

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type

SSM5N15FE

High Speed Switching Applications

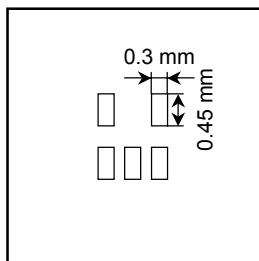
Analog Switch Applications

- Small package
- Low ON resistance : $R_{on} = 4.0 \Omega$ (max) (@ $V_{GS} = 4$ V)
: $R_{on} = 7.0 \Omega$ (max) (@ $V_{GS} = 2.5$ V)

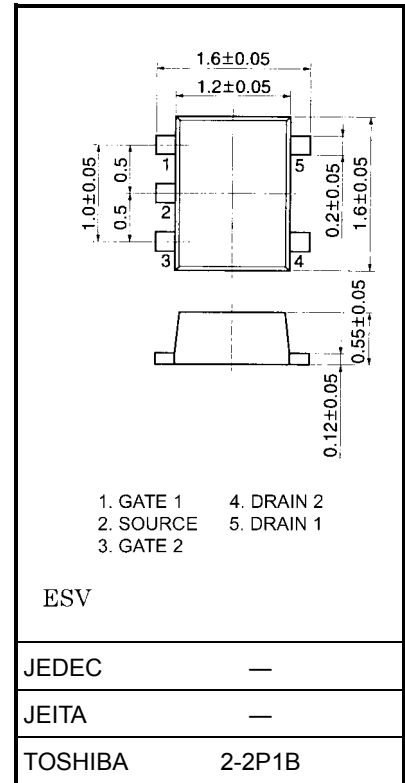
Maximum Ratings ($T_a = 25^\circ\text{C}$) (Q1, Q2 Common)

Characteristics		Symbol	Rating	Unit
Drain-Source voltage		V_{DS}	30	V
Gate-Source voltage		V_{GSS}	± 20	V
Drain current	DC	I_D	100	mA
	Pulse	I_{DP}	200	
Drain power dissipation ($T_a = 25^\circ\text{C}$)		P_D (Note)	150	mW
Channel temperature		T_{ch}	150	$^\circ\text{C}$
Storage temperature range		T_{stg}	$-55 \sim 150$	$^\circ\text{C}$

Note: Total rating, mounted on FR4 board
($25.4 \text{ mm} \times 25.4 \text{ mm} \times 1.6 \text{ t}$, Cu Pad: $0.135 \text{ mm}^2 \times 5$)

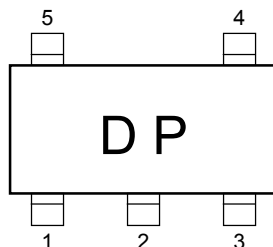


Unit: mm

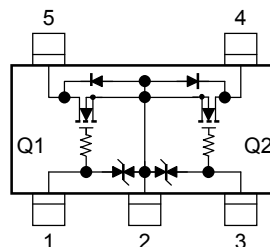


Weight: 0.003 g (typ.)

Marking



Equivalent Circuit (top view)



Handling Precaution

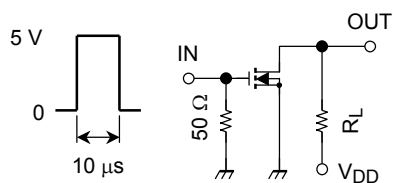
When handling individual devices (which are not yet mounting on a circuit board), be sure that the environment is protected against electrostatic electricity. Operators should wear anti-static clothing, and containers and other objects that come into direct contact with devices should be made of anti-static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

