

TOSHIBA Field-Effect Transistor Silicon P-Channel MOS Type

## SSM3J117TU

## High-Speed Switching Applications

- 4 V drive
- Low ON-resistance:  $R_{on} = 225 \text{ m}\Omega$  (max) (@ $V_{GS} = -4 \text{ V}$ )  
 $R_{on} = 117 \text{ m}\Omega$  (max) (@ $V_{GS} = -10 \text{ V}$ )
- Lead(Pb)-free

## Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Drain-source voltage	$V_{DS}$	-30	V
Gate-source voltage	$V_{GSS}$	$\pm 20$	V
Drain current	DC	$I_D$	A
	Pulse	$I_{DP}$	
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

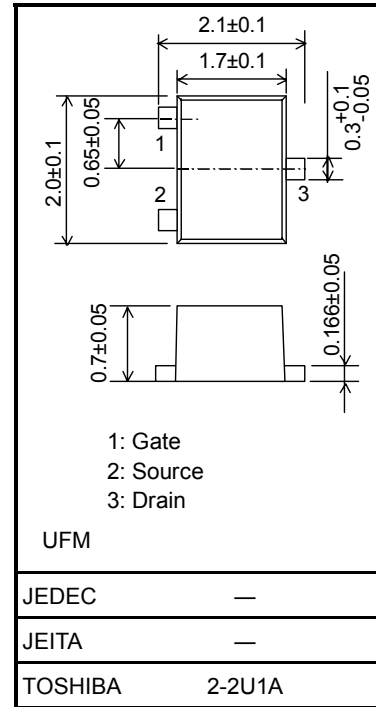
Note 1: Mounted on a ceramic board.

(25.4 mm × 25.4 mm × 0.8 t, Cu Pad: 645 mm<sup>2</sup>)

Note 2: Mounted on an FR4 board.

(25.4 mm × 25.4 mm × 1.6 t, Cu Pad: 645 mm<sup>2</sup>)

Unit: mm



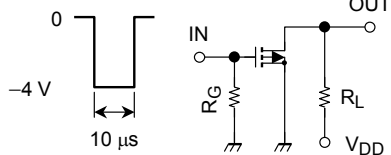
## Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Drain-source breakdown voltage	$V_{(BR)DSS}$	$I_D = -1 \text{ mA}$ , $V_{GS} = 0$	-30	—	—	V
	$V_{(BR)DSX}$	$I_D = -1 \text{ mA}$ , $V_{GS} = +20 \text{ V}$	-15	—	—	
Drain cutoff current	$I_{DSS}$	$V_{DS} = -30 \text{ V}$ , $V_{GS} = 0$	—	—	-1	μA
Gate leakage current	$I_{GSS}$	$V_{GS} = \pm 16 \text{ V}$ , $V_{DS} = 0$	—	—	±1	μA
Gate threshold voltage	$V_{th}$	$V_{DS} = -5 \text{ V}$ , $I_D = -1 \text{ mA}$	-1.2	—	-2.6	V
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = -5 \text{ V}$ , $I_D = -1 \text{ A}$ (Note 3)	1.6	3.1	—	S
Drain-source ON-resistance	$R_{DS(ON)}$	$I_D = -1 \text{ A}$ , $V_{GS} = -10 \text{ V}$ (Note 3)	—	80	117	mΩ
		$I_D = -0.5 \text{ A}$ , $V_{GS} = -4 \text{ V}$ (Note 3)	—	160	225	
Input capacitance	$C_{iss}$	$V_{DS} = -15 \text{ V}$ , $V_{GS} = 0$ , $f = 1 \text{ MHz}$	—	280	—	pF
Output capacitance	$C_{oss}$	$V_{DS} = -15 \text{ V}$ , $V_{GS} = 0$ , $f = 1 \text{ MHz}$	—	80	—	pF
Reverse transfer capacitance	$C_{rss}$	$V_{DS} = -15 \text{ V}$ , $V_{GS} = 0$ , $f = 1 \text{ MHz}$	—	45	—	pF
Switching time	Turn-on time	$V_{DD} = -15 \text{ V}$ , $I_D = -1 \text{ A}$ , $V_{GS} = 0$ to $-4 \text{ V}$ , $R_G = 10 \Omega$	—	16	—	ns
	Turn-off time		—	35	—	
Drain-source forward voltage	$V_{DSF}$	$I_D = 2 \text{ A}$ , $V_{GS} = 0 \text{ V}$ (Note 3)	—	0.8	1.2	V

