

# 74AVCH1T45FU

## 1. Functional Description

- 1-Bit Dual-Supply Bus Transceiver with Bushold and Configurable Power Supply

## 2. General

The 74AVCH1T45FU is a dual-supply, high-speed CMOS 1-bit bus transceiver with bus hold circuitry that allows interfacing between two systems with supply voltages from 0.8 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 bus hold function holds the voltage at the bus terminal input.

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) has a tolerant function that allows input of up to 3.6 V regardless of the supply voltage. By setting one or both power supplies to GND, the internal buffer is placed in a high-impedance mode, and the bus terminals supplied with power are placed in bus hold mode.

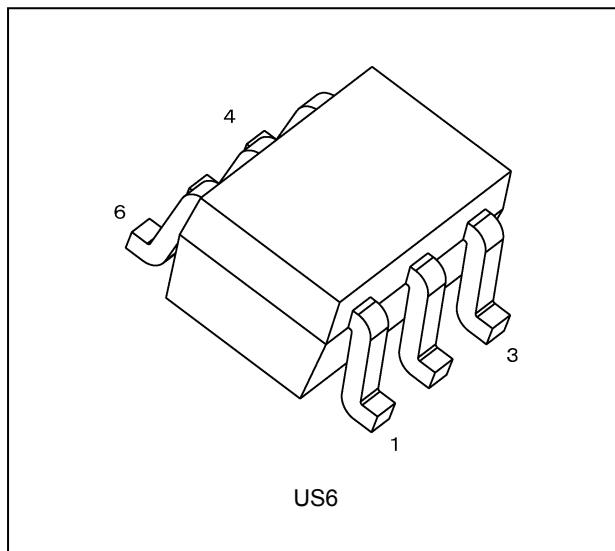
All inputs are equipped with protection circuits to protect the devices from electrostatic discharge damage.

## 3. Features

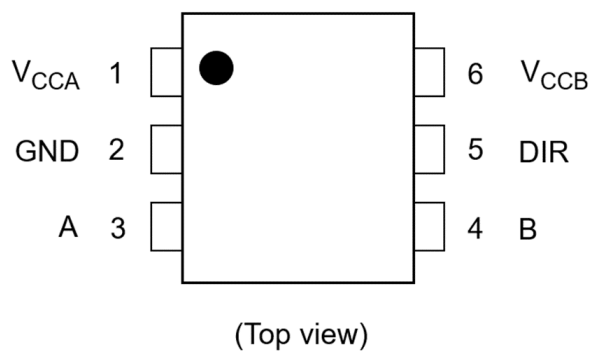
- (1) Wide operating temperature range:  $T_{opr} = -40$  to  $125$  °C
- (2) Wide supply voltage value:  $V_{CCA} = 0.8$  to  $3.6$  V,  $V_{CCB} = 0.8$  to  $3.6$  V
- (3) Bidirectional interface
- (4) High-speed operation:  $t_{pd} = 4.1$  ns (max) ( $V_{CCA} = 3.3 \pm 0.3$  V,  $V_{CCB} = 3.3 \pm 0.3$  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)
- (6) Small package: US6 (Package code : SOT-363)
- (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.

Start of commercial production  
2025-08

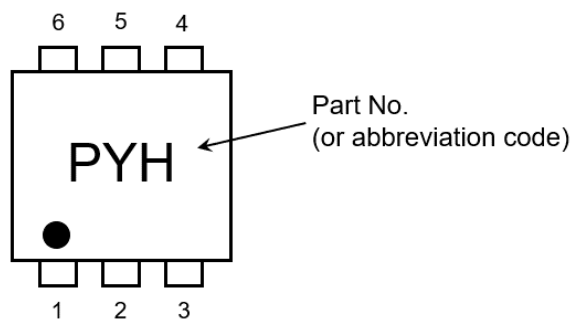
## 4. Packaging



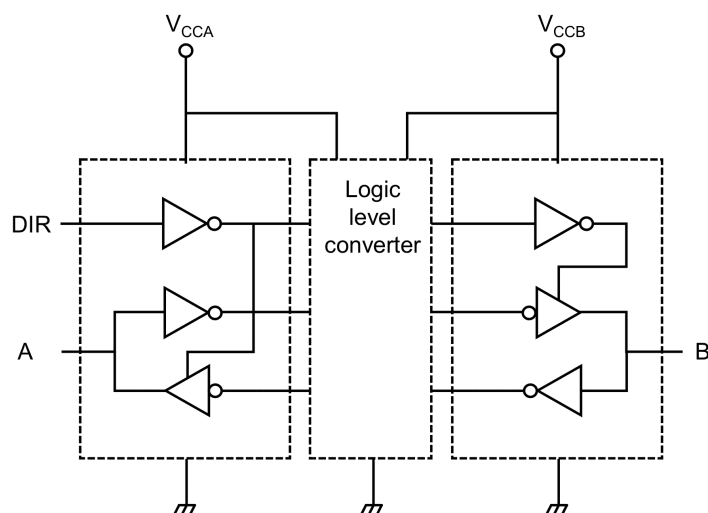
## 5. Pin Assignment



## 6. Marking



### 7. Block Diagram



### 8. Truth Table

Supply voltage $V_{CCA}$	Supply voltage $V_{CCB}$	Input DIR	Input/Output Bus A	Input/Output Bus B	Function
0.8 to 3.6 V	0.8 to 3.6 V	L	Output	Input	A = B
0.8 to 3.6 V	0.8 to 3.6 V	H	Input	Output	B = A
GND	0.8 to 3.6 V	X	Z	Z	Bus-Hold
0.8 to 3.6 V	GND	X	Z	Z	Bus-Hold
GND	GND	X	Z	Z	Z

X: Don't care  
Z: High impedance

### 9. Absolute Maximum Ratings (Note) (Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$ )

Characteristics	Symbol	Note	Rating	Unit
Supply voltage	$V_{CCA}$		-0.5 to 4.6	V
	$V_{CCB}$		-0.5 to 4.6	
Input voltage (DIR)	$V_{IN}$		-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	$P_D$		200	mW
Storage temperature	$T_{stg}$		-65 to 150	$^\circ\text{C}$

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: High impedance state.

Note 2: Input/output state, bus hold state.  $I_{OUT}$  absolute maximum rating must be observed.

