

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (U-MOS III)

# SSM6K22FE

High Current Switching Applications  
DC-DC Converter

Unit: mm

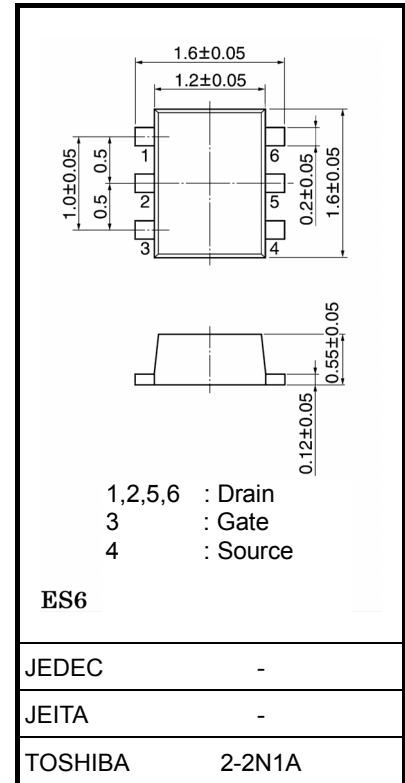
- Suitable for high-density mounting due to compact package
- Low on resistance:  $R_{on} = 170 \text{ m}\Omega$  (max) (@ $V_{GS} = 4.0 \text{ V}$ )  
 $R_{on} = 230 \text{ m}\Omega$  (max) (@ $V_{GS} = 2.5 \text{ V}$ )

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

Characteristics		Symbol	Rating	Unit
Drain-Source voltage		$V_{DS}$	20	V
Gate-Source voltage		$V_{GS}$	$\pm 12$	V
Drain current	DC	$I_D$	1.4	A
	Pulse	$I_{DP}$	5.6	
Drain power dissipation		$P_D$ (Note 1)	500	mW
Channel temperature		$T_{ch}$	150	°C
Storage temperature range		$T_{stg}$	-55~150	°C

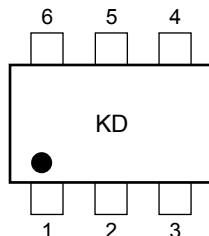
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

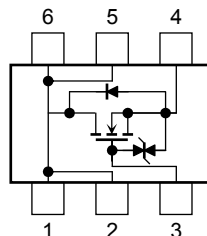


Weight: 3 mg (typ.)

## 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.

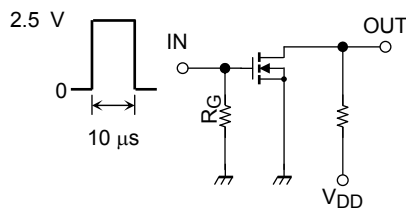
## Electrical Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	$I_{GSS}$	$V_{GS} = \pm 12\text{ V}, V_{DS} = 0$	-	-	$\pm 1$	$\mu\text{A}$
Drain-Source breakdown voltage	$V_{(BR)DSS}$	$I_D = 1\text{ mA}, V_{GS} = 0$	20	-	-	V
	$V_{(BR)DSX}$	$I_D = 1\text{ mA}, V_{GS} = -12\text{ V}$	12	-	-	
Drain cut-off current	$I_{DSS}$	$V_{DS} = 20\text{ V}, V_{GS} = 0$	-	-	1	$\mu\text{A}$
Gate threshold voltage	$V_{th}$	$V_{DS} = 3\text{ V}, I_D = 0.1\text{ mA}$	0.4	-	1.1	V
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 3\text{ V}, I_D = 0.6\text{ A}$ (注 2)	1.4	2.8	-	S
Drain-Source on-resistance	$R_{DS(ON)}$	$I_D = 0.7\text{ A}, V_{GS} = 4\text{ V}$ (注 2)	-	150	170	m $\Omega$
		$I_D = 0.7\text{ A}, V_{GS} = 2.5\text{ V}$ (注 2)	-	190	230	
Input capacitance	$C_{iss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	-	125	-	pF
Reverse transfer capacitance	$C_{rss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	-	17	-	pF
Output capacitance	$C_{oss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	-	42	-	pF
Switching time	Turn-on time	$V_{DD} = 10\text{ V}, I_D = 0.7\text{ A}$ $V_{GS} = 0 \sim 2.5\text{ V}, R_G = 4.7\text{ }\Omega$	-	15.5	-	ns
	Turn-off time		-	8.5	-	

