

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type

SSM3K09FU

High Speed Switching Applications

- Small package
- Low on resistance
 - : $R_{on} = 0.7 \Omega$ (max) (@ $V_{GS} = 10 V$)
 - : $R_{on} = 1.2 \Omega$ (max) (@ $V_{GS} = 4 V$)

Absolute Maximum Ratings (Ta = 25°C)

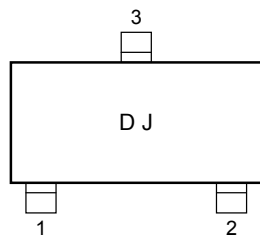
Characteristics	Symbol	Rating	Unit
Drain-Source voltage	V_{DS}	30	V
Gate-Source voltage	V_{GSS}	± 20	V
Drain current	DC	I_D	400
	Pulse	I_{DP}	800
Drain power dissipation (Ta = 25°C)	P_D (Note 1)	150	mW
Channel temperature	T_{ch}	150	°C
Storage temperature	T_{stg}	-55~150	°C

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: Mounted on FR4 board
(25.4 mm × 25.4 mm × 1.6 t, Cu Pad: 0.6 mm² × 3) Figure 1.

Marking



Equivalent Circuit (top view)

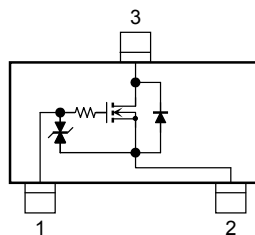
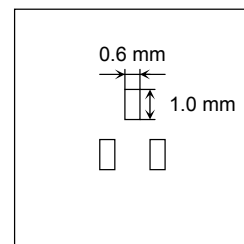


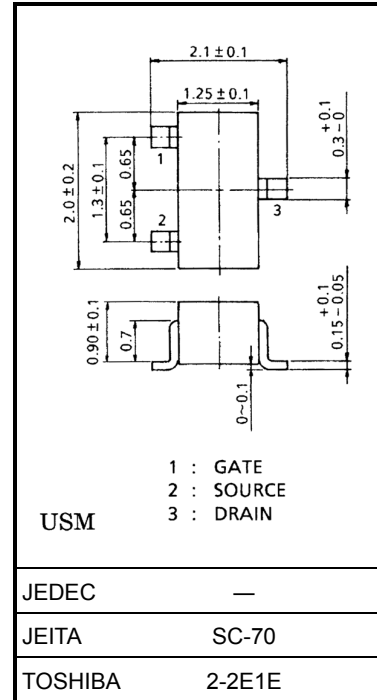
Figure 1: 25.4 mm × 25.4 mm × 1.6 t, Cu Pad: 0.6 mm² × 3



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.

Unit: mm



Weight: 0.006 g (typ.)

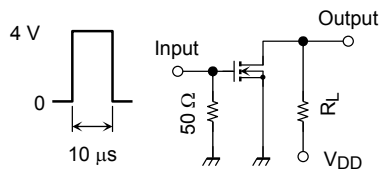
Electrical Characteristics (Ta = 25°C)

Characteristics	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	$V_{(BR)DSS}$	$I_D = 1\text{ mA}, V_{GS} = 0$	30	—	—	V
Drain cut-off current	I_{DSS}	$V_{DS} = 30\text{ V}, V_{GS} = 0$	—	—	1	μA
Gate threshold voltage	V_{th}	$V_{DS} = 5\text{ V}, I_D = 0.1\text{ mA}$	1.1	—	1.8	V
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 5\text{ V}, I_D = 200\text{ mA}$ (Note2)	270	—	—	mS
Drain-Source ON resistance	$R_{DS(ON)}$	$I_D = 200\text{ mA}, V_{GS} = 10\text{ V}$ (Note2)	—	0.5	0.7	Ω
		$I_D = 200\text{ mA}, V_{GS} = 4\text{ V}$ (Note2)	—	0.8	1.2	
		$I_D = 200\text{ mA}, V_{GS} = 3.3\text{ V}$ (Note2)	—	1.0	1.7	
Input capacitance	C_{iss}	$V_{DS} = 5\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	—	20	—	pF
Reverse transfer capacitance	C_{rss}	$V_{DS} = 5\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	—	7	—	pF
Output capacitance	C_{oss}	$V_{DS} = 5\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$	—	16	—	pF
Switching time	Turn-on time	t_{on}	—	72	—	ns
	Turn-off time	t_{off}		68	—	ns

