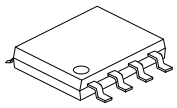
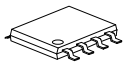
UVXS0102 **CMOS IC**

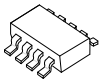
# 2-BIT BIDIRECTIONAL VOLTAGE-LEVEL TRANSLATOR FOR OPEN-DRAIN AND PUSH-PULL APPLICATIONS



SOP-8



MSOP-8



TSOT-23-8

CDFN2030-8

## ■ DESCRIPTION

The UTC **UVXS0102** is a two-bit non-inverting bidirectional voltage-level translator and can be used to establish digital switching compatibility between mixed-voltage systems.

The UTC **UVXS0102** separates A ports with B ports, and both ports are configurable power-supply rails, with the A ports supporting operating voltages from 1.65V to 3.6V, and the B ports supporting operating voltages from 2.3V to 5.5V. This allows the support of both lower and higher logic signal levels while providing bidirectional translation capabilities between any of the 1.8V, 2.5V, 3.3V, and 5V voltage nodes.

All I/Os of the UTC **UVXS0102** are placed in the high-impedance state when the output-enable (OE) input is low, which significantly reduces the power-supply quiescent current consumption. So, to ensure the high-impedance state during power up or power down, OE should be tied to GND through a pull-down resistor; the minimum value of the resistor is determined by the current-sourcing capability of the driver.

## ■ FEATURES

* Maximum Data Rates
  24 Mbps (Push Pull)
  2 Mbps (Open Drain)
* 1.65V~3.6V on A ports and 2.3V~5.5V on B ports ($V_{CCA} \leq V_{CCB}$)
* No Direction-Control Signal Needed
* $V_{CC}$ Isolation Feature: If either $V_{CC}$ input is at GND, both ports are in the High-Impedance state
* No Power-Supply Sequencing Required: Either $V_{CCA}$ or $V_{CCB}$ can be ramped first
* $I_{off}$ Supports Partial-Power-Down Mode Operation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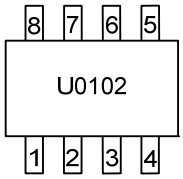
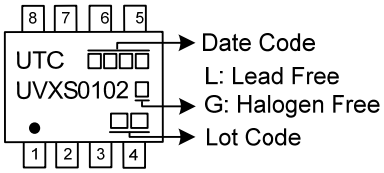
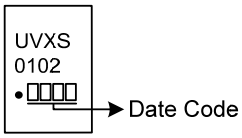
## ■ ORDERING INFORMATION

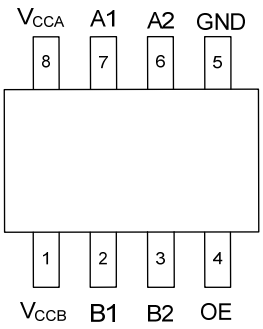
| Ordering Number | | Package | Packing |
|---|---|---|---|
| Lead Free | Halogen Free | | |
| UVXS0102L-AH8-R | UVXS0102G-AH8-R | TSOT-23-8 | Tape Reel |
| UVXS0102L-S08-R | UVXS0102G-S08-R | SOP-8 | Tape Reel |
| UVXS0102L-SM1-R | UVXS0102G-SM1-R | MSOP-8 | Tape Reel |
| UVXS0102L-CK08-2030-R | UVXS0102G-CK08-2030-R | CDFN2030-8 | Tape Reel |

| | |
|---|---|
| UVXS0102G-AH8-R<br>(1)Packing Type<br>(2)Package Type<br>(3)Green Package | (1) R: Tape Reel<br>(2) AH8: TSOT-23-8, S08: SOP-8, SM1: MSOP-8<br>CK08-2030: CDFN2030-8<br>(3) G: Halogen Free and Lead Free, L: Lead Free |

