

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type

SSM5N16FE

High Speed Switching Applications
 Analog Switching Applications

Unit: mm

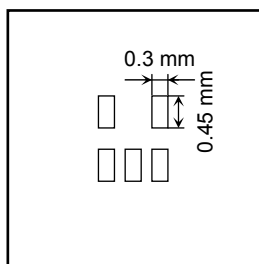
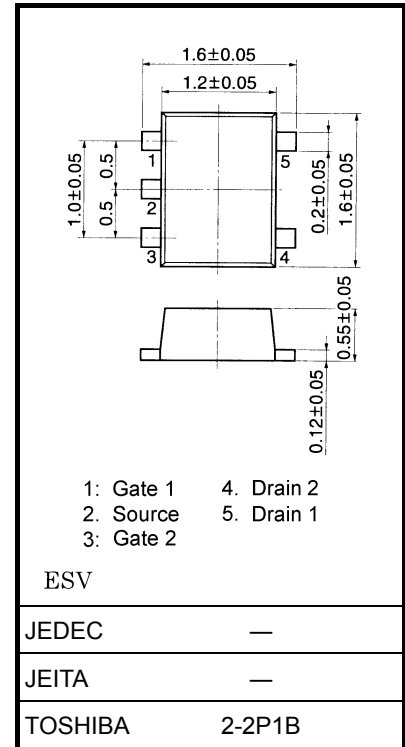
- Suitable for high-density mounting due to compact package
- Low on resistance: $R_{on} = 3.0 \Omega$ (max) (@ $V_{GS} = 4 V$)
 : $R_{on} = 4.0 \Omega$ (max) (@ $V_{GS} = 2.5 V$)
 : $R_{on} = 15 \Omega$ (max) (@ $V_{GS} = 1.5 V$)

Absolute Maximum Ratings (Ta = 25°C) (Q1, Q2 Common)

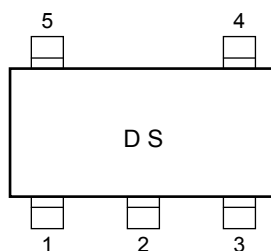
Characteristics	Symbol	Rating	Unit
Drain-Source voltage	V_{DS}	20	V
Gate-Source voltage	V_{GSS}	± 10	V
Drain current	DC	I_D	100
	Pulse	I_{DP}	200
Drain power dissipation (Ta = 25°C)	P_D (Note 1)	150	mW
Channel temperature	T_{ch}	150	°C
Storage temperature range	T_{stg}	-55~150	°C

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).

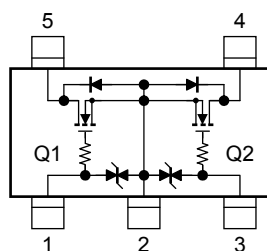
Note 1: Total rating, mounted on FR4 board
 (25.4 mm × 25.4 mm × 1.6 t, Cu Pad: 0.135 mm² × 5)



Marking



Equivalent Circuit



Handling Precaution

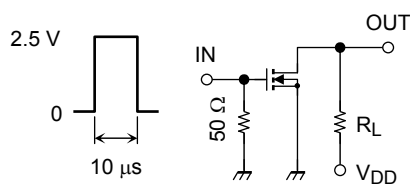
When handling individual devices (which are not yet mounting on a circuit board), be sure that the environment is protected against electrostatic electricity. Operators should wear anti-static clothing, and containers and other objects that come into direct contact with devices should be made of anti-static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

