

74AVC2T45

Dual-bit, dual-supply voltage level translator/transceiver;
3-state

Rev. 01 — 3 July 2007

Product data sheet

1. General description

The 74AVC2T45 is a dual bit, dual supply transceiver that enables bidirectional level translation. It features two data input-output ports (nA and nB), a direction control input (DIR) and dual supply pins ($V_{CC(A)}$ and $V_{CC(B)}$). Both $V_{CC(A)}$ and $V_{CC(B)}$ can be supplied at any voltage between 0.8 V and 3.6 V making the device suitable for translating between any of the low voltage nodes (0.8 V, 1.2 V, 1.5 V, 1.8 V, 2.5 V and 3.3 V). Pins nA and DIR are referenced to $V_{CC(A)}$ and pins nB are referenced to $V_{CC(B)}$. A HIGH on DIR allows transmission from nA to nB and a LOW on DIR allows transmission from nB to nA.

The device is fully specified for partial power-down applications using I_{OFF} . The I_{OFF} circuitry disables the output, preventing any damaging backflow current through the device when it is powered down. In suspend mode when either $V_{CC(A)}$ or $V_{CC(B)}$ are at GND level, both A and B are in the high-impedance OFF-state.

2. Features

- Wide supply voltage range:
 - ◆ $V_{CC(A)}$: 0.8 V to 3.6 V
 - ◆ $V_{CC(B)}$: 0.8 V to 3.6 V
- High noise immunity
- Complies with JEDEC standards:
 - ◆ JESD8-12 (0.8 V to 1.3 V)
 - ◆ JESD8-11 (0.9 V to 1.65 V)
 - ◆ JESD8-7 (1.2 V to 1.95 V)
 - ◆ JESD8-5 (1.8 V to 2.7 V)
 - ◆ JESD8-B (2.7 V to 3.6 V)
- ESD protection:
 - ◆ HBM JESD22-A114E Class 3B exceeds 8000 V
 - ◆ MM JESD22-A115-A exceeds 200 V
 - ◆ CDM JESD22-C101C exceeds 1000 V
- Maximum data rates:
 - ◆ 500 Mbps (1.8 V to 3.3 V translation)
 - ◆ 320 Mbps (< 1.8 V to 3.3 V translation)
 - ◆ 320 Mbps (translate to 2.5 V or 1.8 V)
 - ◆ 280 Mbps (translate to 1.5 V)
 - ◆ 240 Mbps (translate to 1.2 V)
- Suspend mode
- Latch-up performance exceeds 100 mA per JESD 78 Class II

- Inputs accept voltages up to 3.6 V
- Low noise overshoot and undershoot < 10 % of V_{CC}
- I_{OFF} circuitry provides partial Power-down mode operation
- SOT765-1 and SOT833-1 package options
- Specified from −40 °C to +85 °C and −40 °C to +125 °C

3. Ordering information

Table 1. Ordering information

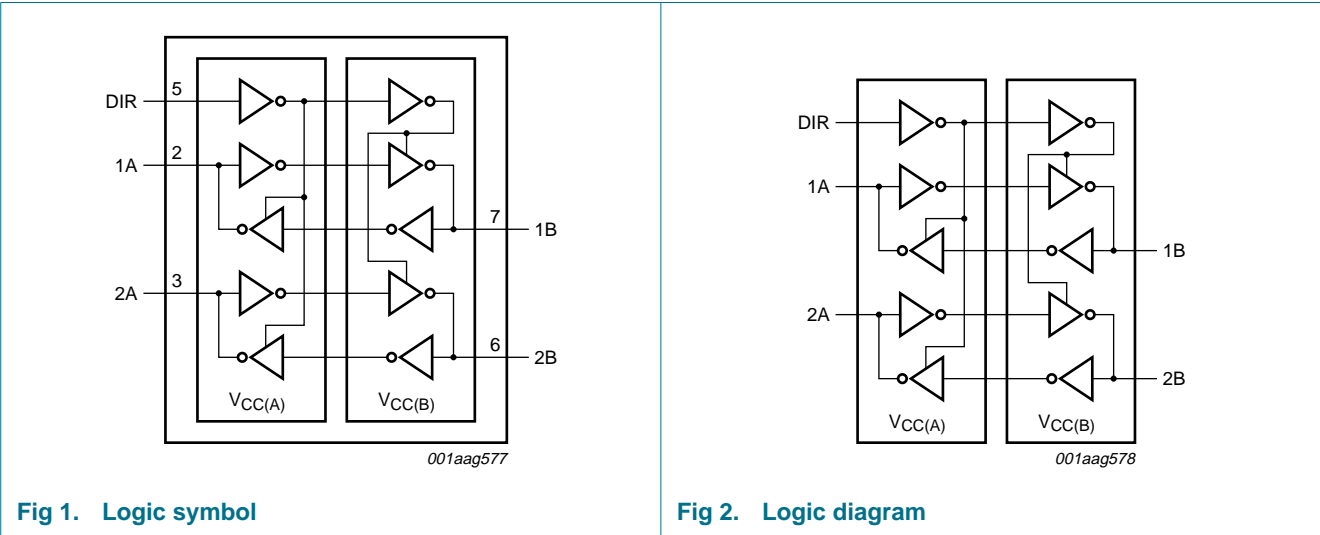
Type number	Package			
	Temperature range	Name	Description	Version
74AVC2T45DC	−40 °C to +125 °C	VSSOP8	plastic very thin shrink small outline package; 8 leads; body width 2.3 mm	SOT765-1
74AVC2T45GT	−40 °C to +125 °C	XSON8	plastic extremely thin small outline package; no leads; 8 terminals; body 1 × 1.95 × 0.5 mm	SOT833-1

4. Marking

Table 2. Marking

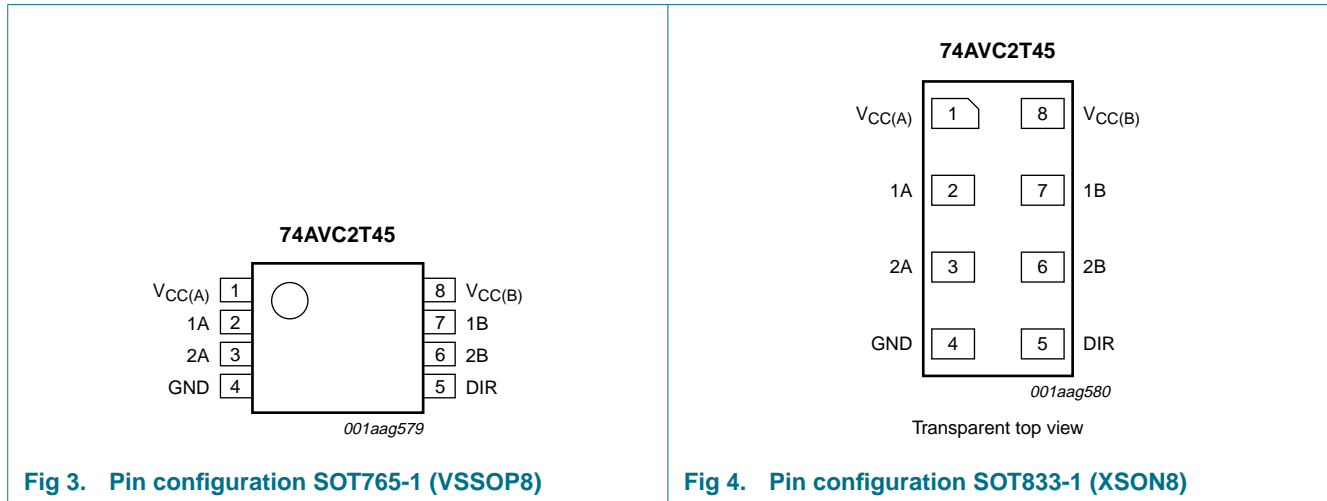
Type number	Marking code
74AVC2T45DC	B45
74AVC2T45GT	B45

5. Functional diagram



6. Pinning information

6.1 Pinning



6.2 Pin description

Table 3. Pin description

Symbol	Pin	Description
$V_{CC(A)}$	1	supply voltage port A and DIR
1A	2	data input or output
2A	3	data input or output
GND	4	ground (0 V)
DIR	5	direction control
2B	6	data input or output
1B	7	data input or output
$V_{CC(B)}$	8	supply voltage port B

7. Functional description

Table 4. Function table^[1]

Supply voltage	Input	Input/output ^[2]	
$V_{CC(A)}, V_{CC(B)}$	DIR ^[3]	nA	nB
0.8 V to 3.6 V	L	nA = nB	input
0.8 V to 3.6 V	H	input	nB = nA
GND ^[4]	X	Z	Z

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

[2] The input circuit of the data I/O is always active.

[3] The DIR input circuit is referenced to $V_{CC(A)}$.

[4] If at least one of $V_{CC(A)}$ or $V_{CC(B)}$ is at GND level, the device goes into suspend mode.

8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC(A)}$	supply voltage port A		-0.5	+4.6	V
$V_{CC(B)}$	supply voltage port B		-0.5	+4.6	V
I_{IK}	input clamping current	$V_I < 0$ V	-50	-	mA
V_I	input voltage		[1] -0.5	+4.6	V
I_{OK}	output clamping current	$V_O < 0$ V	-50	-	mA
V_O	output voltage	Active mode	[1][2][3] -0.5	$V_{CCO} + 0.5$	V
		Suspend or 3-state mode	[1] -0.5	+4.6	V
I_O	output current	$V_O = 0$ V to V_{CC}	-	± 50	mA
I_{CC}	supply current	$I_{CC(A)}$ or $I_{CC(B)}$	-	100	mA
I_{GND}	ground current		-100	-	mA
T_{stg}	storage temperature		-65	+150	°C
P_{tot}	total power dissipation	$T_{amb} = -40$ °C to +125 °C	[4] -	250	mW

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

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

[3] $V_{CCO} + 0.5$ V should not exceed 4.6 V.

