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74AVC16373

16-bit D-type transparent latch; 3.6 V tolerant; 3-state

Rev. 3 — 20 February 2018 Product data sheet

1 General description

The 74AVC16373 is a 16-bit D-type transparent latch featuring separate D-type inputs for each latch and 3-state outputs for bus oriented applications. One latch enable (LE) input and one output enable ($\overline{OE}$) input are provided per 8-bit section. The 74AVC16373 consist of two sections of eight D-type transparent latches with 3-state true outputs.

The 74AVC16373 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, pin n$\overline{OE}$ should be tied 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 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 V_{CC} 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
74AVC16373DGG	−40 °C to +85 °C	TSSOP48	plastic thin shrink small outline package; 48 leads; body width 6.1 mm	SOT362-1

4 Functional diagram

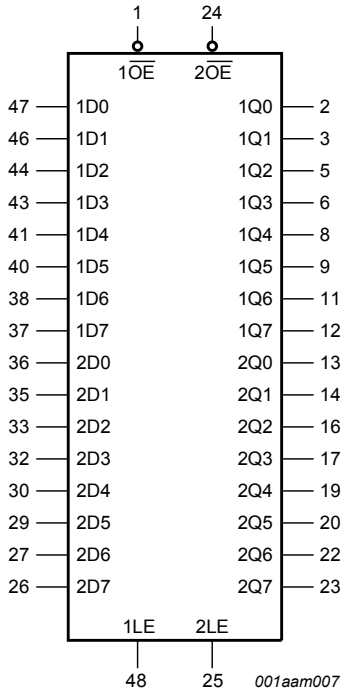


Figure 1. Logic symbol

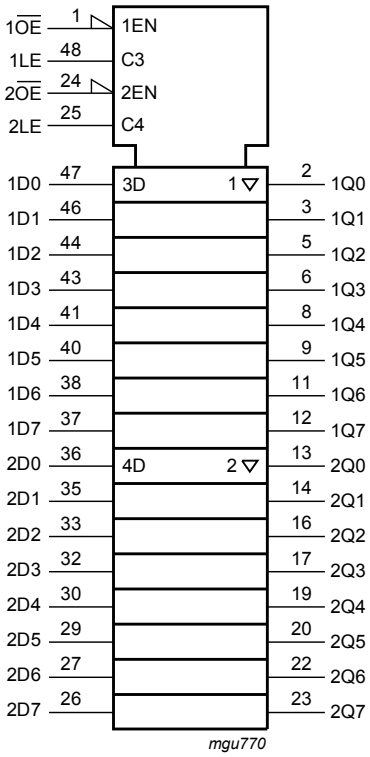


Figure 2. IEC logic symbol

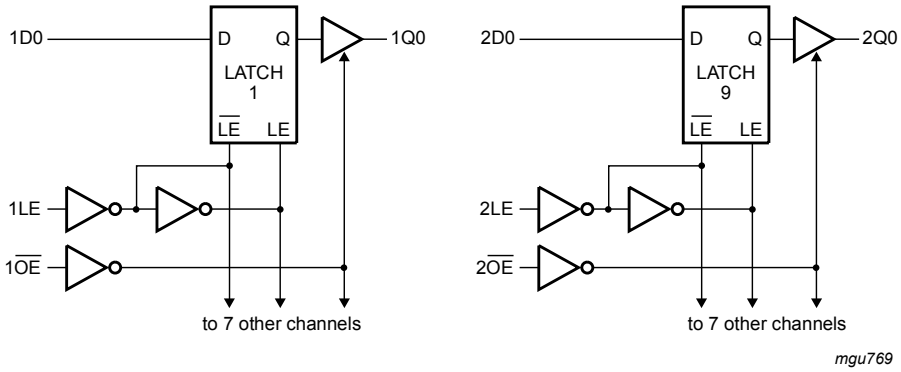


Figure 3. Logic diagram

5 Pinning information

5.1 Pinning

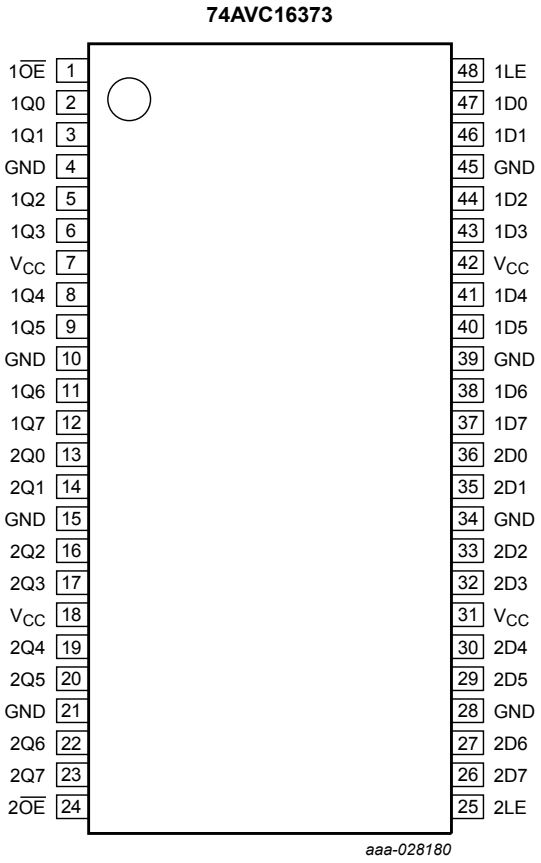


Figure 4. Pin configuration SOT362-1 (TSSOP48)

5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
1D0, 1D1, 1D2, 1D3, 1D4, 1D5, 1D6, 1D7	47, 46, 44, 43, 41, 40, 38, 37	data inputs
