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

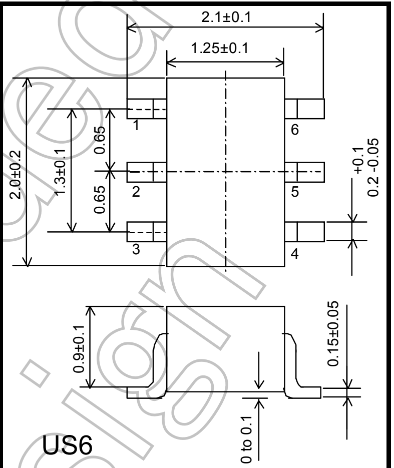
SSM6N7002BFU

High-Speed Switching Applications

Analog Switch Applications

- Small package
- Low ON-resistance : $R_{DS(ON)}$ = 3.3 Ω (max) (@V_{GS} = 4.5 V)
  : $R_{DS(ON)}$ = 2.6 Ω (max) (@V_{GS} = 5 V)
  : $R_{DS(ON)}$ = 2.1 Ω (max) (@V_{GS} = 10 V)

Unit: mm



US6

1.SOURCE1 4.SOURCE2
2.GATE1 5.GATE2
3.DRAIN2 6.DRAIN1

JEDEC	―
JEITA	SC-88
TOSHIBA	2-2J1C

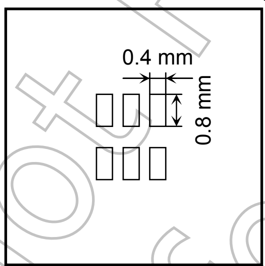
Weight: 6.8 mg (typ.)

Absolute Maximum Ratings (Ta = 25°C) (Q1, Q2 Common)

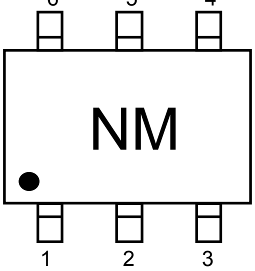
Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	60	V
Gate-source voltage		V_{GSS}	± 20	V
Drain current	DC	I_D	200	mA
	Pulse	I_{DP}	800	
Drain power dissipation (Ta = 25°C)		P_D (Note 1)	300	mW
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55 to 150	°C

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).

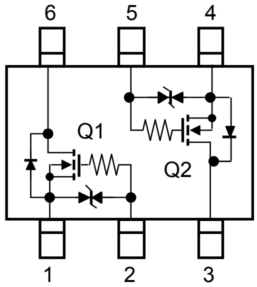
Note 1: Total rating, mounted on FR4 board
(25.4 mm × 25.4 mm × 1.6 mm, Cu Pad: 0.32mm^2 × 6)



Marking



Equivalent Circuit (top view)



Start of commercial production
2009-08

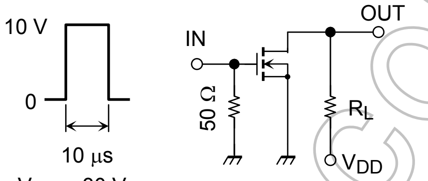
Electrical Characteristics (Ta = 25°C) (Q1, Q2 Common)

Characteristics		Symbol	Test Condition	Min	Typ	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ± 20 V, V_{DS} = 0 V	—	—	±10	μA
Drain-source breakdown voltage		$V_{(BR)\ DSS}$	I_D =10 mA, V_{GS} = 0 V	60	—	—	V
		$V_{(BR)\ DSX}$	I_D = 10 mA, V_{GS} = -10 V	45	—	—	
Drain cutoff current		I_{DSS}	V_{DS} = 60 V, V_{GS} = 0 V	—	—	1	μA
Gate threshold voltage		V_{th}	V_{DS} = 10 V, I_D = 0.25 mA	1.5	—	3.1	V
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = 10 V, I_D = 200 mA (Note 2)	225	—	—	mS
Drain-source ON-resistance		$R_{DS\ (ON)}$	I_D = 500 mA, V_{GS} = 10 V (Note 2)	—	1.62	2.1	Ω
			I_D = 100 mA, V_{GS} = 5 V (Note 2)	—	1.90	2.6	
			I_D = 100 mA, V_{GS} = 4.5 V (Note 2)	—	2.10	3.3	
Input capacitance		C_{iss}	V_{DS} = 25 V, V_{GS} = 0 V, f = 1 MHz	—	17.0	—	pF
Reverse transfer capacitance		C_{rss}		—	1.9	—	
Output capacitance		C_{oss}		—	3.6	—	
Switching time	Turn-on delay time	$t_{d(on)}$	V_{DD} = 30 V , I_D = 200 mA , V_{GS} = 0 to 10 V	—	3.3	6.6	ns
	Turn-off delay time	$t_{d(off)}$		—	14.5	40	
Drain-source forward voltage		V_{DSF}	I_D = -200 mA, V_{GS} = 0 V (Note 2)	—	-0.84	-1.2	V

