

# 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  $-40^{\circ}C$  to  $+85^{\circ}C$  and  $-40^{\circ}C$  to  $+125^{\circ}C$

## 3 Ordering information

Table 1. Ordering information

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

**nexperia**

## 4 Functional diagram

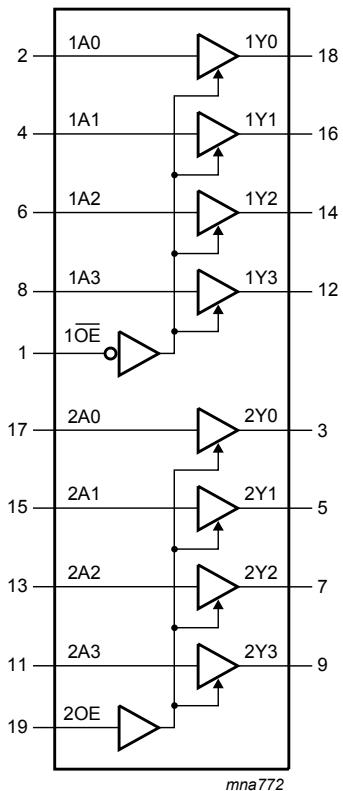


Figure 1. Logic symbol

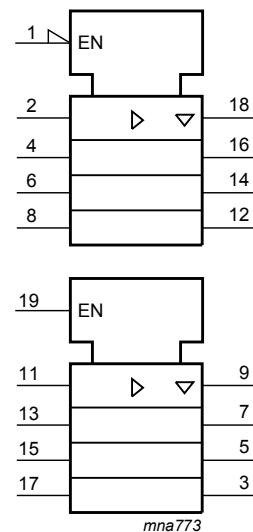


Figure 2. IEC logic symbol

## 5 Pinning information

### 5.1 Pinning

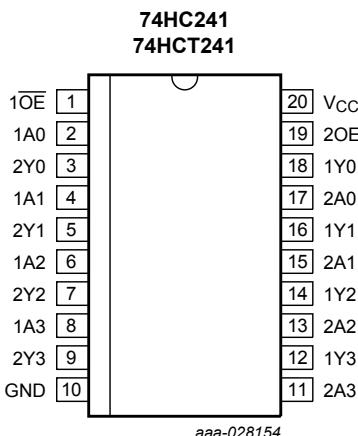


Figure 3. Pin configuration for SO20

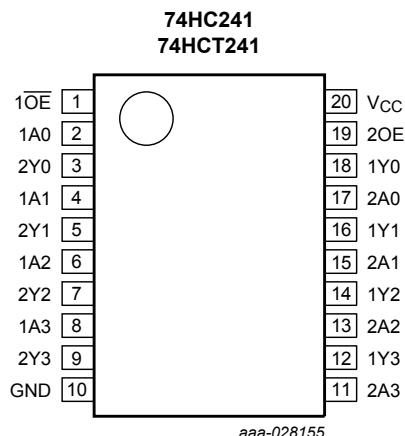


Figure 4. Pin configuration for (T)SSOP20

### 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)
V <sub>CC</sub>	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 <sub>CC</sub>	supply voltage		-0.5	+7	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < -0.5 V or V <sub>I</sub> > V <sub>CC</sub> + 0.5 V	-	±20	mA
I <sub>OK</sub>	output clamping current	V <sub>O</sub> < -0.5 V or V <sub>O</sub> > V <sub>CC</sub> + 0.5 V	-	±20	mA
I <sub>O</sub>	output current	-0.5 V < V <sub>O</sub> < V <sub>CC</sub> + 0.5 V	-	±35	mA
I <sub>CC</sub>	supply current		-	70	mA
I <sub>GND</sub>	ground current		-70	-	mA
T <sub>stg</sub>	storage temperature		-65	+150	°C
P <sub>tot</sub>	total power dissipation	SO20, SSOP20 and TSSOP20	[1]	-	500 mW

[1] For SO20 packages: P<sub>tot</sub> derates linearly with 8 mW/K above 70 °C.