Note 3: Pulse test

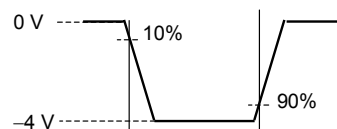
## Switching Time Test Circuit

### (a) Test circuit

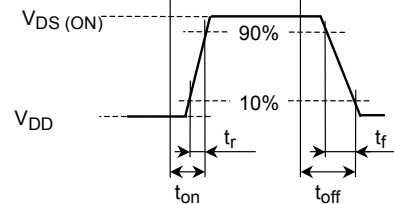


$V_{DD} = -15 \text{ V}$   
 $R_G = 10 \text{ } \Omega$   
 $D.U. \leq 1\%$   
 $V_{IN}: t_r, t_f < 5 \text{ ns}$   
 Common Source  
 $T_a = 25^\circ\text{C}$

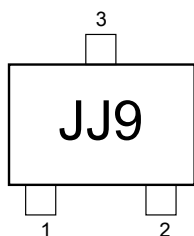
### (b) $V_{IN}$



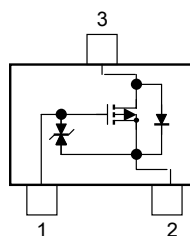
### (c) $V_{OUT}$



## Marking



## Equivalent Circuit (top view)



## Precaution

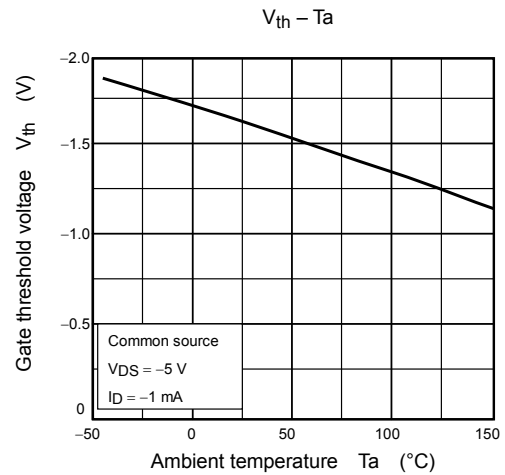
