74AVC2T45

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

Rev. 04 — 5 May 2009 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 Mbit/s (1.8 V to 3.3 V translation)
  - 320 Mbit/s (< 1.8 V to 3.3 V translation)
  - 320 Mbit/s (translate to 2.5 V or 1.8 V)
  - 280 Mbit/s (translate to 1.5 V)
  - 240 Mbit/s (translate to 1.2 V)
- Suspend mode
- Latch-up performance exceeds 100 mA per JESD 78 Class II

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- 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
- Multiple 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
74AVC2T45DP	–40 °C to +125 °C	TSSOP8	plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm	SOT505-2
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
74AVC2T45GD	–40 °C to +125 °C	XSON8U	plastic extremely thin small outline package; no leads; 8 terminals; UTLP based; body 3 × 2 × 0.5 mm	SOT996-2

4. Marking

Table 2. Marking

Type number	Marking code[1]
74AVC2T45DP	B45
74AVC2T45DC	B45
74AVC2T45GT	B45
74AVC2T45GD	B45

[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram

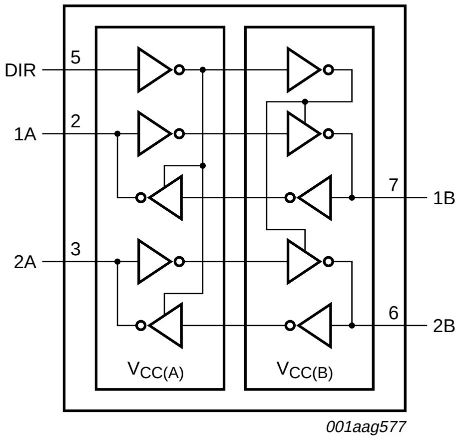


Fig 1. Logic symbol

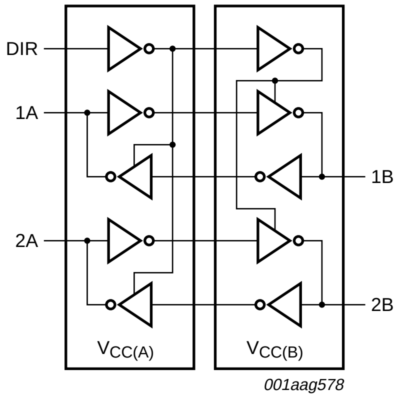


Fig 2. Logic diagram

6. Pinning information

6.1 Pinning

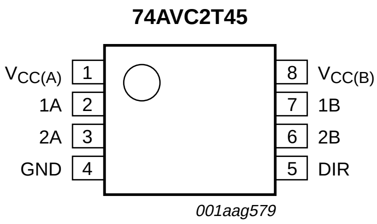


Fig 3. Pin configuration SOT505-2 (TSSOP8) and SOT765-1 (VSSOP8)

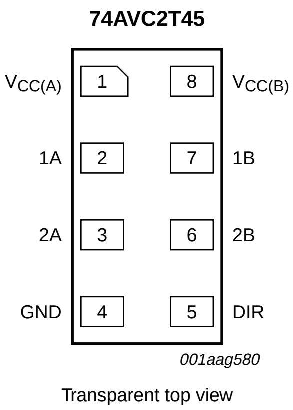


Fig 4. Pin configuration SOT833-1 (XSON8)

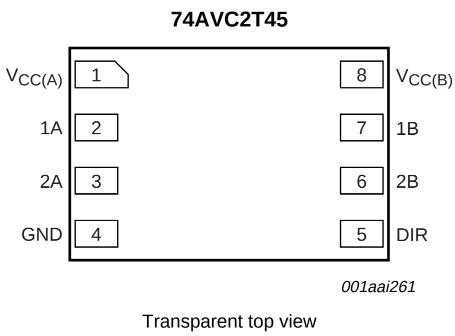


Fig 5. Pin configuration SOT996-2 (XSON8U)

6.2 Pin description

Table 3. Pin description

Symbol	Pin	Description
$V_{CC(A)}$	1	supply voltage A (referenced to pins 1A, 2A 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 B (referenced to pins 1B and 2B)

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 A			–0.5	+4.6	V
$V_{CC(B)}$	supply voltage 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_{CCO}		-	±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 TSSOP8 package: above 55 °C the value of P_{tot} derates linearly at 2.5 mW/K.
For VSSOP8 package: above 110 °C the value of P_{tot} derates linearly with 8 mW/K.
For XSON8 and XSON8U packages: above 118 °C the value of P_{tot} derates linearly with 7.8 mW/K.

9. Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions		Min	Max	Unit
$V_{CC(A)}$	supply voltage A			0.8	3.6	V
$V_{CC(B)}$	supply voltage 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	[2]	-	5	ns/V

