

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type

SSM5N05FU

High Speed Switching Applications

- Optimum for high-density mounting in small packages
- Low on-resistance: $R_{on} = 0.8 \Omega$ (max) (@ $V_{GS} = 4 V$)
: $R_{on} = 1.2 \Omega$ (max) (@ $V_{GS} = 2.5 V$)
- Low gate threshold voltage

Absolute Maximum Ratings ($T_a = 25^\circ C$) (Q1, Q2 Common)

Characteristics		Symbol	Rating	Unit
Drain-Source voltage		V_{DS}	20	V
Gate-Source voltage		V_{GSS}	± 12	V
Drain current	DC	I_D	400	mA
	Pulse	I_{DP}	800	
Drain power dissipation ($T_a = 25^\circ C$)		P_D (Note 1)	300	mW
Channel temperature		T_{ch}	150	$^\circ C$
Storage temperature range		T_{stg}	-55~150	$^\circ C$

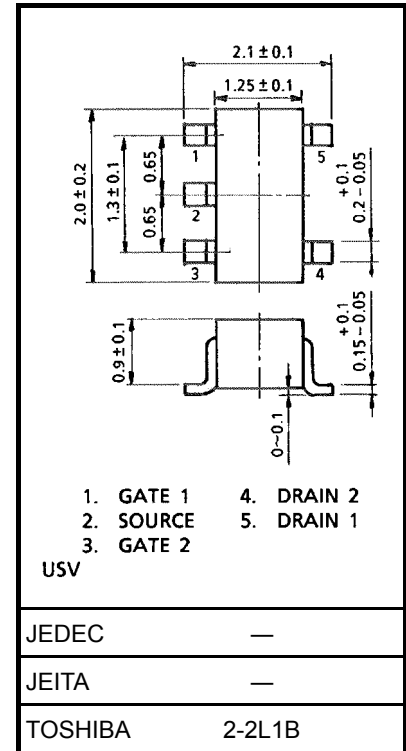
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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: 0.32 mm² × 5)

Handling Precaution

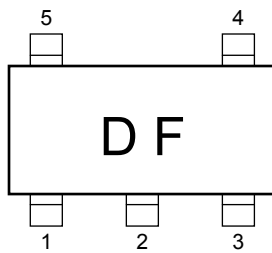
When handling individual devices (which are not yet mounted on a circuit board), be sure that the environment is protected against electrostatic electricity. Operators should wear anti-static clothing, and containers and other objects that come into direct contact with devices should be made of anti-static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

Unit: mm

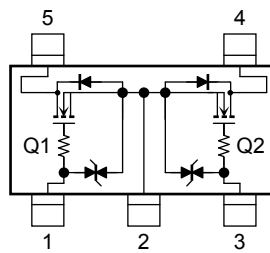


Weight: 6 mg (typ.)

Marking



Equivalent Circuit (top view)



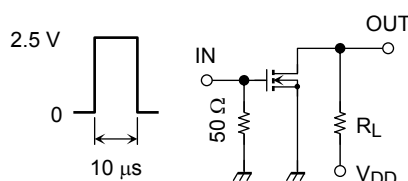
Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	I_{GSS}	$V_{GS} = \pm 12\text{ V}, V_{DS} = 0$	—	—	± 1	μA
Drain-Source breakdown voltage	$V_{(BR)DSS}$	$I_D = 1\text{ mA}, V_{GS} = 0$	20	—	—	V
Drain cut-off current	I_{DSS}	$V_{DS} = 20\text{ V}, V_{GS} = 0$	—	—	1	μA
Gate threshold voltage	V_{th}	$V_{DS} = 3\text{ V}, I_D = 0.1\text{ mA}$	0.6	—	1.1	V
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 3\text{ V}, I_D = 200\text{ mA}$ (Note2)	350	—	—	mS
Drain-Source on-resistance	$R_{DS(ON)}$	$I_D = 200\text{ mA}, V_{GS} = 4\text{ V}$ (Note2)	—	0.6	0.8	Ω
		$I_D = 200\text{ mA}, V_{GS} = 2.5\text{ V}$ (Note2)	—	0.85	1.2	
Input capacitance	C_{iss}	$V_{DS} = 3\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	—	22	—	pF
Reverse transfer capacitance	C_{rss}		—	9	—	pF
Output capacitance	C_{oss}		—	21	—	pF
Switching time	Turn-on time	t_{on}	$V_{DD} = 3\text{ V}, I_D = 100\text{ mA},$		—	ns
	Turn-off time	t_{off}	$V_{GS} = 0 \sim 2.5\text{ V}$			

