

TOSHIBA Field Effect Transistor
Silicon P Channel MOS Type (U-MOSII)

SSM3J13T

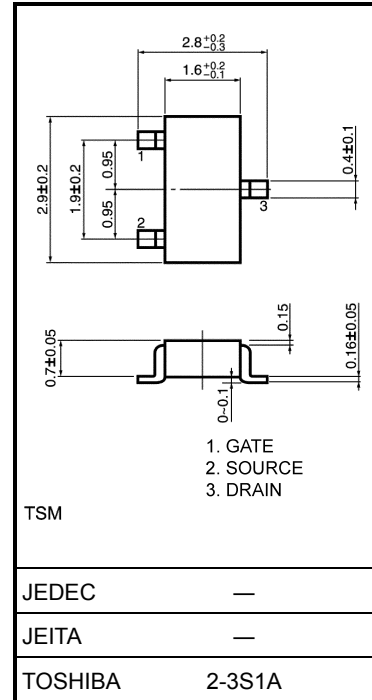
Power Management Switch
High Speed Switching Applications

Unit: mm

- Small Package
- Low on Resistance: $R_{on} = 70 \text{ m}\Omega$ (max) (@ $V_{GS} = -4 \text{ V}$)
: $R_{on} = 95 \text{ m}\Omega$ (max) (@ $V_{GS} = -2.5 \text{ V}$)
- Low Gate Threshold Voltage

Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

Characteristics	Symbol	Rating	Unit
Drain-Source voltage	V_{DS}	-12	V
Gate-Source voltage	V_{GSS}	± 8	V
Drain current	DC	I_D	-3.0
	Pulse	I_{DP} (Note 2)	-6.0
Drain power dissipation	P_D (Note 1)	1.25	W
Channel temperature	T_{ch}	150	$^\circ\text{C}$
Storage temperature range	T_{stg}	-55~150	$^\circ\text{C}$



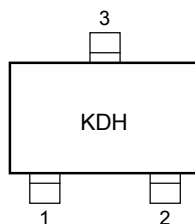
Weight: 10 mg (typ.)

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).

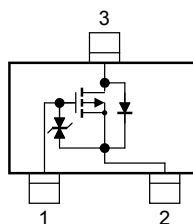
Note 1: Mounted on FR4 board
(25.4 mm × 25.4 mm × 1.6 t, Cu pad: 645 mm², t = 10 s)

Note 2: The pulse width limited by max channel temperature.

Marking



Equivalent Circuit



Handling Precaution

When handling individual devices (which are not yet mounted on a circuit board), be sure that the environment is protected against electrostatic electricity. 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.

The Channel-to-Ambient thermal resistance $R_{th(ch-a)}$ and the drain power dissipation P_D vary according to the board material, board area, board thickness and pad area, and are also affected by the environment in which the product is used. When using this device, please take heat dissipation fully into account

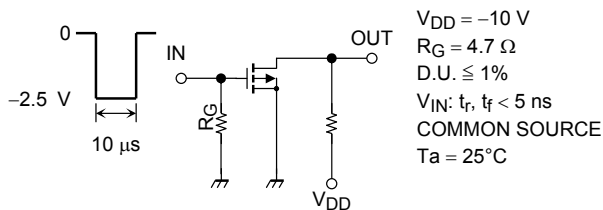
Electrical Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit	
Gate leakage current	I_{GSS}	$V_{GS} = \pm 8 \text{ V}, V_{DS} = 0$	—	—	± 1	μA	
Drain-Source breakdown voltage	$V_{(BR)DSS}$	$I_D = -1 \text{ mA}, V_{GS} = 0$	-12	—	—	V	
	$V_{(BR)DSX}$	$I_D = -1 \text{ mA}, V_{GS} = 8 \text{ V}$	-4	—	—	V	
Drain Cut-off current	I_{DSS}	$V_{DS} = -12 \text{ V}, V_{GS} = 0$	—	—	-1	μA	
Gate threshold voltage	V_{th}	$V_{DS} = -3 \text{ V}, I_D = -0.1 \text{ mA}$	-0.45	—	-1.1	V	
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = -3 \text{ V}, I_D = -1.5 \text{ A}$ (Note 3)	3.8	—	—	S	
Drain-Source ON resistance	$R_{DS(ON)}$	$I_D = -1.5 \text{ A}, V_{GS} = -4 \text{ V}$ (Note 3)	—	50	70	m Ω	
		$I_D = -1.5 \text{ A}, V_{GS} = -2.5 \text{ V}$ (Note 3)	—	70	95		
		$I_D = -1.5 \text{ A}, V_{GS} = -2.0 \text{ V}$ (Note 3)	—	90	180		
Input capacitance	C_{iss}	$V_{DS} = -10 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$	—	890	—	pF	
Reverse transfer capacitance	C_{rss}	$V_{DS} = -10 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$	—	203	—	pF	
Output capacitance	C_{oss}	$V_{DS} = -10 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$	—	288	—	pF	
Switching time	Turn-on time	t_{on}	$V_{DD} = -10 \text{ V}, I_D = -1 \text{ A}$		—	48	ns
	Turn-off time	t_{off}	$V_{GS} = 0 \sim -2.5 \text{ V}, R_G = 4.7 \Omega$		—	120	

