

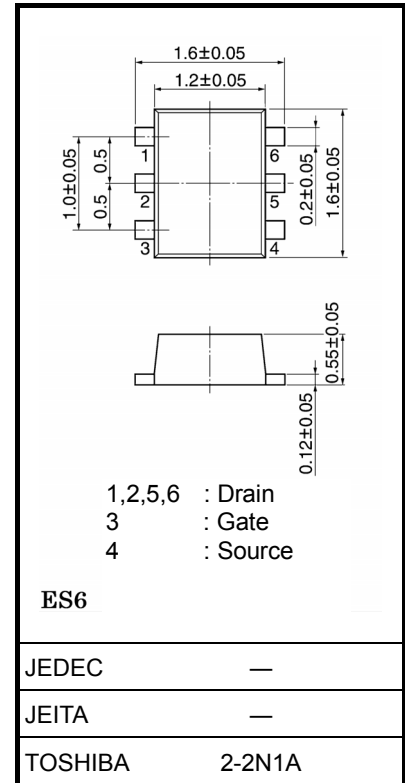
TOSHIBA Field Effect Transistor Silicon P Channel MOS Type (Π-MOSⅦ)

# SSM6K30FE

- High speed switching
- DC-DC Converter

- Small package
- Low R<sub>DS (ON)</sub> : R<sub>on</sub> = 210 mΩ (max) (@V<sub>GS</sub> = 10 V)  
: R<sub>on</sub> = 420 mΩ (max) (@V<sub>GS</sub> = 4 V)
- High speed switching : t<sub>on</sub> = 19 ns (typ)  
: t<sub>off</sub> = 10 ns (typ)

Unit: mm



Weight: 3 mg (typ.)

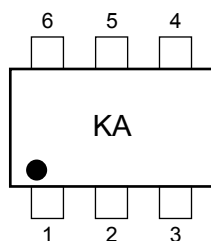
## Absolute Maximum Ratings (Ta = 25°C) MOSFET

Characteristics		Symbol	Rating	Unit
Drain-Source voltage		V <sub>DS</sub>	20	V
Gate-Source voltage		V <sub>GSS</sub>	±20	V
Drain current	DC	I <sub>D</sub>	1.2	A
	Pulse	I <sub>DP</sub>	2.4	
Drain power dissipation		P <sub>D</sub> (Note 1)	500	mW
Channel temperature		T <sub>ch</sub>	150	°C
Storage temperature		T <sub>stg</sub>	-55~150	°C

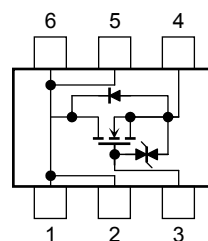
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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>)

## 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.

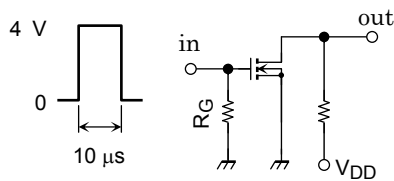
## Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	$I_{GSS}$	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0$	—	—	$\pm 1$	$\mu\text{A}$
Drain-Source breakdown voltage	$V_{(BR)DSS}$	$I_D = 1\text{ mA}, V_{GS} = 0$	20	—	—	V
Drain cut-off current	$I_{DSS}$	$V_{DS} = 20\text{ V}, V_{GS} = 0$	—	—	1	$\mu\text{A}$
Gate threshold voltage	$V_{th}$	$V_{DS} = 5\text{ V}, I_D = 0.1\text{ mA}$	1.1	—	2.3	V
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 5\text{ V}, I_D = 0.6\text{ A}$ (Note 2)	0.68	—	—	S
Drain-Source on-resistance	$R_{DS(ON)}$	$I_D = 0.6\text{ A}, V_{GS} = 10\text{ V}$ (Note 2)	—	145	210	m $\Omega$
		$I_D = 0.6\text{ A}, V_{GS} = 4\text{ V}$ (Note 2)	—	260	420	
Input capacitance	$C_{iss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	—	60	—	pF
Reverse transfer capacitance	$C_{rss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	—	17	—	pF
Output capacitance	$C_{oss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	—	47	—	pF
Switching time	Turn-on time	$t_{on}$	—	19	—	ns
	Turn-off time	$t_{off}$		10		

