

TOSHIBA Field-Effect Transistor Silicon P-Channel MOS Type

SSM3J35CT

- High-Speed Switching Applications
- Analog Switch Applications

- 1.2-V drive
- Low ON-resistance : $R_{on} = 44 \Omega$ (max) (@ $V_{GS} = -1.2$ V)
 : $R_{on} = 22 \Omega$ (max) (@ $V_{GS} = -1.5$ V)
 : $R_{on} = 11 \Omega$ (max) (@ $V_{GS} = -2.5$ V)
 : $R_{on} = 8 \Omega$ (max) (@ $V_{GS} = -4.0$ V)

Absolute Maximum Ratings (Ta = 25°C)

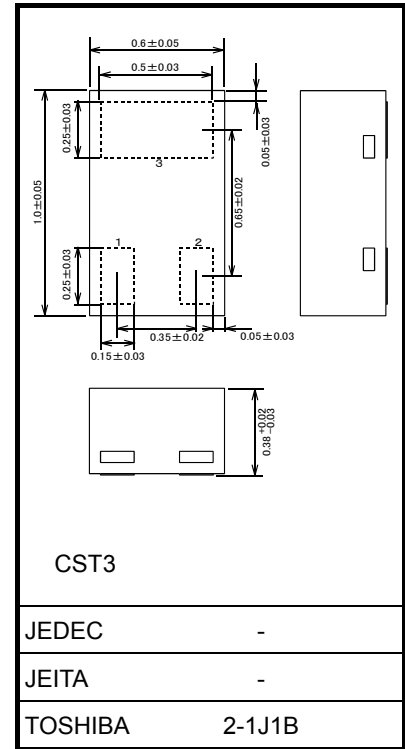
Characteristic	Symbol	Rating	Unit
Drain-source voltage	V_{DSS}	-20	V
Gate-source voltage	V_{GSS}	± 10	V
Drain current	DC	I_D	-100
	Pulse	I_{DP}	-200
Drain power dissipation	P_D (Note 1)	100	mW
Channel temperature	T_{ch}	150	°C
Storage temperature	T_{stg}	-55 to 150	°C

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).

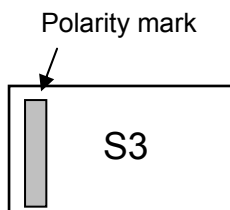
Note 1: Mounted on an FR4 board
 (10 mm × 10 mm × 1.0 mm, Cu Pad: 100 mm²)

Unit: mm

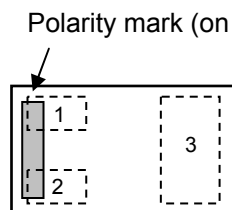


Weight: 0.75 mg (typ.)

Marking (top view)

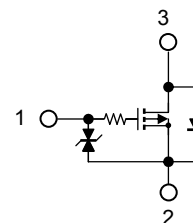


Pin Assignment (top view)



1. Gate
 2. Source
 3. Drain
- *Electrodes: on the bottom

Equivalent Circuit (top view)



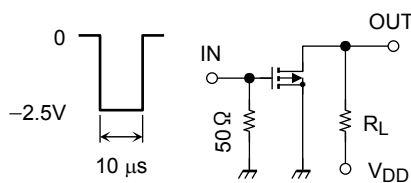
Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit	
Gate leakage current	I_{GSS}	$V_{GS} = \pm 10 \text{ V}, V_{DS} = 0 \text{ V}$	—	—	± 10	μA	
Drain-source breakdown voltage	$V_{(BR)DSS}$	$I_D = -0.1 \text{ mA}, V_{GS} = 0 \text{ V}$	-20	—	—	V	
Drain cutoff current	I_{DSS}	$V_{DS} = -20 \text{ V}, V_{GS} = 0 \text{ V}$	—	—	-1	μA	
Gate threshold voltage	V_{th}	$V_{DS} = -3 \text{ V}, I_D = -1 \text{ mA}$	-0.4	—	-1.0	V	
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = -3 \text{ V}, I_D = -50 \text{ mA}$ (Note 2)	77	—	—	mS	
Drain-source ON-resistance	$R_{DS(ON)}$	$I_D = -50 \text{ mA}, V_{GS} = -4 \text{ V}$ (Note 2)	—	4.3	8	Ω	
		$I_D = -50 \text{ mA}, V_{GS} = -2.5 \text{ V}$ (Note 2)	—	5.6	11		
		$I_D = -5 \text{ mA}, V_{GS} = -1.5 \text{ V}$ (Note 2)	—	8.2	22		
		$I_D = -2 \text{ mA}, V_{GS} = -1.2 \text{ V}$ (Note 2)	—	11	44		
Input capacitance	C_{iss}	$V_{DS} = -3 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	—	12.2	—	pF	
Reverse transfer capacitance	C_{rss}		—	6.5	—		
Output capacitance	C_{oss}		—	10.4	—		
Switching time	Turn-on time	t_{on}	$V_{DD} = -3 \text{ V}, I_D = -50 \text{ mA}, V_{GS} = 0 \text{ to } -2.5 \text{ V}$	—	175	—	ns
	Turn-off time	t_{off}		—	251	—	
Drain-source forward voltage	V_{DSF}	$I_D = 100 \text{ mA}, V_{GS} = 0 \text{ V}$ (Note 2)	—	0.83	1.2	V	

