

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

## TC7MB3257FT, TC7MB3257FK

### Quad 1-of-2 Multiplexer/Demultiplexer

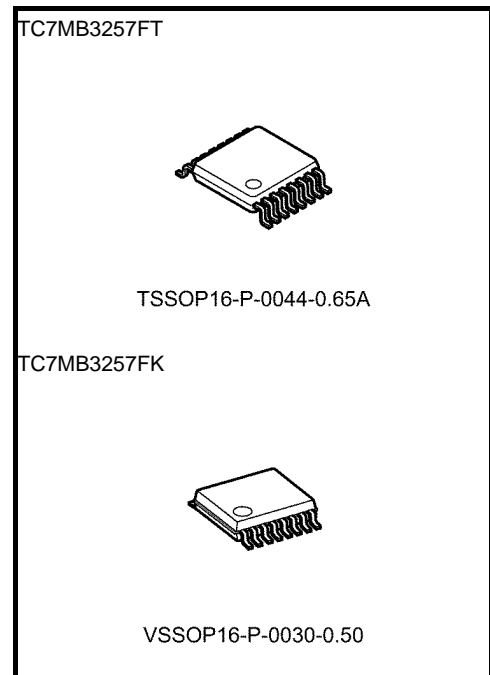
The TC7MB3257 is high-speed CMOS quad 1-2 multiplexer/demultiplexer. The low on resistance of the switch allows connections to be made with minimal propagation delay time.

This device consists of four individual two-inputs multiplexer/demultiplexer with common select input (S) and output enable ( $\overline{OE}$ ). The A inputs is connected to the B1 or B2 outputs determined by the combination both the select input (S) 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.

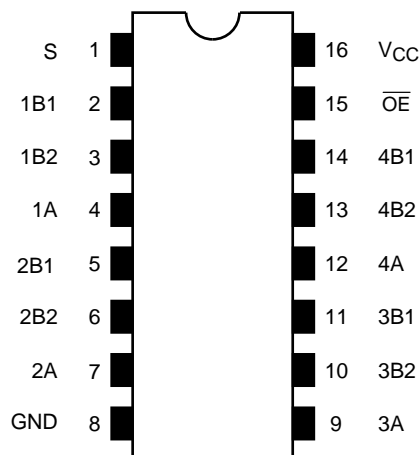
### Features

- Operating voltage:  $V_{CC} = 4.5$  to  $5.5$  V
- High speed:  $t_{pd} = 0.25$  ns (max)
- Low on resistance:  $R_{ON} = 5 \Omega$  (typ.)
- ESD performance: Machine model  $\geq \pm 200$  V  
Human body model  $\geq \pm 2000$  V
- Compatible with TTL outputs (control inputs)
- Package: TSSOP16, VSSOP16 (US16)
- Pin compatible with the 74xx257 type.  
Functionally equivalent to (FST/CBT) 3257.



Weight:  
 TSSOP16-P-0044-0.65A : 0.06 g (typ.)  
 VSSOP16-P-0030-0.50 : 0.02 g (typ.)

