2.5V drive

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type

# SSM3K116TU

#### **High Speed Switching Applications**

Low on-resistance:  $R_{on} = 135m\Omega \text{ (max) } (@V_{GS} = 2.5 \text{ V})$ 

 $R_{on} = 100 m\Omega \text{ (max) } (@V_{GS} = 4.5 \text{ V})$ 

#### Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit	
Drain-Source voltage		V <sub>DS</sub>	30	V	
Gate-Source voltage		V <sub>GSS</sub>	± 12	V	
Drain current	DC	I <sub>D</sub>	2.2	Α	
	Pulse	I <sub>DP</sub>	4.4		
Drain power dissipation		P <sub>D (Note 1)</sub>	800	mW	
		P <sub>D (Note 2)</sub>	500		
Channel temperature		T <sub>ch</sub>	150	°C	
Storage temperature range		T <sub>stg</sub>	<b>−55~150</b>	°C	

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the

absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

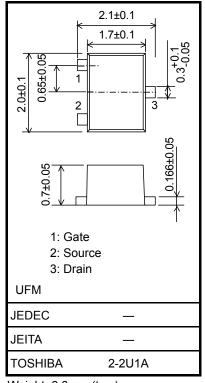
Note 1: Mounted on ceramic board.

 $(25.4 \text{ mm} \times 25.4 \text{ mm} \times 0.8 \text{ mm}, \text{Cu Pad: } 645 \text{ mm}^2)$ 

Note 2: Mounted on FR4 board.

 $(25.4 \text{ mm} \times 25.4 \text{ mm} \times 1.6 \text{ mm}, \text{ Cu Pad: } 645 \text{ mm}^2)$ 

#### Unit: mm



Weight: 6.6 mg (typ.)

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

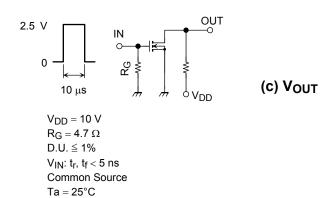
Charact	eristic	Symbol	Test Conditions	Min	Тур.	Max	Unit	
Drain-Source breakdown voltage		V (BR) DSS	$I_D = 1 \text{ mA}, V_{GS} = 0$	30	_	_	٧	
		V (BR) DSX	$I_D = 1 \text{ mA}, V_{GS} = -12 \text{ V}$	18	_			
Drain cut-off curren	t	I <sub>DSS</sub>	V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0	_	_	1	μА	
Gate leakage curre	nt	I <sub>GSS</sub>	$V_{GS} = \pm 12V, V_{DS} = 0$	_	_	±1	μА	
Gate threshold volta	age	V <sub>th</sub>	V <sub>DS</sub> = 3 V, I <sub>D</sub> = 0.1 mA	0.5	_	1.1	V	
Forward transfer ac	Imittance	Y <sub>fs</sub>	$V_{DS} = 3 \text{ V}, I_D = 0.25 \text{ A}$ (Note3)	1	2	_	S	
Drain-Source on-resistance		R <sub>DS</sub> (ON)	$I_D = 0.5 \text{ A}, V_{GS} = 4.5 \text{ V}$ (Note3)	_	75	100	mΩ	
			I <sub>D</sub> = 0.25 A, V <sub>GS</sub> = 2.5 V (Note3)	_	95	135		
Input capacitance		C <sub>iss</sub>	$V_{DS} = 10 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$	_	245	_	pF	
Output capacitance		Coss	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0, f = 1 MHz	_	41	_	pF	
Reverse transfer capacitance		C <sub>rss</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0, f = 1 MHz	_	33	_	pF	
Switching time	Turn-on time	t <sub>on</sub>	$V_{DD} = 10 \text{ V}, I_D = 0.25 \text{ A},$ $V_{GS} = 0 \sim 2.5 \text{ V}, R_G = 4.7 \Omega$	_	9	_	ns	
	Turn-off time	t <sub>off</sub>		_	15	_		
Drain-Source forward voltage		V <sub>DSF</sub>	$I_D = -2.2A, V_{GS} = 0 V$ (Note3)	_	-0.83	-1.2	V	

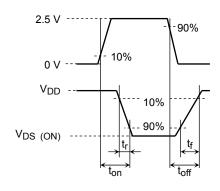
Note3: Pulse test

# **Switching Time Test Circuit**

#### (a) Test Circuit

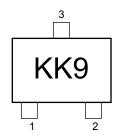


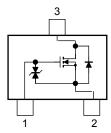




#### Marking

#### **Equivalent Circuit (top view)**





#### **Precaution**

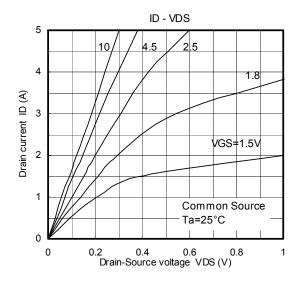
 $V_{th}$  can be expressed as the voltage between gate and source when the low operating current value is  $I_D$ =0.1mA for this product. For normal switching operation,  $V_{GS}$  (on) requires a higher voltage than  $V_{th}$ , and  $V_{GS}$  (off) requires a lower voltage than  $V_{th}$ .

