Toshiba CMOS Digital Integrated Circuit Silicon Monolithic

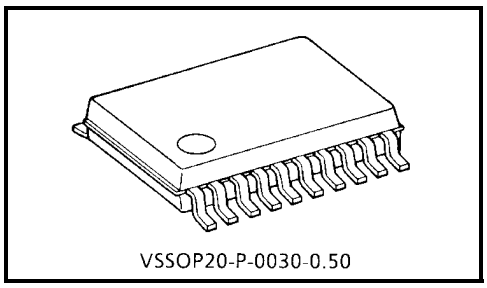
# T C 7 M B 3 2 4 4 F K

Octal Bus Switch

The TC7MB3244FK 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.

All inputs are equipped with protection circuits against static discharge.

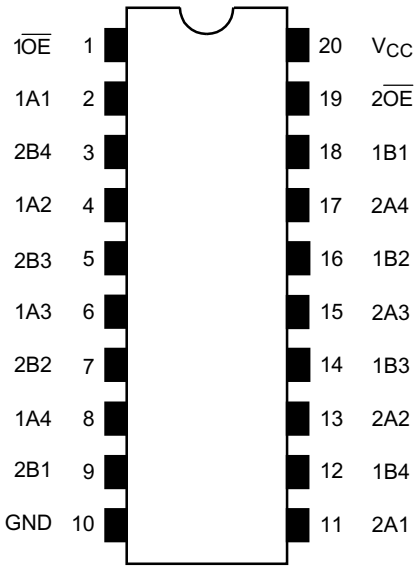



Weight: 0.03 g (typ.)

## Features

- Operating voltage: $V_{CC}$ = 4.5~5.5 V
- High speed: $t_{pd}$ = 0.25 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)
- Package: VSSOP (US20)
- Pin compatible with the 74xx244 type.
  Functionally equivalent to (FST/CBT) 3244.

## Pin Assignment (top view)

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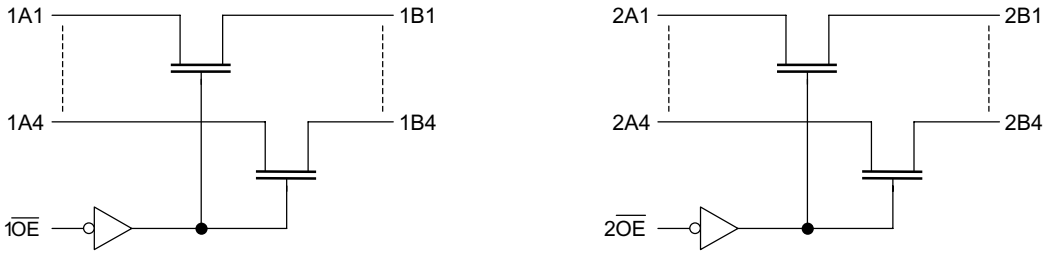
## Truth Table

| 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. (Note1) | 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 | |
| Input leakage current | | $I_{IN}$ | $V_{IN}$ = 0~5.5 V | | 5.5 | — | — | ±1.0 | μA |
| Off-STATE leakage current (switch off) | | $I_{SZ}$ | A, B = 0~5.5 V, $\overline{OE}$ = $V_{CC}$ | | 0~5.5 | — | — | ±1.0 | μA |
| ON resistance (Note2) | | $R_{ON}$ | $V_{IS}$ = 0 V | $I_{IS}$ = 64 mA | 4.5 | — | 5 | 7 | Ω |
| | | | | $I_{IS}$ = 30 mA | 4.5 | — | 5 | 7 | |
| | | | $V_{IS}$ = 2.4 V, $I_{IS}$ = 15 mA | | 4.5 | — | 10 | 15 | |
| Quiescent supply current | | $I_{CC}$ | $V_{IN}$ = $V_{CC}$ or GND, $I_{OUT}$ = 0 | | 5.5 | — | — | 10 | μA |
| Increase in $I_{CC}$ per input | | $\Delta I_{CC}$ | $V_{IN}$ = 3.4 V (one input) | | 5.5 | — | — | 2.5 | mA |

Note1: Typical values are at $V_{CC}$ = 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 | | $V_{CC}$ (V) | Min | Max | Unit |
|---|---|---|---|---|---|---|---|
| Propagation delay time (bus to bus) | $t_{pLH}$ $t_{pHL}$ | Figure 1, Figure 2 | (Note3) | 4.5 | — | 0.25 | ns |
| Output enable time | $t_{pZL}$ $t_{pZH}$ | Figure 1, Figure 3 | | 4.5 | — | 5.0 | ns |
| Output disable time | $t_{pLZ}$ $t_{pHZ}$ | Figure 1, Figure 3 | | 4.5 | — | 5.0 | ns |

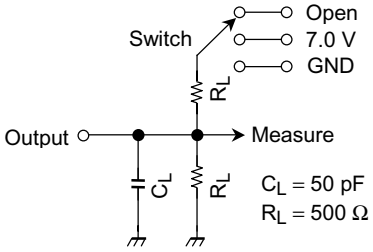
Note3: This parameter is guaranteed by design but is not tested. The bus switch contributes no propagation delay other than the RC delay of the typical On resistance of the switch and the 50 pF load capacitance, when driven by an ideal voltage the source (zero output impedance).

