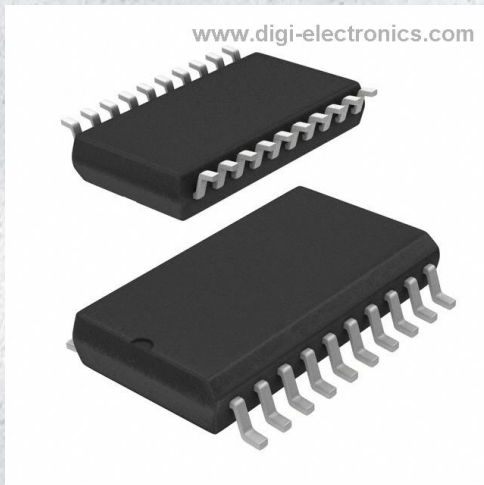


74HC7541D,112 Datasheet



<https://www.DiGi-Electronics.com>

DiGi Electronics Part Number	74HC7541D,112-DG
Manufacturer	Nexperia USA Inc.
Manufacturer Product Number	74HC7541D,112
Description	IC BUFFER NON-INVERT 6V 20SO
Detailed Description	Buffer, Non-Inverting 1 Element 8 Bit per Element 3- -State Output 20-SO



Tel: +00 852-30501935

RFQ Email: Info@DiGi-Electronics.com

DiGi is a global authorized distributor of electronic components.

Purchase and inquiry

Manufacturer Product Number:

74HC7541D,112

Series:

74HC

Logic Type:

Buffer, Non-Inverting

Number of Bits per Element:

8

Output Type:

3-State

Voltage - Supply:

2V ~ 6V

Mounting Type:

Surface Mount

Supplier Device Package:

20-SO

Manufacturer:

Nexperia USA Inc.

Product Status:

Obsolete

Number of Elements:

1

Input Type:

Schmitt Trigger

Current - Output High, Low:

7.8mA, 7.8mA

Operating Temperature:

-40°C ~ 125°C (TA)

Package / Case:

20-SOIC (0.295", 7.50mm Width)

Base Product Number:

74HC7541

Environmental & Export classification

RoHS Status:

ROHS3 Compliant

REACH Status:

REACH Unaffected

HTSUS:

8542.39.0001

Moisture Sensitivity Level (MSL):

1 (Unlimited)

ECCN:

EAR99

74HC7541; 74HCT7541

Octal Schmitt trigger buffer/line driver; 3-state

Rev. 9 — 5 August 2024

Product data sheet

1. General description

The 74HC7541; 74HCT7541 is an 8-bit buffer/line driver with Schmitt-trigger inputs and 3-state outputs. The device features two output enables ($\overline{OE}1$ and $\overline{OE}2$). A HIGH on $\overline{OE}n$ causes the 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} . Schmitt trigger inputs transform slowly changing input signals into sharply defined jitter-free output signals.

2. Features and benefits

- Wide supply voltage range from 2.0 V to 6.0 V
- CMOS low power dissipation
- High noise immunity
- Unlimited input rise and fall times
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level B
- Complies with JEDEC standards:
 - JESD8C (2.7 V to 3.6 V)
 - JESD7A (2.0 V to 6.0 V)
- Non-inverting outputs
- Input levels:
 - For 74HC7541: CMOS level
 - For 74HCT7541: TTL level
- ESD protection:
 - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
 - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V
- Specified from $-40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ and from $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74HC7541D 74HCT7541D	$-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1
74HC7541PW 74HCT7541PW	$-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	SOT360-1

