



# AiPTS2102

## 2-Bit Bidirectional Level-Shifting, Voltage-Level Translator

### Product Specification

#### Specification Revision History:

| Version    | Date    | Description                             |
|------------|---------|-----------------------------------------|
| 2021-04-A1 | 2021-04 | New                                     |
| 2023-08-A2 | 2023-08 | Add order information                   |
| 2024-05-B1 | 2024-05 | Modify the content; Update the template |
|            |         |                                         |



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## 1、General Description

The AiPTS2102 is a 2-bit, dual supply translating transceiver with auto direction sensing, that enables bidirectional voltage level translation. It features two 2-bit input-output ports (An and Bn), one output enable input (OE) and two supply pins ( $V_{CC(A)}$  and  $V_{CC(B)}$ ). Both supplies can be supplied at any voltage between 1.65V and 5.5V. This flexibility makes the device suitable for translating between any of the voltage nodes (1.8V, 2.5V, 3.3V and 5.0V). Pins An and OE are referenced to  $V_{CC(A)}$  and pins Bn are referenced to  $V_{CC(B)}$ .

A LOW level at pin OE causes the outputs to assume a high-impedance OFF-state. This device is fully specified for partial power-down applications using  $I_{OFF}$ . The  $I_{OFF}$  circuitry disables the output, preventing the damaging backflow current through the device when it is powered down.

### Features:

- Wide supply voltage range:  
 $V_{CC(A)}$ : 1.65V to 5.5V  
 $V_{CC(B)}$ : 1.65V to 5.5V
- Maximum data rates: 50Mbps
- $I_{OFF}$  circuitry provides partial Power-down mode operation
- Inputs accept voltages up to 5.5V
- Specified from -40°C to +85°C
- Packaging information: QFN8

### Ordering Information:

#### Reel packing specifications:

| Type number     | Packaging form | Marking code | Reel quantity | Boxed reel quantity | Notes                                                                    |
|-----------------|----------------|--------------|---------------|---------------------|--------------------------------------------------------------------------|
| AiPTS2102QH8.TR | QFN8           | DKXX         | 3000CS/reel   | 30000PCS/box        | Dimensions of plastic enclosure:<br>1.4mm×1.2mm<br>Pin spacing:<br>0.4mm |

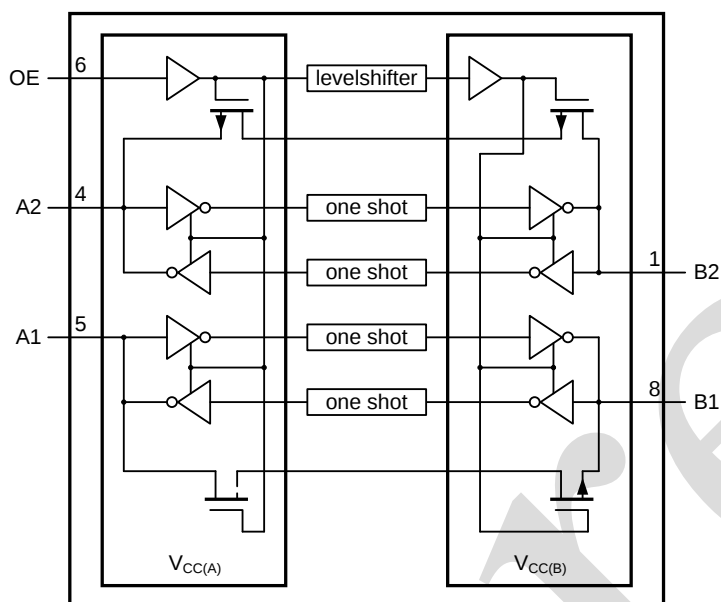
Note 1: "XX" refers to variable content, meaning year and package batch serial number.

Note 2: If the physical information is inconsistent with the ordering information, please refer to the actual product.

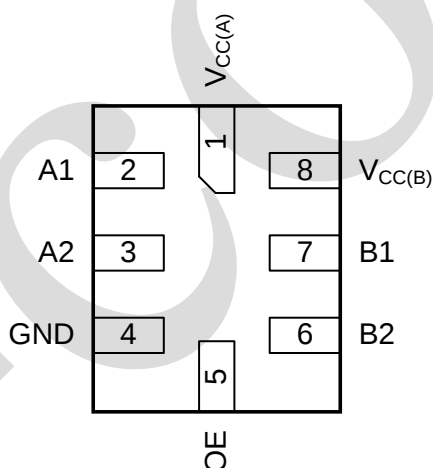


## 2、Block Diagram And Pin Description

### 2.1、Block Diagram



### 2.2、Pin Configurations



### 2.3、Pin Description

| Pin No. | Pin Name    | Description                                                   |
|---------|-------------|---------------------------------------------------------------|
| 1       | $V_{CC(A)}$ | supply voltage A                                              |
| 2       | A1          | data input or output (referenced to $V_{CC(A)}$ )             |
| 3       | A2          | data input or output (referenced to $V_{CC(A)}$ )             |
| 4       | GND         | ground (0V)                                                   |
| 5       | OE          | output enable input (active HIGH; referenced to $V_{CC(A)}$ ) |
| 6       | B2          | data input or output (referenced to $V_{CC(B)}$ )             |
| 7       | B1          | data input or output (referenced to $V_{CC(B)}$ )             |
| 8       | $V_{CC(B)}$ | supply voltage B                                              |



