

TOSHIBA Field Effect Transistor Silicon P Channel MOS Type

**SSM3J15FV**

High Speed Switching Applications

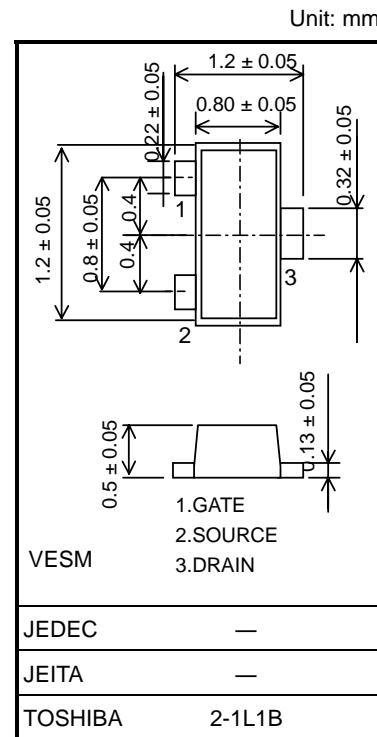
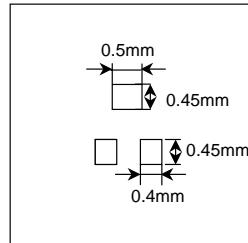
Analog Switch Applications

- Optimum for high-density mounting in small packages
- Low on-resistance :  $R_{on} = 12 \Omega$  (max) (@ $V_{GS} = -4$  V)
- :  $R_{on} = 32 \Omega$  (max) (@ $V_{GS} = -2.5$  V)

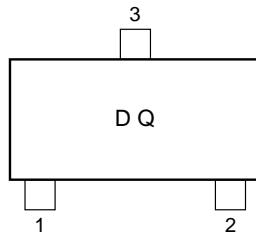
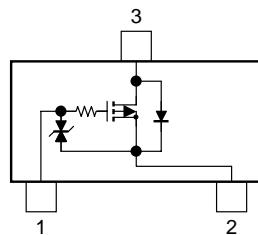
**Maximum Ratings (Ta = 25°C)**

| Characteristics                     | Symbol       | Rating   | Unit |
|-------------------------------------|--------------|----------|------|
| Drain-Source voltage                | $V_{DS}$     | -30      | V    |
| Gate-Source voltage                 | $V_{GSS}$    | $\pm 20$ | V    |
| Drain current                       | DC           | $I_D$    | mA   |
|                                     | Pulse        | $I_{DP}$ |      |
| Drain power dissipation (Ta = 25°C) | $P_D$ (Note) | 150      | mW   |
| Channel temperature                 | $T_{ch}$     | 150      | °C   |
| Storage temperature range           | $T_{stg}$    | -55~150  | °C   |

Note: Total rating, mounted on FR4 board  
(25.4 mm × 25.4 mm × 1.6 t, Cu Pad: 0.585 mm<sup>2</sup>)



Weight: 0.0015 g(typ.)

**Marking****Equivalent Circuit (top view)****Handling Precaution**

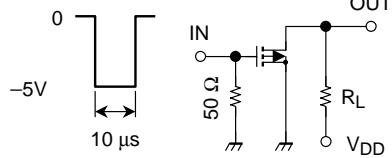
When handling individual devices (which are not yet mounted on a circuit board), be sure that the environment is protected against electrostatic electricity. Operators should wear anti-static clothing, and containers and other objects that come into direct contact with devices should be made of anti-static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