4. Functional diagram

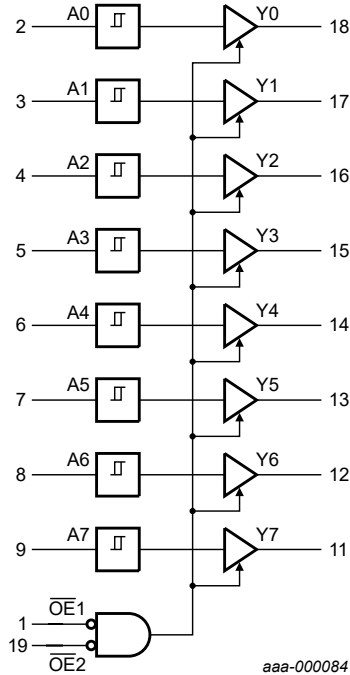


Fig. 1. Logic symbol

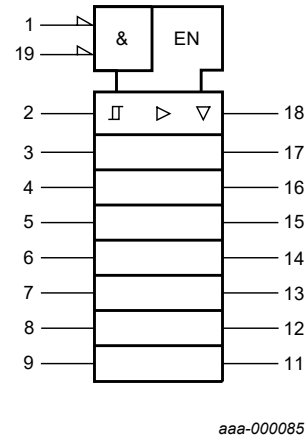
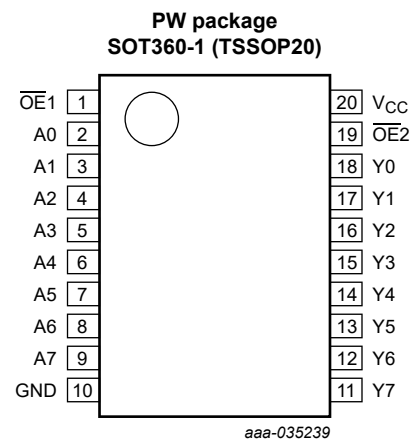
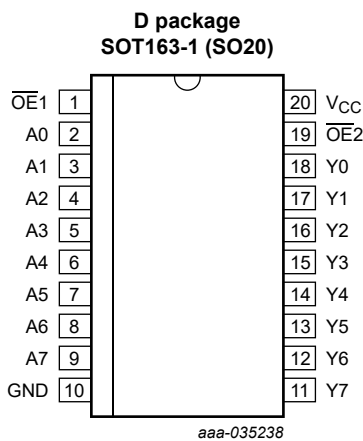


Fig. 2. IEC logic symbol

5. Pinning information

5.1. Pinning



5.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
OE1, OE2	1, 19	output enable input (active LOW)
A0, A1, A2, A3, A4, A5, A6, A7	2, 3, 4, 5, 6, 7, 8, 9	data input
GND	10	ground (0 V)
Y0, Y1, Y2, Y3, Y4, Y5, Y6, Y7	18, 17, 16, 15, 14, 13, 12, 11	data output
V _{CC}	20	supply voltage

6. Functional description

Table 3. Functional table

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

Control		Input	Output
OE1	OE2	An	Yn
L	L	L	L
L	L	H	H
X	H	X	Z
H	X	X	Z

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 V or V _I > V _{CC} + 0.5 V [1]	-	±20	mA
I _{OK}	output clamping current	V _O < -0.5 V or V _O > V _{CC} + 0.5 V [1]	-	±20	mA
I _O	output current	-0.5 V < V _O < V _{CC} + 0.5 V	-	±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	[2]	-	500	mW

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

[2] For SOT163-1 (SO20) package: P_{tot} derates linearly with 12.3 mW/K above 109 °C.
For SOT360-1 (TSSOP20) package: P_{tot} derates linearly with 10.0 mW/K above 100 °C.

8. Recommended operating conditions

Table 5. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V)

Symbol	Parameter	Conditions	74HC7541			74HCT7541			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
T_{amb}	ambient temperature		-40	+25	+125	-40	+25	+125	°C

9. Static characteristics

Table 6. Static characteristics

At recommended operating conditions; 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	
74HC7541										
V_{OH}	HIGH-level output voltage	$V_I = V_{T+}$ or V_{T-}								
		$I_O = -20 \mu A$; $V_{CC} = 2.0 V$	1.9	2.0	-	1.9	-	1.9	-	V
		$I_O = -20 \mu A$; $V_{CC} = 4.5 V$	4.4	4.5	-	4.4	-	4.4	-	V
		$I_O = -20 \mu A$; $V_{CC} = 6.0 V$	5.9	6.0	-	5.9	-	5.9	-	V
		$I_O = -6.0 mA$; $V_{CC} = 4.5 V$	3.98	4.32	-	3.84	-	3.7	-	V
	$I_O = -7.8 mA$; $V_{CC} = 6.0 V$	5.48	5.81	-	5.34	-	5.2	-	V	
V_{OL}	LOW-level output voltage	$V_I = V_{T+}$ or V_{T-}								
		$I_O = 20 \mu A$; $V_{CC} = 2.0 V$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 20 \mu A$; $V_{CC} = 4.5 V$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 20 \mu A$; $V_{CC} = 6.0 V$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 6.0 mA$; $V_{CC} = 4.5 V$	-	0.15	0.26	-	0.33	-	0.4	V
	$I_O = 7.8 mA$; $V_{CC} = 6.0 V$	-	0.16	0.26	-	0.33	-	0.4	V	
I_I	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 6.0 V$	-	-	± 0.1	-	± 1.0	-	± 1.0	μA
I_{OZ}	OFF-state output current	$V_I = V_{T+}$ or V_{T-} ; $V_{CC} = 6.0 V$; $V_O = V_{CC}$ or GND	-	-	± 0.5	-	± 5.0	-	± 10	μA
I_{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0 A$; $V_{CC} = 6.0 V$	-	-	8.0	-	80	-	160	μA
C_I	input capacitance		-	3.5	-	-	-	-	-	pF