Note2: Pulse test

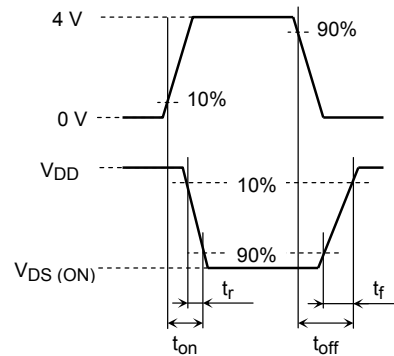
Switching Time Test Circuit

(a) Test circuit

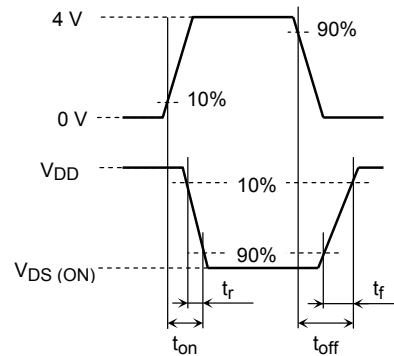


$V_{DD} = 5\text{ V}$
 D.U. $\leq 1\%$
 Input: $t_r, t_f < 5\text{ ns}$
 ($Z_{out} = 50\ \Omega$)
 Common Source
 $T_a = 25^\circ\text{C}$

(b) V_{IN}



(c) V_{OUT}

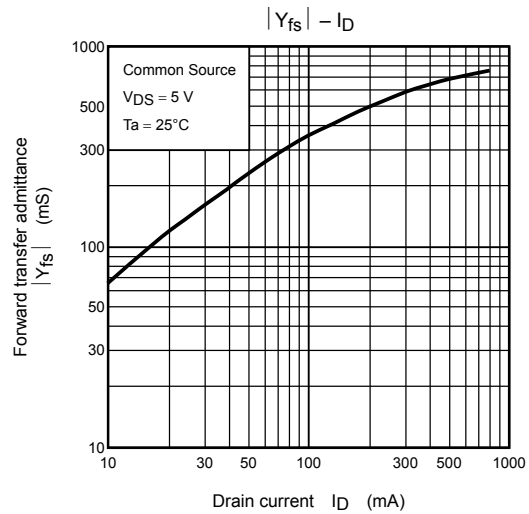
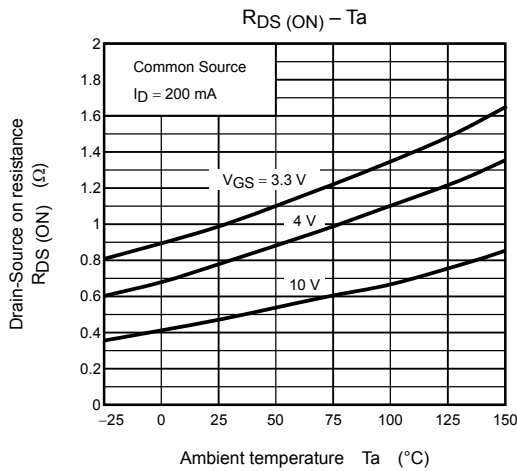
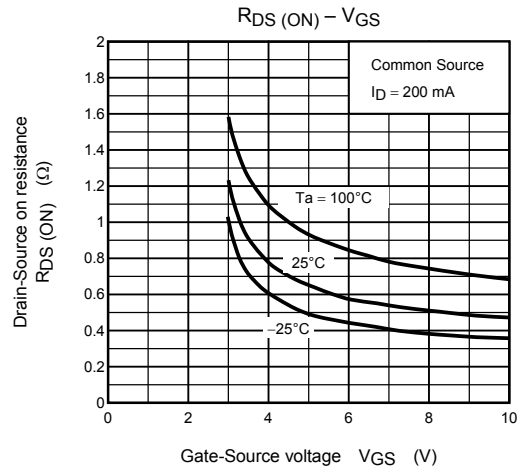
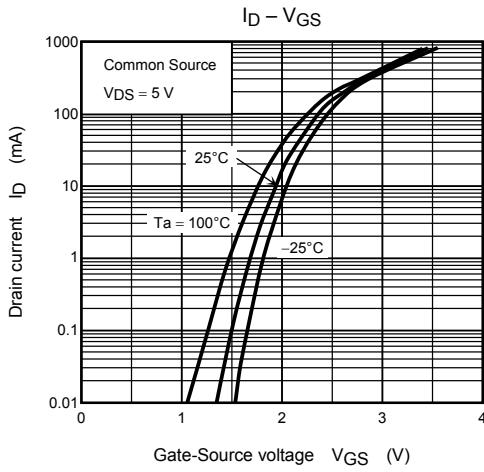
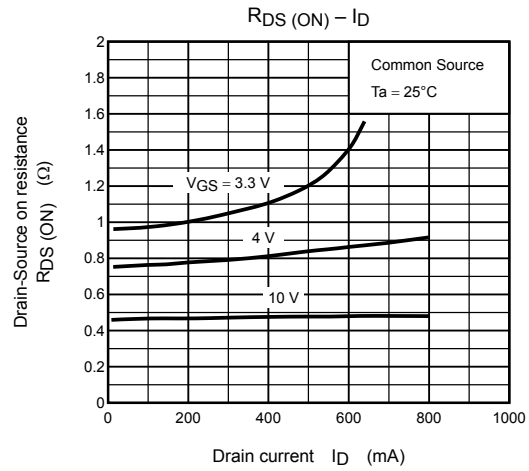
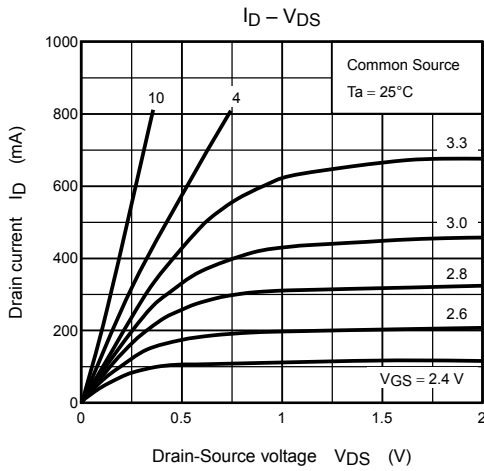