## 2.4、Function table

| Supply voltage |               | Input | Input/Output    |                 |
|----------------|---------------|-------|-----------------|-----------------|
| $V_{CC(A)}$    | $V_{CC(B)}$   | OE    | An              | Bn              |
| 1.65V to 5.5V  | 1.65V to 5.5V | L     | Z               | Z               |
| 1.65V to 5.5V  | 1.65V to 5.5V | H     | input or output | input or output |
| GND            | GND           | X     | Z               | Z               |

Note:

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

[2] When either  $V_{CC(A)}$  or  $V_{CC(B)}$  is at GND level, the device goes into power-down mode.

## 3、Electrical Parameter

### 3.1、Absolute Maximum Ratings

( $T_{amb}=25^{\circ}\text{C}$ , voltages are referenced to GND (ground=0V), unless otherwise specified)

| Characteristic          | Symbol      | Conditions                     |             | Min. | Max.          | Unit               |
|-------------------------|-------------|--------------------------------|-------------|------|---------------|--------------------|
| supply voltage A        | $V_{CC(A)}$ | -                              |             | -0.5 | +6.5          | V                  |
| supply voltage B        | $V_{CC(B)}$ | -                              |             | -0.5 | +6.5          | V                  |
| input voltage           | $V_I$       | A port and OE input            |             | -0.5 | +6.5          | V                  |
|                         |             | B port                         |             | -0.5 | +6.5          | V                  |
| output voltage          | $V_O$       | Active mode                    | A or B port | -0.5 | $V_{CCO}+0.5$ | V                  |
|                         |             | Power-down or 3-state mode     | A or B port | -0.5 | +6.5          | V                  |
| input clamping current  | $I_{IK}$    | $V_I < 0\text{V}$              |             | -50  | -             | mA                 |
| output clamping current | $I_{OK}$    | $V_O < 0\text{V}$              |             | -50  | -             | mA                 |
| output current          | $I_O$       | $V_O = 0\text{V}$ to $V_{CCO}$ |             | -    | $\pm 50$      | mA                 |
| supply current          | $I_{CC}$    | $I_{CC(A)}$ or $I_{CC(B)}$     |             | -    | 100           | mA                 |
| ground current          | $I_{GND}$   | -                              |             | -100 | -             | mA                 |
| storage temperature     | $T_{stg}$   | -                              |             | -65  | +150          | $^{\circ}\text{C}$ |
| total power dissipation | $P_{tot}$   | -                              |             | -    | 250           | mW                 |
| Soldering Temperature   | $T_L$       | 10s                            |             | 260  |               | $^{\circ}\text{C}$ |

Note:

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

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

### 3.2、Recommended Operating Conditions

| Parameter                           | Symbol              | Conditions      |                                                                                          | Min. | Typ. | Max. | Unit               |
|-------------------------------------|---------------------|-----------------|------------------------------------------------------------------------------------------|------|------|------|--------------------|
| supply voltage A                    | $V_{CC(A)}$         | -               |                                                                                          | 1.65 | -    | 5.5  | V                  |
| supply voltage B                    | $V_{CC(B)}$         | -               |                                                                                          | 1.65 | -    | 5.5  | V                  |
| ambient temperature                 | $T_{amb}$           | -               |                                                                                          | -40  | -    | +85  | $^{\circ}\text{C}$ |
| input transition rise and fall rate | $\Delta t/\Delta V$ | A, B or OE port | $V_{CC(A)}=1.65\text{V}$ to $5.5\text{V}$ ;<br>$V_{CC(B)}=1.65\text{V}$ to $5.5\text{V}$ | -    | -    | 10   | ns/V               |

Note:

[1] Hold the A and B sides of an unused I/O pair in the same state, both at  $V_{CCI}$  or both at GND.



## 3.3、Electrical Characteristics

### 3.3.1、DC Characteristics

( $T_{amb} = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , voltages are referenced to GND (ground=0V), unless otherwise specified)

