

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

# TC7MBL3245AFK

## Octal Bus Switch

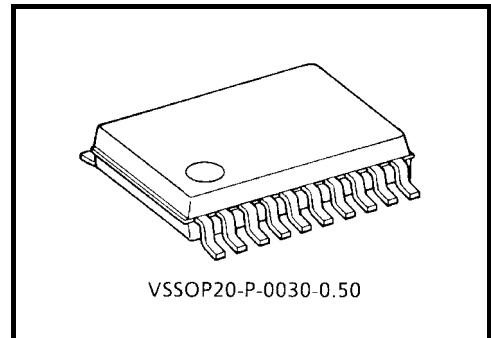
The TC7MBL3245AFK provides eight bits of low-voltage, high-speed bus switching in a standard '245 device pinout. The low ON-resistance of the switch allows connections to be made with minimal propagation delay and while maintaining CMOS low power dissipation.

The device comprises a single 8-bit switch. When output enable ( $\overline{OE}$ ) is low, the switch is on and port A is connected to port B. When  $\overline{OE}$  is high, the switch is open and a high-impedance state exists between the two ports.

All inputs are equipped with protection circuits to guard against static discharge.

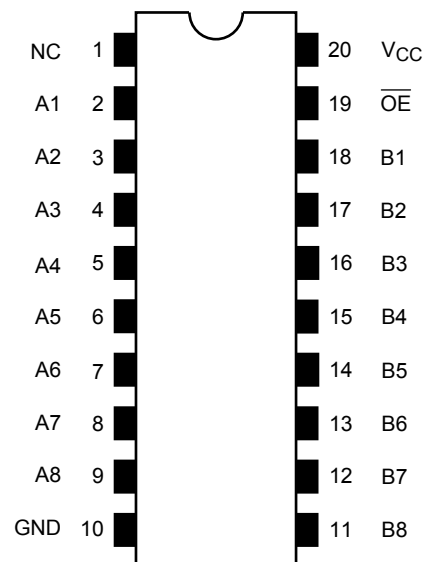
### Features

- Operating voltage:  $V_{CC} = 2.0\sim 3.6\text{ V}$
- High speed:  $t_{pd} = 0.31\text{ ns (max) @ } V_{CC} = 3.0\text{ V}$
- Low ON-resistance:  $R_{ON} = 5\ \Omega\text{ (typ.) @ } V_{CC} = 3.0\text{ V}$
- ESD performance: human body model  $> \pm 2000\text{ V}$   
machine model  $> \pm 200\text{ V}$
- Power-down protection for inputs ( $\overline{OE}$  input only)
- Package: VSSOP (US20)
- Pin compatible with the 74xx245 type
- .



Weight: 0.03 g (typ.)

### Pin Assignment (top view)

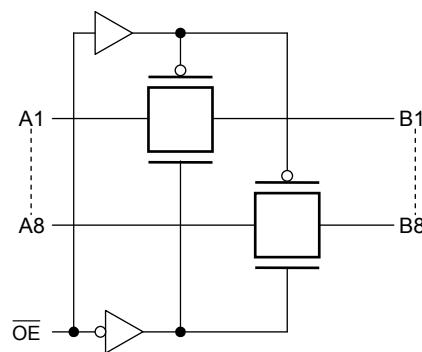


NC-No Internal Connection

## Truth Table

Inputs	Function
$\overline{OE}$	
L	A port = B port
H	Disconnect

## System Diagram



## Absolute Maximum Ratings (Note)

Characteristic	Symbol	Rating	Unit
Power supply range	$V_{CC}$	-0.5~4.6	V
Control pin input voltage	$V_{IN}$	-0.5~4.6	V
Switch terminal I/O voltage	$V_S$	-0.5~ $V_{CC}+0.5$	V
Clump diode current	Control input pin	-50	mA
	Switch terminal	$\pm 50$	
Switch I/O 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, may lead to deterioration in IC performance or even destruction.

