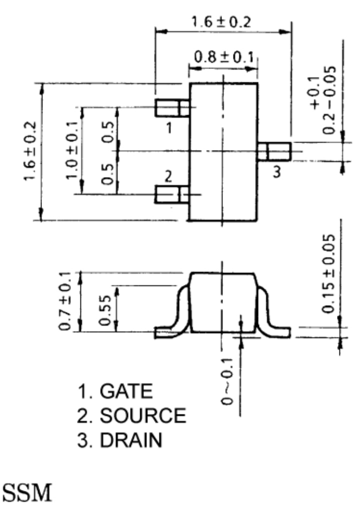
TOSHIBA Field-Effect Transistor Silicon N Channel MOS Type

SSM3K36FS

○ High-Speed Switching Applications

- 1.5-V drive
- Low ON-resistance : R_{on} = 1.52 Ω (max) (@V_{GS} = 1.5 V)
  : R_{on} = 1.14 Ω (max) (@V_{GS} = 1.8 V)
  : R_{on} = 0.85 Ω (max) (@V_{GS} = 2.5 V)
  : R_{on} = 0.66 Ω (max) (@V_{GS} = 4.5 V)
  : R_{on} = 0.63 Ω (max) (@V_{GS} = 5.0 V)

Unit: mm



JEDEC	―
JEITA	―
TOSHIBA	2-2H1B

Weight: 2.4 mg (typ.)

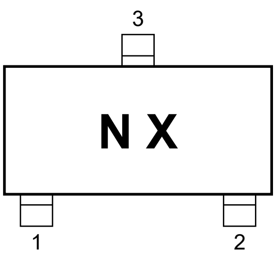
Absolute Maximum Ratings (Ta = 25 °C)

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DS}	20	V
Gate-source voltage		V_{GSS}	± 10	V
Drain current	DC	I_D	500	mA
	Pulse	I_{DP}	1000	
Drain power dissipation		P_D (Note 1)	150	mW
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55 to 150	°C

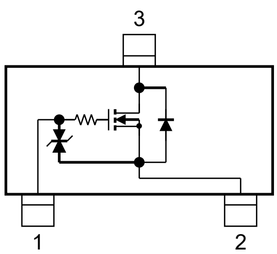
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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 an FR4 board
(25.4 mm × 25.4 mm × 1.6 mm, Cu Pad: 0.36 mm^2 × 3)

Marking



Equivalent Circuit (top view)



Start of commercial production
2008-02

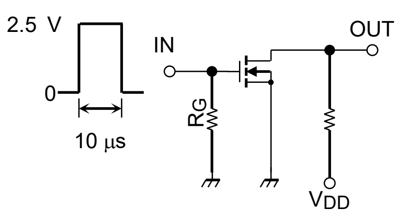
Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Conditions	Min	Typ.	Max	Unit
Drain-source breakdown voltage		$V_{(BR)DSS}$	I_D = 1 mA, V_{GS} = 0 V	20	—	—	V
		$V_{(BR)DSX}$	I_D = 1 mA, V_{GS} = - 10 V	12	—	—	
Drain cutoff current		I_{DSS}	V_{DS} = 20 V, V_{GS} = 0 V	—	—	1	μA
Gate leakage current		I_{GSS}	V_{GS} = ±10 V, V_{DS} = 0 V	—	—	±1	μA
Gate threshold voltage		V_{th}	V_{DS} = 3 V, I_D = 1 mA	0.35	—	1.0	V
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = 3 V, I_D = 200 mA (Note 2)	420	840	—	mS
Drain-source ON-resistance		$R_{DS(ON)}$	I_D = 200 mA, V_{GS} = 5.0 V (Note 2)	—	0.46	0.63	Ω
			I_D = 200 mA, V_{GS} = 4.5 V (Note 2)	—	0.51	0.66	
			I_D = 200 mA, V_{GS} = 2.5 V (Note 2)	—	0.66	0.85	
			I_D = 100 mA, V_{GS} = 1.8 V (Note 2)	—	0.81	1.14	
			I_D = 50 mA, V_{GS} = 1.5 V (Note 2)	—	0.95	1.52	
Input capacitance		C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz	—	46	—	pF
Output capacitance		C_{oss}		—	10.8	—	
Reverse transfer capacitance		C_{rss}		—	7.3	—	
Total Gate Charge		Q_g	V_{DS} = 10 V, I_D = 0.5 A V_{GS} = 4.0 V	—	1.23	—	nC
Gate–Source Charge		Q_{gs}		—	0.60	—	
Gate–Drain Charge		Q_{gd}		—	0.63	—	
Switching time	Turn-on time	t_{on}	V_{DD} = 10 V, I_D = 200 mA V_{GS} = 0 to 2.5 V, R_G = 50 Ω	—	30	—	ns
	Turn-off time	t_{off}		—	75	—	
Drain-source forward voltage		V_{DSF}	I_D = -0.5 A, V_{GS} = 0 V (Note 2)	—	-0.88	-1.2	V

