

# SSM3J111TU

## High Speed Switching Applications

- 2.5V drive
- Low on-resistance:  $R_{on} = 480\text{m}\Omega$  (max) (@ $V_{GS} = -4\text{ V}$ )  
 $R_{on} = 680\text{m}\Omega$  (max) (@ $V_{GS} = -2.5\text{ V}$ )

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

Characteristic		Symbol	Rating	Unit
Drain-Source voltage		$V_{DS}$	-20	V
Gate-Source voltage		$V_{GSS}$	$\pm 12$	V
Drain current	DC	$I_D$	-1	A
	Pulse	$I_{DP}$	-2	
Drain power dissipation		$P_D$ (Note 1)	800	mW
		$P_D$ (Note 2)	500	
Channel temperature		$T_{ch}$	150	°C
Storage temperature range		$T_{stg}$	-55~150	°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>)

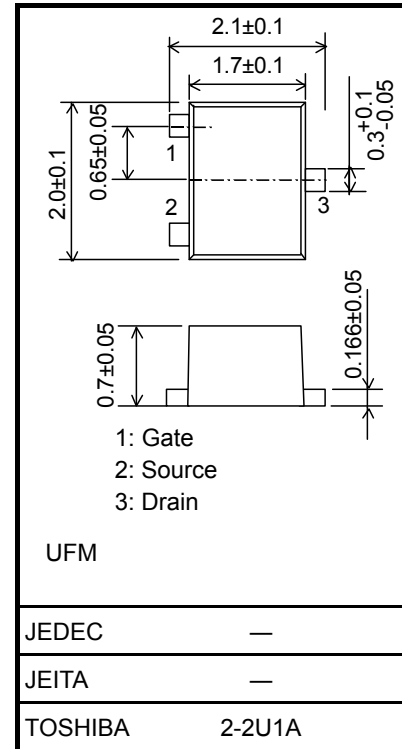
Note 2: Mounted on FR4 board.  
 (25.4 mm × 25.4 mm × 1.6 mm, Cu Pad: 645 mm<sup>2</sup>)

## 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
Drain cut-off current		$I_{DSS}$	$V_{DS} = -20\text{ V}, V_{GS} = 0$	—	—	-1	μA
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 12\text{ V}, V_{DS} = 0$	—	—	±1	μA
Gate threshold voltage		$V_{th}$	$V_{DS} = -3\text{ V}, I_D = -0.1\text{ mA}$	-0.6	—	-1.1	V
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = -3\text{ V}, I_D = -0.3\text{ A}$ (Note3)	0.6	1.2	—	S
Drain-Source on-resistance		$R_{DS(ON)}$	$I_D = -0.3\text{ A}, V_{GS} = -4.0\text{ V}$ (Note3)	—	380	480	mΩ
			$I_D = -0.3\text{ A}, V_{GS} = -2.5\text{ V}$ (Note3)	—	530	680	
Input capacitance		$C_{iss}$	$V_{DS} = -10\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	—	160	—	pF
Output capacitance		$C_{oss}$	$V_{DS} = -10\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	—	90	—	pF
Reverse transfer capacitance		$C_{rss}$	$V_{DS} = -10\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	—	25	—	pF
Switching time	Turn-on time	$t_{on}$	$V_{DD} = -10\text{ V}, I_D = -0.3\text{ A},$ $V_{GS} = 0 \sim -2.5\text{ V}, R_G = 4.7\ \Omega$	—	27	—	ns
	Turn-off time	$t_{off}$		—	43	—	
Drain-Source forward voltage		$V_{DSF}$	$I_D = 1\text{ A}, V_{GS} = 0\text{ V}$ (Note3)	—	0.85	1.2	V

Note3: Pulse test

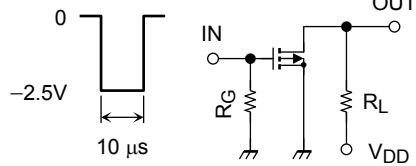
Unit: mm



Weight: 6.6 mg (typ.)

