

SSM6J51TU

High Current Switching Applications

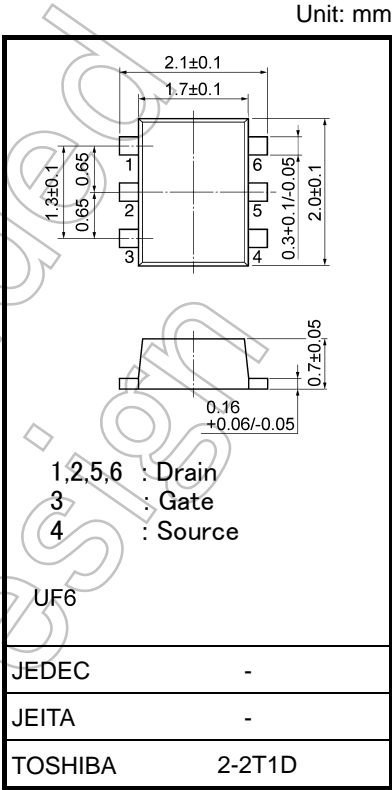
- Suitable for high-density mounting due to compact package
- Low on-resistance:  $R_{on} = 54\text{ m}\Omega\text{ (max) (@}V_{GS} = -2.5\text{ V)}$   
 $85\text{ m}\Omega\text{ (max) (@}V_{GS} = -1.8\text{ V)}$   
 $150\text{ m}\Omega\text{ (max) (@}V_{GS} = -1.5\text{ V)}$

Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-Source voltage		$V_{DS}$	-12	V
Gate-Source voltage		$V_{GSS}$	$\pm 8$	V
Drain current	DC	$I_D$	-4	A
	Pulse	$I_{DP}$	-8	A
Drain power dissipation		$P_D$ (Note 1)	500	mW
Channel temperature		$T_{ch}$	150	°C
Storage temperature range		$T_{stg}$	-55~150	°C

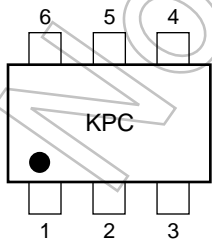
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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 mm × 25.4 mm × 1.6 t, Cu Pad: 645 mm<sup>2</sup>)

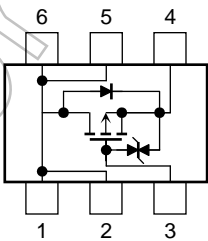


Weight: 7 mg (typ.)

Marking



Equivalent Circuit (top view)



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.

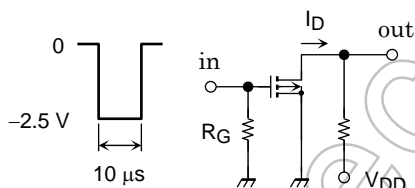
**Electrical Characteristics (Ta = 25°C)**

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	$I_{GSS}$	$V_{GS} = \pm 8 \text{ V}, V_{DS} = 0$	—	—	$\pm 10$	$\mu\text{A}$
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	—	—	
Drain cut-off current	$I_{DSS}$	$V_{DS} = -12 \text{ V}, V_{GS} = 0$	—	—	-10	$\mu\text{A}$
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 2)	6.0	12.0	—	S
Drain-Source on-resistance	$R_{DS(ON)}$	$I_D = -2.0 \text{ A}, V_{GS} = -2.5 \text{ V}$ (Note 2)	—	38	54	$\text{m}\Omega$
		$I_D = -1.0 \text{ A}, V_{GS} = -1.8 \text{ V}$ (Note 2)	—	48	85	
		$I_D = -0.3 \text{ A}, V_{GS} = -1.5 \text{ V}$ (Note 2)	—	60	150	
Input capacitance	$C_{iss}$	$V_{DS} = -10 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$	—	1700	—	
Reverse transfer capacitance	$C_{rss}$	$V_{DS} = -10 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$	—	190	—	pF
Output capacitance	$C_{oss}$	$V_{DS} = -10 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$	—	210	—	pF
Switching time	Turn-on time	$V_{DS} = -10 \text{ V}, I_D = -2.0 \text{ A},$	—	57	—	ns
	Turn-off time	$V_{GS} = 0 \sim -2.5 \text{ V}, R_G = 4.7 \Omega$	—	120	—	