## Operating Range (Note)

Characteristic	Symbol	Rating	Unit
Power supply voltage	$V_{CC}$	2.0~3.6	V
Control pin input voltage	$V_{IN}$	0~3.6	V
Switch I/O voltage	$V_S$	0~ $V_{CC}$	V
Operating temperature	$T_{opr}$	-40~85	$^{\circ}C$
Input rise and fall time	dt/dv	0~10	ns/V

Note: The operating range 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)

Characteristic	Symbol	Test Condition	V <sub>CC</sub> (V)	Min	Typ.	Max	Unit
High-level control input voltage	V <sub>IH</sub>	—	2.0 to 3.6	0.7 × V <sub>CC</sub>	—	—	V
Low-level control input voltage	V <sub>IL</sub>	—	2.0 to 3.6	—	—	0.3 × V <sub>CC</sub>	
Control input current	I <sub>IN</sub>	V <sub>IN</sub> = 0 to 3.6 V	2.0 to 3.6	—	—	±1.0	μA
Power off leakage current	I <sub>OFF</sub>	$\overline{OE}$ = 0 to 3.6 V	0	—	—	±1.0	μA
Off-stage leakage current (switch off)	I <sub>SZ</sub>	A, B = 0 to V <sub>CC</sub> , $\overline{OE}$ = V <sub>CC</sub>	2.0 to 3.6	—	—	±1.0	μA
Switch ON-resistance (Note 2)	R <sub>ON</sub>	V <sub>IS</sub> = 0 V, I <sub>IS</sub> = 30 mA (Note 1)	3.0	—	2	7	Ω
		V <sub>IS</sub> = 3.0 V, I <sub>IS</sub> = 30 mA (Note 1)	3.0	—	3	9	
		V <sub>IS</sub> = 2.4 V, I <sub>IS</sub> = 15 mA (Note 1)	3.0	—	5	20	
		V <sub>IS</sub> = 0 V, I <sub>IS</sub> = 24 mA (Note 1)	2.3	—	3	10	
		V <sub>IS</sub> = 2.3 V, I <sub>IS</sub> = 24 mA (Note 1)	2.3	—	4	15	
Quiescent supply current	I <sub>CC</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND, I <sub>OUT</sub> = 0	3.6	—	—	10	μA

Note 1: All typical values are at Ta = 25°C.

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

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

Characteristic	Symbol	Test Condition	V <sub>CC</sub> (V)	Min	Max	Unit
Propagation delay (bus to bus)	t <sub>pLH</sub> t <sub>pHL</sub>	Figure 1, Figure 2 (Note)	3.3 ± 0.3	—	0.31	ns
			2.5 ± 0.2	—	0.52	
Output enable time	t <sub>pZL</sub> t <sub>pZH</sub>	Figure 1, Figure 3	3.3 ± 0.3	—	6.5	ns
			2.5 ± 0.2	—	8	
Output disable time	t <sub>pLZ</sub> t <sub>pHZ</sub>	Figure 1, Figure 3	3.3 ± 0.3	—	6.5	ns
			2.5 ± 0.2	—	8	

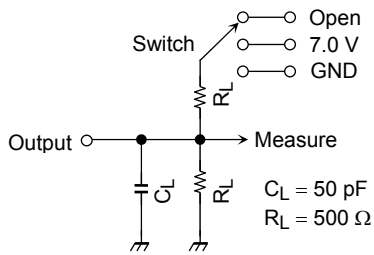
Note: This parameter is guaranteed by design but is not tested. The bus switch contributes no propagation delay other than the RC delay of the typical ON-resistance of the switch and the 50 pF load capacitance when driven by an ideal voltage from the source (zero output impedance).

### Capacitance (Ta = 25°C)

Characteristic	Symbol	Test Condition	V <sub>CC</sub> (V)	Typ.	Unit	
Control input capacitance	C <sub>IN</sub>	(Note)	3.0	3	pF	
Switch terminal capacitance	C <sub>I/O</sub>	$\overline{OE}$ = V <sub>CC</sub>	(Note)	3.0	17	pF

Note: This parameter is guaranteed by design.

