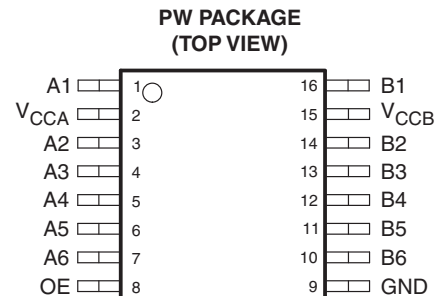


## 6-BIT BIDIRECTIONAL VOLTAGE-LEVEL TRANSLATOR WITH AUTO-DIRECTION SENSING AND $\pm 10$ -kV ESD PROTECTION

### FEATURES

- Qualified for Automotive Applications
- 1.2 V to 3.6 V on A Port and 1.65 to 5.5 V on B Port ( $V_{CCA} \leq V_{CCB}$ )
- $V_{CC}$  Isolation Feature – If Either  $V_{CC}$  Input Is at GND, All Outputs Are in the High-Impedance State
- OE Input Circuit Referenced to  $V_{CCA}$
- $I_{off}$  Supports Partial-Power-Down Mode Operation
- ESD Protection Exceeds AEC-Q100
  - A Port
    - 2000-V Human-Body Model
    - 1500-V Charged-Device Model
  - B Port
    - $\pm 10$ -kV Human-Body Model
    - 1500-V Charged-Device Model



The exposed center pad, if used, must be connected as a secondary ground or left electrically open.

### DESCRIPTION/ORDERING INFORMATION

This 6-bit noninverting translator uses two separate configurable power-supply rails. The A port is designed to track  $V_{CCA}$ .  $V_{CCA}$  accepts any supply voltage from 1.2 V to 3.6 V. The B port is designed to track  $V_{CCB}$ .  $V_{CCB}$  accepts any supply voltage from 1.65 V to 5.5 V. This allows for universal low-voltage bidirectional translation between any of the 1.2-V, 1.5-V, 1.8-V, 2.5-V, 3.3-V, and 5-V voltage nodes.  $V_{CCA}$  should not exceed  $V_{CCB}$ .

When the output-enable (OE) input is low, all outputs are placed in the high-impedance state.

The TXB0106 is designed so that the OE input circuit is supplied by  $V_{CCA}$ .

This device is fully specified for partial-power-down applications using  $I_{off}$ . The  $I_{off}$  circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

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.

### ORDERING INFORMATION<sup>(1)</sup>

$T_A$	PACKAGE <sup>(2)</sup>		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	TSSOP – PW	Reel of 2000	TXB0106IPWRQ1	YE06Q1

(1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at [www.ti.com](http://www.ti.com).

(2) Package drawings, thermal data, and symbolization are available at [www.ti.com/packaging](http://www.ti.com/packaging).

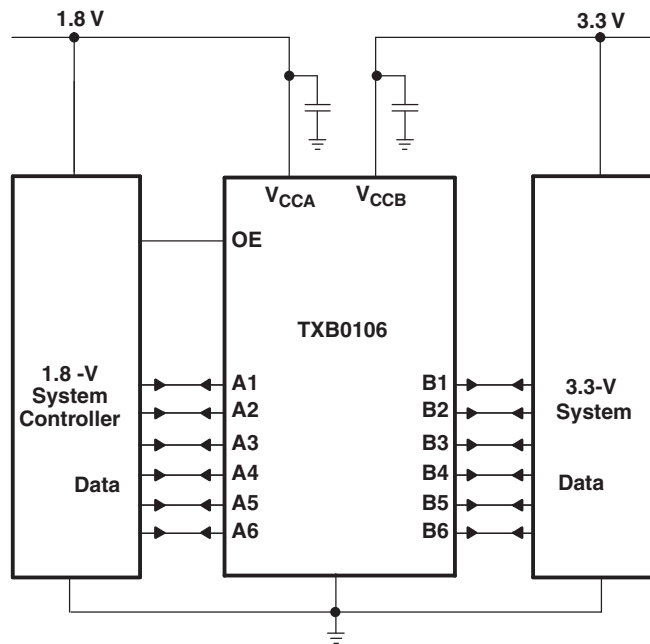


Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

**PIN DESCRIPTION**

NO.	NAME	FUNCTION
1	A1	Input/output 1. Referenced to $V_{CCA}$ .
2	$V_{CCA}$	A-port supply voltage. $1.2\text{ V} \leq V_{CCA} \leq 3.6\text{ V}$ , $V_{CCA} \leq V_{CCB}$ .
3	A2	Input/output 2. Referenced to $V_{CCA}$ .
4	A3	Input/output 3. Referenced to $V_{CCA}$ .
5	A4	Input/output 4. Referenced to $V_{CCA}$ .
6	A5	Input/output 5. Referenced to $V_{CCA}$ .
7	A6	Input/output 6. Referenced to $V_{CCA}$ .
8	OE	Output enable. Pull OE low to place all outputs in 3-state mode. Referenced to $V_{CCA}$ .
9	GND	Ground
10	B6	Input/output 6. Referenced to $V_{CCB}$ .
11	B5	Input/output 5. Referenced to $V_{CCB}$ .
12	B4	Input/output 4. Referenced to $V_{CCB}$ .
13	B3	Input/output 3. Referenced to $V_{CCB}$ .
14	B2	Input/output 2. Referenced to $V_{CCB}$ .
15	$V_{CCB}$	B-port supply voltage. $1.65\text{ V} \leq V_{CCB} \leq 5.5\text{ V}$ .
16	B1	Input/output 1. Referenced to $V_{CCB}$ .

