

# 74HC241; 74HCT241

Octal buffer/line driver; 3-state

Rev. 3 — 20 February 2018

Product data sheet

## 1 General description

The 74HC241; 74HCT241 is an 8-bit buffer/line driver with 3-state outputs. The device can be used as two 4-bit buffers or one 8-bit buffer. The device features two output enables ( $1\overline{OE}$  and  $2OE$ ), each controlling four of the 3-state outputs. A HIGH on  $1\overline{OE}$  or LOW on  $2OE$  causes the associated outputs to assume a high-impedance OFF-state. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of  $V_{CC}$ .

The 74HCT241 device features reduced input threshold levels to allow interfacing to TTL logic levels.

## 2 Features and benefits

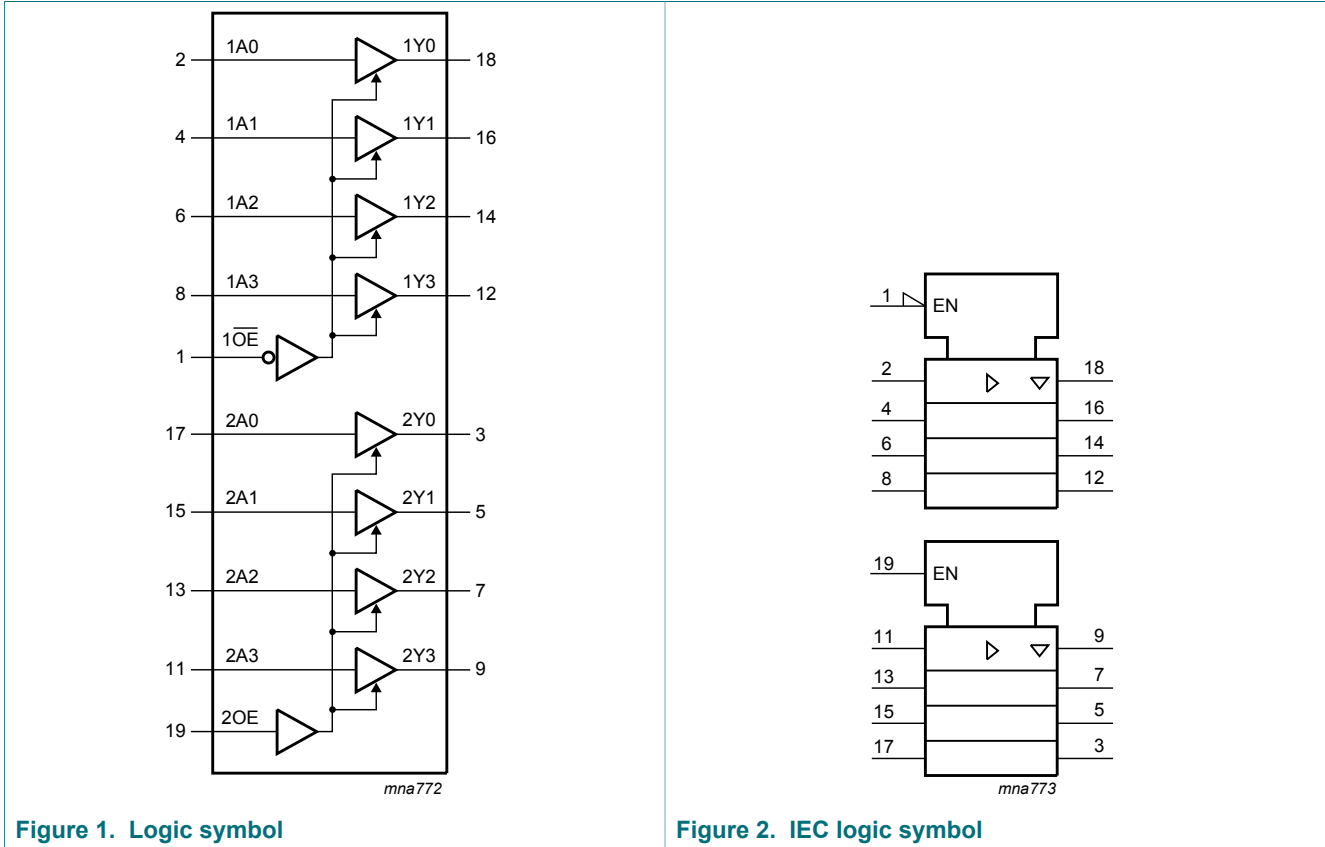
- Input levels:
  - For 74HC241: CMOS level
  - For 74HCT241: TTL level
- Octal bus interface
- Non-inverting 3-state outputs
- Complies with JEDEC standard no. 7 A
- ESD protection:
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V
- Multiple package options
- Specified from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  and  $-40\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$

