

TOSHIBA Field Effect Transistor Silicon P Channel MOS Type

# SSM3J114TU

- High-Speed Switching Applications
- Power Management Switch Applications

- 1.5 V drive
- Low on-resistance

$R_{on} = 526 \text{ m}\Omega$  (max) (@  $V_{GS} = -1.5 \text{ V}$ )  
 $R_{on} = 321 \text{ m}\Omega$  (max) (@  $V_{GS} = -1.8 \text{ V}$ )  
 $R_{on} = 199 \text{ m}\Omega$  (max) (@  $V_{GS} = -2.5 \text{ V}$ )  
 $R_{on} = 149 \text{ m}\Omega$  (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	$I_D$	-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	$T_{stg}$	-55 to 150	°C

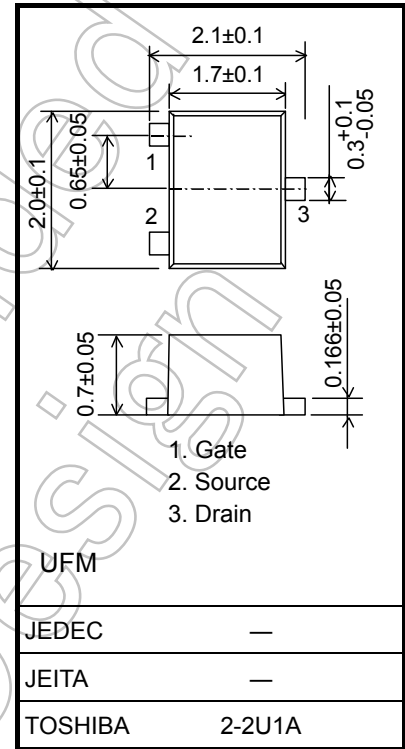
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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 t, Cu Pad: 645 mm<sup>2</sup>)

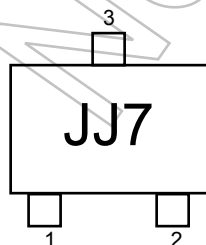
Note 2: Mounted on FR4 board  
(25.4 mm × 25.4 mm × 1.6 t, Cu Pad: 645 mm<sup>2</sup>)

Unit: mm

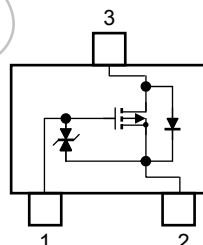


Weight: 6.6 mg (typ.)

### Marking



### Equivalent Circuit (top view)



Start of commercial production  
2005-10

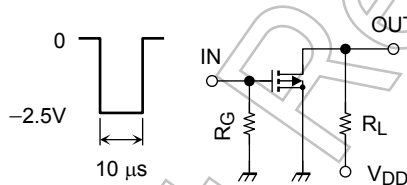
## Electrical Characteristics (Ta = 25°C)

