TOSHIBA Field Effect Transistor Silicon P Channel MOS Type

# SSM6J53FE

- **High-Speed Switching Applications**
- Power Management Switch Applications
- 1.5 V drive
- · Suitable for high-density mounting due to compact package
- Low on-resistance :  $R_{on}$  = 136 m $\Omega$  (max) (@V<sub>GS</sub> = -2.5 V)

:  $R_{on} = 204 \text{ m}\Omega \text{ (max) (@V_{GS} = -1.8 V)}$ 

:  $R_{on} = 364 \text{ m}\Omega \text{ (max) (@V_{GS} = -1.5 V)}$ 

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

Characteristics		Symbol	Rating	Unit	
Drain-Source voltage		$V_{DS}$	-20	V	
Gate-Source voltage		V <sub>GSS</sub>	± 8	V	
Drain current	DC	I <sub>D</sub>	-1.8	Α	
	Pulse	I <sub>DP</sub>	-3.6		
Drain power dissipation		P <sub>D</sub> (Note 1)	500	mW	
Channel temperature		T <sub>ch</sub>	150	°C	
Storage temperature range		T <sub>stg</sub>	<b>−55~150</b>	°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.

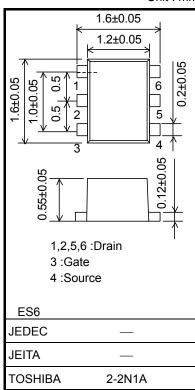
 $(25.4 \text{ mm} \times 25.4 \text{ mm} \times 1.6 \text{ t}, \text{ Cu Pad: } 645 \text{ mm}^2)$ 

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

Char	acteristics	Symbol	Test Condition	Min	Тур.	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 <sub>DSS</sub>	$V_{DS} = -20 \text{ V}, V_{GS} = 0$	_	_	-10	μА
Gate leakage curre	nt	I <sub>GSS</sub>	$V_{GS} = \pm 8 \text{ V}, V_{DS} = 0$	_	_	±1	μА
Gate threshold volt	age	V <sub>th</sub>	$V_{DS} = -3 \text{ V}, I_D = -1 \text{ mA}$	-0.3	_	-1.0	V
Forward transfer ad	dmittance	Y <sub>fs</sub>	$V_{DS} = -3 \text{ V}, I_D = -0.9 \text{ A}$ (Note 2)	2.7	5.4	_	S
Drain-Source on-resistance	R <sub>DS</sub> (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 <sub>iss</sub>	V <sub>DS</sub> = -10 V, V <sub>GS</sub> = 0	_	568	_	pF
Output capacitance		Coss		_	75	_	
Reverse transfer capacitance		C <sub>rss</sub>	1 - 1 1011 12	_	67	_	
Switching time	Turn-on time	t <sub>on</sub>	$V_{DD} = -10 \text{ V}, I_D = -0.9 \text{ A}$	_	29	_	ns
	Turn-off time	t <sub>off</sub>	$V_{GS} = 0 \sim -2.5 \text{ V}, R_{G} = 4.7 \Omega$		39		113
Total gate charge		Qg	V <sub>DS</sub> = -16 V, I <sub>DS</sub> = -1.8 A, V <sub>GS</sub> = -4 V		10.6		nC
Gate-Source charge		Q <sub>gs</sub>		_	7.4	_	
Gate-Drain charge		Q <sub>gd</sub>	VGS	_	3.3	_	
Drain-Source forward voltage		V <sub>DSF</sub>	$I_D = 1.8 \text{ A}, V_{GS} = 0$ (Note 2)	_	0.8	1.2	V

Note 2: Pulse test

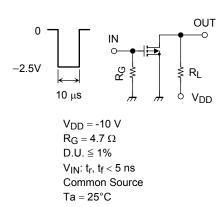
Unit: mm



Weight: 7.0 mg (typ.)

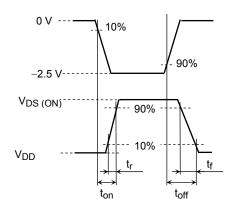
# **Switching Time Test Circuit**

# (a) Test Circuit

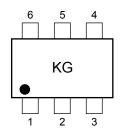


## (b) V<sub>IN</sub>

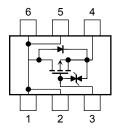
(c) Vout



# Marking



# **Equivalent Circuit (top view)**



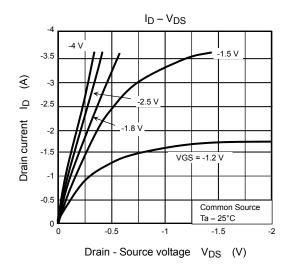
## **Precaution**

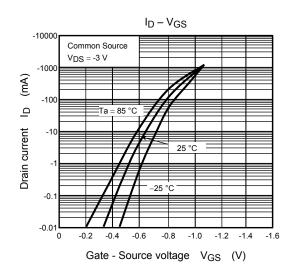
 $V_{th}$  can be expressed as the voltage between the gate and source when the low operating current value is  $I_D$  = -1mA for this product. For normal switching operation,  $V_{GS}$  (on) requires a higher voltage than  $V_{th}$  and  $V_{GS}$  (off) requires a lower voltage than  $V_{th}$ . (The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