[4] For VSSOP8 package: above 110 °C the value of P_{tot} derates linearly with 8 mW/K.
For XSON8 package: above 45 °C the value of P_{tot} derates linearly with 2.4 mW/K.

9. Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC(A)}$	supply voltage port A		0.8	3.6	V
$V_{CC(B)}$	supply voltage port B		0.8	3.6	V
V_I	input voltage		0	3.6	V
V_O	output voltage	Active mode	[1] 0	V_{CCO}	V
		Suspend or 3-state mode	0	3.6	V
T_{amb}	ambient temperature		-40	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CCI} = 0.8$ V to 3.6 V	-	5	ns/V

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

10. Static characteristics

Table 7. Static characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V). All unused data inputs of the device must be held at V_{CCI} or GND to ensure proper device operation.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$T_{amb} = 25\text{ }^{\circ}\text{C}$						
V_{OH}	HIGH-level output voltage	$V_I = V_{IH}$ $I_O = -1.5\text{ mA}$; $V_{CC(A)} = V_{CC(B)} = 0.8\text{ V}$	-	0.69	-	V
V_{OL}	LOW-level output voltage	$V_I = V_{IL}$ $I_O = 1.5\text{ mA}$; $V_{CC(A)} = V_{CC(B)} = 0.8\text{ V}$	-	0.07	-	V
I_I	input leakage current	DIR input; $V_I = \text{GND to } V_{CC(A)}$; $V_{CC(A)} = V_{CC(B)} = 0.8\text{ V to } 3.6\text{ V}$	-	± 0.025	± 0.25	μA
I_{OZ}	OFF-state output current	A or B port; $V_O = \text{GND or } V_{CCO}$; $V_{CC(A)} = V_{CC(B)} = 0.8\text{ V to } 3.6\text{ V}$	[1] -	± 0.5	± 2.5	μA
I_{OFF}	power-off leakage current	A port; V_I or $V_O = 0\text{ V to } 3.6\text{ V}$; $V_{CC(A)} = 0\text{ V}$; $V_{CC(B)} = 0.8\text{ V to } 3.6\text{ V}$	-	± 0.1	± 1.0	μA
		B port; V_I or $V_O = 0\text{ V to } 3.6\text{ V}$; $V_{CC(B)} = 0\text{ V}$; $V_{CC(A)} = 0.8\text{ V to } 3.6\text{ V}$	-	± 0.1	± 1.0	μA
C_I	input capacitance	DIR input; $V_I = \text{GND or } 3.3\text{ V}$; $V_{CC(A)} = V_{CC(B)} = 3.3\text{ V}$	-	1.0	-	pF
$C_{I/O}$	input/output capacitance	A and B port; suspend mode; $V_O = V_{CCO}$ or GND; $V_{CC(A)} = V_{CC(B)} = 3.3\text{ V}$	[1] -	4.0	-	pF
$T_{amb} = -40\text{ }^{\circ}\text{C to } +85\text{ }^{\circ}\text{C}$						
V_{IH}	HIGH-level input voltage	data input [2]				
		$V_{CCI} = 0.8\text{ V}$	$0.70 \times V_{CCI}$	-	-	V
		$V_{CCI} = 1.1\text{ V to } 1.95\text{ V}$	$0.65 \times V_{CCI}$	-	-	V
		$V_{CCI} = 2.3\text{ V to } 2.7\text{ V}$	1.6	-	-	V
		$V_{CCI} = 3.0\text{ V to } 3.6\text{ V}$	2.0	-	-	V
		DIR input [2]				
		$V_{CCI} = 0.8\text{ V}$	$0.70 \times V_{CC(A)}$	-	-	V
		$V_{CCI} = 1.1\text{ V to } 1.95\text{ V}$	$0.65 \times V_{CC(A)}$	-	-	V
		$V_{CCI} = 2.3\text{ V to } 2.7\text{ V}$	1.6	-	-	V
		$V_{CCI} = 3.0\text{ V to } 3.6\text{ V}$	2.0	-	-	V
V_{IL}	LOW-level input voltage	data input [2]				
		$V_{CCI} = 0.8\text{ V}$	-	-	$0.30 \times V_{CCI}$	V
		$V_{CCI} = 1.1\text{ V to } 1.95\text{ V}$	-	-	$0.35 \times V_{CCI}$	V
		$V_{CCI} = 2.3\text{ V to } 2.7\text{ V}$	-	-	0.7	V
		$V_{CCI} = 3.0\text{ V to } 3.6\text{ V}$	-	-	0.9	V
		DIR input [2]				
		$V_{CCI} = 0.8\text{ V}$	-	-	$0.30 \times V_{CC(A)}$	V
		$V_{CCI} = 1.1\text{ V to } 1.95\text{ V}$	-	-	$0.35 \times V_{CC(A)}$	V
		$V_{CCI} = 2.3\text{ V to } 2.7\text{ V}$	-	-	0.7	V
		$V_{CCI} = 3.0\text{ V to } 3.6\text{ V}$	-	-	0.9	V

Table 7. Static characteristics ...continued

At recommended operating conditions; voltages are referenced to GND (ground = 0 V). All unused data inputs of the device must be held at V_{CCI} or GND to ensure proper device operation.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{OH}	HIGH-level output voltage	$V_I = V_{IH}$				
		$I_O = -100\ \mu\text{A}$; $V_{CC(A)} = V_{CC(B)} = 0.8\ \text{V to } 3.6\ \text{V}$	[1] $V_{CCO} - 0.1$	-	-	V
		$I_O = -3\ \text{mA}$; $V_{CC(A)} = V_{CC(B)} = 1.1\ \text{V}$	0.85	-	-	V
		$I_O = -6\ \text{mA}$; $V_{CC(A)} = V_{CC(B)} = 1.4\ \text{V}$	1.05	-	-	V
		$I_O = -8\ \text{mA}$; $V_{CC(A)} = V_{CC(B)} = 1.65\ \text{V}$	1.2	-	-	V
		$I_O = -9\ \text{mA}$; $V_{CC(A)} = V_{CC(B)} = 2.3\ \text{V}$	1.75	-	-	V
V_{OL}	LOW-level output voltage	$V_I = V_{IL}$				
		$I_O = 100\ \mu\text{A}$; $V_{CC(A)} = V_{CC(B)} = 0.8\ \text{V to } 3.6\ \text{V}$	-	-	0.1	V
		$I_O = 3\ \text{mA}$; $V_{CC(A)} = V_{CC(B)} = 1.1\ \text{V}$	-	-	0.25	V
		$I_O = 6\ \text{mA}$; $V_{CC(A)} = V_{CC(B)} = 1.4\ \text{V}$	-	-	0.35	V
		$I_O = 8\ \text{mA}$; $V_{CC(A)} = V_{CC(B)} = 1.65\ \text{V}$	-	-	0.45	V
		$I_O = 9\ \text{mA}$; $V_{CC(A)} = V_{CC(B)} = 2.3\ \text{V}$	-	-	0.55	V
I_I	input leakage current	$I_O = 12\ \text{mA}$; $V_{CC(A)} = V_{CC(B)} = 3.0\ \text{V}$	-	-	0.7	V
I_{OZ}	OFF-state output current	DIR input; $V_I = \text{GND to } V_{CC(A)}$; $V_{CC(A)} = V_{CC(B)} = 0.8\ \text{V to } 3.6\ \text{V}$	-	-	± 1.0	μA
I_{OFF}	power-off leakage current	A or B port; $V_O = \text{GND or } V_{CCO}$; $V_{CC(A)} = V_{CC(B)} = 0.8\ \text{V to } 3.6\ \text{V}$	[1] -	-	± 5.0	μA
		A port; $V_I \text{ or } V_O = 0\ \text{V to } 3.6\ \text{V}$; $V_{CC(A)} = 0\ \text{V}$; $V_{CC(B)} = 0.8\ \text{V to } 3.6\ \text{V}$	-	-	± 5.0	μA
I_{CC}	supply current	B port; $V_I \text{ or } V_O = 0\ \text{V to } 3.6\ \text{V}$; $V_{CC(B)} = 0\ \text{V}$; $V_{CC(A)} = 0.8\ \text{V to } 3.6\ \text{V}$	-	-	± 5.0	μA
		A port; $V_I = \text{GND or } V_{CCI}$; $I_O = 0\ \text{A}$	[2]			
		$V_{CC(A)} = V_{CC(B)} = 0.8\ \text{V to } 3.6\ \text{V}$	-	-	8.0	μA
		$V_{CC(A)} = 3.6\ \text{V}$; $V_{CC(B)} = 0\ \text{V}$	-	-	8.0	μA
		$V_{CC(A)} = 0\ \text{V}$; $V_{CC(B)} = 3.6\ \text{V}$	-2	0	-	μA
		B port; $V_I = \text{GND or } V_{CCI}$; $I_O = 0\ \text{A}$	[2]			
		$V_{CC(A)} = V_{CC(B)} = 0.8\ \text{V to } 3.6\ \text{V}$	-	-	8.0	μA
		$V_{CC(A)} = 3.6\ \text{V}$; $V_{CC(B)} = 0\ \text{V}$	-2	0	-	μA
		$V_{CC(A)} = 0\ \text{V}$; $V_{CC(B)} = 3.6\ \text{V}$	-	-	8.0	μA
I_{CC}	supply current	A plus B port ($I_{CC(A)} + I_{CC(B)}$); $I_O = 0\ \text{A}$; $V_I = \text{GND or } V_{CCI}$; $V_{CC(A)} = V_{CC(B)} = 0.8\ \text{V to } 3.6\ \text{V}$	[2] -	-	16	μA

