

TOSHIBA Field Effect Transistor Silicon P Channel MOS Type

## SSM5P15FE

High Speed Switching Applications

Analog Switch Applications

- Small package
- Low ON resistance :  $R_{on} = 12 \Omega$  (max) (@ $V_{GS} = -4 V$ )  
:  $R_{on} = 32 \Omega$  (max) (@ $V_{GS} = -2.5 V$ )

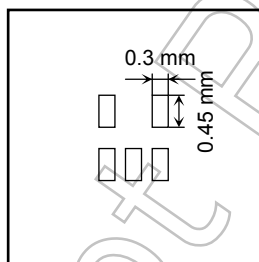
### Absolute Maximum Ratings ( $T_a = 25^\circ C$ ) (Q1, Q2 Common)

Characteristics		Symbol	Rating	Unit
Drain-Source voltage		$V_{DS}$	-30	V
Gate-Source voltage		$V_{GSS}$	$\pm 20$	V
Drain current	DC	$I_D$	-100	mA
	Pulse	$I_{DP}$	-200	
Power dissipation ( $T_a = 25^\circ C$ )		$P_D$ (Note 1)	150	mW
Channel temperature		$T_{ch}$	150	$^\circ C$
Storage temperature range		$T_{stg}$	-55 to 150	$^\circ C$

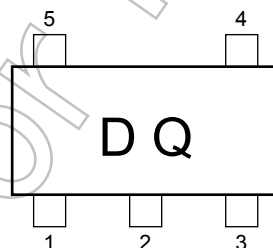
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

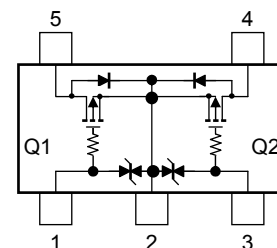
Note 1: Total rating, mounted on FR4 board  
(25.4 mm  $\times$  25.4 mm  $\times$  1.6 t, Cu Pad: 0.135 mm<sup>2</sup>  $\times$  5)



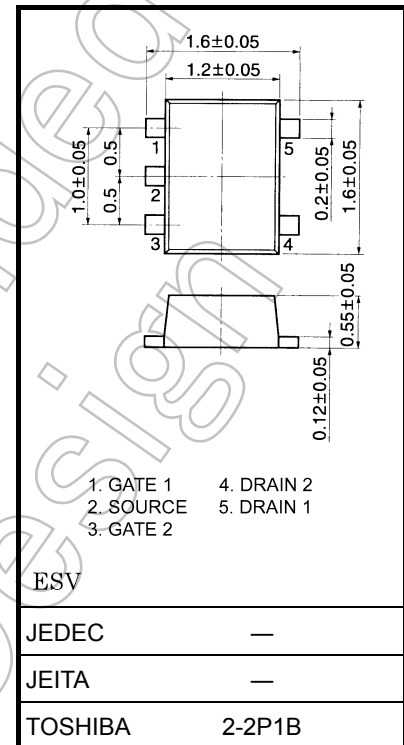
### Marking



### Equivalent Circuit (top view)



Unit: mm



Weight: 0.003g(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.

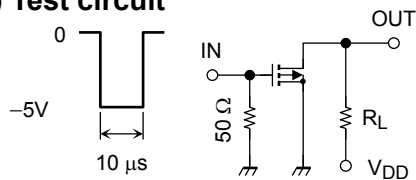
Start of commercial production  
2002-03

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

Characteristic		Symbol	Test Condition	MIN	TYP.	MAX	UNIT
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0$	—	—	$\pm 1$	$\mu\text{A}$
Drain-Source breakdown voltage		$V_{(BR)DSS}$	$I_D = -0.1\text{ mA}, V_{GS} = 0$	-30	—	—	V
Drain cut-off current		$I_{DSS}$	$V_{DS} = -30\text{ V}, V_{GS} = 0$	—	—	-1	$\mu\text{A}$
Gate threshold voltage		$V_{th}$	$V_{DS} = -3\text{ V}, I_D = -0.1\text{ mA}$	-1.1	—	-1.7	V
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = -3\text{ V}, I_D = -10\text{ mA}$	20	—	—	mS
Drain-Source ON resistance		$R_{DS(ON)}$	$I_D = -10\text{ mA}, V_{GS} = -4\text{ V}$	—	8	12	$\Omega$
			$I_D = -1\text{ mA}, V_{GS} = -2.5\text{ V}$	—	14	32	
Input capacitance		$C_{iss}$	$V_{DS} = -3\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	—	9.1	—	$\mu\text{F}$
Reverse transfer capacitance		$C_{rss}$		—	3.5	—	$\mu\text{F}$
Output capacitance		$C_{oss}$		—	8.6	—	$\mu\text{F}$
Switching time	Turn-on time	$t_{on}$	$V_{DD} = -5\text{ V}, I_D = -10\text{ mA},$ $V_{GS} = 0\text{ to }-5\text{ V}$	—	65	—	ns
	Turn-off time	$t_{off}$		—	175	—	

