

TOSHIBA Field-Effect Transistor Silicon N-Channel MOS Type

# SSM3K35CT

- High-Speed Switching Applications
- Analog Switch Applications

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

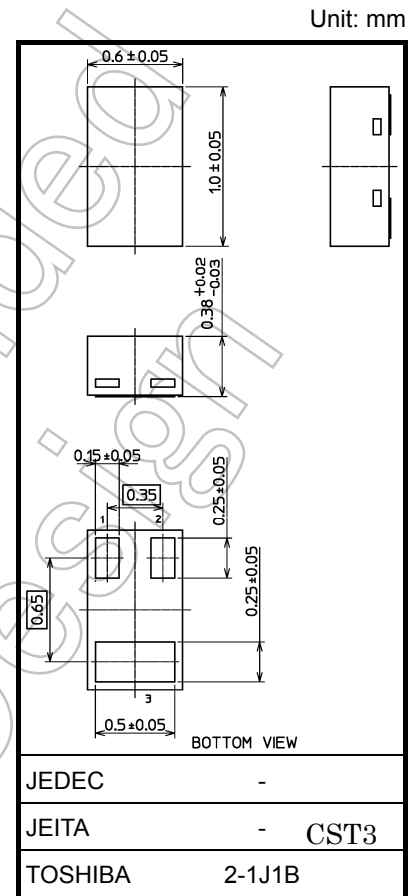
### Absolute Maximum Ratings ( $T_a = 25^\circ C$ )

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		$P_D$ (Note 1)	100	mW
Channel temperature		$T_{ch}$	150	$^\circ C$
Storage temperature		$T_{stg}$	-55 to 150	$^\circ C$

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.

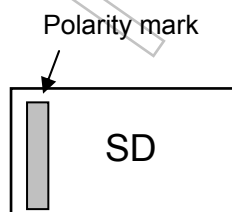
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 1: Mounted on an FR4 board  
 (10 mm  $\times$  10 mm  $\times$  1.0 mm, Cu Pad: 100 mm<sup>2</sup>)

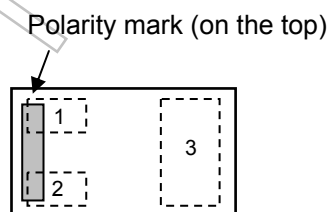


Weight: 0.75 mg (typ.)

### Marking (top view)

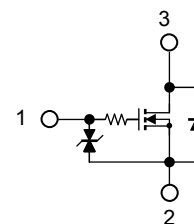


### Pin Condition (top view)



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

### Equivalent Circuit (top view)



Start of commercial production  
 2008-02

## Electrical Characteristics (Ta = 25°C)

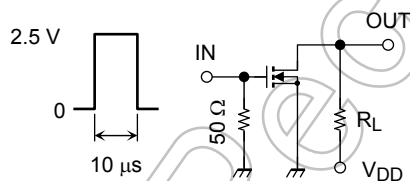
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 10\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 0.1\text{ mA}, V_{GS} = 0\text{ V}$	20	—	—	V
Drain cutoff current		$I_{DSS}$	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$	—	—	1	$\mu\text{A}$
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)	115	—	—	mS
Drain-source ON-resistance		$R_{DS(ON)}$	$I_D = 50\text{ mA}, V_{GS} = 4\text{ V}$ (Note 2)	—	1.5	3	$\Omega$
			$I_D = 50\text{ mA}, V_{GS} = 2.5\text{ V}$ (Note 2)	—	2	4	
			$I_D = 5\text{ mA}, V_{GS} = 1.5\text{ V}$ (Note 2)	—	3	8	
			$I_D = 5\text{ mA}, V_{GS} = 1.2\text{ V}$ (Note 2)	—	5	20	
Input capacitance		$C_{iss}$	$V_{DS} = 3\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	9.5	—	pF
Reverse transfer capacitance		$C_{rss}$		—	4.1	—	
Output capacitance		$C_{oss}$		—	9.5	—	
Switching time	Turn-on time	$t_{on}$	$V_{DD} = 3\text{ V}, I_D = 50\text{ mA}, V_{GS} = 0\text{ to }2.5\text{ V}$	—	115	—	ns
	Turn-off time	$t_{off}$		—	300	—	
Drain-source forward voltage		$V_{DSF}$	$I_D = -180\text{ mA}, V_{GS} = 0\text{ V}$ (Note 2)	—	-0.9	-1.2	V

