

TC7MBL3244AFT, TC7MBL3244AFK

Octal Low Voltage Bus Switch

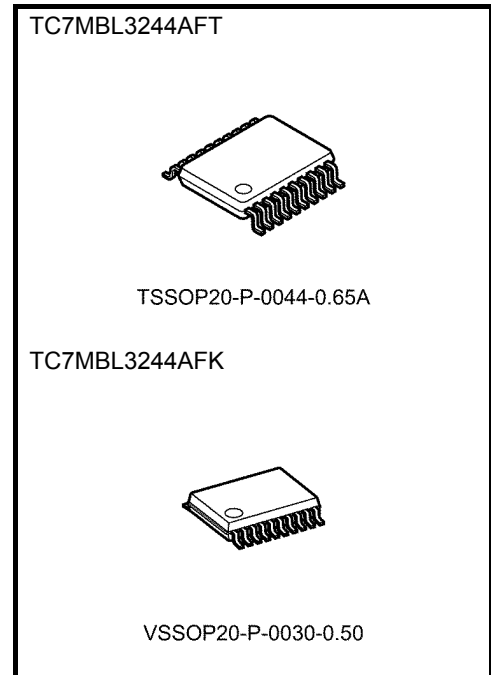
The TC7MBL3244A provides eight bits of low-voltage, high-speed bus switching in a standard '244 device pinout. The low ON-resistance of the switch allows connections to be made with minimal propagation delay and while maintaining CMOS low power dissipation.

The device comprises 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 to guard against static discharge.

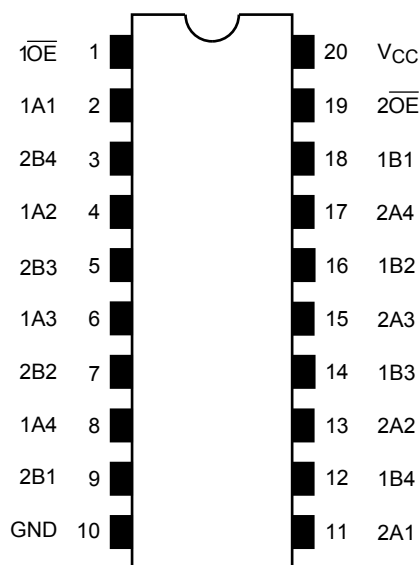
Features

- Operating voltage: $V_{CC} = 2.0$ to 3.6 V
- High speed: $t_{pd} = 0.31$ ns (max) @ $V_{CC} = 3.0$ V
- Low ON-resistance: $R_{ON} = 5 \Omega$ (typ.) @ $V_{CC} = 3.0$ V
- ESD performance: Machine model $\geq \pm 200$ V
Human body model $\geq \pm 2000$ V
- Power-down protection for inputs (\overline{OE} input only)
- Package: TSSOP20, VSSOP20 (US20)
- Pin compatible with the 74xx244 type



Weight:
 TSSOP20-P-0044-0.65A : 0.08 g (typ.)
 VSSOP20-P-0030-0.50 : 0.03 g (typ.)

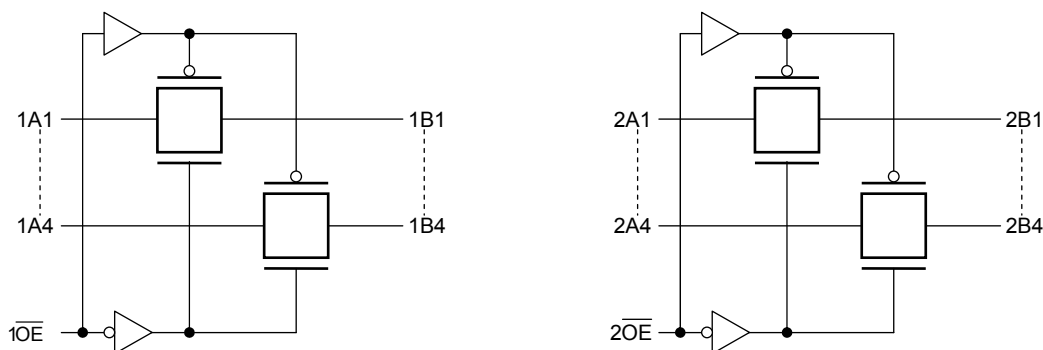
Pin Assignment (top view)



Truth Table

| Inputs | Function |
|--------|-----------------|
| OE | |
| L | A port = B port |
| H | Disconnect |

