

TOSHIBA Field Effect Transistor Silicon P Channel MOS Type

# SSM3J09FU

Power Management Switch

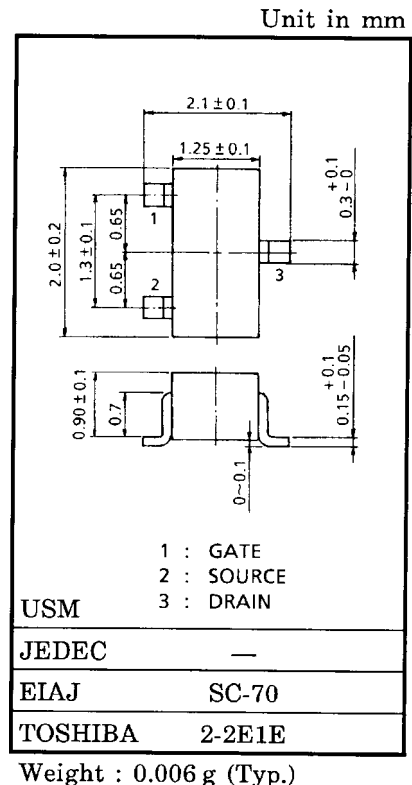
High Speed Switching Applications

- Small package
- Low on resistance  
:  $R_{on} = 2.7 \Omega$  (max) (@ $V_{GS} = -10 V$ )  
:  $R_{on} = 4.2 \Omega$  (max) (@ $V_{GS} = -4 V$ )

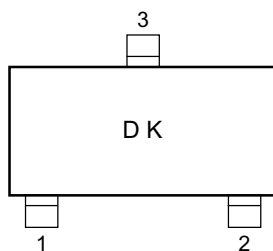
## Maximum Ratings ( $T_a = 25^\circ C$ )

Characteristics		Symbol	Rating	Unit
Drain-Source voltage		$V_{DS}$	-30	V
Gate-Source voltage		$V_{GSS}$	$\pm 20$	V
Drain current	DC	$I_D$	-200	mA
	Pulse	$I_{DP}$	-400	
Drain power dissipation ( $T_a = 25^\circ C$ )		$P_D$ (Note1)	150	mW
Channel temperature		$T_{ch}$	150	$^\circ C$
Storage temperature		$T_{stg}$	-55~150	$^\circ C$

Note1: Mounted on FR4 board  
(25.4 mm  $\times$  25.4 mm  $\times$  1.6 t, Cu Pad:  $0.6 \text{ mm}^2 \times 3$ ) Figure 1.



## Marking



## Equivalent Circuit (top view)

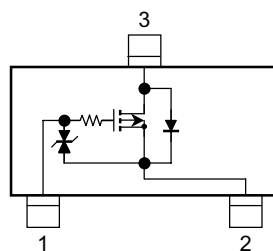
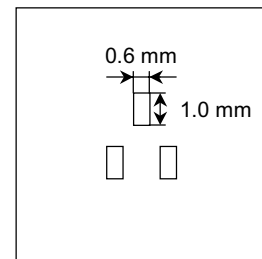


Figure 1: 25.4 mm  $\times$  25.4 mm  $\times$  1.6 t, Cu Pad:  $0.6 \text{ mm}^2 \times 3$



## 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.

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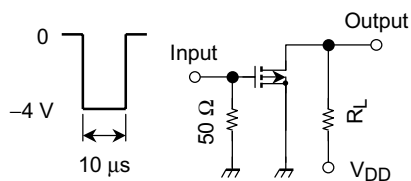
## Electrical Characteristics (Ta = 25°C)

Characteristics		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		$V_{(BR)DSS}$	$I_D = -1 \text{ mA}, V_{GS} = 0$	-30	—	—	V
Drain cut-off current		$I_{DSS}$	$V_{DS} = -30 \text{ V}, V_{GS} = 0$	—	—	-1	$\mu\text{A}$
Gate threshold voltage		$V_{th}$	$V_{DS} = -5 \text{ V}, I_D = -0.1 \text{ mA}$	-1.1	—	-1.8	V
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = -5 \text{ V}, I_D = -100 \text{ mA}$ (Note2)	115	—	—	mS
Drain-Source ON resistance		$R_{DS(ON)}$	$I_D = -100 \text{ mA}, V_{GS} = -10 \text{ V}$ (Note2)	—	2.1	2.7	$\Omega$
			$I_D = -100 \text{ mA}, V_{GS} = -4 \text{ V}$ (Note2)	—	3.3	4.2	
			$I_D = -100 \text{ mA}, V_{GS} = -3.3 \text{ V}$ (Note2)	—	4.0	6.0	
Input capacitance		$C_{iss}$	$V_{DS} = -5 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$	—	22	—	pF
Reverse transfer capacitance		$C_{rss}$	$V_{DS} = -5 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$	—	5	—	pF
Output capacitance		$C_{oss}$	$V_{DS} = -5 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$	—	14	—	pF
Switching time	Turn-on time	$t_{on}$	$V_{DD} = -5 \text{ V}, I_D = -100 \text{ mA},$ $V_{GS} = 0 \sim -4 \text{ V}$	—	85	—	ns
	Turn-off time	$t_{off}$		—	85	—	ns

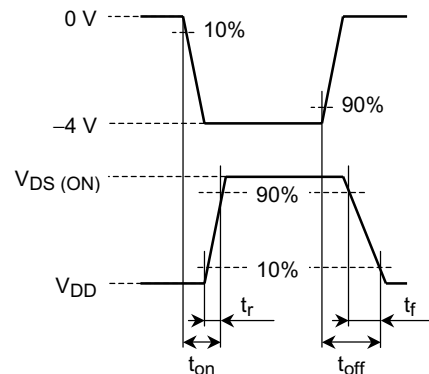
Note2: Pulse test

## Switching Time Test Circuit

## (a) Test circuit



$V_{DD} = -5 \text{ V}$   
 D.U.  $\leq 1\%$   
 Input:  $t_r, t_f < 5 \text{ ns}$   
 $(Z_{out} = 50 \Omega)$   
 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.

$V_{GS}$  recommended voltage of -4.0 V or higher to turn on this product.