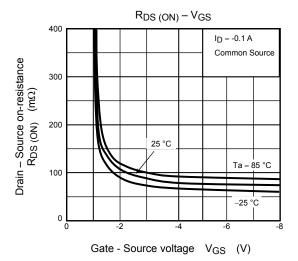
Be sure to take this into consideration when using the device.

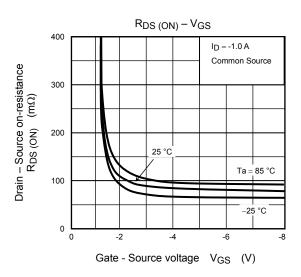
## **Handling Precaution**

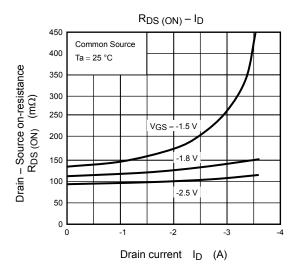
When handling individual devices (which are not yet mounted on a circuit board), ensure that the environment is protected against static electricity. Operators should wear anti-static clothing, and containers and other objects that come into direct contact with devices should be made of anti-static materials.

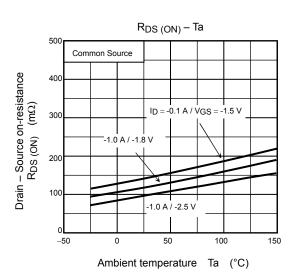




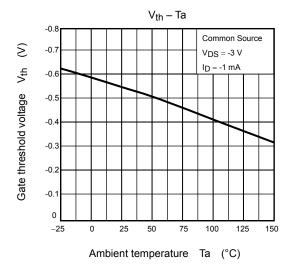


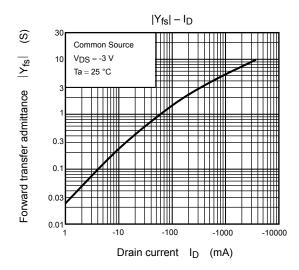


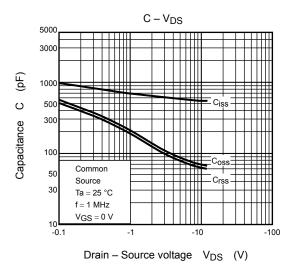


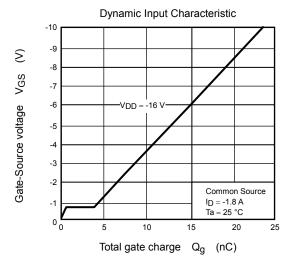


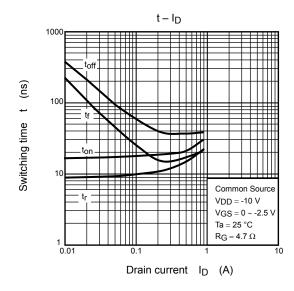
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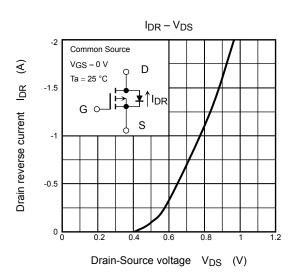


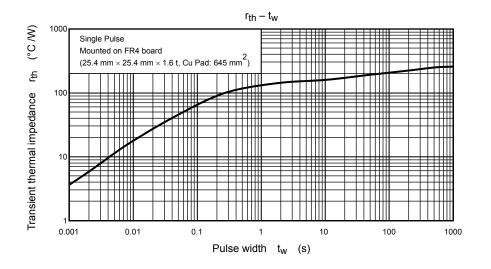


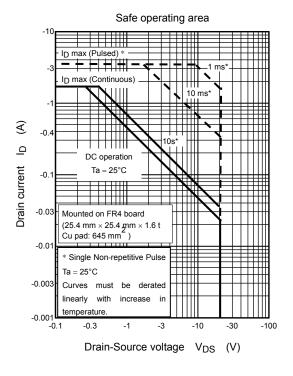


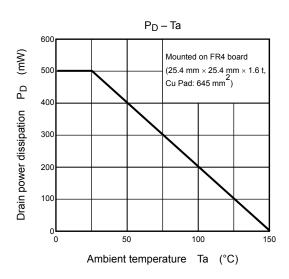












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