

TOSHIBA Field Effect Transistor Silicon P Channel MOS Type

# SSM5P05FU

Power Management Switch  
High Speed Switching Applications

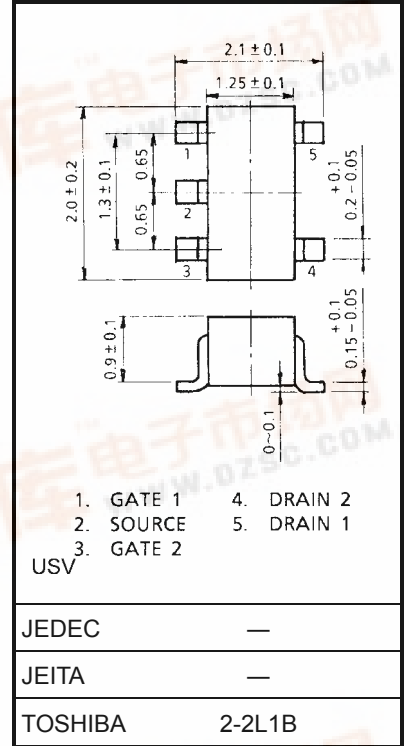
Unit: mm

- 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 (Ta = 25°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 (Ta = 25°C)		$P_D$ (Note1)	300	mW
Channel temperature		$T_{ch}$	150	°C
Storage temperature range		$T_{stg}$	-55~150	°C

Note1: Total rating, mounted on FR4 board  
(25.4 mm × 25.4 mm × 1.6 t, Cu Pad: 0.32 mm<sup>2</sup> × 5)

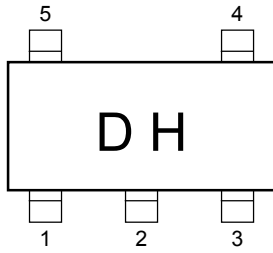


Weight: 6.2 mg (typ.)

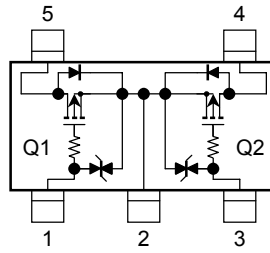
### Handling Precaution

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.

**Marking**



**Equivalent Circuit (top view)**



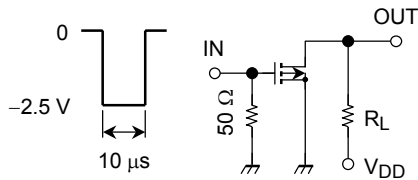
**Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)**

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit	
Gate leakage current	$I_{GSS}$	$V_{GS} = \pm 12\text{ V}, V_{DS} = 0$	—	—	$\pm 1$	$\mu\text{A}$	
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	$\mu\text{A}$	
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	$\Omega$	
		$I_D = -50\text{ mA}, V_{GS} = -2.5\text{ V}$ (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

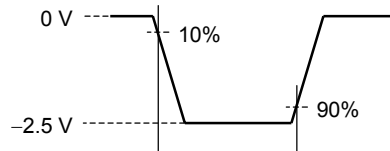
**Switching Time Test Circuit (Q1, Q2 Common)**

**(a) Test circuit**

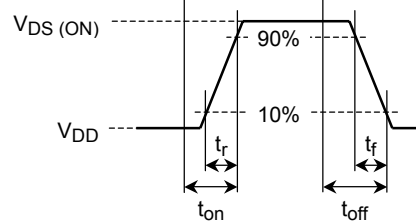


$V_{DD} = -3\text{ V}$   
 Duty  $\leq 1\%$   
 $V_{IN}$ :  $t_r, t_f < 5\text{ ns}$   
 ( $Z_{out} = 50\ \Omega$ )  
 Common Source  
 $T_a = 25^\circ\text{C}$

