

TOSHIBA Field Effect Transistor Silicon P Channel MOS Type (U-MOSII)

# SSM6J08FU

Power Management Switch  
DC-DC Converter

- Small Package
- Low on Resistance :  $R_{on} = 0.18 \Omega$  (max) (@ $V_{GS} = -4 V$ )  
:  $R_{on} = 0.26 \Omega$  (max) (@ $V_{GS} = -2.5 V$ )
- Low Gate Threshold Voltage

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

| Characteristics           |       | Symbol            | Rating     | Unit |
|---------------------------|-------|-------------------|------------|------|
| Drain-Source voltage      |       | $V_{DS}$          | -20        | V    |
| Gate-Source voltage       |       | $V_{GSS}$         | ±12        | V    |
| Drain current             | DC    | $I_D$             | -1.3       | A    |
|                           | Pulse | $I_{DP}$ (Note 2) | -2.6       |      |
| Drain power dissipation   |       | $P_D$ (Note 1)    | 300        | mW   |
| Channel temperature       |       | $T_{ch}$          | 150        | °C   |
| Storage temperature range |       | $T_{stg}$         | -55 to 150 | °C   |

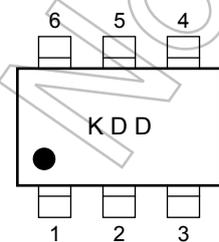
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

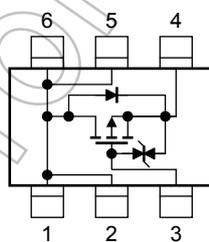
Note 1: Mounted on FR4 board  
(25.4 mm × 25.4 mm × 1.6 t, Cu Pad: 0.32 mm<sup>2</sup> × 6) Fig. 1.

Note 2: The pulse width limited by max channel temperature.

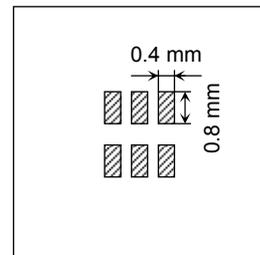
## Marking



## Equivalent Circuit



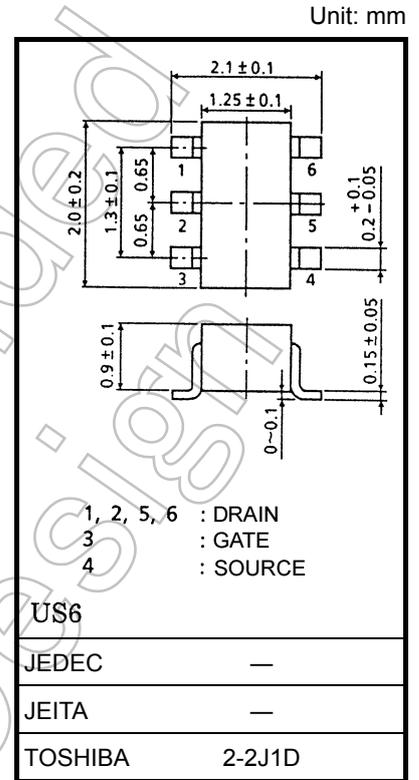
**Fig 1: 25.4 mm × 25.4 mm × 1.6 t, Cu Pad: 0.32 mm<sup>2</sup> × 6**



## 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.

Start of commercial production  
2000-12



Weight: 6.8 mg (typ.)

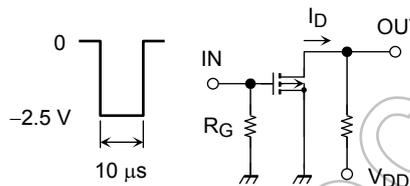
## Electrical Characteristics (Ta = 25°C)

