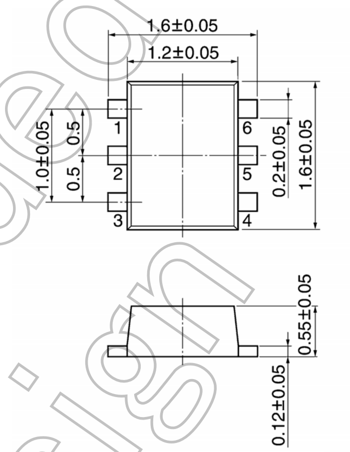
TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (U-MOSⅢ)

SSM6K22FE

High Current Switching Applications
DC-DC Converter

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

Unit: mm



1,2,5,6 : Drain
3 : Gate
4 : Source

ES6

JEDEC	-
JEITA	-
TOSHIBA	2-2N1A

Weight: 3 mg (typ.)

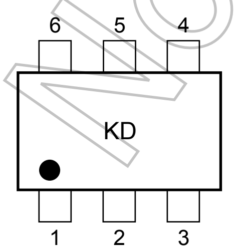
Absolute Maximum Ratings (Ta = 25°C)

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

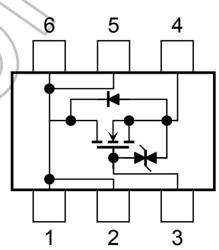
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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 mm^2)

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

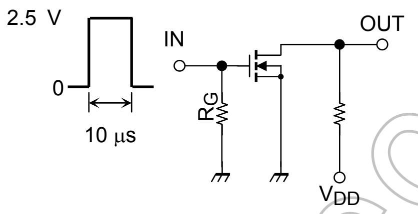
Electrical Characteristics (Ta = 25°C)

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

Note2: Pulse test

Switching Time Test Circuit

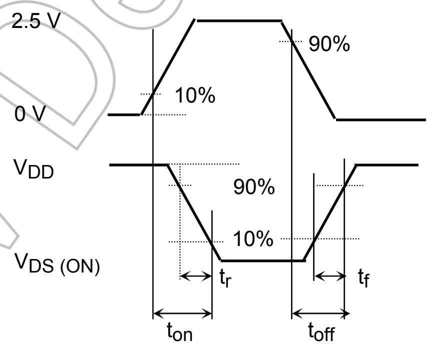
(a) Test Circuit



V_{DD} = 10 V
R_G = 4.7 Ω
Duty ≤ 1%
V_{IN}: t_r, t_f < 5 ns
Common Source
Ta = 25°C

(b) V_{IN}

(c) V_{OUT}

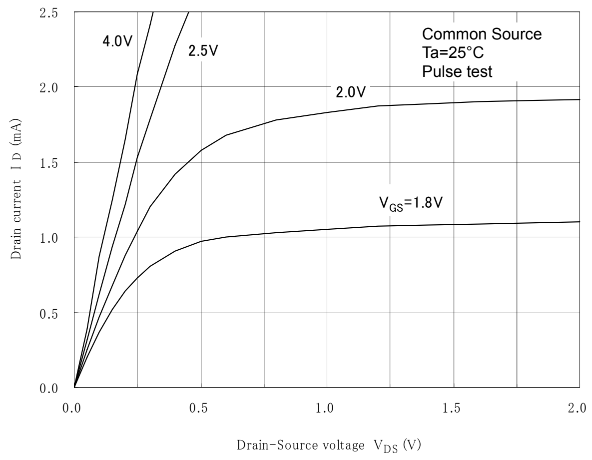


Precaution

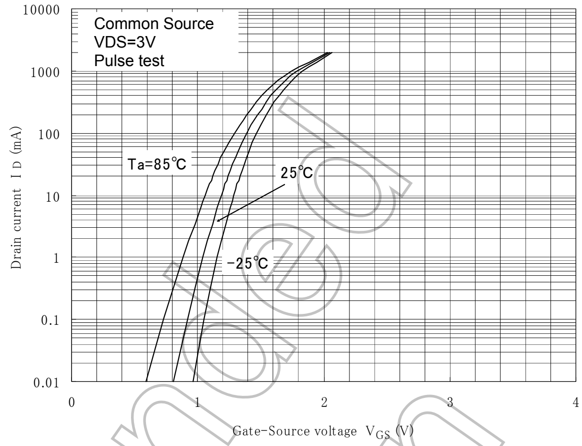
V_{th} can be expressed as the voltage between the gate and source when the low operating current value is I_D = -1mA for this product. For normal switching operation, $V_{GS\ (on)}$ requires a higher voltage than V_{th} and $V_{GS\ (off)}$ requires a lower voltage than V_{th}. (The relationship can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

