

TOSHIBA Field Effect Transistor Silicon P-Channel MOS Type

# SSM3J108TU

## High Speed Switching Applications

- 1.8V drive
- Low on-resistance:  $R_{on} = 363\text{m}\Omega$  (max) (@ $V_{GS} = -1.8\text{ V}$ )  
 $R_{on} = 230\text{m}\Omega$  (max) (@ $V_{GS} = -2.5\text{ V}$ )  
 $R_{on} = 158\text{m}\Omega$  (max) (@ $V_{GS} = -4.0\text{ V}$ )

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

Characteristic	Symbol	Rating	Unit
Drain-Source voltage	$V_{DS}$	-20	V
Gate-Source voltage	$V_{GSS}$	$\pm 8$	V
Drain current	DC	$I_D$	-1.8
	Pulse	$I_{DP}$	-3.6
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).

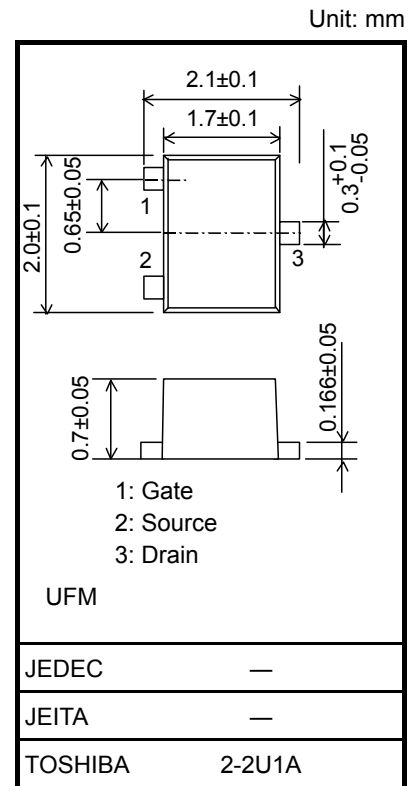
Note 1: Mounted on ceramic board.  
(25.4 mm × 25.4 mm × 0.8 mm, Cu Pad: 645 mm<sup>2</sup>)

Note 2: Mounted on 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
	$V_{(BR)DSX}$	$I_D = -1\text{ mA}, V_{GS} = +8\text{ V}$	-12	—	—	
Drain cut-off current	$I_{DSS}$	$V_{DS} = -20\text{ V}, V_{GS} = 0$	—	—	-10	μA
Gate leakage current	$I_{GSS}$	$V_{GS} = \pm 8\text{ V}, V_{DS} = 0$	—	—	$\pm 1$	μA
Gate threshold voltage	$V_{th}$	$V_{DS} = -3\text{ V}, I_D = -1\text{ mA}$	-0.3	—	-1.0	V
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = -3\text{ V}, I_D = -0.8\text{ A}$ (Note3)	1.9	3.2	—	S
Drain-Source on-resistance	$R_{DS(ON)}$	$I_D = -0.8\text{ A}, V_{GS} = -4.0\text{ V}$ (Note3)	—	125	158	mΩ
		$I_D = -0.4\text{ A}, V_{GS} = -2.5\text{ V}$ (Note3)	—	170	230	
		$I_D = -0.1\text{ A}, V_{GS} = -1.8\text{ V}$ (Note3)	—	230	363	
Input capacitance	$C_{iss}$	$V_{DS} = -10\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	—	250	—	pF
Output capacitance	$C_{oss}$	$V_{DS} = -10\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	—	45	—	pF
Reverse transfer capacitance	$C_{rss}$	$V_{DS} = -10\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	—	35	—	pF
Switching time	Turn-on time	$t_{on}$	—	12	—	ns
	Turn-off time	$t_{off}$		18	—	
Drain-Source forward voltage	$V_{DSF}$	$I_D = 1.8\text{ A}, V_{GS} = 0\text{ V}$ (Note3)	—	0.85	1.2	V

Note3: Pulse test

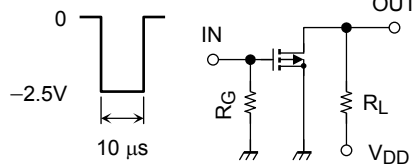


Weight: 6.6 mg (typ.)

