# 74AUP1T1326

## Low-power dual supply buffer/line driver; 3-state

Rev. 01 — 20 January 2009 Product data sheet

## 1. General description

The 74AUP1T1326 is a high-performance, low-power, low-voltage, single-bit, dual supply buffer/line driver with output enable circuitry.

The 74AUP1T1326 is designed for logic-level translation applications and combines the functions of the 74AUP1G32 and 74AUP1G126. The buffer/line driver is controlled by two output enable Schmitt trigger inputs (1OE and 2OE) through an OR-gate. The output enable inputs accept standard input signals and are capable of transforming slowly changing input signals into sharply defined, jitter-free output signals. The output of the OR-gate is also available at output 1Y.

The output enable inputs (1OE and 2OE) switch at different points for positive and negative-going signals. The difference between the positive voltage $V_{T+}$ and the negative voltage $V_{T-}$ is defined as the input hysteresis voltage $V_H$.

Both $V_{CC(A)}$ and $V_{CC(B)}$ can be supplied at any voltage between 1.1 V and 3.6 V making the device suitable for interfacing between any of the low voltage nodes (1.2 V, 1.5 V, 1.8 V, 2.5 V and 3.3 V) with compatible input levels. Pins 1OE, 2OE and 1Y are referenced to $V_{CC(A)}$ and pins A and 2Y are referenced to $V_{CC(B)}$. A logic LOW on both output enable pins causes the output 2Y to assume a high-impedance OFF-state.

The device ensures low static and dynamic power consumption and is fully specified for partial power down applications using $I_{OFF}$. The $I_{OFF}$ circuitry disables the outputs, preventing any damaging backflow current through the device when it is powered down.

## 2. Features

- Wide supply voltage range:
  - $V_{CC(A)}$: 1.1 V to 3.6 V; $V_{CC(B)}$: 1.1 V to 3.6 V.
- High noise immunity
- Complies with JEDEC standards:
  - JESD8-7 (1.2 V to 1.95 V)
  - JESD8-5 (1.8 V to 2.7 V)
  - JESD8-B (2.7 V to 3.6 V)
- ESD protection:
  - HBM JESD22-A114E Class 2A exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V
  - CDM JESD22-C101C exceeds 1000 V
- Low static power consumption; $I_{CC}$ = 0.9 µA (maximum)
- Latch-up performance exceeds 100 mA per JESD 78 Class II
- Inputs accept voltages up to 3.6 V

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- Low noise overshoot and undershoot < 10 % of $V_{CC}$
- $I_{OFF}$ circuitry provides partial Power-down mode operation
- Multiple package options
- Specified from –40 °C to +85 °C

## 3. Ordering information

**Table 1. Ordering information**

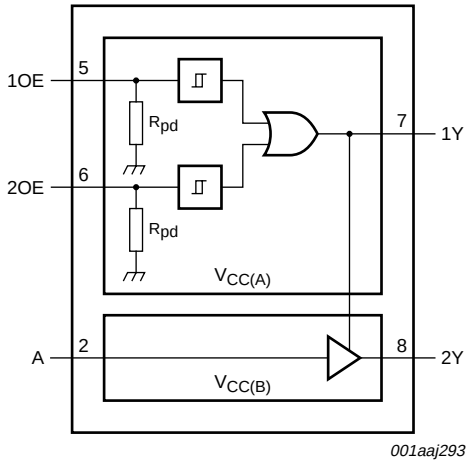
| Type number | Package | | | |
|---|---|---|---|---|
| | Temperature range | Name | Description | Version |
| 74AUP1T1326GT | –40 °C to +85 °C | XSON8 | plastic extremely thin small outline package; no leads; 8 terminals; body 1 x 1.95 x 0.5 mm | SOT833-1 |

## 4. Marking

**Table 2. Marking**

| Type number | Marking code |
|---|---|
| 74AUP1T1326GT | p31 |

## 5. Functional diagram




$R_{pd}$ = Internal pull-down resistor.

**Fig 1. Logic symbol**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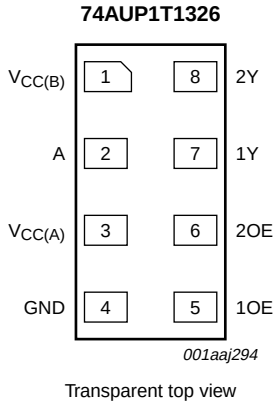
# 6. Pinning information

## 6.1 Pinning




Transparent top view

**Fig 2. Pin configuration SOT833-1 (XSON8)**

## 6.2 Pin description

**Table 3. Pin description**

| Symbol | Pin | Description |
|---|---|---|
| $V_{CC(B)}$ | 1 | supply voltage B |
| A | 2 | data input |
| $V_{CC(A)}$ | 3 | supply voltage A |
| GND | 4 | ground (0 V) |
| 1OE | 5 | output enable input (Schmitt trigger input) |
| 2OE | 6 | output enable input (Schmitt trigger input) |
| 1Y | 7 | data output |
| 2Y | 8 | data output |

# 7. Functional description

**Table 4. Function table[1]**

| Input | | | Output | |
|---|---|---|---|---|
| 1OE | 2OE | A | 1Y | 2Y |
| L | L | X | L | Z |
| X | H | L | H | L |
| X | H | H | H | H |
| H | X | L | H | L |
| H | X | H | H | H |

[1] H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance OFF-state.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## 8. Limiting values

**Table 5. Limiting values**

*In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).*

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{CC(A)}$ | supply voltage A | | | –0.5 | +4.6 | V |
| $V_{CC(B)}$ | supply voltage B | | | –0.5 | +4.6 | V |
| $I_{IK}$ | input clamping current | $V_I < 0$ V | | -50 | - | mA |
| $V_I$ | input voltage | | [1] | –0.5 | +4.6 | V |
| $I_{OK}$ | output clamping current | $V_O > V_{CCO}$ or $V_O < 0$ V | [2] | - | –50 | mA |
| $V_O$ | output voltage | Active mode and Power-down mode | [1] | –0.5 | +4.6 | V |
| $I_O$ | output current | $V_O$ = 0 V to $V_{CCO}$ | [2] | - | ±20 | mA |
| $I_{CC}$ | supply current | | | - | 50 | mA |
| $I_{GND}$ | ground current | | | -50 | - | mA |
| $T_{stg}$ | storage temperature | | | –65 | +150 | °C |
| $P_{tot}$ | total power dissipation | $T_{amb}$ = –40 °C to +85 °C | [3] | - | 250 | mW |

[1] The minimum input and output voltage ratings may be exceeded if the input and output current ratings are observed.

[2] $V_{CCO}$ is the supply voltage associated with an output pin.

[3] For XSON8 package: above 45 °C the value of $P_{tot}$ derates linearly with 2.4 mW/K.

## 9. Recommended operating conditions

**Table 6. Recommended operating conditions**

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{CC(A)}$ | supply voltage A | | | 1.1 | 3.6 | V |
| $V_{CC(B)}$ | supply voltage B | | | 1.1 | 3.6 | V |
| $V_I$ | input voltage | | | 0 | 3.6 | V |
| $V_O$ | output voltage | | [1] | 0 | $V_{CCO}$ | V |
| $T_{amb}$ | ambient temperature | | | –40 | +85 | °C |
| $\Delta t/\Delta V$ | input transition rise and fall rate | input A; $V_{CCI}$ = 1.1 V to 3.6 V | [2] | - | 200 | ns/V |
| | | input nOE; $V_{CCI}$ = 1.1 V to 3.6 V | [2] | - | 30 | ms/V |

[1] $V_{CCO}$ is the supply voltage associated with an output pin.

[2] $V_{CCI}$ is the supply voltage associated with an input pin.