Note 2: Pulse test

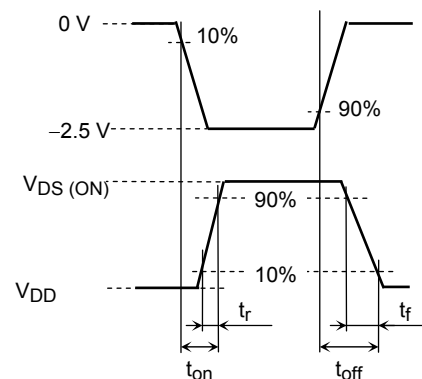
Switching Time Test Circuit

(a) Test Circuit



$V_{DD} = -3 \text{ V}$
 D.U. $\leq 1\%$
 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}

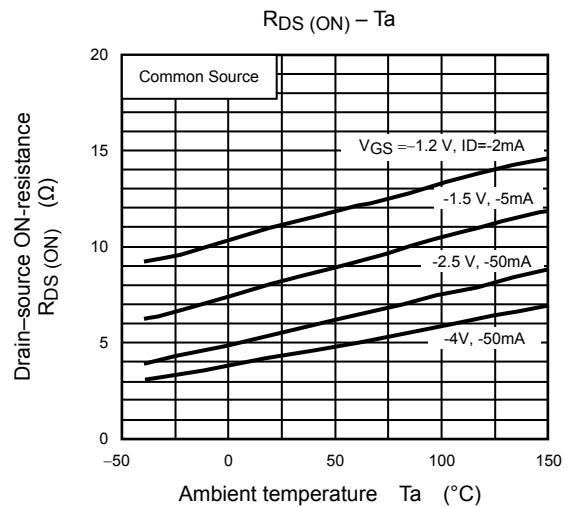
