TOSHIBA Field-Effect Transistor Silicon N-Channel MOS Type

# SSM3K329R

- O Power Management Switch Applications
- O High-Speed Switching Applications

• 1.8-V drive

• Low ON-resistance:  $R_{DS(ON)}$  = 289 m $\Omega$  (max) (@V<sub>GS</sub> = 1.8 V)

:  $R_{DS(ON)}$  = 170 m $\Omega$  (max) (@V<sub>GS</sub> = 2.5 V)

:  $R_{DS(ON)}$  = 126 m $\Omega$  (max) (@V<sub>GS</sub> = 4.0 V)

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

Characteristic		Symbol		Rating	Unit	
Drain-source voltage		$V_{DSS}$		30	V	
Gate-source voltage		$V_{GSS}$		±12	V	
Drain current	DC	ΙD		3.5	А	
	Pulse	$I_{DP}$		7.0		
Power dissipation		P <sub>D</sub> (Note 1)		1	W	
			t = 10s	2	v V	
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.

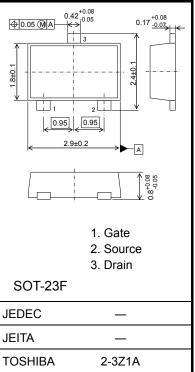
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

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

Note 2: Mounted on a 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: 11 mg (typ.)



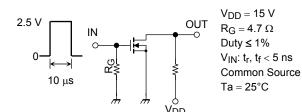
# Electrical Characteristics (Ta = 25°C)

Chara	acteristic	Symbol	Test Conditions		Min	Тур.	Max	Unit
Drain-source breakdown voltage	V <sub>(BR) DSS</sub>	$I_D = 1 \text{ mA}, V_{GS} = 0 \text{ V}$	30	_	_	٧		
Diaiii-source breakdown voitage		V (BR) DSX	$I_D = 1 \text{ mA}, V_{GS} = -12 \text{ V}$	18	_		_	
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 curr	ent	I <sub>GSS</sub>	$V_{GS} = \pm 12 \text{ V}, V_{DS} = 0 \text{ V}$		_	_	±1	μΑ
Gate threshold vo	Itage	V <sub>th</sub>	$V_{DS} = 3 \text{ V}, I_D = 1 \text{ mA}$		0.4	_	1.0	V
Forward transfer a	admittance	Y <sub>fs</sub>	$V_{DS} = 3 \text{ V}, I_{D} = 1.0 \text{ A}$	(Note 3)	2.1	4.2	_	S
Drain-source ON-resistance	R <sub>DS</sub> (ON)	I <sub>D</sub> = 1.0 A, V <sub>GS</sub> = 4.0 V	(Note 3)	_	96	126	mΩ	
		I <sub>D</sub> = 0.8 A, V <sub>GS</sub> = 2.5 V	(Note 3)	_	118	170		
		I <sub>D</sub> = 0.5 A, V <sub>GS</sub> = 1.8 V	(Note 3)	_	158	289		
Input capacitance		C <sub>iss</sub>			_	123	_	
Output capacitance		C <sub>oss</sub>	$V_{DS} = 15V, V_{GS} = 0 V, f = 1 MHz$		_	43	_	pF
Reverse transfer of	capacitance	C <sub>rss</sub>			_	18	_	
Total gate charge		Qg	\/ = 15\/  - = 2.0 A		_	1.5	_	
Gate-source charge		Q <sub>gs1</sub>	V <sub>DS</sub> = 15V, I <sub>D</sub> = 2.0 A V <sub>GS</sub> = 4 V		_	0.3	_	nC
Gate-drain charge		Q <sub>gd</sub>			_	0.6	_	
Switching time	Turn-on time	t <sub>on</sub>	V <sub>DD</sub> = 15 V, I <sub>D</sub> = 1.0 A,		_	9.2	_	ns
	Turn-off time	t <sub>off</sub>	$V_{GS} = 0$ to 2.5 V, $R_G = 4.7 \Omega$		_	6.4	_	115
Drain-source forward voltage		V <sub>DSF</sub>	$I_D = -3.5 \text{ A}, V_{GS} = 0 \text{ V}$	(Note 3)	_	-0.90	-1.2	V

Note 3: Pulse test

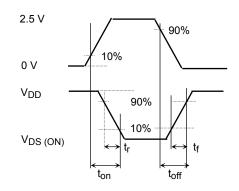
#### **Switching Time Test Circuit**

#### (a) Test Circuit



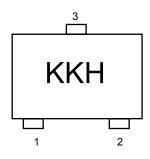
#### (b) V<sub>IN</sub>

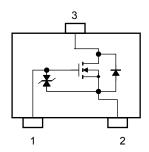
(c) Vout



#### **Marking**

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





### **Usage Considerations**

Let  $V_{th}$  be the voltage applied between gate and source that causes the drain current (I<sub>D</sub>) to below (1 mA for the SSM3K329R). 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:  $V_{GS(off)} < V_{th} < V_{GS(on)}$ .

