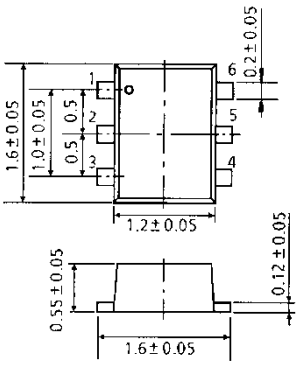
TOSHIBA Field Effect Transistor Silicon N Channel MOS Type

SSM6N16FE

High Speed Switching Applications
Analog Switching Applications

- Suitable for high-density mounting due to compact package
- Low on resistance: R_{on} = 3.0 Ω (max) (@V_{GS} = 4 V)
  : R_{on} = 4.0 Ω (max) (@V_{GS} = 2.5 V)
  : R_{on} = 15 Ω (max) (@V_{GS} = 1.5 V)

Unit: mm



1: Source 1 4. Source 2
2. Gate 1 5. Gate 2
3: Drain 2 6. Drain 1

ES6

JEDEC	—
JEITA	—
TOSHIBA	2-2N1D

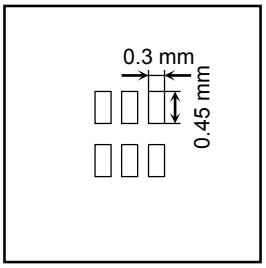
Weight: 3.0 mg (typ.)

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

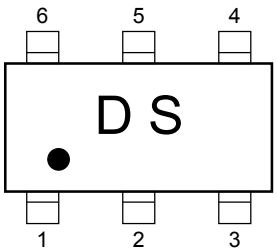
Characteristics		Symbol	Rating	Unit
Drain-Source voltage		V_{DS}	20	V
Gate-Source voltage		V_{GSS}	±10	V
Drain current	DC	I_D	100	mA
	Pulse	I_{DP}	200	
Drain power dissipation (Ta = 25°C) (Note 1)		P_D	150	mW
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	-55 to 150	°C

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).

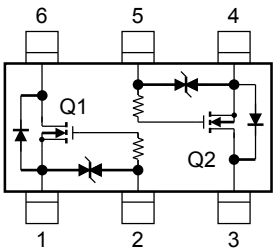
Note 1: Total rating, mounted on FR4 board
(25.4 mm × 25.4 mm × 1.6 mm, Cu Pad: 0.135 mm^2 × 6)



Marking



Equivalent Circuit



Handling Precaution

When handling individual devices (which are not yet mounting 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.

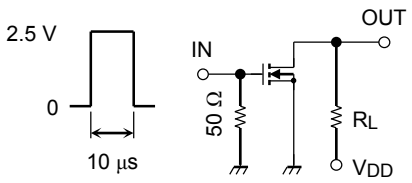
Start of commercial production
2001-03

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

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±10 V, V_{DS} = 0 V	—	—	±1	μA
Drain-Source breakdown voltage		$V_{(BR)DSS}$	I_D = 0.1 mA, V_{GS} = 0 V	20	—	—	V
Drain cut-off current		I_{DSS}	V_{DS} = 20 V, V_{GS} = 0 V	—	—	1	μA
Gate threshold voltage		V_{th}	V_{DS} = 3 V, I_D = 0.1 mA	0.6	—	1.1	V
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = 3 V, I_D = 10 mA	40	—	—	mS
Drain-Source ON resistance		$R_{DS(ON)}$	I_D = 10 mA, V_{GS} = 4 V	—	1.5	3.0	Ω
			I_D = 10 mA, V_{GS} = 2.5 V	—	2.2	4.0	
			I_D = 1 mA, V_{GS} = 1.5 V	—	5.2	15	
Input capacitance		C_{iss}	V_{DS} = 3 V, V_{GS} = 0 V, f = 1 MHz	—	9.3	—	pF
Reverse transfer capacitance		C_{rss}		—	4.5	—	pF
Output capacitance		C_{oss}		—	9.8	—	pF
Switching time	Turn-on time	t_{on}	V_{DD} = 3 V, I_D = 10 mA, V_{GS} = 0 to 2.5 V	—	70	—	ns
	Turn-off time	t_{off}		—	125	—	

Switching Time Test Circuit

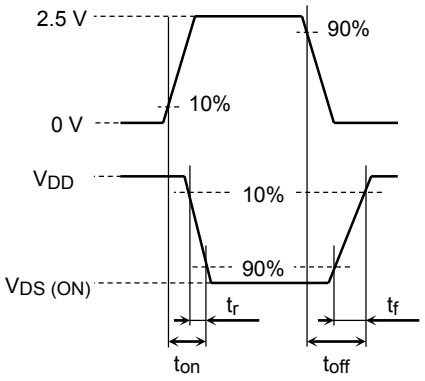
(a) Test circuit



V_{DD} = 3 V
Duty ≤ 1%
V_{IN}: t_r, t_f < 5 ns
(Z_{out} = 50 Ω)
Common Source
Ta = 25°C