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## 10. Static characteristics

**Table 7. Static characteristics**

*At recommended operating conditions; voltages are referenced to GND (ground = 0 V).*

| Symbol | Parameter | Conditions | 25 °C | | | –40 °C to +85 °C | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | |
| **$T_{amb}$ = 25 °C** | | | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | input A; [1][3] | | | | | | |
| | | $V_{CCI}$ = 1.1 V to 1.95 V | 0.65$V_{CCI}$ | - | - | 0.65$V_{CCI}$ | - | V |
| | | $V_{CCI}$ = 2.3 V to 2.7 V | 1.6 | - | - | 1.6 | - | V |
| | | $V_{CCI}$ = 3.0 V to 3.6 V | 2.0 | - | - | 2.0 | - | V |
| $V_{IL}$ | LOW-level input voltage | input A; [1][3] | | | | | | |
| | | $V_{CCI}$ = 1.1 V to 1.95 V | - | - | 0.35$V_{CCI}$ | - | 0.35$V_{CCI}$ | V |
| | | $V_{CCI}$ = 2.3 V to 2.7 V | - | - | 0.7 | - | 0.7 | V |
| | | $V_{CCI}$ = 3.0 V to 3.6 V | - | - | 0.9 | - | 0.9 | V |
| $V_{OH}$ | HIGH-level output voltage | $V_I$ = $V_{IL}$ or $V_I$ or $V_I$ = $V_{T+}$ or $V_{T-}$ | | | | | | |
| | | $I_O$ = –20 µA; $V_{CCO}$ = 1.1 V to 3.6 V [2] | $V_{CCO}$ – 0.1 | - | - | $V_{CCO}$ – 0.1 | - | V |
| | | $I_O$ = –1.1 mA; $V_{CCO}$ = 1.1 V [2] | 0.825 | - | - | 0.825 | - | V |
| | | $I_O$ = –1.7 mA; $V_{CCO}$ = 1.4 V | 1.05 | - | - | 1.05 | - | V |
| | | $I_O$ = –3 mA; $V_{CCO}$ = 1.65 V | 1.2 | - | - | 1.2 | - | V |
| | | $I_O$ = –2.3 mA; $V_{CCO}$ = 2.3 V | 1.97 | - | - | 1.97 | - | V |
| | | $I_O$ = –4.0 mA; $V_{CCO}$ = 2.3 V | 2.0 | - | - | 2.0 | - | V |
| | | $I_O$ = –2.7 mA; $V_{CCO}$ = 3.0 V | 2.67 | - | - | 2.67 | - | V |
| | | $I_O$ = –6.0 mA; $V_{CCO}$ = 3.0 V | 2.48 | - | - | 2.48 | - | V |
| $V_{OL}$ | LOW-level output voltage | $V_I$ = $V_{IL}$ or $V_I$ or $V_I$ = $V_{T+}$ or $V_{T-}$ [2] | | | | | | |
| | | $I_O$ = 20 µA; $V_{CCO}$ = 1.1 V to 3.6 V | - | - | 0.10 | - | 0.10 | V |
| | | $I_O$ = 1.1 mA; $V_{CCO}$ = 1.1 V | - | - | 0.275 | - | 0.275 | V |
| | | $I_O$ = 1.7 mA; $V_{CCO}$ = 1.4 V | - | - | 0.35 | - | 0.35 | V |
| | | $I_O$ = 3.0 mA; $V_{CCO}$ = 1.65 V | - | - | 0.45 | - | 0.45 | V |
| | | $I_O$ = 2.3 mA; $V_{CCO}$ = 2.3 V | - | - | 0.33 | - | 0.33 | V |
| | | $I_O$ = 4.0 mA; $V_{CCO}$ = 2.3 V | - | - | 0.40 | - | 0.40 | V |
| | | $I_O$ = 2.7 mA; $V_{CCO}$ = 3.0 V | - | - | 0.33 | - | 0.33 | V |
| | | $I_O$ = 6.0 mA; $V_{CCO}$ = 3.0 V | - | - | 0.40 | - | 0.40 | V |
| $I_I$ | input leakage current | input A; $V_I$ = 0 V to 3.6 V; $V_{CCI}$ = 1.1 V to 3.6 V [1] | - | - | ±0.1 | - | ±0.5 | µA |
| $I_{OZ}$ | OFF-state output current | output 2Y; $V_I$ = $V_{IH}$ or $V_{IL}$; $V_O$ = 0 V to 3.6 V; $V_{CC(A)}$ = 1.1 V to 3.6 V; $V_{CC(B)}$ = 1.1 V to 3.6 V | - | - | ±0.1 | - | ±0.5 | µA |



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**Table 7. Static characteristics** *…continued*

*At recommended operating conditions; voltages are referenced to GND (ground = 0 V).*

| Symbol | Parameter | Conditions | | 25 °C | | | –40 °C to +85 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | Min | Max | |
| $I_{OFF}$ | power-off leakage current | 1Y; $V_{CC(A)}$ = 0 V; $V_O$ = 0 V to 3.6 V; $V_{CC(B)}$ = 1.1 V to 3.6 V | | - | - | ±0.2 | - | ±0.5 | µA |
| | | A, 2Y; $V_{CC(B)}$ = 0 V; $V_I$ or $V_O$ = 0 V to 3.6 V; $V_{CC(A)}$ = 1.1 V to 3.6 V | | - | - | ±0.2 | - | ±0.5 | µA |
| $\Delta I_{OFF}$ | additional power-off leakage current | 1Y; $V_{CC(A)}$ = 0 V to 0.2 V; $V_O$ = 0 V to 3.6 V; $V_{CC(B)}$ = 1.1 V to 3.6 V | | - | - | ±0.2 | - | ±0.6 | µA |
| | | A, 2Y; $V_{CC(B)}$ = 0 V to 0.2 V; $V_I$ or $V_O$ = 0 V to 3.6 V; $V_{CC(A)}$ = 1.1 V to 3.6 V | | - | - | ±0.2 | - | ±0.6 | µA |
| $I_{CC(A)}$ | supply current A | $V_I$ = 0 V or $V_{CC(A)}$; $I_O$ = 0 A | [1] | | | | | | |
| | | $V_{CC(A)}$ = 1.1 V to 3.6 V; $V_{CC(B)}$ = 0 V to 3.6 V | | - | - | 0.5 | - | 0.9 | µA |
| $I_{CC(B)}$ | supply current B | $V_I$ = 0 V or $V_{CC(B)}$; $I_O$ = 0 A | [1] | | | | | | |
| | | $V_{CC(A)}$ = $V_{CC(B)}$ = 1.1 V to 3.6 V | | - | - | 0.5 | - | 0.9 | µA |
| | | $V_{CC(A)}$ = 1.71 V; $V_{CC(B)}$ = 2.6 V | | - | - | 350 | - | 500 | µA |
| $\Delta I_{CC}$ | additional supply current | nOE; $V_{CC(A)}$ = $V_{CC(B)}$ = 3.3 V; $V_I$ = $V_{CC(A)}$ – 0.6 V | | - | - | 40 | - | 50 | µA |
| | | A; $V_{CC(A)}$ = $V_{CC(B)}$ = 3.3 V; $V_I$ = $V_{CC(B)}$ – 0.6 V; | | - | - | 40 | - | 50 | µA |
| | | A; $V_I$ = GND to 3.6 V; nOE = GND; $V_{CC(A)}$ = $V_{CC(B)}$ = 1.1 V to 3.6 V | [4] | - | - | - | - | 1 | µA |
| $R_{pd}$ | pull-down resistance | | | 151 | 281 | 428 | 150 | 435 | kΩ |
| $C_I$ | input capacitance | input A; $V_I$ = 0 V or $V_{CCI}$; $V_{CCI}$ = 1.1 V to 3.6 V | [1] | - | 0.9 | - | - | - | pF |
| | | input nOE; $V_I$ = 0 V or $V_{CCI}$; $V_{CCI}$ = 1.1 V to 3.6 V | [1] | - | 0.8 | - | - | - | pF |
| $C_O$ | output capacitance | 1Y; $V_O$ = GND; $V_{CCO}$ = 0 V | [2] | - | 1.7 | - | - | - | pF |
| | | 2Y enabled; $V_O$ = GND; $V_{CCO}$ = 0 V | [2] | - | 1.7 | - | - | - | pF |
| | | 2Y disabled; $V_{CCO}$ = 0 V to 3.6 V; $V_O$ = GND or $V_{CCO}$ | [2] | - | 1.5 | - | - | - | pF |

[1] $V_{CCI}$ is the supply voltage associated with the input pin.