Note 2: Pulse test

## Switching Time Test Circuit

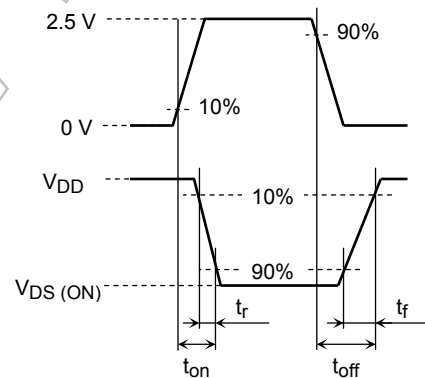
(a) Test Circuit

(b)  $V_{IN}$



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

(c)  $V_{OUT}$



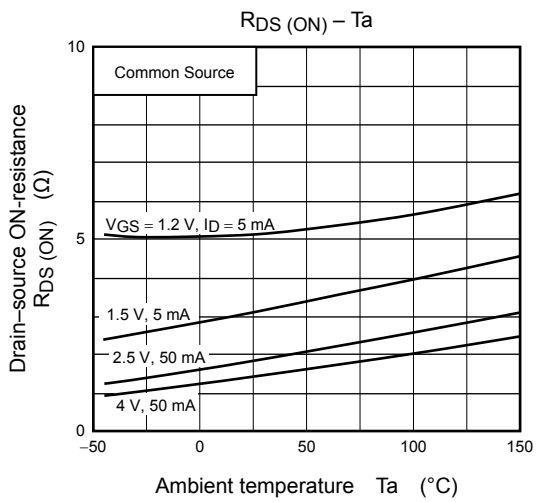
