

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC74VCX164245FT

16-Bit Dual Supply Bus Transceiver

The TC74VCX164245FT is a dual supply, advanced high-speed CMOS 16-bit dual supply voltage interface bus transceiver fabricated with silicon gate CMOS technology.

It is also designed with over voltage tolerant inputs and outputs up to 3.6 V.

Designed for use as an interface between a 3.3-V or 2.5-V bus and a 2.5-V or 1.8-V bus in mixed 3.3-V or 2.5-V/2.5-V or 1.8-V supply systems.

The B-port interfaces with the 3.3-V or 2.5-V bus, the A-port with the 2.5-V or 1.8-V bus.

The direction of data transmission is determined by the level of the DIR input. The enable input (\overline{OE}) can be used to disable the device so that the buses are effectively isolated.

All inputs are equipped with protection circuits against static discharge or transient excess voltage.



Weight: 0.25 g (typ.)

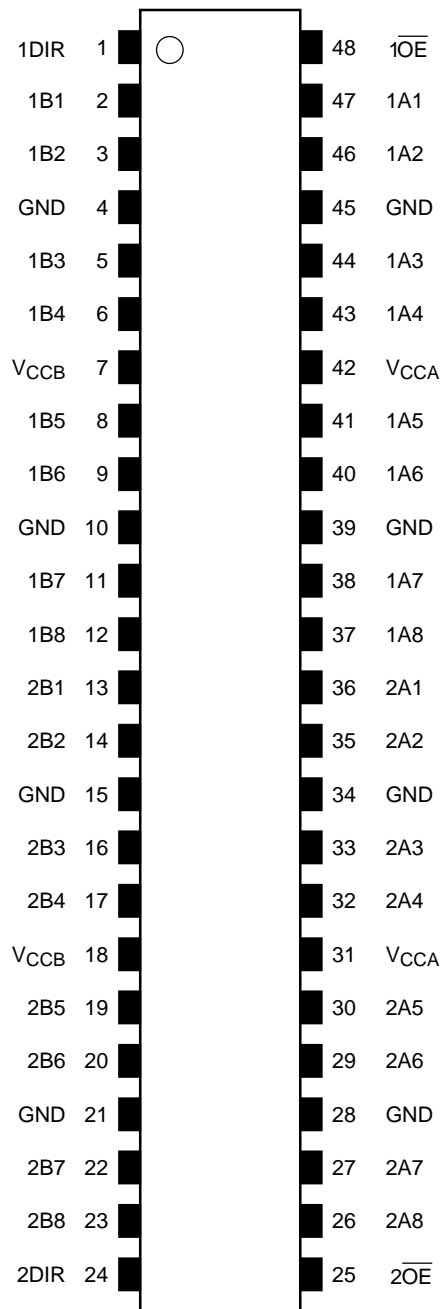
Features

- Bidirectional interface between 3.3 V and 2.5 V, 3.3 V and 1.8 V, 2.5 V and 1.8 V
- High-speed: $t_{pd} = 4.6$ ns (max) ($V_{CCB} = 3.3 \pm 0.3$ V, $V_{CCA} = 2.5 \pm 0.2$ V)
 $t_{pd} = 7.1$ ns (max) ($V_{CCB} = 3.3 \pm 0.3$ V, $V_{CCA} = 1.8 \pm 0.15$ V)
 $t_{pd} = 7.0$ ns (max) ($V_{CCB} = 2.5 \pm 0.2$ V, $V_{CCA} = 1.8 \pm 0.15$ V)
- Output current: $I_{OH}/I_{OL} = \pm 24$ mA (min) ($V_{CC} = 3.0$ V)
: $I_{OH}/I_{OL} = \pm 18$ mA (min) ($V_{CC} = 2.3$ V)
: $I_{OH}/I_{OL} = \pm 6$ mA (min) ($V_{CC} = 1.65$ V)
- Latch-up performance: ± 300 mA
- ESD performance: Machine model $> \pm 200$ V
: Human body model $> \pm 2000$ V
- Package: TSSOP (thin shrink small outline package)
- 3.6-V tolerant function and power-down protection provided on all inputs and outputs

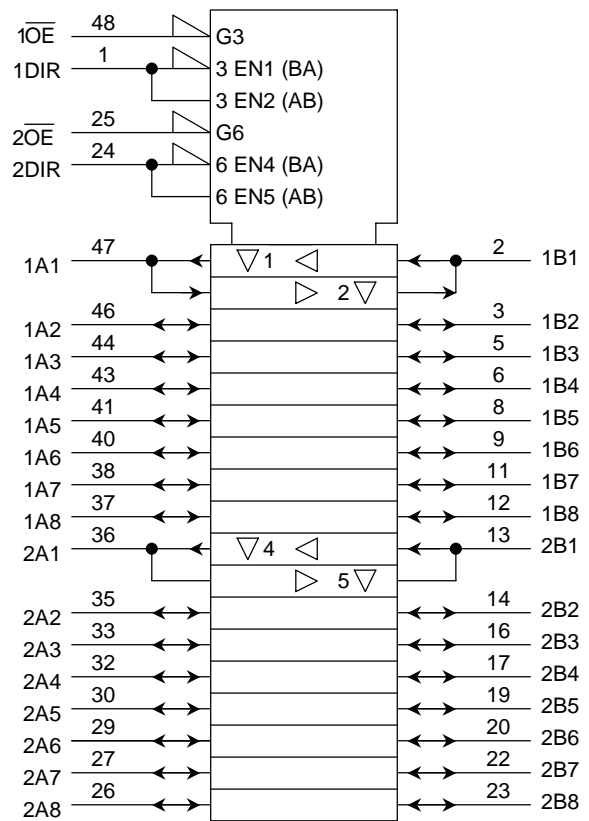
Note 1: Do not apply a signal to any bus pins when it is in the output mode. Damage may result.

