

TOSHIBA Field Effect Transistor
Silicon P Channel MOS Type

SSM5P05FU

Power Management Switch

High Speed Switching Applications

- Small package
- Low on resistance : $R_{on} = 3.3 \Omega$ (max) (@ $V_{GS} = -4$ V)
: $R_{on} = 4.0 \Omega$ (max) (@ $V_{GS} = -2.5$ V)
- Low gate threshold voltage

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

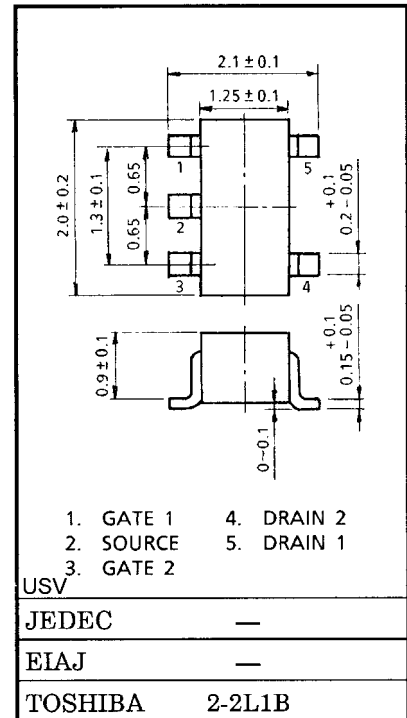
Characteristics		Symbol	Rating	Unit
Drain-Source voltage		V_{DS}	-20	V
Gate-Source voltage		V_{GSS}	± 12	V
Drain current	DC	I_D	-200	mA
	Pulse	I_{DP}	-400	
Drain power dissipation ($T_a = 25^\circ\text{C}$)		P_D (Note1)	300	mW
Channel temperature		T_{ch}	150	$^\circ\text{C}$
Storage temperature range		T_{stg}	-55~150	$^\circ\text{C}$

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)

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.

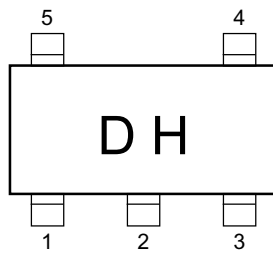
Unit in mm



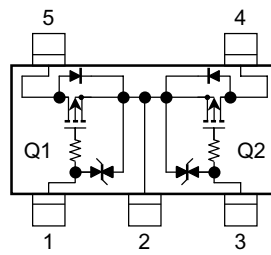
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Marking



Equivalent Circuit (top view)



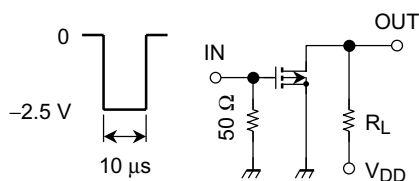
Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)

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} $	$V_{DS} = -3 \text{ V}, I_D = -50 \text{ mA}$ (Note2)	100	—	—	mS
Drain-Source ON resistance	$R_{DS(ON)}$	$I_D = -100 \text{ mA}, V_{GS} = -4 \text{ V}$ (Note2)	—	2.1	3.3	Ω
		$I_D = -50 \text{ mA}, V_{GS} = -2.5 \text{ V}$ (Note2)	—	3.2	4.0	
Input capacitance	C_{iss}	$V_{DS} = -3 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$	—	27	—	pF
Reverse transfer capacitance	C_{rss}		—	7	—	pF
Output capacitance	C_{oss}		—	21	—	pF
Switching time	Turn-on time	t_{on}	$V_{DD} = -3 \text{ V}, I_D = -50 \text{ mA},$ $V_{GS} = 0 \sim -2.5 \text{ V}$	70	—	ns
	Turn-off time	t_{off}		70	—	

Note2: Pulse test

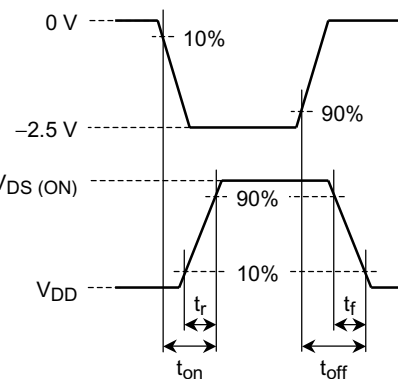
Switching Time Test Circuit (Q1, Q2 Common)