| Parameter                 | Symbol    | Conditions                                                                                                                     |                                                                                                                 | Min.                    | Typ. | Max.                    | Unit          |
|---------------------------|-----------|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------|------|-------------------------|---------------|
| HIGH-level input voltage  | $V_{IH}$  | A or B port                                                                                                                    | $V_{CC(A)}=1.65\text{V to }5.5\text{V};$<br>$V_{CC(B)}=1.65\text{V to }5.5\text{V}$                             | $V_{CCI}-0.4$           | -    | -                       | V             |
|                           |           | OE input                                                                                                                       | $V_{CC(A)}=1.65\text{V to }5.5\text{V};$<br>$V_{CC(B)}=1.65\text{V to }5.5\text{V}$                             | $0.65 \times V_{CC(A)}$ | -    | -                       | V             |
| LOW-level input voltage   | $V_{IL}$  | A or B port                                                                                                                    | $V_{CC(A)}=1.65\text{V to }5.5\text{V};$<br>$V_{CC(B)}=1.65\text{V to }5.5\text{V}$                             | -                       | -    | 0.4                     | V             |
|                           |           | OE input                                                                                                                       | $V_{CC(A)}=1.65\text{V to }5.5\text{V};$<br>$V_{CC(B)}=1.65\text{V to }5.5\text{V}$                             | -                       | -    | $0.35 \times V_{CC(A)}$ | V             |
| LOW-level output voltage  | $V_{OL}$  | A or B port;<br>$I_O=6\text{mA}$                                                                                               | $V_I \leq 0.15\text{V};$<br>$V_{CC(A)}=1.65\text{V to }5.5\text{V};$<br>$V_{CC(B)}=1.65\text{V to }5.5\text{V}$ | -                       | -    | 0.4                     | V             |
| input leakage current     | $I_I$     | OE input; $V_I=0\text{V to }V_{CC(A)};$<br>$V_{CC(A)}=1.65\text{V to }5.5\text{V};$<br>$V_{CC(B)}=1.65\text{V to }5.5\text{V}$ |                                                                                                                 | -                       | -    | $\pm 1$                 | $\mu\text{A}$ |
| OFF-state output current  | $I_{OZ}$  | A or B port; $V_O=0\text{V or }V_{CCO};$<br>$V_{CC(A)}=0\text{V to }5.5\text{V};$<br>$V_{CC(B)}=0\text{V to }5.5\text{V}$      |                                                                                                                 | -                       | -    | $\pm 2$                 | $\mu\text{A}$ |
| power-off leakage current | $I_{OFF}$ | A port; $V_I$ or $V_O=0\text{V to }5.5\text{V};$<br>$V_{CC(A)}=0\text{V}; V_{CC(B)}=0\text{V to }5.5\text{V}$                  |                                                                                                                 | -                       | -    | $\pm 2$                 | $\mu\text{A}$ |
|                           |           | B port; $V_I$ or $V_O=0\text{V to }5.5\text{V};$<br>$V_{CC(B)}=0\text{V}; V_{CC(A)}=0\text{V to }5.5\text{V}$                  |                                                                                                                 | -                       | -    | $\pm 2$                 | $\mu\text{A}$ |
| supply current            | $I_{CC}$  | $V_I=0\text{V or }V_{CCI}; I_O=0\text{A}$                                                                                      |                                                                                                                 |                         |      |                         |               |
|                           |           | $I_{CC(A)}$                                                                                                                    | $V_{CC(A)}=1.65\text{V to }5.5\text{V};$<br>$V_{CC(B)}=1.65\text{V to }5.5\text{V};$<br>OE=LOW or HIGH          | -                       | -    | 5                       | $\mu\text{A}$ |
|                           |           |                                                                                                                                | $V_{CC(A)}=1.65\text{V to }5.5\text{V};$<br>$V_{CC(B)}=0\text{V}$                                               | -                       | -    | 2                       | $\mu\text{A}$ |
|                           |           |                                                                                                                                | $V_{CC(A)}=0\text{V};$<br>$V_{CC(B)}=1.65\text{V to }5.5\text{V}$                                               | -                       | -    | -2                      | $\mu\text{A}$ |
|                           |           | $I_{CC(B)}$                                                                                                                    | $V_{CC(A)}=1.65\text{V to }5.5\text{V};$<br>$V_{CC(B)}=1.65\text{V to }5.5\text{V};$<br>OE=LOW                  | -                       | -    | 5                       | $\mu\text{A}$ |
|                           |           |                                                                                                                                | $V_{CC(A)}=1.65\text{V to }5.5\text{V};$<br>$V_{CC(B)}=0\text{V}$                                               | -                       | -    | -2                      | $\mu\text{A}$ |
|                           |           |                                                                                                                                | $V_{CC(A)}=0\text{V};$<br>$V_{CC(B)}=1.65\text{V to }5.5\text{V}$                                               | -                       | -    | 2                       | $\mu\text{A}$ |
| input capacitance         | $C_I$     | OE input; $V_{CC(A)}=V_{CC(B)}=0\text{V}$                                                                                      |                                                                                                                 | -                       | 2.2  | -                       | pF            |
| input/output capacitance  | $C_{I/O}$ | A or B port; $V_{CC(A)}=5.0\text{V}; V_{CC(B)}=5.0\text{V}$                                                                    |                                                                                                                 | -                       | 10   | -                       | pF            |

Note:

