

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

SSM6K22FE

High Current Switching Applications
DC-DC Converter

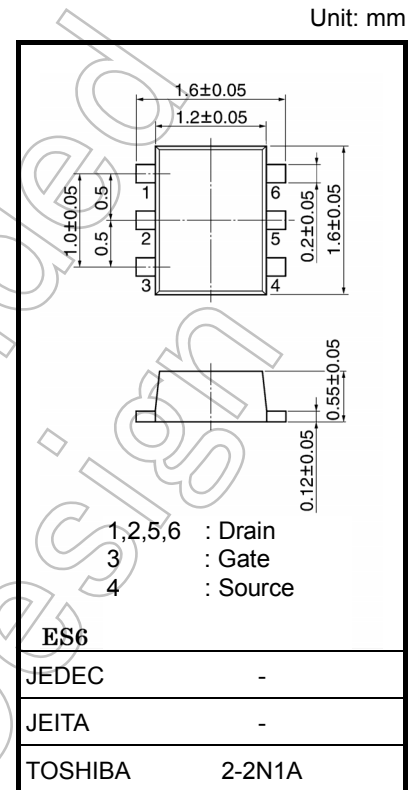
- Suitable for high-density mounting due to compact package
- Low on resistance: $R_{DS(ON)} = 170 \text{ m}\Omega$ (max) (@ $V_{GS} = 4.0 \text{ V}$)
 $R_{DS(ON)} = 230 \text{ m}\Omega$ (max) (@ $V_{GS} = 2.5 \text{ V}$)

Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DS}	20	V
Gate-source voltage		V_{GSS}	± 12	V
Drain current	DC	I_D	1.4	A
	Pulse	I_{DP}	5.6	
Power dissipation		P_D (Note 1)	500	mW
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	-55 to 150	°C

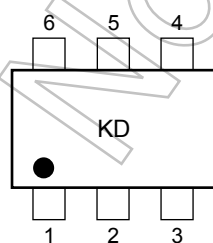
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

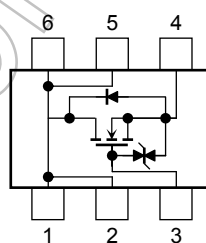


Weight: 3 mg (typ.)

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.

Start of commercial production
2004-01

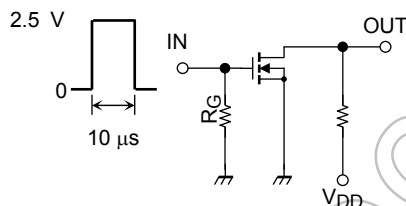
Electrical Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit	
Gate leakage current	I_{GSS}	$V_{GS} = \pm 12\text{ V}, V_{DS} = 0$	-	-	± 1	μA	
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	μA	
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} $	$V_{DS} = 3\text{ V}, I_D = 0.7\text{ A}$ (Note 2)	1.4	2.8	-	S	
Drain-source on-resistance	$R_{DS(ON)}$	$I_D = 0.7\text{ A}, V_{GS} = 4\text{ V}$ (Note 2)	-	150	170	m Ω	
		$I_D = 0.7\text{ A}, V_{GS} = 2.5\text{ V}$ (Note 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	t_{on}	$V_{DD} = 10\text{ V}, I_D = 0.7\text{ A}$	-	15.5	-	ns
	Turn-off time	t_{off}	$V_{GS} = 0\text{ to }2.5\text{ V}, R_G = 4.7\ \Omega$	-	8.5	-	

Note2: Pulse test

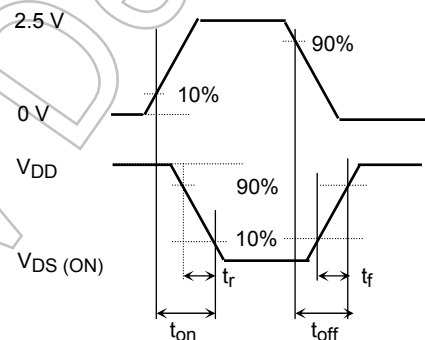
Switching Time Test Circuit

(a) Test Circuit

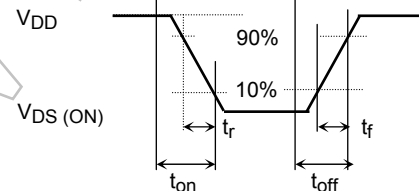


$V_{DD} = 10\text{ V}$
 $R_G = 4.7\ \Omega$
 Duty $\leq 1\%$
 V_{IN} : $t_r, t_f < 5\text{ ns}$
 Common Source
 $T_a = 25^\circ\text{C}$

