

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type

## SSM3K15FS

High Speed Switching Applications

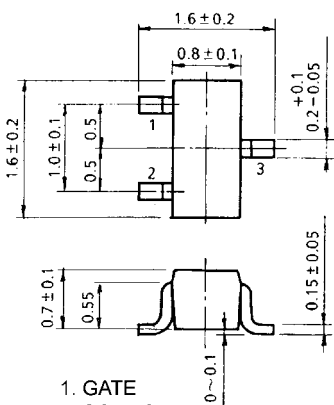
Analog Switching Applications

Unit: mm

- Compact package suitable for high-density mounting
- Low ON-resistance :  $R_{on} = 4.0 \Omega$  (max) (@ $V_{GS} = 4 V$ )  
:  $R_{on} = 7.0 \Omega$  (max) (@ $V_{GS} = 2.5 V$ )

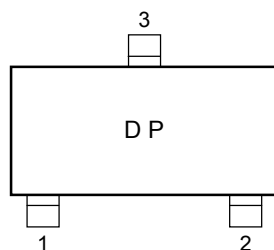
### Maximum Ratings ( $T_a = 25^\circ C$ )

| Characteristic                                 |       | Symbol    | Rating         | Unit       |
|------------------------------------------------|-------|-----------|----------------|------------|
| Drain-Source voltage                           |       | $V_{DS}$  | 30             | V          |
| Gate-Source voltage                            |       | $V_{GSS}$ | $\pm 20$       | V          |
| Drain current                                  | DC    | $I_D$     | 100            | mA         |
|                                                | Pulse | $I_{DP}$  | 200            |            |
| Drain power dissipation ( $T_a = 25^\circ C$ ) |       | $P_D$     | 100            | mW         |
| Channel temperature                            |       | $T_{ch}$  | 150            | $^\circ C$ |
| Storage temperature range                      |       | $T_{stg}$ | $-55 \sim 150$ | $^\circ C$ |

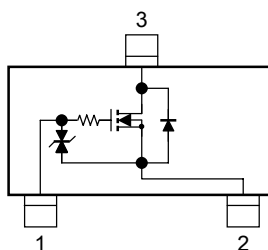
|                                                                                                                               |        |
|-------------------------------------------------------------------------------------------------------------------------------|--------|
|  <p>1. GATE<br/>2. SOURCE<br/>3. DRAIN</p> |        |
| SSM                                                                                                                           |        |
| JEDEC                                                                                                                         | —      |
| JEITA                                                                                                                         | —      |
| TOSHIBA                                                                                                                       | 2-2H1B |

Weight: 2.4 mg (typ.)

### Marking



### Equivalent Circuit



### Handling Precaution

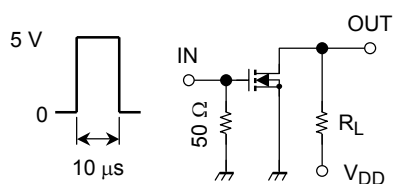
When handling individual devices (which are not yet mounted on a circuit board), be sure that the environment is protected against electrostatic electricity. Operators should wear anti-static clothing, and containers and other objects that come into direct contact with devices should be made of anti-static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