System Diagram



Absolute Maximum Ratings (Note)

| Characteristic | Symbol | Rating | Unit |
|-----------------------------|-------------------|----------------------|------|
| Power supply range | V_{CC} | -0.5~4.6 | V |
| Control pin input voltage | V_{IN} | -0.5~4.6 | V |
| Switch terminal I/O voltage | V_S | -0.5 to $V_{CC}+0.5$ | V |
| Clump diode current | Control input pin | -50 | mA |
| | Switch terminal | ±50 | |
| Switch I/O current | I_S | 128 | mA |
| Power dissipation | P_D | 180 | mW |
| DC V_{CC}/GND current | I_{CC}/I_{GND} | ±100 | mA |
| Storage temperature | T_{stg} | -65 to 150 | °C |

Note: Exceeding any of the absolute maximum ratings, even briefly, may 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)

| Characteristic | Symbol | Rating | Unit |
|---------------------------|-----------|---------------|------|
| Power supply voltage | V_{CC} | 2.0 to 3.6 | V |
| Control pin input voltage | V_{IN} | 0 to 3.6 | V |
| Switch I/O voltage | V_S | 0 to V_{CC} | V |
| Operating temperature | T_{opr} | -40 to 85 | °C |
| Input rise and fall time | dt/dv | 0 to 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 V_{CC} or GND.

Electrical Characteristics

DC Characteristics (Ta = -40 to 85°C)

| Characteristic | Symbol | Test Condition | V _{CC} (V) | Min | Typ. | Max | Unit |
|--|------------------|---|---------------------|-----------------------|------|-----------------------|------|
| | | | | | | | |
| High-level control input voltage | V _{IH} | — | 2.0 to 3.6 | 0.7 × V _{CC} | — | — | V |
| Low-level control input voltage | V _{IL} | — | 2.0 to 3.6 | — | — | 0.3 × V _{CC} | |
| Control input current | I _{IN} | V _{IN} = 0 to 3.6 V | 2.0 to 3.6 | — | — | ±1.0 | μA |
| Power off leakage current | I _{OFF} | \overline{OE} = 0 to 3.6 V | 0 | — | — | ±1.0 | μA |
| Off-stage leakage current (switch off) | I _{SZ} | A, B = 0 to V _{CC} , \overline{OE} = V _{CC} | 2.0 to 3.6 | — | — | ±1.0 | μA |
| Switch ON-resistance (Note 2) | R _{ON} | V _{IS} = 0 V, I _{IS} = 30 mA (Note 1) | 3.0 | — | 2 | 7 | Ω |
| | | V _{IS} = 3.0 V, I _{IS} = 30 mA (Note 1) | 3.0 | — | 3 | 9 | |
| | | V _{IS} = 2.4 V, I _{IS} = 15 mA (Note 1) | 3.0 | — | 5 | 20 | |
| | | V _{IS} = 0 V, I _{IS} = 24 mA (Note 1) | 2.3 | — | 3 | 10 | |
| | | V _{IS} = 2.3 V, I _{IS} = 24 mA (Note 1) | 2.3 | — | 4 | 15 | |
| Quiescent supply current | I _{CC} | V _{IN} = V _{CC} or GND, I _{OUT} = 0 | 3.6 | — | — | 10 | μA |

Note 1: All typical values are at Ta = 25°C.

Note 2: Measured by voltage drop between A and B pins at indicated current through the switch. ON-resistance is determined by the lower of the voltages on the two pins (A or B).

AC Characteristics (Ta = -40 to 85°C)

| Characteristic | Symbol | Test Condition | V _{CC} (V) | Min | Max | Unit |
|--------------------------------|--------------------------------------|---------------------------|---------------------|-----|------|------|
| | | | | | | |
| Propagation delay (bus to bus) | t _{pLH} t _{pHL} | Figure 1, Figure 2 (Note) | 3.3 ± 0.3 | — | 0.31 | ns |
| | | | 2.5 ± 0.2 | — | 0.52 | |
| Output enable time | t _{pZL} t _{pZH} | Figure 1, Figure 3 | 3.3 ± 0.3 | — | 6 | ns |
| | | | 2.5 ± 0.2 | — | 7.5 | |
| Output disable time | t _{pLZ} t _{pHZ} | Figure 1, Figure 3 | 3.3 ± 0.3 | — | 6 | ns |
| | | | 2.5 ± 0.2 | — | 7.5 | |

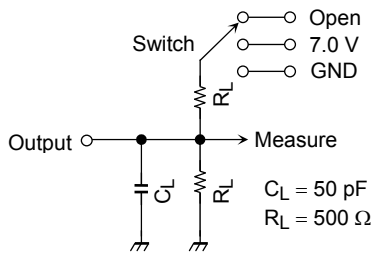
Note: This parameter is guaranteed by design but is not tested. The bus switch contributes no propagation delay other than the RC delay of the typical ON-resistance of the switch and the 50 pF load capacitance when driven by an ideal voltage from the source (zero output impedance).

