

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type

# SSM3K106TU

## High-Speed Switching Applications

- 4 V drive
- Low ON-resistance:  $R_{on} = 530 \text{ m}\Omega$  (max) (@ $V_{GS} = 4 \text{ V}$ )  
 $R_{on} = 310 \text{ m}\Omega$  (max) (@ $V_{GS} = 10 \text{ V}$ )

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

Characteristic	Symbol	Rating	Unit
Drain-source voltage	$V_{DS}$	20	V
Gate-source voltage	$V_{GSS}$	$\pm 20$	V
Drain current	DC	$I_D$	1.2
	Pulse	$I_{DP}$	2.4
Drain power dissipation	$P_D$ (Note 1)	800	mW
	$P_D$ (Note 2)	500	
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).

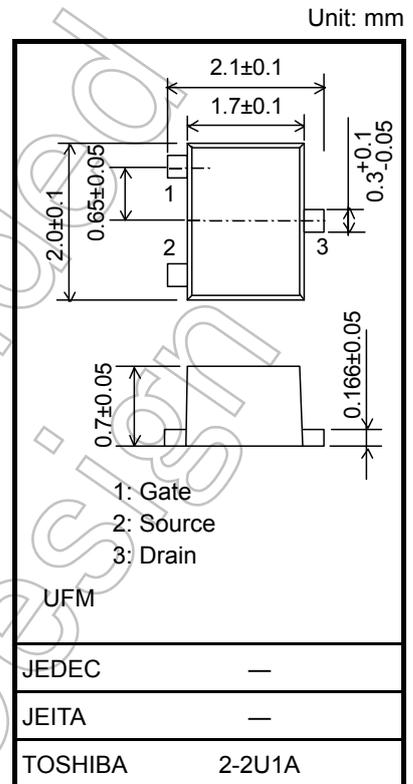
Note 1: Mounted on a ceramic board.  
 (25.4 mm × 25.4 mm × 0.8 mm, Cu Pad: 645 mm<sup>2</sup>)

Note 2: Mounted on an FR4 board.  
 (25.4 mm × 25.4 mm × 1.6 mm, Cu Pad: 645 mm<sup>2</sup>)

## Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Conditions	Min	Typ.	Max	Unit
Drain-source breakdown voltage	$V_{(BR)DSS}$	$I_D = 1 \text{ mA}, V_{GS} = 0$	20	—	—	V
Drain cutoff current	$I_{DSS}$	$V_{DS} = 20 \text{ V}, V_{GS} = 0$	—	—	1	μA
Gate leakage current	$I_{GSS}$	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0$	—	—	±1	μA
Gate threshold voltage	$V_{th}$	$V_{DS} = 5 \text{ V}, I_D = 0.1 \text{ mA}$	1.1	—	2.3	V
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 5 \text{ V}, I_D = 0.6 \text{ A}$ (Note 3)	0.58	1.16	—	S
Drain-source ON-resistance	$R_{DS(ON)}$	$I_D = 0.6 \text{ A}, V_{GS} = 10 \text{ V}$ (Note 3)	—	230	310	mΩ
		$I_D = 0.6 \text{ A}, V_{GS} = 4 \text{ V}$ (Note 3)	—	390	530	
Input capacitance	$C_{iss}$	$V_{DS} = 10 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$	—	36	—	pF
Output capacitance	$C_{oss}$	$V_{DS} = 10 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$	—	30	—	pF
Reverse transfer capacitance	$C_{rss}$	$V_{DS} = 10 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$	—	10	—	pF
Switching time	Turn-on time	$V_{DD} = 10 \text{ V}, I_D = 0.6 \text{ A},$ $V_{GS} = 0 \text{ to } 4 \text{ V}, R_G = 10 \Omega$	—	21	—	ns
	Turn-off time		—	8	—	
Drain-source forward voltage	$V_{DSF}$	$I_D = -1.2 \text{ A}, V_{GS} = 0 \text{ V}$ (Note 3)	—	-1.0	-1.4	V

Note 3: Pulse test

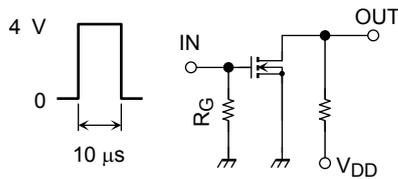


Weight: 6.6 mg (typ.)