For SSOP20 and TSSOP20 packages: P<sub>tot</sub> 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 <sub>CC</sub>	supply voltage		2.0	5.0	6.0	4.5	5.0	5.5	V
V <sub>I</sub>	input voltage		0	-	V <sub>CC</sub>	0	-	V <sub>CC</sub>	V
V <sub>O</sub>	output voltage		0	-	V <sub>CC</sub>	0	-	V <sub>CC</sub>	V
Δt/ΔV	input transition rise and fall rate	V <sub>CC</sub> = 2.0 V	-	-	625	-	-	-	ns/V
		V <sub>CC</sub> = 4.5 V	-	1.67	139	-	1.67	139	ns/V
		V <sub>CC</sub> = 6.0 V	-	-	83	-	-	-	ns/V
T <sub>amb</sub>	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	
		I <sub>O</sub> = -7.8 mA; V <sub>CC</sub> = 6.0 V	5.48	5.81	-	5.34	-	5.2	-	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>O</sub> = 7.8 mA; V <sub>CC</sub> = 6.0 V	-	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> = 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; 1 $\overline{OE}$	-	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	Max			
<b>74HC241</b>											
t <sub>pd</sub>	propagation delay	nAn to nYn; see <a href="#">Figure 5</a> [1]									
		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	1 $\overline{OE}$ to 1Yn; see <a href="#">Figure 6</a> ; 2OE to 2Yn; see <a href="#">Figure 7</a> [2]									
		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	
		1 $\overline{OE}$ to 1Yn; see <a href="#">Figure 6</a> ; 2OE to 2Yn; see <a href="#">Figure 7</a> [3]									
t <sub>dis</sub>	disable time	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> [4]						
		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> [5]	-	30	-	-	-	pF

74HCT241								
t <sub>pd</sub>	propagation delay	nAn to nYn; see <a href="#">Figure 5</a> [1]						
		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 [2]	-	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 [3]	-	18	30	38	45	ns
t <sub>t</sub>	transition time	V <sub>CC</sub> = 4.5 V; see <a href="#">Figure 5</a> [4]	-	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 [5]	-	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>PZL</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  $\mu$ W):

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

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

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

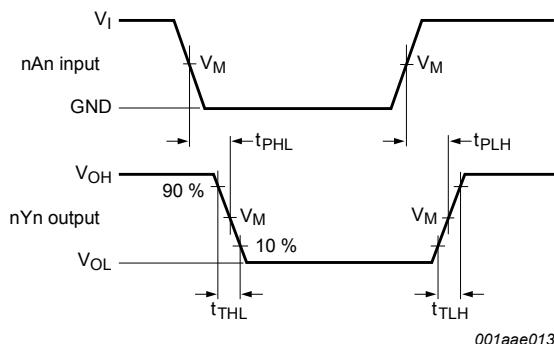
C<sub>L</sub> = output load capacitance in pF;

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

N = number of inputs switching;

$\sum (C_L V_{CC}^2 f_o)$  = sum of outputs.

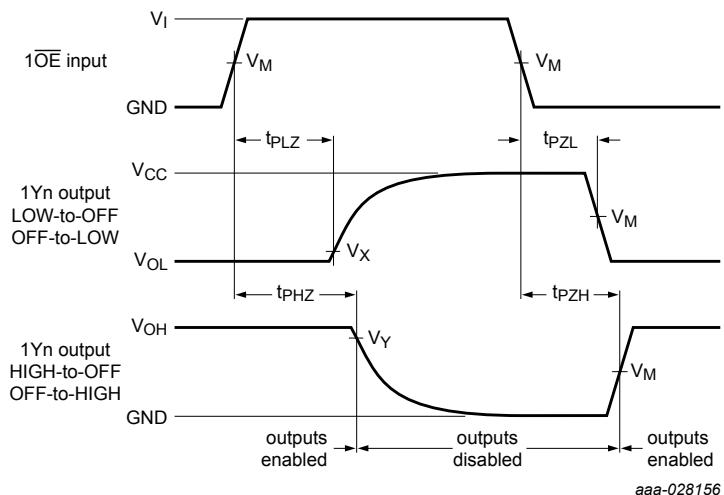
## 10.1 Waveforms and test circuit



See [Table 8](#) for measurement points.

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

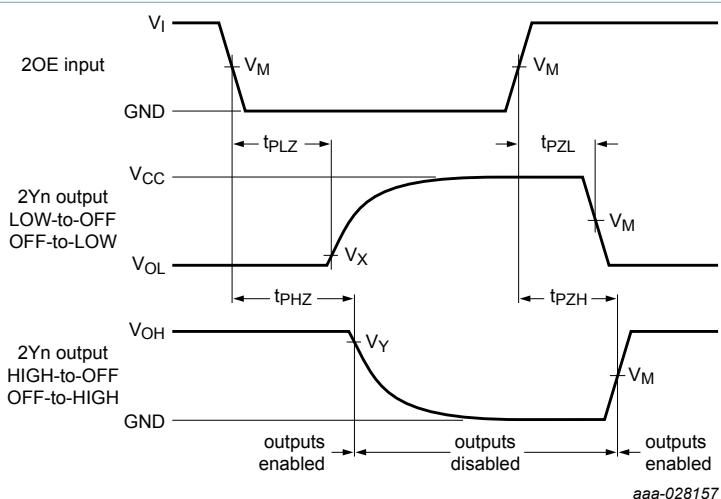
**Figure 5. Input (nAn) to output (nYn) propagation delays and output transition times**