**TYPICAL OPERATING CIRCUIT**



## ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>

over operating free-air temperature range (unless otherwise noted)

		MIN	MAX	UNIT
$V_{CCA}$	Supply voltage range	-0.5	4.6	V
$V_{CCB}$	Supply voltage range	-0.5	6.5	V
$V_I$	Input voltage range <sup>(2)</sup>	-0.5	6.5	V
$V_O$	Voltage range applied to any output in the high-impedance or power-off state <sup>(2)</sup>	-0.5	6.5	V
$V_O$	Voltage range applied to any output in the high or low state <sup>(2)(3)</sup>	A inputs	-0.5 $V_{CCA} + 0.5$	V
		B inputs	-0.5 $V_{CCB} + 0.5$	
$I_{IK}$	Input clamp current	$V_I < 0$	-50	mA
$I_{OK}$	Output clamp current	$V_O < 0$	-50	mA
$I_O$	Continuous output current		±50	mA
	Continuous current through $V_{CCA}$ , $V_{CCB}$ , or GND		±100	mA
$J_A$	Package thermal impedance <sup>(4)</sup>		83	°C/W
$T_{stg}$	Storage temperature range	-65	150	°C

- (1) Stresses beyond those listed under *absolute maximum ratings* may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *recommended operating conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (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.
- (4) The package thermal impedance is calculated in accordance with JESD 51-7.

## RECOMMENDED OPERATING CONDITIONS<sup>(1)(2)</sup>

		$V_{CCA}$	$V_{CCB}$	MIN	MAX	UNIT	
$V_{CCA}$	Supply voltage			1.2	3.6	V	
$V_{CCB}$				1.65	5.5		
$V_{IH}$	High-level input voltage	Data inputs	1.2 V to 3.6 V	1.65 V to 5.5 V	$V_{CCI} \times 0.65$ <sup>(3)</sup>	$V_{CCI}$	V
		OE			$V_{CCA} \times 0.65$	5.5	
$V_{IL}$	Low-level input voltage	Data inputs	1.2 V to 5.5 V	1.65 V to 5.5 V	0	$V_{CCI} \times 0.35$ <sup>(3)</sup>	V
		OE			1.2 V to 3.6 V	0	
$\Delta t/\Delta v$	Input transition rise or fall rate	A-port inputs	1.2 V to 3.6 V	1.65 V to 5.5 V		40	ns/V
		B-port inputs	1.2 V to 3.6 V	1.65 V to 3.6 V		40	
				4.5 V to 5.5 V		30	
$T_A$	Operating free-air temperature			-40	85	°C	

- (1) The A and B sides of an unused data I/O pair must be held in the same state, i.e., both at  $V_{CCI}$  or both at GND.
- (2)  $V_{CCA}$  must be less than or equal to  $V_{CCB}$  and must not exceed 3.6 V.
- (3)  $V_{CCI}$  is the supply voltage associated with the input port.

