

# SSM3J16FS

High Speed Switching Applications

Analog Switch Applications

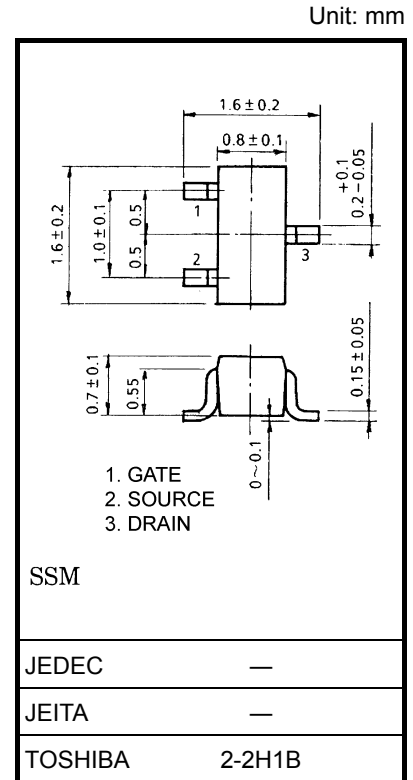
- Small package
- Low on-resistance :  $R_{DS(ON)} = 8\ \Omega$  (max) (@ $V_{GS} = -4\text{ V}$ )  
:  $R_{DS(ON)} = 12\ \Omega$  (max) (@ $V_{GS} = -2.5\text{ V}$ )  
:  $R_{DS(ON)} = 45\ \Omega$  (max) (@ $V_{GS} = -1.5\text{ V}$ )

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

| Characteristics           |       | Symbol    | Rating     | Unit |
|---------------------------|-------|-----------|------------|------|
| Drain-Source voltage      |       | $V_{DSS}$ | -20        | V    |
| Gate-Source voltage       |       | $V_{GSS}$ | ±10        | V    |
| Drain current             | DC    | $I_D$     | -100       | mA   |
|                           | Pulse | $I_{DP}$  | -200       |      |
| Power dissipation         |       | $P_D$     | 100        | mW   |
| Channel temperature       |       | $T_{ch}$  | 150        | °C   |
| Storage temperature range |       | $T_{stg}$ | -55 to 150 | °C   |

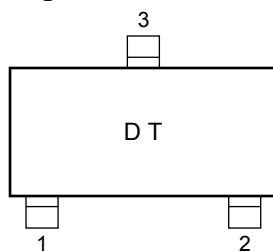
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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).

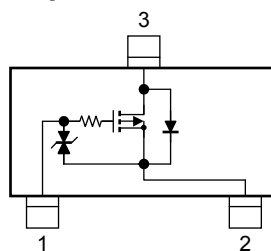


Weight: 2.4 mg (typ.)

## Marking



## Equivalent Circuit (top view)



## Handling Precaution

When handling individual devices (which are not yet mounted on a circuit board), ensure that the environment is protected against static 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.

Start of commercial production  
2002-01

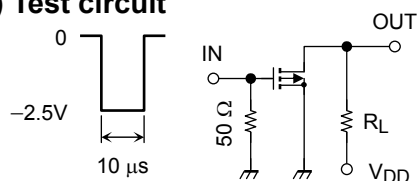
## Electrical Characteristics (Ta = 25°C)