## Electrical Characteristics (Ta = 25°C)

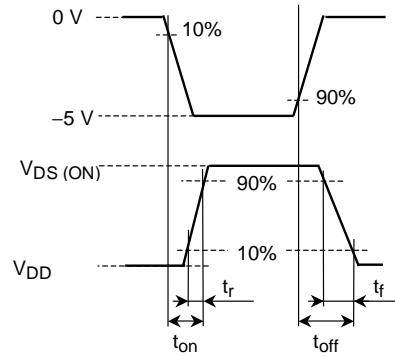
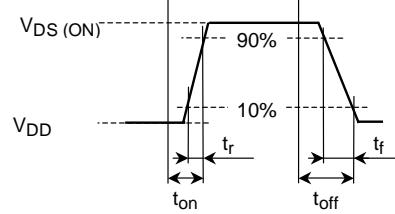
| Characteristic                 | Symbol                | Test Condition   | MIN.   | TYP. | MAX. | UNIT |
|--------------------------------|-----------------------|--|--|------|------|------|
| Gate leakage current           | I <sub>GSS</sub>      | V <sub>GS</sub> = ±16 V, V <sub>DS</sub> = 0           | —  | —    | ±1   | μA   |
| Drain-Source breakdown voltage | V <sub>(BR) DSS</sub> | I <sub>D</sub> = -0.1 mA, V <sub>GS</sub> = 0          | -30  | —    | —    | V    |
| Drain cut-off current          | I <sub>DSS</sub>      | V <sub>DS</sub> = -30 V, V <sub>GS</sub> = 0           | —  | —    | -1   | μA   |
| Gate threshold voltage         | V <sub>th</sub>       | V <sub>DS</sub> = -3 V, I <sub>D</sub> = -0.1 mA       | -1.1   | —    | -1.7 | V    |
| Forward transfer admittance    | Y <sub>fs</sub>       | V <sub>DS</sub> = -3 V, I <sub>D</sub> = -10 mA        | 20   | —    | —    | mS   |
| Drain-Source on-resistance     | R <sub>DSS</sub> (ON) | I <sub>D</sub> = -10 mA, V <sub>GS</sub> = -4 V        | —  | 8    | 12   | Ω    |
|                                |                       | I <sub>D</sub> = -1 mA, V <sub>GS</sub> = -2.5 V       | —  | 14   | 32   |      |
| Input capacitance              | C <sub>iss</sub>      | V <sub>DS</sub> = -3 V, V <sub>GS</sub> = 0, f = 1 MHz | —  | 9.1  | —    | pF   |
| Reverse transfer capacitance   | C <sub>rss</sub>      |  | —  | 3.5  | —    | pF   |
| Output capacitance             | C <sub>oss</sub>      |  | —  | 8.6  | —    | pF   |
| Switching time                 | Turn-on time          | t <sub>on</sub>  | V <sub>DD</sub> = -5 V, I <sub>D</sub> = -10 mA, V <sub>GS</sub> = 0~5 V | —    | 65   | —    |
|                                | Turn-off time         | t <sub>off</sub>                                       |  | —    | 175  | —    |