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

[2] V_{CCI} is the supply voltage associated with the input 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 °C							
V_{OH}	HIGH-level output voltage	$V_I = V_{IH}$					
		I_O = –1.5 mA; $V_{CC(A)} = V_{CC(B)}$ = 0.8 V		-	0.69	-	V
V_{OL}	LOW-level output voltage	$V_I = V_{IL}$					
		I_O = 1.5 mA; $V_{CC(A)} = V_{CC(B)}$ = 0.8 V		-	0.07	-	V
I_I	input leakage current	DIR input; V_I = GND to $V_{CC(A)}$; $V_{CC(A)} = V_{CC(B)}$ = 0.8 V to 3.6 V		-	±0.025	±0.25	μA
I_{OZ}	OFF-state output current	A or B port; V_O = GND or V_{CCO}; $V_{CC(A)} = V_{CC(B)}$ = 0.8 V to 3.6 V	[1]	-	±0.5	±2.5	μA
I_{OFF}	power-off leakage current	A port; V_I or V_O = 0 V to 3.6 V; $V_{CC(A)}$ = 0 V; $V_{CC(B)}$ = 0.8 V to 3.6 V		-	±0.1	±1.0	μA
		B port; V_I or V_O = 0 V to 3.6 V; $V_{CC(B)}$ = 0 V; $V_{CC(A)}$ = 0.8 V to 3.6 V		-	±0.1	±1.0	μA
C_I	input capacitance	DIR input; V_I = GND or 3.3 V; $V_{CC(A)} = V_{CC(B)}$ = 3.3 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 V	[1]	-	4.0	-	pF
T_{amb} = –40 °C to +85 °C							
V_{IH}	HIGH-level input voltage	data input	[2]				
		V_{CCI} = 0.8 V		$0.7V_{CCI}$	-	-	V
		V_{CCI} = 1.1 V to 1.95 V		$0.65V_{CCI}$	-	-	V
		V_{CCI} = 2.3 V to 2.7 V		1.6	-	-	V
		V_{CCI} = 3.0 V to 3.6 V		2.0	-	-	V
		DIR input	[2]				
		V_{CCI} = 0.8 V		$0.7V_{CC(A)}$	-	-	V
		V_{CCI} = 1.1 V to 1.95 V		$0.65V_{CC(A)}$	-	-	V
		V_{CCI} = 2.3 V to 2.7 V		1.6	-	-	V
		V_{CCI} = 3.0 V to 3.6 V		2.0	-	-	V
V_{IL}	LOW-level input voltage	data input	[2]				
		V_{CCI} = 0.8 V		-	-	$0.3V_{CCI}$	V
		V_{CCI} = 1.1 V to 1.95 V		-	-	$0.35V_{CCI}$	V
		V_{CCI} = 2.3 V to 2.7 V		-	-	0.7	V
		V_{CCI} = 3.0 V to 3.6 V		-	-	0.9	V
		DIR input	[2]				
		V_{CCI} = 0.8 V		-	-	$0.3V_{CC(A)}$	V
		V_{CCI} = 1.1 V to 1.95 V		-	-	$0.35V_{CC(A)}$	V
		V_{CCI} = 2.3 V to 2.7 V		-	-	0.7	V
		V_{CCI} = 3.0 V to 3.6 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	$V_I = V_{IH}$					
		$I_O = -100$ µA; $V_{CC(A)} = V_{CC(B)} = 0.8$ V to 3.6 V	[1]	$V_{CCO} - 0.1$	-	-	V
		$I_O = -3$ mA; $V_{CC(A)} = V_{CC(B)} = 1.1$ V		0.85	-	-	V
		$I_O = -6$ mA; $V_{CC(A)} = V_{CC(B)} = 1.4$ V		1.05	-	-	V
		$I_O = -8$ mA; $V_{CC(A)} = V_{CC(B)} = 1.65$ V		1.2	-	-	V
		$I_O = -9$ mA; $V_{CC(A)} = V_{CC(B)} = 2.3$ V		1.75	-	-	V
		$I_O = -12$ mA; $V_{CC(A)} = V_{CC(B)} = 3.0$ V		2.3	-	-	V
V_{OL}	LOW-level output voltage	$V_I = V_{IL}$					
		$I_O = 100$ µA; $V_{CC(A)} = V_{CC(B)} = 0.8$ V to 3.6 V		-	-	0.1	V
		$I_O = 3$ mA; $V_{CC(A)} = V_{CC(B)} = 1.1$ V		-	-	0.25	V
		$I_O = 6$ mA; $V_{CC(A)} = V_{CC(B)} = 1.4$ V		-	-	0.35	V
		$I_O = 8$ mA; $V_{CC(A)} = V_{CC(B)} = 1.65$ V		-	-	0.45	V
		$I_O = 9$ mA; $V_{CC(A)} = V_{CC(B)} = 2.3$ V		-	-	0.55	V
		$I_O = 12$ mA; $V_{CC(A)} = V_{CC(B)} = 3.0$ V		-	-	0.7	V
I_I	input leakage current	DIR input; V_I = GND to $V_{CC(A)}$; $V_{CC(A)} = V_{CC(B)} = 0.8$ V to 3.6 V		-	-	±1.0	µA
I_{OZ}	OFF-state output current	A or B port; V_O = GND or V_{CCO}; $V_{CC(A)} = V_{CC(B)} = 0.8$ V to 3.6 V	[1]	-	-	±5.0	µA
I_{OFF}	power-off leakage current	A port; V_I or V_O = 0 V to 3.6 V; $V_{CC(A)} = 0$ V; $V_{CC(B)} = 0.8$ V to 3.6 V		-	-	±5.0	µA
		B port; V_I or V_O = 0 V to 3.6 V; $V_{CC(B)} = 0$ V; $V_{CC(A)} = 0.8$ V to 3.6 V		-	-	±5.0	µA
I_{CC}	supply current	A port; V_I = GND or V_{CCI}; $I_O = 0$ A	[2]				
		$V_{CC(A)} = 0.8$ V to 3.6 V; $V_{CC(B)} = 0.8$ V to 3.6 V		-	-	8.0	µA
		$V_{CC(A)} = 3.6$ V; $V_{CC(B)} = 0$ V		-	-	8.0	µA
		$V_{CC(A)} = 0$ V; $V_{CC(B)} = 3.6$ V		−2	0	-	µA
		B port; V_I = GND or V_{CCI}; $I_O = 0$ A	[2]				
		$V_{CC(A)} = 0.8$ V to 3.6 V; $V_{CC(B)} = 0.8$ V to 3.6 V		-	-	8.0	µA
		$V_{CC(A)} = 3.6$ V; $V_{CC(B)} = 0$ V		−2	0	-	µA
		$V_{CC(A)} = 0$ V; $V_{CC(B)} = 3.6$ V		-	-	8.0	µA
		A plus B port ($I_{CC(A)} + I_{CC(B)}$); $I_O = 0$ A; V_I = GND or V_{CCI}; $V_{CC(A)} = 0.8$ V to 3.6 V; $V_{CC(B)} = 0.8$ V to 3.6 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 °C to +125 °C							
V_{IH}	HIGH-level input voltage	data input	[2]				
		V_{CCI} = 0.8 V		$0.7V_{CCI}$	-	-	V
		V_{CCI} = 1.1 V to 1.95 V		$0.65V_{CCI}$	-	-	V
		V_{CCI} = 2.3 V to 2.7 V		1.6	-	-	V
		V_{CCI} = 3.0 V to 3.6 V		2.0	-	-	V
		DIR input	[2]				
		V_{CCI} = 0.8 V		$0.7V_{CC(A)}$	-	-	V
		V_{CCI} = 1.1 V to 1.95 V		$0.65V_{CC(A)}$	-	-	V
		V_{CCI} = 2.3 V to 2.7 V		1.6	-	-	V
		V_{CCI} = 3.0 V to 3.6 V		2.0	-	-	V
V_{IL}	LOW-level input voltage	data input	[2]				
		V_{CCI} = 0.8 V		-	-	$0.3V_{CCI}$	V
		V_{CCI} = 1.1 V to 1.95 V		-	-	$0.35V_{CCI}$	V
		V_{CCI} = 2.3 V to 2.7 V		-	-	0.7	V
		V_{CCI} = 3.0 V to 3.6 V		-	-	0.9	V
		DIR input	[2]				
		V_{CCI} = 0.8 V		-	-	$0.3V_{CC(A)}$	V
		V_{CCI} = 1.1 V to 1.95 V		-	-	$0.35V_{CC(A)}$	V
		V_{CCI} = 2.3 V to 2.7 V		-	-	0.7	V
		V_{CCI} = 3.0 V to 3.6 V		-	-	0.9	V
V_{OH}	HIGH-level output voltage	$V_I = V_{IH}$					
		I_O = −100 µA; $V_{CC(A)} = V_{CC(B)}$ = 0.8 V to 3.6 V	[1]	V_{CCO} − 0.1	-	-	V
		I_O = −3 mA; $V_{CC(A)} = V_{CC(B)}$ = 1.1 V		0.85	-	-	V
		I_O = −6 mA; $V_{CC(A)} = V_{CC(B)}$ = 1.4 V		1.05	-	-	V
		I_O = −8 mA; $V_{CC(A)} = V_{CC(B)}$ = 1.65 V		1.2	-	-	V
		I_O = −9 mA; $V_{CC(A)} = V_{CC(B)}$ = 2.3 V		1.75	-	-	V
		I_O = −12 mA; $V_{CC(A)} = V_{CC(B)}$ = 3.0 V		2.3	-	-	V
V_{OL}	LOW-level output voltage	$V_I = V_{IL}$					
		I_O = 100 µA; $V_{CC(A)} = V_{CC(B)}$ = 0.8 V to 3.6 V		-	-	0.1	V
		I_O = 3 mA; $V_{CC(A)} = V_{CC(B)}$ = 1.1 V		-	-	0.25	V
		I_O = 6 mA; $V_{CC(A)} = V_{CC(B)}$ = 1.4 V		-	-	0.35	V
		I_O = 8 mA; $V_{CC(A)} = V_{CC(B)}$ = 1.65 V		-	-	0.45	V
		I_O = 9 mA; $V_{CC(A)} = V_{CC(B)}$ = 2.3 V		-	-	0.55	V
		I_O = 12 mA; $V_{CC(A)} = V_{CC(B)}$ = 3.0 V		-	-	0.7	V
I_I	input leakage current	DIR input; V_I = GND to $V_{CC(A)}$; $V_{CC(A)} = V_{CC(B)}$ = 0.8 V to 3.6 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 = GND or V_{CCO}; $V_{CC(A)} = V_{CC(B)}$ = 0.8 V to 3.6 V	[1]	-	-	±7.5	µA
I_{OFF}	power-off leakage current	A port; V_I or V_O = 0 V to 3.6 V; $V_{CC(B)}$ = 0 V; $V_{CC(A)}$ = 0.8 V to 3.6 V		-	-	±35	µA
		B port; V_I or V_O = 0 V to 3.6 V; $V_{CC(B)}$ = 0 V; $V_{CC(A)}$ = 0.8 V to 3.6 V		-	-	±35	µA
I_{CC}	supply current	A port; V_I = GND or V_{CCI}; I_O = 0 A	[2]				
		$V_{CC(A)}$ = 0.8 V to 3.6 V; $V_{CC(B)}$ = 0.8 V to 3.6 V		-	-	11.5	µA
		$V_{CC(A)}$ = 3.6 V; $V_{CC(B)}$ = 0 V		-	-	11.5	µA
		$V_{CC(A)}$ = 0 V; $V_{CC(B)}$ = 3.6 V		–8	0	-	µA
		B port; V_I = GND or V_{CCI}; I_O = 0 A	[2]				
		$V_{CC(A)}$ = 0.8 V to 3.6 V; $V_{CC(B)}$ = 0.8 V to 3.6 V		-	-	11.5	µA
		$V_{CC(A)}$ = 3.6 V; $V_{CC(B)}$ = 0 V		–8	0	-	µA
		$V_{CC(A)}$ = 0 V; $V_{CC(B)}$ = 3.6 V		-	-	11.5	µA
		A plus B port ($I_{CC(A)} + I_{CC(B)}$); I_O = 0 A; V_I = GND or V_{CCI}; $V_{CC(A)}$ = 0.8 V to 3.6 V; $V_{CC(B)}$ = 0.8 V to 3.6 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 8.