Note 2: Pulse test

Switching Time Test Circuit

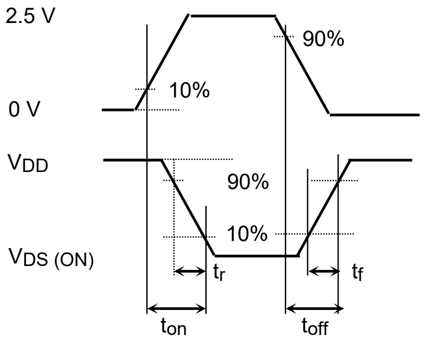
(a) Test Circuit



V_{DD} = 10 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}

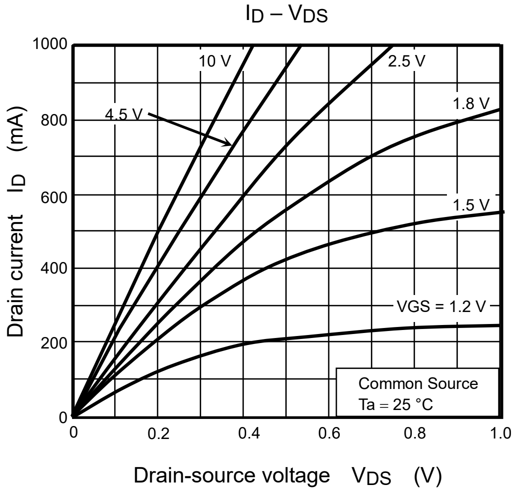


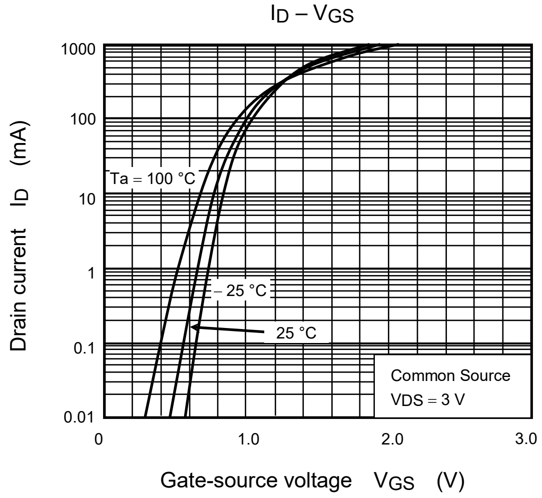
Usage Considerations

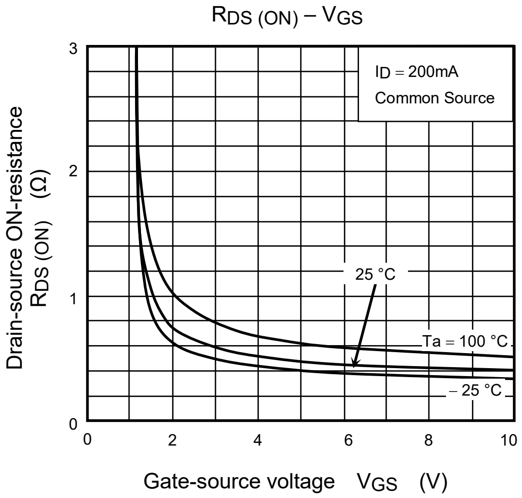
Let V_{th} be the voltage applied between gate and source that causes the drain current (I_D) to below (1 mA for the SSM3K36FS). Then, for normal switching operation, $V_{GS(on)}$ must be higher than V_{th}, and $V_{GS(off)}$ must be lower than V_{th}. This relationship can be expressed as: $V_{GS(off)} < V_{th} < V_{GS(on)}$.
Take this into consideration when using the device.