Note 3:  $V_{OUT} < \text{GND}$

### 10. Operating Ranges (Note)

Characteristics	Symbol	Note	Test Condition	Rating	Unit
Supply voltage	$V_{CCA}$		—	0.8 to 3.6	V
	$V_{CCB}$		—	0.8 to 3.6	
Input voltage (DIR)	$V_{IN}$		—	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 $1.2$ V	$\pm 2$	
			$V_{CCA} = 0.95$ to $1.05$ V	$\pm 1$	
			$V_{CCA} = 0.85$ to $0.95$ V	$\pm 0.5$	
	$I_{OUTB}$		$V_{CCB} = 3.0$ 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 $1.2$ V	$\pm 2$	
			$V_{CCB} = 0.95$ to $1.05$ V	$\pm 1$	
			$V_{CCB} = 0.85$ to $0.95$ V	$\pm 0.5$	
Operating temperature	$T_{opr}$		—	-40 to 125	$^{\circ}\text{C}$
Input rise and fall times	dt/dv	(Note 3)	$V_{CC} = 0.8$ V	0 to 20	ns/V
			$V_{CC} = 1.2$ 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: High impedance state.

Note 2: Input/output state, bus hold 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	$V_{IHA}$	A, DIR	0.8 to 1.95	0.8 to 3.6	$V_{CCA} \times 0.70$	—	V	
			2.3 to 2.7	0.8 to 3.6	1.6	—		
			3.0 to 3.6	0.8 to 3.6	2.0	—		
	$V_{IHB}$	B	0.8 to 3.6	0.8 to 1.95	$V_{CCB} \times 0.70$	—		
			0.8 to 3.6	2.3 to 2.7	1.6	—		
			0.8 to 3.6	3.0 to 3.6	2.0	—		
Low-level input voltage	$V_{ILA}$	A, DIR	0.8 to 1.95	0.8 to 3.6	—	$V_{CCA} \times 0.30$	V	
			2.3 to 2.7	0.8 to 3.6	—	0.7		
			3.0 to 3.6	0.8 to 3.6	—	0.9		
	$V_{ILB}$	B	0.8 to 3.6	0.8 to 1.95	—	$V_{CCB} \times 0.30$		
			0.8 to 3.6	2.3 to 2.7	—	0.7		
			0.8 to 3.6	3.0 to 3.6	—	0.9		
High-level output voltage	$V_{OH}$	A, B Output H	$I_{OH} = -0.1$ mA	0.8 to 3.6	0.8 to 3.6	$V_{CCO} - 0.1$	—	V
			$I_{OH} = -0.5$ mA	0.85	0.85	0.65	—	
			$I_{OH} = -1$ mA	0.95	0.95	0.75	—	
			$I_{OH} = -2$ 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	$V_{OL}$	A, B Output L	$I_{OL} = 0.1$ mA	0.8 to 3.6	0.8 to 3.6	—	0.1	V
			$I_{OL} = 0.5$ mA	0.85	0.85	—	0.2	
			$I_{OL} = 1$ mA	0.95	0.95	—	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	Test Condition	V <sub>CCA</sub> (V)	V <sub>CCB</sub> (V)	Min	Typ.	Max	Unit
Input leakage current	I <sub>IN</sub>	V <sub>IN(DIR)</sub> = 0 V to 3.6 V	0.8 to 3.6	0 to 3.6	—	—	±1	μA
Bushold input minimum drive hold current	I <sub>I</sub> (HOLD)	V <sub>I</sub> = 0.24 V	0.8	0.8	3	—	—	μA
		V <sub>I</sub> = 0.56 V	0.8	0.8	-3	—	—	
		V <sub>I</sub> = 0.26 V	0.85	0.85	4	—	—	
		V <sub>I</sub> = 0.6 V	0.85	0.85	-4	—	—	
		V <sub>I</sub> = 0.29 V	0.95	0.95	6	—	—	
		V <sub>I</sub> = 0.67 V	0.95	0.95	-6	—	—	
		V <sub>I</sub> = 0.33 V	1.1	1.1	10	—	—	
		V <sub>I</sub> = 0.77 V	1.1	1.1	-10	—	—	
		V <sub>I</sub> = 0.42 V	1.4	1.4	15	—	—	
		V <sub>I</sub> = 0.98 V	1.4	1.4	-15	—	—	
		V <sub>I</sub> = 0.50 V	1.65	1.65	25	—	—	
		V <sub>I</sub> = 1.15 V	1.65	1.65	-25	—	—	
		V <sub>I</sub> = 0.7 V	2.3	2.3	45	—	—	
		V <sub>I</sub> = 1.6 V	2.3	2.3	-45	—	—	
		V <sub>I</sub> = 0.8 V	3.0	3.0	100	—	—	
V <sub>I</sub> = 2.0 V	3.0	3.0	-100	—	—			
Bushold input over-drive current to change state	I <sub>I(OD)</sub>	V <sub>I</sub> = L → H	0.8	0.8	50	—	—	μA
		V <sub>I</sub> = H → L	0.8	0.8	-50	—	—	
		V <sub>I</sub> = L → H	0.95	0.95	65	—	—	
		V <sub>I</sub> = H → L	0.95	0.95	-65	—	—	
		V <sub>I</sub> = L → H	1.05	1.05	80	—	—	
		V <sub>I</sub> = H → L	1.05	1.05	-80	—	—	
		V <sub>I</sub> = L → H	1.3	1.3	110	—	—	
		V <sub>I</sub> = H → L	1.3	1.3	-110	—	—	
		V <sub>I</sub> = L → H	1.6	1.6	150	—	—	
		V <sub>I</sub> = H → L	1.6	1.6	-150	—	—	
		V <sub>I</sub> = L → H	1.95	1.95	250	—	—	
		V <sub>I</sub> = H → L	1.95	1.95	-250	—	—	
		V <sub>I</sub> = L → H	2.7	2.7	400	—	—	
		V <sub>I</sub> = H → L	2.7	2.7	-400	—	—	
		V <sub>I</sub> = L → H	3.6	3.6	600	—	—	
V <sub>I</sub> = H → L	3.6	3.6	-600	—	—			
Power-OFF leakage current	I <sub>OFFA</sub>	V <sub>IOA</sub> = 0 V to 3.6 V	0	0.8 to 3.6	—	—	±1	μA
	I <sub>OFFB</sub>	V <sub>IOB</sub> = 0 V to 3.6 V	0.8 to 3.6	0	—	—	±1	
Quiescent supply current	I <sub>CCA</sub>	Fix the input to V <sub>CC</sub> or GND.	0.8 to 3.6	0.8 to 3.6	—	—	2	μA
			3.6	0	—	—	2	
	I <sub>CCB</sub>	Fix the input to V <sub>CC</sub> or GND.	0.8 to 3.6	0.8 to 3.6	—	—	2	
			0	3.6	—	—	2	