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 6	[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 6	[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 7	[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 7	[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 8.

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 7 [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 7 [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

Table 8. Dynamic characteristics *...continued*

Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 8.

Symbol	Parameter	Conditions		25 °C			–40 °C to +125 °C			Unit
				Min	Typ[1]	Max	Min	Max (85 °C)	Max (125 °C)	
$V_{CC(A)}$ = 1.1 V to 1.3 V										
t_{pd}	propagation delay	A to B; see Figure 6	[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 6	[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
t_{dis}	disable time	DIR to A; see Figure 7	[3]							
		$V_{CC(B)}$ = 0.8 V		-	4.9	-	-	-	-	ns
		$V_{CC(B)}$ = 1.1 V to 3.6 V		-	-	-	2.2	8.8	9.7	ns
		DIR to B; see Figure 7	[3]							
		$V_{CC(B)}$ = 0.8 V		-	9.2	-	-	-	-	ns
		$V_{CC(B)}$ = 1.1 V to 1.3 V		-	-	-	2.2	8.4	9.2	ns
		$V_{CC(B)}$ = 1.4 V to 1.6 V		-	-	-	1.8	6.7	7.4	ns
		$V_{CC(B)}$ = 1.65 V to 1.95 V		-	-	-	2.0	6.9	7.6	ns
		$V_{CC(B)}$ = 2.3 V to 2.7 V		-	-	-	1.7	6.2	6.9	ns
		$V_{CC(B)}$ = 3.0 V to 3.6 V		-	-	-	2.4	7.2	8.0	ns

Table 8. Dynamic characteristics *...continued*

Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 8.

