TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC7MBD3245AFK

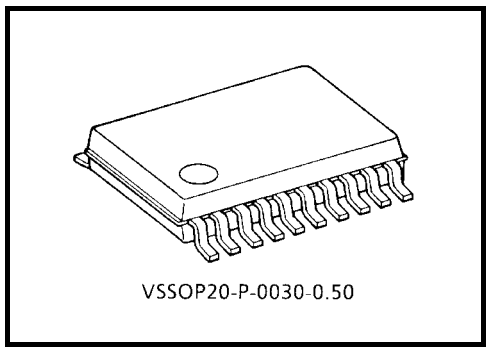
Octal Bus Switch

The TC7MBD3245AFK 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 device 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.

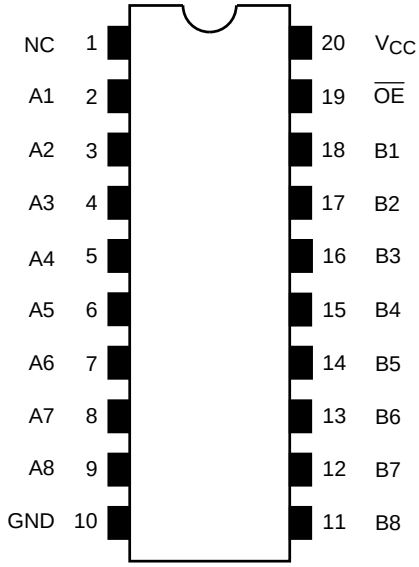


Weight: 0.03 g (typ.)

Features

- Operating voltage: V_{CC} = 4.5~5.5 V
- High speed: t_{pd} = 0.32 ns (max)
- Low on resistance: R_{ON} = 5 Ω (typ.)
- ESD performance: Human body model > ±2000 V
  Machine model > ±200 V
- Compatible with TTL outputs (control inputs)
- Low Power Dissipation: Icc = 10 μA (max.)
- Package: VSSOP (US20)
- Pin compatible with the 74xx245 type.
- Functionally equivalent to (FST/CBT) 3245.

Pin Assignment (top view)

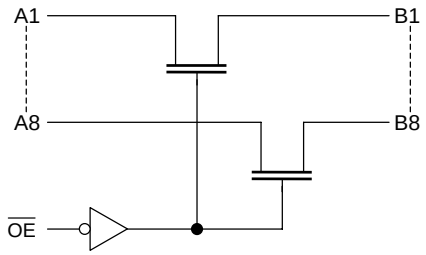


NC-No Internal Connection

Truth Table

Inputs $\overline{OE}$	Function
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}	±100	mA
Storage temperature	T_{stg}	−65~150	°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	°C
Input rise and fall time	dt/dv	0~10	ns/V

Electrical Characteristics

DC Characteristics (Ta = –40~85°C)

Characteristics		Symbol	Test Condition		V_{CC} (V)	Min	Typ. (Note 1)	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	
High-level output voltage (Note 2)		V_{OH}	IOH=-1μA $V_{IS} = V_{CC}$		4.75	2.3	2.8	3.2	V
					5.0	2.5	3.0	3.4	
					5.25	2.7	3.2	3.6	
Input leakage current		I_{IN}	V_{IN} = 0~5.5 V		4.5~5.5	—	—	±1.0	μA
Power off leakage current		I_{OFF}	A, B, $\overline{OE}$ = 0~5.5 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 (Note 3)		R_{ON}	V_{IS} = 0 V	I_{IS} = 64 mA	4.5	—	5	9	Ω
					4.75	—	5	8	
				I_{IS} = 30 mA	4.5	—	5	9	
					4.75	—	5	8	
			V_{IS} = 2.3 V, I_{IS} = 15 mA		4.5	—	35	65	
					4.75	—	35	50	
Quiescent supply current		ICC	VIN = VCC or GND, I_{OUT} = 0		5.5	—	—	10	μA
Increase in I_{CC} per input		ΔI_{CC}	V_{IN} = 3.4 V (one input)		5.5	—	—	2.5	mA

Note 1: Typical values are at V_{CC} = 5 V, Ta = 25°C.

