

# 74AHCV244A

Octal buffer/line driver; 3-state

Rev. 1 — 23 November 2016

Product data sheet

## 1. General description

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The 74AHCV244A is an 8-bit buffer/line driver with 3-state outputs and Schmitt trigger inputs. The device features two output enables ( $1\overline{OE}1$  and  $2\overline{OE}$ ). A HIGH on  $n\overline{OE}$  causes the associated outputs to assume a high-impedance OFF-state.

Inputs are overvoltage tolerant. This feature allows the use of these devices as translators in mixed voltage environments.

The data ( $nA_n$ ) and control ( $n\overline{OE}$ ) inputs include Schmitt trigger inputs, capable of transforming slowly changing input signals into sharply defined, jitter-free output signals.

This device is fully specified for partial Power-down applications using  $I_{OFF}$ . The  $I_{OFF}$  circuitry disables the output, preventing the damaging backflow current through the device when it is powered down.

## 2. Features and benefits

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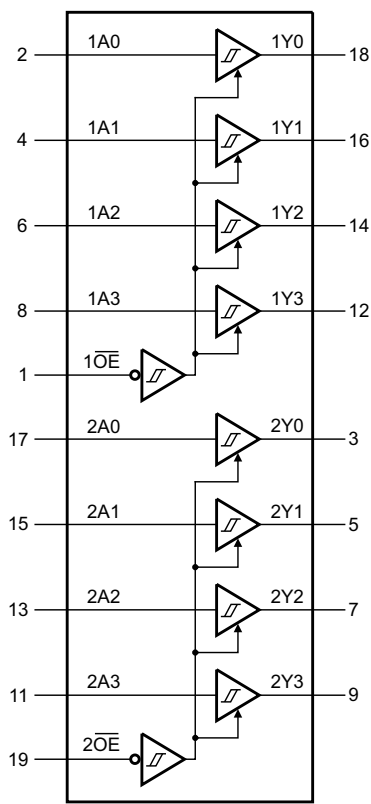
- Wide supply voltage range from 1.8 V to 5.5 V
- Typical  $t_{pd}$  of 3.0 ns at 5 V
- Typical  $V_{OL(p)} < 0.8$  V at  $V_{CC} = 3.3$  V,  $T_{amb} = 25$  °C
- Typical  $V_{OH(v)} > 2.3$  V at  $V_{CC} = 3.3$  V,  $T_{amb} = 25$  °C
- Supports mixed-mode voltage operation on all ports
- $I_{OFF}$  circuitry provides partial Power-down mode operation
- Latch-up performance exceeds 250 mA per JESD 78 Class II
- ESD protection:
  - ◆ HBM ANSI/ESDA/JEDEC JS-001 Class 2 exceeds 3 kV
  - ◆ MM JESD22-A115-A exceeds 150 V
  - ◆ CDM JESD22-C101E exceeds 2 kV
- Specified from  $-40$  °C to  $+85$  °C and from  $-40$  °C to  $+125$  °C

### 3. Ordering information

Table 1. Ordering information

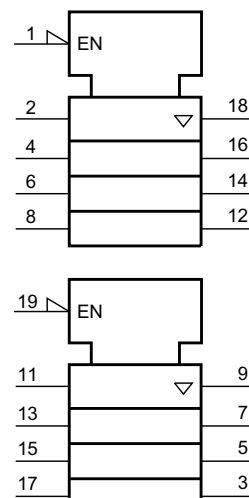
Type number	Package			Version
	Temperature range	Name	Description	
74AHCV244APW	-40 °C to +125 °C	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	SOT360-1