**ELECTRICAL CHARACTERISTICS<sup>(1)(2)</sup>**

over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	V <sub>CCA</sub>	V <sub>CCB</sub>	T <sub>A</sub> = 25°C			–40°C to 85°C		UNIT	
				MIN	TYP	MAX	MIN	MAX		
V <sub>OHA</sub>	I <sub>OH</sub> = –20 μA	1.2 V		1.1			V <sub>CCA</sub> – 0.4		V	
		1.4 V to 3.6 V								
V <sub>OLA</sub>	I <sub>OL</sub> = 20 μA	1.2 V		0.9			0.4		V	
		1.4 V to 3.6 V								
V <sub>OHB</sub>	I <sub>OH</sub> = –20 μA		1.65 V to 5.5 V				V <sub>CCB</sub> – 0.4		V	
V <sub>OLB</sub>	I <sub>OL</sub> = 20 μA		1.65 V to 5.5 V				0.4		V	
I <sub>I</sub>	OE	1.2 V to 3.6 V	1.65 V to 5.5 V	±1			±2		μA	
I <sub>off</sub>	A port	0 V	0 V to 5.5 V	±1			±2		μA	
	B port	0 V to 3.6 V	0 V	±1			±2			
I <sub>OZ</sub>	A or B port	OE = GND	1.2 V to 3.6 V	1.65 V to 5.5 V	±1			±2		μA
I <sub>CCA</sub>	V <sub>I</sub> = V <sub>CC1</sub> or GND, I <sub>O</sub> = 0	1.2 V	1.65 V to 5.5 V	0.06			9		μA	
		1.4 V to 3.6 V								
		3.6 V	0 V				2			
		0 V	5.5 V				2			
I <sub>CCB</sub>	V <sub>I</sub> = V <sub>CC1</sub> or GND, I <sub>O</sub> = 0	1.2 V	1.65 V to 5.5 V	3.4			9		μA	
		1.4 V to 3.6 V								
		3.6 V	0 V				–2			
		0 V	5.5 V				2			
I <sub>CCA</sub> + I <sub>CCB</sub>	V <sub>I</sub> = V <sub>CC1</sub> or GND, I <sub>O</sub> = 0	1.2 V	1.65 V to 5.5 V	3.5			18		μA	
		1.4 V to 3.6 V								
I <sub>CCZA</sub>	V <sub>I</sub> = V <sub>CC1</sub> or GND, I <sub>O</sub> = 0, OE = GND	1.2 V	1.65 V to 5.5 V	0.05			5		μA	
		1.4 V to 3.6 V								
I <sub>CCZB</sub>	V <sub>I</sub> = V <sub>CC1</sub> or GND, I <sub>O</sub> = 0, OE = GND	1.2 V	1.65 V to 5.5 V	3.3			5		μA	
		1.4 V to 3.6 V								
C <sub>I</sub>	OE	1.2 V to 3.6 V	1.65 V to 5.5 V	5			5.5		pF	
C <sub>io</sub>	A port	1.2 V to 3.6 V	1.65 V to 5.5 V	5			6.5		pF	
	B port			8			10			

- (1) V<sub>CC1</sub> is the supply voltage associated with the input port.
- (2) V<sub>CC0</sub> is the supply voltage associated with the output port.

**TIMING REQUIREMENTS**

V<sub>CCA</sub> = 1.2 V, T<sub>A</sub> = 25°C

			V <sub>CCB</sub> = 1.8 V	V <sub>CCB</sub> = 2.5 V	V <sub>CCB</sub> = 3.3 V	V <sub>CCB</sub> = 5 V	UNIT
			TYP	TYP	TYP	TYP	
Data rate			20	20	20	20	Mbps
t <sub>w</sub>	Pulse duration	Data inputs	50	50	50	50	ns

**TIMING REQUIREMENTS**

V<sub>CCA</sub> = 1.5 V ± 0.1 V, over recommended operating free-air temperature range (unless otherwise noted)

			V <sub>CCB</sub> = 1.8 V ± 0.15 V		V <sub>CCB</sub> = 2.5 V ± 0.2 V		V <sub>CCB</sub> = 3.3 V ± 0.3 V		V <sub>CCB</sub> = 5 V ± 0.5 V		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
Data rate			50		50		50		50		Mbps
t <sub>w</sub>	Pulse duration	Data inputs	20		20		20		20		ns

## TIMING REQUIREMENTS

 $V_{CCA} = 1.8\text{ V} \pm 0.15\text{ V}$ , over recommended operating free-air temperature range (unless otherwise noted)

		$V_{CCB} = 1.8\text{ V} \pm 0.15\text{ V}$		$V_{CCB} = 2.5\text{ V} \pm 0.2\text{ V}$		$V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$		$V_{CCB} = 5\text{ V} \pm 0.5\text{ V}$		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
	Data rate	52		60		60		60		Mbps
$t_w$	Pulse duration	19		17		17		17		ns

## TIMING REQUIREMENTS

 $V_{CCA} = 2.5\text{ V} \pm 0.2\text{ V}$ , over recommended operating free-air temperature range (unless otherwise noted)

		$V_{CCB} = 2.5\text{ V} \pm 0.2\text{ V}$		$V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$		$V_{CCB} = 5\text{ V} \pm 0.5\text{ V}$		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
	Data rate	70		100		100		Mbps
$t_w$	Pulse duration	14		10		10		ns

## TIMING REQUIREMENTS

 $V_{CCA} = 3.3\text{ V} \pm 0.3\text{ V}$ , over recommended operating free-air temperature range (unless otherwise noted)

		$V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$		$V_{CCB} = 5\text{ V} \pm 0.5\text{ V}$		UNIT
		MIN	MAX	MIN	MAX	
	Data rate	100		100		Mbps
$t_w$	Pulse duration	10		10		ns

## SWITCHING CHARACTERISTICS

 $V_{CCA} = 1.2\text{ V}$ ,  $T_A = 25^\circ\text{C}$ 

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB} = 1.8\text{ V}$	$V_{CCB} = 2.5\text{ V}$	$V_{CCB} = 3.3\text{ V}$	$V_{CCB} = 5\text{ V}$	UNIT
			TYP	TYP	TYP	TYP	
$t_{pd}$	A	B	9.5	7.9	7.6	8.5	ns
	B	A	9.2	8.8	8.4	8	
$t_{en}$	OE	A	1	1	1	1	$\mu\text{s}$
		B	1	1	1	1	
$t_{dis}^{(1)}$	OE	A	20	17	17	18	ns
		B	20	16	15	15	
$t_{rA}$ , $t_{fA}$	A-port rise and fall times		4.1	4.4	4.1	3.9	ns
$t_{rB}$ , $t_{fB}$	B-port rise and fall times		5	5	5.1	5.1	ns
$t_{SK(O)}$	Channel-to-channel skew		2.4	1.7	1.9	7	ns
Max data rate			20	20	20	20	Mbps

(1) Test procedure uses a 25-MHz sine wave on the input.