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74HCT7541										
V _{OH}	HIGH-level output voltage	V _I = V _{T+} or V _{T-} ; V _{CC} = 4.5 V								
		I _O = -20 μA	4.4	4.5	-	4.4	-	4.4	-	V
		I _O = -6.0 mA	3.98	4.32	-	3.84	-	3.7	-	V
V _{OL}	LOW-level output voltage	V _I = V _{T+} or V _{T-} ; V _{CC} = 4.5 V								
		I _O = 20 μA;	-	0	0.1	-	0.1	-	0.1	V
		I _O = 6.0 mA;	-	0.15	0.26	-	0.33	-	0.4	V
I _I	input leakage current	V _I = V _{CC} or GND; V _{CC} = 5.5 V	-	-	±0.1	-	±1.0	-	±1.0	μA
I _{OZ}	OFF-state output current	V _I = V _{T+} or V _{T-} ; V _{CC} = 5.5 V; V _O = V _{CC} or GND	-	-	±0.5	-	±5.0	-	±10	μA
I _{CC}	supply current	V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V	-	-	8.0	-	80	-	160	μA
ΔI _{CC}	additional supply current	per input pin; I _O = 0 A; V _I = V _{CC} - 2.1 V; other inputs at V _{CC} or GND; V _{CC} = 4.5 V to 5.5 V								
		An input	-	20	72	-	90	-	98	μA
		$\overline{\text{OEn}}$ input	-	130	468	-	585	-	637	μA
C _I	input capacitance		-	3.5	-	-	-	-	-	pF

10. Dynamic characteristics

Table 7. Dynamic characteristics

GND = 0 V; C_L = 50 pF; for test circuit see Fig. 5.

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74HC7541										
t _{pd}	propagation delay	An to Yn; see Fig. 3 [1]								
		V _{CC} = 2.0 V	-	39	120	-	150	-	180	ns
		V _{CC} = 4.5 V	-	14	24	-	30	-	36	ns
		V _{CC} = 5.0 V; C _L = 15 pF	-	10	-	-	-	-	-	ns
		V _{CC} = 6.0 V	-	11	20	-	26	-	32	ns
t _{en}	enable time	$\overline{\text{OEn}}$ to Yn; see Fig. 4 [1]								
		V _{CC} = 2.0 V	-	44	160	-	200	-	240	ns
		V _{CC} = 4.5 V	-	16	32	-	40	-	48	ns
		V _{CC} = 6.0 V	-	13	27	-	34	-	41	ns
t _{dis}	disable time	$\overline{\text{OEn}}$ to Yn; see Fig. 4 [1]								
		V _{CC} = 2.0 V	-	58	160	-	200	-	240	ns
		V _{CC} = 4.5 V	-	21	32	-	40	-	48	ns
		V _{CC} = 6.0 V	-	17	27	-	34	-	41	ns