[2] $V_{CCO}$ is the supply voltage associated with the output pin.

[3] For $V_{CCI}$ values not specified in the data sheet: minimum $V_{IH} = 0.7 \times V_{CCI}$ and maximum $V_{IL} = 0.3 \times V_{CCI}$.

[4] To show $I_{CC}$ remains very low when the input-disable feature is enabled.



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## 11. Dynamic characteristics

**Table 8. Dynamic characteristics**

*Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 5.*

| Symbol | Parameter | Conditions | 25 °C | | | −40 °C to +85 °C | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ[1] | Max | Min | Max | |
| **$C_L$ = 5 pF** | | | | | | | | |
| $t_{pd}$ | propagation delay | A to 2Y; see Figure 3 [2] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 3.0 | 5.4 | 9.5 | 2.7 | 9.7 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 2.4 | 3.8 | 5.7 | 2.1 | 6.1 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 1.9 | 3.1 | 4.5 | 1.7 | 5.0 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 1.5 | 2.3 | 3.4 | 1.3 | 3.8 | ns |
| | | $V_{CC(B)}$ = 3.0 V to 3.6 V | 1.2 | 2.1 | 3.0 | 1.0 | 3.3 | ns |
| | | nOE to 1Y; see Figure 3 | | | | | | |
| | | $V_{CC(A)}$ = 1.1 V to 1.3 V | 3.4 | 5.6 | 9.3 | 3.2 | 9.5 | ns |
| | | $V_{CC(A)}$ = 1.4 V to 1.6 V | 2.8 | 4.2 | 5.9 | 2.6 | 6.3 | ns |
| | | $V_{CC(A)}$ = 1.65 V to 1.95 V | 2.4 | 3.5 | 4.9 | 2.2 | 5.3 | ns |
| | | $V_{CC(A)}$ = 2.3 V to 2.7 V | 2.2 | 2.9 | 3.9 | 2.0 | 4.1 | ns |
| | | $V_{CC(A)}$ = 3.0 V to 3.6 V | 1.9 | 2.6 | 3.4 | 1.8 | 3.7 | ns |
| **$C_L$ = 10 pF** | | | | | | | | |
| $t_{pd}$ | propagation delay | A to 2Y; see Figure 3 [2] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 3.4 | 6.2 | 11.0 | 3.0 | 11.4 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 2.7 | 4.4 | 6.6 | 2.4 | 7.1 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 2.3 | 3.6 | 5.3 | 2.0 | 5.8 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 1.8 | 2.8 | 4.1 | 1.5 | 4.5 | ns |
| | | $V_{CC(B)}$ = 3.0 V to 3.6 V | 1.6 | 2.6 | 3.8 | 1.3 | 4.2 | ns |
| | | nOE to 1Y; see Figure 3 | | | | | | |
| | | $V_{CC(A)}$ = 1.1 V to 1.3 V | 3.7 | 6.4 | 10.8 | 3.4 | 11.1 | ns |
| | | $V_{CC(A)}$ = 1.4 V to 1.6 V | 3.1 | 4.7 | 6.8 | 2.8 | 7.2 | ns |
| | | $V_{CC(A)}$ = 1.65 V to 1.95 V | 2.9 | 4.0 | 5.6 | 2.5 | 6.1 | ns |
| | | $V_{CC(A)}$ = 2.3 V to 2.7 V | 2.5 | 3.4 | 4.6 | 2.2 | 4.9 | ns |
| | | $V_{CC(A)}$ = 3.0 V to 3.6 V | 2.3 | 3.1 | 4.1 | 2.1 | 4.5 | ns |



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**Table 8. Dynamic characteristics** *…continued*

*Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 5.*

| Symbol | Parameter | Conditions | 25 °C | | | –40 °C to +85 °C | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ[1] | Max | Min | Max | |
| **$C_L$ = 15 pF** | | | | | | | | |
| $t_{pd}$ | propagation delay | A to 2Y; see Figure 3 [2] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 3.8 | 6.9 | 12.5 | 3.4 | 12.9 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 3.2 | 4.9 | 7.5 | 2.8 | 8.1 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 2.7 | 4.0 | 6.0 | 2.3 | 6.5 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 2.2 | 3.2 | 4.8 | 1.8 | 5.3 | ns |
| | | $V_{CC(B)}$ = 3.0 V to 3.6 V | 1.8 | 2.9 | 4.4 | 1.6 | 4.8 | ns |
| | | nOE to 1Y; see Figure 3 | | | | | | |
| | | $V_{CC(A)}$ = 1.1 V to 1.3 V | 4.2 | 7.2 | 12.4 | 3.8 | 12.7 | ns |
| | | $V_{CC(A)}$ = 1.4 V to 1.6 V | 3.6 | 5.2 | 7.6 | 3.3 | 8.2 | ns |
| | | $V_{CC(A)}$ = 1.65 V to 1.95 V | 3.1 | 4.5 | 6.3 | 2.7 | 6.9 | ns |
| | | $V_{CC(A)}$ = 2.3 V to 2.7 V | 2.8 | 3.8 | 5.3 | 2.5 | 5.6 | ns |
| | | $V_{CC(A)}$ = 3.0 V to 3.6 V | 2.5 | 3.5 | 4.8 | 2.3 | 5.2 | ns |
| **$C_L$ = 30 pF** | | | | | | | | |
| $t_{pd}$ | propagation delay | A to 2Y; see Figure 3 [2] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 4.8 | 9.0 | 16.6 | 4.2 | 17.3 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 4.0 | 6.3 | 9.8 | 3.4 | 10.6 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 3.5 | 5.1 | 7.8 | 3.0 | 8.6 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 2.7 | 4.2 | 6.2 | 2.4 | 6.8 | ns |
| | | $V_{CC(B)}$ = 3.0 V to 3.6 V | 2.5 | 3.9 | 5.9 | 2.3 | 6.4 | ns |
| | | nOE to 1Y; see Figure 3 | | | | | | |
| | | $V_{CC(A)}$ = 1.1 V to 1.3 V | 5.1 | 9.2 | 16.4 | 4.6 | 17.1 | ns |
| | | $V_{CC(A)}$ = 1.4 V to 1.6 V | 4.3 | 6.6 | 9.9 | 3.8 | 10.8 | ns |
| | | $V_{CC(A)}$ = 1.65 V to 1.95 V | 4.0 | 5.6 | 8.1 | 3.5 | 8.9 | ns |
| | | $V_{CC(A)}$ = 2.3 V to 2.7 V | 3.4 | 4.7 | 6.7 | 3.0 | 7.2 | ns |
| | | $V_{CC(A)}$ = 3.0 V to 3.6 V | 3.3 | 4.4 | 6.2 | 3.0 | 6.7 | ns |
| **$C_L$ = 5 pF; $V_{CC(A)}$ = 1.1 V to 1.3 V** | | | | | | | | |
| $t_{en}$ | enable time | nOE to 2Y; see Figure 4 [3] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 3.4 | 8.7 | 20.0 | 3.2 | 20.3 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 2.8 | 7.0 | 15.6 | 2.5 | 15.8 | ns |
| $t_{dis}$ | disable time | nOE to 2Y; see Figure 4 [4] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 3.4 | 7.1 | 15.2 | 3.2 | 15.5 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 2.8 | 6.1 | 13.5 | 2.5 | 13.9 | ns |