Electrical Characteristics (Ta = 25°C) (Q1, Q2 Common)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit	
Gate leakage current	I_{GSS}	$V_{GS} = \pm 10\text{ V}, V_{DS} = 0$	—	—	± 1	μA	
Drain-Source breakdown voltage	$V_{(BR)DSS}$	$I_D = 0.1\text{ mA}, V_{GS} = 0$	20	—	—	V	
Drain cut-off current	I_{DSS}	$V_{DS} = 20\text{ V}, V_{GS} = 0$	—	—	1	μA	
Gate threshold voltage	V_{th}	$V_{DS} = 3\text{ V}, I_D = 0.1\text{ mA}$	0.6	—	1.1	V	
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 3\text{ V}, I_D = 10\text{ mA}$	40	—	—	mS	
Drain-Source ON resistance	$R_{DS(ON)}$	$I_D = 10\text{ mA}, V_{GS} = 4\text{ V}$	—	1.5	3.0	Ω	
		$I_D = 10\text{ mA}, V_{GS} = 2.5\text{ V}$	—	2.2	4.0		
		$I_D = 1\text{ mA}, V_{GS} = 1.5\text{ V}$	—	5.2	15		
Input capacitance	C_{iss}	$V_{DS} = 3\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	—	9.3	—	pF	
Reverse transfer capacitance	C_{rss}	$V_{DS} = 3\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	—	4.5	—	pF	
Output capacitance	C_{oss}	$V_{DS} = 3\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	—	9.8	—	pF	
Switching time	Turn-on time	t_{on}	$V_{DD} = 3\text{ V}, I_D = 10\text{ mA},$ $V_{GS} = 0 \sim 2.5\text{ V}$	—	70	—	ns
	Turn-off time	t_{off}		—	125	—	

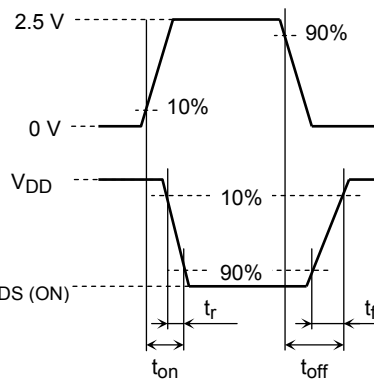
Switching Time Test Circuit

(a) Test circuit

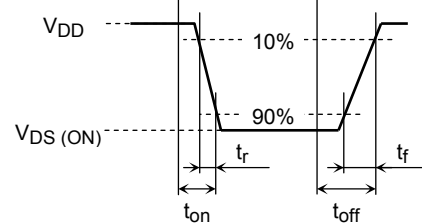


$V_{DD} = 3\text{ V}$
 Duty $\leq 1\%$
 V_{IN} : $t_r, t_f < 5\text{ ns}$
 $(Z_{out} = 50\ \Omega)$
 Common Source
 $T_a = 25^\circ\text{C}$