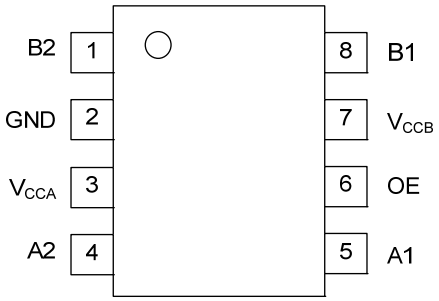
## ■ MARKING

| PACKAGE | MARKING |
|---|---|
| TSOT-23-8 |  |
| SOP-8 / MSOP-8 |  |
| CDFN2030-8 |  |

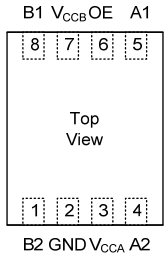
## ■ PIN CONFIGURATION




TSOT-23-8




SOP-8 / MSOP-8

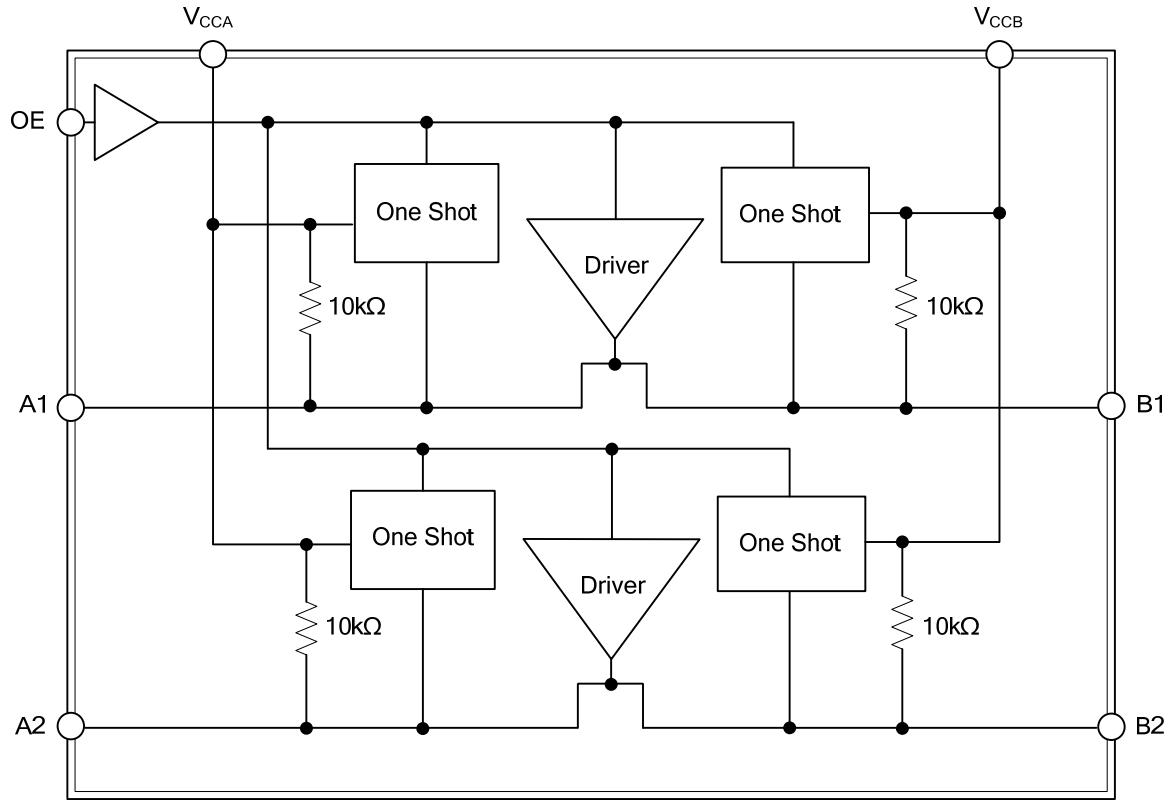



CDFN2030-8

## ■ PIN DESCRIPTION

| PIN NO. | | PIN NAME | DESCRIPTION |
|---|---|---|---|
| TSOT-23-8 | SOP-8<br>MSOP-8<br>CDFN2030-8 | | |
| 1 | 7 | $V_{CCB}$ | Power: B-port supply voltage. 2.3V≤$V_{CCB}$≤5.5V and $V_{CCA}$≤$V_{CCB}$ |
| 2 | 8 | B1 | B-port: Input/output. Referenced to $V_{CCB}$ |
| 3 | 1 | B2 | B-port: Input/output. Referenced to $V_{CCB}$ |
| 4 | 6 | OE | Enable: active High, Pull OE low to place all outputs in 3-state mode. Referenced to $V_{CCA}$ |
| 5 | 2 | GND | Ground |
| 6 | 4 | A2 | A-port: Input/output. Referenced to $V_{CCA}$ |
| 7 | 5 | A1 | A-port: Input/output. Referenced to $V_{CCA}$ |
| 8 | 3 | $V_{CCA}$ | Power: A-port supply voltage. 1.65V≤$V_{CCA}$≤3.6V |