## SWITCHING CHARACTERISTICS

$V_{CCA} = 1.5\text{ V} \pm 0.1\text{ V}$ , over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB} = 1.8\text{ V} \pm 0.15\text{ V}$		$V_{CCB} = 2.5\text{ V} \pm 0.2\text{ V}$		$V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$		$V_{CCB} = 5\text{ V} \pm 0.5\text{ V}$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
$t_{pd}$	A	B	1.4	13.5	1.2	10.5	1.1	10.5	0.8	10.1	ns
	B	A	0.9	15.2	0.7	13.8	0.4	13.8	0.3	13.7	
$t_{en}$	OE	A		1		1		1		1	$\mu\text{s}$
		B		1		1		1		1	
$t_{dis}^{(1)}$	OE	A	6.6	33	6.4	25.3	6.1	23.1	5.9	24.6	ns
		B	6.6	35.6	5.8	25.6	5.5	22.1	5.6	20.6	
$t_{rA}, t_{fA}$	A-port rise and fall times		0.8	6.5	0.8	6.3	0.8	6.3	0.8	6.3	ns
$t_{rB}, t_{fB}$	B-port rise and fall times		1	7.3	0.7	4.9	0.7	4.6	0.6	4.6	ns
$t_{SK(O)}$	Channel-to-channel skew			2.6		1.9		1.6		1.3	ns
Max data rate			50		50		50		50		Mbps

(1) Test procedure uses a 25-MHz sine wave on the input.

## SWITCHING CHARACTERISTICS

$V_{CCA} = 1.8\text{ V} \pm 0.15\text{ V}$ , over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB} = 1.8\text{ V} \pm 0.15\text{ V}$		$V_{CCB} = 2.5\text{ V} \pm 0.2\text{ V}$		$V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$		$V_{CCB} = 5\text{ V} \pm 0.5\text{ V}$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
$t_{pd}$	A	B	1.6	12	1.4	7.7	1.3	6.8	1.2	6.5	ns
	B	A	1.5	13.5	1.2	10	0.8	8.2	0.5	8	
$t_{en}$	OE	A		1		1		1		1	$\mu\text{s}$
		B		1		1		1		1	
$t_{dis}^{(1)}$	OE	A	5.9	26.7	5.6	21.6	5.4	18.9	4.8	18.7	ns
		B	6.1	33.9	5.2	23.7	5	19.9	5	17.6	
$t_{rA}, t_{fA}$	A-port rise and fall times		0.7	5.1	0.7	5	1	5	0.7	5	ns
$t_{rB}, t_{fB}$	B-port rise and fall times		1	7.3	0.7	5	0.7	3.9	0.6	3.8	ns
$t_{SK(O)}$	Channel-to-channel skew			0.8		0.7		0.6		0.6	ns
Max data rate			52		60		60		60		Mbps

(1) Test procedure uses a 25-MHz sine wave on the input.

## SWITCHING CHARACTERISTICS

$V_{CCA} = 2.5\text{ V} \pm 0.2\text{ V}$ , over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB} = 2.5\text{ V} \pm 0.2\text{ V}$		$V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$		$V_{CCB} = 5\text{ V} \pm 0.5\text{ V}$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
$t_{pd}$	A	B	1.1	6.7	1	5.7	0.9	5	ns
	B	A	1	8.5	0.6	7	0.3	7	
$t_{en}$	OE	A		1		1		1	$\mu\text{s}$
		B		1		1		1	
$t_{dis}^{(1)}$	OE	A	5	16.9	4.9	15	4.5	13.8	ns
		B	4.8	21.8	4.5	17.9	4.4	15.2	
$t_{rA}, t_{fA}$	A-port rise and fall times		0.8	3.6	0.6	3.6	0.5	3.5	ns
$t_{rB}, t_{fB}$	B-port rise and fall times		0.6	4.9	0.7	3.9	0.6	3.2	ns
$t_{SK(O)}$	Channel-to-channel skew			0.4		0.3		0.3	ns
Max data rate			70		100		100		Mbps

(1) Test procedure uses a 25-MHz sine wave on the input.