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 (1OE to 1Yn) enable and disable times**



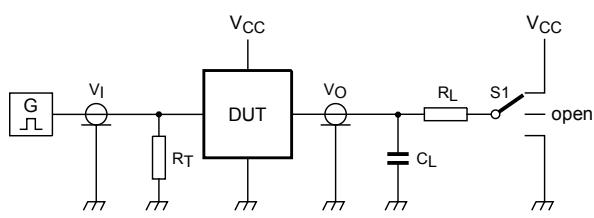
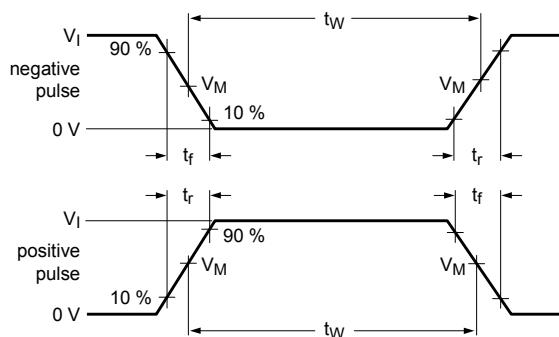
See [Table 8](#) for measurement points.

V<sub>OL</sub> and V<sub>OH</sub> are typical output voltage levels that occur with the output load.

**Figure 7. 3-state output (2OE to 2Yn) enable and disable times**

**Table 8. Measurement points**

Type	Input		Output		
	V <sub>I</sub>	V <sub>M</sub>	V <sub>M</sub>	V <sub>X</sub>	V <sub>Y</sub>
74HC241	GND to V <sub>CC</sub>	0.5 x V <sub>CC</sub>	0.5 x V <sub>CC</sub>	0.1 x V <sub>CC</sub>	0.9 x V <sub>CC</sub>
74HCT241	GND to 3 V	1.3 V	1.3 V	0.1 x V <sub>CC</sub>	0.9 x V <sub>CC</sub>



