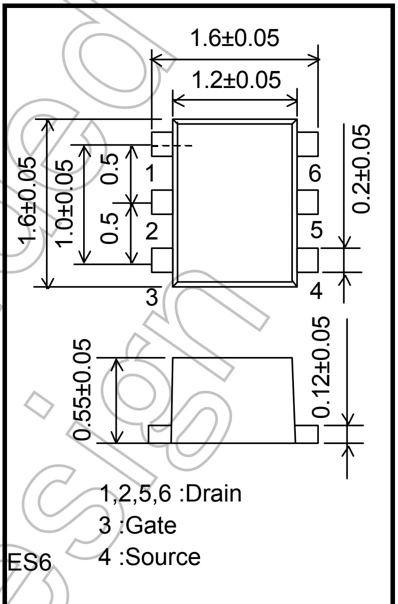
TOSHIBA Field Effect Transistor Silicon P Channel MOS Type (U-MOSIII)

SSM6J25FE

High Speed Switching Applications

Unit: mm



JEDEC	—
JEITA	—
TOSHIBA	2-2N1A

Weight: 3.0 mg (typ.)

- Optimum for high-density mounting in small packages
- Low on-resistance: R_{on} = 260mΩ (max) (@V_{GS} = -4 V)
  R_{on} = 430mΩ (max) (@V_{GS} = -2.5 V)

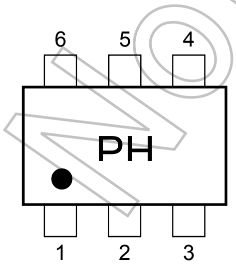
Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-Source voltage		V_{DS}	-20	V
Gate-Source voltage		V_{GSS}	± 12	V
Drain current	DC	I_D	-0.5	A
	Pulse	I_{DP}	-1.5	
Drain power dissipation		P_D (Note 1)	500	mW
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55 to 150	°C

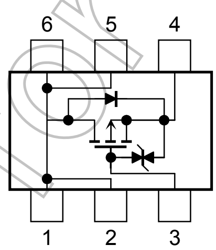
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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 t, 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), be sure that the environment is protected against electrostatic 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.

