

# 74AVC4T345FT

## 1. Functional Description

- 3-Bit+1-Bit Dual-Supply Bus Transceiver with Configurable Power Supply

## 2. General

The 74AVC4T345FT is a dual power supply type high-speed CMOS 3-bit + 1-bit bus transceiver that enables interfacing between two systems with power supply voltages from 0.7 V to 3.6 V.

The two supply voltages can be user-configurable within the operating range and the sequence of supply voltage ON/OFF can be freely set.

The Enable input  $\overline{OE}$  is H level, both A-bus and B-bus become floating state (high-impedance). When the transmission direction switching input DIR is set to "H", bus A becomes an input and bus B becomes an output, and when set to "L", bus A becomes an output and bus B becomes an input. The input (DIR and  $\overline{OE}$ ) has a tolerant function that allows input of up to 3.6 V regardless of the supply voltage. When either power supply is at the GND level, the bus terminals are placed in a high impedance mode and a voltage of up to 3.6 V is allowed to be applied.

This function enables application to partial power-down interfaces.

All inputs are equipped with protection circuits to protect the devices from electrostatic discharge damage.

## 3. Features

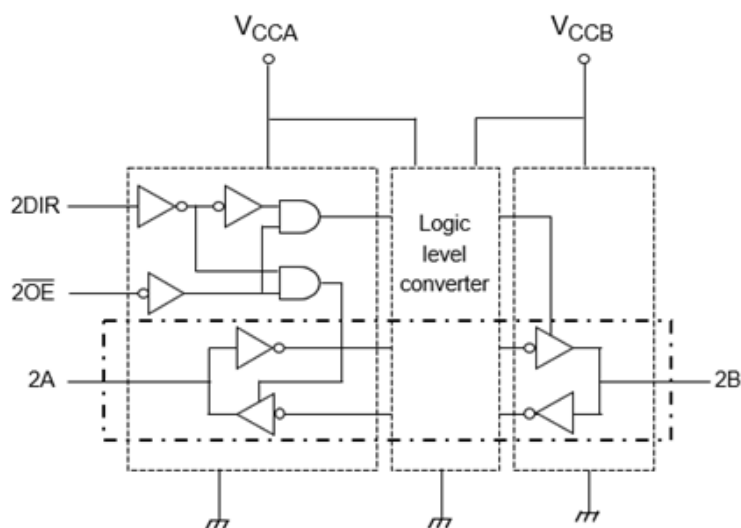
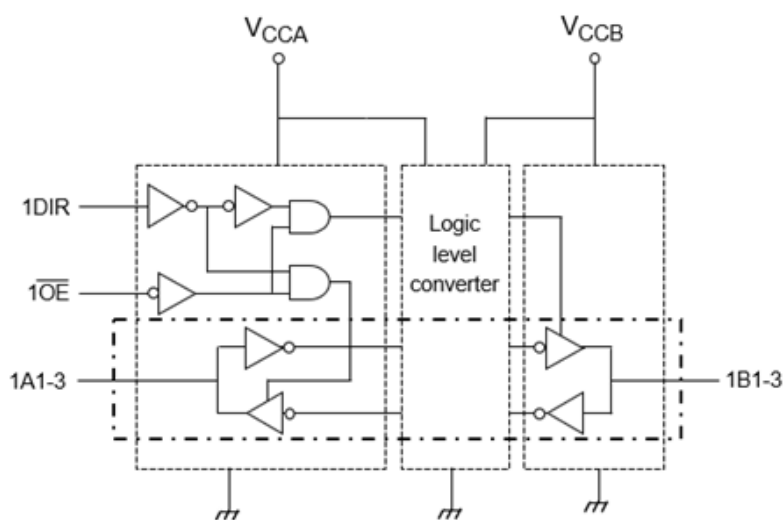
- (1) Wide operating temperature range:  $T_{opr} = -40$  to  $125$  °C
- (2) Wide supply voltage value:  $V_{CCA} = 0.7$  to  $3.6$  V,  $V_{CCB} = 0.7$  to  $3.6$  V (Note1)
- (3) Bidirectional interface
- (4) High-speed operation:  $t_{pd} = 3.6$  ns (max) ( $V_{CCA} = 3.3 \pm 0.3$  V,  $V_{CCB} = 3.3 \pm 0.3$  V)
- (5) Output current:  $|I_{OH}|/|I_{OL}| = \pm 12$  mA (min) ( $V_{CC} = 3.0$  V)  
 $|I_{OH}|/|I_{OL}| = \pm 9$  mA (min) ( $V_{CC} = 2.3$  V)  
 $|I_{OH}|/|I_{OL}| = \pm 6$  mA (min) ( $V_{CC} = 1.65$  V)  
 $|I_{OH}|/|I_{OL}| = \pm 4$  mA (min) ( $V_{CC} = 1.4$  V)  
 $|I_{OH}|/|I_{OL}| = \pm 2$  mA (min) ( $V_{CC} = 1.1$  V)  
 $|I_{OH}|/|I_{OL}| = \pm 0.5$  mA (min) ( $V_{CC} = 0.85$  V)  
 $|I_{OH}|/|I_{OL}| = \pm 0.2$  mA (min) ( $V_{CC} = 0.76$  V)  
 $|I_{OH}|/|I_{OL}| = \pm 0.05$  mA (min) ( $V_{CC} = 0.7$  V)
- (6) Small package: TSSOP16B
- (7) Low power dissipation: Suitable for battery-driven applications such as PDAs and cellular phones.
- (8) 3.6 V tolerance and power-down protection are provided to all inputs and outputs.

Note1: The operating voltage range of 0.7 V to 3.6 V applies to products manufactured after September 2025.

Start of commercial production  
2024-09



### 7. Block Diagram



### 8. Truth Table

Supply voltage $V_{CCA}$	Supply voltage $V_{CCB}$	Input $nOE$	Input $nDIR$	Input/Output Bus $nA$	Input/Output Bus $nB$	Function
0.7 to 3.6 V	0.7 to 3.6 V	L	L	Output	Input	$A = B$
0.7 to 3.6 V	0.7 to 3.6 V	L	H	Input	Output	$B = A$
0.7 to 3.6 V	0.7 to 3.6 V	H	X	Z	Z	Z
GND	0.7 to 3.6 V	X	X	Z	Z	Z
0.7 to 3.6 V	GND	X	X	Z	Z	Z
GND	GND	X	X	Z	Z	Z

X: Don't care

Z: High impedance

### 9. Absolute Maximum Ratings (Note)

Characteristics	Symbol	Note	Rating	Unit
Supply voltage	$V_{CCA}$		-0.5 to 4.6	V
	$V_{CCB}$		-0.5 to 4.6	
Input voltage (nDIR, nOE)	$V_{IN}$		-0.5 to 4.6	V
Bus I/O voltage	$V_{I/OA}$	(Note 1)	-0.5 to 4.6	V
		(Note 2)	-0.5 to $V_{CCA} + 0.5$	
	$V_{I/OB}$	(Note 1)	-0.5 to 4.6	
		(Note 2)	-0.5 to $V_{CCB} + 0.5$	
Input diode current	$I_{IK}$		-50	mA
I/O diode current	$I_{I/OK}$	(Note 3)	-50	mA
Output current	$I_{OUTA}$		$\pm 50$	mA
	$I_{OUTB}$		$\pm 50$	
$V_{CC}$ /ground current per supply pin	$I_{CCA}$		100	mA
	$I_{CCB}$		100	
Power dissipation	$P_D$	(Note 4)	180	mW
Storage temperature	$T_{stg}$		-65 to 150	°C

Note: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 1: Input state or high impedance state.

Note 2: Output state.  $I_{OUT}$  absolute maximum rating must be observed.

Note 3:  $V_{OUT} < GND$

Note 4: 180 mW in the range of  $T_a = -40$  to  $85$  °C. From  $T_a = 85$  to  $125$  °C a derating factor of  $-3.25$  mW/°C shall be applied until 50 mW.

