TOSHIBA Field-Effect Transistor Silicon N-Channel MOS Type

T2N7002AK

High Speed Switching Applications

· ESD protected gate

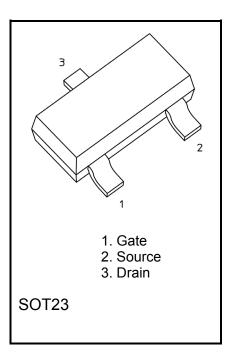
• Low ON-resistance $R_{DS(on)} = 2.8 \Omega \text{ (typ.) } (@V_{GS} = 10 \text{ V})$

 $R_{DS(on)} = 3.1 \Omega \text{ (typ.) } (@V_{GS} = 5 \text{ V})$

 $R_{DS(on)} = 3.2 \Omega \text{ (typ.) } (@V_{GS} = 4.5 \text{ V})$

Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit	
Drain-source voltage	V_{DSS}	60	V		
Gate-source voltage	V_{GSS}	± 20	V		
Drain current (Note1)	DC	I _D	200	mA	
Diain current (Note i)	Pulse	I _{DP} (Note 2)	760		
Dower dissination	P _D (Note 3)	320	mW		
Power dissipation		P _D (Note 4)	1000		
Channel temperature	T _{ch}	150	°C		
Storage temperature	T _{stg}	−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: Pulse width ≤ 10 µs, Duty ≤ 1%

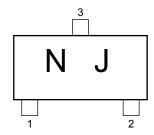
Note 3: Mounted on an FR4 board

 $(25.4 \text{ mm} \times 25.4 \text{ mm} \times 1.6 \text{ mm}, \text{ Cu Pad: } 0.42 \text{ mm}^2 \text{ x 3})$

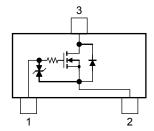
Note 4: Mounted on an FR4 board

(25.4 mm \times 25.4 mm \times 1.6 mm, Cu Pad: 645 mm^2)

Marking



Equivalent Circuit (top view)



Start of commercial production 2015-01

Electrical Characteristics (Ta = 25°C, Otherwise specified)

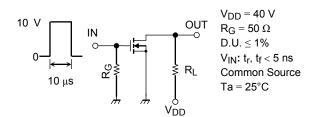
Characteristic		Symbol	Test Condition	Min	Тур.	Max	Unit
Drain-source b	Orain-source breakdown voltage $V_{(BR)DSS}$ $I_D = 250 \mu A, V_{GS} = 0 V$		$I_D = 250 \mu A, V_{GS} = 0 V$	60	_	_	٧
Drain cutoff current	I _{DSS}	V _{DS} = 60 V, V _{GS} = 0 V	_	_	1		
		V _{DS} = 60 V, V _{GS} = 0 V, Tj=150 °C	_	_	200	μΑ	
Gate leakage current	I _{GSS}	$V_{GS} = \pm 16 \text{ V}, V_{DS} = 0 \text{ V}$	_	_	±2	μА	
		$V_{GS} = \pm 10 \text{ V}, V_{DS} = 0 \text{ V}$	_	_	±0.5		
		V _{GS} = ±5 V, V _{DS} = 0 V	_	_	±0.1		
Gate threshold	l voltage	V _{th}	I _D = 250 μA, V _{DS} = V _{GS}	1.1	_	2.1	V
Forward transf	er admittance	Y _{fs}	V _{DS} = 10 V, I _D = 200 mA (Note 5)	_	450	_	mS
	R _{DS} (ON) (Note 5)	I _D = 100 mA, V _{GS} = 10 V	_	2.8	3.9	Ω	
Drain-source ON-resistance		I _D = 100 mA, V _{GS} = 10 V, Tj=150 °C	_	5.4	8.1		
		I _D = 100 mA, V _{GS} = 5 V	_	3.1	4.4		
		I _D = 100 mA, V _{GS} = 4.5 V	_	3.2	4.7		
Total Gate Charge Gate-Source Charge Gate-Drain Charge		Q _{G(tot)}		_	0.27	0.35	nC
		Q_{GS}	$V_{DS} = 30 \text{ V}, I_{D} = 200 \text{ mA}$ $V_{GS} = 4.5 \text{ V}$	_	0.08	_	
		Q_{GD}	VGS = 4.5 V	_	0.08	_	
Input capacitance		C _{iss}	V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz	_	11	17	pF
Output capacitance		Coss		_	3	_	
Reverse transfer capacitance		C _{rss}		_	0.7	_	
Switching time	Turn-on delay time	t _{d(on)}		_	2	4	- ns
	Rise time	t _r	V _{DD} = 40 V, I _D = 160 mA	_	3	_	
	Turn-off delay time	t _{d(off)}	$V_{GS} = 0 \text{ V to } 10 \text{ V}, R_G = 50 \Omega$	_	7	14	
	Fall time	t _f		_	24	_	
Drain-source forward voltage		V _{DSF}	$I_D = -115 \text{ mA}, V_{GS} = 0 \text{ V}$ (Note 5)	_	-0.87	-1.2	V

