

## SSM3J120TU

○ Power Management Switch Applications

○ High-Current Switching Applications

- 1.5 V drive
- Low on-resistance

$R_{on} = 140 \text{ m}\Omega$  (max) (@ $V_{GS} = -1.5 \text{ V}$ )  
 $R_{on} = 78 \text{ m}\Omega$  (max) (@ $V_{GS} = -1.8 \text{ V}$ )  
 $R_{on} = 49 \text{ m}\Omega$  (max) (@ $V_{GS} = -2.5 \text{ V}$ )  
 $R_{on} = 38 \text{ m}\Omega$  (max) (@ $V_{GS} = -4.0 \text{ V}$ )

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

Characteristics	Symbol	Rating	Unit
Drain-Source voltage	$V_{DS}$	-20	V
Gate-Source voltage	$V_{GSS}$	$\pm 8$	V
Drain current	DC	$I_D$	-4.0
	Pulse	$I_{DP}$	-8.0
Drain power dissipation	$P_D$ (Note 1)	800	mW
	$P_D$ (Note 2)	500	
Channel temperature	$T_{ch}$	150	°C
Storage temperature	$T_{stg}$	-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).

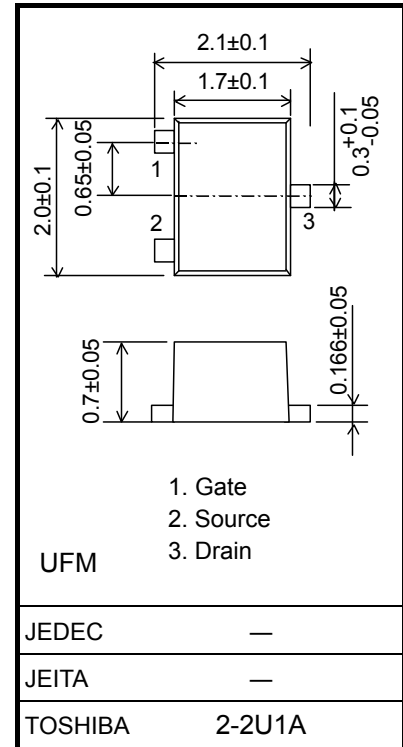
Note 1 : Mounted on ceramic board  
(25.4 mm × 25.4 mm × 0.8 t, Cu Pad: 645 mm<sup>2</sup>)

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

### Electrical Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	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} $	$V_{DS} = -3 \text{ V}, I_D = -2.0 \text{ A}$ (Note 3)	6.1	12.1	—	S	
Drain-Source ON-resistance	$R_{DS(ON)}$	$I_D = -3.0 \text{ A}, V_{GS} = -4.0 \text{ V}$ (Note 3)	—	28	38	mΩ	
		$I_D = -2.0 \text{ A}, V_{GS} = -2.5 \text{ V}$ (Note 3)	—	34	49		
		$I_D = -1.0 \text{ A}, V_{GS} = -1.8 \text{ V}$ (Note 3)	—	47	78		
		$I_D = -0.3 \text{ A}, V_{GS} = -1.5 \text{ V}$ (Note 3)	—	60	140		
Input capacitance	$C_{iss}$	$V_{DS} = -10 \text{ V}, V_{GS} = 0$ $f = 1 \text{ MHz}$	—	1484	—	pF	
Output capacitance	$C_{oss}$		—	185	—	pF	
Reverse transfer capacitance	$C_{rss}$		—	169	—	pF	
Switching time	Turn-on time	$t_{on}$	$V_{DD} = -10 \text{ V}, I_D = -2.0 \text{ A}$ $V_{GS} = 0 \sim -2.5 \text{ V}, R_G = 4.7 \Omega$	—	67	—	ns
	Turn-off time	$t_{off}$		—	92	—	

Unit: mm



Weight: 6.6mg (typ.)