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	$\mu\text{A}$	
Gate leakage current	$I_{GSS}$	$V_{GS} = \pm 8 \text{ V}, V_{DS} = 0$	—	—	$\pm 1$	$\mu\text{A}$	
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} $	$V_{DS} = -3 \text{ V}, I_D = -0.6 \text{ A}$ (Note 3)	1.9	3.9	—	S	
Drain-Source ON-resistance	$R_{DS(ON)}$	$I_D = -0.6 \text{ A}, V_{GS} = -4.0 \text{ V}$ (Note 3)	—	100	149	m $\Omega$	
		$I_D = -0.6 \text{ A}, V_{GS} = -2.5 \text{ V}$ (Note 3)	—	133	199		
		$I_D = -0.6 \text{ A}, V_{GS} = -1.8 \text{ V}$ (Note 3)	—	183	321		
		$I_D = -0.1 \text{ A}, V_{GS} = -1.5 \text{ V}$ (Note 3)	—	220	526		
Input capacitance	$C_{iss}$	$V_{DS} = -10 \text{ V}, V_{GS} = 0$	—	331	—	pF	
Output capacitance	$C_{oss}$	$f = 1 \text{ MHz}$	—	48	—	pF	
Reverse transfer capacitance	$C_{rss}$		—	39	—	pF	
Switching time	Turn-on time	$t_{on}$	$V_{DD} = -10 \text{ V}, I_D = -0.6 \text{ A}$	—	19	—	ns
	Turn-off time	$t_{off}$	$V_{GS} = 0 \text{ to } -2.5 \text{ V}, R_G = 4.7 \text{ }\Omega$	—	18	—	
Total gate charge	$Q_g$		—	7.7	—	nC	
Gate-Source charge	$Q_{gs}$	$V_{DS} = -16 \text{ V}, I_{DS} = -1.2 \text{ A},$ $V_{GS} = -4 \text{ V}$	—	4.9	—		
Gate-Drain charge	$Q_{gd}$		—	2.8	—		
Drain-Source forward voltage	$V_{DSF}$	$I_D = 1.8 \text{ A}, V_{GS} = 0$ (Note 3)	—	0.8	1.2	V	

Note 3: Pulse test

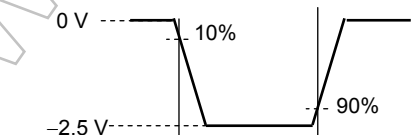
## Switching Time Test Circuit

### (a) Test Circuit

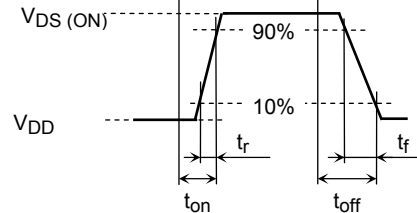


$V_{DD} = -10 \text{ V}$   
 $R_G = 4.7 \text{ }\Omega$   
 Duty  $\leq 1\%$   
 $V_{IN}$ :  $t_r, t_f \leq 5 \text{ ns}$   
 Common Source  
 $T_a = 25 \text{ }^\circ\text{C}$

