

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC7MB3251FK

1-of-8 FET Multiplexer/Demultiplexer

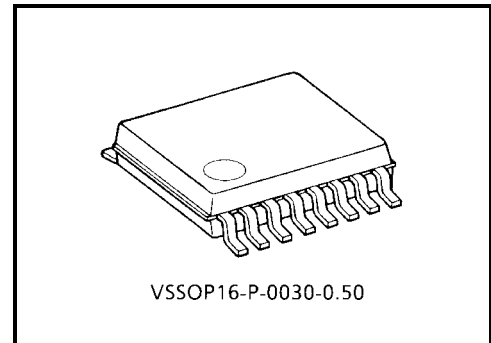
The TC7MB3251FK is high-speed CMOS 1-8 multiplexer/demultiplexer. The low on resistance of the switch allows connections to be made with minimal propagation delay time.

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.

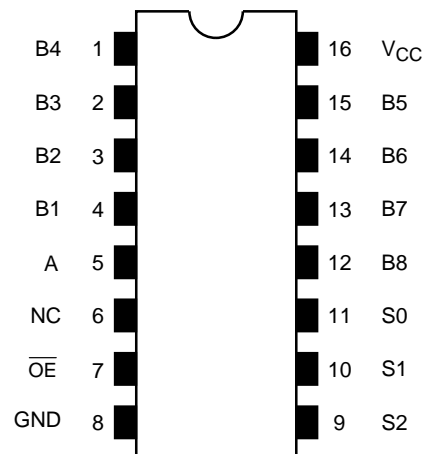
Features

- 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 $> \pm 200\text{ V}$
Human body model $> \pm 2000\text{ V}$
- 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.)

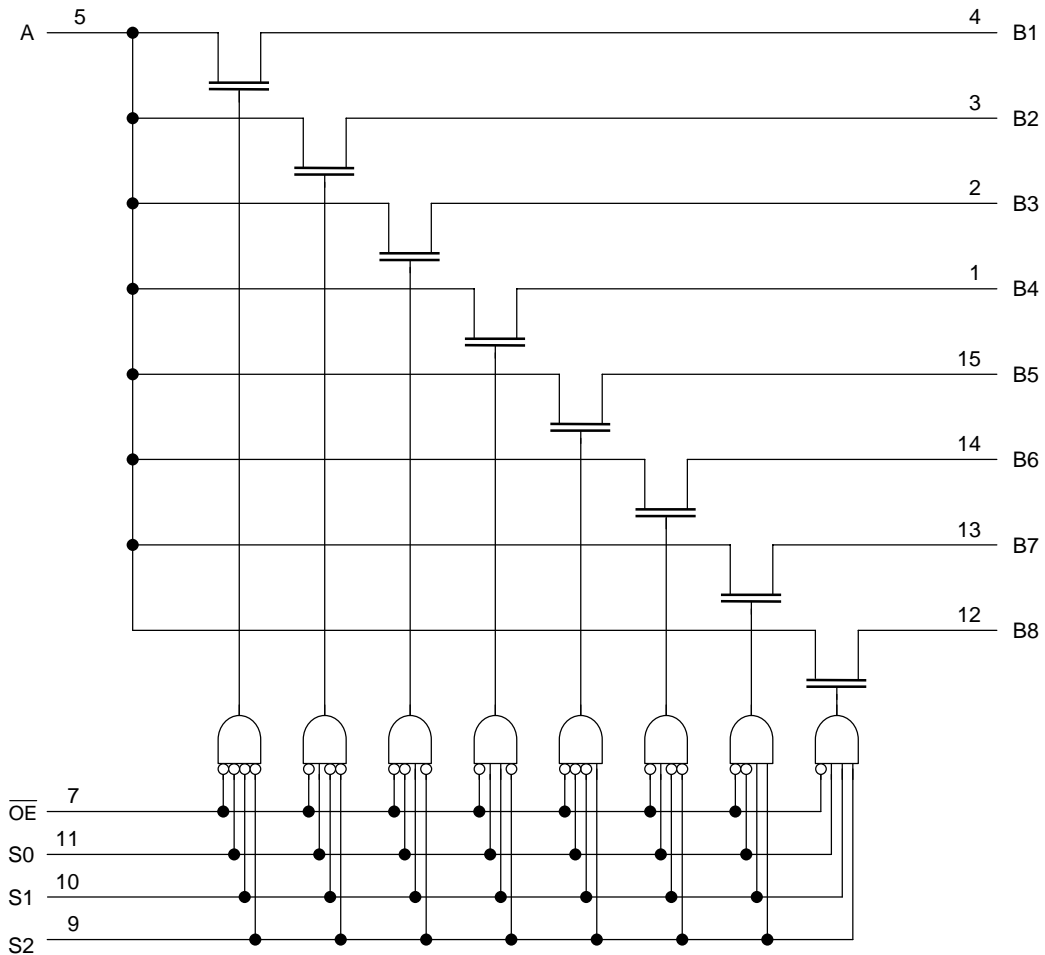
Pin Assignment (top view)



