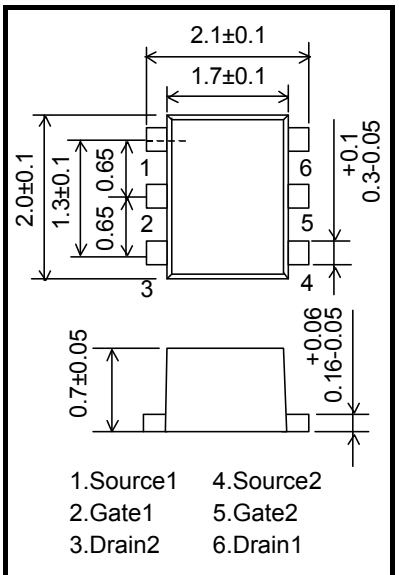
TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (U-MOSIII)

SSM6N24TU

High Speed Switching Applications

- Optimum for high-density mounting in small packages
- Low on-resistance: R_{on} = 145mΩ (max) (@V_{GS} = 4.5 V)
  R_{on} = 180mΩ (max) (@V_{GS} = 2.5 V)

Unit: mm



UF6	
JEDEC	—
JEITA	—
TOSHIBA	2-2T1B

Weight: 7.0 mg (typ.)

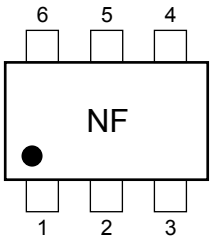
Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-Source voltage		V_{DS}	30	V
Gate-Source voltage		V_{GSS}	± 12	V
Drain current	DC	I_D	0.5	A
	Pulse	I_{DP}	1.5	
Drain power dissipation		P_D (Note 1)	500	mW
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55 to 150	°C

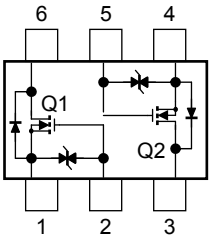
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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 FR4 board. (total dissipation)
(25.4 mm × 25.4 mm × 1.6 t, Cu Pad: 645 mm^2)

Marking



Equivalent Circuit (top view)



Handling Precaution

When handling individual devices (which are not yet mounted on a circuit board), be sure that the environment is protected against electrostatic electricity. 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.

Start of commercial production
2004-01

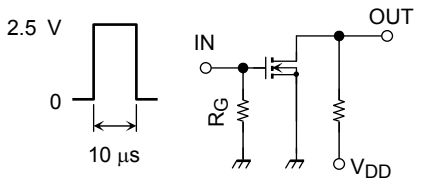
Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±□12 V, V_{DS} = 0	—	—	±1	μA
Drain-Source breakdown voltage		$V_{(BR)\ DSS}$	I_D = 1 mA, V_{GS} = 0	30	—	—	V
		$V_{(BR)\ DSX}$	I_D = 1 mA, V_{GS} = −12 V	18	—	—	
Drain cut-off current		I_{DSS}	V_{DS} = 30 V, V_{GS} = 0	—	—	1	μA
Gate threshold voltage		V_{th}	V_{DS} = 3 V, I_D = 0.1 mA	0.5	—	1.1	V
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = 3 V, I_D = 0.25 A (Note2)	1.0	2.0	—	S
Drain-Source on-resistance		$R_{DS\ (ON)}$	I_D = 0.50 A, V_{GS} = 4.5 V (Note2)	—	120	145	mΩ
			I_D = 0.25 A, V_{GS} = 2.5 V (Note2)	—	140	180	
Input capacitance		C_{iss}	V_{DS} = 10 V, V_{GS} = 0, f = 1 MHz	—	245	—	pF
Reverse transfer capacitance		C_{rss}	V_{DS} = 10 V, V_{GS} = 0, f = 1 MHz	—	33	—	pF
Output capacitance		C_{oss}	V_{DS} = 10 V, V_{GS} = 0, f = 1 MHz	—	41	—	pF
Switching time	Turn-on time	t_{on}	V_{DD} = 10 V, I_D = 0.25 A,	—	9	—	ns
	Turn-off time	t_{off}	V_{GS} = 0~2.5 V, R_G = 4.7 Ω	—	15	—	

Note2: Pulse test

Switching Time Test Circuit

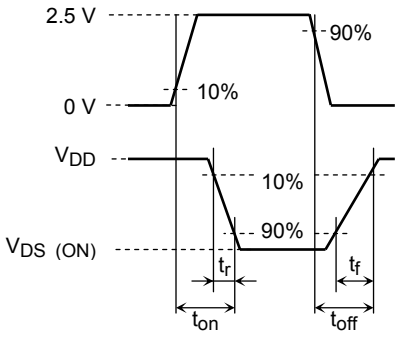
(a) Test Circuit



V_{DD} = 10 V
R_G = 4.7 Ω
Duty ≤ 1%
V_{IN}: t_r, t_f < 5 ns
Common Source
Ta = 25°C