Note 2: Pulse measurement

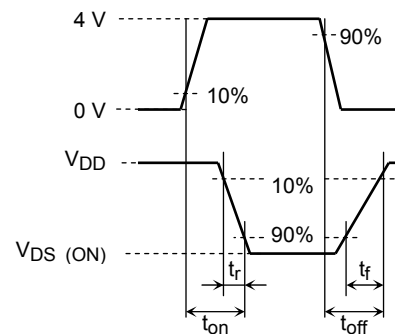
## Switching Time Test Circuit

### (a) Test circuit

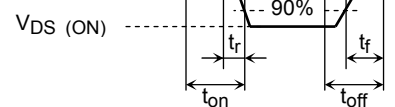


$V_{DD} = 10\text{ V}$   
 $R_G = 10\Omega$   
 Duty  $\leq 1\%$   
 $V_{IN}$ :  $t_r, t_f < 5\text{ ns}$   
 Common source  
 $T_a = 25^\circ\text{C}$

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



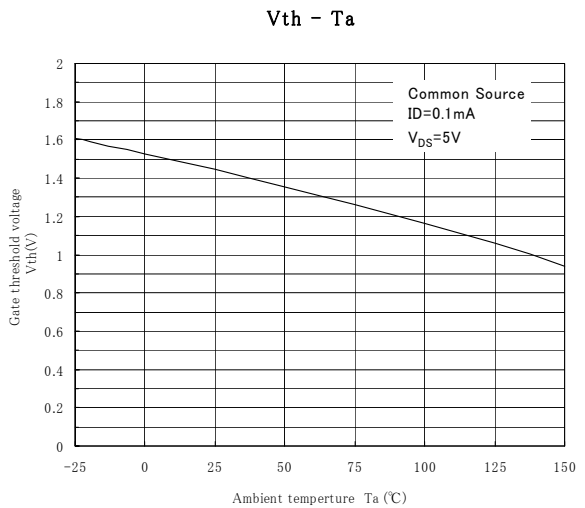
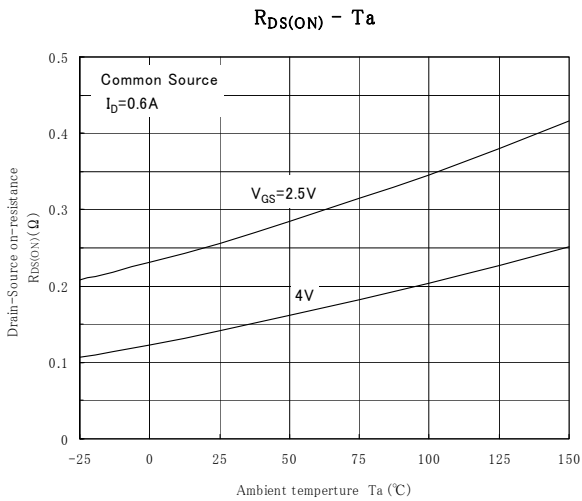
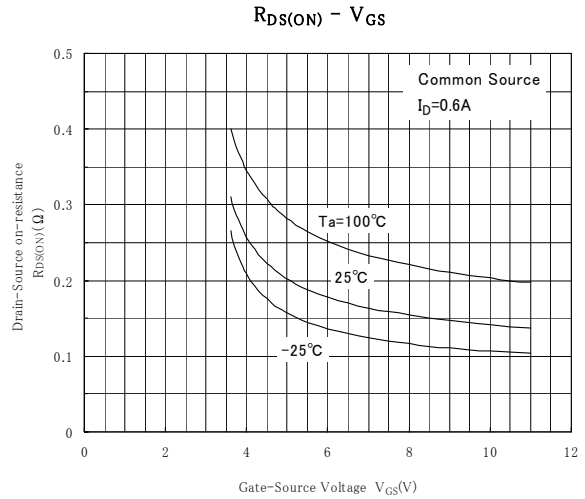
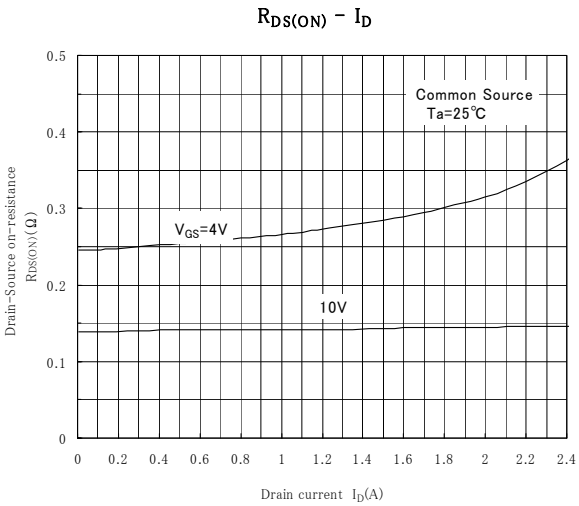
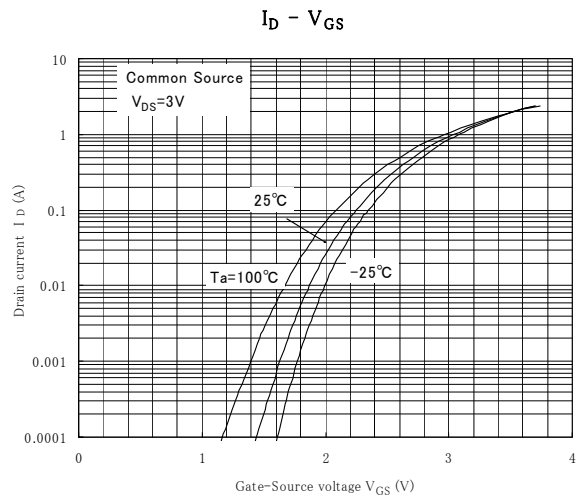
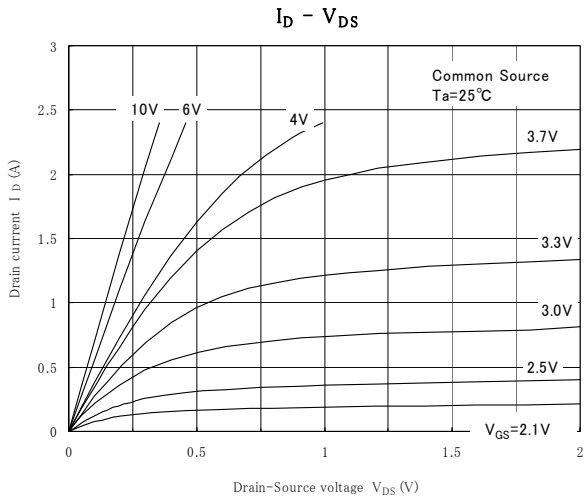
### (c) $V_{OUT}$



