

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type

SSM3K102TU

High Speed Switching Applications

- 1.8V drive
- Low on-resistance: $R_{on} = 154\text{m}\Omega$ (max) (@ $V_{GS} = 1.8\text{ V}$)
 $R_{on} = 99\text{m}\Omega$ (max) (@ $V_{GS} = 2.5\text{ V}$)
 $R_{on} = 71\text{m}\Omega$ (max) (@ $V_{GS} = 4.0\text{ V}$)

Unit: mm

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

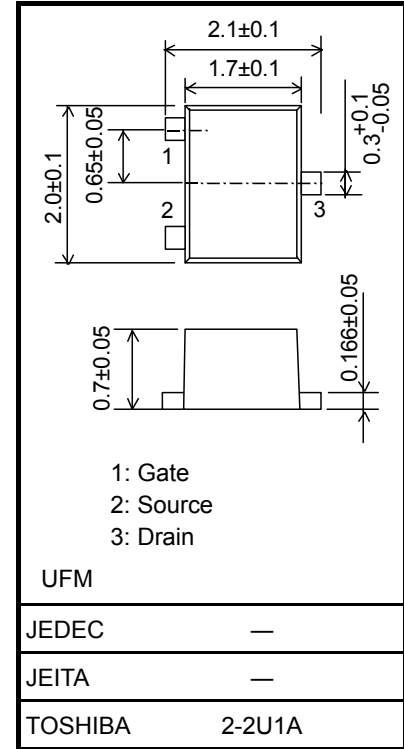
Characteristic	Symbol	Rating	Unit
Drain-Source voltage	V_{DS}	20	V
Gate-Source voltage	V_{GSS}	± 12	V
Drain current	DC	I_D	A
	Pulse	I_{DP}	
Drain power dissipation	P_D (Note 1)	800	mW
	P_D (Note 2)	500	
Channel temperature	T_{ch}	150	$^\circ\text{C}$
Storage temperature range	T_{stg}	$-55\sim 150$	$^\circ\text{C}$

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.
 $(25.4\text{ mm} \times 25.4\text{ mm} \times 0.8\text{ mm, Cu Pad: } 645\text{ mm}^2)$

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



Weight: 6.6 mg (typ.)

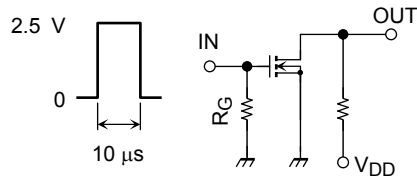
Electrical Characteristics ($T_a = 25^\circ\text{C}$)

Characteristic	Symbol	Test Conditions	Min	Typ.	Max	Unit
Drain-Source breakdown voltage	$V_{(BR)DSS}$	$I_D = 1\text{ mA, } V_{GS} = 0$	20	—	—	V
	$V_{(BR)DSX}$	$I_D = 1\text{ mA, } V_{GS} = -12\text{ V}$	10	—	—	
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}	$V_{DS} = 3\text{ V, } I_D = 1\text{ mA}$	0.4	—	1.0	V
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 3\text{ V, } I_D = 1.0\text{ A}$ (Note3)	3.6	6	—	S
Drain-Source on-resistance	$R_{DS(ON)}$	$I_D = 1.0\text{ A, } V_{GS} = 4.0\text{ V}$ (Note3)	—	63	71	$\text{m}\Omega$
		$I_D = 0.5\text{ A, } V_{GS} = 2.5\text{ V}$ (Note3)	—	80	99	
		$I_D = 0.2\text{ A, } V_{GS} = 1.8\text{ V}$ (Note3)	—	115	154	
Input capacitance	C_{iss}	$V_{DS} = 10\text{ V, } V_{GS} = 0, f = 1\text{ MHz}$	—	268	—	pF
Output capacitance	C_{oss}	$V_{DS} = 10\text{ V, } V_{GS} = 0, f = 1\text{ MHz}$	—	44	—	pF
Reverse transfer capacitance	C_{rss}	$V_{DS} = 10\text{ V, } V_{GS} = 0, f = 1\text{ MHz}$	—	34	—	pF
Switching time	Turn-on time	$V_{DD} = 10\text{ V, } I_D = 0.25\text{ A, } V_{GS} = 0\sim 2.5\text{ V, } R_G = 4.7\text{ }\Omega$	—	9	—	ns
	Turn-off time		—	16	—	
Drain-Source forward voltage	V_{DSF}	$I_D = -2.6\text{ A, } V_{GS} = 0\text{ V}$ (Note3)	—	-0.85	-1.2	V