2D0, 2D1, 2D2, 2D3, 2D4, 2D5, 2D6, 2D7	36, 35, 33, 32, 30, 29, 27, 26	data inputs
1Q0, 1Q1, 1Q2, 1Q3, 1Q4, 1Q5, 1Q6, 1Q7	2, 3, 5, 6, 8, 9, 11, 12	data outputs
2Q0, 2Q1, 2Q2, 2Q3, 2Q4, 2Q5, 2Q6, 2Q7	13, 14, 16, 17, 19, 20, 22, 23	data outputs
$1\overline{OE}$, $2\overline{OE}$	1, 24	output enable inputs (active LOW)
1LE, 2LE	48, 25	latch enable inputs (active HIGH)
GND	4, 10, 15, 21, 28, 34, 39, 45	ground (0 V)
V_{CC}	7, 18, 31, 42	supply voltage

6 Functional description

Table 3. Function table [1]

Operating mode	Inputs			Internal latches	Outputs nQn
	$n\overline{OE}$	nLE	nDn		
enable and read register (transparent mode)	L	H	L	L	L
	L	H	H	H	H
latch and read register	L	↓	l	L	L
	L	↓	h	H	H
Hold	L	L	X	NC	NC
Latch register and disable outputs	H	L	X	NC	Z
	H	H	nDn	nDn	Z

[1] H = HIGH voltage level;
L = LOW voltage level;
↓ = HIGH-to-LOW LE transition;
h = HIGH voltage level one set-up time prior to the HIGH-to-LOW LE transition;
l = LOW voltage level one set-up time prior to the HIGH-to-LOW LE transition;
X = don't care;
NC = No change;
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	data and control inputs	[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 +85 °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	for low-voltage applications	1.2	-	3.6	V
		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
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 2.3 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