Start of commercial production  
2005-02

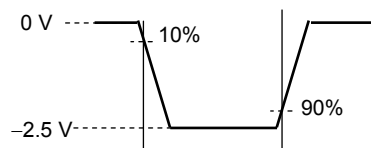
## Switching Time Test Circuit

### (a) Test circuit

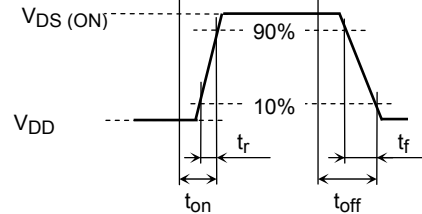


$V_{DD} = -10\text{ V}$   
 $R_G = 4.7\ \Omega$   
 Duty  $\leq 1\%$   
 $V_{IN}$ :  $t_r, t_f < 5\text{ ns}$   
 Common Source  
 $T_a = 25^\circ\text{C}$

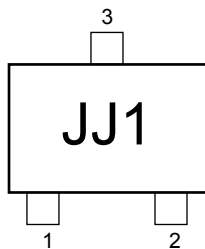
### (b) $V_{IN}$



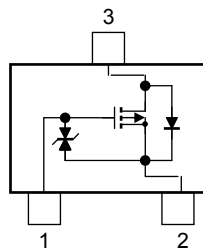
### (c) $V_{OUT}$



## Marking



## Equivalent Circuit (top view)



## Precaution

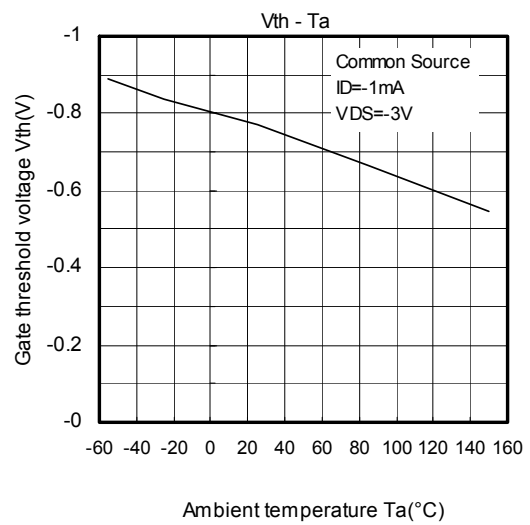
