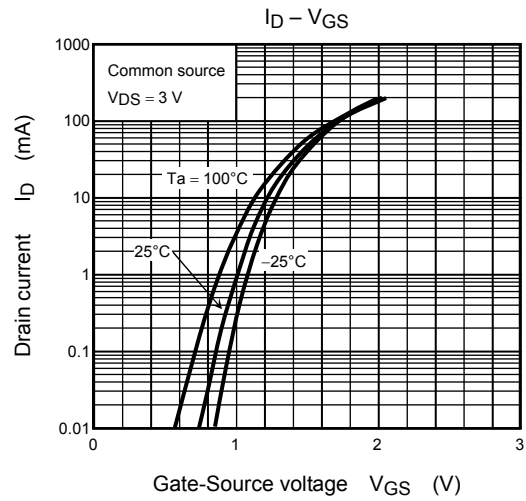
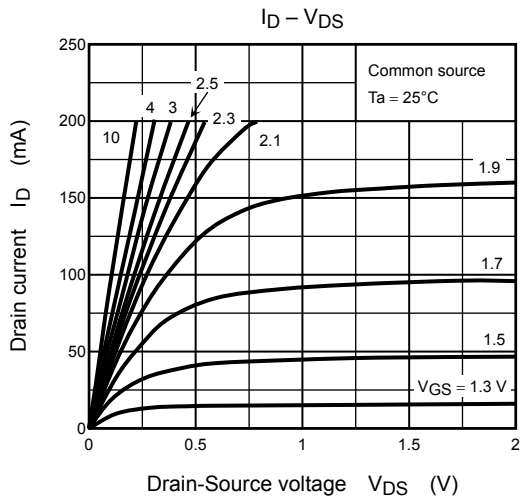
$V_{DD} = 3 \text{ V}$   
 Duty  $\leq 1\%$   
 $V_{IN}$ :  $t_r, t_f < 5 \text{ ns}$   
 $(Z_{out} = 50 \Omega)$   
 Common Source  
 $T_a = 25^\circ\text{C}$

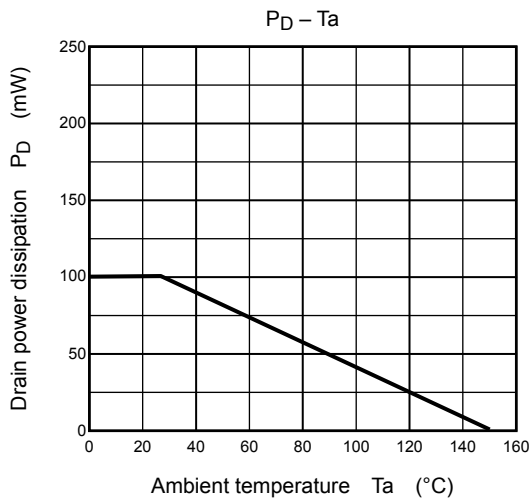
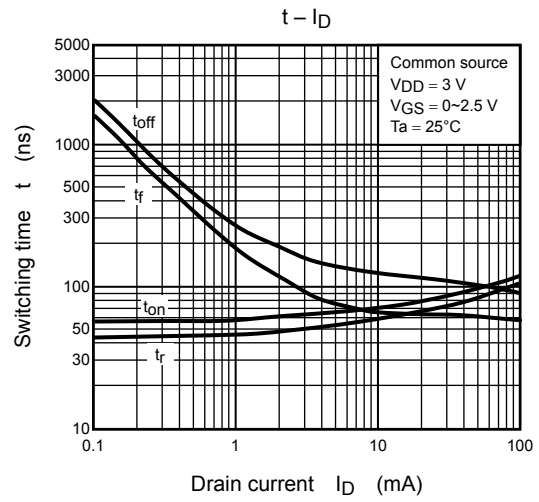
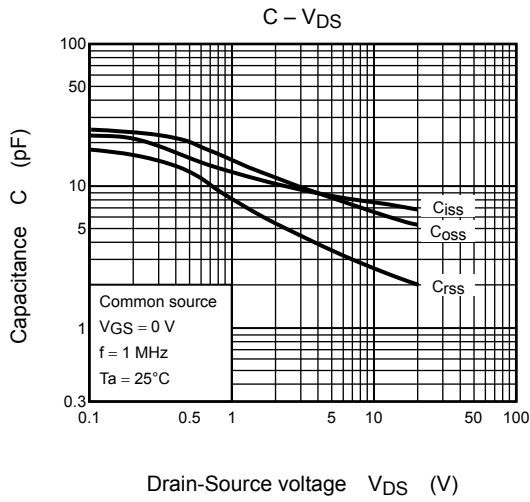
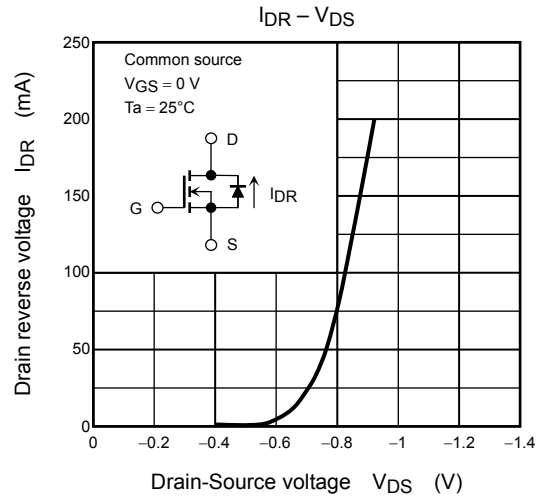
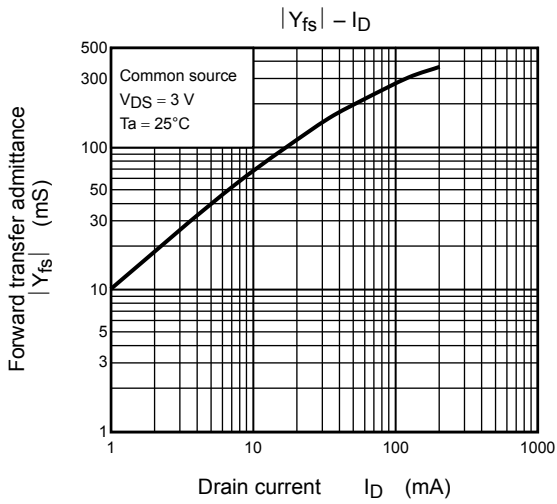
(b)  $V_{IN}$ (c)  $V_{OUT}$ 

## Precaution

$V_{th}$  can be expressed as voltage between gate and source when low operating current value is  $I_D = 100 \mu\text{A}$  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.





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20070701-EN GENERAL

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