

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

# TC7MB3251FK

## 1-of-8 FET Multiplexer/Demultiplexer

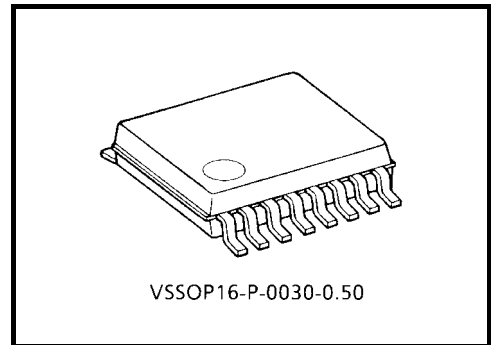
The TC7MB3251FK is high-speed CMOS 1-8 multiplexer/demultiplexer. The low on resistance of the switch allows connections to be made with minimal propagation delay time.

This device is 1 to 8 multiplexer/demultiplexer controlled by the combination of select inputs (S0, S1, S2) and output enable ( $\overline{OE}$ ). The A inputs is connected to the corresponded B1~B8 outputs determined by the combination both the select inputs (S0, S1, S2) and output enable ( $\overline{OE}$ ). When the output enable ( $\overline{OE}$ ) input is held "H" level, the switches are open with regardless the state of select inputs and a high-impedance state exists between the switches.

All inputs are equipped with protection circuits against static discharge.

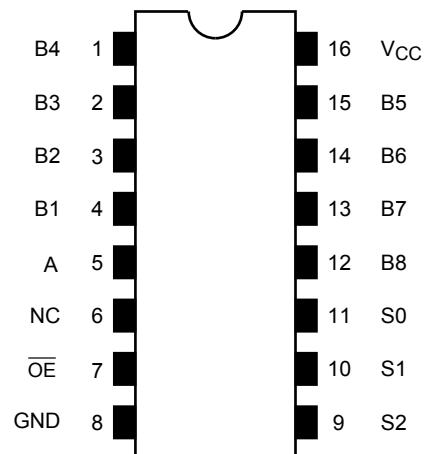
### Features

- Operating voltage:  $V_{CC} = 4.5\sim 5.5\text{ V}$
- High speed:  $t_{pd} = 0.25\text{ ns (max)}$
- Low on resistance:  $R_{ON} = 5\ \Omega\text{ (typ.)}$
- ESD performance: Machine model  $\geq \pm 200\text{ V}$   
Human body model  $\geq \pm 2000\text{ V}$
- Compatible with TTL outputs (control inputs)
- Package: VSSOP (US16)
- Pin compatible with the 74xx251 type.  
Functionally equivalent to (FST/CBT) 3251.



Weight: 0.02 g (typ.)

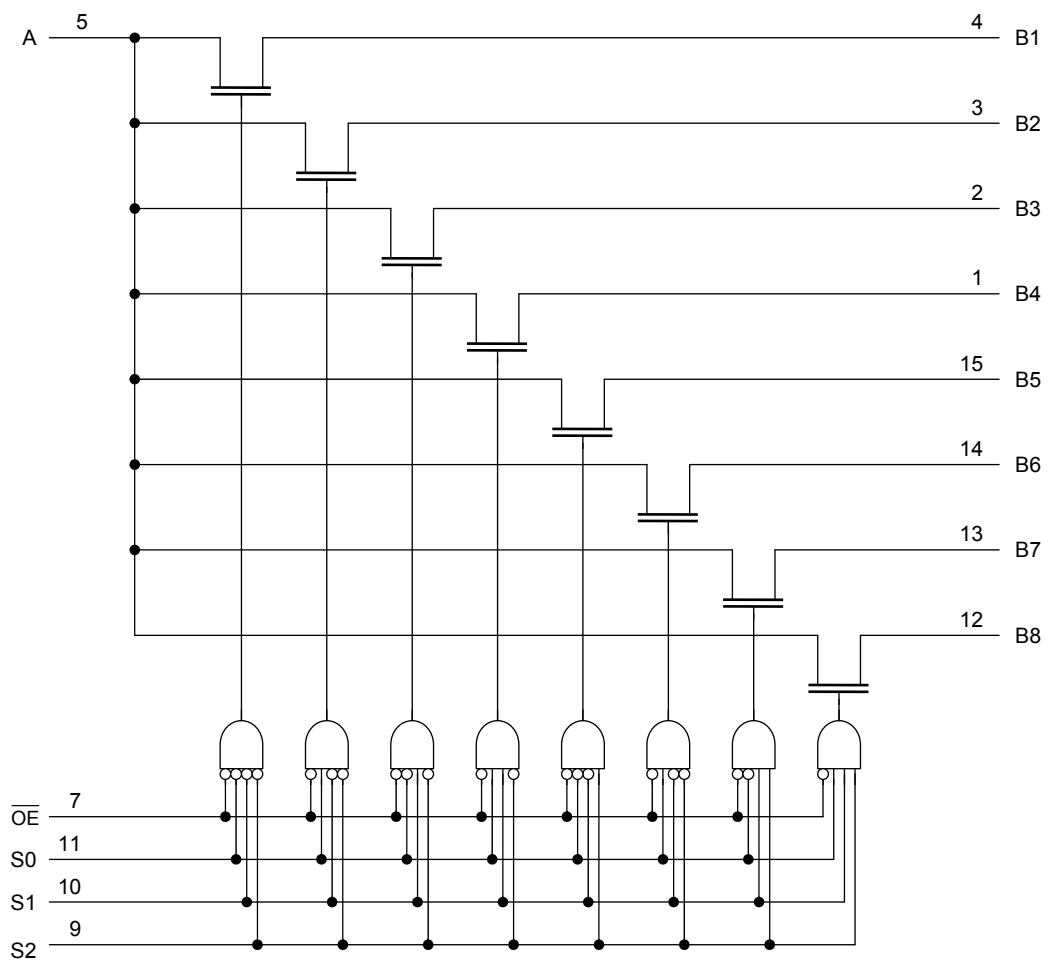
### Pin Assignment (top view)