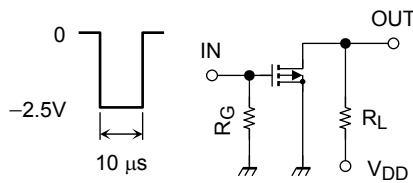
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Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Total gate charge	$Q_g$	$V_{DS} = -16\text{ V}$ , $I_{DS} = -4.0\text{ A}$ , $V_{GS} = -4.0\text{ V}$ ,	—	22.3	—	nC
Gate-Source charge	$Q_{gs}$		—	14.9	—	
Gate-Drain charge	$Q_{gd}$		—	7.3	—	
Drain-Source forward voltage	$V_{DSF}$	$I_D = 4.0\text{ A}$ , $V_{GS} = 0$ (Note 3)	—	0.8	1.2	V

Note 3: Pulse test

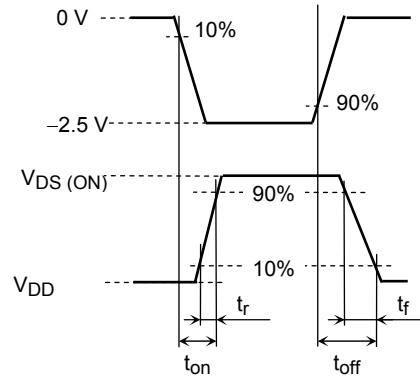
## Switching Time Test Circuit

### (a) Test Circuit



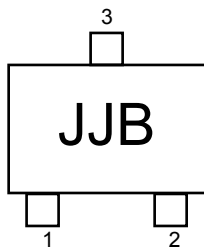
$V_{DD} = -10\text{ V}$   
 $R_G = 4.7\ \Omega$   
 $D.U. \leq 1\%$   
 $V_{IN}$ :  $t_r, t_f < 5\text{ ns}$   
 Common Source  
 $T_a = 25\text{ }^\circ\text{C}$

