

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

# SSM6K08FU

## High Speed Switching Applications

- Small package
- Low on resistance:  $R_{on} = 105 \text{ m}\Omega$  (max) (@ $V_{GS} = 4 \text{ V}$ )  
 $R_{on} = 140 \text{ m}\Omega$  (max) (@ $V_{GS} = 2.5 \text{ V}$ )
- High-speed switching:  $t_{on} = 16 \text{ ns}$  (typ.)  
 $t_{off} = 15 \text{ ns}$  (typ.)

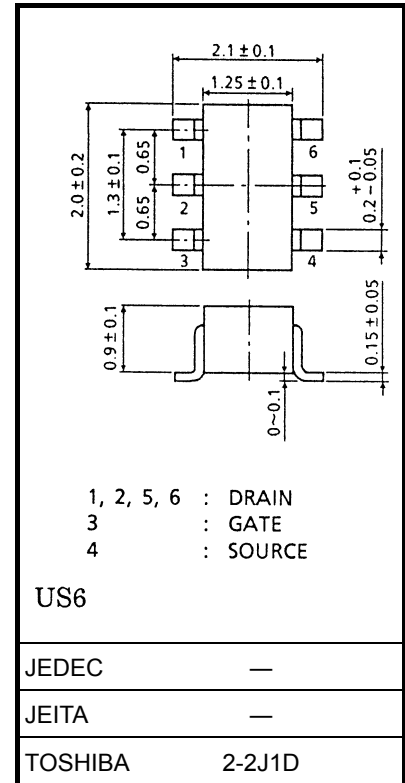
## Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Characteristics	Symbol	Rating	Unit
Drain-Source voltage	$V_{DS}$	20	V
Gate-Source voltage	$V_{GS}$	$\pm 12$	V
Drain current	DC	$I_D$	1.6
	Pulse	$I_{DP}$	3.2
Drain power dissipation	$P_D$ (Note 1)	300	mW
Channel temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage temperature range	$T_{stg}$	-55~150	$^\circ\text{C}$

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).

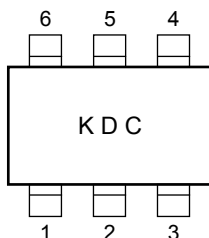
Note 1: Mounted on FR4 board.  
(25.4 mm × 25.4 mm × 1.6 t, Cu Pad: 0.32 mm<sup>2</sup> × 6) Figure 1.

Unit: mm

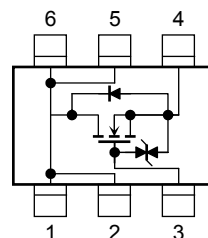


Weight: 6.8 mg (typ.)

## Marking



## Equivalent Circuit (top view)



## Handling Precaution

When handling individual devices (which are not yet mounting 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.

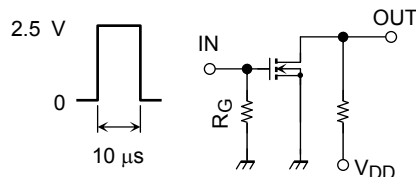
## Electrical Characteristics (Ta = 25°C)

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	
	$V_{(BR)DSX}$	$I_D = 1\text{ mA}, V_{GS} = -12\text{ V}$	12	—	—		
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	—	1.2	V	
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 3\text{ V}, I_D = 0.8\text{ A}$ (Note2)	2.0	—	—	S	
Drain-Source ON resistance	$R_{DS(ON)}$	$I_D = 0.8\text{ A}, V_{GS} = 4\text{ V}$ (Note2)	—	77	105	m $\Omega$	
		$I_D = 0.8\text{ A}, V_{GS} = 2.5\text{ V}$ (Note2)	—	100	140		
		$I_D = 0.8\text{ A}, V_{GS} = 2.0\text{ V}$ (Note2)	—	125	210		
Input capacitance	$C_{iss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	—	306	—	pF	
Reverse transfer capacitance	$C_{rss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	—	44	—	pF	
Output capacitance	$C_{oss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	—	74	—	pF	
Switching time	Turn-on time	$t_{on}$	$V_{DD} = 10\text{ V}, I_D = 0.8\text{ A},$	—	16	—	ns
	Turn-off time	$t_{off}$	$V_{GS} = 0 \sim 2.5\text{ V}, R_G = 4.7\ \Omega$	—	15	—	