## Truth Table

Inputs				Function
$\overline{OE}$	S2	S1	S0	
L	L	L	L	A port = B1 port
L	L	L	H	A port = B2 port
L	L	H	L	A port = B3 port
L	L	H	H	A port = B4 port
L	H	L	L	A port = B5 port
L	H	L	H	A port = B6 port
L	H	H	L	A port = B7 port
L	H	H	H	A port = B8 port
H	X	X	X	Disconnect

## System Diagram



**Absolute Maximum Ratings (Note)**

Characteristics	Symbol	Rating	Unit
Power supply range	$V_{CC}$	-0.5~7.0	V
DC input voltage	$V_{IN}$	-0.5~7.0	V
DC switch voltage	$V_S$	-0.5~7.0	V
Input diode current	$I_{IK}$	-50	mA
Continuous channel current	$I_S$	128	mA
Power dissipation	$P_D$	180	mW
DC $V_{CC}/GND$ current	$I_{CC}/I_{GND}$	$\pm 100$	mA
Storage temperature	$T_{stg}$	-65~150	$^{\circ}C$

Note: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

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 and the operating ranges.

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).

**Operating Ranges (Note)**

Characteristics	Symbol	Rating	Unit
Supply voltage	$V_{CC}$	4.5~5.5	V
Input voltage ( $\overline{OE}$ , S)	$V_{IN}$	0~5.5	V
Switch voltage	$V_S$	0~5.5	V
Operating temperature	$T_{opr}$	-40~85	$^{\circ}C$
Input rise and fall time	dt/dv	0~10	ns/V

Note: The operating ranges must be maintained to ensure the normal operation of the device.  
Unused inputs must be tied to either VCC or GND.

## Electrical Characteristics

### DC Characteristics (Ta = -40~85°C)

Characteristics		Symbol	Test Condition	V <sub>CC</sub> (V)	Min	Typ. (Note 1)	Max	Unit
Input voltage	"H" level	V <sub>IH</sub>	—	4.5~5.5	2.0	—	—	V
	"L" level	V <sub>IL</sub>	—	4.5~5.5	—	—	0.8	
Input leakage current ( $\overline{OE}$ , S)		I <sub>IN</sub>	V <sub>IN</sub> = 0~5.5 V	4.5~5.5	—	—	±1.0	μA
Power off leakage current		I <sub>OFF</sub>	A, B, $\overline{OE}$ = 0~5.5 V	0	—	—	±1.0	μA
Off-state leakage current (switch off)		I <sub>SZ</sub>	A, B = 0~5.5 V, $\overline{OE}$ = V <sub>CC</sub>	4.5~5.5	—	—	±1.0	μA
ON resistance (Note 2)	R <sub>ON</sub>	V <sub>IS</sub> = 0 V	I <sub>IS</sub> = 64 mA	4.5	—	5	7	Ω
			I <sub>IS</sub> = 30 mA	4.5	—	5	7	
		V <sub>IS</sub> = 2.4 V, I <sub>IS</sub> = 15 mA		4.5	—	10	15	
Increase in I <sub>CC</sub> per input		I <sub>CC</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND, I <sub>OUT</sub> = 0	5.5	—	—	10	μA
		ΔI <sub>CC</sub>	V <sub>IN</sub> = 3.4 V (one input)	5.5	—	—	2.5	mA

Note 1: Typical values are at V<sub>CC</sub> = 5 V, Ta = 25°C.