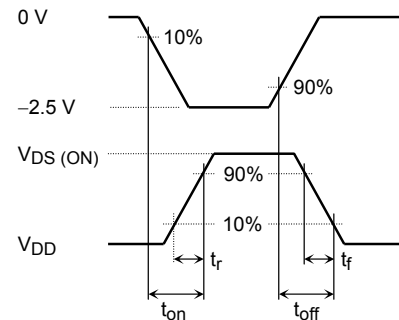
Note 3: Pulse test

Switching Time Test Circuit

(a) Test circuit



(b) V_{IN}



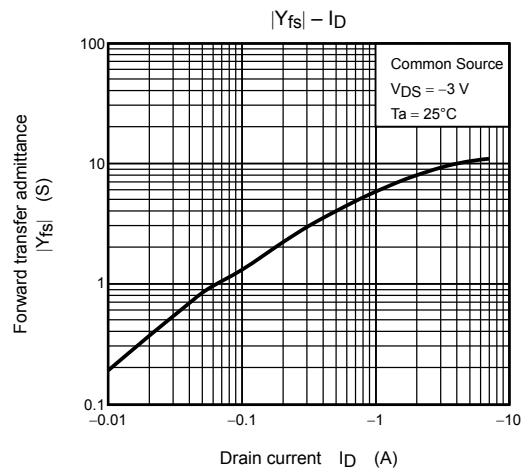
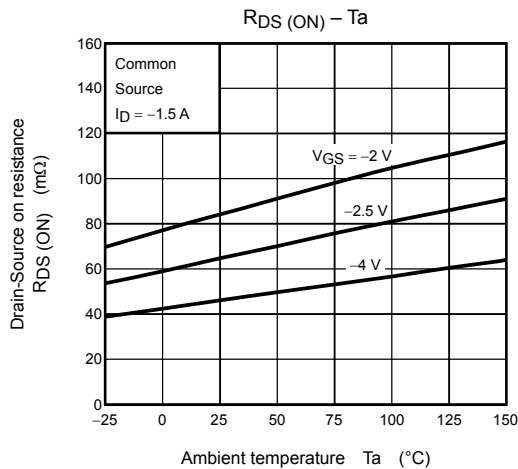
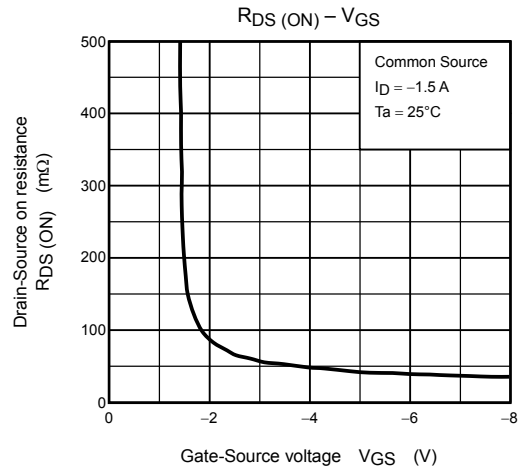
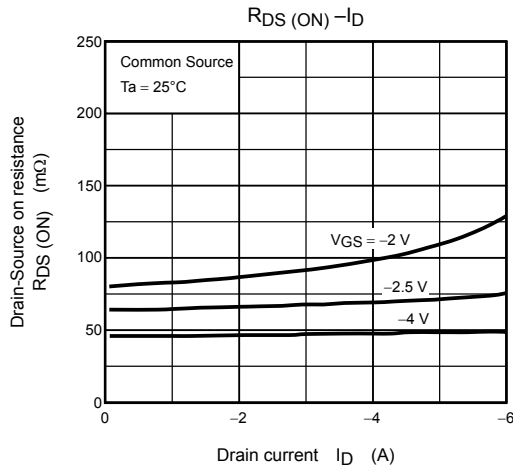
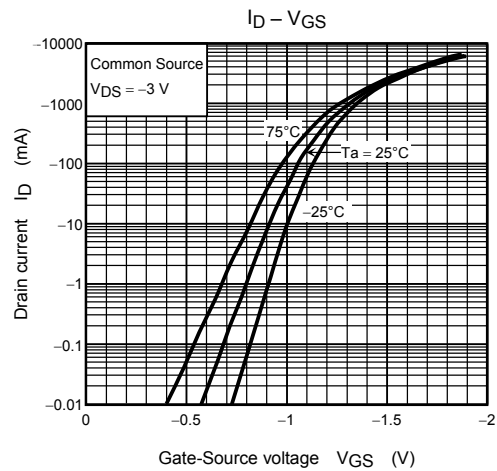
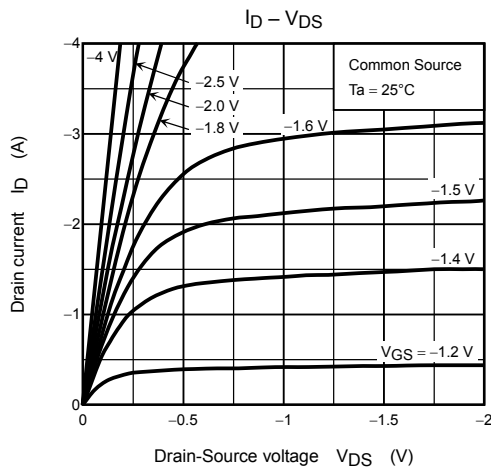
(c) V_{OUT}

