

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

SSM3J13T

Power Management Switch
High Speed Switching Applications

Unit: mm

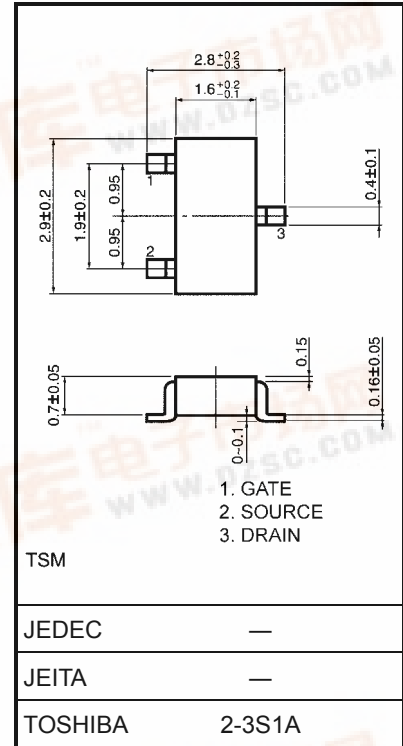
- Small Package
- Low on Resistance: $R_{on} = 70 \text{ m}\Omega$ (max) (@ $V_{GS} = -4 \text{ V}$)
: $R_{on} = 95 \text{ m}\Omega$ (max) (@ $V_{GS} = -2.5 \text{ V}$)
- Low Gate Threshold Voltage

Maximum Ratings (Ta = 25°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	A
	Pulse	I_{DP} (Note 2)	-6.0	
Drain power dissipation		P_D (Note 1)	1.25	W
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	-55~150	°C

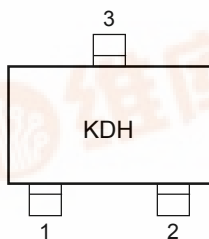
Note 1: Mounted on FR4 board
(25.4 mm × 25.4 mm × 1.6 t, Cu pad: 645 mm², t = 10 s)

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

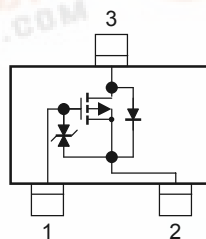


Weight: 10 mg (typ.)

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

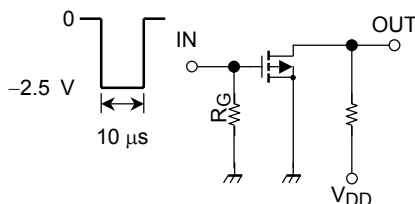
Electrical Characteristics (Ta = 25°C)

Characteristic	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

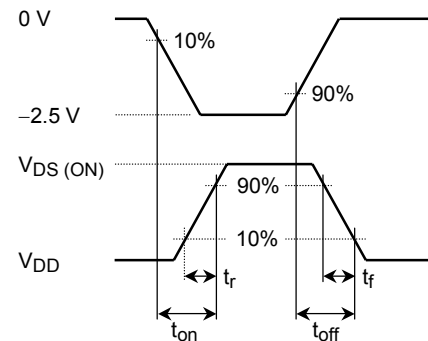
Switching Time Test Circuit

(a) Test circuit



$V_{DD} = -10 \text{ V}$
 $R_G = 4.7 \Omega$
 D.U. $\leq 1\%$
 V_{IN} : $t_r, t_f < 5 \text{ ns}$
 COMMON SOURCE
 $T_a = 25^\circ\text{C}$