### 10. Operating Ranges (Note)

Characteristics	Symbol	Note	Test Condition	Rating	Unit
Supply voltage	$V_{CCA}$		—	0.7 to 3.6	V
	$V_{CCB}$		—	0.7 to 3.6	
Input voltage(nDIR, nOE)	$V_{IN}$		—	0 to 3.6	V
Bus I/O voltage	$V_{IOA}$	(Note 1)	—	0 to 3.6	V
		(Note 2)	—	0 to $V_{CCA}$	
	$V_{IOB}$	(Note 1)	—	0 to 3.6	
		(Note 2)	—	0 to $V_{CCB}$	
Output current	$I_{OUTA}$		$V_{CCA} = 3.0$ to $3.6$ V	$\pm 12$	mA
			$V_{CCA} = 2.3$ to $2.7$ V	$\pm 9$	
			$V_{CCA} = 1.65$ to $1.95$ V	$\pm 6$	
			$V_{CCA} = 1.4$ to $1.6$ V	$\pm 4$	
			$V_{CCA} = 1.1$ to $1.3$ V	$\pm 2$	
			$V_{CCA} = 0.85$ to $0.95$ V	$\pm 0.5$	
			$V_{CCA} = 0.76$ to $0.84$ V	$\pm 0.2$	
			$V_{CCA} = 0.7$ V	$\pm 0.05$	
	$I_{OUTB}$		$V_{CCB} = 3.0$ to $3.6$ V	$\pm 12$	
			$V_{CCB} = 2.3$ to $2.7$ V	$\pm 9$	
			$V_{CCB} = 1.65$ to $1.95$ V	$\pm 6$	
			$V_{CCB} = 1.4$ to $1.6$ V	$\pm 4$	
			$V_{CCB} = 1.1$ to $1.3$ V	$\pm 2$	
			$V_{CCA} = 0.85$ to $0.95$ V	$\pm 0.5$	
			$V_{CCA} = 0.76$ to $0.84$ V	$\pm 0.2$	
			$V_{CCA} = 0.7$ V	$\pm 0.05$	
Operating temperature	$T_{opr}$		—	-40 to 125	°C
Input rise and fall times	dt/dv	(Note 3)	$V_{CC} = 0.7$ V	0 to 20	ns/V
			$V_{CC} = 0.76$ to $1.6$ V	0 to 20	
			$V_{CC} = 1.65$ to $1.95$ V	0 to 20	
			$V_{CC} = 2.3$ to $2.7$ V	0 to 20	
			$V_{CC} = 3.0$ to $3.6$ V	0 to 10	

Note: The operating ranges must be maintained to ensure the normal operation of the device.

Unused inputs and bus inputs must be tied to either  $V_{CC}$  or GND.

Note 1: Input state or high impedance state.

Note 2: Output state.  $I_{OUT}$  absolute maximum rating must be observed.

Note 3:  $V_{CC} = V_{CCA}, V_{CCB}$

### 11. Electrical Characteristics

#### 11.1. DC Characteristics (Unless otherwise specified, $T_a = -40$ to $85$ °C)

Characteristics	Symbol	Test Condition	$V_{CCA}$ (V)	$V_{CCB}$ (V)	Min	Max	Unit	
High-level input voltage	$V_{IHA}$	nA, nDIR, $\overline{nOE}$	0.7	0.7 to 3.6	$V_{CCA} \times 0.80$	—	V	
			0.8 to 1.95	0.7 to 3.6	$V_{CCA} \times 0.70$	—		
			2.3 to 2.7	0.7 to 3.6	1.6	—		
			3.0 to 3.6	0.7 to 3.6	2.0	—		
	$V_{IHB}$	nB	0.7 to 3.6	0.7	$V_{CCB} \times 0.80$	—		
			0.7 to 3.6	0.8 to 1.95	$V_{CCB} \times 0.70$	—		
			0.7 to 3.6	2.3 to 2.7	1.6	—		
			0.7 to 3.6	3.0 to 3.6	2.0	—		
Low-level input voltage	$V_{ILA}$	nA, nDIR, $\overline{nOE}$	0.7	0.7 to 3.6	—	$V_{CCA} \times 0.20$	V	
			0.8 to 1.95	0.7 to 3.6	—	$V_{CCA} \times 0.30$		
			2.3 to 2.7	0.7 to 3.6	—	0.7		
			3.0 to 3.6	0.7 to 3.6	—	0.9		
	$V_{ILB}$	nB	0.7 to 3.6	0.7	—	$V_{CCB} \times 0.20$		
			0.7 to 3.6	0.8 to 1.95	—	$V_{CCB} \times 0.30$		
			0.7 to 3.6	2.3 to 2.7	—	0.7		
			0.7 to 3.6	3.0 to 3.6	—	0.9		
High-level output voltage	$V_{OH}$	nA, nB Output H	$I_{OH} = -0.1$ mA	0.7 to 3.6	0.7 to 3.6	$V_{CCO} - 0.1$	—	V
			$I_{OH} = -0.2$ mA	0.76	0.76	0.58	—	
			$I_{OH} = -0.5$ mA	0.85	0.85	0.65	—	
			$I_{OH} = -2$ mA	1.1	1.1	0.85	—	
			$I_{OH} = -4$ mA	1.4	1.4	1.05	—	
			$I_{OH} = -6$ mA	1.65	1.65	1.2	—	
			$I_{OH} = -9$ mA	2.3	2.3	1.75	—	
			$I_{OH} = -12$ mA	3.0	3.0	2.3	—	
Low-level output voltage	$V_{OL}$	nA, nB Output L	$I_{OL} = 0.1$ mA	0.7 to 3.6	0.7 to 3.6	—	0.1	V
			$I_{OL} = 0.2$ mA	0.76	0.76	—	0.18	
			$I_{OL} = 0.5$ mA	0.85	0.85	—	0.2	
			$I_{OL} = 2$ mA	1.1	1.1	—	0.25	
			$I_{OL} = 4$ mA	1.4	1.4	—	0.35	
			$I_{OL} = 6$ mA	1.65	1.65	—	0.45	
			$I_{OL} = 9$ mA	2.3	2.3	—	0.55	
			$I_{OL} = 12$ mA	3.0	3.0	—	0.7	

Characteristics	Symbol	Note	Test Condition	V <sub>CCA</sub> (V)	V <sub>CCB</sub> (V)	Min	Max	Unit	
3-state output OFF-state leakage current	I <sub>OZA</sub>	(Note 1)	Function OFF State, V <sub>IOA</sub> = 0 V or 3.6 V	0.7 to 3.6	0.7 to 3.6	—	±5	μA	
	I <sub>OZB</sub>	(Note 1)	Function OFF State, V <sub>IOB</sub> = 0 V or 3.6 V	0.7 to 3.6	0.7 to 3.6	—	±5		
Input leakage current	I <sub>IN</sub>	(Note 1)	Input = 0 V to 3.6 V	0.7 to 3.6	0 to 3.6	—	±1	μA	
Power-OFF leakage current	I <sub>OFFA</sub>	(Note 1)	V <sub>IOA</sub> = 0 V to 3.6 V	0	0.7 to 3.6	—	±5	μA	
	I <sub>OFFB</sub>	(Note 1)	V <sub>IOB</sub> = 0 V to 3.6 V	0.7 to 3.6	0	—	±5		
Quiescent supply current	I <sub>CCA</sub>	(Note 1)	—	0.7 to 3.6	0.7 to 3.6	—	8	μA	
				3.6	0	—	8		
	I <sub>CCB</sub>	(Note 1)	—	0.7 to 3.6	0.7 to 3.6	—	8		
				0	3.6	—	8		
	I <sub>CCTA</sub>			V <sub>CCA</sub> - 0.6V (per input)	3.0 to 3.6	0.7 to 3.6	—		500
	I <sub>CCTB</sub>			V <sub>CCB</sub> - 0.6V (per input)	0.7 to 3.6	3.0 to 3.6	—		500

Note 1: Fix the input terminal to each power supply terminal or 0V.