## 3 Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74HC241D	$-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1
74HCT241D				
74HC241DB	$-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$	SSOP20	plastic shrink small outline package; 20 leads; body width 5.3 mm	SOT339-1
74HCT241DB				
74HC241PW	$-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	SOT360-1
74HCT241PW				

## 4 Functional diagram



## 5 Pinning information

### 5.1 Pinning

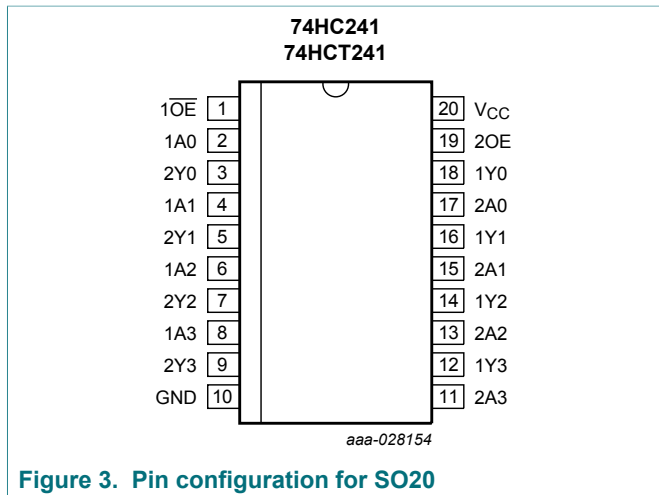


Figure 3. Pin configuration for SO20

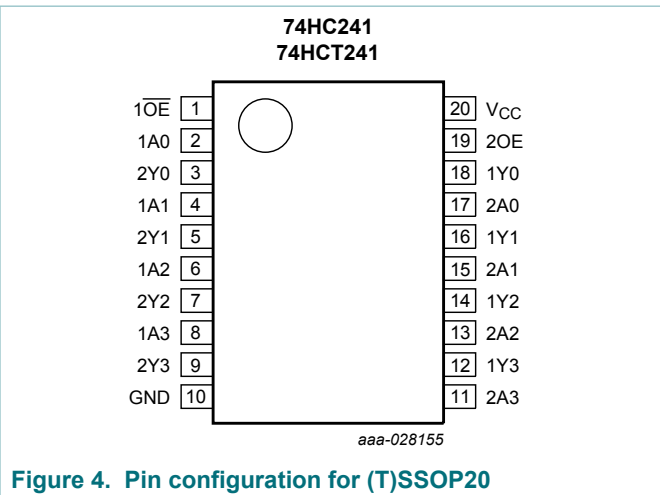


Figure 4. Pin configuration for (T)SSOP20

### 5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
1OE	1	output enable input (active LOW)
1A0, 1A1, 1A2, 1A3	2, 4, 6, 8	data input
2A0, 2A1, 2A2, 2A3	17, 15, 13, 11	data input
GND	10	ground (0 V)
1Y0, 1Y1, 1Y2, 1Y3	18, 16, 14, 12	data output
2Y0, 2Y1, 2Y2, 2Y3	3, 5, 7, 9	data output
2OE	19	output enable input (active HIGH)
VCC	20	supply voltage

## 6 Functional description

Table 3. Function table <sup>[1]</sup>

Inputs		Outputs	Inputs		Outputs
1OE	1An	1Yn	2OE	2An	2Yn
L	L	L	H	L	L
L	H	H	H	H	H
H	X	Z	L	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	V
$I_{IK}$	input clamping current	$V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$	-	$\pm 20$	mA
$I_{OK}$	output clamping current	$V_O < -0.5\text{ V}$ or $V_O > V_{CC} + 0.5\text{ V}$	-	$\pm 20$	mA
$I_O$	output current	$-0.5\text{ V} < V_O < V_{CC} + 0.5\text{ V}$	-	$\pm 35$	mA
$I_{CC}$	supply current		-	70	mA
$I_{GND}$	ground current		-70	-	mA
$T_{stg}$	storage temperature		-65	+150	°C
$P_{tot}$	total power dissipation	SO20, SSOP20 and TSSOP20 [1]	-	500	mW

[1] For SO20 packages:  $P_{tot}$  derates linearly with 8 mW/K above 70 °C.

For SSOP20 and TSSOP20 packages:  $P_{tot}$  derates linearly with 5.5 mW/K above 60 °C.