Note 2: Measured by the voltage drop between A and B pins at the indicated current through the switch. ON resistance is determined by the lower of the voltages on the two (A or B) pins.

### AC Characteristics (Ta = -40~85°C)

Characteristics		Symbol	Test Condition	V <sub>CC</sub> (V)	Min	Max	Unit
Propagation delay time (bus to bus)		t <sub>pLH</sub> t <sub>pHL</sub>	Figure 1, Figure 2 (Note)	4.5	—	0.25	ns
Propagation delay time (S to bus)		t <sub>pLH</sub> t <sub>pHL</sub>	Figure 1, Figure 2	4.5	—	6.0	ns
Output enable time ( $\overline{OE}$ to bus)		t <sub>pZL</sub> t <sub>pZH</sub>	Figure 1, Figure 3	4.5	—	5.6	ns
Output enable time (S to bus)		t <sub>pZL</sub> t <sub>pZH</sub>	Figure 1, Figure 3	4.5	—	5.6	ns
Output disable time ( $\overline{OE}$ to bus)		t <sub>pLZ</sub> t <sub>pHZ</sub>	Figure 1, Figure 3	4.5	—	6.4	ns
Output disable time (S to bus)		t <sub>pLZ</sub> t <sub>pHZ</sub>	Figure 1, Figure 3	4.5	—	6.4	ns

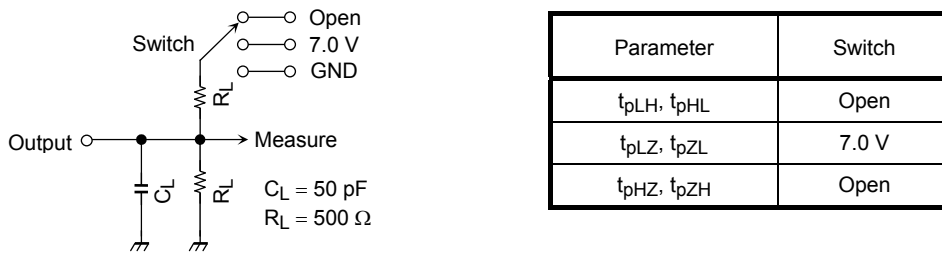
Note: This parameter is guaranteed by design but is not tested. The bus switch contributes no propagation delay other than the RC delay of the typical on resistance of the switch and the 50 pF load capacitance, when driven by an ideal voltage the source (zero output impedance).

### Capacitive Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	V <sub>CC</sub> (V)	Typ.	Unit	
Control pin input capacitance ( $\overline{OE}$ , S)		C <sub>IN</sub>	(Note)	5.0	3	pF	
Switch terminal capacitance (B1~8)		C <sub>I/O</sub>	$\overline{OE}$ = V <sub>CC</sub>	(Note)	5.0	10	pF
Switch terminal capacitance (A)		C <sub>I/O</sub>	$\overline{OE}$ = V <sub>CC</sub>	(Note)	5.0	59	pF

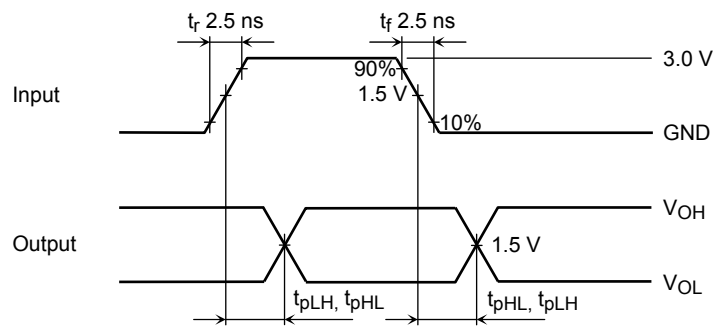
Note: This parameter is guaranteed by design.

