TOSHIBA Field-Effect Transistor Silicon P-Channel MOS Type

# SSM3J306T

#### Power management switch Applications

4 V drive

Low ON-resistance:  $R_{on} = 225 \text{ m}\Omega \text{ (max) (@V_{GS} = -4 V)}$ 

 $R_{on} = 117 \text{ m}\Omega \text{ (max) (@V_{GS} = -10 V)}$ 

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

Characteristic		Symbol	Rating	Unit	
Drain-source voltage		$V_{DS}$	-30	V	
Gate-source voltage		$V_{GSS}$	± 20	V	
Drain current	DC	ΙD	-2.4	Α	
	Pulse	I <sub>DP</sub>	-4.8		
Drain power dissipation		P <sub>D (Note 1)</sub>	700	mW	
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.

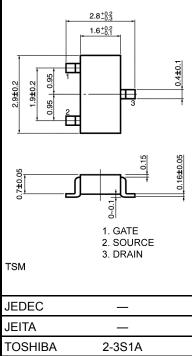
> Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure

rate, etc).

Note 1: Mounted on an FR4 board.

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

Unit: mm



Weight: 10 mg (typ.)

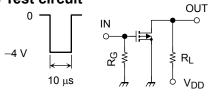
#### **Electrical Characteristics (Ta = 25°C)**

Charac	teristic	Symbol	Test Condition	Min	Тур.	Max	Unit
Drain–source breakdown voltage	V (BR) DSS	$I_D = -1 \text{ mA}, V_{GS} = 0$	-30	_	_	V	
	V (BR) DSX	$I_D = -1 \text{ mA}, V_{GS} = +20 \text{ V}$	-15	_	_	v	
Drain cutoff curren	t	I <sub>DSS</sub>	$V_{DS} = -30 \text{ V}, V_{GS} = 0$	_	_	-1	μА
Gate leakage curre	ent	I <sub>GSS</sub>	$V_{GS} = \pm 16 \text{ V}, V_{DS} = 0$	_	_	±1	μА
Gate threshold vol	tage	V <sub>th</sub>	$V_{DS} = -5 \text{ V}, I_D = -1 \text{ mA}$	-1.2	_	-2.6	V
Forward transfer a	dmittance	Y <sub>fs</sub>	$V_{DS} = -5 \text{ V}, I_D = -1 \text{ A}$ (Note 2)	1.6	3.1	_	S
Drain-source ON-resistance	R <sub>DS</sub> (ON)	$I_D = -1 \text{ A}, V_{GS} = -10 \text{ V}$ (Note 2)	_	80	117	mΩ	
Diam-source Oiv-resistance		$I_D = -0.5 \text{ A}, V_{GS} = -4 \text{ V}$ (Note 2)	_	160	225		
Input capacitance		C <sub>iss</sub>		_	280	_	
Output capacitance		Coss	$V_{DS} = -15 \; V,  V_{GS} = 0,  f = 1 \; MHz$	_	80	_	pF
Reverse transfer c	apacitance	C <sub>rss</sub>			45	_	
Total Gate Charge		$Q_g$		_	2.5	_	
Gate-Source Char	Source Charge $Q_{gs}$ $V_{DS}$ = -15 V, $I_{DS}$ = -2.4 A $V_{GS}$ = -4 V		_	1.3	_	nC	
Gate-Drain Charge	)	$Q_{gd}$	VGS4 V	_	1.2	_	
Switching time	Turn-on time	t <sub>on</sub>	$V_{DD} = -15 \text{ V}, I_D = -1 \text{ A},$ $V_{GS} = 0 \text{ to } -4 \text{ V}, R_G = 10 \Omega$	_	16	_	ns
	Turn-off time	t <sub>off</sub>		_	35	_	
Drain-source forward voltage		V <sub>DSF</sub>	I <sub>D</sub> = 2.4 A, V <sub>GS</sub> = 0 V (Note 2		0.8	1.2	V

Note 2: Pulse test

# **Switching Time Test Circuit**





 $V_{DD} = -15 \text{ V}$ 

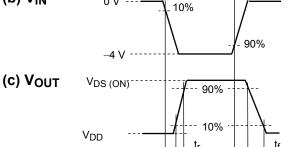
 $R_G = 10 \Omega$ 

D.U. ≦ 1%

 $V_{IN}$ :  $t_r$ ,  $t_f < 5$  ns Common Source

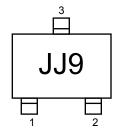
 $Ta = 25^{\circ}C$ 

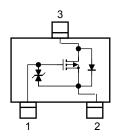
# (b) V<sub>IN</sub>



# **Marking**

# **Equivalent Circuit (top view)**





#### **Precaution**

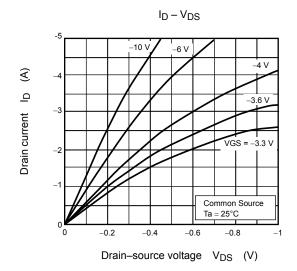
 $V_{th}$  can be expressed as the voltage between gate and source when the low operating current value is  $I_D$  = -1 mA for this product. For normal switching operation,  $V_{GS}$  (on) requires a higher voltage than  $V_{th}$  and  $V_{GS}$  (off) requires a lower voltage than  $V_{th}$ .