## ■ BLOCK DIAGRAM



## ■ ABSOLUTE MAXIMUM RATING (NOTE 1)

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|---|---|---|---|---|
| Supply Voltage Range | | $V_{CCA}$ | -0.5 ~ 4.6 | V |
| Supply Voltage Range | | $V_{CCB}$ | -0.5 ~ 6.5 | V |
| Input Voltage Range (Note 2) | A port | $V_I$ | -0.5 ~ 4.6 | V |
| | B port | | -0.5 ~ 6.5 | |
| Voltage Range Applied To Any Output In The High-Impedance Or Power-Off State (Note 2) | A port | $V_O$ | -0.5 ~ 4.6 | V |
| | B port | | -0.5 ~ 6.5 | |
| Voltage Range Applied To Any Output In The High Or Low State (Note 2, 3) | A port | $V_O$ | -0.5 ~ $V_{CCA}$+0.5 | V |
| | B port | | -0.5 ~ $V_{CCB}$+0.5 | |
| Input Clamp Current | $V_I$<0 | $I_{IK}$ | -50 | mA |
| Output Clamp Current | $V_O$<0 | $I_{OK}$ | -50 | mA |
| Continuous Output Current | | $I_O$ | ±50 | mA |
| Continuous Current Through $V_{CCA}$, $V_{CCB}$, or GND | | $I_{CC}$ / $I_{GND}$ | ±100 | mA |
| Junction Temperature | | $T_J$ | +150 | °C |
| Storage Temperature | | $T_{STG}$ | -65 ~ +150 | °C |

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.
2. The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
3. The value of $V_{CCA}$ and $V_{CCB}$ are provided in the recommended operating conditions table.

## ■ RECOMMENDED OPERATING CONDITIONS

$V_{CCI}$ is the supply voltage associated with the input port. $V_{CCO}$ is the supply voltage associated with the output port.

| PARAMETER | | | SYMBOL | RATINGS | UNIT |
|---|---|---|---|---|---|
| Supply Voltage (Note 1) | | | $V_{CCA}$ | 1.65 ~ 3.6 | V |
| Supply Voltage | | | $V_{CCB}$ | 2.3 ~ 5.5 | V |
| High-Level Input Voltage | A-Port I/Os | $V_{CCA}$=1.65V ~ 1.95V, $V_{CCB}$=2.3V ~ 5.5V | $V_{IH}$ | $V_{CCI}$ - 0.2 ~ $V_{CCI}$ | V |
| | | $V_{CCA}$=2.3V ~ 3.6V, $V_{CCB}$=2.3V ~ 5.5V | | $V_{CCI}$ - 0.4 ~ $V_{CCI}$ | |
| | B-Port I/Os | $V_{CCA}$=1.65V ~ 3.6V, $V_{CCB}$=2.3V ~ 5.5V | | $V_{CCI}$ - 0.4 ~ $V_{CCI}$ | |
| | OE Input | $V_{CCA}$=1.65V ~ 3.6V, $V_{CCB}$=2.3V ~ 5.5V | | $V_{CCA}$×0.65 ~ 5.5 | |
| Low-Level Input Voltage (Note 2) | A-Port I/Os | $V_{CCA}$=1.65V ~ 3.6V, $V_{CCB}$=2.3V ~ 5.5V | $V_{IL}$ | 0 ~ 0.15 | V |
| | B-Port I/Os | $V_{CCA}$=1.65V ~ 3.6V, $V_{CCB}$=2.3V ~ 5.5V | | 0 ~ 0.15 | |
| | OE Input | $V_{CCA}$=1.65V ~ 3.6V, $V_{CCB}$=2.3V ~ 5.5V | | 0 ~ $V_{CCA}$×0.30 | |
| Input Transition Rise Or Fall Rate | A-Port I/Os Push-Pull Driving | $V_{CCA}$=1.65V ~ 3.6V, $V_{CCB}$=2.3V ~ 5.5V | Δt/Δv | 10 | ns/V |
| | B-Port I/Os Push-Pull Driving | $V_{CCA}$=1.65V ~ 3.6V, $V_{CCB}$=2.3V ~ 5.5V | | 10 | |
| | Control Input | $V_{CCA}$=1.65V ~ 3.6V, $V_{CCB}$=2.3V ~ 5.5V | | 10 | |
| Operating Free-Air Temperature | | | $T_A$ | -40 ~ +125 | °C |

Notes: 1. $V_{CCA}$ must be less than or equal to $V_{CCB}$, and $V_{CCA}$ must not exceed 3.6V.
2. The maximum $V_{IL}$ value is provided to ensure that a valid $V_{OL}$ is maintained. The $V_{OL}$ value is $V_{IL}$ plus the voltage drop across the pass-gate transistor.