All floating (high impedance) bus pins must have their input level fixed by means of pull-up or pull-down resistors.

Pin Assignment (top view)



IEC Logic Symbol



Truth Table

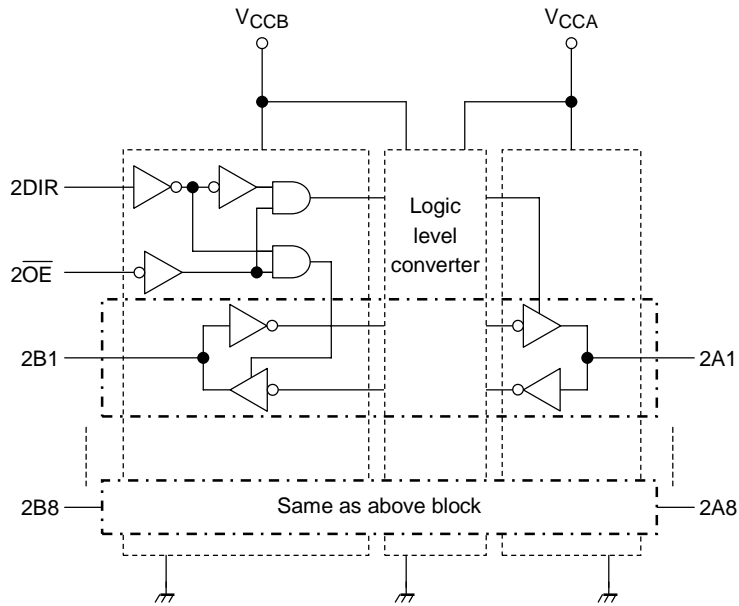
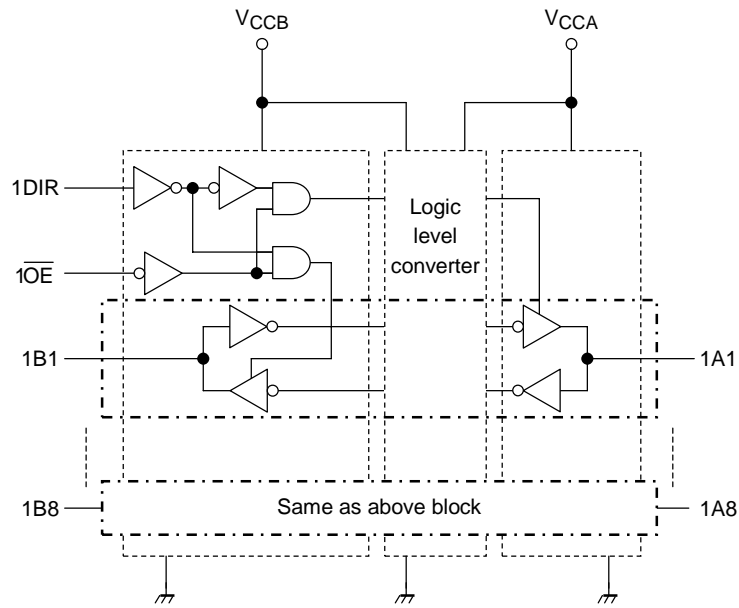
| Inputs | | Function | | Outputs |
|------------------|------|----------------|----------------|---------|
| $\overline{1OE}$ | 1DIR | Bus 1A1-1A8 | Bus 1B1-1B8 | |
| L | L | Output | Input | A = B |
| L | H | Input | Output | B = A |
| H | X | Z | | Z |

| Inputs | | Function | | Outputs |
|------------------|------|----------------|----------------|---------|
| $\overline{2OE}$ | 2DIR | Bus 2A1-2A8 | Bus 2B1-2B8 | |
| L | L | Output | Input | A = B |
| L | H | Input | Output | B = A |
| H | X | Z | | Z |

