

**Preliminary**

## TOSHIBA Field Effect Transistor Silicon P Channel MOS Type (U-MOSII)

# SSM3J13T

Power Management Switch

High Speed Switching Applications

UNIT : mm

- Small Package
- Low on Resistance:  $R_{on} = 70 \text{ m}\Omega$  (max) (@ $V_{GS} = -4 \text{ V}$ )  
:  $R_{on} = 95 \text{ m}\Omega$  (max) (@ $V_{GS} = -2.5 \text{ V}$ )
- Low Gate Threshold Voltage

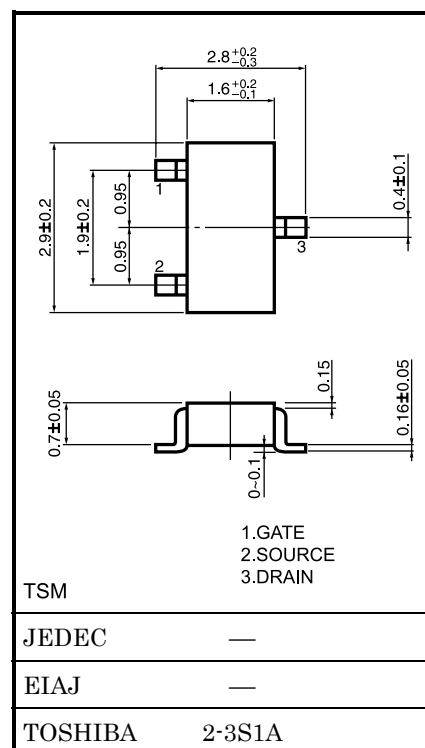
### Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Characteristics		Symbol	Rating	Unit
Drain-Source voltage		$V_{DS}$	-12	V
Gate-Source voltage		$V_{GSS}$	$\pm 8$	V
Drain current	DC	$I_D$	-3.0	A
	Pulse	$I_{DP}$ (Note 2)	-6.0	
Drain power dissipation		$P_D$ (Note 1)	1.25	W
Channel temperature		$T_{ch}$	150	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	-55~150	$^\circ\text{C}$

Note 1: Mounted on FR4 board

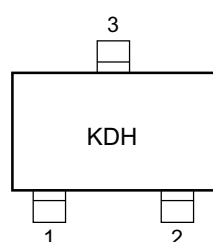
(25.4 mm × 25.4 mm × 1.6 t, Cu pad: 645 mm<sup>2</sup>, t = 10 s)

Note 2: The pulse width limited by max channel temperature.

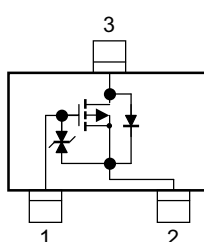


Weight: 10 mg

### Marking



### Equivalent Circuit



### Handling Precaution

When handling individual devices (which are not yet mounted 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.

The Channel-to-Ambient thermal resistance  $R_{th(ch-a)}$  and the drain power dissipation  $P_D$  vary according to the board material, board area, board thickness and pad area, and are also affected by the environment in which the product is used. When using this device, please take heat dissipation fully into account

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- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.  
In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc..

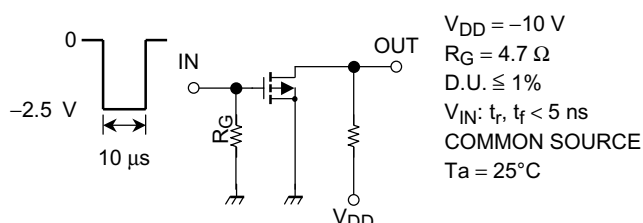
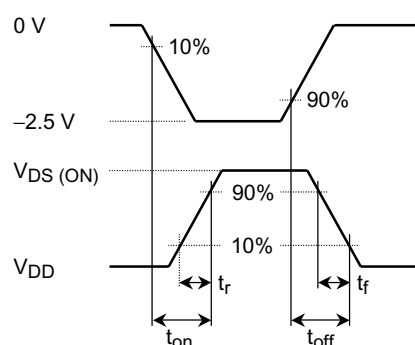
## Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	I <sub>GSS</sub>	V <sub>GS</sub> = ±8 V, V <sub>DS</sub> = 0	—	—	±1	μA
Drain-Source breakdown voltage	V (BR) DSS	I <sub>D</sub> = -1 mA, V <sub>GS</sub> = 0	-12	—	—	V
	V (BR) DSX	I <sub>D</sub> = -1 mA, V <sub>GS</sub> = 8 V	-4	—	—	V
Drain Cut-off current	I <sub>DSS</sub>	V <sub>DS</sub> = -12 V, V <sub>GS</sub> = 0	—	—	-1	μA
Gate threshold voltage	V <sub>th</sub>	V <sub>DS</sub> = -3 V, I <sub>D</sub> = -0.1 mA	-0.45	—	-1.1	V
Forward transfer admittance	Y <sub>fs</sub>	V <sub>DS</sub> = -3 V, I <sub>D</sub> = -1.5 A (Note 3)	3.8	—	—	S
Drain-Source ON resistance	R <sub>DS</sub> (ON)	I <sub>D</sub> = -1.5 A, V <sub>GS</sub> = -4 V (Note 3)	—	50	70	mΩ
		I <sub>D</sub> = -1.5 A, V <sub>GS</sub> = -2.5 V (Note 3)	—	70	95	
		I <sub>D</sub> = -1.5 A, V <sub>GS</sub> = -2.0 V (Note 3)	—	90	180	
Input capacitance	C <sub>iss</sub>	V <sub>DS</sub> = -10 V, V <sub>GS</sub> = 0, f = 1 MHz	—	890	—	pF
Reverse transfer capacitance	C <sub>rss</sub>	V <sub>DS</sub> = -10 V, V <sub>GS</sub> = 0, f = 1 MHz	—	203	—	pF
Output capacitance	C <sub>oss</sub>	V <sub>DS</sub> = -10 V, V <sub>GS</sub> = 0, f = 1 MHz	—	288	—	pF
Switching time	Turn-on time	t <sub>on</sub>	V <sub>DD</sub> = -10 V, I <sub>D</sub> = -1 A	—	48	ns
	Turn-off time	t <sub>off</sub>	V <sub>GS</sub> = 0 ~ -2.5 V, R <sub>G</sub> = 4.7 Ω	—	120	

Note 3: Pulse test

## Switching Time Test Circuit

(a) Test circuit

(b) V<sub>IN</sub>(c) V<sub>OUT</sub>

## Precaution

V<sub>th</sub> can be expressed as voltage between gate and source when low operating current value is I<sub>D</sub> = -100 μA for this product. For normal switching operation, V<sub>GS</sub> (on) requires higher voltage than V<sub>th</sub> and V<sub>GS</sub> (off) requires lower voltage than V<sub>th</sub>.

(relationship can be established as follows: V<sub>GS</sub> (off) < V<sub>th</sub> < V<sub>GS</sub> (on))

Please take this into consideration for using the device.

V<sub>GS</sub> recommended voltage of -2.5 V or higher to turn on this product.

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