(b) VIN

(c) VOUT



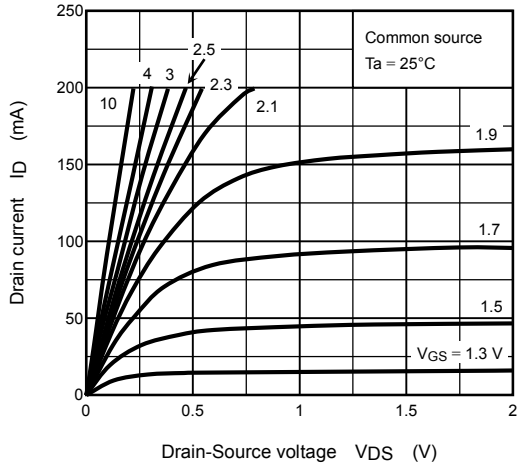
Precaution

V_{th} can be expressed as voltage between gate and source when low operating current value is I_D = 100 μA for this product. For normal switching operation, $V_{GS(on)}$ requires higher voltage than V_{th} and $V_{GS(off)}$ requires lower voltage than V_{th}. (Relationship can be established as follows: $V_{GS(off)}$ < V_{th} < $V_{GS(on)}$)

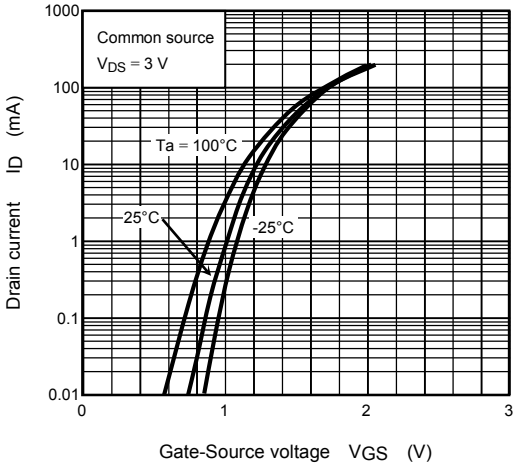
Please take this into consideration for using the device.

(Q1, Q2 common)