### 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	$V_{IHA}$	A, DIR	0.8 to 1.95	0.8 to 3.6	$V_{CCA} \times 0.70$	—	V	
			2.3 to 2.7	0.8 to 3.6	1.6	—		
			3.0 to 3.6	0.8 to 3.6	2.0	—		
	$V_{IHB}$	B	0.8 to 3.6	0.8 to 1.95	$V_{CCB} \times 0.70$	—		
			0.8 to 3.6	2.3 to 2.7	1.6	—		
			0.8 to 3.6	3.0 to 3.6	2.0	—		
Low-level input voltage	$V_{ILA}$	A, DIR	0.8 to 1.95	0.8 to 3.6	—	$V_{CCA} \times 0.30$	V	
			2.3 to 2.7	0.8 to 3.6	—	0.7		
			3.0 to 3.6	0.8 to 3.6	—	0.9		
	$V_{ILB}$	B	0.8 to 3.6	0.8 to 1.95	—	$V_{CCB} \times 0.30$		
			0.8 to 3.6	2.3 to 2.7	—	0.7		
			0.8 to 3.6	3.0 to 3.6	—	0.9		
High-level output voltage	$V_{OH}$	A, B Output H	$I_{OH} = -0.1$ mA	0.8 to 3.6	0.8 to 3.6	$V_{CCO} - 0.1$	—	V
			$I_{OH} = -0.5$ mA	0.85	0.85	0.65	—	
			$I_{OH} = -1$ mA	0.95	0.95	0.75	—	
			$I_{OH} = -2$ 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	$V_{OL}$	A, B Output L	$I_{OL} = 0.1$ mA	0.8 to 3.6	0.8 to 3.6	—	0.1	V
			$I_{OL} = 0.5$ mA	0.85	0.85	—	0.2	
			$I_{OL} = 1$ mA	0.95	0.95	—	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	Test Condition	V <sub>CCA</sub> (V)	V <sub>CCB</sub> (V)	Min	Typ.	Max	Unit
Input leakage current	I <sub>IN</sub>	V <sub>IN</sub> (DIR) = 0 V to 3.6 V	0.8 to 3.6	0 to 3.6	—	—	±2.5	μA
Bushold input minimum drive hold current	I <sub>I</sub> (HOLD)	V <sub>I</sub> = 0.24 V	0.8	0.8	1	—	—	μA
		V <sub>I</sub> = 0.56 V	0.8	0.8	-1	—	—	
		V <sub>I</sub> = 0.26 V	0.85	0.85	4	—	—	
		V <sub>I</sub> = 0.6 V	0.85	0.85	-4	—	—	
		V <sub>I</sub> = 0.29 V	0.95	0.95	6	—	—	
		V <sub>I</sub> = 0.67 V	0.95	0.95	-6	—	—	
		V <sub>I</sub> = 0.33 V	1.1	1.1	10	—	—	
		V <sub>I</sub> = 0.77 V	1.1	1.1	-10	—	—	
		V <sub>I</sub> = 0.42 V	1.4	1.4	15	—	—	
		V <sub>I</sub> = 0.98 V	1.4	1.4	-15	—	—	
		V <sub>I</sub> = 0.50 V	1.65	1.65	25	—	—	
		V <sub>I</sub> = 1.15 V	1.65	1.65	-25	—	—	
		V <sub>I</sub> = 0.7 V	2.3	2.3	45	—	—	
		V <sub>I</sub> = 1.6 V	2.3	2.3	-45	—	—	
		V <sub>I</sub> = 0.8 V	3.0	3.0	100	—	—	
V <sub>I</sub> = 2.0 V	3.0	3.0	-100	—	—			
Bushold input over-drive current to change state	I <sub>I(OD)</sub>	V <sub>I</sub> = L → H	0.8	0.8	50	—	—	μA
		V <sub>I</sub> = H → L	0.8	0.8	-50	—	—	
		V <sub>I</sub> = L → H	0.95	0.95	65	—	—	
		V <sub>I</sub> = H → L	0.95	0.95	-65	—	—	
		V <sub>I</sub> = L → H	1.05	1.05	80	—	—	
		V <sub>I</sub> = H → L	1.05	1.05	-80	—	—	
		V <sub>I</sub> = L → H	1.3	1.3	110	—	—	
		V <sub>I</sub> = H → L	1.3	1.3	-110	—	—	
		V <sub>I</sub> = L → H	1.6	1.6	150	—	—	
		V <sub>I</sub> = H → L	1.6	1.6	-150	—	—	
		V <sub>I</sub> = L → H	1.95	1.95	250	—	—	
		V <sub>I</sub> = H → L	1.95	1.95	-250	—	—	
		V <sub>I</sub> = L → H	2.7	2.7	400	—	—	
		V <sub>I</sub> = H → L	2.7	2.7	-400	—	—	
		V <sub>I</sub> = L → H	3.6	3.6	600	—	—	
V <sub>I</sub> = H → L	3.6	3.6	-600	—	—			
Power-OFF leakage current	I <sub>OFFA</sub>	V <sub>IOA</sub> = 0 V to 3.6 V	0	0.8 to 3.6	—	—	±4	μA
	I <sub>OFFB</sub>	V <sub>IOB</sub> = 0 V to 3.6 V	0.8 to 3.6	0	—	—	±4	
Quiescent supply current	I <sub>CCA</sub>	Fix the input to V <sub>CC</sub> or GND.	0.8 to 3.6	0.8 to 3.6	—	—	6	μA
			3.6	0	—	—	6	
	I <sub>CCB</sub>	Fix the input to V <sub>CC</sub> or GND.	0.8 to 3.6	0.8 to 3.6	—	—	6	
			0	3.6	—	—	6	

### 11.3. AC Characteristics (Note) ( $V_{CCA} = 0.8\text{ V}$ , $T_a = 25\text{ }^\circ\text{C}$ )

Characteristics	Symbol	$V_{CCB}$ 0.8 V Typ.	$V_{CCB}$ 0.9 V Typ.	$V_{CCB}$ 1.0 V Typ.	$V_{CCB}$ 1.2 V Typ.	$V_{CCB}$ 1.5 V Typ.	$V_{CCB}$ 1.8 V Typ.	$V_{CCB}$ 2.5 V Typ.	$V_{CCB}$ 3.3 V Typ.	Unit
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	11.4	10.4	9.8	9.8	9.2	9.0	9.7	11.7	ns
Propagation delay time (B → A)		11.4	10.0	9.1	8.0	7.2	6.8	6.2	5.9	
3-state output disable time (DIR → A)	$t_{PLZ}/t_{PHZ}$	18.7	18.7	18.7	18.6	18.6	18.6	18.7	18.7	
3-state output disable time (DIR → B)		22.0	19.7	17.8	12.4	10.8	10.7	9.9	11.0	
3-state output enable time (DIR → A)	$t_{PZL}/t_{PZH}$ (Note 1)	33.4	29.7	26.9	20.4	18.0	17.5	16.1	16.9	
3-state output enable time (DIR → B)		30.1	29.1	28.5	28.4	27.8	27.6	28.4	30.4	

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

Note1: Output enable time is obtained from the following formula.

