

TOSHIBA Field-Effect Transistor Silicon N-Channel MOS Type

## SSM3K35FS

○ High-Speed Switching Applications

○ Analog Switch Applications

Unit: mm

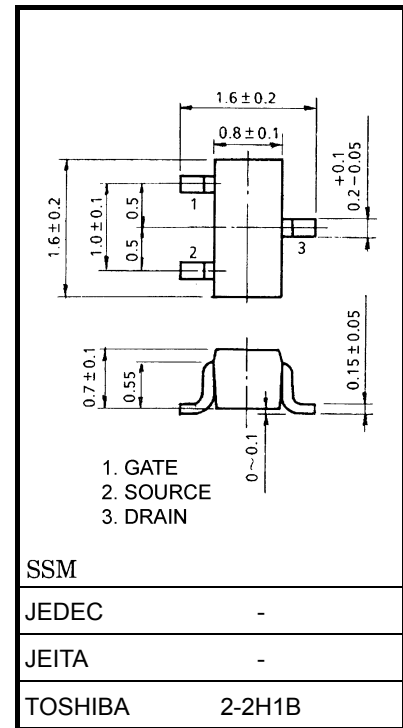
- 1.2-V drive
- Low ON-resistance:  $R_{ON} = 20\ \Omega$  (max) (@ $V_{GS} = 1.2\text{ V}$ )  
 $R_{ON} = 8\ \Omega$  (max) (@ $V_{GS} = 1.5\text{ V}$ )  
 $R_{ON} = 4\ \Omega$  (max) (@ $V_{GS} = 2.5\text{ V}$ )  
 $R_{ON} = 3\ \Omega$  (max) (@ $V_{GS} = 4.0\text{ V}$ )

Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Characteristics		Symbol	Rating	Unit
Drain-source voltage		$V_{DSS}$	20	V
Gate-source voltage		$V_{GSS}$	$\pm 10$	V
Drain current	DC	$I_D$	180	mA
	Pulse	$I_{DP}$	360	
Drain power dissipation		$P_D$	100	mW
Channel temperature		$T_{ch}$	150	$^\circ\text{C}$
Storage temperature		$T_{stg}$	-55 to 150	$^\circ\text{C}$

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.).



Weight: 2.4 mg (typ.)

Electrical Characteristics ( $T_a = 25^\circ\text{C}$ )

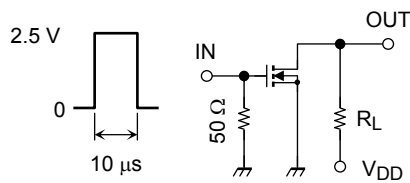
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I <sub>GSS</sub>	V <sub>GS</sub> = ±10 V, V <sub>DS</sub> = 0V	—	—	±10	μA
Drain–source breakdown voltage		V <sub>(BR) DSS</sub>	I <sub>D</sub> = 0.1 mA, V <sub>GS</sub> = 0V	20	—	—	V
Drain cutoff current		I <sub>DSS</sub>	V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0V	—	—	1	μA
Gate threshold voltage		V <sub>th</sub>	V <sub>DS</sub> = 3 V, I <sub>D</sub> = 1 mA	0.4	—	1.0	V
Forward transfer admittance		Y <sub>fs</sub>	V <sub>DS</sub> = 3 V, I <sub>D</sub> = 50 mA (Note 1)	115	—	—	mS
Drain–source ON-resistance		R <sub>DS (ON)</sub>	I <sub>D</sub> = 50 mA, V <sub>GS</sub> = 4 V (Note 1)	—	1.5	3	Ω
			I <sub>D</sub> = 50 mA, V <sub>GS</sub> = 2.5 V (Note 1)	—	2	4	
			I <sub>D</sub> = 5 mA, V <sub>GS</sub> = 1.5 V (Note 1)	—	3	8	
			I <sub>D</sub> = 5 mA, V <sub>GS</sub> = 1.2 V (Note 1)	—	5	20	
Input capacitance		C <sub>iss</sub>	V <sub>DS</sub> = 3 V, V <sub>GS</sub> = 0V, f = 1 MHz	—	9.5	—	pF
Reverse transfer capacitance		C <sub>rss</sub>		—	4.1	—	
Output capacitance		C <sub>oss</sub>		—	9.5	—	
Switching time	Turn-on time	t <sub>on</sub>	V <sub>DD</sub> = 3 V, I <sub>D</sub> = 50 mA, V <sub>GS</sub> = 0 to 2.5 V	—	115	—	ns
	Turn-off time	t <sub>off</sub>		—	300	—	
Drain–source forward voltage		V <sub>DSF</sub>	I <sub>D</sub> = - 180 mA, V <sub>GS</sub> = 0V (Note 1)	—	-0.9	-1.2	V