## Electrical Characteristics (Ta = 25°C)

| Characteristic                 | Symbol        | Test Condition                                                           | Min | Typ. | Max     | Unit          |
|--------------------------------|---------------|--------------------------------------------------------------------------|-----|------|---------|---------------|
| Gate leakage current           | $I_{GSS}$     | $V_{GS} = \pm 16 \text{ V}, V_{DS} = 0$                                  | —   | —    | $\pm 1$ | $\mu\text{A}$ |
| Drain-Source breakdown voltage | $V_{(BR)DSS}$ | $I_D = 0.1 \text{ mA}, V_{GS} = 0$                                       | 30  | —    | —       | V             |
| Drain Cut-off current          | $I_{DSS}$     | $V_{DS} = 30 \text{ V}, V_{GS} = 0$                                      | —   | —    | 1       | $\mu\text{A}$ |
| Gate threshold voltage         | $V_{th}$      | $V_{DS} = 3 \text{ V}, I_D = 0.1 \text{ mA}$                             | 0.8 | —    | 1.5     | V             |
| Forward transfer admittance    | $ Y_{fs} $    | $V_{DS} = 3 \text{ V}, I_D = 10 \text{ mA}$                              | 25  | —    | —       | mS            |
| Drain-Source ON resistance     | $R_{DS(ON)}$  | $I_D = 10 \text{ mA}, V_{GS} = 4 \text{ V}$                              | —   | 2.2  | 4.0     | $\Omega$      |
|                                |               | $I_D = 10 \text{ mA}, V_{GS} = 2.5 \text{ V}$                            | —   | 4.0  | 7.0     |               |
| Input capacitance              | $C_{iss}$     | $V_{DS} = 3 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$                    | —   | 7.8  | —       | pF            |
| Reverse transfer capacitance   | $C_{rss}$     | $V_{DS} = 3 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$                    | —   | 3.6  | —       | pF            |
| Output capacitance             | $C_{oss}$     | $V_{DS} = 3 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$                    | —   | 8.8  | —       | pF            |
| Switching time                 | Turn-on time  | $V_{DD} = 5 \text{ V}, I_D = 10 \text{ mA}, V_{GS} = 0 \sim 5 \text{ V}$ | —   | 50   | —       | ns            |
|                                | Turn-off time |                                                                          | —   | 180  | —       |               |

