

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type

SSM5N05FU

High Speed Switching Applications

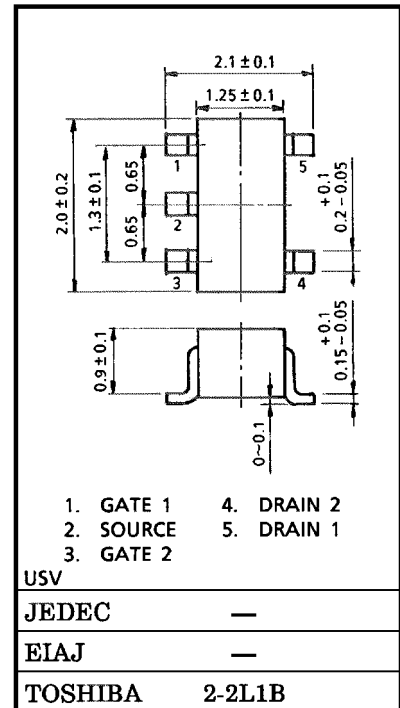
- Small package
- Low on resistance : $R_{on} = 0.8 \Omega$ (max) (@ $V_{GS} = 4 V$)
: $R_{on} = 1.2 \Omega$ (max) (@ $V_{GS} = 2.5 V$)
- Low gate threshold voltage

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 (Note1)	300	mW
Channel temperature		T_{ch}	150	$^\circ C$
Storage temperature range		T_{stg}	$-55 \sim 150$	$^\circ C$

Note1: Total rating, mounted on FR4 board
(25.4 mm $\times$ 25.4 mm $\times$ 1.6 t, Cu Pad: 0.32 mm² $\times$ 5)

Unit in mm



Handling Precaution

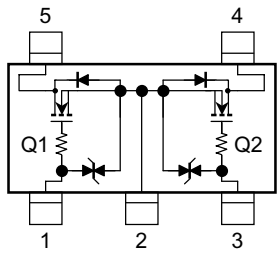
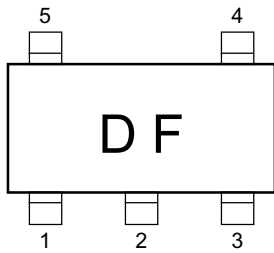
When handling individual devices (which are not yet mounting on a circuit board), be sure that the environment is protected against electrostatic electricity. Operators should wear anti-static clothing, and containers and other objects that come into direct contact with devices should be made of anti-static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

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Marking

Equivalent Circuit (top view)



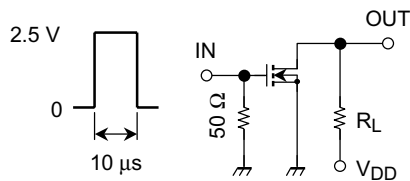
Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)

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}	$V_{DD} = 3\text{ V}, I_D = 100\text{ mA},$ $V_{GS} = 0 \sim 2.5\text{ V}$	—	60	—	ns
	Turn-off time	t_{off}		—	70	—	

Note2: Pulse test

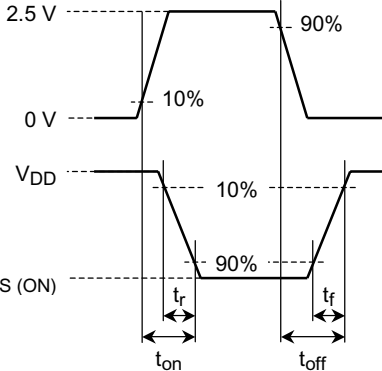
Switching Time Test Circuit

(a) Test circuit

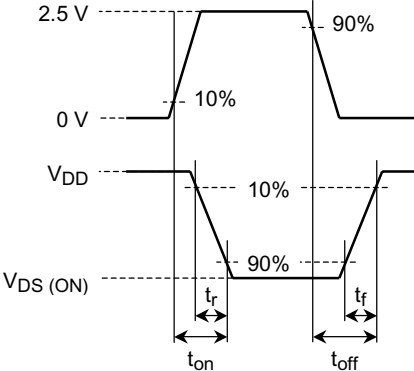


$V_{DD} = 3\text{ V}$
Duty $\leq 1\%$
 V_{IN} : $t_r, t_f < 5\text{ ns}$
($Z_{out} = 50\ \Omega$)
Common Source
 $T_a = 25^\circ\text{C}$