## Switching Time Test Circuit

## (a) Test circuit



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

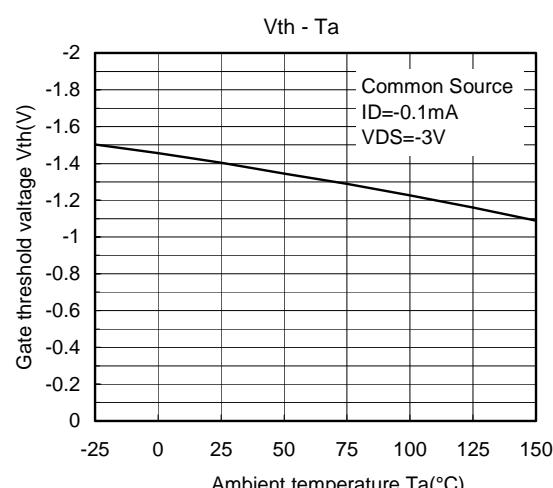
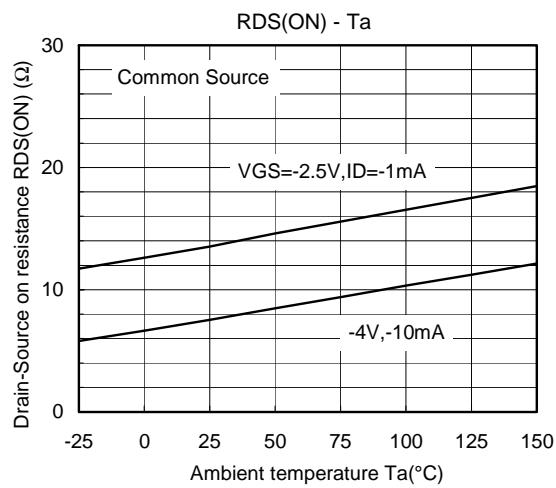
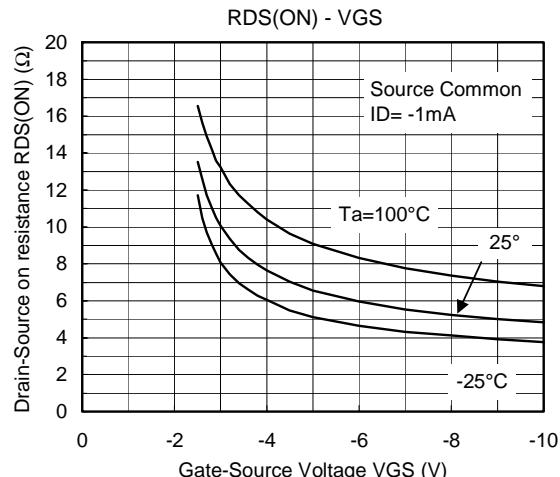
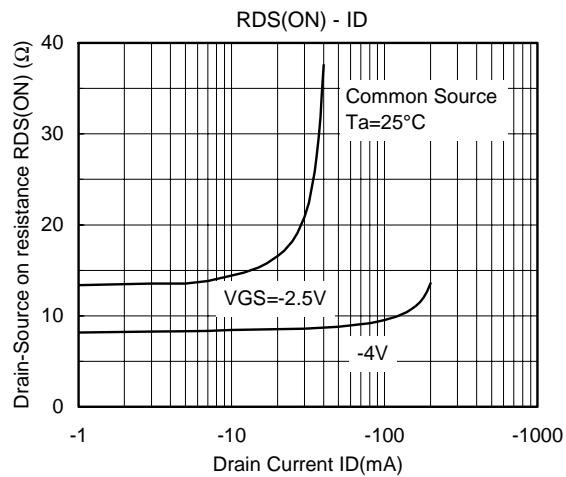
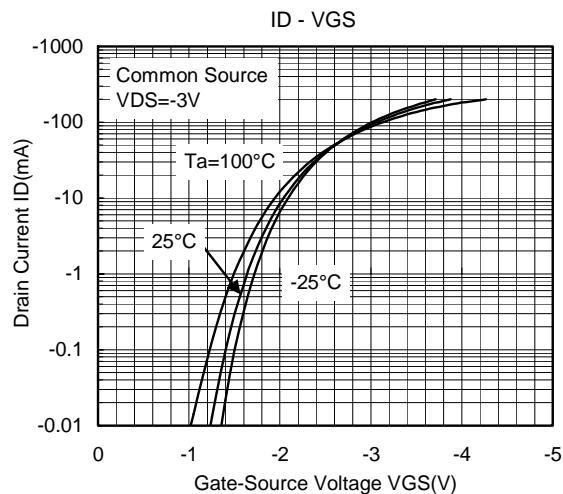
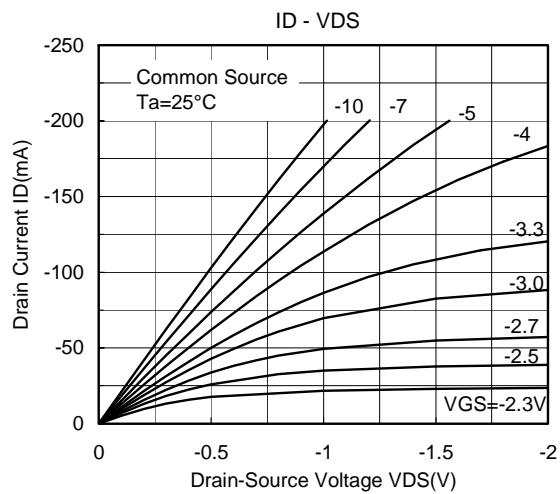
(b)  $V_{IN}$ (c)  $V_{OUT}$ 