Note2: Pulse test

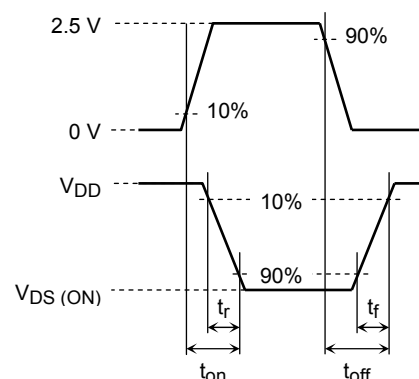
Switching Time Test Circuit

(a) Test circuit



$V_{DD} = 3\text{ V}$
 Duty $\leq 1\%$
 V_{IN} : $t_r, t_f < 5\text{ ns}$
 ($Z_{out} = 50\ \Omega$)
 Common Source
 $T_a = 25^\circ\text{C}$

(b) V_{IN}



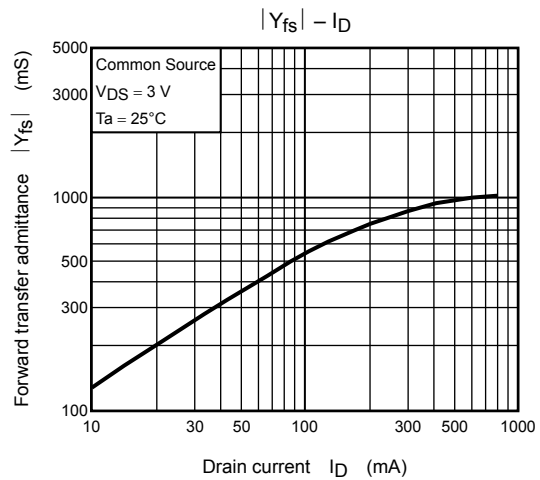
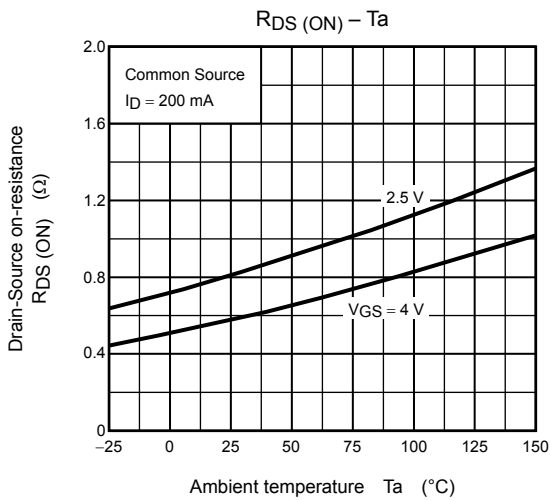
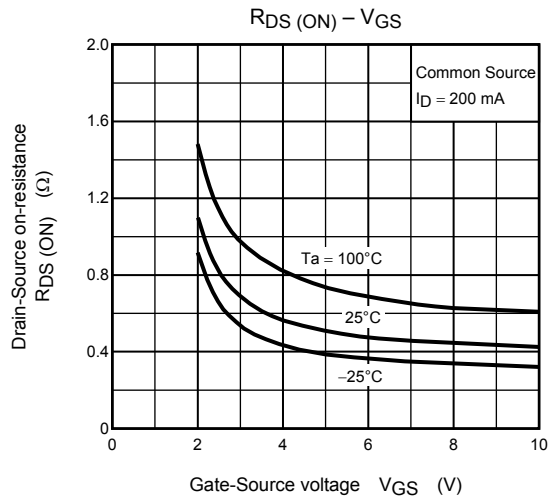
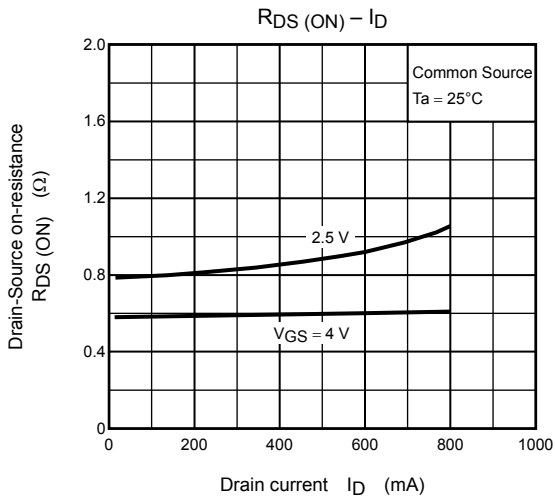
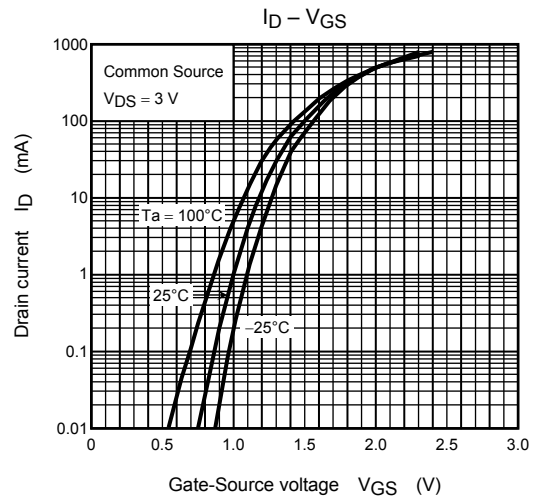
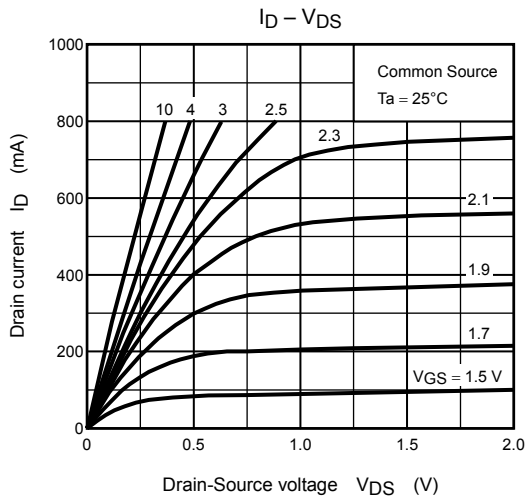
(c) V_{OUT}