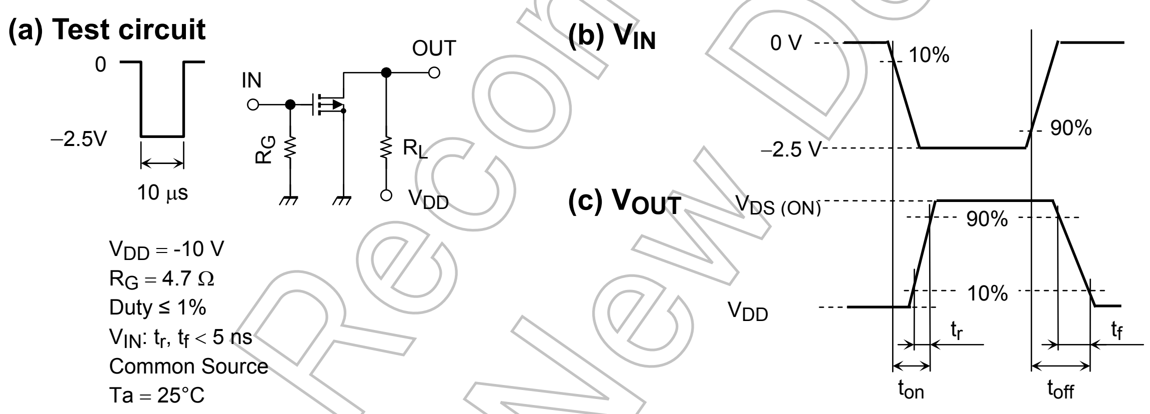
Start of commercial production
2004-03

Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ± 12V, 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	-8	—	—	
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	-0.5	—	-1.1	V
Forward transfer admittance		$\lvert Y_{fs} \rvert$	V_{DS} = -3 V, I_D = -0.25 A (Note2)	0.65	1.3	—	S
Drain-Source on-resistance		$R_{DS\ (ON)}$	I_D = -0.25 A, V_{GS} = -4 V (Note2)	—	210	260	mΩ
			I_D = -0.25 A, V_{GS} = -2.5 V (Note2)	—	310	430	
Input capacitance		C_{iss}	V_{DS} = -10 V, V_{GS} = 0, f = 1 MHz	—	218	—	pF
Reverse transfer capacitance		C_{rss}	V_{DS} = -10 V, V_{GS} = 0, f = 1 MHz	—	42	—	pF
Output capacitance		C_{oss}	V_{DS} = -10 V, V_{GS} = 0, f = 1 MHz	—	52	—	pF
Switching time	Turn-on time	t_{on}	V_{DD} = -10 V, I_D = -0.25 A,	—	16	—	ns
	Turn-off time	t_{off}	V_{GS} = 0 to -2.5 V, R_G = 4.7 Ω	—	15	—	