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



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



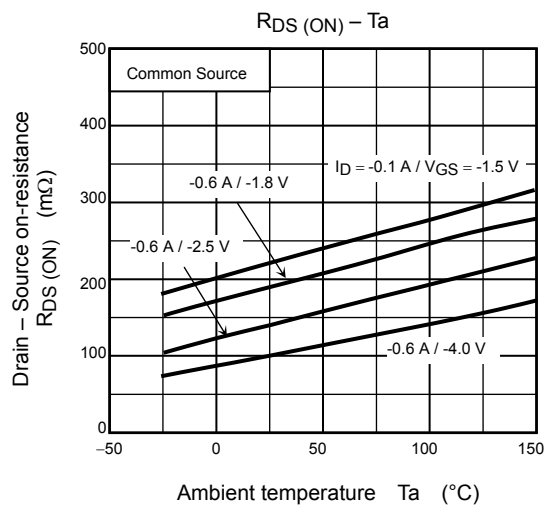
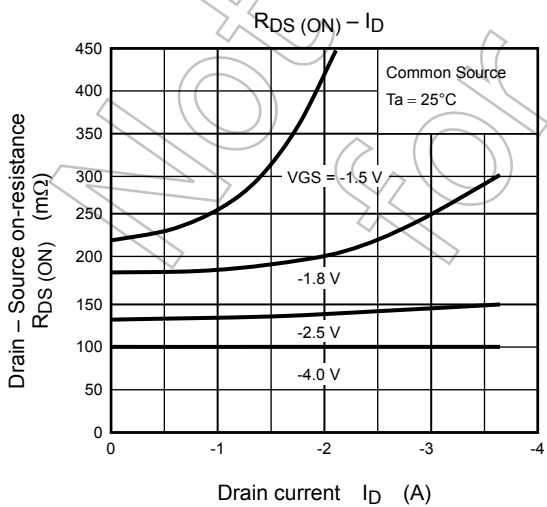
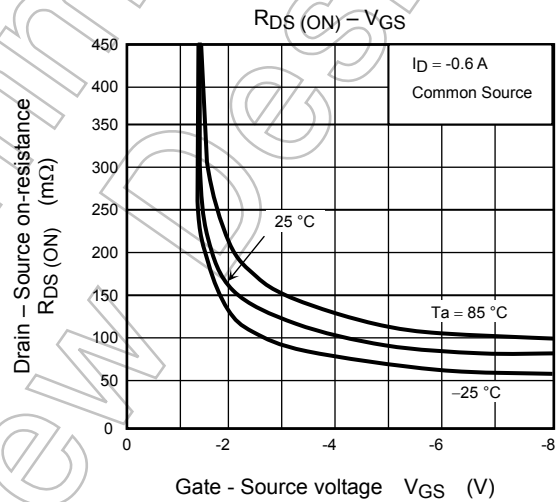
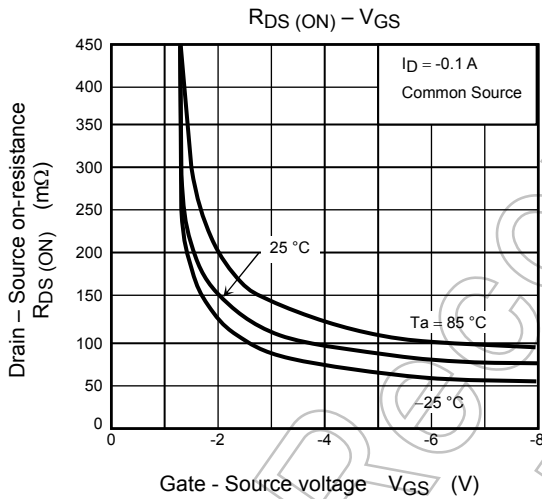
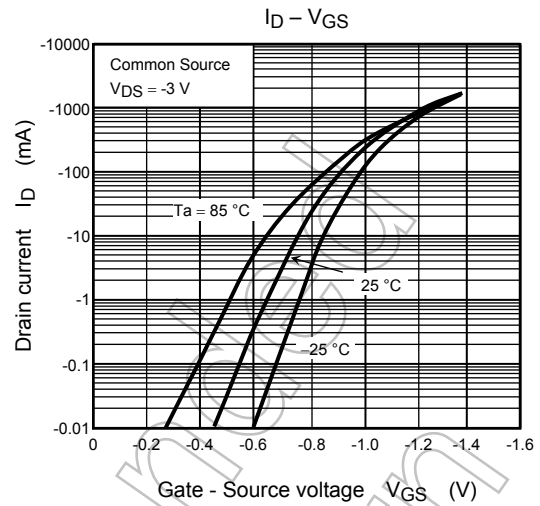
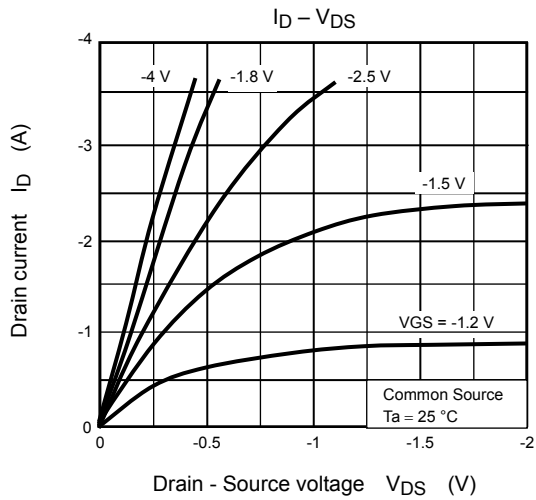
## Precaution