Note 1: Pulse test

Start of commercial production  
2008-02

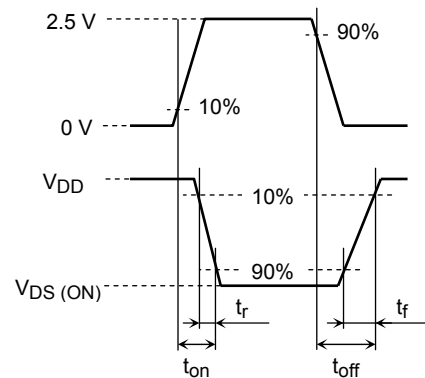
## Switching Time Test Circuit

(a) Test Circuit



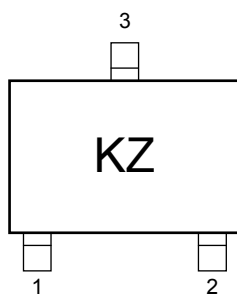
$V_{DD} = 3\text{ V}$   
 Duty  $\leq 1\%$   
 $V_{IN}$ :  $t_r, t_f < 5\text{ ns}$   
 $(Z_{out} = 50\ \Omega)$   
 Common Source  
 $T_a = 25^\circ\text{C}$

(b)  $V_{IN}$

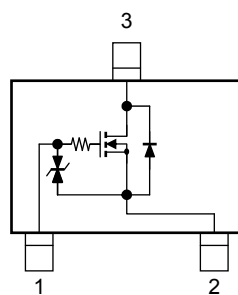


(c)  $V_{OUT}$

## Marking



## Equivalent Circuit (top view)

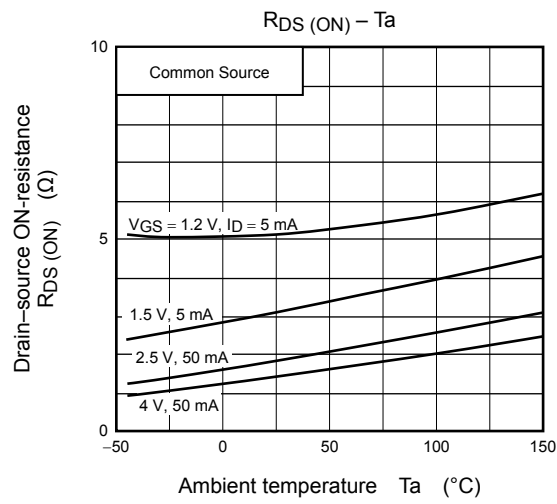
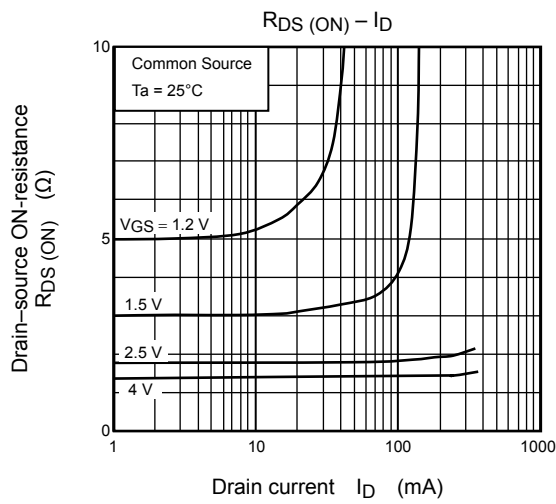
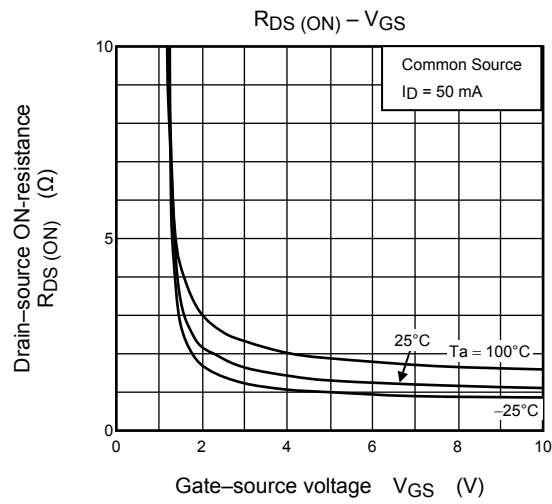
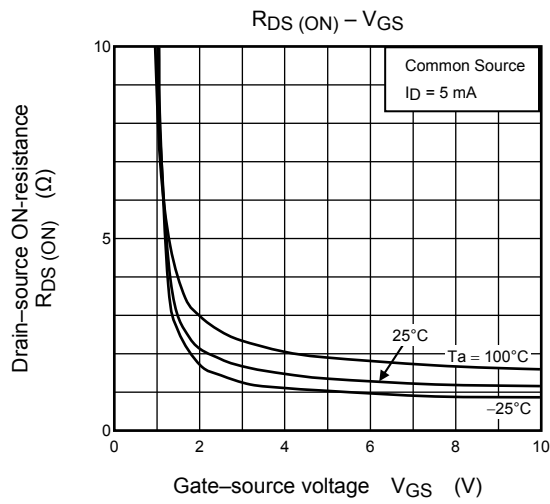
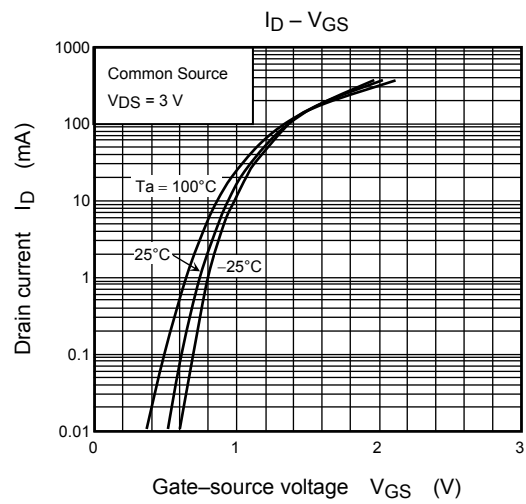
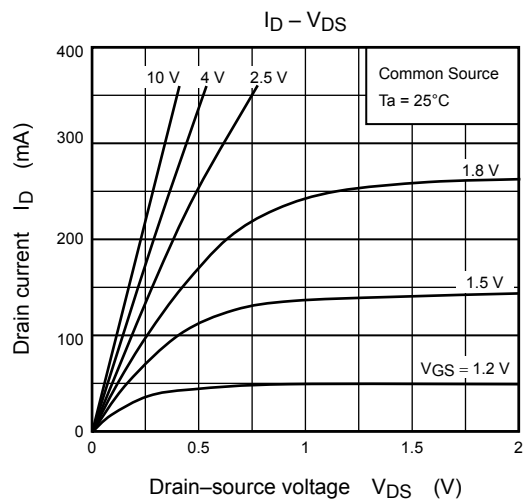