## 8 Recommended operating conditions

**Table 5. Recommended operating conditions**

Symbol	Parameter	Conditions	74HC241			74HCT241			Unit
			Min	Typ	Max	Min	Typ	Max	
$V_{CC}$	supply voltage		2.0	5.0	6.0	4.5	5.0	5.5	V
$V_I$	input voltage		0	-	$V_{CC}$	0	-	$V_{CC}$	V
$V_O$	output voltage		0	-	$V_{CC}$	0	-	$V_{CC}$	V
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 2.0\text{ V}$	-	-	625	-	-	-	ns/V
		$V_{CC} = 4.5\text{ V}$	-	1.67	139	-	1.67	139	ns/V
		$V_{CC} = 6.0\text{ V}$	-	-	83	-	-	-	ns/V
$T_{amb}$	ambient temperature		-40	-	+125	-40	-	+125	°C

## 9 Static characteristics

**Table 6. Static characteristics**

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

Symbol	Parameter	Conditions	T <sub>amb</sub> (°C)						Unit	
			25			-40 to +85		-40 to +125		
			Min	Typ	Max	Min	Max	Min		Max
<b>74HC241</b>										
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 2.0 V	1.5	1.2	-	1.5	-	1.5	-	V
		V <sub>CC</sub> = 4.5 V	3.15	2.4	-	3.15	-	3.15	-	V
		V <sub>CC</sub> = 6.0 V	4.2	3.2	-	4.2	-	4.2	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 2.0 V	-	0.8	0.5	-	0.5	-	0.5	V
		V <sub>CC</sub> = 4.5 V	-	2.1	1.35	-	1.35	-	1.35	V
		V <sub>CC</sub> = 6.0 V	-	2.8	1.8	-	1.8	-	1.8	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>								
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 2.0 V	1.9	2.0	-	1.9	-	1.9	-	V
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 6.0 V	5.9	6.0	-	5.9	-	5.9	-	V
		I <sub>O</sub> = -6.0 mA; V <sub>CC</sub> = 4.5 V	3.98	4.32	-	3.84	-	3.7	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>								
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 2.0 V	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 4.5 V	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 6.0 V	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 6.0 mA; V <sub>CC</sub> = 4.5 V	-	0.15	0.26	-	0.33	-	0.4	V
I <sub>I</sub>	input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V	-	-	±0.1	-	±1.0	-	±1.0	μA
I <sub>OZ</sub>	OFF-state output current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 6.0 V; V <sub>O</sub> = V <sub>CC</sub> or GND	-	-	±0.5	-	±5.0	-	±10	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> = 6.0 V	-	-	8.0	-	80	-	160	μA
C <sub>I</sub>	input capacitance		-	3.5	-	-	-	-	-	pF
<b>74HCT241</b>										
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	2.0	1.6	-	2.0	-	2.0	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	-	1.2	0.8	-	0.8	-	0.8	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V								
		I <sub>O</sub> = -20 μA	4.4	4.5	-	4.4	-	4.4	-	V
		I <sub>O</sub> = -6 mA	3.98	4.32	-	3.84	-	3.7	-	V

Symbol	Parameter	Conditions	T <sub>amb</sub> (°C)						Unit	
			25			-40 to +85		-40 to +125		
			Min	Typ	Max	Min	Max	Min		Max
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V								
		I <sub>O</sub> = 20 μA	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 6.0 mA	-	0.16	0.26	-	0.33	-	0.4	V
I <sub>I</sub>	input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5 V	-	-	±0.1	-	±1.0	-	±1.0	μA
I <sub>oz</sub>	OFF-state output current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 5.5 V; V <sub>O</sub> = V <sub>CC</sub> or GND	-	-	±0.5	-	±5.0	-	±10	μA
I <sub>CC</sub>	supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5 V; I <sub>O</sub> = 0 A	-	-	8.0	-	80	-	160	μA
ΔI <sub>CC</sub>	additional supply current	per input pin; V <sub>CC</sub> = 4.5 V to 5.5 V; V <sub>I</sub> = V <sub>CC</sub> - 2.1 V; other inputs at V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A								
		nAn; 1OE	-	70	252	-	315	-	343	μA
		2OE	-	150	540	-	675	-	735	μA
C <sub>I</sub>	input capacitance		-	3.5	-	-	-	-	-	pF

