

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC7MBD3244AFK

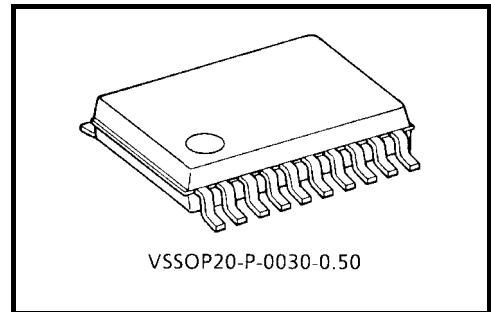
Octal Bus Switch

The TC7MBD3244AFK provides eight bits of high-speed TTL-compatible bus switching in a standard '244 device pinout. The low on resistance of the switch allows connections to be made with minimal propagation delay.

The device is organized as two 4-bit low-impedance switches with separate output-enable (\overline{OE}) inputs. When \overline{OE} is low, the switch is on and data can flow from port A to port B, or vice versa. When \overline{OE} is high, the switch is open and a high-impedance state exists between the two ports.

The device is able to realize the shift of signal level from 5 V to 3.3 V.

All inputs are equipped with protection circuits against static discharge.

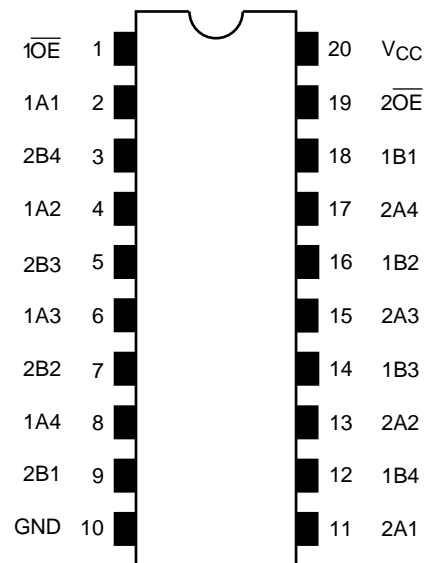


Weight: 0.03 g (typ.)

Features

- Operating voltage: $V_{CC} = 4.5\sim 5.5$ V
- High speed: $t_{pd} = 0.32$ 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)
- Low Power Dissipation: $I_{cc} = 10 \mu A$ (max.)
- Package: VSSOP (US20)
- Pin compatible with the 74xx244 type.
Functionally equivalent to (FST/CBT) 3244.

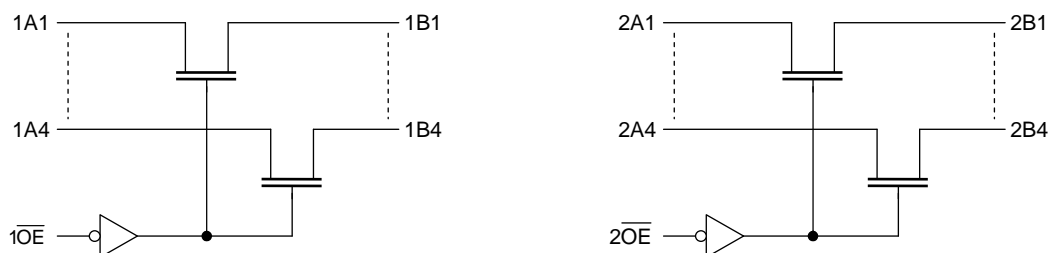
Pin Assignment (top view)



Truth Table

Inputs	Function
OE	
L	A port = B port
H	Disconnect

System Diagram



Absolute Maximum Ratings (Note)

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	$^{\circ}C$

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

Note: The operating ranges must be maintained to ensure the normal operation of the device.
Unused inputs must be tied to either VCC or GND.

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}	I _{OH} =-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	I _{CC}	V _{IN} = V _{CC} 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 causes to drop a V_{OH} 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)	4.5	—	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

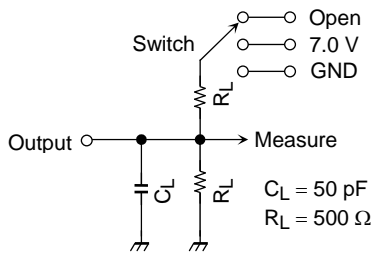
Note: The propagation delay time is calculated by the RC (on-resistance and load capacitance) time constant.

