

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

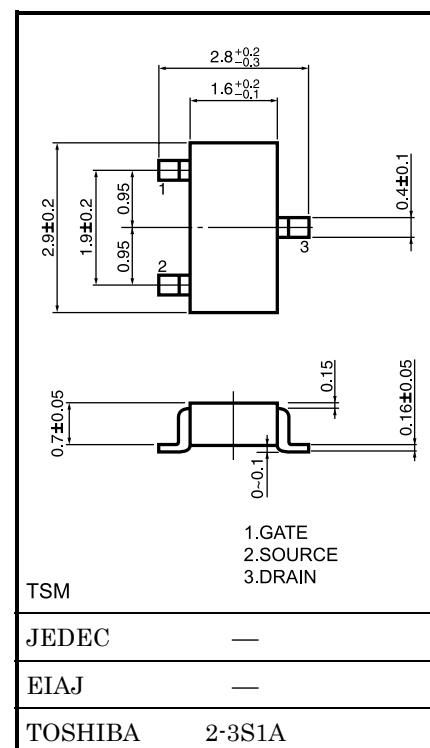
Maximum Ratings ($T_a = 25^\circ\text{C}$)

Characteristics	Symbol	Rating	Unit
Drain-Source voltage	V_{DS}	-12	V
Gate-Source voltage	V_{GSS}	± 8	V
Drain current	DC	I_D	A
	Pulse	I_{DP} (Note 2)	
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

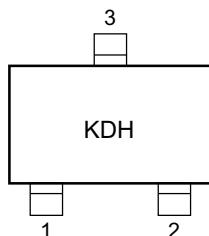
(25.4 mm \times 25.4 mm \times 1.6 t, Cu pad: 645 mm^2 , t = 10 s)

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

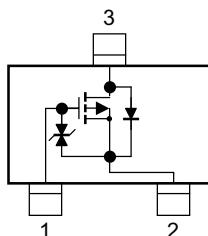


Weight: 10 mg

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..

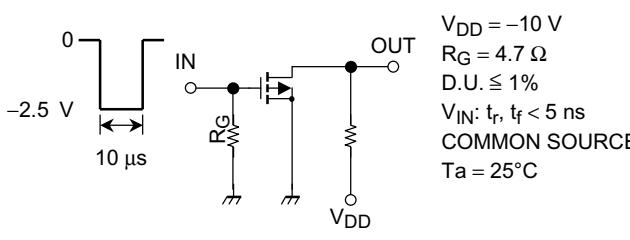
Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit	
Gate leakage current	I_{GSS}	$V_{GS} = \pm 8 \text{ V}$, $V_{DS} = 0$	—	—	± 1	μA	
Drain-Source breakdown voltage	$V_{(\text{BR}) \text{ DSS}}$	$I_D = -1 \text{ mA}$, $V_{GS} = 0$	-12	—	—	V	
	$V_{(\text{BR}) \text{ DSX}}$	$I_D = -1 \text{ mA}$, $V_{GS} = 8 \text{ V}$	-4	—	—	V	
Drain Cut-off current	I_{DSS}	$V_{DS} = -12 \text{ V}$, $V_{GS} = 0$	—	—	-1	μA	
Gate threshold voltage	V_{th}	$V_{DS} = -3 \text{ V}$, $I_D = -0.1 \text{ mA}$	-0.45	—	-1.1	V	
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = -3 \text{ V}$, $I_D = -1.5 \text{ A}$ (Note 3)	3.8	—	—	S	
Drain-Source ON resistance	$R_{DS} \text{ (ON)}$	$I_D = -1.5 \text{ A}$, $V_{GS} = -4 \text{ V}$ (Note 3)	—	50	70	$\text{m}\Omega$	
		$I_D = -1.5 \text{ A}$, $V_{GS} = -2.5 \text{ V}$ (Note 3)	—	70	95		
		$I_D = -1.5 \text{ A}$, $V_{GS} = -2.0 \text{ V}$ (Note 3)	—	90	180		
Input capacitance	C_{iss}	$V_{DS} = -10 \text{ V}$, $V_{GS} = 0$, $f = 1 \text{ MHz}$	—	890	—	pF	
Reverse transfer capacitance	C_{rss}	$V_{DS} = -10 \text{ V}$, $V_{GS} = 0$, $f = 1 \text{ MHz}$	—	203	—	pF	
Output capacitance	C_{oss}	$V_{DS} = -10 \text{ V}$, $V_{GS} = 0$, $f = 1 \text{ MHz}$	—	288	—	pF	
Switching time	Turn-on time	t_{on}	$V_{DD} = -10 \text{ V}$, $I_D = -1 \text{ A}$ $V_{GS} = 0 \sim -2.5 \text{ V}$, $R_G = 4.7 \Omega$	—	48	—	ns
	Turn-off time	t_{off}		—	120	—	

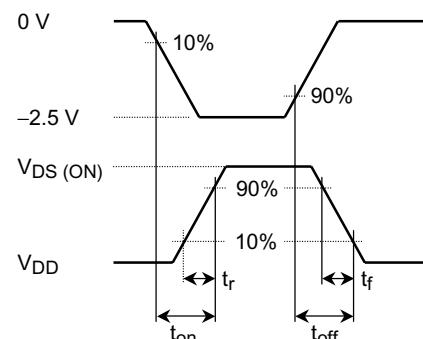
Note 3: Pulse test

Switching Time Test Circuit

(a) Test circuit



(b) V_{IN}



(c) V_{OUT}

Precaution

V_{th} can be expressed as voltage between gate and source when low operating current value is $I_D = -100 \mu A$ 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: $V_{GS(\text{off})} < V_{th} < V_{GS(\text{on})}$)

Please take this into consideration for using the device.

VGS recommended voltage of -2.5 V or higher to turn on this product.

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