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
t _t	transition time	see Fig. 3 [2]								
		V _{CC} = 2.0 V	-	14	60	-	75	-	90	ns
		V _{CC} = 4.5 V	-	5	12	-	15	-	18	ns
		V _{CC} = 6.0 V	-	4	10	-	13	-	15	ns
C _{PD}	power dissipation capacitance	per package; V _I = GND to V _{CC} [3]	-	30	-	-	-	-	-	pF
74HCT7541										
t _{pd}	propagation delay	An to Yn; see Fig. 3 [1]								
		V _{CC} = 4.5 V	-	19	32	-	40	-	48	ns
		V _{CC} = 5.0 V; C _L = 15 pF	-	16	-	-	-	-	-	ns
t _{en}	enable time	OE̅n to Yn; see Fig. 4 [1]								
		V _{CC} = 4.5 V	-	18	32	-	40	-	48	ns
t _{dis}	disable time	OE̅n to Yn; see Fig. 4 [1]								
		V _{CC} = 4.5 V	-	20	32	-	40	-	48	ns
t _t	transition time	V _{CC} = 4.5 V; see Fig. 3 [2]	-	5	12	-	15	-	18	ns
C _{PD}	power dissipation capacitance	per package; V _I = GND to V _{CC} - 1.5 V [3]	-	32	-	-	-	-	-	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] t_t is the same as t_{THL} and t_{TLH}.

[3] C_{PD} is used to determine the dynamic power dissipation (P_D in μW):

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

f_i = input frequency in MHz;

f_o = output frequency in MHz;

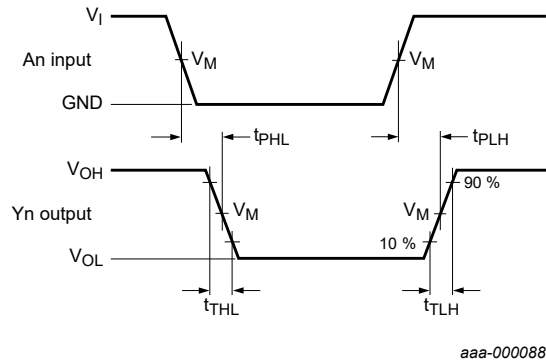
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

Σ(C_L × V_{CC}² × f_o) = sum of outputs.

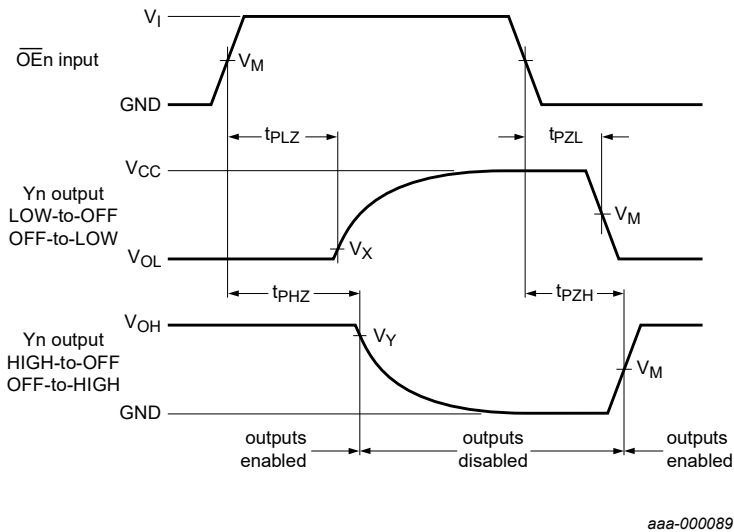
10.1. Waveforms and test circuit



Measurement points are given in [Table 8](#).

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

Fig. 3. Input to output propagation delays



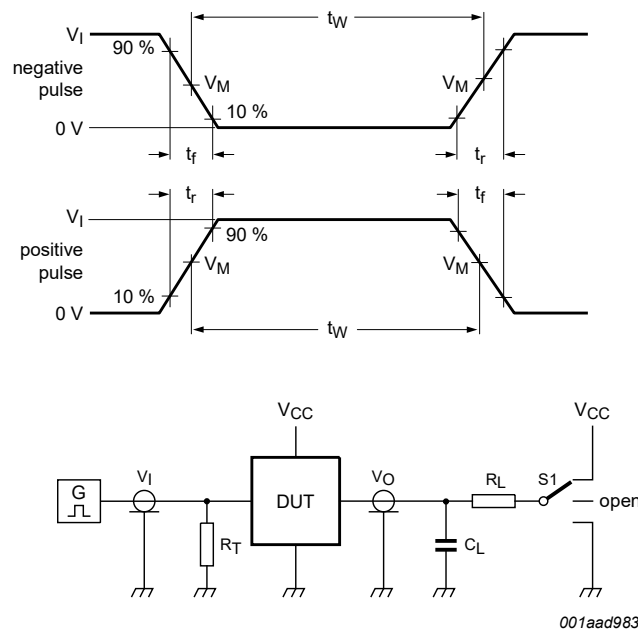
Measurement points are given in [Table 8](#).

