

TOSHIBA Field-Effect Transistor Silicon P-Channel MOS Type

# SSM6J402TU

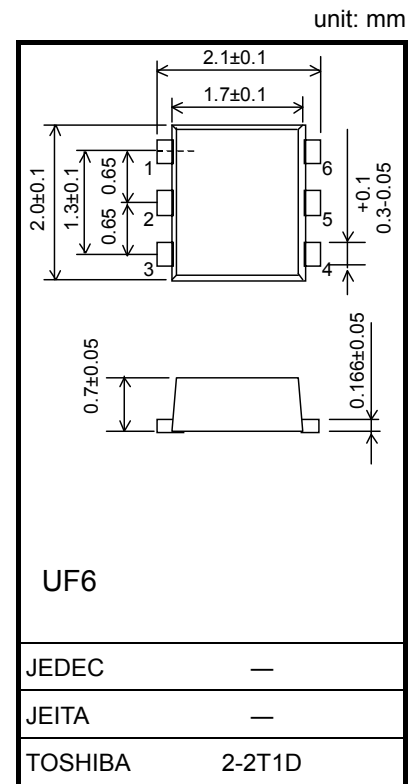
- DC/DC Converter Application
- High-Speed Switching Applications

- 4.0 V drive
- Low ON-resistance :  $R_{DS(ON)} = 225m\Omega$  max (@ $V_{GS} = -4$  V)  
                           :  $R_{DS(ON)} = 117m\Omega$  max (@ $V_{GS} = -10$  V)

## Absolute Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Drain-source voltage	$V_{DSS}$	-30	V
Gate-source voltage	$V_{GSS}$	±20	V
Drain current	DC	$I_D$	-2.0
	Pulse	$I_{DP}$	-4.0
Drain power dissipation	$P_D$ (注 1)	500	mW
Channel temperature	$T_{ch}$	150	°C
Storage temperature	$T_{stg}$	-55 to 150	°C

Note 1: Mounted on an FR4 board  
 (25.4 mm × 25.4 mm × 1.6 t, Cu Pad: 645 mm<sup>2</sup>)



Weight: 7.0 mg (typ.)

## Electrical Characteristics (Ta = 25°C)

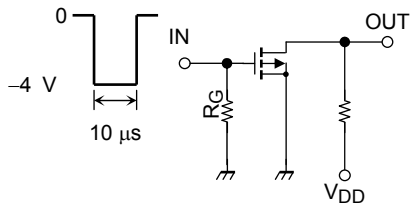
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Drain-source breakdown voltage	$V_{(BR) DSS}$	$I_D = -1$ mA, $V_{GS} = 0$ V	-30	—	—	V
	$V_{(BR) DSX}$	$I_D = -1$ mA, $V_{GS} = 20$ V	-15	—	—	
Drain cutoff current	$I_{DSS}$	$V_{DS} = -30$ V, $V_{GS} = 0$ V	—	—	-1	μA
Gate leakage current	$I_{GSS}$	$V_{GS} = \pm 16$ V, $V_{DS} = 0$ V	—	—	±1	μA
Gate threshold voltage	$V_{th}$	$V_{DS} = -5$ V, $I_D = -1$ mA	-1.2	—	-2.6	V
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = -5$ V, $I_D = -1$ A (Note2)	1.6	3.1	—	S
Drain-source ON-resistance	$R_{DS(ON)}$	$I_D = -1$ A, $V_{GS} = -10$ V (Note2)	—	80	117	mΩ
		$I_D = -0.5$ A, $V_{GS} = -4$ V (Note2)	—	160	225	
Input capacitance	$C_{iss}$	$V_{DS} = -15$ V, $V_{GS} = 0$ V, $f = 1$ MHz	—	280	—	pF
Output capacitance	$C_{oss}$		—	80	—	
Reverse transfer capacitance	$C_{rss}$		—	45	—	
Total Gate Charge	$Q_g$	$V_{DS} = -15$ V, $I_D = -2.0$ A $V_{GS} = -10$ V	—	5.3	—	nC
Gate-Source Charge	$Q_{gs}$		—	4.1	—	
Gate-Drain Charge	$Q_{gd}$		—	1.2	—	
Switching time	Turn-on time	$V_{DD} = -15$ V, $I_D = -1$ A	—	16	—	ns
	Turn-off time	$V_{GS} = 0$ to $-4$ V, $R_G = 10$ Ω	—	35	—	
Drain-source forward voltage	$V_{DSF}$	$I_D = 2$ A, $V_{GS} = 0$ V (Note2)	—	0.8	1.2	V