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**Table 8. Dynamic characteristics** *…continued*

*Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 5.*

| Symbol | Parameter | Conditions | 25 °C | | | –40 °C to +85 °C | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ[1] | Max | Min | Max | |
| **$C_L$ = 5 pF; $V_{CC(A)}$ = 1.4 V to 1.6 V** | | | | | | | | |
| $t_{en}$ | enable time | nOE to 2Y; see Figure 4 [3] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 3.4 | 7.8 | 16.6 | 3.1 | 17.1 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 2.8 | 6.1 | 12.2 | 2.5 | 12.6 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 2.4 | 5.4 | 10.7 | 2.1 | 11.1 | ns |
| $t_{dis}$ | disable time | nOE to 2Y; see Figure 4 [4] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 3.4 | 6.3 | 11.8 | 3.1 | 12.3 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 2.8 | 5.3 | 10.1 | 2.5 | 10.7 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 2.4 | 5.4 | 9.9 | 2.1 | 10.5 | ns |
| **$C_L$ = 5 pF; $V_{CC(A)}$ = 1.65 V to 1.95 V** | | | | | | | | |
| $t_{en}$ | enable time | nOE to 2Y; see Figure 4 [3] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 3.4 | 7.4 | 15.6 | 3.1 | 16.0 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 2.8 | 5.6 | 11.2 | 2.5 | 11.5 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 2.4 | 4.9 | 9.7 | 2.1 | 10.1 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 2.2 | 4.4 | 8.2 | 1.9 | 8.8 | ns |
| $t_{dis}$ | disable time | nOE to 2Y; see Figure 4 [4] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 3.4 | 6.0 | 10.8 | 3.1 | 11.2 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 2.8 | 5.0 | 9.1 | 2.5 | 9.6 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 2.4 | 5.1 | 8.9 | 2.1 | 9.4 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 2.2 | 4.3 | 7.8 | 1.9 | 8.4 | ns |
| **$C_L$ = 5 pF; $V_{CC(A)}$ = 2.3 V to 2.7 V** | | | | | | | | |
| $t_{en}$ | enable time | nOE to 2Y; see Figure 4 [3] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 3.4 | 6.8 | 14.6 | 3.1 | 14.9 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 2.8 | 5.0 | 10.1 | 2.5 | 10.4 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 2.4 | 4.3 | 8.7 | 2.1 | 9.0 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 2.2 | 3.7 | 7.2 | 1.9 | 7.7 | ns |
| | | $V_{CC(B)}$ = 3.0 V to 3.6 V | 1.9 | 3.6 | 6.8 | 1.6 | 7.3 | ns |
| $t_{dis}$ | disable time | nOE to 2Y; see Figure 4 [4] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 3.4 | 5.5 | 9.8 | 3.1 | 10.1 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 2.8 | 4.5 | 8.1 | 2.5 | 8.5 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 2.4 | 4.6 | 7.9 | 2.1 | 8.3 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 2.2 | 3.9 | 6.8 | 1.9 | 7.3 | ns |
| | | $V_{CC(B)}$ = 3.0 V to 3.6 V | 1.9 | 4.4 | 7.3 | 1.6 | 7.7 | ns |



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**Table 8. Dynamic characteristics** *…continued*

*Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 5.*

| Symbol | Parameter | Conditions | 25 °C | | | –40 °C to +85 °C | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ[1] | Max | Min | Max | |
| **$C_L$ = 5 pF; $V_{CC(A)}$ = 3.0 V to 3.6 V** | | | | | | | | |
| $t_{en}$ | enable time | nOE to 2Y; see Figure 4 [3] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 3.4 | 6.5 | 14.2 | 3.1 | 14.4 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 2.8 | 4.8 | 9.7 | 2.5 | 9.9 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 2.4 | 4.1 | 8.2 | 2.1 | 8.5 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 2.2 | 3.4 | 6.7 | 1.9 | 7.2 | ns |
| | | $V_{CC(B)}$ = 3.0 V to 3.6 V | 1.9 | 3.2 | 6.3 | 1.6 | 6.8 | ns |
| $t_{dis}$ | disable time | nOE to 2Y; see Figure 4 [4] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 3.4 | 5.3 | 9.3 | 3.1 | 9.7 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 2.8 | 4.3 | 7.7 | 2.5 | 8.0 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 2.4 | 4.4 | 7.4 | 2.1 | 7.9 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 2.2 | 3.7 | 6.4 | 1.9 | 6.8 | ns |
| | | $V_{CC(B)}$ = 3.0 V to 3.6 V | 1.9 | 4.2 | 6.9 | 1.6 | 7.2 | ns |
| **$C_L$ = 10 pF; $V_{CC(A)}$ = 1.1 V to 1.3 V** | | | | | | | | |
| $t_{en}$ | enable time | nOE to 2Y; see Figure 4 [3] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 3.7 | 9.9 | 22.9 | 3.3 | 23.1 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 3.1 | 8.0 | 17.8 | 2.8 | 18.1 | ns |
| $t_{dis}$ | disable time | nOE to 2Y; see Figure 4 [4] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 3.7 | 8.5 | 18.0 | 3.3 | 18.3 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 3.1 | 7.3 | 16.0 | 2.8 | 16.4 | ns |
| **$C_L$ = 10 pF; $V_{CC(A)}$ = 1.4 V to 1.6 V** | | | | | | | | |
| $t_{en}$ | enable time | nOE to 2Y; see Figure 4 [3] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 3.7 | 8.8 | 18.8 | 3.3 | 19.3 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 3.1 | 6.9 | 13.8 | 2.8 | 14.2 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 2.9 | 6.1 | 12.2 | 2.5 | 12.9 | ns |
| $t_{dis}$ | disable time | nOE to 2Y; see Figure 4 [4] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 3.7 | 7.6 | 14.0 | 3.3 | 14.5 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 3.1 | 6.4 | 11.9 | 2.8 | 12.5 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 2.9 | 6.7 | 12.0 | 2.5 | 12.6 | ns |
| **$C_L$ = 10 pF; $V_{CC(A)}$ = 1.65 V to 1.95 V** | | | | | | | | |
| $t_{en}$ | enable time | nOE to 2Y; see Figure 4 [3] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 3.7 | 8.3 | 17.6 | 3.3 | 18.1 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 3.1 | 6.4 | 12.6 | 2.8 | 13.1 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 2.9 | 5.6 | 11.0 | 2.5 | 11.7 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 2.5 | 5.1 | 9.7 | 2.2 | 10.5 | ns |



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**Table 8. Dynamic characteristics** *…continued*

*Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 5.*

| Symbol | Parameter | Conditions | 25 °C | | | –40 °C to +85 °C | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ[1] | Max | Min | Max | |
| $t_{dis}$ | disable time | nOE to 2Y; see Figure 4 [4] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 3.7 | 7.2 | 12.8 | 3.3 | 13.4 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 3.1 | 6.0 | 10.8 | 2.8 | 11.4 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 2.9 | 6.3 | 10.8 | 2.5 | 11.5 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 2.5 | 5.2 | 9.5 | 2.2 | 10.1 | ns |
| **$C_L$ = 10 pF; $V_{CC(A)}$ = 2.3 V to 2.7 V** | | | | | | | | |
| $t_{en}$ | enable time | nOE to 2Y; see Figure 4 [3] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 3.7 | 7.7 | 16.6 | 3.3 | 16.9 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 3.1 | 5.8 | 11.6 | 2.8 | 11.9 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 2.9 | 5.0 | 10.0 | 2.5 | 10.5 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 2.5 | 4.4 | 8.7 | 2.2 | 9.3 | ns |
| | | $V_{CC(B)}$ = 3.0 V to 3.6 V | 2.3 | 4.3 | 8.3 | 2.1 | 8.8 | ns |
| $t_{dis}$ | disable time | nOE to 2Y; see Figure 4 [4] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 3.7 | 6.8 | 11.8 | 3.3 | 12.2 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 3.1 | 5.6 | 9.7 | 2.8 | 10.2 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 2.9 | 5.9 | 9.8 | 2.5 | 10.3 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 2.5 | 4.8 | 8.4 | 2.2 | 8.9 | ns |
| | | $V_{CC(B)}$ = 3.0 V to 3.6 V | 2.3 | 5.8 | 9.4 | 2.1 | 9.8 | ns |
| **$C_L$ = 10 pF; $V_{CC(A)}$ = 3.0 V to 3.6 V** | | | | | | | | |
| $t_{en}$ | enable time | nOE to 2Y; see Figure 4 [3] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 3.7 | 7.4 | 16.1 | 3.3 | 16.5 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 3.1 | 5.5 | 11.1 | 2.8 | 11.5 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 2.9 | 4.7 | 9.5 | 2.5 | 10.1 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 2.5 | 4.1 | 8.3 | 2.2 | 8.8 | ns |
| | | $V_{CC(B)}$ = 3.0 V to 3.6 V | 2.3 | 3.9 | 7.8 | 2.1 | 8.3 | ns |
| $t_{dis}$ | disable time | nOE to 2Y; see Figure 4 [4] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 3.7 | 6.6 | 11.3 | 3.3 | 11.7 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 3.1 | 5.4 | 9.3 | 2.8 | 9.7 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 2.9 | 5.7 | 9.4 | 2.5 | 9.8 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 2.5 | 4.6 | 8.0 | 2.2 | 8.5 | ns |
| | | $V_{CC(B)}$ = 3.0 V to 3.6 V | 2.3 | 5.6 | 9.0 | 2.1 | 9.4 | ns |
| **$C_L$ = 15 pF; $V_{CC(A)}$ = 1.1 V to 1.3 V** | | | | | | | | |
| $t_{en}$ | enable time | nOE to 2Y; see Figure 4 [3] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 4.2 | 10.9 | 25.5 | 3.8 | 25.9 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 3.6 | 8.9 | 20.1 | 3.2 | 20.6 | ns |
| $t_{dis}$ | disable time | nOE to 2Y; see Figure 4 [4] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 4.2 | 9.9 | 20.8 | 3.8 | 21.1 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 3.6 | 8.4 | 18.4 | 3.2 | 18.9 | ns |



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**Table 8. Dynamic characteristics** *…continued*

*Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 5.*

| Symbol | Parameter | Conditions | 25 °C | | | –40 °C to +85 °C | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ[1] | Max | Min | Max | |
| **$C_L$ = 15 pF; $V_{CC(A)}$ = 1.4 V to 1.6 V** | | | | | | | | |
| $t_{en}$ | enable time | nOE to 2Y; see Figure 4 [3] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 4.2 | 9.7 | 20.8 | 3.8 | 21.4 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 3.6 | 7.6 | 15.3 | 3.2 | 16.1 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 3.1 | 6.8 | 13.6 | 2.7 | 14.5 | ns |
| $t_{dis}$ | disable time | nOE to 2Y; see Figure 4 [4] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 4.2 | 8.9 | 16.0 | 3.8 | 16.6 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 3.6 | 7.4 | 13.7 | 3.2 | 14.4 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 3.1 | 8.0 | 14.1 | 2.7 | 14.8 | ns |
| **$C_L$ = 15 pF; $V_{CC(A)}$ = 1.65 V to 1.95 V** | | | | | | | | |
| $t_{en}$ | enable time | nOE to 2Y; see Figure 4 [3] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 4.2 | 9.1 | 19.5 | 3.8 | 20.1 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 3.6 | 7.0 | 14.0 | 3.1 | 14.7 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 3.1 | 6.2 | 12.2 | 2.7 | 13.2 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 2.8 | 5.6 | 11.0 | 2.4 | 11.8 | ns |
| $t_{dis}$ | disable time | nOE to 2Y; see Figure 4 [4] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 4.2 | 8.5 | 14.7 | 3.8 | 15.3 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 3.6 | 7.0 | 12.4 | 3.1 | 13.1 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 3.1 | 7.5 | 12.7 | 2.7 | 13.5 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 2.8 | 6.1 | 11.0 | 2.4 | 11.8 | ns |
| **$C_L$ = 15 pF; $V_{CC(A)}$ = 2.3 V to 2.7 V** | | | | | | | | |
| $t_{en}$ | enable time | nOE to 2Y; see Figure 4 [3] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 4.2 | 8.5 | 18.4 | 3.8 | 18.8 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 3.6 | 6.4 | 13.0 | 3.2 | 13.5 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 3.1 | 5.6 | 11.2 | 2.7 | 11.9 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 2.8 | 4.9 | 10.0 | 2.5 | 10.6 | ns |
| | | $V_{CC(B)}$ = 3.0 V to 3.6 V | 2.5 | 4.8 | 9.6 | 2.3 | 10.1 | ns |
| $t_{dis}$ | disable time | nOE to 2Y; see Figure 4 [4] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 4.2 | 8.0 | 13.6 | 3.8 | 14.0 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 3.6 | 6.6 | 11.3 | 3.2 | 11.8 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 3.1 | 7.1 | 11.7 | 2.7 | 12.3 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 2.8 | 5.7 | 10.0 | 2.5 | 10.5 | ns |
| | | $V_{CC(B)}$ = 3.0 V to 3.6 V | 2.5 | 7.1 | 11.5 | 2.3 | 11.9 | ns |



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**Table 8. Dynamic characteristics** *…continued*

*Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 5.*

| Symbol | Parameter | Conditions | 25 °C | | | –40 °C to +85 °C | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ[1] | Max | Min | Max | |
| **$C_L$ = 15 pF; $V_{CC(A)}$ = 3.0 V to 3.6 V** | | | | | | | | |
| $t_{en}$ | enable time | nOE to 2Y; see Figure 4 [3] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 4.2 | 8.2 | 18.0 | 3.8 | 18.4 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 3.6 | 6.1 | 12.5 | 3.2 | 13.0 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 3.1 | 5.2 | 10.7 | 2.7 | 11.5 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 2.8 | 4.6 | 9.5 | 2.5 | 10.1 | ns |
| | | $V_{CC(B)}$ = 3.0 V to 3.6 V | 2.5 | 4.4 | 9.1 | 2.3 | 9.6 | ns |
| $t_{dis}$ | disable time | nOE to 2Y; see Figure 4 [4] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 4.2 | 7.8 | 13.2 | 3.8 | 13.6 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 3.6 | 6.3 | 10.9 | 3.2 | 11.4 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 3.1 | 6.9 | 11.3 | 2.7 | 11.8 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 2.8 | 5.5 | 9.5 | 2.5 | 10.0 | ns |
| | | $V_{CC(B)}$ = 3.0 V to 3.6 V | 2.5 | 6.8 | 11.0 | 2.3 | 11.5 | ns |
| **$C_L$ = 30 pF; $V_{CC(A)}$ = 1.1 V to 1.3 V** | | | | | | | | |
| $t_{en}$ | enable time | nOE to 2Y; see Figure 4 [3] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 5.1 | 13.8 | 33.1 | 4.6 | 33.8 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 4.3 | 11.2 | 26.1 | 3.8 | 27.7 | ns |
| $t_{dis}$ | disable time | nOE to 2Y; see Figure 4 [4] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 5.1 | 13.9 | 28.5 | 4.6 | 29.2 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 4.3 | 11.7 | 25.4 | 3.8 | 26.2 | ns |
| **$C_L$ = 30 pF; $V_{CC(A)}$ = 1.4 V to 1.6 V** | | | | | | | | |
| $t_{en}$ | enable time | nOE to 2Y; see Figure 4 [3] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 5.1 | 12.1 | 26.6 | 4.6 | 27.5 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 4.3 | 9.5 | 19.6 | 3.8 | 21.4 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 4.0 | 8.5 | 17.7 | 3.5 | 19.2 | ns |
| $t_{dis}$ | disable time | nOE to 2Y; see Figure 4 [4] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 5.1 | 12.6 | 22.0 | 4.6 | 22.9 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 4.3 | 10.4 | 18.9 | 3.8 | 19.9 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 4.0 | 11.6 | 20.1 | 3.5 | 21.2 | ns |
| **$C_L$ = 30 pF; $V_{CC(A)}$ = 1.65 V to 1.95 V** | | | | | | | | |
| $t_{en}$ | enable time | nOE to 2Y; see Figure 4 [3] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 5.1 | 11.4 | 24.8 | 4.6 | 25.6 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 4.3 | 8.7 | 17.8 | 3.8 | 19.5 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 4.0 | 7.7 | 15.9 | 3.5 | 17.3 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 3.4 | 7.1 | 14.3 | 3.1 | 15.3 | ns |



