

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

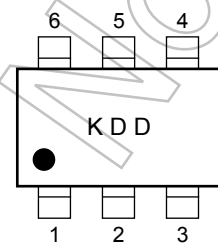
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

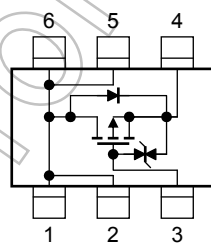
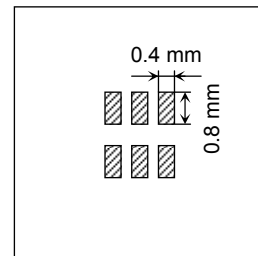


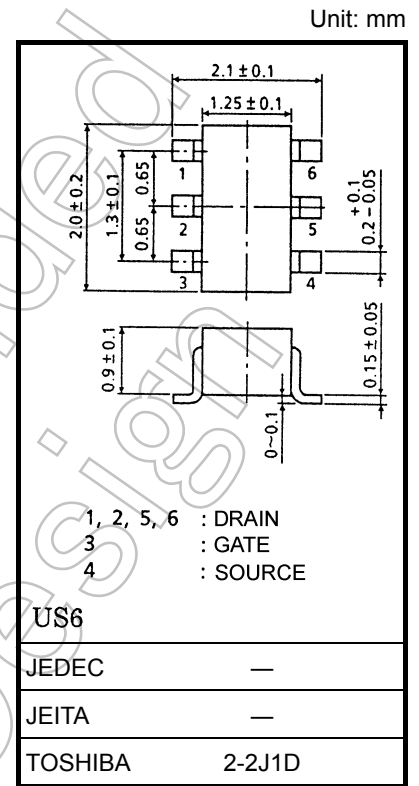
Fig 1: 25.4 mm × 25.4 mm × 1.6 t,  
Cu Pad: 0.32 mm<sup>2</sup> × 6



## 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.)

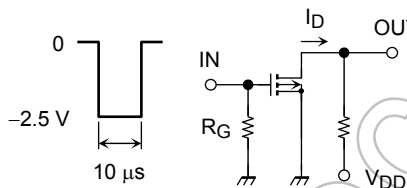
## Electrical Characteristics (Ta = 25°C)

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

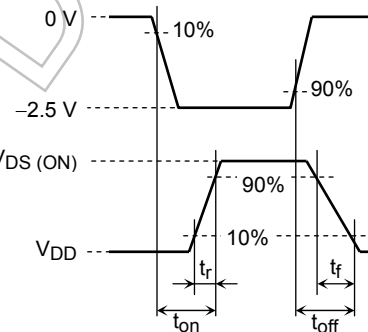
## Switching Time Test Circuit

### (a) Test circuit

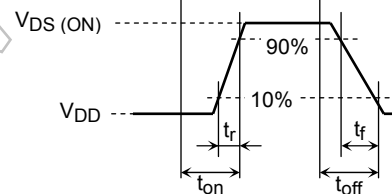


$V_{DD} = -10\text{ V}$   
 $R_G = 4.7\ \Omega$   
 D.U.  $\leq 1\%$   
 $V_{IN}$ :  $t_r, t_f < 5\text{ ns}$   
 COMMON SOURCE  
 $T_a = 25^\circ\text{C}$