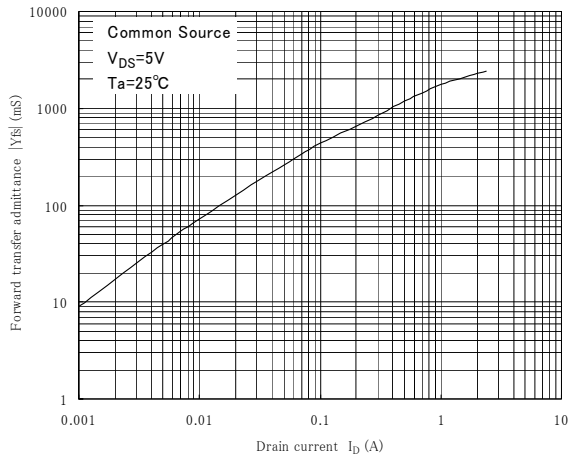
## Precaution

$V_{th}$  can be expressed as the voltage between the 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:  $V_{GS(OFF)} < V_{th} < V_{GS(ON)}$ .)

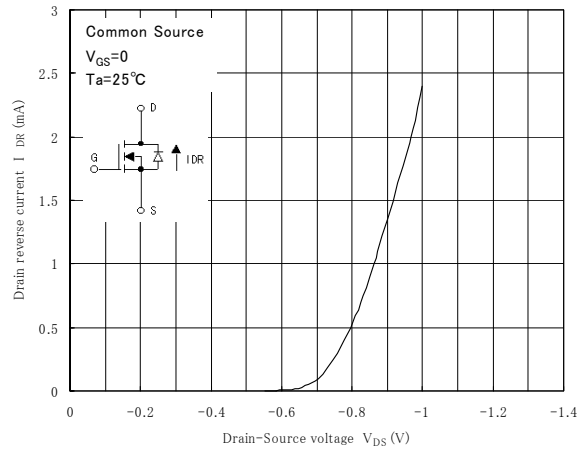
Be sure to take this into consideration when using the device.