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**Table 8. Dynamic characteristics** *…continued*

*Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 5.*

| Symbol | Parameter | Conditions | 25 °C | | | –40 °C to +85 °C | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ[1] | Max | Min | Max | |
| $t_{dis}$ | disable time | nOE to 2Y; see Figure 4 [4] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 5.1 | 12.0 | 20.2 | 4.6 | 21.0 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 4.3 | 9.9 | 17.1 | 3.8 | 18.0 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 4.0 | 11.1 | 18.3 | 3.5 | 19.3 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 3.4 | 8.7 | 15.5 | 3.2 | 16.4 | ns |
| **$C_L$ = 30 pF; $V_{CC(A)}$ = 2.3 V to 2.7 V** | | | | | | | | |
| $t_{en}$ | enable time | nOE to 2Y; see Figure 4 [3] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 5.1 | 10.6 | 23.3 | 4.6 | 23.9 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 4.3 | 7.9 | 16.4 | 3.8 | 17.8 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 4.0 | 6.9 | 14.4 | 3.5 | 15.6 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 3.4 | 6.2 | 12.8 | 3.2 | 13.6 | ns |
| | | $V_{CC(B)}$ = 3.0 V to 3.6 V | 3.3 | 6.1 | 12.4 | 3.1 | 13.0 | ns |
| $t_{dis}$ | disable time | nOE to 2Y; see Figure 4 [4] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 5.1 | 11.5 | 18.7 | 4.6 | 19.3 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 4.3 | 9.3 | 15.6 | 3.8 | 16.3 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 4.0 | 10.5 | 16.8 | 3.5 | 17.5 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 3.4 | 8.2 | 14.0 | 3.2 | 14.7 | ns |
| | | $V_{CC(B)}$ = 3.0 V to 3.6 V | 3.3 | 10.7 | 17.0 | 3.1 | 17.6 | ns |
| **$C_L$ = 30 pF; $V_{CC(A)}$ = 3.0 V to 3.6 V** | | | | | | | | |
| $t_{en}$ | enable time | nOE to 2Y; see Figure 4 [3] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 5.1 | 10.2 | 22.9 | 4.6 | 23.4 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 4.3 | 7.6 | 15.9 | 3.8 | 17.2 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 4.0 | 6.6 | 14.0 | 3.5 | 15.1 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 3.4 | 5.8 | 12.4 | 3.2 | 13.1 | ns |
| | | $V_{CC(B)}$ = 3.0 V to 3.6 V | 3.3 | 5.6 | 12.0 | 3.1 | 12.5 | ns |
| $t_{dis}$ | disable time | nOE to 2Y; see Figure 4 [4] | | | | | | |
| | | $V_{CC(B)}$ = 1.1 V to 1.3 V | 5.1 | 11.2 | 18.3 | 4.6 | 18.8 | ns |
| | | $V_{CC(B)}$ = 1.4 V to 1.6 V | 4.3 | 9.1 | 15.2 | 3.8 | 15.8 | ns |
| | | $V_{CC(B)}$ = 1.65 V to 1.95 V | 4.0 | 10.2 | 16.4 | 3.5 | 17.0 | ns |
| | | $V_{CC(B)}$ = 2.3 V to 2.7 V | 3.4 | 7.9 | 13.6 | 3.2 | 14.2 | ns |
| | | $V_{CC(B)}$ = 3.0 V to 3.6 V | 3.3 | 10.5 | 16.5 | 3.1 | 17.1 | ns |



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**Table 8. Dynamic characteristics** *…continued*

*Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 5.*

| Symbol | Parameter | Conditions | 25 °C | | | –40 °C to +85 °C | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ[1] | Max | Min | Max | |
| **$C_L$ = 5 pF, 10 pF, 15 pF and 30 pF** | | | | | | | | |
| $C_{PD}$ | power dissipation capacitance | output 2Y; $f_i$ = 1 MHz; $V_I$ = 0 V to $V_{CC}$ [5] | | | | | | |
| | | $V_{CC(A)}$ = $V_{CC(B)}$ = 1.2 V | - | 2.8 | - | - | - | pF |
| | | $V_{CC(A)}$ = $V_{CC(B)}$ = 1.5 V | - | 3.0 | - | - | - | pF |
| | | $V_{CC(A)}$ = $V_{CC(B)}$ = 1.8 V | - | 3.0 | - | - | - | pF |
| | | $V_{CC(A)}$ = $V_{CC(B)}$ = 2.5 V | - | 3.6 | - | - | - | pF |
| | | $V_{CC(A)}$ = $V_{CC(B)}$ = 3.3 V | - | 4.1 | - | - | - | pF |

[1] All typical values are measured at nominal $V_{CC(A)}$ and $V_{CC(B)}$.

[2] $t_{pd}$ is the same as $t_{PLH}$ and $t_{PHL}$.

[3] $t_{en}$ is the same as $t_{PZH}$ and $t_{PZL}$.

[4] $t_{dis}$ is the same as $t_{PHZ}$ and $t_{PLZ}$.

[5] $C_{PD}$ is used to determine the dynamic power dissipation ($P_D$ in µW).
$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ where:
$f_i$ = input frequency in MHz;
$f_o$ = output frequency in MHz;
$C_L$ = load capacitance in pF;
$V_{CC}$ = supply voltage in V;
N = number of inputs switching;
$\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.


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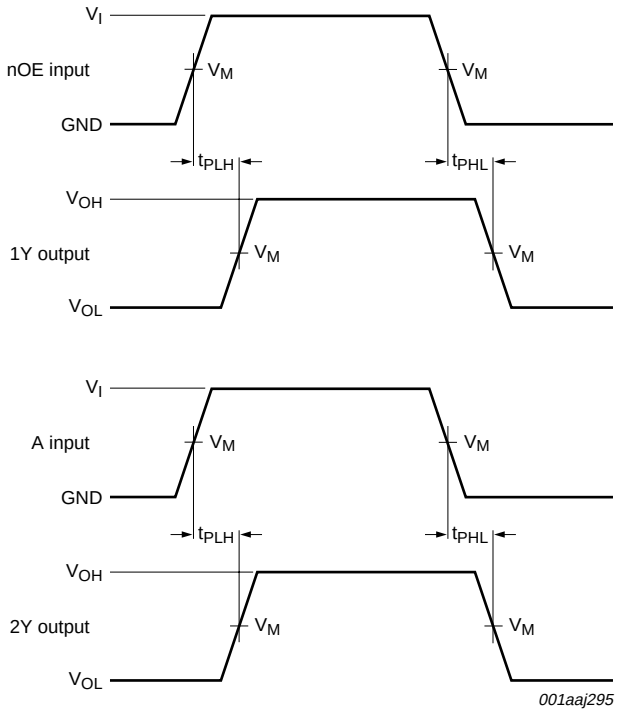
## 12. Waveforms




Measurement points are given in Table 9.