X: Don't care

Z: High impedance

Block Diagram



Maximum Ratings

| Characteristics | Symbol | Rating | Unit |
|--|------------|----------------------------------|-------------|
| Power supply voltage (Note 2) | V_{CCB} | -0.5 to 4.6 | V |
| | V_{CCA} | -0.5 to V_{CCB} | |
| DC input voltage (DIR, \overline{OE}) | V_{IN} | -0.5 to 4.6 | V |
| DC bus I/O voltage | V_{IOB} | -0.5 to 4.6 (Note 3) | V |
| | | -0.5 to $V_{CCB} + 0.5$ (Note 4) | |
| | V_{IOA} | -0.5 to 4.6 (Note 3) | |
| | | -0.5 to $V_{CCA} + 0.5$ (Note 4) | |
| Input diode current | I_{IK} | -50 | mA |
| Output diode current | $I_{I/OK}$ | ± 50 (Note 5) | mA |
| DC output current | I_{OUTB} | ± 50 | mA |
| | I_{OUTA} | ± 50 | |
| DC V_{CC} /ground current per supply pin | I_{CCB} | ± 100 | mA |
| | I_{CCA} | ± 100 | |
| Power dissipation | P_D | 400 | mW |
| Storage temperature | T_{stg} | -65 to 150 | $^{\circ}C$ |

Note 2: $V_{CCB} > V_{CCA}$

Don't supply a voltage to V_{CCA} terminal when V_{CCB} is in the off-state.

Note 3: OFF state

Note 4: High or low state. I_{OUT} absolute maximum rating must be observed.

Note 5: $V_{OUT} < GND$, $V_{OUT} > V_{CC}$

Recommended Operating Range

| Characteristics | Symbol | Rating | Unit |
|--|------------|-------------------------|--------------------|
| Power supply voltage | V_{CCB} | 2.3 to 3.6 | V |
| | V_{CCA} | 1.65 to 2.7 | |
| Input voltage (DIR, \overline{OE}) | V_{IN} | 0 to 3.6 | V |
| Bus I/O voltage | V_{IOB} | 0 to 3.6 (Note 6) | V |
| | | 0 to V_{CCB} (Note 7) | |
| | V_{IOA} | 0 to 3.6 (Note 6) | |
| | | 0 to V_{CCA} (Note 7) | |
| Output current | I_{OUTB} | ± 24 (Note 8) | mA |
| | | ± 18 (Note 9) | |
| | I_{OUTA} | ± 18 (Note 10) | |
| | | ± 6 (Note 11) | |
| Operating temperature | T_{opr} | -40 to 85 | $^{\circ}\text{C}$ |
| Input rise and fall time | dt/dv | 0 to 10 (Note 12) | ns/V |

Note 6: Output in OFF state

Note 7: High or low state

Note 8: $V_{CCB} = 3.0$ to 3.6 V

Note 9: $V_{CCA} = 2.3$ to 2.7 V

Note 10: $V_{CCA} = 2.3$ to 2.7 V

Note 11: $V_{CCA} = 1.65$ to 1.95 V

Note 12: $V_{INB} = 0.8$ to 2.0 V, $V_{CCB} = 3.0$ V
 $V_{INA} = 0.7$ to 1.6 V, $V_{CCA} = 2.5$ V

Electrical Characteristics

DC Characteristics ($V_{CCB} = 3.3 \pm 0.3$ V, $V_{CCA} = 2.5 \pm 0.2$ V)

| Characteristics | Symbol | Test Condition | V_{CCB} (V) | V_{CCA} (V) | Ta = -40 to 85°C | | Unit | |
|----------------------------------|------------|--|------------------------------|---------------|------------------|-----------------|---------------|---|
| | | | | | Min | Max | | |
| H-level input voltage | V_{IHB} | DIR, \overline{OE} , Bn | 3.3 ± 0.3 | 2.5 ± 0.2 | 2.0 | — | V | |
| | V_{IHA} | An | 3.3 ± 0.3 | 2.5 ± 0.2 | 1.6 | — | | |
| L-level input voltage | V_{ILB} | DIR, \overline{OE} , Bn | 3.3 ± 0.3 | 2.5 ± 0.2 | — | 0.8 | V | |
| | V_{ILA} | An | 3.3 ± 0.3 | 2.5 ± 0.2 | — | 0.7 | | |
| H-level output voltage | V_{OHB} | $V_{IN} = V_{IH}$ or V_{IL} | $I_{OHB} = -100 \mu\text{A}$ | 3.3 ± 0.3 | 2.5 ± 0.2 | $V_{CCB} - 0.2$ | — | V |
| | | | $I_{OHB} = -24 \text{ mA}$ | 3.0 | 2.5 ± 0.2 | 2.2 | — | |
| | V_{OHA} | | $I_{OHA} = -100 \mu\text{A}$ | 3.3 ± 0.3 | 2.5 ± 0.2 | $V_{CCA} - 0.2$ | — | |
| | | | $I_{OHA} = -18 \text{ mA}$ | 3.3 ± 0.3 | 2.3 | 1.7 | — | |
| L-level output voltage | V_{OLB} | $V_{IN} = V_{IH}$ or V_{IL} | $I_{OLB} = 100 \mu\text{A}$ | 3.3 ± 0.3 | 2.5 ± 0.2 | — | 0.2 | V |
| | | | $I_{OLB} = 24 \text{ mA}$ | 3.0 | 2.5 ± 0.2 | — | 0.55 | |
| | V_{OLA} | | $I_{OLA} = 100 \mu\text{A}$ | 3.3 ± 0.3 | 2.5 ± 0.2 | — | 0.2 | |
| | | | $I_{OLA} = 18 \text{ mA}$ | 3.3 ± 0.3 | 2.3 | — | 0.6 | |
| 3-state output OFF state current | I_{OZB} | $V_{IN} = V_{IH}$ or V_{IL} $V_{OUT} = 0$ to 3.6 V | 3.3 ± 0.3 | 2.5 ± 0.2 | — | ± 10 | μA | |
| | I_{OZA} | $V_{IN} = V_{IH}$ or V_{IL} $V_{OUT} = 0$ to 3.6 V | 3.3 ± 0.3 | 2.5 ± 0.2 | — | ± 10 | | |
| Input leakage current | I_{IN} | V_{IN} (DIR, \overline{OE}) = 0 to 3.6 V | 3.3 ± 0.3 | 2.5 ± 0.2 | — | ± 5.0 | μA | |
| Power-off leakage current | I_{OFF} | $V_{IN}, V_{OUT} = 0$ to 3.6 V | 0 | 0 | — | 10 | μA | |
| Quiescent supply current | I_{CCB} | $V_{INA} = V_{CCA}$ or GND $V_{INB} = V_{CCB}$ or GND | 3.3 ± 0.3 | 2.5 ± 0.2 | — | 20 | μA | |
| | I_{CCA} | $V_{INA} = V_{CCA}$ or GND $V_{INB} = V_{CCB}$ or GND | 3.3 ± 0.3 | 2.5 ± 0.2 | — | 20 | | |
| | I_{CCB} | $V_{CCB} < (V_{IN}, V_{OUT}) \leq 3.6$ V | 3.3 ± 0.3 | 2.5 ± 0.2 | — | ± 20 | μA | |
| | I_{CCA} | $V_{CCA} \leq (V_{IN}, V_{OUT}) \leq 3.6$ V | 3.3 ± 0.3 | 2.5 ± 0.2 | — | ± 20 | | |
| | I_{CCTB} | $V_{INB} = V_{CCB} - 0.6$ V per input | 3.3 ± 0.3 | 2.5 ± 0.2 | — | 750 | μA | |
| | I_{CCTA} | $V_{INA} = V_{CCA} - 0.6$ V per input | 3.3 ± 0.3 | 2.5 ± 0.2 | — | 750 | μA | |