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

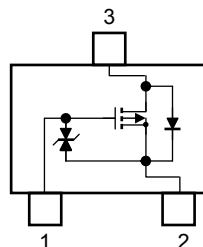


### (c) $V_{OUT}$

## Marking



## Equivalent Circuit (top view)



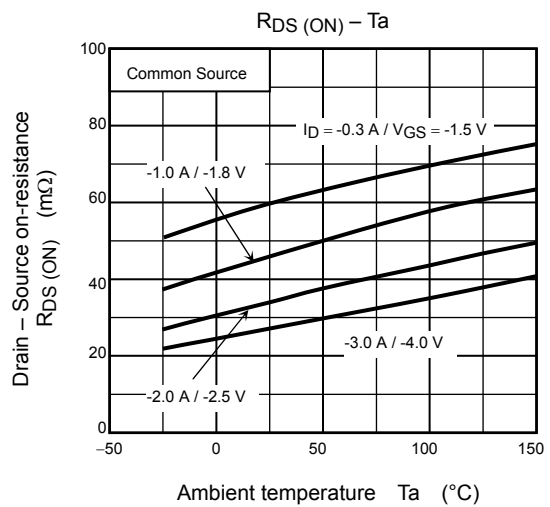
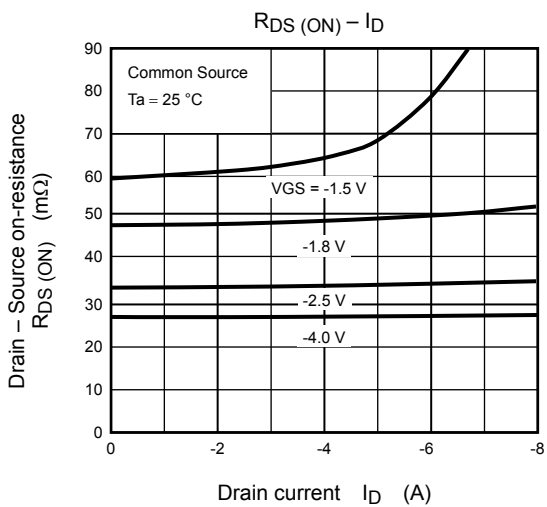
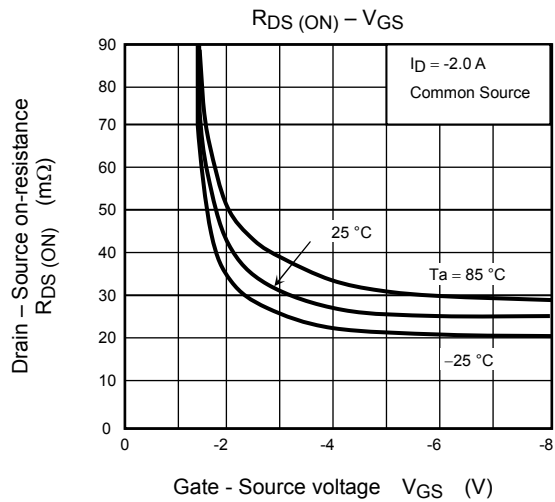
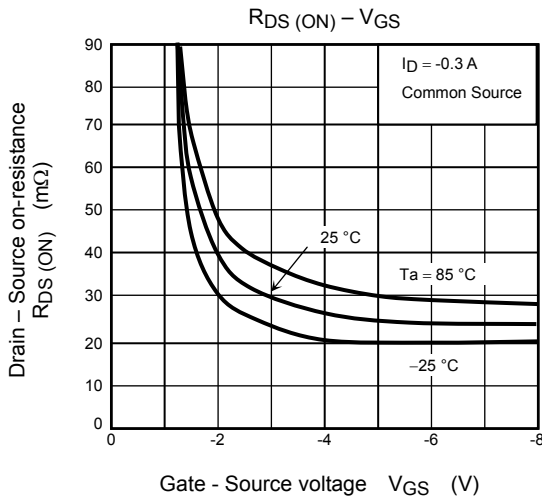
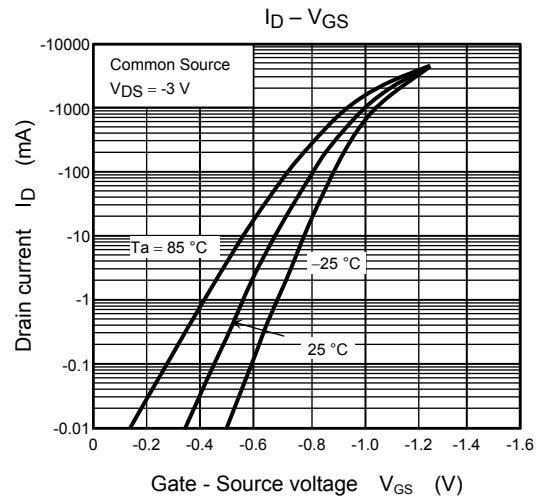
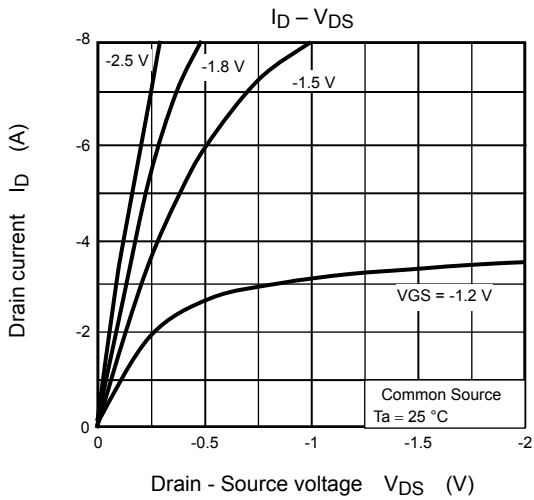
## Precaution