Note 2: Pulse test

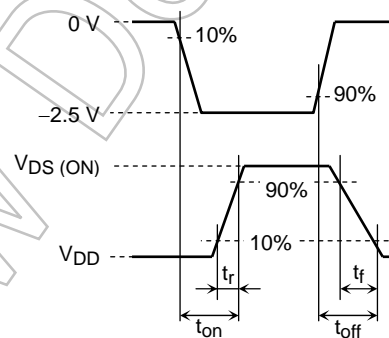
**Switching Time Test Circuit**

**(a) Test Circuit**

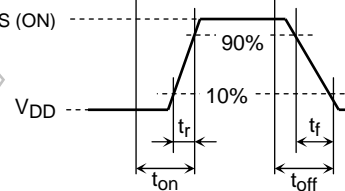


$V_{DD} = -10 \text{ V}$   
 $R_G = 4.7 \Omega$   
 $\text{D.U.} \leq 1\%$   
 $V_{IN}: t_r, t_f < 5 \text{ ns}$   
 Common Source  
 $T_a = 25^\circ\text{C}$

**(b)  $V_{IN}$**



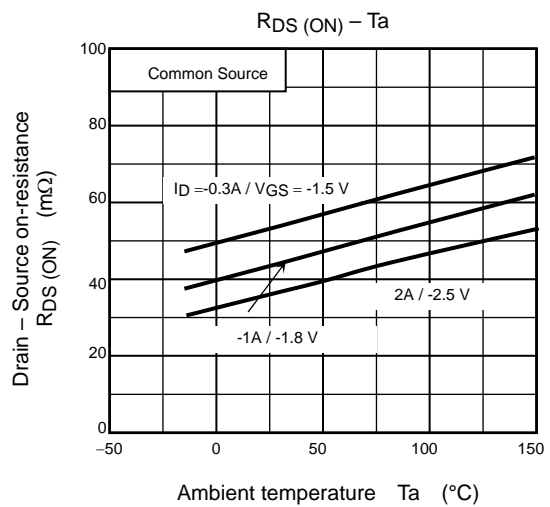
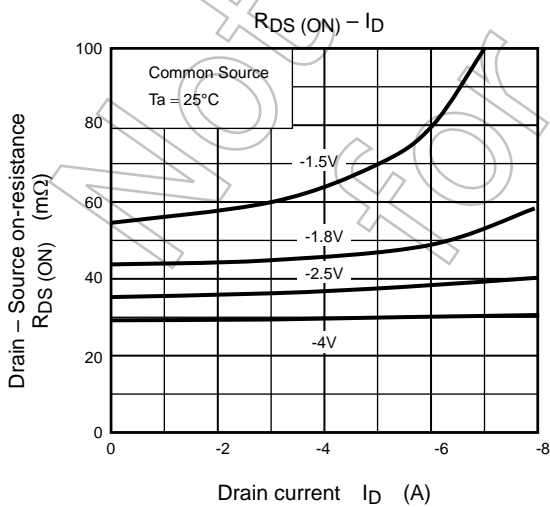
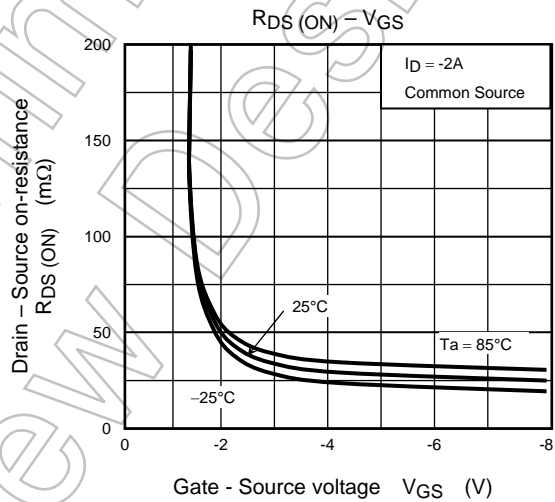
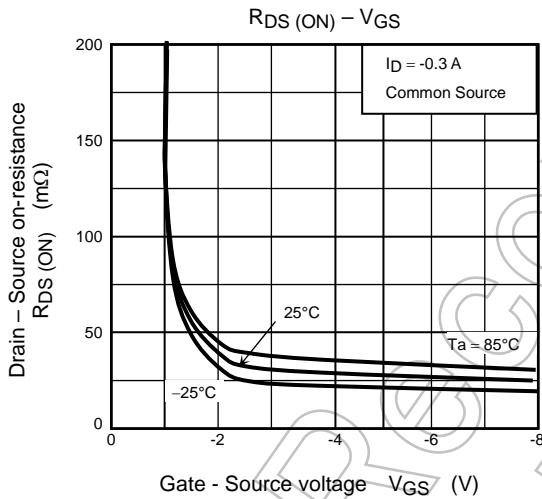
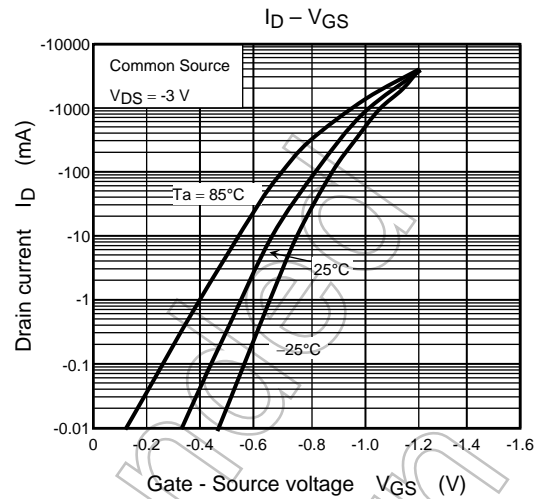
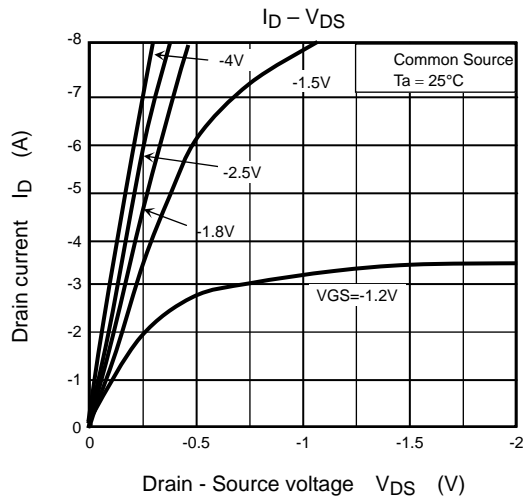
**(c)  $V_{OUT}$**