Note2: Pulse test

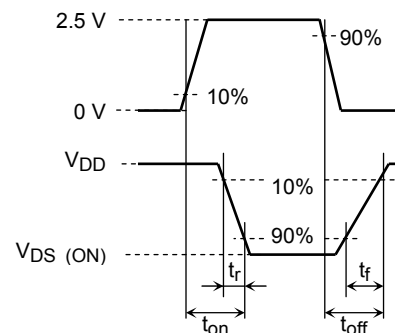
## Switching Time Test Circuit

### (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) $V_{IN}$



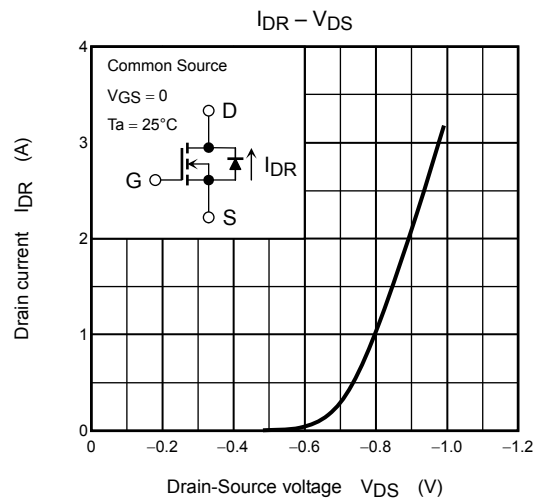
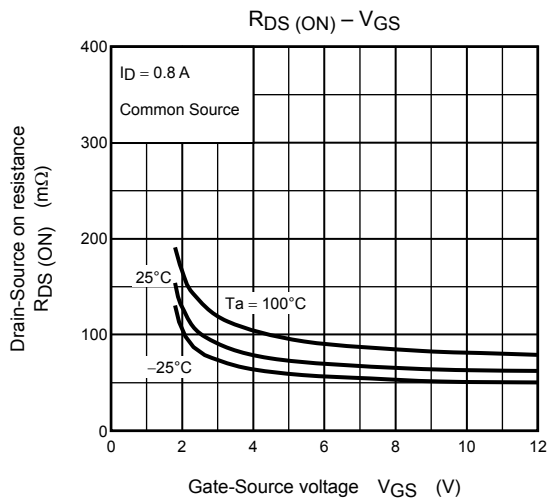
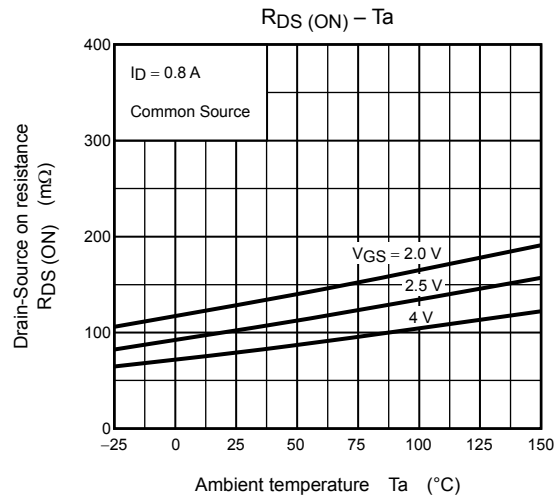
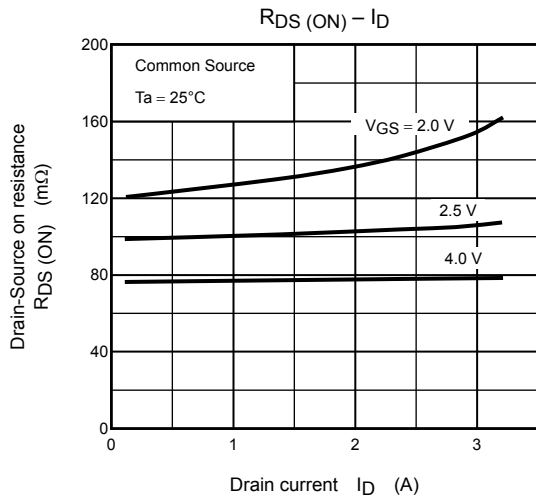
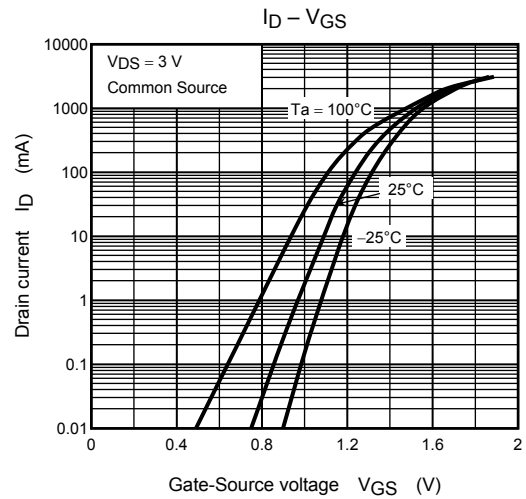
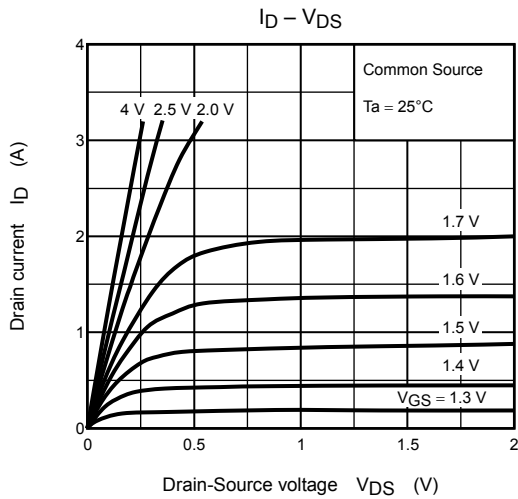
### (c) $V_{OUT}$