Capacitive Characteristics (Ta = 25°C)

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

Figure 1

AC Waveform

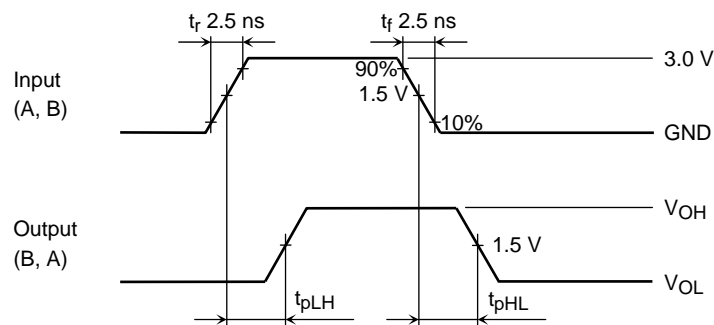


Figure 2 t_{pLH} , t_{pHL}

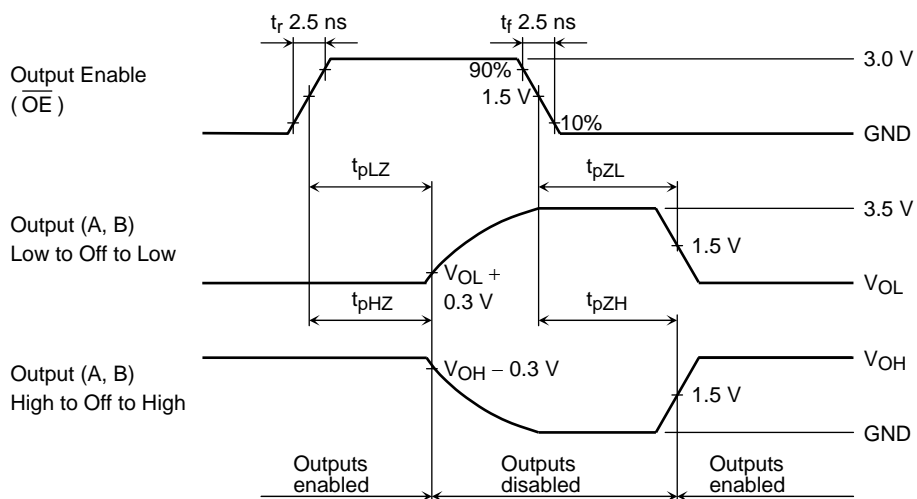


Figure 3 t_{pLZ} , t_{pHZ} , t_{pZL} , t_{pZH}

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

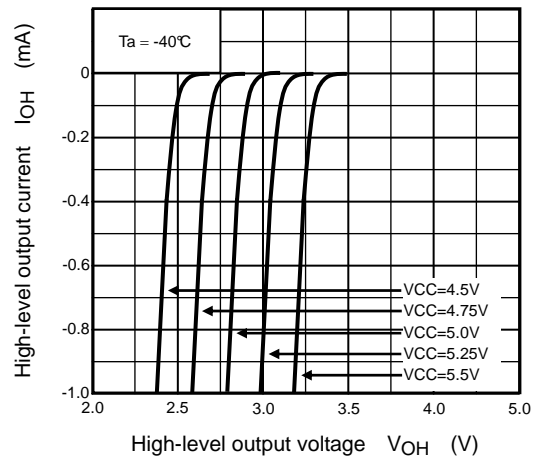