### 11.2. DC Characteristics (Unless otherwise specified, $T_a = -40$ to $125$ °C)

Characteristics	Symbol	Test Condition	$V_{CCA}$ (V)	$V_{CCB}$ (V)	Min	Max	Unit	
High-level input voltage	$V_{IHA}$	nA, nDIR, $\overline{nOE}$	0.7	0.7 to 3.6	$V_{CCA} \times 0.80$	—	V	
			0.8 to 1.95	0.7 to 3.6	$V_{CCA} \times 0.70$	—		
			2.3 to 2.7	0.7 to 3.6	1.6	—		
			3.0 to 3.6	0.7 to 3.6	2.0	—		
	$V_{IHB}$	nB	0.7 to 3.6	0.7	$V_{CCB} \times 0.80$	—		
			0.7 to 3.6	0.8 to 1.95	$V_{CCB} \times 0.70$	—		
			0.7 to 3.6	2.3 to 2.7	1.6	—		
			0.7 to 3.6	3.0 to 3.6	2.0	—		
Low-level input voltage	$V_{ILA}$	nA, nDIR, $\overline{nOE}$	0.7	0.7 to 3.6	—	$V_{CCA} \times 0.20$	V	
			0.8 to 1.95	0.7 to 3.6	—	$V_{CCA} \times 0.30$		
			2.3 to 2.7	0.7 to 3.6	—	0.7		
			3.0 to 3.6	0.7 to 3.6	—	0.9		
	$V_{ILB}$	nB	0.7 to 3.6	0.7	—	$V_{CCB} \times 0.20$		
			0.7 to 3.6	0.8 to 1.95	—	$V_{CCB} \times 0.30$		
			0.7 to 3.6	2.3 to 2.7	—	0.7		
			0.7 to 3.6	3.0 to 3.6	—	0.9		
High-level output voltage	$V_{OH}$	nA, nB Output H	$I_{OH} = -0.1$ mA	0.7 to 3.6	0.7 to 3.6	$V_{CCO} - 0.1$	—	V
			$I_{OH} = -0.2$ mA	0.76	0.76	0.58	—	
			$I_{OH} = -0.5$ mA	0.85	0.85	0.65	—	
			$I_{OH} = -2$ mA	1.1	1.1	0.85	—	
			$I_{OH} = -4$ mA	1.4	1.4	1.05	—	
			$I_{OH} = -6$ mA	1.65	1.65	1.2	—	
			$I_{OH} = -9$ mA	2.3	2.3	1.75	—	
			$I_{OH} = -12$ mA	3.0	3.0	2.3	—	
Low-level output voltage	$V_{OL}$	nA, nB Output L	$I_{OL} = 0.1$ mA	0.7 to 3.6	0.7 to 3.6	—	0.1	V
			$I_{OL} = 0.2$ mA	0.76	0.76	—	0.18	
			$I_{OL} = 0.5$ mA	0.85	0.85	—	0.2	
			$I_{OL} = 2$ mA	1.1	1.1	—	0.25	
			$I_{OL} = 4$ mA	1.4	1.4	—	0.35	
			$I_{OL} = 6$ mA	1.65	1.65	—	0.45	
			$I_{OL} = 9$ mA	2.3	2.3	—	0.55	
			$I_{OL} = 12$ mA	3.0	3.0	—	0.7	

Characteristics	Symbol	Note	Test Condition	V <sub>CCA</sub> (V)	V <sub>CCB</sub> (V)	Min	Max	Unit
3-state output OFF-state leakage current	I <sub>OZA</sub>	(Note 1)	Function OFF State, V <sub>IOA</sub> = 0 V or 3.6 V	0.7 to 3.6	0.7 to 3.6	—	±7.5	μA
	I <sub>OZB</sub>	(Note 1)	Function OFF State, V <sub>IOB</sub> = 0 V or 3.6 V	0.7 to 3.6	0.7 to 3.6	—	±7.5	
Input leakage current	I <sub>IN</sub>	(Note 1)	Input = 0 V to 3.6 V	0.7 to 3.6	0 to 3.6	—	±5	μA
Power-OFF leakage current	I <sub>OFFA</sub>	(Note 1)	V <sub>IOA</sub> = 0 V to 3.6 V	0	0.7 to 3.6	—	±10	μA
	I <sub>OFFB</sub>	(Note 1)	V <sub>IOB</sub> = 0 V to 3.6 V	0.7 to 3.6	0	—	±10	
Quiescent supply current	I <sub>CCA</sub>	(Note 1)	—	0.7 to 3.6	0.8 to 3.6	—	18	μA
				3.6	0	—	18	
	I <sub>CCB</sub>	(Note 1)	—	0.7 to 3.6	0.7 to 3.6	—	18	
				0	3.6	—	18	
	I <sub>CCTA</sub>		V <sub>CCA</sub> - 0.6 V (per input)	3.0 to 3.6	0.7 to 3.6	—	500	
	I <sub>CCTB</sub>		V <sub>CCB</sub> - 0.6 V (per input)	0.7 to 3.6	3.0 to 3.6	—	500	

Note 1: Fix the input terminal to each power supply terminal or 0V.

### 11.3. AC Characteristics (Note) (V<sub>CCA</sub> = 0.7 V, T<sub>a</sub> = 25 °C)

Characteristics	Symbol	V <sub>CCB</sub>	V <sub>CCB</sub>	V <sub>CCB</sub>	V <sub>CCB</sub>	V <sub>CCB</sub>	V <sub>CCB</sub>	V <sub>CCB</sub>	V <sub>CCB</sub>	Unit
		0.7 V Typ.	0.8 V Typ.	0.9 V Typ.	1.2 V Typ.	1.5 V Typ.	1.8 V Typ.	2.5 V Typ.	3.3 V Typ.	
Propagation delay time(B → A)	t <sub>PLH</sub> /t <sub>PHL</sub>	16.2	14.1	13.0	11.9	11.0	10.6	10.6	11.1	ns
Propagation delay time (B → A)		16.2	13.5	12.0	10.0	9.2	8.8	8.3	8.1	
3-state output disable time (OE → A)	t <sub>PLZ</sub> /t <sub>PHZ</sub>	24.1	24.1	24.1	24.1	24.1	24.1	24.0	23.2	
3-state output disable time (OE → B)		25.9	21.7	19.7	13.0	12.0	12.3	11.9	12.8	
3-state output enable time (OE → A)	t <sub>PZL</sub> /t <sub>PZH</sub>	26.9	26.9	26.9	26.9	26.9	26.9	26.8	26.7	
3-state output enable time (OE → B)		44.6	34.0	28.4	22.1	19.5	18.3	17.7	17.8	

Note: See Figure 12.1, 13.1, 13.2, table 12.1.1, 12.1.2, 13.1.1 for the measurement circuit.

### 11.4. AC Characteristics (Note) (V<sub>CCB</sub> = 0.7 V, T<sub>a</sub> = 25 °C)

Characteristics	Symbol	V <sub>CCA</sub>	V <sub>CCA</sub>	V <sub>CCA</sub>	V <sub>CCA</sub>	V <sub>CCA</sub>	V <sub>CCA</sub>	V <sub>CCA</sub>	V <sub>CCA</sub>	Unit
		0.7 V Typ.	0.8 V Typ.	0.9 V Typ.	1.2 V Typ.	1.5 V Typ.	1.8 V Typ.	2.5 V Typ.	3.3 V Typ.	
Propagation delay time (A → B)	t <sub>PLH</sub> /t <sub>PHL</sub>	16.2	13.5	12.0	10.0	9.2	8.8	8.3	8.1	ns
Propagation delay time (B → A)		16.2	14.1	13.0	11.9	11.0	10.6	10.6	11.1	
3-state output disable time (OE → A)	t <sub>PLZ</sub> /t <sub>PHZ</sub>	24.1	18.6	15.0	6.8	5.1	4.8	3.4	3.7	
3-state output disable time (OE → B)		25.9	22.8	21.5	19.8	19.1	18.5	17.7	17.4	
3-state output enable time (OE → A)	t <sub>PZL</sub> /t <sub>PZH</sub>	26.9	18.7	14.3	9.4	7.1	6.1	5.2	5.1	
3-state output enable time (OE → B)		44.6	41.2	39.6	37.6	37.2	37.1	37.2	37.2	

Note: See Figure 12.1, 13.1, 13.2, table 12.1.1, 12.1.2, 13.1.1 for the measurement circuit.