DC Characteristics ($V_{CCB} = 3.3 \pm 0.3$ V, $V_{CCA} = 1.8 \pm 0.15$ V)

| Characteristics | Symbol | Test Condition | V_{CCB} (V) | V_{CCA} (V) | Ta = -40 to 85°C | | Unit | |
|----------------------------------|------------|--|------------------------------|----------------|----------------------|----------------------|---------------|---|
| | | | | | Min | Max | | |
| H-level input voltage | V_{IHB} | DIR, \overline{OE} , Bn | 3.3 ± 0.3 | 1.8 ± 0.15 | 2.0 | — | V | |
| | V_{IHA} | An | 3.3 ± 0.3 | 1.8 ± 0.15 | $0.65 \times V_{CC}$ | — | | |
| L-level input voltage | V_{ILB} | DIR, \overline{OE} , Bn | 3.3 ± 0.3 | 1.8 ± 0.15 | — | 0.8 | V | |
| | V_{ILA} | An | 3.3 ± 0.3 | 1.8 ± 0.15 | — | $0.35 \times V_{CC}$ | | |
| H-level output voltage | V_{OHB} | $V_{IN} = V_{IH}$ or V_{IL} | $I_{OHB} = -100 \mu\text{A}$ | 3.3 ± 0.3 | 1.8 ± 0.15 | $V_{CCB} - 0.2$ | — | V |
| | | | $I_{OHB} = -24 \text{ mA}$ | 3.0 | 1.8 ± 0.15 | 2.2 | — | |
| | V_{OHA} | | $I_{OHA} = -100 \mu\text{A}$ | 3.3 ± 0.3 | 1.8 ± 0.15 | $V_{CCA} - 0.2$ | — | |
| | | | $I_{OHA} = -6 \text{ mA}$ | 3.3 ± 0.3 | 1.65 | 1.25 | — | |
| L-level output voltage | V_{OLB} | $V_{IN} = V_{IH}$ or V_{IL} | $I_{OLB} = 100 \mu\text{A}$ | 3.3 ± 0.3 | 1.8 ± 0.15 | — | 0.2 | V |
| | | | $I_{OLB} = 24 \text{ mA}$ | 3.0 | 1.8 ± 0.15 | — | 0.55 | |
| | V_{OLA} | | $I_{OLA} = 100 \mu\text{A}$ | 3.3 ± 0.3 | 1.8 ± 0.15 | — | 0.2 | |
| | | | $I_{OLA} = 6 \text{ mA}$ | 3.3 ± 0.3 | 1.65 | — | 0.3 | |
| 3-state output OFF state current | I_{OZB} | $V_{IN} = V_{IH}$ or V_{IL} $V_{OUT} = 0$ to 3.6 V | 3.3 ± 0.3 | 1.8 ± 0.15 | — | ± 10 | μA | |
| | I_{OZA} | $V_{IN} = V_{IH}$ or V_{IL} $V_{OUT} = 0$ to 3.6 V | 3.3 ± 0.3 | 1.8 ± 0.15 | — | ± 10 | | |
| Input leakage current | I_{IN} | V_{IN} (DIR, \overline{OE}) = 0 to 3.6 V | 3.3 ± 0.3 | 1.8 ± 0.15 | — | ± 5.0 | μA | |
| Power-off leakage current | I_{OFF} | $V_{IN}, V_{OUT} = 0$ to 3.6 V | 0 | 0 | — | 10 | μA | |
| Quiescent supply current | I_{CCB} | $V_{INA} = V_{CCA}$ or GND $V_{INB} = V_{CCB}$ or GND | 3.3 ± 0.3 | 1.8 ± 0.15 | — | 20 | μA | |
| | I_{CCA} | $V_{INA} = V_{CCA}$ or GND $V_{INB} = V_{CCB}$ or GND | 3.3 ± 0.3 | 1.8 ± 0.15 | — | 20 | | |
| | I_{CCB} | $V_{CCB} < (V_{IN}, V_{OUT}) \leq 3.6$ V | 3.3 ± 0.3 | 1.8 ± 0.15 | — | ± 20 | μA | |
| | I_{CCA} | $V_{CCA} \leq (V_{IN}, V_{OUT}) \leq 3.6$ V | 3.3 ± 0.3 | 1.8 ± 0.15 | — | ± 20 | | |
| | I_{CCTB} | $V_{INB} = V_{CCB} - 0.6$ V per input | 3.3 ± 0.3 | 1.8 ± 0.15 | — | 750 | μA | |
| | I_{CCTA} | $V_{INA} = V_{CCA} - 0.6$ V per input | 3.3 ± 0.3 | 1.8 ± 0.15 | — | 750 | μA | |

