TOSHIBA Field Effect Transistor Silicon P Channel MOS Type

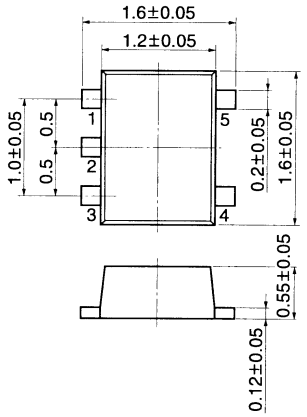
SSM5P16FE

High Speed Switching Applications

Analog Switch Applications

- Small package
- Low on-resistance : R_{on} = 8 Ω (max) (@V_{GS} = −4 V)
  : R_{on} = 12 Ω (max) (@V_{GS} = −2.5 V)
  : R_{on} = 45 Ω (max) (@V_{GS} = −1.5 V)

Unit: mm



1. GATE 1
2. SOURCE
3. GATE 2
4. DRAIN 2
5. DRAIN 1

ESV

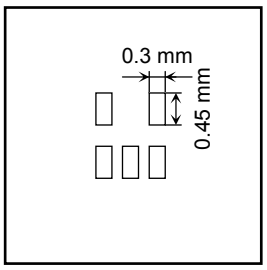
JEDEC	—
JEITA	—
TOSHIBA	2-2P1B

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

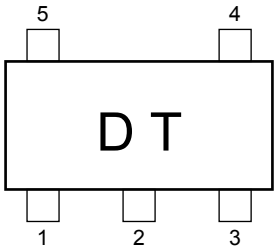
Characteristics		Symbol	Rating	Unit
Drain-Source voltage		V_{DS}	−20	V
Gate-Source voltage		V_{GSS}	±10	V
Drain current	DC	I_D	−100	mA
	Pulse	I_{DP}	−200	
Drain power dissipation (Ta = 25°C)		P_D (Note 1)	150	mW
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55~150	°C

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).

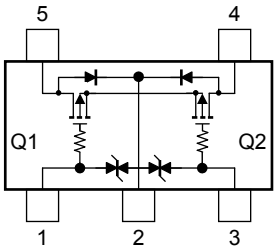
Note 1: Total rating, mounted on FR4 board
(25.4 mm × 25.4 mm × 1.6 t, Cu Pad: 0.135 mm^2 × 5)



Marking



Equivalent Circuit (top view)



Handling Precaution

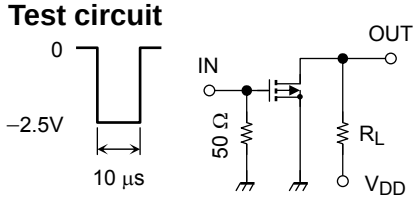
When handling individual devices (which are not yet mounted on a circuit board), ensure that the environment is protected against static electricity. Operators should wear anti-static clothing, and containers and other objects that come into direct contact with devices should be made of anti-static materials.

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

Characteristic		Symbol	Test Condition	MIN.	TYP.	MAX.	UNIT
Gate leakage current		I_{GSS}	V_{GS} = ±10 V, V_{DS} = 0	—	—	±1	μA
Drain-Source breakdown voltage		$V_{(BR)\ DSS}$	I_D = −0.1 mA, V_{GS} = 0	−20	—	—	V
Drain cut-off current		I_{DSS}	V_{DS} = −20 V, V_{GS} = 0	—	—	−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	25	—	—	mS
Drain-Source on-resistance		$R_{DS\ (ON)}$	I_D = −10 mA, V_{GS} = −4 V	—	6	8	Ω
			I_D = −10 mA, V_{GS} = −2.5 V	—	8	12	
			I_D = −1 mA, V_{GS} = −1.5 V	—	18	45	
Input capacitance		C_{iss}	V_{DS} = −3 V, V_{GS} = 0, f = 1 MHz	—	11	—	pF
Reverse transfer capacitance		C_{rss}		—	3.7	—	pF
Output capacitance		C_{oss}		—	10	—	pF
Switching time	Turn-on time	t_{on}	V_{DD} = −3 V, I_D = − 10 mA, V_{GS} = 0 ~ −2.5 V	—	130	—	ns
	Turn-off time	t_{off}		—	190	—	