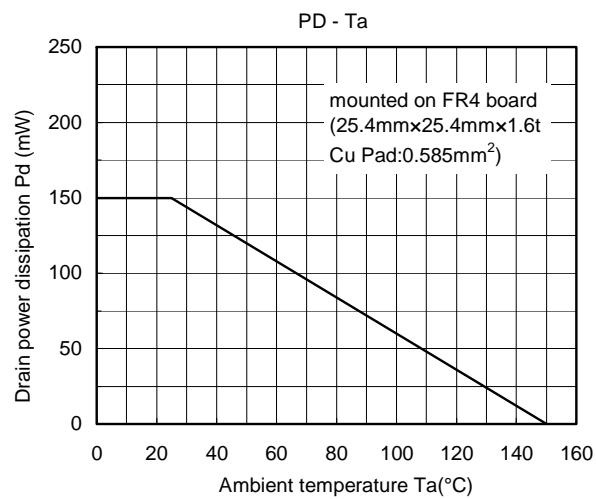
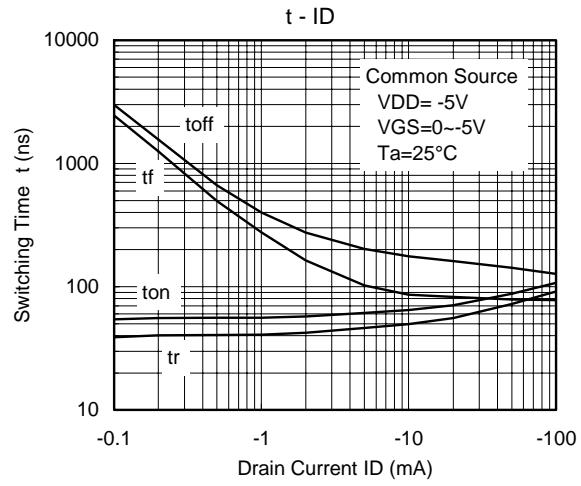
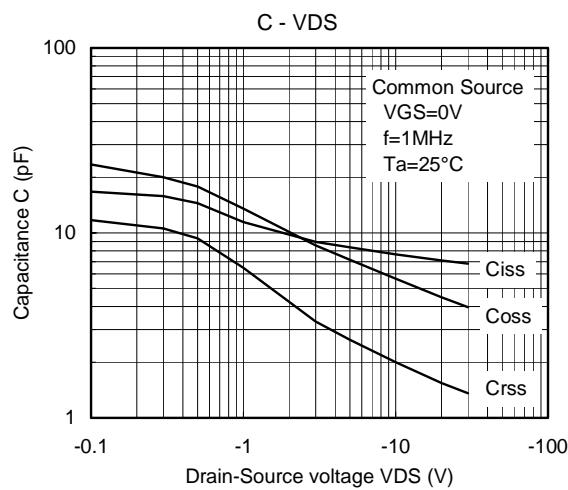
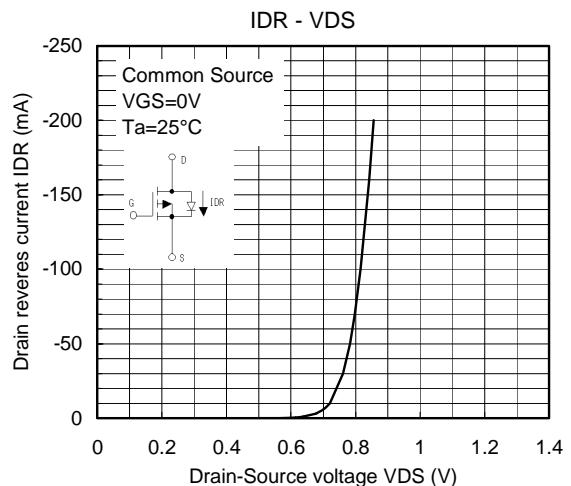
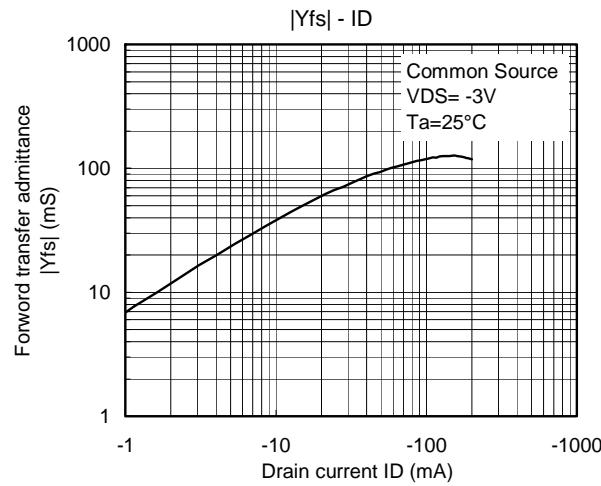
## Precaution

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

Please take this into consideration when using the device. The  $V_{GS}$  recommended voltage for turning on this product is -2.5 V or higher.





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