(b) V_{IN}



(c) V_{OUT}

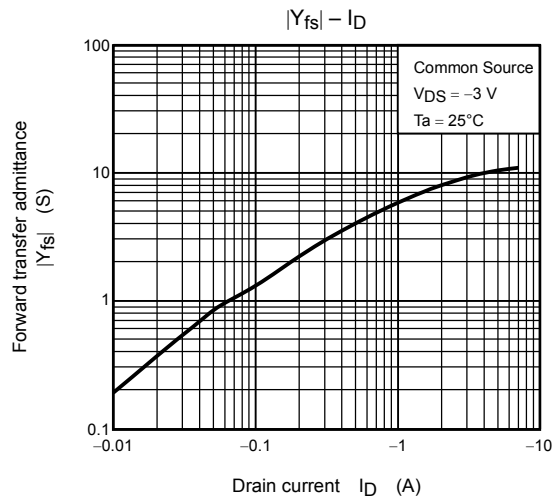
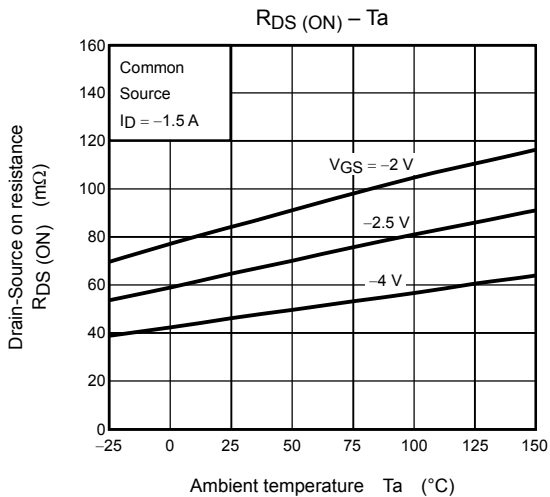
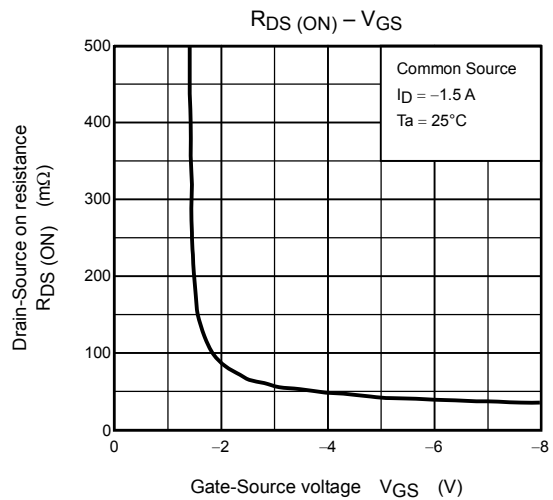
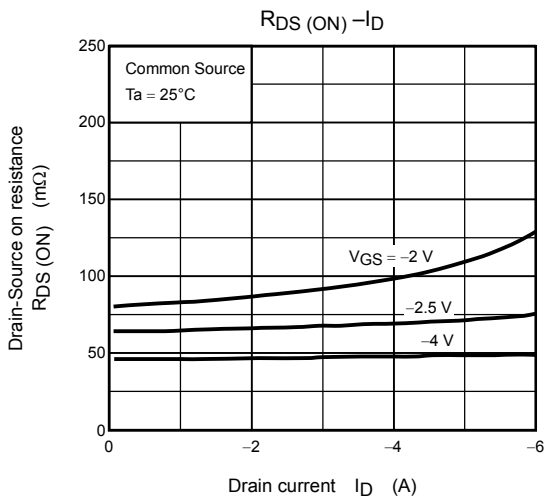
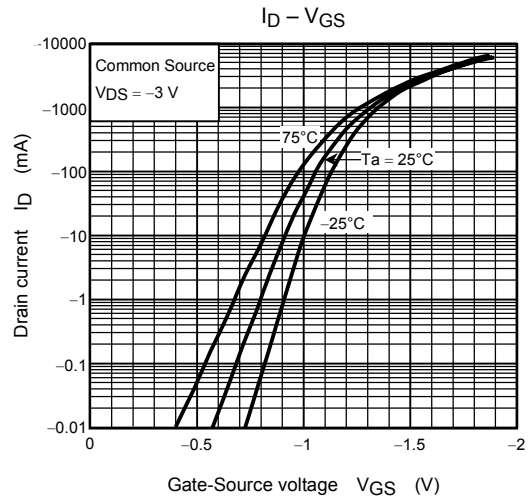
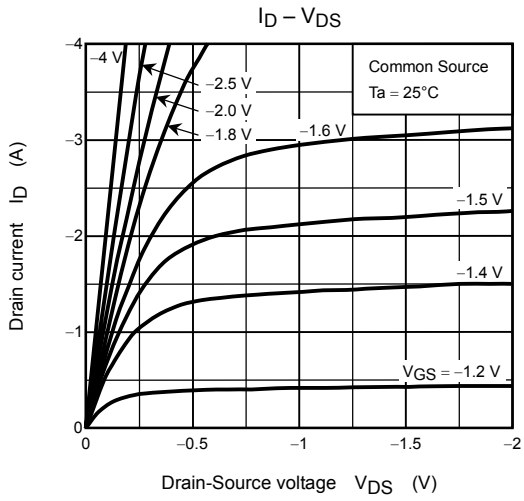
Precaution