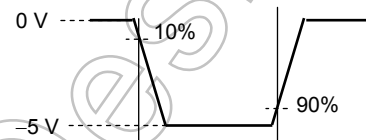
**Switching Time Test Circuit**

**(a) Test circuit**

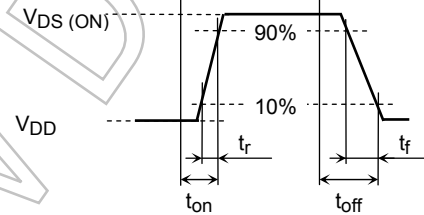


$V_{DD} = -5\text{ V}$   
 Duty  $\leq 1\%$   
 $V_{IN}$ :  $t_r, t_f < 5\text{ ns}$   
 ( $Z_{out} = 50\ \Omega$ )  
 Common Source  
 $T_a = 25^\circ\text{C}$

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



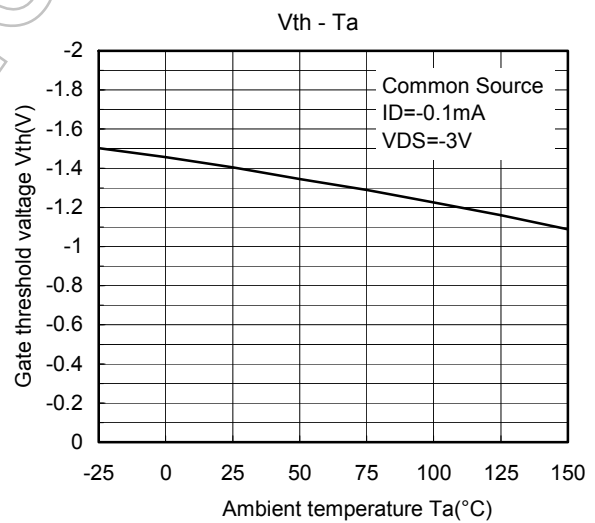
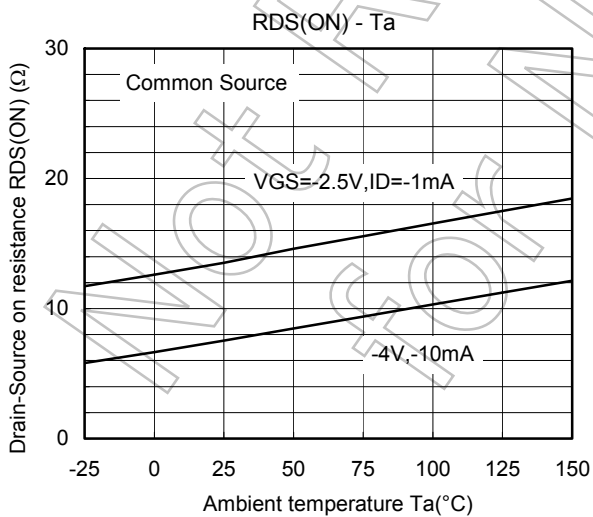
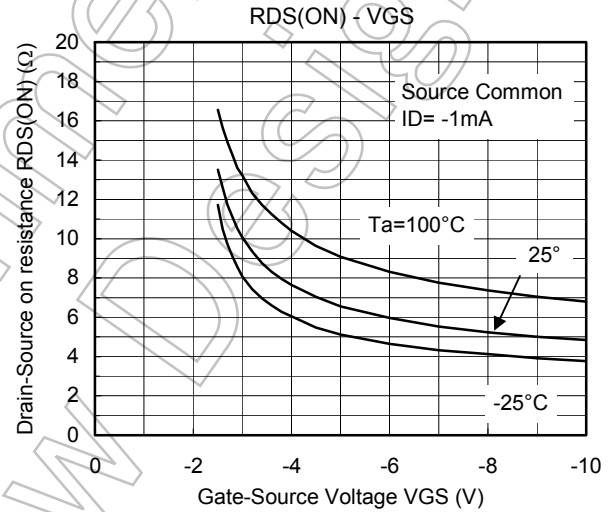
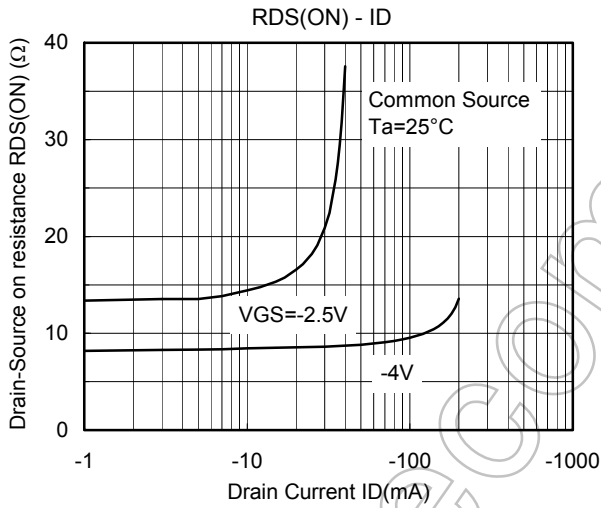
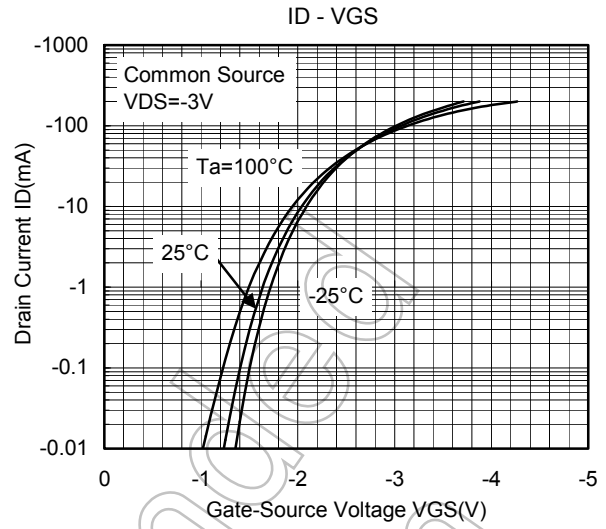
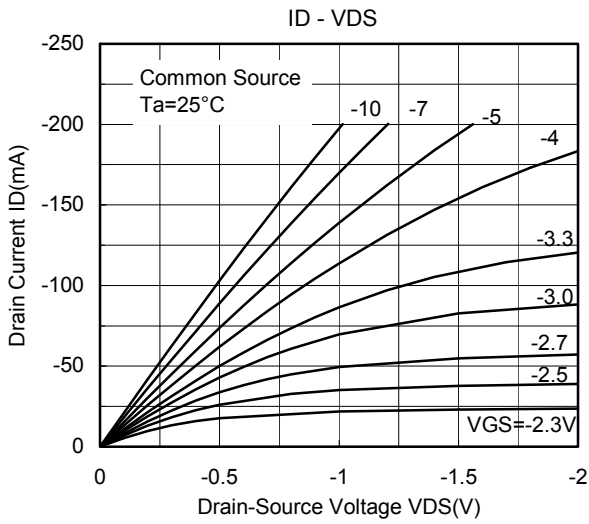
**(c)  $V_{OUT}$**