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



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

### 3.3.2、AC Characteristics 1

( $T_{amb}=25^{\circ}C$ , voltages are referenced to GND (ground=0V), unless otherwise specified)

| Parameter                          | Symbol    | Conditions                                                                  | $V_{CCO}$ |      |      |      | Unit |
|------------------------------------|-----------|-----------------------------------------------------------------------------|-----------|------|------|------|------|
|                                    |           |                                                                             | 1.8V      | 2.5V | 3.3V | 5.0V |      |
| LOW to HIGH output transition time | $t_{TLH}$ | A or B port                                                                 | 7         | 5    | 4    | 3    | ns   |
| HIGH to LOW output transition time | $t_{THL}$ | A or B port                                                                 | 4         | 6    | 8    | 11   | ns   |
| power dissipation capacitance      | $C_{PD}$  | $OE=V_{CC(A)}$ ;<br>$V_{CC(A)}=V_{CC(B)}$ ;<br>$f_i=400kHz$ ; $V_I=V_{CCI}$ | -         | -    | -    | 13.5 | pF   |

Note:

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

[2]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in uW).

$$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum (C_L \times V_{CC}^2 \times f_o) \text{ where:}$$

$f_i$ =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;

$\sum (C_L \times V_{CC}^2 \times f_o)$ =sum of the outputs.

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



## 3.3.2、AC Characteristics 2

( $T_{amb}=-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , voltages are referenced to GND (ground=0V), unless otherwise specified)

| Parameter                          | Symbol             | Conditions       | V <sub>CC(B)</sub> |      |           |      |           |      |           |      | Unit |
|------------------------------------|--------------------|------------------|--------------------|------|-----------|------|-----------|------|-----------|------|------|
|                                    |                    |                  | 1.8V±0.15V         |      | 2.5V±0.2V |      | 3.3V±0.3V |      | 5.0V±0.5V |      |      |
|                                    |                    |                  | Typ.               | Max. | Typ.      | Max. | Typ.      | Max. | Typ.      | Max. |      |
| V <sub>CC(A)</sub> =1.8V±0.15V     |                    |                  |                    |      |           |      |           |      |           |      |      |
| HIGH to LOW propagation delay      | t <sub>PHL</sub>   | A to B           | 3                  | 7    | 3         | 6    | 3         | 5    | 5         | 7    | ns   |
| LOW to HIGH propagation delay      | t <sub>PLH</sub>   | A to B           | 5                  | 12   | 5         | 8    | 4         | 8    | 4         | 7    | ns   |
| HIGH to LOW propagation delay      | t <sub>PHL</sub>   | B to A           | 3                  | 7    | 3         | 6    | 3         | 5    | 5         | 7    | ns   |
| LOW to HIGH propagation delay      | t <sub>PLH</sub>   | B to A           | 5                  | 12   | 1         | 3    | 1         | 2    | 1         | 2    | ns   |
| OFF-state to LOW propagation delay | t <sub>PZL</sub>   | OE to A          | 9                  | 16   | 9         | 18   | 10        | 14   | 10        | 15   | ns   |
|                                    |                    | OE to B          | 9                  | 16   | 6         | 12   | 6         | 12   | 6         | 14   | ns   |
| LOW to OFF-state propagation delay | t <sub>PLZ</sub>   | OE to A          | 100                | 120  | 100       | 120  | 100       | 120  | 100       | 120  | ns   |
|                                    |                    | OE to B          | 100                | 120  | 100       | 120  | 100       | 120  | 100       | 120  | ns   |
| output skew time                   | t <sub>sk(o)</sub> | between channels | -                  | 1    | -         | 1    | -         | 1    | -         | 1    | ns   |
| data rate                          | f <sub>data</sub>  | -                | -                  | 18   | -         | 18   | -         | 18   | -         | 18   | Mbps |
| V <sub>CC(A)</sub> =2.5V±0.2V      |                    |                  |                    |      |           |      |           |      |           |      |      |
| HIGH to LOW propagation delay      | t <sub>PHL</sub>   | A to B           | 3                  | 6    | 2         | 5    | 2         | 5    | 2         | 5    | ns   |
| LOW to HIGH propagation delay      | t <sub>PLH</sub>   | A to B           | 1                  | 3    | 2         | 4    | 2.5       | 7    | 2.5       | 5    | ns   |
| HIGH to LOW propagation delay      | t <sub>PHL</sub>   | B to A           | 3                  | 6    | 2         | 5    | 2         | 5    | 2         | 5    | ns   |
| LOW to HIGH propagation delay      | t <sub>PLH</sub>   | B to A           | 5                  | 8    | 2         | 4    | 1.5       | 3    | 1         | 3    | ns   |
| OFF-state to LOW propagation delay | t <sub>PZL</sub>   | OE to A          | 6                  | 12   | 5         | 10   | 8         | 10   | 5         | 6    | ns   |
|                                    |                    | OE to B          | 9                  | 18   | 5         | 10   | 4.5       | 9    | 4         | 8    | ns   |
| LOW to OFF-state propagation delay | t <sub>PLZ</sub>   | OE to A          | 100                | 120  | 100       | 120  | 100       | 120  | 100       | 120  | ns   |
|                                    |                    | OE to B          | 100                | 120  | 100       | 120  | 100       | 120  | 100       | 120  | ns   |
| output skew time                   | t <sub>sk(o)</sub> | between          | -                  | 1    | -         | 1    | -         | 1    | -         | 1    | ns   |
| data rate                          | f <sub>data</sub>  | -                | -                  | 18   | -         | 32   | -         | 32   | -         | 32   | Mbps |
| V <sub>CC(A)</sub> =3.3V±0.3V      |                    |                  |                    |      |           |      |           |      |           |      |      |
| HIGH to LOW propagation delay      | t <sub>PHL</sub>   | A to B           | 3                  | 5    | 2         | 5    | 2         | 4    | 2         | 4    | ns   |
| LOW to HIGH propagation delay      | t <sub>PLH</sub>   | A to B           | 1                  | 2    | 1.5       | 3    | 1.5       | 3    | 2         | 4    | ns   |
| HIGH to LOW propagation delay      | t <sub>PHL</sub>   | B to A           | 3                  | 5    | 2         | 5    | 2         | 4    | 2         | 4    | ns   |
| LOW to HIGH propagation delay      | t <sub>PLH</sub>   | B to A           | 4                  | 8    | 2.5       | 7    | 1.5       | 3    | 1         | 3    | ns   |
| OFF-state to LOW                   | t <sub>PZL</sub>   | OE to A          | 6                  | 12   | 4.5       | 9    | 6         | 9    | 4         | 7    | ns   |