## SWITCHING CHARACTERISTICS

$V_{CCA} = 3.3\text{ V} \pm 0.3\text{ V}$ , over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$		$V_{CCB} = 5\text{ V} \pm 0.5\text{ V}$		UNIT
			MIN	MAX	MIN	MAX	
$t_{pd}$	A	B	0.9	5.5	0.8	4.5	ns
	B	A	0.5	6.5	0.2	6	
$t_{en}$	OE	A		1		1	$\mu\text{s}$
		B		1		1	
$t_{dis}^{(1)}$	OE	A	4.5	13.9	4.1	12.4	ns
		B	4.1	17.3	4	14.4	
$t_{rA}, t_{fA}$	A-port rise and fall times		0.5	3	0.5	3	ns
$t_{rB}, t_{fB}$	B-port rise and fall times		0.7	3.9	0.6	3.2	ns
$t_{SK(O)}$	Channel-to-channel skew			0.4		0.3	ns
Max data rate			100		100		Mbps

(1) Test procedure uses a 25-MHz sine wave on the input.

**OPERATING CHARACTERISTICS**

T<sub>A</sub> = 25°C

PARAMETER		TEST CONDITIONS	V <sub>CCA</sub>						UNIT			
			1.2 V	1.2 V	1.5 V	1.8 V	2.5 V	2.5 V		3.3 V		
			V <sub>CCB</sub>							3.3 V to 5 V		
			5 V	1.8 V	1.8 V	1.8 V	2.5 V	5 V				
			TYP	TYP	TYP	TYP	TYP	TYP	TYP			
C <sub>pdA</sub>	A-port input, B-port output	C <sub>L</sub> = 0, f = 10 MHz, t <sub>r</sub> = t <sub>f</sub> = 1 ns, OE = V <sub>CCA</sub> (outputs enabled)		9	8	7	7	7	7	8	pF	
	B-port input, A-port output			12	11	11	11	11	11	11		
C <sub>pdB</sub>	A-port input, B-port output			35	26	27	27	27	27	27		28
	B-port input, A-port output			26	19	18	18	18	20	21		
C <sub>pdA</sub>	A-port input, B-port output	C <sub>L</sub> = 0, f = 10 MHz, t <sub>r</sub> = t <sub>f</sub> = 1 ns, OE = GND (outputs disabled)		0.01	0.01	0.01	0.01	0.01	0.01	0.01	pF	
	B-port input, A-port output			0.01	0.01	0.01	0.01	0.01	0.01	0.01		
C <sub>pdB</sub>	A-port input, B-port output			0.01	0.01	0.01	0.01	0.01	0.01	0.03		
	B-port input, A-port output			0.01	0.01	0.01	0.01	0.01	0.01	0.03		



## PRINCIPLES OF OPERATION

### Applications

The TXB0106 can be used in level-translation applications for interfacing devices or systems operating at different interface voltages with one another.

### Architecture

The TXB0106 architecture (see Figure 1) does not require a direction-control signal to control the direction of data flow from A to B or from B to A. In a dc state, the output drivers of the TXB0106 can maintain a high or low, but are designed to be weak, so that they can be overdriven by an external driver when data on the bus starts flowing the opposite direction.

The output one shots detect rising or falling edges on the A or B ports. During a rising edge, the one shot turns on the PMOS transistors (T1, T3) for a short duration, which speeds up the low-to-high transition. Similarly, during a falling edge, the one shot turns on the NMOS transistors (T2, T4) for a short duration, which speeds up the high-to-low transition. The typical output impedance during output transition is 70  $\Omega$  at  $V_{CCO} = 1.2\text{ V}$  to 1.8 V, 50  $\Omega$  at  $V_{CCO} = 1.8\text{ V}$  to 3.3 V and 40  $\Omega$  at  $V_{CCO} = 3.3\text{ V}$  to 5 V.