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

Characteristic		Symbol	Test Condition	Min	Typ	Max	Unit
Gate leakage current		I_{GSS}	$V_{GS} = \pm 16 \text{ V}, V_{DS} = 0$	—	—	± 1	μA
Drain-Source breakdown voltage		$V_{(BR)DSS}$	$I_D = 0.1 \text{ mA}, V_{GS} = 0$	30	—	—	V
Drain cut-off current		I_{DSS}	$V_{DS} = 30 \text{ V}, V_{GS} = 0$	—	—	1	μA
Gate threshold voltage		V_{th}	$V_{DS} = 3 \text{ V}, I_D = 0.1 \text{ mA}$	0.8	—	1.5	V
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 3 \text{ V}, I_D = 10 \text{ mA}$	25	—	—	mS
Drain-Source ON resistance		$R_{DS(ON)}$	$I_D = 10 \text{ mA}, V_{GS} = 4 \text{ V}$	—	2.2	4.0	Ω
			$I_D = 10 \text{ mA}, V_{GS} = 2.5 \text{ V}$	—	4.0	7.0	
Input capacitance		C_{iss}	$V_{DS} = 3 \text{ V}, V_{GS} = 0, f = 1 \text{ MHz}$	—	7.8	—	pF
Reverse transfer capacitance		C_{rss}		—	3.6	—	pF
Output capacitance		C_{oss}		—	8.8	—	pF
Switching time	Turn-on time	t_{on}	$V_{DD} = 5 \text{ V}, I_D = 10 \text{ mA},$ $V_{GS} = 0 \sim 5 \text{ V}$	—	50	—	ns
	Turn-off time	t_{off}		—	180	—	

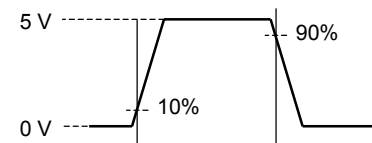
Switching Time Test Circuit

(a) Test circuit

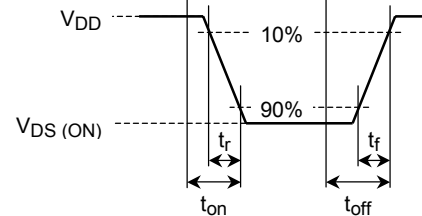


$V_{DD} = 5 \text{ V}$
 Duty $\leq 1\%$
 V_{IN} : $t_r, t_f < 5 \text{ ns}$
 $(Z_{out} = 50 \Omega)$
 Common Source
 $T_a = 25^\circ\text{C}$