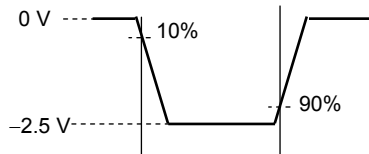
**Switching Time Test Circuit**

**(a) Test circuit**

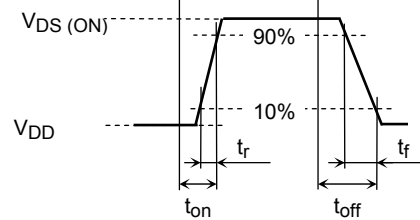


$V_{DD} = -10\text{ V}$   
 $R_G = 4.7\ \Omega$   
 $D.U. \leq 1\%$   
 $V_{IN}$ :  $t_r, t_f < 5\text{ ns}$   
 Common Source  
 $T_a = 25^\circ\text{C}$

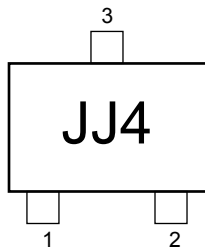
**(b)  $V_{IN}$**



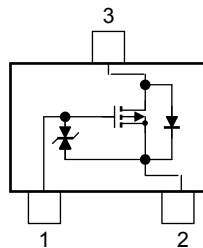
**(c)  $V_{OUT}$**



**Marking**



**Equivalent Circuit (top view)**



**Precaution**

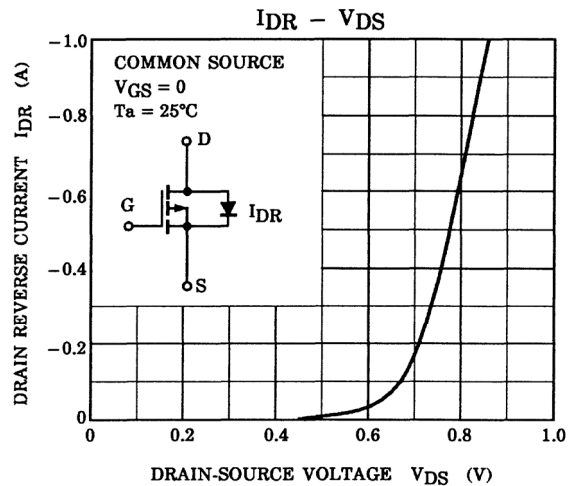