(b) V_{IN}



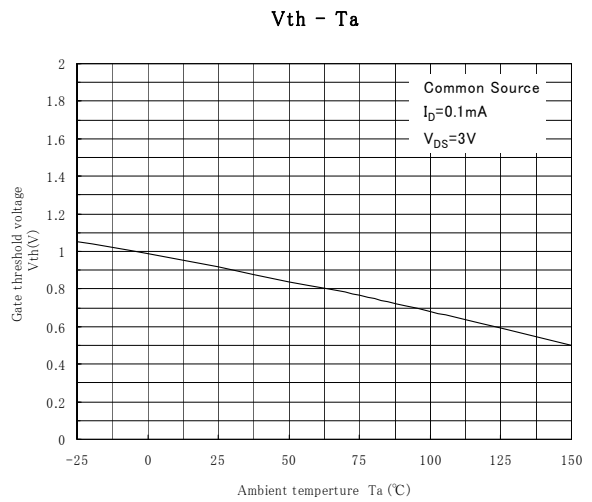
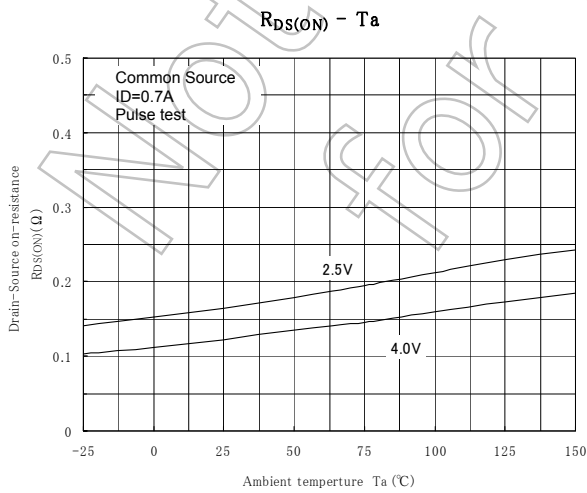
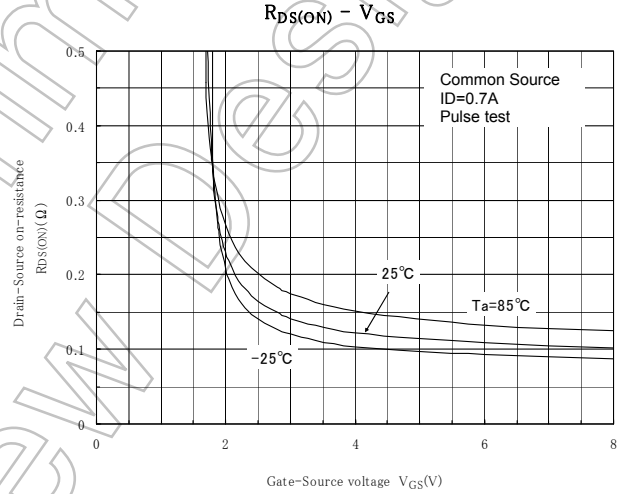
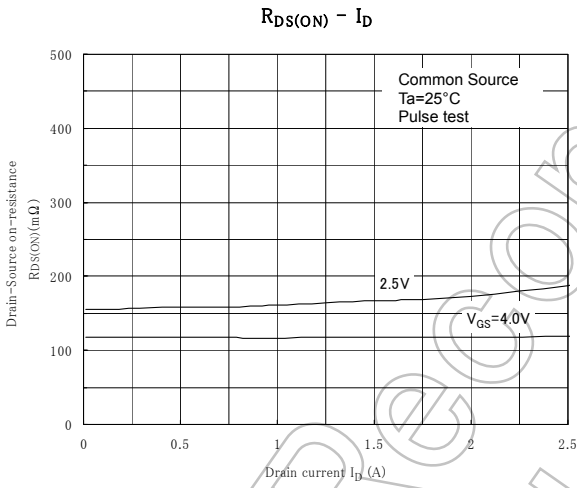
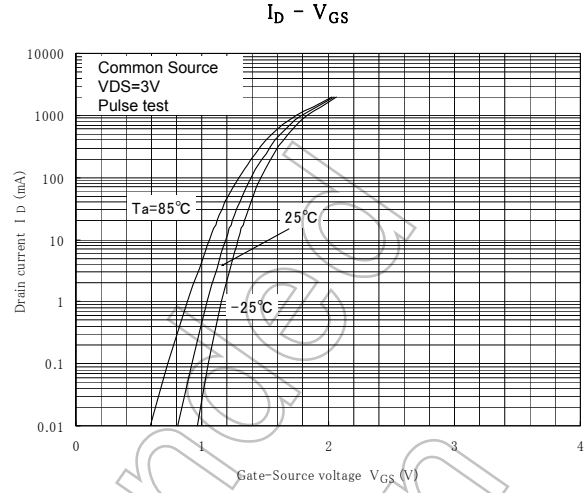
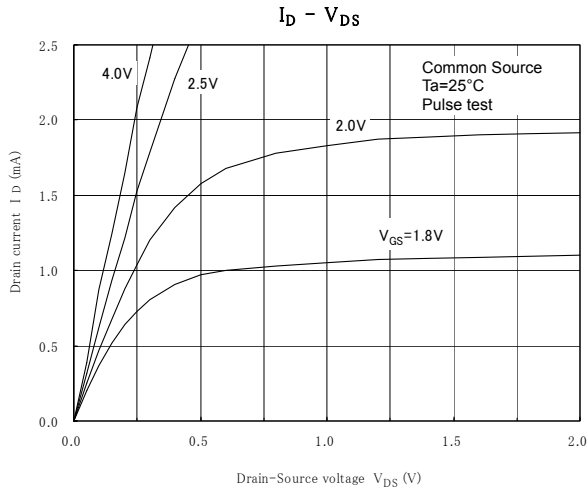
(c) V_{OUT}