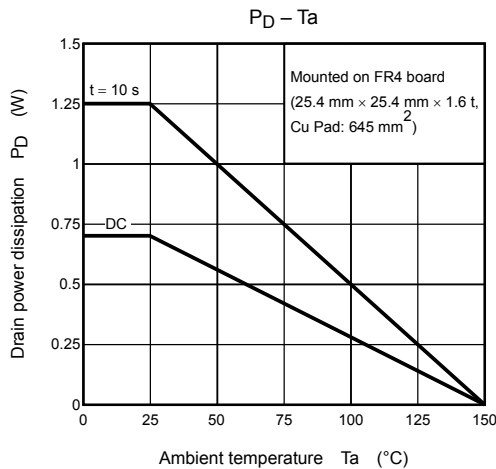
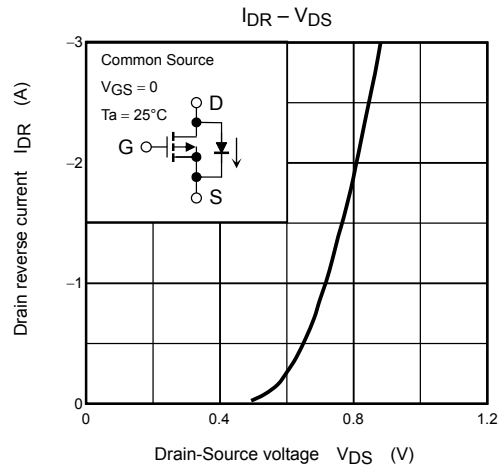
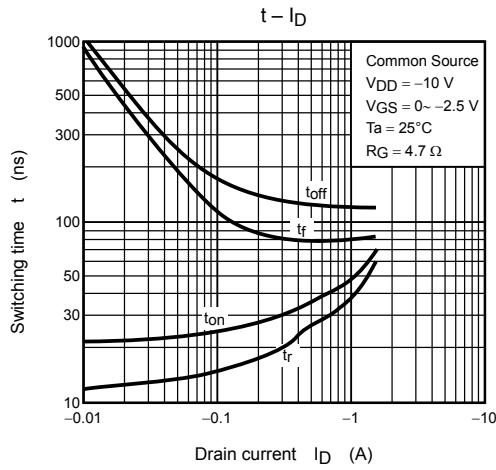
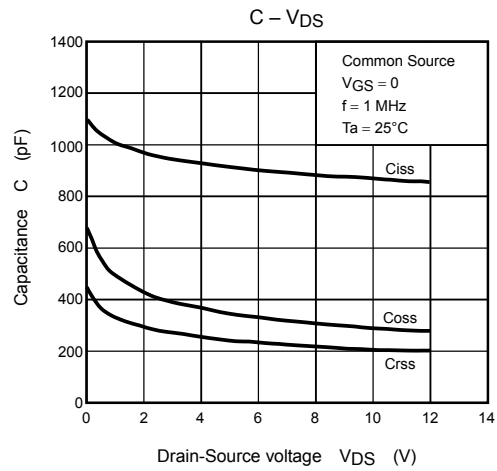
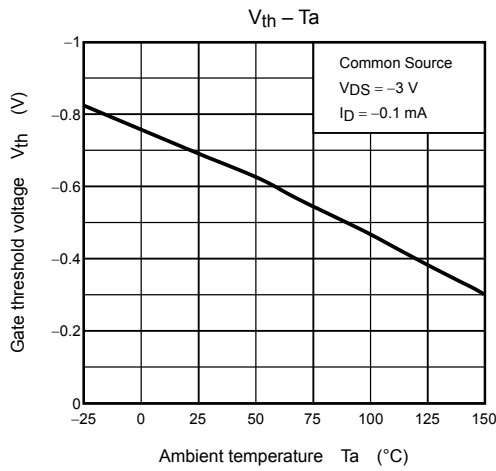
Precaution

