

TOSHIBA Field Effect Transistor Silicon P-Channel MOS Type

SSM3J113TU

High Speed Switching Applications

- 2.0V drive
- Low on-resistance: $R_{on} = 449m\Omega$ (max) (@ $V_{GS} = -2.0$ V)
 $R_{on} = 249m\Omega$ (max) (@ $V_{GS} = -2.5$ V)
 $R_{on} = 169m\Omega$ (max) (@ $V_{GS} = -4.0$ V)

Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
Drain-Source voltage		V_{DS}	-20	V
Gate-Source voltage		V_{GSS}	± 12	V
Drain current	DC	I_D	-1.7	A
	Pulse	I_{DP}	-3.4	
Drain power dissipation	P_D (Note 1)		800	mW
	P_D (Note 2)		500	
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	-55 to 150	°C

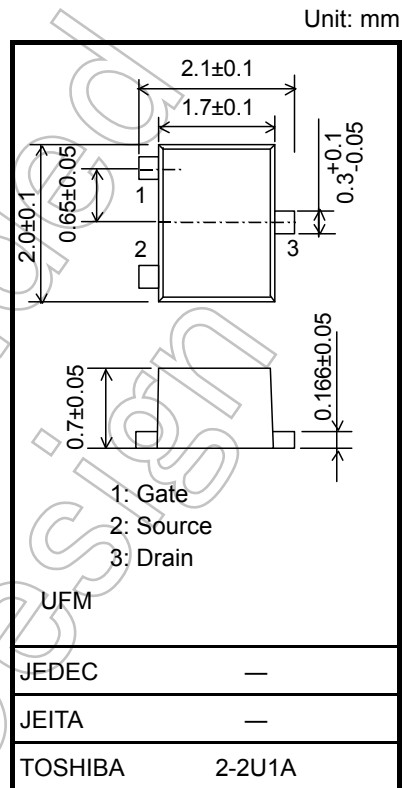
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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: Mounted on ceramic board.
(25.4 mm × 25.4 mm × 0.8 mm, Cu Pad: 645 mm²)
- Note 2: Mounted on FR4 board.
(25.4 mm × 25.4 mm × 1.6 mm, Cu Pad: 645 mm²)

Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Conditions	Min	Typ.	Max	Unit
Drain-Source breakdown voltage		$V_{(BR)DSS}$	$I_D = -1$ mA, $V_{GS} = 0$	-20	—	—	V
		$V_{(BR)DSX}$	$I_D = -1$ mA, $V_{GS} = +12$ V	-8	—	—	
Drain cut-off current		I_{DSS}	$V_{DS} = -20$ V, $V_{GS} = 0$	—	—	-1	μA
Gate leakage current		I_{GSS}	$V_{GS} = \pm 12$ V, $V_{DS} = 0$	—	—	± 1	μA
Gate threshold voltage		V_{th}	$V_{DS} = -3$ V, $I_D = -0.1$ mA	-0.5	—	-1.1	V
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = -3$ V, $I_D = -0.65$ A (Note3)	1.3	2.7	—	S
Drain-Source on-resistance		$R_{DS(ON)}$	$I_D = -0.65$ A, $V_{GS} = -4.0$ V (Note3)	—	129	169	mΩ
			$I_D = -0.65$ A, $V_{GS} = -2.5$ V (Note3)	—	189	249	
			$I_D = -0.65$ A, $V_{GS} = -2.0$ V (Note3)	—	249	449	
Input capacitance		C_{iss}	$V_{DS} = -10$ V, $V_{GS} = 0$, $f = 1$ MHz	—	370	—	pF
Output capacitance		C_{oss}	$V_{DS} = -10$ V, $V_{GS} = 0$, $f = 1$ MHz	—	116	—	pF
Reverse transfer capacitance		C_{rss}	$V_{DS} = -10$ V, $V_{GS} = 0$, $f = 1$ MHz	—	73	—	pF
Switching time	Turn-on time	t_{on}	$V_{DD} = -10$ V, $I_D = -0.65$ A, $V_{GS} = 0$ to -2.5 V, $R_G = 4.7$ Ω	—	33	—	ns
	Turn-off time	t_{off}		—	47	—	
Drain-Source forward voltage		V_{DSF}	$I_D = 1.7$ A, $V_{GS} = 0$ V (Note3)	—	0.77	1.2	V

Note3: Pulse test

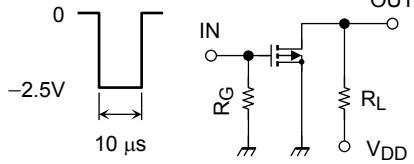


Weight: 6.6 mg (typ.)