Note2: Pulse test

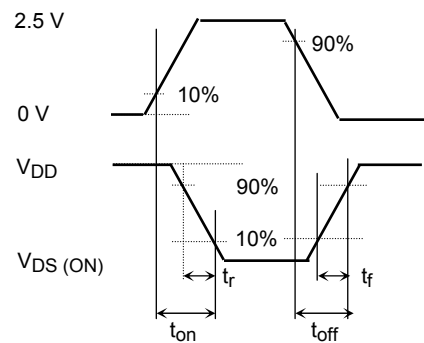
## Switching Time Test Circuit

### (a) Test Circuit

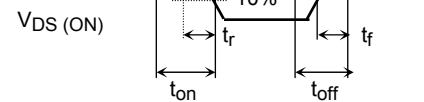


$V_{DD} = 10\text{ V}$   
 $R_G = 4.7\text{ }\Omega$   
 $D.U. \leq 1\%$   
 $V_{IN}: t_r, t_f < 5\text{ ns}$   
 Common Source  
 $T_a = 25^\circ\text{C}$

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



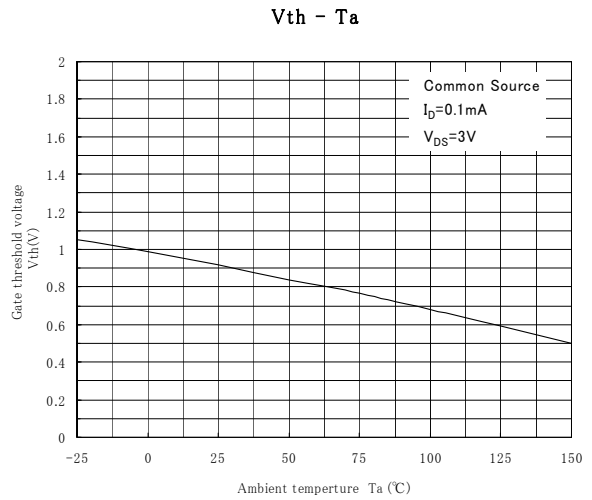
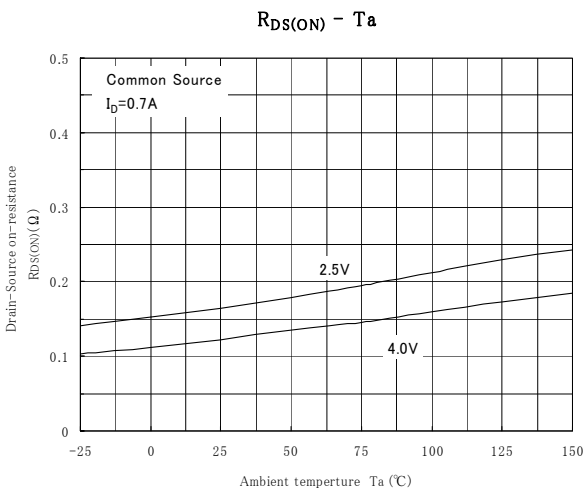
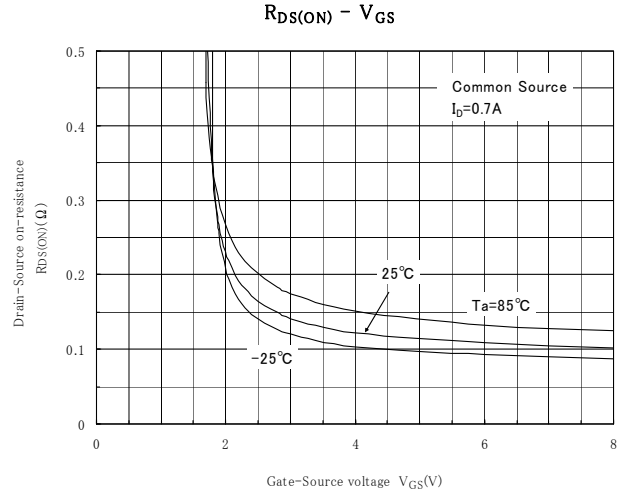
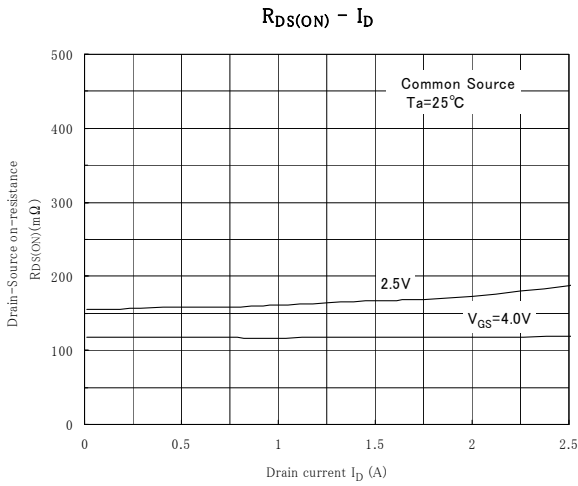
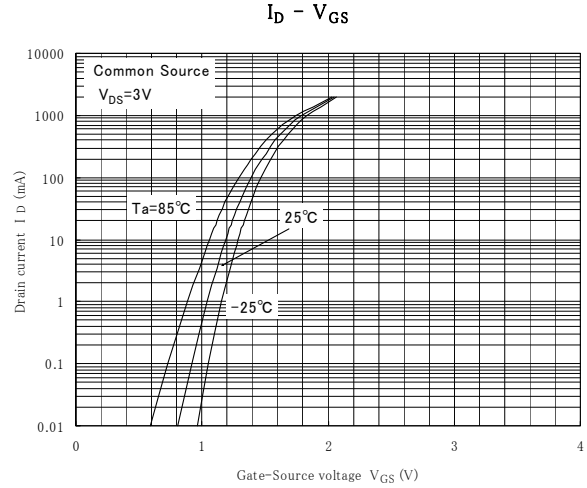
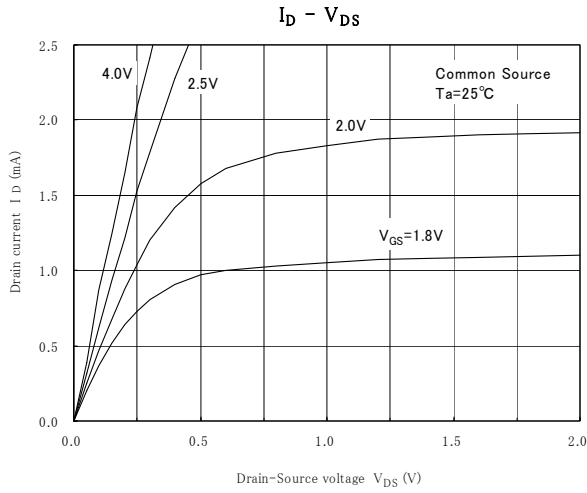
### (c) $V_{OUT}$