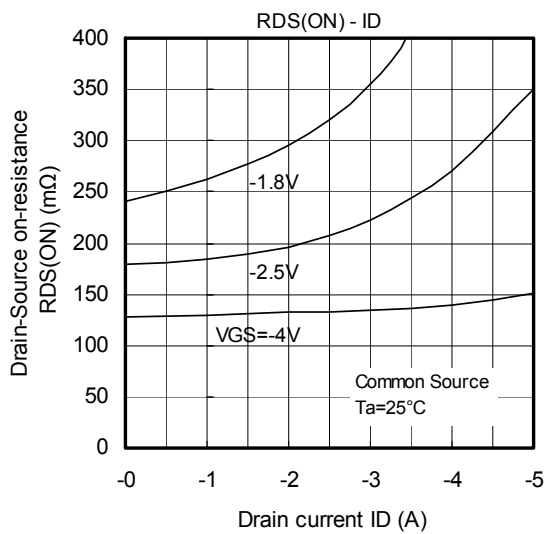
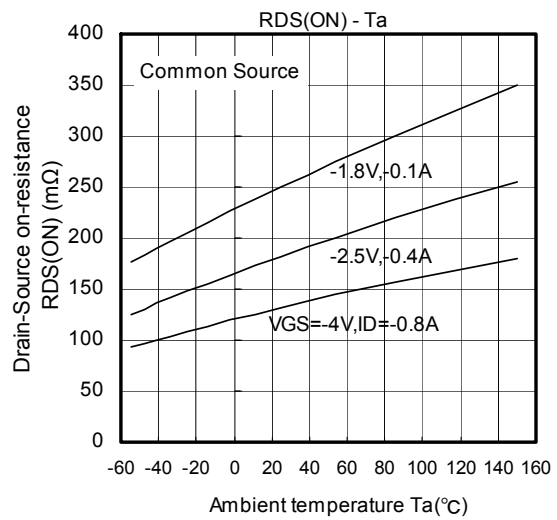
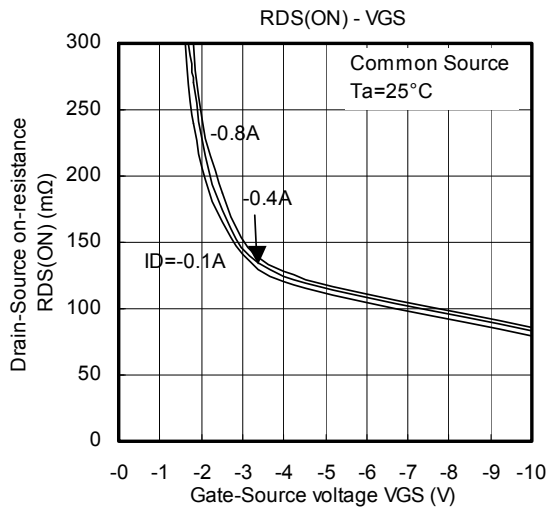
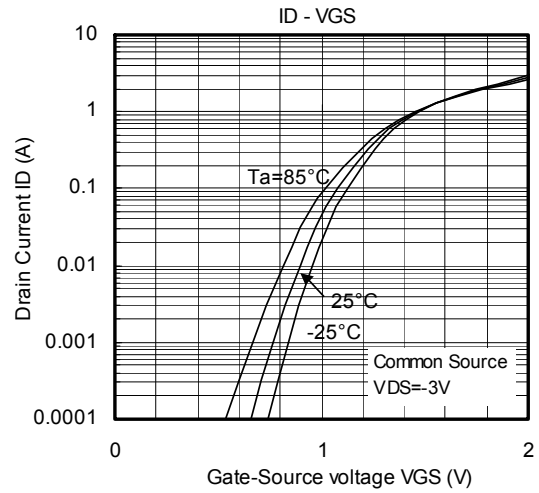
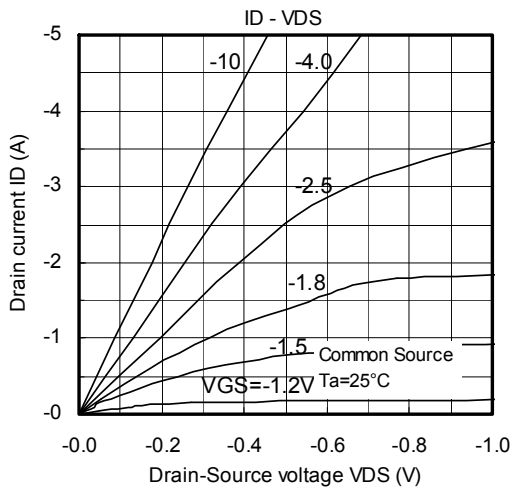
$V_{th}$  can be expressed as the voltage between gate and source when the low operating current value is  $I_D = -1\text{ mA}$  for this product. For normal switching operation,  $V_{GS(on)}$  requires a higher voltage than  $V_{th}$ , and  $V_{GS(off)}$  requires a lower voltage than  $V_{th}$ .