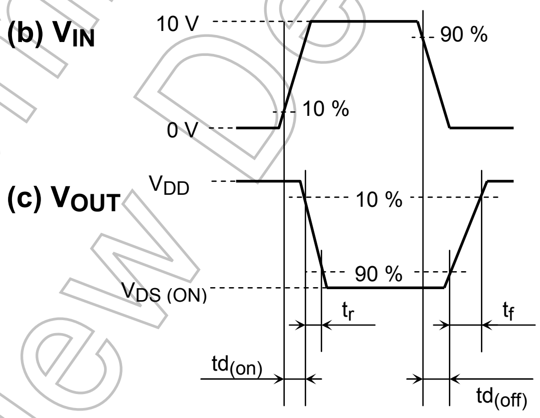
Note2: Pulse test

Switching Time Test Circuit

(a) Test circuit



V_{DD} = 30 V
Duty ≤ 1%
V_{IN}: t_r, t_f < 2 ns
(Z_{out} = 50 Ω)
Common Source
Ta = 25 °C



Precaution

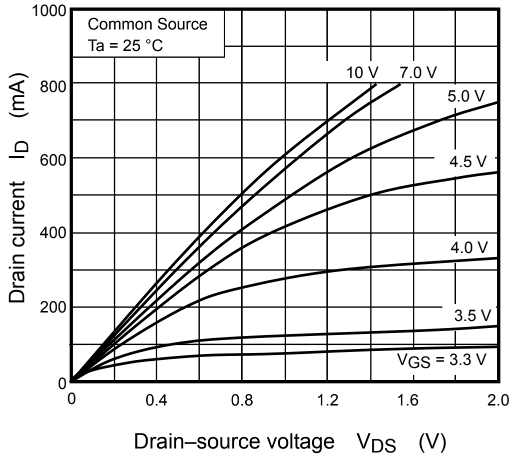
Let V_{th} be the voltage applied between gate and source that causes the drain current (I_D) to be low (0.25 mA for the SSM6N7002BFU). Then, for normal switching operation, $V_{GS(on)}$ must be higher than $V_{th,}$ and $V_{GS(off)}$ must be lower than $V_{th.}$ This relationship can be expressed as: $V_{GS(off)} < V_{th} < V_{GS(on)}$.
Take this into consideration when using the device

Handling Precaution

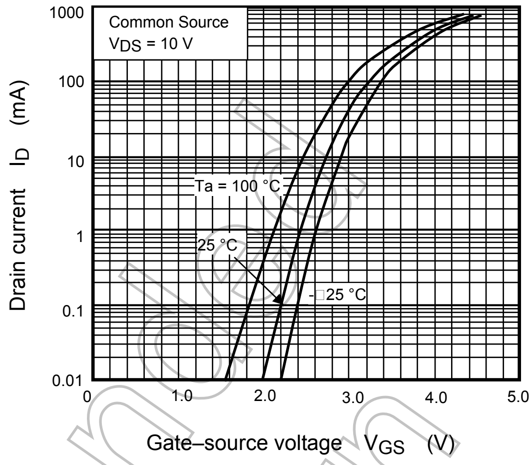
When handling individual devices that are not yet mounted on a circuit board, make sure that the environment is protected against electrostatic discharge. Operators should wear antistatic clothing, and containers and other objects that come into direct contact with devices should be made of antistatic materials.

