

TOSHIBA Field Effect Transistor Silicon P Channel MOS Type

SSM3J120TU

○ Power Management Switch Applications

○ High-Current Switching Applications

- 1.5 V drive
- Low on-resistance

 $R_{on} = 140 \text{ m}\Omega \text{ (max) (@}V_{GS} = -1.5 \text{ V)}$
 $R_{on} = 78 \text{ m}\Omega \text{ (max) (@}V_{GS} = -1.8 \text{ V)}$
 $R_{on} = 49 \text{ m}\Omega \text{ (max) (@}V_{GS} = -2.5 \text{ V)}$
 $R_{on} = 38 \text{ m}\Omega \text{ (max) (@}V_{GS} = -4.0 \text{ V)}$

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

Characteristics		Symbol	Rating	Unit
Drain-Source voltage		V_{DS}	-20	V
Gate-Source voltage		V_{GSS}	± 8	V
Drain current	DC	I_D	-4.0	A
	Pulse	I_{DP}	-8.0	
Drain power dissipation		P_D (Note 1)	800	mW
		P_D (Note 2)	500	
Channel temperature		T_{ch}	150	$^\circ\text{C}$
Storage temperature		T_{stg}	-55~150	$^\circ\text{C}$

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).

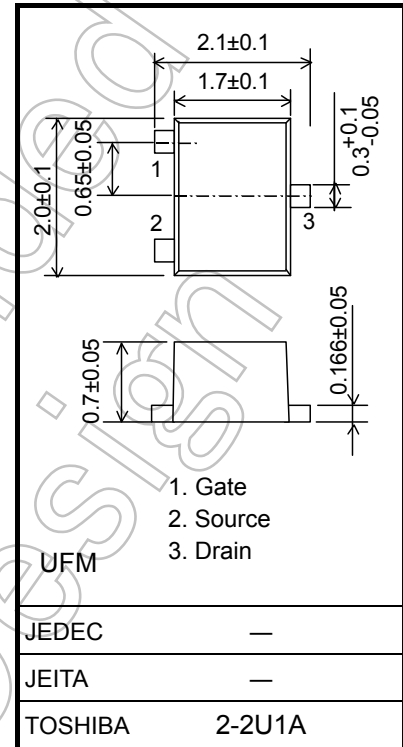
Note 1 : Mounted on ceramic board

(25.4 mm × 25.4 mm × 0.8 t, Cu Pad: 645 mm²)

Note 2 : Mounted on FR4 board

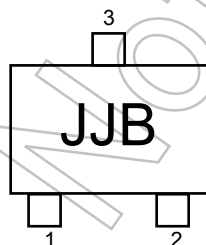
(25.4 mm × 25.4 mm × 1.6 t, Cu Pad: 645 mm²)

Unit: mm

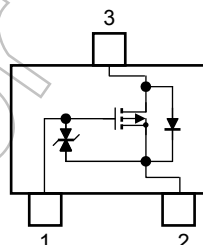


Weight: 6.6mg (typ.)

Marking



Equivalent Circuit (top view)



