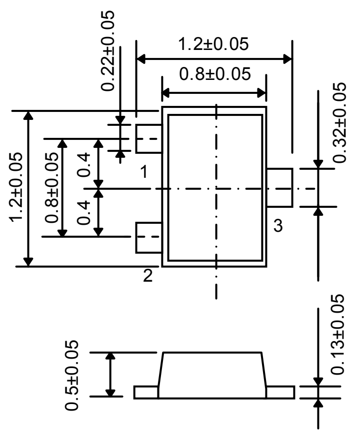
TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (U-MOS III)

SSM3K15AMFV

Load Switching Applications

- 2.5 V drive
- Low ON-resistance: $R_{DS(ON)}$ = 3.6 Ω (max) (@V_{GS} = 4 V)
  $R_{DS(ON)}$ = 6.0 Ω (max) (@V_{GS} = 2.5 V)

Unit: mm



VESM

1.Gate
2.Source
3.Drain

JEDEC	―
JEITA	―
TOSHIBA	2-1L1B

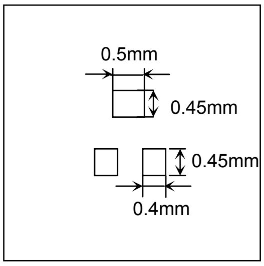
Weight: 1.5 mg (typ.)

Absolute Maximum Ratings (Ta = 25°C)

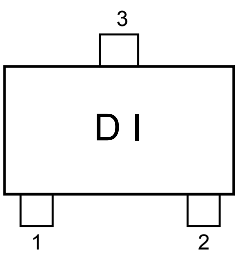
Characteristics		Symbol	Rating	Unit
Drain-Source voltage		V_{DSS}	30	V
Gate-Source voltage		V_{GSS}	± 20	V
Drain current	DC	I_D	100	mA
	Pulse	I_{DP}	400	
Drain dissipation		P_D(Note 1)	150	mW
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55 to 150	°C

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).

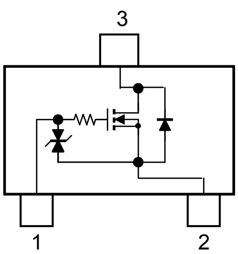
Note 1: Mounted on FR4 board (25.4 mm × 25.4 mm × 1.6 mm, Cu Pad: 0.585mm^2)



Marking



Equivalent Circuit (top view)



Start of commercial production
2010-06

Electrical characteristics (Ta = 25°C)

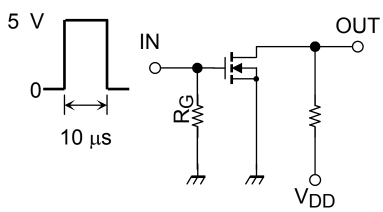
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Drain-Source breakdown voltage	$V_{(BR)\ DSS}$	I_D = 0.1 mA, V_{GS} = 0 V	30	—	—	V
	$V_{(BR)\ DSX}$	I_D = 0.1 mA, V_{GS} = -10 V (Note 3)	16	—	—	
Drain cut-off current	I_{DSS}	V_{DS} = 30 V, V_{GS} = 0 V	—	—	1	μA
Gate leakage current	I_{GSS}	V_{GS} = ±16 V, V_{DS} = 0 V	—	—	±1	μA
Gate threshold voltage	V_{th}	V_{DS} = 3 V, I_D = 0.1 mA	0.8	—	1.5	V
Forward transfer admittance	$\|Y_{fs}\|$	V_{DS} = 3 V, I_D = 10 mA (Note 2)	35	—	—	mS
Drain-Source ON-resistance	$R_{DS\ (ON)}$	I_D = 10 mA, V_{GS} = 4 V (Note 2)	—	2.3	3.6	Ω
		I_D = 10 mA, V_{GS} = 2.5 V (Note 2)	—	3.5	6.0	
Input capacitance	C_{iss}	V_{DS} = 3 V, V_{GS} = 0 V, f = 1 MHz	—	13.5	—	pF
Output capacitance	C_{oss}		—	8.0	—	
Reverse transfer capacitance	C_{rss}		—	6.5	—	
Switching time — Turn-on time	t_{on}	V_{DD} = 5 V, I_D = 10 mA, V_{GS} = 0 to 5 V, R_G = 50 Ω	—	5.5	—	ns
Switching time — Turn-off time	t_{off}		—	35	—	
Drain-source forward voltage	V_{DSF}	I_D = -100 mA, V_{GS} = 0 V (Note 2)	—	-0.85	-1.2	V

Note 2: Pulse test

Note 3: If a reverse bias is applied between gate and source, this device enters V(BR)DSX mode. Note that the drain-source breakdown voltage is lowered in this mode.