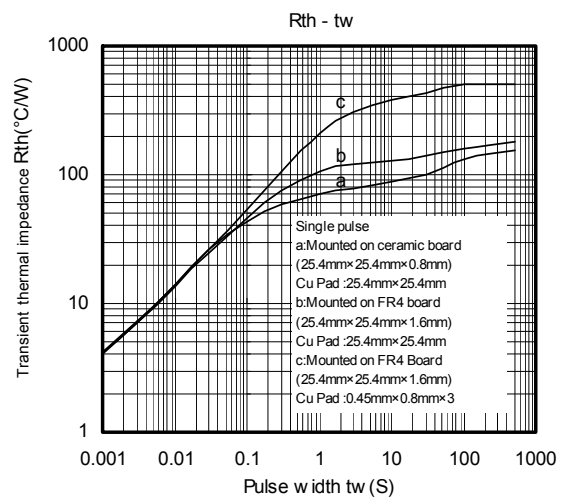
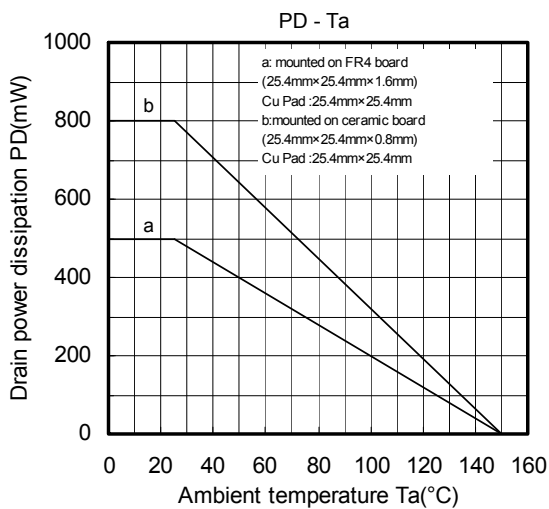
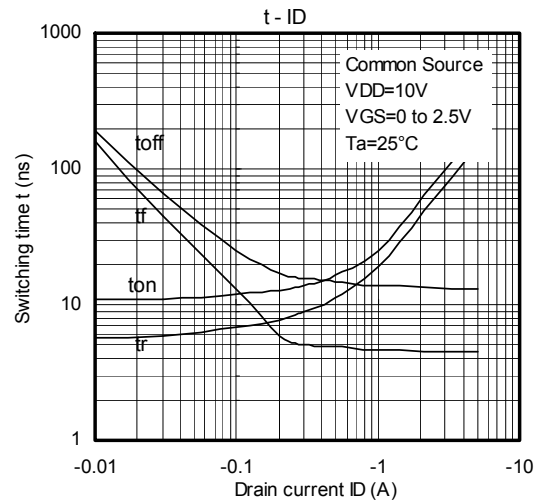
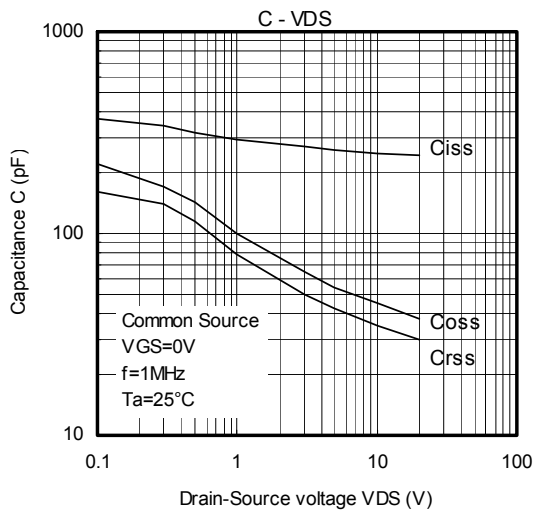
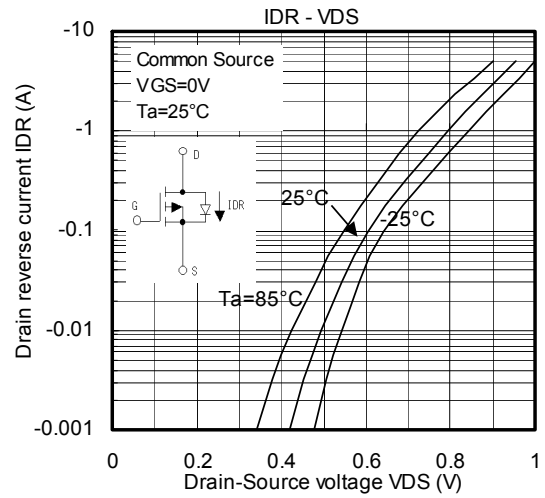
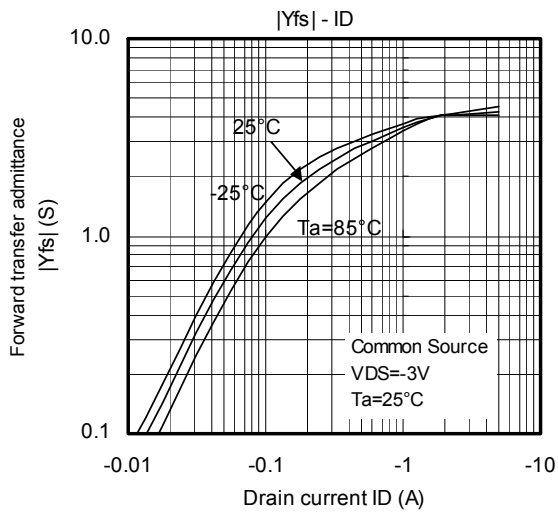
(The relationship can be established as follows:  $V_{GS(off)} < V_{th} < V_{GS(on)}$ )

Take this into consideration when using the device.

## Handling Precaution

When handling individual devices which 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.





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