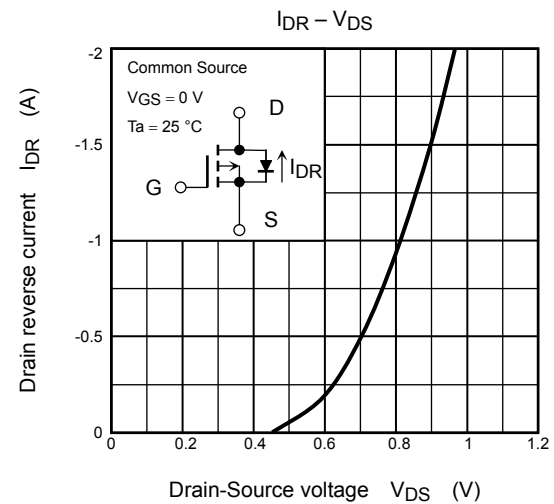
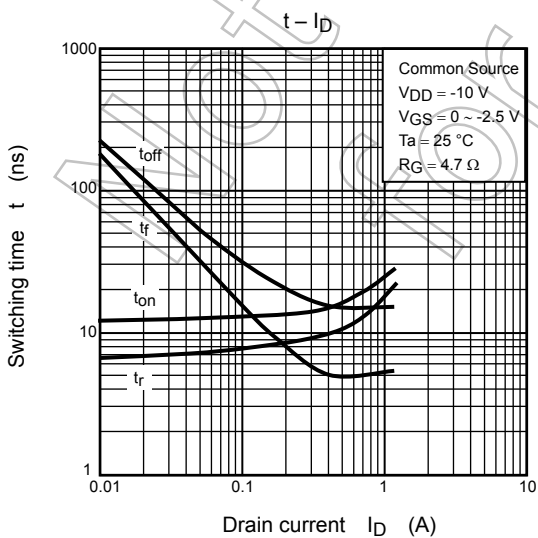
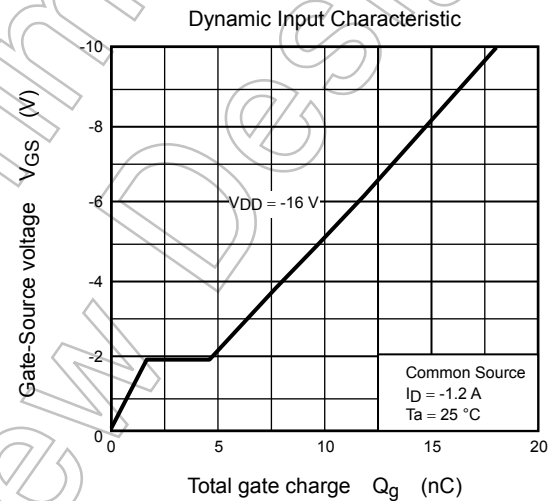
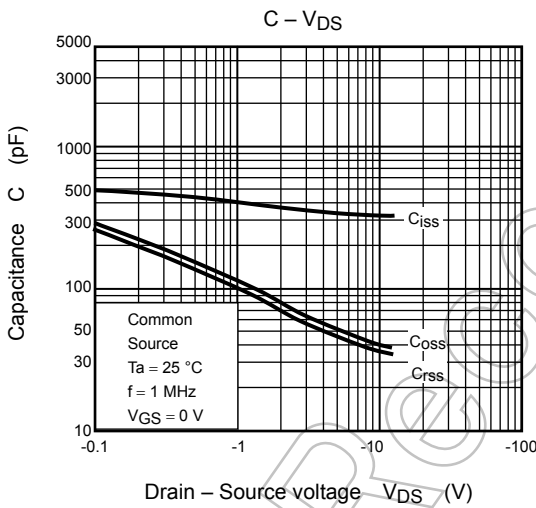
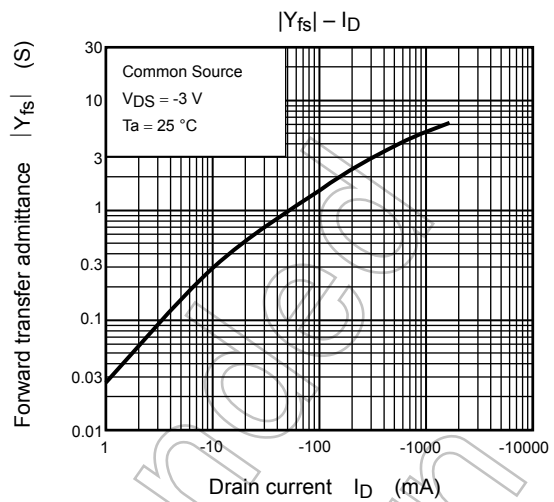
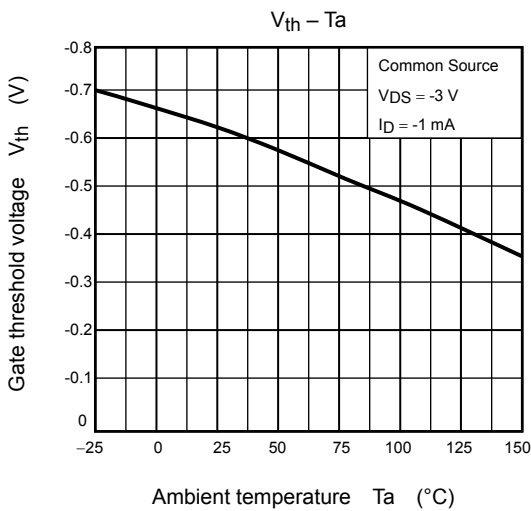
$V_{th}$  can be expressed as the voltage between the gate and source when the low operating current value is  $I_D = -1 \text{ mA}$  for this product. For normal switching operation,  $V_{GS(ON)}$  requires a higher voltage than  $V_{th}$  and  $V_{GS(OFF)}$  requires a lower voltage than  $V_{th}$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

