

**Under Development**

TOSHIBA Field Effect Transistor  
Silicon N Channel MOS Type (Lateral)

**SSM3K11T**

The information contained herein is subject to change without notice;  
likewise, product development may be discontinued.

DC-DC Converter

High Speed Switching Applications

- Ultra-high-speed switching achieved using a lateral structure  
 $t_{on} = 6.4 \text{ ns}$ ,  $t_{off} = 4.9 \text{ ns}$
- Low reverse transfer capacitance:  $C_{rss} = 6.8 \text{ pF}$  (typ.)
- Thin package
- Low ON-resistance:  $R_{DS(ON)} = 1.2 \Omega$  (typ.) @  $V_{GS} = 2.5 \text{ V}$
- Direct drive by CMOS possible

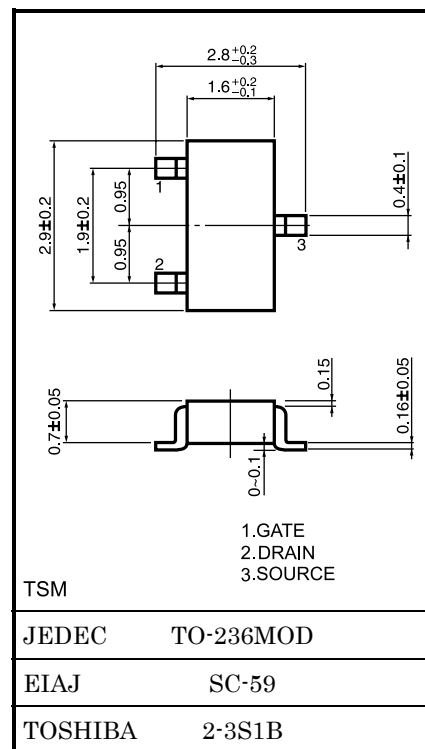
### Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Characteristic	Symbol	Rating	Unit
Drain-Source voltage	$V_{DS}$	40	V
Gate-Source voltage	$V_{GSS}$	$\pm 10$	V
Drain current	DC	$I_D$	500 mA
	Pulse	$I_{DP}$ (Note2)	2 A
Drain power dissipation	$P_D$ (Note1)	1250	mW
Channel temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage temperature range	$T_{stg}$	-55~150	$^\circ\text{C}$

Note1: Mounted on FR4 board  
(25.4 mm  $\times$  25.4 mm  $\times$  1.6 t, Cu pad: 645 mm<sup>2</sup>, t = 10 s)

Note2: The pulse width limited by max channel temperature.

Unit in: mm



Weight: 10 mg

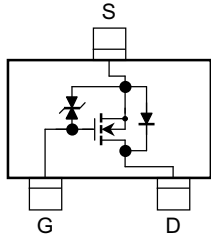
### Handling Precaution

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.

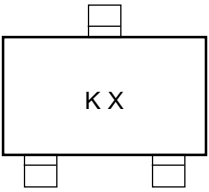
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**Equivalent Circuit**



**Marking**



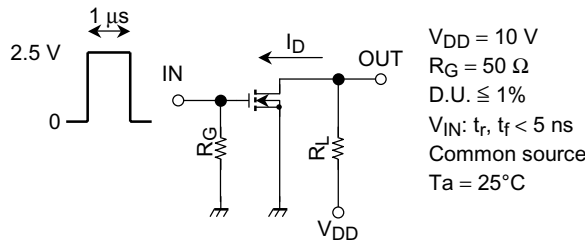
**Electrical Characteristics (Ta = 25°C)**

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 10\text{ V}, V_{DS} = 0$	—	—	$\pm 0.1$	$\mu\text{A}$
Drain-Source breakdown voltage		$V_{(BR)DSS}$	$I_D = 1\text{ mA}, V_{GS} = 0$	40	—	—	V
Drain Cut-off current		$I_{DSS}$	$V_{DS} = 40\text{ V}, V_{GS} = 0$	—	—	1	$\mu\text{A}$
Gate threshold voltage		$V_{th}$	$V_{DS} = 3\text{ V}, I_D = 0.1\text{ mA}$	0.8	—	1.4	V
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 3\text{ V}, I_D = 500\text{ mA}$ (Note3)	0.55	1.1	—	S
Drain-Source ON resistance		$R_{DS(ON)}$	$I_D = 250\text{ mA}, V_{GS} = 2.5\text{ V}$ (Note3)	—	1.2	1.8	$\Omega$
			$I_D = 500\text{ mA}, V_{GS} = 4\text{ V}$ (Note3)	—	1.0	1.3	
Input capacitance		$C_{iss}$	$V_{DS} = 3\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	—	64	—	pF
Reverse transfer capacitance		$C_{rss}$	$V_{DS} = 3\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	—	6.8	—	pF
Output capacitance		$C_{oss}$	$V_{DS} = 3\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	—	38	—	pF
Switching time	Rise time	$t_r$	$V_{DD} = 10\text{ V}, I_D = 250\text{ mA}$ $V_{GS} = 0 \sim 2.5\text{ V}$	—	2.9	—	ns
	Turn-on time	$t_{on}$		—	6.4	—	
	Fall time	$t_f$		—	2.1	—	
	Turn-off time	$t_{off}$		—	4.9	—	

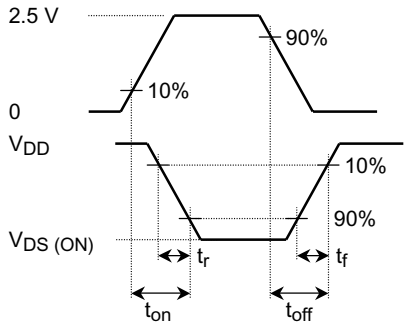
Note3: Pulse test

**Switching Time Test Circuit**

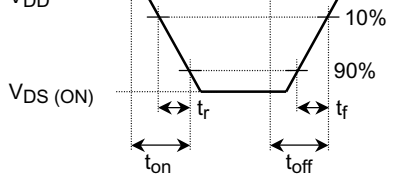
**(a) Test circuit**



**(b) VIN**



**(c) VOUT**



**Precaution**

$V_{th}$  can be expressed as voltage between gate and source when low operating current value is  $I_D = 100\text{ }\mu\text{A}$  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 2.5 V or higher to turn on this product.