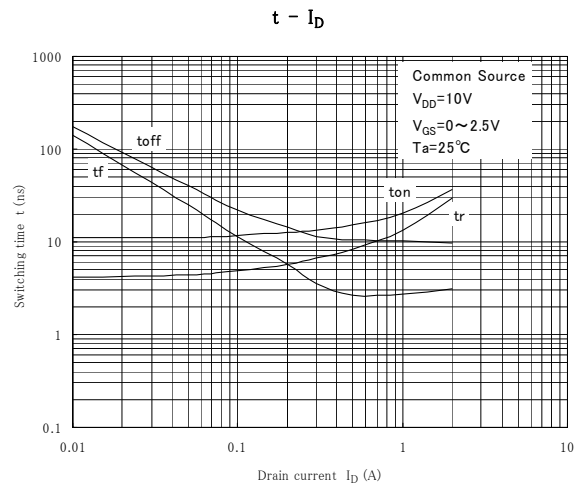
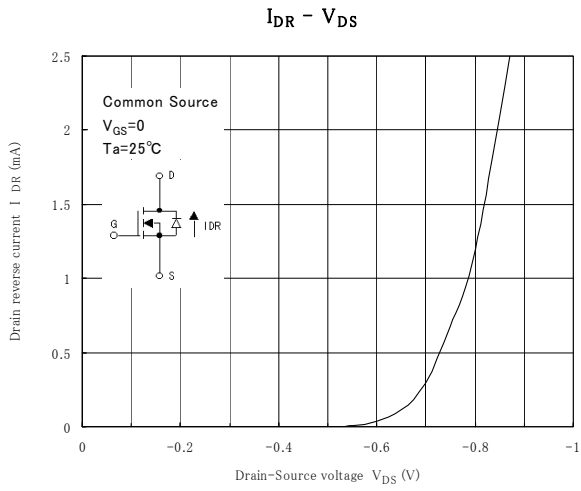
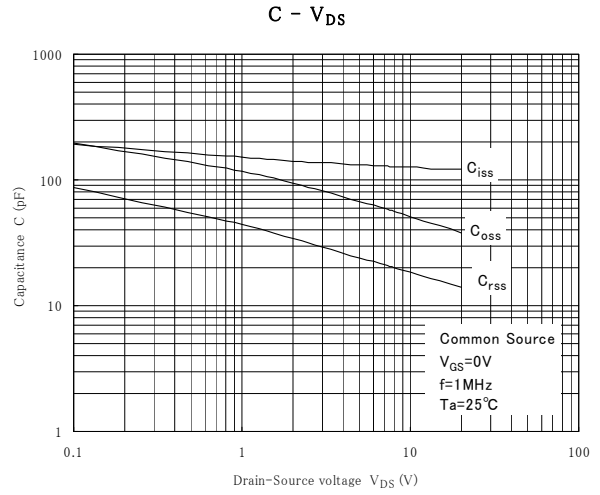
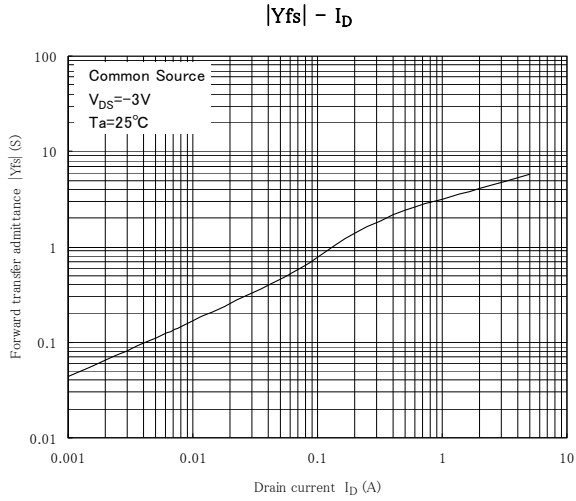