Note3: Pulse test

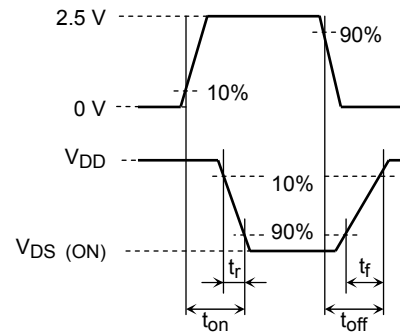
Switching Time Test Circuit

(a) Test Circuit

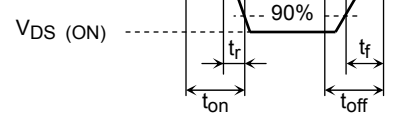


$V_{DD} = 10\text{ V}$
 $R_G = 4.7\ \Omega$
 $D.U. \leq 1\%$
 $V_{IN}: t_r, t_f < 5\text{ ns}$
 Common Source
 $T_a = 25^\circ\text{C}$

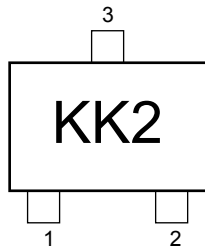
(b) V_{IN}



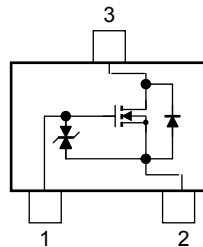
(c) V_{OUT}



Marking



Equivalent Circuit (top view)