## 10 Dynamic characteristics

Table 7. Dynamic characteristics

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

Symbol	Parameter	Conditions	T <sub>amb</sub> (°C)					Unit	
			+25			-40 to +85			-40 to +125
			Min	Typ	Max	Max	Max		
<b>74HC241</b>									
t <sub>pd</sub>	propagation delay	nAn to nYn; see Figure 5 <sup>[1]</sup>							
		V <sub>CC</sub> = 2.0 V	-	25	100	125	150	ns	
		V <sub>CC</sub> = 4.5 V	-	9	20	25	30	ns	
		V <sub>CC</sub> = 5.0 V; C <sub>L</sub> = 15 pF	-	7	-	-	-	ns	
		V <sub>CC</sub> = 6.0 V	-	7	17	21	26	ns	
t <sub>en</sub>	enable time	1OE to 1Yn; see Figure 6; 2OE to 2Yn; see Figure 7 <sup>[2]</sup>							
		V <sub>CC</sub> = 2.0 V	-	30	150	190	225	ns	
		V <sub>CC</sub> = 4.5 V	-	11	30	38	45	ns	
		V <sub>CC</sub> = 6.0 V	-	9	26	33	38	ns	
t <sub>dis</sub>	disable time	1OE to 1Yn; see Figure 6; 2OE to 2Yn; see Figure 7 <sup>[3]</sup>							
		V <sub>CC</sub> = 2.0 V	-	39	150	190	225	ns	
		V <sub>CC</sub> = 4.5 V	-	14	30	38	45	ns	
		V <sub>CC</sub> = 6.0 V	-	11	26	33	38	ns	

Symbol	Parameter	Conditions	T <sub>amb</sub> (°C)					Unit
			+25			-40 to +85	-40 to +125	
			Min	Typ	Max	Max	Max	
t <sub>t</sub>	transition time	see <a href="#">Figure 5</a> <sup>[4]</sup>						
		V <sub>CC</sub> = 2.0 V	-	14	60	75	90	ns
		V <sub>CC</sub> = 4.5 V	-	5	12	15	18	ns
		V <sub>CC</sub> = 6.0 V	-	4	10	13	15	ns
C <sub>PD</sub>	power dissipation capacitance	per buffer; V <sub>I</sub> = GND to V <sub>CC</sub> <sup>[5]</sup>	-	30	-	-	-	pF
<b>74HCT241</b>								
t <sub>pd</sub>	propagation delay	nAn to nYn; see <a href="#">Figure 5</a> <sup>[1]</sup>						
		V <sub>CC</sub> = 4.5 V	-	13	22	28	33	ns
		V <sub>CC</sub> = 5.0 V; C <sub>L</sub> = 15 pF	-	11	-	-	-	ns
t <sub>en</sub>	enable time	1OE to 1Yn; see <a href="#">Figure 6</a> ; 2OE to 2Yn; see <a href="#">Figure 7</a> ; V <sub>CC</sub> = 4.5 V <sup>[2]</sup>	-	15	30	38	45	ns
t <sub>dis</sub>	disable time	1OE to 1Yn; see <a href="#">Figure 6</a> ; 2OE to 2Yn; see <a href="#">Figure 7</a> ; V <sub>CC</sub> = 4.5 V <sup>[3]</sup>	-	18	30	38	45	ns
t <sub>t</sub>	transition time	V <sub>CC</sub> = 4.5 V; see <a href="#">Figure 5</a> <sup>[4]</sup>	-	5	12	15	18	ns
C <sub>PD</sub>	power dissipation capacitance	per buffer; V <sub>I</sub> = GND to V <sub>CC</sub> - 1.5 V <sup>[5]</sup>	-	30	-	-	-	pF

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

[2] t<sub>en</sub> is the same as t<sub>PZH</sub> and t<sub>PZL</sub>.

[3] t<sub>dis</sub> is the same as t<sub>PHZ</sub> and t<sub>PLZ</sub>.

[4] t<sub>t</sub> is the same as t<sub>THL</sub> and t<sub>TLH</sub>.

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

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

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

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

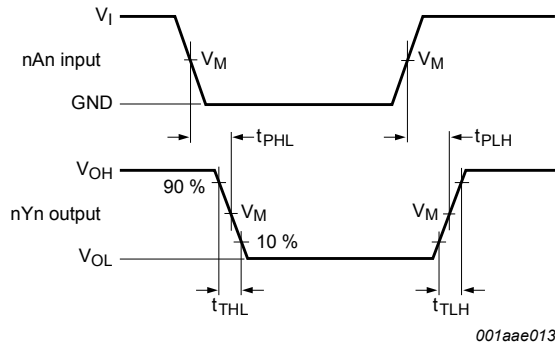
C<sub>L</sub> = output load capacitance in pF;

V<sub>CC</sub> = supply voltage in V;

N = number of inputs switching;

∑(C<sub>L</sub> V<sub>CC</sub><sup>2</sup> f<sub>o</sub>) = sum of outputs.