### 11.5. AC Characteristics (Note) ( $V_{CCA} = 0.7 \text{ V}$ , $T_a = -40 \text{ to } 85 \text{ }^\circ\text{C}$ )

Characteristics	Symbol	$V_{CCB}$ 0.7 V	$V_{CCB}$ $0.8 \pm 0.04 \text{ V}$	$V_{CCB}$ $0.9 \pm 0.045 \text{ V}$	$V_{CCB}$ $1.2 \pm 0.1 \text{ V}$	$V_{CCB}$ $1.5 \pm 0.1 \text{ V}$	$V_{CCB}$ $1.8 \pm 0.15 \text{ V}$	$V_{CCB}$ $2.5 \pm 0.2 \text{ V}$	$V_{CCB}$ $3.3 \pm 0.3 \text{ V}$	Unit
		Max	Max	Max	Max	Max	Max	Max	Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	40.9	33.9	28.7	24.4	23.2	23.1	25.3	31.2	ns
Propagation delay time (B → A)		40.9	33.7	29.1	24.4	22.9	22.5	22.0	21.7	
3-state output disable time ( $\overline{OE} \rightarrow A$ )	$t_{PLZ}/t_{PHZ}$	49.5	49.5	49.5	49.5	49.5	49.5	49.5	49.5	
3-state output disable time ( $\overline{OE} \rightarrow B$ )		51.9	42.5	34.8	26.3	24.3	24.5	25.1	27.4	
3-state output enable time ( $\overline{OE} \rightarrow A$ )	$t_{PZL}/t_{PZH}$	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	
3-state output enable time ( $\overline{OE} \rightarrow B$ )		117.4	86.3	63.5	45.7	40.0	38.4	38.4	40.1	

Note: See Figure 12.1, 13.1, 13.2, table 12.1.1, 12.1.2, 13.1.1 for the measurement circuit.

### 11.6. AC Characteristics (Note) ( $V_{CCA} = 0.8 \pm 0.04 \text{ V}$ , $T_a = -40 \text{ to } 85 \text{ }^\circ\text{C}$ )

Characteristics	Symbol	$V_{CCB}$ 0.7 V	$V_{CCB}$ $0.8 \pm 0.04 \text{ V}$	$V_{CCB}$ $0.9 \pm 0.045 \text{ V}$	$V_{CCB}$ $1.2 \pm 0.1 \text{ V}$	$V_{CCB}$ $1.5 \pm 0.1 \text{ V}$	$V_{CCB}$ $1.8 \pm 0.15 \text{ V}$	$V_{CCB}$ $2.5 \pm 0.2 \text{ V}$	$V_{CCB}$ $3.3 \pm 0.3 \text{ V}$	Unit
		Max	Max	Max	Max	Max	Max	Max	Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	33.7	26.9	21.6	18.2	16.4	16.0	16.5	17.8	ns
Propagation delay time (B → A)		33.9	26.9	22.0	17.4	16.1	15.6	15.1	14.9	
3-state output disable time ( $\overline{OE} \rightarrow A$ )	$t_{PLZ}/t_{PHZ}$	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	
3-state output disable time ( $\overline{OE} \rightarrow B$ )		46.0	36.6	28.7	20.0	17.9	17.9	17.5	19.1	
3-state output enable time ( $\overline{OE} \rightarrow A$ )	$t_{PZL}/t_{PZH}$	44.8	44.8	44.8	44.8	44.8	44.8	44.8	44.8	
3-state output enable time ( $\overline{OE} \rightarrow B$ )		107.9	76.4	53.3	35.6	29.6	27.6	26.6	27.2	

Note: See Figure 12.1, 13.1, 13.2, table 12.1.1, 12.1.2, 13.1.1 for the measurement circuit.

### 11.7. AC Characteristics (Note) ( $V_{CCA} = 0.9 \pm 0.045 \text{ V}$ , $T_a = -40 \text{ to } 85 \text{ }^\circ\text{C}$ )

Characteristics	Symbol	$V_{CCB}$ 0.7 V	$V_{CCB}$ $0.8 \pm 0.04 \text{ V}$	$V_{CCB}$ $0.9 \pm 0.045 \text{ V}$	$V_{CCB}$ $1.2 \pm 0.1 \text{ V}$	$V_{CCB}$ $1.5 \pm 0.1 \text{ V}$	$V_{CCB}$ $1.8 \pm 0.15 \text{ V}$	$V_{CCB}$ $2.5 \pm 0.2 \text{ V}$	$V_{CCB}$ $3.3 \pm 0.3 \text{ V}$	Unit
		Max	Max	Max	Max	Max	Max	Max	Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	29.1	22.0	16.6	13.9	12.2	11.2	10.9	11.0	ns
Propagation delay time (B → A)		28.7	21.6	16.6	12.5	11.1	10.5	9.8	9.5	
3-state output disable time ( $\overline{OE} \rightarrow A$ )	$t_{PLZ}/t_{PHZ}$	22.9	22.9	22.9	22.9	22.9	22.9	22.9	22.9	
3-state output disable time ( $\overline{OE} \rightarrow B$ )		40.9	31.9	24.0	15.9	13.4	13.1	12.0	13.1	
3-state output enable time ( $\overline{OE} \rightarrow A$ )	$t_{PZL}/t_{PZH}$	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	
3-state output enable time ( $\overline{OE} \rightarrow B$ )		101.6	69.7	46.3	30.1	23.7	21.2	18.8	17.9	

Note: See Figure 12.1, 13.1, 13.2, table 12.1.1, 12.1.2, 13.1.1 for the measurement circuit.

### 11.8. AC Characteristics (Note) ( $V_{CCA} = 1.2 \pm 0.1 \text{ V}$ , $T_a = -40 \text{ to } 85 \text{ }^\circ\text{C}$ )

Characteristics	Symbol	$V_{CCB}$ 0.7 V	$V_{CCB}$ $0.8 \pm 0.04 \text{ V}$	$V_{CCB}$ $0.9 \pm 0.045 \text{ V}$	$V_{CCB}$ $1.2 \pm 0.1 \text{ V}$	$V_{CCB}$ $1.5 \pm 0.1 \text{ V}$	$V_{CCB}$ $1.8 \pm 0.15 \text{ V}$	$V_{CCB}$ $2.5 \pm 0.2 \text{ V}$	$V_{CCB}$ $3.3 \pm 0.3 \text{ V}$	Unit
		Max	Max	Max	Max	Max	Max	Max	Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	24.4	17.4	12.5	10.2	9.0	8.5	7.6	7.3	ns
Propagation delay time (B → A)		24.4	18.2	13.9	10.2	8.2	7.5	6.7	6.4	
3-state output disable time ( $\overline{OE} \rightarrow A$ )	$t_{PLZ}/t_{PHZ}$	12.3	12.2	12.2	12.2	12.2	12.2	12.2	12.3	
3-state output disable time ( $\overline{OE} \rightarrow B$ )		37.1	27.4	21.1	13.6	10.8	9.5	7.9	7.3	
3-state output enable time ( $\overline{OE} \rightarrow A$ )	$t_{PZL}/t_{PZH}$	18.0	17.9	17.8	17.7	18.0	18.0	18.0	18.1	
3-state output enable time ( $\overline{OE} \rightarrow B$ )		97.1	64.3	40.3	27.7	20.0	17.0	13.7	12.5	

Note: See Figure 12.1, 13.1, 13.2, table 12.1.1, 12.1.2, 13.1.1 for the measurement circuit.

### 11.9. AC Characteristics (Note) ( $V_{CCA} = 1.5 \pm 0.1 \text{ V}$ , $T_a = -40 \text{ to } 85 \text{ }^\circ\text{C}$ )

Characteristics	Symbol	$V_{CCB}$ 0.7 V	$V_{CCB}$ $0.8 \pm$ $0.04 \text{ V}$	$V_{CCB}$ $0.9 \pm$ $0.045 \text{ V}$	$V_{CCB}$ $1.2 \pm$ $0.1 \text{ V}$	$V_{CCB}$ $1.5 \pm$ $0.1 \text{ V}$	$V_{CCB}$ $1.8 \pm$ $0.15 \text{ V}$	$V_{CCB}$ $2.5 \pm$ $0.2 \text{ V}$	$V_{CCB}$ $3.3 \pm$ $0.3 \text{ V}$	Unit
		Max	Max	Max	Max	Max	Max	Max	Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	22.9	16.1	11.1	8.2	6.9	6.5	5.9	5.5	ns
Propagation delay time (B → A)		23.2	16.4	12.2	9.0	6.9	6.0	5.2	4.9	
3-state output disable time ( $\overline{OE} \rightarrow A$ )	$t_{PLZ}/t_{PHZ}$	8.5	8.4	8.4	8.4	8.4	8.4	8.3	8.2	
3-state output disable time ( $\overline{OE} \rightarrow B$ )		35.9	25.9	20.0	12.1	9.1	7.6	6.1	5.4	
3-state output enable time ( $\overline{OE} \rightarrow A$ )	$t_{PZL}/t_{PZH}$	11.9	11.8	11.7	11.6	11.7	11.9	11.8	11.8	
3-state output enable time ( $\overline{OE} \rightarrow B$ )		95.9	63.0	38.7	25.1	17.4	14.4	11.0	9.7	

Note: See Figure 12.1, 13.1, 13.2, table 12.1.1, 12.1.2, 13.1.1 for the measurement circuit.