### 4. Functional diagram



aaa-025792

Fig 1. Logic symbol



mna873

Fig 2. IEC logic symbol

## 5. Pinning information

### 5.1 Pinning

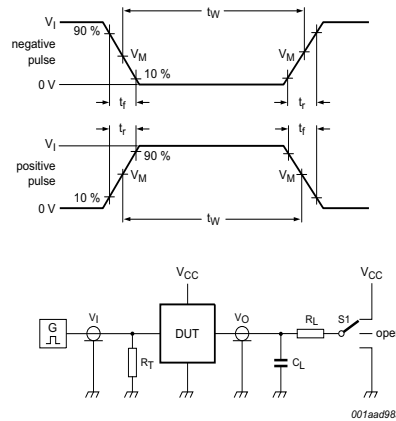


Fig 3. Pin configuration TSSOP20

### 5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
$\overline{1OE}, \overline{2OE}$	1, 19	output enable input (active LOW)
1A0, 1A1, 1A2, 1A3	2, 4, 6, 8	data input
2Y0, 2Y1, 2Y2, 2Y3	3, 5, 7, 9	data output
GND	10	ground (0 V)
2A0, 2A1, 2A2, 2A3	17, 15, 13, 11	data input
1Y0, 1Y1, 1Y2, 1Y3,	18, 16, 14, 12	data output

## 6. Functional description

Table 3. Function table [\[1\]](#)

Control	Input	Output
nOE	nAn	nYn
L	L	L
L	H	H
H	X	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	+7.0	V
$V_I$	input voltage	<a href="#">[1]</a>	-0.5	+7.0	V
$V_O$	output voltage	active mode <a href="#">[2][3]</a>	-0.5	$V_{CC} + 0.5$	V
		power-down or 3-state mode <a href="#">[2]</a>	-0.5	+7.0	V
$I_{IK}$	input clamping current	$V_I < 0$ V	-50	-	mA
$I_{OK}$	output clamping current	$V_O < 0$ V	-50	-	mA
$I_O$	output current	$V_O = 0$ V to $V_{CC}$	-	$\pm 50$	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 <a href="#">[4]</a>	-	500	mW

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

[2] The output voltage ratings may be exceeded if the output current ratings are observed.

[3] This value is limited to 7.0 V maximum.

[4] For TSSOP20 package: above 100 °C the value of  $P_{tot}$  derates linearly with 10 mW/K.

## 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage		1.8	5.5	V
$V_I$	input voltage		0	5.5	V
$V_O$	output voltage	active mode	0	$V_{CC}$	V
		power-down or 3-state mode	0	5.5	V
$T_{amb}$	ambient temperature		-40	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	-	50	ms/V
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	-	20	ms/V
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	-	1	ms/V

## 9. Static characteristics

**Table 6. Static characteristics**

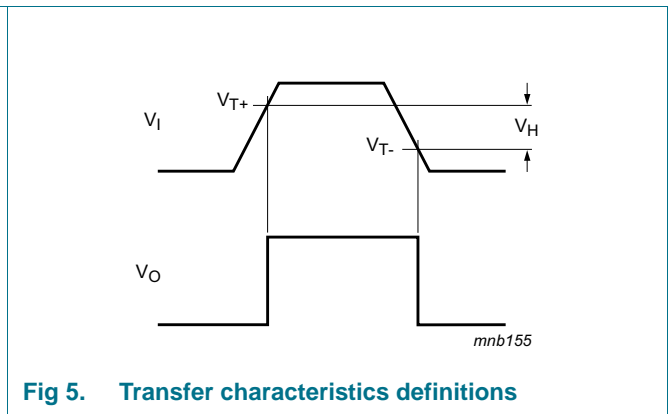
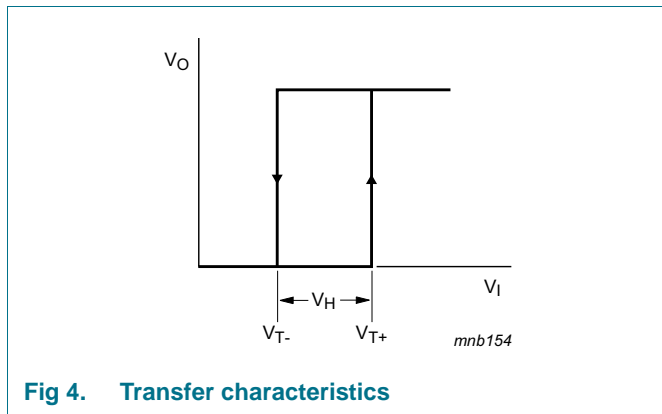
Voltages are referenced to GND (ground = 0 V).