## Precaution

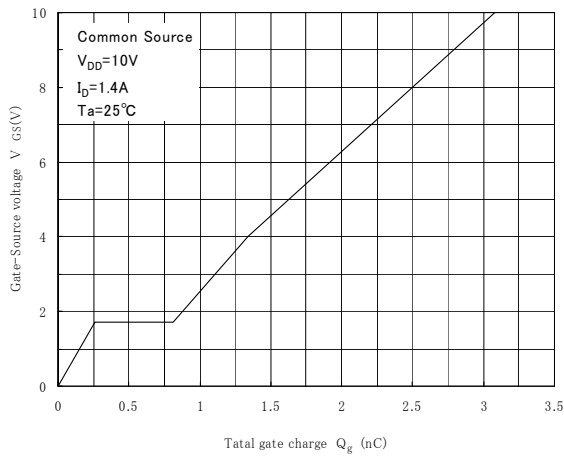
$V_{th}$  can be expressed as the voltage between the gate and source when the low operating current value is  $I_D = -1\text{ mA}$  for this product. For normal switching operation,  $V_{GS(ON)}$  requires a higher voltage than  $V_{th}$  and  $V_{GS(OFF)}$  requires a lower voltage than  $V_{th}$ .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

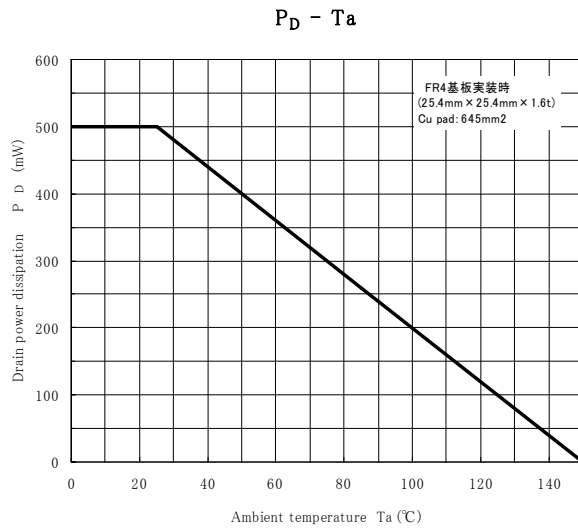
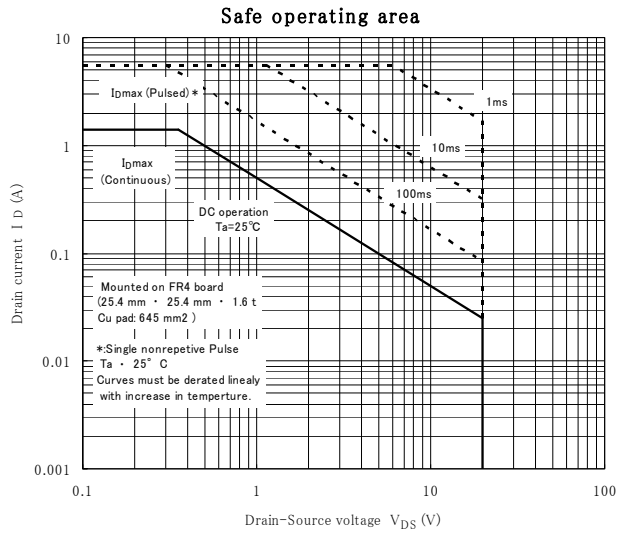
Be sure to take this into consideration when using the device.





### Dynamic Input Characteristic





**RESTRICTIONS ON PRODUCT USE**

20070701-EN GENERAL

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