### 11.10. AC Characteristics (Note) ( $V_{CCA} = 1.8 \pm 0.15 \text{ V}$ , $T_a = -40 \text{ to } 85 \text{ }^\circ\text{C}$ )

Characteristics	Symbol	$V_{CCB}$ 0.7 V	$V_{CCB}$ $0.8 \pm$ $0.04 \text{ V}$	$V_{CCB}$ $0.9 \pm$ $0.045 \text{ V}$	$V_{CCB}$ $1.2 \pm$ $0.1 \text{ V}$	$V_{CCB}$ $1.5 \pm$ $0.1 \text{ V}$	$V_{CCB}$ $1.8 \pm$ $0.15 \text{ V}$	$V_{CCB}$ $2.5 \pm$ $0.2 \text{ V}$	$V_{CCB}$ $3.3 \pm$ $0.3 \text{ V}$	Unit
		Max	Max	Max	Max	Max	Max	Max	Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	22.5	15.6	10.5	7.5	6.0	5.5	5.1	4.8	ns
Propagation delay time (B → A)		23.1	16.0	11.2	8.5	6.5	5.5	4.6	4.3	
3-state output disable time ( $\overline{OE} \rightarrow A$ )	$t_{PLZ}/t_{PHZ}$	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.2	
3-state output disable time ( $\overline{OE} \rightarrow B$ )		35.3	25.5	19.7	12.6	9.3	7.7	6.0	5.2	
3-state output enable time ( $\overline{OE} \rightarrow A$ )	$t_{PZL}/t_{PZH}$	9.4	9.3	9.2	9.2	9.2	9.3	9.3	9.3	
3-state output enable time ( $\overline{OE} \rightarrow B$ )		95.9	62.9	38.2	24.2	16.5	13.4	10.0	8.6	

Note: See Figure 12.1, 13.1, 13.2, table 12.1.1, 12.1.2, 13.1.1 for the measurement circuit.

### 11.11. AC Characteristics (Note) ( $V_{CCA} = 2.5 \pm 0.2 \text{ V}$ , $T_a = -40 \text{ to } 85 \text{ }^\circ\text{C}$ )

Characteristics	Symbol	$V_{CCB}$ 0.7 V	$V_{CCB}$ $0.8 \pm$ $0.04 \text{ V}$	$V_{CCB}$ $0.9 \pm$ $0.045 \text{ V}$	$V_{CCB}$ $1.2 \pm$ $0.1 \text{ V}$	$V_{CCB}$ $1.5 \pm$ $0.1 \text{ V}$	$V_{CCB}$ $1.8 \pm$ $0.15 \text{ V}$	$V_{CCB}$ $2.5 \pm$ $0.2 \text{ V}$	$V_{CCB}$ $3.3 \pm$ $0.3 \text{ V}$	Unit
		Max	Max	Max	Max	Max	Max	Max	Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	22.0	15.1	9.8	6.7	5.2	4.6	4.0	3.9	ns
Propagation delay time (B → A)		25.3	16.5	10.9	7.6	5.9	5.1	4.0	3.5	
3-state output disable time ( $\overline{OE} \rightarrow A$ )	$t_{PLZ}/t_{PHZ}$	5.1	5.1	5.1	4.9	4.9	4.9	4.9	4.9	
3-state output disable time ( $\overline{OE} \rightarrow B$ )		34.0	24.6	18.7	11.8	8.5	7.0	5.3	4.5	
3-state output enable time ( $\overline{OE} \rightarrow A$ )	$t_{PZL}/t_{PZH}$	8.1	7.7	7.4	6.7	6.5	6.5	6.5	6.5	
3-state output enable time ( $\overline{OE} \rightarrow B$ )		97.3	63.4	38.3	23.7	15.8	12.5	9.0	7.5	

Note: See Figure 12.1, 13.1, 13.2, table 12.1.1, 12.1.2, 13.1.1 for the measurement circuit.

### 11.12. AC Characteristics (Note) ( $V_{CCA} = 3.3 \text{ V}$ , $T_a = -40 \text{ to } 85 \text{ }^\circ\text{C}$ )

Characteristics	Symbol	$V_{CCB}$ 0.7 V	$V_{CCB}$ $0.8 \pm$ $0.04 \text{ V}$	$V_{CCB}$ $0.9 \pm$ $0.045 \text{ V}$	$V_{CCB}$ $1.2 \pm$ $0.1 \text{ V}$	$V_{CCB}$ $1.5 \pm$ $0.1 \text{ V}$	$V_{CCB}$ $1.8 \pm$ $0.15 \text{ V}$	$V_{CCB}$ $2.5 \pm$ $0.2 \text{ V}$	$V_{CCB}$ $3.3 \pm$ $0.3 \text{ V}$	Unit
		Max	Max	Max	Max	Max	Max	Max	Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	21.7	14.9	9.5	6.4	4.9	4.3	3.5	3.3	ns
Propagation delay time (B → A)		31.2	17.8	11.0	7.3	5.5	4.8	3.9	3.3	
3-state output disable time ( $\overline{OE} \rightarrow A$ )	$t_{PLZ}/t_{PHZ}$	5.2	5.2	5.2	5.0	5.0	5.0	5.0	5.0	
3-state output disable time ( $\overline{OE} \rightarrow B$ )		34.6	24.2	18.6	15.7	11.4	9.3	6.5	5.3	
3-state output enable time ( $\overline{OE} \rightarrow A$ )	$t_{PZL}/t_{PZH}$	7.1	6.4	6.1	5.9	5.3	5.3	5.2	5.2	
3-state output enable time ( $\overline{OE} \rightarrow B$ )		98.5	64.0	38.5	23.7	15.5	12.1	8.6	7.1	

Note: See Figure 12.1, 13.1, 13.2, table 12.1.1, 12.1.2, 13.1.1 for the measurement circuit.

### 11.13. AC Characteristics (Note) ( $V_{CCA} = 0.7 \text{ V}$ , $T_a = -40 \text{ to } 125 \text{ }^\circ\text{C}$ )

Characteristics	Symbol	$V_{CCB}$ 0.7 V	$V_{CCB}$ $0.8 \pm 0.04 \text{ V}$	$V_{CCB}$ $0.9 \pm 0.045 \text{ V}$	$V_{CCB}$ $1.2 \pm 0.1 \text{ V}$	$V_{CCB}$ $1.5 \pm 0.1 \text{ V}$	$V_{CCB}$ $1.8 \pm 0.15 \text{ V}$	$V_{CCB}$ $2.5 \pm 0.2 \text{ V}$	$V_{CCB}$ $3.3 \pm 0.3 \text{ V}$	Unit
		Max	Max	Max	Min	Min	Min	Min	Min	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	40.9	33.9	28.7	24.4	23.2	23.1	25.3	31.2	ns
Propagation delay time (B → A)		40.9	33.7	29.1	24.4	22.9	22.5	22.0	21.7	
3-state output disable time ( $\overline{OE} \rightarrow A$ )	$t_{PLZ}/t_{PHZ}$	49.5	49.5	49.5	49.5	49.5	49.5	49.5	49.5	
3-state output disable time ( $\overline{OE} \rightarrow B$ )		51.9	42.5	34.8	26.3	24.3	24.5	25.1	27.4	
3-state output enable time ( $\overline{OE} \rightarrow A$ )	$t_{PZL}/t_{PZH}$	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	
3-state output enable time ( $\overline{OE} \rightarrow B$ )		117.4	86.3	63.5	45.7	40.0	38.4	38.4	40.1	

Note: See Figure 12.1, 13.1, 13.2, table 12.1.1, 12.1.2, 13.1.1 for the measurement circuit.