## Switching Time Test Circuit

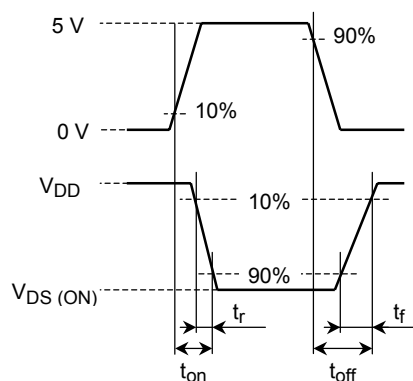
### (a) Test circuit



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

### (b) $V_{IN}$

### (c) $V_{OUT}$



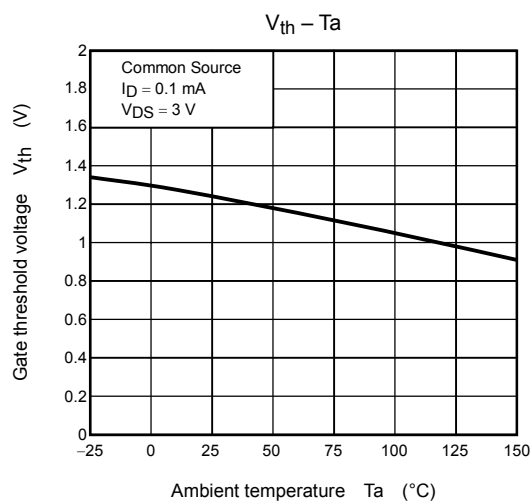
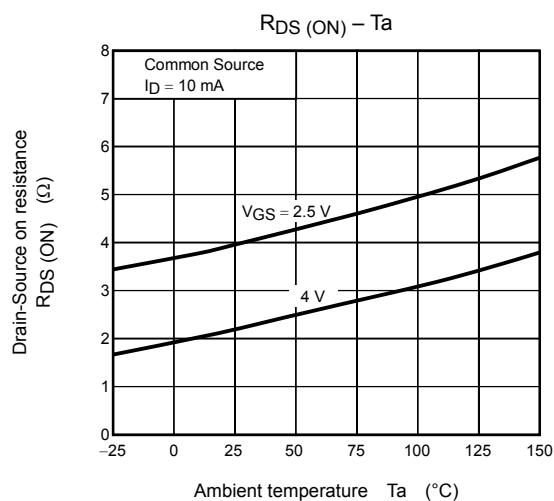
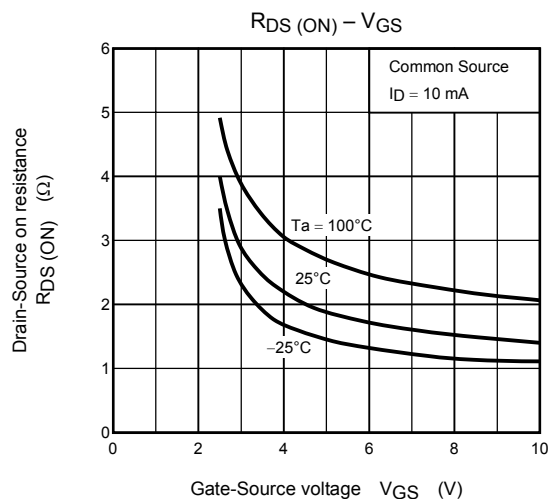
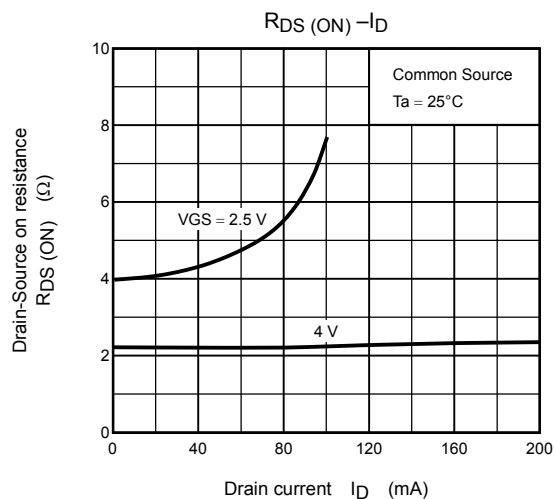
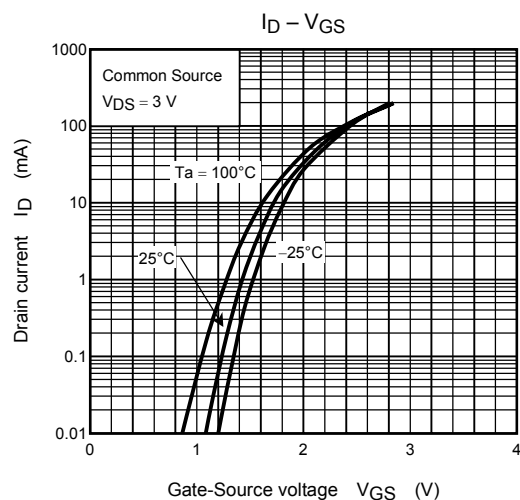
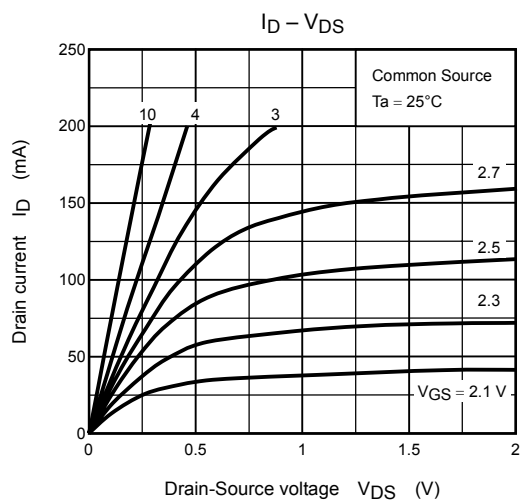
## Precaution