| Characteristic                 | Symbol        | Test Condition                                          | MIN.                                                                                      | TYP. | MAX.    | UNIT          |
|--------------------------------|---------------|---------------------------------------------------------|-------------------------------------------------------------------------------------------|------|---------|---------------|
| Gate leakage current           | $I_{GSS}$     | $V_{GS} = \pm 10 \text{ V}, V_{DS} = 0$                 | —                                                                                         | —    | $\pm 1$ | $\mu\text{A}$ |
| 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} $    | $V_{DS} = -3 \text{ V}, I_D = -10 \text{ mA}$ (Note1)   | 25                                                                                        | —    | —       | mS            |
| Drain-Source on-resistance     | $R_{DS(ON)}$  | $I_D = -10 \text{ mA}, V_{GS} = -4 \text{ V}$ (Note1)   | —                                                                                         | 6    | 8       | $\Omega$      |
|                                |               | $I_D = -10 \text{ mA}, V_{GS} = -2.5 \text{ V}$ (Note1) | —                                                                                         | 8    | 12      |               |
|                                |               | $I_D = -1 \text{ mA}, V_{GS} = -1.5 \text{ V}$ (Note1)  | —                                                                                         | 18   | 45      |               |
| Input capacitance              | $C_{iss}$     | $V_{DS} = -3 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$  | —                                                                                         | 11   | —       | pF            |
| Reverse transfer capacitance   | $C_{rss}$     |                                                         | —                                                                                         | 3.7  | —       | pF            |
| Output capacitance             | $C_{oss}$     |                                                         | —                                                                                         | 10   | —       | pF            |
| Switching time                 | Turn-on time  | $t_{on}$                                                | $V_{DD} = -3 \text{ V}, I_D = -10 \text{ mA},$<br>$V_{GS} = 0 \text{ to } -2.5 \text{ V}$ | —    | 130     | ns            |
|                                | Turn-off time | $t_{off}$                                               |                                                                                           | —    | 190     |               |

Note1: Pulse test

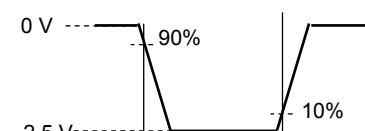
## Switching Time Test Circuit

### (a) Test circuit

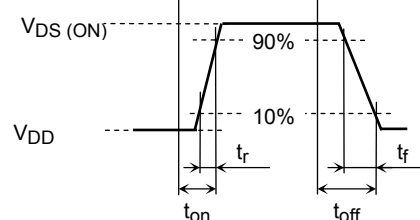


$V_{DD} = -3 \text{ V}$   
 Duty  $\leq 1\%$   
 $V_{IN}$ :  $t_r, t_f < 5 \text{ ns}$   
 $(Z_{out} = 50 \Omega)$   
 Common Source  
 $T_a = 25^\circ\text{C}$

