

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

# TC7MBD3245FK

## Octal Bus Switch

The TC7MBD3245FK provides eight bits of high-speed TTL-compatible bus switching in a standard '245 device pinout. The low on-state resistance of the switch allows connections to be made with minimal propagation delay.

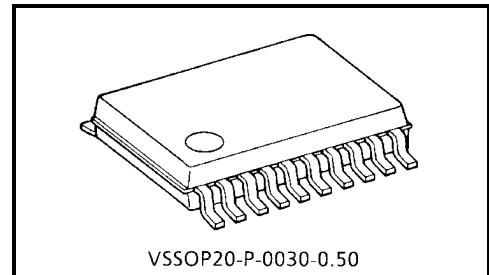
The device is organized as one 8-bit switch. When output enable ( $\overline{OE}$ ) is low, the switch is on and port A is connected to port B. When  $\overline{OE}$  is high, the switch is open and a high-impedance state exists between the two ports.

The internal diode which adds to power supply line is enable to realize the shift of signal level from 5 V to 3.3 V.

All inputs are equipped with protection circuits against static discharge.

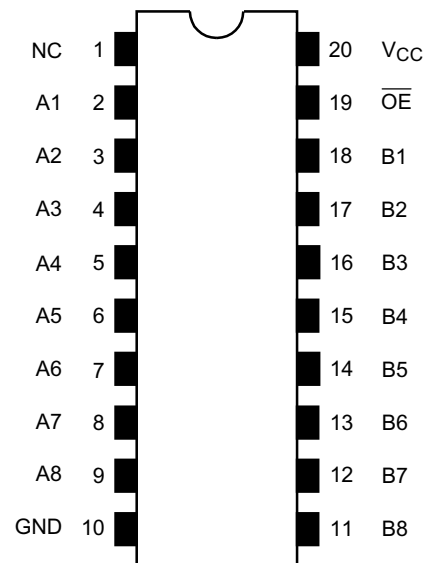
### Features

- Operating voltage:  $V_{CC} = 4.5\sim 5.5$  V
- High speed:  $t_{pd} = 0.25$  ns (max)
- Low on resistance:  $R_{ON} = 5 \Omega$  (typ.)
- ESD performance: Human body model  $> \pm 2000$  V  
Machine model  $> \pm 200$  V
- Compatible with TTL outputs (control inputs)
- Package: VSSOP (US20)
- Pin compatible with the 74xx245 type.  
Functionally equivalent to (FST/CBT) 3245.



Weight: 0.03 g (typ.)

### Pin Assignment (top view)



NC-No Internal Connection

000630EBA1

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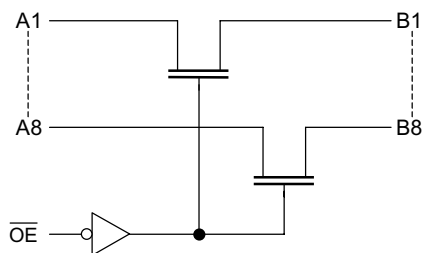
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## Truth Table

Inputs	Function
$\overline{\text{OE}}$	
L	A port = B port
H	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 circuit	$I_S$	128	mA
Power dissipation	$P_D$	180	mW
DC $V_{CC}$ /ground current	$I_{CC}/I_{GND}$	$\pm 100$	mA
Storage temperature	$T_{stg}$	-65~150	$^{\circ}\text{C}$

## Recommended Operating Conditions

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

## Electrical Characteristics

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

Characteristics		Symbol	Test Condition		Min	Typ. (Note1)	Max	Unit
Input voltage	"H" level	V <sub>IH</sub>	—		2.0	—	—	V
	"L" level	V <sub>IL</sub>	—		—	—	0.8	
High-level output voltage		V <sub>OH</sub>	Figure 4		—	—	—	—
Input leakage current		I <sub>IN</sub>	V <sub>IN</sub> = 0~5.5 V		5.5	—	±1.0	μA
Off-STATE leakage current (switch off)		I <sub>SZ</sub>	A, B = 0~5.5 V, $\overline{OE} = V_{CC}$		0~5.5	—	±1.0	μA
ON resistance  (Note2)	R <sub>ON</sub>	V <sub>IS</sub> = 0 V	I <sub>IS</sub> = 64 mA		4.5	—	5	Ω
			I <sub>IS</sub> = 30 mA		4.5	—	5	
		V <sub>IS</sub> = 2.4 V, I <sub>IS</sub> = 15 mA		4.5	—	35	15	
Quiescent supply current	I <sub>CC</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND I <sub>OUT</sub> = 0	Switch ON		5.5	—	1.5	mA
			Switch OFF		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

Note1: Typical values are at V<sub>CC</sub> = 5 V, Ta = 25°C.