Capacitance (Ta = 25°C)

| Characteristic | Symbol | Test Condition | V _{CC} (V) | Typ. | Unit | |
|-----------------------------|------------------|-----------------------------------|---------------------|------|------|----|
| | | | | | | |
| Control input capacitance | C _{IN} | (Note) | 3.0 | 3 | pF | |
| Switch terminal capacitance | C _{I/O} | \overline{OE} = V _{CC} | (Note) | 3.0 | 17 | pF |

Note: This parameter is guaranteed by design.

AC Test Circuit



| Parameter | Switch |
|-----------------------|-------------------|
| t_{pLH} , t_{pHL} | Open |
| t_{pLZ} , t_{pZL} | $2 \times V_{CC}$ |
| t_{pHZ} , t_{pZH} | GND |

Figure 1

AC Waveforms

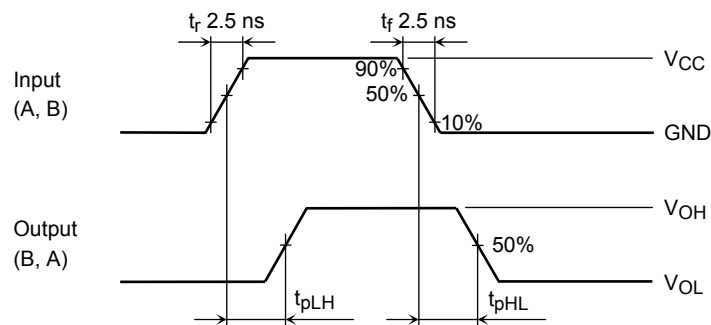


Figure 2 t_{pLH} , t_{pHL}

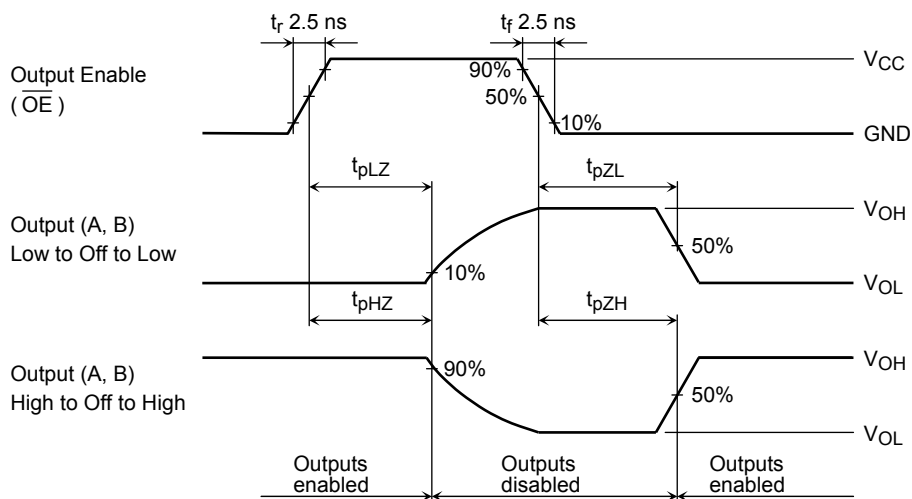
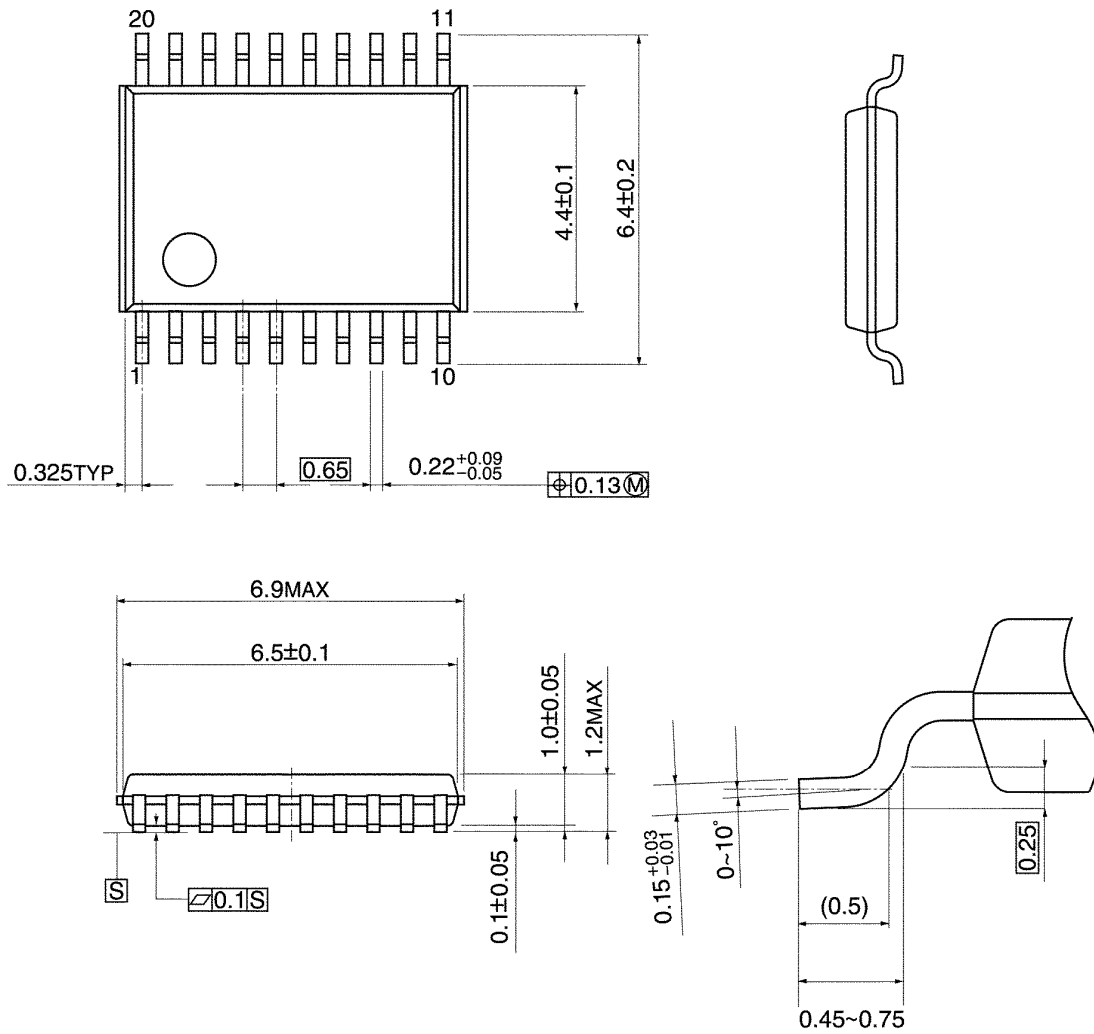