|                                           |             |         |     |     |     |     |     |     |     |     |      |
|-------------------------------------------|-------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|
| propagation delay                         |             | OE to B | 10  | 14  | 5   | 10  | 6   | 9   | 4   | 8   | ns   |
| LOW to OFF-state propagation delay        | $t_{PLZ}$   | OE to A | 100 | 120 | 100 | 120 | 100 | 120 | 100 | 120 | ns   |
|                                           |             | OE to B | 100 | 120 | 100 | 120 | 100 | 120 | 100 | 120 | ns   |
| output skew time                          | $t_{sk(o)}$ | between | -   | 1   | -   | 1   | -   | 1   | -   | 1   | ns   |
| data rate                                 | $f_{data}$  | -       | -   | 18  | -   | 32  | -   | 40  | -   | 40  | Mbps |
| <b><math>V_{CC(A)}=5.5V\pm0.5V</math></b> |             |         |     |     |     |     |     |     |     |     |      |
| HIGH to LOW propagation delay             | $t_{PHL}$   | A to B  | 5   | 7   | 2   | 5   | 2   | 4   | 2   | 4   | ns   |
| LOW to HIGH propagation delay             | $t_{PLH}$   | A to B  | 1   | 2   | 1   | 3   | 1   | 3   | 1   | 3   | ns   |
| HIGH to LOW propagation delay             | $t_{PHL}$   | B to A  | 5   | 7   | 2   | 5   | 2   | 4   | 2   | 4   | ns   |
| LOW to HIGH propagation delay             | $t_{PLH}$   | B to A  | 4   | 7   | 2.5 | 5   | 2   | 4   | 1   | 3   | ns   |
| OFF-state to LOW propagation delay        | $t_{PZL}$   | OE to A | 6   | 14  | 4   | 8   | 4   | 8   | 3   | 5   | ns   |
|                                           |             | OE to B | 10  | 15  | 5   | 8   | 4   | 7   | 4   | 5   | ns   |
| LOW to OFF-state propagation delay        | $t_{PLZ}$   | OE to A | 100 | 120 | 100 | 120 | 100 | 120 | 100 | 120 | ns   |
|                                           |             | OE to B | 100 | 120 | 100 | 120 | 100 | 120 | 100 | 120 | ns   |
| output skew time                          | $t_{sk(o)}$ | between | -   | 1   | -   | 1   | -   | 1   | -   | 1   | ns   |
| data rate                                 | $f_{data}$  | -       | -   | 18  | -   | 32  | -   | 40  | -   | 52  | Mbps |

Note:

[1] All typical values are measured at nominal  $V_{CC}$  and  $T_{amb}=25^{\circ}C$ .

[2] Skew between any two outputs of the same package switching in the same direction.



## 4、Testing Circuit

### 4.1、AC Testing Circuit

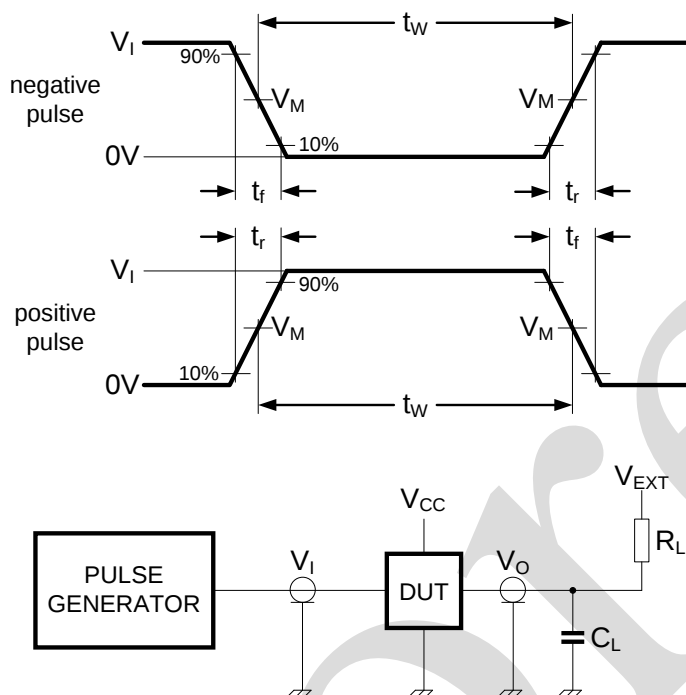


Figure 1. Test circuit for measuring switching times

All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10\text{MHz}$ ;  $Z_0 = 50\Omega$ ;  $dV/dt \geq 1.0\text{V/ns}$ .