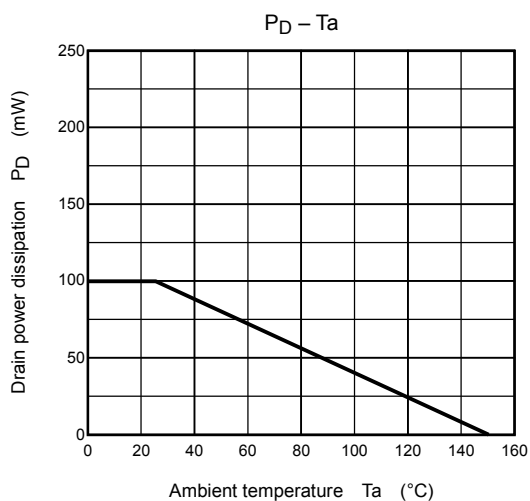
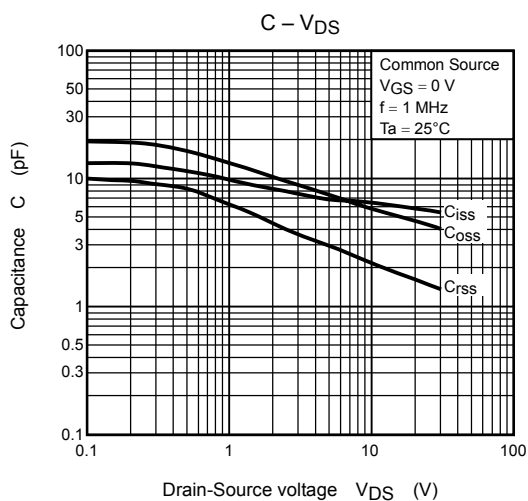
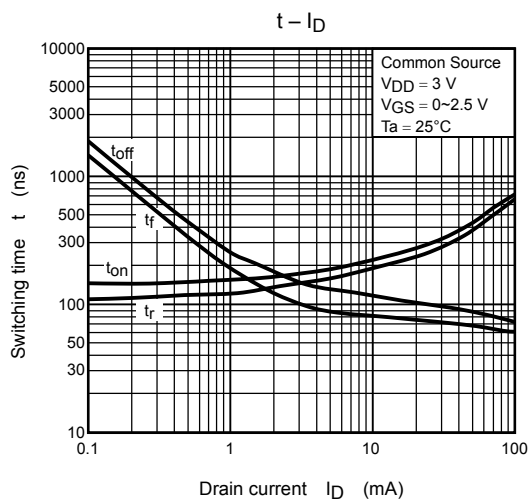
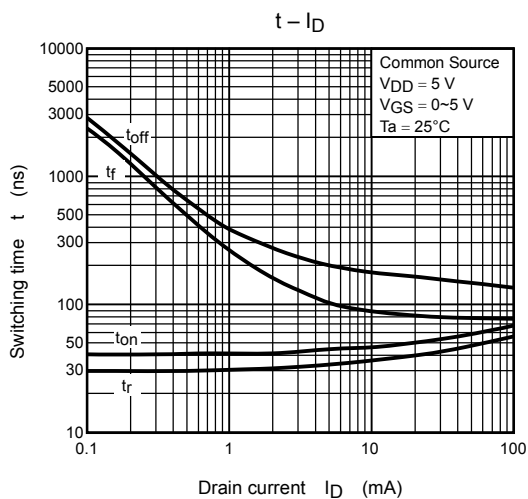
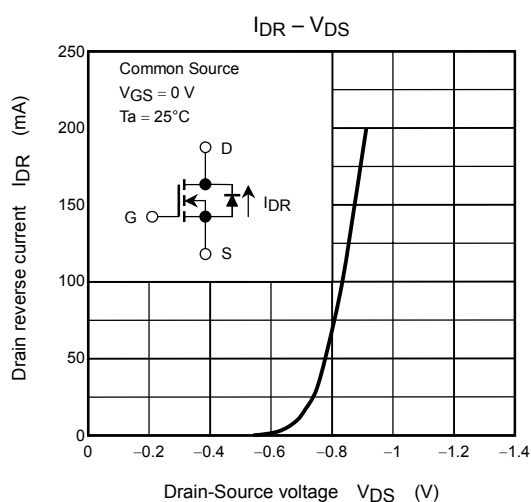
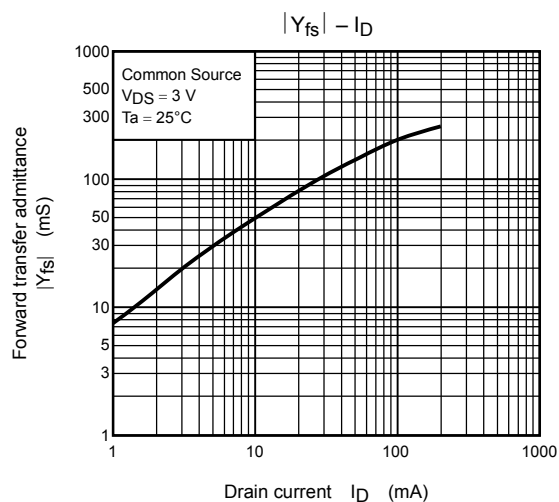
$V_{th}$  can be expressed as voltage between gate and source when low operating current value is  $I_D = 100 \mu\text{A}$  for this product. For normal switching operation,  $V_{GS(on)}$  requires higher voltage than  $V_{th}$  and  $V_{GS(off)}$  requires lower voltage than  $V_{th}$ .

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

Please take this into consideration for using the device.

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





**RESTRICTIONS ON PRODUCT USE**

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