Start of commercial production
2005-11

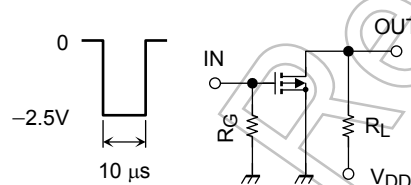
Electrical Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Drain-Source breakdown voltage	$V_{(BR)DSS}$	$I_D = -1 \text{ mA}$, $V_{GS} = 0$	-20	—	—	V
	$V_{(BR)DSX}$	$I_D = -1 \text{ mA}$, $V_{GS} = +8 \text{ V}$	-12	—	—	
Drain cut-off current	I_{DSS}	$V_{DS} = -20 \text{ V}$, $V_{GS} = 0$	—	—	-10	μA
Gate leakage current	I_{GSS}	$V_{GS} = \pm 8 \text{ V}$, $V_{DS} = 0$	—	—	± 1	μA
Gate threshold voltage	V_{th}	$V_{DS} = -3 \text{ V}$, $I_D = -1 \text{ mA}$	-0.3	—	-1.0	V
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = -3 \text{ V}$, $I_D = -2.0 \text{ A}$ (Note 3)	6.1	12.1	—	S
Drain-Source ON-resistance	$R_{DS(ON)}$	$I_D = -3.0 \text{ A}$, $V_{GS} = -4.0 \text{ V}$ (Note 3)	—	28	38	$\text{m}\Omega$
		$I_D = -2.0 \text{ A}$, $V_{GS} = -2.5 \text{ V}$ (Note 3)	—	34	49	
		$I_D = -1.0 \text{ A}$, $V_{GS} = -1.8 \text{ V}$ (Note 3)	—	47	78	
		$I_D = -0.3 \text{ A}$, $V_{GS} = -1.5 \text{ V}$ (Note 3)	—	60	140	
Input capacitance	C_{iss}	$V_{DS} = -10 \text{ V}$, $V_{GS} = 0$ $f = 1 \text{ MHz}$	—	1484	—	pF
Output capacitance	C_{oss}		—	185	—	pF
Reverse transfer capacitance	C_{rss}		—	169	—	pF
Switching time	Turn-on time	t_{on}	—	67	—	ns
	Turn-off time	t_{off}		92		
Total gate charge	Q_g	$V_{DS} = -16 \text{ V}$, $I_{DS} = -4.0 \text{ A}$, $V_{GS} = -4.0 \text{ V}$	—	22.3	—	nC
Gate-Source charge	Q_{gs}		—	14.9	—	
Gate-Drain charge	Q_{gd}		—	7.3	—	
Drain-Source forward voltage	V_{DSF}	$I_D = 4.0 \text{ A}$, $V_{GS} = 0$ (Note 3)	—	0.8	1.2	V

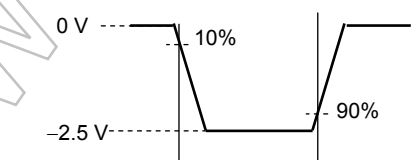
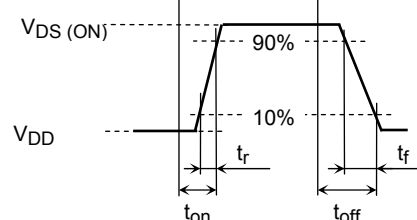
Note 3: Pulse test

Switching Time Test Circuit

(a) Test Circuit



$V_{DD} = -10 \text{ V}$
 $R_G = 4.7 \Omega$
 Duty $\leq 1\%$
 V_{IN} : $t_r, t_f < 5 \text{ ns}$
 Common Source
 $T_a = 25^\circ\text{C}$