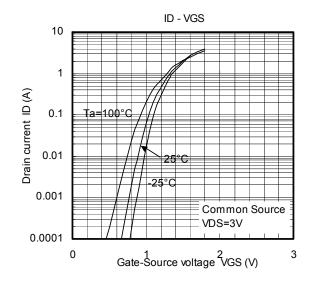
(The relationship can be established as follows:  $V_{GS (off)} < V_{th} < V_{GS (on)}$ )

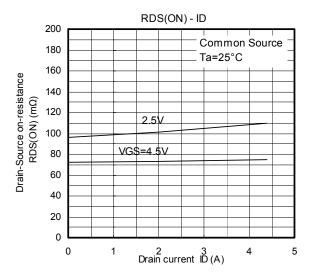
Take this into consideration when using the device.

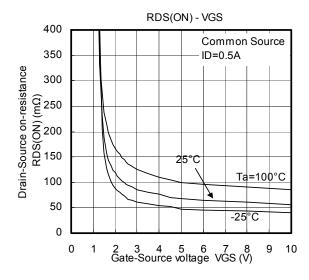
### **Handling Precaution**

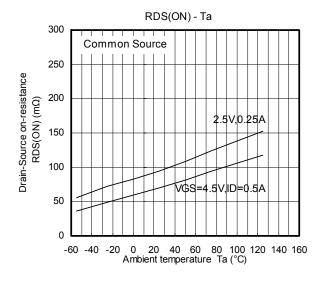
When handling individual devices which are not yet mounted on a circuit board, be sure that the environment is protected against electrostatic discharge. Operators should wear anti-static clothing, and containers and other objects that come into direct contact with devices should be made of anti-static materials.

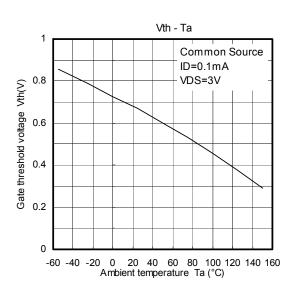


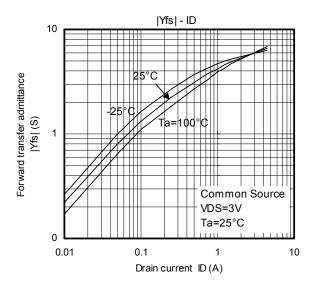


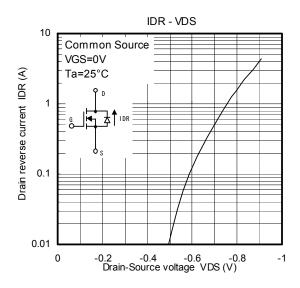


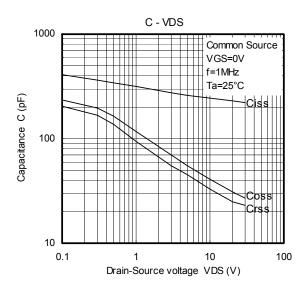


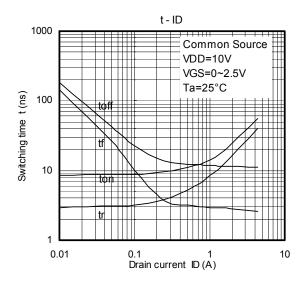


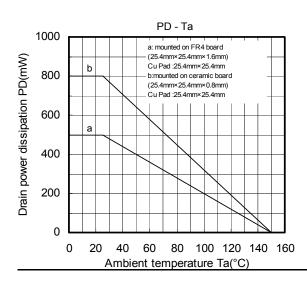


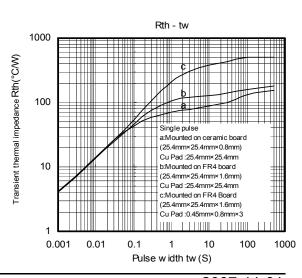












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