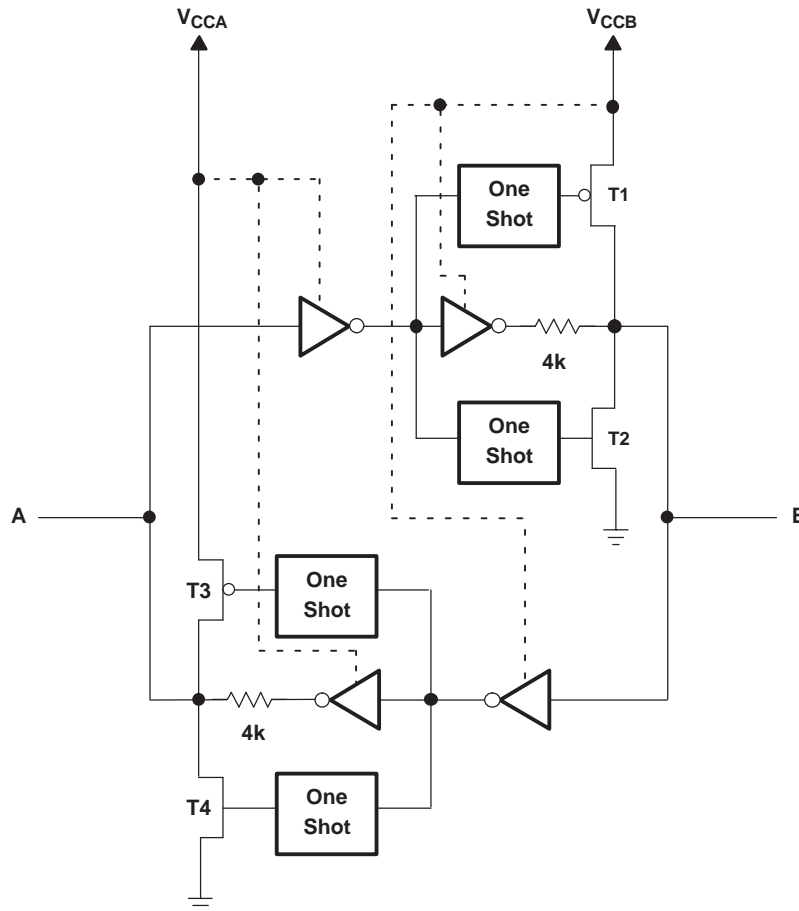
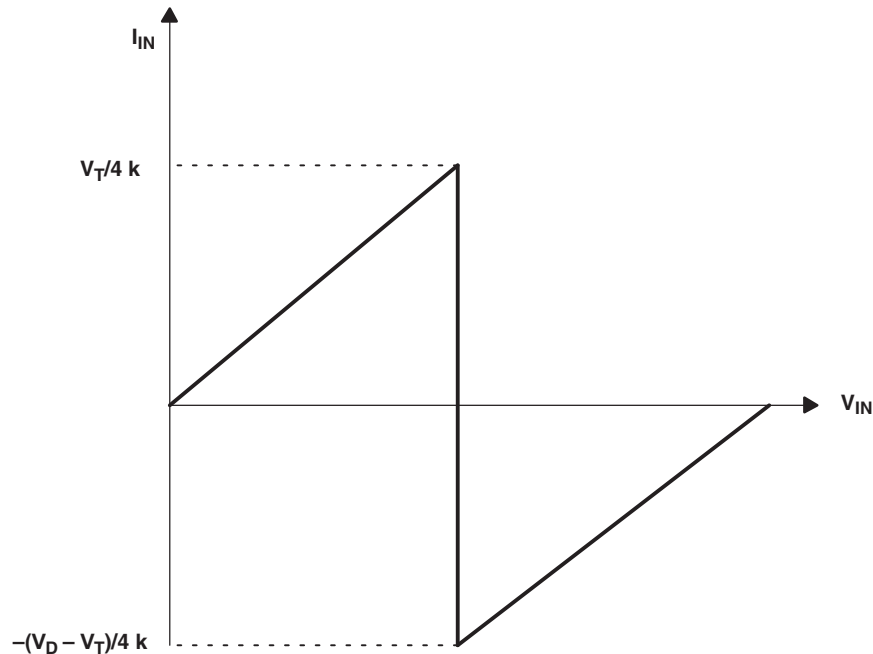


Figure 1. Architecture of TXB0106 I/O Cell

## Input Driver Requirements

Typical  $I_{IN}$  vs  $V_{IN}$  characteristics of the TXB0106 are shown in Figure 2. For proper operation, the device driving the data I/Os of the TXB0106 must have drive strength of at least  $\pm 2$  mA.



- A.  $V_T$  is the input threshold voltage of the TXB0106 (typically  $V_{CCI}/2$ ).
- B.  $V_D$  is the supply voltage of the external driver.

**Figure 2. Typical  $I_{IN}$  vs  $V_{IN}$  Curve**

## Power Up

During operation, ensure that  $V_{CCA} \leq V_{CCB}$  at all times. During power-up sequencing,  $V_{CCA} \geq V_{CCB}$  does not damage the device, so any power supply can be ramped up first. The TXB0106 has circuitry that disables all output ports when either  $V_{CC}$  is switched off ( $V_{CCA/B} = 0$  V).

