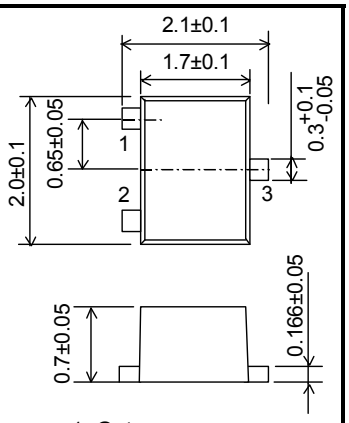
TOSHIBA Field Effect Transistor Silicon N Channel MOS Type

SSM3K105TU

High Speed Switching Applications

- 4V drive
- Low on-resistance: R_{on} = 480mΩ (max) (@V_{GS} = 3.3V)
  R_{on} = 200mΩ (max) (@V_{GS} = 4V)
  R_{on} = 110mΩ (max) (@V_{GS} = 10V)

Unit: mm



1: Gate
2: Source
3: Drain

UFM

JEDEC	—
JEITA	—
TOSHIBA	2-2U1A

Weight: 6.6 mg (typ.)

Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
Drain-Source voltage		V_{DS}	30	V
Gate-Source voltage		V_{GSS}	±20	V
Drain current	DC	I_D	2.1	A
	Pulse	I_{DP}	4.2	
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}	−55~150	°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 mm, Cu Pad: 645 mm^2)

Note 2: Mounted on FR4 board.
(25.4 mm × 25.4 mm × 1.6 mm, Cu Pad: 645 mm^2)

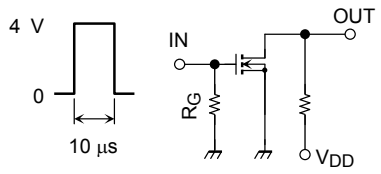
Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Conditions		Min	Typ.	Max	Unit
Drain-Source breakdown voltage		$V_{(BR)\ DSS}$	I_D = 1 mA, V_{GS} = 0		30	—	—	V
Drain cut-off current		I_{DSS}	V_{DS} = 30 V, V_{GS} = 0		—	—	1	μA
Gate leakage current		I_{GSS}	V_{GS} = ±16V, V_{DS} = 0		—	—	±1	μA
Gate threshold voltage		V_{th}	V_{DS} = 5 V, I_D = 0.1 mA		1.1	—	1.8	V
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = 5 V, I_D = 0.75 A	(Note3)	1.0	2.0	—	S
Drain-Source on-resistance		$R_{DS\ (ON)}$	I_D = 0.75 A, V_{GS} = 10 V	(Note3)	—	85	110	mΩ
			I_D = 0.75 A, V_{GS} = 4 V	(Note3)	—	150	200	
			I_D = 0.75 A, V_{GS} = 3.3 V	(Note3)	—	210	480	
Input capacitance		C_{iss}	V_{DS} = 15 V, V_{GS} = 0, f = 1 MHz		—	102	—	pF
Output capacitance		C_{oss}	V_{DS} = 15 V, V_{GS} = 0, f = 1 MHz		—	57	—	pF
Reverse transfer capacitance		C_{rss}	V_{DS} = 15 V, V_{GS} = 0, f = 1 MHz		—	22	—	pF
Switching time	Turn-on time	t_{on}	V_{DD} = 15 V, I_D = 0.75 A, V_{GS} = 0~4 V, R_G = 10 Ω		—	46	—	ns
	Turn-off time	t_{off}			—	65	—	
Drain-Source forward voltage		V_{DSF}	I_D = −2.1A, V_{GS} = 0 V	(Note3)	—	−0.95	−1.3	V

Note3: Pulse test

Switching Time Test Circuit

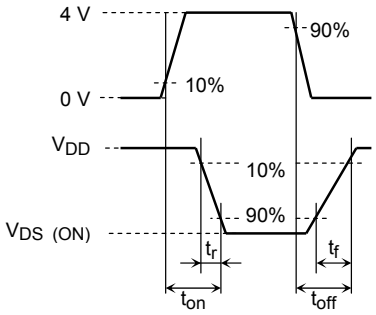
(a) Test Circuit



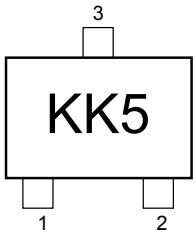
V_{DD} = 15 V
R_G = 10 Ω
D.U. ≦ 1%
V_{IN}: t_r, t_f < 5 ns
Common Source
Ta = 25°C

