

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

# SSM6J50TU

## ○ High Current Switching Applications

- Compact package suitable for high-density mounting
- Low on-resistance:
  - $R_{on} = 205m\Omega$  (max) (@ $V_{GS} = -2.0$  V)
  - $R_{on} = 100m\Omega$  (max) (@ $V_{GS} = -2.5$  V)
  - $R_{on} = 64m\Omega$  (max) (@ $V_{GS} = -4.5$  V)

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

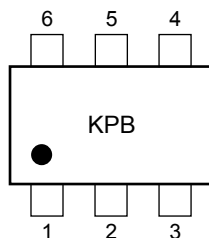
Characteristics		Symbol	Rating	Unit
Drain-Source voltage		$V_{DS}$	-20	V
Gate-Source voltage		$V_{GSS}$	$\pm 10$	V
Drain current	DC	$I_D$	-2.5	A
	Pulse	$I_{DP}$	-5	
Drain power dissipation		$P_D$ (Note 1)	500	mW
Channel temperature		$T_{ch}$	150	°C
Storage temperature range		$T_{stg}$	-55 to 150	°C

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.

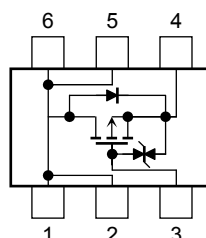
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 1: Mounted on FR4 board.  
(25.4 mm × 25.4 mm × 1.6 t, Cu Pad: 645 mm<sup>2</sup>)

## Marking

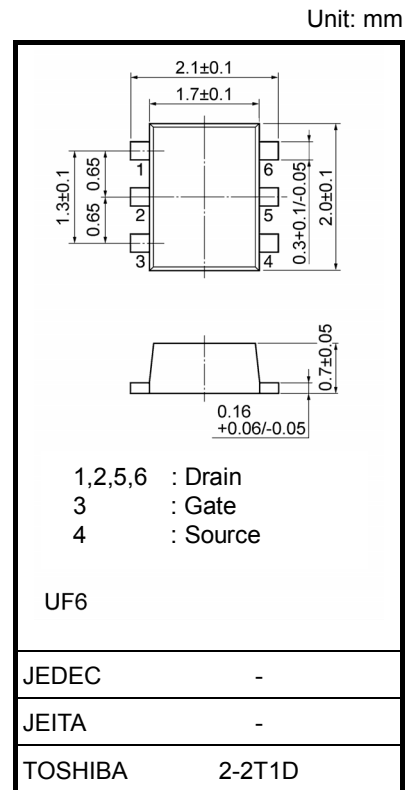


## Equivalent Circuit



## 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.



Weight: 7 mg (typ.)

Start of commercial production  
2003-11

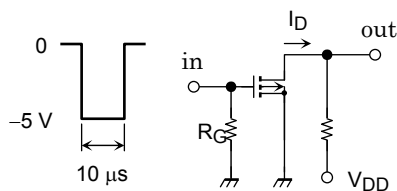
## Electrical Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit	
Gate leakage current	$I_{GSS}$	$V_{GS} = \pm 8 \text{ V}, V_{DS} = 0$	—	—	$\pm 10$	$\mu\text{A}$	
Drain-Source breakdown voltage	$V_{(BR)DSS}$	$I_D = -10 \text{ mA}, V_{GS} = 0$	-20	—	—	V	
	$V_{(BR)DSX}$	$I_D = -10 \text{ mA}, V_{GS} = +10 \text{ V}$	-10	—	—		
Drain cut-off current	$I_{DSS}$	$V_{DS} = -20 \text{ V}, V_{GS} = 0$	—	—	-10	$\mu\text{A}$	
Gate threshold voltage	$V_{th}$	$V_{DS} = -10 \text{ V}, I_D = -0.2 \text{ mA}$	-0.5	—	-1.2	V	
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = -10 \text{ V}, I_D = -1.5 \text{ A}$ (Note2)	3.1	6.2	—	S	
Drain-Source on-resistance	$R_{DS(ON)}$	$I_D = -1.5 \text{ A}, V_{GS} = -4.5 \text{ V}$ (Note2)	—	49	64	m $\Omega$	
		$I_D = -1.5 \text{ A}, V_{GS} = -2.5 \text{ V}$ (Note2)	—	73	100		
		$I_D = -1.5 \text{ A}, V_{GS} = -2.0 \text{ V}$ (Note2)	—	105	205		
Input capacitance	$C_{iss}$	$V_{DS} = -10 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$	—	800	—	pF	
Reverse transfer capacitance	$C_{rss}$	$V_{DS} = -10 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$	—	120	—	pF	
Output capacitance	$C_{oss}$	$V_{DS} = -10 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$	—	160	—	pF	
Switching time	Turn-on time	$t_{on}$	$V_{DD} = -10 \text{ V}, I_D = -1.5 \text{ A},$	—	15	—	ns
	Turn-off time	$t_{off}$	$V_{GS} = 0 \text{ to } -5 \text{ V}, R_G = 4.7 \Omega$	—	51	—	