Table 7. Static characteristics ...continued

At recommended operating conditions; voltages are referenced to GND (ground = 0 V). All unused data inputs of the device must be held at V_{CCI} or GND to ensure proper device operation.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$T_{amb} = -40\text{ }^{\circ}\text{C to }+125\text{ }^{\circ}\text{C}$						
V_{IH}	HIGH-level input voltage	data input [2]				
		$V_{CCI} = 0.8\text{ V}$	$0.70 \times V_{CCI}$	-	-	V
		$V_{CCI} = 1.1\text{ V to }1.95\text{ V}$	$0.65 \times V_{CCI}$	-	-	V
		$V_{CCI} = 2.3\text{ V to }2.7\text{ V}$	1.6	-	-	V
		$V_{CCI} = 3.0\text{ V to }3.6\text{ V}$	2.0	-	-	V
		DIR input [2]				
		$V_{CCI} = 0.8\text{ V}$	$0.70 \times V_{CC(A)}$	-	-	V
		$V_{CCI} = 1.1\text{ V to }1.95\text{ V}$	$0.65 \times V_{CC(A)}$	-	-	V
		$V_{CCI} = 2.3\text{ V to }2.7\text{ V}$	1.6	-	-	V
		$V_{CCI} = 3.0\text{ V to }3.6\text{ V}$	2.0	-	-	V
V_{IL}	LOW-level input voltage	data input [2]				
		$V_{CCI} = 0.8\text{ V}$	-	-	$0.30 \times V_{CCI}$	V
		$V_{CCI} = 1.1\text{ V to }1.95\text{ V}$	-	-	$0.35 \times V_{CCI}$	V
		$V_{CCI} = 2.3\text{ V to }2.7\text{ V}$	-	-	0.7	V
		$V_{CCI} = 3.0\text{ V to }3.6\text{ V}$	-	-	0.9	V
		DIR input [2]				
		$V_{CCI} = 0.8\text{ V}$	-	-	$0.30 \times V_{CC(A)}$	V
		$V_{CCI} = 1.1\text{ V to }1.95\text{ V}$	-	-	$0.35 \times V_{CC(A)}$	V
		$V_{CCI} = 2.3\text{ V to }2.7\text{ V}$	-	-	0.7	V
		$V_{CCI} = 3.0\text{ V to }3.6\text{ V}$	-	-	0.9	V
V_{OH}	HIGH-level output voltage	$V_I = V_{IH}$				
		$I_O = -100\text{ }\mu\text{A}$; $V_{CC(A)} = V_{CC(B)} = 0.8\text{ V to }3.6\text{ V}$ [1]	$V_{CCO} - 0.1$	-	-	V
		$I_O = -3\text{ mA}$; $V_{CC(A)} = V_{CC(B)} = 1.1\text{ V}$	0.85	-	-	V
		$I_O = -6\text{ mA}$; $V_{CC(A)} = V_{CC(B)} = 1.4\text{ V}$	1.05	-	-	V
		$I_O = -8\text{ mA}$; $V_{CC(A)} = V_{CC(B)} = 1.65\text{ V}$	1.2	-	-	V
		$I_O = -9\text{ mA}$; $V_{CC(A)} = V_{CC(B)} = 2.3\text{ V}$	1.75	-	-	V
		$I_O = -12\text{ mA}$; $V_{CC(A)} = V_{CC(B)} = 3.0\text{ V}$	2.3	-	-	V
V_{OL}	LOW-level output voltage	$V_I = V_{IL}$				
		$I_O = 100\text{ }\mu\text{A}$; $V_{CC(A)} = V_{CC(B)} = 0.8\text{ V to }3.6\text{ V}$	-	-	0.1	V
		$I_O = 3\text{ mA}$; $V_{CC(A)} = V_{CC(B)} = 1.1\text{ V}$	-	-	0.25	V
		$I_O = 6\text{ mA}$; $V_{CC(A)} = V_{CC(B)} = 1.4\text{ V}$	-	-	0.35	V
		$I_O = 8\text{ mA}$; $V_{CC(A)} = V_{CC(B)} = 1.65\text{ V}$	-	-	0.45	V
		$I_O = 9\text{ mA}$; $V_{CC(A)} = V_{CC(B)} = 2.3\text{ V}$	-	-	0.55	V
		$I_O = 12\text{ mA}$; $V_{CC(A)} = V_{CC(B)} = 3.0\text{ V}$	-	-	0.7	V
I_I	input leakage current	DIR input; $V_I = \text{GND to }V_{CC(A)}$; $V_{CC(A)} = V_{CC(B)} = 0.8\text{ V to }3.6\text{ V}$	-	-	± 1.5	μA

Table 7. Static characteristics ...continued

At recommended operating conditions; voltages are referenced to GND (ground = 0 V). All unused data inputs of the device must be held at V_{CCI} or GND to ensure proper device operation.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{OZ}	OFF-state output current	A or B port; $V_O = \text{GND or } V_{CCO}$; $V_{CC(A)} = V_{CC(B)} = 0.8 \text{ V to } 3.6 \text{ V}$	[1] -	-	± 7.5	μA
I_{OFF}	power-off leakage current	A port; $V_I \text{ or } V_O = 0 \text{ V to } 3.6 \text{ V}$; $V_{CC(B)} = 0 \text{ V}$; $V_{CC(A)} = 0.8 \text{ V to } 3.6 \text{ V}$	-	-	± 35	μA
		B port; $V_I \text{ or } V_O = 0 \text{ V to } 3.6 \text{ V}$; $V_{CC(B)} = 0 \text{ V}$; $V_{CC(A)} = 0.8 \text{ V to } 3.6 \text{ V}$	-	-	± 35	μA
I_{CC}	supply current	A port; $V_I = \text{GND or } V_{CCI}$; $I_O = 0 \text{ A}$	[2]			
		$V_{CC(A)} = V_{CC(B)} = 0.8 \text{ V to } 3.6 \text{ V}$	-	-	11.5	μA
		$V_{CC(A)} = 3.6 \text{ V}$; $V_{CC(B)} = 0 \text{ V}$	-	-	11.5	μA
		$V_{CC(A)} = 0 \text{ V}$; $V_{CC(B)} = 3.6 \text{ V}$	-8	0	-	μA
		B port; $V_I = \text{GND or } V_{CCI}$; $I_O = 0 \text{ A}$	[2]			
		$V_{CC(A)} = V_{CC(B)} = 0.8 \text{ V to } 3.6 \text{ V}$	-	-	11.5	μA
		$V_{CC(A)} = 3.6 \text{ V}$; $V_{CC(B)} = 0 \text{ V}$	-8	0	-	μA
		$V_{CC(A)} = 0 \text{ V}$; $V_{CC(B)} = 3.6 \text{ V}$	-	-	11.5	μA
		A plus B port ($I_{CC(A)} + I_{CC(B)}$); $I_O = 0 \text{ A}$; $V_I = \text{GND or } V_{CCI}$; $V_{CC(A)} = V_{CC(B)} = 0.8 \text{ V to } 3.6 \text{ V}$	[2] -	-	23	μA

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

[2] V_{CCI} is the supply voltage associated with the input port.

11. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 7](#).

Symbol	Parameter	Conditions	25 °C			–40 °C to +125 °C			Unit
			Min	Typ ^[1]	Max	Min	Max (85 °C)	Max (125 °C)	
V _{CC(A)} = 0.8 V									
t _{pd}	propagation delay	A to B; see Figure 5	[2]						
		V _{CC(B)} = 0.8 V	-	15.5	-	-	-	-	ns
		V _{CC(B)} = 1.1 V to 1.3 V	-	8.1	-	-	-	-	ns
		V _{CC(B)} = 1.4 V to 1.6 V	-	7.6	-	-	-	-	ns
		V _{CC(B)} = 1.65 V to 1.95 V	-	7.7	-	-	-	-	ns
		V _{CC(B)} = 2.3 V to 2.7 V	-	8.4	-	-	-	-	ns
		V _{CC(B)} = 3.0 V to 3.6 V	-	9.2	-	-	-	-	ns
		B to A; see Figure 5	[2]						
		V _{CC(B)} = 0.8 V	-	15.5	-	-	-	-	ns
		V _{CC(B)} = 1.1 V to 1.3 V	-	12.7	-	-	-	-	ns
		V _{CC(B)} = 1.4 V to 1.6 V	-	12.3	-	-	-	-	ns
		V _{CC(B)} = 1.65 V to 1.95 V	-	12.2	-	-	-	-	ns
		V _{CC(B)} = 2.3 V to 2.7 V	-	12.0	-	-	-	-	ns
		V _{CC(B)} = 3.0 V to 3.6 V	-	11.8	-	-	-	-	ns
t _{dis}	disable time	DIR to A; see Figure 6	[3]						
		V _{CC(B)} = 0.8 V	-	12.2	-	-	-	-	ns
		V _{CC(B)} = 1.1 V to 1.3 V	-	12.2	-	-	-	-	ns
		V _{CC(B)} = 1.4 V to 1.6 V	-	12.2	-	-	-	-	ns
		V _{CC(B)} = 1.65 V to 1.95 V	-	12.2	-	-	-	-	ns
		V _{CC(B)} = 2.3 V to 2.7 V	-	12.2	-	-	-	-	ns
		V _{CC(B)} = 3.0 V to 3.6 V	-	12.2	-	-	-	-	ns
		DIR to B; see Figure 6	[3]						
		V _{CC(B)} = 0.8 V	-	11.7	-	-	-	-	ns
		V _{CC(B)} = 1.1 V to 1.3 V	-	7.9	-	-	-	-	ns
		V _{CC(B)} = 1.4 V to 1.6 V	-	7.6	-	-	-	-	ns
		V _{CC(B)} = 1.65 V to 1.95 V	-	8.2	-	-	-	-	ns
		V _{CC(B)} = 2.3 V to 2.7 V	-	8.7	-	-	-	-	ns
		V _{CC(B)} = 3.0 V to 3.6 V	-	10.2	-	-	-	-	ns

Table 8. Dynamic characteristics ...continued

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 7](#).