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



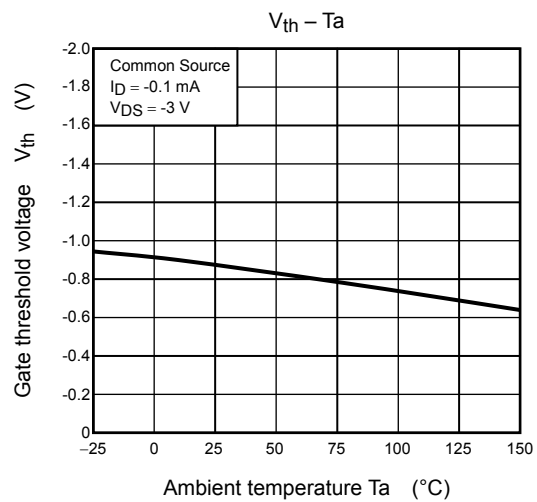
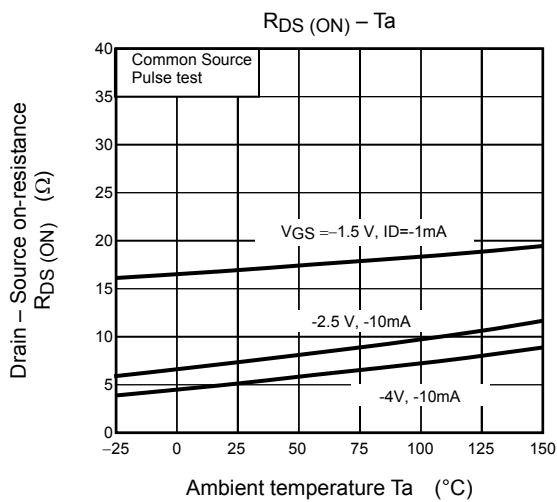
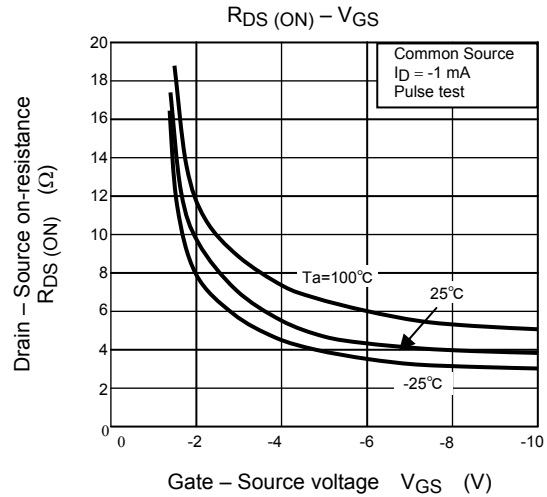
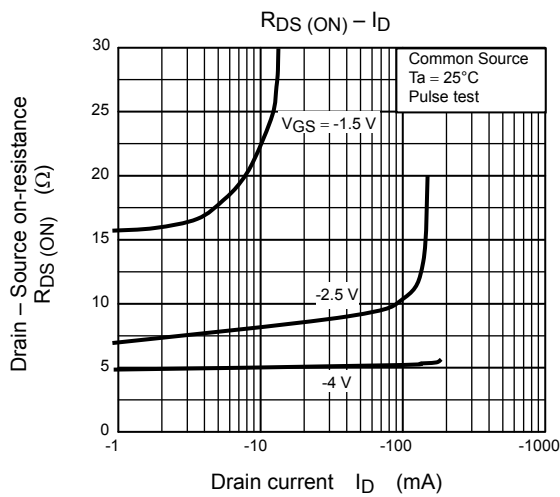
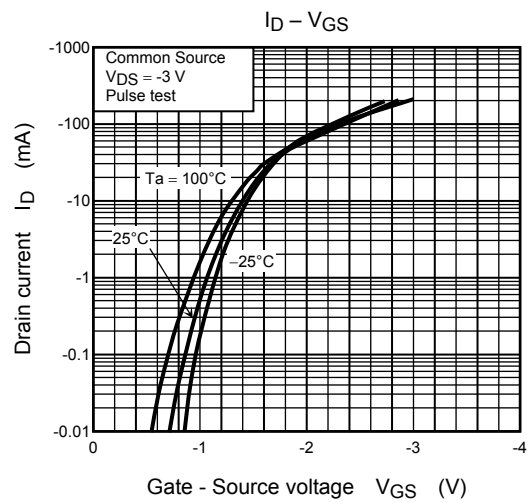
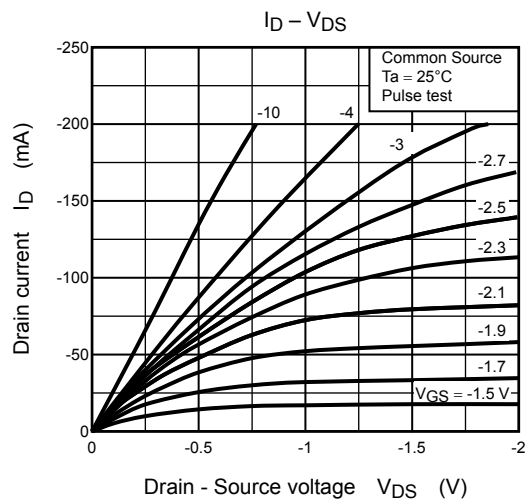
### (c) $V_{OUT}$