Start of commercial production
2005-06

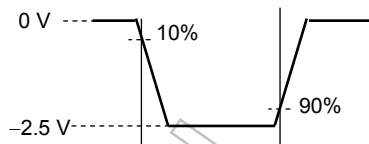
Switching Time Test Circuit

(a) Test circuit

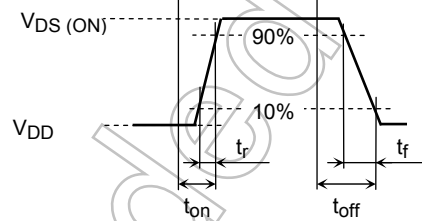


$V_{DD} = -10\text{ V}$
 $R_G = 4.7\ \Omega$
 Duty $\leq 1\%$
 V_{IN} : $t_r, t_f < 5\text{ ns}$
 Common Source
 $T_a = 25^\circ\text{C}$

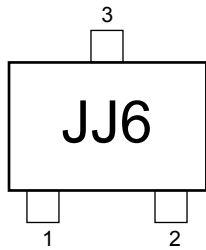
(b) V_{IN}



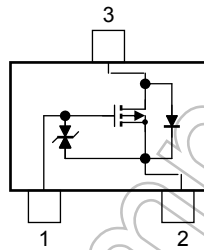
(c) V_{OUT}



