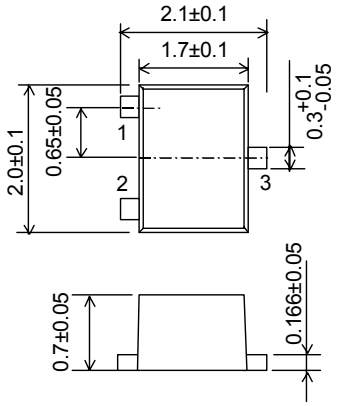
TOSHIBA Field Effect Transistor Silicon N Channel MOS Type

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)
- Lead(Pb)-free

Unit: mm



1 :Gate
2 :Source
3 :Drain

UFM

JEDEC	―
JEITA	―
TOSHIBA	2-2U1A

Weight: 6.6 mg (typ.)

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		$P_{D\ (Note1)}$	800	mW
		$P_{D\ (Note2)}$	500	
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55~150	°C

Note1: Mounted on ceramic board.
(25.4 mm × 25.4 mm × 0.8 mm, Cu Pad: 645 mm^2)
Note2: Mounted on FR4 board.
(25.4 mm × 25.4 mm × 1.6 mm, Cu Pad: 645 mm^2)

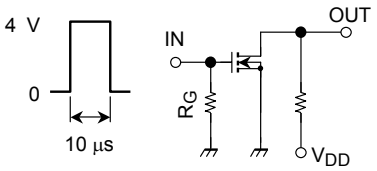
Electrical Characteristics (Ta = 25°C)

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,	―	46	―	ns
	Turn-off time	t_{off}	V_{GS} = 0~4 V, R_G = 10 Ω	―	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

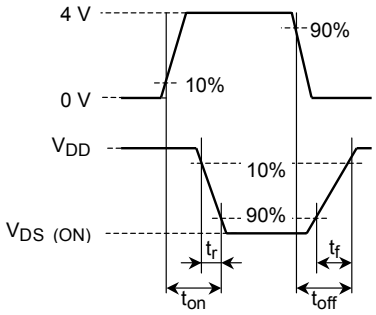
(a) Test Circuit



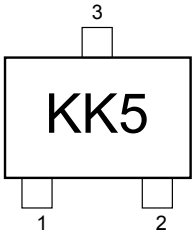
V_{DD} = 15 V
R_G = 10 Ω
D.U. ≦ 1%
V_{IN}: t_r, t_f < 5 ns
Common Source
Ta = 25°C

(b) V_{IN}

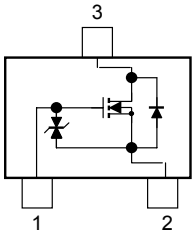
(c) V_{OUT}



Marking



Equivalent Circuit (top view)



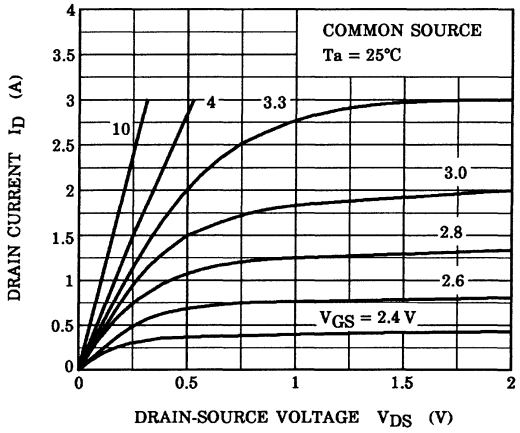
Precaution

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.
The recommended V_{GS} voltage for turning on this product is 3.3 V or higher.

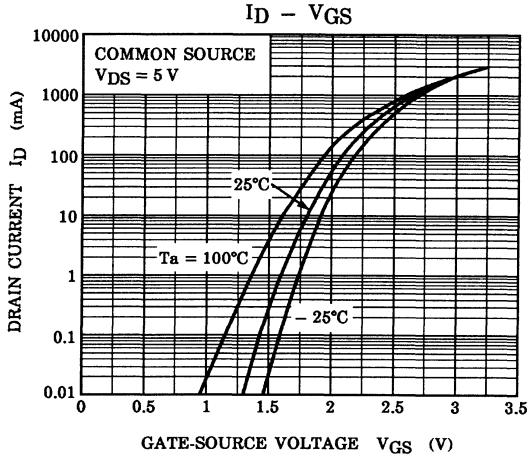
Handling Precaution

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.