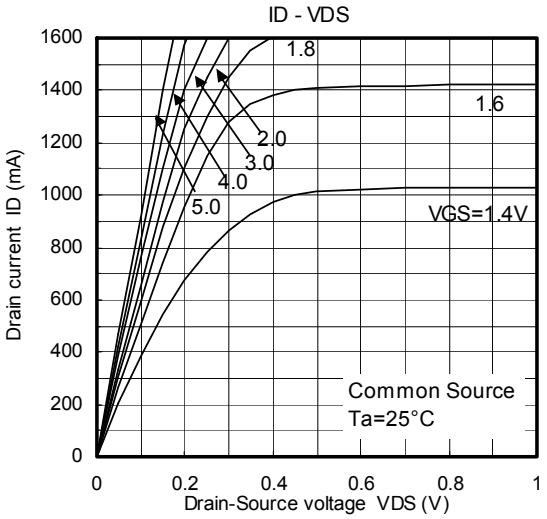
(b) V_{IN}

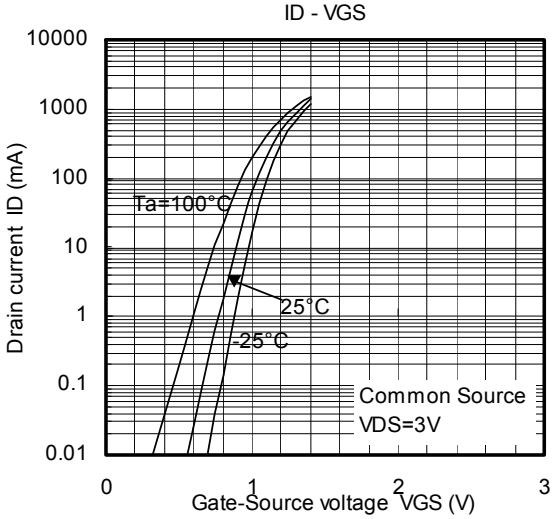
(c) V_{OUT}

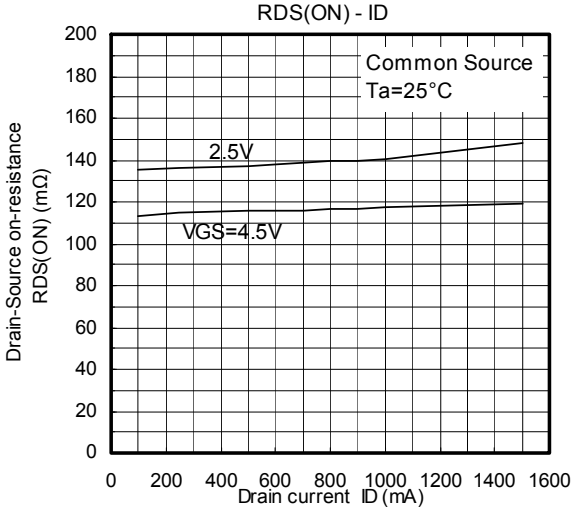


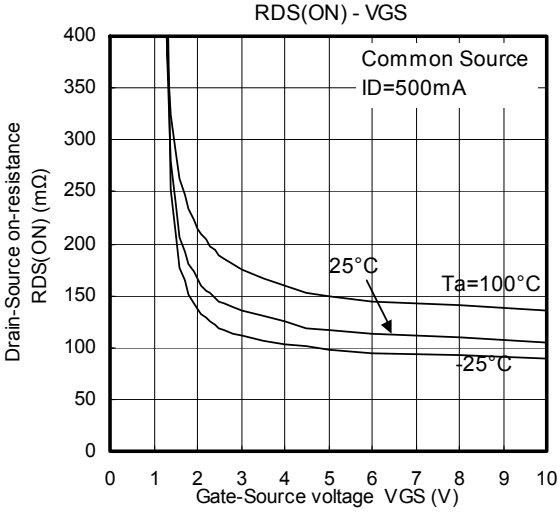
Precaution

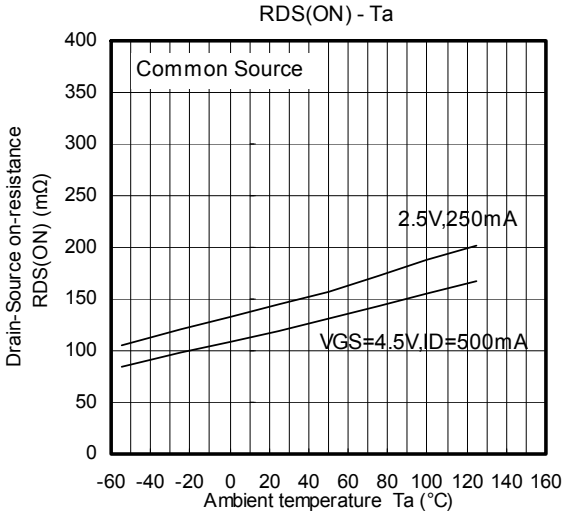
V_{th} can be expressed as the voltage between gate and source when the low operating current value is I_D=100 μA for this product. For normal switching operation, $V_{GS\ (on)}$ requires a higher voltage than V_{th} and $V_{GS\ (off)}$ requires a lower voltage than V_{th}.