■ ELECTRICAL CHARACTERISTICS (Note 1, 2, 3) ($T_A$=25°C, unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| Port A Output High Voltage | $V_{OHA}$ | $I_{OH}$=-20μA, $V_{IB}$≥$V_{CCB}$-0.4V<br>$V_{CCA}$=1.65V~3.6V, $V_{CCB}$=2.3V~5.5V | | $V_{CCA}$ ×0.67 | | | V |
| Port A Output Low Voltage | $V_{OLA}$ | $I_{OL}$=1mA, $V_{IB}$≤0.15V<br>$V_{CCA}$=1.65V~3.6V, $V_{CCB}$=2.3V~5.5V | | | | 0.6 | V |
| Port B Output High Voltage | $V_{OHB}$ | $V_{CCA}$=1.65V~3.6V, $V_{CCB}$=2.3V~5.5V | | $V_{CCB}$ ×0.67 | | | V |
| Port B Output Low Voltage | $V_{OLB}$ | $V_{CCA}$=1.65V~3.6V, $V_{CCB}$=2.3V~5.5V | | | | 0.6 | V |
| Input Leakage Current | $I_I$ | $V_{CCA}$=1.65V~3.6V, $V_{CCB}$=2.3V~5.5V | | | | ±1 | μA |
| Partial Power Down Current | $I_{off}$ | A port, $V_{CCA}$=0V | | | | ±1 | μA |
| | | B port, $V_{CCA}$=0V~3.6V | | | | ±1 | |
| High-Impedance State Output Current | $I_{OZ}$ | A or B port<br>$V_{CCA}$=1.65V~3.6V, $V_{CCB}$=2.3V~5.5V | | | | ±1 | μA |
| $V_{CCA}$ Supply Current | $I_{CCA}$ | $V_I$=$V_O$=open, $I_O$=0 | $V_{CCA}$=1.65V~$V_{CCB}$<br>$V_{CCB}$=2.3V~5.5V | | | 2.4 | μA |
| | | | $V_{CCA}$=3.6V<br>$V_{CCB}$=0V | | | 2.2 | μA |
| | | | $V_{CCA}$=0V<br>$V_{CCB}$=5.5V | | | -1 | μA |
| $V_{CCB}$ Supply Current | $I_{CCB}$ | $V_I$=$V_O$=open, $I_O$=0 | $V_{CCA}$=1.65V~$V_{CCB}$<br>$V_{CCB}$=2.3V~5.5V | | | 12 | μA |
| | | | $V_{CCA}$=3.6V<br>$V_{CCB}$=0V | | | -1 | μA |
| | | | $V_{CCA}$=0V<br>$V_{CCB}$=5.5V | | | 1 | μA |
| Combined Supply Current | $I_{CCA}$+$I_{CCB}$ | $V_I$=$V_{CCI}$ or GND,<br>$I_O$=0 | $V_{CCA}$=1.65V~$V_{CCB}$<br>$V_{CCB}$=2.3V~5.5V | | | 14.4 | μA |
| Input Capacitance | $C_I$ | OE | $V_{CCA}$=3.3V<br>$V_{CCB}$=3.3V | | 2.5 | | pF |
| Input-to-Output Internal Capacitance | $C_{io}$ | A or B port | $V_{CCA}$=3.3V<br>$V_{CCB}$=3.3V | | 10 | | pF |
| | | A port | | | 5 | | pF |
| | | B port | | | 6 | | pF |

Notes: 1. $V_{CCI}$ is the $V_{CC}$ associated with the input port.
2. $V_{CCO}$ is the $V_{CC}$ associated with the output port.
3. $V_{CCA}$ must be less than or equal to $V_{CCB}$, and $V_{CCA}$ must not exceed 3.6V.

## ■ TIMING REQUIREMENTS ($T_A$=25°C, unless otherwise specified)

**$V_{CCA}$=1.8V±0.15V**

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Push-Pull Driving | Data Rate | $V_{CCB}$=2.5V±0.2V | | | 21 | Mbps |
| | | $V_{CC}$=3.3V±0.3V | | | 22 | Mbps |
| | | $V_{CC}$=5V±0.5V | | | 24 | Mbps |
| Open-Drain Driving | | $V_{CCB}$=2.5V±0.2V | | | 2 | Mbps |
| | | $V_{CC}$=3.3V±0.3V | | | 2 | Mbps |
| | | $V_{CC}$=5V±0.5V | | | 2 | Mbps |
| Push-Pull Driving (Data Inputs) | Pulse Duration | $V_{CCB}$=2.5V±0.2V | 47 | | | ns |
| | | $V_{CC}$=3.3V±0.3V | 45 | | | ns |
| | | $V_{CC}$=5V±0.5V | 41 | | | ns |
| Open-Drain Driving (Data Inputs) | | $V_{CCB}$=2.5V±0.2V | 500 | | | ns |
| | | $V_{CC}$=3.3V±0.3V | 500 | | | ns |
| | | $V_{CC}$=5V±0.5V | 500 | | | ns |