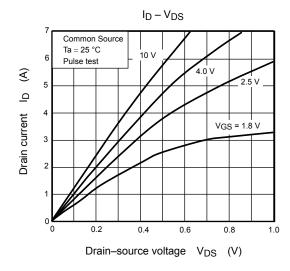
Take this into consideration when using the device.

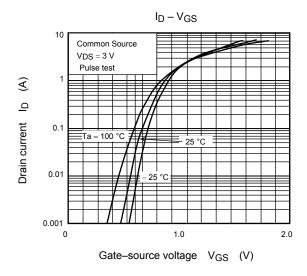
#### **Handling Precaution**

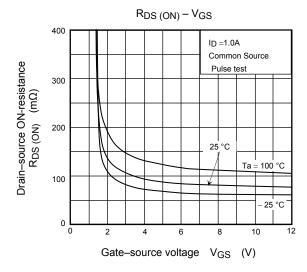
When handling individual devices that are not yet mounted on a circuit board, make sure that the environment is protected against electrostatic discharge. Operators should wear antistatic clothing, and containers and other objects that come into direct contact with devices should be made of antistatic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

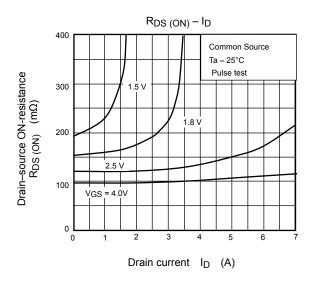
Thermal resistance  $R_{th\ (ch-a)}$  and Power dissipation  $P_D$  vary depending on board material, board area, board thickness and pad area. When using this device, please take heat dissipation into consideration

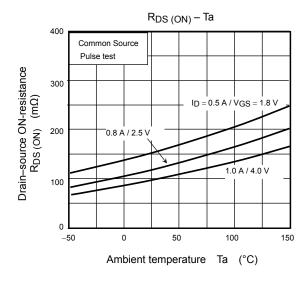
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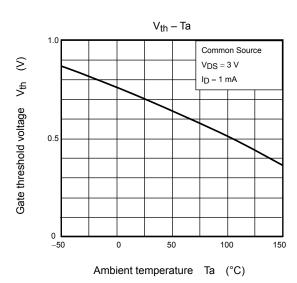




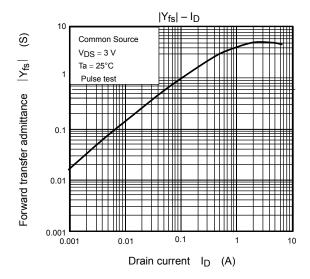


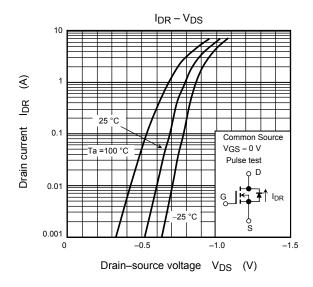


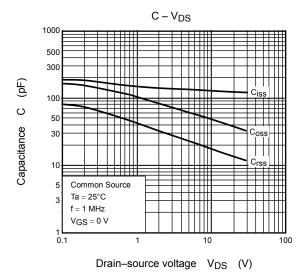


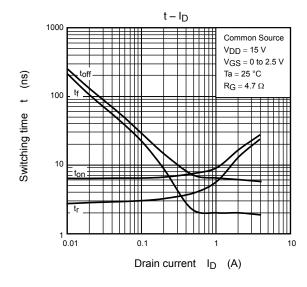


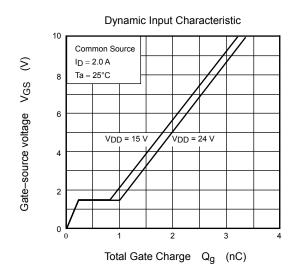
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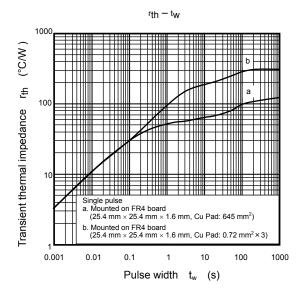


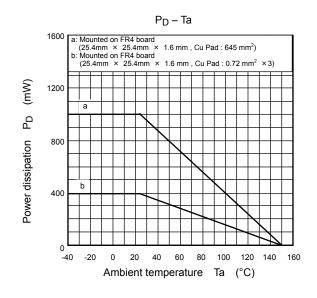






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