Note 2: Pulse test

Start of commercial production  
 2008-01

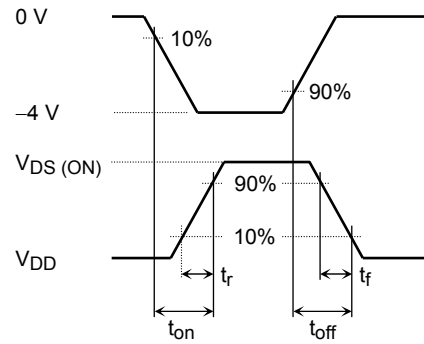
**Switching Time Test Circuit**

**(a) Test Circuit**



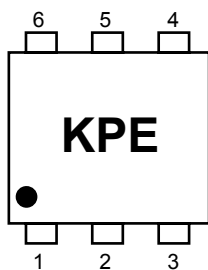
$V_{DD} = -15\text{ V}$   
 $R_G = 10\ \Omega$   
 Duty  $\leq 1\%$   
 $V_{IN}$ :  $t_r, t_f < 5\text{ ns}$   
 Common Source  
 $T_a = 25^\circ\text{C}$

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

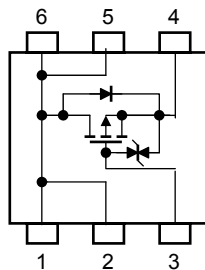


**(c)  $V_{OUT}$**

**Marking**



**Equivalent Circuit (top view)**



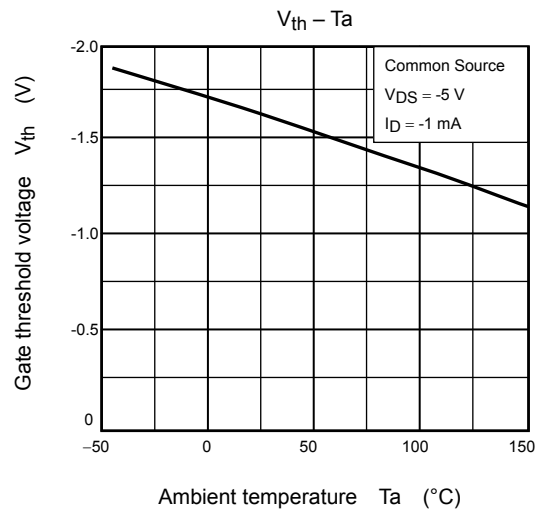
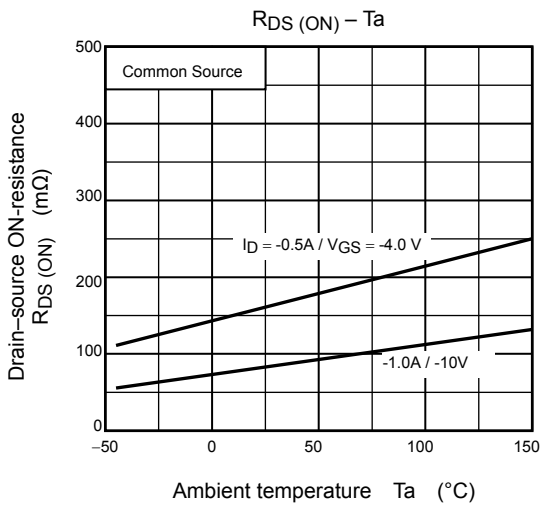
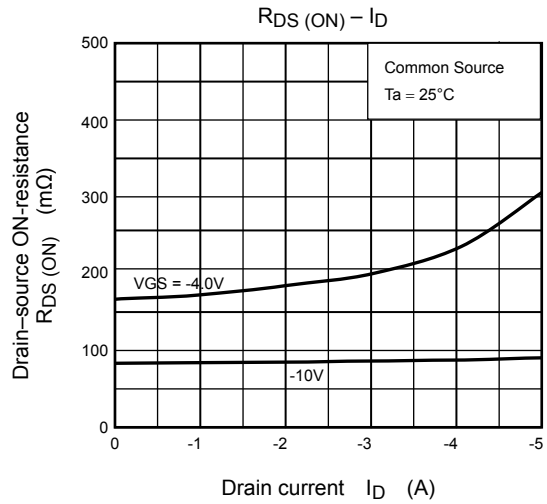
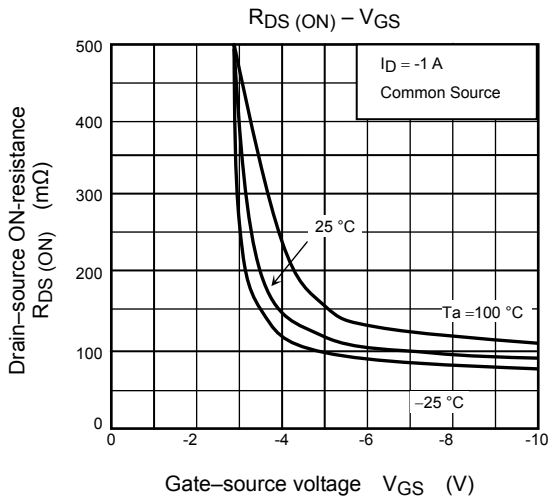
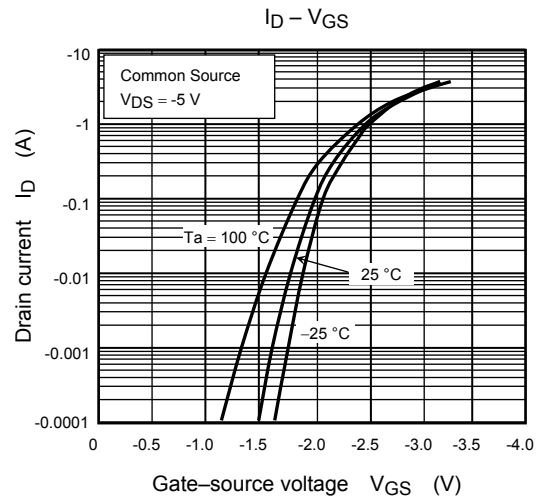
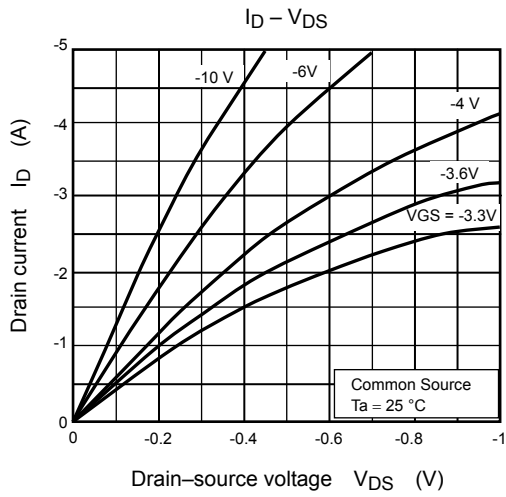
**Notice on Usage**