Switching Time Test Circuit

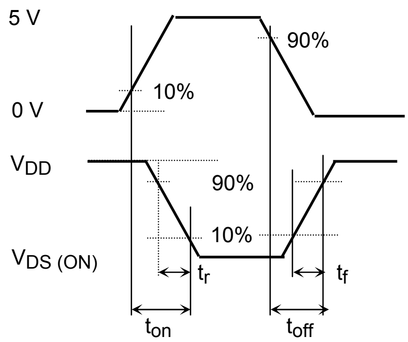
(a) Test circuit



V_{DD} = 5 V
R_G = 50 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 voltage between gate and source when low operating current value is I_D = 0.1 mA for this product. For normal switching operation, $V_{GS\ (on)}$ requires higher voltage than V_{th} and $V_{GS\ (off)}$ requires lower voltage than V_{th}. (Relationship can be established as follows: $V_{GS\ (off)} < V_{th} < V_{GS\ (on)}$)
Please take this into consideration for using the device.

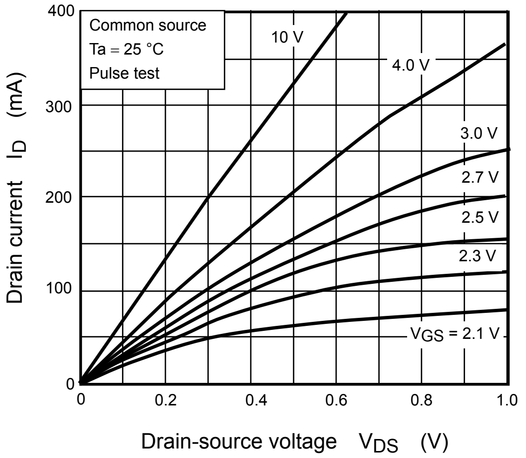
Do not use this device under avalanche mode. It may cause the device to break down.

Handling Precaution

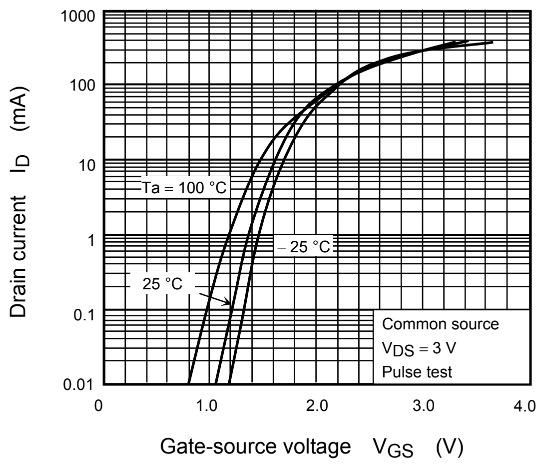
When handling individual devices (which are not yet mounting on a circuit board), be sure that the environment is protected against electrostatic electricity. Operators should wear anti-static clothing, and containers and other objects that come into direct contact with devices should be made of anti-static materials.

Thermal resistance $R_{th\ (ch-a)}$ and power dissipation P_D vary depending on board material, board area, board thickness and pad area. When using this device, please take heat dissipation into consideration