Note2: 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		Min	Max	Unit	
								V <sub>CC</sub> (V)
Propagation delay time (bus to bus)	t <sub>pLH</sub>	t <sub>pLH</sub> t <sub>pHL</sub>	Figure 1, Figure 2	(Note3)	4.5	—	0.25	ns
	t <sub>pHL</sub>							
Output enable time	t <sub>pZL</sub>	t <sub>pZL</sub> t <sub>pZH</sub>	Figure 1, Figure 3		4.5	—	7.0	ns
	t <sub>pZH</sub>							
Output disable time	t <sub>pLZ</sub>	t <sub>pLZ</sub> t <sub>pHZ</sub>	Figure 1, Figure 3		4.5	—	6.0	ns
	t <sub>pHZ</sub>							

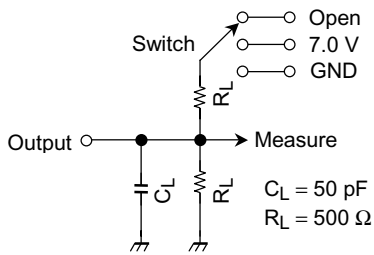
Note3: The propagation delay time is calculated by the RC (on-resistance and load capacitance) time constant.

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

Characteristics		Symbol	Test Condition		Typ.	Unit		
							V <sub>CC</sub> (V)	
Control pin input capacitance		C <sub>IN</sub>	(Note4)		5.0	3	pF	
Switch terminal capacitance		C <sub>I/O</sub>	$\overline{OE} = V_{CC}$		(Note4)	5.0	10	pF

Note4: This parameter is guaranteed by design.

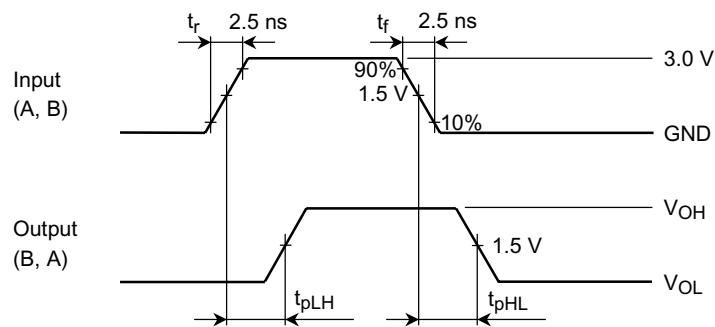
**AC Test Circuit**



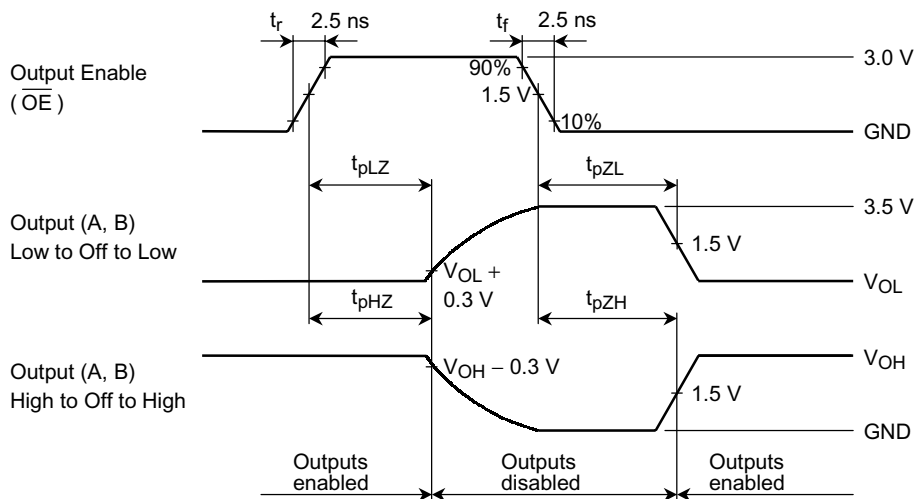
Parameter	Switch
$t_{pLH}, t_{pHL}$	Open
$t_{pLZ}, t_{pZL}$	7.0 V
$t_{pHZ}, t_{pZH}$	Open