DC Characteristics ($V_{CCB} = 2.5 \pm 0.2$ V, $V_{CCA} = 1.8 \pm 0.15$ V)

| Characteristics | Symbol | Test Condition | V_{CCB} (V) | V_{CCA} (V) | Ta = -40 to 85°C | | Unit | |
|----------------------------------|------------|--|------------------------|----------------|----------------------|----------------------|---------|---|
| | | | | | Min | Max | | |
| H-level input voltage | V_{IHB} | DIR, \overline{OE} , Bn | 2.5 ± 0.2 | 1.8 ± 0.15 | 1.6 | — | V | |
| | V_{IHA} | An | 2.5 ± 0.2 | 1.8 ± 0.15 | $0.65 \times V_{CC}$ | — | | |
| L-level input voltage | V_{ILB} | DIR, \overline{OE} , Bn | 2.5 ± 0.2 | 1.8 ± 0.15 | — | 0.7 | V | |
| | V_{ILA} | An | 2.5 ± 0.2 | 1.8 ± 0.15 | — | $0.35 \times V_{CC}$ | | |
| H-level output voltage | V_{OHB} | $V_{IN} = V_{IH}$ or V_{IL} | $I_{OHB} = -100 \mu A$ | 2.5 ± 0.2 | 1.8 ± 0.15 | $V_{CCB} - 0.2$ | — | V |
| | | | $I_{OHB} = -18 mA$ | 2.3 | 1.8 ± 0.15 | 1.7 | — | |
| | V_{OHA} | | $I_{OHA} = -100 \mu A$ | 2.5 ± 0.2 | 1.8 ± 0.15 | $V_{CCA} - 0.2$ | — | |
| | | | $I_{OHA} = -6 mA$ | 2.5 ± 0.2 | 1.65 | 1.25 | — | |
| L-level output voltage | V_{OLB} | $V_{IN} = V_{IH}$ or V_{IL} | $I_{OLB} = 100 \mu A$ | 2.5 ± 0.2 | 1.8 ± 0.15 | — | 0.2 | V |
| | | | $I_{OLB} = 18 mA$ | 2.3 | 1.8 ± 0.15 | — | 0.6 | |
| | V_{OLA} | | $I_{OLA} = 100 \mu A$ | 2.5 ± 0.2 | 1.8 ± 0.15 | — | 0.2 | |
| | | | $I_{OLA} = 6 mA$ | 2.5 ± 0.2 | 1.65 | — | 0.3 | |
| 3-state output OFF state current | I_{OZB} | $V_{IN} = V_{IH}$ or V_{IL} $V_{OUT} = 0$ to 3.6 V | 2.5 ± 0.2 | 1.8 ± 0.15 | — | ± 10 | μA | |
| | I_{OZA} | $V_{IN} = V_{IH}$ or V_{IL} $V_{OUT} = 0$ to 3.6 V | 2.5 ± 0.2 | 1.8 ± 0.15 | — | ± 10 | | |
| Input leakage current | I_{IN} | V_{IN} (DIR, \overline{OE}) = 0 to 3.6 V | 2.5 ± 0.2 | 1.8 ± 0.15 | — | ± 5.0 | μA | |
| Power-off leakage current | I_{OFF} | $V_{IN}, V_{OUT} = 0$ to 3.6 V | 0 | 0 | — | 10 | μA | |
| Quiescent supply current | I_{CCB} | $V_{INA} = V_{CCA}$ or GND $V_{INB} = V_{CCB}$ or GND | 2.5 ± 0.2 | 1.8 ± 0.15 | — | 20 | μA | |
| | I_{CCA} | $V_{INA} = V_{CCA}$ or GND $V_{INB} = V_{CCB}$ or GND | 2.5 ± 0.2 | 1.8 ± 0.15 | — | 20 | | |
| | I_{CCB} | $V_{CCB} < (V_{IN}, V_{OUT}) \leq 3.6$ V | 2.5 ± 0.2 | 1.8 ± 0.15 | — | ± 20 | μA | |
| | I_{CCA} | $V_{CCA} \leq (V_{IN}, V_{OUT}) \leq 3.6$ V | 2.5 ± 0.2 | 1.8 ± 0.15 | — | ± 20 | | |
| | I_{CCTB} | $V_{INB} = V_{CCB} - 0.6$ V per input | 2.5 ± 0.2 | 1.8 ± 0.15 | — | 750 | μA | |
| | I_{CCTA} | $V_{INA} = V_{CCA} - 0.6$ V per input | 2.5 ± 0.2 | 1.8 ± 0.15 | — | 750 | μA | |