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 7	[4][5]							
		$V_{CC(B)}$ = 0.8 V		-	17.3	-	-	-	-	ns
		$V_{CC(B)}$ = 1.1 V to 1.3 V		-	-	-	-	17.4	19.1	ns
		$V_{CC(B)}$ = 1.4 V to 1.6 V		-	-	-	-	14.7	16.2	ns
		$V_{CC(B)}$ = 1.65 V to 1.95 V		-	-	-	-	14.6	16.1	ns
		$V_{CC(B)}$ = 2.3 V to 2.7 V		-	-	-	-	13.4	14.9	ns
		$V_{CC(B)}$ = 3.0 V to 3.6 V		-	-	-	-	14.3	15.9	ns
		DIR to B; see Figure 7	[4][5]							
		$V_{CC(B)}$ = 0.8 V		-	17.6	-	-	-	-	ns
		$V_{CC(B)}$ = 1.1 V to 1.3 V		-	-	-	-	17.8	19.6	ns
		$V_{CC(B)}$ = 1.4 V to 1.6 V		-	-	-	-	15.6	17.2	ns
		$V_{CC(B)}$ = 1.65 V to 1.95 V		-	-	-	-	14.9	16.5	ns
		$V_{CC(B)}$ = 2.3 V to 2.7 V		-	-	-	-	14.5	16.0	ns
		$V_{CC(B)}$ = 3.0 V to 3.6 V		-	-	-	-	14.9	16.5	ns
$V_{CC(A)}$ = 1.4 V to 1.6 V										
t_{pd}	propagation delay	A to B; see Figure 6	[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 6	[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

Table 8. Dynamic characteristics *...continued*

Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 8.

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 7	[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 7	[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
t_{en}	enable time	DIR to A; see Figure 7	[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 7	[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

Table 8. Dynamic characteristics *...continued*

Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 8.

Symbol	Parameter	Conditions		25 °C			−40 °C to +125 °C			Unit
				Min	Typ[1]	Max	Min	Max (85 °C)	Max (125 °C)	
$V_{CC(A)}$ = 1.65 V to 1.95 V										
t_{pd}	propagation delay	A to B; see Figure 6	[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 6	[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
t_{dis}	disable time	DIR to A; see Figure 7	[3]							
		$V_{CC(B)}$ = 0.8 V		-	3.7	-	-	-	-	ns
		$V_{CC(B)}$ = 1.1 V to 3.6 V		-	-	-	1.6	5.5	6.1	ns
		DIR to B; see Figure 7	[3]							
		$V_{CC(B)}$ = 0.8 V		-	8.8	-	-	-	-	ns
		$V_{CC(B)}$ = 1.1 V to 1.3 V		-	-	-	1.8	7.7	8.5	ns
		$V_{CC(B)}$ = 1.4 V to 1.6 V		-	-	-	1.8	5.7	6.3	ns
		$V_{CC(B)}$ = 1.65 V to 1.95 V		-	-	-	1.4	5.8	6.4	ns
		$V_{CC(B)}$ = 2.3 V to 2.7 V		-	-	-	1.0	4.5	5.0	ns
		$V_{CC(B)}$ = 3.0 V to 3.6 V		-	-	-	1.5	5.2	5.8	ns

Table 8. Dynamic characteristics *...continued*

Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 8.

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 7	[4][5]							
		$V_{CC(B)}$ = 0.8 V		-	16.5	-	-	-	-	ns
		$V_{CC(B)}$ = 1.1 V to 1.3 V		-	-	-	-	13.8	15.3	ns
		$V_{CC(B)}$ = 1.4 V to 1.6 V		-	-	-	-	10.3	11.4	ns
		$V_{CC(B)}$ = 1.65 V to 1.95 V		-	-	-	-	10.2	11.3	ns
		$V_{CC(B)}$ = 2.3 V to 2.7 V		-	-	-	-	8.4	9.3	ns
		$V_{CC(B)}$ = 3.0 V to 3.6 V		-	-	-	-	8.9	9.9	ns
		DIR to B; see Figure 7	[4][5]							
		$V_{CC(B)}$ = 0.8 V		-	15.9	-	-	-	-	ns
		$V_{CC(B)}$ = 1.1 V to 1.3 V		-	-	-	-	13.2	14.6	ns
		$V_{CC(B)}$ = 1.4 V to 1.6 V		-	-	-	-	10.6	11.8	ns
		$V_{CC(B)}$ = 1.65 V to 1.95 V		-	-	-	-	9.8	10.9	ns
		$V_{CC(B)}$ = 2.3 V to 2.7 V		-	-	-	-	8.9	9.9	ns
		$V_{CC(B)}$ = 3.0 V to 3.6 V		-	-	-	-	8.6	9.6	ns
$V_{CC(A)}$ = 2.3 V to 2.7 V										
t_{pd}	propagation delay	A to B; see Figure 6	[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 6	[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

Table 8. Dynamic characteristics *...continued*

Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 8.

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 7	[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 7	[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
t_{en}	enable time	DIR to A; see Figure 7	[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 7	[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

Table 8. Dynamic characteristics *...continued*

Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 8.

