74AVC16245

16-bit transceiver with direction pin; 3.6 V tolerant; 3-state

Rev. 3 — 31 January 2013 **Product data sheet**

1. General description

The 74AVC16245 is a 16-bit transceiver featuring non-inverting 3-state bus compatible outputs in both send and receive directions. The device features two output enable inputs (n$\overline{OE}$) for easy cascading and two send/receive inputs (nDIR) for direction control. Inputs n$\overline{OE}$ control the outputs so that the buses are effectively isolated. This device can be used as two 8-bit transceivers or one 16-bit transceiver.

The 74AVC16245 is designed to have an extremely fast propagation delay and a minimum amount of power consumption.

To ensure the high-impedance output state during power-up or power-down, tie pins n$\overline{OE}$ to V_{CC} through a pull-up resistor (Live Insertion).

A Dynamic Controlled Output (DCO) circuitry is implemented to support termination line drive during transient (see Figure 4 and Figure 5)

2. Features and benefits

- Wide supply voltage range from 1.2 V to 3.6 V
- Complies with JEDEC standards:
  - JESD8-7 (1.2 V to 1.95 V)
  - JESD8-5 (1.8 V to 2.7 V)
  - JESD8-1A (2.7 V to 3.6 V)
- CMOS low power consumption
- Input/output tolerant up to 3.6 V
- Dynamic Controlled Output (DCO) circuit dynamically changes output impedance, resulting in noise reduction without speed degradation
- Low inductance multiple VCC and GND pins to minimize noise and ground bounce
- Supports Live Insertion

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74AVC16245DGG	–40 °C to +85 °C	TSSOP48	plastic thin shrink small outline package; 48 leads; body width 6.1 mm	SOT362-1