Note2: Pulse test

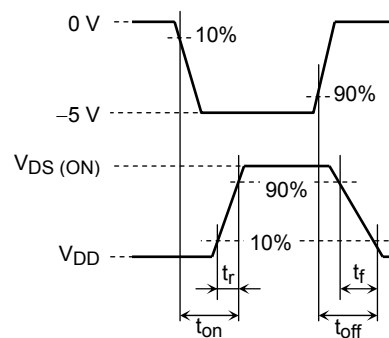
## Switching Time Test Circuit

### (a) Test Circuit

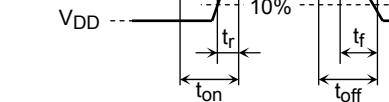


$V_{DD} = -10 \text{ V}$   
 $R_G = 4.7 \Omega$   
 Duty  $\leq 1\%$   
 $V_{IN}: t_r, t_f < 5 \text{ ns}$   
 Common Source  
 $T_a = 25^\circ\text{C}$

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



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

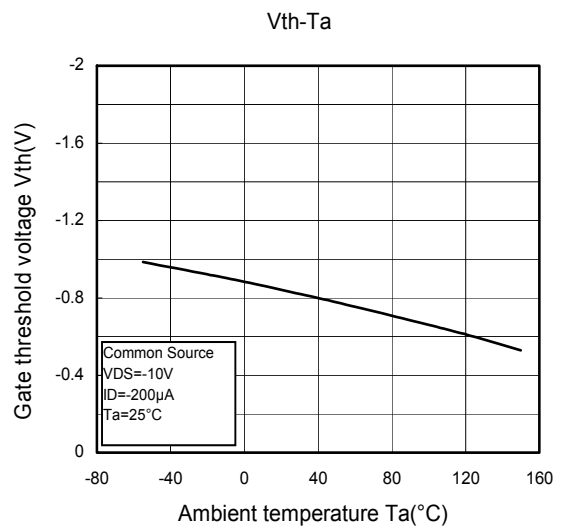
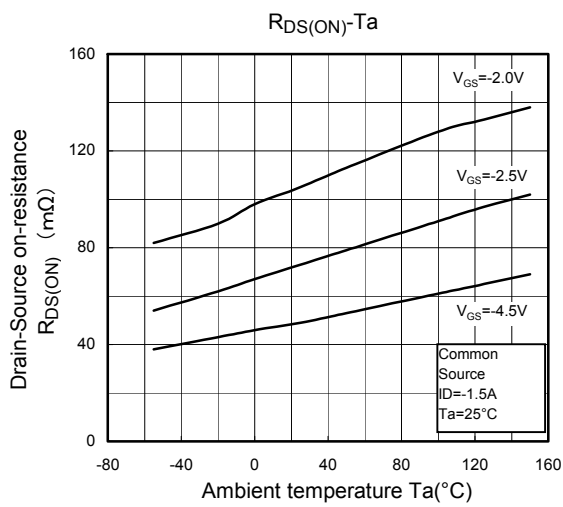
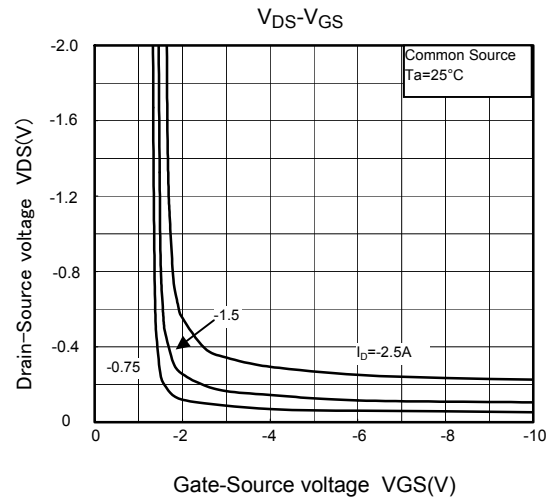
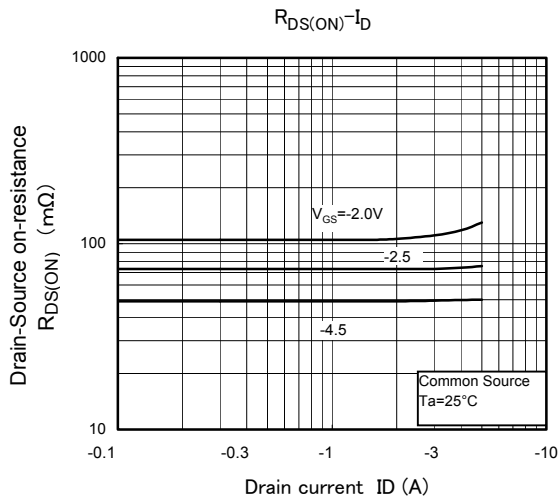
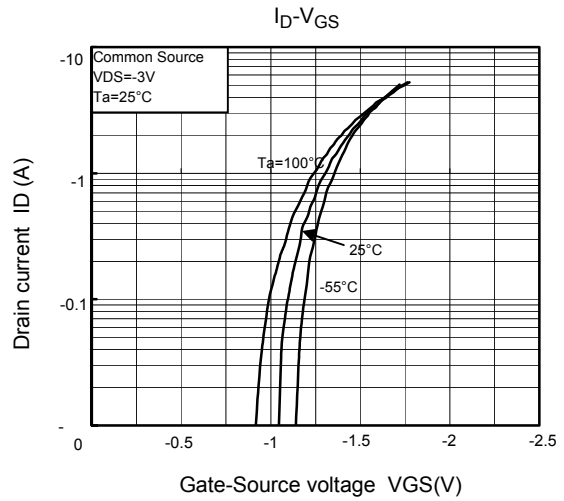
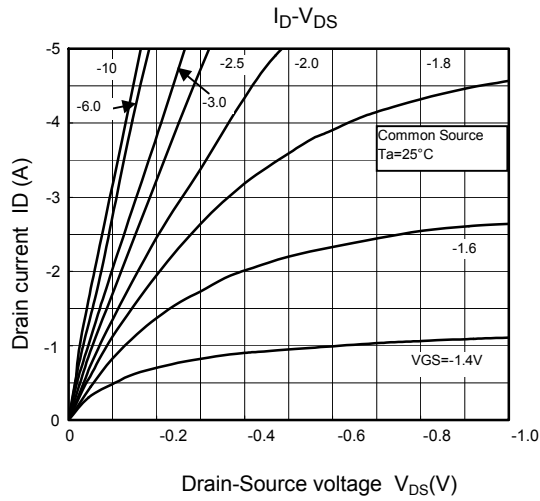