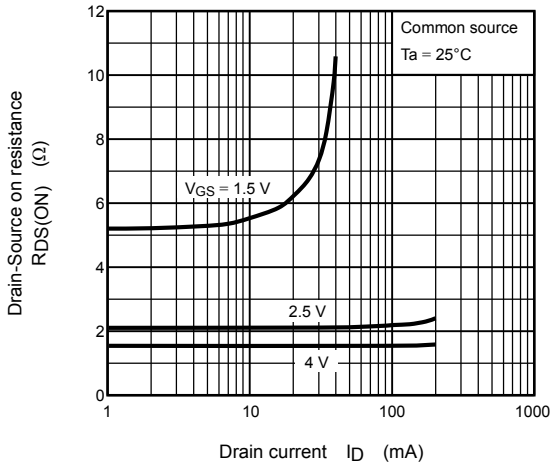
$I_D - V_{DS}$



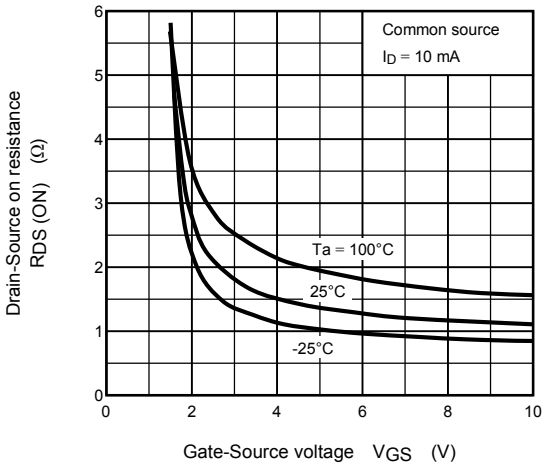
$I_D - V_{GS}$



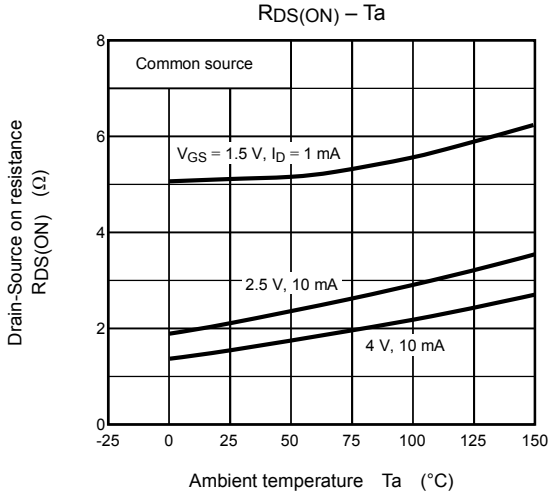
$R_{DS(ON)} - I_D$



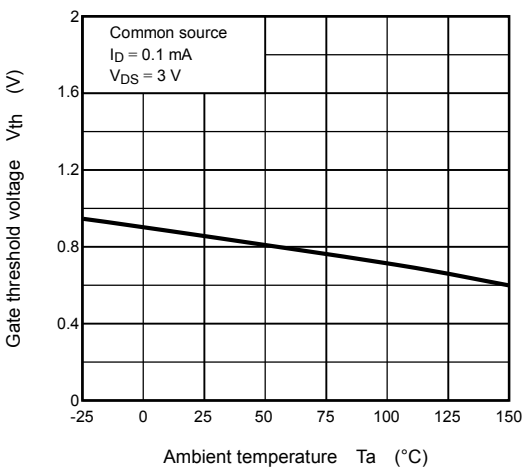
$R_{DS(ON)} - V_{GS}$



$R_{DS(ON)} - Ta$

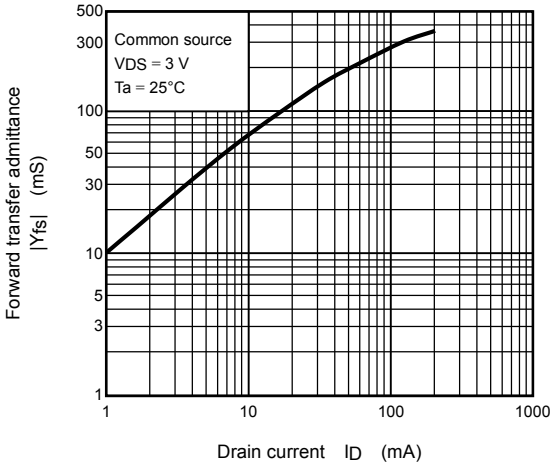


$V_{th} - Ta$

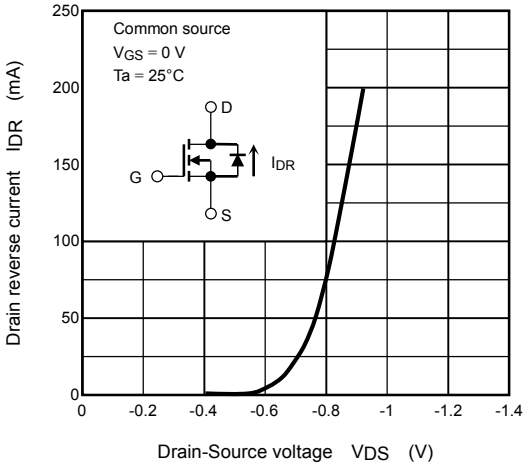


(Q1, Q2 common)

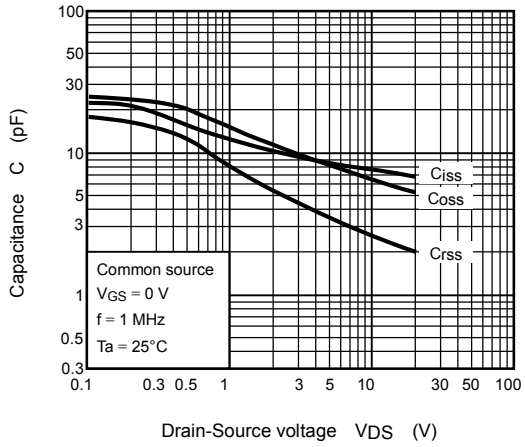
$|Y_{fs}| - I_D$



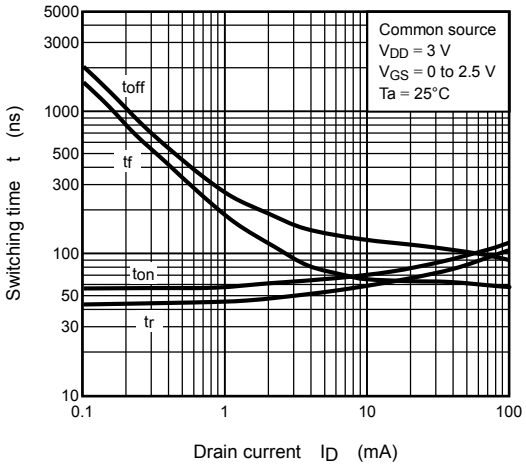
$I_{DR} - V_{DS}$



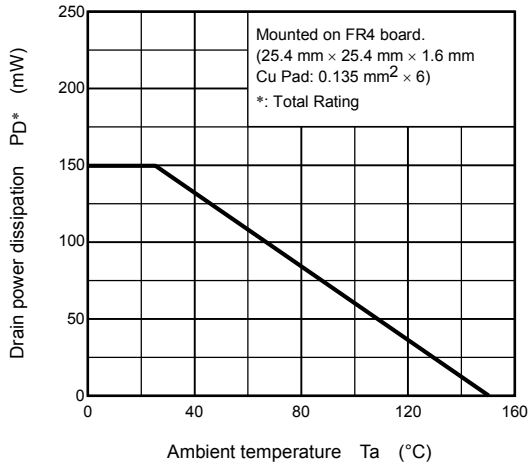
$C - V_{DS}$



$t - I_D$



$P_D^* - Ta$



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