**$V_{CCA}$=2.5V±0.2V**

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Push-Pull Driving | Data Rate | $V_{CCB}$=2.5V±0.2V | | | 20 | Mbps |
| | | $V_{CC}$=3.3V±0.3V | | | 22 | Mbps |
| | | $V_{CC}$=5V±0.5V | | | 24 | Mbps |
| Open-Drain Driving | | $V_{CCB}$=2.5V±0.2V | | | 2 | Mbps |
| | | $V_{CC}$=3.3V±0.3V | | | 2 | Mbps |
| | | $V_{CC}$=5V±0.5V | | | 2 | Mbps |
| Push-Pull Driving (Data Inputs) | Pulse Duration | $V_{CCB}$=2.5V±0.2V | 50 | | | ns |
| | | $V_{CC}$=3.3V±0.3V | 45 | | | ns |
| | | $V_{CC}$=5V±0.5V | 41 | | | ns |
| Open-Drain Driving (Data Inputs) | | $V_{CCB}$=2.5V±0.2V | 500 | | | ns |
| | | $V_{CC}$=3.3V±0.3V | 500 | | | ns |
| | | $V_{CC}$=5V±0.5V | 500 | | | ns |

**$V_{CCA}$=3.3V±0.3V**

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Push-Pull Driving | Data Rate | $V_{CC}$=3.3V±0.3V | | | 23 | Mbps |
| | | $V_{CC}$=5V±0.5V | | | 24 | Mbps |
| Open-Drain Driving | | $V_{CC}$=3.3V±0.3V | | | 2 | Mbps |
| | | $V_{CC}$=5V±0.5V | | | 2 | Mbps |
| Push-Pull Driving (Data Inputs) | Pulse Duration | $V_{CC}$=3.3V±0.3V | 43 | | | ns |
| | | $V_{CC}$=5V±0.5V | 41 | | | ns |
| Open-Drain Driving (Data Inputs) | | $V_{CC}$=3.3V±0.3V | 500 | | | ns |
| | | $V_{CC}$=5V±0.5V | 500 | | | ns |

■ SWITCHING CHARACTERISTICS ($T_A$=25°C, unless otherwise specified)

**$V_{CCA}$=1.8V±0.15V**

| PARAMETER | SYMBOL | TEST CONDITIONS | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| Propagation Delay Time High to Low Output (A to B) | $t_{PHL}$ | Push-pull driving | $V_{CCB}$=2.5V±0.2V | | | 15.3 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | | | 15.4 | ns |
| | | | $V_{CCB}$=5V±0.5V | | | 16.8 | ns |
| | | Open-drain driving | $V_{CCB}$=2.5V±0.2V | 2.3 | | 18.8 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | 2.4 | | 19.6 | ns |
| | | | $V_{CCB}$=5V±0.5V | 2.6 | | 20 | ns |
| Propagation Delay Time Low to High Output (A to B) | $t_{PLH}$ | Push-pull driving | $V_{CCB}$=2.5V±0.2V | | | 16.8 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | | | 17.1 | ns |
| | | | $V_{CCB}$=5V±0.5V | | | 17.5 | ns |
| | | Open-drain driving | $V_{CCB}$=2.5V±0.2V | 45 | | 260 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | 36 | | 208 | ns |
| | | | $V_{CCB}$=5V±0.5V | 27 | | 198 | ns |
| Propagation Delay Time High to Low Output (B to A) | $t_{PHL}$ | Push-pull driving | $V_{CCB}$=2.5V±0.2V | | | 14.4 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | | | 14.5 | ns |
| | | | $V_{CCB}$=5V±0.5V | | | 14.7 | ns |
| | | Open-drain driving | $V_{CCB}$=2.5V±0.2V | 1.9 | | 15.3 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | 1.1 | | 14.4 | ns |
| | | | $V_{CCB}$=5V±0.5V | 1.2 | | 14 | ns |
| Propagation Delay Time Low to High Output (B to A) | $t_{PLH}$ | Push-pull driving | $V_{CCB}$=2.5V±0.2V | | | 15.3 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | | | 14.5 | ns |
| | | | $V_{CCB}$=5V±0.5V | | | 10.5 | ns |
| | | Open-drain driving | $V_{CCB}$=2.5V±0.2V | 45 | | 175 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | 36 | | 140 | ns |
| | | | $V_{CCB}$=5V±0.5V | 27 | | 102 | ns |
| Enable Time | $t_{en}$ | OE to A or B | $V_{CCB}$=2.5V±0.2V | | | 200 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | | | 200 | ns |
| | | | $V_{CCB}$=5V±0.5V | | | 200 | ns |
| Disable Time | $t_{dis}$ | OE to A or B | $V_{CCB}$=2.5V±0.2V | | | 90 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | | | 90 | ns |
| | | | $V_{CCB}$=5V±0.5V | | | 90 | ns |
| Input Rise Time (A port rise time) | $t_{rA}$ | Push-pull driving | $V_{CCB}$=2.5V±0.2V | 3.2 | | 19.5 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | 2.3 | | 19.3 | ns |
| | | | $V_{CCB}$=5V±0.5V | 2 | | 17.6 | ns |
| | | Open-drain driving | $V_{CCB}$=2.5V±0.2V | 38 | | 165 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | 30 | | 132 | ns |
| | | | $V_{CCB}$=5V±0.5V | 22 | | 95 | ns |
| Input Rise Time (B port rise time) | $t_{rB}$ | Push-pull driving | $V_{CCB}$=2.5V±0.2V | 4 | | 20.8 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | 2.7 | | 19.1 | ns |
| | | | $V_{CCB}$=5V±0.5V | 2.7 | | 17.6 | ns |
| | | Open-drain driving | $V_{CCB}$=2.5V±0.2V | 34 | | 145 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | 23 | | 106 | ns |
| | | | $V_{CCB}$=5V±0.5V | 10 | | 58 | ns |
| Input Fall Time (A port fall time) | $t_{fA}$ | Push-pull driving | $V_{CCB}$=2.5V±0.2V | 2 | | 15.9 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | 1.9 | | 16 | ns |
| | | | $V_{CCB}$=5V±0.5V | 1.7 | | 16.3 | ns |
| | | Open-drain driving | $V_{CCB}$=2.5V±0.2V | 4.4 | | 16.9 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | 4.3 | | 16.4 | ns |
| | | | $V_{CCB}$=5V±0.5V | 4.2 | | 16.1 | ns |