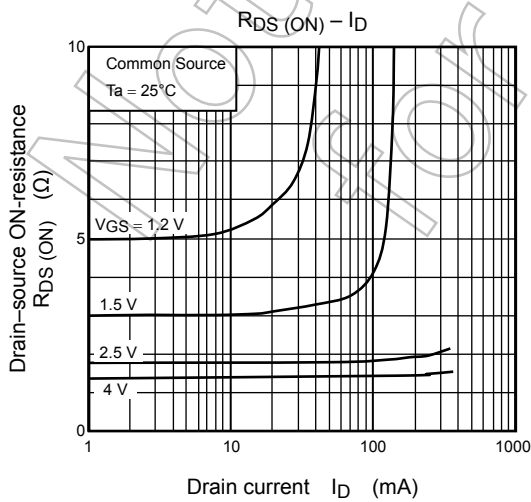
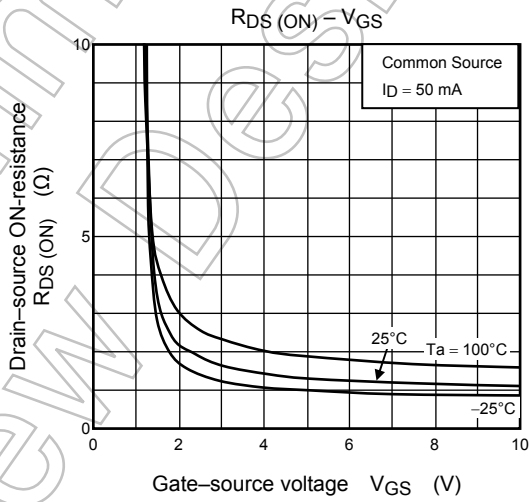
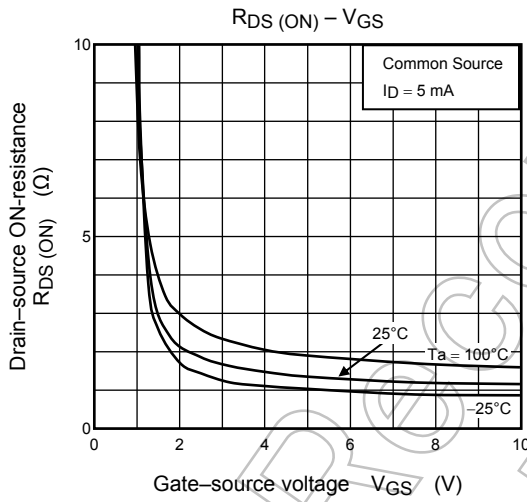
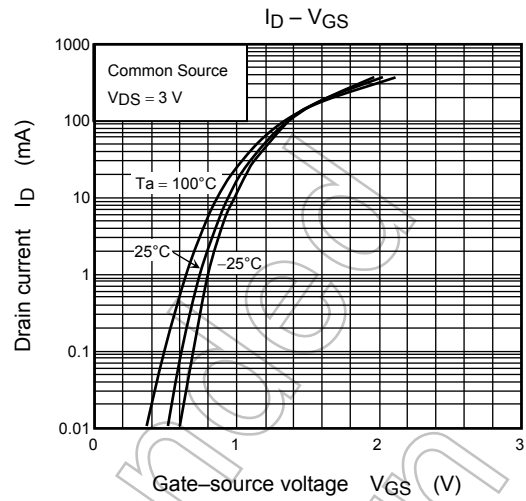
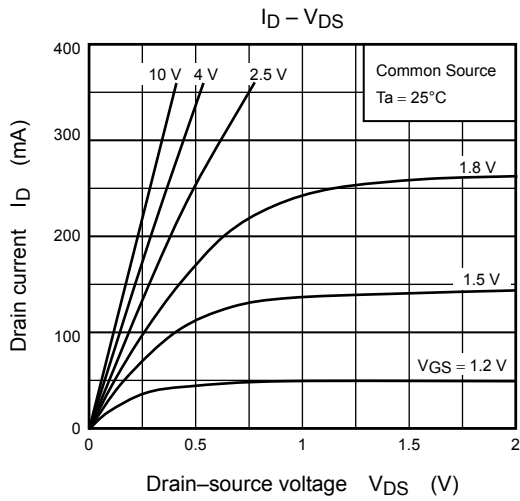
## Usage Considerations