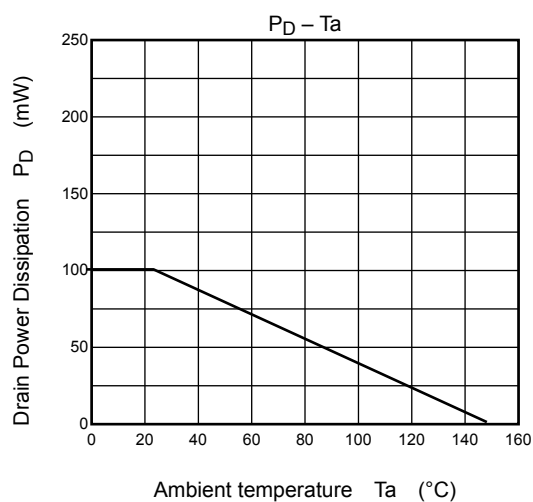
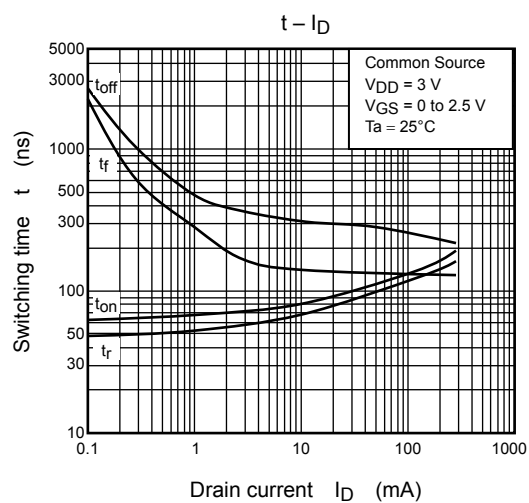
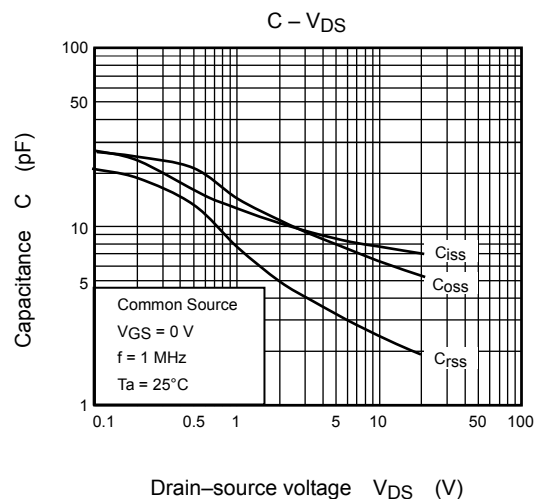
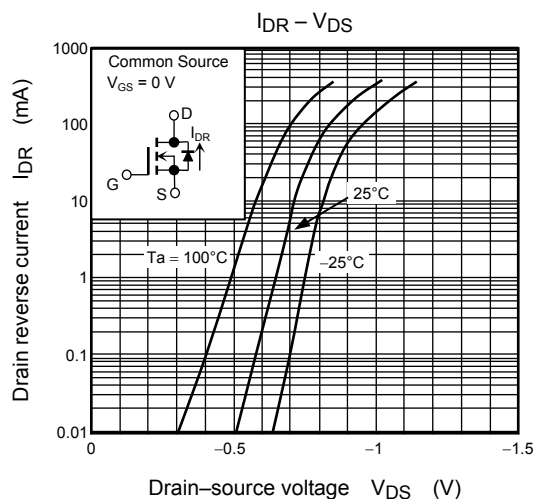
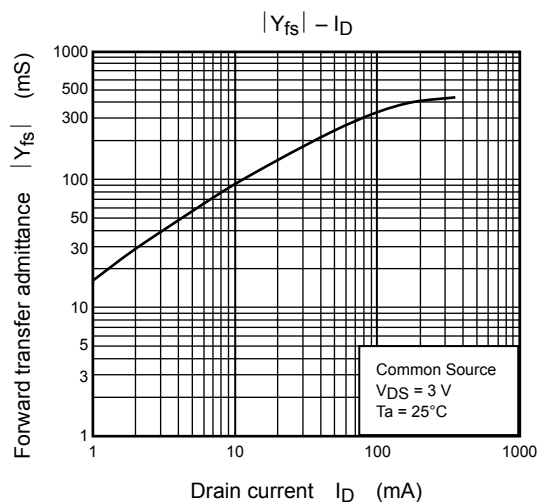
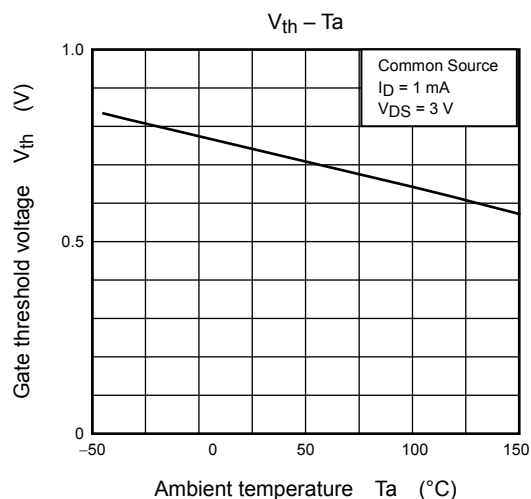
## Usage Considerations

Let  $V_{th}$  be the voltage applied between gate and source that causes the drain current ( $I_D$ ) to be below (1 mA for the SSM3K35FS). 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 (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.





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