■ SWITCHING CHARACTERISTICS (Cont.)

| PARAMETER | SYMBOL | TEST CONDITIONS | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| Input Fall Time (B port fall time) | $t_{fB}$ | Push-pull driving | $V_{CCB}$=2.5V±0.2V | 2.9 | | 21.1 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | 2.8 | | 21.6 | ns |
| | | | $V_{CCB}$=5V±0.5V | 2.8 | | 22.2 | ns |
| | | Open-drain driving | $V_{CCB}$=2.5V±0.2V | 6.9 | | 21.8 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | 7.5 | | 22.2 | ns |
| | | | $V_{CCB}$=5V±0.5V | 7 | | 22.4 | ns |
| Skew (Time), Output | $t_{SK(O)}$ | Channel -to- channel skew | $V_{CCB}$=2.5V±0.2V | | | 0.7 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | | | 0.7 | ns |
| | | | $V_{CCB}$=5V±0.5V | | | 0.7 | ns |

**$V_{CCA}$=2.5V±0.2V**

| PARAMETER | SYMBOL | TEST CONDITIONS | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| Propagation Delay Time High to Low Output (A to B) | $t_{PHL}$ | Push-pull driving | $V_{CCB}$=2.5V±0.2V | | | 13.2 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | | | 13.7 | ns |
| | | | $V_{CCB}$=5V±0.5V | | | 13.8 | ns |
| | | Open-drain driving | $V_{CCB}$=2.5V±0.2V | 1.7 | | 16.3 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | 2 | | 16 | ns |
| | | | $V_{CCB}$=5V±0.5V | 2.1 | | 15.8 | ns |
| Propagation Delay Time Low to High Output (A to B) | $t_{PLH}$ | Push-pull driving | $V_{CCB}$=2.5V±0.2V | | | 13.5 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | | | 14.1 | ns |
| | | | $V_{CCB}$=5V±0.5V | | | 14.4 | ns |
| | | Open-drain driving | $V_{CCB}$=2.5V±0.2V | 43 | | 250 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | 36 | | 206 | ns |
| | | | $V_{CCB}$=5V±0.5V | 27 | | 190 | ns |
| Propagation Delay Time High to Low Output (B to A) | $t_{PHL}$ | Push-pull driving | $V_{CCB}$=2.5V±0.2V | | | 13 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | | | 13.6 | ns |
| | | | $V_{CCB}$=5V±0.5V | | | 14.3 | ns |
| | | Open-drain driving | $V_{CCB}$=2.5V±0.2V | 1.8 | | 14.7 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | 2.6 | | 14.2 | ns |
| | | | $V_{CCB}$=5V±0.5V | 1.2 | | 14 | ns |
| Propagation Delay Time Low to High Output (B to A) | $t_{PLH}$ | Push-pull driving | $V_{CCB}$=2.5V±0.2V | | | 12.5 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | | | 11.6 | ns |
| | | | $V_{CCB}$=5V±0.5V | | | 11 | ns |
| | | Open-drain driving | $V_{CCB}$=2.5V±0.2V | 44 | | 170 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | 37 | | 140 | ns |
| | | | $V_{CCB}$=5V±0.5V | 27 | | 103 | ns |
| Enable Time | $t_{en}$ | OE to A or B | $V_{CCB}$=2.5V±0.2V | | | 200 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | | | 200 | ns |
| | | | $V_{CCB}$=5V±0.5V | | | 200 | ns |
| Disable Time | $t_{dis}$ | OE to A or B | $V_{CCB}$=2.5V±0.2V | | | 90 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | | | 90 | ns |
| | | | $V_{CCB}$=5V±0.5V | | | 90 | ns |

■ SWITCHING CHARACTERISTICS (Cont.)