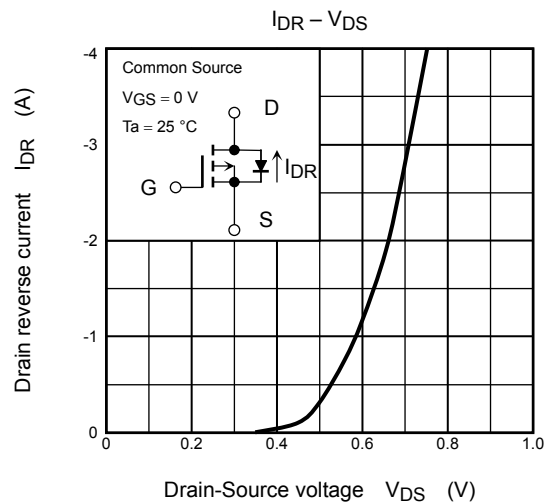
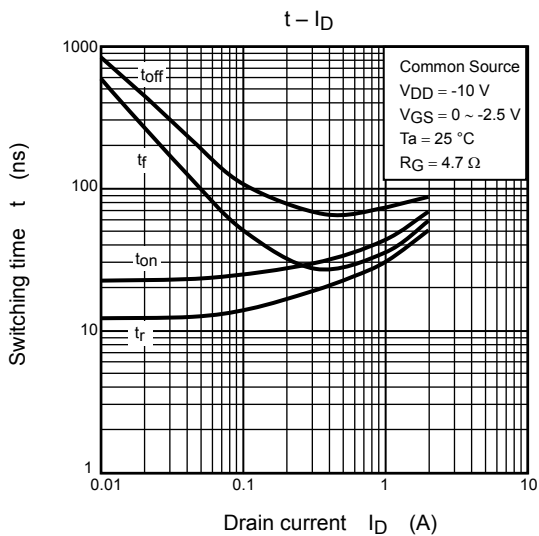
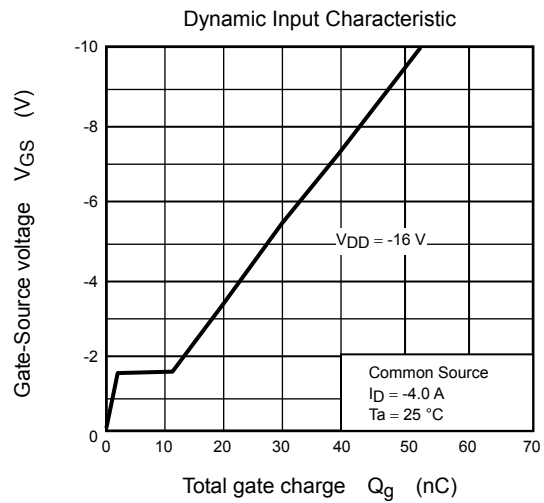
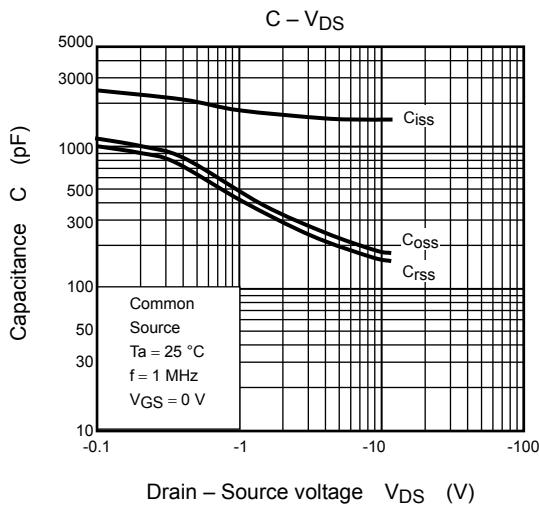
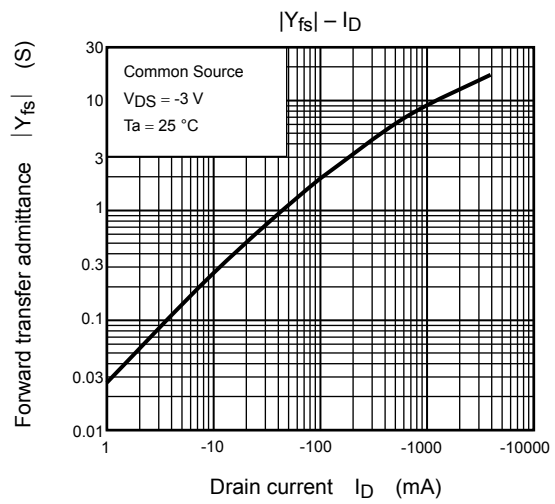
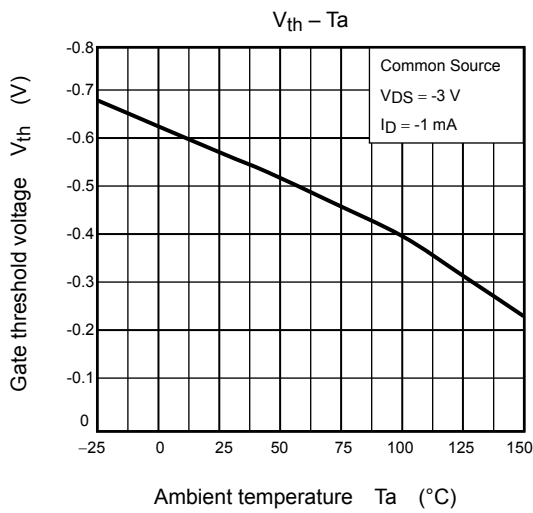
$V_{th}$  can be expressed as the voltage between the gate and source when the low operating current value is  $I_D = -1\text{ mA}$  for this product. For normal switching operation,  $V_{GS(on)}$  requires a higher voltage than  $V_{th}$  and  $V_{GS(off)}$  requires a lower voltage than  $V_{th}$ .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