Symbol	Parameter	Conditions	25 °C			–40 °C to +125 °C			Unit
			Min	Typ ^[1]	Max	Min	Max (85 °C)	Max (125 °C)	
t _{en}	enable time	DIR to A; see Figure 6 ^{[4][5]}							
		V _{CC(B)} = 0.8 V	-	27.2	-	-	-	-	ns
		V _{CC(B)} = 1.1 V to 1.3 V	-	20.6	-	-	-	-	ns
		V _{CC(B)} = 1.4 V to 1.6 V	-	19.9	-	-	-	-	ns
		V _{CC(B)} = 1.65 V to 1.95 V	-	20.4	-	-	-	-	ns
		V _{CC(B)} = 2.3 V to 2.7 V	-	20.7	-	-	-	-	ns
		V _{CC(B)} = 3.0 V to 3.6 V	-	22.0	-	-	-	-	ns
		DIR to B; see Figure 6 ^{[4][5]}							
		V _{CC(B)} = 0.8 V	-	27.7	-	-	-	-	ns
		V _{CC(B)} = 1.1 V to 1.3 V	-	20.3	-	-	-	-	ns
		V _{CC(B)} = 1.4 V to 1.6 V	-	19.8	-	-	-	-	ns
		V _{CC(B)} = 1.65 V to 1.95 V	-	19.9	-	-	-	-	ns
		V _{CC(B)} = 2.3 V to 2.7 V	-	20.6	-	-	-	-	ns
		V _{CC(B)} = 3.0 V to 3.6 V	-	21.4	-	-	-	-	ns
V_{CC(A)} = 1.1 V to 1.3 V									
t _{pd}	propagation delay	A to B; see Figure 5 ^[2]							
		V _{CC(B)} = 0.8 V	-	12.7	-	-	-	-	ns
		V _{CC(B)} = 1.1 V to 1.3 V	-	-	-	1.0	9.0	9.9	ns
		V _{CC(B)} = 1.4 V to 1.6 V	-	-	-	0.7	6.8	7.5	ns
		V _{CC(B)} = 1.65 V to 1.95 V	-	-	-	0.6	6.1	6.8	ns
		V _{CC(B)} = 2.3 V to 2.7 V	-	-	-	0.5	5.7	6.3	ns
		V _{CC(B)} = 3.0 V to 3.6 V	-	-	-	0.5	6.1	6.8	ns
		B to A; see Figure 5 ^[2]							
		V _{CC(B)} = 0.8 V	-	8.1	-	-	-	-	ns
		V _{CC(B)} = 1.1 V to 1.3 V	-	-	-	1.0	9.0	9.9	ns
		V _{CC(B)} = 1.4 V to 1.6 V	-	-	-	0.8	8.0	8.8	ns
		V _{CC(B)} = 1.65 V to 1.95 V	-	-	-	0.7	7.7	8.5	ns
		V _{CC(B)} = 2.3 V to 2.7 V	-	-	-	0.6	7.2	8.0	ns
		V _{CC(B)} = 3.0 V to 3.6 V	-	-	-	0.5	7.1	7.9	ns

Table 8. Dynamic characteristics ...continued

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 7](#).

Symbol	Parameter	Conditions	25 °C			–40 °C to +125 °C			Unit
			Min	Typ ^[1]	Max	Min	Max (85 °C)	Max (125 °C)	
t_{dis}	disable time	DIR to A; see Figure 6 ^[3]							
		$V_{CC(B)} = 0.8\text{ V}$	-	4.9	-	-	-	-	ns
		$V_{CC(B)} = 1.1\text{ V to }3.6\text{ V}$	-	-	-	2.2	8.8	9.7	ns
		DIR to B; see Figure 6 ^[3]							
		$V_{CC(B)} = 0.8\text{ V}$	-	9.2	-	-	-	-	ns
		$V_{CC(B)} = 1.1\text{ V to }1.3\text{ V}$	-	-	-	2.2	8.4	9.2	ns
		$V_{CC(B)} = 1.4\text{ V to }1.6\text{ V}$	-	-	-	1.8	6.7	7.4	ns
		$V_{CC(B)} = 1.65\text{ V to }1.95\text{ V}$	-	-	-	2.0	6.9	7.6	ns
		$V_{CC(B)} = 2.3\text{ V to }2.7\text{ V}$	-	-	-	1.7	6.2	6.9	ns
		$V_{CC(B)} = 3.0\text{ V to }3.6\text{ V}$	-	-	-	2.4	7.2	8.0	ns
t_{en}	enable time	DIR to A; see Figure 6 ^{[4][5]}							
		$V_{CC(B)} = 0.8\text{ V}$	-	17.3	-	-	-	-	ns
		$V_{CC(B)} = 1.1\text{ V to }1.3\text{ V}$	-	-	-	-	17.4	19.1	ns
		$V_{CC(B)} = 1.4\text{ V to }1.6\text{ V}$	-	-	-	-	14.7	16.2	ns
		$V_{CC(B)} = 1.65\text{ V to }1.95\text{ V}$	-	-	-	-	14.6	16.1	ns
		$V_{CC(B)} = 2.3\text{ V to }2.7\text{ V}$	-	-	-	-	13.4	14.9	ns
		$V_{CC(B)} = 3.0\text{ V to }3.6\text{ V}$	-	-	-	-	14.3	15.9	ns
		DIR to B; see Figure 6 ^{[4][5]}							
		$V_{CC(B)} = 0.8\text{ V}$	-	17.6	-	-	-	-	ns
		$V_{CC(B)} = 1.1\text{ V to }1.3\text{ V}$	-	-	-	-	17.8	19.6	ns
		$V_{CC(B)} = 1.4\text{ V to }1.6\text{ V}$	-	-	-	-	15.6	17.2	ns
		$V_{CC(B)} = 1.65\text{ V to }1.95\text{ V}$	-	-	-	-	14.9	16.5	ns
		$V_{CC(B)} = 2.3\text{ V to }2.7\text{ V}$	-	-	-	-	14.5	16.0	ns
		$V_{CC(B)} = 3.0\text{ V to }3.6\text{ V}$	-	-	-	-	14.9	16.5	ns

Table 8. Dynamic characteristics ...continued

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 7](#).

Symbol	Parameter	Conditions	25 °C			–40 °C to +125 °C			Unit
			Min	Typ ^[1]	Max	Min	Max (85 °C)	Max (125 °C)	
V _{CC(A)} = 1.4 V to 1.6 V									
t _{pd}	propagation delay	A to B; see Figure 5	[2]						
		V _{CC(B)} = 0.8 V	-	12.3	-	-	-	-	ns
		V _{CC(B)} = 1.1 V to 1.3 V	-	-	-	1.0	8.0	8.8	ns
		V _{CC(B)} = 1.4 V to 1.6 V	-	-	-	0.7	5.4	6.0	ns
		V _{CC(B)} = 1.65 V to 1.95 V	-	-	-	0.6	4.6	5.1	ns
		V _{CC(B)} = 2.3 V to 2.7 V	-	-	-	0.5	3.7	4.1	ns
		V _{CC(B)} = 3.0 V to 3.6 V	-	-	-	0.5	3.5	3.9	ns
		B to A; see Figure 5	[2]						
		V _{CC(B)} = 0.8 V	-	7.6	-	-	-	-	ns
		V _{CC(B)} = 1.1 V to 1.3 V	-	-	-	1.0	6.8	7.5	ns
		V _{CC(B)} = 1.4 V to 1.6 V	-	-	-	0.8	5.4	6.0	ns
		V _{CC(B)} = 1.65 V to 1.95 V	-	-	-	0.7	5.1	5.7	ns
		V _{CC(B)} = 2.3 V to 2.7 V	-	-	-	0.6	4.7	5.2	ns
		V _{CC(B)} = 3.0 V to 3.6 V	-	-	-	0.5	4.5	5.0	ns
t _{dis}	disable time	DIR to A; see Figure 6	[3]						
		V _{CC(B)} = 0.8 V	-	3.8	-	-	-	-	ns
		V _{CC(B)} = 1.1 V to 3.6 V	-	-	-	1.6	6.3	7.0	ns
		DIR to B; see Figure 6	[3]						
		V _{CC(B)} = 0.8 V	-	9.0	-	-	-	-	ns
		V _{CC(B)} = 1.1 V to 1.3 V	-	-	-	2.0	7.6	8.3	ns
		V _{CC(B)} = 1.4 V to 1.6 V	-	-	-	1.8	5.9	6.5	ns
		V _{CC(B)} = 1.65 V to 1.95 V	-	-	-	1.6	6.0	6.6	ns
		V _{CC(B)} = 2.3 V to 2.7 V	-	-	-	1.2	4.8	5.3	ns
		V _{CC(B)} = 3.0 V to 3.6 V	-	-	-	1.7	5.5	6.1	ns

Table 8. Dynamic characteristics ...continued

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 7](#).