001aad983

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**

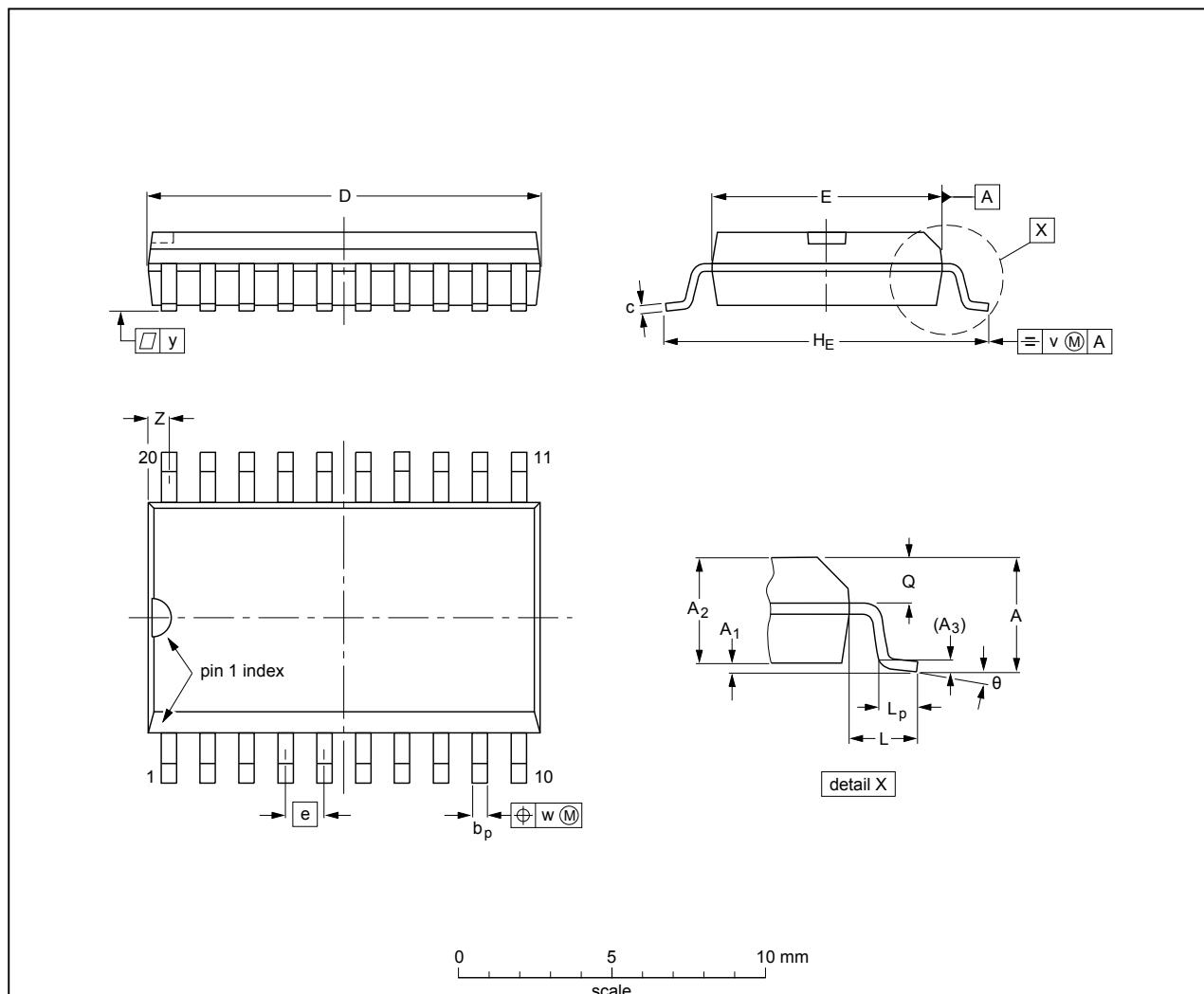
**Table 9. Test data**

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 0.1	0.3 2.25	2.45 0.25	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 0.004	0.012 0.089	0.096 0.014	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 0.016	0.035 0.004	0° 0°

### Note

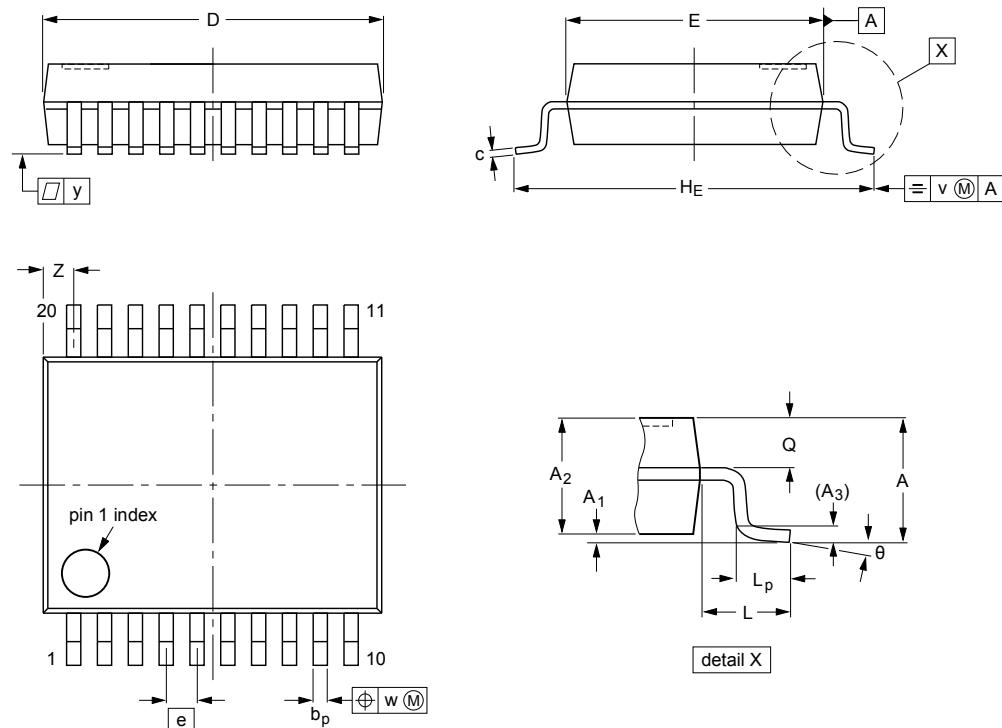
1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