nexperia

4. Functional diagram

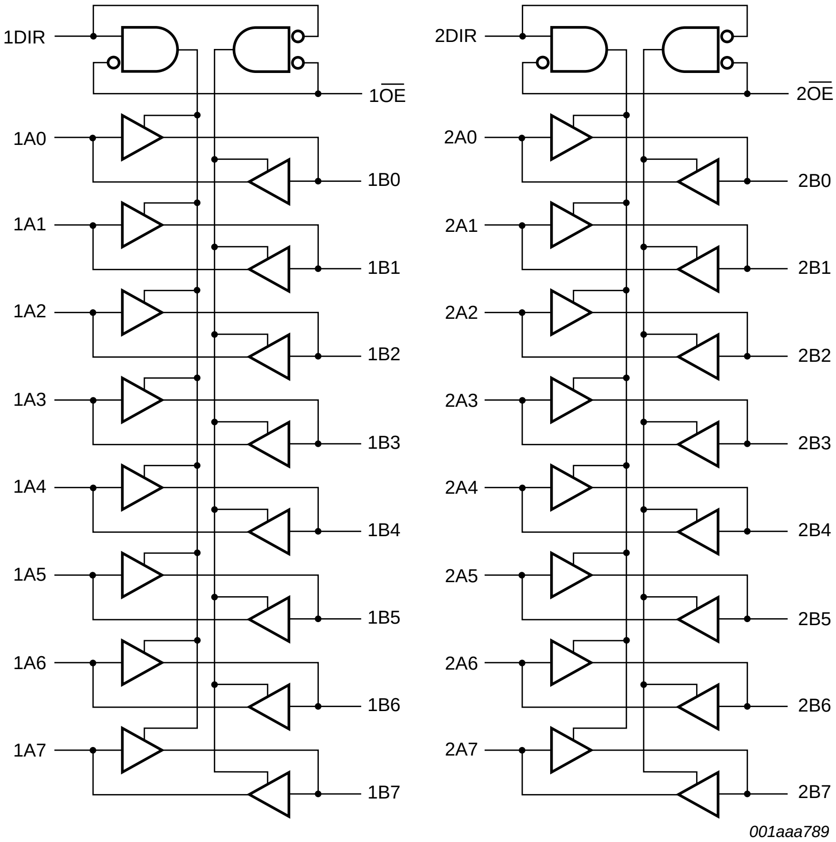


Fig 1. Logic symbol

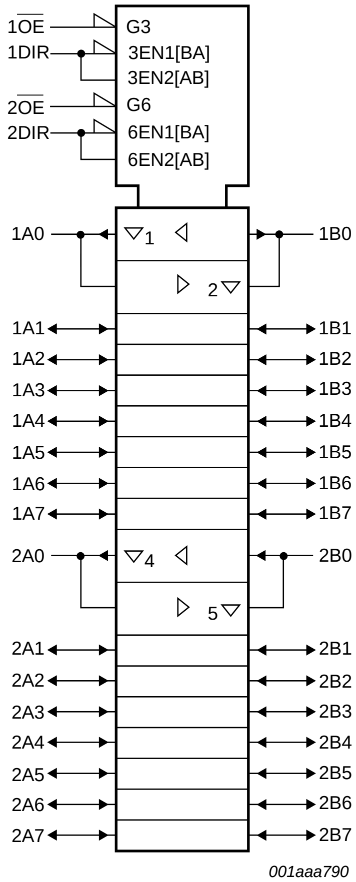


Fig 2. IEC logic symbol

5. Pinning information

5.1 Pinning

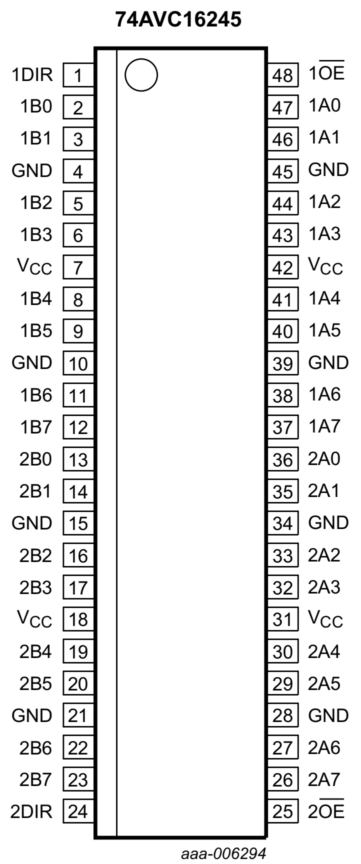


Fig 3. Pin configuration

5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
1DIR, 2DIR	1, 24	direction control input
1B0 to 1B7	2, 3, 5, 6, 8, 9, 11, 12	data input/output
2B0 to 2B7	13, 14, 16, 17, 19, 20, 22, 23	data input/output
GND	4, 10, 15, 21, 28, 34, 39, 45	ground (0 V)
V_{CC}	7, 18, 31, 42	supply voltage
$1\overline{OE}$, $2\overline{OE}$	48, 25	output enable input (active LOW)
1A0 to 1A7	47, 46, 44, 43, 41, 40, 38, 37	data input/output
2A0 to 2A7	36, 35, 33, 32, 30, 29, 27, 26	data input/output

6. Functional description

Table 3. Function table[1]

Inputs		Outputs	
$n\overline{OE}$	nDIR	nAn	nBn
L	L	A = B	inputs
L	H	inputs	B = A
H	X	Z	Z

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

7. Limiting values

Table 4. 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}	supply voltage			−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	output HIGH or LOW	[1]	−0.5	V_{CC} + 0.5	V
		output 3-state	[1]	−0.5	+4.6	V
I_O	output current	V_O = 0 V to V_{CC}		-	±50	mA
I_{CC}	supply current			-	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	[2]	-	500	mW

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

[2] Above 60 °C, the value of P_{tot} derates linearly with 5.5 mW/K.

8. Recommended operating conditions

Table 5. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CC}	supply voltage	according to JEDEC Low Voltage Standards	1.4	-	1.6	V
			1.65	-	1.95	V
			2.3	-	2.7	V
			3.0	-	3.6	V
		for low-voltage applications	1.2	-	3.6	V
V_I	input voltage		0	-	3.6	V
V_O	output voltage	output HIGH or LOW	0	-	V_{CC}	V
		output 3-state	0	-	3.6	V
T_{amb}	ambient temperature	in free air	−40	-	+85	°C
$\Delta t/\Delta V$	input transition rise and fall rate	V_{CC} = 1.4 V to 1.6 V	0	-	40	ns/V
		V_{CC} = 1.65 V to 1.95 V	0	-	30	ns/V
		V_{CC} = 2.3 V to 3.0 V	0	-	20	ns/V
		V_{CC} = 3.0 V to 3.6 V	0	-	10	ns/V