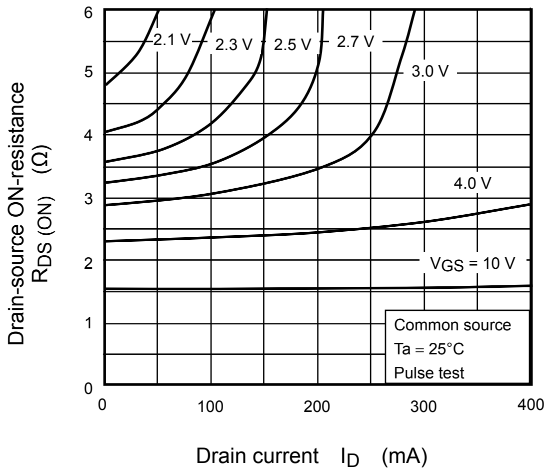
I_D – V_{DS}



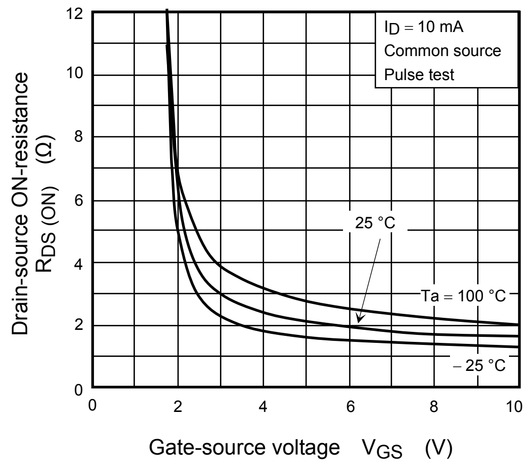
I_D – V_{GS}



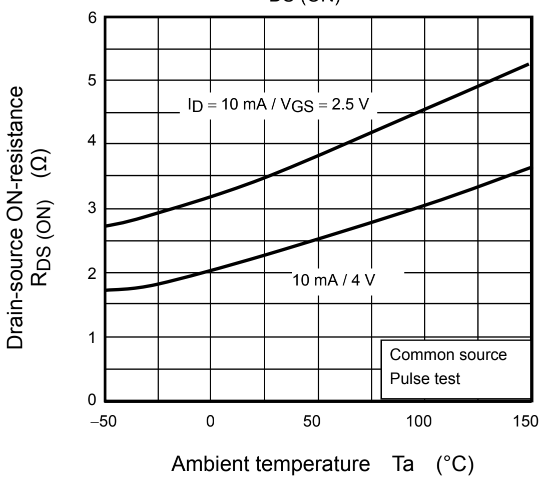
$R_{DS\ (ON)}$ – I_D



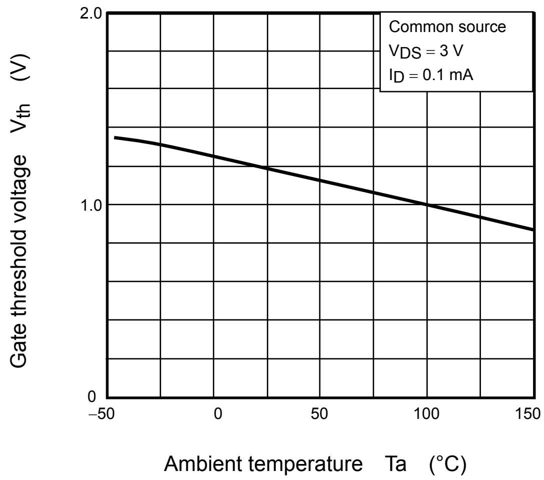
$R_{DS\ (ON)}$ – V_{GS}

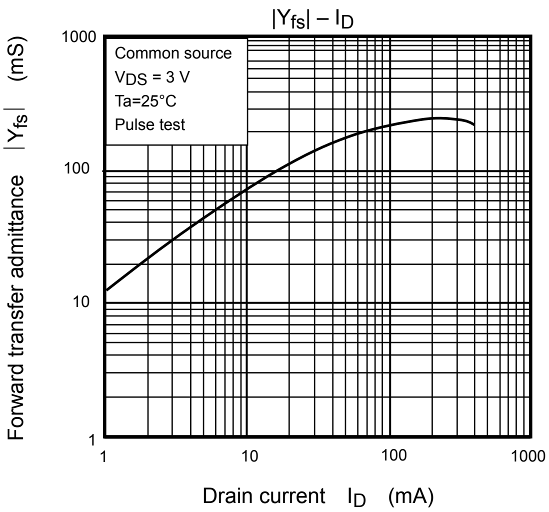


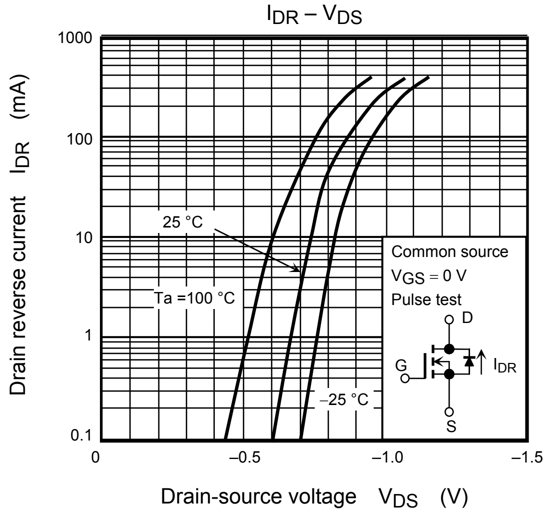
$R_{DS\ (ON)}$ – Ta

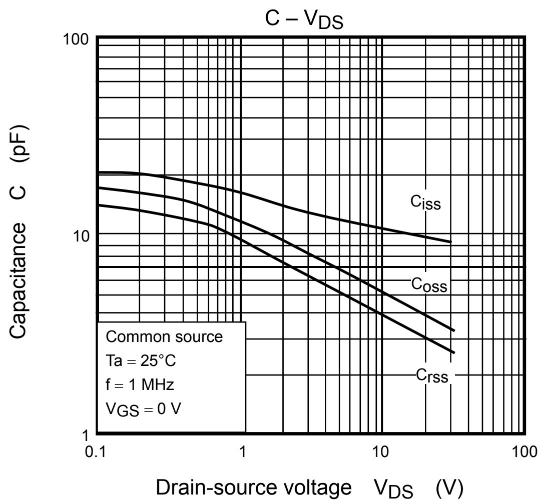


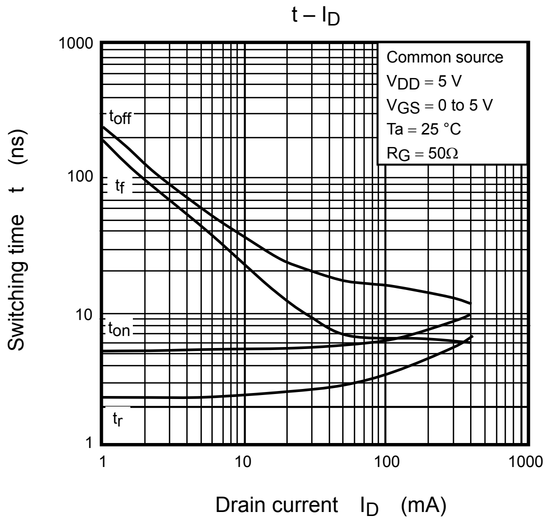
V_{th} – Ta

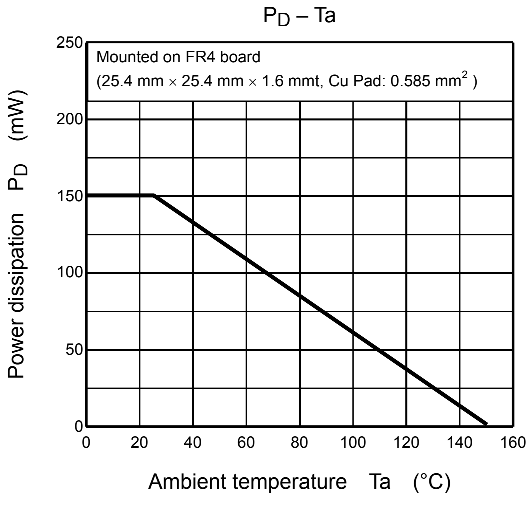



|Yfs| – ID
Common source
VDS = 3 V
Ta=25°C
Pulse test
Forward transfer admittance |Yfs| (mS)
Drain current ID (mA)
1000
100
10
1
1
10
100
1000


IDR – VDS
Common source
VGS = 0 V
Pulse test
D
G
S
IDR
25 °C
Ta =100 °C
−25 °C
Drain reverse current IDR (mA)
Drain-source voltage VDS (V)
1000
100
10
1
0.1
0
−0.5
−1.0
−1.5


C – VDS
Ciss
Coss
Crss
Common source
Ta = 25°C
f = 1 MHz
VGS = 0 V
Capacitance C (pF)
Drain-source voltage VDS (V)
100
10
1
0.1
1
10
100


t – ID
Common source
VDD = 5 V
VGS = 0 to 5 V
Ta = 25 °C
RG = 50Ω
toff
tf
ton
tr
Switching time t (ns)
Drain current ID (mA)
1000
100
10
1
1
10
100
1000


PD – Ta
Mounted on FR4 board
(25.4 mm × 25.4 mm × 1.6 mmt, Cu Pad: 0.585 mm2)
Power dissipation PD (mW)
Ambient temperature Ta (°C)
250
200
150
100
50
0
0
20
40
60
80
100
120
140
160

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