| Characteristics                | Symbol        | Test Condition  | Min  | Typ. | Max     | Unit          |
|--------------------------------|---------------|---|------|------|---------|---------------|
| Gate leakage current           | $I_{GSS}$     | $V_{GS} = \pm 12\text{ V}, V_{DS} = 0$                  | —    | —    | $\pm 1$ | $\mu\text{A}$ |
| Drain-Source breakdown voltage | $V_{(BR)DSS}$ | $I_D = -1\text{ mA}, V_{GS} = 0$                        | -20  | —    | —       | V             |
|                                | $V_{(BR)DSX}$ | $I_D = -1\text{ mA}, V_{GS} = 12\text{ V}$              | -8   | —    | —       |               |
| Drain Cut-off current          | $I_{DSS}$     | $V_{DS} = -20\text{ V}, V_{GS} = 0$                     | —    | —    | -1      | $\mu\text{A}$ |
| Gate threshold voltage         | $V_{th}$      | $V_{DS} = -3\text{ V}, I_D = -0.1\text{ mA}$            | -0.5 | —    | -1.1    | V             |
| Forward transfer admittance    | $ Y_{fs} $    | $V_{DS} = -3\text{ V}, I_D = -0.65\text{ A}$ (Note 3)   | 1.3  | 2.7  | —       | S             |
| Drain-Source ON resistance     | $R_{DS(ON)}$  | $I_D = -0.65\text{ A}, V_{GS} = -4\text{ V}$ (Note 3)   | —    | 140  | 180     | m $\Omega$    |
|                                |               | $I_D = -0.65\text{ A}, V_{GS} = -2.5\text{ V}$ (Note 3) | —    | 200  | 260     |               |
|                                |               | $I_D = -0.65\text{ A}, V_{GS} = -2.0\text{ V}$ (Note 3) | —    | 260  | 460     |               |
| Input capacitance              | $C_{iss}$     | $V_{DS} = -10\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$   | —    | 370  | —       | pF            |
| Reverse transfer capacitance   | $C_{rss}$     | $V_{DS} = -10\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$   | —    | 73   | —       | pF            |
| Output capacitance             | $C_{oss}$     | $V_{DS} = -10\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$   | —    | 116  | —       | pF            |
| Switching time                 | Turn-on time  | $t_{on}$  | —    | 33   | —       | ns            |
|                                | Turn-off time | $t_{off}$   | —    | 47   | —       | ns            |

Note 3: Pulse test

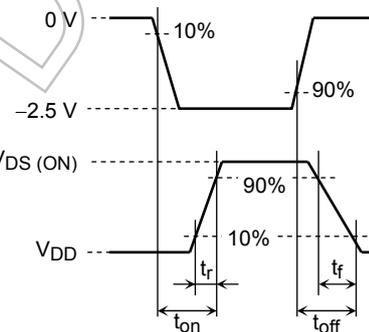
## Switching Time Test Circuit

### (a) Test circuit

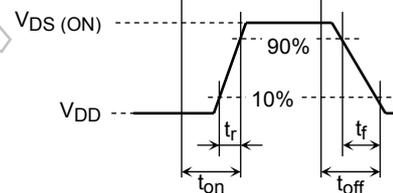


$V_{DD} = -10\text{ V}$   
 $R_G = 4.7\ \Omega$   
 D.U.  $\leq 1\%$   
 $V_{IN}$ :  $t_r, t_f < 5\text{ ns}$   
 COMMON SOURCE  
 $T_a = 25^\circ\text{C}$