(b) V_{IN} (c) V_{OUT} 

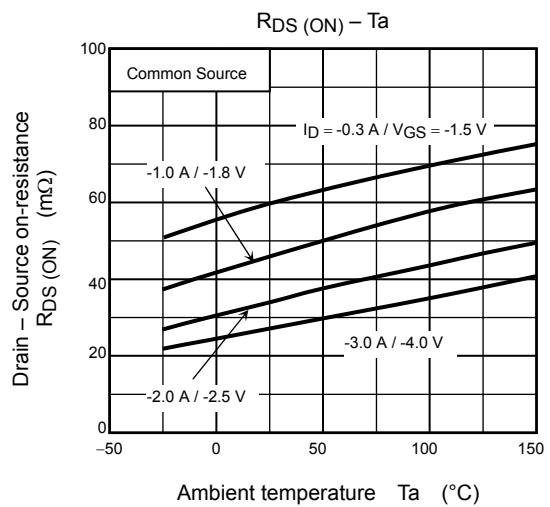
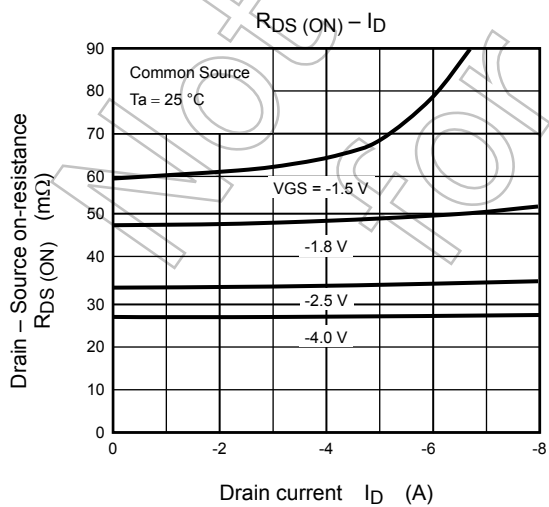
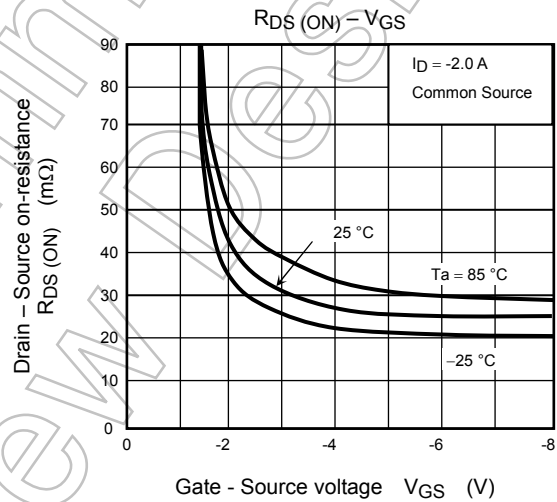
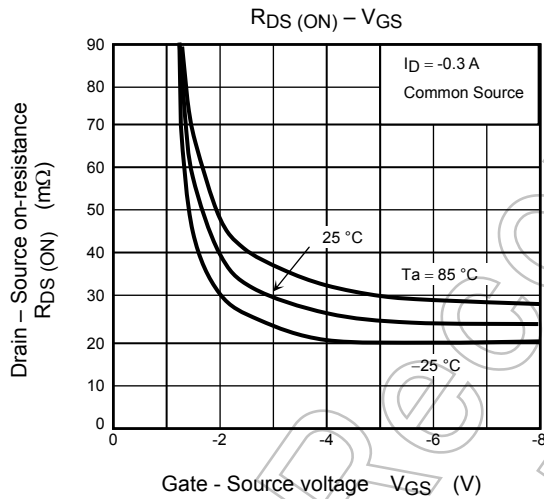
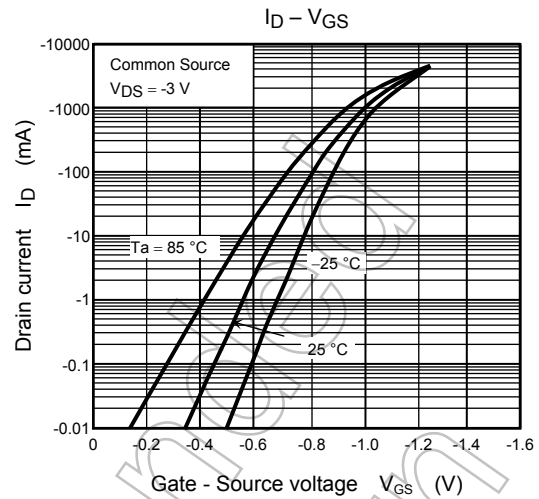
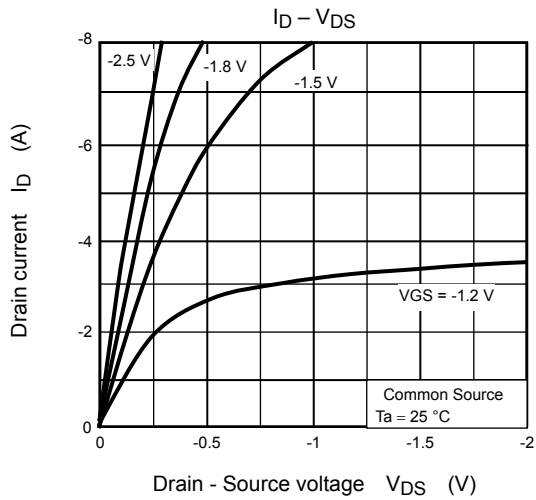
Precaution