### 11.14. AC Characteristics (Note) ( $V_{CCA} = 0.8 \pm 0.04 \text{ V}$ , $T_a = -40 \text{ to } 125 \text{ }^\circ\text{C}$ )

Characteristics	Symbol	$V_{CCB}$ 0.7 V	$V_{CCB}$ $0.8 \pm 0.04 \text{ V}$	$V_{CCB}$ $0.9 \pm 0.045 \text{ V}$	$V_{CCB}$ $1.2 \pm 0.1 \text{ V}$	$V_{CCB}$ $1.5 \pm 0.1 \text{ V}$	$V_{CCB}$ $1.8 \pm 0.15 \text{ V}$	$V_{CCB}$ $2.5 \pm 0.2 \text{ V}$	$V_{CCB}$ $3.3 \pm 0.3 \text{ V}$	Unit
		Max	Max	Max	Max	Max	Max	Max	Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	33.7	26.9	21.6	18.2	16.4	16.0	16.5	17.8	ns
Propagation delay time (B → A)		33.9	26.9	22.0	17.4	16.1	15.6	15.1	14.9	
3-state output disable time ( $\overline{OE} \rightarrow A$ )	$t_{PLZ}/t_{PHZ}$	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	
3-state output disable time ( $\overline{OE} \rightarrow B$ )		46.0	36.6	28.7	20.0	17.9	17.9	17.5	19.1	
3-state output enable time ( $\overline{OE} \rightarrow A$ )	$t_{PZL}/t_{PZH}$	44.8	44.8	44.8	44.8	44.8	44.8	44.8	44.8	
3-state output enable time ( $\overline{OE} \rightarrow B$ )		107.9	76.4	53.3	35.6	29.6	27.6	26.6	27.2	

Note: See Figure 12.1, 13.1, 13.2, table 12.1.1, 12.1.2, 13.1.1 for the measurement circuit.

### 11.15. AC Characteristics (Note) ( $V_{CCA} = 0.9 \pm 0.045 \text{ V}$ , $T_a = -40 \text{ to } 125 \text{ }^\circ\text{C}$ )

Characteristics	Symbol	$V_{CCB}$ 0.7 V	$V_{CCB}$ $0.8 \pm 0.04 \text{ V}$	$V_{CCB}$ $0.9 \pm 0.045 \text{ V}$	$V_{CCB}$ $1.2 \pm 0.1 \text{ V}$	$V_{CCB}$ $1.5 \pm 0.1 \text{ V}$	$V_{CCB}$ $1.8 \pm 0.15 \text{ V}$	$V_{CCB}$ $2.5 \pm 0.2 \text{ V}$	$V_{CCB}$ $3.3 \pm 0.3 \text{ V}$	Unit
		Max	Max	Max	Max	Max	Max	Max	Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	29.1	22.0	16.6	14.1	12.5	11.4	10.9	11.0	ns
Propagation delay time (B → A)		28.7	21.6	16.6	12.5	11.1	10.6	9.8	9.5	
3-state output disable time ( $\overline{OE} \rightarrow A$ )	$t_{PLZ}/t_{PHZ}$	22.9	22.9	22.9	22.9	22.9	22.9	22.9	22.9	
3-state output disable time ( $\overline{OE} \rightarrow B$ )		40.9	31.9	24.0	15.9	13.4	13.1	12.0	13.1	
3-state output enable time ( $\overline{OE} \rightarrow A$ )	$t_{PZL}/t_{PZH}$	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	
3-state output enable time ( $\overline{OE} \rightarrow B$ )		101.6	69.7	46.3	30.1	23.7	21.2	18.8	17.9	

Note: See Figure 12.1, 13.1, 13.2, table 12.1.1, 12.1.2, 13.1.1 for the measurement circuit.

### 11.16. AC Characteristics (Note) ( $V_{CCA} = 1.2 \pm 0.1 \text{ V}$ , $T_a = -40 \text{ to } 125 \text{ }^\circ\text{C}$ )

Characteristics	Symbol	$V_{CCB}$ 0.7 V	$V_{CCB}$ $0.8 \pm 0.04 \text{ V}$	$V_{CCB}$ $0.9 \pm 0.045 \text{ V}$	$V_{CCB}$ $1.2 \pm 0.1 \text{ V}$	$V_{CCB}$ $1.5 \pm 0.1 \text{ V}$	$V_{CCB}$ $1.8 \pm 0.15 \text{ V}$	$V_{CCB}$ $2.5 \pm 0.2 \text{ V}$	$V_{CCB}$ $3.3 \pm 0.3 \text{ V}$	Unit
		Max	Max	Max	Max	Max	Max	Max	Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	24.4	17.4	12.5	10.5	9.4	8.9	7.9	7.6	ns
Propagation delay time (B → A)		24.4	18.2	14.1	10.5	8.6	7.9	7.0	6.7	
3-state output disable time ( $\overline{OE} \rightarrow A$ )	$t_{PLZ}/t_{PHZ}$	12.6	12.5	12.5	12.5	12.5	12.5	12.5	12.6	
3-state output disable time ( $\overline{OE} \rightarrow B$ )		37.1	27.4	21.1	14.1	11.3	10.0	8.2	7.6	
3-state output enable time ( $\overline{OE} \rightarrow A$ )	$t_{PZL}/t_{PZH}$	18.5	18.4	18.4	18.2	18.5	18.6	18.6	18.7	
3-state output enable time ( $\overline{OE} \rightarrow B$ )		97.1	64.3	40.3	28.6	21.0	18.0	14.5	13.1	

Note: See Figure 12.1, 13.1, 13.2, table 12.1.1, 12.1.2, 13.1.1 for the measurement circuit.

### 11.17. AC Characteristics (Note) ( $V_{CCA} = 1.5 \pm 0.1 \text{ V}$ , $T_a = -40 \text{ to } 125 \text{ }^\circ\text{C}$ )

Characteristics	Symbol	$V_{CCB}$ 0.7 V	$V_{CCB}$ $0.8 \pm$ $0.04 \text{ V}$	$V_{CCB}$ $0.9 \pm$ $0.045 \text{ V}$	$V_{CCB}$ $1.2 \pm$ $0.1 \text{ V}$	$V_{CCB}$ $1.5 \pm$ $0.1 \text{ V}$	$V_{CCB}$ $1.8 \pm$ $0.15 \text{ V}$	$V_{CCB}$ $2.5 \pm$ $0.2 \text{ V}$	$V_{CCB}$ $3.3 \pm$ $0.3 \text{ V}$	Unit
		Max	Max	Max	Max	Max	Max	Max	Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	22.9	16.1	11.1	8.6	7.3	6.9	6.3	5.8	ns
Propagation delay time (B → A)		23.2	16.4	12.5	9.4	7.3	6.4	5.5	5.2	
3-state output disable time ( $\overline{OE} \rightarrow A$ )	$t_{PLZ}/t_{PHZ}$	8.9	8.9	8.8	8.8	8.9	8.8	8.8	8.7	
3-state output disable time ( $\overline{OE} \rightarrow B$ )		35.9	25.9	20.0	12.8	9.6	8.0	6.4	5.7	
3-state output enable time ( $\overline{OE} \rightarrow A$ )	$t_{PZL}/t_{PZH}$	12.7	12.6	12.4	12.3	12.5	12.6	12.5	12.5	
3-state output enable time ( $\overline{OE} \rightarrow B$ )		95.9	63.0	38.7	26.2	18.4	15.4	11.8	10.3	

Note: See Figure 12.1, 13.1, 13.2, table 12.1.1, 12.1.2, 13.1.1 for the measurement circuit.

### 11.18. AC Characteristics (Note) ( $V_{CCA} = 1.8 \pm 0.15 \text{ V}$ , $T_a = -40 \text{ to } 125 \text{ }^\circ\text{C}$ )

Characteristics	Symbol	$V_{CCB}$ 0.7 V	$V_{CCB}$ $0.8 \pm$ $0.04 \text{ V}$	$V_{CCB}$ $0.9 \pm$ $0.045 \text{ V}$	$V_{CCB}$ $1.2 \pm$ $0.1 \text{ V}$	$V_{CCB}$ $1.5 \pm$ $0.1 \text{ V}$	$V_{CCB}$ $1.8 \pm$ $0.15 \text{ V}$	$V_{CCB}$ $2.5 \pm$ $0.2 \text{ V}$	$V_{CCB}$ $3.3 \pm$ $0.3 \text{ V}$	Unit
		Max	Max	Max	Max	Max	Max	Max	Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	22.5	15.6	10.6	7.9	6.4	5.9	5.5	5.1	ns
Propagation delay time (B → A)		23.1	16.0	11.4	8.9	6.9	5.9	4.9	4.6	
3-state output disable time ( $\overline{OE} \rightarrow A$ )	$t_{PLZ}/t_{PHZ}$	7.7	7.7	7.7	7.7	7.7	7.6	7.6	7.5	
3-state output disable time ( $\overline{OE} \rightarrow B$ )		35.3	25.5	19.7	13.4	9.8	8.1	6.3	5.5	
3-state output enable time ( $\overline{OE} \rightarrow A$ )	$t_{PZL}/t_{PZH}$	10.0	9.9	9.8	9.9	9.9	9.9	10.0	10.0	
3-state output enable time ( $\overline{OE} \rightarrow B$ )		95.9	62.9	38.2	25.1	17.5	14.4	10.7	9.2	

Note: See Figure 12.1, 13.1, 13.2, table 12.1.1, 12.1.2, 13.1.1 for the measurement circuit.