Switching Time Test Circuit

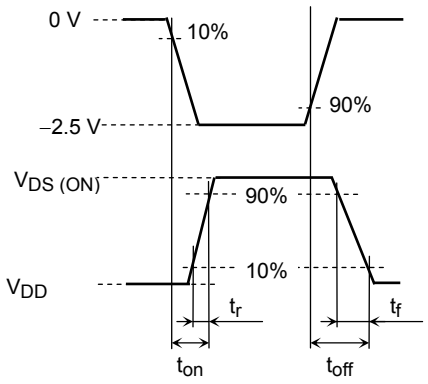
(a) Test circuit



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

(b) V_{IN}

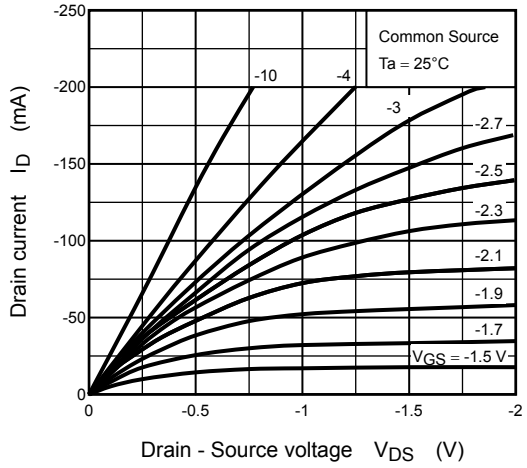
(c) V_{OUT}



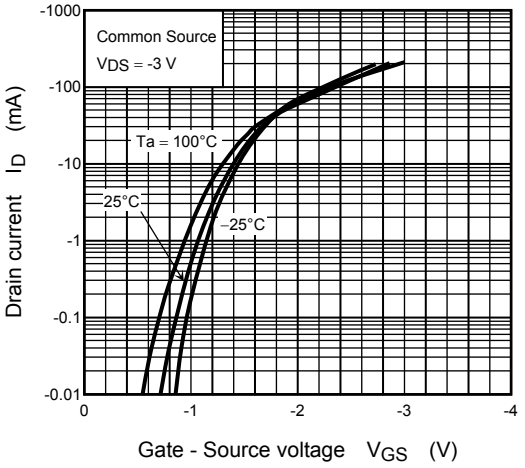
Precaution

V_{th} can be expressed as the voltage between the 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: $V_{GS\ (off)} < V_{th} < V_{GS\ (on)}$.)
Be sure to take this into consideration when using the device.