(The relationship can be established as follows: $V_{GS\ (off)}$ < V_{th} < $V_{GS\ (on)}$)
Please take this into consideration when using the device.

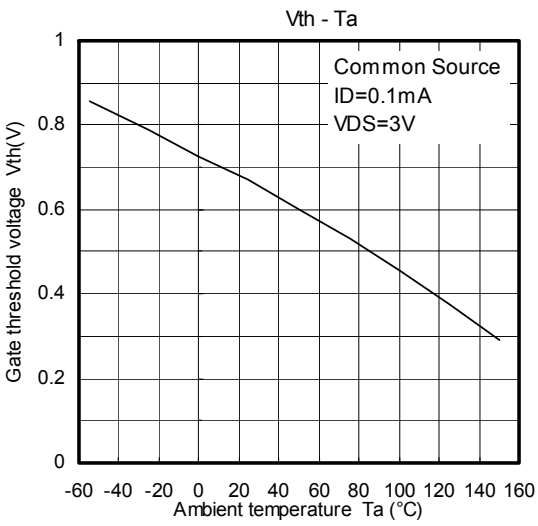

ID - VDS
Drain current ID (mA)
Drain-Source voltage VDS (V)
1.8
1.6
2.0
3.0
4.0
5.0
VGS=1.4V
Common Source
Ta=25°C

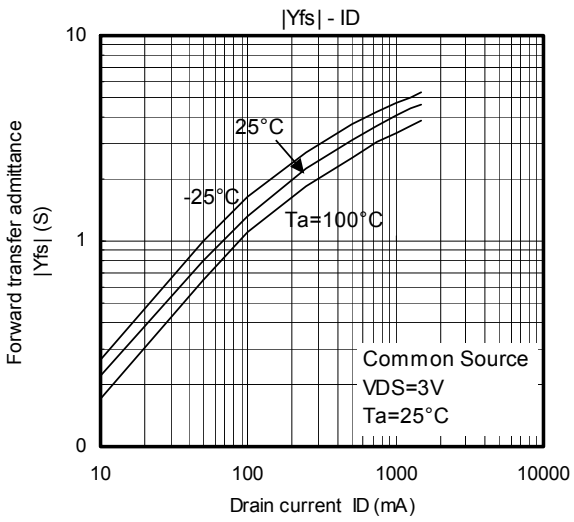

ID - VGS
Drain current ID (mA)
Gate-Source voltage VGS (V)
Ta=100°C
25°C
-25°C
Common Source
VDS=3V

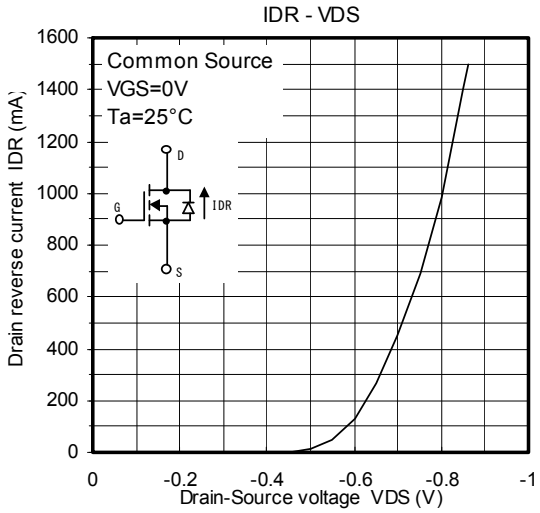

RDS(ON) - ID
Drain-Source on-resistance RDS(ON) (mΩ)
Drain current ID (mA)
Common Source
Ta=25°C
2.5V
VGS=4.5V