**AC Test Circuit**

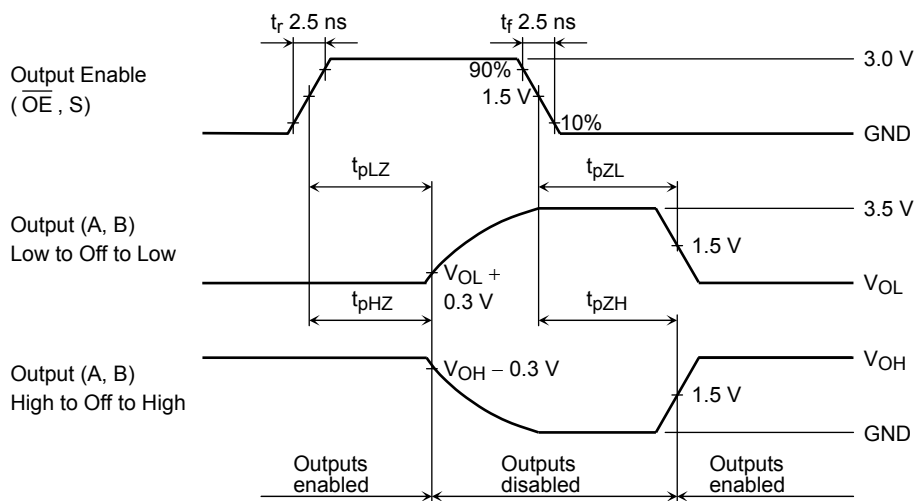


**Figure 1**

**AC Waveform**



**Figure 2  $t_{pLH}, t_{pHL}$**

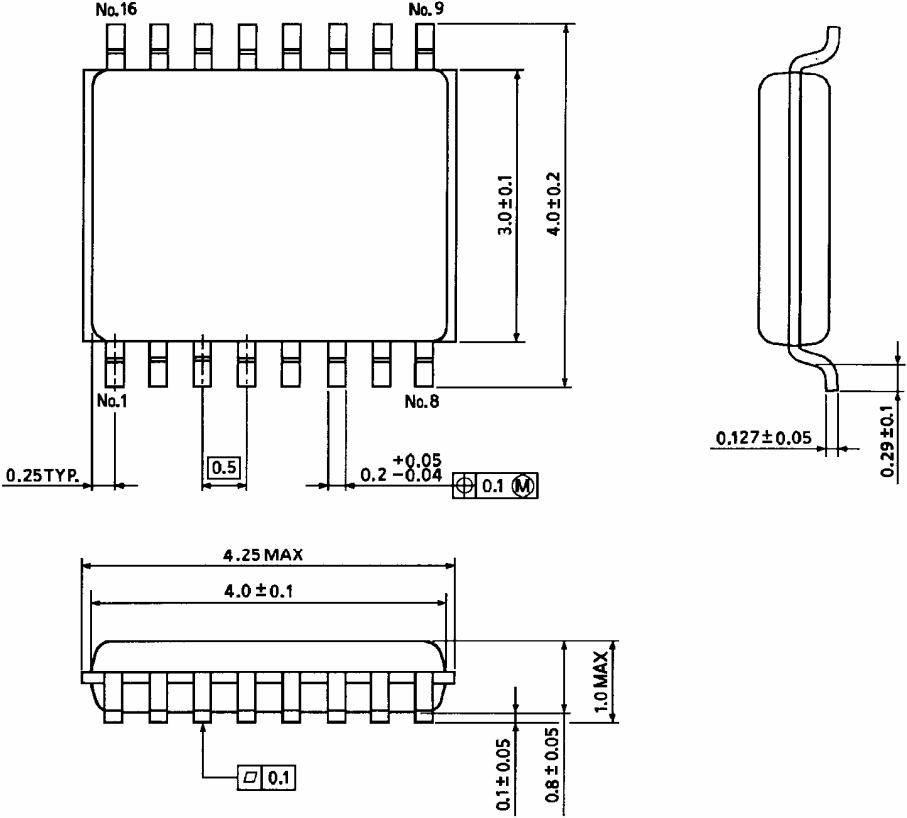


**Figure 3  $t_{pLZ}, t_{pHZ}, t_{pZL}, t_{pZH}$**

Package Dimensions

VSSOP16-P-0030-0.50

Unit : mm



Weight: 0.02 g (typ.)

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20070701-EN GENERAL

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