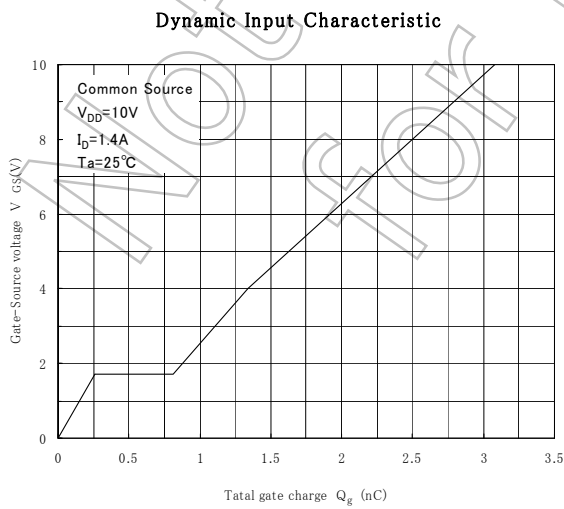
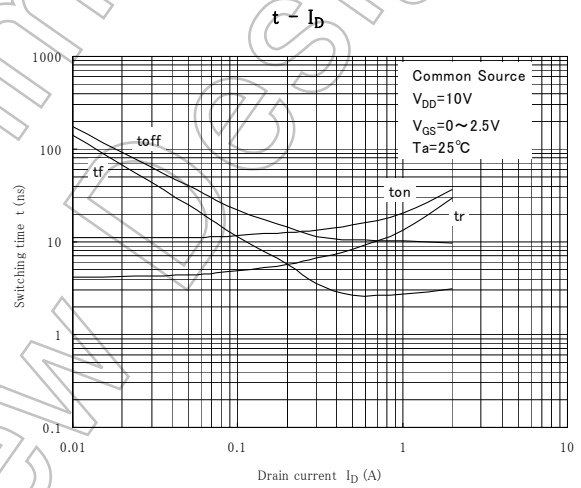
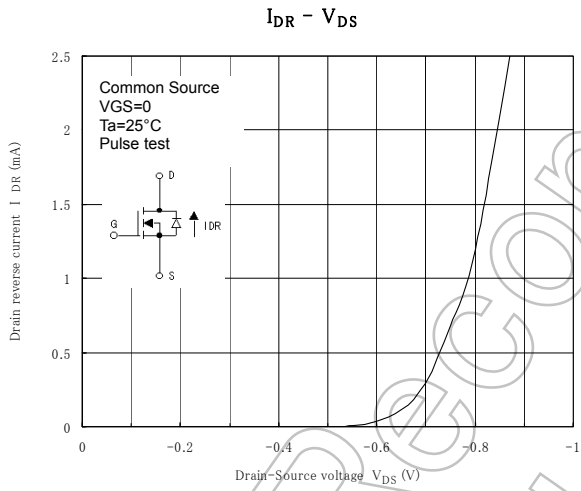
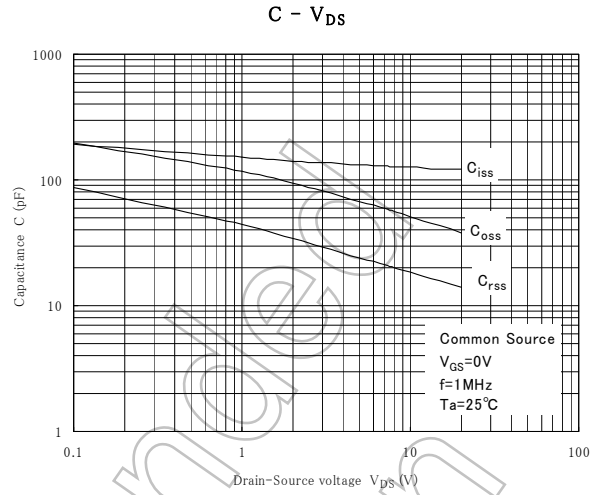
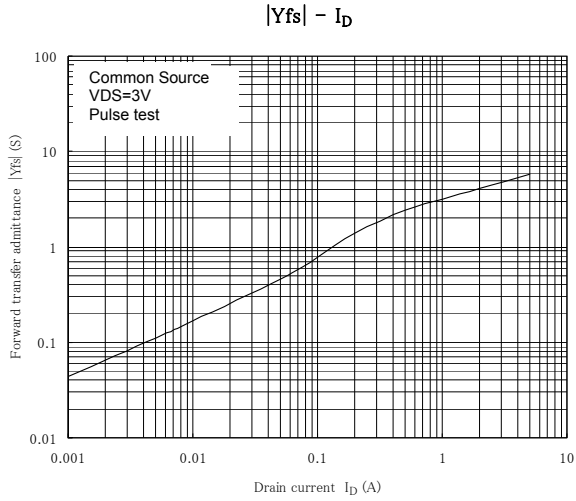