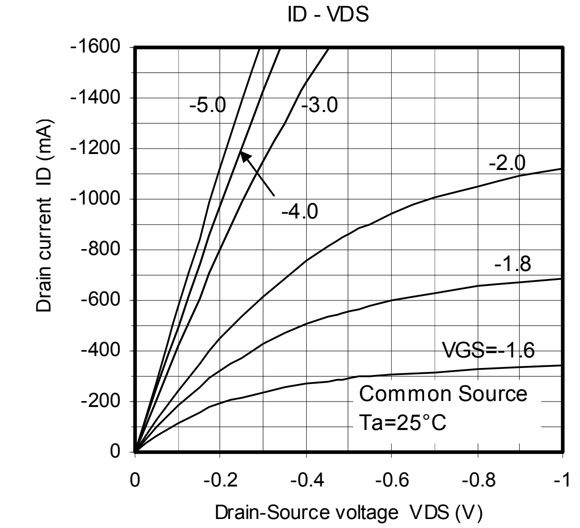
Note2: Pulse test

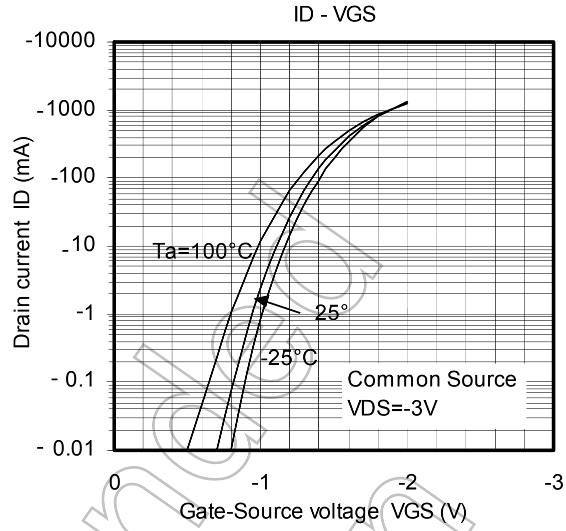
Switching Time Test Circuit

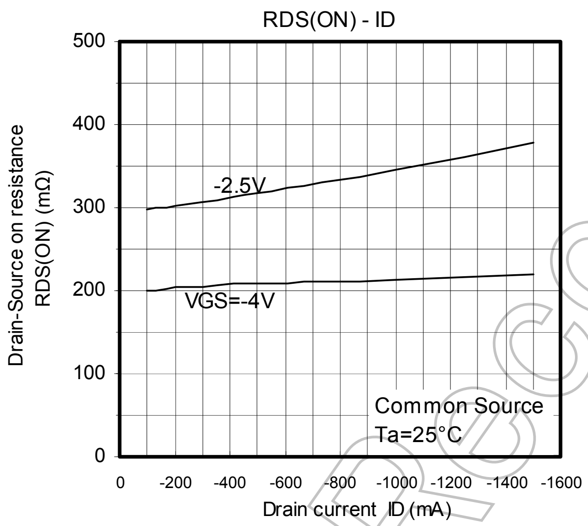


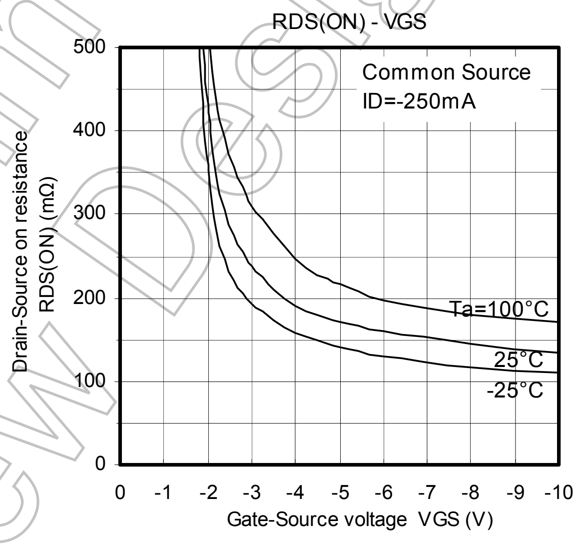
Precaution

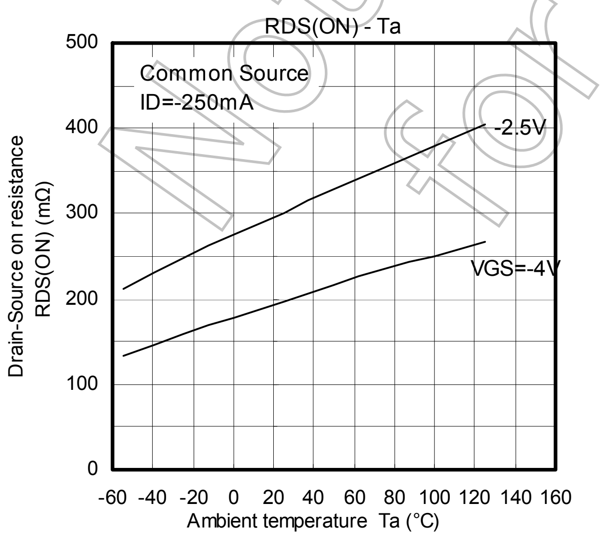
V_{th} can be expressed as the voltage between gate and source when the low operating current value is I_D = -100 μA for this product. For normal switching operation, $V_{GS\ (on)}$ requires a higher voltage than V_{th} and $V_{GS\ (off)}$ requires a lower voltage than V_{th}.
(The relationship can be established as follows: $V_{GS\ (off)} < V_{th} < V_{GS\ (on)}$)
Please take this into consideration when using the device.

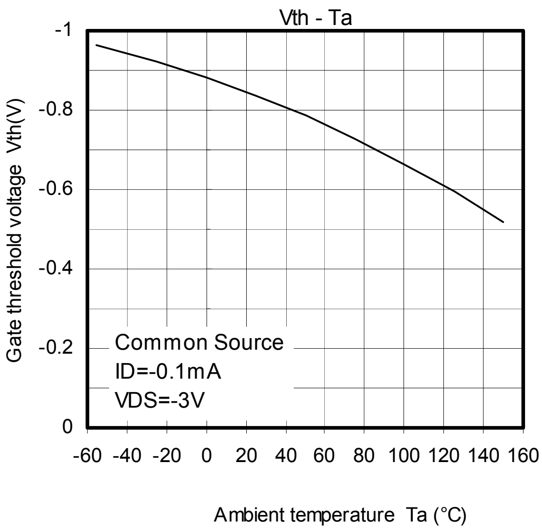

ID - VDS
Drain current ID (mA)
-1600
-1400
-1200
-1000
-800
-600
-400
-200
0
-5.0
-3.0
-4.0
-2.0
-1.8
VGS=-1.6
Common Source
Ta=25°C
0
-0.2
-0.4
-0.6
-0.8
-1
Drain-Source voltage VDS (V)