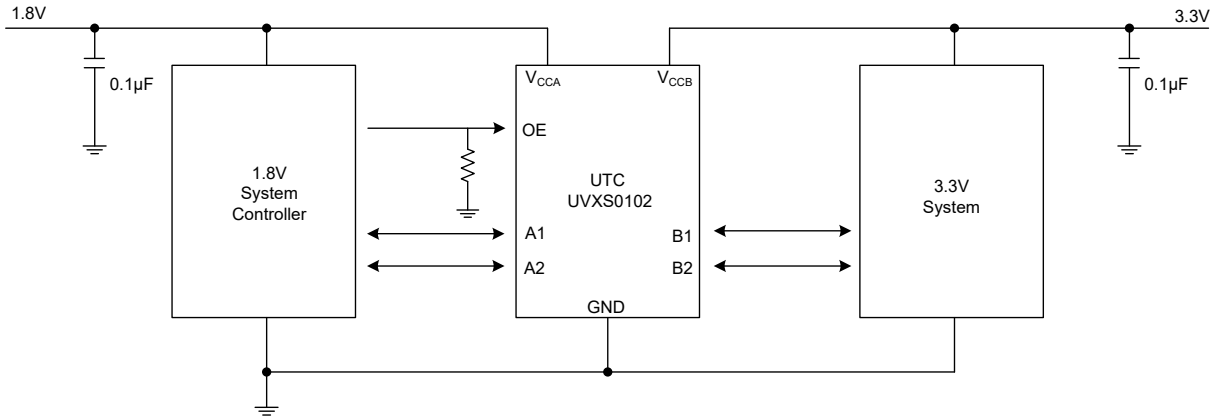
| PARAMETER | SYMBOL | TEST CONDITIONS | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| Input Rise Time (A port rise time) | $t_{rA}$ | Push-pull driving | $V_{CCB}$=2.5V±0.2V | 2.8 | | 17.4 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | 2.6 | | 16.6 | ns |
| | | | $V_{CCB}$=5V±0.5V | 1.8 | | 15.6 | ns |
| | | Open-drain driving | $V_{CCB}$=2.5V±0.2V | 3 | | 149 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | 28 | | 121 | ns |
| | | | $V_{CCB}$=5V±0.5V | 24 | | 89 | ns |
| Input Rise Time (B port rise time) | $t_{rB}$ | Push-pull driving | $V_{CCB}$=2.5V±0.2V | 3.2 | | 18.3 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | 2.9 | | 17.2 | ns |
| | | | $V_{CCB}$=5V±0.5V | 2.4 | | 16.1 | ns |
| | | Open-drain driving | $V_{CCB}$=2.5V±0.2V | 35 | | 151 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | 24 | | 112 | ns |
| | | | $V_{CCB}$=5V±0.5V | 12 | | 64 | ns |
| Input Fall Time (A port fall time) | $t_{fA}$ | Push-pull driving | $V_{CCB}$=2.5V±0.2V | 1.9 | | 15.7 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | 1.9 | | 15.5 | ns |
| | | | $V_{CCB}$=5V±0.5V | 1.8 | | 15.3 | ns |
| | | Open-drain driving | $V_{CCB}$=2.5V±0.2V | 4.4 | | 16.9 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | 4.3 | | 16.2 | ns |
| | | | $V_{CCB}$=5V±0.5V | 4.2 | | 15.8 | ns |
| Input Fall Time (B port fall time) | $t_{fB}$ | Push-pull driving | $V_{CCB2.6}$=2.5V±0.2V | 2.2 | | 17.8 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | 2.4 | | 16.7 | ns |
| | | | $V_{CCB}$=5V±0.5V | 2.6 | | 16.6 | ns |
| | | Open-drain driving | $V_{CCB}$=2.5V±0.2V | 5.1 | | 18.8 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | 5.4 | | 19.4 | ns |
| | | | $V_{CCB}$=5V±0.5V | 5.4 | | 20.4 | ns |
| Skew (Time), Output | $t_{SK(O)}$ | Channel -to- channel skew | $V_{CCB}$=2.5V±0.2V | | | 0.7 | ns |
| | | | $V_{CCB}$=3.3V±0.3V | | | 0.7 | ns |
| | | | $V_{CCB}$=5V±0.5V | | | 0.7 | ns |