Symbol	Parameter	Conditions		25 °C			−40 °C to +125 °C			Unit
				Min	Typ[1]	Max	Min	Max (85 °C)	Max (125 °C)	
$V_{CC(A)}$ = 3.0 V to 3.6 V										
t_{pd}	propagation delay	A to B; see Figure 6	[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 6	[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
t_{dis}	disable time	DIR to A; see Figure 7	[3]							
		$V_{CC(B)}$ = 0.8 V		-	3.4	-	-	-	-	ns
		$V_{CC(B)}$ = 1.1 V to 3.6 V		-	-	-	1.5	4.7	5.2	ns
		DIR to B; see Figure 7	[3]							
		$V_{CC(B)}$ = 0.8 V		-	8.6	-	-	-	-	ns
		$V_{CC(B)}$ = 1.1 V to 1.3 V		-	-	-	1.7	7.2	7.9	ns
		$V_{CC(B)}$ = 1.4 V to 1.6 V		-	-	-	0.7	5.5	6.1	ns
		$V_{CC(B)}$ = 1.65 V to 1.95 V		-	-	-	0.6	5.5	6.1	ns
		$V_{CC(B)}$ = 2.3 V to 2.7 V		-	-	-	0.7	4.1	4.6	ns
		$V_{CC(B)}$ = 3.0 V to 3.6 V		-	-	-	1.7	4.7	5.2	ns

Table 8. Dynamic characteristics *...continued*

Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 8.

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 7	[4][5]							
		$V_{CC(B)}$ = 0.8 V		-	17.8	-	-	-	-	ns
		$V_{CC(B)}$ = 1.1 V to 1.3 V		-	-	-	-	13.3	14.7	ns
		$V_{CC(B)}$ = 1.4 V to 1.6 V		-	-	-	-	9.1	10.1	ns
		$V_{CC(B)}$ = 1.65 V to 1.95 V		-	-	-	-	8.6	9.6	ns
		$V_{CC(B)}$ = 2.3 V to 2.7 V		-	-	-	-	6.7	7.5	ns
		$V_{CC(B)}$ = 3.0 V to 3.6 V		-	-	-	-	7.1	7.9	ns
		DIR to B; see Figure 7	[4][5]							
		$V_{CC(B)}$ = 0.8 V		-	15.2	-	-	-	-	ns
		$V_{CC(B)}$ = 1.1 V to 1.3 V		-	-	-	-	11.8	13.1	ns
		$V_{CC(B)}$ = 1.4 V to 1.6 V		-	-	-	-	9.2	10.2	ns
		$V_{CC(B)}$ = 1.65 V to 1.95 V		-	-	-	-	8.4	9.3	ns
		$V_{CC(B)}$ = 2.3 V to 2.7 V		-	-	-	-	7.5	8.3	ns
		$V_{CC(B)}$ = 3.0 V to 3.6 V		-	-	-	-	7.1	7.9	ns

Table 8. Dynamic characteristics *…continued*

Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 8.

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]							
		$V_{CC(A)} = V_{CC(B)} = 0.8$ V		-	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;

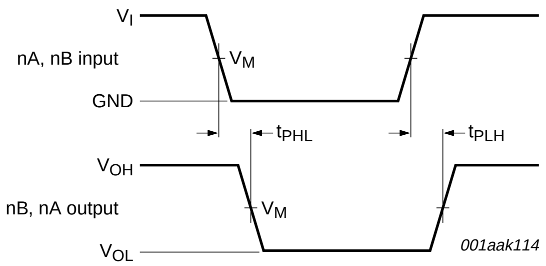
V_{CC} = supply voltage in V;

N = number of inputs switching;

$\Sigma(C_L \times V_{CC}^2 \times f_o)$ = 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; $R_L = \infty\ \Omega$.

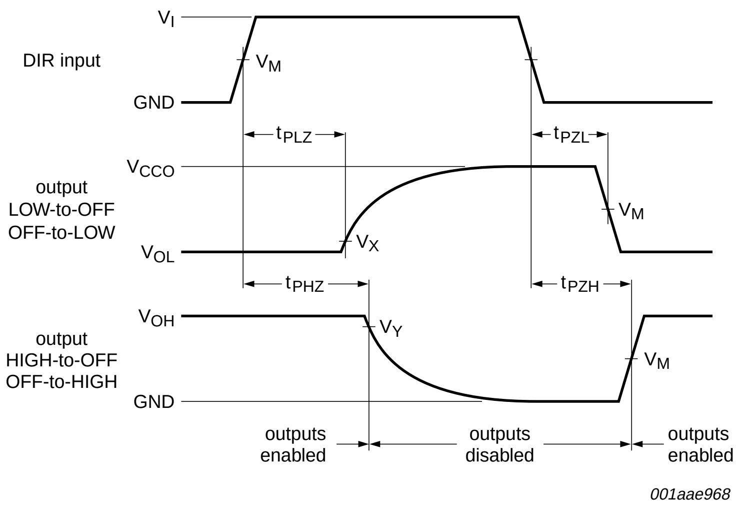
12. Waveforms



Measurement points are given in Table 9.

V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig 6. The data input (nA, nB) to output (nB, nA) propagation delay times



Measurement points are given in Table 9.

