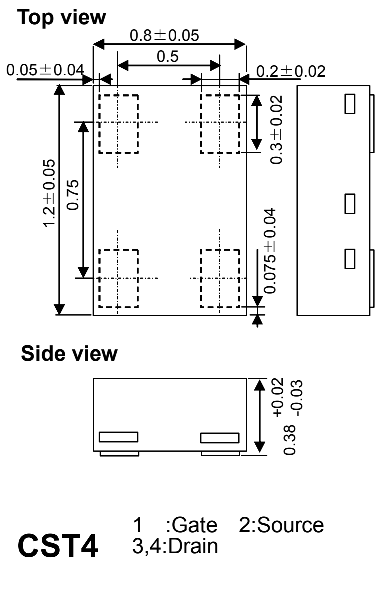
TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (U-MOSⅢ)

SSM4K27CT

○ Switching Applications

- Suitable for high-density mounting due to compact package
- Low on-resistance: R_{on} = 205 mΩ (max) (@V_{GS} = 4.0 V)
  R_{on} = 260 mΩ (max) (@V_{GS} = 2.5 V)
  R_{on} = 390 mΩ (max) (@V_{GS} = 1.8 V)

Unit: mm



JEDEC	―
JEITA	―
TOSHIBA	2-1M1A

Weight: 1.1 mg (typ.)

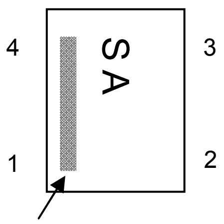
Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-Source voltage		V_{DS}	20	V
Gate-Source voltage		V_{GSS}	±12	V
Drain current	DC	I_D	0.5	A
	Pulse	I_{DP}	1.0	
Drain power dissipation		P_D (Note 1)	400	mW
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55~150	°C

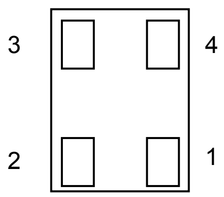
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

Marking (top view)

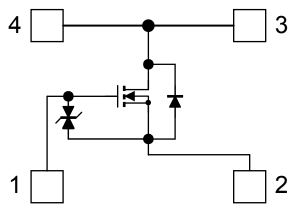


Electrode Layout (bottom view)



1 Gate
2 Source
3 Drain
4 Drain

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.

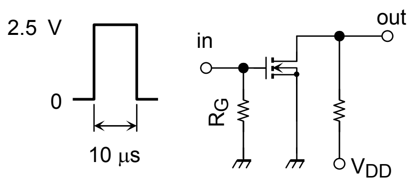
Electrical Characteristics (Ta=25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±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	10	–	–	
Drain cut-off current		I_{DSS}	V_{DS} = 20 V, V_{GS} = 0	–	–	10	μA
Gate threshold voltage		V_{th}	V_{DS} = 3 V, I_D = 1 mA	0.5	–	1.1	V
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = 3 V, I_D = 0.25 A (Note2)	0.8	1.6	–	S
Drain-Source on-resistance		$R_{DS(ON)}$	I_D = 0.25 A, V_{GS} = 4 V (Note2)	—	175	205	mΩ
			I_D = 0.25 A, V_{GS} = 2.5 V (Note2)	—	200	260	
			I_D = 0.10 A, V_{GS} = 1.8 V (Note2)	—	250	390	
Input capacitance		C_{iss}	V_{DS} = 10 V, V_{GS} = 0, f = 1 MHz	–	174	–	pF
Reverse transfer capacitance		C_{rss}	V_{DS} = 10 V, V_{GS} = 0, f = 1 MHz	–	25	–	pF
Output capacitance		C_{oss}	V_{DS} = 10 V, V_{GS} = 0, f = 1 MHz	–	31	–	pF
Switching time	Turn-on time	t_{on}	V_{DS} = 10 V, I_D = 0.25 A,	–	16.4	–	ns
	Turn-off time	t_{off}	V_{GS} = 0~2.5 V, R_G = 4.7 Ω	–	17	–	