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



Maximum Ratings

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}	± 100	mA
Storage temperature	T_{stg}	-65~150	$^{\circ}C$

Recommended Operating Conditions

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

Electrical Characteristics

DC Characteristics ($T_a = -40\sim 85^{\circ}C$)

Characteristics	Symbol	Test Condition	V_{CC} (V)	Min	Typ. (Note1)	Max	Unit	
Input voltage	"H" level	V_{IH}	—	4.5~5.5	2.0	—	—	V
	"L" level	V_{IL}	—	4.5~5.5	—	—	0.8	
Input leakage current (\overline{OE} , S)	I_{IN}	$V_{IN} = 0\sim 5.5\text{ V}$	4.5~5.5	—	—	± 1.0	μA	
Power off leakage current	I_{OFF}	A, B, $\overline{OE} = 0\sim 5.5\text{ V}$	0	—	—	± 1.0	μA	
Off-state leakage current (switch off)	I_{SZ}	A, B = 0~5.5 V, $\overline{OE} = V_{CC}$	4.5~5.5	—	—	± 1.0	μA	
ON resistance (Note2)	R_{ON}	$V_{IS} = 0\text{ V}$	$I_{IS} = 64\text{ mA}$	4.5	—	5	7	Ω
			$I_{IS} = 30\text{ mA}$	4.5	—	5	7	
		$V_{IS} = 2.4\text{ V}, I_{IS} = 15\text{ mA}$	4.5	—	10	15		
Increase in I_{CC} per input	I_{CC}	$V_{IN} = V_{CC}$ or GND, $I_{OUT} = 0$	5.5	—	—	10	μA	
	ΔI_{CC}	$V_{IN} = 3.4\text{ V}$ (one input)	5.5	—	—	2.5	mA	

Note 1: Typical values are at $V_{CC} = 5\text{ V}$, $T_a = 25^{\circ}C$.

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 _{CC} (V)	Min	Max	Unit
Propagation delay time (bus to bus)	t _{pLH} t _{pHL}	Figure 1, Figure 2 (Note3)	4.5	—	0.25	ns
Propagation delay time (S to bus)	t _{pLH} t _{pHL}	Figure 1, Figure 2	4.5	—	6.0	ns
Output enable time (\overline{OE} to bus)	t _{pZL} t _{pZH}	Figure 1, Figure 3	4.5	—	5.6	ns
Output enable time (S to bus)	t _{pZL} t _{pZH}	Figure 1, Figure 3	4.5	—	5.6	ns
Output disable time (\overline{OE} to bus)	t _{pLZ} t _{pHZ}	Figure 1, Figure 3	4.5	—	6.4	ns
Output disable time (S to bus)	t _{pLZ} t _{pHZ}	Figure 1, Figure 3	4.5	—	6.4	ns

Note 3: 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 _{CC} (V)	Typ.	Unit
Control pin input capacitance (\overline{OE} , S)	C _{IN}	(Note4)	5.0	3	pF
Switch terminal capacitance (B1~8)	C _{I/O}	$\overline{OE} = V_{CC}$ (Note4)	5.0	10	pF
Switch terminal capacitance (A)	C _{I/O}	$\overline{OE} = V_{CC}$ (Note4)	5.0	59	pF

Note 4: This parameter is guaranteed by design.