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



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

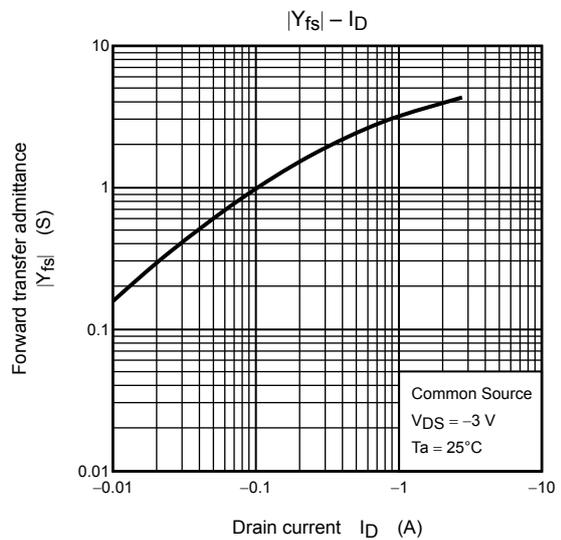
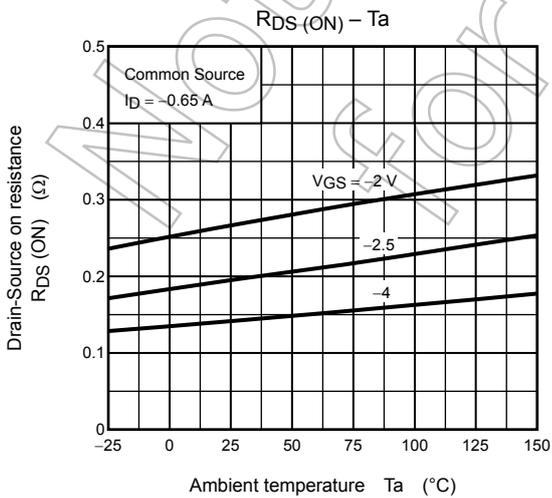
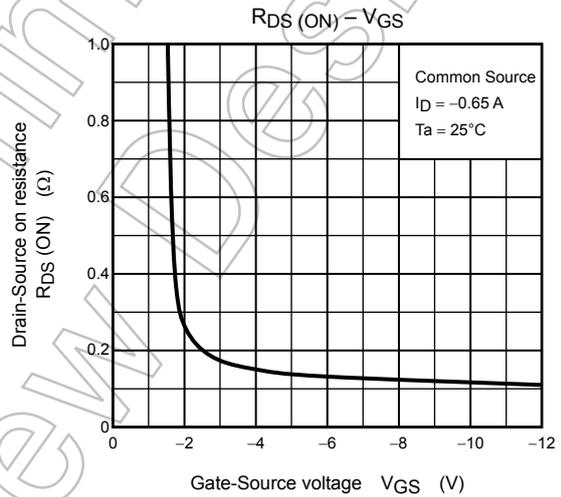
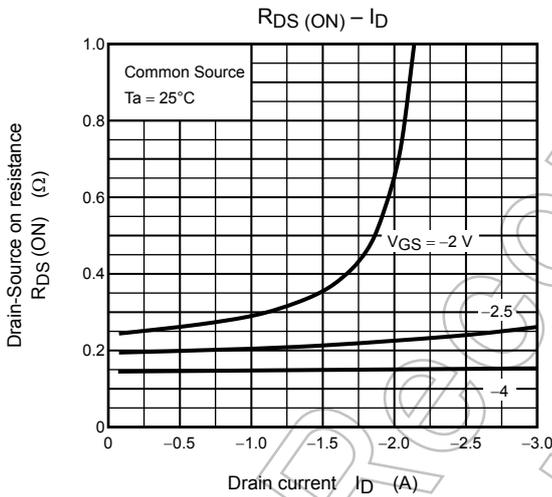
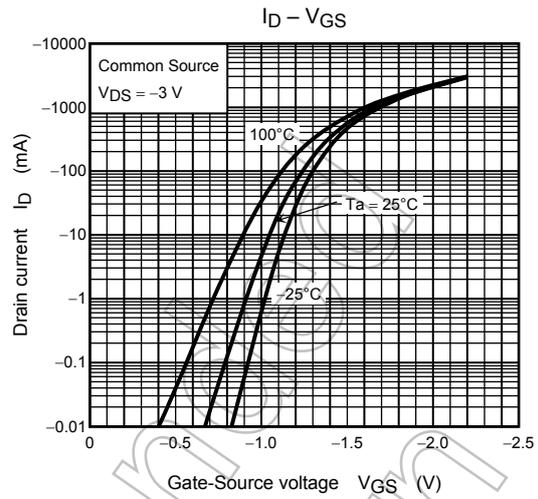
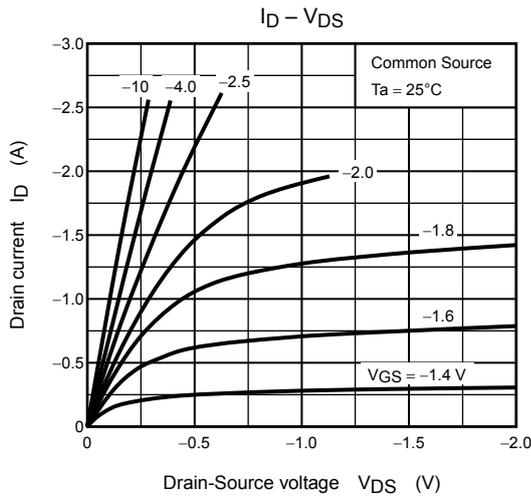