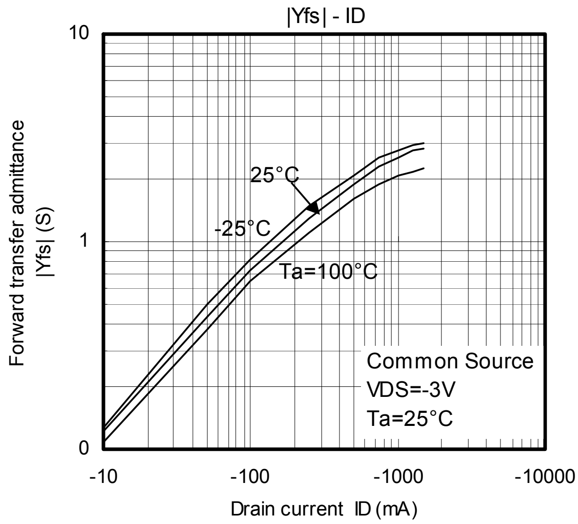

ID - VGS
Drain current ID (mA)
-10000
-1000
-100
-10
-1
- 0.1
- 0.01
Ta=100°C
25°
-25°C
Common Source
VDS=-3V
0
-1
-2
-3
Gate-Source voltage VGS (V)

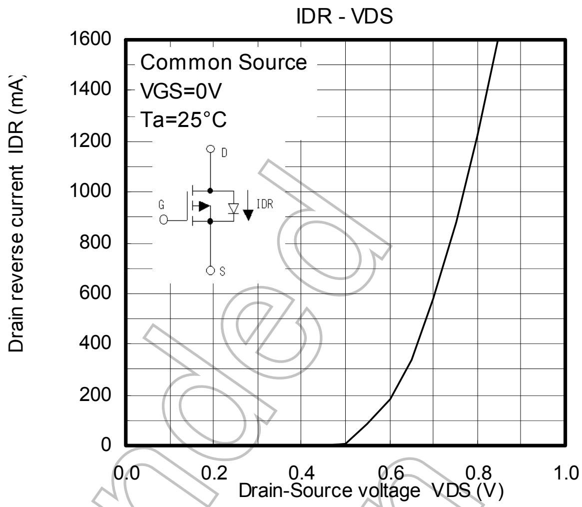

RDS(ON) - ID
Drain-Source on resistance
RDS(ON) (mΩ)
500
400
300
200
100
0
-2.5V
VGS=-4V
Common Source
Ta=25°C
0
-200
-400
-600
-800
-1000
-1200
-1400
-1600
Drain current ID (mA)

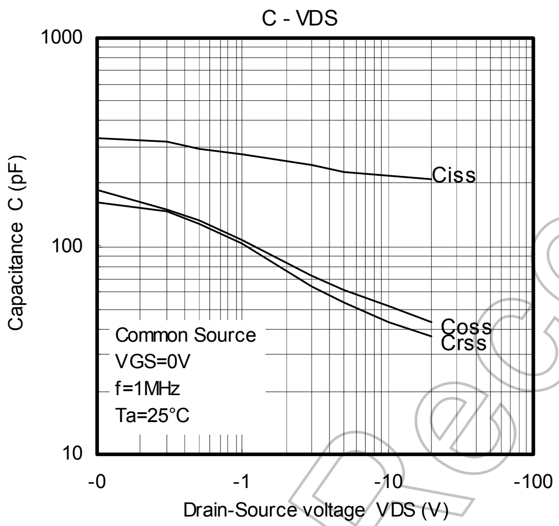

RDS(ON) - VGS
Drain-Source on resistance
RDS(ON) (mΩ)
500
400
300
200
100
0
Common Source
ID=-250mA
Ta=100°C
25°C
-25°C
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
Gate-Source voltage VGS (V)