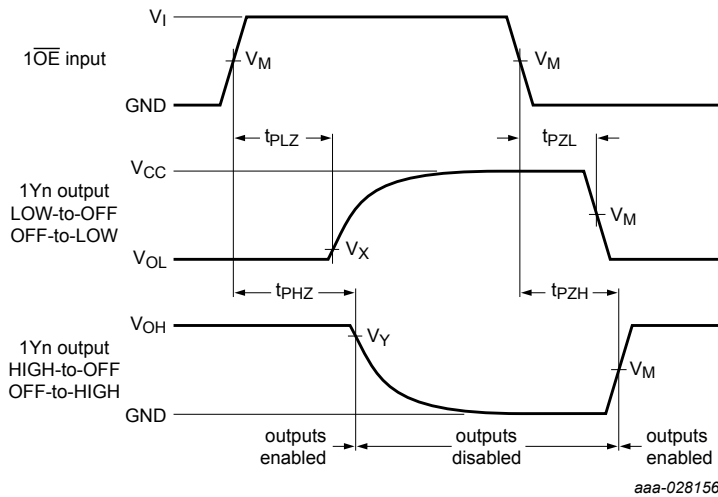
10.1 Waveforms and test circuit



See Table 8 for measurement points.

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

Figure 5. Input (nAn) to output (nYn) propagation delays and output transition times

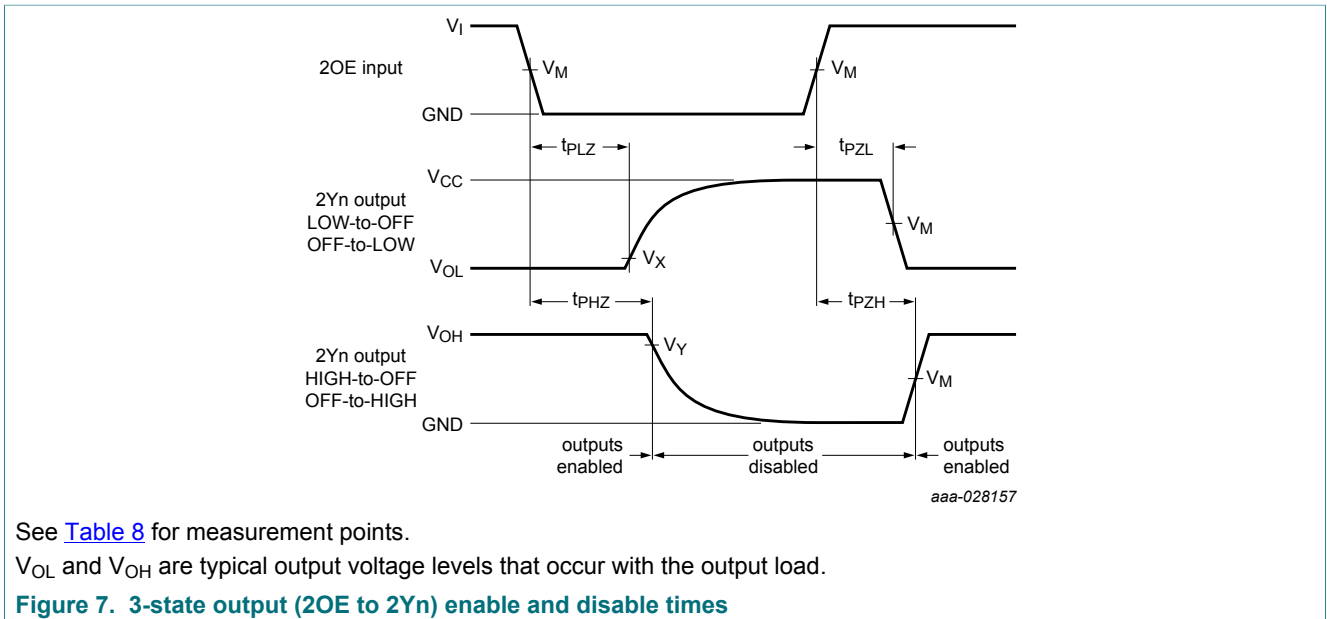


See Table 8 for measurement points.