AC Characteristics (Ta = -40~85°C, Input: tr = tf = 2.0 ns, CL = 30 pF, RL = 500 Ω)

VCCB = 3.3 ± 0.3 V, VCCA = 2.5 ± 0.2 V

| Characteristics | Symbol | Test Condition | Min | Max | Unit |
|--|--|--------------------|-----|-----|------|
| Propagation delay time (Bn → An) | t _{pLH} t _{pHL} | Figure 1, Figure 2 | 0.8 | 4.6 | ns |
| 3-state output enable time (\overline{OE} → An) | t _{pZL} t _{pZH} | Figure 1, Figure 3 | 0.8 | 4.6 | |
| 3-state output disable time (\overline{OE} → An) | t _{pLZ} t _{pHZ} | Figure 1, Figure 3 | 0.8 | 4.4 | |
| Propagation delay time (An → Bn) | t _{pLH} t _{pHL} | Figure 1, Figure 2 | 0.6 | 4.4 | ns |
| 3-state output enable time (\overline{OE} → Bn) | t _{pZL} t _{pZH} | Figure 1, Figure 3 | 0.6 | 4.8 | |
| 3-state output disable time (\overline{OE} → Bn) | t _{pLZ} t _{pHZ} | Figure 1, Figure 3 | 0.8 | 4.8 | |
| Output to output skew | t _{osLH} t _{osHL} | (Note 12) | — | 0.5 | ns |

Note 12: Parameter guaranteed by design.

$$(t_{osLH} = |t_{pLHm} - t_{pLHn}|, t_{osHL} = |t_{pHLm} - t_{pHLn}|)$$

VCCB = 3.3 ± 0.3 V, VCCA = 1.8 ± 0.15 V

| Characteristics | Symbol | Test Condition | Min | Max | Unit |
|--|--|--------------------|-----|-----|------|
| Propagation delay time (Bn → An) | t _{pLH} t _{pHL} | Figure 1, Figure 2 | 1.5 | 7.1 | ns |
| 3-state output enable time (\overline{OE} → An) | t _{pZL} t _{pZH} | Figure 1, Figure 3 | 1.5 | 8.2 | |
| 3-state output disable time (\overline{OE} → An) | t _{pLZ} t _{pHZ} | Figure 1, Figure 3 | 0.8 | 4.5 | |
| Propagation delay time (An → Bn) | t _{pLH} t _{pHL} | Figure 1, Figure 2 | 0.6 | 5.5 | ns |
| 3-state output enable time (\overline{OE} → Bn) | t _{pZL} t _{pZH} | Figure 1, Figure 3 | 0.6 | 5.3 | |
| 3-state output disable time (\overline{OE} → Bn) | t _{pLZ} t _{pHZ} | Figure 1, Figure 3 | 0.8 | 5.6 | |
| Output to output skew | t _{osLH} t _{osHL} | (Note 12) | — | 0.5 | ns |

Note 12: Parameter guaranteed by design.

$$(t_{osLH} = |t_{pLHm} - t_{pLHn}|, t_{osHL} = |t_{pHLm} - t_{pHLn}|)$$

$V_{CCB} = 2.5 \pm 0.2 \text{ V}$, $V_{CCA} = 1.8 \pm 0.15 \text{ V}$

| Characteristics | Symbol | Test Condition | Min | Max | Unit |
|--|-------------|--------------------|-----|-----|------|
| Propagation delay time (Bn → An) | t_{pLH} | Figure 1, Figure 2 | 1.5 | 7.0 | ns |
| | t_{pHL} | | | | |
| 3-state output enable time (\overline{OE} → An) | t_{pZL} | Figure 1, Figure 3 | 1.5 | 8.3 | |
| | t_{pZH} | | | | |
| 3-state output disable time (\overline{OE} → An) | t_{pLZ} | Figure 1, Figure 3 | 0.8 | 4.6 | |
| | t_{pHZ} | | | | |
| Propagation delay time (An → Bn) | t_{pLH} | Figure 1, Figure 2 | 0.8 | 5.8 | |
| | t_{pHL} | | | | |
| 3-state output enable time (\overline{OE} → Bn) | t_{pZL} | Figure 1, Figure 3 | 0.8 | 5.8 | |
| | t_{pZH} | | | | |
| 3-state output disable time (\overline{OE} → Bn) | t_{pLZ} | Figure 1, Figure 3 | 0.8 | 5.2 | |
| | t_{pHZ} | | | | |
| Output to output skew | $t_{oS LH}$ | (Note 12) | — | 0.5 | ns |
| | $t_{oS HL}$ | | | | |

Note 12: Parameter guaranteed by design.