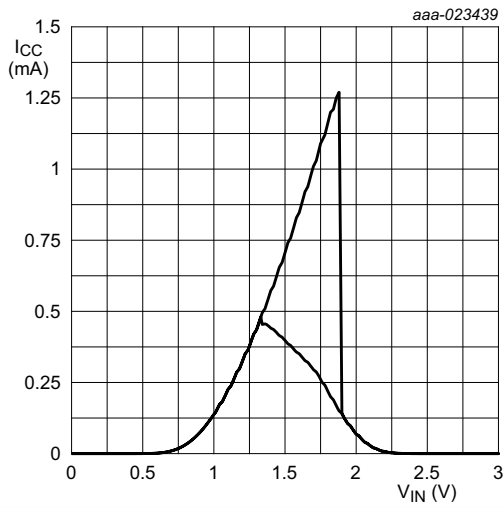
Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
$V_{T+}$	positive-going threshold voltage	$V_{CC} = 1.8\text{ V}$	-	-	1.65	-	1.65	-	1.65	V
		$V_{CC} = 2.3\text{ V}$	-	-	1.85	-	1.85	-	1.85	V
		$V_{CC} = 3.0\text{ V}$	-	-	2.2	-	2.2	-	2.2	V
		$V_{CC} = 4.5\text{ V}$	-	-	3.15	-	3.15	-	3.15	V
		$V_{CC} = 5.5\text{ V}$	-	-	3.85	-	3.85	-	3.85	V
$V_{T-}$	negative-going threshold voltage	$V_{CC} = 1.8\text{ V}$	0.15	-	-	0.15	-	0.15	-	V
		$V_{CC} = 2.3\text{ V}$	0.45	-	-	0.45	-	0.45	-	V
		$V_{CC} = 3.0\text{ V}$	0.9	-	-	0.9	-	0.9	-	V
		$V_{CC} = 4.5\text{ V}$	1.35	-	-	1.35	-	1.35	-	V
		$V_{CC} = 5.5\text{ V}$	1.65	-	-	1.65	-	1.65	-	V
$V_H$	hysteresis voltage	$V_{CC} = 1.8\text{ V}$	0.15	-	1.05	0.15	1.05	0.15	1.05	V
		$V_{CC} = 2.3\text{ V}$	0.2	-	1.1	0.2	1.1	0.2	1.1	V
		$V_{CC} = 3.0\text{ V}$	0.3	-	1.2	0.3	1.2	0.3	1.2	V
		$V_{CC} = 4.5\text{ V}$	0.4	-	1.4	0.4	1.4	0.4	1.4	V
		$V_{CC} = 5.5\text{ V}$	0.5	-	1.6	0.5	1.6	0.5	1.6	V
$V_{OH}$	HIGH-level output voltage	$V_I = V_{T+}$ or $V_{T-}$								V
		$I_O = -50\ \mu\text{A}; V_{CC} = 1.8\text{ V}$	1.7	1.8	-	1.7	-	1.7	-	V
		$I_O = -50\ \mu\text{A}; V_{CC} = 3.0\text{ V}$	2.9	3.0	-	2.9	-	2.9	-	V
		$I_O = -50\ \mu\text{A}; V_{CC} = 4.5\text{ V}$	4.4	4.5	-	4.4	-	4.4	-	V
		$I_O = -8\text{ mA}; V_{CC} = 3.0\text{ V}$	2.58	-	-	2.48	-	2.48	-	V
	$I_O = -16\text{ mA}; V_{CC} = 4.5\text{ V}$	3.94	-	-	3.80	-	3.80	-		