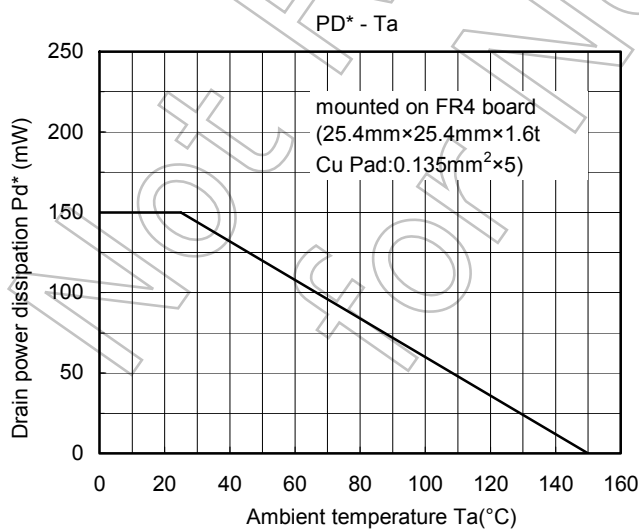
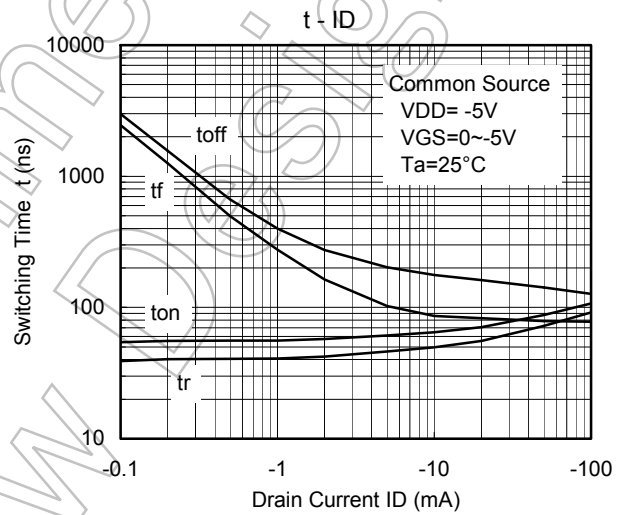
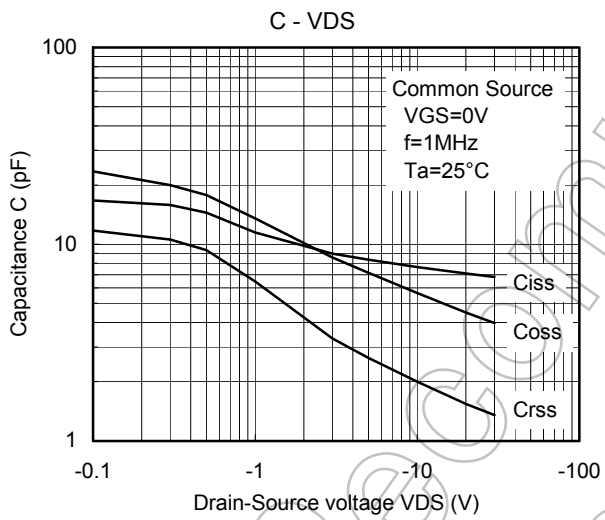
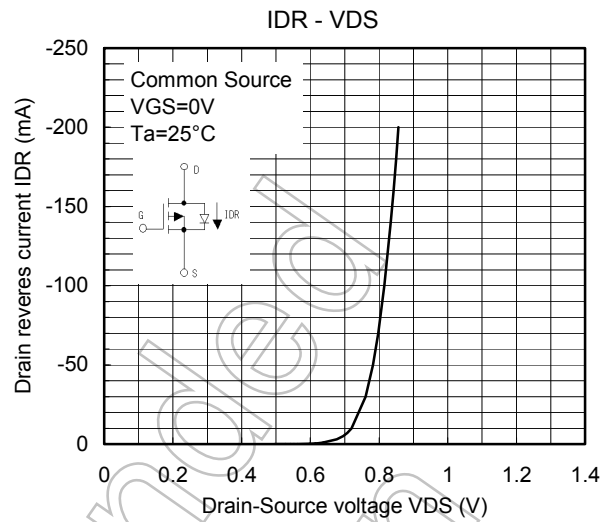
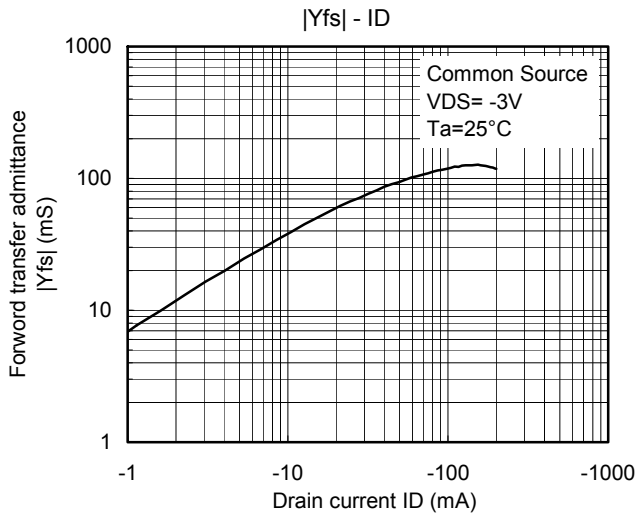


**Precaution**

$V_{th}$  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.





\*: Total Rating

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