

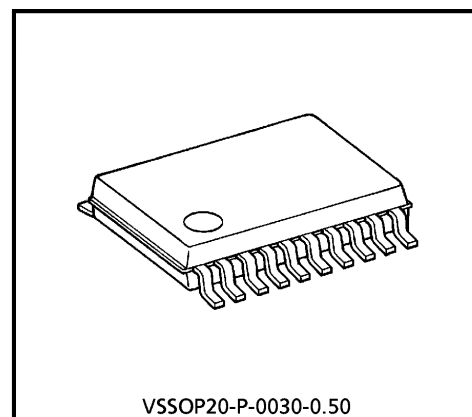
TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

# TC7MBD3244FK

## OCTAL BUS SWITCH

The TC7MBD3244FK 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 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.



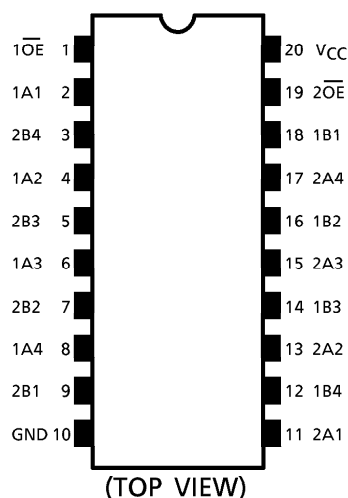
VSSOP20-P-0030-0.50

Weight : 0.03 g (typ.)

### 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 74xx244 type.  
Functionally Equivalent to (FST / CBT) 3244.

### PIN ASSIGNMENT



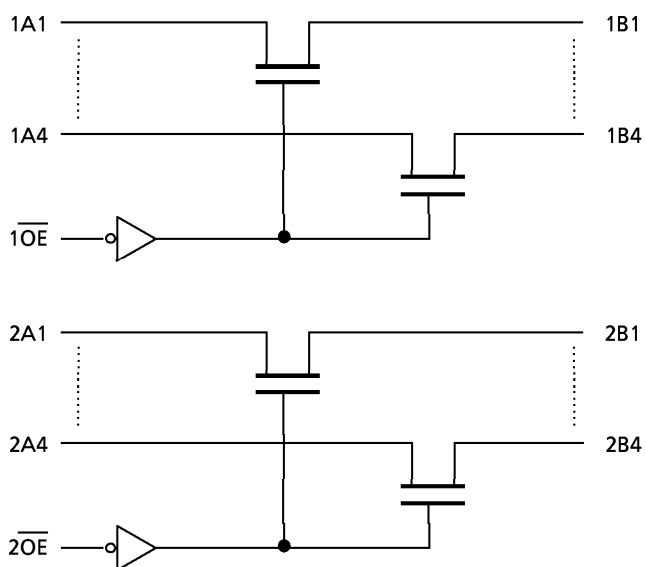
980910EBA1

- TOSHIBA is continually working to improve the quality and the 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 observe standards of safety, and to avoid situations in which a malfunction or failure of a TOSHIBA product 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 products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.
- 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.

**TRUTH TABLE**

INPUTS		FUNCTION
$\overline{OE}$		
L		Aport = Bport
H		Disconnect

**SYSTEM DIAGRAM**



**MAXIMUM RATINGS**

PARAMETER	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 Current	$I_S$	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	$^{\circ}C$

## RECOMMENDED OPERATING CONDITIONS

PARAMETER	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 ( $T_a = -40\sim 85^\circ\text{C}$ )

PARAMETER	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
High-Level Output Voltage	$V_{OH}$	(Fig.4)	—	—	—	—	—		
Input Leakage Current	$I_{IN}$	$V_{IN} = 0\sim 5.5\text{ V}$	5.5	—	—	$\pm 1.0$	$\mu\text{A}$		
Off-STATE Leakage Current	$I_{SZ}$	A, B = 0~5.5 V, $\overline{OE} = V_{CC}$	0~5.5	—	—	$\pm 1.0$	$\mu\text{A}$		
ON Resistance (Note 2)	$R_{ON}$	$V_{IS} = 0\text{ V}$	$I_{IS} = 64\text{ mA}$	4.5	—	5	7	$\Omega$	
			$I_{IS} = 30\text{ mA}$	4.5	—	5	7		
		$V_{IS} = 2.4\text{ V}, I_{IS} = 15\text{ mA}$	4.5	—	35	50			
Quiescent Supply Current	$I_{CC}$	$V_{IN} = V_{CC}$ or GND, $I_{OUT} = 0$		Switch ON	5.5	—	—	1.5	mA
				Switch OFF	5.5	—	—	10	$\mu\text{A}$
Increase In $I_{CC}$ Per Input	$\Delta I_{CC}$	$V_{IN} = 3.4\text{ V}$ (One Input)	5.5	—	—	2.5	mA		

(Note 1): Typical values are at  $V_{CC} = 5.0\text{ V}$  and  $T_a = +25^\circ\text{C}$ .