(b) V_{IN}



(c) V_{OUT}

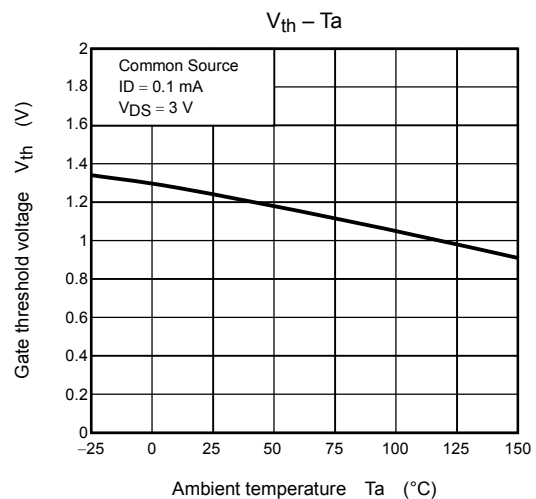
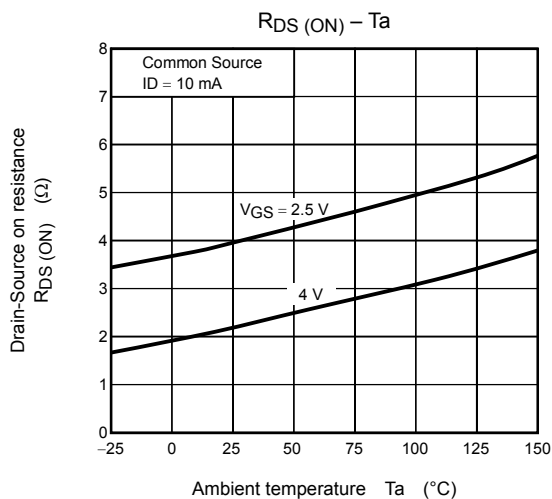
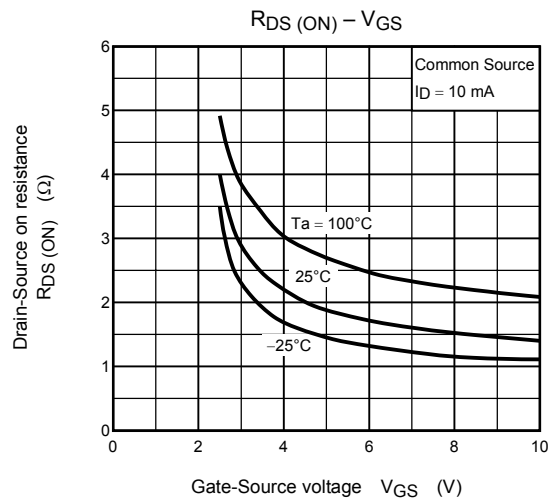
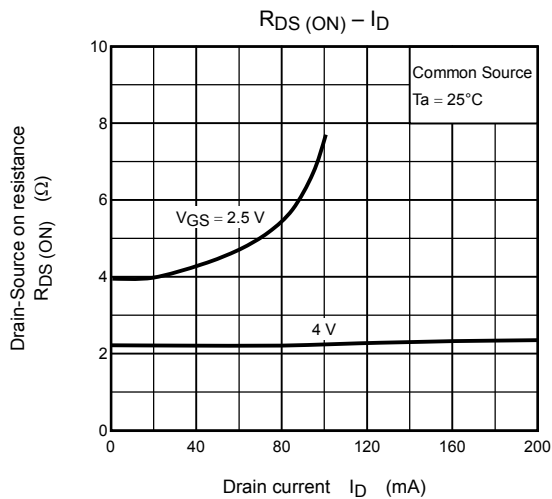
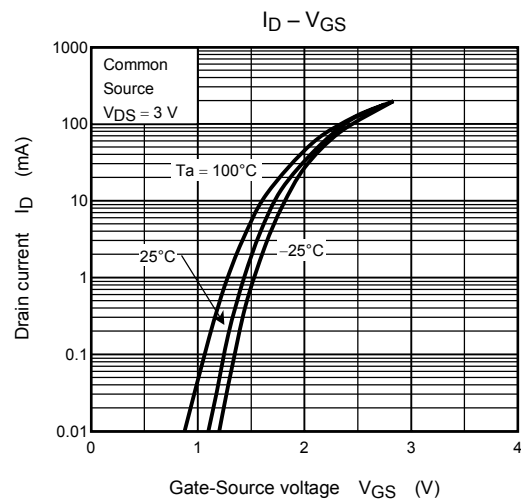
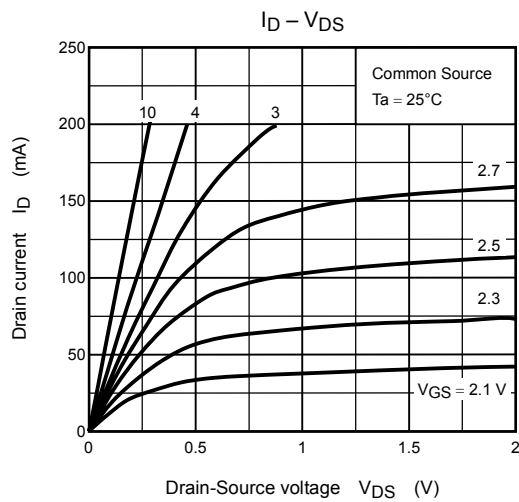