**(b)  $V_{IN}$**



**(c)  $V_{OUT}$**

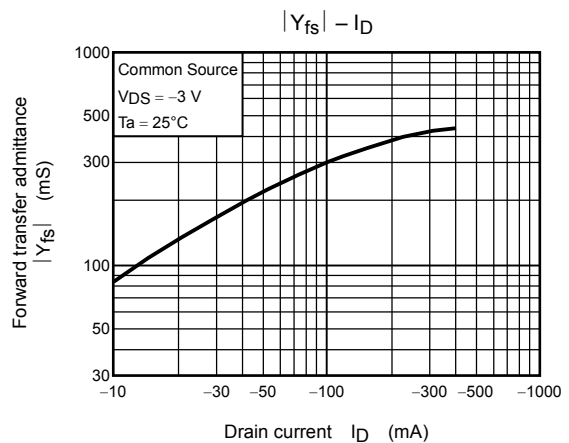
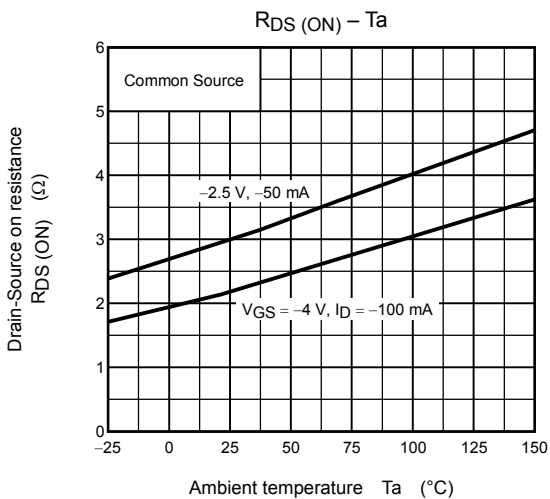
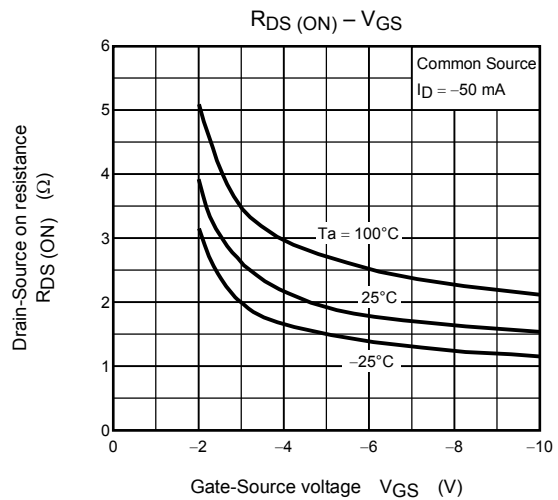
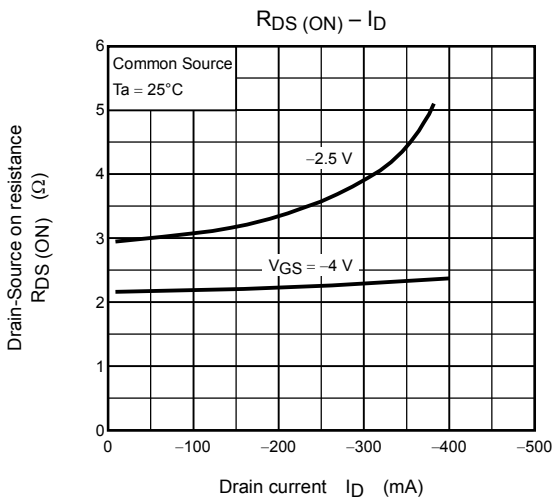
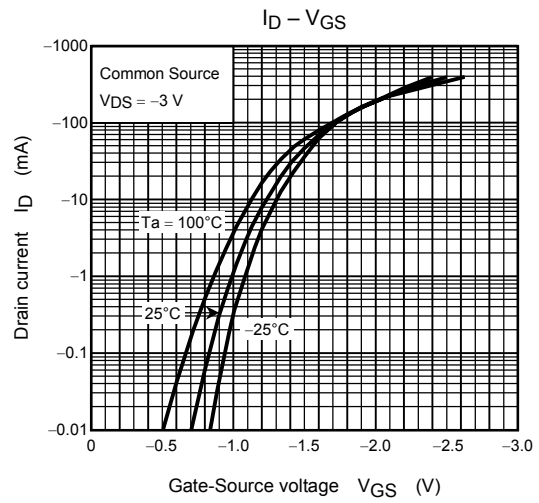
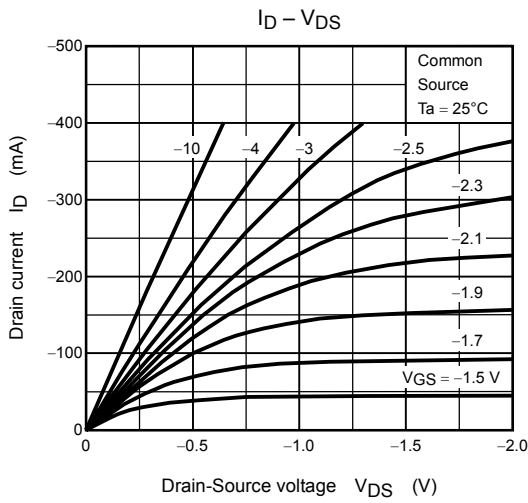