Start of commercial production  
2005-02

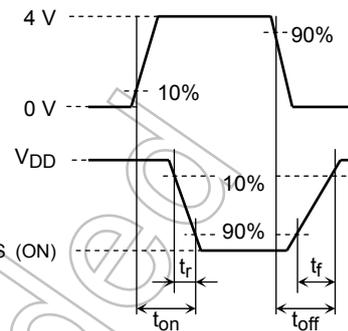
## Switching Time Test Circuit

(a) Test Circuit

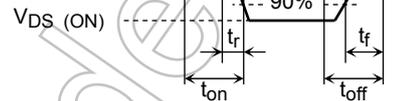


$V_{DD} = 10\text{ V}$   
 $R_G = 10\ \Omega$   
 Duty  $\leq 5\%$   
 $V_{IN}$ :  $t_r, t_f < 5\text{ ns}$   
 Common Source  
 $T_a = 25^\circ\text{C}$

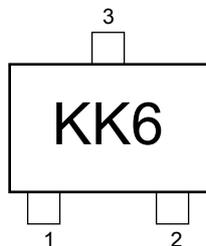
(b)  $V_{IN}$



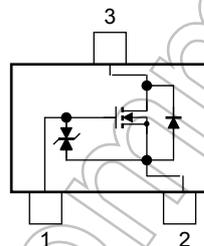
(c)  $V_{OUT}$



## Marking



## Equivalent Circuit (top view)



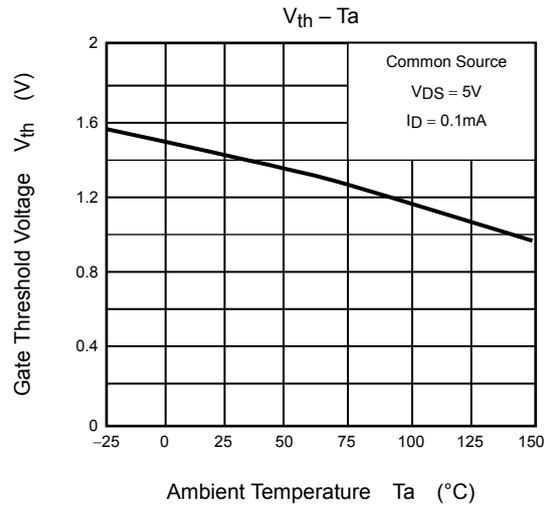
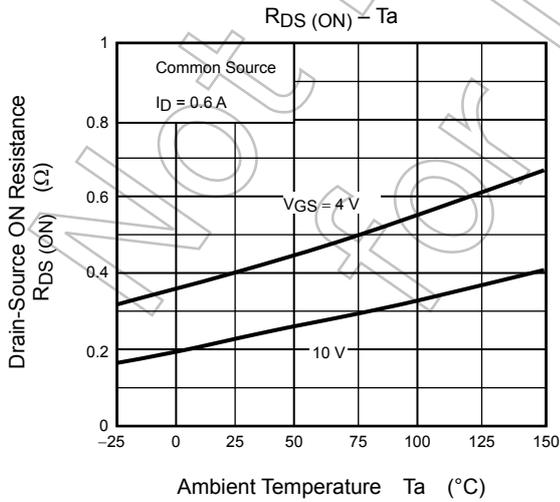
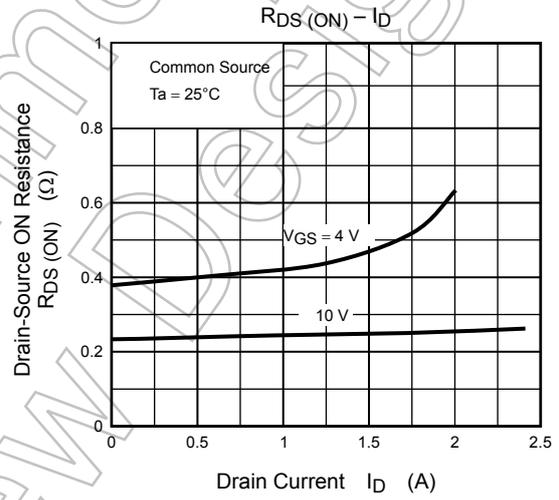
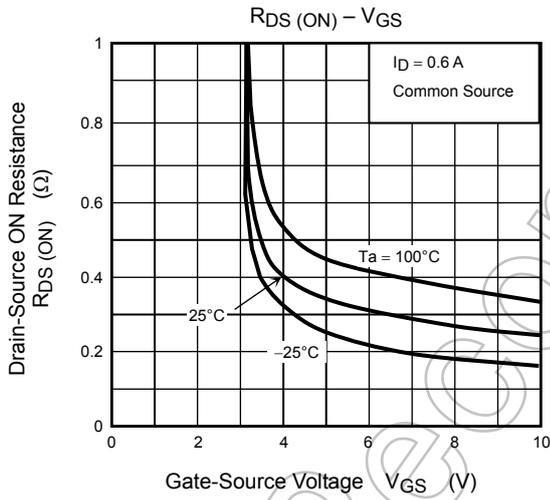
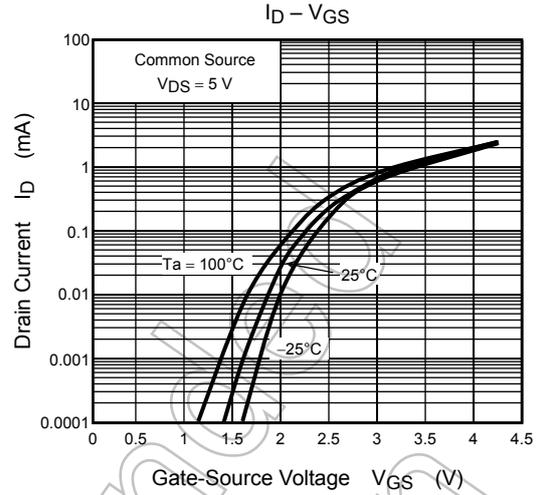
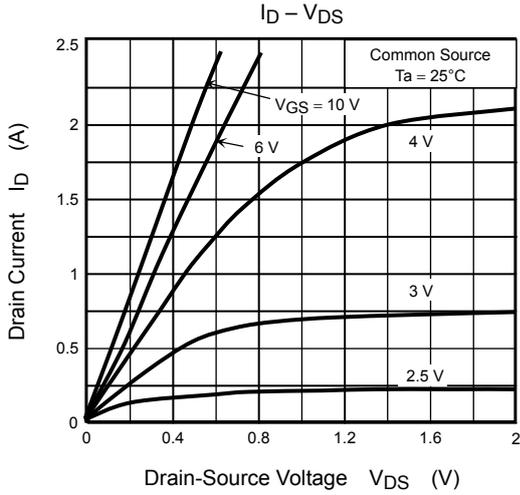
## Note