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



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

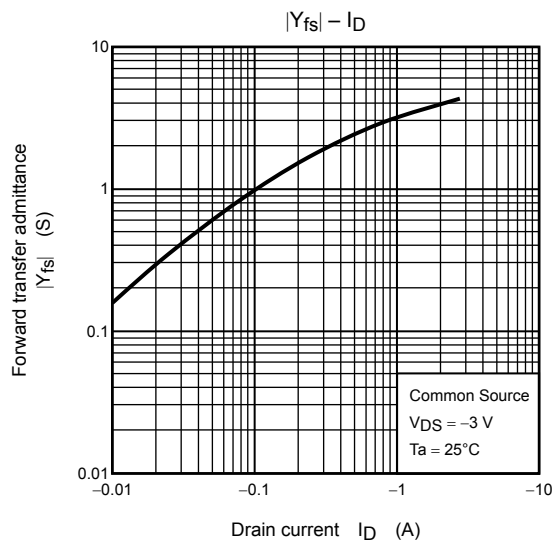
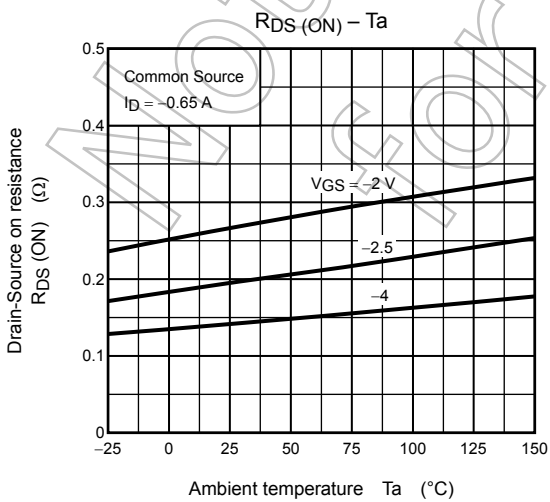
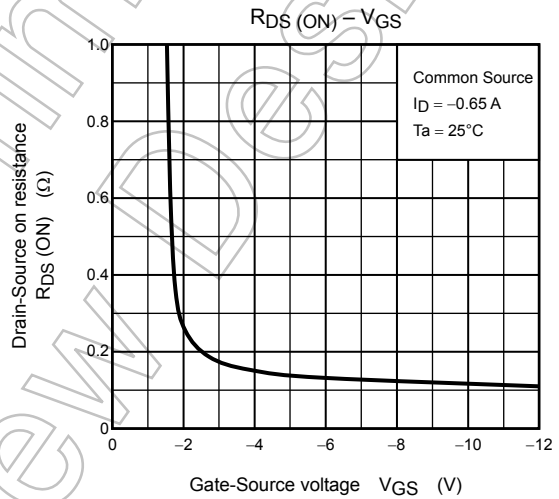
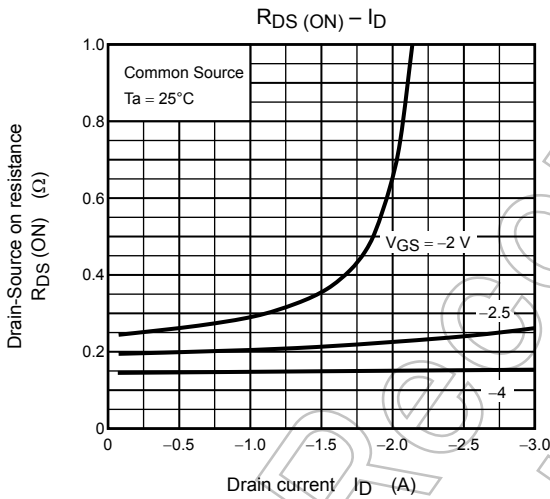
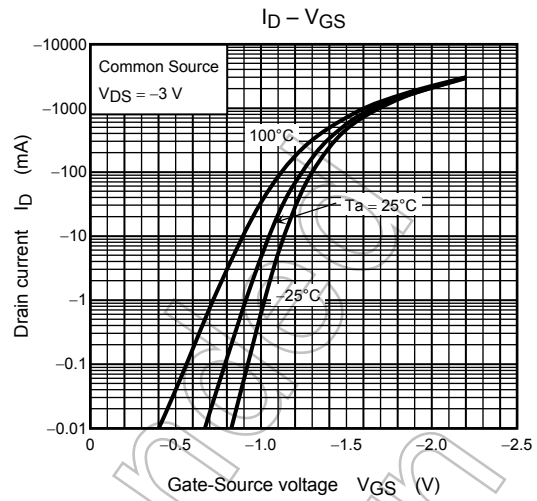
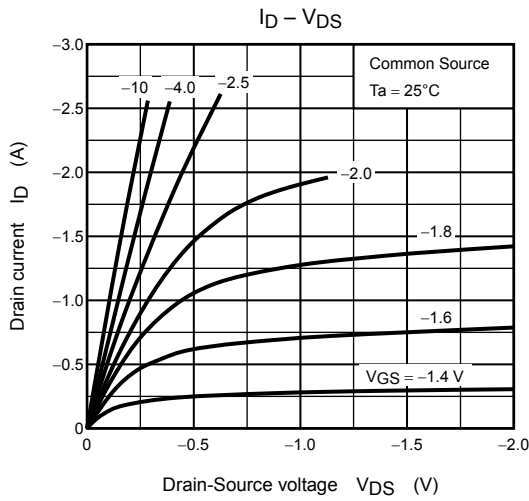