(a) Test circuit

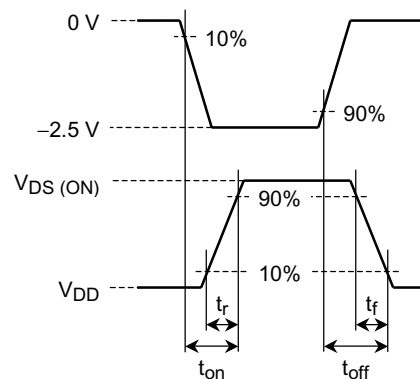


$V_{DD} = -3 \text{ V}$
Duty $\leq 1\%$
 V_{IN} : $t_r, t_f < 5 \text{ ns}$
($Z_{out} = 50 \Omega$)
Common Source
 $T_a = 25^\circ\text{C}$

(b) V_{IN}



(c) V_{OUT}

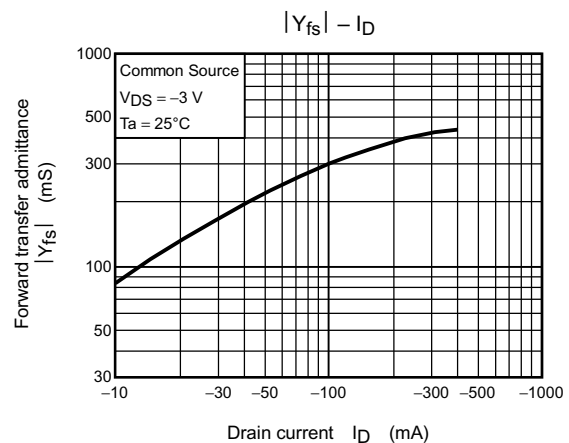
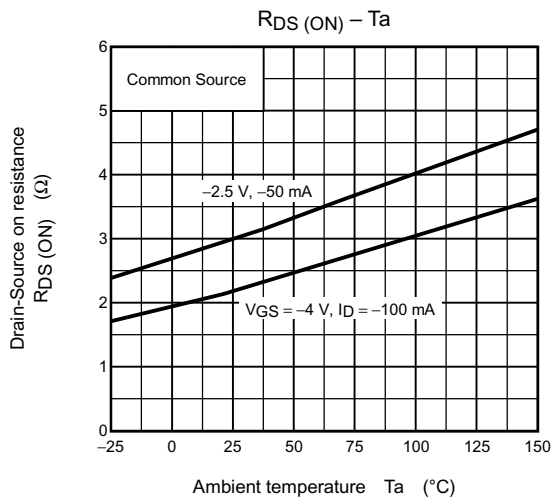
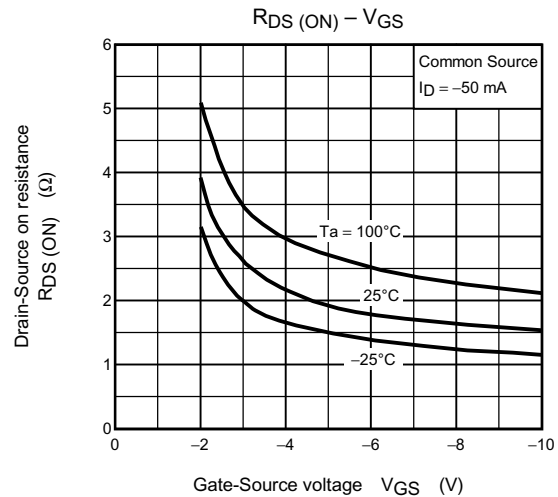
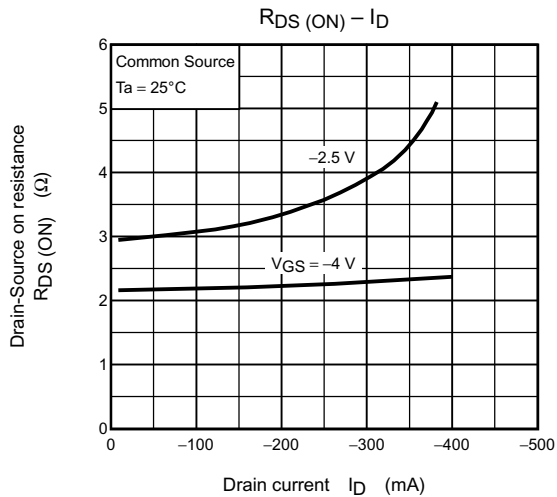
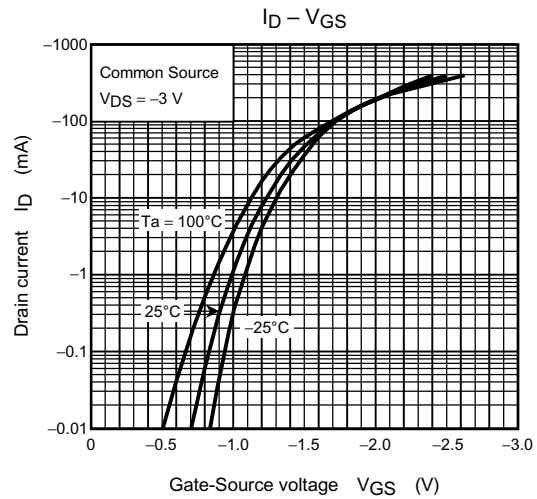
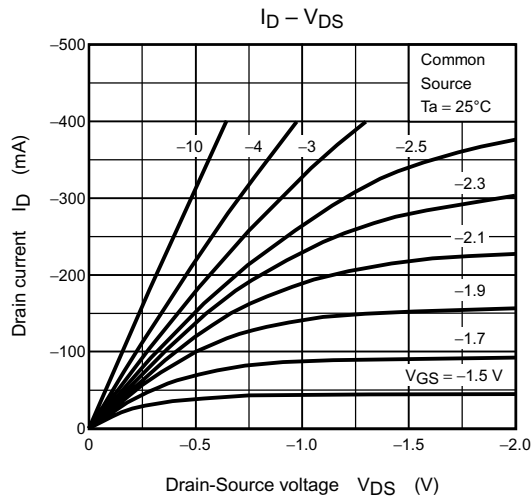