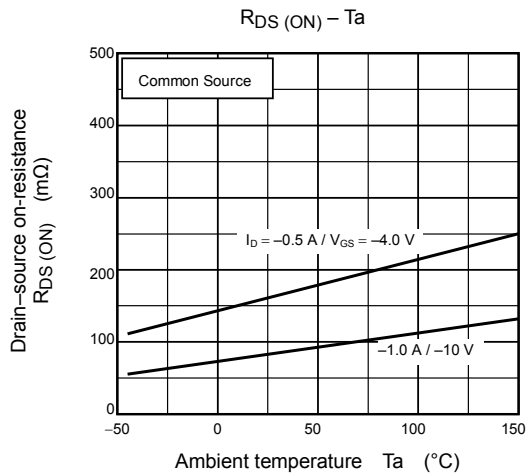
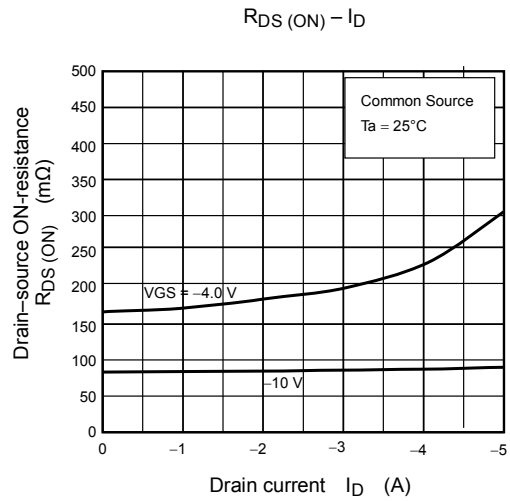
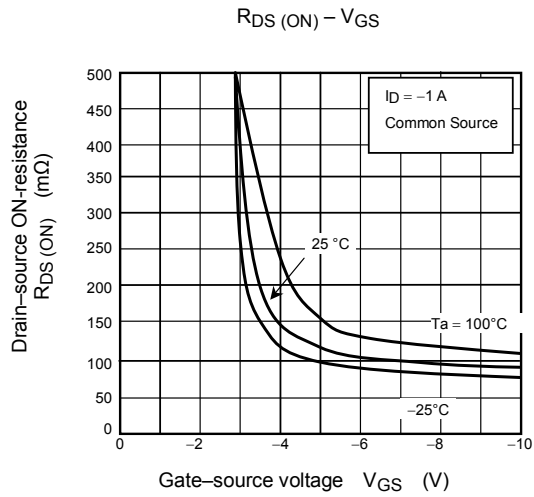
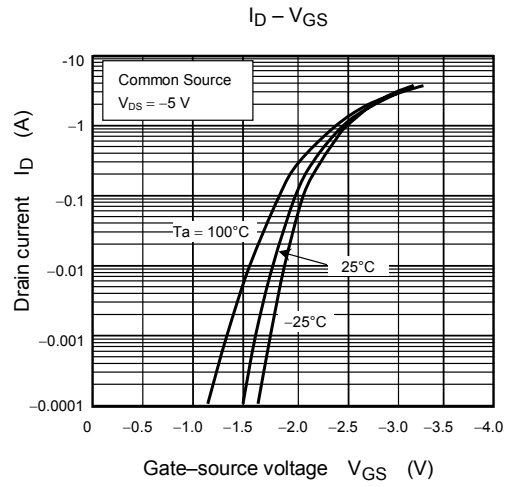
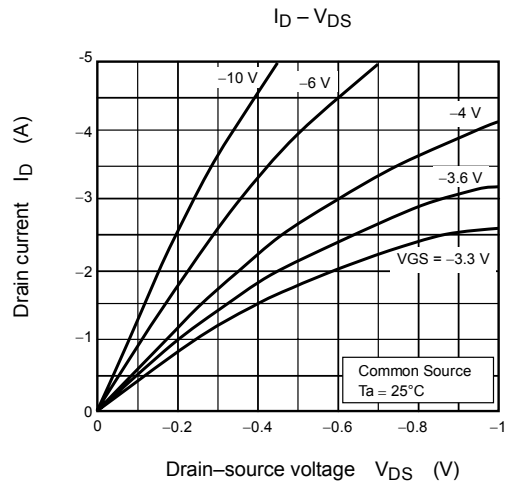
$V_{th}$  can be expressed as the voltage between gate and source when the low operating current value is  $I_D = -1 \text{ mA}$  for this product. For normal switching operation,  $V_{GS(ON)}$  requires a higher voltage than  $V_{th}$  and  $V_{GS(OFF)}$  requires a lower voltage than  $V_{th}$ .