(b) V_{IN}



(c) V_{OUT}

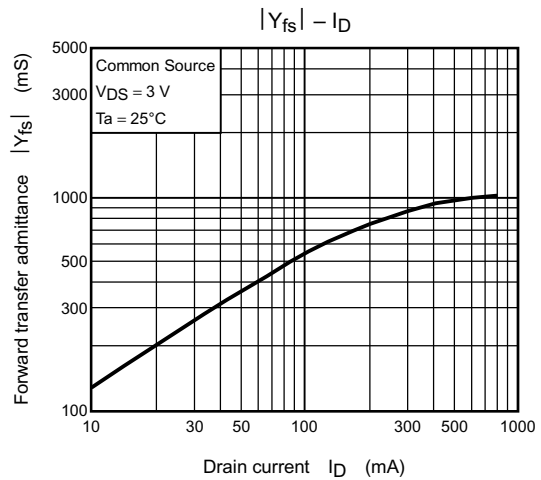
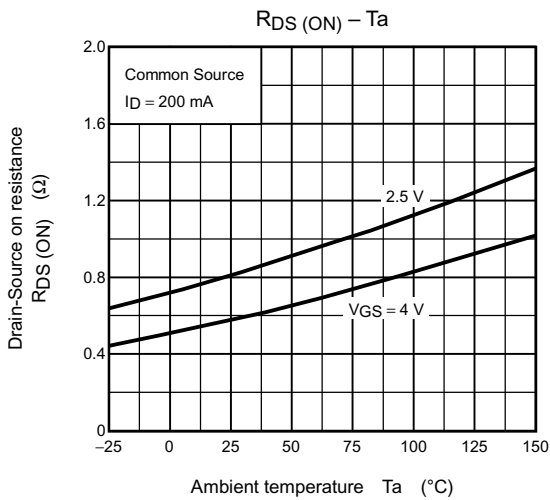
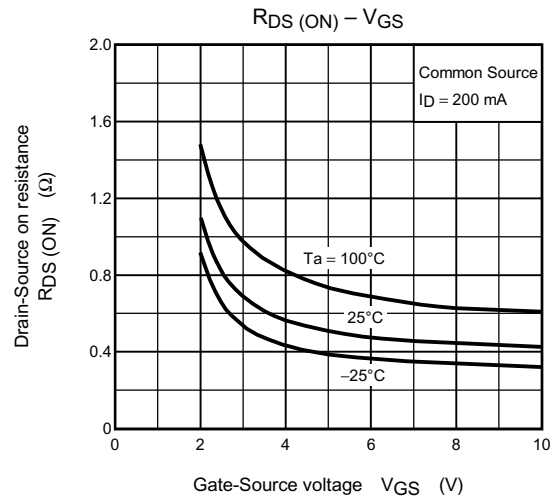
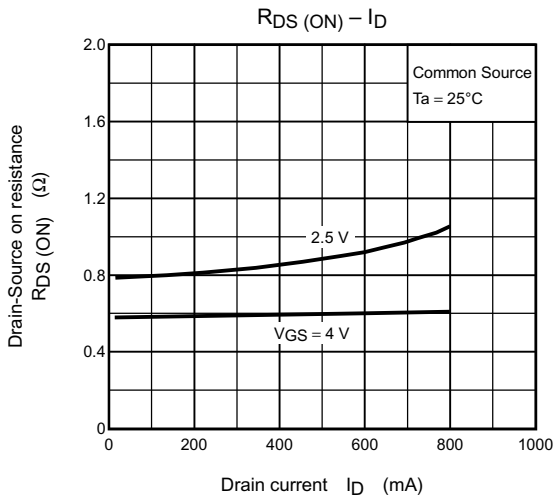
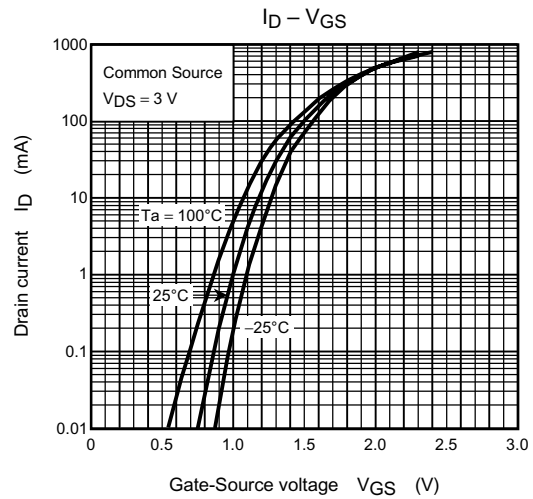
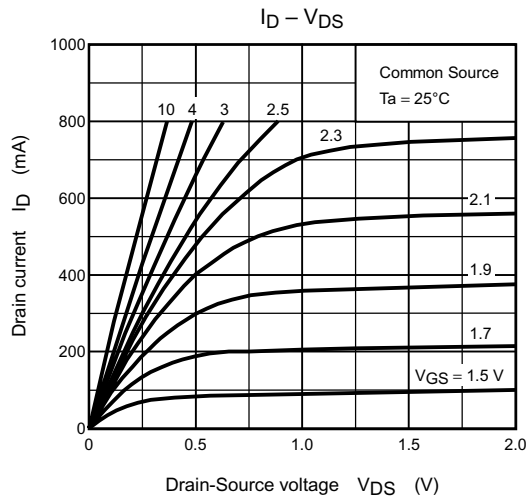