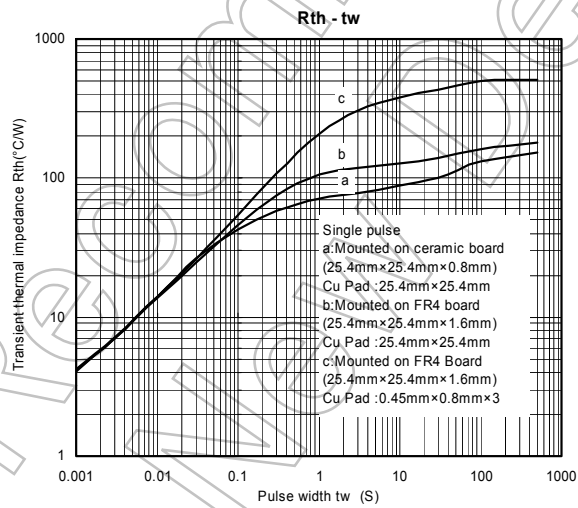
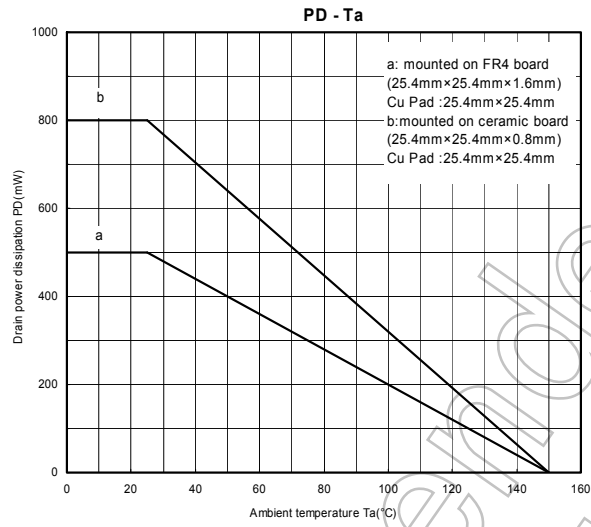
Be sure to take this into consideration when using the device.

## 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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