TOSHIBA Field-Effect Transistor Silicon N-Channel MOS Type (U-MOSIV)

# SSM3K315T

## ○ High-Speed Switching Applications

4.5-V drive

Low ON-resistance :  $R_{on}$  = 41.5 m $\Omega$  (max) (@V<sub>GS</sub> = 4.5 V) :  $R_{on} = 27.6 \text{ m}\Omega \text{ (max) (@V_{GS} = 10 V)}$ 

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

Characteristic		Symbol		Rating	Unit	
Drain-Source voltage		$V_{DSS}$		30	V	
Gate-Source voltage		V <sub>GSS</sub>		±20	V	
Drain current	DC	I <sub>D</sub> (Note 1)		6.0	А	
	Pulse	I <sub>DP</sub> (Note 1)		12.0		
Drain power dissipation		PD	(Note 1)	700	mW	
			t = 10 s	1250		
Channel temperature		T <sub>ch</sub>		150	°C	
Storage temperature range		T <sub>stg</sub>		-55 to 150	°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.

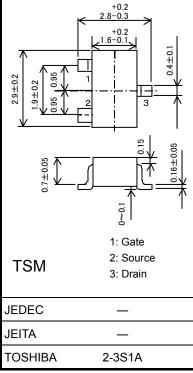
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate,

Note 1: The junction temperature should not exceed 150°C during use.

Note 2: Mounted on an FR4 board. (25.4 mm × 25.4 mm × 1.6 mm, Cu Pad: 645 mm<sup>2</sup>)

# +0.2

Unit: mm



Weight: 10 mg (typ.)

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

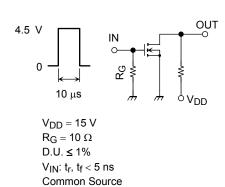
Chara	cteristic	Symbol	Test Conditions		Min	Тур.	Max	Unit
Drain-Source breakdown voltage	V (BR) DSS	$I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}$	30	_	_	٧		
	V (BR) DSX	$I_D = 10 \text{ mA}, V_{GS} = -20 \text{ V}$	15	_	_			
Drain cut-off curre	nt	I <sub>DSS</sub>	V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V		_	_	1	μΑ
Gate leakage curre	ent	I <sub>GSS</sub>	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$		_	_	±0.1	μА
Gate threshold vol	tage	V <sub>th</sub>	$V_{DS} = 5 \text{ V}, I_{D} = 1 \text{ mA}$		1.3	_	2.5	V
Forward transfer a	dmittance	Y <sub>fs</sub>	V <sub>DS</sub> = 5 V, I <sub>D</sub> = 4 A	(Note 3)	11.5	23.0	_	S
Drain-source ON-resistance	R <sub>DS</sub> (ON)	I <sub>D</sub> = 4.0 A, V <sub>GS</sub> = 10 V	(Note 3)	_	20.5	27.6	mΩ	
		I <sub>D</sub> = 2.0 A, V <sub>GS</sub> = 4.5 V	(Note 3)	_	27.0	41.5		
Input capacitance		C <sub>iss</sub>			_	450	_	
Output capacitance		Coss	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 0 V, f = 1 l	_	120	_	pF	
Reverse transfer of	apacitance	C <sub>rss</sub>			_	77	_	
Total Gate Charge	•	$Q_g$			_	10.1	_	nC
Gate-Source Charge Gate-Drain Charge		$Q_{gs}$	V <sub>DS</sub> = 15 V, I <sub>D</sub> =6.0 A		_	7.6	_	
		$Q_{gd}$	V <sub>GS</sub> = 10 V		_	2.5	_	
Switching time	Turn-on time	t <sub>on</sub>	$V_{DD} = 15 \text{ V}, I_D = 2.0 \text{ A},$		_	21	_	
	Turn-off time	t <sub>off</sub>	$V_{GS} = 0 \text{ to } 4.5 \text{ V}, R_{G} = 10 \Omega$		_	15	_	ns
Drain-Source forward voltage		V <sub>DSF</sub>	I <sub>D</sub> = -6.0 A, V <sub>GS</sub> = 0 V	(Note 3)		-0.85	-1.2	V

