

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type

SSM3K116TU

High Speed Switching Applications

- 2.5V drive
- Low on-resistance: $R_{ON} = 135\text{m}\Omega$ (max) (@ $V_{GS} = 2.5\text{ V}$)
 $R_{ON} = 100\text{m}\Omega$ (max) (@ $V_{GS} = 4.5\text{ V}$)

Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

Characteristic		Symbol	Rating	Unit
Drain-Source voltage		V_{DS}	30	V
Gate-Source voltage		V_{GSS}	± 12	V
Drain current	DC	I_D	2.2	A
	Pulse	I_{DP}	4.4	
Drain power dissipation		P_D (Note 1)	800	mW
		P_D (Note 2)	500	
Channel temperature		T_{ch}	150	$^\circ\text{C}$
Storage temperature range		T_{stg}	-55 to 150	$^\circ\text{C}$

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).

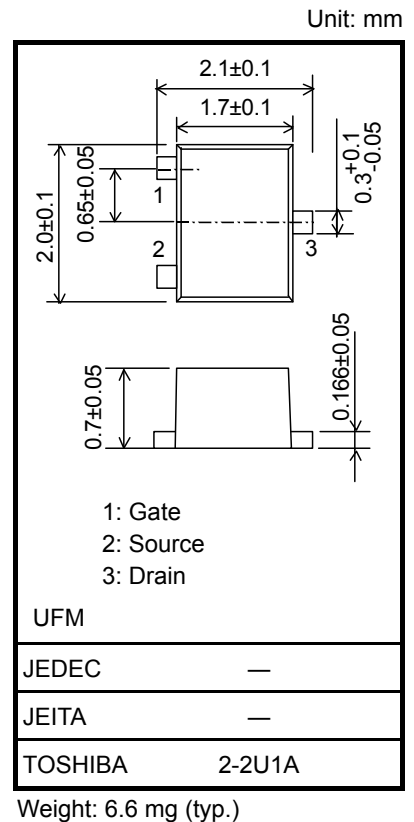
Note 1: Mounted on ceramic board.
 (25.4 mm $\times$ 25.4 mm $\times$ 0.8 mm, Cu Pad: 645 mm²)

Note 2: Mounted on FR4 board.
 (25.4 mm $\times$ 25.4 mm $\times$ 1.6 mm, Cu Pad: 645 mm²)

Electrical Characteristics ($T_a = 25^\circ\text{C}$)

Characteristic		Symbol	Test Conditions	Min	Typ.	Max	Unit
Drain-Source breakdown voltage		$V_{(BR)DSS}$	$I_D = 1\text{ mA}$, $V_{GS} = 0$	30	—	—	V
		$V_{(BR)DSX}$	$I_D = 1\text{ mA}$, $V_{GS} = -12\text{ V}$	18	—	—	
Drain cut-off current		I_{DSS}	$V_{DS} = 30\text{ V}$, $V_{GS} = 0$	—	—	1	μA
Gate leakage current		I_{GSS}	$V_{GS} = \pm 12\text{ V}$, $V_{DS} = 0$	—	—	± 1	μA
Gate threshold voltage		V_{th}	$V_{DS} = 3\text{ V}$, $I_D = 0.1\text{ mA}$	0.5	—	1.1	V
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 3\text{ V}$, $I_D = 0.25\text{ A}$ (Note3)	1	2	—	S
Drain-Source on-resistance		$R_{DS(ON)}$	$I_D = 0.5\text{ A}$, $V_{GS} = 4.5\text{ V}$ (Note3)	—	75	100	m Ω
			$I_D = 0.25\text{ A}$, $V_{GS} = 2.5\text{ V}$ (Note3)	—	95	135	
Input capacitance		C_{iss}	$V_{DS} = 10\text{ V}$, $V_{GS} = 0$, $f = 1\text{ MHz}$	—	245	—	pF
Output capacitance		C_{oss}	$V_{DS} = 10\text{ V}$, $V_{GS} = 0$, $f = 1\text{ MHz}$	—	41	—	pF
Reverse transfer capacitance		C_{rss}	$V_{DS} = 10\text{ V}$, $V_{GS} = 0$, $f = 1\text{ MHz}$	—	33	—	pF
Switching time	Turn-on time	t_{on}	$V_{DD} = 10\text{ V}$, $I_D = 0.25\text{ A}$, $V_{GS} = 0$ to 2.5 V , $R_G = 4.7\text{ }\Omega$	—	9	—	ns
	Turn-off time	t_{off}		—	15	—	
Drain-Source forward voltage		V_{DSF}	$I_D = -2.2\text{ A}$, $V_{GS} = 0\text{ V}$ (Note3)	—	-0.83	-1.2	V