### 11.19. AC Characteristics (Note) ( $V_{CCA} = 2.5 \pm 0.2 \text{ V}$ , $T_a = -40 \text{ to } 125 \text{ }^\circ\text{C}$ )

Characteristics	Symbol	$V_{CCB}$ 0.7 V	$V_{CCB}$ $0.8 \pm$ $0.04 \text{ V}$	$V_{CCB}$ $0.9 \pm$ $0.045 \text{ V}$	$V_{CCB}$ $1.2 \pm$ $0.1 \text{ V}$	$V_{CCB}$ $1.5 \pm$ $0.1 \text{ V}$	$V_{CCB}$ $1.8 \pm$ $0.15 \text{ V}$	$V_{CCB}$ $2.5 \pm$ $0.2 \text{ V}$	$V_{CCB}$ $3.3 \pm$ $0.3 \text{ V}$	Unit
		Max	Max	Max	Max	Max	Max	Max	Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	22.0	15.1	9.8	7.0	5.5	4.9	4.3	4.2	ns
Propagation delay time (B → A)		25.3	16.5	10.9	7.9	6.3	5.5	4.3	3.8	
3-state output disable time ( $\overline{OE} \rightarrow A$ )	$t_{PLZ}/t_{PHZ}$	5.4	5.4	5.4	5.2	5.2	5.2	5.2	5.2	
3-state output disable time ( $\overline{OE} \rightarrow B$ )		34.0	24.6	18.7	12.6	8.9	7.3	5.6	4.7	
3-state output enable time ( $\overline{OE} \rightarrow A$ )	$t_{PZL}/t_{PZH}$	8.1	7.7	7.4	7.2	7.0	6.9	6.9	7.0	
3-state output enable time ( $\overline{OE} \rightarrow B$ )		97.3	63.4	38.3	24.5	16.8	13.4	9.6	8.0	

Note: See Figure 12.1, 13.1, 13.2, table 12.1.1, 12.1.2, 13.1.1 for the measurement circuit.

### 11.20. AC Characteristics (Note) ( $V_{CCA} = 3.3 \pm 0.3 \text{ V}$ , $T_a = -40 \text{ to } 125 \text{ }^\circ\text{C}$ )

Characteristics	Symbol	$V_{CCB}$ 0.7 V	$V_{CCB}$ $0.8 \pm$ $0.04 \text{ V}$	$V_{CCB}$ $0.9 \pm$ $0.045 \text{ V}$	$V_{CCB}$ $1.2 \pm$ $0.1 \text{ V}$	$V_{CCB}$ $1.5 \pm$ $0.1 \text{ V}$	$V_{CCB}$ $1.8 \pm$ $0.15 \text{ V}$	$V_{CCB}$ $2.5 \pm$ $0.2 \text{ V}$	$V_{CCB}$ $3.3 \pm$ $0.3 \text{ V}$	Unit
		Max	Max	Max	Max	Max	Max	Max	Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	21.7	14.9	9.5	6.7	5.2	4.6	3.8	3.6	ns
Propagation delay time (B → A)		31.2	17.8	11.0	7.6	5.8	5.1	4.2	3.6	
3-state output disable time ( $\overline{OE} \rightarrow A$ )	$t_{PLZ}/t_{PHZ}$	5.4	5.4	5.4	5.2	5.2	5.2	5.2	5.2	
3-state output disable time ( $\overline{OE} \rightarrow B$ )		34.6	24.2	18.6	16.3	11.8	9.6	6.7	5.5	
3-state output enable time ( $\overline{OE} \rightarrow A$ )	$t_{PZL}/t_{PZH}$	7.5	6.8	6.5	6.3	5.7	5.6	5.6	5.6	
3-state output enable time ( $\overline{OE} \rightarrow B$ )		98.5	64.0	38.5	24.5	16.5	13.0	9.2	7.6	

Note: See Figure 12.1, 13.1, 13.2, table 12.1.1, 12.1.2, 13.1.1 for the measurement circuit.

### 11.21. Capacitive Characteristics (Unless otherwise specified, T<sub>a</sub> = 25 °C)

Characteristics	Symbol	Note	Test Condition	V <sub>CCA</sub> , V <sub>CCB</sub> 0.7 V Typ.	V <sub>CCA</sub> , V <sub>CCB</sub> 0.8 V Typ.	V <sub>CCA</sub> , V <sub>CCB</sub> 0.9 V Typ.	V <sub>CCA</sub> , V <sub>CCB</sub> 1.2 V Typ.	V <sub>CCA</sub> , V <sub>CCB</sub> 1.5 V Typ.	V <sub>CCA</sub> , V <sub>CCB</sub> 1.8 V Typ.	V <sub>CCA</sub> , V <sub>CCB</sub> 2.5 V Typ.	V <sub>CCA</sub> , V <sub>CCB</sub> 3.3 V Typ.	Unit
Input capacitance	C <sub>IN</sub>		V <sub>IN</sub> = 0 V or 3.3 V	—	—	—	—	—	—	—	4	pF
Bus I/O capacitance	C <sub>I/OA</sub>		An = OFF, V <sub>IOA</sub> = 0 V or 3.3 V	—	—	—	—	—	—	—	5	pF
	C <sub>I/OB</sub>		Bn = OFF, V <sub>IOB</sub> = 0 V or 3.3 V	—	—	—	—	—	—	—	5	
Power dissipation capacitance	C <sub>PD A</sub>	(Note 1)	A → B	1.5	1.5	1.5	1.5	2	2	2	2.5	pF
			B → A	13	13	13	13.5	13.5	14	14.5	15	
	C <sub>PD B</sub>	(Note 1)	A → B	13	13	13	13.5	13.5	14	14.5	15	
			B → A	1.5	1.5	1.5	1.5	2	2	2	2.5	

Note 1: C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation.

$$I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/4 \text{ (per bit)}$$

## 12. AC Test Circuit

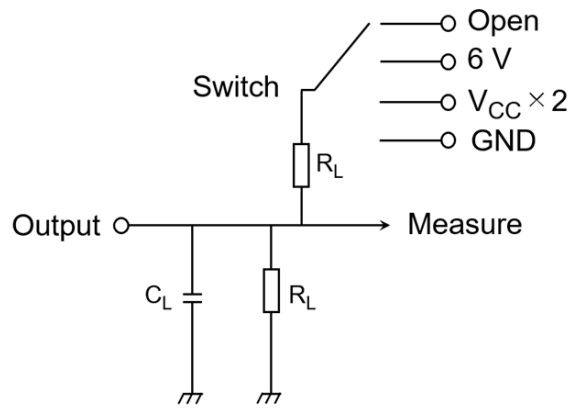


Fig. 12.1 AC Test Circuit

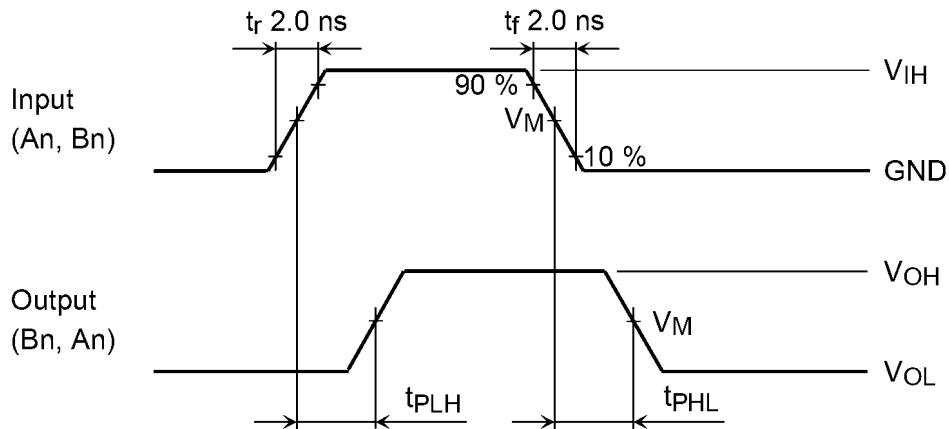
Table 12.1.1 Parameter for AC Test Circuit