$V_{OL}$ and $V_{OH}$ are typical output voltage levels that occur with the output load.

**Fig 3. Input nOE to output 1Y and A to output 2Y propagation delay times**



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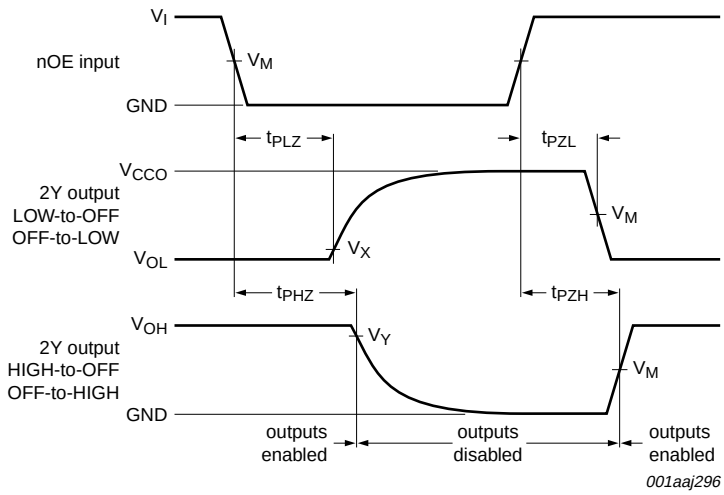


Measurement points are given in Table 9.

$V_{OL}$ and $V_{OH}$ are typical output voltage levels that occur with the output load.

$V_{CCO}$ is the supply voltage associated with the output pin.

Output 1Y has no external load.

**Fig 4. Enable and disable times**

**Table 9. Measurement points**

| Supply voltage | Input[1] | Output[2] | | |
|---|---|---|---|---|
| $V_{CC(A)}$, $V_{CC(B)}$ | $V_M$ | $V_M$ | $V_X$ | $V_Y$ |
| 1.1 V to 1.6 V | $0.5V_{CCI}$ | $0.5V_{CCO}$ | $V_{OL}$ + 0.1 V | $V_{OH}$ − 0.1 V |
| 1.65 V to 2.7 V | $0.5V_{CCI}$ | $0.5V_{CCO}$ | $V_{OL}$ + 0.15 V | $V_{OH}$ − 0.15 V |
| 3.0 V to 3.6 V | $0.5V_{CCI}$ | $0.5V_{CCO}$ | $V_{OL}$ + 0.3 V | $V_{OH}$ − 0.3 V |

[1] $V_{CCI}$ is the supply voltage associated with the data input port.

[2] $V_{CCO}$ is the supply voltage associated with the output port.



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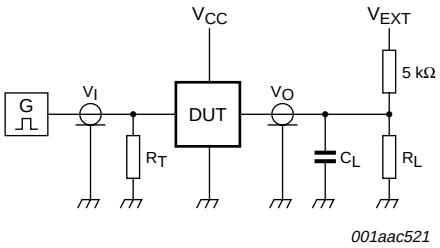


Test data is given in Table 10.

Definitions for test circuit:

$R_L$ = Load resistance.

$C_L$ = Load capacitance including jig and probe capacitance.

$R_T$ = Termination resistance should be equal to the output impedance $Z_o$ of the pulse generator.

$V_{EXT}$ = External voltage for measuring switching times.

**Fig 5. Load circuit for switching times**

**Table 10. Test data**

| Supply voltage | Input | | Load[2] | | $V_{EXT}$ | | |
|---|---|---|---|---|---|---|---|
| $V_{CC(A)}$, $V_{CC(B)}$ | $V_I$[1] | $t_r = t_f$ | $C_L$ | $R_L$[3] | $t_{PLH}$, $t_{PHL}$ | $t_{PZH}$, $t_{PHZ}$ | $t_{PZL}$, $t_{PLZ}$[4] |
| 1.1 V to 3.6 V | $V_{CCI}$ | ≤ 3.0 ns | 5 pF, 10 pF, 15 pF and 30 pF | 5 kΩ or 1 MΩ | open | GND | $2V_{CCO}$ |

[1] $V_{CCI}$ is the supply voltage associated with the data input port.

[2] For measuring enable and disable times, $C_L$ and $R_L$ are connected to pin 2Y. Pin 1Y has no load.

[3] For measuring enable and disable times $R_L$ = 5 kΩ, for measuring propagation delays $R_L$ = 1 MΩ.

[4] $V_{CCO}$ is the supply voltage associated with the output port.



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## 13. Transfer characteristics

**Table 11. Transfer characteristics**

*Voltages are referenced to GND (ground = 0 V; for test circuit see Figure 5.*

| Symbol | Parameter | Conditions | 25 °C | | | –40 °C to +85 °C | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | |
| $V_{T+}$ | positive-going threshold voltage | nOE inputs; see Figure 6 and Figure 7 | | | | | | |
| | | $V_{CC(A)}$ = 1.1 V | 0.53 | - | 0.90 | 0.53 | 0.90 | V |
| | | $V_{CC(A)}$ = 1.4 V | 0.74 | - | 1.11 | 0.74 | 1.11 | V |
| | | $V_{CC(A)}$ = 1.65 V | 0.91 | - | 1.29 | 0.91 | 1.29 | V |
| | | $V_{CC(A)}$ = 2.3 V | 1.37 | - | 1.77 | 1.37 | 1.77 | V |
| | | $V_{CC(A)}$ = 3.0 V | 1.88 | - | 2.29 | 1.88 | 2.29 | V |
| $V_{T-}$ | negative-going threshold voltage | nOE inputs; see Figure 6 and Figure 7 | | | | | | |
| | | $V_{CC(A)}$ = 1.1 V | 0.26 | - | 0.65 | 0.26 | 0.65 | V |
| | | $V_{CC(A)}$ = 1.4 V | 0.39 | - | 0.75 | 0.39 | 0.75 | V |
| | | $V_{CC(A)}$ = 1.65 V | 0.47 | - | 0.84 | 0.47 | 0.84 | V |
| | | $V_{CC(A)}$ = 2.3 V | 0.69 | - | 1.04 | 0.69 | 1.04 | V |
| | | $V_{CC(A)}$ = 3.0 V | 0.88 | - | 1.24 | 0.88 | 1.24 | V |
| $V_H$ | hysteresis voltage | nOE inputs; ($V_{T+} - V_{T-}$); see Figure 6, Figure 7, Figure 8 and Figure 9 | | | | | | |
| | | $V_{CC(A)}$ = 1.1 V | 0.08 | - | 0.46 | 0.08 | 0.46 | V |
| | | $V_{CC(A)}$ = 1.4 V | 0.18 | - | 0.56 | 0.18 | 0.56 | V |
| | | $V_{CC(A)}$ = 1.65 V | 0.27 | - | 0.66 | 0.27 | 0.66 | V |
| | | $V_{CC(A)}$ = 2.3 V | 0.53 | - | 0.92 | 0.53 | 0.92 | V |
| | | $V_{CC(A)}$ = 3.0 V | 0.79 | - | 1.31 | 0.79 | 1.31 | V |

## 14. Waveforms transfer characteristics

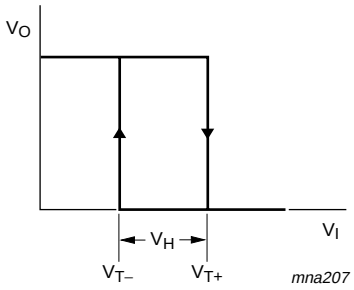
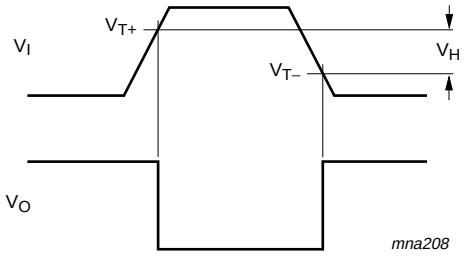



**Fig 6. Transfer characteristic**




$V_{T+}$ and $V_{T-}$ limits at 70 % and 20 %.