Symbol	Parameter	Conditions	25 °C			–40 °C to +125 °C			Unit
			Min	Typ ^[1]	Max	Min	Max (85 °C)	Max (125 °C)	
t _{en}	enable time	DIR to A; see Figure 6 ^{[4][5]}							
		V _{CC(B)} = 0.8 V	-	16.6	-	-	-	-	ns
		V _{CC(B)} = 1.1 V to 1.3 V	-	-	-	-	14.4	15.8	ns
		V _{CC(B)} = 1.4 V to 1.6 V	-	-	-	-	11.3	12.5	ns
		V _{CC(B)} = 1.65 V to 1.95 V	-	-	-	-	11.1	12.3	ns
		V _{CC(B)} = 2.3 V to 2.7 V	-	-	-	-	9.5	10.5	ns
		V _{CC(B)} = 3.0 V to 3.6 V	-	-	-	-	10.0	11.1	ns
		DIR to B; see Figure 6 ^{[4][5]}							
		V _{CC(B)} = 0.8 V	-	16.1	-	-	-	-	ns
		V _{CC(B)} = 1.1 V to 1.3 V	-	-	-	-	14.3	15.8	ns
		V _{CC(B)} = 1.4 V to 1.6 V	-	-	-	-	11.7	13.0	ns
		V _{CC(B)} = 1.65 V to 1.95 V	-	-	-	-	10.9	12.1	ns
		V _{CC(B)} = 2.3 V to 2.7 V	-	-	-	-	10.0	11.1	ns
		V _{CC(B)} = 3.0 V to 3.6 V	-	-	-	-	9.8	10.9	ns
V_{CC(A)} = 1.65 V to 1.95 V									
t _{pd}	propagation delay	A to B; see Figure 5 ^[2]							
		V _{CC(B)} = 0.8 V	-	12.2	-	-	-	-	ns
		V _{CC(B)} = 1.1 V to 1.3 V	-	-	-	1.0	7.7	8.5	ns
		V _{CC(B)} = 1.4 V to 1.6 V	-	-	-	0.6	5.1	5.7	ns
		V _{CC(B)} = 1.65 V to 1.95 V	-	-	-	0.5	4.3	4.8	ns
		V _{CC(B)} = 2.3 V to 2.7 V	-	-	-	0.5	3.4	3.8	ns
		V _{CC(B)} = 3.0 V to 3.6 V	-	-	-	0.5	3.1	3.5	ns
		B to A; see Figure 5 ^[2]							
		V _{CC(B)} = 0.8 V	-	7.7	-	-	-	-	ns
		V _{CC(B)} = 1.1 V to 1.3 V	-	-	-	1.0	6.1	6.8	ns
		V _{CC(B)} = 1.4 V to 1.6 V	-	-	-	0.7	4.6	5.1	ns
		V _{CC(B)} = 1.65 V to 1.95 V	-	-	-	0.5	4.4	4.9	ns
		V _{CC(B)} = 2.3 V to 2.7 V	-	-	-	0.5	3.9	4.3	ns
		V _{CC(B)} = 3.0 V to 3.6 V	-	-	-	0.5	3.7	4.1	ns

Table 8. Dynamic characteristics ...continued

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 7](#).

Symbol	Parameter	Conditions	25 °C			–40 °C to +125 °C			Unit
			Min	Typ ^[1]	Max	Min	Max (85 °C)	Max (125 °C)	
t_{dis}	disable time	DIR to A; see Figure 6 ^[3]							
		$V_{CC(B)} = 0.8\text{ V}$	-	3.7	-	-	-	-	ns
		$V_{CC(B)} = 1.1\text{ V to }3.6\text{ V}$	-	-	-	1.6	5.5	6.1	ns
		DIR to B; see Figure 6 ^[3]							
		$V_{CC(B)} = 0.8\text{ V}$	-	8.8	-	-	-	-	ns
		$V_{CC(B)} = 1.1\text{ V to }1.3\text{ V}$	-	-	-	1.8	7.7	8.5	ns
		$V_{CC(B)} = 1.4\text{ V to }1.6\text{ V}$	-	-	-	1.8	5.7	6.3	ns
		$V_{CC(B)} = 1.65\text{ V to }1.95\text{ V}$	-	-	-	1.4	5.8	6.4	ns
		$V_{CC(B)} = 2.3\text{ V to }2.7\text{ V}$	-	-	-	1.0	4.5	5.0	ns
		$V_{CC(B)} = 3.0\text{ V to }3.6\text{ V}$	-	-	-	1.5	5.2	5.8	ns
t_{en}	enable time	DIR to A; see Figure 6 ^{[4][5]}							
		$V_{CC(B)} = 0.8\text{ V}$	-	16.5	-	-	-	-	ns
		$V_{CC(B)} = 1.1\text{ V to }1.3\text{ V}$	-	-	-	-	13.8	15.3	ns
		$V_{CC(B)} = 1.4\text{ V to }1.6\text{ V}$	-	-	-	-	10.3	11.4	ns
		$V_{CC(B)} = 1.65\text{ V to }1.95\text{ V}$	-	-	-	-	10.2	11.3	ns
		$V_{CC(B)} = 2.3\text{ V to }2.7\text{ V}$	-	-	-	-	8.4	9.3	ns
		$V_{CC(B)} = 3.0\text{ V to }3.6\text{ V}$	-	-	-	-	8.9	9.9	ns
		DIR to B; see Figure 6 ^{[4][5]}							
		$V_{CC(B)} = 0.8\text{ V}$	-	15.9	-	-	-	-	ns
		$V_{CC(B)} = 1.1\text{ V to }1.3\text{ V}$	-	-	-	-	13.2	14.6	ns
		$V_{CC(B)} = 1.4\text{ V to }1.6\text{ V}$	-	-	-	-	10.6	11.8	ns
		$V_{CC(B)} = 1.65\text{ V to }1.95\text{ V}$	-	-	-	-	9.8	10.9	ns
		$V_{CC(B)} = 2.3\text{ V to }2.7\text{ V}$	-	-	-	-	8.9	9.9	ns
		$V_{CC(B)} = 3.0\text{ V to }3.6\text{ V}$	-	-	-	-	8.6	9.6	ns

Table 8. Dynamic characteristics ...continued

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 7](#).

Symbol	Parameter	Conditions	25 °C			–40 °C to +125 °C			Unit
			Min	Typ ^[1]	Max	Min	Max (85 °C)	Max (125 °C)	
V _{CC(A)} = 2.3 V to 2.7 V									
t _{pd}	propagation delay	A to B; see Figure 5	[2]						
		V _{CC(B)} = 0.8 V	-	12.0	-	-	-	-	ns
		V _{CC(B)} = 1.1 V to 1.3 V	-	-	-	1.0	7.2	8.0	ns
		V _{CC(B)} = 1.4 V to 1.6 V	-	-	-	0.5	4.7	5.2	ns
		V _{CC(B)} = 1.65 V to 1.95 V	-	-	-	0.5	3.9	4.3	ns
		V _{CC(B)} = 2.3 V to 2.7 V	-	-	-	0.5	3.0	3.3	ns
		V _{CC(B)} = 3.0 V to 3.6 V	-	-	-	0.5	2.6	2.9	ns
		B to A; see Figure 5	[2]						
		V _{CC(B)} = 0.8 V	-	8.4	-	-	-	-	ns
		V _{CC(B)} = 1.1 V to 1.3 V	-	-	-	1.0	5.7	6.3	ns
		V _{CC(B)} = 1.4 V to 1.6 V	-	-	-	0.6	3.8	4.2	ns
		V _{CC(B)} = 1.65 V to 1.95 V	-	-	-	0.5	3.4	3.8	ns
		V _{CC(B)} = 2.3 V to 2.7 V	-	-	-	0.5	3.0	3.3	ns
		V _{CC(B)} = 3.0 V to 3.6 V	-	-	-	0.5	2.8	3.1	ns
t _{dis}	disable time	DIR to A; see Figure 6	[3]						
		V _{CC(B)} = 0.8 V	-	2.8	-	-	-	-	ns
		V _{CC(B)} = 1.1 V to 3.6 V	-	-	-	1.5	4.2	4.7	ns
		DIR to B; see Figure 6	[3]						
		V _{CC(B)} = 0.8 V	-	8.7	-	-	-	-	ns
		V _{CC(B)} = 1.1 V to 1.3 V	-	-	-	1.7	7.3	8.0	ns
		V _{CC(B)} = 1.4 V to 1.6 V	-	-	-	2.0	5.2	5.8	ns
		V _{CC(B)} = 1.65 V to 1.95 V	-	-	-	1.5	5.1	5.7	ns
		V _{CC(B)} = 2.3 V to 2.7 V	-	-	-	0.6	4.2	4.7	ns
		V _{CC(B)} = 3.0 V to 3.6 V	-	-	-	1.1	4.8	5.3	ns

Table 8. Dynamic characteristics ...continued

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 7](#).

Symbol	Parameter	Conditions	25 °C			–40 °C to +125 °C			Unit
			Min	Typ ^[1]	Max	Min	Max (85 °C)	Max (125 °C)	
t _{en}	enable time	DIR to A; see Figure 6 ^{[4][5]}							
		V _{CC(B)} = 0.8 V	-	17.1	-	-	-	-	ns
		V _{CC(B)} = 1.1 V to 1.3 V	-	-	-	-	13.0	14.3	ns
		V _{CC(B)} = 1.4 V to 1.6 V	-	-	-	-	9.0	10.0	ns
		V _{CC(B)} = 1.65 V to 1.95 V	-	-	-	-	8.5	9.5	ns
		V _{CC(B)} = 2.3 V to 2.7 V	-	-	-	-	7.2	8.0	ns
		V _{CC(B)} = 3.0 V to 3.6 V	-	-	-	-	7.6	8.4	ns
		DIR to B; see Figure 6 ^{[4][5]}							
		V _{CC(B)} = 0.8 V	-	14.8	-	-	-	-	ns
		V _{CC(B)} = 1.1 V to 1.3 V	-	-	-	-	11.4	12.7	ns
		V _{CC(B)} = 1.4 V to 1.6 V	-	-	-	-	8.9	9.9	ns
		V _{CC(B)} = 1.65 V to 1.95 V	-	-	-	-	8.1	9.0	ns
		V _{CC(B)} = 2.3 V to 2.7 V	-	-	-	-	7.2	8.0	ns
		V _{CC(B)} = 3.0 V to 3.6 V	-	-	-	-	6.8	7.6	ns
V_{CC(A)} = 3.0 V to 3.6 V									
t _{pd}	propagation delay	A to B; see Figure 5 ^[2]							
		V _{CC(B)} = 0.8 V	-	11.8	-	-	-	-	ns
		V _{CC(B)} = 1.1 V to 1.3 V	-	-	-	1.0	7.1	7.9	ns
		V _{CC(B)} = 1.4 V to 1.6 V	-	-	-	0.5	4.5	5.0	ns
		V _{CC(B)} = 1.65 V to 1.95 V	-	-	-	0.5	3.7	4.1	ns
		V _{CC(B)} = 2.3 V to 2.7 V	-	-	-	0.5	2.8	3.1	ns
		V _{CC(B)} = 3.0 V to 3.6 V	-	-	-	0.5	2.4	2.7	ns
		B to A; see Figure 5 ^[2]							
		V _{CC(B)} = 0.8 V	-	9.2	-	-	-	-	ns
		V _{CC(B)} = 1.1 V to 1.3 V	-	-	-	1.0	6.1	6.8	ns
		V _{CC(B)} = 1.4 V to 1.6 V	-	-	-	0.6	3.6	4.0	ns
		V _{CC(B)} = 1.65 V to 1.95 V	-	-	-	0.5	3.1	3.5	ns
		V _{CC(B)} = 2.3 V to 2.7 V	-	-	-	0.5	2.6	2.9	ns
		V _{CC(B)} = 3.0 V to 3.6 V	-	-	-	0.5	2.4	2.7	ns

Table 8. Dynamic characteristics ...continued

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 7](#).

