

# SSM6J53FE

- High-Speed Switching Applications
- Power Management Switch Applications

Unit : mm

- 1.5 V drive
- Suitable for high-density mounting due to compact package
- Low on-resistance :  $R_{ON} = 136 \text{ m}\Omega$  (max) (@ $V_{GS} = -2.5 \text{ V}$ )  
                           :  $R_{ON} = 204 \text{ m}\Omega$  (max) (@ $V_{GS} = -1.8 \text{ V}$ )  
                           :  $R_{ON} = 364 \text{ m}\Omega$  (max) (@ $V_{GS} = -1.5 \text{ V}$ )

### Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Drain-Source voltage	$V_{DS}$	-20	V
Gate-Source voltage	$V_{GSS}$	$\pm 8$	V
Drain current	DC	$I_D$	-1.8
	Pulse	$I_{DP}$	-3.6
Drain power dissipation	$P_D$ (Note 1)	500	mW
Channel temperature	$T_{ch}$	150	°C
Storage temperature range	$T_{stg}$	-55~150	°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.

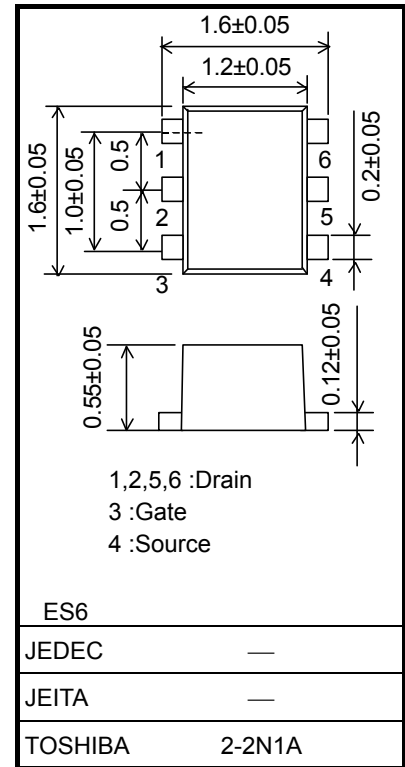
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc.).

Note 1: Mounted on an FR4 board.  
 (25.4 mm × 25.4 mm × 1.6 t, Cu Pad: 645 mm<sup>2</sup>)

### Electrical Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Drain-Source breakdown voltage	$V_{(BR)DSS}$	$I_D = -1 \text{ mA}, V_{GS} = 0$	-20	—	—	V
	$V_{(BR)DSX}$	$I_D = -1 \text{ mA}, V_{GS} = +8 \text{ V}$	-12	—	—	
Drain cut-off current	$I_{DSS}$	$V_{DS} = -20 \text{ V}, V_{GS} = 0$	—	—	-10	μA
Gate leakage current	$I_{GSS}$	$V_{GS} = \pm 8 \text{ V}, V_{DS} = 0$	—	—	$\pm 1$	μA
Gate threshold voltage	$V_{th}$	$V_{DS} = -3 \text{ V}, I_D = -1 \text{ mA}$	-0.3	—	-1.0	V
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = -3 \text{ V}, I_D = -0.9 \text{ A}$ (Note 2)	2.7	5.4	—	S
Drain-Source on-resistance	$R_{DS(ON)}$	$I_D = -1.0 \text{ A}, V_{GS} = -2.5 \text{ V}$ (Note 2)	—	95	136	mΩ
		$I_D = -1.0 \text{ A}, V_{GS} = -1.8 \text{ V}$ (Note 2)	—	122	204	
		$I_D = -0.1 \text{ A}, V_{GS} = -1.5 \text{ V}$ (Note 2)	—	137	364	
Input capacitance	$C_{iss}$	$V_{DS} = -10 \text{ V}, V_{GS} = 0$ $f = 1 \text{ MHz}$	—	568	—	pF
Output capacitance	$C_{oss}$		—	75	—	
Reverse transfer capacitance	$C_{rss}$		—	67	—	
Switching time	Turn-on time	$t_{on}$	$V_{DD} = -10 \text{ V}, I_D = -0.9 \text{ A}$		—	ns
	Turn-off time	$t_{off}$	$V_{GS} = 0 \sim -2.5 \text{ V}, R_G = 4.7 \Omega$		—	
Total gate charge	$Q_g$	$V_{DS} = -16 \text{ V}, I_{DS} = -1.8 \text{ A},$ $V_{GS} = -4 \text{ V}$	—	10.6	—	nC
Gate-Source charge	$Q_{gs}$		—	7.4	—	
Gate-Drain charge	$Q_{gd}$		—	3.3	—	
Drain-Source forward voltage	$V_{DSF}$	$I_D = 1.8 \text{ A}, V_{GS} = 0$ (Note 2)	—	0.8	1.2	V

