

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type

## SSM3K09FU

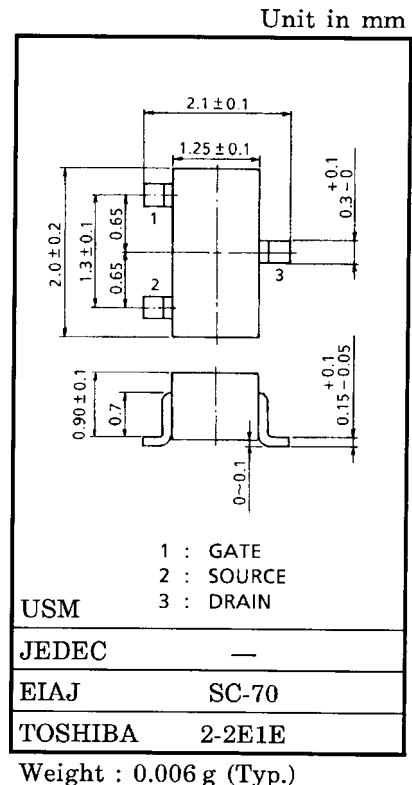
High Speed Switching Applications

- Small package
- Low on resistance
  - :  $R_{on} = 0.7 \Omega$  (max) (@ $V_{GS} = 10 V$ )
  - :  $R_{on} = 1.2 \Omega$  (max) (@ $V_{GS} = 4 V$ )

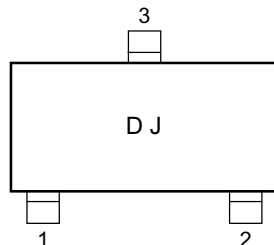
### Maximum Ratings ( $T_a = 25^\circ C$ )

Characteristics	Symbol	Rating	Unit
Drain-Source voltage	$V_{DS}$	30	V
Gate-Source voltage	$V_{GSS}$	$\pm 20$	V
Drain current	DC	$I_D$	mA
	Pulse	$I_{DP}$	
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 mm<sup>2</sup>  $\times$  3) Figure 1.



### Marking



### Equivalent Circuit (top view)

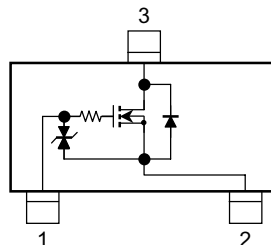
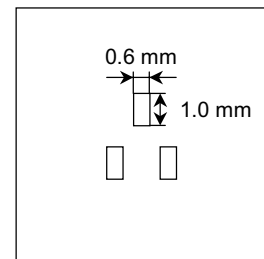


Figure 1: 25.4 mm  $\times$  25.4 mm  $\times$  1.6 t, Cu Pad: 0.6 mm<sup>2</sup>  $\times$  3



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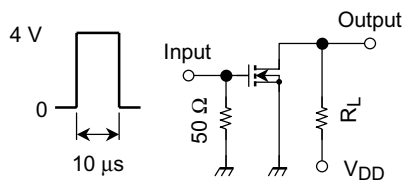
## Electrical Characteristics (Ta = 25°C)

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} $	$V_{DS} = 5 \text{ V}, I_D = 200 \text{ mA}$ (Note2)	270	—	—	mS
Drain-Source ON resistance	$R_{DS(ON)}$	$I_D = 200 \text{ mA}, V_{GS} = 10 \text{ V}$ (Note2)	—	0.5	0.7	$\Omega$
		$I_D = 200 \text{ mA}, V_{GS} = 4 \text{ V}$ (Note2)	—	0.8	1.2	
		$I_D = 200 \text{ mA}, V_{GS} = 3.3 \text{ V}$ (Note2)	—	1.0	1.7	
Input capacitance	$C_{iss}$	$V_{DS} = 5 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$	—	20	—	pF
Reverse transfer capacitance	$C_{rss}$	$V_{DS} = 5 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$	—	7	—	pF
Output capacitance	$C_{oss}$	$V_{DS} = 5 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$	—	16	—	pF
Switching time	Turn-on time	$t_{on}$	$V_{DD} = 5 \text{ V}, I_D = 200 \text{ mA},$ $V_{GS} = 0 \sim 4 \text{ V}$		—	ns
	Turn-off time	$t_{off}$			—	ns

Note2: Pulse test

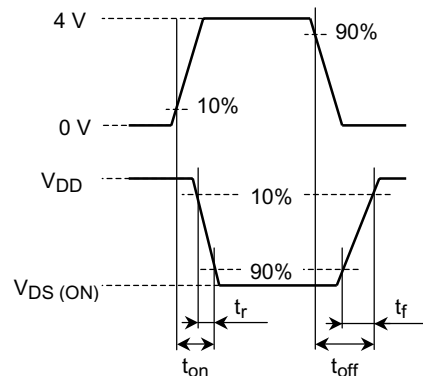
## Switching Time Test Circuit

### (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.

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