**Table 6. Static characteristics ...continued**  
 Voltages are referenced to GND (ground = 0 V).

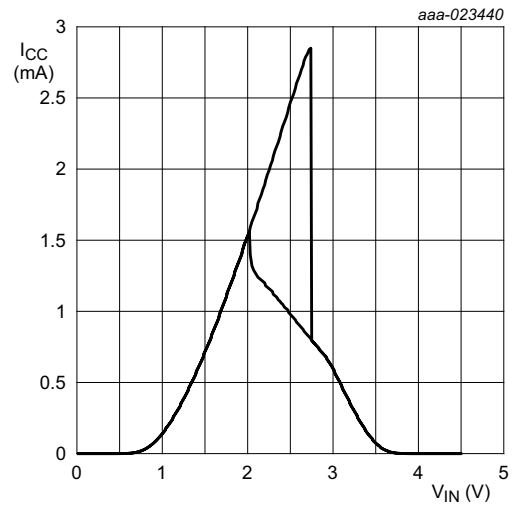
Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>T+</sub> or V <sub>T-</sub>								
		I <sub>O</sub> = 50 μA; V <sub>CC</sub> = 1.8 V	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 50 μA; V <sub>CC</sub> = 3.0 V	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 50 μA; V <sub>CC</sub> = 4.5 V	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 8 mA; V <sub>CC</sub> = 3.0 V	-	-	0.36	-	0.44	-	0.44	V
		I <sub>O</sub> = 16 mA; V <sub>CC</sub> = 4.5 V	-	-	0.44	-	0.55	-	0.55	V
I <sub>OZ</sub>	OFF-state output current	V <sub>CC</sub> = 1.8 V to 5.5 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = GND to 5.5 V	-	-	±0.25	-	±2.5	-	±2.5	μA
I <sub>OFF</sub>	power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = GND to 5.5 V; V <sub>CC</sub> = 0 V	-	-	0.5	-	5	-	5	μA
I <sub>I</sub>	input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 0 V to 5.5 V	-	-	±0.1	-	±1	-	±1	μA
I <sub>CC</sub>	supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 5.5 V	-	-	2	-	20	-	20	μA

**9.1 Transfer characteristics waveforms**

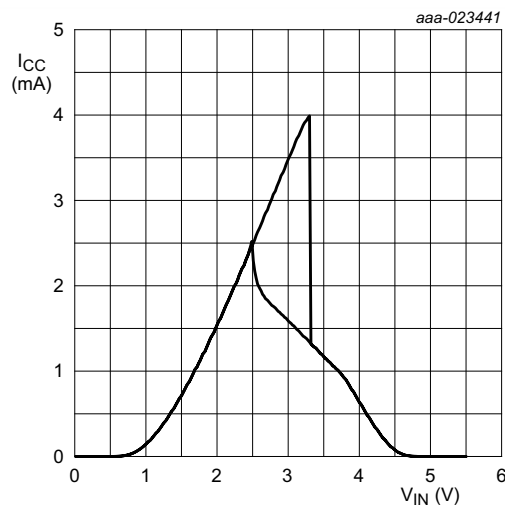




a.  $V_{CC} = 3.0\text{ V}$



b.  $V_{CC} = 4.5\text{ V}$



c.  $V_{CC} = 5.5\text{ V}$

**Fig 6. Typical transfer characteristics**

## 10. Dynamic characteristics

**Table 7. Dynamic characteristics**  
*GND = 0 V. For test circuit see Figure 9.*

Symbol	Parameter	Conditions	25 °C			−40 °C to +85 °C		−40 °C to +125 °C		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	Min	Max	
t <sub>pd</sub>	propagation delay	nAn to nYn; see <a href="#">Figure 7</a> <sup>[2]</sup>								
		V <sub>CC</sub> = 2.3 V to 2.7 V								
		C <sub>L</sub> = 15 pF	-	5.1	12.5	1	15	1	15	ns
		C <sub>L</sub> = 50 pF	-	7	15.3	1	18	1	18	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V								
		C <sub>L</sub> = 15 pF	-	3.9	8.4	1	10	1	10	ns
		C <sub>L</sub> = 50 pF	-	5.4	11.9	1	13.5	1	13.5	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V								
		C <sub>L</sub> = 15 pF	-	3	5.5	1	6.5	1	6.5	ns
C <sub>L</sub> = 50 pF	-	4.2	7.5	1	8.5	1	8.5	ns		
t <sub>en</sub>	enable time	nOE to nYn; see <a href="#">Figure 8</a> <sup>[2]</sup>								
		V <sub>CC</sub> = 2.3 V to 2.7 V								
		C <sub>L</sub> = 15 pF	-	6.1	14.6	1	17	1	17	ns
		C <sub>L</sub> = 50 pF	-	8.2	17.8	1	21	1	21	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V								
		C <sub>L</sub> = 15 pF	-	4.6	10.6	1	12.5	1	12.5	ns
		C <sub>L</sub> = 50 pF	-	6.3	14.1	1	16	1	16	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V								
		C <sub>L</sub> = 15 pF	-	3.0	7.3	1	8.5	1	8.5	ns
C <sub>L</sub> = 50 pF	-	4.4	9.3	1	10.5	1	10.5	ns		
t <sub>dis</sub>	disable time	nOE to nYn; see <a href="#">Figure 8</a> <sup>[2]</sup>								
		V <sub>CC</sub> = 2.3 V to 2.7 V								
		C <sub>L</sub> = 15 pF	-	6.6	15	1	17	1	17	ns
		C <sub>L</sub> = 50 pF	-	11.2	19.2	1	21	1	21	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V								
		C <sub>L</sub> = 15 pF	-	5.3	13	1	15	1	15	ns
		C <sub>L</sub> = 50 pF	-	8.8	14	1	16	1	16	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V								
		C <sub>L</sub> = 15 pF	-	4.2	12	1	14	1	14	ns
C <sub>L</sub> = 50 pF	-	6.4	9.2	1	10.5	1	10.5	ns		
t <sub>sk(o)</sub>	skew	C <sub>L</sub> = 50 pF								
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	2	-	2	-	2	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	-	1.5	-	1.5	-	1.5	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V	-	-	1	-	1	-	1	ns