AC Test Circuit

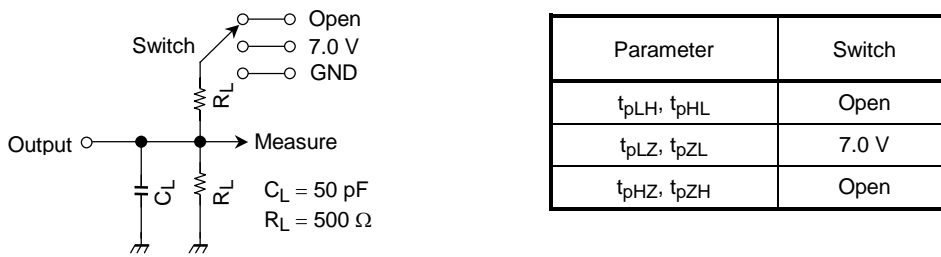


Figure 1

AC Waveform

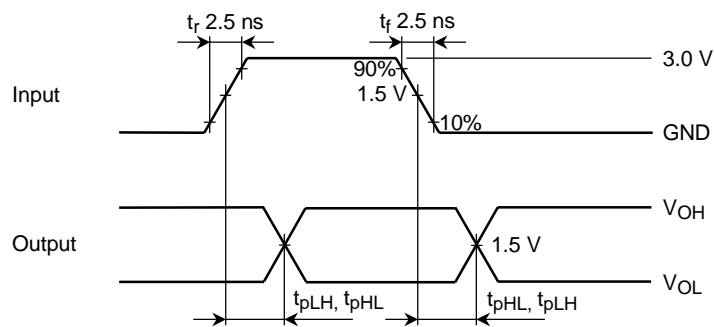


Figure 2 t_{pLH}, t_{pHL}

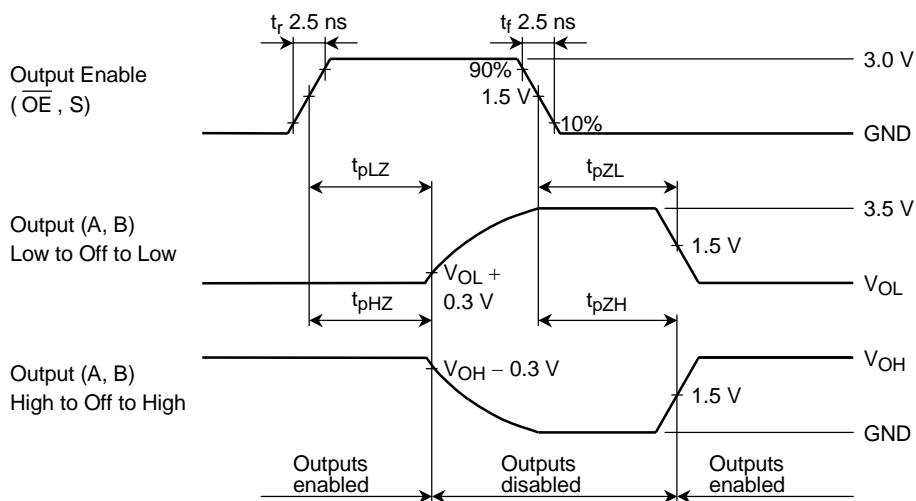
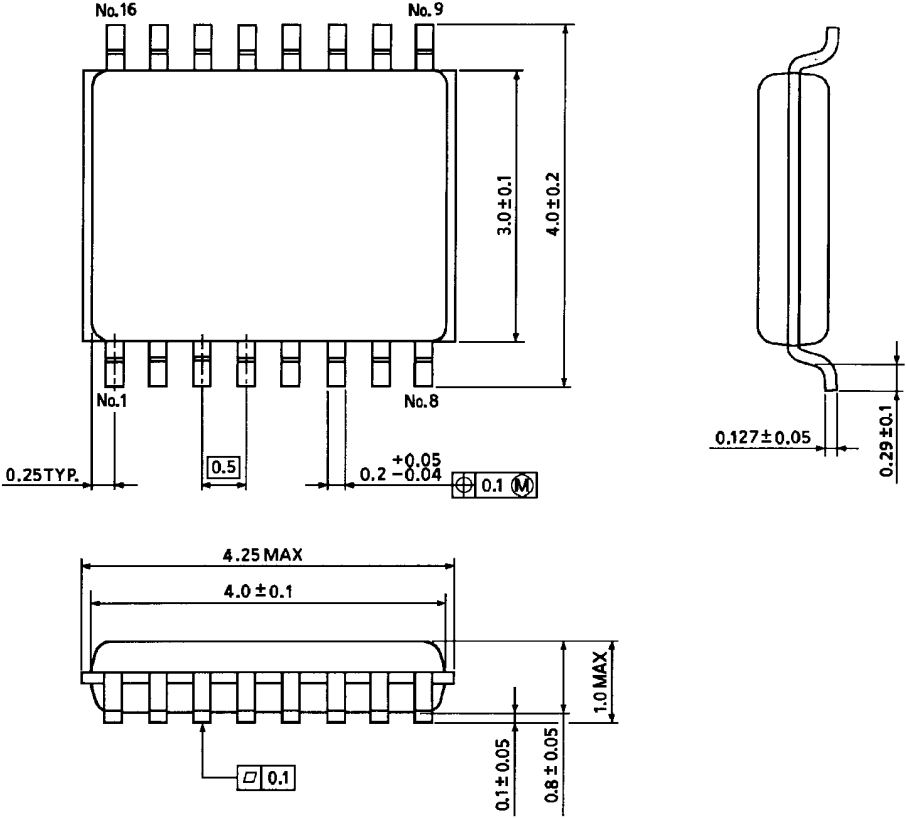


Figure 3 $t_{pLZ}, t_{pHZ}, t_{pZL}, t_{pZH}$

Package Dimensions

VSSOP16-P-0030-0.50

Unit : mm



Weight: 0.02 g (typ.)

RESTRICTIONS ON PRODUCT USE

000707EBA

- 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..
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.
- The products described in this document are subject to the foreign exchange and foreign trade laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.