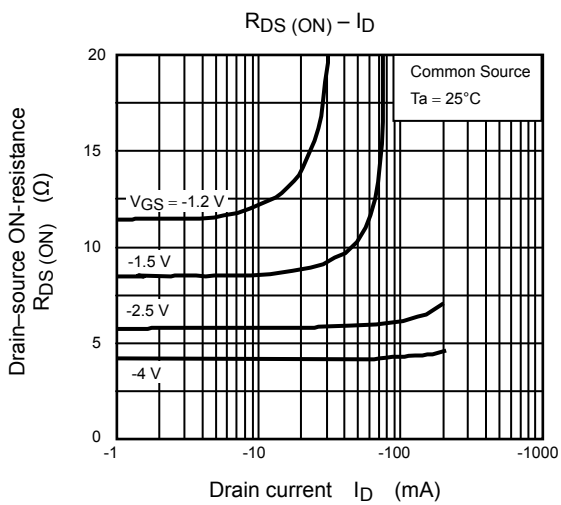
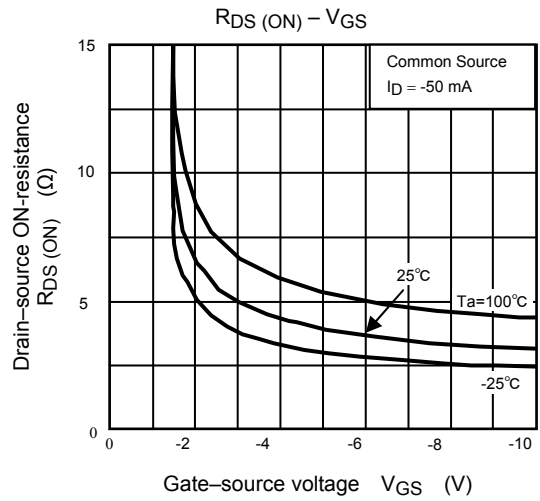
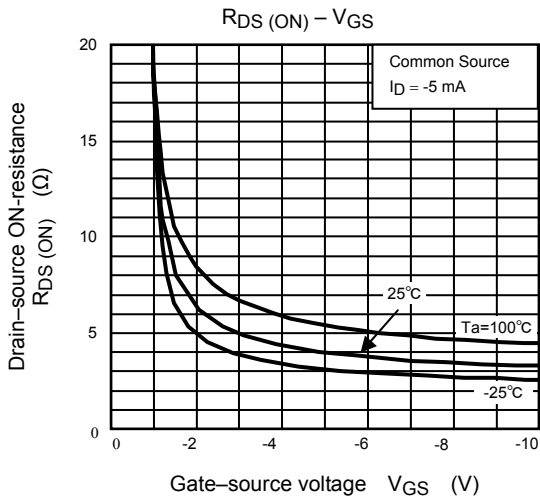
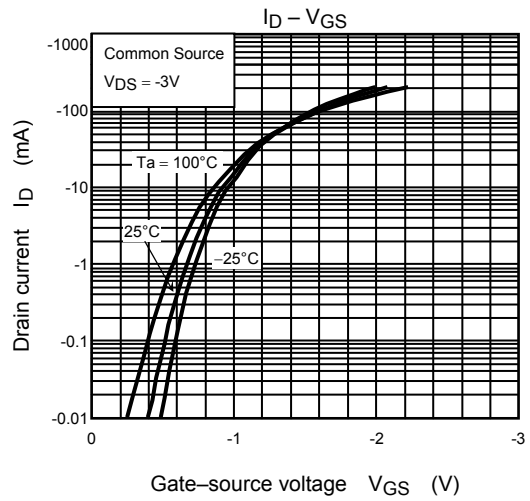
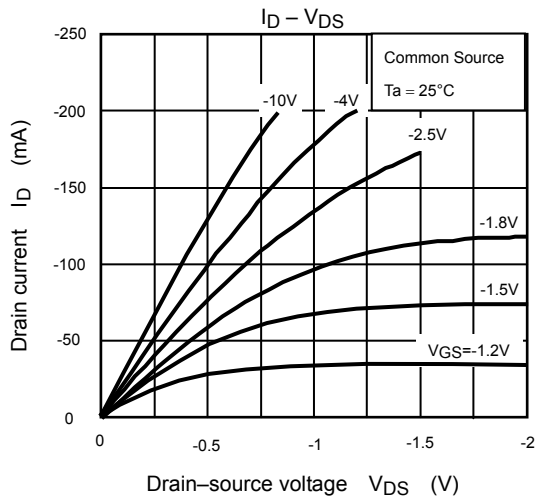
Usage Considerations