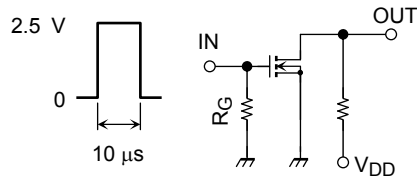
Note3: Pulse test



Start of commercial production
2005-06

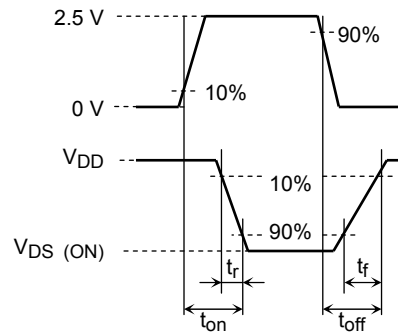
Switching Time Test Circuit

(a) Test Circuit



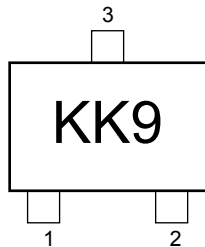
$V_{DD} = 10\text{ V}$
 $R_G = 4.7\ \Omega$
 Duty $\leq 1\%$
 V_{IN} : $t_r, t_f < 5\text{ ns}$
 Common Source
 $T_a = 25^\circ\text{C}$

(b) V_{IN}

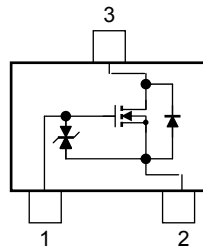


(c) V_{OUT}

Marking



Equivalent Circuit (top view)