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 $I_D = -0.1\text{ mA}$ 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} .

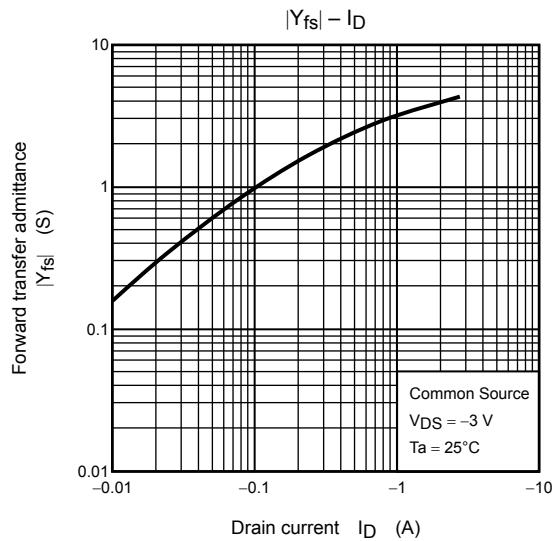
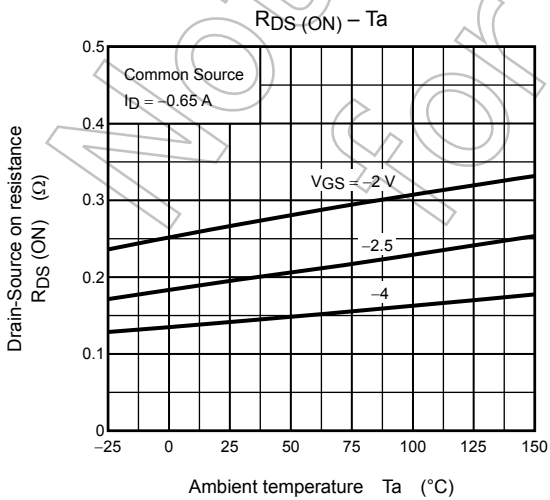
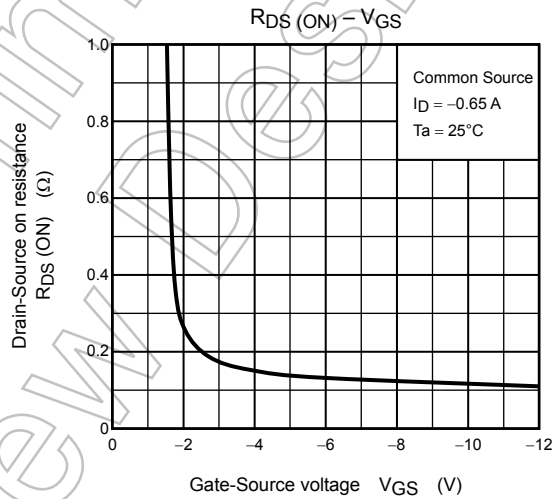
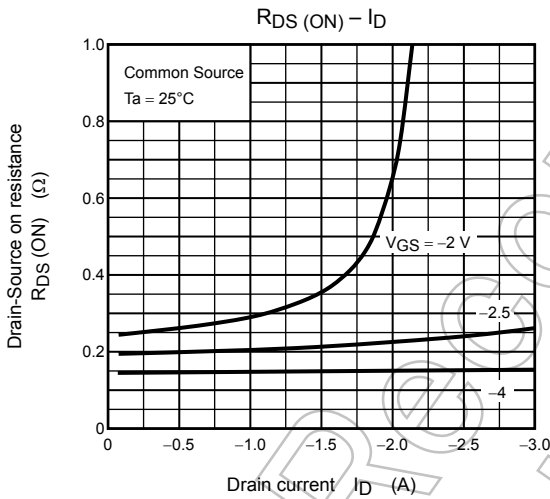
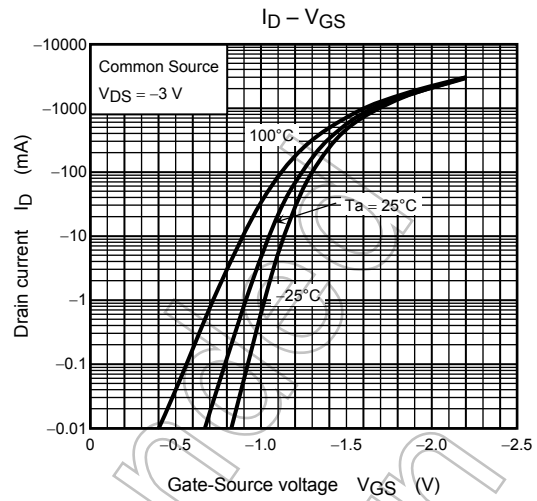
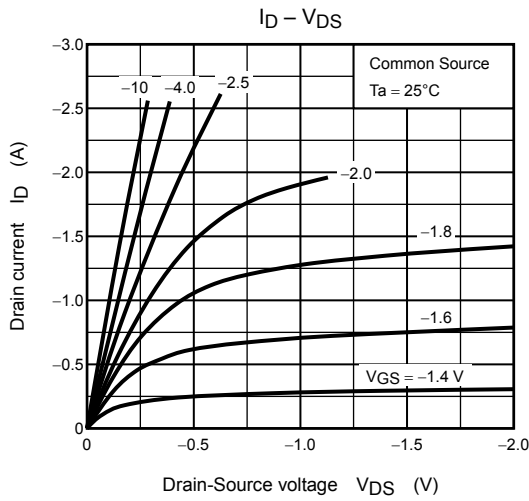
(The relationship can be established as follows: $V_{GS (off)} < V_{th} < V_{GS (on)}$)