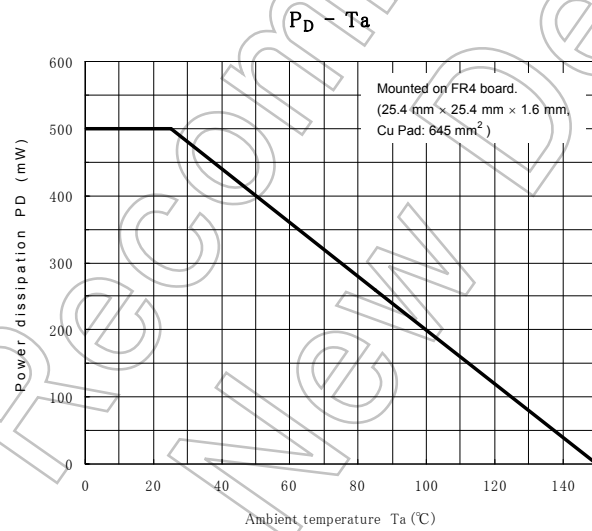
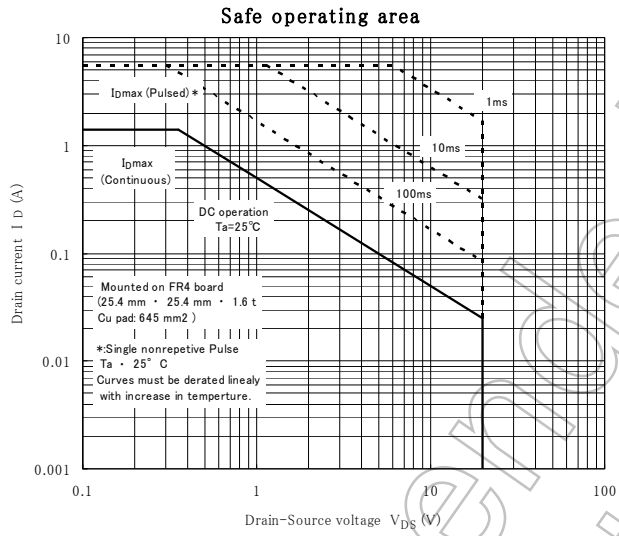
Precaution

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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