Precaution

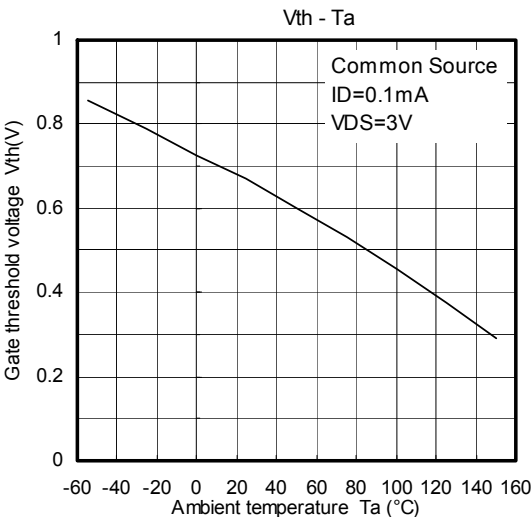
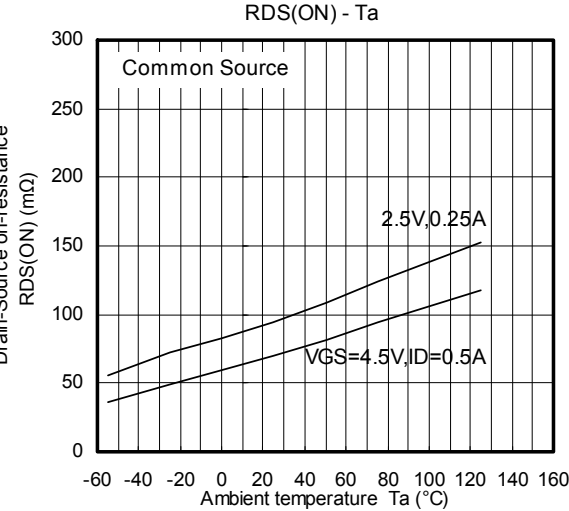
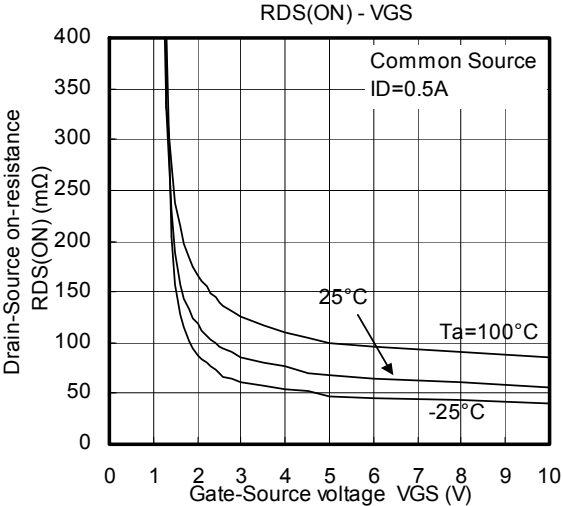
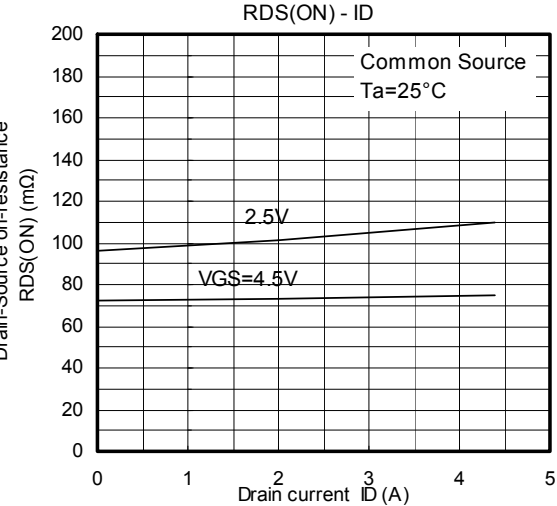
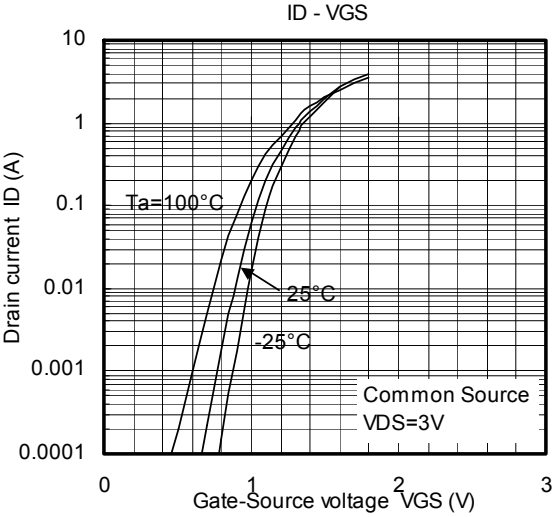
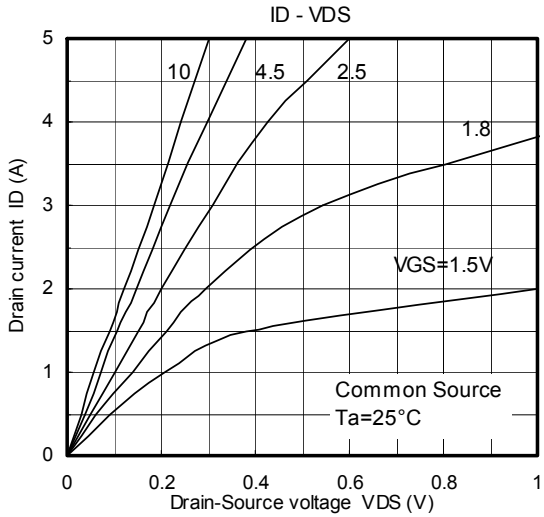
V_{th} can be expressed as the voltage between gate and source when the low operating current value is $I_D=0.1\text{mA}$ for this product. For normal switching operation, $V_{GS (on)}$ requires a higher voltage than V_{th} , and $V_{GS (off)}$ requires a lower voltage than V_{th} .