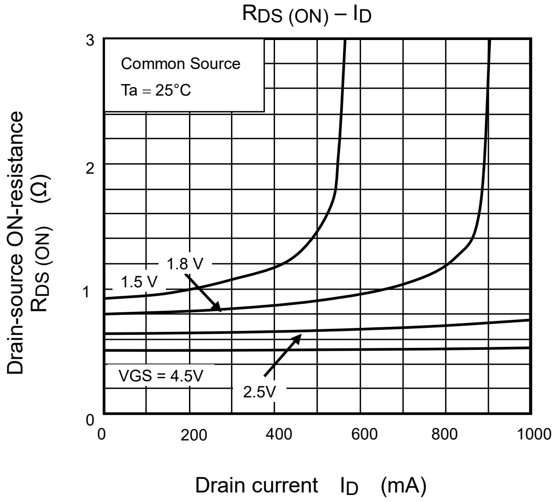
Handling Precaution

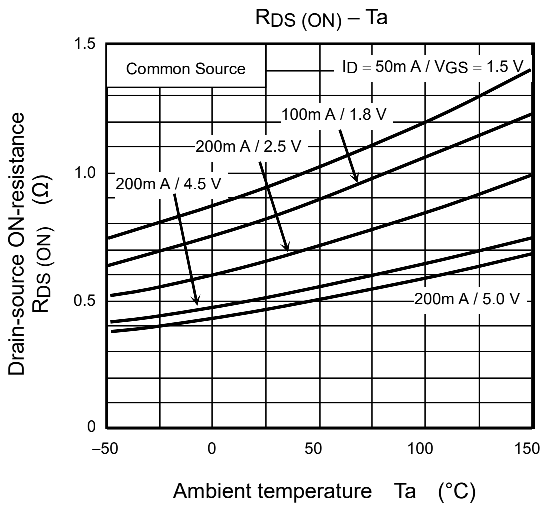
When handling individual devices that are not yet mounted on a circuit board, make sure that the environment is protected against electrostatic discharge. Operators should wear antistatic clothing, and containers and other objects that come into direct contact with devices should be made of antistatic materials.

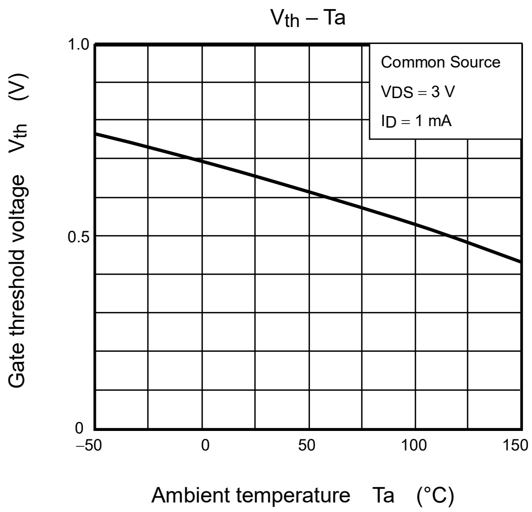












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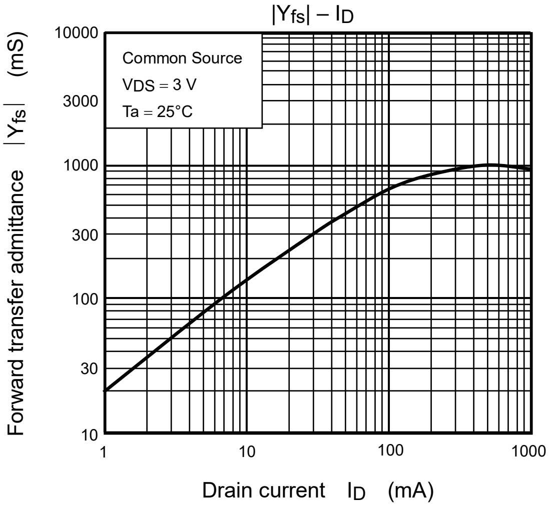