Precaution

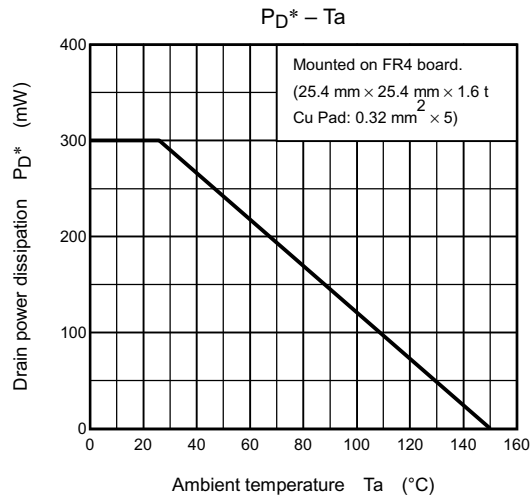
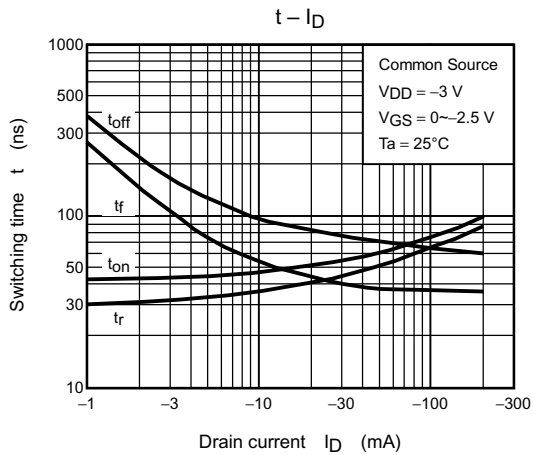
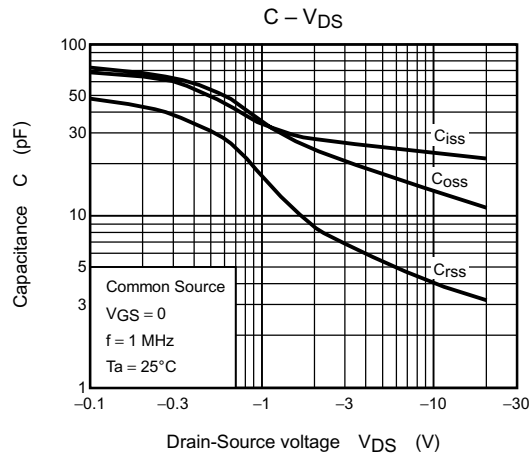
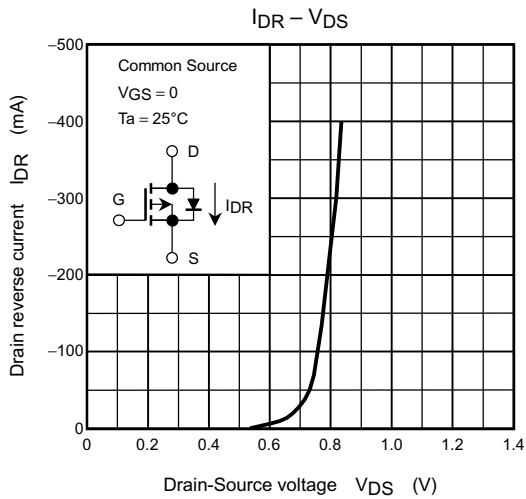
V_{th} can be expressed as voltage between gate and source when low operating current value is $I_D = -100 \mu\text{A}$ for this product. For normal switching operation, $V_{GS(ON)}$ requires higher voltage than V_{th} and $V_{GS(OFF)}$ requires lower voltage than V_{th} . (Relationship can be established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