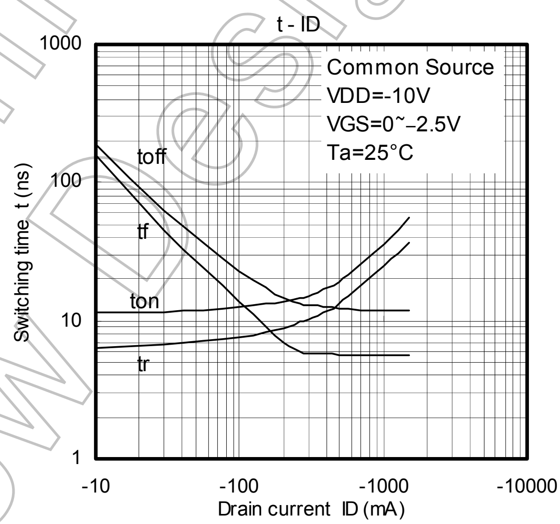

RDS(ON) - Ta
Drain-Source on resistance
RDS(ON) (mΩ)
500
400
300
200
100
0
Common Source
ID=-250mA
-2.5V
VGS=-4V
-60
-40
-20
0
20
40
60
80
100
120
140
160
Ambient temperature Ta (°C)

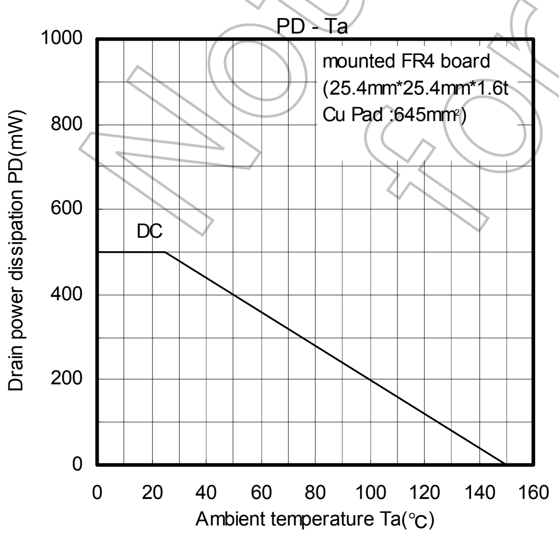

Vth - Ta
Gate threshold voltage Vth(V)
-1
-0.8
-0.6
-0.4
-0.2
0
Common Source
ID=-0.1mA
VDS=-3V
-60
-40
-20
0
20
40
60
80
100
120
140
160
Ambient temperature Ta (°C)


|Yfs| - ID
Forward transfer admittance |Yfs| (S)
Drain current ID (mA)
25°C
-25°C
Ta=100°C
Common Source
VDS=-3V
Ta=25°C
10
1
0
-10
-100
-1000
-10000


IDR - VDS
Drain reverse current IDR (mA)
Drain-Source voltage VDS (V)
Common Source
VGS=0V
Ta=25°C
D
G
S
IDR
1600
1400
1200
1000
800
600
400
200
0
0.0
0.2
0.4
0.6
0.8
1.0


C - VDS
Capacitance C (pF)
Drain-Source voltage VDS (V)
Ciss
Coss
Crss
Common Source
VGS=0V
f=1MHz
Ta=25°C
1000
100
10
-0
-1
-10
-100


t - ID
Switching time t (ns)
Drain current ID (mA)
Common Source
VDD=-10V
VGS=0~-2.5V
Ta=25°C
toff
tf
ton
tr
1000
100
10
1
-10
-100
-1000
-10000


PD - Ta
Drain power dissipation PD(mW)
Ambient temperature Ta(°C)
mounted FR4 board
(25.4mm*25.4mm*1.6t
Cu Pad :645mm²)
DC
1000
800
600
400
200
0
0
20
40
60
80
100
120
140
160

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