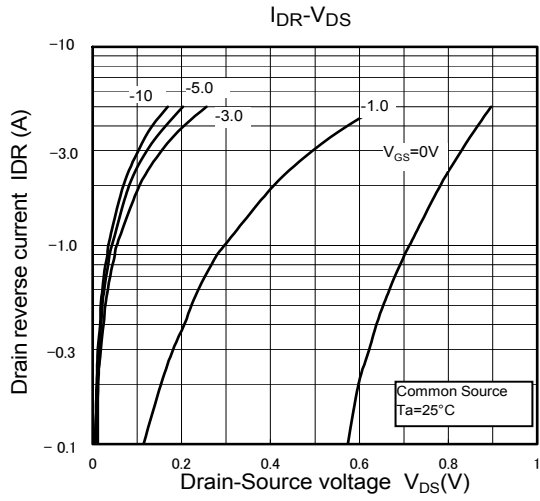
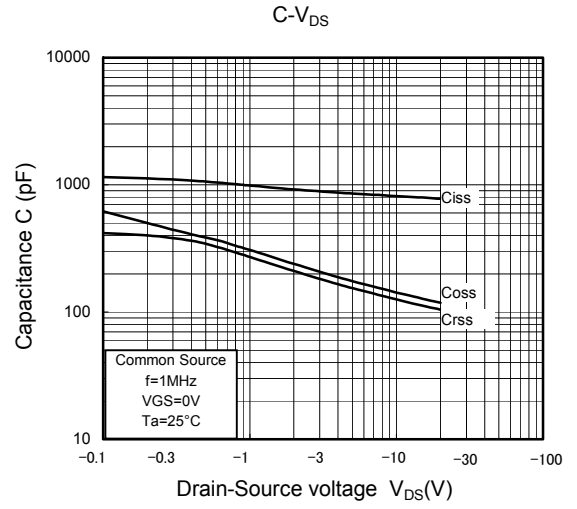
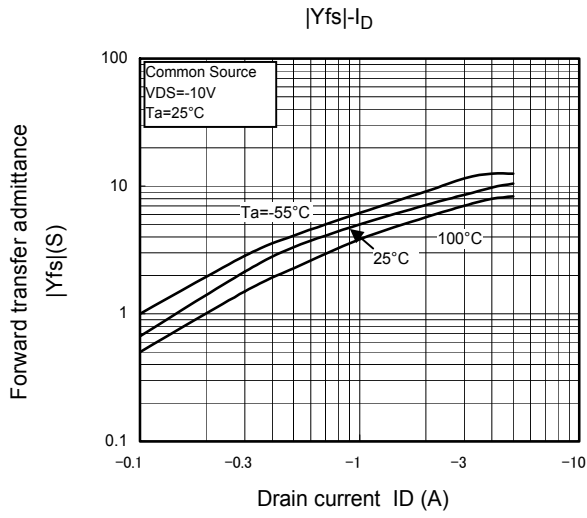
## Precaution