Note 3: Pulse test

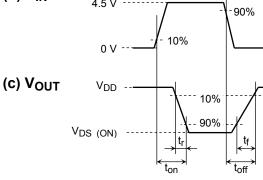
# **Switching Time Test Circuit**

 $Ta = 25^{\circ}C$ 

#### (a) Test Circuit

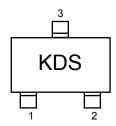


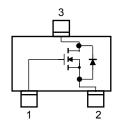
#### (b) V<sub>IN</sub>



# Marking







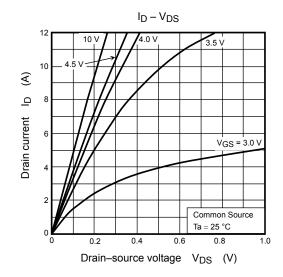
# **Handling Precaution**

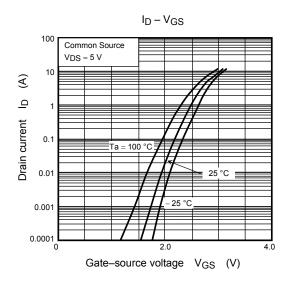
When handling individual devices that are not yet mounted on a circuit board, make sure that the environment is protected against electrostatic discharge. Operators should wear antistatic clothing, and containers and other objects that come into direct contact with devices should be made of antistatic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

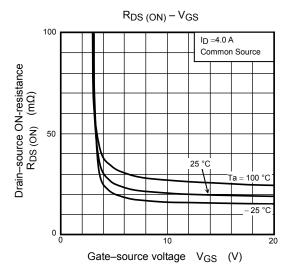
#### **Usage Consideration**

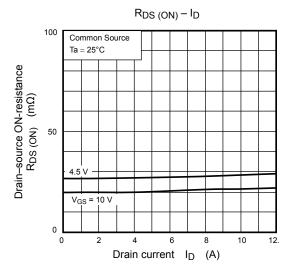
Let  $V_{th}$  be the voltage applied between gate and source that causes the drain current (I<sub>D</sub>) to be low (1 mA for the SSM3K315T). Then, for normal switching operation,  $V_{GS(on)}$  must be higher than  $V_{th}$ , and  $V_{GS(off)}$  must be lower than  $V_{th}$ . This relationship can be expressed as:  $V_{GS(off)} < V_{th} < V_{GS(on)}$ .

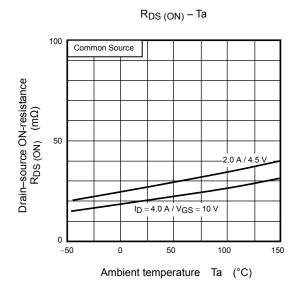
Take this into consideration when using the device

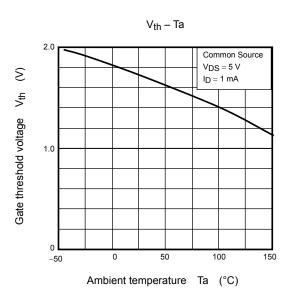


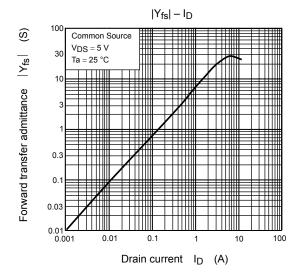


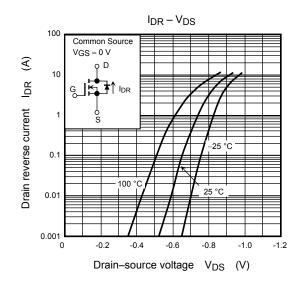


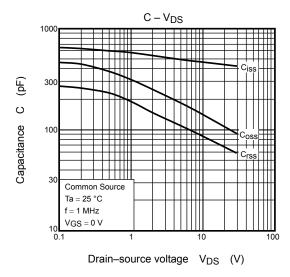


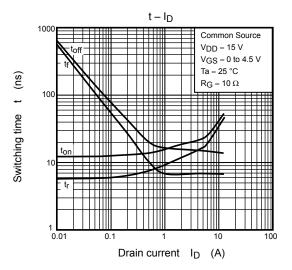


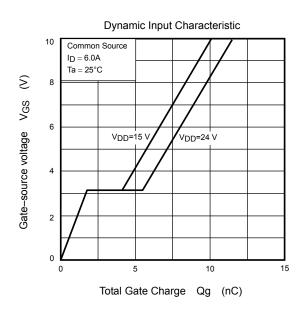




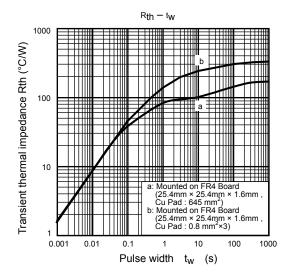


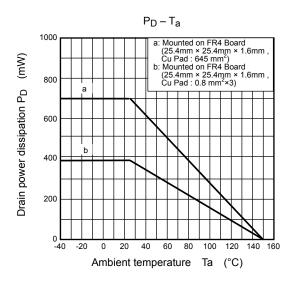






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