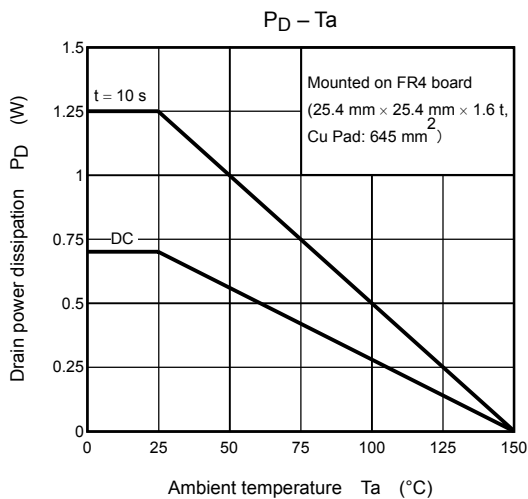
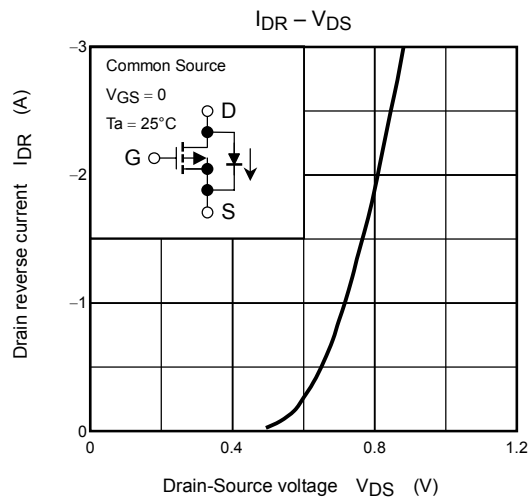
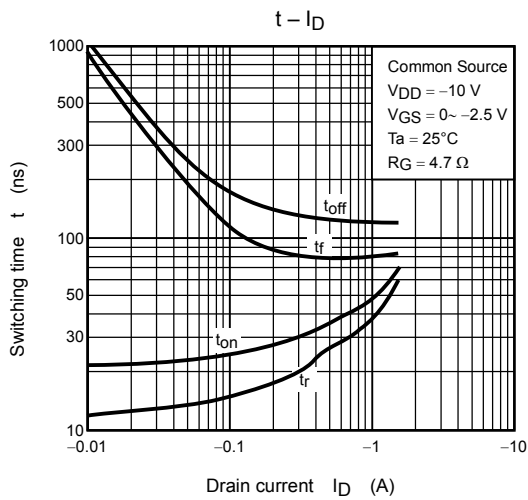
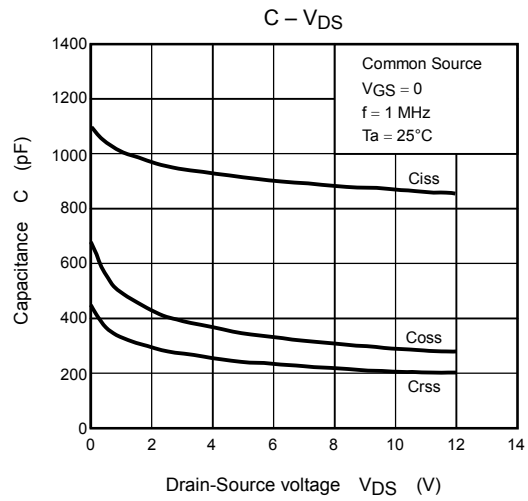
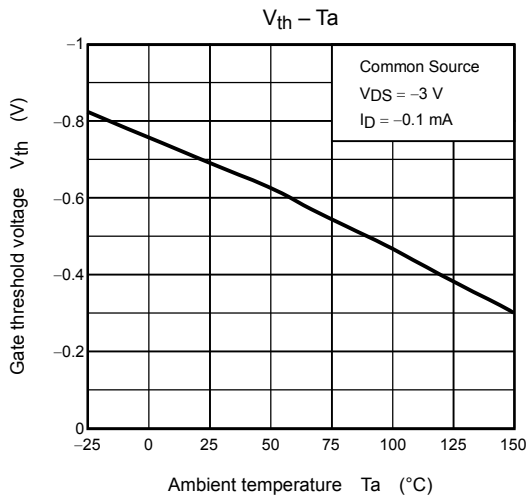
V_{th} can be expressed as voltage between gate and source when low operating current value is $I_D = -100 \mu\text{A}$ for this product. For normal switching operation, $V_{GS(ON)}$ requires higher voltage than V_{th} and $V_{GS(OFF)}$ requires lower voltage than V_{th} .