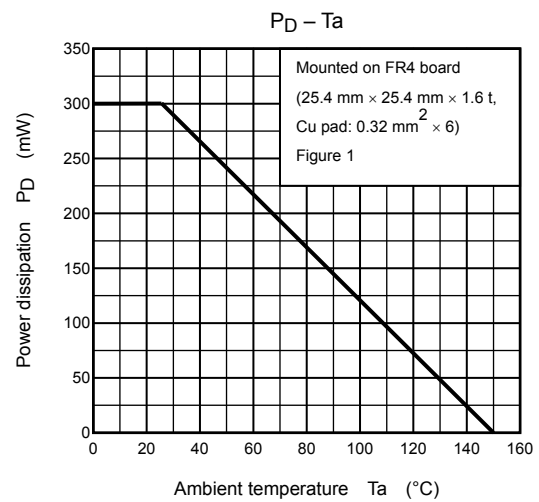
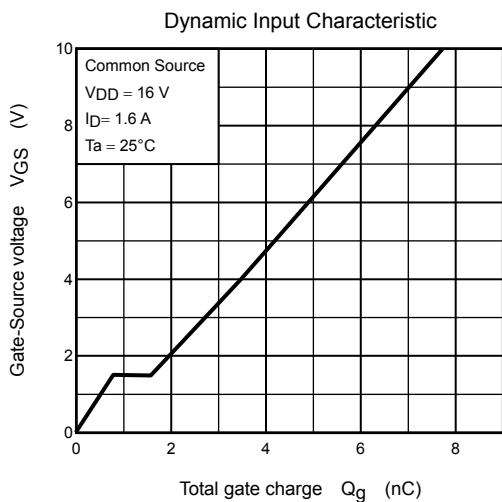
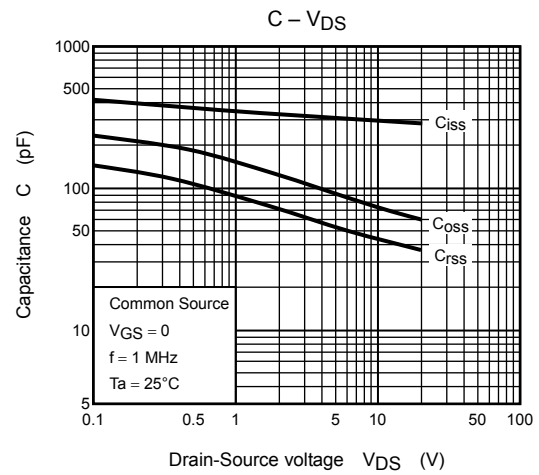
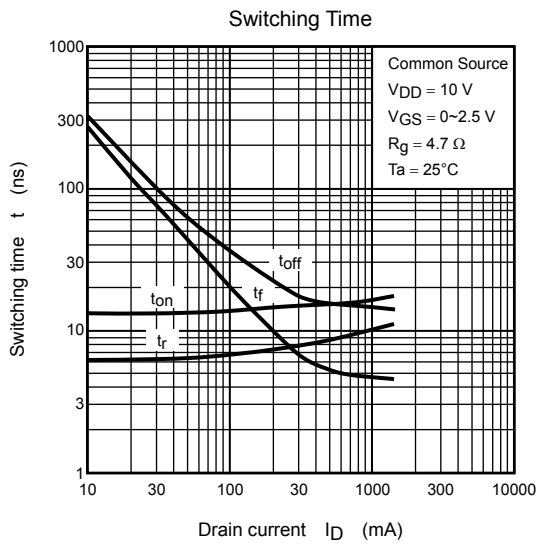
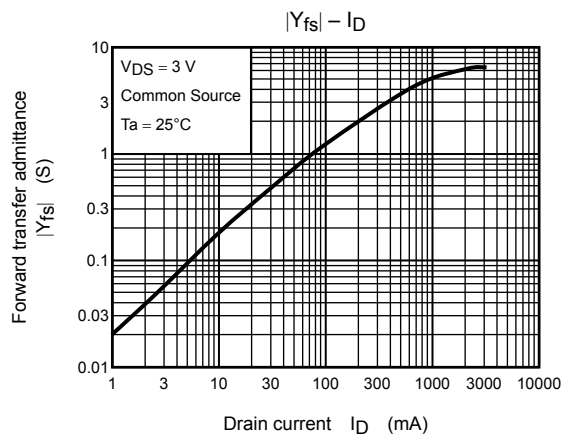
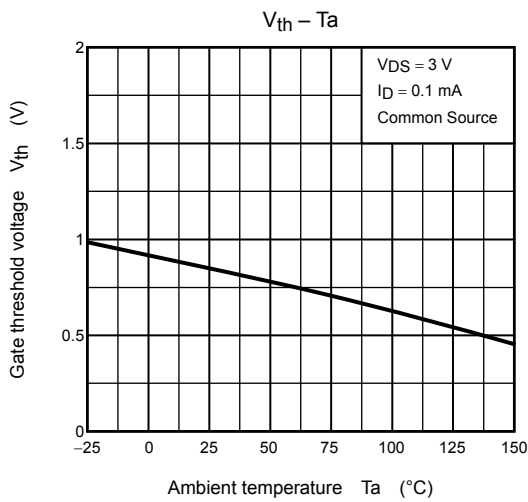
## Precaution