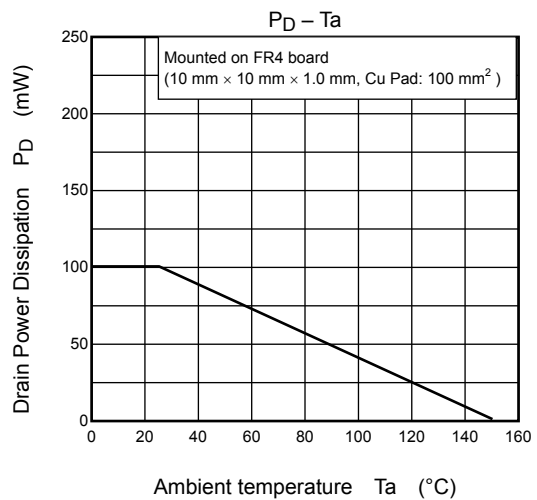
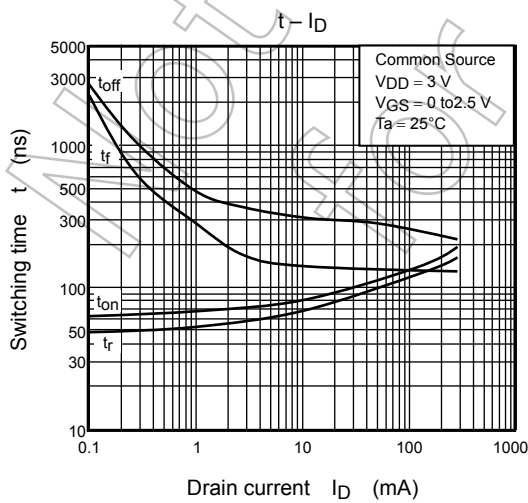
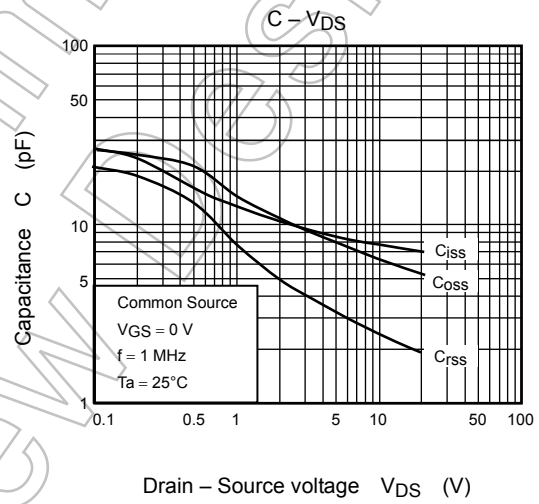
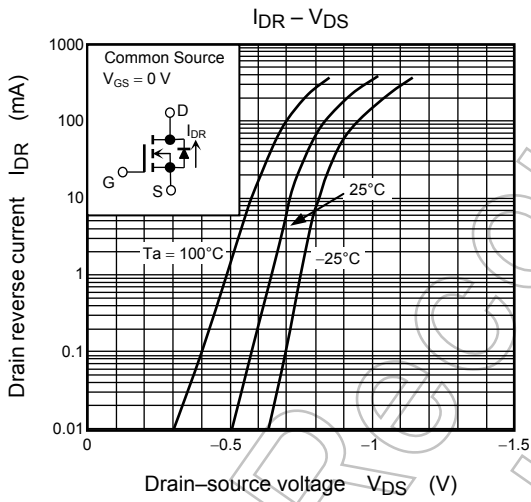
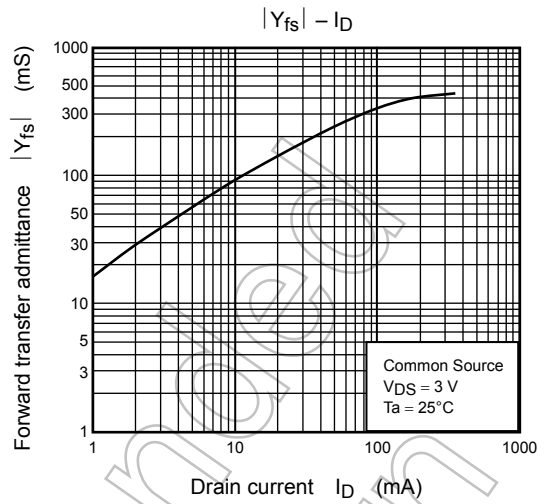
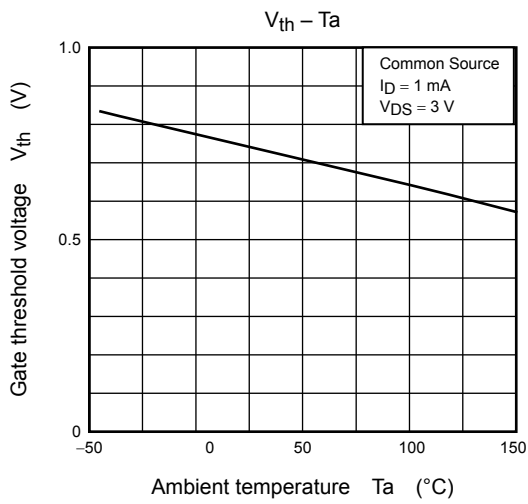
Let  $V_{th}$  be the voltage applied between gate and source that causes the drain current ( $I_D$ ) to below (1 mA for the SSM3K35CT). Then, for normal switching operation,  $V_{GS(on)}$  must be higher than  $V_{th}$ , and  $V_{GS(off)}$  must be lower than  $V_{th}$ . This relationship can be expressed 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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