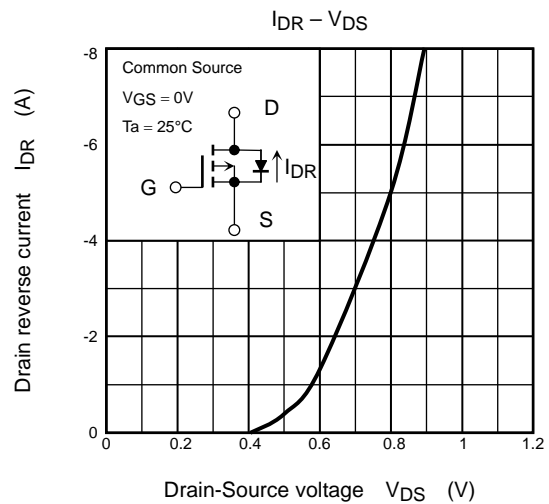
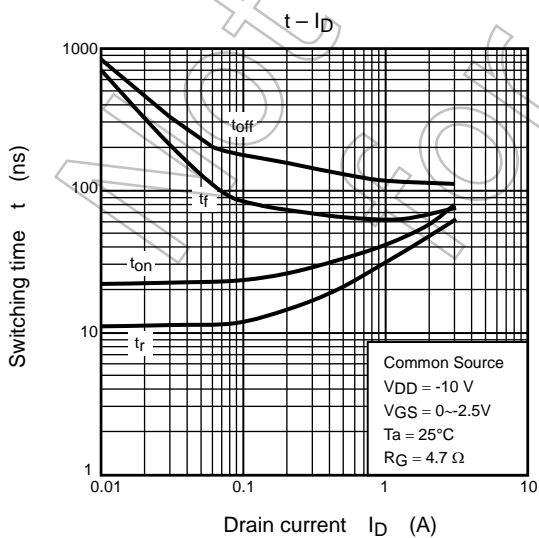
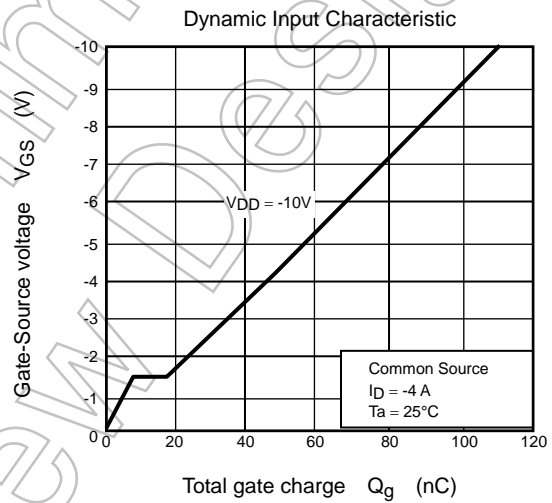
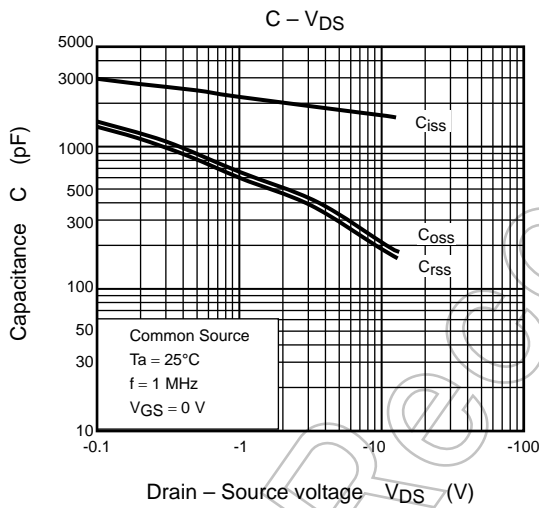
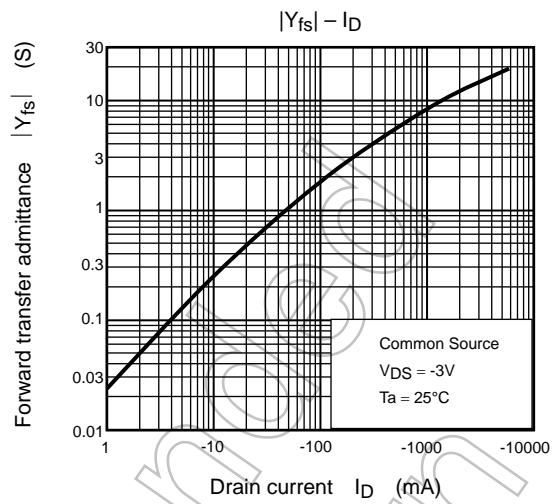
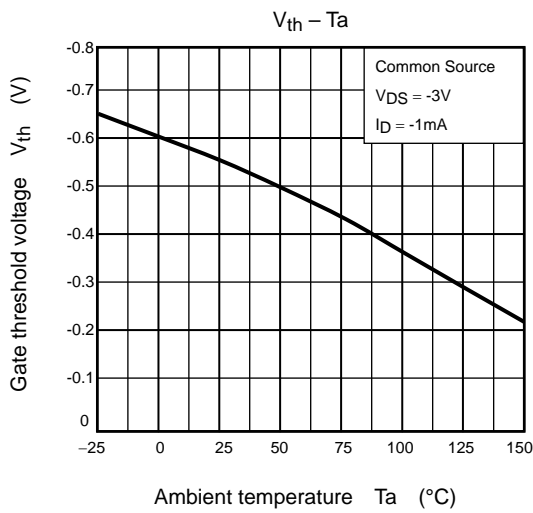