$R_L$ =Load resistance.

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

$V_{CCO}$ =Supply voltage associated with the output.

### 4.2、AC Testing Waveforms

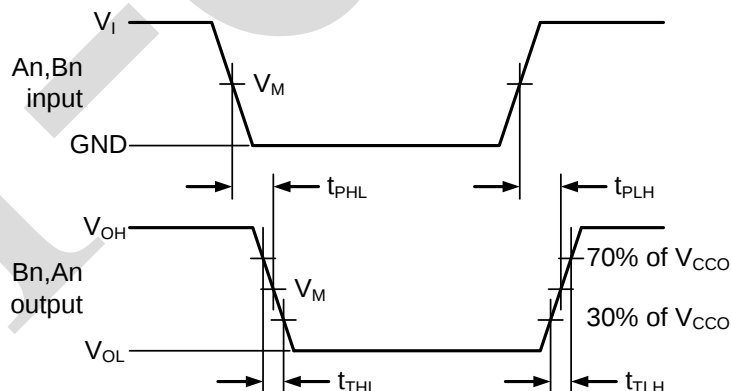


Figure 2. The data input (An, Bn) to data output (Bn, An) propagation delay times

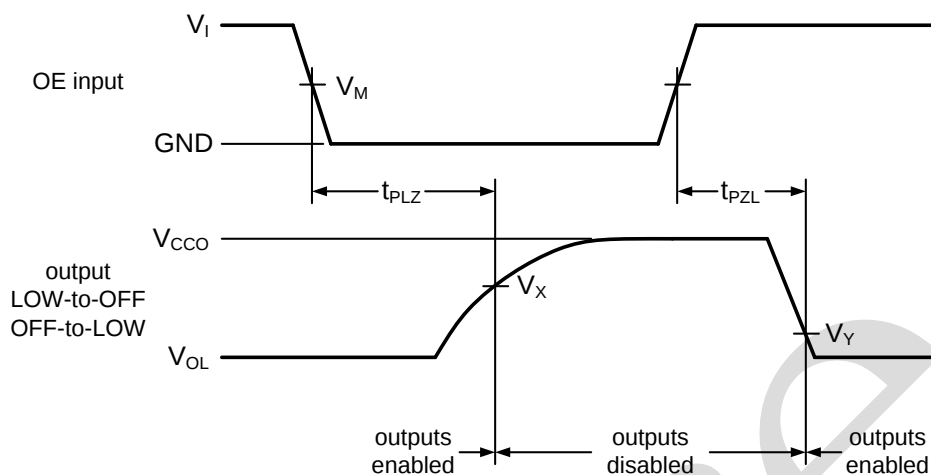


Figure 3. Enable and disable times

## 4.3、Measurement Points

| Supply voltage | Input        | Output       |              |              |
|----------------|--------------|--------------|--------------|--------------|
| $V_{CCO}$      | $V_M$        | $V_M$        | $V_X$        | $V_Y$        |
| 1.65V to 5.5V  | $0.5V_{CCI}$ | $0.5V_{CCO}$ | $0.5V_{CCO}$ | $0.1V_{CCO}$ |

Note:

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

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

## 4.4、Test Data

| Supply voltage |                | Input     |                     | Load  |               |
|----------------|----------------|-----------|---------------------|-------|---------------|
| $V_{CC(A)}$    | $V_{CC(B)}$    | $V_I$     | $t_r/t_f$           | $C_L$ | $R_L$         |
| 1.65V to 1.95V | 1.65V to 1.95V | $V_{CCI}$ | $\leq 2.0\text{ns}$ | 50pF  | 2.2k $\Omega$ |
| 2.3V to 2.7V   | 2.3V to 2.7V   | $V_{CCI}$ | $\leq 2.0\text{ns}$ | 50pF  | 2.2k $\Omega$ |
| 3.0V to 3.6V   | 3.0V to 3.6V   | $V_{CCI}$ | $\leq 2.5\text{ns}$ | 50pF  | 2.2k $\Omega$ |
| 4.5V to 5.5V   | 4.5V to 5.5V   | $V_{CCI}$ | $\leq 2.5\text{ns}$ | 50pF  | 2.2k $\Omega$ |

Note:

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



## 5、Typical Application Circuit And Application Note

### 5.1、Applications

The AiPTS2102 can be used in point-to-point applications to interface between devices or systems operating at different supply voltages. The device is targeted at I<sup>2</sup>C or 1-wire buses which use open-drain drivers.