Output enable time (DIR → A) = Output disable time (DIR → B) + Propagation delay time (B → A)

Output enable time (DIR → B) = Output disable time (DIR → A) + Propagation delay time (A → B)

### 11.4. AC Characteristics (Note) ( $V_{CCB} = 0.8\text{ V}$ , $T_a = 25\text{ }^\circ\text{C}$ )

Characteristics	Symbol	$V_{CCA}$ 0.8 V Typ.	$V_{CCA}$ 0.9 V Typ.	$V_{CCA}$ 1.0 V Typ.	$V_{CCA}$ 1.2 V Typ.	$V_{CCA}$ 1.5 V Typ.	$V_{CCA}$ 1.8 V Typ.	$V_{CCA}$ 2.5 V Typ.	$V_{CCA}$ 3.3 V Typ.	Unit
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	11.4	10.0	9.1	8.0	7.2	6.8	6.2	5.9	ns
Propagation delay time (B → A)		11.4	10.4	9.8	9.8	9.2	9.0	9.7	11.7	
3-state output disable time (DIR → A)	$t_{PLZ}/t_{PHZ}$	18.7	15.1	12.8	6.9	5.1	4.8	3.3	3.7	
3-state output disable time (DIR → B)		22.0	20.0	19.0	18.6	19.3	19.3	20.6	21.9	
3-state output enable time (DIR → A)	$t_{PZL}/t_{PZH}$ (Note 1)	33.4	30.4	28.8	28.4	28.5	28.3	30.3	33.6	
3-state output enable time (DIR → B)		30.1	25.1	21.9	14.9	12.3	11.6	9.5	9.6	

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

Note 1: Output enable time is obtained from the following formula.

Output enable time (DIR → A) = Output disable time (DIR → B) + Propagation delay time (B → A)

Output enable time (DIR → B) = Output disable time (DIR → A) + Propagation delay time (A → B)

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

Characteristics	Symbol	$V_{CCB}$ $0.9 \pm$ $0.045\text{ V}$ Max	$V_{CCB}$ 1.0 $\pm 0.05\text{ V}$ Max	$V_{CCB}$ 1.2 $\pm 0.1\text{ V}$ Max	$V_{CCB}$ 1.5 $\pm 0.1\text{ V}$ Max	$V_{CCB}$ 1.8 $\pm 0.15\text{ V}$ Max	$V_{CCB}$ 2.5 $\pm 0.2\text{ V}$ Max	$V_{CCB}$ 3.3 $\pm 0.3\text{ V}$ Max	Unit
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	17.7	15.8	15.2	13.8	13.2	13.5	16.7	ns
Propagation delay time (B → A)		17.7	15.2	13.1	11.7	10.7	10.1	10.4	
3-state output disable time (DIR → A)	$t_{PLZ}/t_{PHZ}$	24.7	24.7	24.7	24.7	24.7	24.8	25.8	
3-state output disable time (DIR → B)		28.1	24.8	18.6	16.1	15.4	13.9	14.6	
3-state output enable time (DIR → A)	$t_{PZL}/t_{PZH}$ (Note 1)	45.8	40.0	31.7	27.8	26.1	24.0	25.0	
3-state output enable time (DIR → B)		42.4	40.5	39.9	38.5	37.9	38.3	42.5	

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

Note 1: Output enable time is obtained from the following formula.

Output enable time (DIR → A) = Output disable time (DIR → B) + Propagation delay time (B → A)

Output enable time (DIR → B) = Output disable time (DIR → A) + Propagation delay time (A → B)

### 11.6. AC Characteristics (Note) ( $V_{CCA} = 1.0 \pm 0.05 \text{ V}$ , $T_a = -40 \text{ to } 85 \text{ }^\circ\text{C}$ )

Characteristics	Symbol	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	Unit
		$0.9 \pm 0.045 \text{ V}$ Max	$1.0 \pm 0.05 \text{ V}$ Max	$1.2 \pm 0.1 \text{ V}$ Max	$1.5 \pm 0.1 \text{ V}$ Max	$1.8 \pm 0.15 \text{ V}$ Max	$2.5 \pm 0.2 \text{ V}$ Max	$3.3 \pm 0.3 \text{ V}$ Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	15.2	13.6	12.8	11.6	11.4	10.9	11.1	ns
Propagation delay time (B → A)		15.8	13.6	11.2	10.1	9.1	8.6	8.7	
3-state output disable time (DIR → A)	$t_{PLZ}/t_{PHZ}$	19.6	19.6	19.6	19.6	19.6	19.6	19.6	
3-state output disable time (DIR → B)		25.8	22.6	16.2	14.0	13.3	12.0	12.3	
3-state output enable time (DIR → A)	$t_{PZL}/t_{PZH}$ (Note 1)	41.6	36.2	27.4	24.1	22.4	20.6	21.0	
3-state output enable time (DIR → B)		34.8	33.2	32.4	31.2	31.0	30.5	30.7	

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

Note 1: Output enable time is obtained from the following formula.

Output enable time (DIR → A) = Output disable time (DIR → B) + Propagation delay time (B → A)

Output enable time (DIR → B) = Output disable time (DIR → A) + Propagation delay time (A → B)

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

Characteristics	Symbol	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	Unit
		$0.9 \pm 0.045 \text{ V}$ Max	$1.0 \pm 0.05 \text{ V}$ Max	$1.2 \pm 0.1 \text{ V}$ Max	$1.5 \pm 0.1 \text{ V}$ Max	$1.8 \pm 0.15 \text{ V}$ Max	$2.5 \pm 0.2 \text{ V}$ Max	$3.3 \pm 0.3 \text{ V}$ Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	13.1	11.2	10.7	9.3	8.7	8.7	8.6	ns
Propagation delay time (B → A)		15.2	12.8	10.7	9.1	8.5	7.8	7.6	
3-state output disable time (DIR → A)	$t_{PLZ}/t_{PHZ}$	12.2	12.2	12.2	12.2	12.2	12.2	12.2	
3-state output disable time (DIR → B)		24.3	20.2	14.9	12.0	11.4	9.7	9.8	
3-state output enable time (DIR → A)	$t_{PZL}/t_{PZH}$ (Note 1)	39.5	33.0	25.6	21.1	19.9	17.5	17.4	
3-state output enable time (DIR → B)		25.3	23.4	22.9	21.5	20.9	20.9	20.8	

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

Note 1: Output enable time is obtained from the following formula.