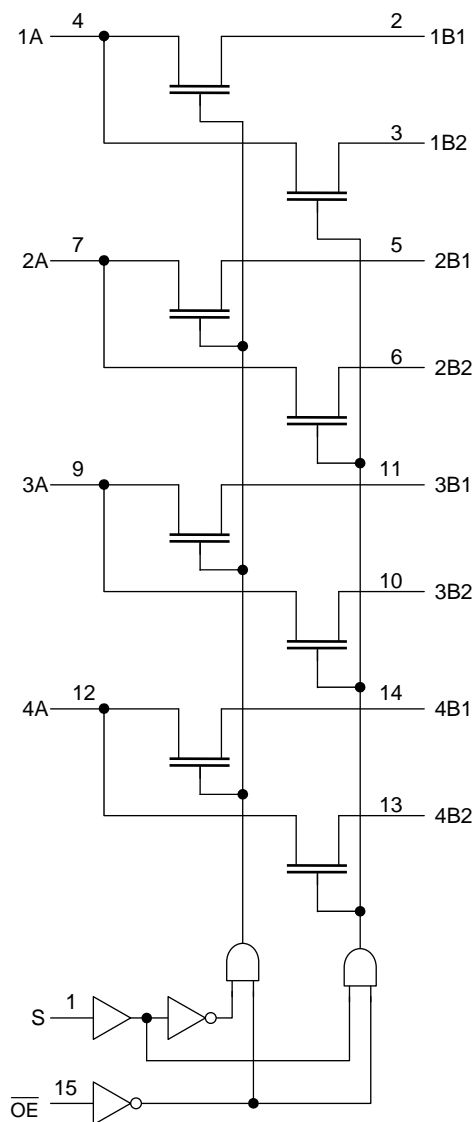
### Pin Assignment (top view)



## Truth Table

Inputs		Function
$\overline{OE}$	S	
L	L	A port = B1 port
L	H	A port = B2 port
H	X	Disconnect

## System Diagram



**Absolute Maximum Ratings (Note)**

Characteristics	Symbol	Rating	Unit
Power supply range	$V_{CC}$	-0.5 to 7.0	V
DC input voltage	$V_{IN}$	-0.5 to 7.0	V
DC switch voltage	$V_S$	-0.5 to 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 to 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 to 5.5	V
Input voltage	$V_{IN}$	0 to 5.5	V
Switch voltage	$V_S$	0 to 5.5	V
Operating temperature	$T_{opr}$	-40 to 85	$^{\circ}C$
Input rise and fall time	$dt/dv$	0 to 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  $V_{CC}$  or GND.

**Electrical Characteristics**

**DC Characteristics (Ta = -40 to 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 to 5.5	2.0	—	—	V
	"L" level	V <sub>IL</sub>	—		4.5 to 5.5	—	—	0.8	
Input leakage current ( $\overline{OE}$ , S)		I <sub>IN</sub>	V <sub>IN</sub> = 0 to 5.5 V		4.5 to 5.5	—	—	±1.0	μA
Power off leakage current		I <sub>OFF</sub>	A, B, $\overline{OE}$ = 0 to 5.5 V		0	—	—	±1.0	μA
Off-state leakage current (switch off)		I <sub>SZ</sub>	A, B = 0 to 5.5 V, $\overline{OE}$ = V <sub>CC</sub>		4.5 to 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		
Quiescent supply current		I <sub>CC</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND, I <sub>OUT</sub> = 0		5.5	—	—	10	μA
Increase in I <sub>CC</sub> per input		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 to 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
	t <sub>pHL</sub>							
Propagation delay time (S to bus)	t <sub>pLH</sub>	t <sub>pHL</sub>	Figure 1, Figure 2		4.5	—	5.0	ns
	t <sub>pHL</sub>							
Output enable time ( $\overline{OE}$ to bus)	t <sub>pZL</sub>	t <sub>pZH</sub>	Figure 1, Figure 3		4.5	—	5.5	ns
	t <sub>pZH</sub>							
Output enable time (S to bus)	t <sub>pZL</sub>	t <sub>pZH</sub>	Figure 1, Figure 3		4.5	—	5.5	ns
	t <sub>pZH</sub>							
Output disable time ( $\overline{OE}$ to bus)	t <sub>pLZ</sub>	t <sub>pHZ</sub>	Figure 1, Figure 3		4.5	—	5.0	ns
	t <sub>pHZ</sub>							
Output disable time (S to bus)	t <sub>pLZ</sub>	t <sub>pHZ</sub>	Figure 1, Figure 3		4.5	—	5.0	ns
	t <sub>pHZ</sub>							

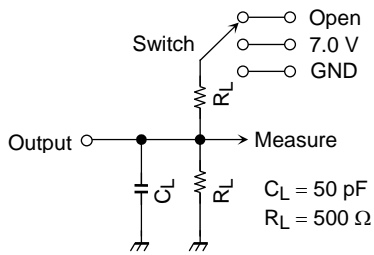
Note: This parameter is guaranteed by design but is not tested. The bus switch contributes no propagation delay other than the RC delay of the typical on resistance of the switch and the 50 pF load capacitance, when driven by an ideal voltage the source (zero output impedance).