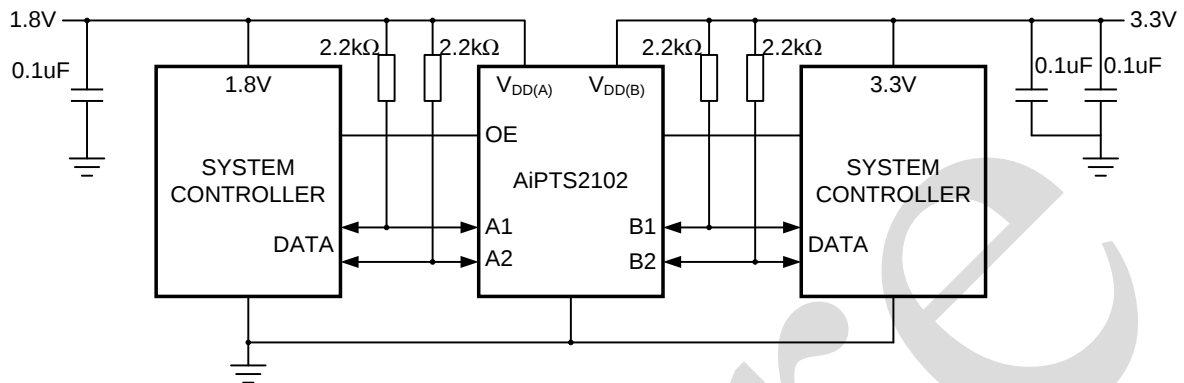


Figure 4. Typical voltage level-translation circuit

### 5.2、Input Driver Requirements

As the AiPTS2102 is a switch type translator, properties of the input driver directly affect the output signal. The external open-drain driver applied to an I/O, determines the static current sinking capability of the system. The maximum data rate, output transition times ( $t_{THL}$ ,  $t_{TLH}$ ) and propagation delays ( $t_{PHL}$ ,  $t_{PLH}$ ) are dependent upon the output impedance and edge-rate of the external driver.

### 5.3、Output Load Considerations

The maximum lumped capacitive load that can be driven is dependent upon the one-shot pulse duration and has been tuned to 600 pF. In cases with higher capacitive loading, there is a risk that the output does not reach the positive rail within the one-shot pulse duration. To avoid excessive capacitive loading and to ensure correct triggering of the one-shot, use short trace lengths and low capacitance connectors on AiPTS2102 PCB layouts. The length of the PCB trace should be such that the round-trip delay of any reflection is within the one-shot pulse duration. Such a length ensures low impedance termination and avoids output signal oscillations and one-shot retriggering.

### 5.4、Output Enable (OE)

An output enable input (OE) is used to disable the device. Setting OE=LOW causes all I/Os to assume the high-impedance OFF-state.



## 5.5、Power-Up

When either of the supplies  $V_{CC(n)}$  is at 0 V, outputs are in the high-impedance OFF-state. One of the advantages of AiPTS010X/2102 translators is that either  $V_{CC(A)}$  or  $V_{CC(B)}$  may be powered up first. To reduce dissipation during power-up, ensure that output enable (OE) is defined. Connect it via a pull down resistor to GND or, if the application allows, hardwired to  $V_{CC(A)}$ . If the OE pin is hardwired to  $V_{CC(A)}$ , either supply can be powered up or down first. If a pull down is used, the following sequences are recommended.

For power-up:

1. Apply power to either supply pin
2. Apply power to other supply pin
3. Enable the device by driving OE HIGH

For power down:

1. Disable the device by driving OE LOW
2. Remove power from either supply pin
3. Remove power from other supply pin

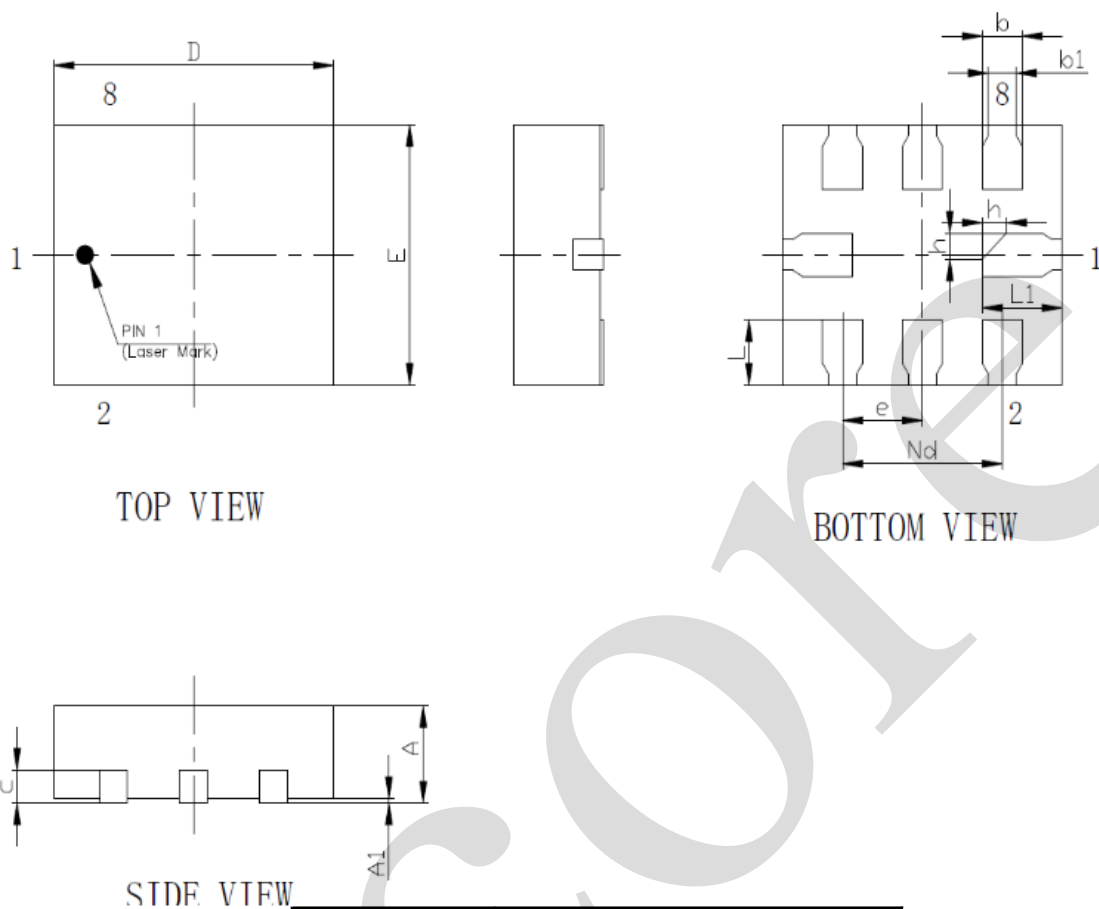
## 5.6、Pull-Up Resistors On I/O Lines

Each A port I/O requires a pull-up resistor to  $V_{CC(A)}$ , and each B port I/O requires a pull-up resistor to  $V_{CC(B)}$ . Choose the magnitude of the pull-up resistors to ensure that the output voltage levels meet the application requirement.



## 6、Package Information

### 6.1、QFN8



| 2023/12/A | Dimensions In Millimeters |      |
|-----------|---------------------------|------|
|           | Min                       | Max  |
| A         | 0.40                      | 0.50 |
| A1        | 0                         | 0.05 |
| b         | 0.15                      | 0.25 |
| b1        | 0.14                      |      |
| c         | 0.15                      |      |
| D         | 1.35                      | 1.45 |
| e         | 0.40                      |      |
| Nd        | 0.80                      |      |
| E         | 1.15                      | 1.25 |
| L         | 0.25                      | 0.35 |
| L1        | 0.35                      | 0.45 |
| h         | 0.07                      | 0.17 |



## 7、Statements And Notes

### 7.1、The name and content of Hazardous substances or Elements in the product

| Part name               | Hazardous substances or Elements                                                                                                                                                                                                                                                 |                               |                               |                               |                          |                                |                   |                       |                           |                      |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------|--------------------------|--------------------------------|-------------------|-----------------------|---------------------------|----------------------|
|                         | Lead and lead compounds                                                                                                                                                                                                                                                          | Mercury and mercury compounds | Cadmium and cadmium compounds | Hexavalent chromium compounds | Polybrominated biphenyls | Polybrominated biphenyl ethers | Dibutyl phthalate | Butylbenzyl phthalate | Di-2-ethylhexyl phthalate | Diisobutyl phthalate |
| Lead frame              | ○                                                                                                                                                                                                                                                                                | ○                             | ○                             | ○                             | ○                        | ○                              | ○                 | ○                     | ○                         | ○                    |
| Plastic resin           | ○                                                                                                                                                                                                                                                                                | ○                             | ○                             | ○                             | ○                        | ○                              | ○                 | ○                     | ○                         | ○                    |
| Chip                    | ○                                                                                                                                                                                                                                                                                | ○                             | ○                             | ○                             | ○                        | ○                              | ○                 | ○                     | ○                         | ○                    |
| The lead                | ○                                                                                                                                                                                                                                                                                | ○                             | ○                             | ○                             | ○                        | ○                              | ○                 | ○                     | ○                         | ○                    |
| Plastic sheet installed | ○                                                                                                                                                                                                                                                                                | ○                             | ○                             | ○                             | ○                        | ○                              | ○                 | ○                     | ○                         | ○                    |
| explanation             | <p>○: Indicates that the content of hazardous substances or elements in the detection limit of the following the SJ/T11363-2006 standard.</p> <p>×: Indicates that the content of hazardous substances or elements exceeding the SJ/T11363-2006 Standard limit requirements.</p> |                               |                               |                               |                          |                                |                   |                       |                           |                      |

### 7.2、Notes

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