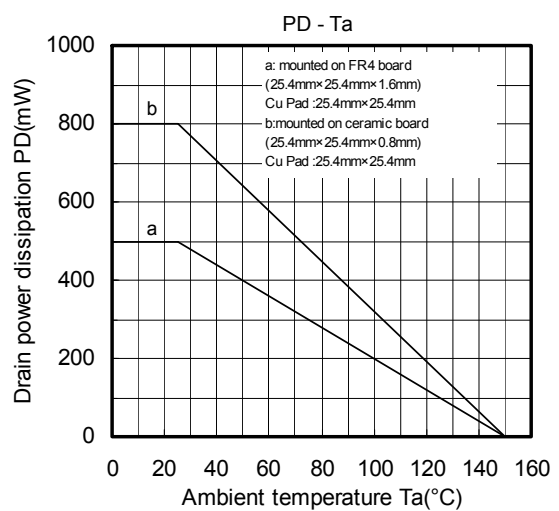
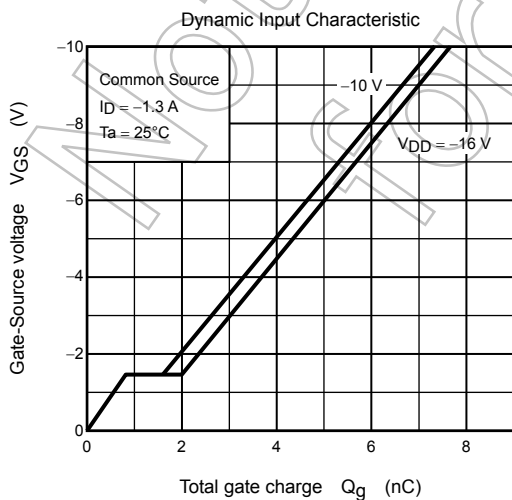
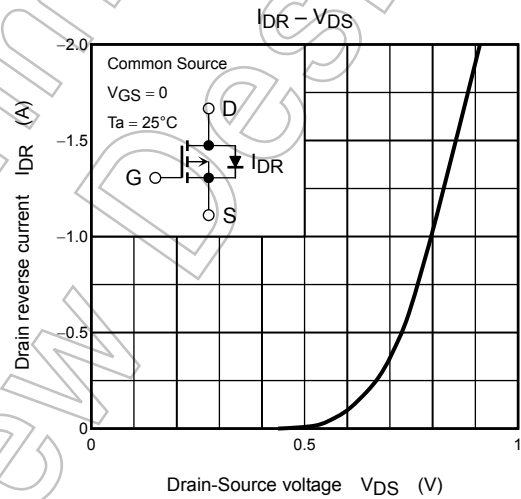
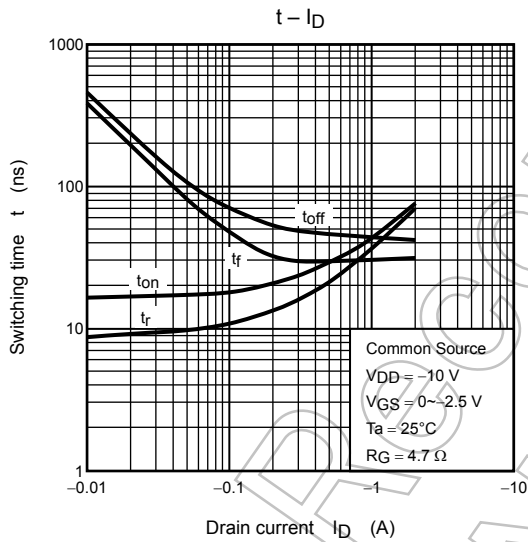
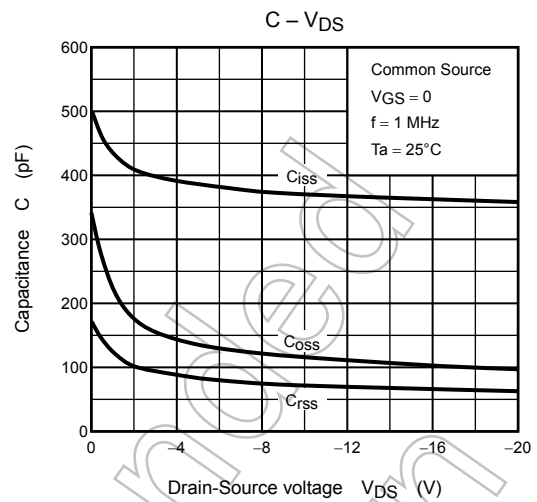
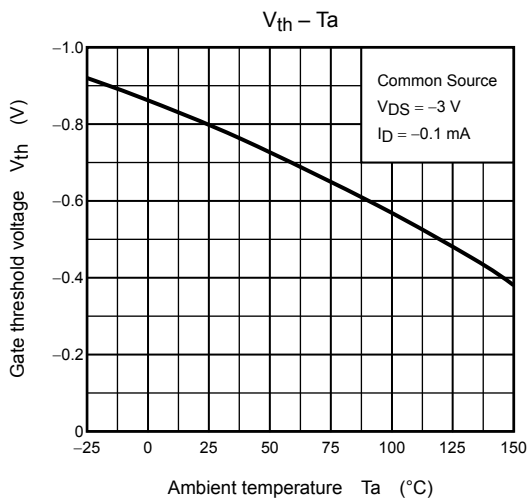
Take this into consideration when using the device.

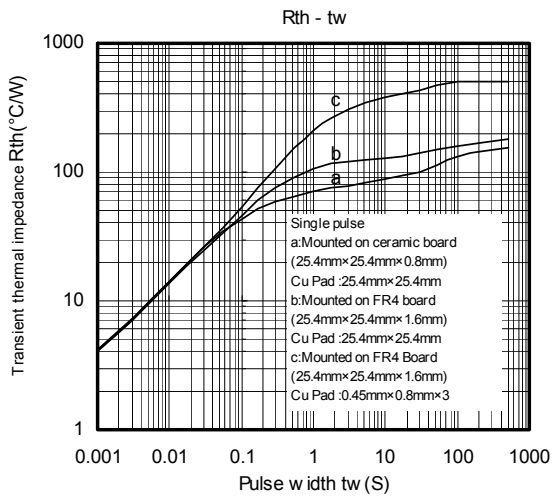
Handling Precaution

When handling individual devices which are not yet mounted on a circuit board, be sure that the environment is protected against electrostatic discharge. 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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Not Recommended for New Design

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