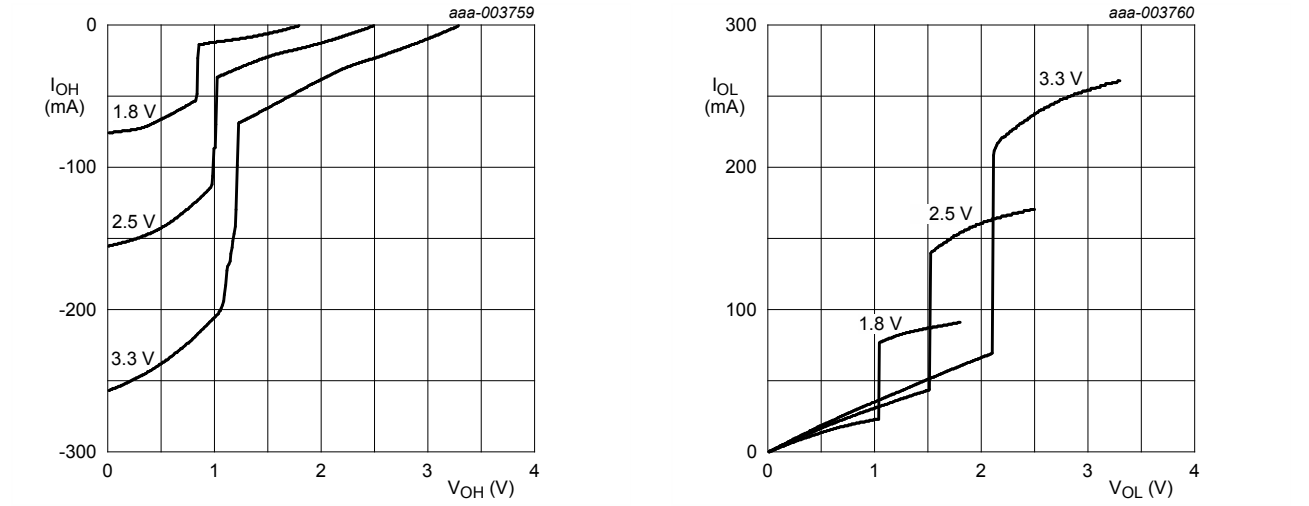
At recommended operating conditions; T_{amb} = −40 °C to +85 °C; Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Typ[1]	Max	Unit
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}; see Figure 5				
		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} - 0.23	-	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} - 0.38	-	V
		I_O = -12 mA; V_{CC} = 3.0 V	V_{CC} - 0.70	V_{CC} - 0.48	-	V

Symbol	Parameter	Conditions	Min	Typ[1]	Max	Unit
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}; see Figure 5				
		I_O = 100 µA; V_{CC} = 1.65 V to 3.6 V	-	GND	0.20	V
		I_O = 3 mA; V_{CC} = 1.4 V	-	0.18	0.35	V
		I_O = 4 mA; V_{CC} = 1.65 V	-	0.22	0.45	V
		I_O = 8 mA; V_{CC} = 2.3 V	-	0.37	0.55	V
		I_O = 12 mA; V_{CC} = 3.0 V	-	0.51	0.70	V
I_I	input leakage current	$V_I = V_{CC}$ or GND; V_{CC} = 1.4 V to 3.6 V				
		per input pin	-	0.1	2.5	µA
I_{OFF}	power-off leakage current	V_I or V_O = 3.6 V; V_{CC} = 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 Dynamic controlled output graphs



a. HIGH-level output current.

b. LOW-level output current.

Figure 5. Output current as a function of output voltage.

10 Dynamic characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V). For test circuit see Figure 10.

Symbol	Parameter	Conditions	−40 °C to +85 °C			Unit
			Min	Typ [1]	Max	
t_{pd}	propagation delay	nDn to nQn; see Figure 6 [2]				
		V_{CC} = 1.2 V	-	3.6	-	ns
		V_{CC} = 1.4 V to 1.6 V	1.2	3.1	6.8	ns
		V_{CC} = 1.65 V to 1.95 V	1.0	2.2	5.7	ns
		V_{CC} = 2.3 V to 2.7 V	0.7	1.6	3.3	ns
		V_{CC} = 3.0 V to 3.6 V	0.7	1.4	2.8	ns
		nLE to nQn; see Figure 7 [2]				
		V_{CC} = 1.2 V	-	3.6	-	ns
		V_{CC} = 1.4 V to 1.6 V	2.5	3.1	9.4	ns
		V_{CC} = 1.65 V to 1.95 V	2.3	2.2	7.8	ns
		V_{CC} = 2.3 V to 2.7 V	1.3	1.6	4.2	ns
		V_{CC} = 3.0 V to 3.6 V	0.7	1.4	3.9	ns
t_{en}	enable time	$n\overline{OE}$ to nQn; see Figure 8 [2]				
		V_{CC} = 1.2 V	-	5.9	-	ns
		V_{CC} = 1.4 V to 1.6 V	1.6	4.2	8.8	ns
		V_{CC} = 1.65 V to 1.95 V	1.6	3.5	6.7	ns
		V_{CC} = 2.3 V to 2.7 V	1.4	2.4	4.3	ns
		V_{CC} = 3.0 V to 3.6 V	0.7	2.0	3.4	ns
t_{dis}	disable time	$n\overline{OE}$ to nQn; see Figure 8 [2]				
		V_{CC} = 1.2 V	-	5.8	-	ns
		V_{CC} = 1.4 V to 1.6 V	2.5	4.6	9.4	ns
		V_{CC} = 1.65 V to 1.95 V	2.3	3.6	7.8	ns
		V_{CC} = 2.3 V to 2.7 V	1.3	1.9	4.2	ns
		V_{CC} = 3.0 V to 3.6 V	1.2	2.1	3.9	ns
t_W	pulse width	nLE HIGH; see Figure 7.				
		V_{CC} = 1.2 V	-	2.4	-	ns
		V_{CC} = 1.4 V to 1.6 V	-	1.9	-	ns
		V_{CC} = 1.65 V to 1.95 V	2.2	1.7	-	ns
		V_{CC} = 2.3 V to 2.7 V	2.0	1.6	-	ns
		V_{CC} = 3.0 V to 3.6 V	1.8	1.4	-	ns