(b) V_{IN}

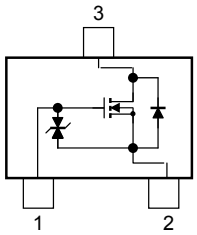
(c) V_{OUT}



Marking



Equivalent Circuit (top view)



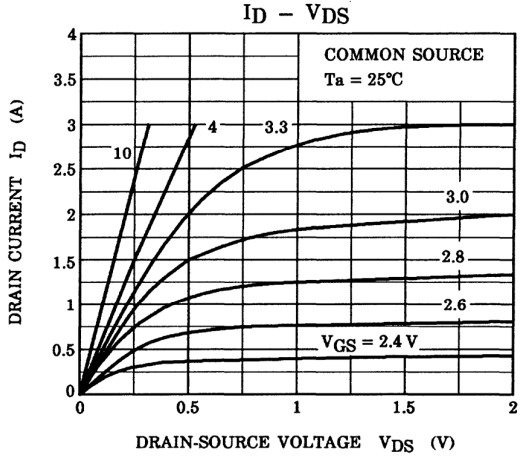
Precaution

V_{th} can be expressed as the voltage between gate and source when the low operating current value is I_D=0.1mA 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.

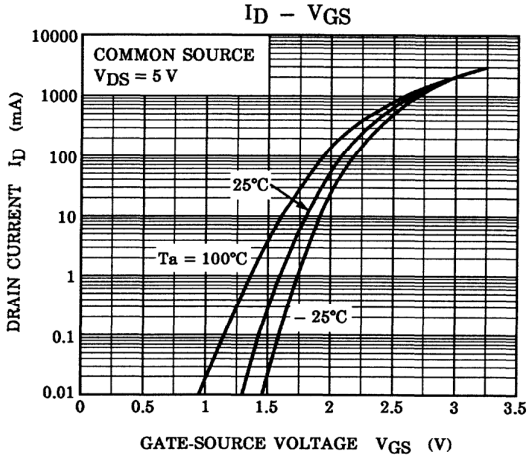
Handling Precaution

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.