Symbol	Parameter	Conditions	25 °C			–40 °C to +125 °C			Unit
			Min	Typ ^[1]	Max	Min	Max (85 °C)	Max (125 °C)	
t_{dis}	disable time	DIR to A; see Figure 6 ^[3]							
		$V_{CC(B)} = 0.8\text{ V}$	-	3.4	-	-	-	-	ns
		$V_{CC(B)} = 1.1\text{ V to }3.6\text{ V}$	-	-	-	1.5	4.7	5.2	ns
		DIR to B; see Figure 6 ^[3]							
		$V_{CC(B)} = 0.8\text{ V}$	-	8.6	-	-	-	-	ns
		$V_{CC(B)} = 1.1\text{ V to }1.3\text{ V}$	-	-	-	1.7	7.2	7.9	ns
		$V_{CC(B)} = 1.4\text{ V to }1.6\text{ V}$	-	-	-	0.7	5.5	6.1	ns
		$V_{CC(B)} = 1.65\text{ V to }1.95\text{ V}$	-	-	-	0.6	5.5	6.1	ns
		$V_{CC(B)} = 2.3\text{ V to }2.7\text{ V}$	-	-	-	0.7	4.1	4.6	ns
		$V_{CC(B)} = 3.0\text{ V to }3.6\text{ V}$	-	-	-	1.7	4.7	5.2	ns
t_{en}	enable time	DIR to A; see Figure 6 ^{[4][5]}							
		$V_{CC(B)} = 0.8\text{ V}$	-	17.8	-	-	-	-	ns
		$V_{CC(B)} = 1.1\text{ V to }1.3\text{ V}$	-	-	-	-	13.3	14.7	ns
		$V_{CC(B)} = 1.4\text{ V to }1.6\text{ V}$	-	-	-	-	9.1	10.1	ns
		$V_{CC(B)} = 1.65\text{ V to }1.95\text{ V}$	-	-	-	-	8.6	9.6	ns
		$V_{CC(B)} = 2.3\text{ V to }2.7\text{ V}$	-	-	-	-	6.7	7.5	ns
		$V_{CC(B)} = 3.0\text{ V to }3.6\text{ V}$	-	-	-	-	7.1	7.9	ns
		DIR to B; see Figure 6 ^{[4][5]}							
		$V_{CC(B)} = 0.8\text{ V}$	-	15.2	-	-	-	-	ns
		$V_{CC(B)} = 1.1\text{ V to }1.3\text{ V}$	-	-	-	-	11.8	13.1	ns
		$V_{CC(B)} = 1.4\text{ V to }1.6\text{ V}$	-	-	-	-	9.2	10.2	ns
		$V_{CC(B)} = 1.65\text{ V to }1.95\text{ V}$	-	-	-	-	8.4	9.3	ns
		$V_{CC(B)} = 2.3\text{ V to }2.7\text{ V}$	-	-	-	-	7.5	8.3	ns
		$V_{CC(B)} = 3.0\text{ V to }3.6\text{ V}$	-	-	-	-	7.1	7.9	ns

Table 8. Dynamic characteristics ...continued

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 7](#).

Symbol	Parameter	Conditions	25 °C			−40 °C to +125 °C			Unit
			Min	Typ ^[1]	Max	Min	Max (85 °C)	Max (125 °C)	
Power dissipation capacitance									
C _{PD}	power dissipation capacitance	A port: (direction A to B); B port: (direction B to A)	[6] [7]						
		V _{CC(A)} = V _{CC(B)} = 0.8 V	-	1	-	-	-	-	pF
		V _{CC(A)} = V _{CC(B)} = 1.2 V	-	2	-	-	-	-	pF
		V _{CC(A)} = V _{CC(B)} = 1.5 V	-	2	-	-	-	-	pF
		V _{CC(A)} = V _{CC(B)} = 1.8 V	-	2	-	-	-	-	pF
		V _{CC(A)} = V _{CC(B)} = 2.5 V	-	2	-	-	-	-	pF
		V _{CC(A)} = V _{CC(B)} = 3.3 V	-	2	-	-	-	-	pF
		A port: (direction B to A); B port: (direction A to B)	[6] [7]						
		V _{CC(A)} = V _{CC(B)} = 0.8V	-	9	-	-	-	-	pF
		V _{CC(A)} = V _{CC(B)} = 1.2 V	-	11	-	-	-	-	pF
		V _{CC(A)} = V _{CC(B)} = 1.5 V	-	11	-	-	-	-	pF
		V _{CC(A)} = V _{CC(B)} = 1.8 V	-	12	-	-	-	-	pF
		V _{CC(A)} = V _{CC(B)} = 2.5 V	-	14	-	-	-	-	pF
		V _{CC(A)} = V _{CC(B)} = 3.3 V	-	17	-	-	-	-	pF

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

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

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

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

[5] The enable time is a calculated value using the formula shown in [Section 13.4 "Enable times"](#).

[6] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

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

f_i = input frequency in MHz;

f_o = output frequency in MHz;

C_L = load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

Σ(C_L × V_{CC}² × f_o) = sum of the outputs.

[7] f_i = 10 MHz; V_i = GND to V_{CC}; t_r = t_f = 1 ns; C_L = 0 pF; R_L = ∞ Ω.

12. Waveforms

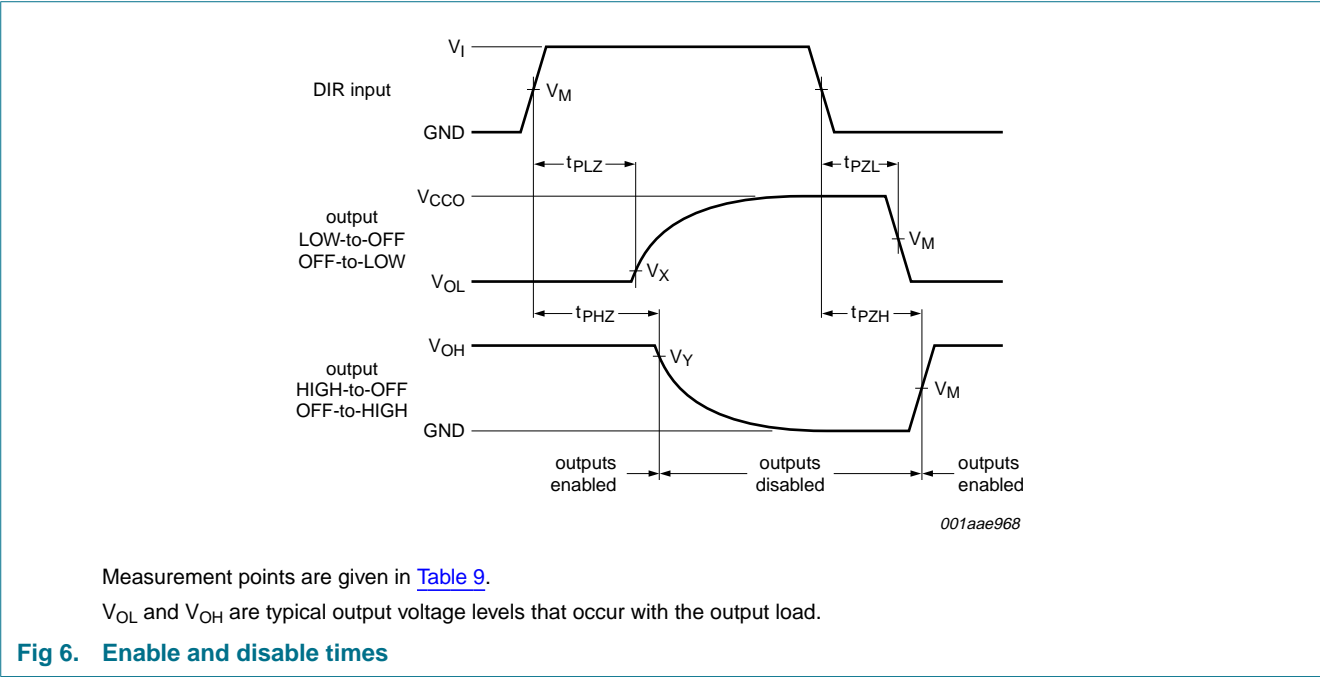
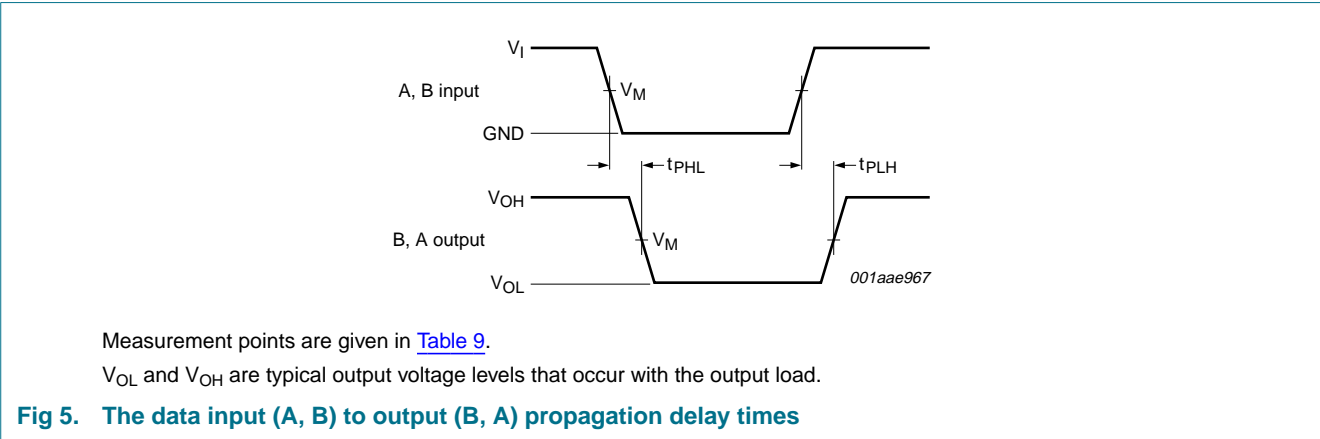
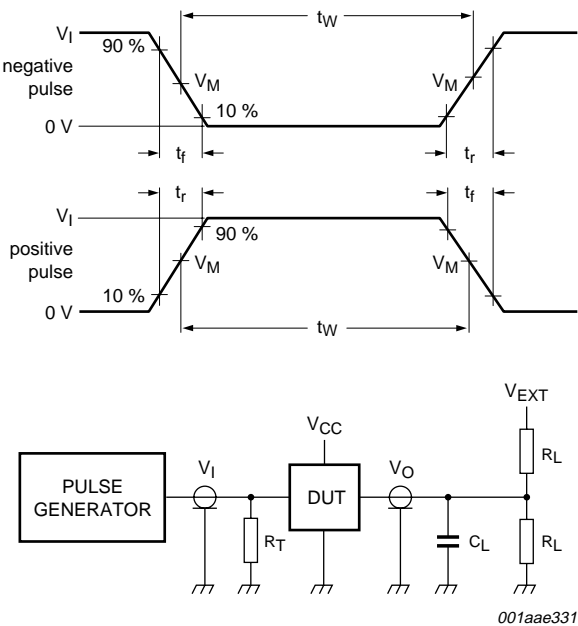