Note 2: It recommends that this device uses Pull-up resistance when adding and using resistance for an output terminal. Since it couses to drop a VOH voltage level when using Pull-down resistance for an output terminal.

Note 3: 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	(Note 4)	4.5	—	0.32	ns
Output enable time	t_{pZL} t_{pZH}	Figure 1, Figure 3		4.5	—	7.0	ns
Output disable time	t_{pLZ} t_{pHZ}	Figure 1, Figure 3		4.5	—	7.0	ns

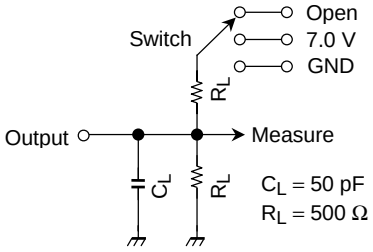
Note 4: The propagation delay time is calculated by the RC (on-resistance and load capacitance) time constant.

Capacitive Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition		V_{CC} (V)	Typ.	Unit
Control pin input capacitance	C_{IN}		(Note 5)	5.0	3	pF
Switch terminal capacitance	$C_{I/O}$	$\overline{OE}$ = V_{CC}	(Note 5)	5.0	10	pF

Note 5: This parameter is guaranteed by design.

AC Test Circuit



Paramenter	Switch
t_{pLH}, t_{pHL}	Open
t_{pLZ}, t_{pZL}	7.0 V
t_{pHZ}, t_{pZH}	GND