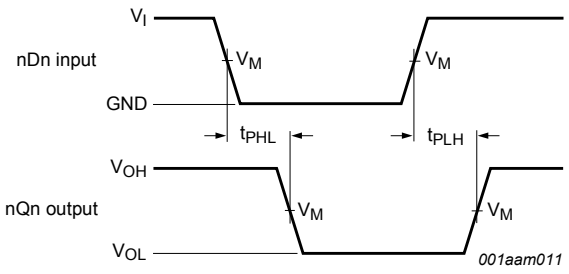
Symbol	Parameter	Conditions	−40 °C to +85 °C			Unit
			Min	Typ [1]	Max	
t_{su}	set-up time	nDn to nLE; see Figure 9				
		V_{CC} = 1.2 V	-	0.4	-	ns
		V_{CC} = 1.4 V to 1.6 V	1.2	0.2	-	ns
		V_{CC} = 1.65 V to 1.95 V	1.1	0.1	-	ns
		V_{CC} = 2.3 V to 2.7 V	0.9	-0.1	-	ns
		V_{CC} = 3.0 V to 3.6 V	0.8	-0.1	-	ns
t_h	hold time	nDn to nLE; see Figure 9				
		V_{CC} = 1.2 V	-	-0.2	-	ns
		V_{CC} = 1.4 V to 1.6 V	1.1	-0.1	-	ns
		V_{CC} = 1.65 V to 1.95 V	1.1	0.0	-	ns
		V_{CC} = 2.3 V to 2.7 V	1.1	0.1	-	ns
		V_{CC} = 3.0 V to 3.6 V	1.0	0.2	-	ns
C_{PD}	power dissipation capacitance	per buffer; V_I = GND to V_{CC} [3]				
		outputs enabled	-	34	-	pF
		outputs disabled	-	1	-	pF

[1] 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.

[2] 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}.

[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.

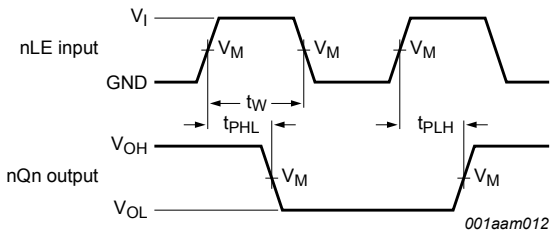
10.1 Waveforms and test circuit



Measurement points are given in Table 8.

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

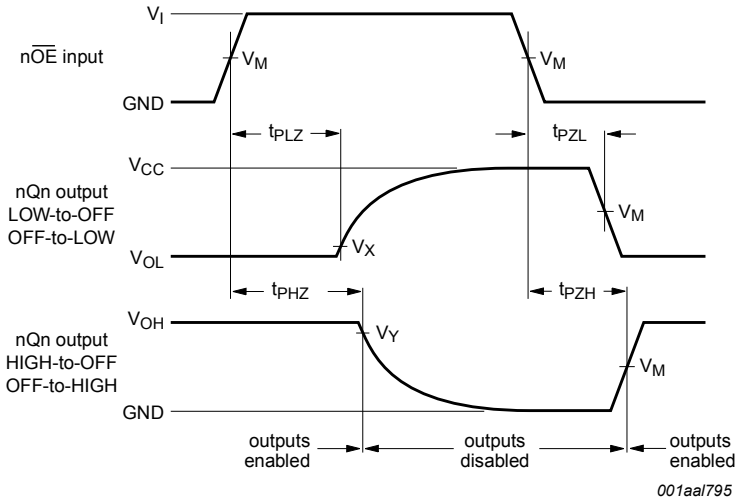
Figure 6. Input (nDn) to output (nQn) propagation delays



Measurement points are given in Table 8.