Precaution

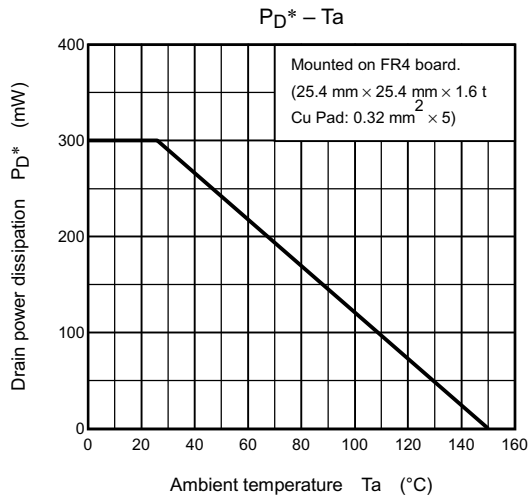
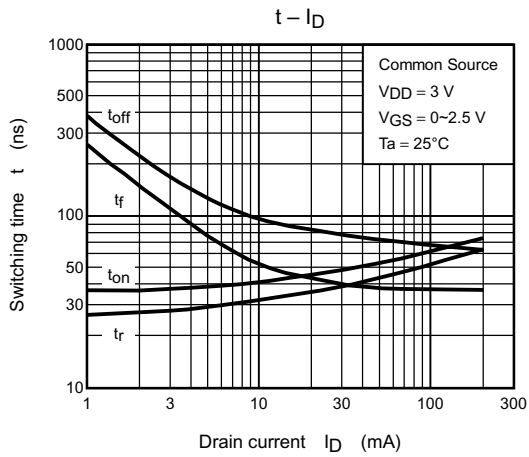
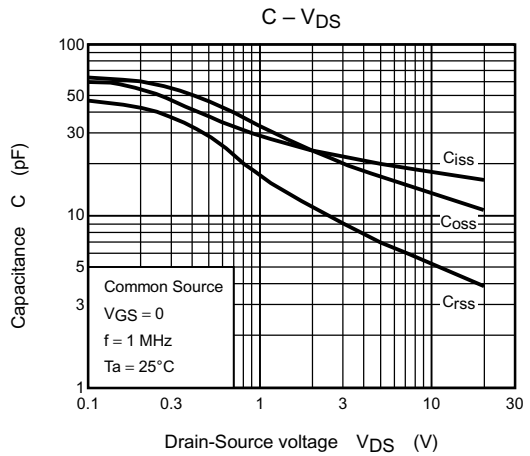
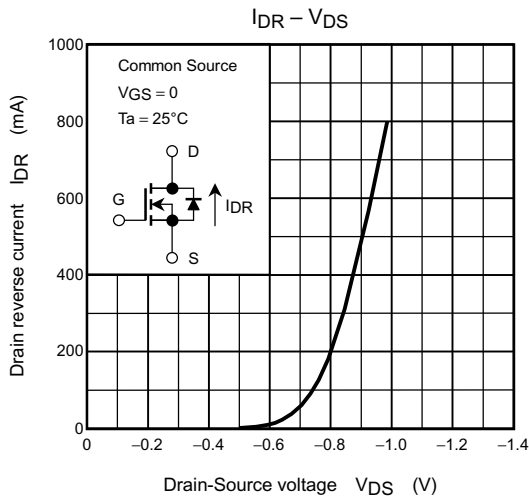
V_{th} can be expressed as voltage between gate and source when low operating current value is $I_D = 100\ \mu\text{A}$ for this product. For normal switching operation, $V_{GS(ON)}$ requires higher voltage than V_{th} and $V_{GS(OFF)}$ requires lower voltage than V_{th} . (Relationship can be established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

Please take this into consideration for using the device. V_{GS} recommended voltage of 2.5 V or higher to turn on this product.

(Q1, Q2 common)



(Q1, Q2 common)



*: Total rating