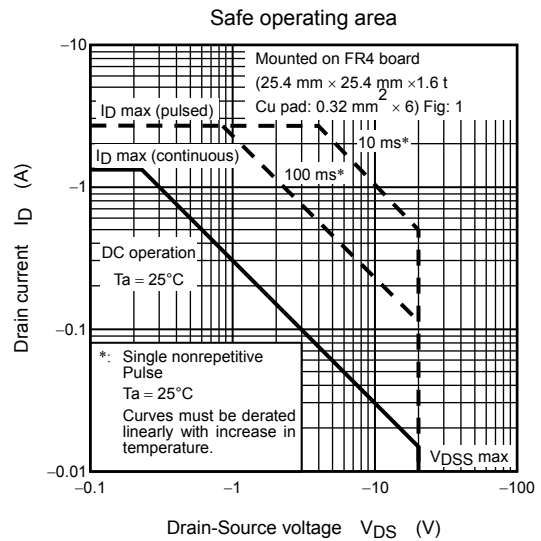
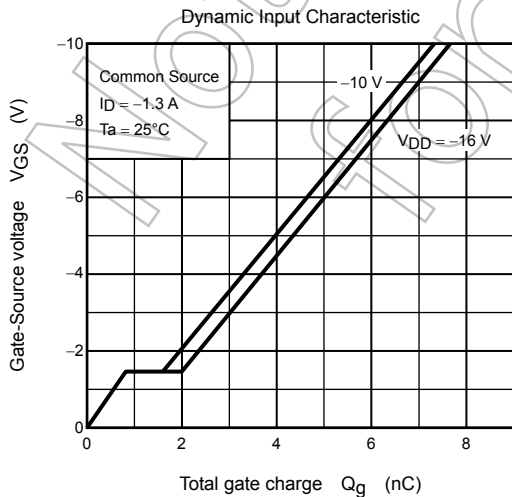
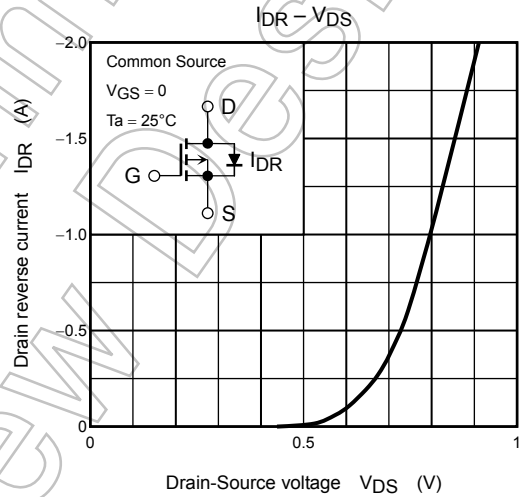
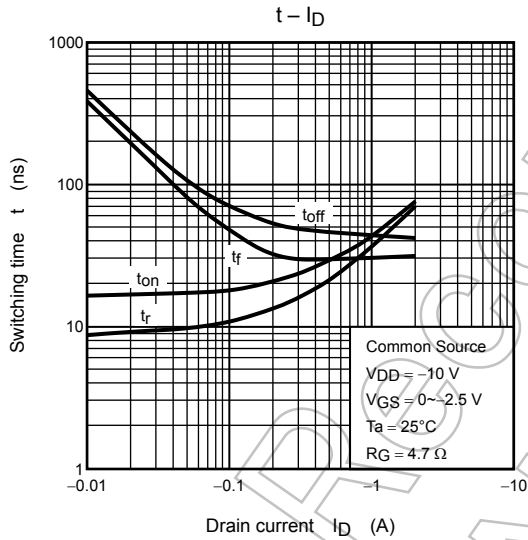
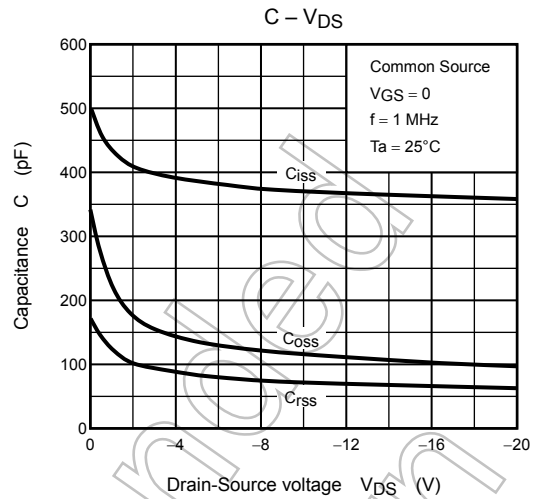
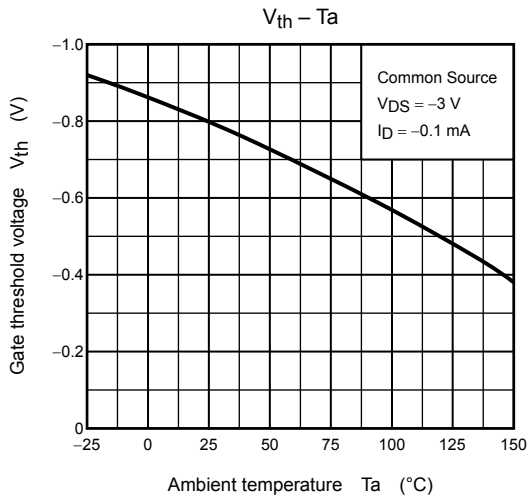
## Precaution