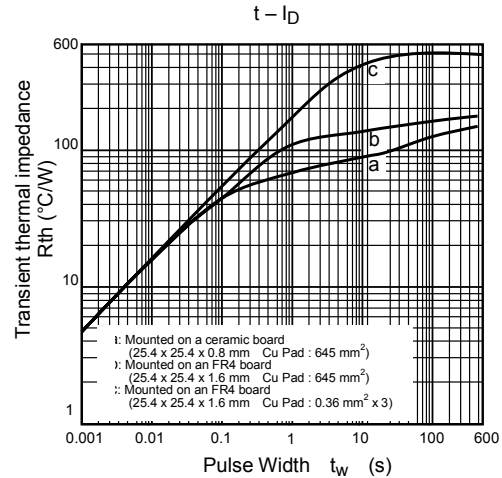
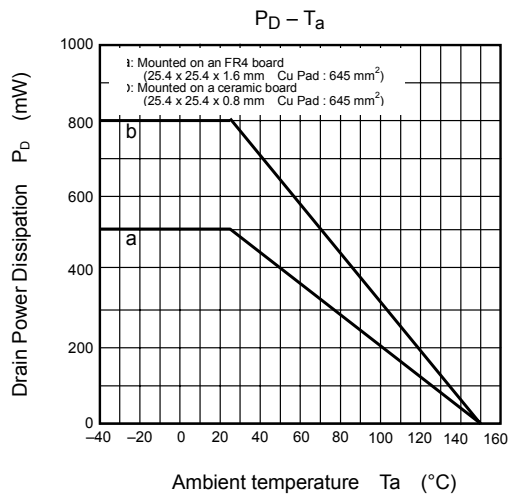
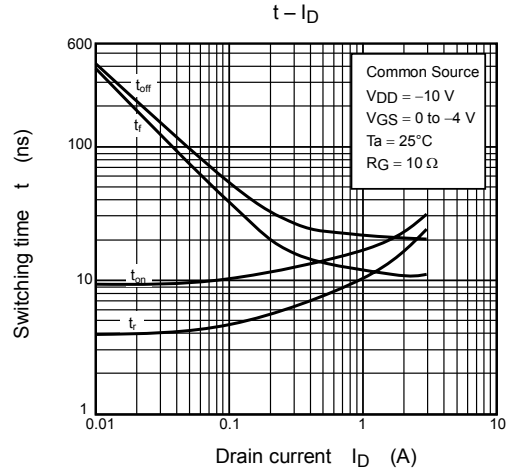
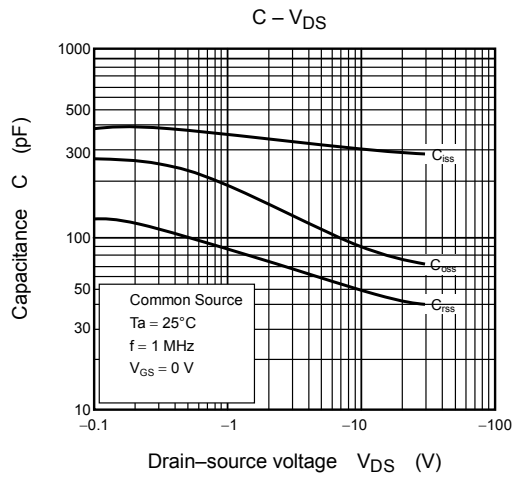
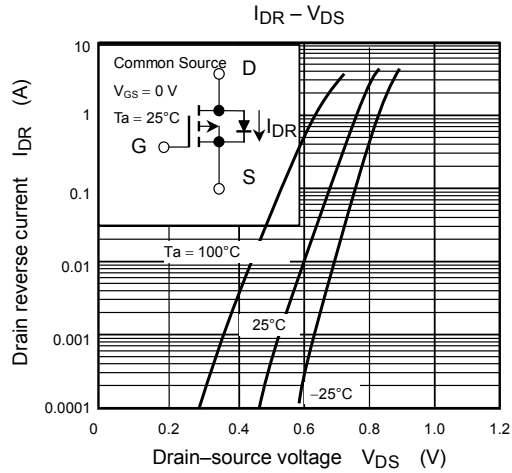
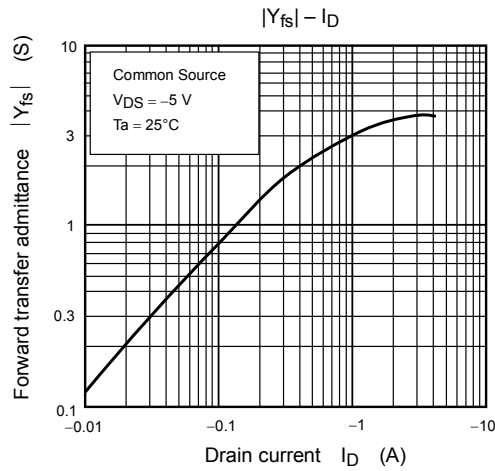
(The relationship can be established as follows:  $V_{GS(OFF)} < V_{th} < V_{GS(ON)}$ .)

Take this into consideration when using the device. The  $V_{GS}$  recommended voltage for turning on this product is  $-4 \text{ V}$  or higher.

## Handling Precaution

When handling individual devices that are not yet mounted on a circuit board, make sure that the environment is protected against electrostatic discharge. Operators should wear antistatic clothing, and containers and other objects that come into direct contact with devices should be made of antistatic materials.





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