(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 ELECTRICAL CHARACTERISTICS (Ta = -40~85°C)

PARAMETER	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>	(Fig.1, 2) (Note 3)	4.5	—	0.25	ns
Output Enable Time	t <sub>pZL</sub> t <sub>pZH</sub>	(Fig.1, 3)	4.5	—	6.0	ns
Output Disable Time	t <sub>pLZ</sub> t <sub>pHZ</sub>	(Fig.1, 3)	4.5	—	5.0	ns

(Note 3): 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).

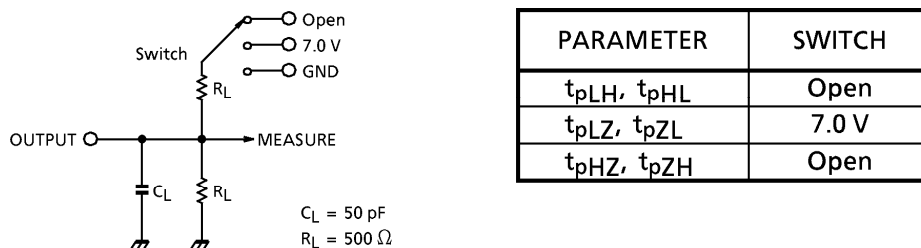
## Capacitive Characteristics (Ta = 25°C)

PARAMETER	SYMBOL	TEST CONDITION	V <sub>CC</sub> (V)	Typ.	UNIT
Control Pin Input Capacitance	C <sub>IN</sub>	(Note 4)	5.0	3	pF
Switch Terminal Capacitance	C <sub>I/O</sub>	$\overline{OE} = V_{CC}$ (Note 4)	5.0	10	pF