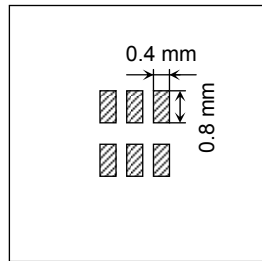
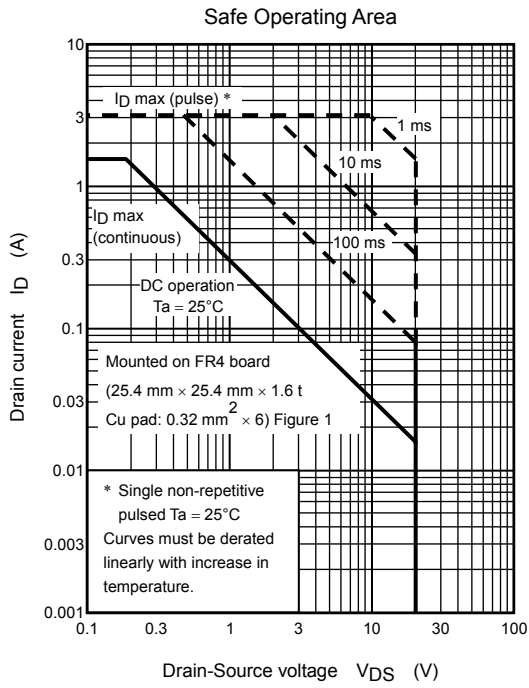
$V_{th}$  can be expressed as voltage between gate and source when low operating current value is  $I_D = 100\ \mu\text{A}$  for this product. For normal switching operation,  $V_{GS(ON)}$  requires higher voltage than  $V_{th}$  and  $V_{GS(OFF)}$  requires lower voltage than  $V_{th}$ .

(Relationship can be established as follows:  $V_{GS(OFF)} < V_{th} < V_{GS(ON)}$ )

Please take this into consideration for using the device.







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

**Figure 1**

**RESTRICTIONS ON PRODUCT USE**

20070701-EN GENERAL

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