(Q1,Q2 Common)

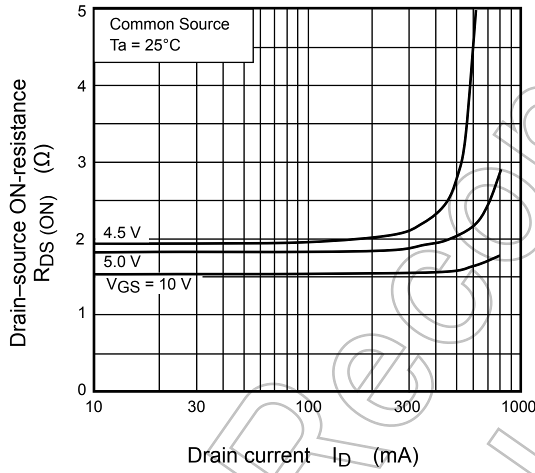
$I_D – V_{DS}$



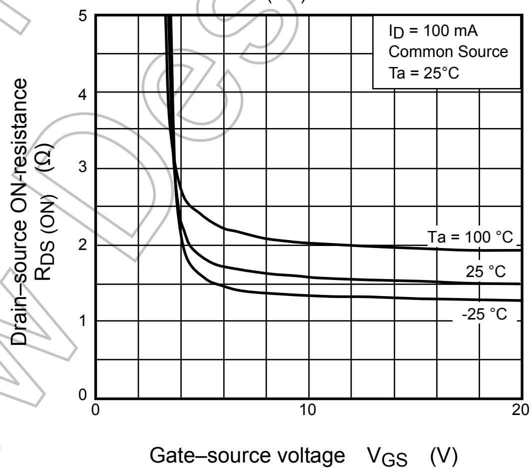
$I_D – V_{GS}$



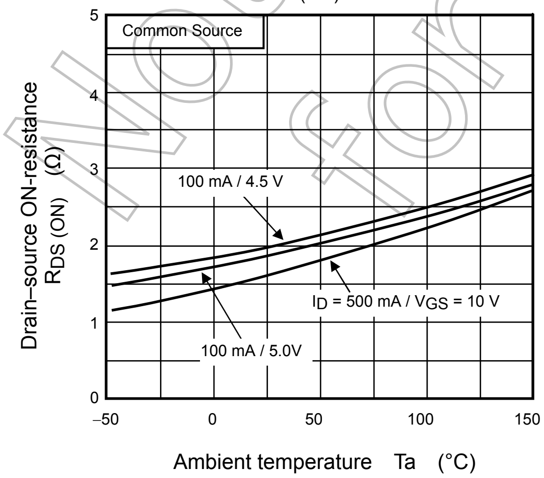
$R_{DS (ON)} – I_D$



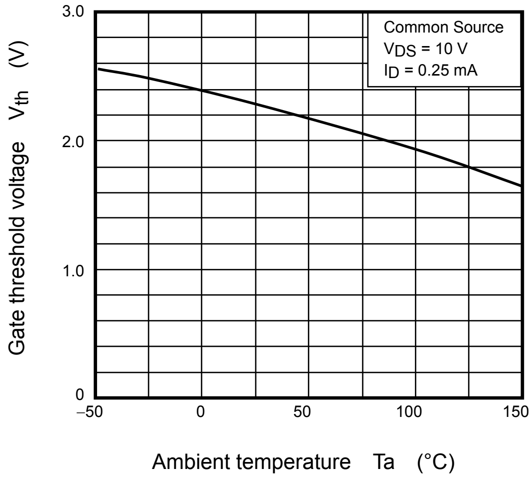
$R_{DS (ON)} – V_{GS}$



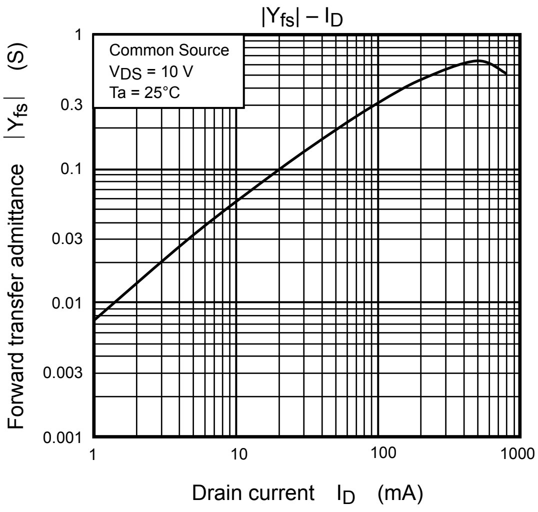