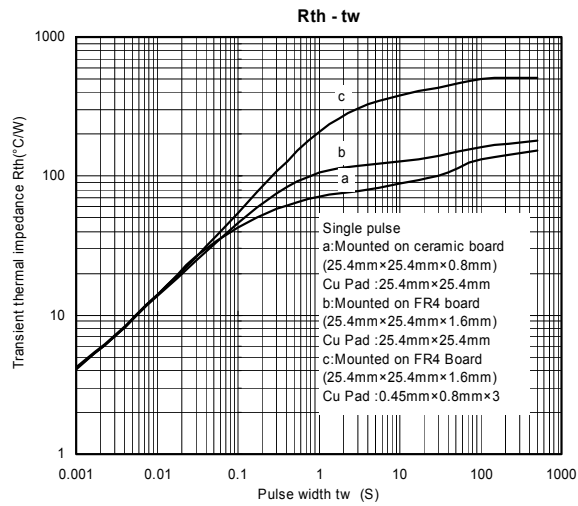
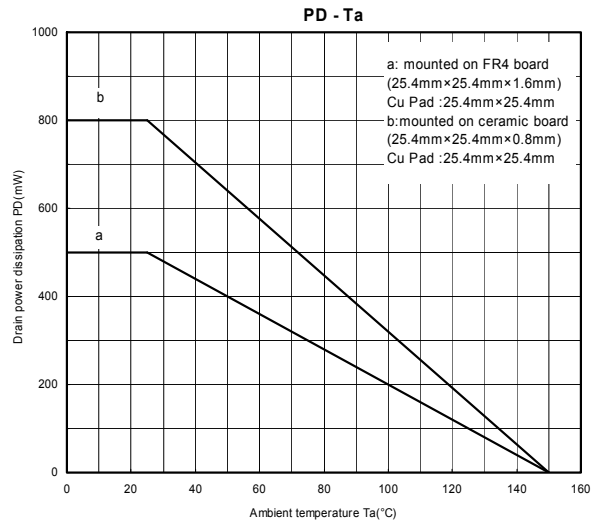
Be sure to take this into consideration when using the device.

## Handling Precaution

When handling individual devices (which are not yet mounted on a circuit board), ensure that the environment is protected against static 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.







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20070701-EN GENERAL

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