## ■ SWITCHING CHARACTERISTICS (Cont.)

**$V_{CCA}$=3.3V±0.3V**

| PARAMETER | SYMBOL | TEST CONDITIONS | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| Propagation Delay Time High to Low Output (A to B) | $t_{PHL}$ | Push-pull driving | $V_{CCB}$=3.3V±0.3V | | | 12.4 | ns |
| | | | $V_{CCB}$=5V±0.5V | | | 13.1 | ns |
| | | Open-drain driving | $V_{CCB}$=3.3V±0.3V | 1.3 | | 14.2 | ns |
| | | | $V_{CCB}$=5V±0.5V | 1.4 | | 14.6 | ns |
| Propagation Delay Time Low to High Output (A to B) | $t_{PLH}$ | Push-pull driving | $V_{CCB}$=3.3V±0.3V | | | 14.2 | ns |
| | | | $V_{CCB}$=5V±0.5V | | | 14.4 | ns |
| | | Open-drain driving | $V_{CCB}$=3.3V±0.3V | 36 | | 204 | ns |
| | | | $V_{CCB}$=5V±0.5V | 28 | | 165 | ns |
| Propagation Delay Time High to Low Output (B to A) | $t_{PHL}$ | Push-pull driving | $V_{CCB}$=3.3V±0.3V | | | 12.5 | ns |
| | | | $V_{CCB}$=5V±0.5V | | | 13.3 | ns |
| | | Open-drain driving | $V_{CCB}$=3.3V±0.3V | 1 | | 124 | ns |
| | | | $V_{CCB}$=5V±0.5V | 1 | | 97 | ns |
| Propagation Delay Time Low to High Output (B to A) | $t_{PLH}$ | Push-pull driving | $V_{CCB}$=3.3V±0.3V | | | 12.5 | ns |
| | | | $V_{CCB}$=5V±0.5V | 3 | | 12.6 | ns |
| | | Open-drain driving | $V_{CCB}$=3.3V±0.3V | 3 | | 139 | ns |
| | | | $V_{CCB}$=5V±0.5V | | | 105 | ns |
| Enable Time | $t_{en}$ | OE to A or B | $V_{CCB}$=3.3V±0.3V | | | 200 | ns |
| | | | $V_{CCB}$=5V±0.5V | | | 200 | ns |
| Disable Time | $t_{dis}$ | OE to A or B | $V_{CCB}$=3.3V±0.3V | | | 90 | ns |
| | | | $V_{CCB}$=5V±0.5V | | | 90 | ns |
| Input Rise Time (A port rise time) | $t_{rA}$ | Push-pull driving | $V_{CCB}$=3.3V±0.3V | 2.3 | | 15.6 | ns |
| | | | $V_{CCB}$=5V±0.5V | 1.9 | | 14.8 | ns |
| | | Open-drain driving | $V_{CCB}$=3.3V±0.3V | 25 | | 116 | ns |
| | | | $V_{CCB}$=5V±0.5V | 19 | | 85 | ns |
| Input Rise Time (B port rise time) | $t_{rB}$ | Push-pull driving | $V_{CCB}$=3.3V±0.3V | 2.5 | | 16.4 | ns |
| | | | $V_{CCB}$=5V±0.5V | 2.1 | | 17.4 | ns |
| | | Open-drain driving | $V_{CCB}$=3.3V±0.3V | 26 | | 116 | ns |
| | | | $V_{CCB}$=5V±0.5V | 14 | | 72 | ns |
| Input Fall Time (A port fall time) | $t_{fA}$ | Push-pull driving | $V_{CCB}$=3.3V±0.3V | 2 | | 15.4 | ns |
| | | | $V_{CCB}$=5V±0.5V | 1.9 | | 15 | ns |
| | | Open-drain driving | $V_{CCB}$=3.3V±0.3V | 4.3 | | 16.1 | ns |
| | | | $V_{CCB}$=5V±0.5V | 4.2 | | 15.7 | ns |
| Input Fall Time (B port fall time) | $t_{fB}$ | Push-pull driving | $V_{CCB}$=3.3V±0.3V | 2.3 | | 17.4 | ns |
| | | | $V_{CCB}$=5V±0.5V | 2.4 | | 17.6 | ns |
| | | Open-drain driving | $V_{CCB}$=3.3V±0.3V | 5 | | 17.6 | ns |
| | | | $V_{CCB}$=5V±0.5V | 4.8 | | 18.3 | ns |
| Skew (Time), Output | $t_{SK(O)}$ | Channel -to- channel skew | $V_{CCB}$=3.3V±0.3V | | | 0.7 | ns |
| | | | $V_{CCB}$=5V±0.5V | | | 0.7 | ns |

## ■ TYPICAL APPLICATION CIRCUIT

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