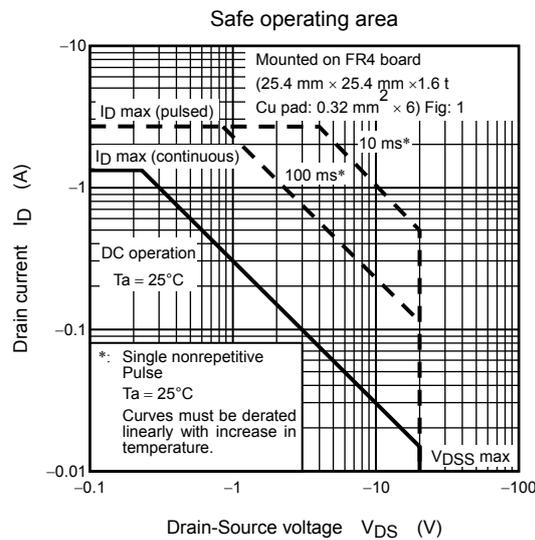
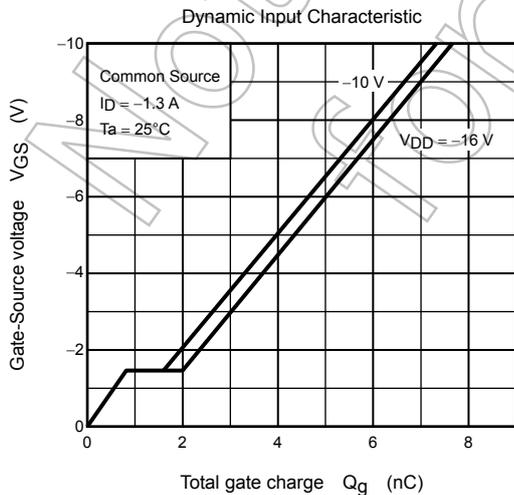
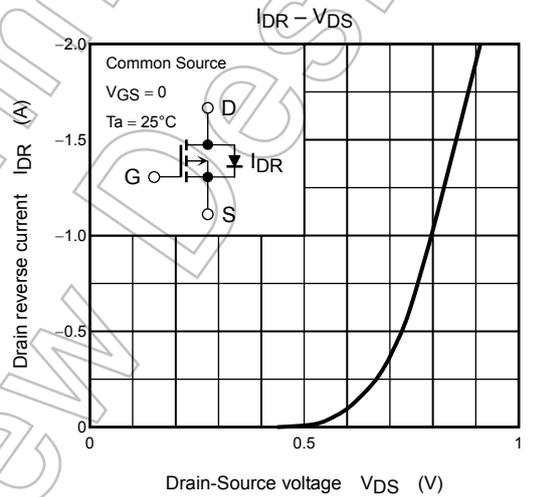
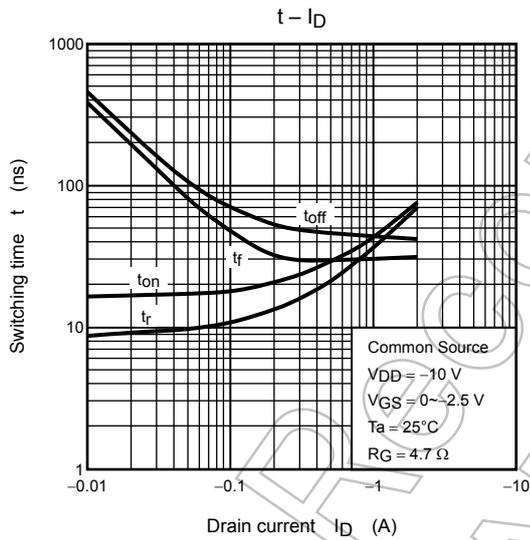
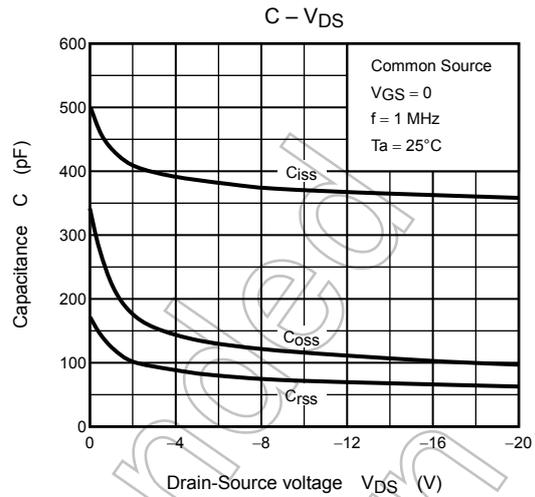
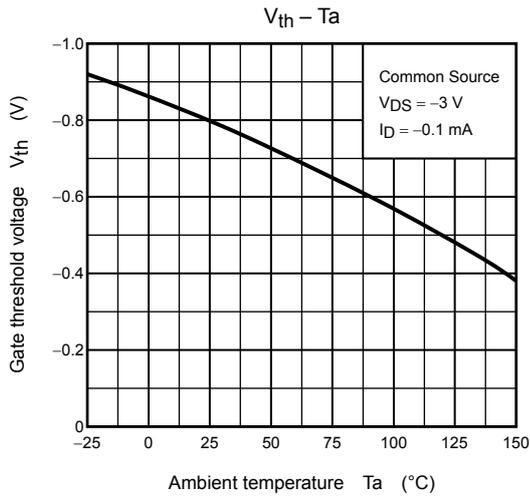
## Precaution