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

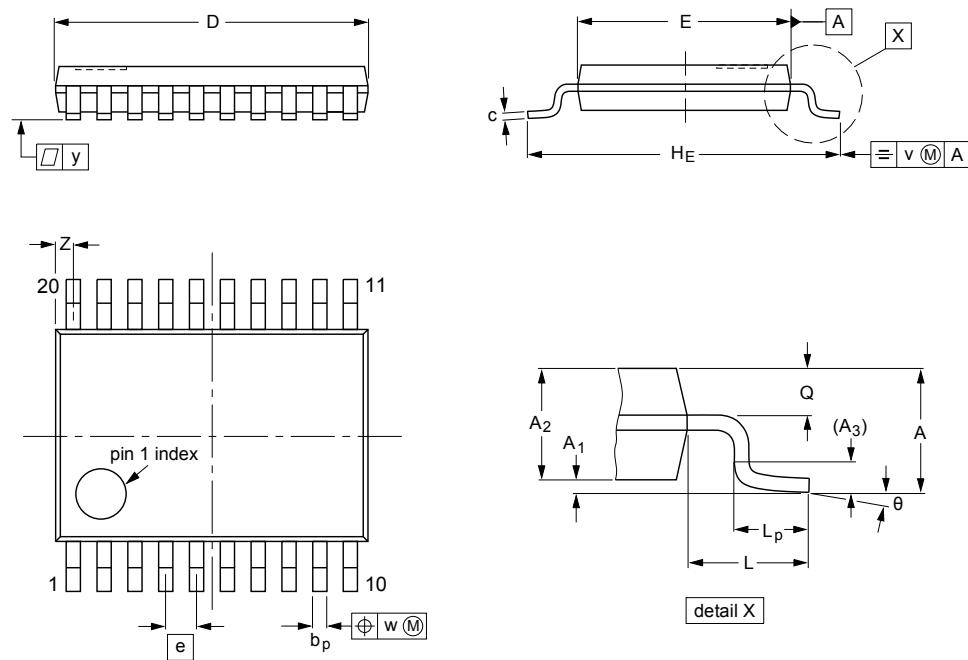
1. Plastic or metal protrusions of 0.2 mm maximum per side are not included.

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



## 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>(2)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	z <sup>(1)</sup>	θ
mm	1.1 0.05	0.15 0.80	0.95	0.25	0.30 0.19	0.2 0.1	6.6 6.4	4.5 4.3	0.65	6.6 6.2	1	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.5 0.2	8° 0°

## 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			
SOT360-1		MO-153				-99-12-27 03-02-19

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

**Draft** — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. Nexperia does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

**Short data sheet** — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local Nexperia sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

**Product specification** — The information and data provided in a Product data sheet shall define the specification of the product as agreed between Nexperia and its customer, unless Nexperia and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the Nexperia product is deemed to offer functions and qualities beyond those described in the Product data sheet.

systems or equipment, nor in applications where failure or malfunction of an Nexperia product can reasonably be expected to result in personal injury, death or severe property or environmental damage. Nexperia and its suppliers accept no liability for inclusion and/or use of Nexperia products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

**Applications** — Applications that are described herein for any of these products are for illustrative purposes only. Nexperia makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification. Customers are responsible for the design and operation of their applications and products using Nexperia products, and Nexperia accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the Nexperia product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products. Nexperia does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using Nexperia products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). Nexperia does not accept any liability in this respect.

**Limiting values** — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

**Terms and conditions of commercial sale** — Nexperia products are sold subject to the general terms and conditions of commercial sale, as published at <http://www.nexperia.com/profile/terms>, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. Nexperia hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of Nexperia products by customer.

**No offer to sell or license** — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

**Export control** — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

### 14.3 Disclaimers

**Limited warranty and liability** — Information in this document is believed to be accurate and reliable. However, Nexperia does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. Nexperia takes no responsibility for the content in this document if provided by an information source outside of Nexperia. In no event shall Nexperia be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory. Notwithstanding any damages that customer might incur for any reason whatsoever, Nexperia's aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the Terms and conditions of commercial sale of Nexperia.

**Right to make changes** — Nexperia reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

**Suitability for use** — Nexperia products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical

**Non-automotive qualified products** — Unless this data sheet expressly states that this specific Nexperia product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. Nexperia accepts no liability for inclusion and/or use of non-automotive qualified products in automotive equipment or applications. In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without Nexperia's warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond Nexperia's specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies Nexperia for any liability, damages or failed product claims resulting from customer

design and use of the product for automotive applications beyond Nexperia's standard warranty and Nexperia's product specifications.

**Translations** — A non-English (translated) version of a document is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

## 14.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

## Contents

---

<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>

---

Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.