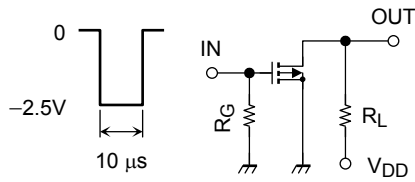
Note 2: Pulse test



Weight: 7.0 mg (typ.)

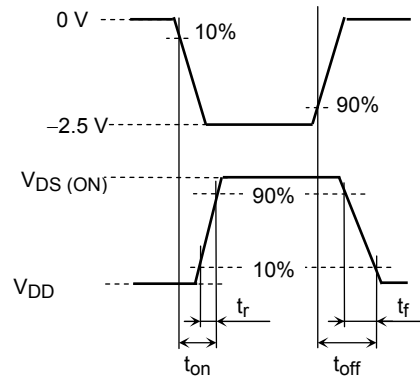
## Switching Time Test Circuit

(a) Test Circuit



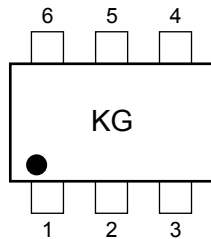
$V_{DD} = -10\text{ V}$   
 $R_G = 4.7\ \Omega$   
 $D.U. \leq 1\%$   
 $V_{IN}: t_r, t_f < 5\text{ ns}$   
 Common Source  
 $T_a = 25^\circ\text{C}$