($t_{oS LH} = |t_{pLHm} - t_{pLHn}|$, $t_{oS HL} = |t_{pHLm} - t_{pHLn}|$)

Dynamic Switching Characteristics (Ta = 25°C, Input: $t_r = t_f = 2.0 \text{ ns}$, $C_L = 30 \text{ pF}$)

| Characteristics | Symbol | Test Condition | V _{CCB} (V) | | V _{CCA} (V) | Typ. | Unit |
|--|--------|------------------|---|-----|----------------------|-------|------|
| | | | 2.5 | 3.3 | | | |
| Quiet output maximum dynamic V _{OL} | B → A | V _{OLP} | V _{IH} = V _{CC} , V _{IL} = 0 V | 2.5 | 1.8 | 0.25 | V |
| | | | | 3.3 | 1.8 | 0.25 | |
| | | | | 3.3 | 2.5 | 0.6 | |
| | A → B | | | 2.5 | 1.8 | 0.6 | |
| | | | | 3.3 | 1.8 | 0.8 | |
| | | | | 3.3 | 2.5 | 0.8 | |
| Quiet output minimum dynamic V _{OL} | B → A | V _{OLV} | V _{IH} = V _{CC} , V _{IL} = 0 V | 2.5 | 1.8 | -0.25 | V |
| | | | | 3.3 | 1.8 | -0.25 | |
| | | | | 3.3 | 2.5 | -0.6 | |
| | A → B | | | 2.5 | 1.8 | -0.6 | |
| | | | | 3.3 | 1.8 | -0.8 | |
| | | | | 3.3 | 2.5 | -0.8 | |
| Quiet output minimum dynamic V _{OH} | B → A | V _{OHV} | V _{IH} = V _{CC} , V _{IL} = 0 V | 2.5 | 1.8 | 1.3 | V |
| | | | | 3.3 | 1.8 | 1.3 | |
| | | | | 3.3 | 2.5 | 1.7 | |
| | A → B | | | 2.5 | 1.8 | 1.7 | |
| | | | | 3.3 | 1.8 | 2.0 | |
| | | | | 3.3 | 2.5 | 2.0 | |

Capacitive Characteristics (Ta = 25°C)

| Characteristics | Symbol | Test Circuit | Test Condition | V _{CCB} (V) | | Typ. | Unit |
|--|------------------|--------------|-----------------------------|----------------------|-----|------|------|
| | | | | V _{CCA} (V) | | | |
| Input capacitance | C _{IN} | — | DIR, $\overline{\text{OE}}$ | 3.3 | 2.5 | 7 | pF |
| Output capacitance | C _{I/O} | — | An, Bn | 3.3 | 2.5 | 8 | pF |
| Power dissipation capacitance (Note 13) | C _{PDA} | — | A ⇒ B (DIR = "H") | 3.3 | 2.5 | 2 | pF |
| | | | B ⇒ A (DIR = "L") | 3.3 | 2.5 | 33 | |
| | C _{PDB} | — | A ⇒ B (DIR = "H") | 3.3 | 2.5 | 24 | |
| | | | B ⇒ A (DIR = "L") | 3.3 | 2.5 | 3 | |

Note 13: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation:

$$I_{CC(\text{opr})} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/16 \text{ (per bit)}$$