(b) V_{IN}



(c) V_{OUT}

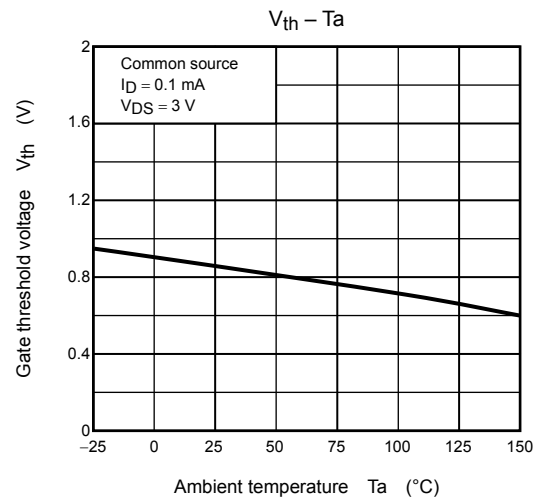
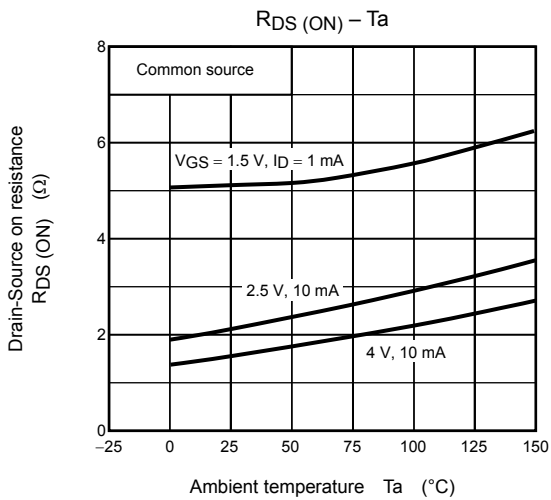
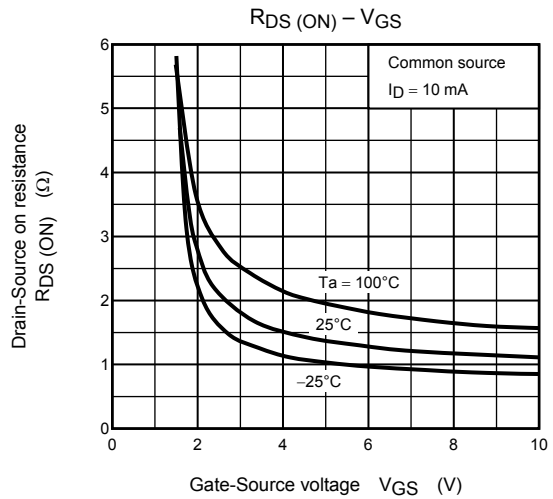
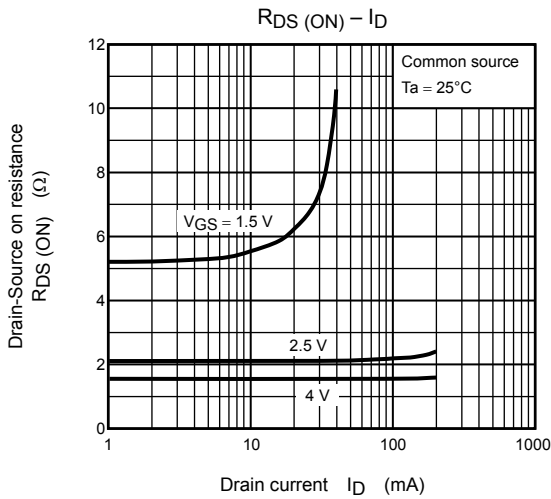
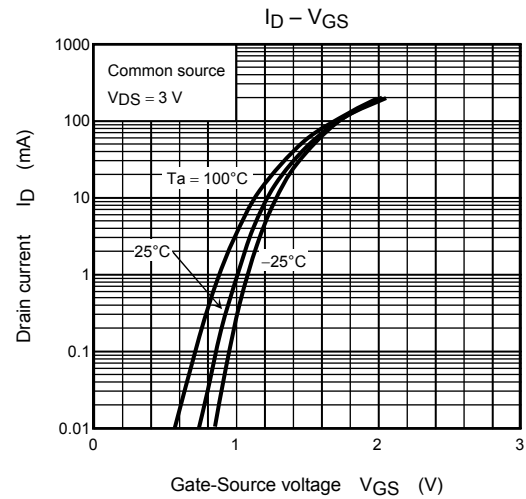
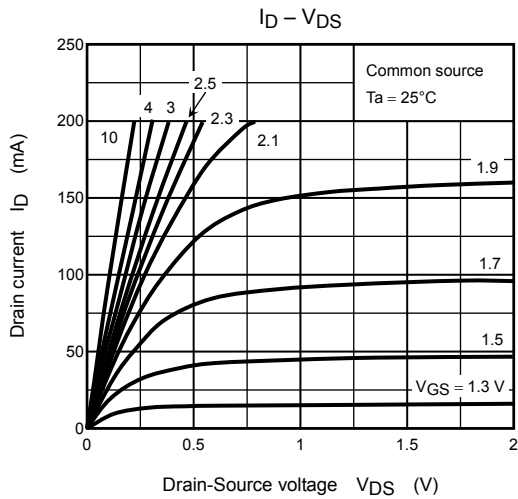