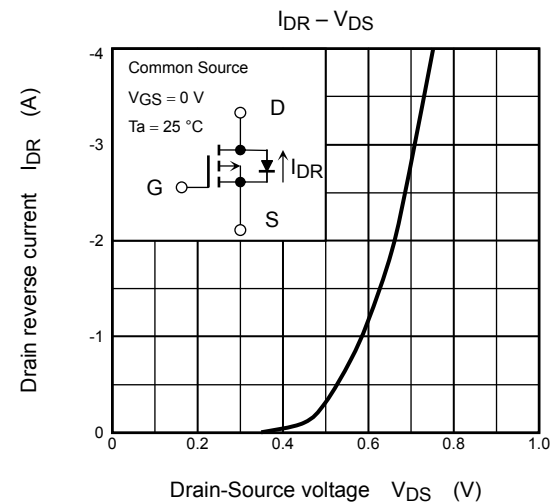
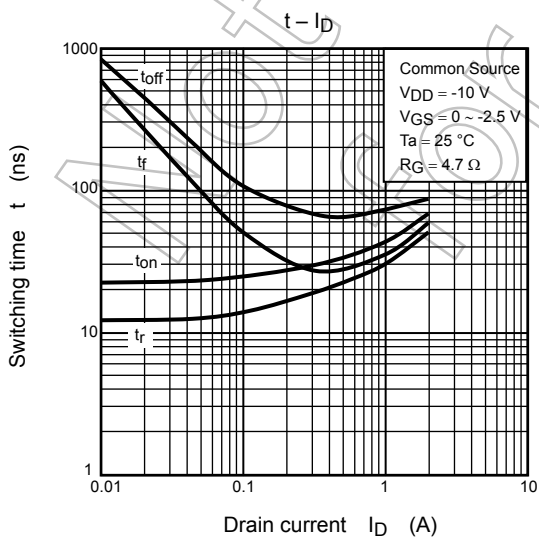
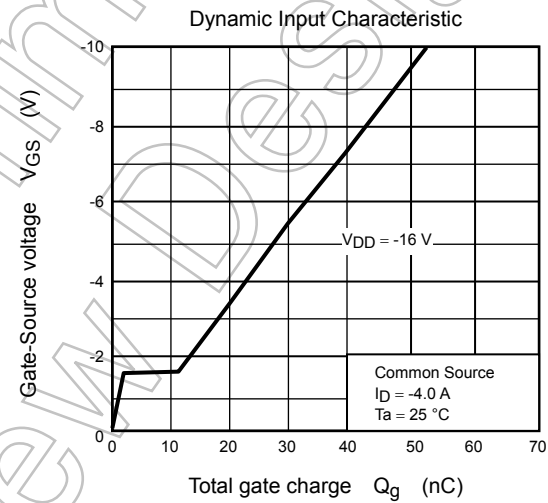
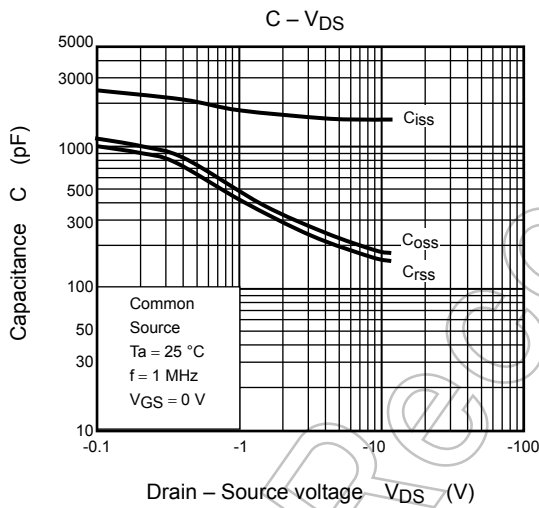
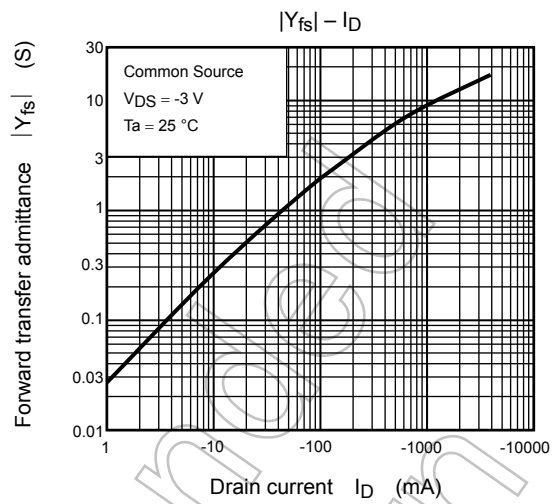
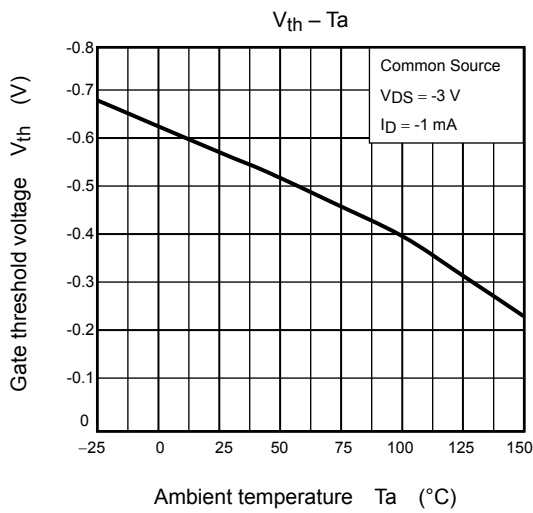
V_{th} can be expressed as the voltage between the gate and source when the low operating current value is $I_D = -1 \text{ mA}$ for this product. For normal switching operation, $V_{GS(ON)}$ requires a higher voltage than V_{th} and $V_{GS(OFF)}$ requires a lower voltage than V_{th} . (The relationship can be established as follows: $V_{GS(OFF)} < V_{th} < V_{GS(ON)}$.)