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

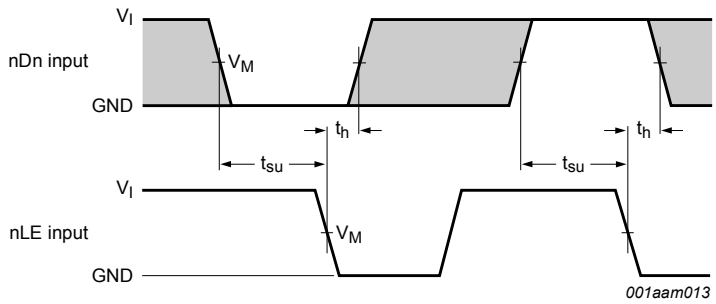
Figure 7. Latch enable input (nLE) to data output (nQn) propagation delays and pulse width



Measurement points are given in Table 8.

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

Figure 8. 3-state enable and disable times



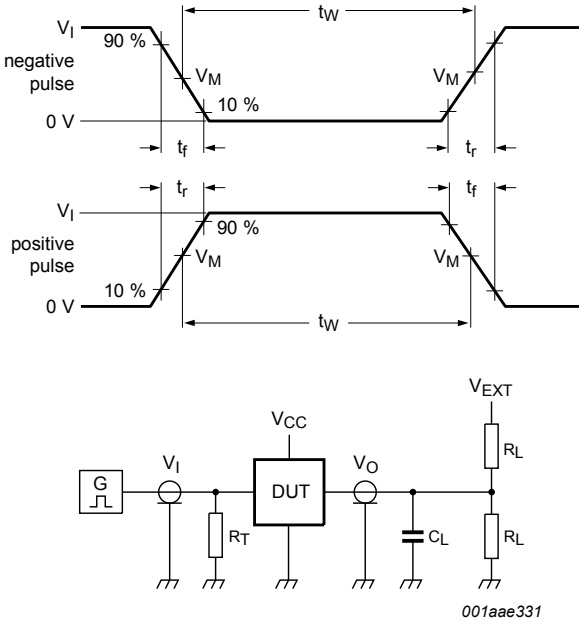
Measurement points are given in Table 8.

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

Figure 9. Input (nDn) to input (nLE) data set-up and hold times

Table 8. Measurement points

Supply voltage	Input		Output		
V_{CC}	V_I	V_M	V_M	V_X	V_Y
≤2.3 V	V_{CC}	0.5 x V_{CC}	0.5 x V_{CC}	V_{OL} + 0.15 V	V_{OH} - 0.15 V
2.3 V to 2.7 V	V_{CC}	0.5 x V_{CC}	0.5 x V_{CC}	V_{OL} + 0.15 V	V_{OH} - 0.15 V
3.0 V to 3.6 V	V_{CC}	0.5 x V_{CC}	0.5 x V_{CC}	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.