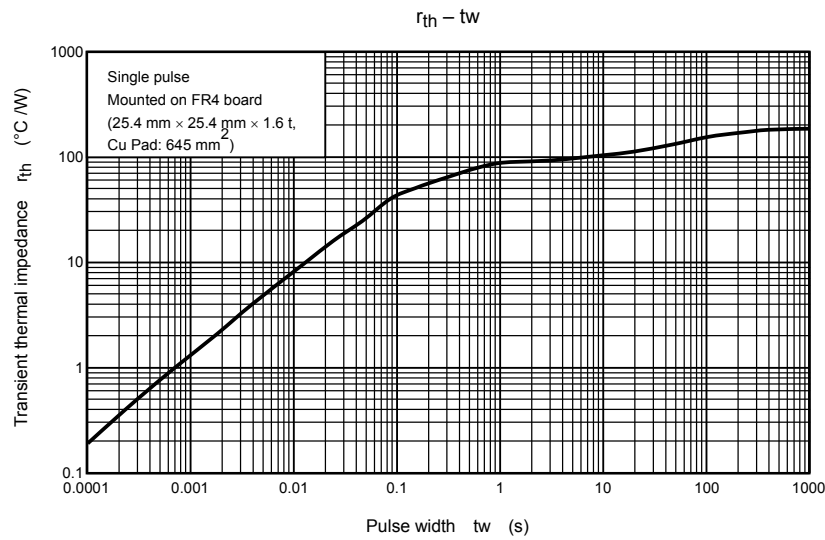
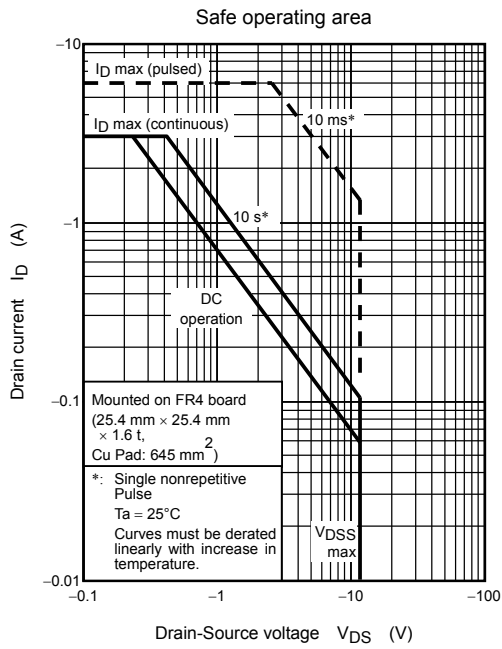
V_{th} can be expressed as voltage between gate and source when low operating current value is $I_D = -100 \mu\text{A}$ for this product. For normal switching operation, $V_{GS(ON)}$ requires higher voltage than V_{th} and $V_{GS(OFF)}$ requires lower voltage than V_{th} .

(relationship can be established as follows: $V_{GS(OFF)} < V_{th} < V_{GS(ON)}$)

Please take this into consideration for using the device.







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