Table 9. Measurement points

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

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

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



Test data is given in [Table 10](#).
 R_L = Load resistance.
 C_L = Load capacitance including jig and probe capacitance.
 R_T = Termination resistance.
 V_{EXT} = External voltage for measuring switching times.

Fig 7. Load circuitry for switching times

Table 10. Test data

Supply voltage	Input		Load		V_{EXT}		
$V_{CC(A)}, V_{CC(B)}$	V_I ^[1]	$\Delta t/\Delta V$ ^[2]	C_L	R_L	t_{PLH}, t_{PHL}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ} ^[3]
1.1 V to 1.6 V	V_{CCI}	$\leq 1.0 \text{ ns/V}$	15 pF	2 k Ω	open	GND	$2 \times V_{CCO}$
1.65 V to 2.7 V	V_{CCI}	$\leq 1.0 \text{ ns/V}$	15 pF	2 k Ω	open	GND	$2 \times V_{CCO}$
3.0 V to 3.6 V	V_{CCI}	$\leq 1.0 \text{ ns/V}$	15 pF	2 k Ω	open	GND	$2 \times V_{CCO}$

[1] V_{CCI} is the supply voltage associated with the data input port.
[2] $dV/dt \geq 1.0 \text{ V/ns}$
[3] V_{CCO} is the supply voltage associated with the output port.

13. Application information

13.1 Unidirectional logic level-shifting application

The circuit given in [Figure 8](#) is an example of the 74AVC2T45 being used in an unidirectional logic level-shifting application.

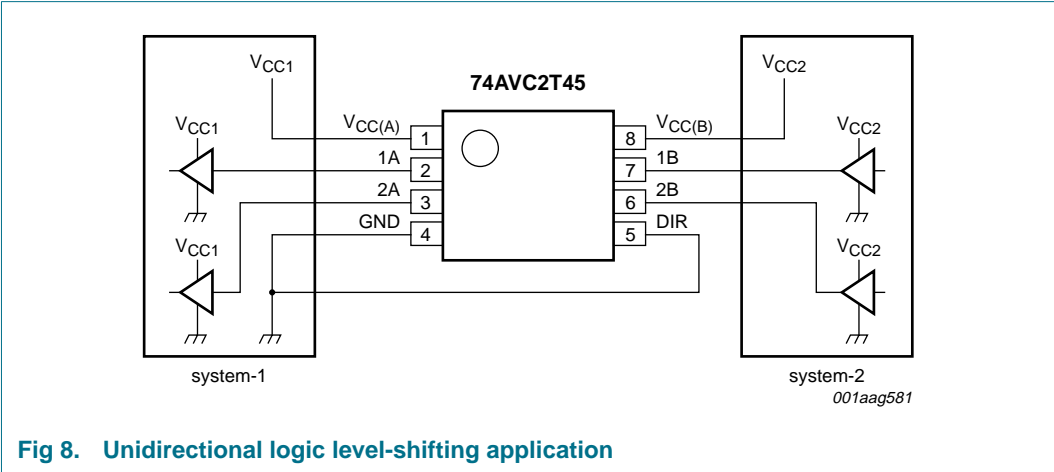


Table 11. Unidirectional logic level-shifting application

Pin	Name	Function	Description
1	V _{CC(A)}	V _{CC1}	supply voltage of system-1 (0.8 V to 3.6 V)
2	1A	OUT1	output level depends on V _{CC1} voltage
3	2A	OUT2	output level depends on V _{CC1} voltage
4	GND	GND	device GND
5	DIR	DIR	the GND (LOW level) determines B port to A port direction
6	2B	IN2	input threshold value depends on V _{CC2} voltage
7	1B	IN1	input threshold value depends on V _{CC2} voltage
8	V _{CC(B)}	V _{CC2}	supply voltage of system-2 (0.8 V to 3.6 V)

13.2 Bidirectional logic level-shifting application

Figure 9 shows the 74AVC2T45 being used in a bidirectional logic level-shifting application. Since the device does not have an output enable (OE) pin, the system designer should take precautions to avoid bus contention between system-1 and system-2 when changing directions.

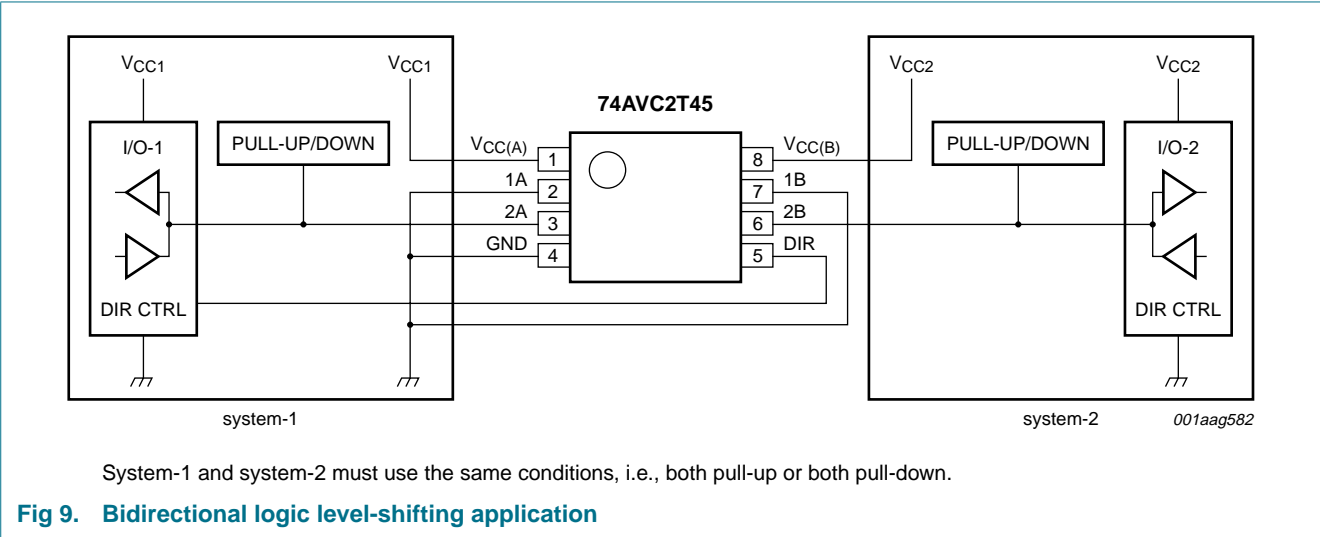


Table 12 gives a sequence that will illustrate data transmission from system-1 to system-2 and then from system-2 to system-1.

Table 12. Bidirectional logic level-shifting application[1][2]

State	DIR CTRL	I/O-1	I/O-2	Description
1	H	output	input	system-1 data to system-2
2	H	Z	Z	system-2 is getting ready to send data to system-1. I/O-1 and I/O-2 are disabled. The bus-line state depends on the pull-up or pull-down.
3	L	Z	Z	DIR bit is set LOW. I/O-1 and I/O-2 still are disabled. The bus-line state depends on the pull-up or pull-down.
4	L	input	output	system-2 data to system-1

[1] System-1 and system-2 must use the same conditions, i.e., both pull-up or both pull-down.

[2] H = HIGH voltage level;
L = LOW voltage level;
Z = high-impedance OFF-state.