AC Test Circuit

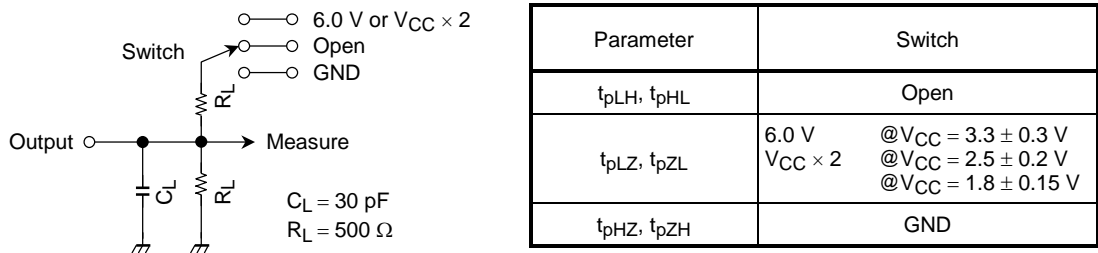


Figure 1

AC Waveform

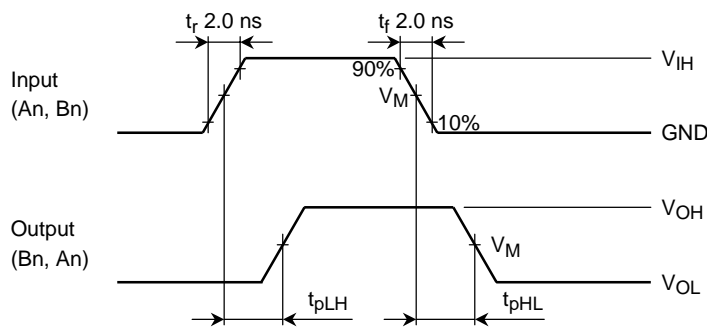


Figure 2 t_{pLH} , t_{pHL}

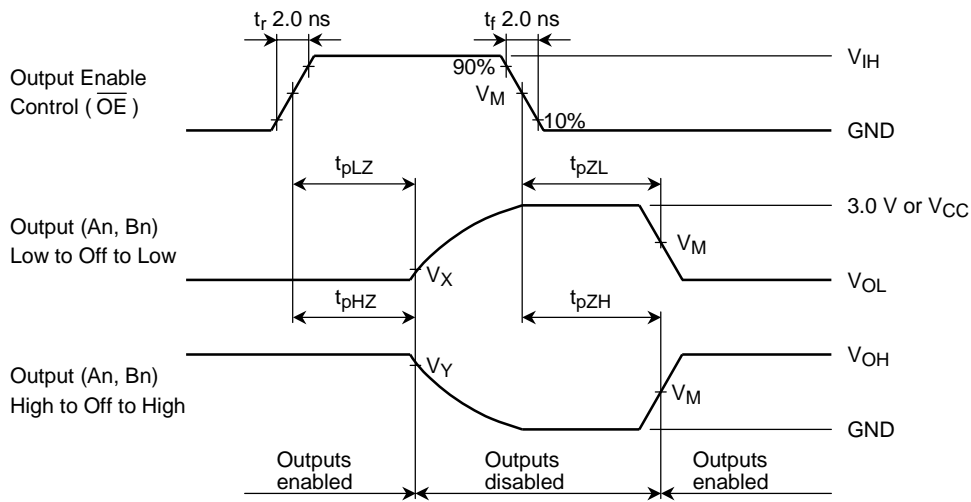


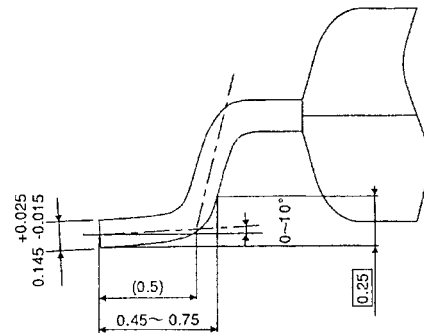
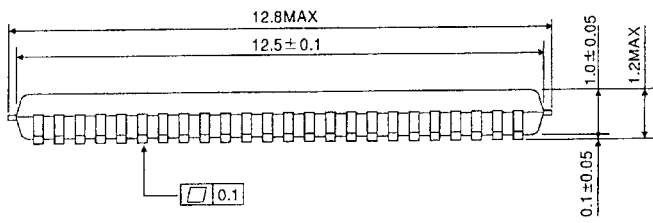
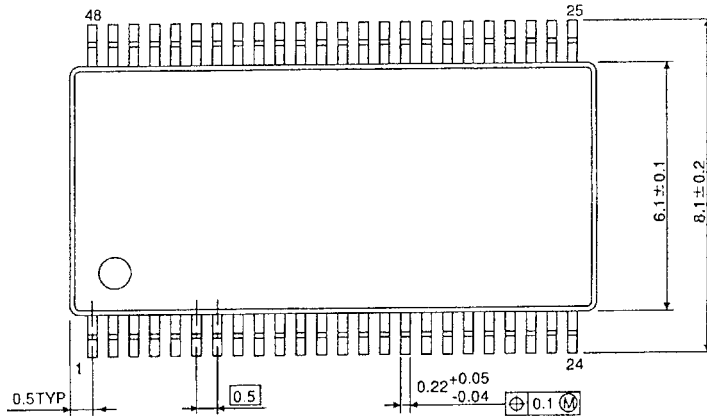
Figure 3 t_{pLZ} , t_{pHZ} , t_{pZL} , t_{pZH}

| Symbol | V_{CC} | | |
|----------|------------------|-------------------|-------------------|
| | 3.3 ± 0.3 V | 2.5 ± 0.2 V | 1.8 ± 0.15 V |
| V_{IH} | 2.7 V | V_{CC} | V_{CC} |
| V_M | 1.5 V | $V_{CC}/2$ | $V_{CC}/2$ |
| V_X | $V_{OL} + 0.3$ V | $V_{OL} + 0.15$ V | $V_{OL} + 0.15$ V |
| V_Y | $V_{OH} - 0.3$ V | $V_{OH} - 0.15$ V | $V_{OH} - 0.15$ V |

Package Dimensions

TSSOP48-P-0061-0.50

Unit : mm



Weight: 0.25 g (typ.)

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000707EBA

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