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

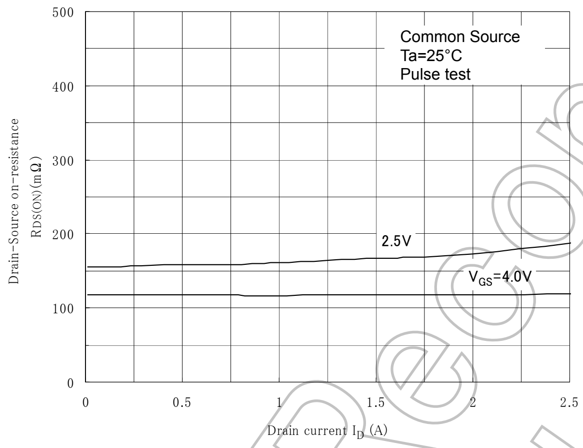
I_D – V_{DS}



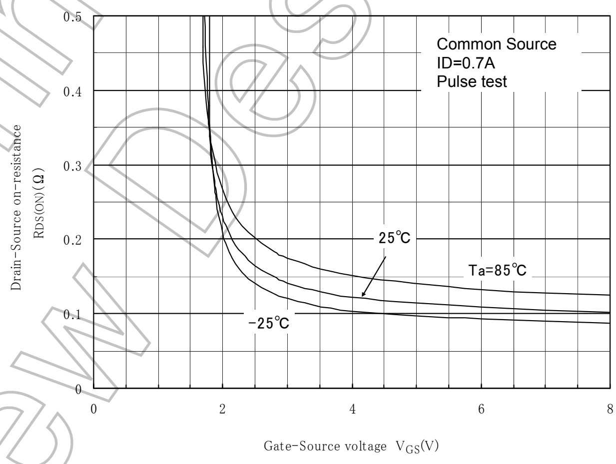
I_D – V_{GS}



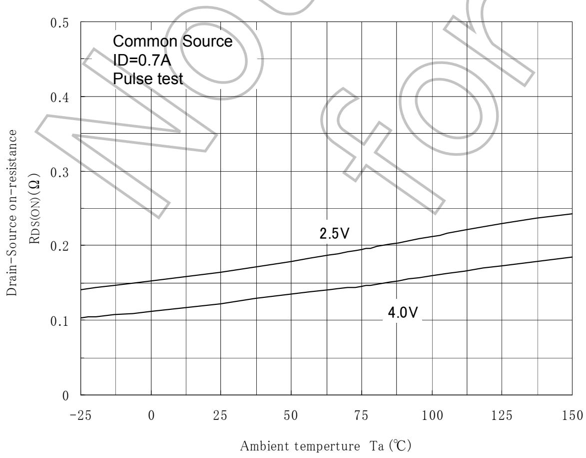
$R_{DS(ON)}$ – I_D



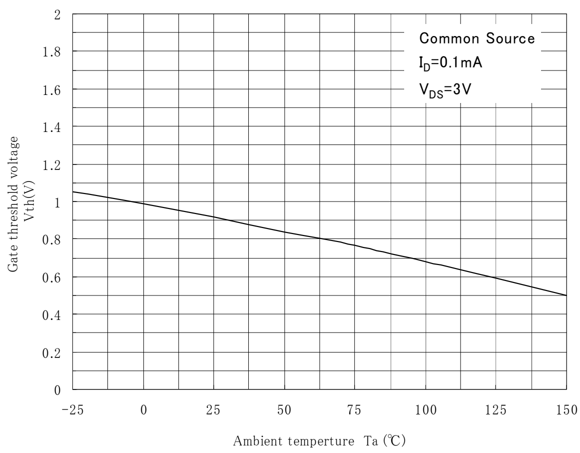
$R_{DS(ON)}$ – V_{GS}



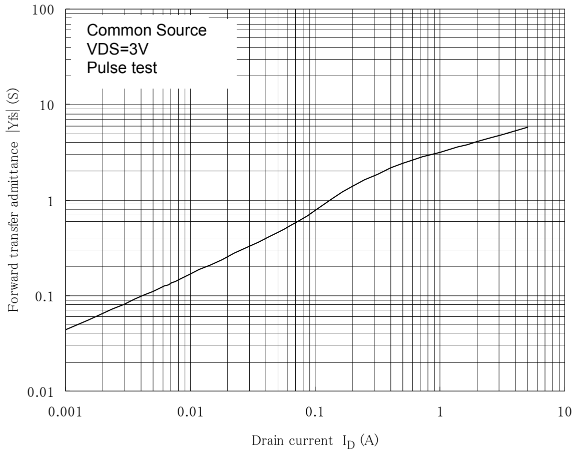
$R_{DS(ON)}$ – Ta



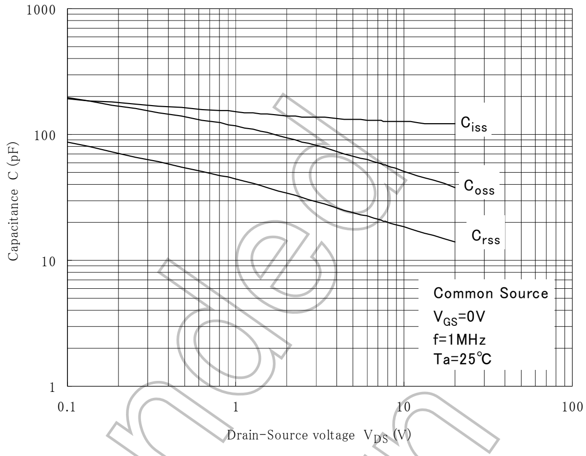