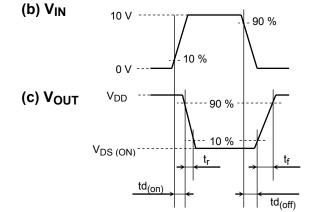
Note 5: Pulse test

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Switching Time Test Circuit

(a) Test Circuit



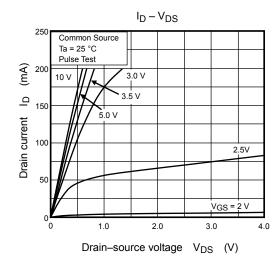


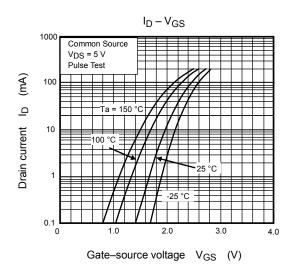
Notice of Usage

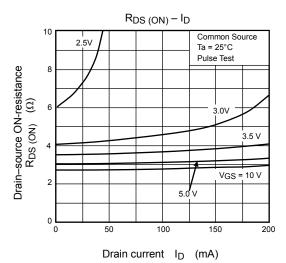
Let V_{th} be the voltage applied between gate and source that causes the drain current (ID) to below (0.25 mA for this device). Then, for normal switching operation, $V_{GS(ON)}$ must be higher than V_{th} , and $V_{GS(OFF)}$ must be lower than V_{th} . This relationship can be expressed as: $V_{GS(OFF)} < V_{th} < V_{GS(ON)}$. Take this into consideration when using the device.

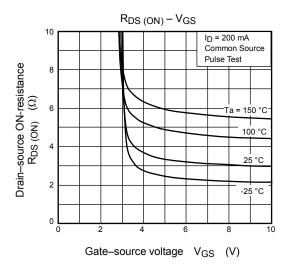
Handling Precaution

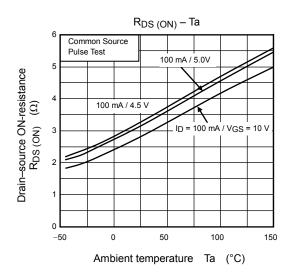
The MOSFETs in this device are sensitive to electrostatic discharge. When handling this device, the worktables, operators, soldering irons and other objects should be protected against anti-static discharge.

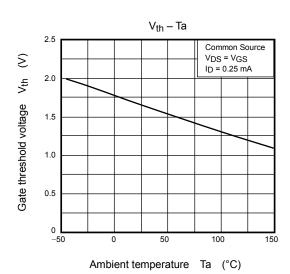




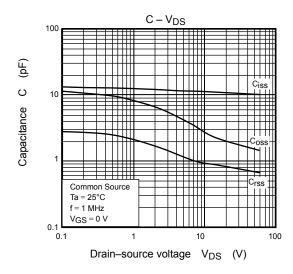


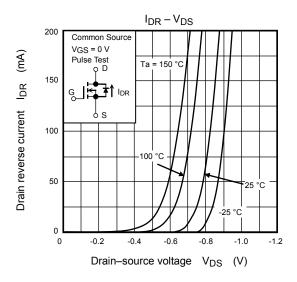


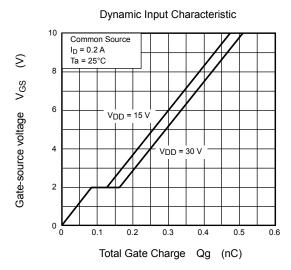


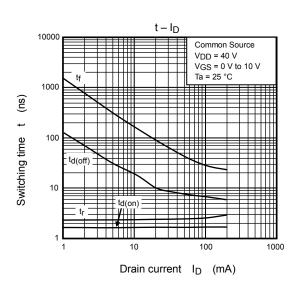


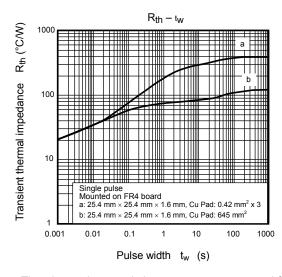
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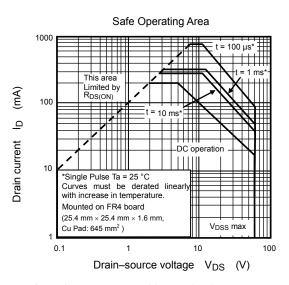












Note: The above characteristics curves are presented for reference only and not guaranteed by production test.

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Package Dimensions

Unit: mm SOT23 0.15 +0.1 -0.05 2.9 ± 0.1 Α 3 2 1 0.4 +0.1 -0.05 ф0.10 (М) А 0.95 0.95 1.9 0.05 ±0.05 0.9 ± 0.1

Weight: 0.009g (typ.)

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