Precaution

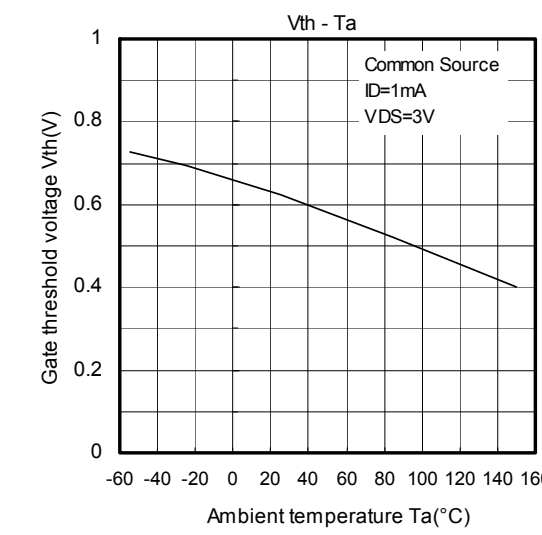
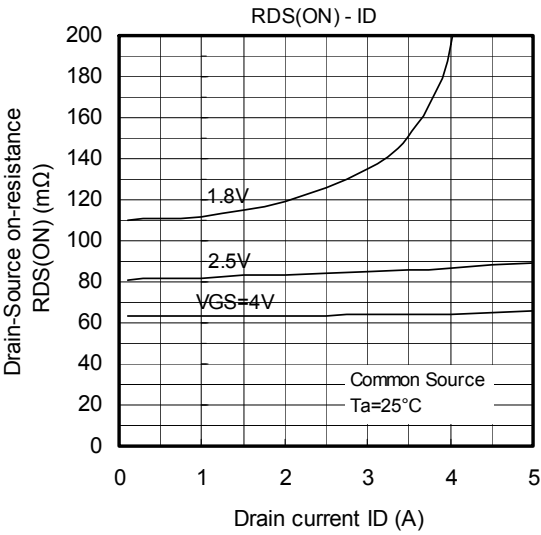
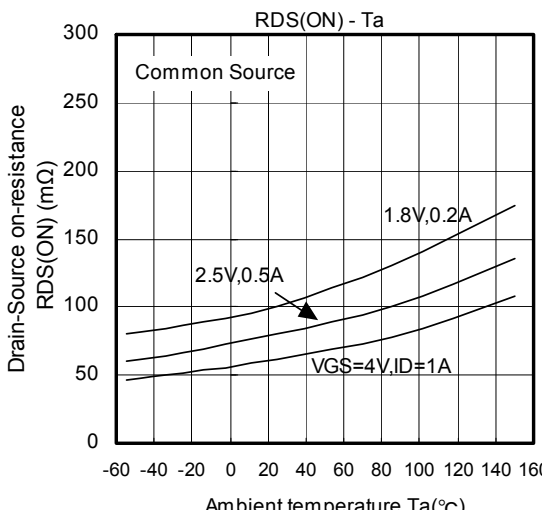
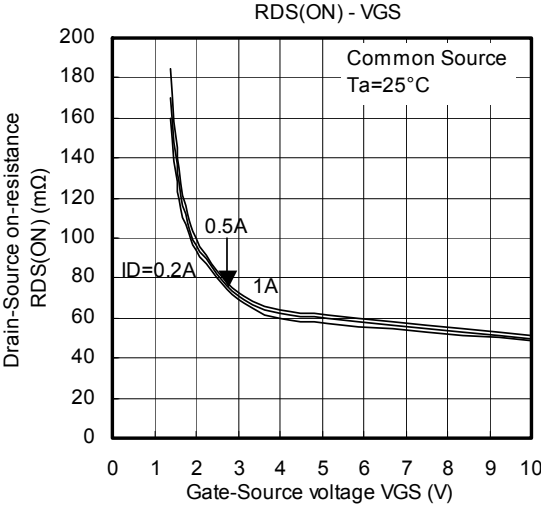
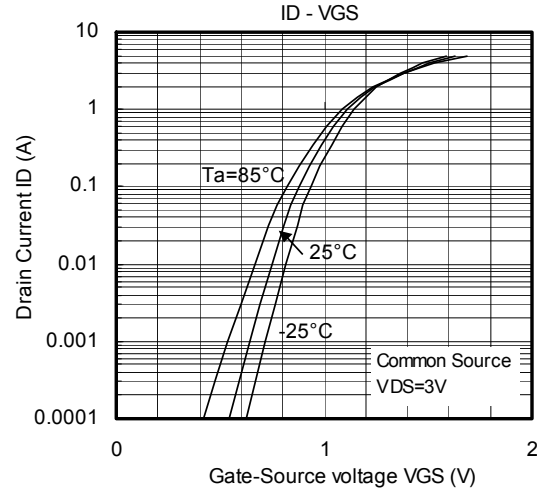
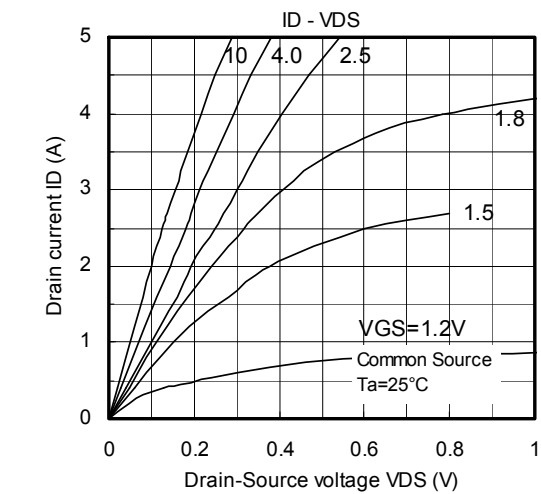
V_{th} can be expressed as the voltage between gate and source when the low operating current value is $I_D=1\text{mA}$ for this product. For normal switching operation, $V_{GS (on)}$ requires a higher voltage than V_{th} , and $V_{GS (off)}$ requires a lower voltage than V_{th} .