(Note 4): Parameter guaranteed by design

**TEST CIRCUIT**

Fig.1



**AC WAVEFORM**

Fig.2  $t_{pLH}, t_{pHL}$

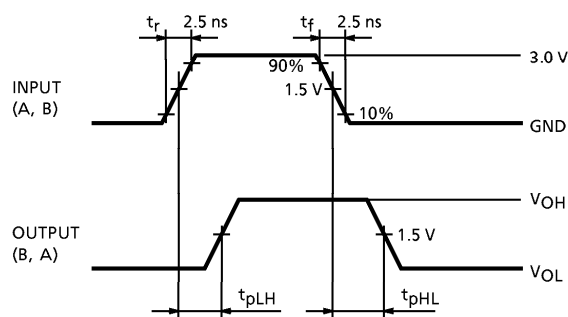


Fig.3  $t_{pLZ}, t_{pHZ}, t_{pZL}, t_{pZH}$

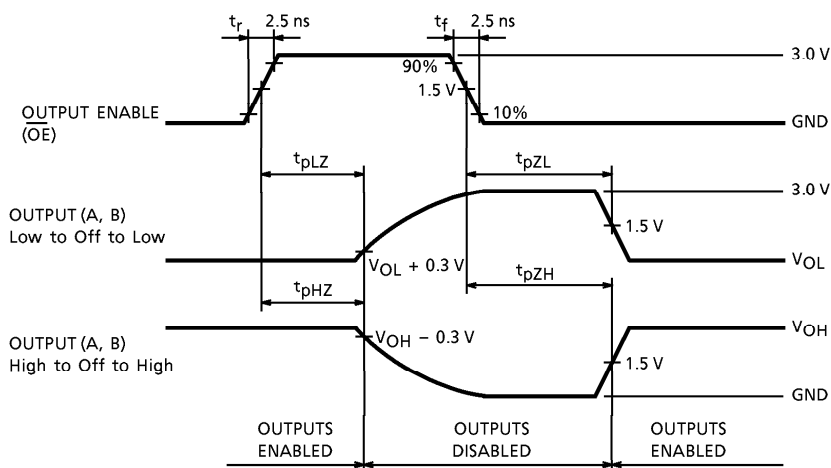
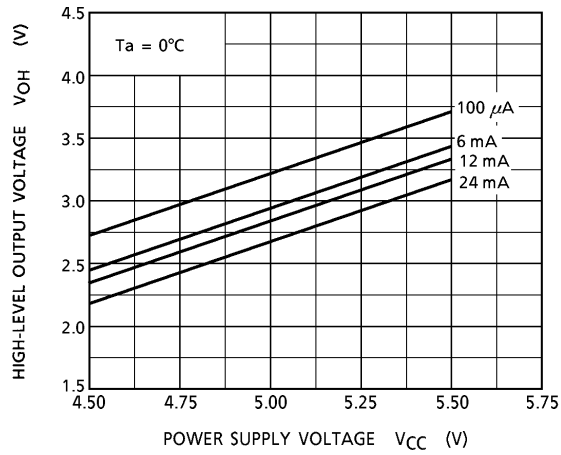
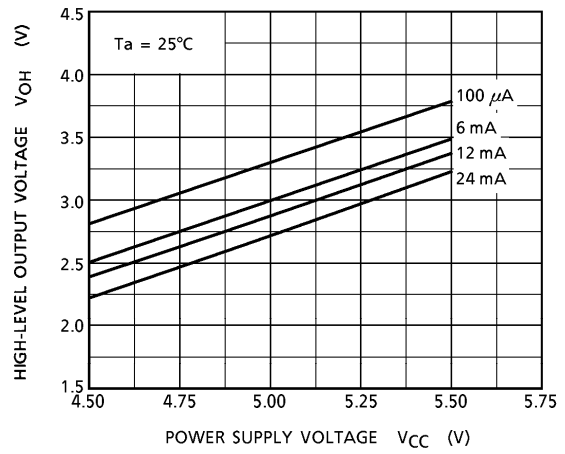
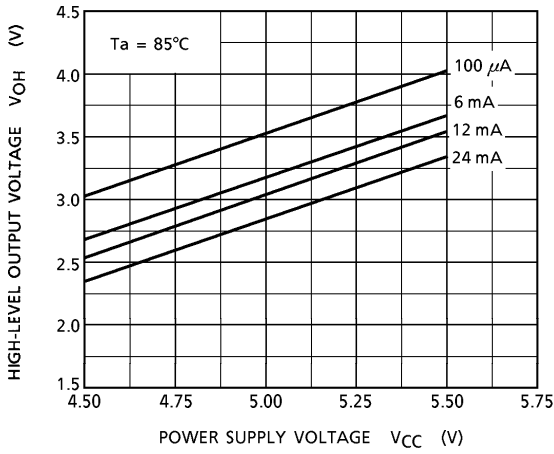
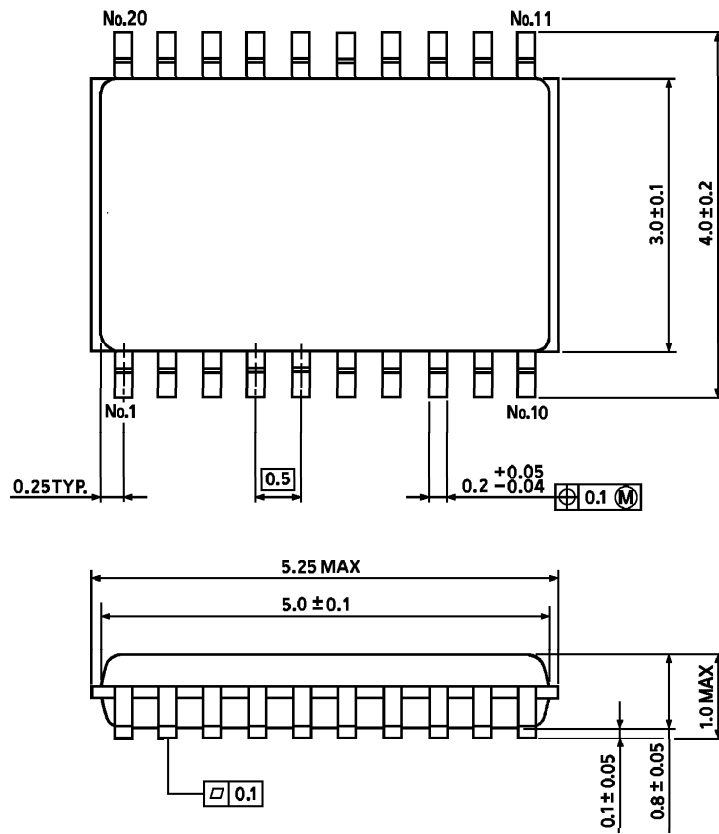


Fig.4  $V_{OH}$ - $V_{CC}$  Characteristics (typ.)



**PACKAGE DIMENSIONS**  
VSSOP20-P-0030-0.50

Unit : mm



Weight : 0.03 g (typ.)