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

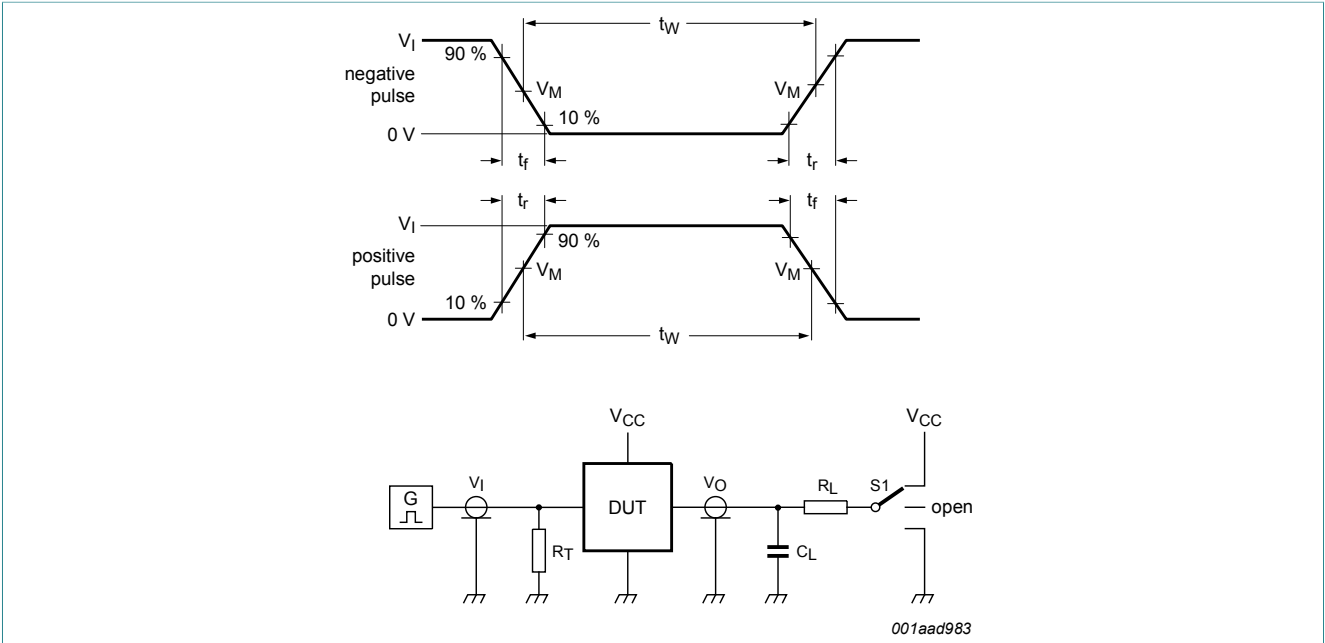
Figure 6. 3-state output ( $\overline{1OE}$  to 1Yn) enable and disable times





**Table 8. Measurement points**

Type	Input		Output		
	$V_I$	$V_M$	$V_M$	$V_X$	$V_Y$
74HC241	GND to $V_{CC}$	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$0.1 \times V_{CC}$	$0.9 \times V_{CC}$
74HCT241	GND to 3 V	1.3 V	1.3 V	$0.1 \times V_{CC}$	$0.9 \times V_{CC}$



Test data is given in [Table 9](#).

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 resistance.

S1 = Test selection switch.