13.3 Power-up considerations

The device is designed such that no special power-up sequence is required other than GND being applied first.

Table 13. Typical total supply current ($I_{CC(A)} + I_{CC(B)}$)

$V_{CC(A)}$	$V_{CC(B)}$							Unit
	0 V	0.8 V	1.2 V	1.5 V	1.8 V	2.5 V	3.3 V	
0 V	0	0.1	0.1	0.1	0.1	0.1	0.1	μA
0.8 V	0.1	0.1	0.1	0.1	0.1	0.7	2.3	μA
1.2 V	0.1	0.1	0.1	0.1	0.1	0.3	1.4	μA
1.5 V	0.1	0.1	0.1	0.1	0.1	0.1	0.9	μA
1.8 V	0.1	0.1	0.1	0.1	0.1	0.1	0.5	μA
2.5 V	0.1	0.7	0.3	0.1	0.1	0.1	0.1	μA
3.3 V	0.1	2.3	1.4	0.9	0.5	0.1	0.1	μA

13.4 Enable times

Calculate the enable times for the 74AVC2T45 using the following formulas:

- $t_{en} \text{ (DIR to nA)} = t_{dis} \text{ (DIR to nB)} + t_{pd} \text{ (nB to nA)}$
- $t_{en} \text{ (DIR to nB)} = t_{dis} \text{ (DIR to nA)} + t_{pd} \text{ (nA to nB)}$

In a bidirectional application, these enable times provide the maximum delay from the time the DIR bit is switched until an output is expected. For example, if the 74AVC2T45 initially is transmitting from A to B, then the DIR bit is switched, the B port of the device must be disabled before presenting it with an input. After the B port has been disabled, an input signal applied to it appears on the corresponding A port after the specified propagation delay.

14. Package outline

VSSOP8: plastic very thin shrink small outline package; 8 leads; body width 2.3 mm

SOT765-1

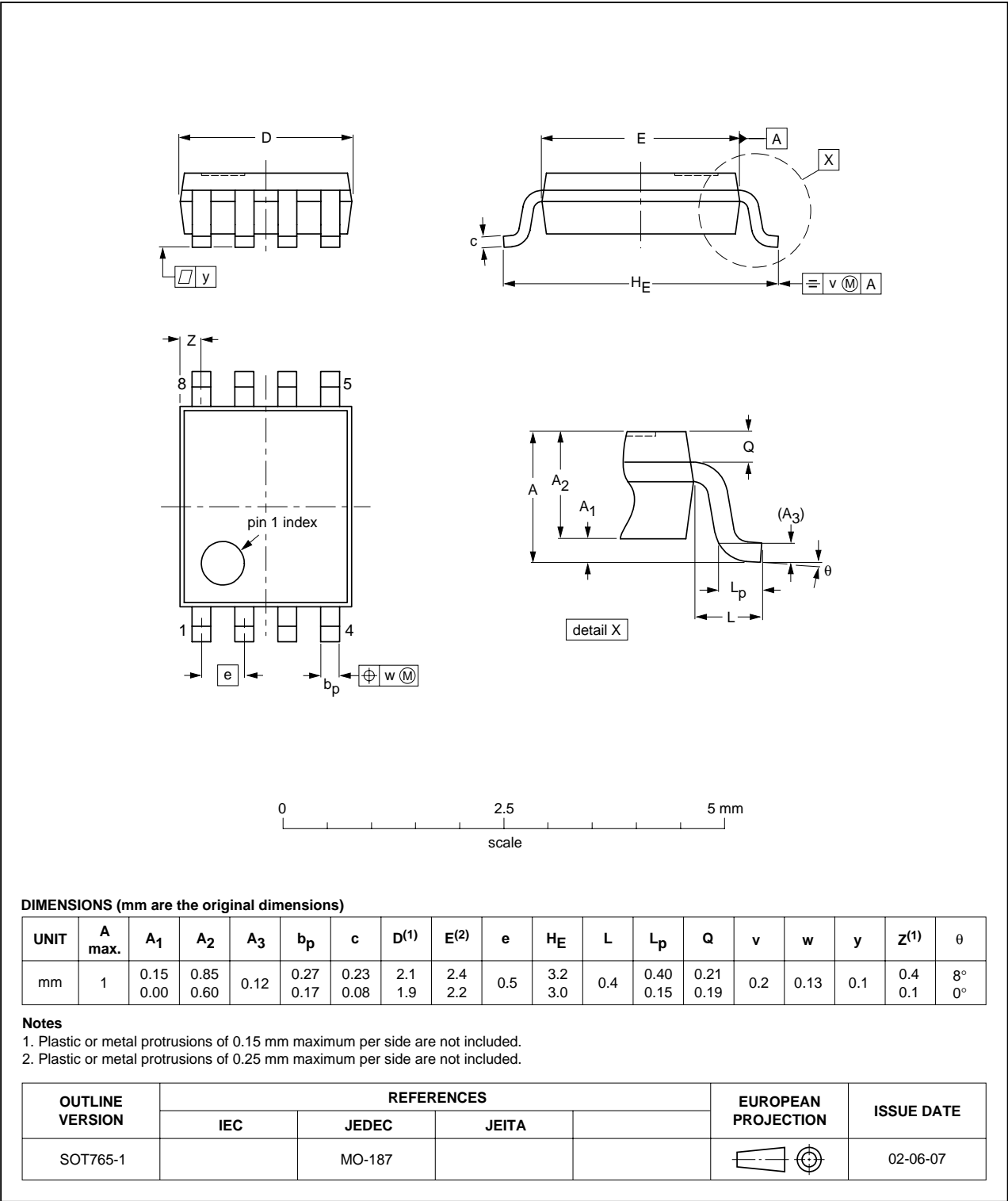


Fig 10. Package outline SOT765-1 (VSSOP8)

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

SOT833-1

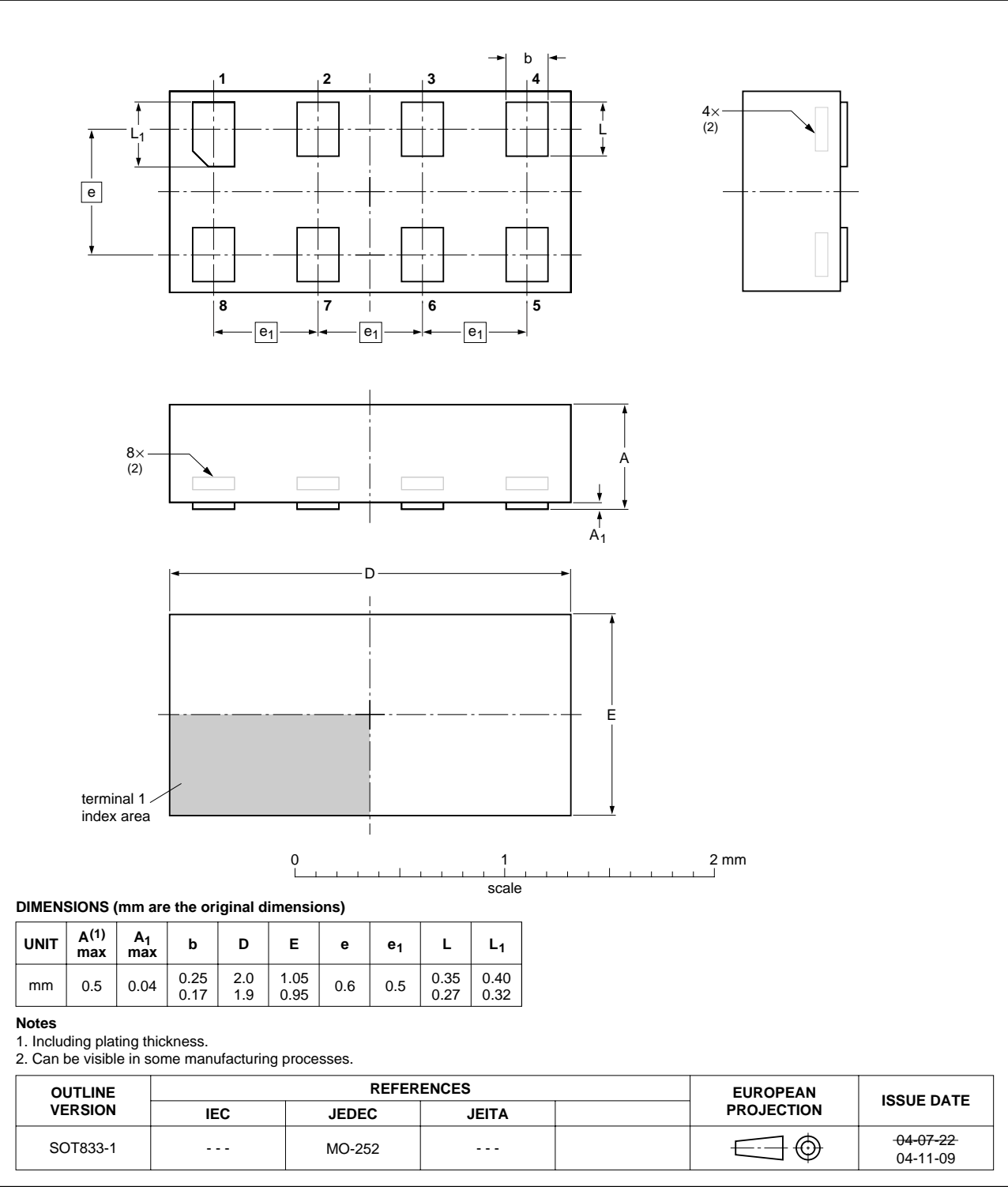


Fig 11. Package outline SOT833-1 (XSON8)

15. Abbreviations

Table 14. Abbreviations

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

16. Revision history

Table 15. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AVC2T45_1	20070703	Product data sheet	-	-

17. Legal information

17.1 Data sheet status

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

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

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

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