**Figure 1**

**AC Waveform**

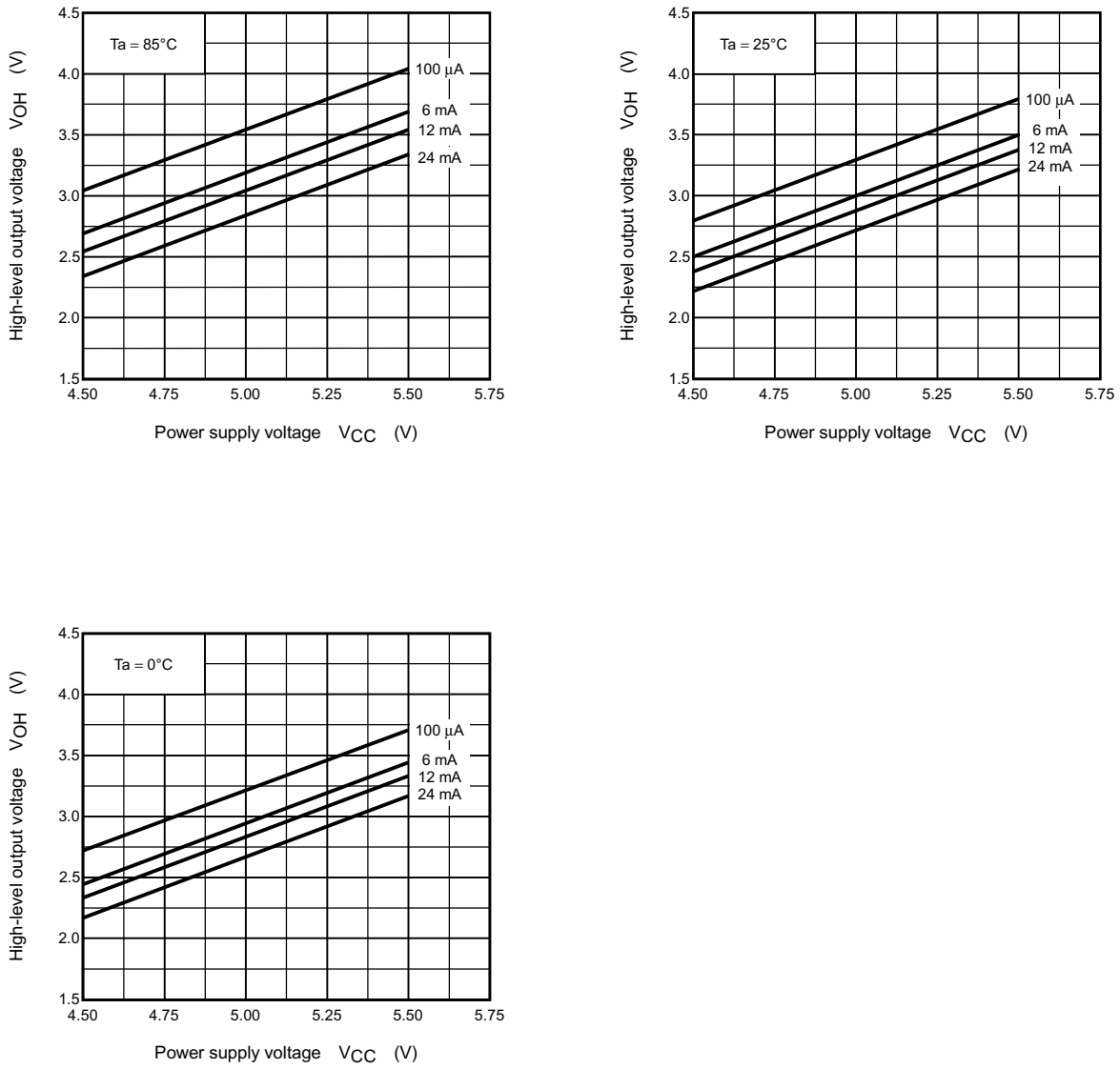


**Figure 2  $t_{pLH}, t_{pHL}$**



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

**$V_{OH} - V_{CC}$  Characteristics (typ.)**

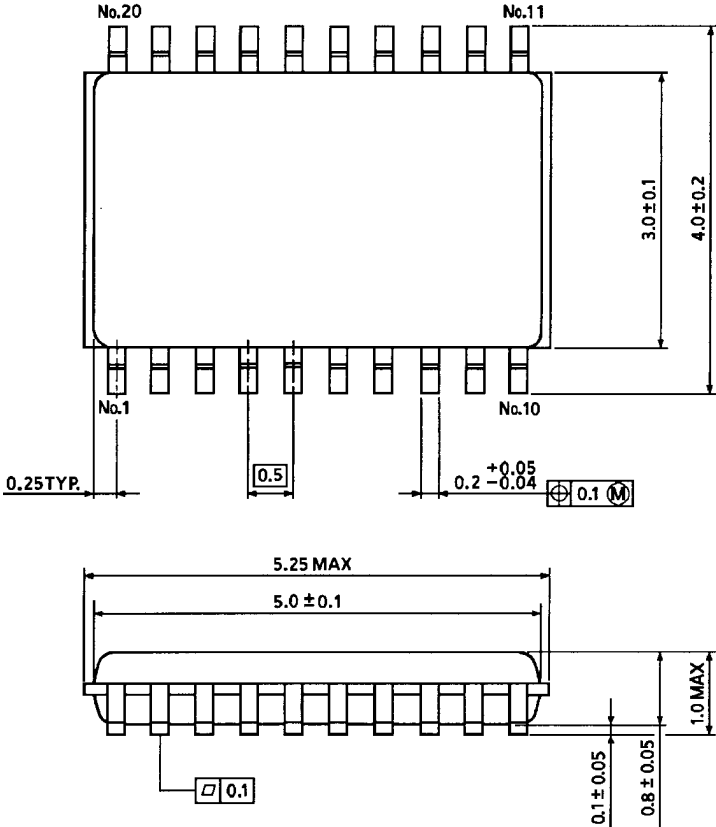


**Figure 4**

Package Dimensions

VSSOP20-P-0030-0.50

Unit : mm



Weight: 0.03 g (typ.)