Parameter	Switch
$t_{PLH}$ , $t_{PHL}$	Open
$t_{PLZ}$ , $t_{PZL}$	$V_{CC} \times 2$
$t_{PHZ}$ , $t_{PZH}$	GND

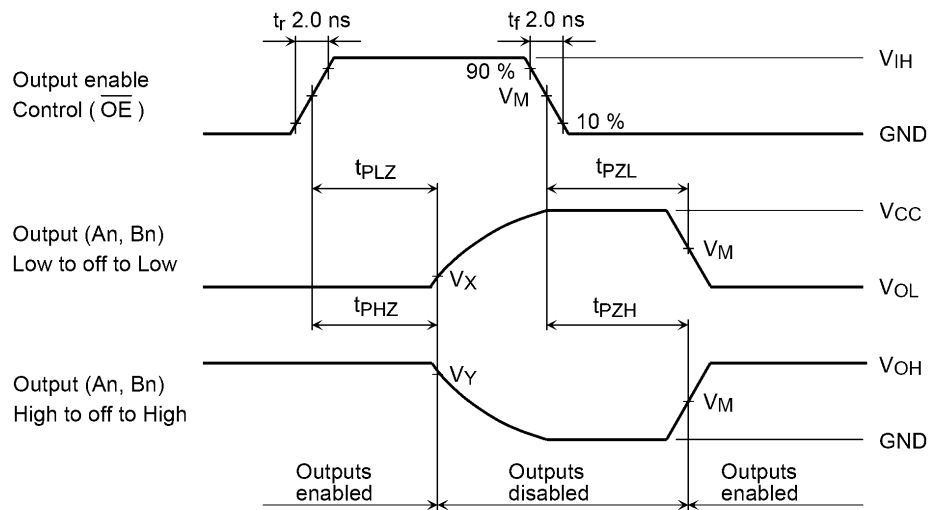
Table 12.1.2 Parameter for AC Test Circuit

Symbol	$V_{CC} = 3.3 \pm 0.3 \text{ V}$	$V_{CC} = 2.5 \pm 0.2 \text{ V}$	$V_{CC} = 1.8 \pm 0.15 \text{ V}$	$V_{CC} = 1.5 \pm 0.1 \text{ V}$	$V_{CC} = 1.2 \pm 0.1 \text{ V}$	$V_{CC} = 0.9 \pm 0.045 \text{ V}$	$V_{CC} = 0.8 \pm 0.04 \text{ V}$	$V_{CC} = 0.7 \text{ V}$
$R_L$	2 k $\Omega$	2 k $\Omega$	2 k $\Omega$	2 k $\Omega$	2 k $\Omega$	10 k $\Omega$	10 k $\Omega$	10 k $\Omega$
$C_L$	15 pF	15 pF	15 pF	15 pF	15 pF	5 pF	5 pF	5 pF

### 13. AC Waveform



**Fig. 13.1**  $t_{PLH}$ ,  $t_{PHL}$



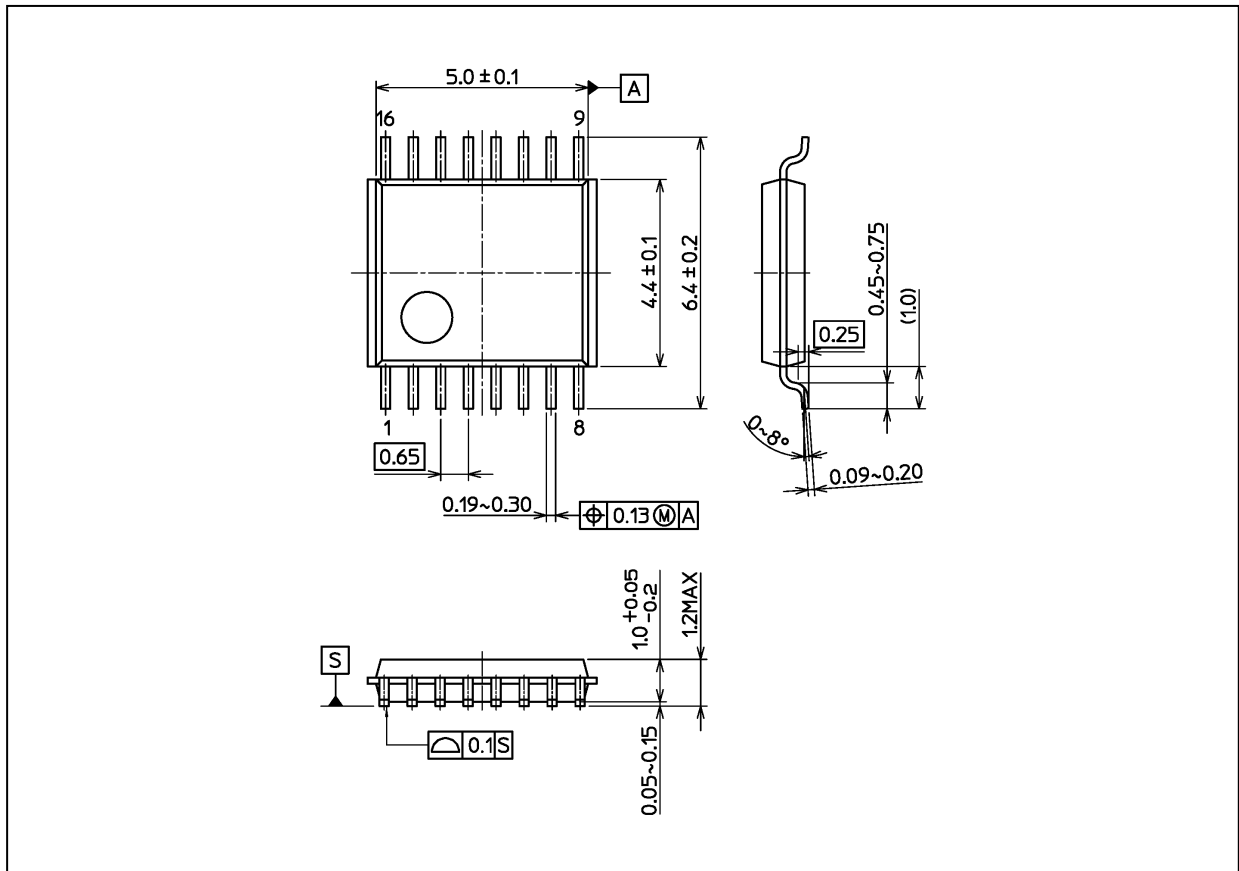
**Fig. 13.2**  $t_{PLZ}$ ,  $t_{PHZ}$ ,  $t_{PZL}$ ,  $t_{PZH}$

**Table 13.1.1** AC Waveform Symbols

Symbol	$V_{CC} = 3.3 \pm 0.3 \text{ V}$	$V_{CC} = 2.5 \pm 0.2 \text{ V}$ $V_{CC} = 1.8 \pm 0.15 \text{ V}$	$V_{CC} = 1.5 \pm 0.1 \text{ V}$ $V_{CC} = 1.2 \pm 0.1 \text{ V}$	$V_{CC} = 0.9 \pm 0.045 \text{ V}$ $V_{CC} = 0.8 \pm 0.04 \text{ V}$ $V_{CC} = 0.7 \text{ V}$
$V_{IH}$	$V_{CC}$	$V_{CC}$	$V_{CC}$	$V_{CC}$
$V_M$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$
$V_X$	$V_{OL} + 0.3 \text{ V}$	$V_{OL} + 0.15 \text{ V}$	$V_{OL} + 0.1 \text{ V}$	$V_{OL} + 0.1 \text{ V}$
$V_Y$	$V_{OH} - 0.3 \text{ V}$	$V_{OH} - 0.15 \text{ V}$	$V_{OH} - 0.1 \text{ V}$	$V_{OH} - 0.1 \text{ V}$

## Package Dimensions

Unit: mm



Weight: 0.055 g (typ.)

Package Name(s)
Nickname: TSSOP16B

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