**Figure 8. Test circuit for measuring switching times**

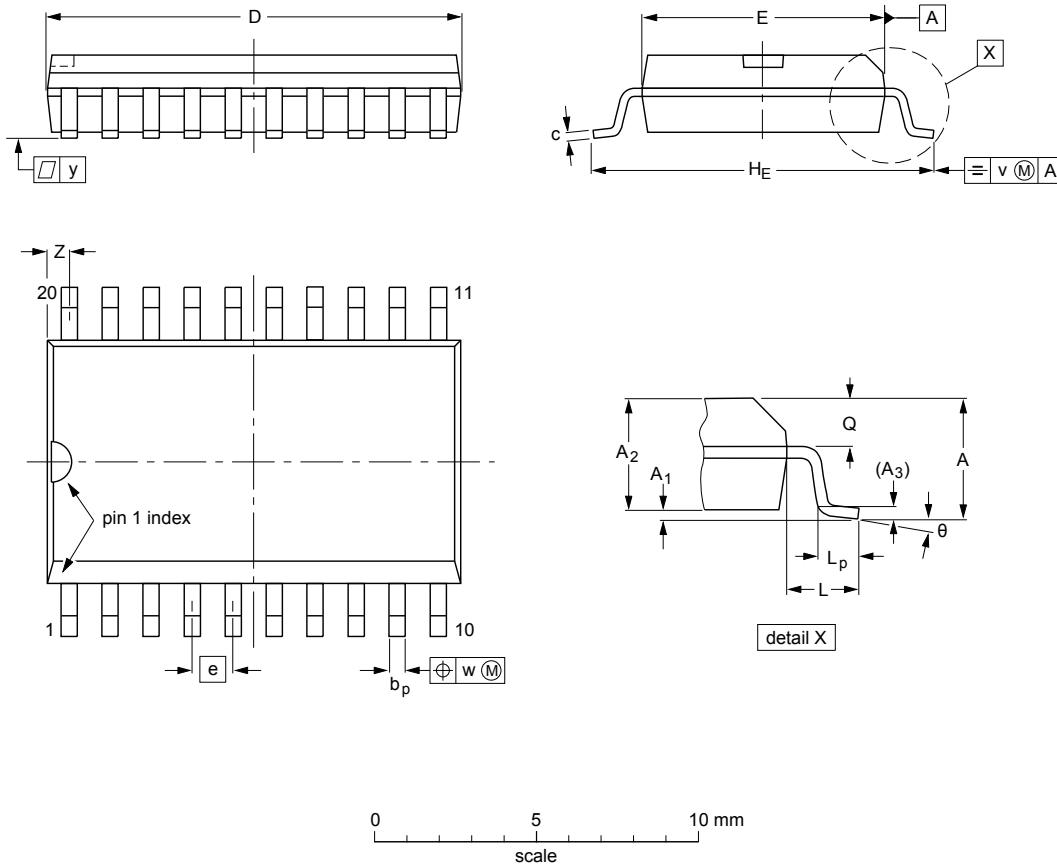
**Table 9. Test data**

Type	Input		Load		S1 position		
	$V_I$	$t_r, t_f$	$C_L$	$R_L$	$t_{PHL}, t_{PLH}$	$t_{PZH}, t_{PHZ}$	$t_{PZL}, t_{PLZ}$
74HC241	GND to $V_{CC}$	6 ns	50 pF	1 k $\Omega$	open	GND	$V_{CC}$
74HCT241	GND to 3 V	6 ns	50 pF	1 k $\Omega$	open	GND	$V_{CC}$

11 Package outline

SO20: plastic small outline package; 20 leads; body width 7.5 mm

SOT163-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	2.65	0.3 0.1	2.45 2.25	0.25	0.49 0.36	0.32 0.23	13.0 12.6	7.6 7.4	1.27	10.65 10.00	1.4	1.1 0.4	1.1 1.0	0.25	0.25	0.1	0.9 0.4	8° 0°
inches	0.1	0.012 0.004	0.096 0.089	0.01	0.019 0.014	0.013 0.009	0.51 0.49	0.30 0.29	0.05	0.419 0.394	0.055	0.043 0.016	0.043 0.039	0.01	0.01	0.004	0.035 0.016	

Note

1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA		
SOT163-1	075E04	MS-013			99-12-27 03-02-19

Figure 9. Package outline SOT163-1 (SO20)

SSOP20: plastic shrink small outline package; 20 leads; body width 5.3 mm

SOT339-1



**DIMENSIONS (mm are the original dimensions)**

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	2	0.21 0.05	1.80 1.65	0.25	0.38 0.25	0.20 0.09	7.4 7.0	5.4 5.2	0.65	7.9 7.6	1.25	1.03 0.63	0.9 0.7	0.2	0.13	0.1	0.9 0.5	8° 0°

**Note**

1. Plastic or metal protrusions of 0.2 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT339-1		MO-150				99-12-27 03-02-19

Figure 10. Package outline SOT339-1 (SSOP20)