Output enable time (DIR → A) = Output disable time (DIR → B) + Propagation delay time (B → A)

Output enable time (DIR → B) = Output disable time (DIR → A) + Propagation delay time (A → B)

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

Characteristics	Symbol	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	Unit
		$0.9 \pm 0.045 \text{ V}$ Max	$1.0 \pm 0.05 \text{ V}$ Max	$1.2 \pm 0.1 \text{ V}$ Max	$1.5 \pm 0.1 \text{ V}$ Max	$1.8 \pm 0.15 \text{ V}$ Max	$2.5 \pm 0.2 \text{ V}$ Max	$3.3 \pm 0.3 \text{ V}$ Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	11.7	10.1	9.1	7.4	6.9	6.6	6.5	ns
Propagation delay time (B → A)		13.8	11.6	9.3	7.4	6.8	5.9	5.7	
3-state output disable time (DIR → A)	$t_{PLZ}/t_{PHZ}$	8.5	8.4	8.4	8.4	8.4	8.3	8.2	
3-state output disable time (DIR → B)		24.2	19.7	11.6	10.1	9.6	7.8	7.9	
3-state output enable time (DIR → A)	$t_{PZL}/t_{PZH}$ (Note 1)	38.0	31.3	20.9	17.5	16.4	13.7	13.6	
3-state output enable time (DIR → B)		20.2	18.5	17.5	15.8	15.3	14.9	14.7	

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

Note 1: Output enable time is obtained from the following formula.

Output enable time (DIR → A) = Output disable time (DIR → B) + Propagation delay time (B → A)

Output enable time (DIR → B) = Output disable time (DIR → A) + Propagation delay time (A → B)

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

Characteristics	Symbol	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	Unit
		$0.9 \pm 0.045 \text{ V}$ Max	$1.0 \pm 0.05 \text{ V}$ Max	$1.2 \pm 0.1 \text{ V}$ Max	$1.5 \pm 0.1 \text{ V}$ Max	$1.8 \pm 0.15 \text{ V}$ Max	$2.5 \pm 0.2 \text{ V}$ Max	$3.3 \pm 0.3 \text{ V}$ Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	10.7	9.1	8.5	6.8	6.2	5.8	5.7	ns
Propagation delay time (B → A)		13.2	11.4	8.7	6.9	6.2	5.3	4.7	
3-state output disable time (DIR → A)	$t_{PLZ}/t_{PHZ}$	7.3	7.3	7.3	7.3	7.3	7.3	7.2	
3-state output disable time (DIR → B)		25.2	21.6	11.0	8.9	8.6	7.0	7.0	
3-state output enable time (DIR → A)	$t_{PZL}/t_{PZH}$ (Note 1)	38.4	33.0	19.7	15.8	14.8	12.3	11.7	
3-state output enable time (DIR → B)		18.0	16.4	15.8	14.1	13.5	13.1	12.9	

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

Note 1: Output enable time is obtained from the following formula.

Output enable time (DIR → A) = Output disable time (DIR → B) + Propagation delay time (B → A)

Output enable time (DIR → B) = Output disable time (DIR → A) + Propagation delay time (A → B)

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

Characteristics	Symbol	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	Unit
		$0.9 \pm 0.045 \text{ V}$ Max	$1.0 \pm 0.05 \text{ V}$ Max	$1.2 \pm 0.1 \text{ V}$ Max	$1.5 \pm 0.1 \text{ V}$ Max	$1.8 \pm 0.15 \text{ V}$ Max	$2.5 \pm 0.2 \text{ V}$ Max	$3.3 \pm 0.3 \text{ V}$ Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	10.1	8.6	7.8	5.9	5.3	4.7	4.5	ns
Propagation delay time (B → A)		13.5	10.9	8.7	6.6	5.8	4.7	4.1	
3-state output disable time (DIR → A)	$t_{PLZ}/t_{PHZ}$	5.6	5.6	5.6	5.6	5.6	5.6	5.6	
3-state output disable time (DIR → B)		28.5	22.9	10.9	7.6	7.1	5.9	6.1	
3-state output enable time (DIR → A)	$t_{PZL}/t_{PZH}$ (Note 1)	42.0	33.8	19.6	14.2	12.9	10.6	10.2	
3-state output enable time (DIR → B)		15.7	14.2	13.4	11.5	10.9	10.3	10.1	

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

Note 1: Output enable time is obtained from the following formula.

Output enable time (DIR → A) = Output disable time (DIR → B) + Propagation delay time (B → A)

Output enable time (DIR → B) = Output disable time (DIR → A) + Propagation delay time (A → B)

### 11.11. AC Characteristics (Note) ( $V_{CCA} = 3.3 \pm 0.3 \text{ V}$ , $T_a = -40 \text{ to } 85 \text{ }^\circ\text{C}$ )

Characteristics	Symbol	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	Unit
		$0.9 \pm 0.045 \text{ V}$ Max	$1.0 \pm 0.05 \text{ V}$ Max	$1.2 \pm 0.1 \text{ V}$ Max	$1.5 \pm 0.1 \text{ V}$ Max	$1.8 \pm 0.15 \text{ V}$ Max	$2.5 \pm 0.2 \text{ V}$ Max	$3.3 \pm 0.3 \text{ V}$ Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	10.4	8.7	7.6	5.7	4.7	4.1	3.9	ns
Propagation delay time (B → A)		16.7	11.1	8.6	6.5	5.7	4.5	3.9	
3-state output disable time (DIR → A)	$t_{PLZ}/t_{PHZ}$	5.7	5.7	5.7	5.7	5.7	5.7	5.7	
3-state output disable time (DIR → B)		27.6	24.6	11.5	6.7	6.3	5.4	5.6	
3-state output enable time (DIR → A)	$t_{PZL}/t_{PZH}$ (Note 1)	44.3	35.7	20.1	13.2	12.0	9.9	9.5	
3-state output enable time (DIR → B)		16.1	14.4	13.3	11.4	10.4	9.8	9.6	

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

Note 1: Output enable time is obtained from the following formula.

Output enable time (DIR → A) = Output disable time (DIR → B) + Propagation delay time (B → A)

Output enable time (DIR → B) = Output disable time (DIR → A) + Propagation delay time (A → B)

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

Characteristics	Symbol	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	Unit
		$0.9 \pm 0.045 \text{ V}$ Max	$1.0 \pm 0.05 \text{ V}$ Max	$1.2 \pm 0.1 \text{ V}$ Max	$1.5 \pm 0.1 \text{ V}$ Max	$1.8 \pm 0.15 \text{ V}$ Max	$2.5 \pm 0.2 \text{ V}$ Max	$3.3 \pm 0.3 \text{ V}$ Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	17.7	15.8	15.3	13.9	13.4	13.6	16.7	ns
Propagation delay time (B → A)		17.7	15.2	13.1	11.7	10.7	10.1	10.4	
3-state output disable time (DIR → A)	$t_{PLZ}/t_{PHZ}$	24.7	24.7	24.7	24.7	24.7	24.8	25.8	
3-state output disable time (DIR → B)		28.1	24.8	18.8	16.3	15.6	13.9	14.6	
3-state output enable time (DIR → A)	$t_{PZL}/t_{PZH}$ (Note 1)	45.8	40.0	31.9	28.0	26.3	24.0	25.0	
3-state output enable time (DIR → B)		42.4	40.5	40.0	38.6	38.1	38.4	42.5	

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

Note 1: Output enable time is obtained from the following formula.