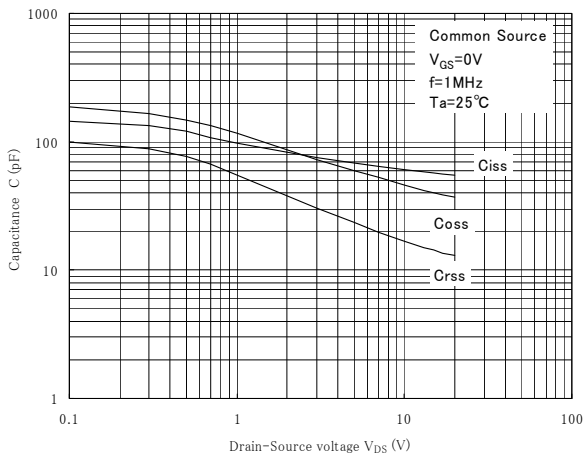
**|Yfs| - ID**



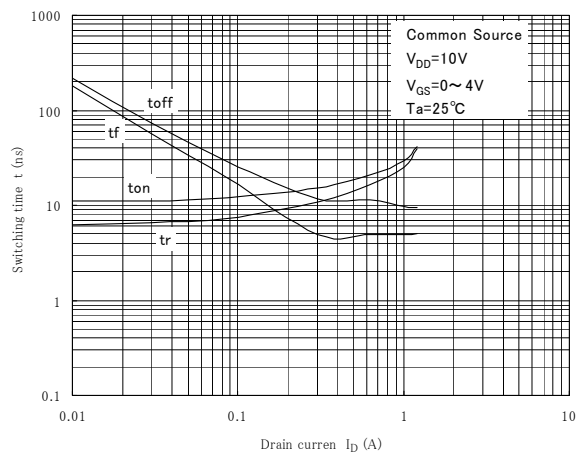
**IDR - VDS**



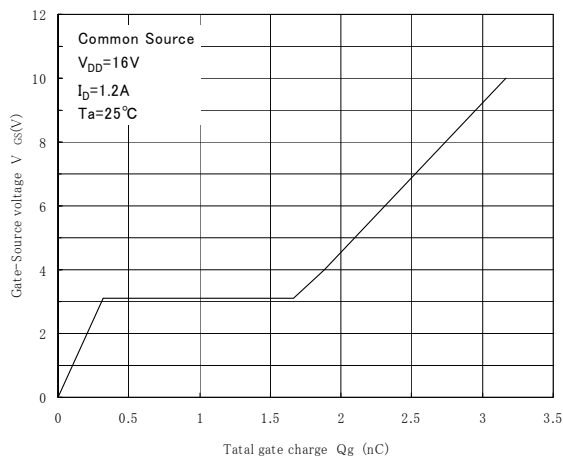
**C - VDS**



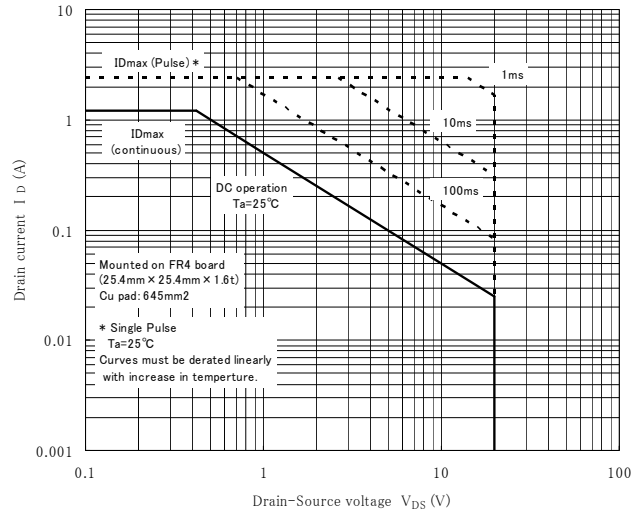
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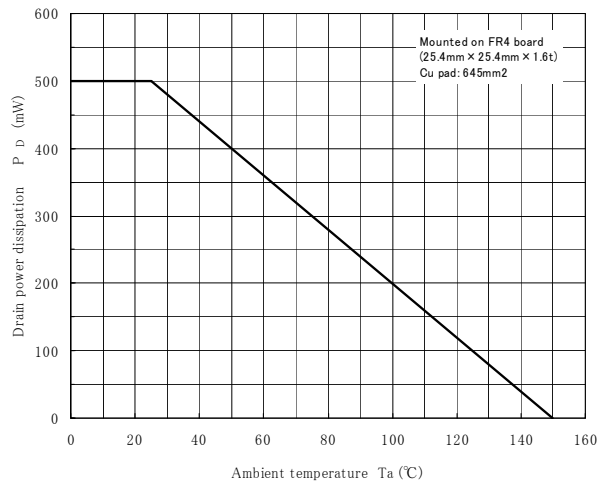
**Dynamic Input Characteristic**



**Safe operating area**



**$P_D - T_a$**



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20070701-EN GENERAL

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