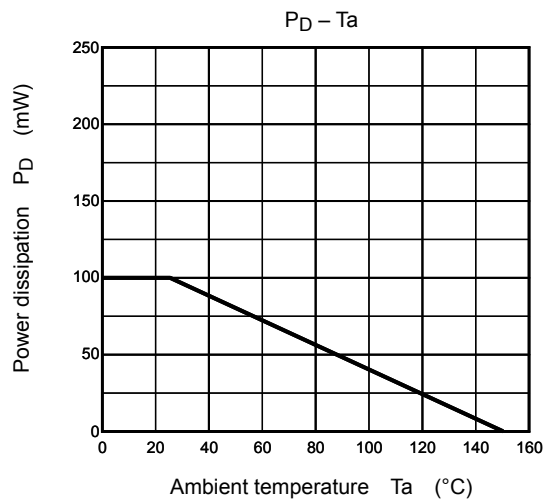
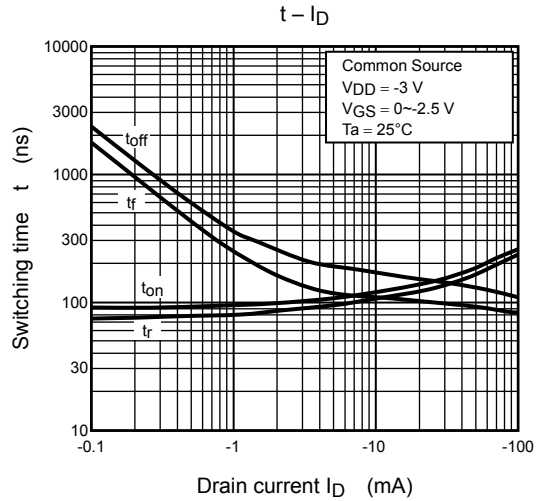
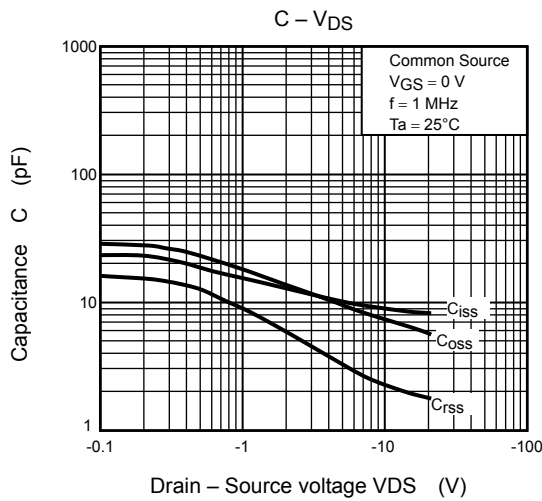
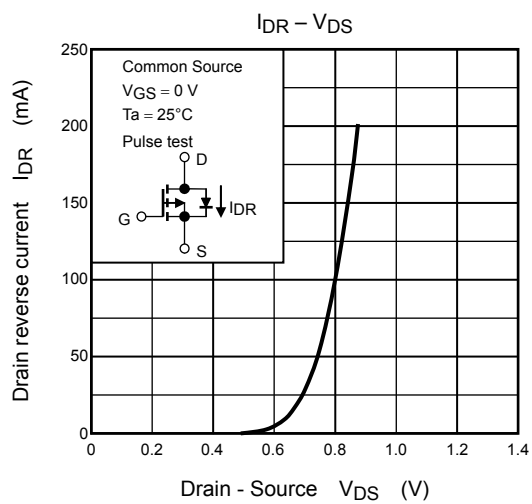
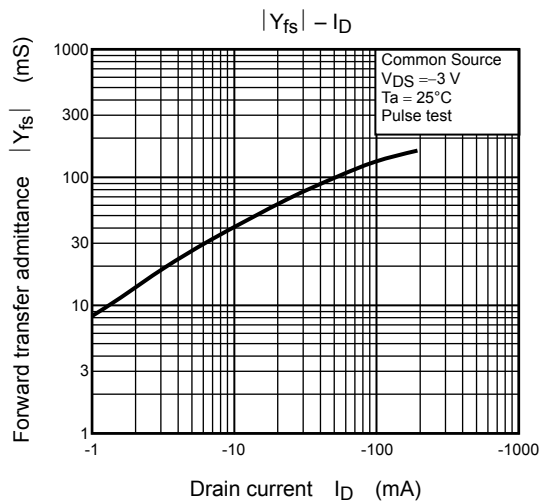


## Precaution

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

Be sure to take this into consideration when using the device.





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