(b)  $V_{IN}$

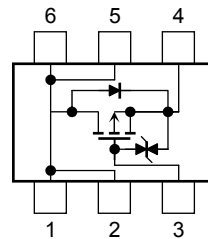


(c)  $V_{OUT}$

## Marking



## Equivalent Circuit (top view)



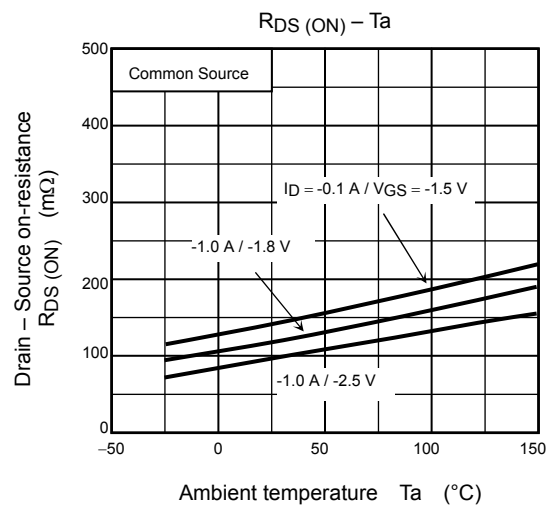
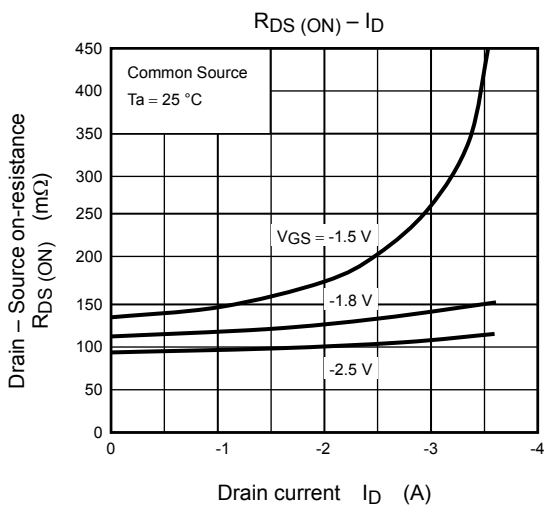
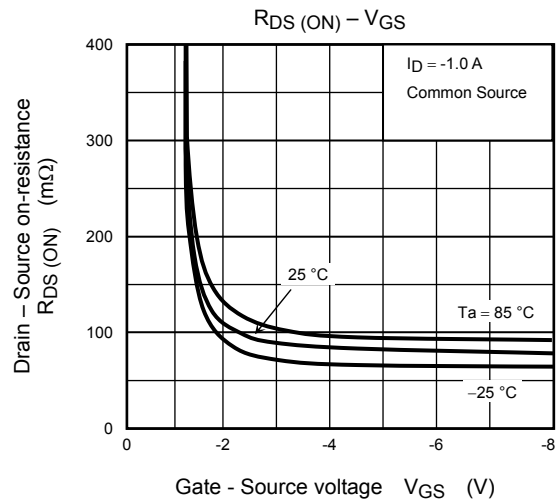
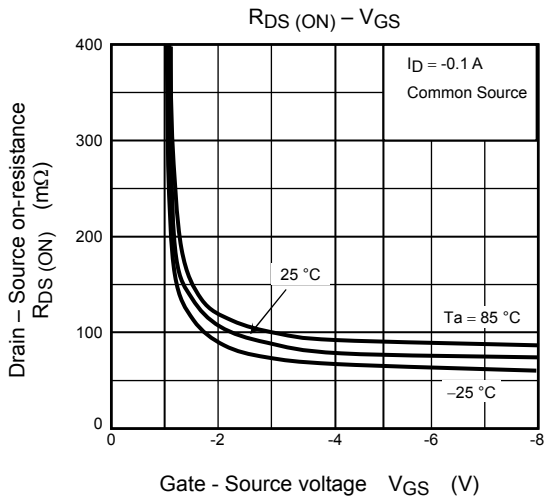
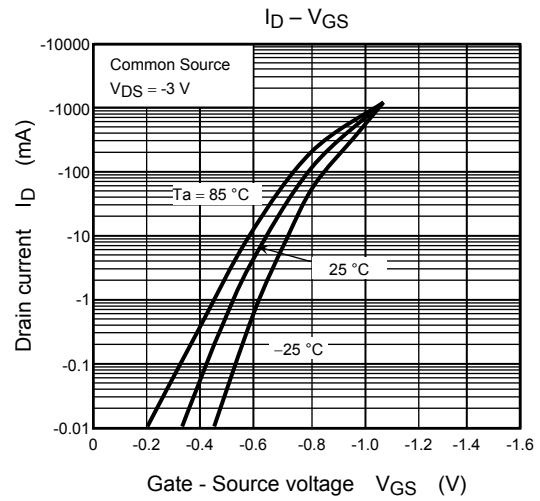
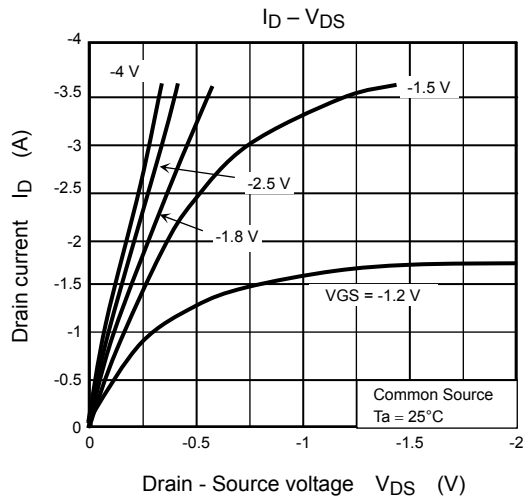
## Precaution