**Precaution**

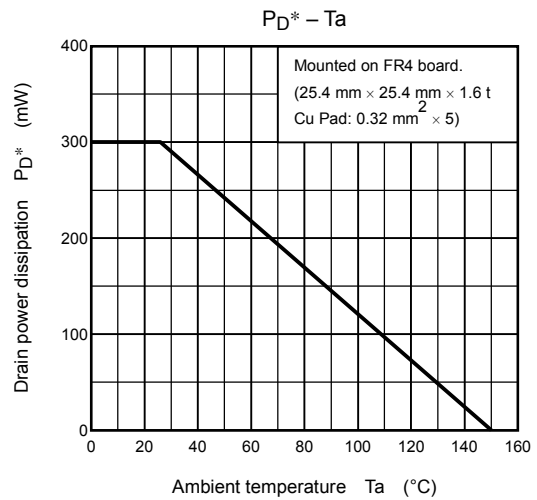
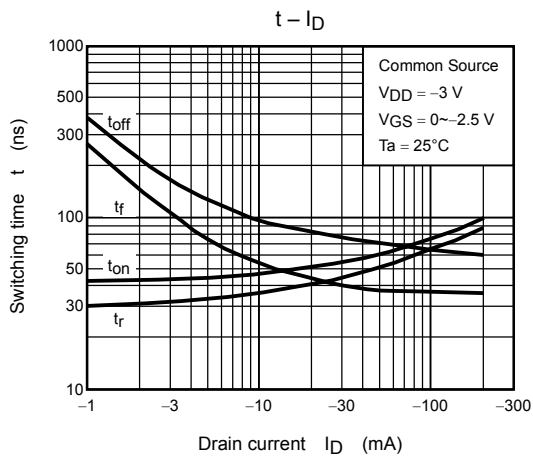
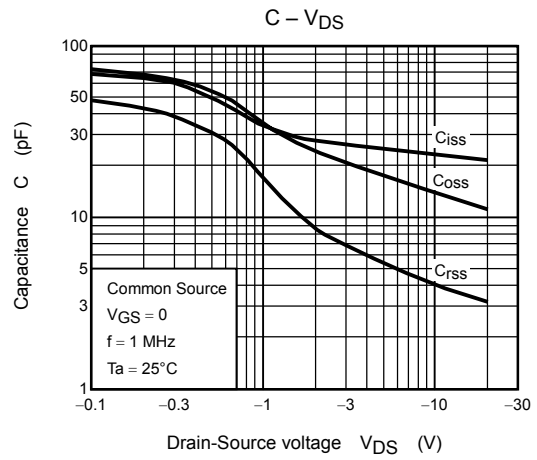
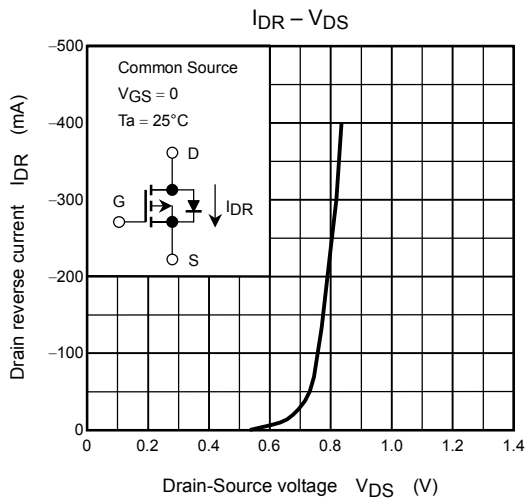
$V_{th}$  can be expressed as voltage between gate and source when low operating current value is  $I_D = -100\ \mu\text{A}$  for this product. For normal switching operation,  $V_{GS(ON)}$  requires higher voltage than  $V_{th}$  and  $V_{GS(OFF)}$  requires lower voltage than  $V_{th}$ . (Relationship 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  $-2.5\text{ V}$  or higher to turn on this product.

(Q1, Q2 common)



(Q1, Q2 common)



\*: Total rating

**RESTRICTIONS ON PRODUCT USE**

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