**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,B2)		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	17	pF

Note: This parameter is guaranteed by design.

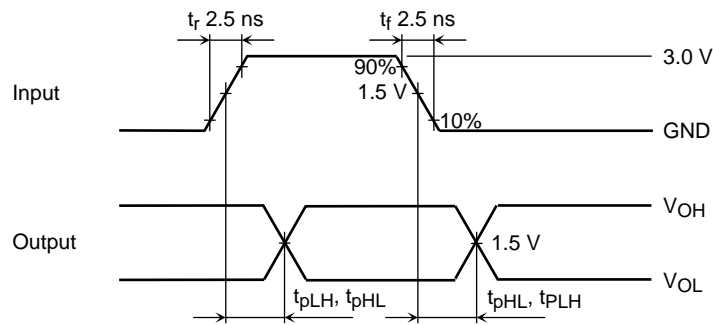
**AC Test Circuit**



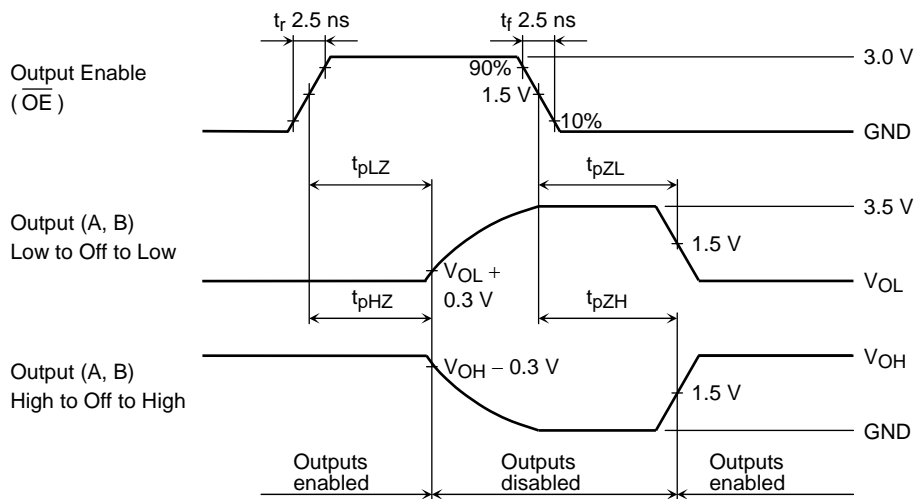
Parameter	Switch
$t_{pLH}, t_{pHL}$	Open
$t_{pLZ}, t_{pZL}$	7.0 V
$t_{pHZ}, t_{pZH}$	Open