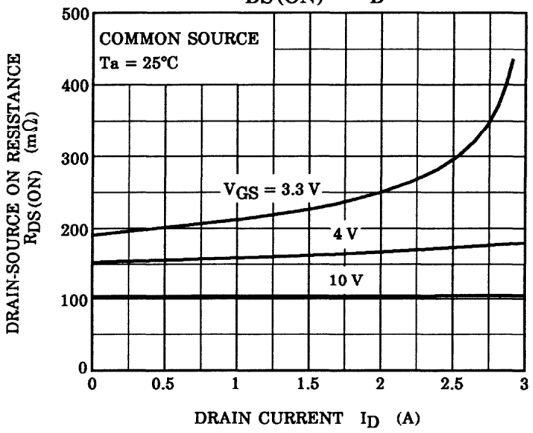
I_D – V_{DS}



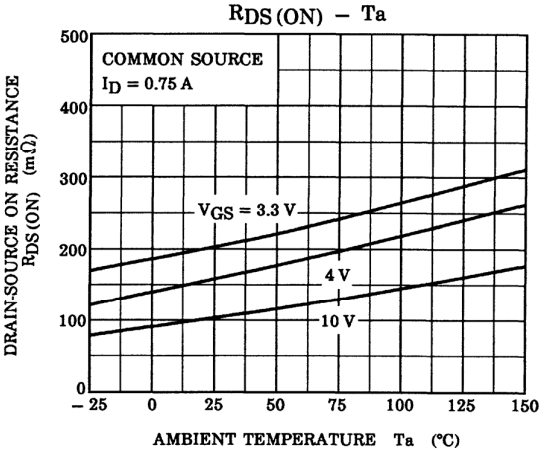
I_D – V_{GS}



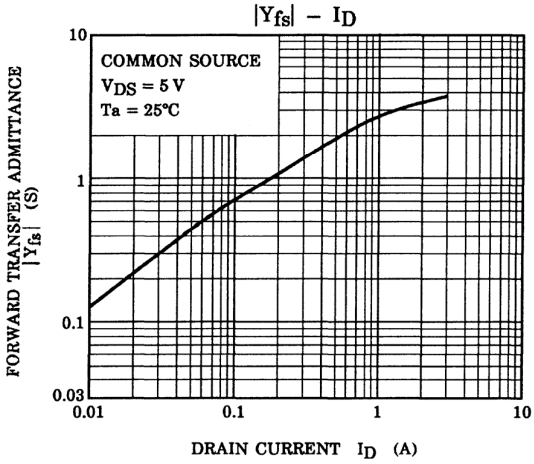
$R_{DS\,(ON)}$ – I_D



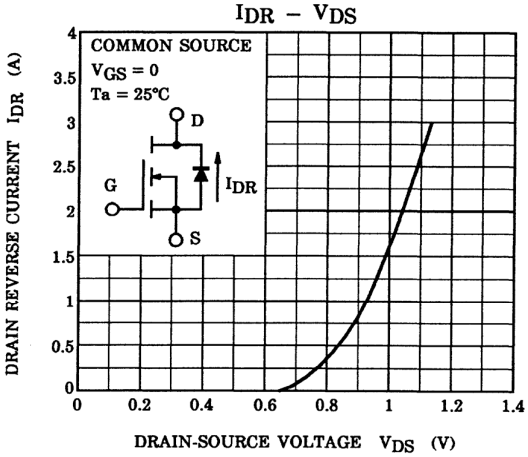
$R_{DS\,(ON)}$ – Ta

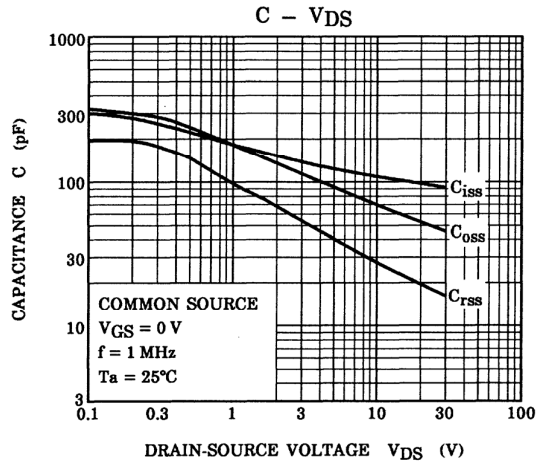


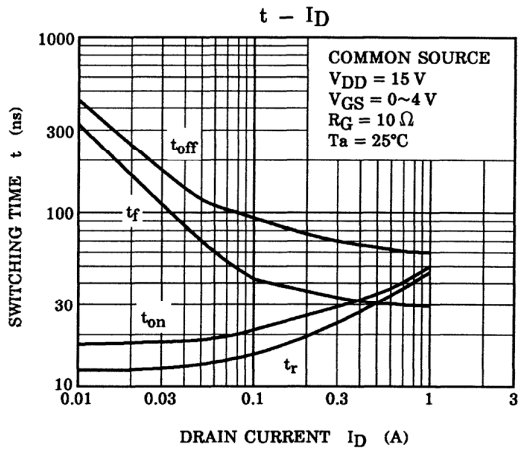
$|Y_{fs}|$ – I_D

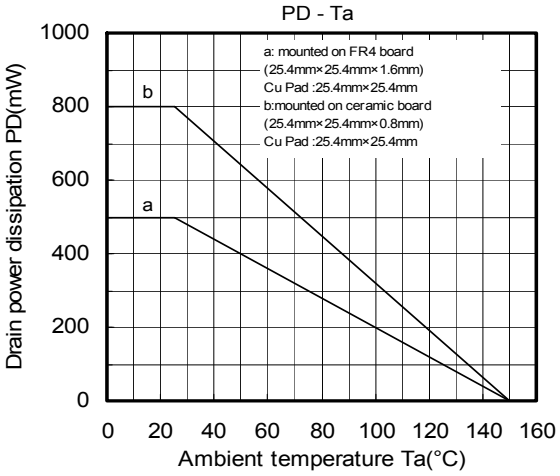


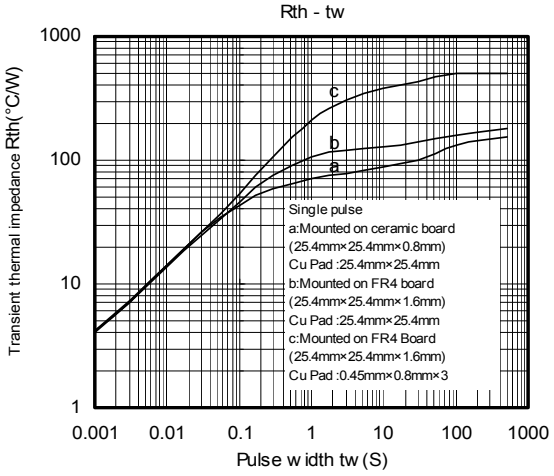
I_{DR} – V_{DS}











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20070701-EN GENERAL

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