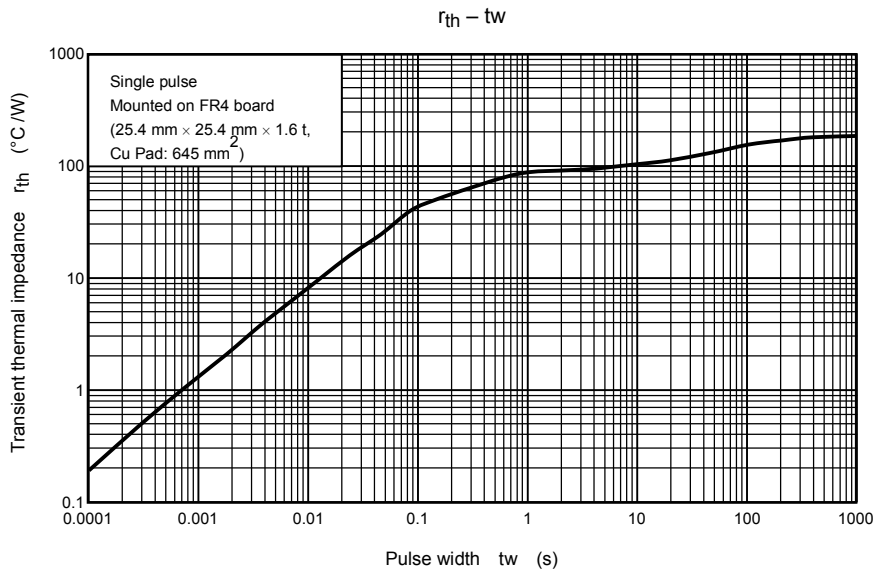
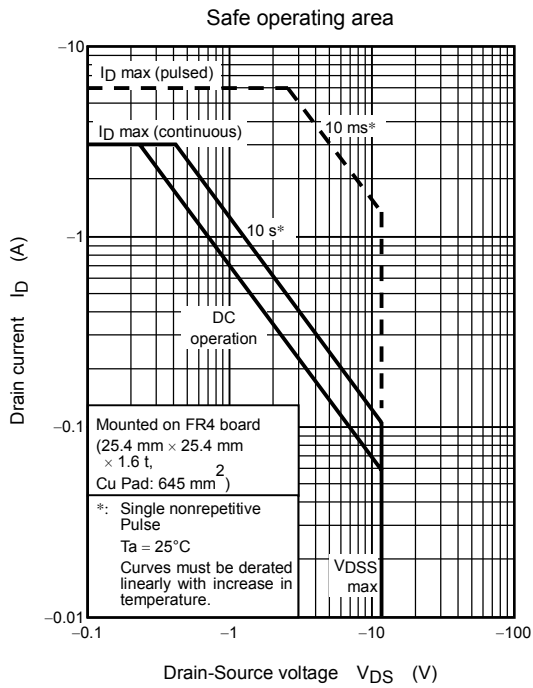
(relationship can be established as follows: $V_{GS(OFF)} < V_{th} < V_{GS(ON)}$)

Please take this into consideration for using the device.

V_{GS} recommended voltage of -2.5 V or higher to turn on this product.







RESTRICTIONS ON PRODUCT USE

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