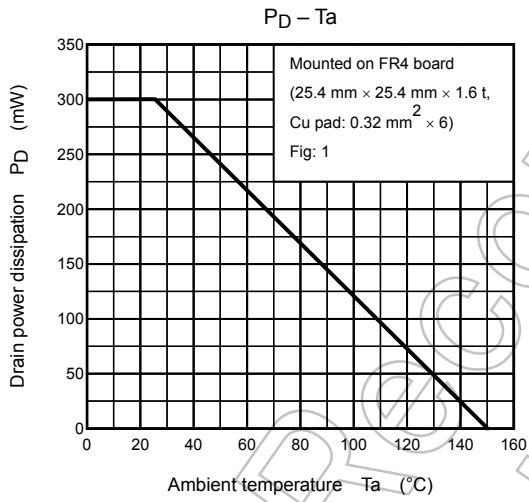
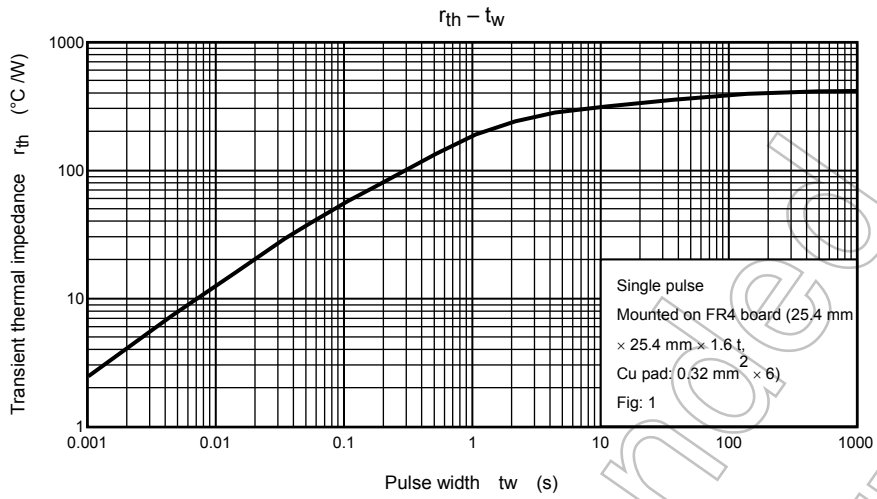
$V_{th}$  can be expressed as voltage between gate and source when low operating current value is  $I_D = -100\ \mu\text{A}$  for this product. For normal switching operation,  $V_{GS(on)}$  requires higher voltage than  $V_{th}$  and  $V_{GS(off)}$  requires lower voltage than  $V_{th}$ .

(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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