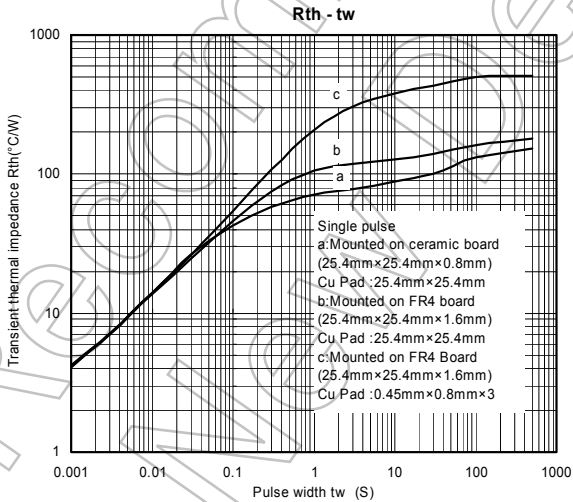
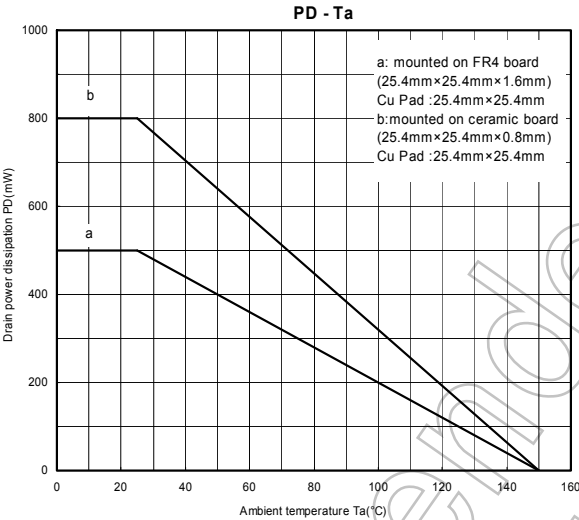
Be sure to take this into consideration when using the device.

Handling Precaution

When handling individual devices (which are not yet mounted on a circuit board), ensure that the environment is protected against static 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.







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