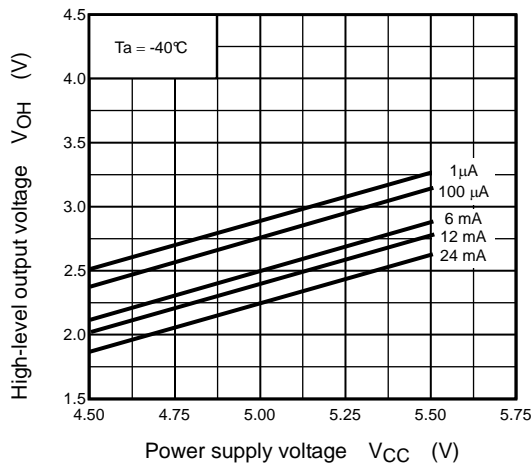
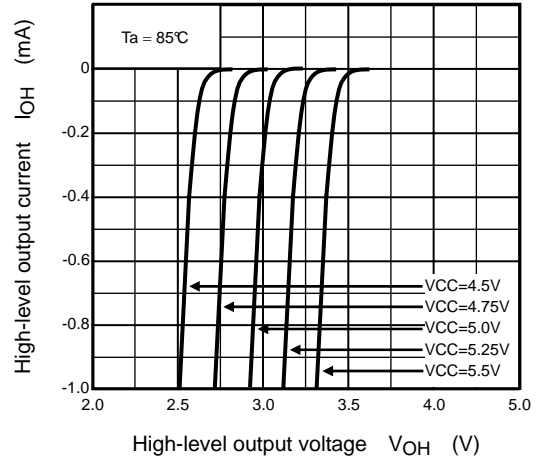
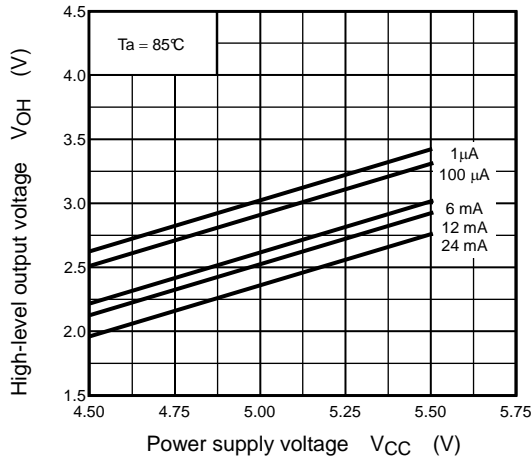
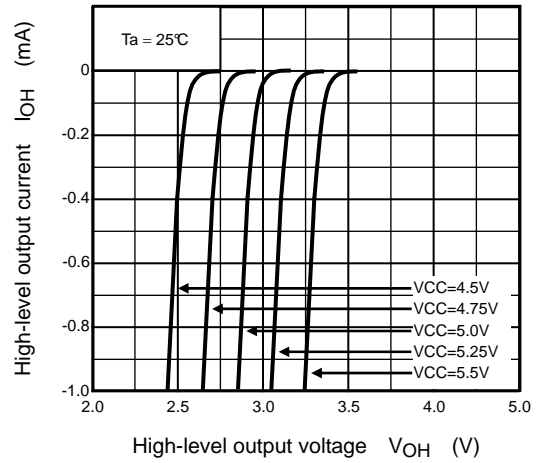
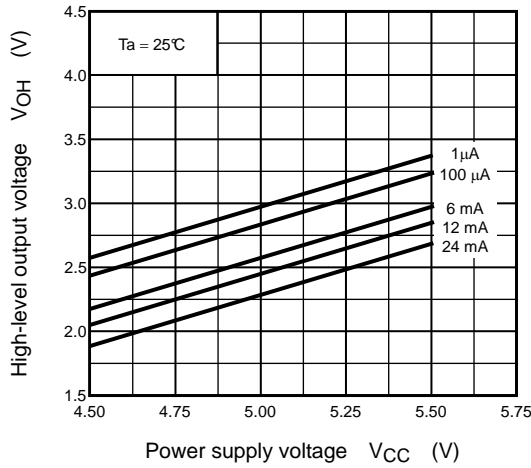
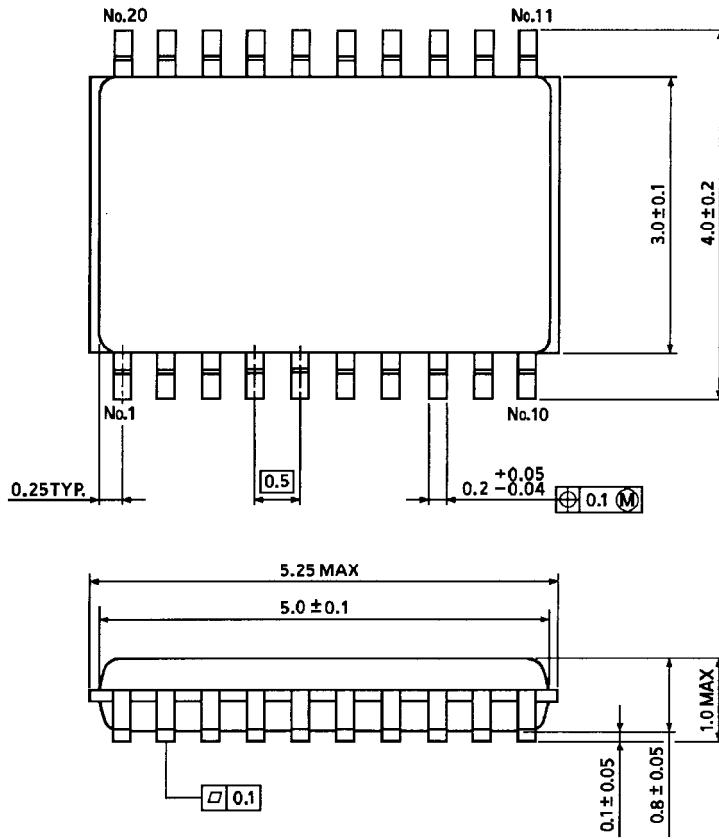


Figure 4

Package Dimensions

VSSOP20-P-0030-0.50

Unit : mm



Weight: 0.03 g (typ.)

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