9. Static characteristics

Table 6. Static characteristics

At recommended operating conditions. Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Typ[1]	Max	Unit
T_{amb} = −40 °C to +85 °C						
V_{IH}	HIGH-level input voltage	V_{CC} = 1.2 V	V_{CC}	-	-	V
		V_{CC} = 1.4 V to 1.6 V	0.65 × V_{CC}	0.9	-	V
		V_{CC} = 1.65 V to 1.95 V	0.65 × V_{CC}	0.9	-	V
		V_{CC} = 2.3 V to 2.7 V	1.7	1.2	-	V
		V_{CC} = 3.0 V to 3.6 V	2.0	1.5	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 1.2 V	-	-	GND	V
		V_{CC} = 1.4 V to 1.6 V	-	0.9	0.35 × V_{CC}	V
		V_{CC} = 1.65 V to 1.95 V	-	0.9	0.35 × V_{CC}	V
		V_{CC} = 2.3 V to 2.7 V	-	1.2	0.7	V
		V_{CC} = 3.0 V to 3.6 V	-	1.5	0.8	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}				
		I_O = −100 μA; V_{CC} = 1.65 V to 3.6 V	V_{CC} − 0.20	V_{CC}	-	V
		I_O = −3 mA; V_{CC} = 1.4 V	V_{CC} − 0.35	V_{CC} − 0.21	-	V
		I_O = −4 mA; V_{CC} = 1.65 V	V_{CC} − 0.45	V_{CC} − 0.25	-	V
		I_O = −8 mA; V_{CC} = 2.3 V	V_{CC} − 0.55	V_{CC} − 0.37	-	V
		I_O = −12 mA; V_{CC} = 3.0 V	V_{CC} − 0.70	V_{CC} − 0.47	-	V

Table 6. Static characteristics *...continued*

At recommended operating conditions. Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Typ[1]	Max	Unit
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		$I_O = 100\ \mu A$; $V_{CC} = 1.65\ V$ to $3.6\ V$	-	GND	0.20	V
		$I_O = 3\ mA$; $V_{CC} = 1.4\ V$	-	0.22	0.35	V
		$I_O = 4\ mA$; $V_{CC} = 1.65\ V$	-	0.24	0.45	V
		$I_O = 8\ mA$; $V_{CC} = 2.3\ V$	-	0.38	0.55	V
		$I_O = 12\ mA$; $V_{CC} = 3.0\ V$	-	0.53	0.70	V
I_I	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 1.4\ V$ to $3.6\ V$	-	0.1	2.5	μA
I_{OFF}	power-off leakage current	V_I or $V_O = 3.6\ V$; $V_{CC} = 0.0\ V$	-	±0.1	±10	μA
I_{OZ}	OFF-state output current	$V_I = V_{IH}$ or V_{IL}; $V_O = V_{CC}$ or GND				
		$V_{CC} = 1.4\ V$ to $2.7\ V$	-	0.1	5	μA
		$V_{CC} = 3.0\ V$ to $3.6\ V$	-	0.1	10	μA
I_{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0\ A$				
		$V_{CC} = 1.4\ V$ to $2.7\ V$	-	0.1	20	μA
		$V_{CC} = 3.0\ V$ to $3.6\ V$	-	0.2	40	μA
C_I	input capacitance		-	5.0	-	pF

[1] All typical values are measured at $T_{amb} = 25\ °C$.

9.1 Graphs

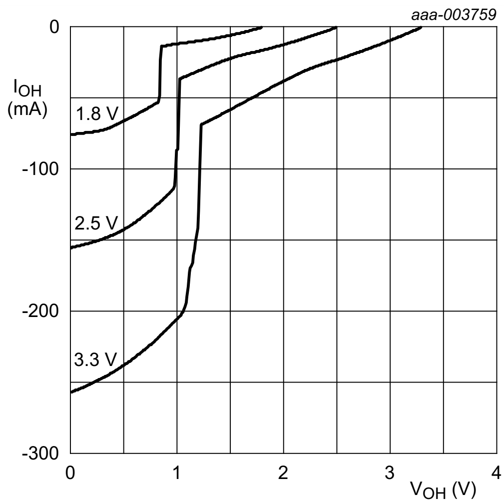


Fig 4. Output voltage as a function of the HIGH-level output current.