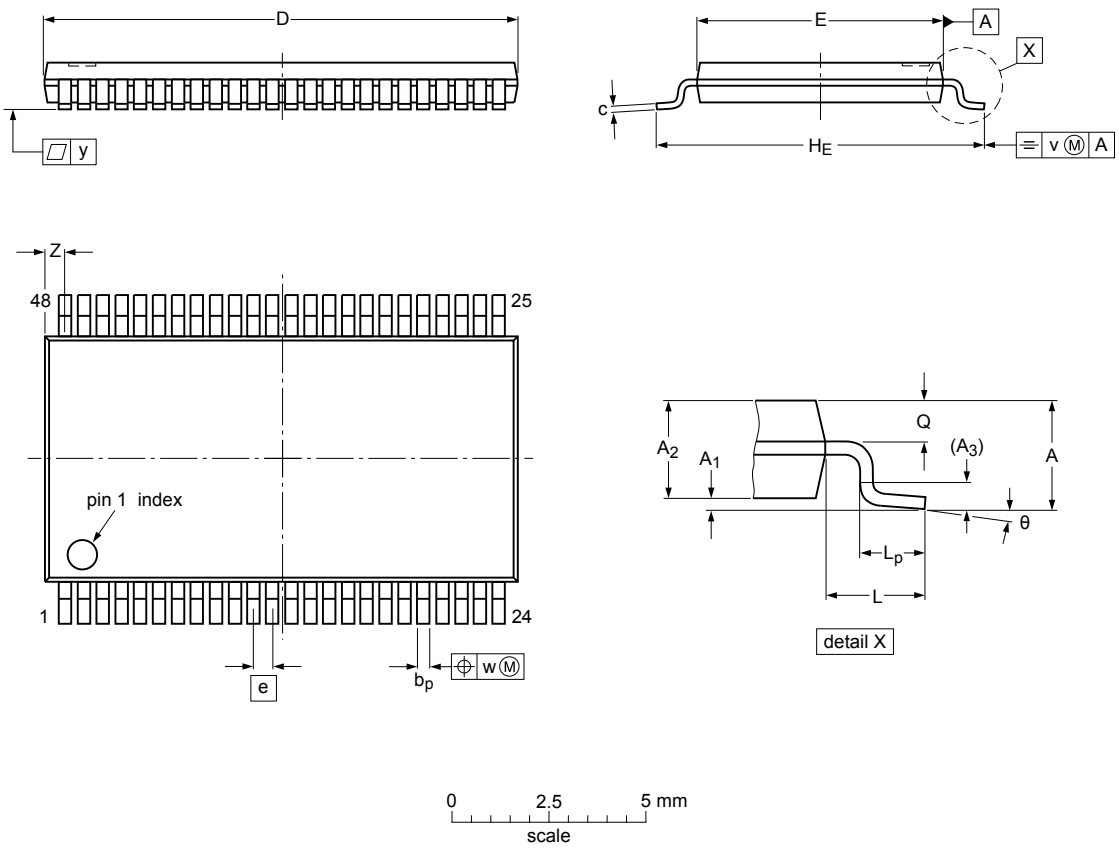
Figure 10. Test circuit for measuring switching times

Table 9. Test data

Supply voltage	Input		Load		V_{EXT}		
V_{CC}	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}	≤ 2.0 ns	15 pF	2000 Ω	open	2 x V_{CC}	GND
1.4 V to 1.6 V	V_{CC}	≤ 2.0 ns	15 pF	2000 Ω	open	2 x V_{CC}	GND
1.65 V to 1.95 V	V_{CC}	≤ 2.0 ns	30 pF	1000 Ω	open	2 x V_{CC}	GND
2.3 V to 2.7 V	V_{CC}	≤ 2.0 ns	30 pF	500 Ω	open	2 x V_{CC}	GND
3.0 V to 3.6 V	V_{CC}	≤ 2.0 ns	30 pF	500 Ω	open	2 x V_{CC}	GND

11 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	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	max	1.2	0.15	1.05	0.25	0.28	0.2	12.6	6.2	0.5	8.3	1	0.8	0.50	0.25	0.08	0.1	0.8	8°
	nom																		
	min		0.05	0.85		0.17	0.1	12.4	6.0		7.9		0.4	0.35				0.4	0°

Note
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.

sot362-1_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT362-1		MO-153				~~03-02-19~~ 13-08-05

Figure 11. Package outline SOT362-1 (TSSOP48)

12 Abbreviations

Table 10. Abbreviations

Acronym	Description
CMOS	Complementary Metal-Oxide Semiconductor
DCO	Dynamic Controlled Output
DUT	Device Under Test

13 Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AVC16373 v.3	20180220	Product data sheet	-	74AVC16373 v.2
Modifications:	• The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. • Legal texts have been adapted to the new company name where appropriate.			
74AVC16373 v.2	20000309	Product specification	-	74AVC_AVCH16373_N v.1
74AVC_AVCH16373_N v.1	19981211	Product specification	-	-

14 Legal information

14.1 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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