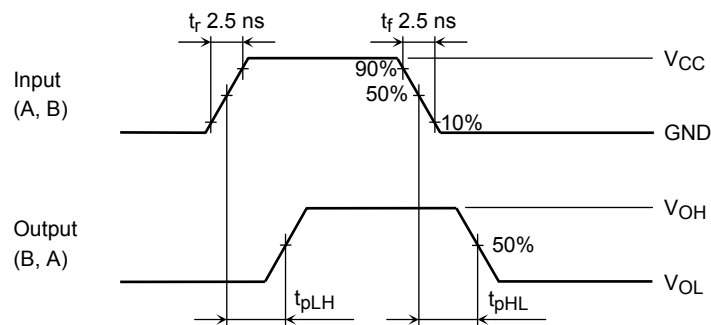
**AC Test Circuit**



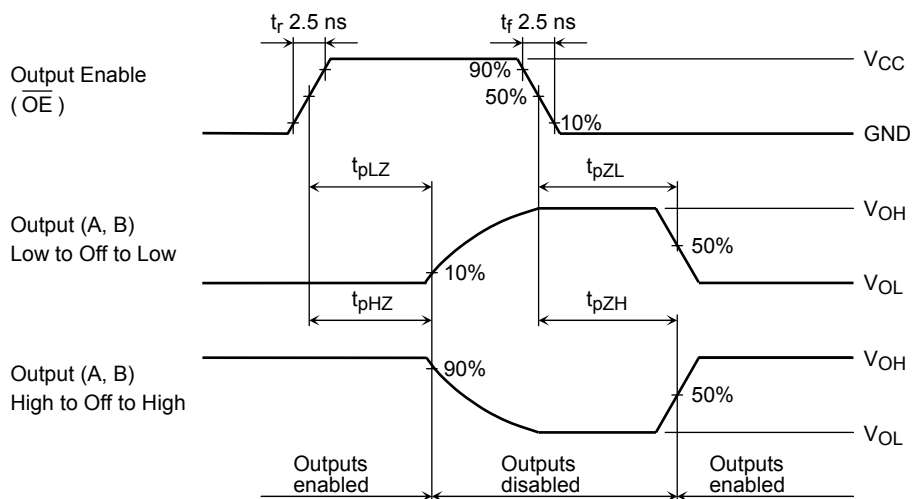
Parameter	Switch
$t_{pLH}$ , $t_{pHL}$	Open
$t_{pLZ}$ , $t_{pZL}$	$2 \times V_{CC}$
$t_{pHZ}$ , $t_{pZH}$	GND

**Figure 1**

**AC Waveforms**



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

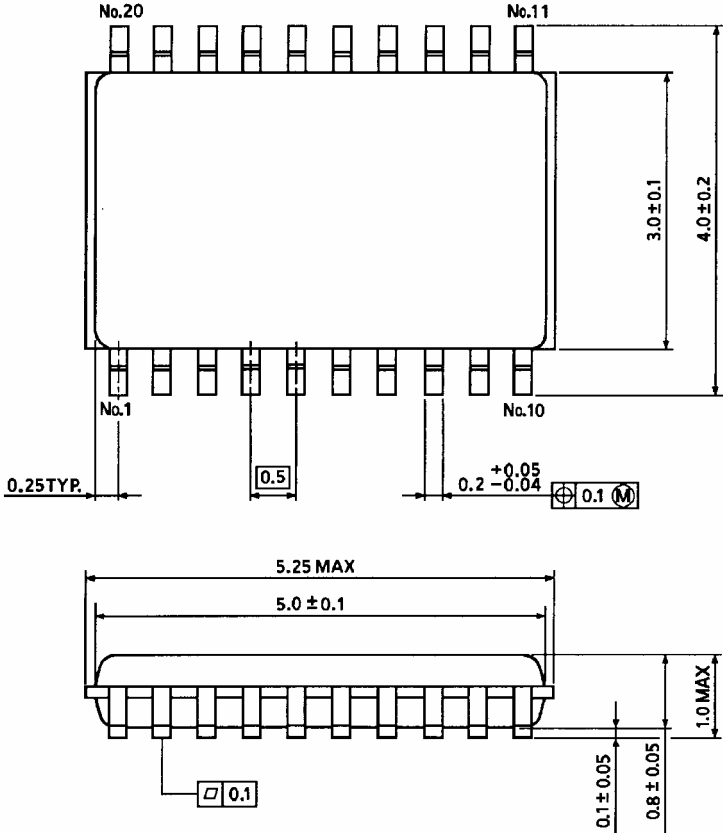


**Figure 3  $t_{pLZ}$ ,  $t_{pHZ}$ ,  $t_{pZL}$ ,  $t_{pZH}$**

Package Dimensions

VSSOP20-P-0030-0.50

Unit : mm



Weight: 0.03 g (typ.)

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