V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

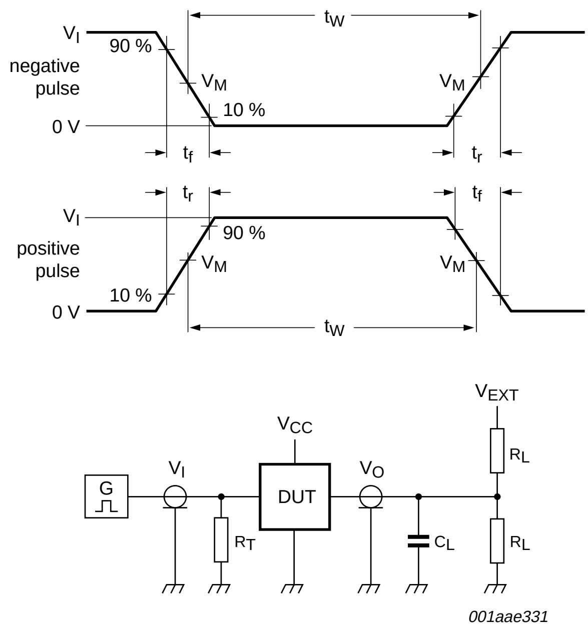
Fig 7. Enable and disable times

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	$0.5V_{CCI}$	$0.5V_{CCO}$	V_{OL} + 0.1 V	V_{OH} – 0.1 V
1.65 V to 2.7 V	$0.5V_{CCI}$	$0.5V_{CCO}$	V_{OL} + 0.15 V	V_{OH} – 0.15 V
3.0 V to 3.6 V	$0.5V_{CCI}$	$0.5V_{CCO}$	V_{OL} + 0.3 V	V_{OH} – 0.3 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 8. 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}	≤ 1.0 ns/V	15 pF	2 kΩ	open	GND	$2V_{CCO}$
1.65 V to 2.7 V	V_{CCI}	≤ 1.0 ns/V	15 pF	2 kΩ	open	GND	$2V_{CCO}$
3.0 V to 3.6 V	V_{CCI}	≤ 1.0 ns/V	15 pF	2 kΩ	open	GND	$2V_{CCO}$

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

[2] dV/dt ≥ 1.0 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 9 is an example of the 74AVC2T45 being used in an unidirectional logic level-shifting application.

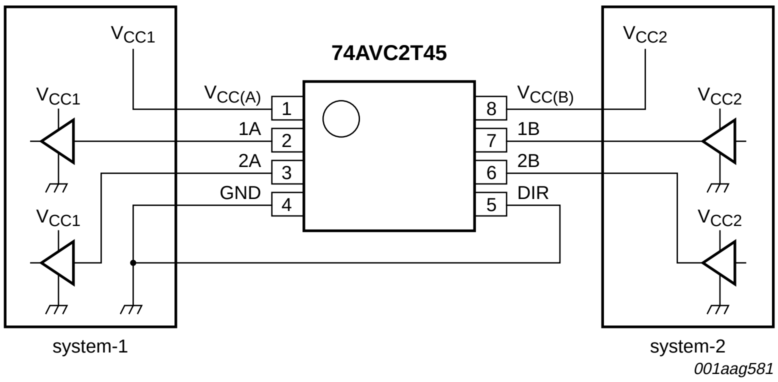


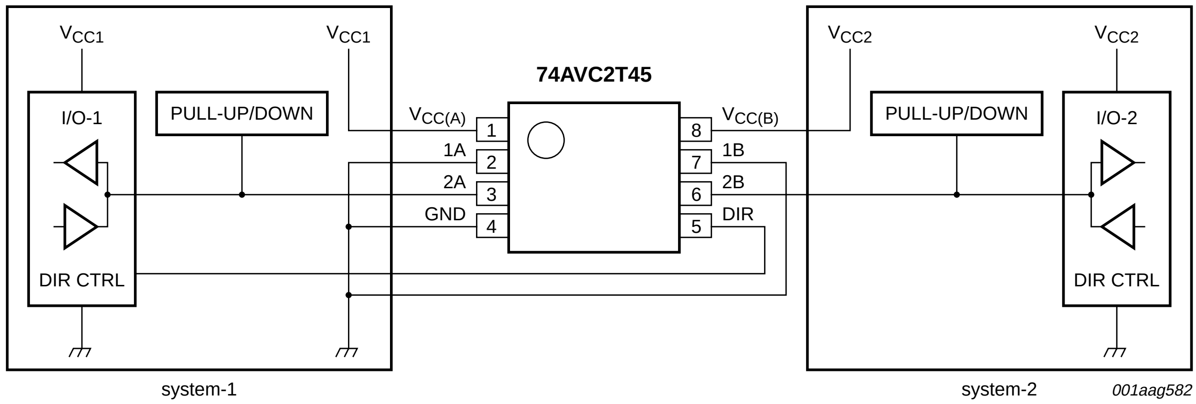
Fig 9. Unidirectional logic level-shifting application

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 10 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.



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

Fig 10. Bidirectional logic level-shifting application

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

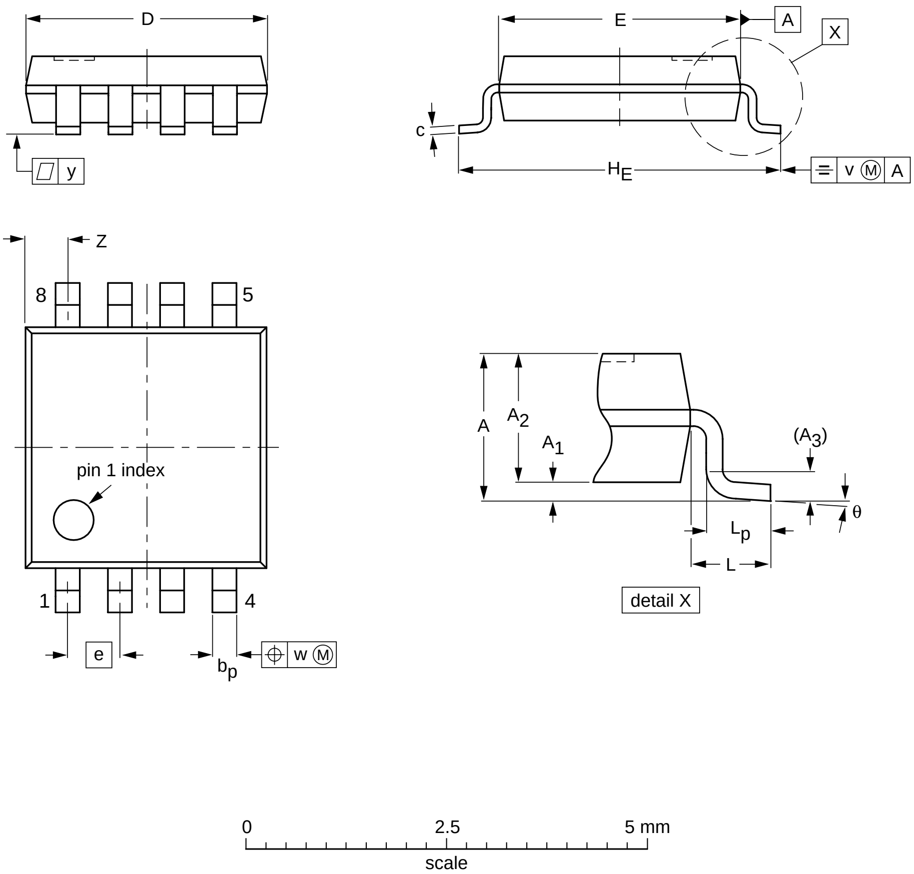
The enable times for the 74AVC2T45 are calculated from the following formulas:

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

TSSOP8: plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm   SOT505-2



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	H_E	L	L_p	v	w	y	$Z^{(1)}$	θ
mm	1.1	0.15 0.00	0.95 0.75	0.25	0.38 0.22	0.18 0.08	3.1 2.9	3.1 2.9	0.65	4.1 3.9	0.5	0.47 0.33	0.2	0.13	0.1	0.70 0.35	8° 0°

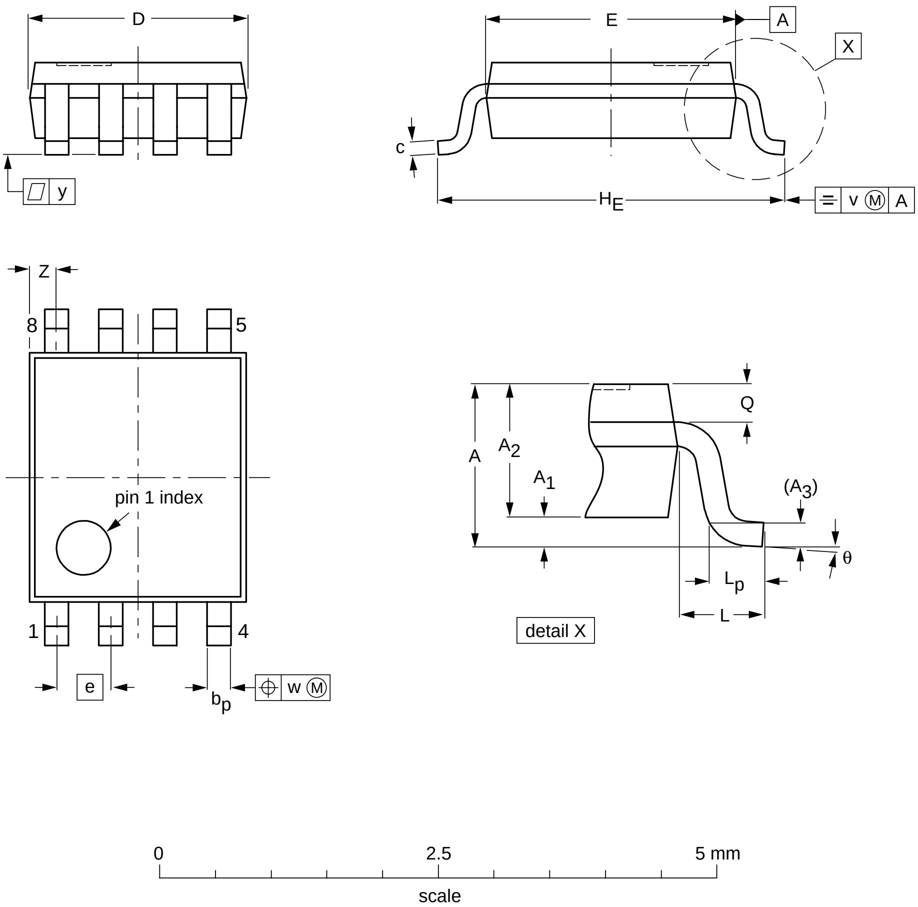
Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT505-2		- - -				02-01-16

Fig 11. Package outline SOT505-2 (TSSOP8)

VSSOP8: plastic very thin shrink small outline package; 8 leads; body width 2.3 mm **SOT765-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D(1)	E(2)	e	H_E	L	L_p	Q	v	w	y	Z(1)	θ
mm	1	0.15 0.00	0.85 0.60	0.12	0.27 0.17	0.23 0.08	2.1 1.9	2.4 2.2	0.5	3.2 3.0	0.4	0.40 0.15	0.21 0.19	0.2	0.13	0.1	0.4 0.1	8° 0°

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

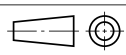
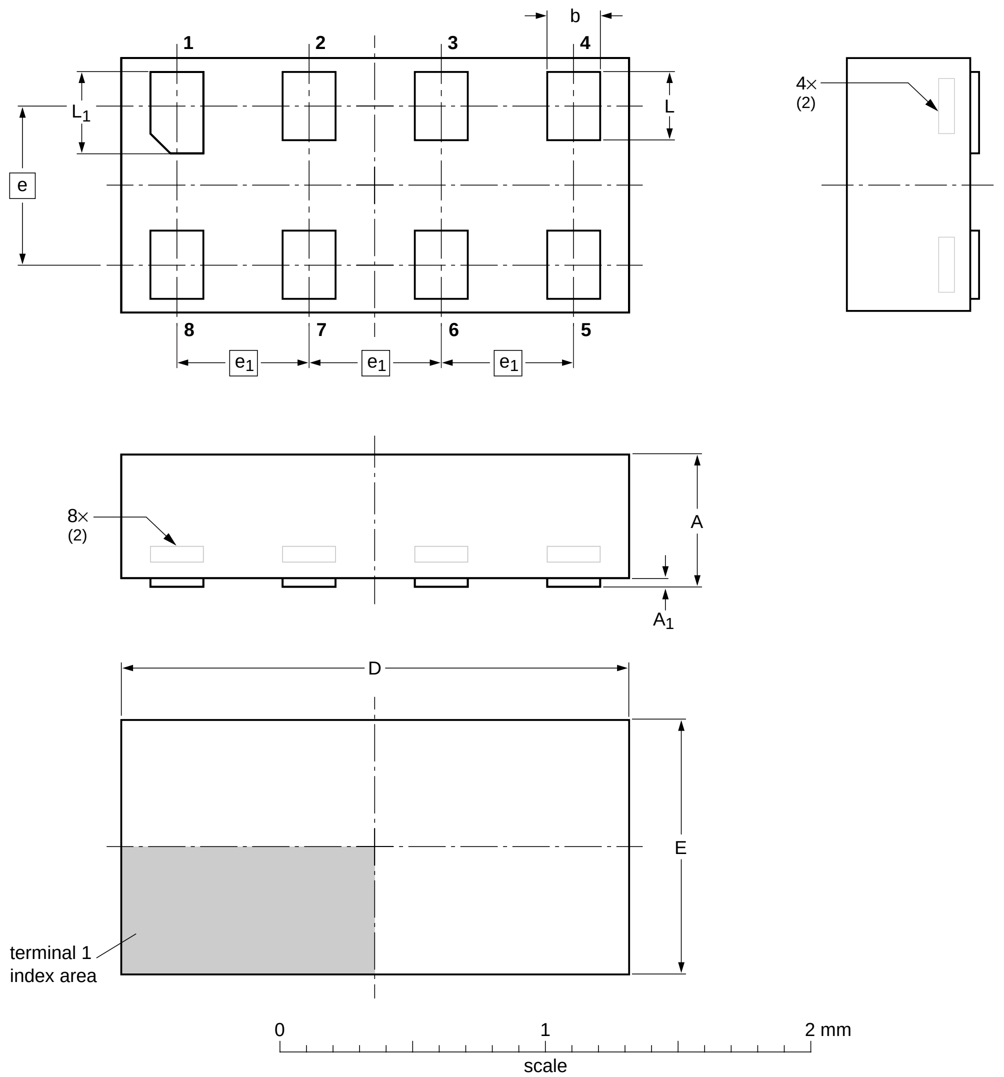
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT765-1		MO-187				02-06-07