Figure 1

AC Waveform

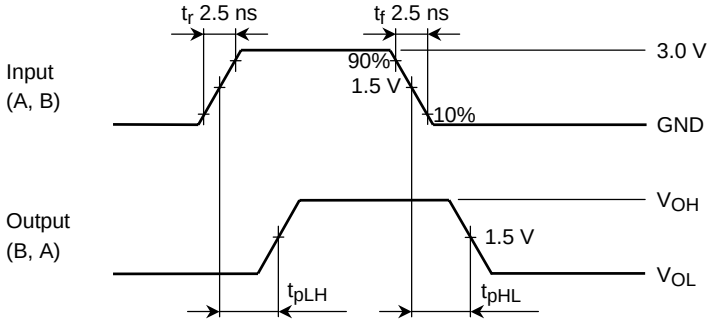


Figure 2 t_{pLH}, t_{pHL}

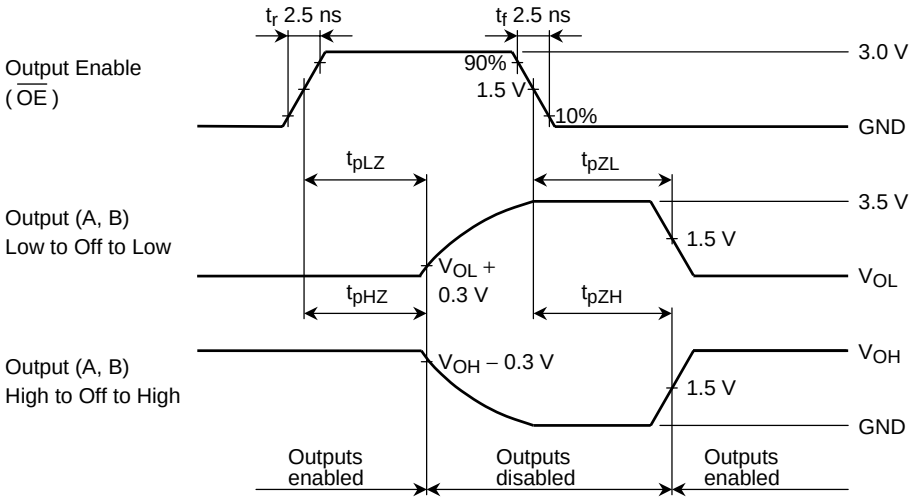
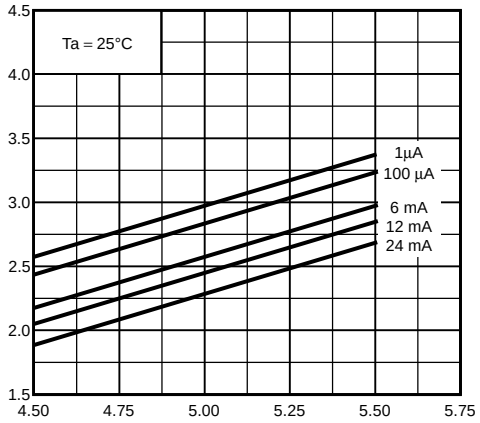
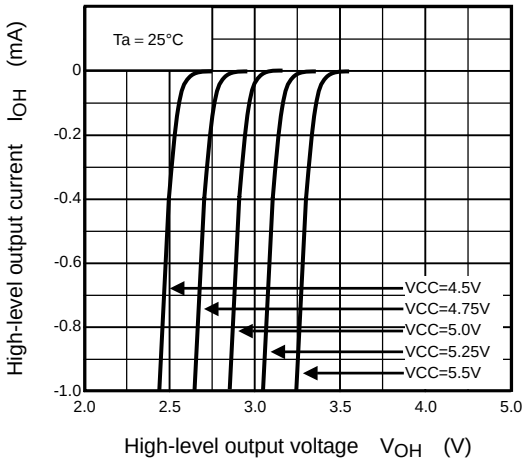
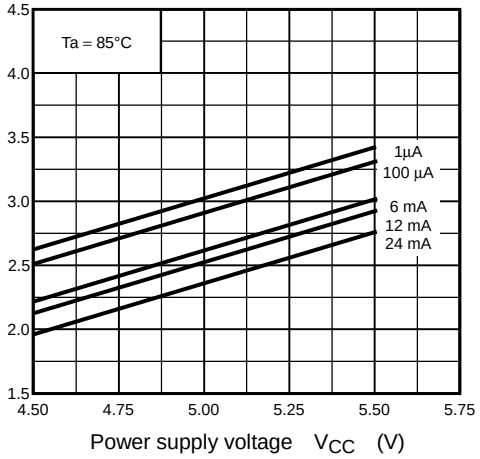


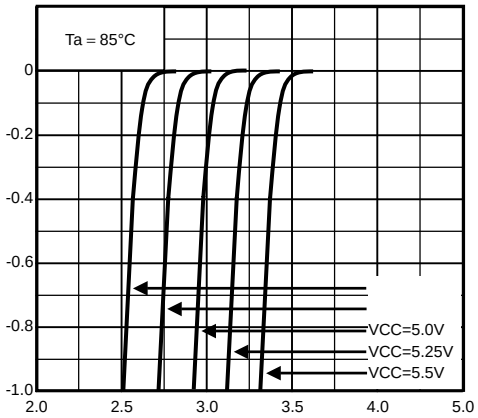
Figure 3 t_{pLZ}, t_{pHZ}, t_{pZL}, t_{pZH}

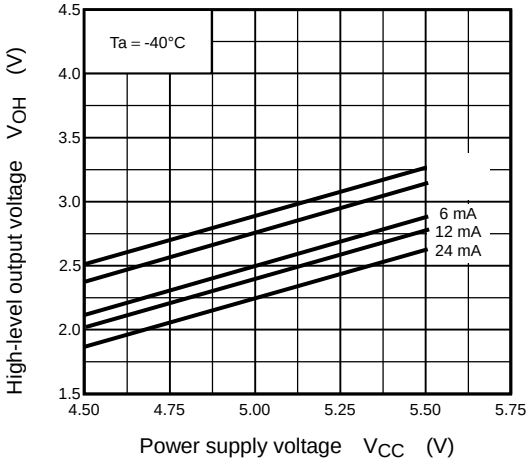
V_{OH} – V_{CC} Characteristics (typ.)