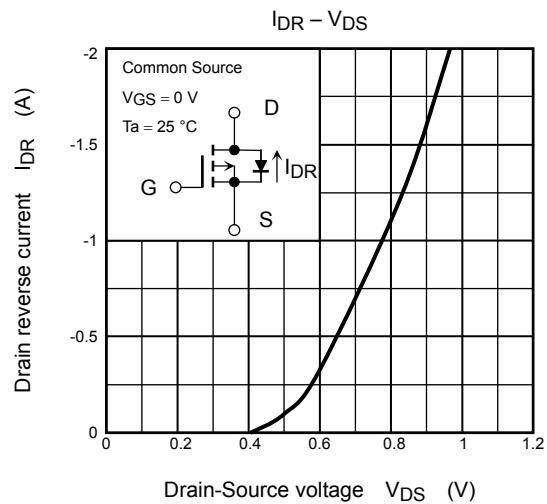
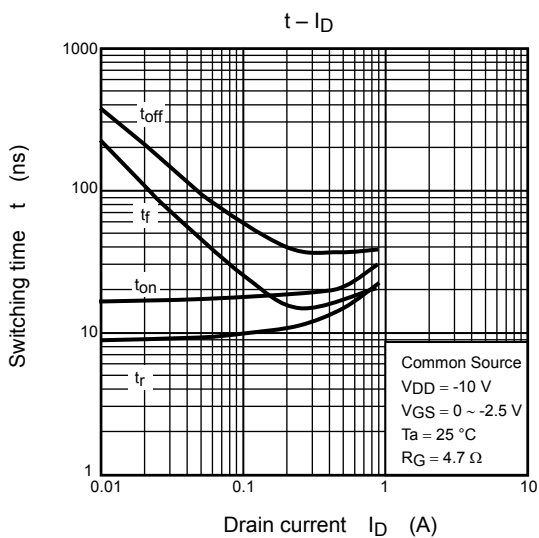
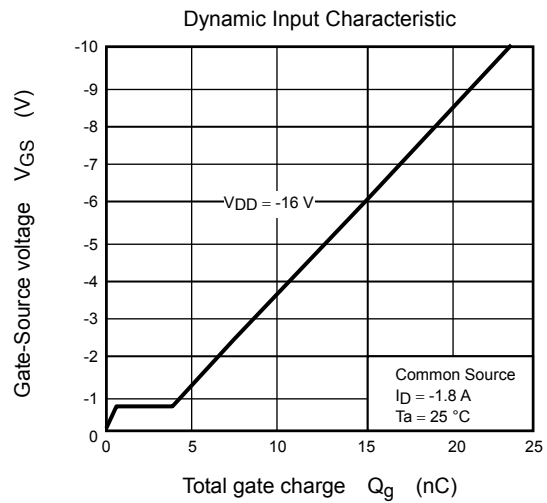
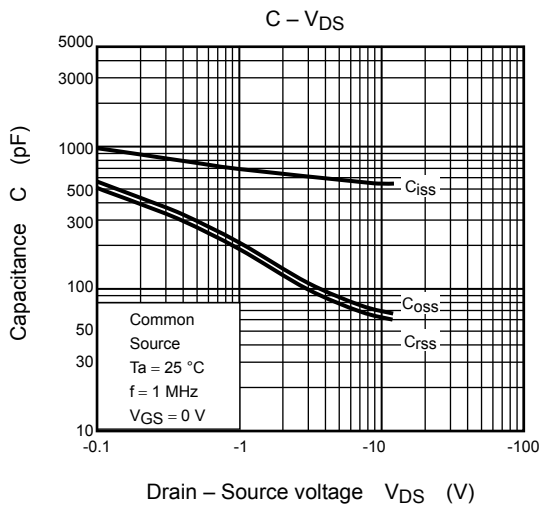
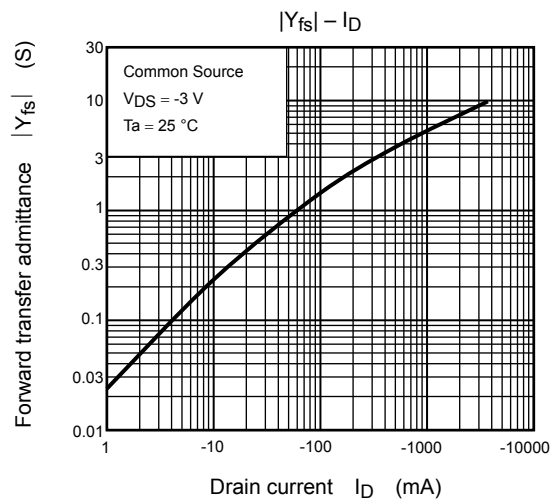
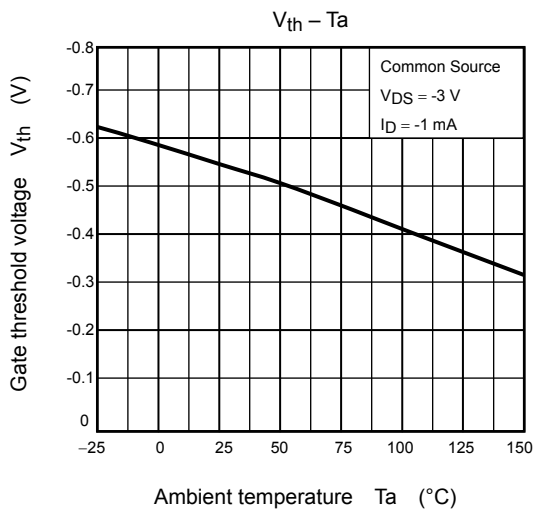
$V_{th}$  can be expressed as the voltage between the gate and source when the low operating current value is  $I_D = -1\text{ mA}$  for this product. For normal switching operation,  $V_{GS(on)}$  requires a higher voltage than  $V_{th}$  and  $V_{GS(off)}$  requires a lower voltage than  $V_{th}$ . (The relationship can be established as follows:  $V_{GS(off)} < V_{th} < V_{GS(on)}$ .)