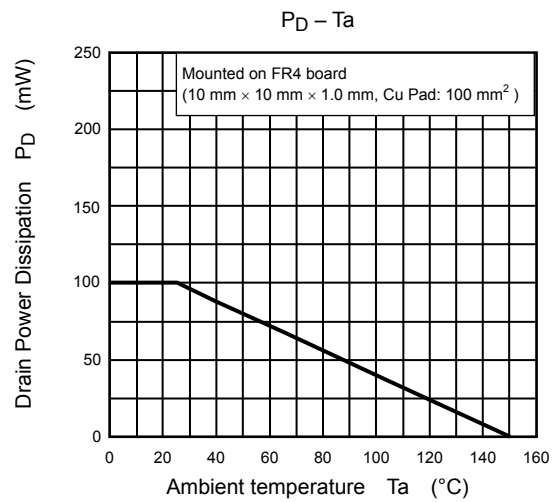
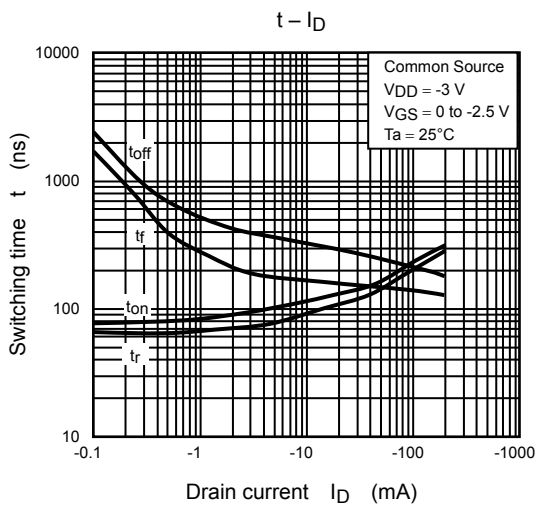
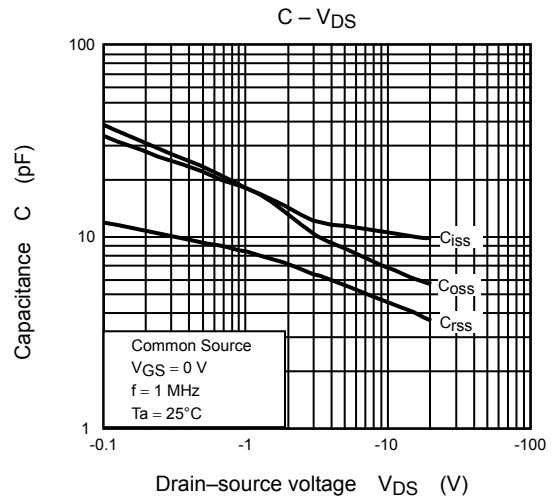
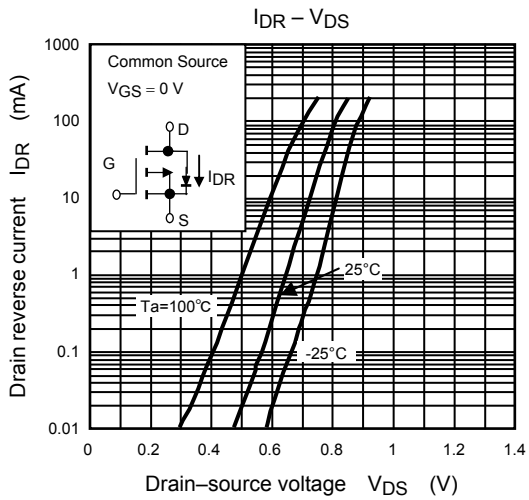
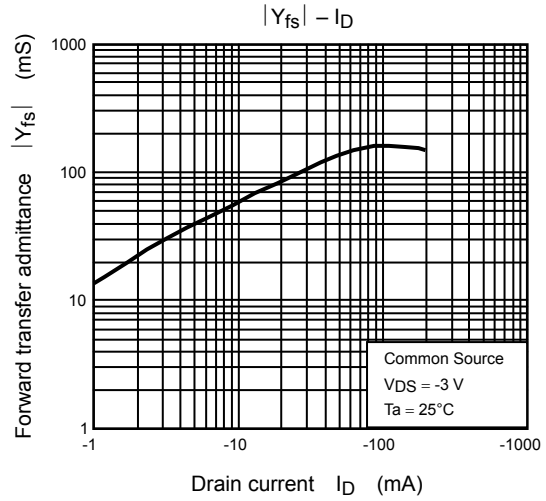
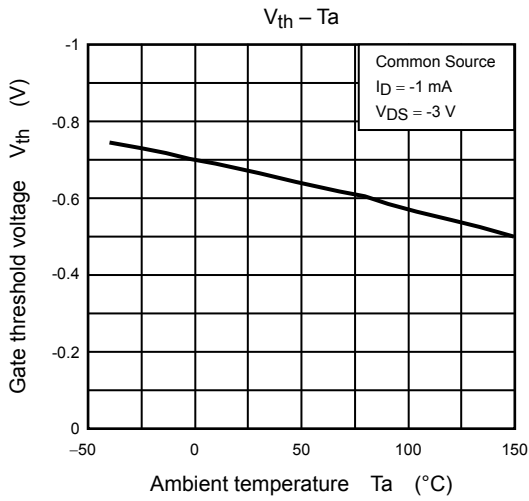
Let V_{th} be the voltage applied between gate and source that causes the drain current (I_D) to be below (-1 mA for the SSM3J35CT). Then, for normal switching operation, $V_{GS(on)}$ must be higher than V_{th} , and $V_{GS(off)}$ must be lower than V_{th} . This relationship can be expressed as: $V_{GS(off)} < V_{th} < V_{GS(on)}$.

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.





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.
In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc.
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