Output enable time (DIR → A) = Output disable time (DIR → B) + Propagation delay time (B → A)

Output enable time (DIR → B) = Output disable time (DIR → A) + Propagation delay time (A → B)

### 11.13. AC Characteristics (Note) ( $V_{CCA} = 1.0 \pm 0.05 \text{ V}$ , $T_a = -40 \text{ to } 125 \text{ }^\circ\text{C}$ )

Characteristics	Symbol	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	Unit
		$0.9 \pm 0.045 \text{ V}$ Max	$1.0 \pm 0.05 \text{ V}$ Max	$1.2 \pm 0.1 \text{ V}$ Max	$1.5 \pm 0.1 \text{ V}$ Max	$1.8 \pm 0.15 \text{ V}$ Max	$2.5 \pm 0.2 \text{ V}$ Max	$3.3 \pm 0.3 \text{ V}$ Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	15.2	13.7	13.1	11.9	11.7	11.2	11.3	ns
Propagation delay time (B → A)		15.8	13.7	11.4	10.4	9.3	8.8	8.9	
3-state output disable time (DIR → A)	$t_{PLZ}/t_{PHZ}$	19.8	19.8	19.8	19.8	19.8	20.2	19.9	
3-state output disable time (DIR → B)		25.8	23.0	16.6	14.4	13.7	12.3	12.5	
3-state output enable time (DIR → A)	$t_{PZL}/t_{PZH}$ (Note 1)	41.6	36.7	28.0	24.8	23.0	21.1	21.4	
3-state output enable time (DIR → B)		35.0	33.5	32.9	31.7	31.5	31.4	31.2	

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

Note 1: Output enable time is obtained from the following formula.

Output enable time (DIR → A) = Output disable time (DIR → B) + Propagation delay time (B → A)

Output enable time (DIR → B) = Output disable time (DIR → A) + Propagation delay time (A → B)

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

Characteristics	Symbol	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	Unit
		$0.9 \pm 0.045 \text{ V}$ Max	$1.0 \pm 0.05 \text{ V}$ Max	$1.2 \pm 0.1 \text{ V}$ Max	$1.5 \pm 0.1 \text{ V}$ Max	$1.8 \pm 0.15 \text{ V}$ Max	$2.5 \pm 0.2 \text{ V}$ Max	$3.3 \pm 0.3 \text{ V}$ Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	13.1	11.4	11.1	9.7	9.1	9.1	9.0	ns
Propagation delay time (B → A)		15.3	13.1	11.1	9.6	8.9	8.2	8.0	
3-state output disable time (DIR → A)	$t_{PLZ}/t_{PHZ}$	12.6	12.6	12.6	12.6	12.6	12.6	12.6	
3-state output disable time (DIR → B)		24.3	20.9	15.9	12.5	11.8	10.1	10.2	
3-state output enable time (DIR → A)	$t_{PZL}/t_{PZH}$ (Note 1)	39.6	34.0	27.0	22.1	20.7	18.3	18.2	
3-state output enable time (DIR → B)		25.7	24.0	23.7	22.3	21.7	21.7	21.6	

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

Note 1: Output enable time is obtained from the following formula.

Output enable time (DIR → A) = Output disable time (DIR → B) + Propagation delay time (B → A)

Output enable time (DIR → B) = Output disable time (DIR → A) + Propagation delay time (A → B)

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

Characteristics	Symbol	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	Unit
		$0.9 \pm 0.045 \text{ V}$ Max	$1.0 \pm 0.05 \text{ V}$ Max	$1.2 \pm 0.1 \text{ V}$ Max	$1.5 \pm 0.1 \text{ V}$ Max	$1.8 \pm 0.15 \text{ V}$ Max	$2.5 \pm 0.2 \text{ V}$ Max	$3.3 \pm 0.3 \text{ V}$ Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	11.7	10.4	9.6	7.8	7.3	7.0	6.9	ns
Propagation delay time (B → A)		13.9	11.9	9.7	7.8	7.2	6.3	6.0	
3-state output disable time (DIR → A)	$t_{PLZ}/t_{PHZ}$	8.8	8.8	8.8	8.8	8.8	8.7	8.7	
3-state output disable time (DIR → B)		24.8	19.9	12.0	10.6	10.1	8.3	8.3	
3-state output enable time (DIR → A)	$t_{PZL}/t_{PZH}$ (Note 1)	38.7	31.8	21.7	18.4	17.3	14.6	14.3	
3-state output enable time (DIR → B)		20.5	19.2	18.4	16.6	16.1	15.7	15.6	

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

Note 1: Output enable time is obtained from the following formula.

Output enable time (DIR → A) = Output disable time (DIR → B) + Propagation delay time (B → A)

Output enable time (DIR → B) = Output disable time (DIR → A) + Propagation delay time (A → B)

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

Characteristics	Symbol	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	Unit
		$0.9 \pm 0.045 \text{ V}$ Max	$1.0 \pm 0.05 \text{ V}$ Max	$1.2 \pm 0.1 \text{ V}$ Max	$1.5 \pm 0.1 \text{ V}$ Max	$1.8 \pm 0.15 \text{ V}$ Max	$2.5 \pm 0.2 \text{ V}$ Max	$3.3 \pm 0.3 \text{ V}$ Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	10.7	9.3	8.9	7.2	6.5	6.1	6.0	ns
Propagation delay time (B → A)		7.7	11.7	9.1	7.3	6.5	5.7	5.0	
3-state output disable time (DIR → A)	$t_{PLZ}/t_{PHZ}$	7.7	7.7	7.7	7.7	7.6	7.6	7.5	
3-state output disable time (DIR → B)		25.8	21.8	11.4	9.4	9.1	7.5	7.4	
3-state output enable time (DIR → A)	$t_{PZL}/t_{PZH}$ (Note 1)	39.2	33.5	20.5	16.7	15.6	13.2	12.4	
3-state output enable time (DIR → B)		18.4	17.0	16.6	14.9	14.1	13.7	13.5	

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

Note 1: Output enable time is obtained from the following formula.

Output enable time (DIR → A) = Output disable time (DIR → B) + Propagation delay time (B → A)

Output enable time (DIR → B) = Output disable time (DIR → A) + Propagation delay time (A → B)

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

Characteristics	Symbol	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	$V_{CCB}$	Unit
		$0.9 \pm 0.045 \text{ V}$ Max	$1.0 \pm 0.05 \text{ V}$ Max	$1.2 \pm 0.1 \text{ V}$ Max	$1.5 \pm 0.1 \text{ V}$ Max	$1.8 \pm 0.15 \text{ V}$ Max	$2.5 \pm 0.2 \text{ V}$ Max	$3.3 \pm 0.3 \text{ V}$ Max	
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	10.1	8.8	8.2	6.3	5.7	5.0	4.7	ns
Propagation delay time (B → A)		13.6	11.2	9.1	7.0	6.1	5.0	4.4	
3-state output disable time (DIR → A)	$t_{PLZ}/t_{PHZ}$	5.8	5.8	5.8	5.8	5.8	5.8	5.8	
3-state output disable time (DIR → B)		29.1	23.1	11.3	8.0	7.5	6.4	6.5	
3-state output enable time (DIR → A)	$t_{PZL}/t_{PZH}$ (Note 1)	42.7	34.3	20.4	15.0	13.6	11.4	10.9	
3-state output enable time (DIR → B)		15.9	14.6	14.0	12.1	11.5	10.8	10.5	

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

Note 1: Output enable time is obtained from the following formula.