**Figure 1**

**AC Waveform**



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

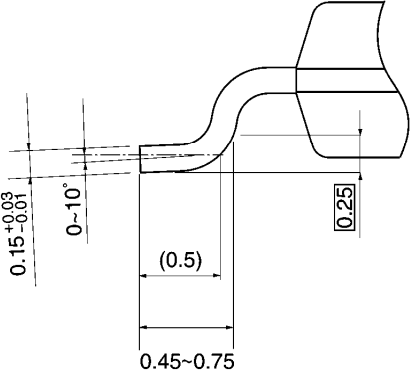
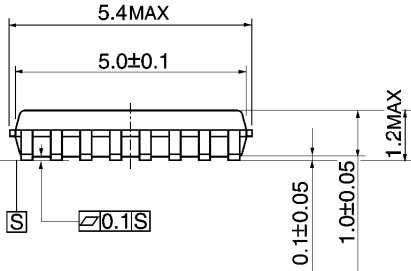
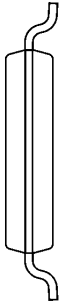
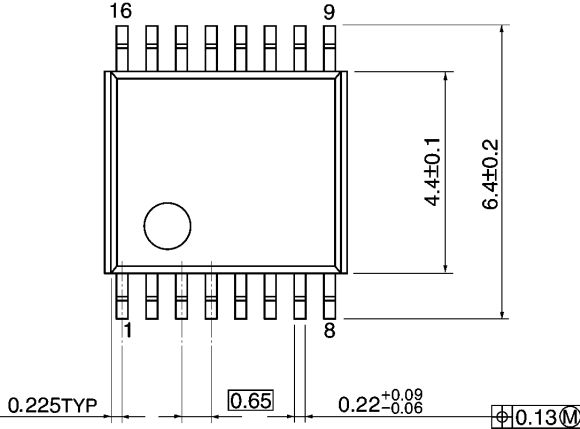


**Figure 3  $t_{pLZ}, t_{pHZ}, t_{pZL}, t_{pZH}$**

Package Dimensions

TSSOP16-P-0044-0.65A

Unit: mm

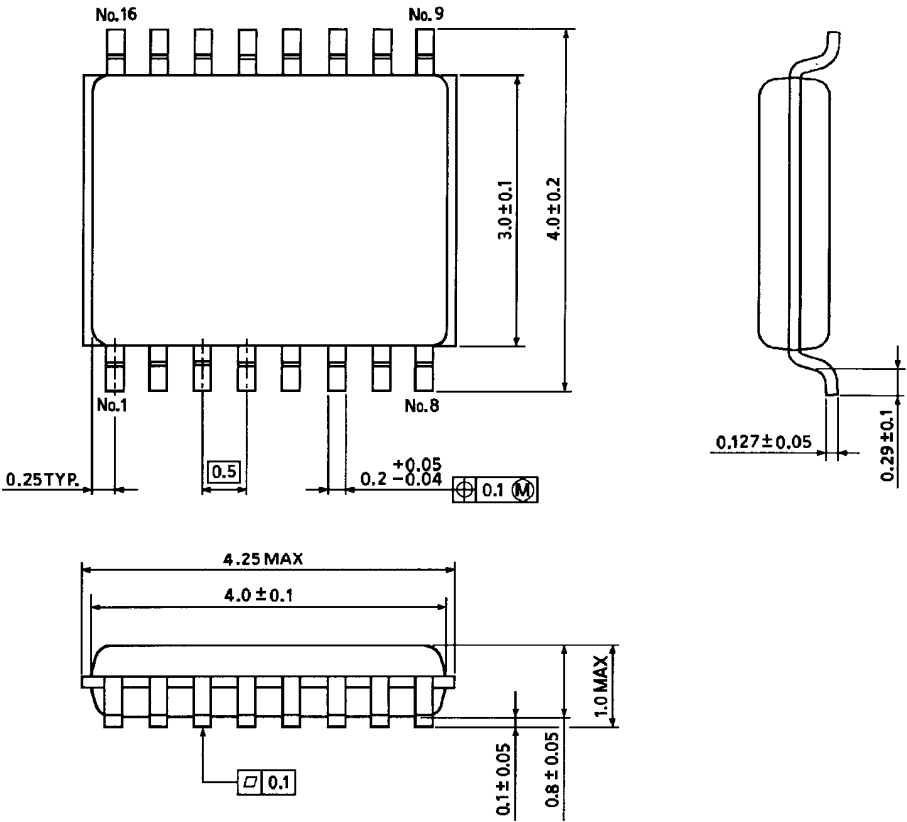


Weight: 0.06 g (typ.)

Package Dimensions

VSSOP16-P-0030-0.50

Unit : mm



Weight: 0.02 g (typ.)

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