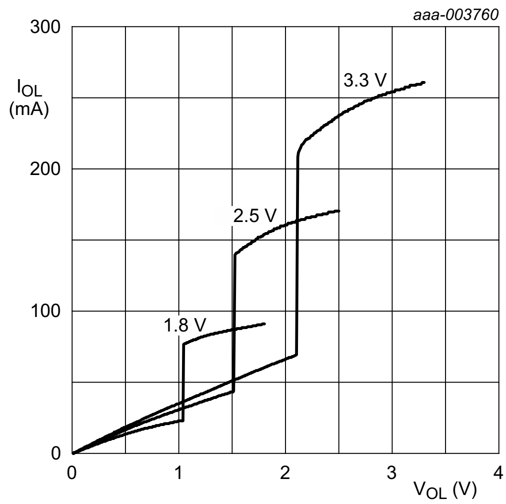


Fig 5. Output voltage as a function of the LOW-level output current.

10. Dynamic characteristics

Table 7. Dynamic characteristics

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

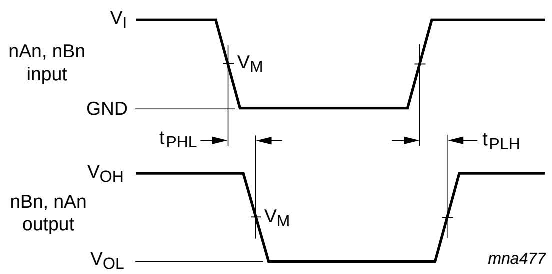
Symbol	Parameter	Conditions		−40 °C to +85 °C			Unit
				Min	Typ[2]	Max	
t_{pd}	propagation delay	nAn to nBn; nBn to nAn; see Figure 6	[1]				
		V_{CC} = 1.2 V		-	2.8	-	ns
		V_{CC} = 1.4 V to 1.6 V		-	1.8	-	ns
		V_{CC} = 1.65 V to 1.95 V		0.7	1.8	3.0	ns
		V_{CC} = 2.3 V to 2.7 V		0.6	1.3	1.9	ns
		V_{CC} = 3.0 V to 3.6 V		0.5	1.1	1.7	ns
t_{en}	enable time	$n\overline{OE}$ to nAn, nBn; see Figure 7	[1]				
		V_{CC} = 1.2 V		-	5.9	-	ns
		V_{CC} = 1.4 V to 1.6 V		-	3.9	-	ns
		V_{CC} = 1.65 V to 1.95 V		1.4	3.3	6.5	ns
		V_{CC} = 2.3 V to 2.7 V		1.0	2.4	4.5	ns
		V_{CC} = 3.0 V to 3.6 V		0.7	2.0	3.7	ns
t_{dis}	disable time	$n\overline{OE}$ to nAn, nBn; see Figure 7	[1]				
		V_{CC} = 1.2 V		-	6.9	-	ns
		V_{CC} = 1.4 V to 1.6 V		-	4.8	-	ns
		V_{CC} = 1.65 V to 1.95 V		2.2	3.7	6.0	ns
		V_{CC} = 2.3 V to 2.7 V		1.1	2.0	4.2	ns
		V_{CC} = 3.0 V to 3.6 V		1.2	2.2	3.7	ns
C_{PD}	power dissipation capacitance	per input; V_I = GND to V_{CC}	[3]				
		outputs enabled		-	42	-	pF
		outputs disabled		-	2	-	pF

[1] t_{pd} is the same as t_{PLH} and t_{PHL}.
t_{en} is the same as t_{PZL} and t_{PZH}.
t_{dis} is the same as t_{PLZ} and t_{PHZ}.

[2] Typical values are measured at T_{amb} = 25 °C and V_{CC} = 1.2 V, 1.5 V, 1.8 V, 2.5 V and 3.3 V respectively.

[3] 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 = output load capacitance in pF
V_{CC} = supply voltage in Volts
N = number of inputs switching
$\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.

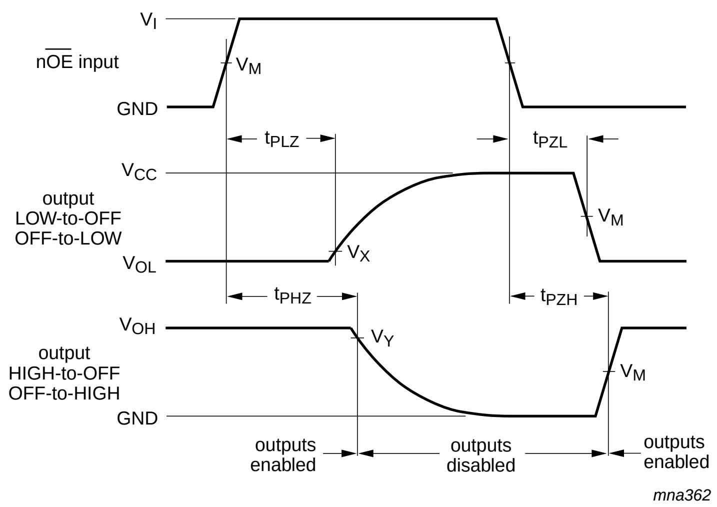
11. Waveforms



Measurement points are given in Table 8.