$R_{DS (ON)} – Ta$

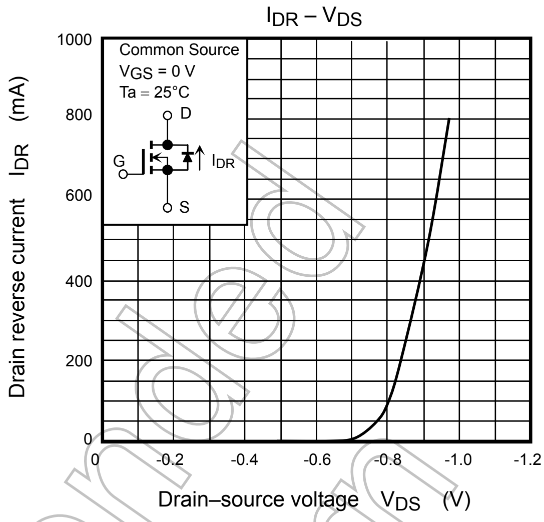


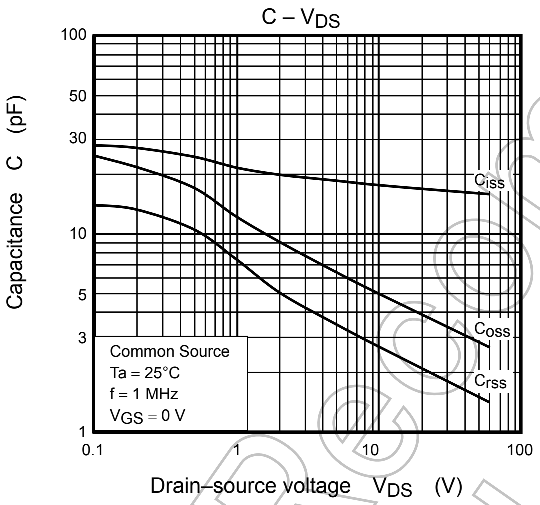
$V_{th} – Ta$

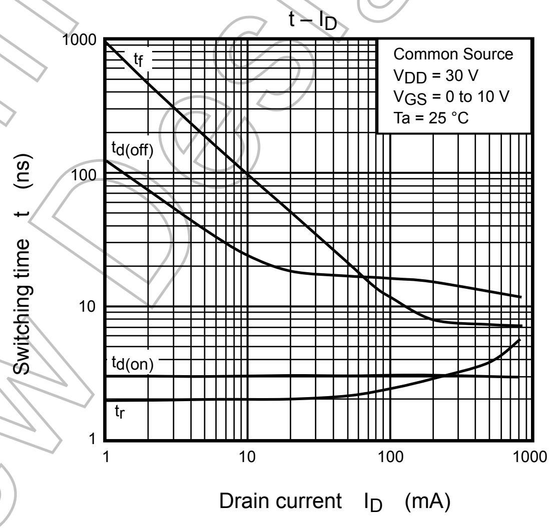


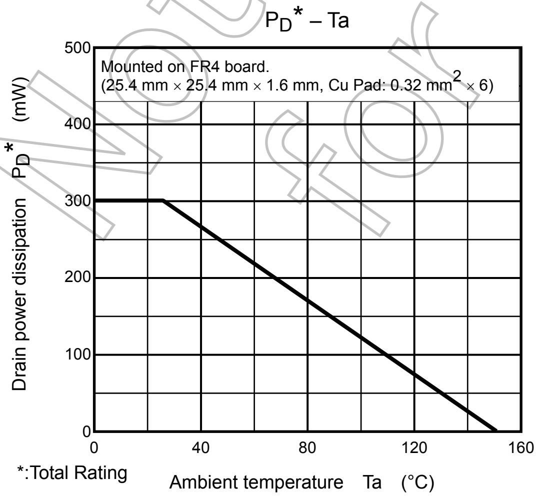
(Q1, Q2 Common)











*:Total Rating

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