## Enable and Disable

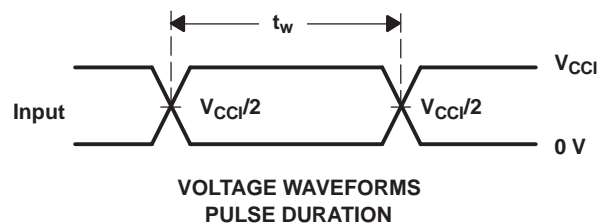
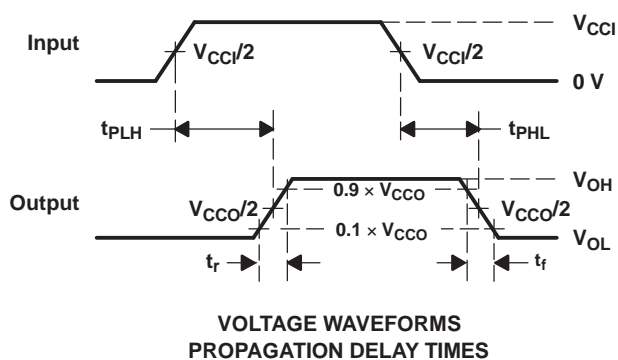
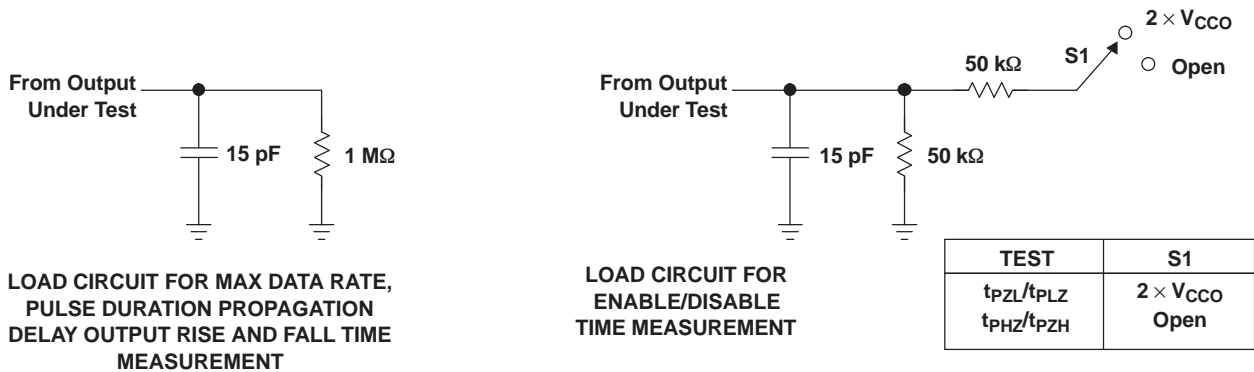
The TXB0106 has an OE input that is used to disable the device by setting OE = low, which places all I/Os in the high-impedance (Hi-Z) state. The disable time ( $t_{dis}$ ) indicates the delay between when OE goes low and when the outputs actually get disabled (Hi-Z). The enable time ( $t_{en}$ ) indicates the amount of time the user must allow for the one-shot circuitry to become operational after OE is taken high.

## Pullup or Pulldown Resistors on I/O Lines

The TXB0106 is designed to drive capacitive loads of up to 70 pF. The output drivers of the TXB0106 have low dc drive strength. If pullup or pulldown resistors are connected externally to the data I/Os, their values must be kept higher than 50 k $\Omega$  to ensure that they do not contend with the output drivers of the TXB0106.

For the same reason, the TXB0106 should not be used in applications such as I<sup>2</sup>C or 1-Wire where an open-drain driver is connected on the bidirectional data I/O. For these applications, use a device from the TI TXS01xx series of level translators.

PARAMETER MEASUREMENT INFORMATION



- A. C<sub>L</sub> includes probe and jig capacitance.
- B. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, Z<sub>O</sub> = 50 Ω, dv/dt ≥ 1 V/ns.
- C. The outputs are measured one at a time, with one transition per measurement.
- D. t<sub>PLH</sub> and t<sub>PHL</sub> are the same as t<sub>pd</sub>.
- E. V<sub>CCI</sub> is the V<sub>CC</sub> associated with the input port.
- F. V<sub>CCO</sub> is the V<sub>CC</sub> associated with the output port.
- G. All parameters and waveforms are not applicable to all devices.

Figure 3. Load Circuits and Voltage Waveforms

**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/ Ball Finish	MSL Peak Temp <sup>(3)</sup>	Samples (Requires Login)
TXB0106IPWRQ1	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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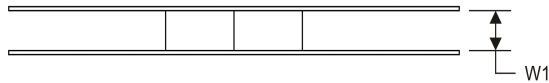
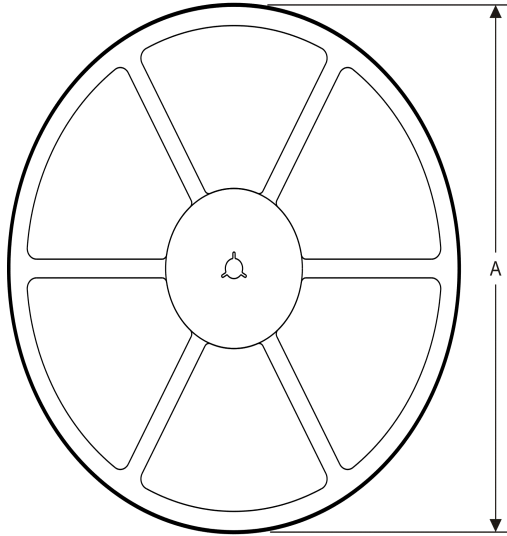
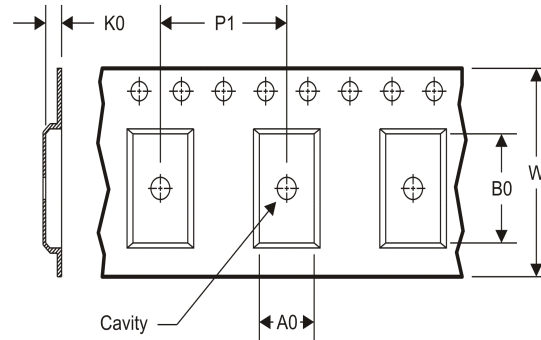
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**OTHER QUALIFIED VERSIONS OF TXB0106-Q1 :**