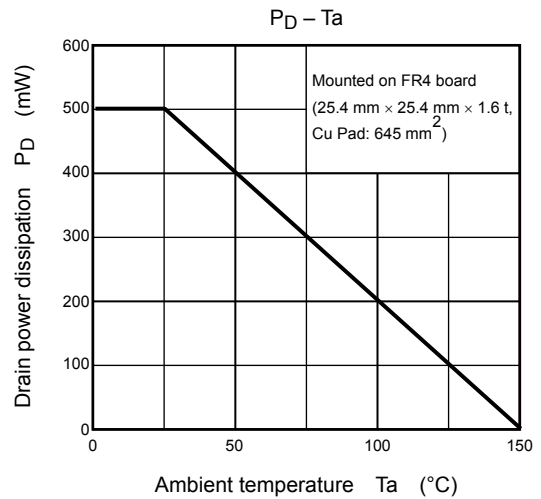
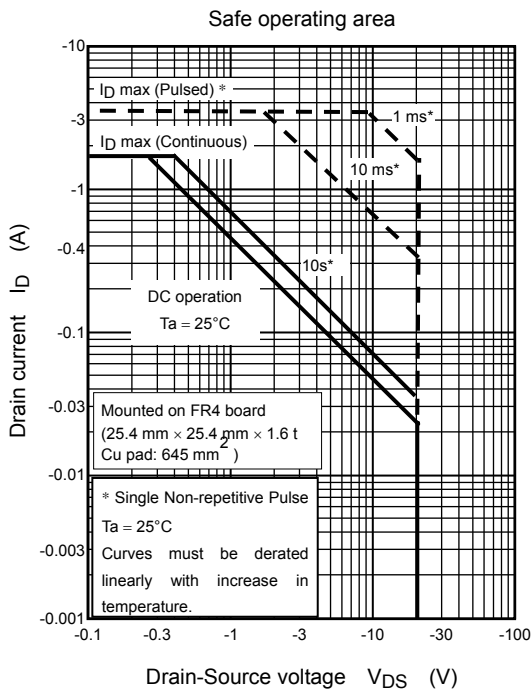
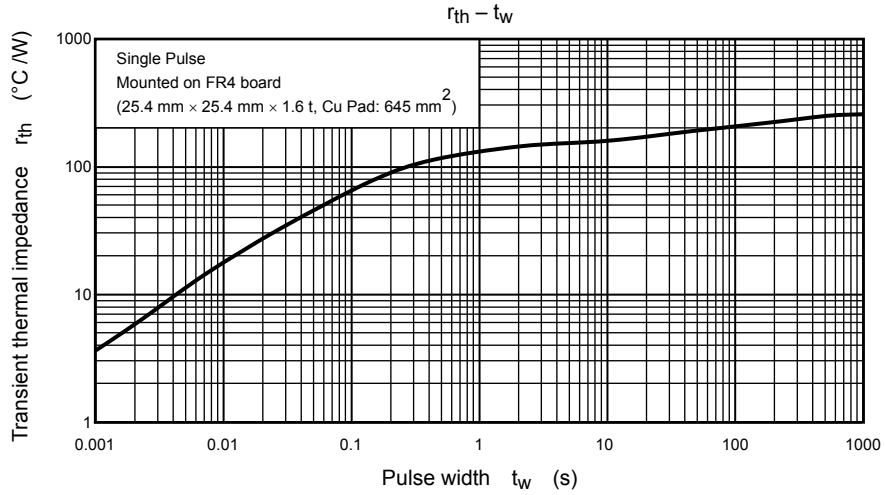
Be sure to take this into consideration when using the device.

## Handling Precaution

When handling individual devices (which are not yet mounted on a circuit board), ensure that the environment is protected against static 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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