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

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

Note4: Parameter 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

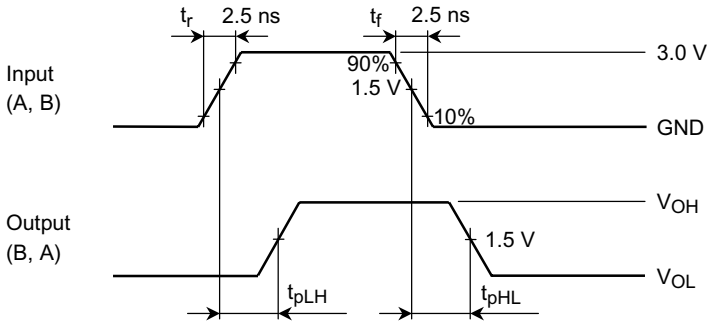



**Figure 2 $t_{pLH}$, $t_{pHL}$**

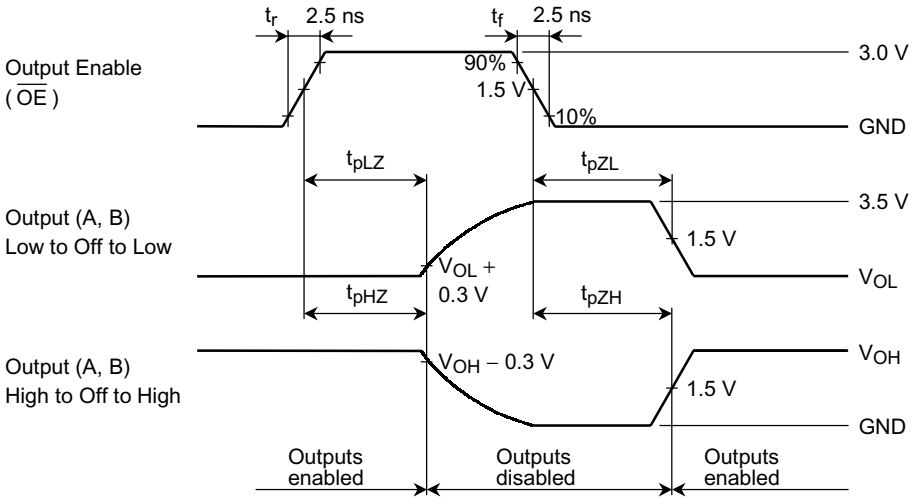
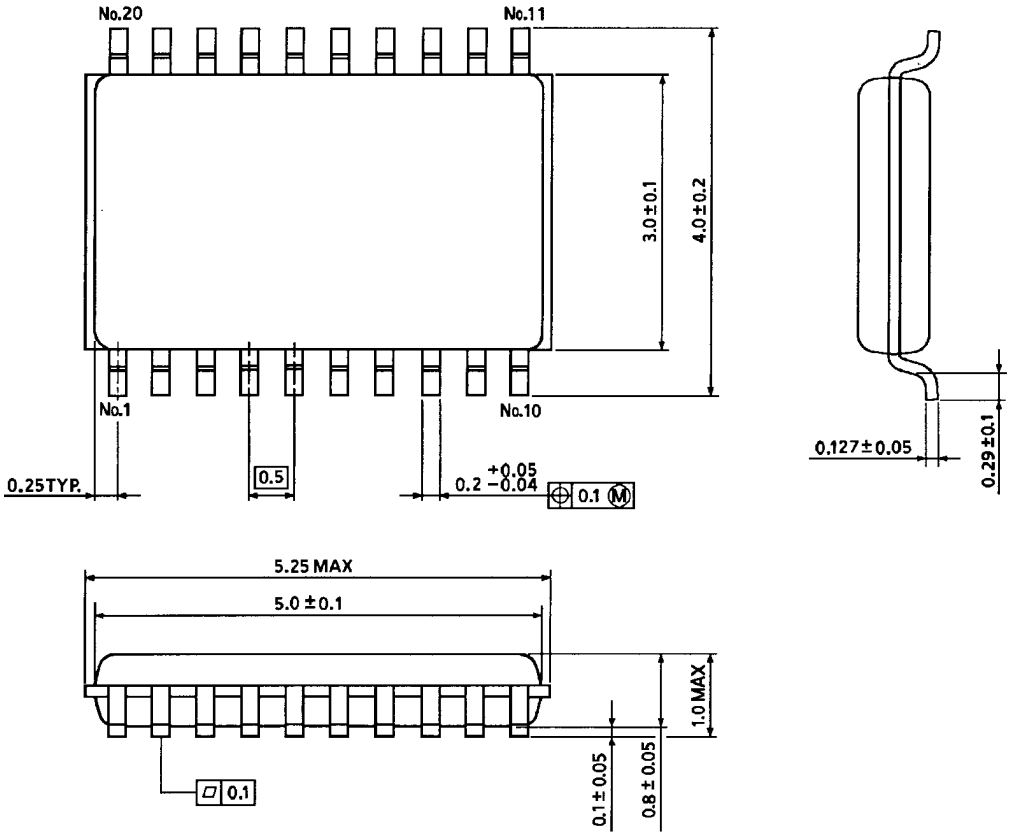



**Figure 3 $t_{pLZ}$, $t_{pHZ}$, $t_{pZL}$, $t_{pZH}$**

## Package Dimensions

VSSOP20-P-0030-0.50 Unit : mm

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