Output enable time (DIR → A) = Output disable time (DIR → B) + Propagation delay time (B → A)

Output enable time (DIR → B) = Output disable time (DIR → A) + Propagation delay time (A → B)

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

Characteristics	Symbol	$V_{CCB}$ 0.9 ± 0.045 V Max	$V_{CCB}$ 1.0 ± 0.05 V Max	$V_{CCB}$ 1.2 ± 0.1 V Max	$V_{CCB}$ 1.5 ± 0.1 V Max	$V_{CCB}$ 1.8 ± 0.15 V Max	$V_{CCB}$ 2.5 ± 0.2 V Max	$V_{CCB}$ 3.3 ± 0.3 V Max	Unit
Propagation delay time (A → B)	$t_{PLH}/t_{PHL}$	10.4	8.9	8.0	6.0	5.0	4.4	4.1	ns
Propagation delay time (B → A)		16.7	11.3	9.0	6.9	6.0	4.7	4.1	
3-state output disable time (DIR → A)	$t_{PLZ}/t_{PHZ}$	6.0	6.0	6.0	6.0	6.0	6.0	5.9	
3-state output disable time (DIR → B)		27.6	24.7	11.8	7.3	6.8	5.7	6.0	
3-state output enable time (DIR → A)	$t_{PZL}/t_{PZH}$ (Note 1)	44.3	36.0	20.8	14.2	12.8	10.4	10.1	
3-state output enable time (DIR → B)		16.4	14.9	14.0	12.0	11.0	10.4	10.0	

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

Note 1: Output enable time is obtained from the following formula.

Output enable time (DIR → A) = Output disable time (DIR → B) + Propagation delay time (B → A)

Output enable time (DIR → B) = Output disable time (DIR → A) + Propagation delay time (A → B)

### 11.19. Capacitive Characteristics (Unless otherwise specified, $T_a = 25 \text{ }^\circ\text{C}$ )

Characteristics	Symbol	Note	Test Condition	$V_{CCA},$ $V_{CCB}$ 0.8 V Typ.	$V_{CCA},$ $V_{CCB}$ 0.9 V Typ.	$V_{CCA},$ $V_{CCB}$ 1.0 V Typ.	$V_{CCA},$ $V_{CCB}$ 1.2 V Typ.	$V_{CCA},$ $V_{CCB}$ 1.5 V Typ.	$V_{CCA},$ $V_{CCB}$ 1.8 V Typ.	$V_{CCA},$ $V_{CCB}$ 2.5 V Typ.	$V_{CCA},$ $V_{CCB}$ 3.3 V Typ.	Unit
Input capacitance	$C_{IN}$		$V_{IN} = 0 \text{ V or } 3.3 \text{ V}$	—	—	—	—	—	—	—	4	pF
Bus I/O capacitance	$C_{IOA}$		A = OFF, $V_{IOA} = 0 \text{ V or } 3.3 \text{ V}$	—	—	—	—	—	—	—	5	pF
	$C_{IOB}$		B = OFF, $V_{IOB} = 0 \text{ V or } 3.3 \text{ V}$	—	—	—	—	—	—	—	5	
Power dissipation capacitance	$C_{PDA}$	(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	
	$C_{PDB}$	(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:  $C_{PD}$  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.

$$I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}$$

### 12. AC Test Circuit

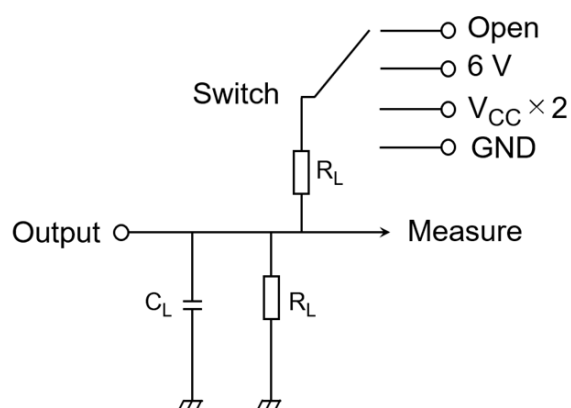


Fig. 12.1 AC Test Circuit

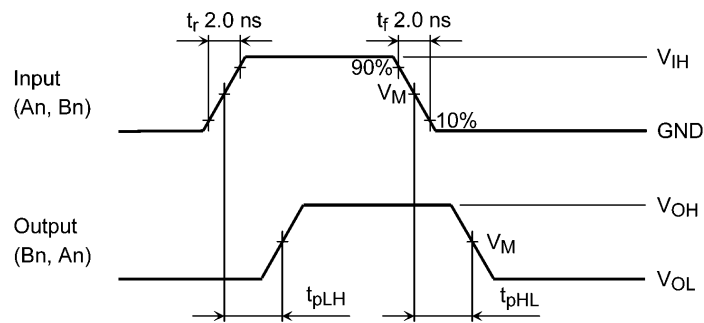
Table 12.1.1 Parameter for AC Test Circuit

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

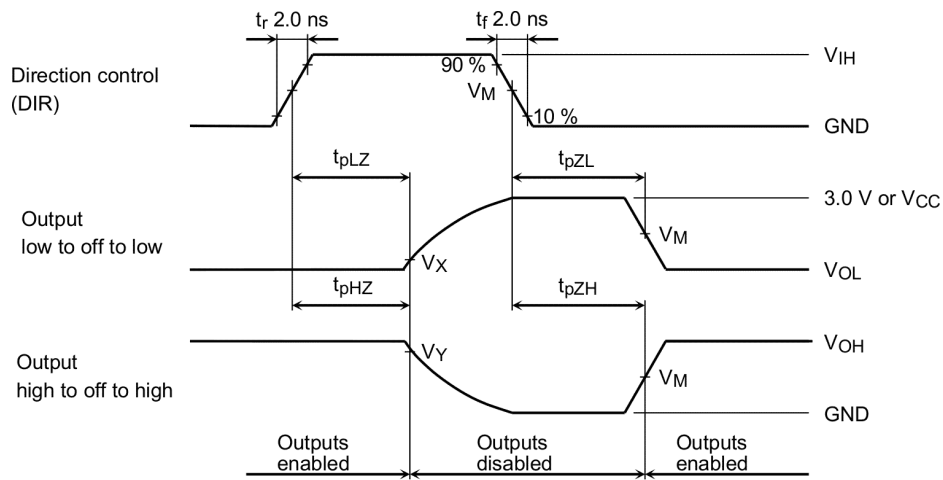
Table 12.1.2 Parameter for AC Test Circuit