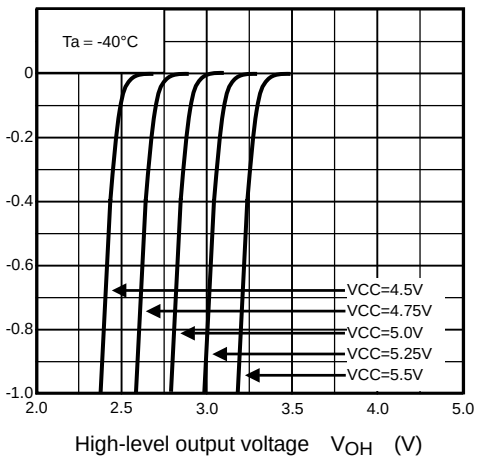
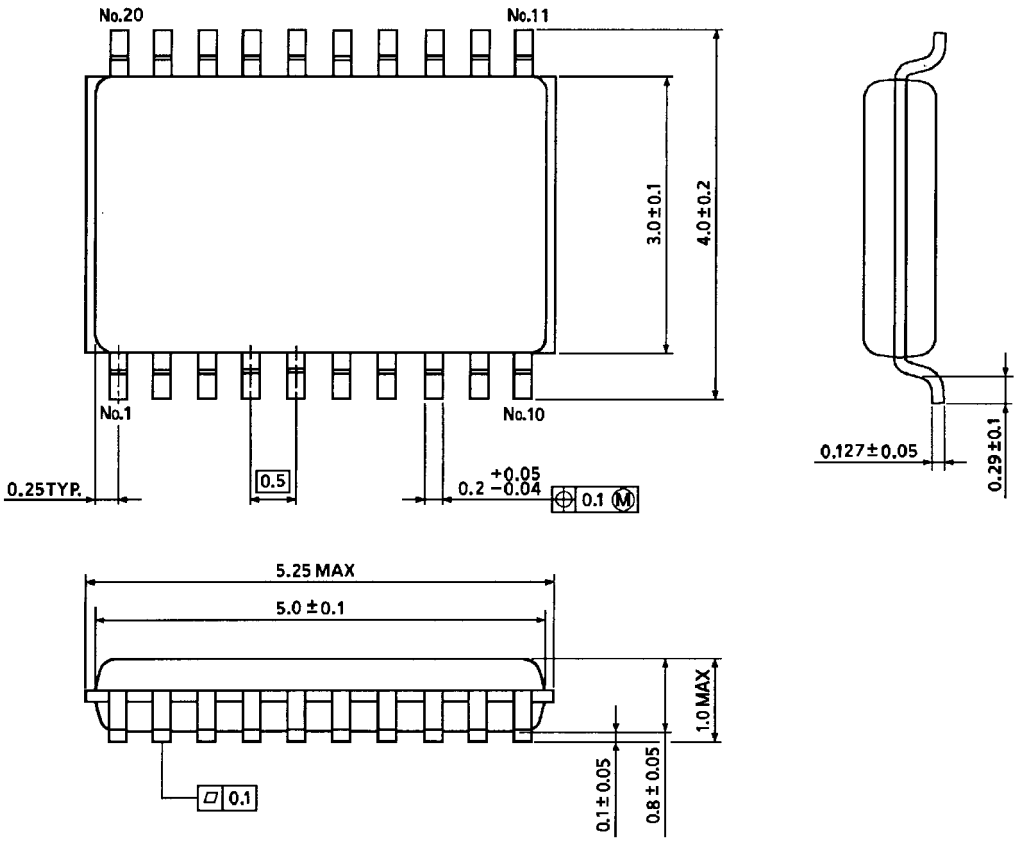


Figure 4

Package Dimensions

VSSOP20-P-0030-0.50 Unit : mm



Weight: 0.03 g (typ.)

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.