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

Fig 6. The input (nAn, nBn) to output (nBn, nAn) propagation delays



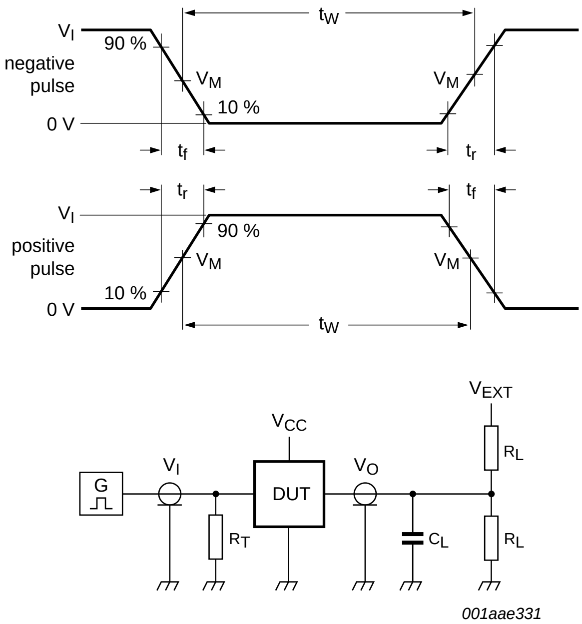
Measurement points are given in Table 8.

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

Fig 7. 3-state enable and disable times

Table 8. Measurement points

Supply voltage	V_M	Input			
V_{CC}		V_I	$t_r = t_f$	V_X	V_Y
1.2 V	$0.5 \times V_{CC}$	V_{CC}	≤ 2 ns	$V_{OL} + 0.15$ V	$V_{OH} - 0.15$ V
1.4 V to 1.6 V	$0.5 \times V_{CC}$	V_{CC}	≤ 2 ns	$V_{OL} + 0.15$ V	$V_{OH} - 0.15$ V
1.65 V to 1.95 V	$0.5 \times V_{CC}$	V_{CC}	≤ 2 ns	$V_{OL} + 0.15$ V	$V_{OH} - 0.15$ V
2.3 V to 2.7 V	$0.5 \times V_{CC}$	V_{CC}	≤ 2 ns	$V_{OL} + 0.15$ V	$V_{OH} - 0.15$ V
3.0 V to 3.6 V	$0.5 \times V_{CC}$	V_{CC}	≤ 2 ns	$V_{OL} + 0.3$ V	$V_{OH} - 0.3$ V



Test data is given in Table 9.

Definitions for test circuit:

R_L = Load resistance.

C_L = Load capacitance including jig and probe capacitance.

R_T = Termination resistance should be equal to output impedance Z_o of the pulse generator.

V_{EXT} = External voltage for measuring switching times.