Symbol	$V_{CC} = 0.8 \text{ V}$	$V_{CC} = 0.9 \pm 0.045 \text{ V}$ $V_{CC} = 1.0 \pm 0.05 \text{ V}$	$V_{CC} = 1.2 \pm 0.1 \text{ V}$ $V_{CC} = 1.5 \pm 0.1 \text{ V}$	$V_{CC} = 1.8 \pm 0.15 \text{ V}$ $V_{CC} = 2.5 \pm 0.2 \text{ V}$	$V_{CC} = 3.3 \pm 0.3 \text{ V}$
$R_L$	10 k $\Omega$	10 k $\Omega$	2 k $\Omega$	2 k $\Omega$	2 k $\Omega$
$C_L$	5 pF	5 pF	15 pF	15 pF	15 pF

### 13. AC Waveform



**Fig. 13.1  $t_{pLH}$ ,  $t_{pHL}$**



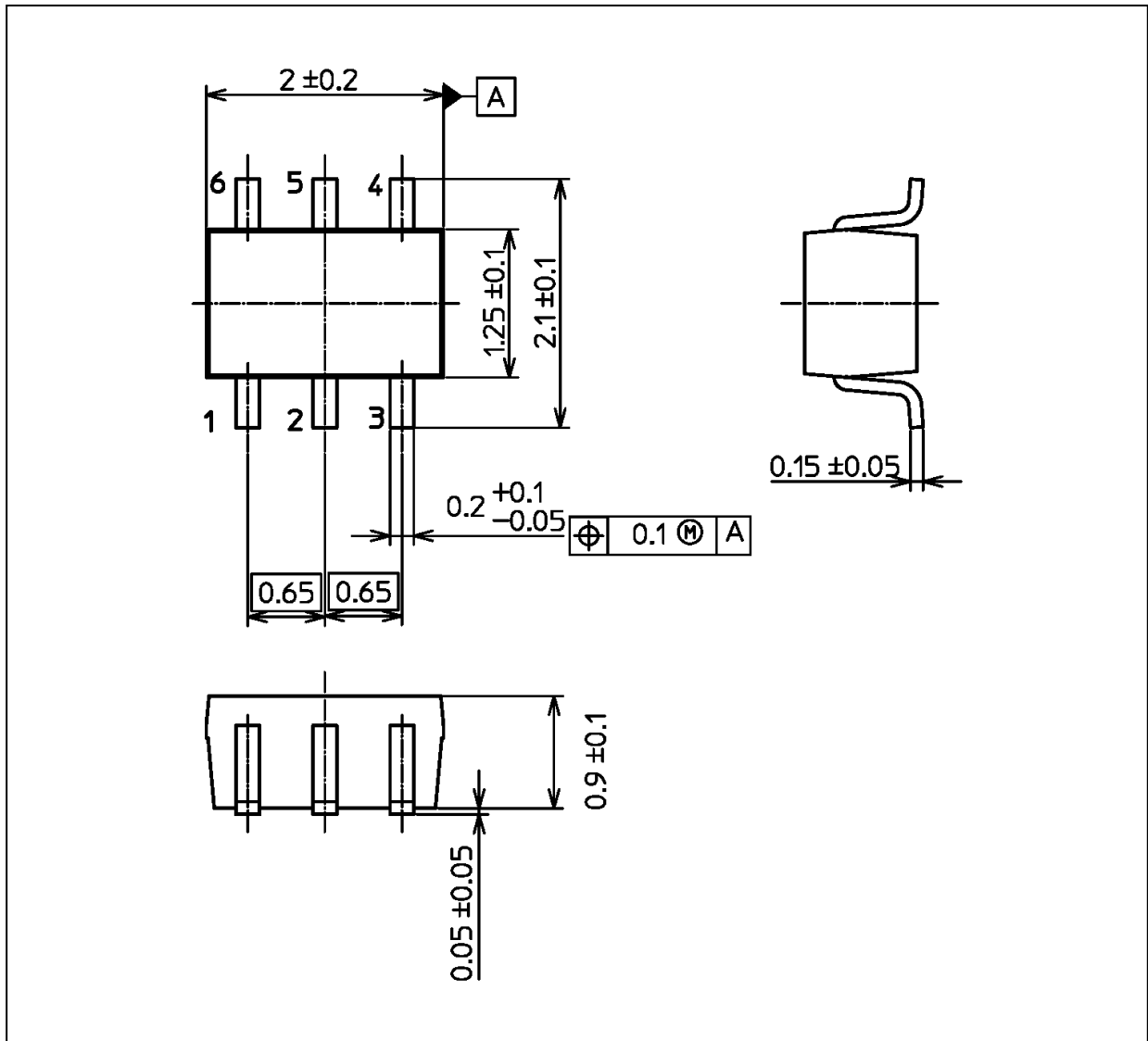
**Fig. 13.2  $t_{pLZ}$ ,  $t_{pHZ}$ ,  $t_{pZL}$ ,  $t_{pZH}$**

**Table 13.1.1 AC Waveform Symbols**

Symbol	$V_{CC} = 0.8 \text{ V}$	$V_{CC} = 1.0 \pm 0.05 \text{ V}$ $V_{CC} = 0.9 \pm 0.045 \text{ V}$	$V_{CC} = 1.5 \pm 0.1 \text{ V}$ $V_{CC} = 1.2 \pm 0.1 \text{ V}$	$V_{CC} = 2.5 \pm 0.2 \text{ V}$ $V_{CC} = 1.8 \pm 0.15 \text{ V}$	$V_{CC} = 3.3 \pm 0.3 \text{ V}$
$V_{IH}$	$V_{CC}$	$V_{CC}$	$V_{CC}$	$V_{CC}$	$V_{CC}$
$V_M$	$V_{CC} / 2$	$V_{CC} / 2$	$V_{CC} / 2$	$V_{CC} / 2$	$V_{CC} / 2$
$V_X$	$V_{OL} + 0.1 \text{ V}$	$V_{OL} + 0.1 \text{ V}$	$V_{OL} + 0.1 \text{ V}$	$V_{OL} + 0.15 \text{ V}$	$V_{OL} + 0.3 \text{ V}$
$V_Y$	$V_{OH} - 0.1 \text{ V}$	$V_{OH} - 0.1 \text{ V}$	$V_{OH} - 0.1 \text{ V}$	$V_{OH} - 0.15 \text{ V}$	$V_{OH} - 0.3 \text{ V}$

## Package Dimensions

Unit: mm



Weight: 0.007 g (typ.)

Package Name(s)
Nickname: US6

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