**Fig 7. Definition of $V_{T+}$, $V_{T-}$ and $V_H$**



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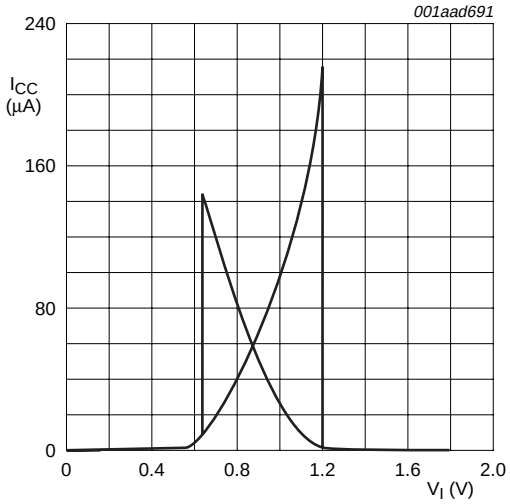


**Fig 8. Typical transfer characteristics; $V_{CC(A)}$ = 1.8 V**

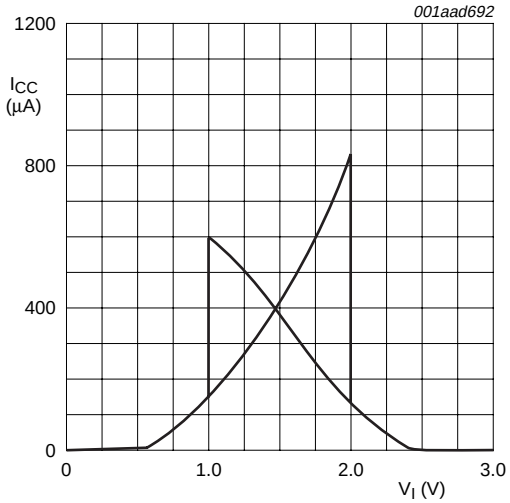


**Fig 9. Typical transfer characteristics; $V_{CC(A)}$ = 3.0 V**


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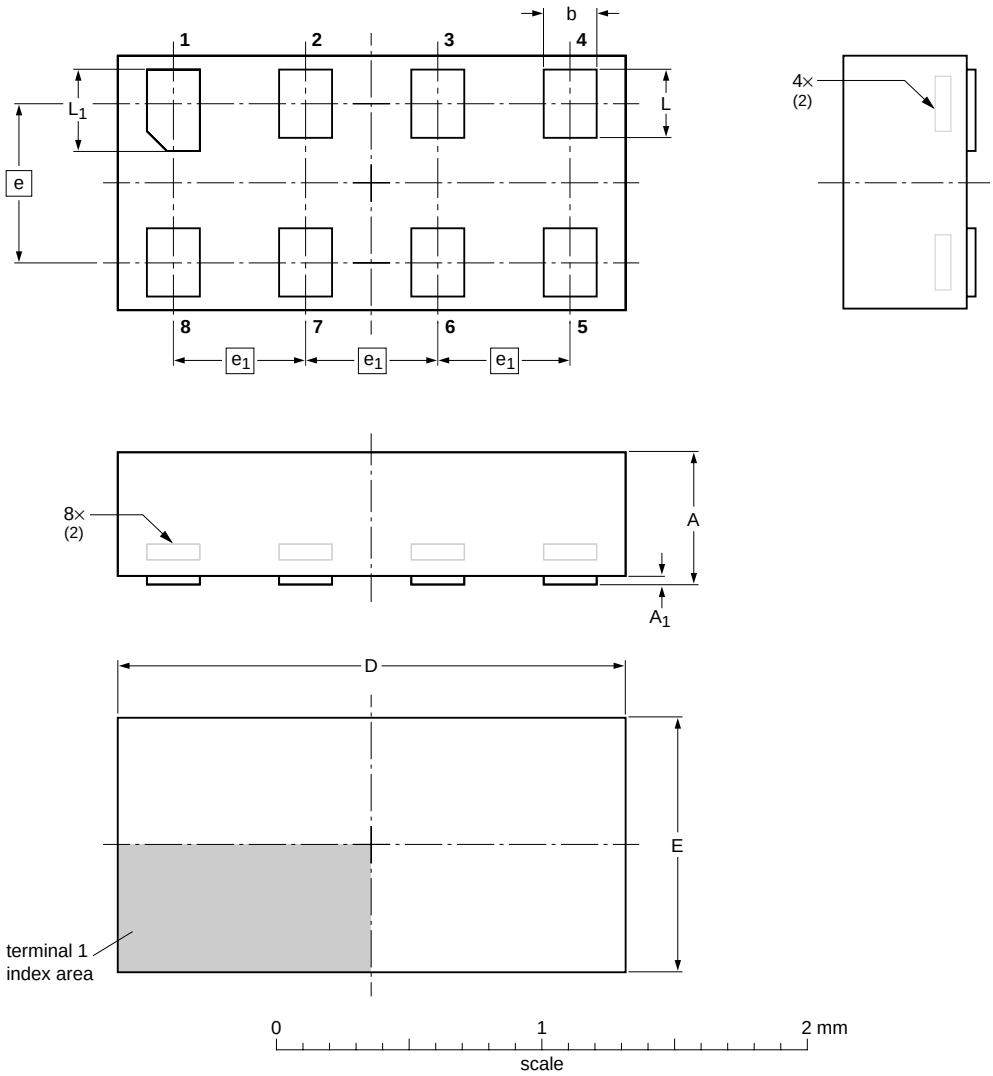
## 15. Package outline

**XSON8: plastic extremely thin small outline package; no leads; 8 terminals; body 1 x 1.95 x 0.5 mm** **SOT833-1**




**DIMENSIONS (mm are the original dimensions)**

| UNIT | A(1) max | A1 max | b | D | E | e | e1 | L | L1 |
|---|---|---|---|---|---|---|---|---|---|
| mm | 0.5 | 0.04 | 0.25<br>0.17 | 2.0<br>1.9 | 1.05<br>0.95 | 0.6 | 0.5 | 0.35<br>0.27 | 0.40<br>0.32 |

**Notes**

1. Including plating thickness.
2. Can be visible in some manufacturing processes.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT833-1 | - - - | MO-252 | - - - | | | ~~07-11-14~~<br>07-12-07 |

**Fig 10. Package outline SOT833-1 (XSON8)**



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## 16. Abbreviations

**Table 12. Abbreviations**

| Acronym | Description |
|---|---|
| CDM | Charged Device Model |
| CMOS | Complementary Metal-Oxide Semiconductor |
| DUT | Device Under Test |
| ESD | ElectroStatic Discharge |
| HBM | Human Body Model |
| MM | Machine Model |
| TTL | Transistor-Transistor Logic |

## 17. Revision history

**Table 13. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| 74AUP1T1326_1 | 20090120 | Product data sheet | - | - |


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# 18. Legal information

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| Document status[1][2] | Product status[3] | Definition |
|---|---|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification | This document contains data from the preliminary specification. |
| Product [short] data sheet | Production | This document contains the product specification. |

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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