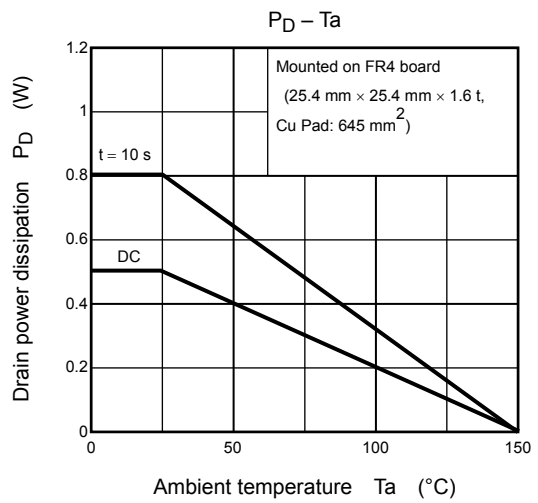
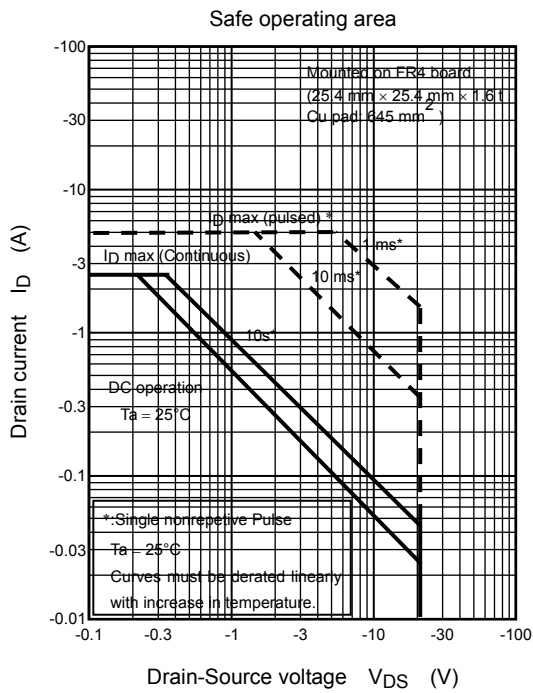
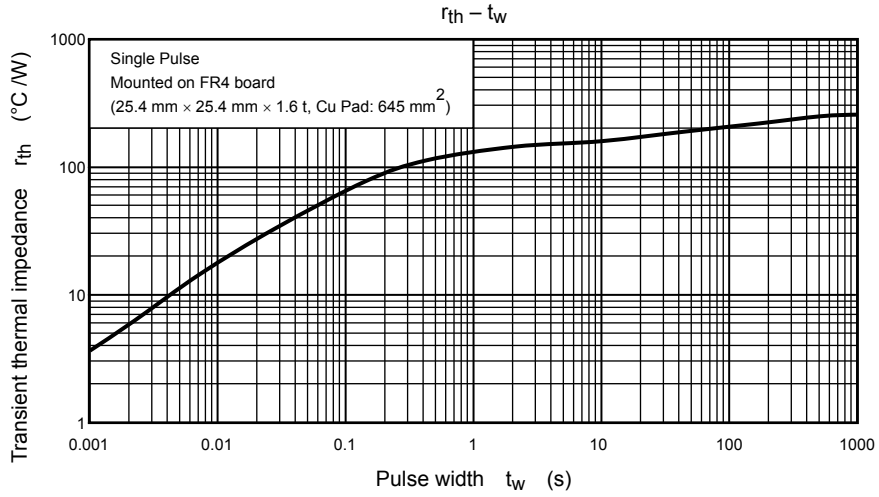
$V_{th}$  can be expressed as the voltage between gate and source when the low operating current value is  $I_D = -200 \mu\text{A}$  for this product. For normal switching operation,  $V_{GS(ON)}$  requires a higher voltage than  $V_{th}$  and  $V_{GS(OFF)}$  requires a lower voltage than  $V_{th}$ .

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

Be sure to take this into consideration when using the device.







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