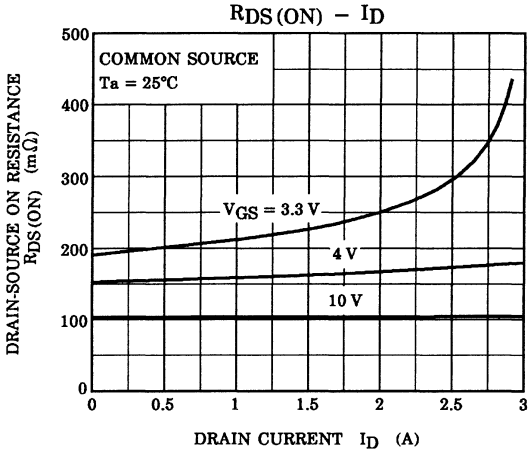
I_D – V_{DS}



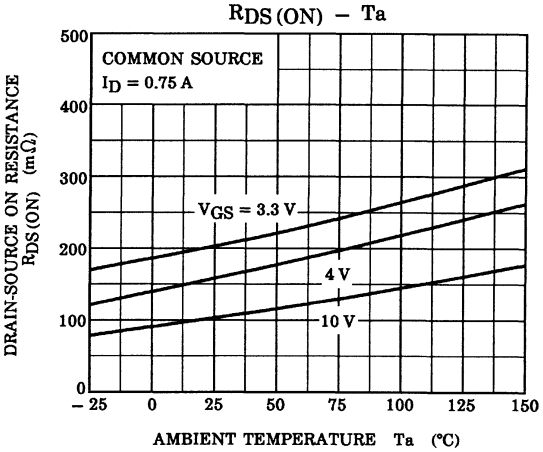
I_D – V_{GS}



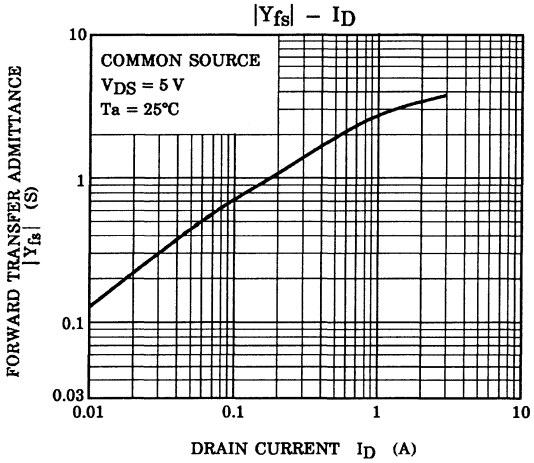
$R_{DS\,(ON)}$ – I_D



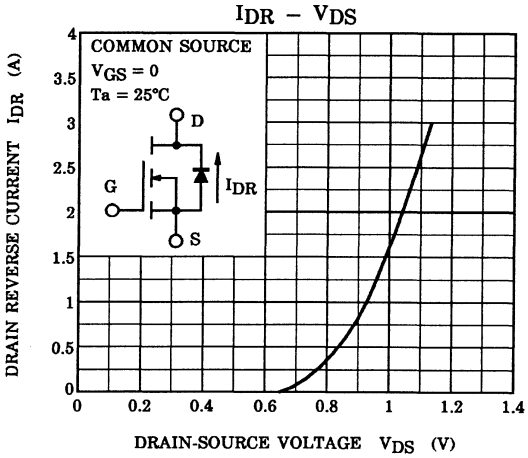
$R_{DS\,(ON)}$ – Ta

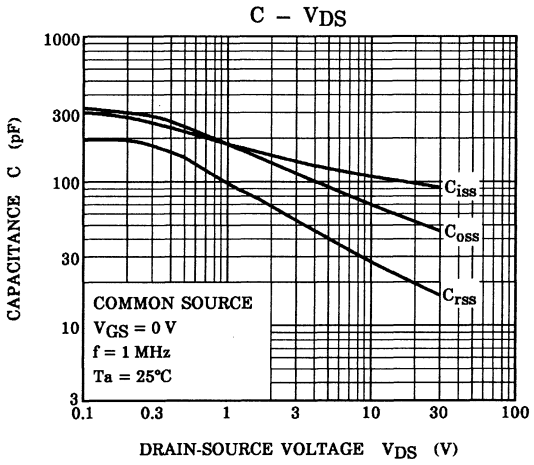


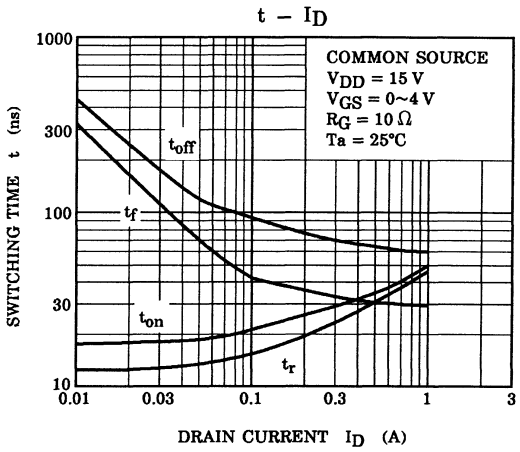
$|Y_{fs}|$ – I_D

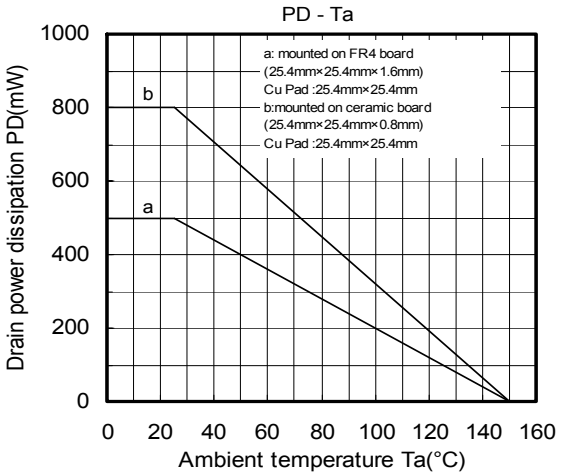


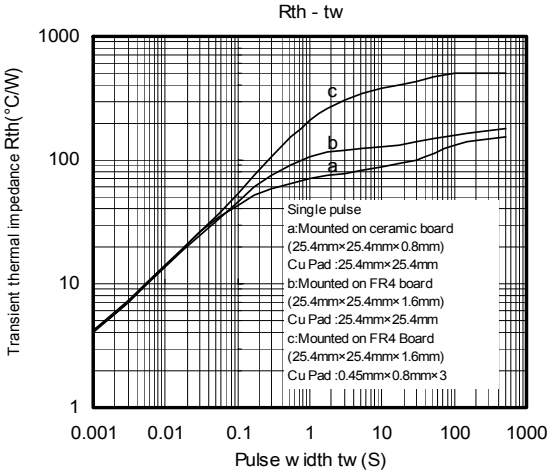
I_{DR} – V_{DS}




C – VDS
CAPACITANCE C (pF)
DRAIN-SOURCE VOLTAGE VDS (V)
Ciss
Coss
Crss
COMMON SOURCE
VGS = 0 V
f = 1 MHz
Ta = 25°C


t – ID
SWITCHING TIME t (ns)
DRAIN CURRENT ID (A)
toff
tf
ton
tr
COMMON SOURCE
VDD = 15 V
VGS = 0~4 V
RG = 10 Ω
Ta = 25°C


PD - Ta
Drain power dissipation PD(mW)
Ambient temperature Ta(°C)
a: mounted on FR4 board
(25.4mm×25.4mm×1.6mm)
Cu Pad :25.4mm×25.4mm
b:mounted on ceramic board
(25.4mm×25.4mm×0.8mm)
Cu Pad :25.4mm×25.4mm


Rth - tw
Transient thermal impedance Rth(°C/W)
Pulse w idth tw (S)
Single pulse
a:Mounted on ceramic board
(25.4mm×25.4mm×0.8mm)
Cu Pad :25.4mm×25.4mm
b:Mounted on FR4 board
(25.4mm×25.4mm×1.6mm)
Cu Pad :25.4mm×25.4mm
c:Mounted on FR4 Board
(25.4mm×25.4mm×1.6mm)
Cu Pad :0.45mm×0.8mm×3

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