Precaution

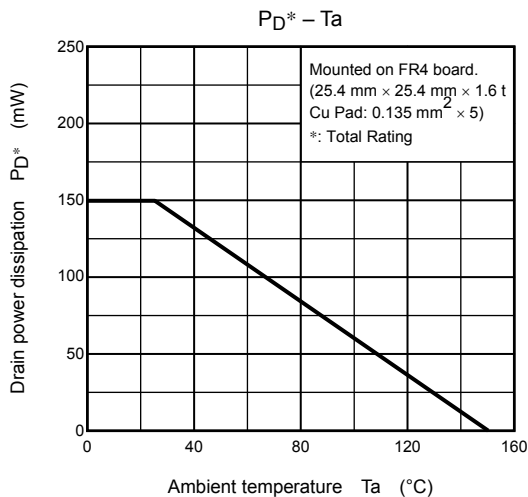
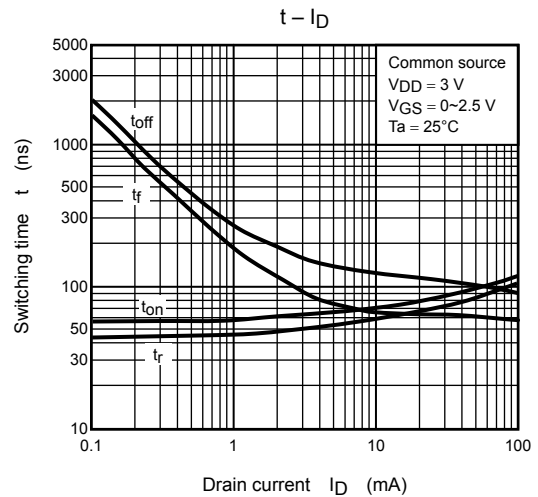
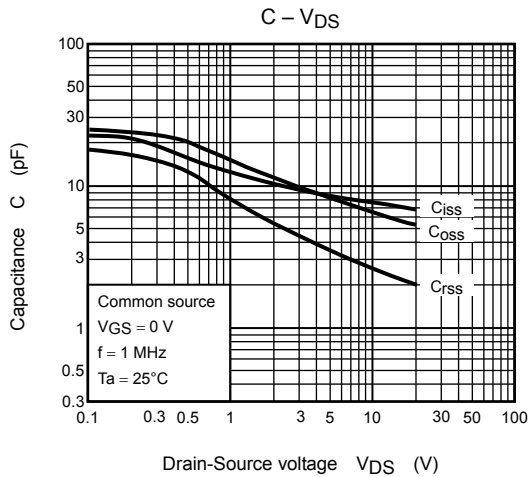
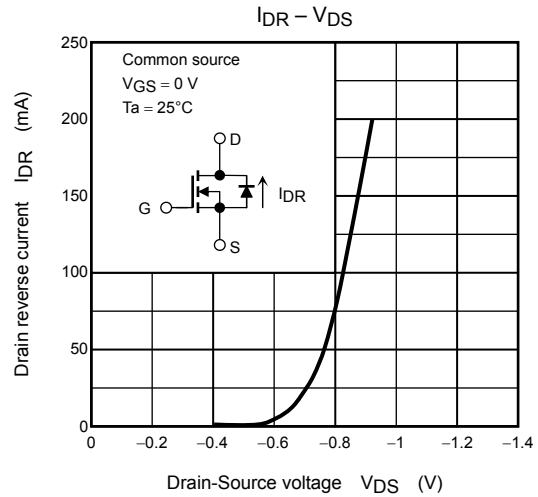
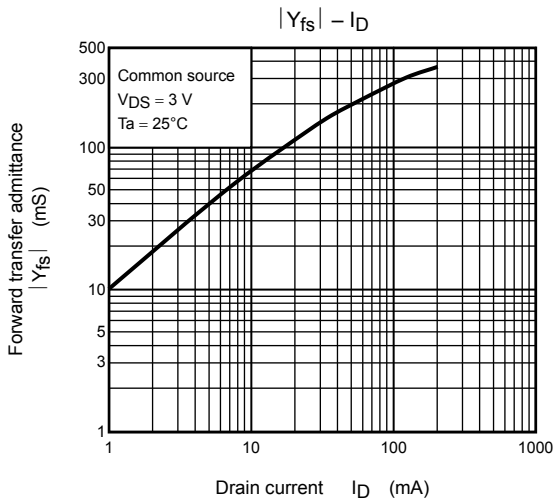
V_{th} can be expressed as voltage between gate and source when low operating current value is $I_D = 100\ \mu\text{A}$ for this product. For normal switching operation, $V_{GS(on)}$ requires higher voltage than V_{th} and $V_{GS(off)}$ requires lower voltage than V_{th} . (Relationship can be established as follows: $V_{GS(off)} < V_{th} < V_{GS(on)}$)

Please take this into consideration for using the device.

(Q1, Q2 common)



(Q1, Q2 common)



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