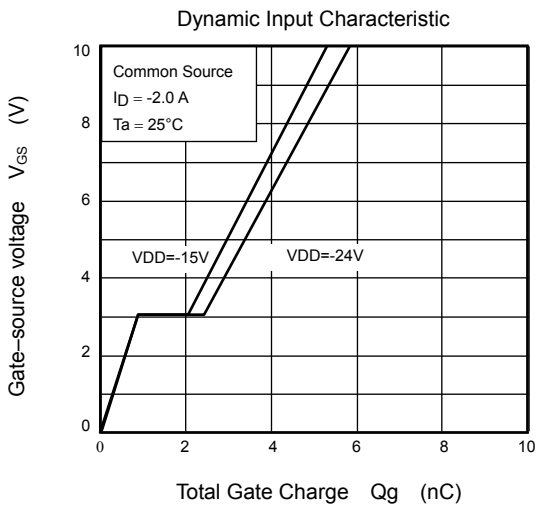
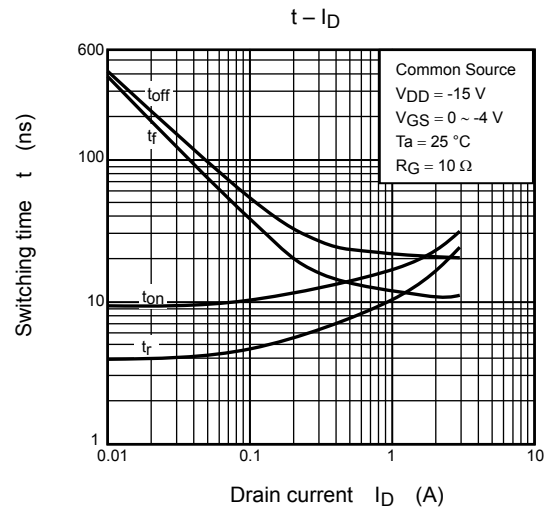
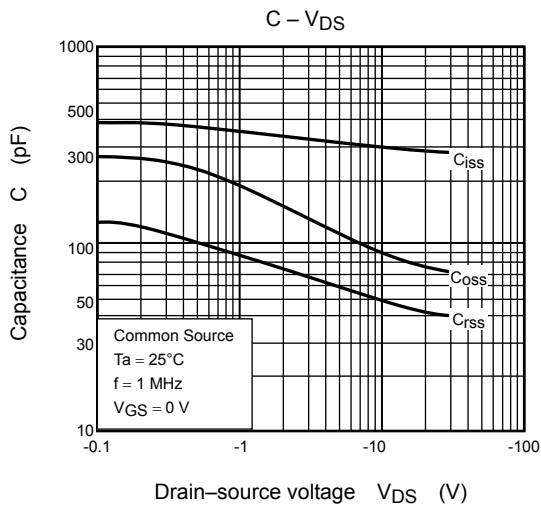
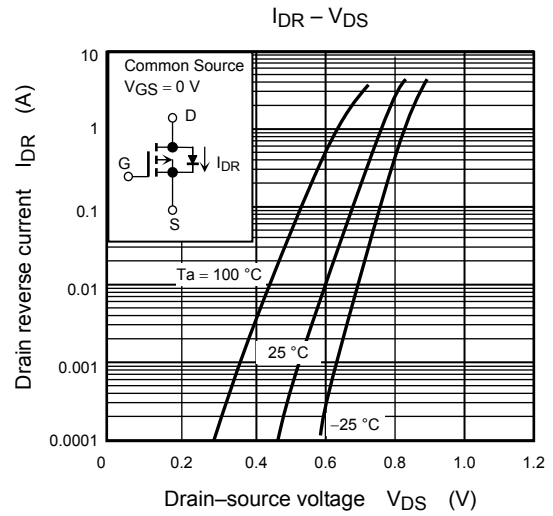
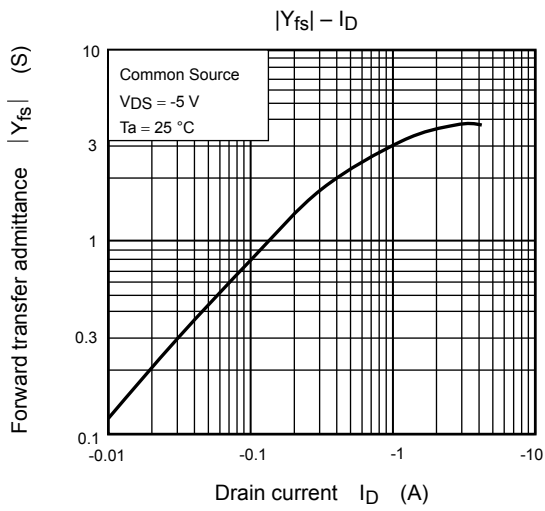
$V_{th}$  can be expressed as the voltage between gate and source when the low operating current value is  $I_D = 1\text{ mA}$  for this product. For normal switching operation,  $V_{GS(ON)}$  requires a higher voltage than  $V_{th}$  and  $V_{GS(OFF)}$  requires a lower voltage than  $V_{th}$ . (The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