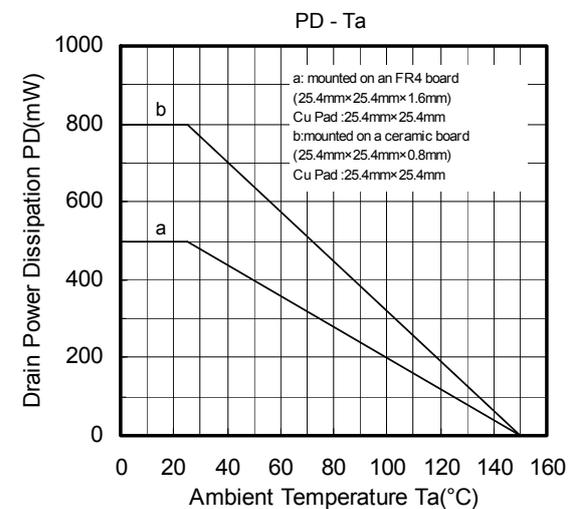
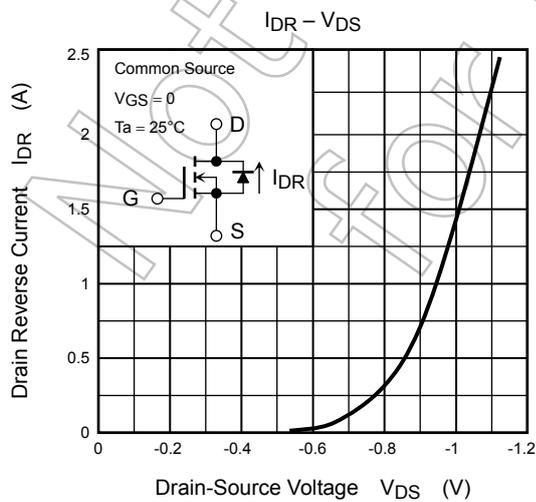
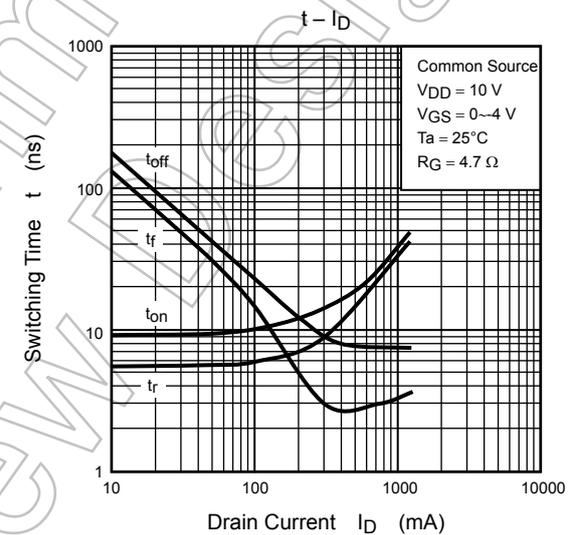
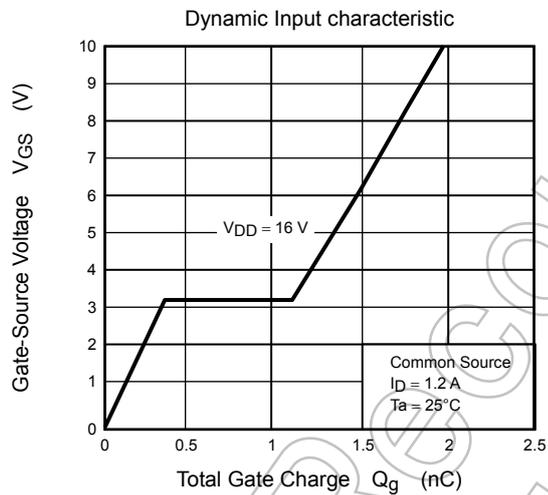
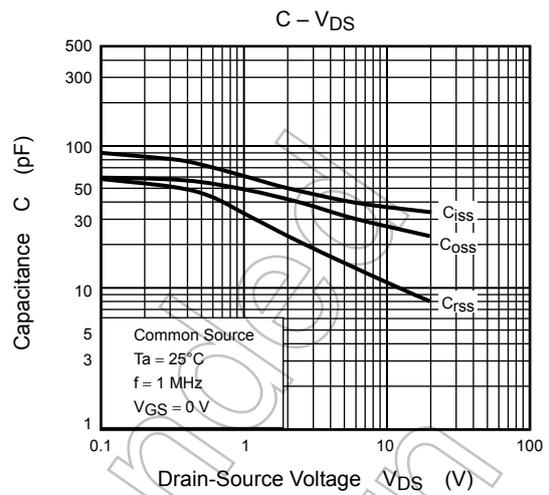
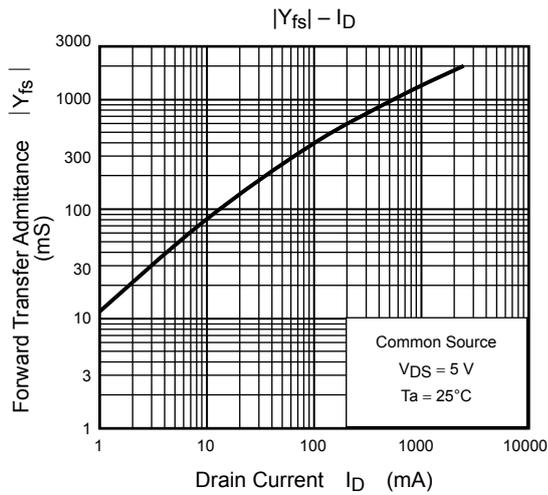
$V_{th}$  can be expressed as the voltage between gate and source when the low operating current value is  $I_D = 0.1\text{ mA}$  for this product. For normal switching operation,  $V_{GS (on)}$  requires a higher voltage than  $V_{th}$ , and  $V_{GS (off)}$  requires a lower voltage than  $V_{th}$ . (The relationship can be established as follows:  $V_{GS (off)} < V_{th} < V_{GS (on)}$ .)

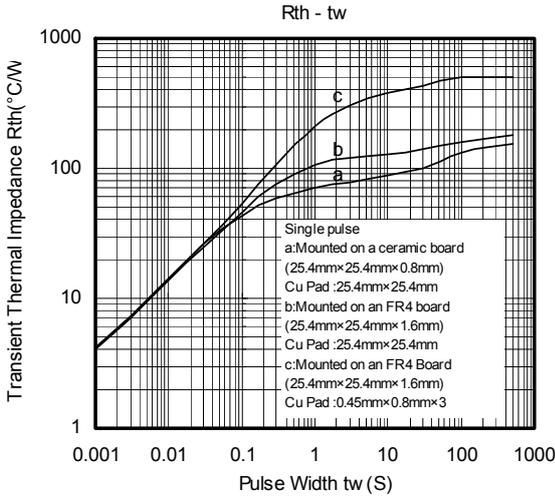
Take this into consideration when using the device.

## Handling Precaution

When handling individual devices that are not yet mounted on a circuit board, be sure that the environment is protected against electrostatic discharge. 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.







Not Recommended for New Design

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