Figure 3 t_{pLZ} , t_{pHZ} , t_{pZL} , t_{pZH}

Package Dimensions

TSSOP20-P-0044-0.65A

Unit: mm

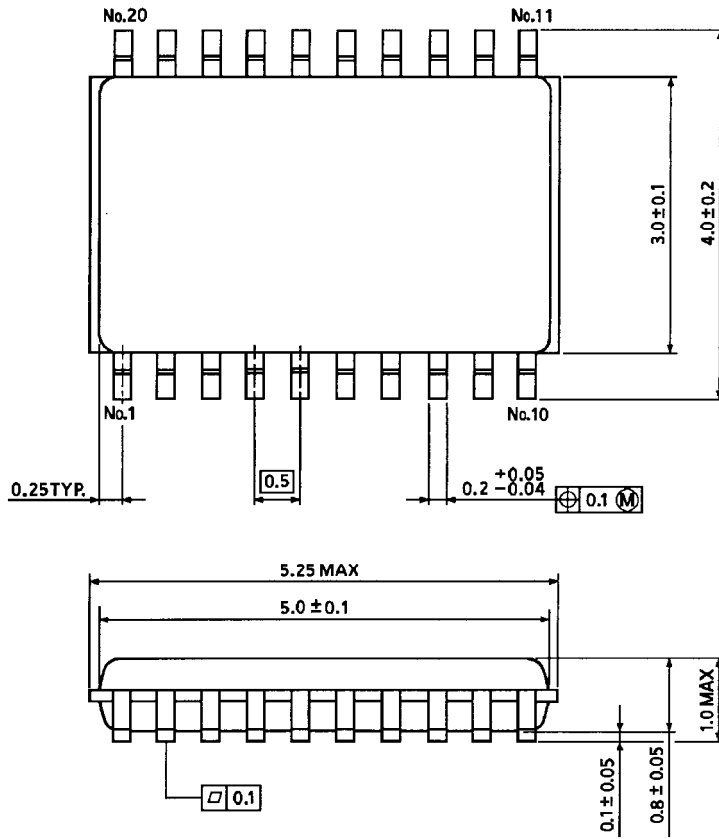


Weight: 0.08g (typ.)

Package Dimensions

VSSOP20-P-0030-0.50

Unit : mm



Weight: 0.03 g (typ.)

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