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

SOT360-1

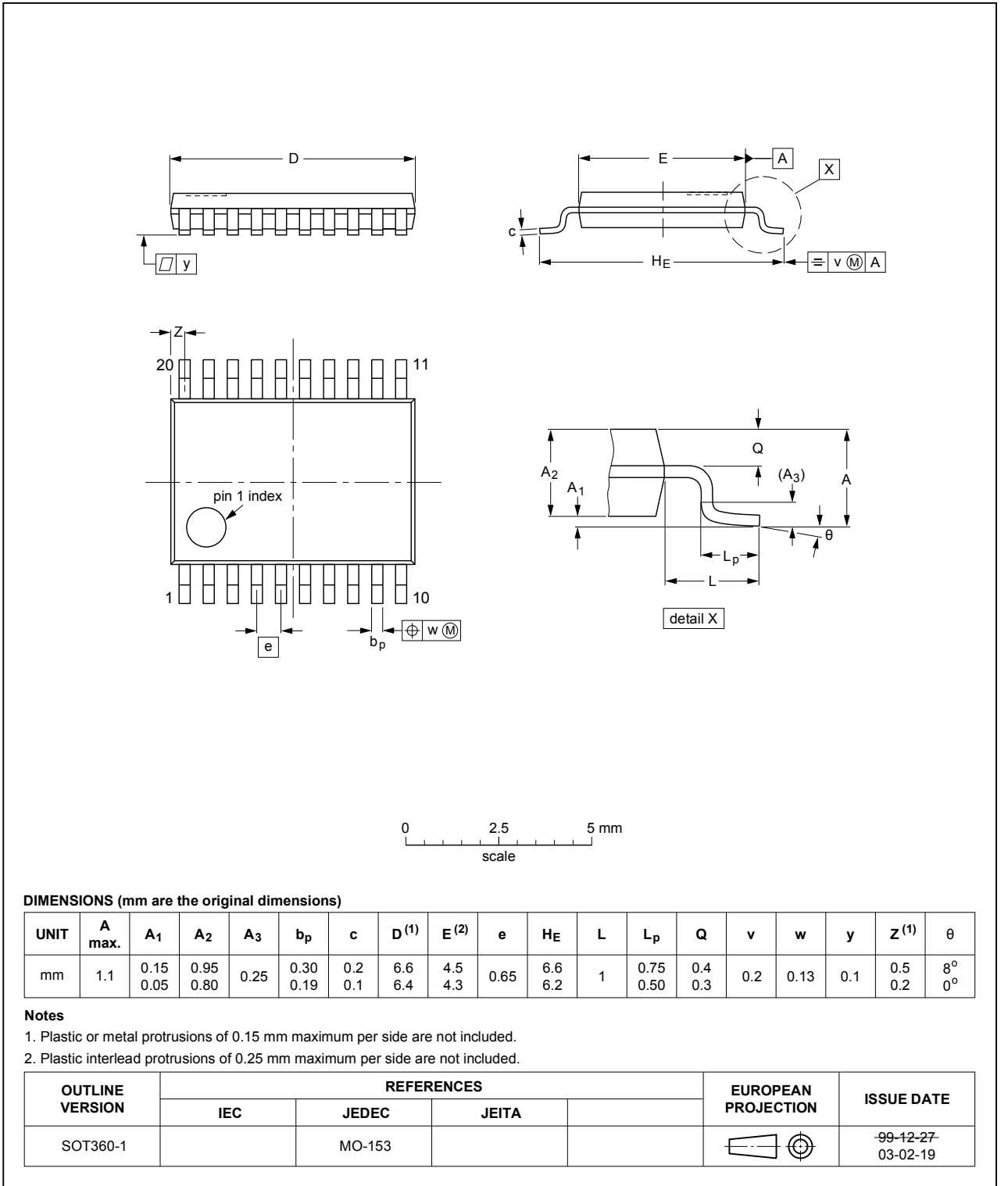


Figure 11. Package outline SOT360-1 (TSSOP20)

## 12 Abbreviations

Table 10. Abbreviations

Acronym	Description
CMOS	Complementary Metal-Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model
TTL	Transistor-Transistor Logic

## 13 Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT241 v.3	20180220	Product data sheet	-	74HC_HCT241 v.2
Modifications:	<ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> </ul>			
74HC_HCT241 v.2	19930801	Product data sheet	-	74HC_HCT241 v.1

## 14 Legal information

### 14.1 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>.

### 14.2 Definitions

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**Contents**

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<b>1</b>	<b>General description .....</b>	<b>1</b>
<b>2</b>	<b>Features and benefits .....</b>	<b>1</b>
<b>3</b>	<b>Ordering information .....</b>	<b>1</b>
<b>4</b>	<b>Functional diagram .....</b>	<b>2</b>
<b>5</b>	<b>Pinning information .....</b>	<b>3</b>
5.1	Pinning .....	3
5.2	Pin description .....	3
<b>6</b>	<b>Functional description .....</b>	<b>3</b>
<b>7</b>	<b>Limiting values .....</b>	<b>4</b>
<b>8</b>	<b>Recommended operating conditions .....</b>	<b>4</b>
<b>9</b>	<b>Static characteristics .....</b>	<b>5</b>
<b>10</b>	<b>Dynamic characteristics .....</b>	<b>6</b>
10.1	Waveforms and test circuit .....	8
<b>11</b>	<b>Package outline .....</b>	<b>11</b>
<b>12</b>	<b>Abbreviations .....</b>	<b>14</b>
<b>13</b>	<b>Revision history .....</b>	<b>14</b>
<b>14</b>	<b>Legal information .....</b>	<b>15</b>

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Date of release: 20 February 2018  
Document identifier: 74HC\_HCT241

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