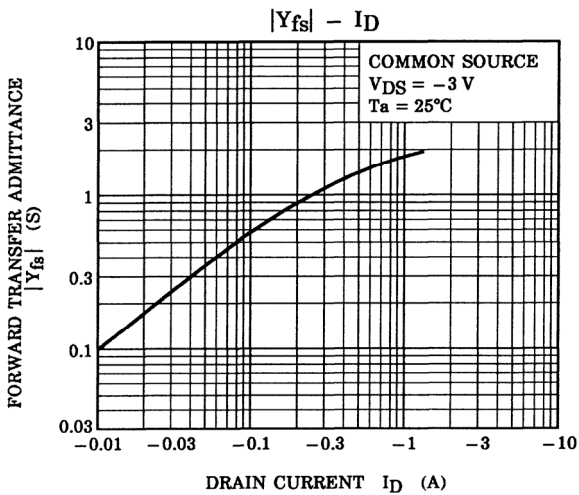
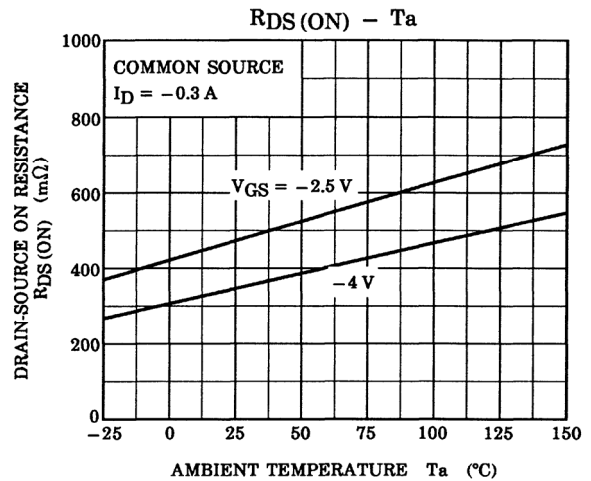
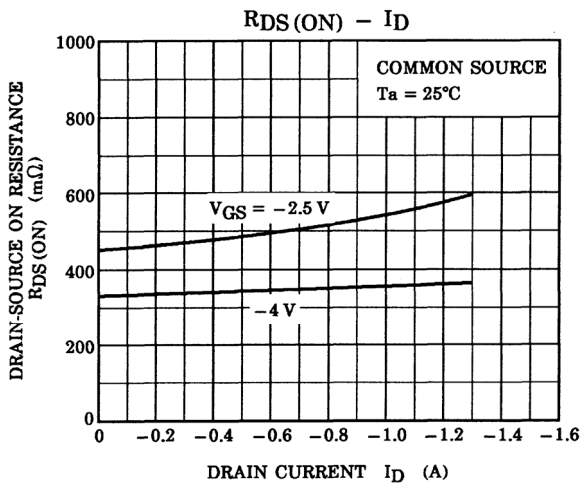
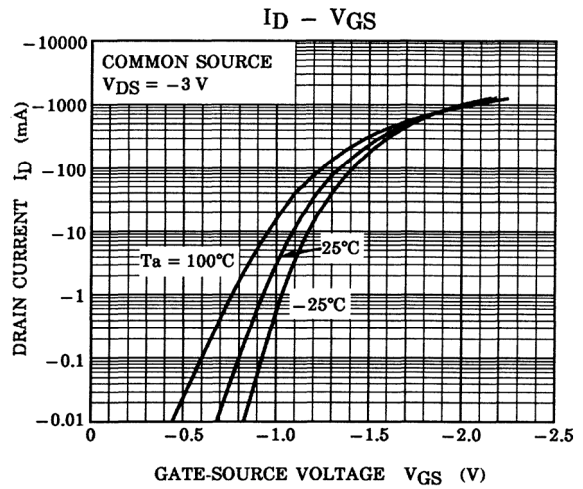
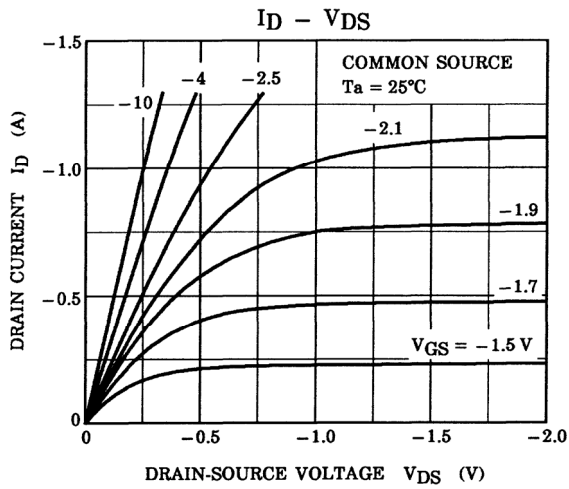
$V_{th}$  can be expressed as the voltage between gate and source when the low operating current value is  $I_D = -0.1\text{ mA}$  for this product. For normal switching operation,  $V_{GS(ON)}$  requires a higher voltage than  $V_{th}$ , and  $V_{GS(OFF)}$  requires a lower voltage than  $V_{th}$ .