Fig 12. 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**



DIMENSIONS (mm are the original dimensions)

UNIT	$A^{(1)}$ max	A_1 max	b	D	E	e	e_1	L	L_1
mm	0.5	0.04	0.25 0.17	2.0 1.9	1.05 0.95	0.6	0.5	0.35 0.27	0.40 0.32

Notes
1. Including plating thickness.
2. Can be visible in some manufacturing processes.

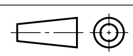
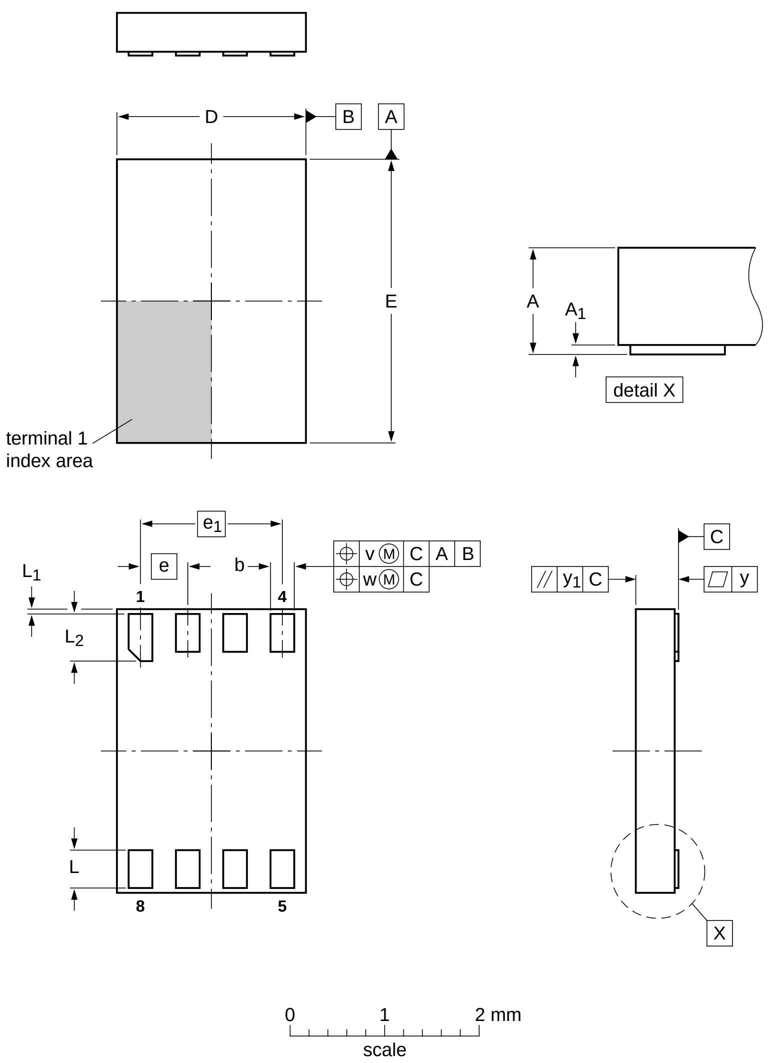
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT833-1	- - -	MO-252	- - -			~~07-11-14~~ 07-12-07

Fig 13. Package outline SOT833-1 (XSON8)

XSON8U: plastic extremely thin small outline package; no leads; 8 terminals; UTLP based; body 3 x 2 x 0.5 mm **SOT996-2**



DIMENSIONS (mm are the original dimensions)

UNIT	A max	A_1	b	D	E	e	e_1	L	L_1	L_2	v	w	y	y_1
mm	0.5	0.05 0.00	0.35 0.15	2.1 1.9	3.1 2.9	0.5	1.5	0.5 0.3	0.15 0.05	0.6 0.4	0.1	0.05	0.05	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT996-2	- - -		- - -			~~07-12-18~~ 07-12-21

Fig 14. Package outline SOT996-2 (XSON8U)

15. Abbreviations

Table 14. Abbreviations

Acronym	Description
CDM	Charged Device Model
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_4	20090505	Product data sheet	-	74AVC2T45_3
Modifications:	• Section 8 "Limiting values": Changed: total power dissipation.			
74AVC2T45_3	20090129	Product data sheet	-	74AVC2T45_2
74AVC2T45_2	20080620	Product data sheet	-	74AVC2T45_1
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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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19. Contents

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