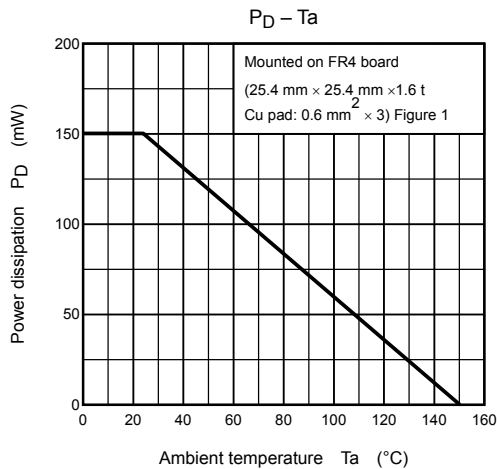
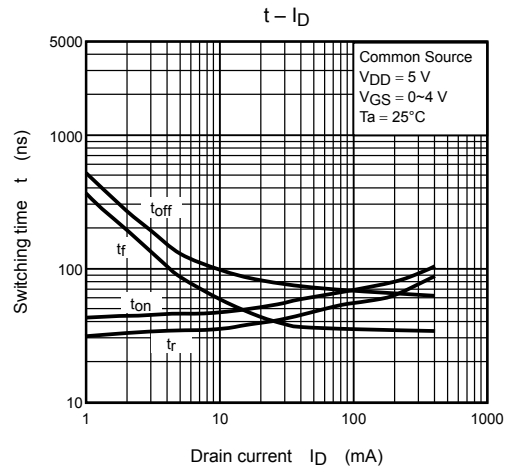
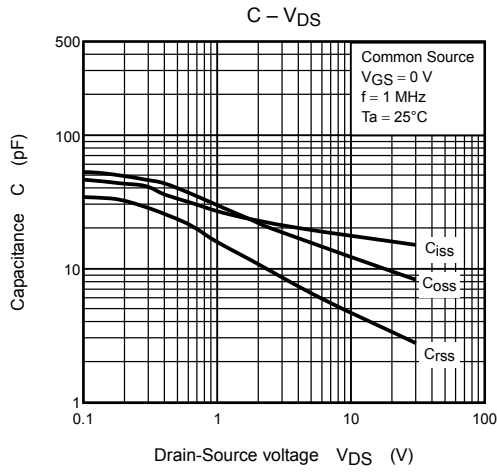
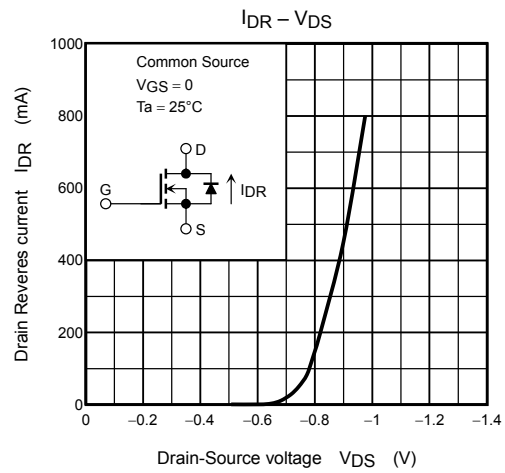
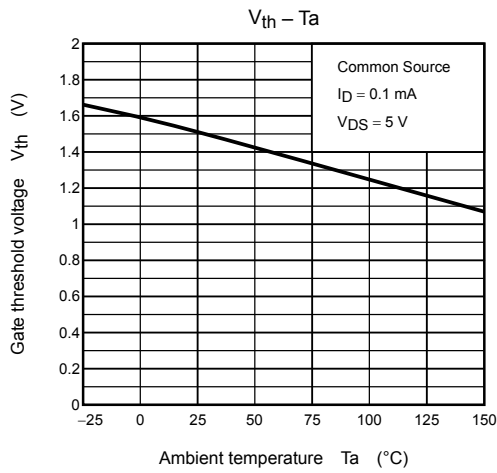
Precaution

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.





RESTRICTIONS ON PRODUCT USE

20070701-EN GENERAL

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- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
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