**Table 7. Dynamic characteristics ...continued**  
 GND = 0 V. For test circuit see [Figure 9](#).

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	Min	Max	
C <sub>I</sub>	input capacitance	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 3.3 V	-	2	6	-	6	-	6	pF
C <sub>O</sub>	output capacitance	V <sub>O</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 3.3 V	-	5	-	-	-	-	-	pF
C <sub>PD</sub>	power dissipation capacitance	per buffer; C <sub>L</sub> = 0 pF; f = 10 MHz; V <sub>CC</sub> = 5 V; V <sub>I</sub> = GND to V <sub>CC</sub>	-	15	-	-	-	-	-	pF

[1] Typical values are measured at T<sub>amb</sub> = 25 °C and V<sub>CC</sub> = 2.5 V, 3.3 V, and 5 V respectively, unless otherwise specified.

[2] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.

t<sub>en</sub> is the same as t<sub>pZL</sub> and t<sub>pZH</sub>.

t<sub>dis</sub> is the same as t<sub>pLZ</sub> and t<sub>pHZ</sub>.

[3] C<sub>PD</sub> is used to determine the dynamic power dissipation P<sub>D</sub> (μW).

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

f<sub>i</sub> = input frequency in MHz;

f<sub>o</sub> = output frequency in MHz;

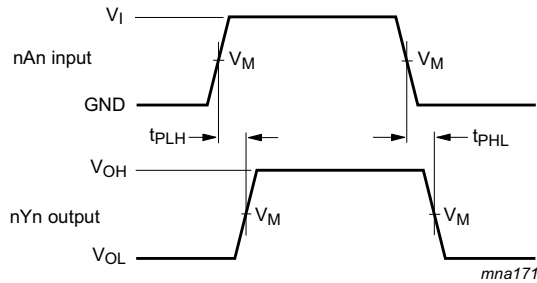
C<sub>L</sub> = output load capacitance in pF;

V<sub>CC</sub> = supply voltage in Volts.