- Catalog: [TXB0106](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

**TAPE AND REEL INFORMATION**
**REEL DIMENSIONS**

**TAPE DIMENSIONS**


A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

**TAPE AND REEL INFORMATION**

\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TXB0106IPWRQ1	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TXB0106IPWRQ1	TSSOP	PW	16	2000	346.0	346.0	29.0

PW (R-PDSO-G16)

PLASTIC SMALL OUTLINE

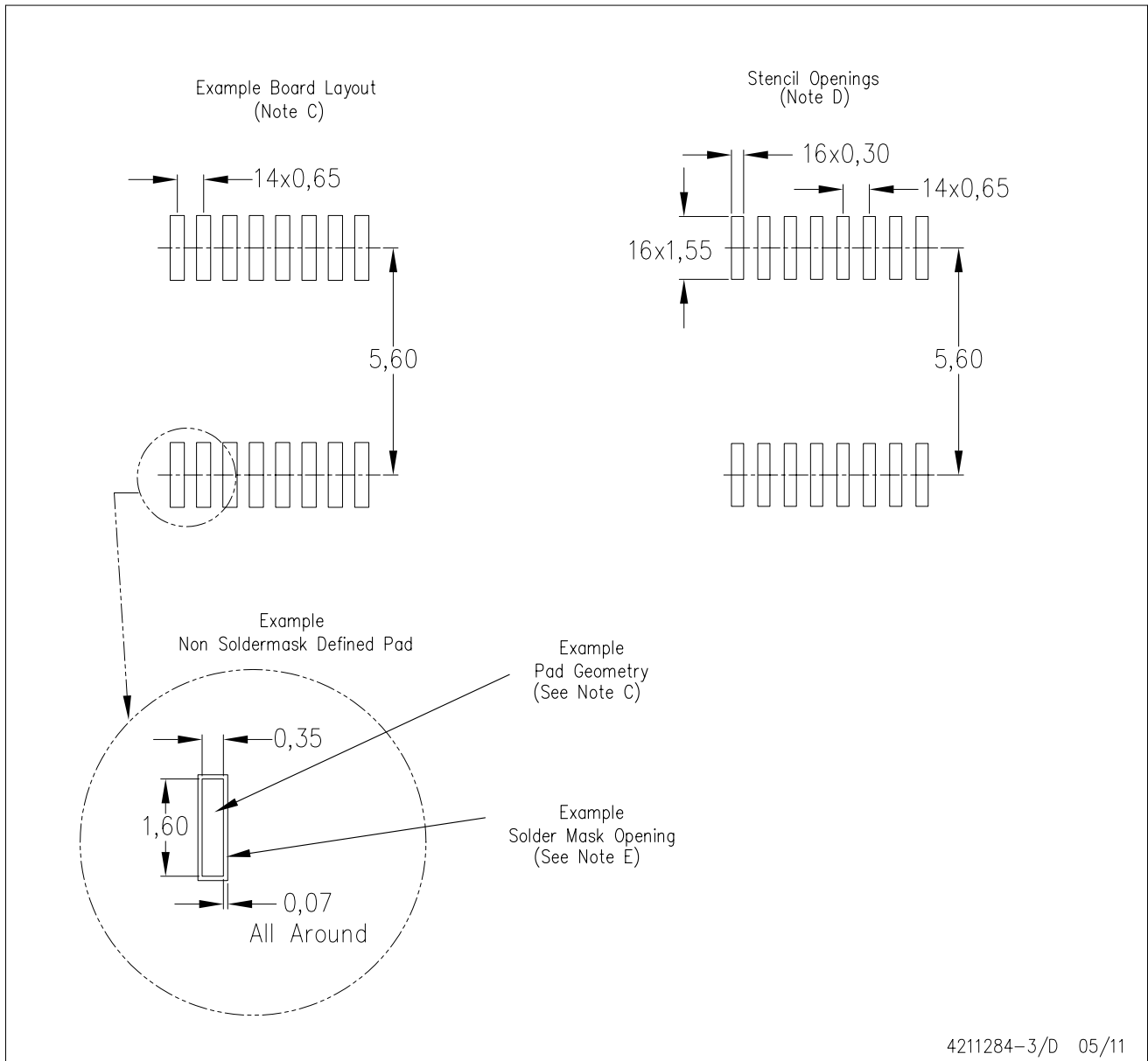


4040064-4/G 02/11

- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  -  Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
  -  Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
  - E. Falls within JEDEC MO-153

PW (R-PDSO-G16)

PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Publication IPC-7351 is recommended for alternate designs.
  - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
  - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



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