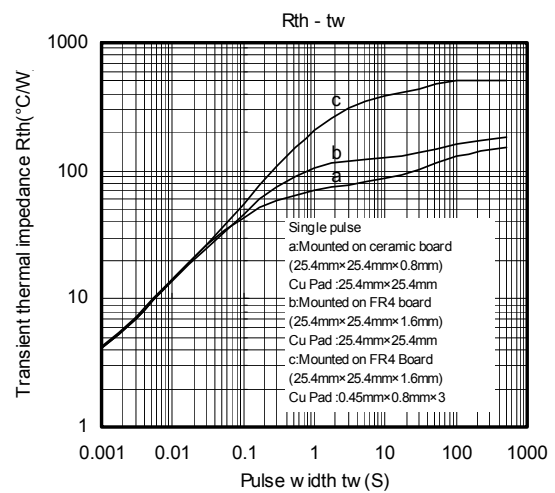
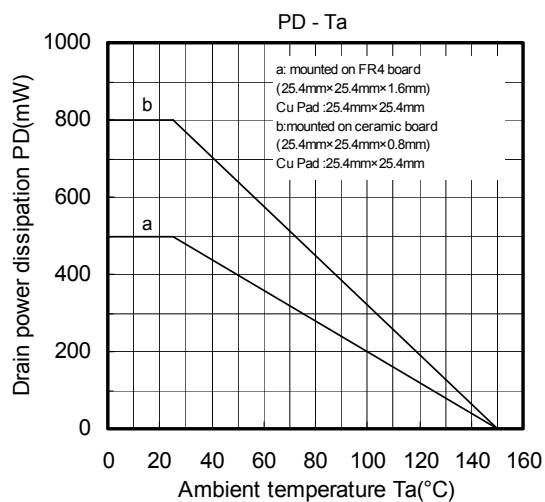
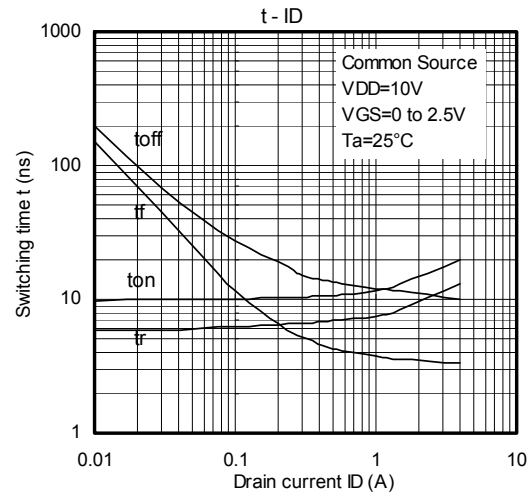
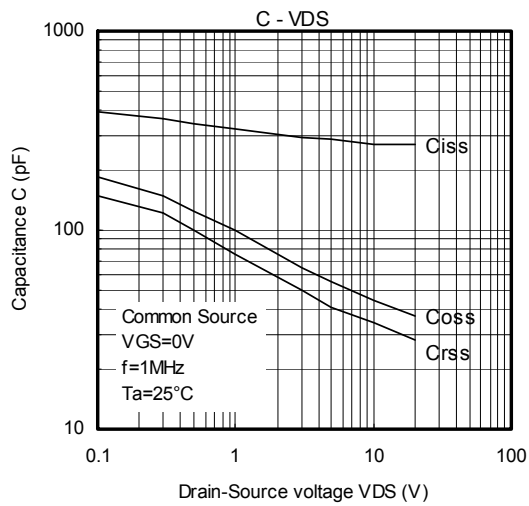
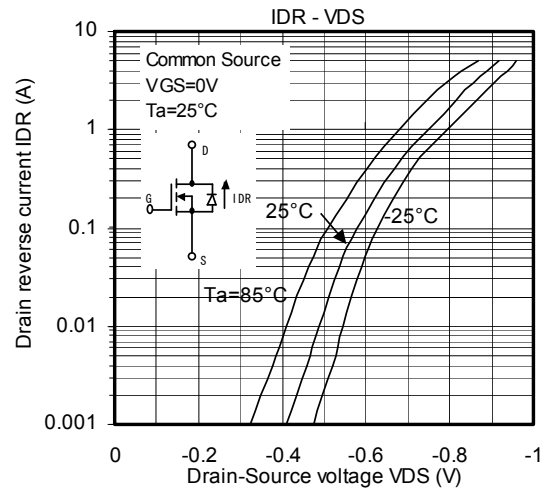
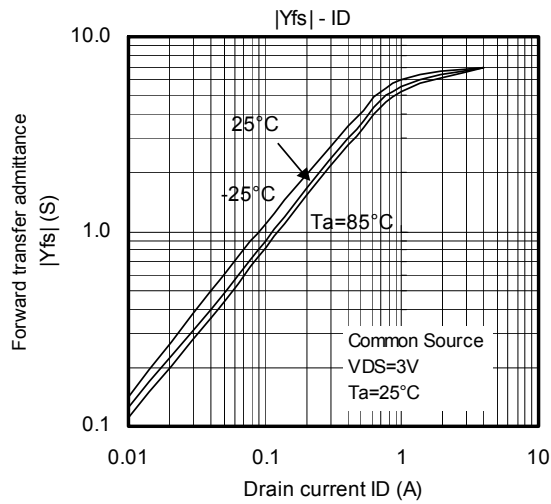
(The relationship can be established as follows: $V_{GS (off)} < V_{th} < V_{GS (on)}$)

Take this into consideration when using the device.

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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