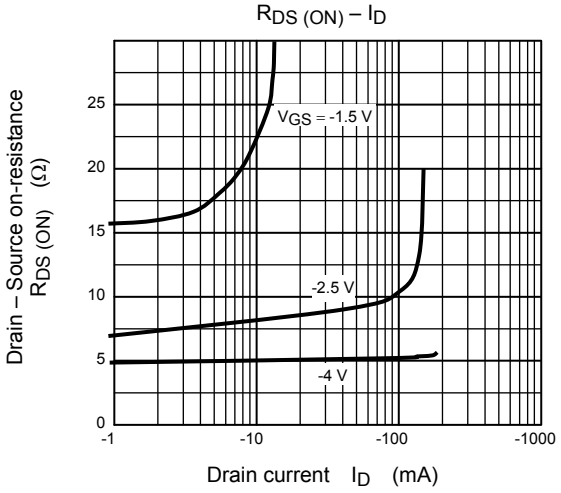
$I_D - V_{DS}$



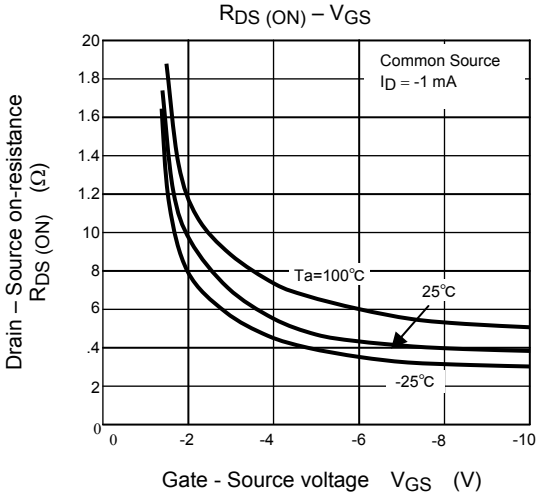
$I_D - V_{GS}$



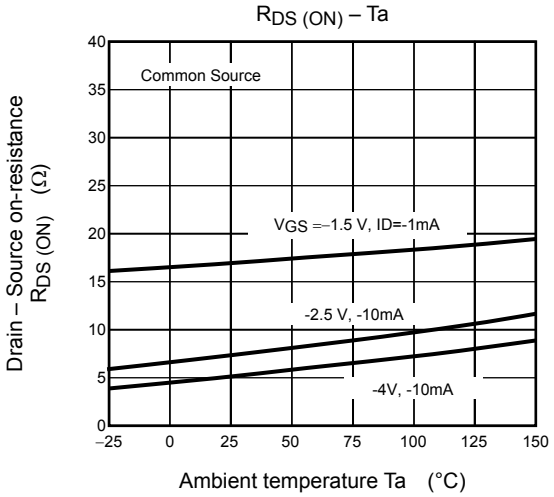
$R_{DS\ (ON)} - I_D$



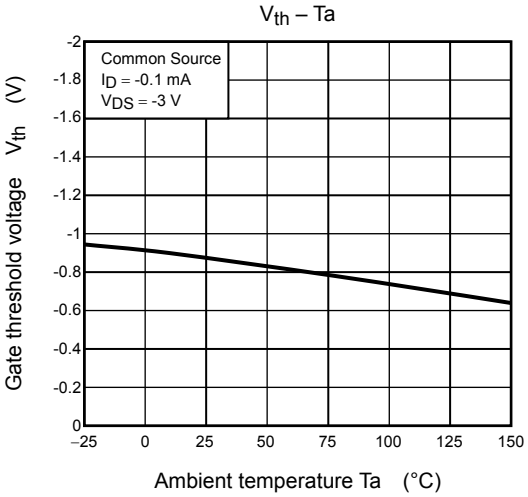
$R_{DS\ (ON)} - V_{GS}$



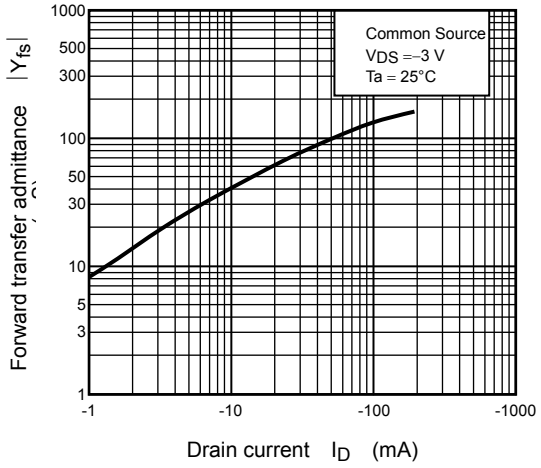
$R_{DS\ (ON)} - Ta$



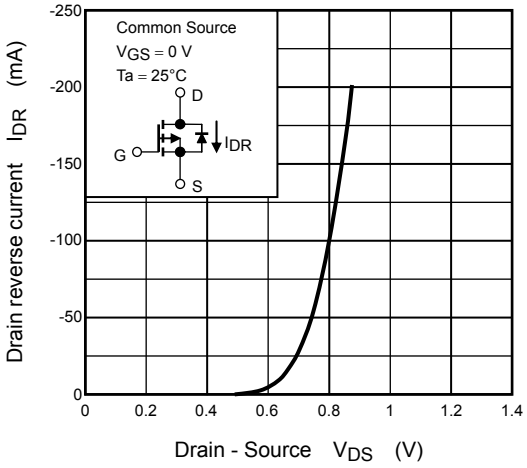
$V_{th} - Ta$



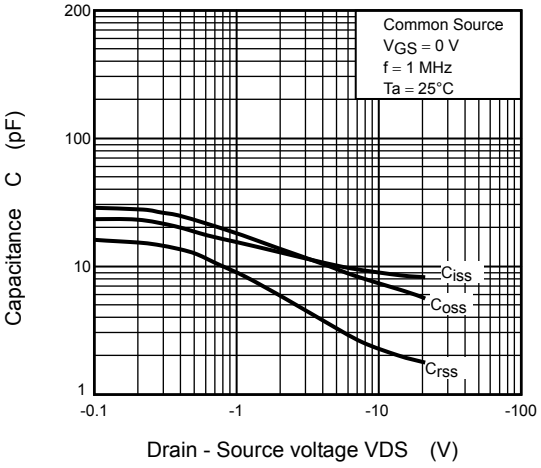
$|Y_{fs}| - I_D$



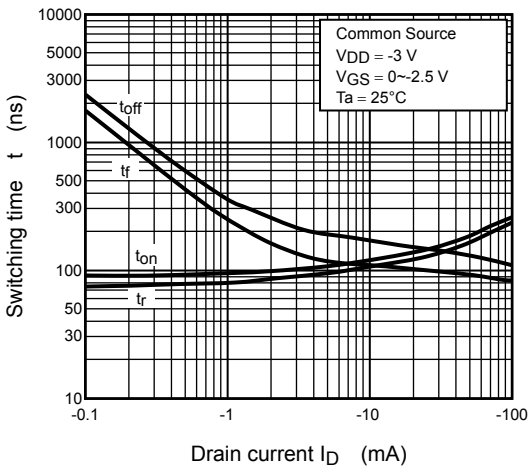
$I_{DR} - V_{DS}$



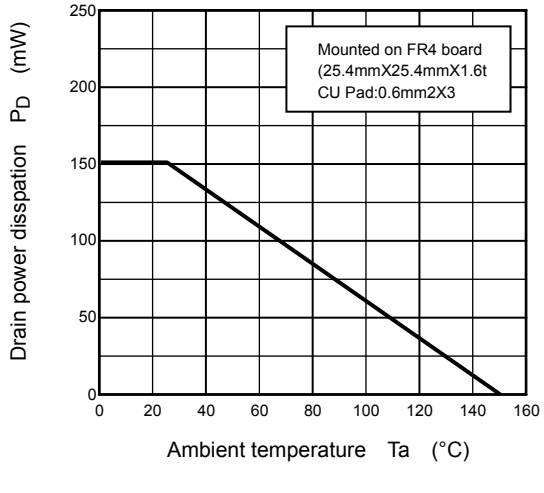
$c - V_{DS}$



$t - I_D$



$P_D - Ta$



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