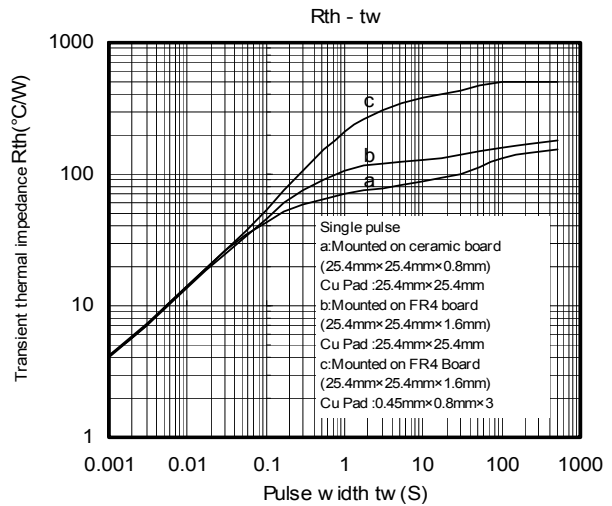
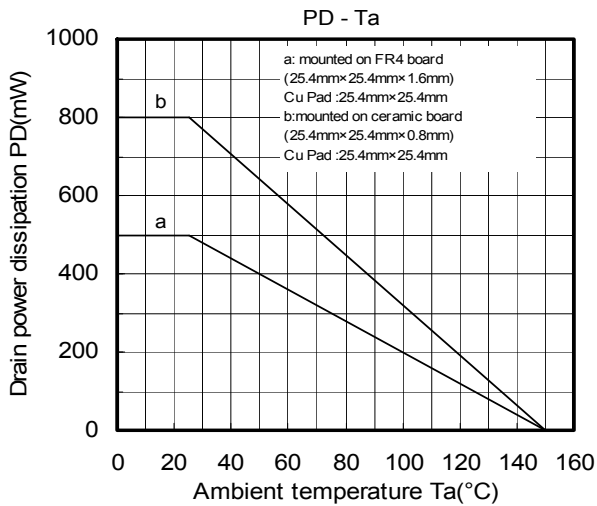
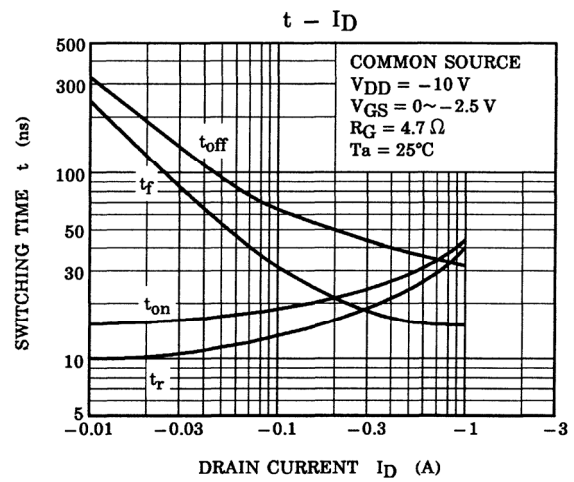
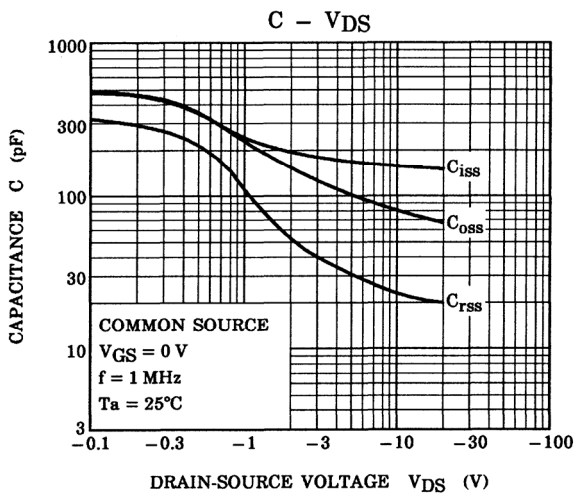
(The relationship can be established as follows:  $V_{GS(OFF)} < V_{th} < V_{GS(ON)}$ )

Take this into consideration when using the device.

**Handling Precaution**

When handling individual devices 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.





**RESTRICTIONS ON PRODUCT USE**

20070701-EN GENERAL

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- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.  
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