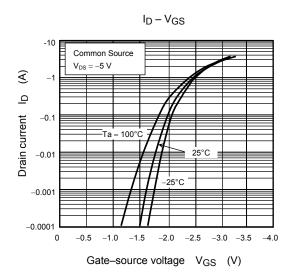
(The relationship can be established as follows: V<sub>GS (off)</sub> < V<sub>th</sub> < V<sub>GS (on).</sub>)

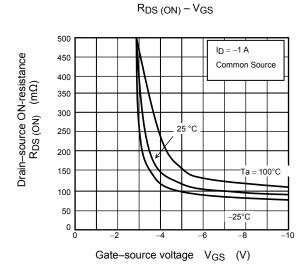
Take this into consideration when using the device.

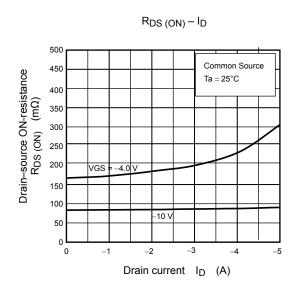
#### **Handling Precaution**

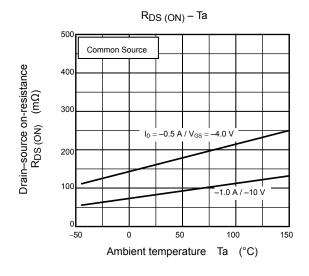
When handling individual devices that are not yet mounted on a circuit board, make sure that the environment is protected against electrostatic discharge. Operators should wear antistatic clothing, and containers and other objects that come into direct contact with devices should be made of antistatic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

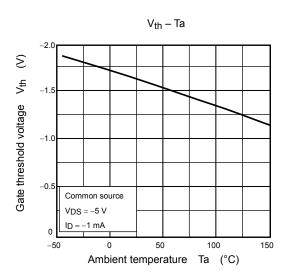




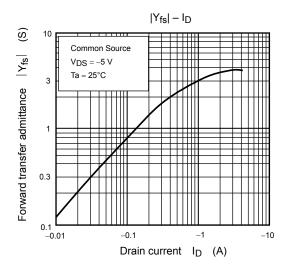


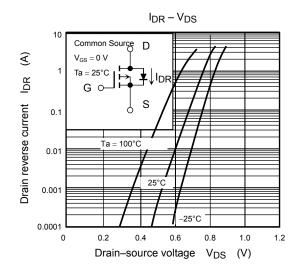


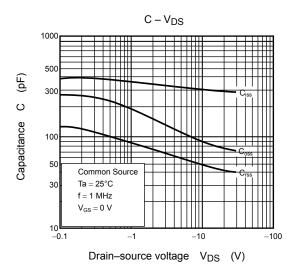


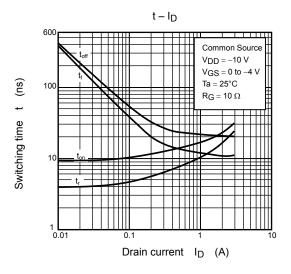


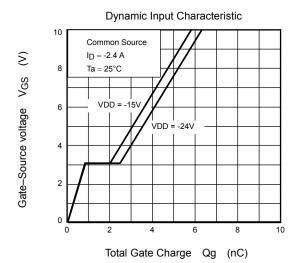
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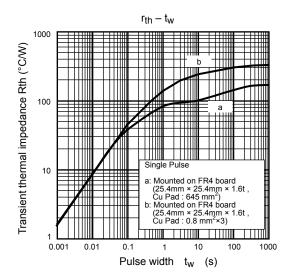


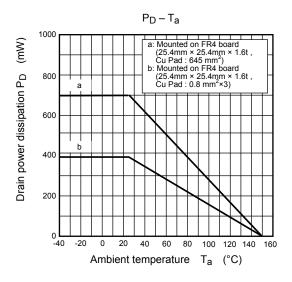












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20070701-EN GENERAL

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