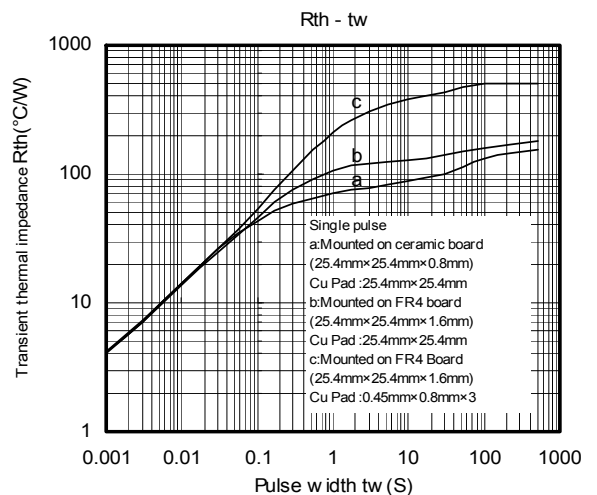
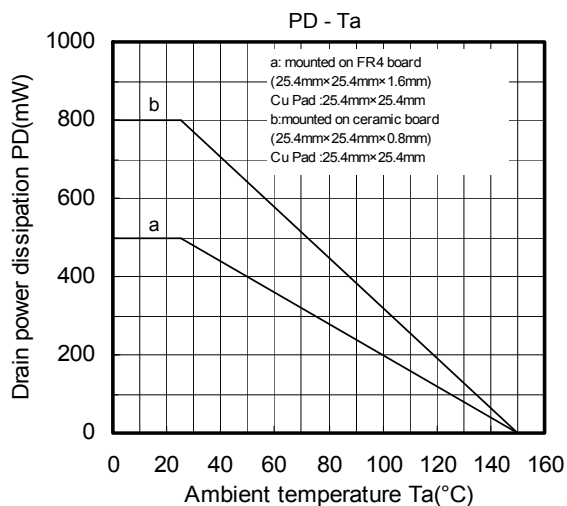
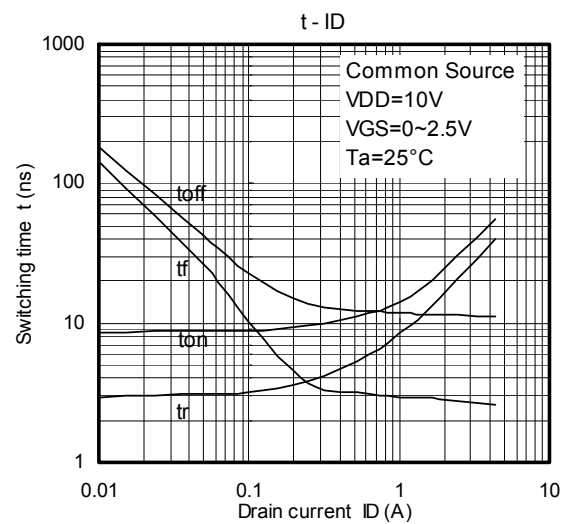
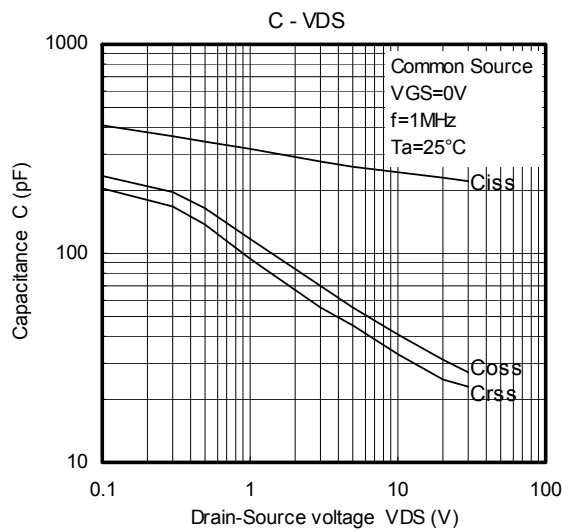
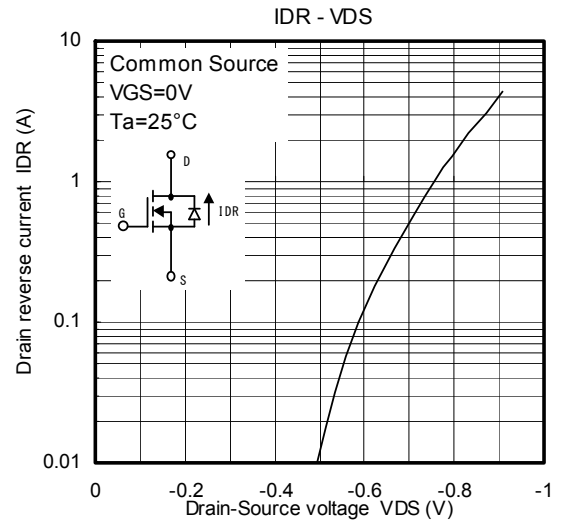
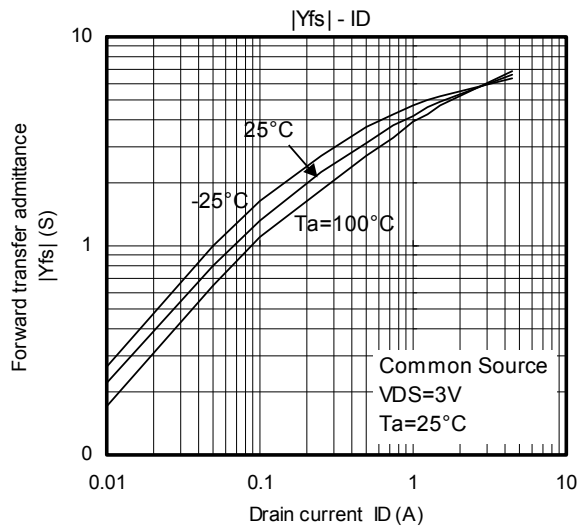
(The relationship can be established as follows: $V_{GS (off)} < V_{th} < V_{GS (on)}$)

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.





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