**Table 8. Noise characteristics**  
 GND = 0 V. For test circuit see [Figure 9](#).

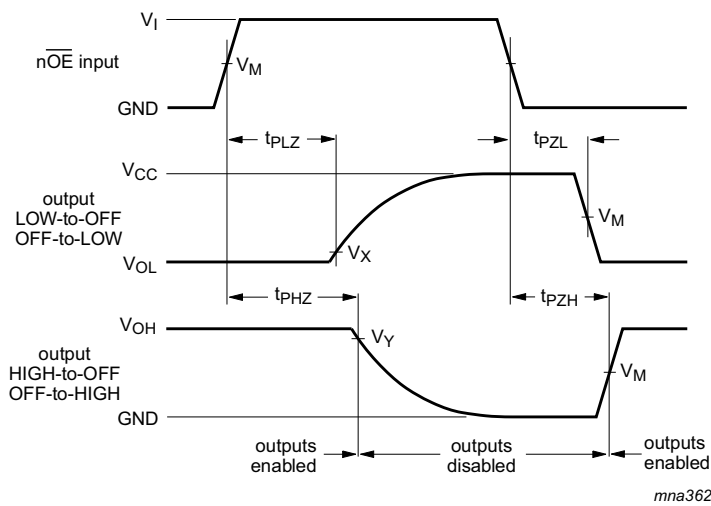
Symbol	Parameter	Conditions	T <sub>amb</sub> = 25 °C			Unit
			Min	Typ	Max	
<b>V<sub>CC</sub> = 3.3 V; C<sub>L</sub> = 50 pF</b>						
V <sub>OL(p)</sub>	LOW-level output voltage (peak)		-	0.3	0.8	V
V <sub>OL(v)</sub>	LOW-level output voltage (valley)		-0.8	-0.2	-	V
V <sub>OH(v)</sub>	HIGH-level output voltage (valley)		-	2.9	-	V
V <sub>IH(AC)</sub>	AC HIGH-level input voltage (dynamic)		2.31	-	-	V
V <sub>IL(AC)</sub>	AC LOW-level input voltage (dynamic)		-	-	0.99	V
<b>V<sub>CC</sub> = 5.0 V; C<sub>L</sub> = 50 pF</b>						
V <sub>OL(p)</sub>	LOW-level output voltage (peak)		-	0.6	1.5	V
V <sub>OL(v)</sub>	LOW-level output voltage (valley)		-1.5	-0.6	-	V
V <sub>OH(v)</sub>	HIGH-level output voltage (valley)		-	4.0	-	V
V <sub>IH(AC)</sub>	AC HIGH-level input voltage (dynamic)		3.5	-	-	V
V <sub>IL(AC)</sub>	AC LOW-level input voltage (dynamic)		-	-	1.5	V

11. Waveforms



Measurement points are given in [Table 9](#).  
 VOL and VOH are typical voltage output levels that occur with the output load.

Fig 7. Propagation delay input (An) to output (Yn)

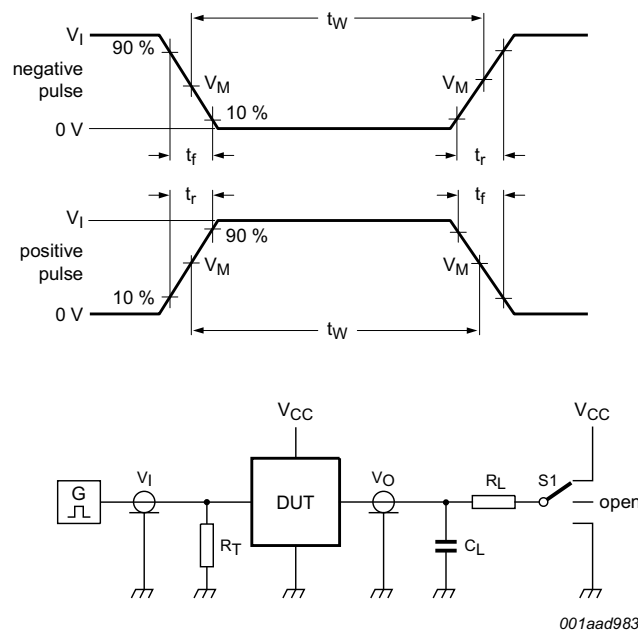


Measurement points are given in [Table 9](#).  
 VOL and VOH are typical voltage output levels that occur with the output load.

Fig 8. enable and disable times

Table 9. Measurement points

Input	Output		
<b>VM</b>	<b>VM</b>	<b>Vx</b>	<b>Vy</b>
0.5VCC	0.5VCC	VOL + 0.3 V	VOH - 0.3 V



Test data is given in [Table 10](#).

Definitions test circuit:

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

$C_L$  = Load capacitance including jig and probe capacitance

$R_L$  = Load resistor

S1 = Test selection switch

**Fig 9. Test circuit for measuring switching times**

**Table 10. Test data**

Input		Load		S1 position		
$V_I$	$t_r, t_f$	$C_L$	$R_L$	$t_{PHL}, t_{PLH}$	$t_{PZH}, t_{PHZ}$	$t_{PZL}, t_{PLZ}$
GND to $V_{CC}$	3.0 ns	15 pF, 50 pF	1 k $\Omega$	open	GND	$V_{CC}$