Vth – Ta



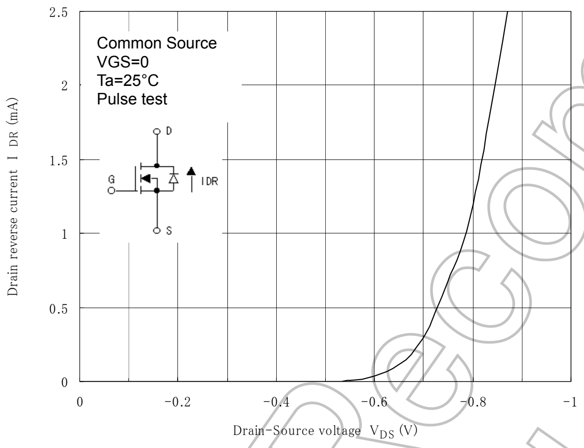
|Yfs| – I_D



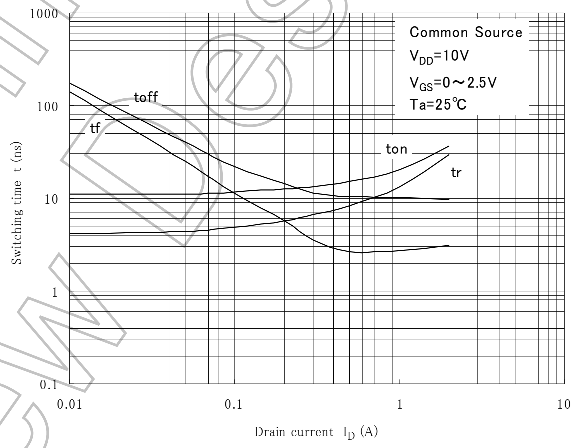
C – V_{DS}



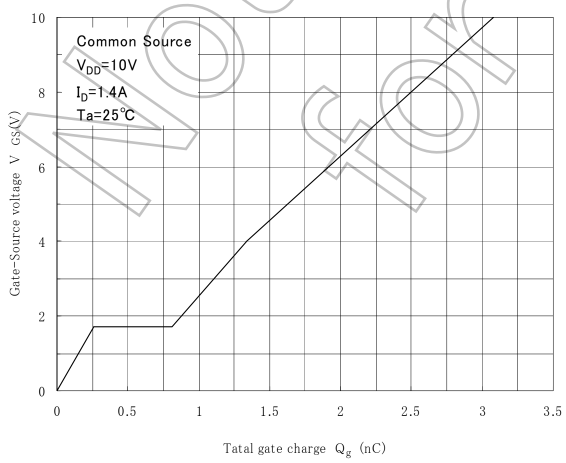
I_{DR} – V_{DS}



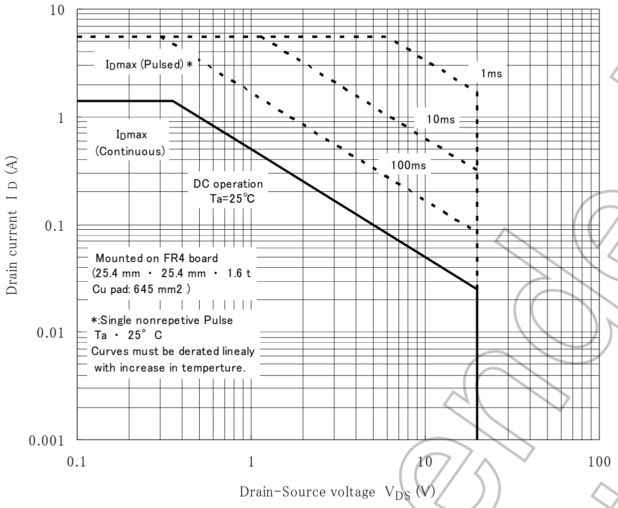
t – I_D



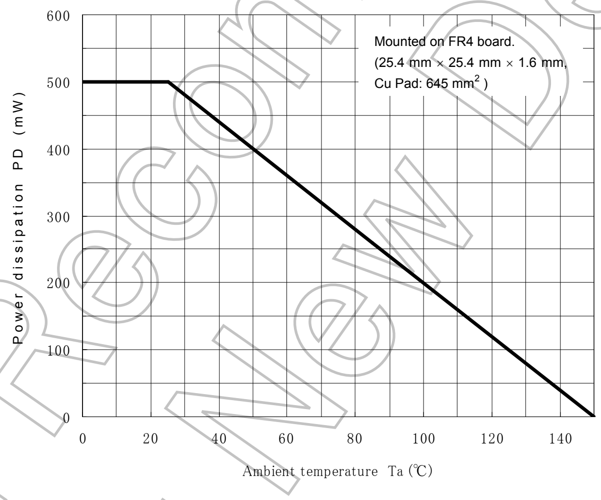
Dynamic Input Characteristic



Safe operating area



P_D – Ta



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