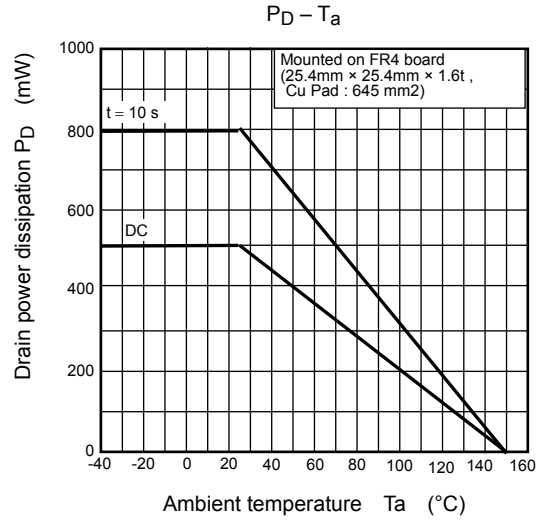
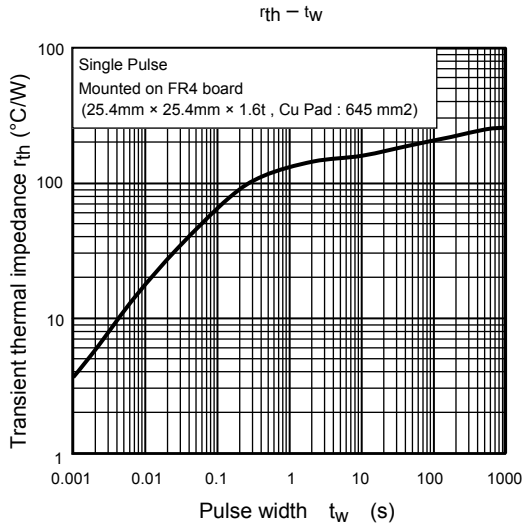
Take this into consideration when using the device.

**Handling Precaution**

When handling individual devices that are not yet mounted on a circuit board, make sure that the environment is protected against electrostatic discharge. Operators should wear antistatic clothing, and containers and other objects that come into direct contact with devices should be made of antistatic materials.







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