Precaution

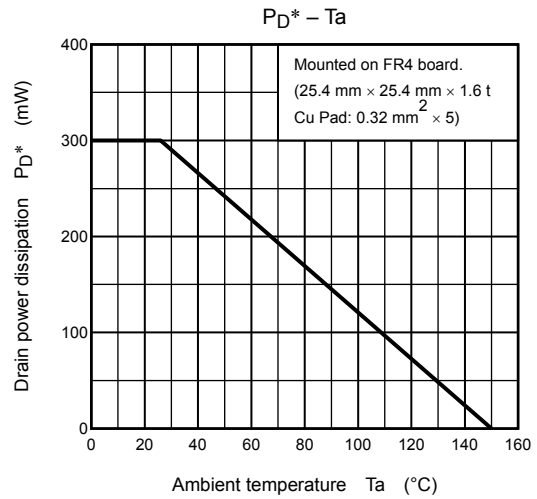
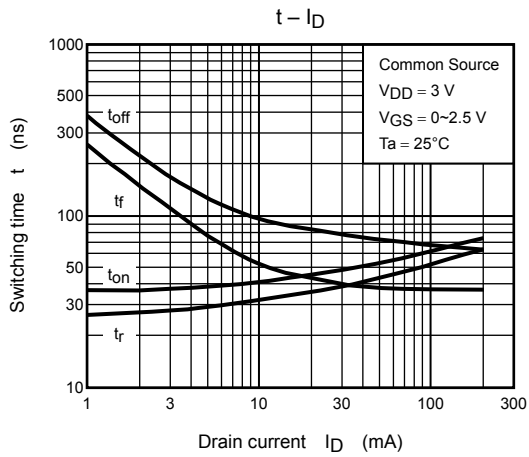
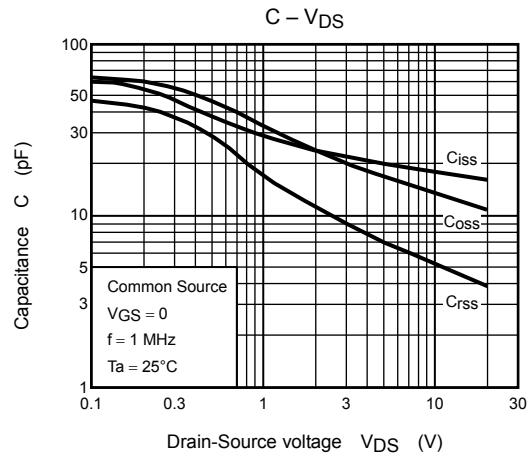
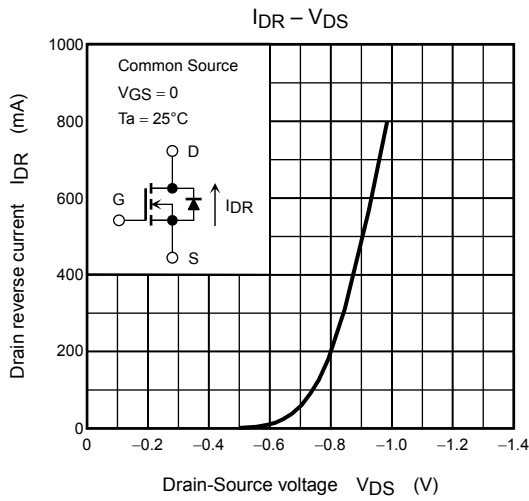
V_{th} can be expressed as the voltage between gate and source when the low operating current value is $I_D = 100\ \mu\text{A}$ for this product. For normal switching operation, $V_{GS(on)}$ requires a higher voltage than V_{th} and $V_{GS(off)}$ requires a lower voltage than V_{th} . (The relationship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

Please take this into consideration when using the device.

(Q1, Q2 common)



(Q1, Q2 common)



*: Total rating

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20070701-EN GENERAL

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