Precaution

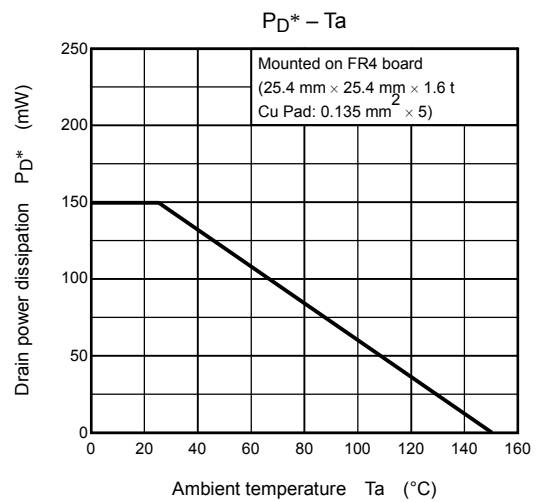
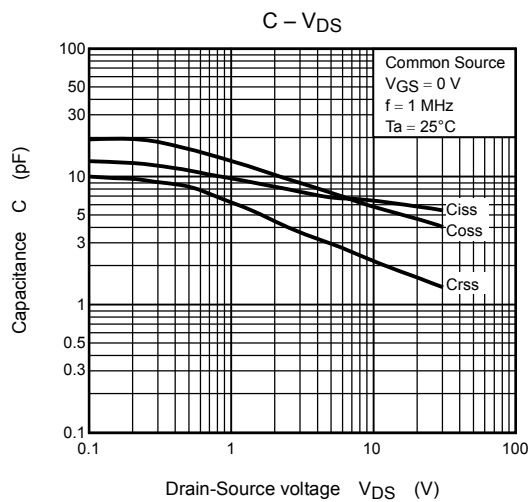
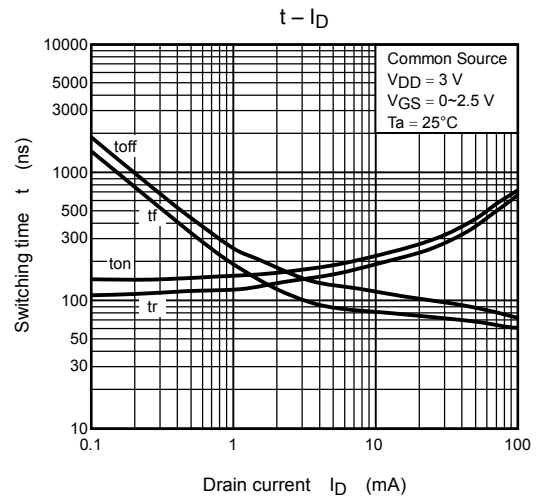
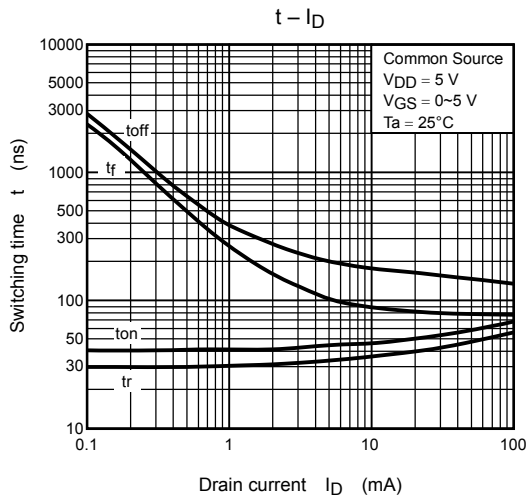
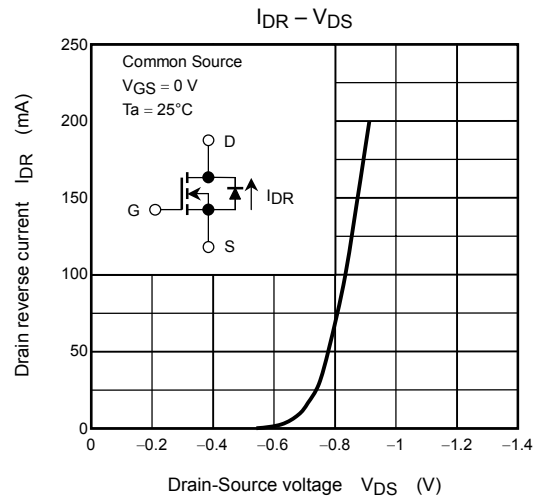
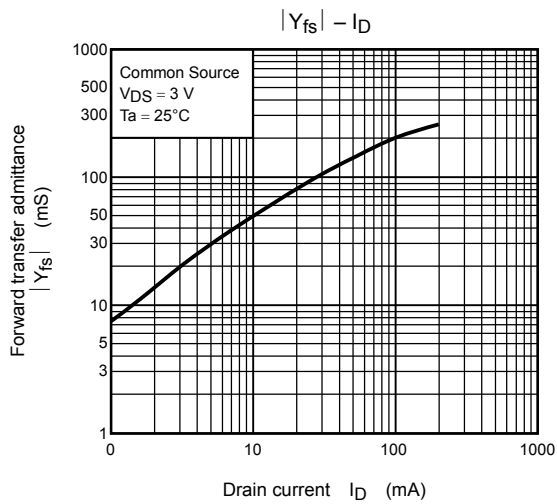
V_{th} can be expressed as voltage between gate and source when low operating current value is $I_D = 100 \mu\text{A}$ for this product. For normal switching operation, $V_{GS(on)}$ requires higher voltage than V_{th} and $V_{GS(off)}$ requires lower voltage than V_{th} . (Relationship can be established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

Please take this into consideration for using the device. V_{GS} recommended voltage of 2.5 V or higher to turn on this product.

(Q1, Q2 common)



(Q1, Q2 common)



*: Total rating

RESTRICTIONS ON PRODUCT USE

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