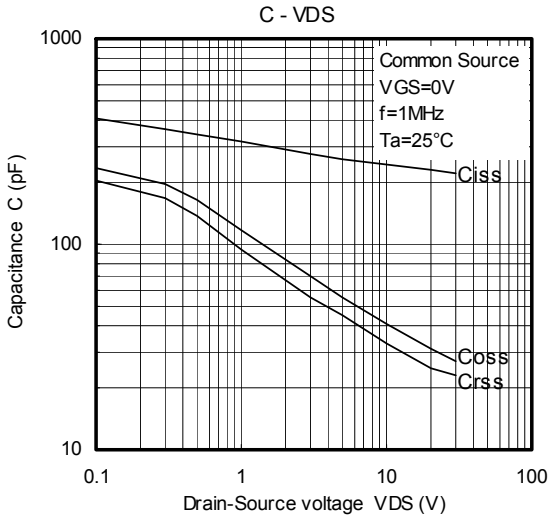

RDS(ON) - VGS
Drain-Source on-resistance RDS(ON) (mΩ)
Gate-Source voltage VGS (V)
Common Source
ID=500mA
25°C
Ta=100°C
-25°C

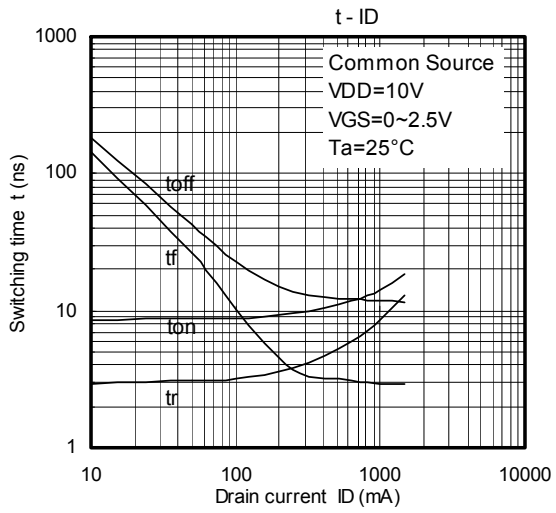

RDS(ON) - Ta
Drain-Source on-resistance RDS(ON) (mΩ)
Ambient temperature Ta (°C)
Common Source
2.5V,250mA
VGS=4.5V,ID=500mA

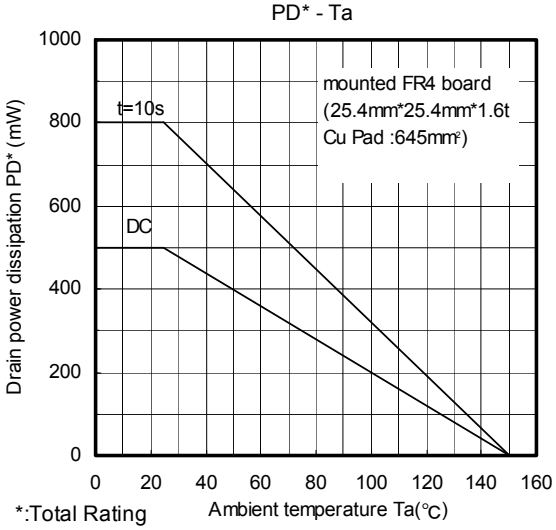

Vth - Ta
Gate threshold voltage Vth(V)
Ambient temperature Ta (°C)
Common Source
ID=0.1mA
VDS=3V



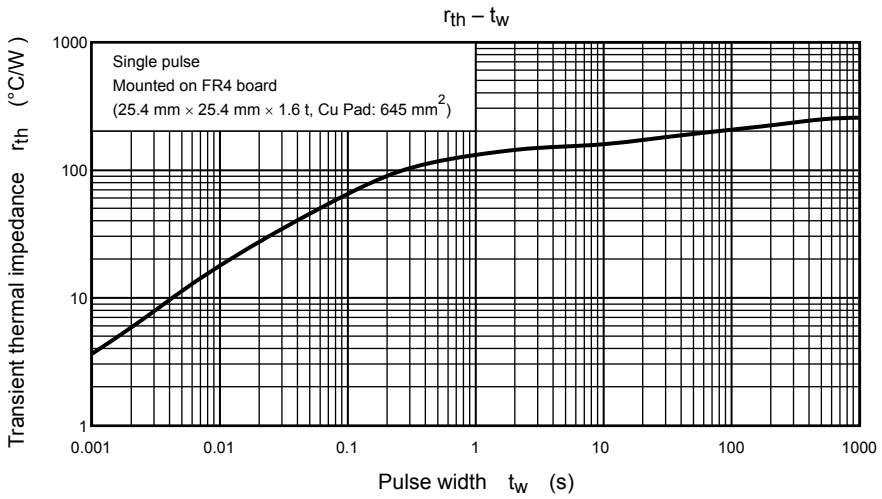








*:Total Rating


$r_{th} - t_w$
Single pulse
Mounted on FR4 board
(25.4 mm × 25.4 mm × 1.6 t, Cu Pad: 645 mm^2)
Transient thermal impedance r_{th} (°C/W)
1000
100
10
1
0.001
0.01
0.1
1
10
100
1000
Pulse width t_w (s)

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