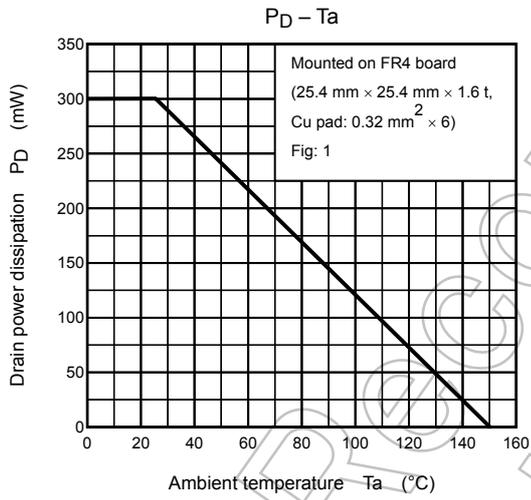
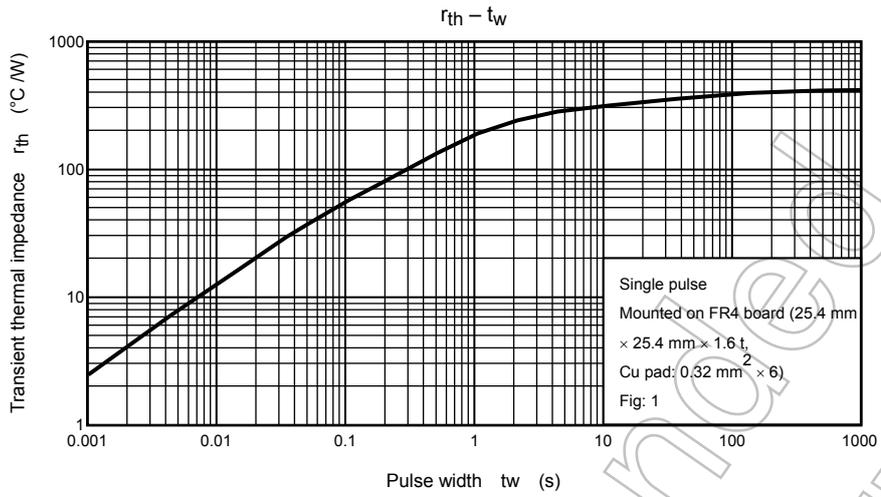
$V_{th}$  can be expressed as voltage between gate and source when low operating current value is  $I_D = -100\ \mu\text{A}$  for this product. For normal switching operation,  $V_{GS(on)}$  requires higher voltage than  $V_{th}$  and  $V_{GS(off)}$  requires lower voltage than  $V_{th}$ .

(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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