Note2: Pulse test

Switching Time Test Circuit

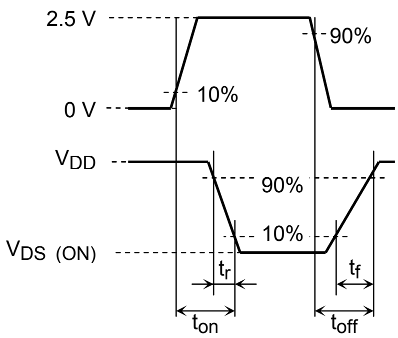
(a) Test Circuit



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

(b) V_{IN}

(c) V_{OUT}

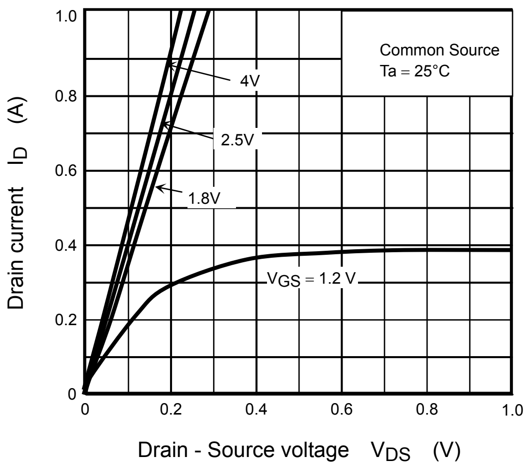


Precaution

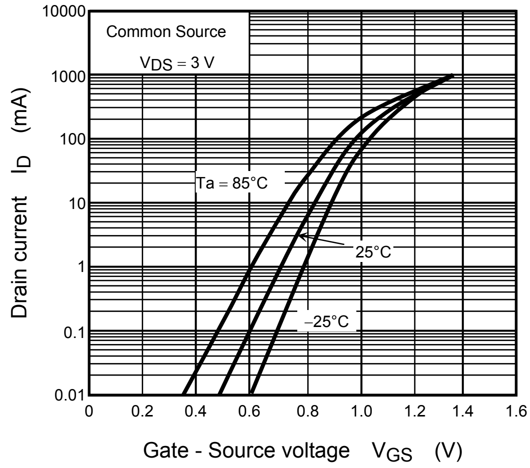
V_{th} can be expressed as the voltage between the gate and source when the low operating current value is I_D = 1mA for this product. For normal switching operation, $V_{GS (on)}$ requires a higher voltage than V_{th} and $V_{GS (off)}$ requires a lower voltage than V_{th}. (The relationship can be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