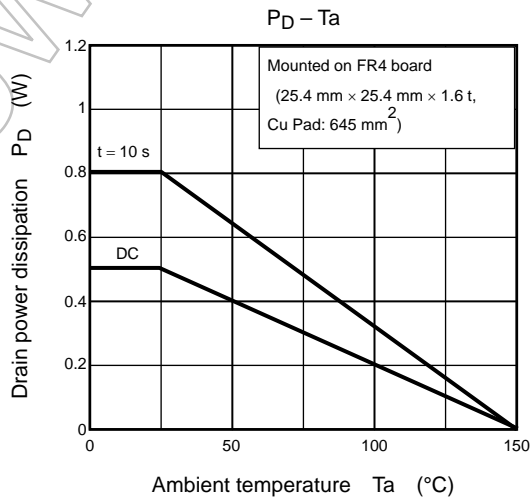
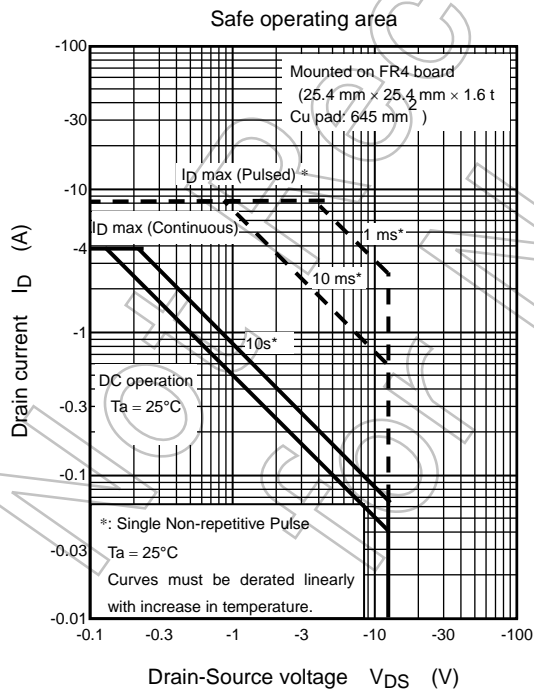
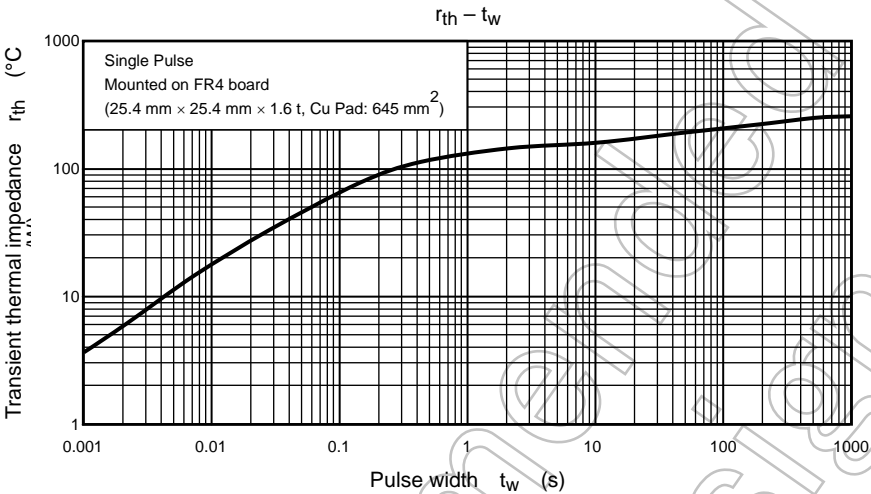
**Precaution**

$V_{th}$  can be expressed as 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.







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