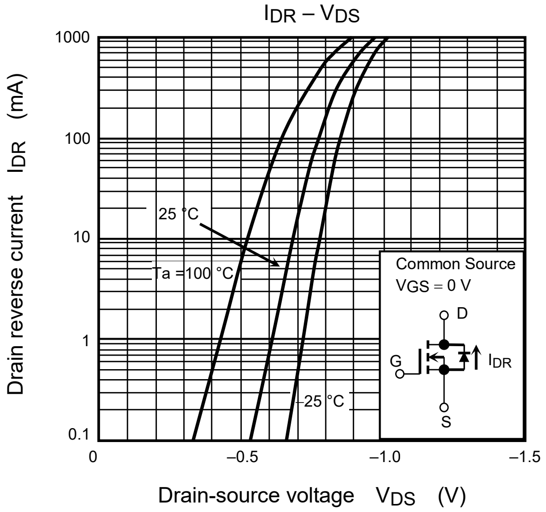

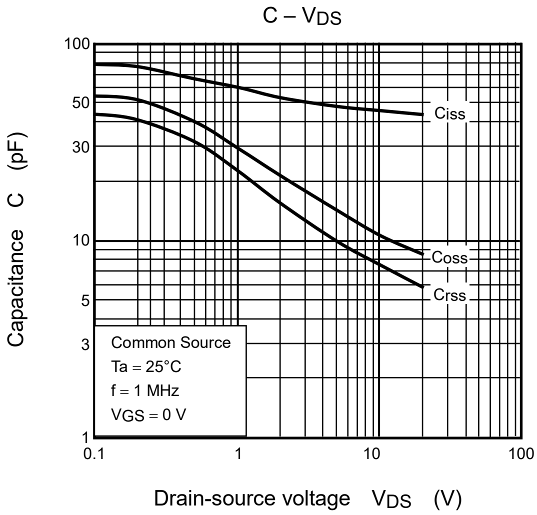

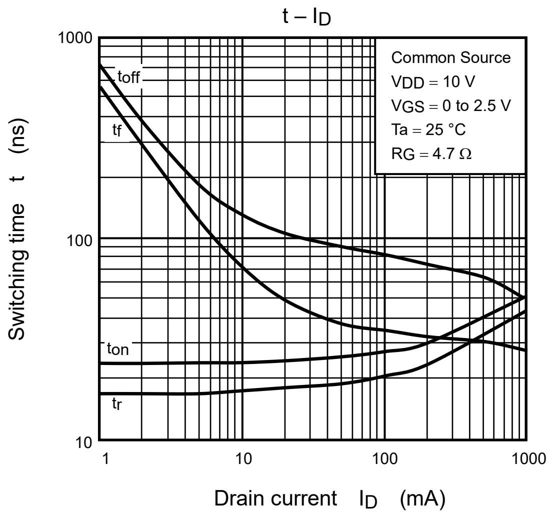

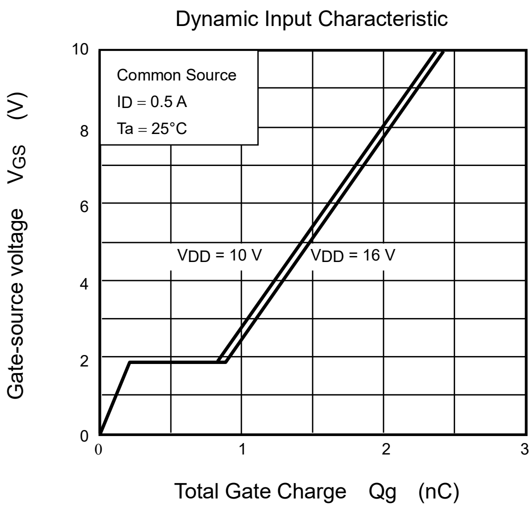

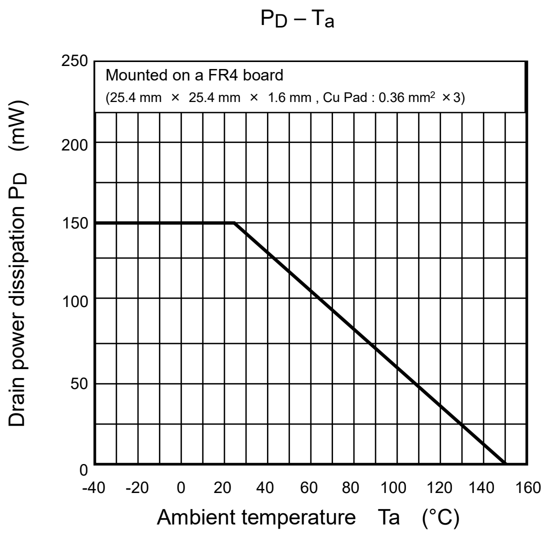

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