12. Package outline

TSSOP20: plastic thin shrink small outline package; 20 leads; body width 4.4 mm

SOT360-1

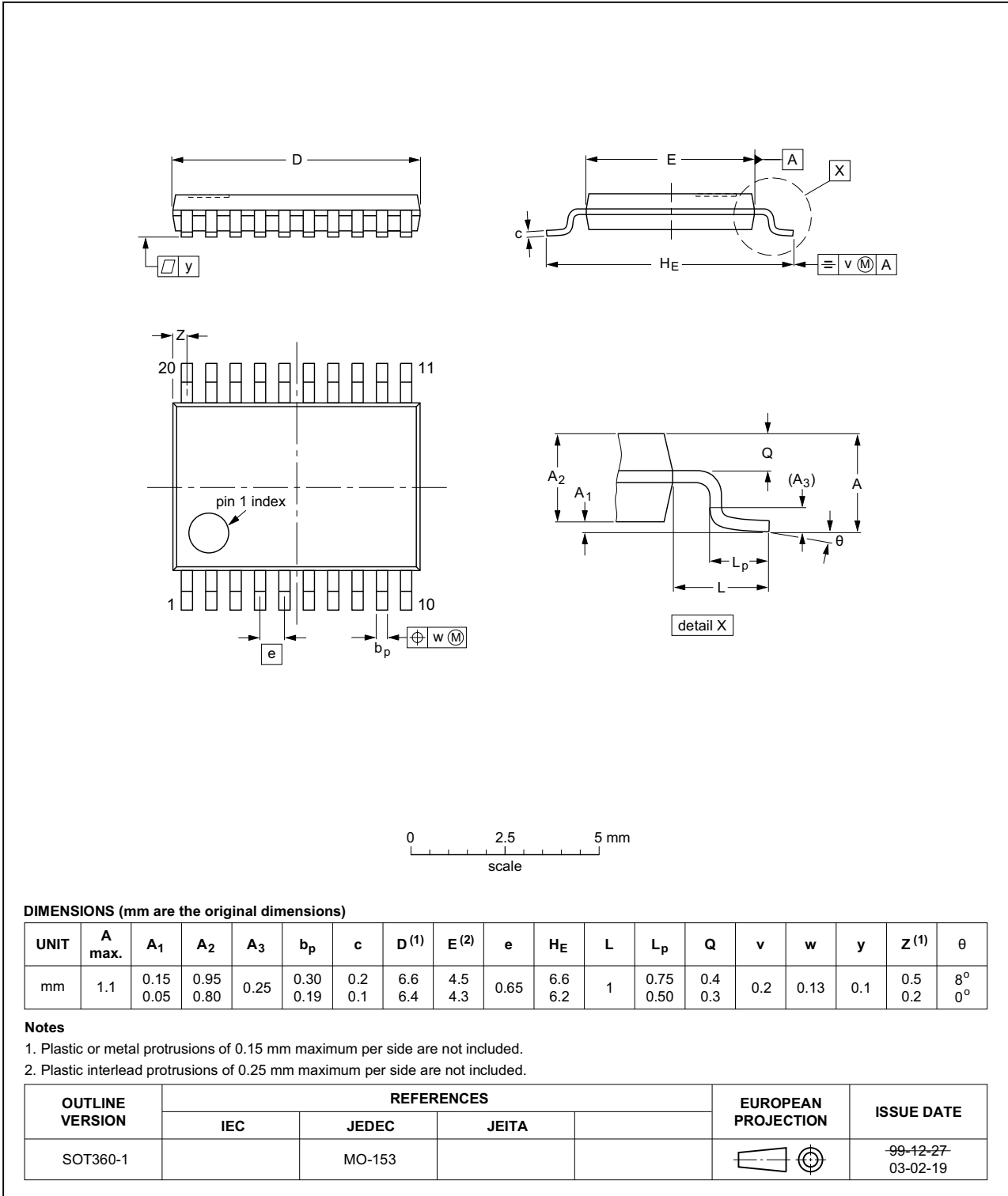


Fig 10. Package outline SOT360-1 (TSSOP20)

## 13. Abbreviations

Table 11. Abbreviations

Acronym	Description
CDM	Charge Device Model
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model

## 14. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AHCV244A v.1	20161123	Product data sheet	-	-

## 15. Legal information

### 15.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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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## 16. Contact information

For more information, please visit: <http://www.nexperia.com>

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