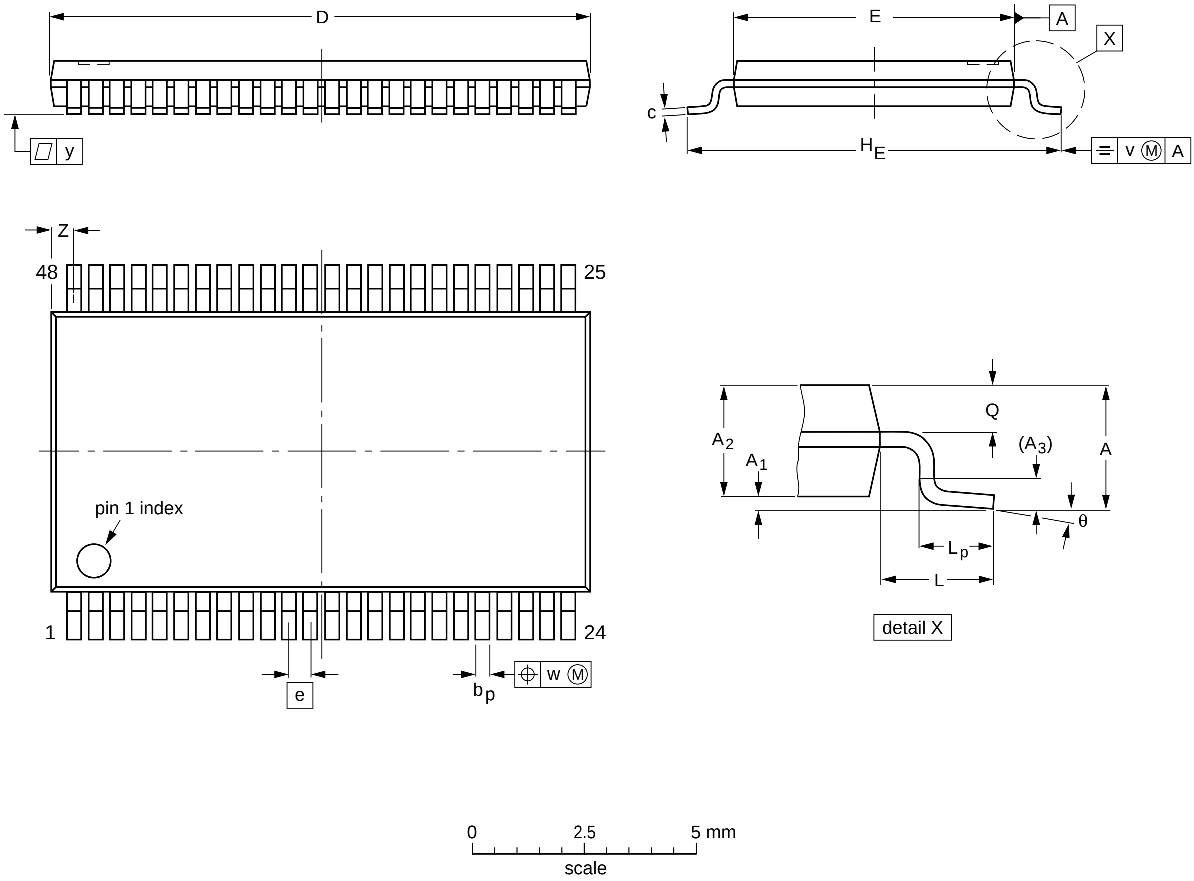
Fig 8. Test circuit for measuring switching times

Table 9. Test data

Supply voltage	Input		Load		V_{EXT}		
	V_I	t_r, t_f	C_L	R_L	t_{PLH}, t_{PHL}	t_{PLZ}, t_{PZL}	t_{PHZ}, t_{PZH}
1.2 V	V_{CC}	≤ 2 ns	15 pF	2 kΩ	open	2 × V_{CC}	GND
1.4 V to 1.6 V	V_{CC}	≤ 2 ns	15 pF	2 kΩ	open	2 × V_{CC}	GND
1.65 V to 1.95 V	V_{CC}	≤ 2 ns	30 pF	1 kΩ	open	2 × V_{CC}	GND
2.3 V to 2.7 V	V_{CC}	≤ 2 ns	30 pF	500 Ω	open	2 × V_{CC}	GND
3.0 V to 3.6 V	V_{CC}	≤ 2 ns	30 pF	500 Ω	open	2 × V_{CC}	GND

12. Package outline

TSSOP48: plastic thin shrink small outline package; 48 leads; body width 6.1 mm **SOT362-1**



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	θ
mm	1.2	0.15 0.05	1.05 0.85	0.25	0.28 0.17	0.2 0.1	12.6 12.4	6.2 6.0	0.5	8.3 7.9	1	0.8 0.4	0.50 0.35	0.25	0.08	0.1	0.8 0.4	8^o 0^o

Notes

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

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT362-1		MO-153				~~99-12-27~~ 03-02-19

Fig 9. Package outline SOT362-1 (TSSOP48)

13. Abbreviations

Table 10. Abbreviations

Acronym	Description
CMOS	Complementary Metal-Oxide Semiconductor
DUT	Device Under Test
TTL	Transistor-Transistor Logic

14. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Order number	Supersedes
74AVC16245 v.3	20130131	Product data sheet	-	-	74AVC16245 v.2
Modifications:	• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate.				
74AVC16245 v.2	19991115	Product specification	-	-	74AVC16245 v.1
74AVC16245 v.1	19981211	Product specification	-	-	-

15. Legal information

15.1 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.nexperia.com.

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Date of release: 31 January 2013

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- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения **«JONHON»**, а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов **«FORSTAR»**.

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).

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