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

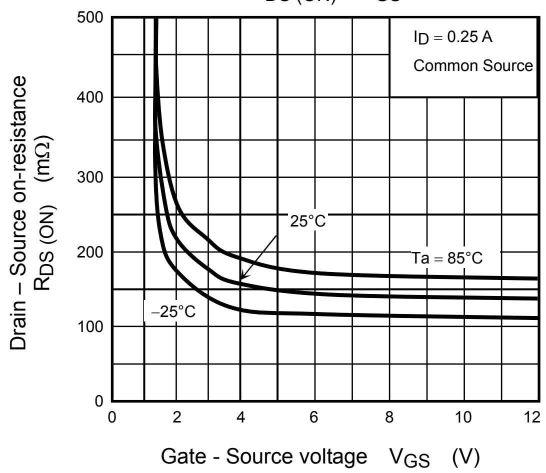
I_D – V_{DS}



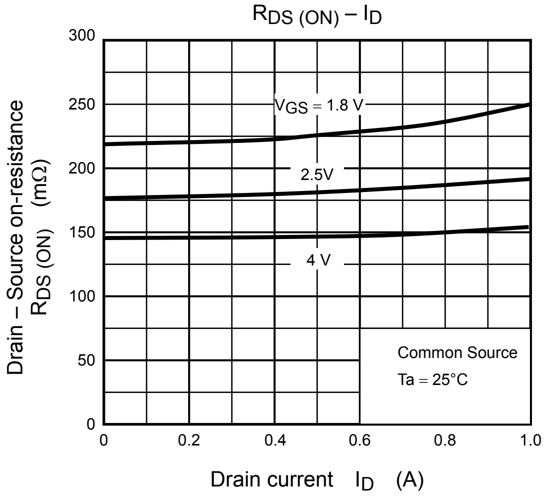
I_D – V_{GS}



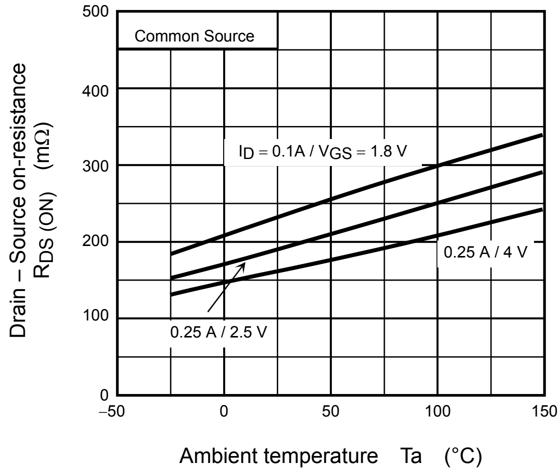
$R_{DS (ON)}$ – V_{GS}



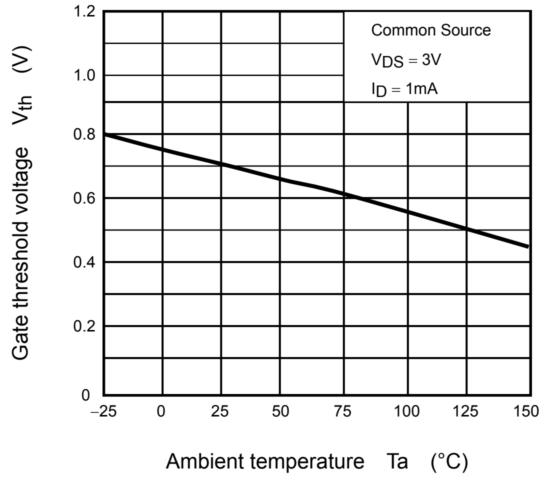
$R_{DS (ON)}$ – I_D

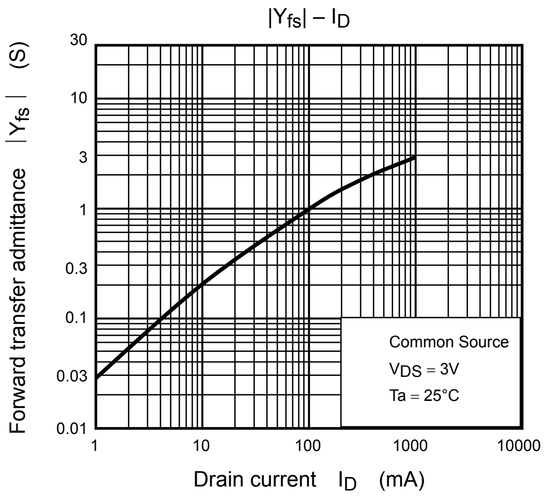


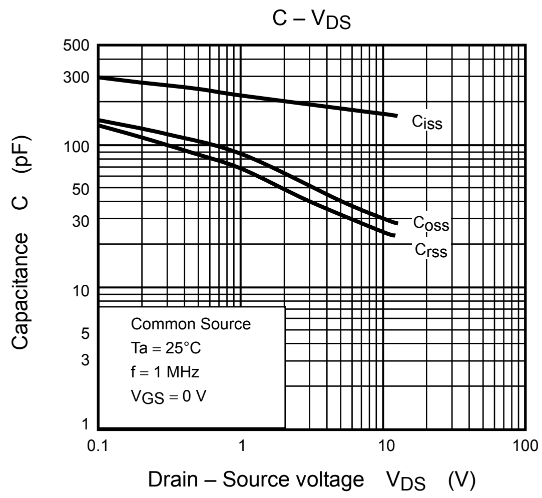
$R_{DS (ON)}$ – Ta

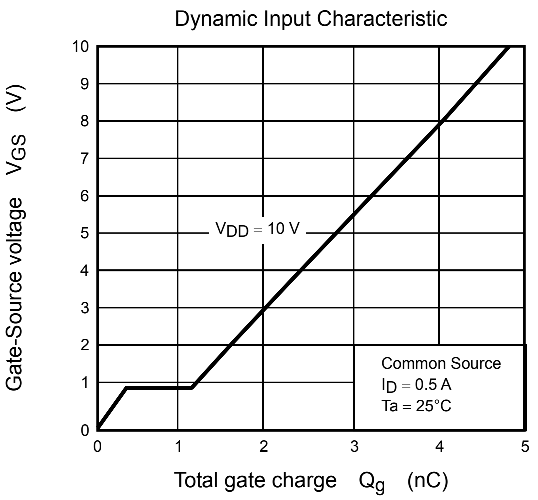


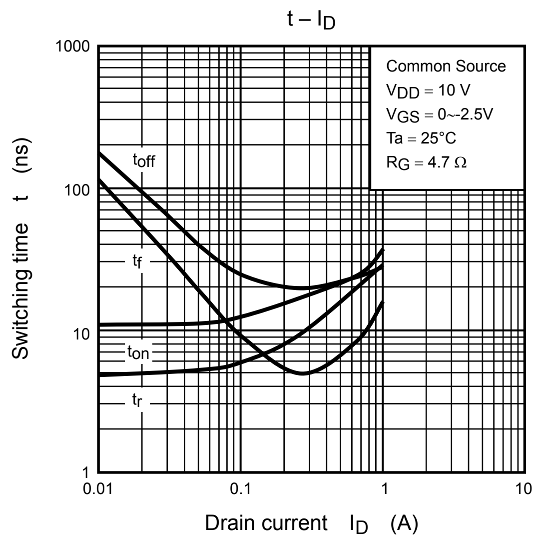
V_{th} – Ta

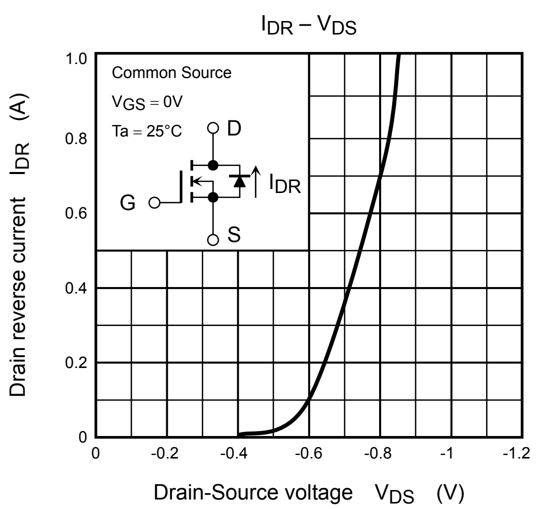


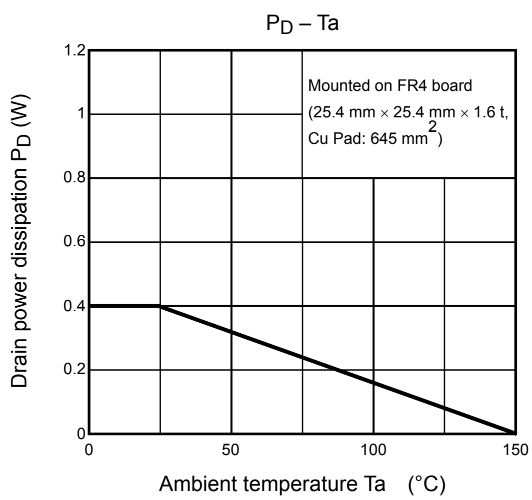

|Yfs| – ID
Forward transfer admittance |Yfs| (S)
Drain current ID (mA)
Common Source
VDS = 3V
Ta = 25°C
30
10
3
1
0.3
0.1
0.03
0.01
1
10
100
1000
10000


C – VDS
Capacitance C (pF)
Drain – Source voltage VDS (V)
Ciss
Coss
Crss
Common Source
Ta = 25°C
f = 1 MHz
VGS = 0 V
500
300
100
50
30
10
5
3
1
0.1
1
10
100


Dynamic Input Characteristic
Gate-Source voltage VGS (V)
Total gate charge Qg (nC)
VDD = 10 V
Common Source
ID = 0.5 A
Ta = 25°C
10
9
8
7
6
5
4
3
2
1
0
1
2
3
4
5


t – ID
Switching time t (ns)
Drain current ID (A)
Common Source
VDD = 10 V
VGS = 0~-2.5V
Ta = 25°C
RG = 4.7 Ω
toff
tf
ton
tr
1000
100
10
1
0.01
0.1
1
10


IDR – VDS
Drain reverse current IDR (A)
Drain-Source voltage VDS (V)
Common Source
VGS = 0V
Ta = 25°C
D
G
S
IDR
1.0
0.8
0.6
0.4
0.2
0
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2


PD – Ta
Drain power dissipation PD (W)
Ambient temperature Ta (°C)
Mounted on FR4 board
(25.4 mm × 25.4 mm × 1.6 t,
Cu Pad: 645 mm2)
1.2
1
0.8
0.6
0.4
0.2
0
0
50
100
150

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20070701-EN GENERAL

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