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

Fig. 4. 3-state enable and disable times

Table 8. Measurement points

Type	Input	Output		
	V_M	V_M	V_X	V_Y
74HC7541	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$0.1 \times V_{CC}$	$0.9 \times V_{CC}$
74HCT7541	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.

Fig. 5. 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}
74HC7541	V_{CC}	6 ns	15 pF, 50 pF	1 k Ω	open	GND	V_{CC}
74HCT7541	3 V	6 ns	15 pF, 50 pF	1 k Ω	open	GND	V_{CC}

11. Transfer characteristics

Table 10. Transfer characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V); see Fig. 6 and Fig. 7.

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74HC7541										
V_{T+}	positive-going threshold voltage	$V_{CC} = 2.0 \text{ V}$	-	-	1.5	-	1.5	-	1.5	V
		$V_{CC} = 4.5 \text{ V}$	-	-	3.15	-	3.15	-	3.15	V
		$V_{CC} = 6.0 \text{ V}$	-	-	4.2	-	4.2	-	4.2	V
V_{T-}	negative-going threshold voltage	$V_{CC} = 2.0 \text{ V}$	0.3	-	-	0.3	-	0.3	-	V
		$V_{CC} = 4.5 \text{ V}$	1.35	-	-	1.35	-	1.35	-	V
		$V_{CC} = 6.0 \text{ V}$	1.8	-	-	1.8	-	1.8	-	V
V_H	hysteresis voltage	$V_{CC} = 2.0 \text{ V}$	0.1	0.20	-	0.1	-	0.1	-	V
		$V_{CC} = 4.5 \text{ V}$	0.25	0.40	-	0.25	-	0.25	-	V
		$V_{CC} = 6.0 \text{ V}$	0.3	0.5	-	0.3	-	0.3	-	V
74HCT7541										
V_{T+}	positive-going threshold voltage	$V_{CC} = 4.5 \text{ V}$	-	-	2.0	-	2.0	-	2.0	V
		$V_{CC} = 5.5 \text{ V}$	-	-	2.1	-	2.1	-	2.1	V
V_{T-}	negative-going threshold voltage	$V_{CC} = 4.5 \text{ V}$	0.7	-	-	0.64	-	0.6	-	V
		$V_{CC} = 5.5 \text{ V}$	0.8	-	-	0.74	-	0.7	-	V
V_H	hysteresis voltage	$V_{CC} = 4.5 \text{ V}$	0.17	0.23	-	-	-	-	-	V
		$V_{CC} = 5.5 \text{ V}$	0.17	0.23	-	-	-	-	-	V

11.1. Transfer characteristics waveforms

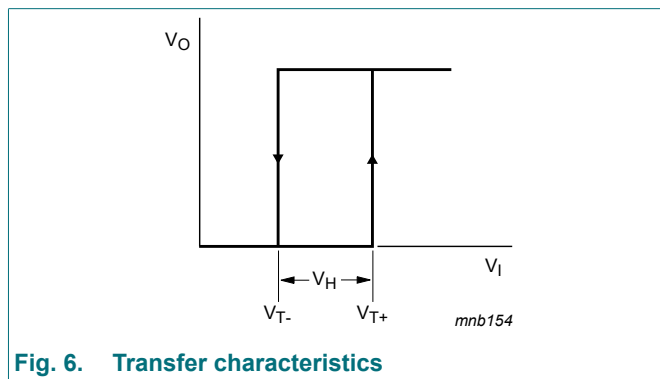


Fig. 6. Transfer characteristics

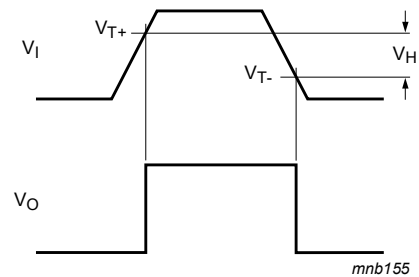


Fig. 7. Transfer characteristics definitions

12. Package outline

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

SOT163-1

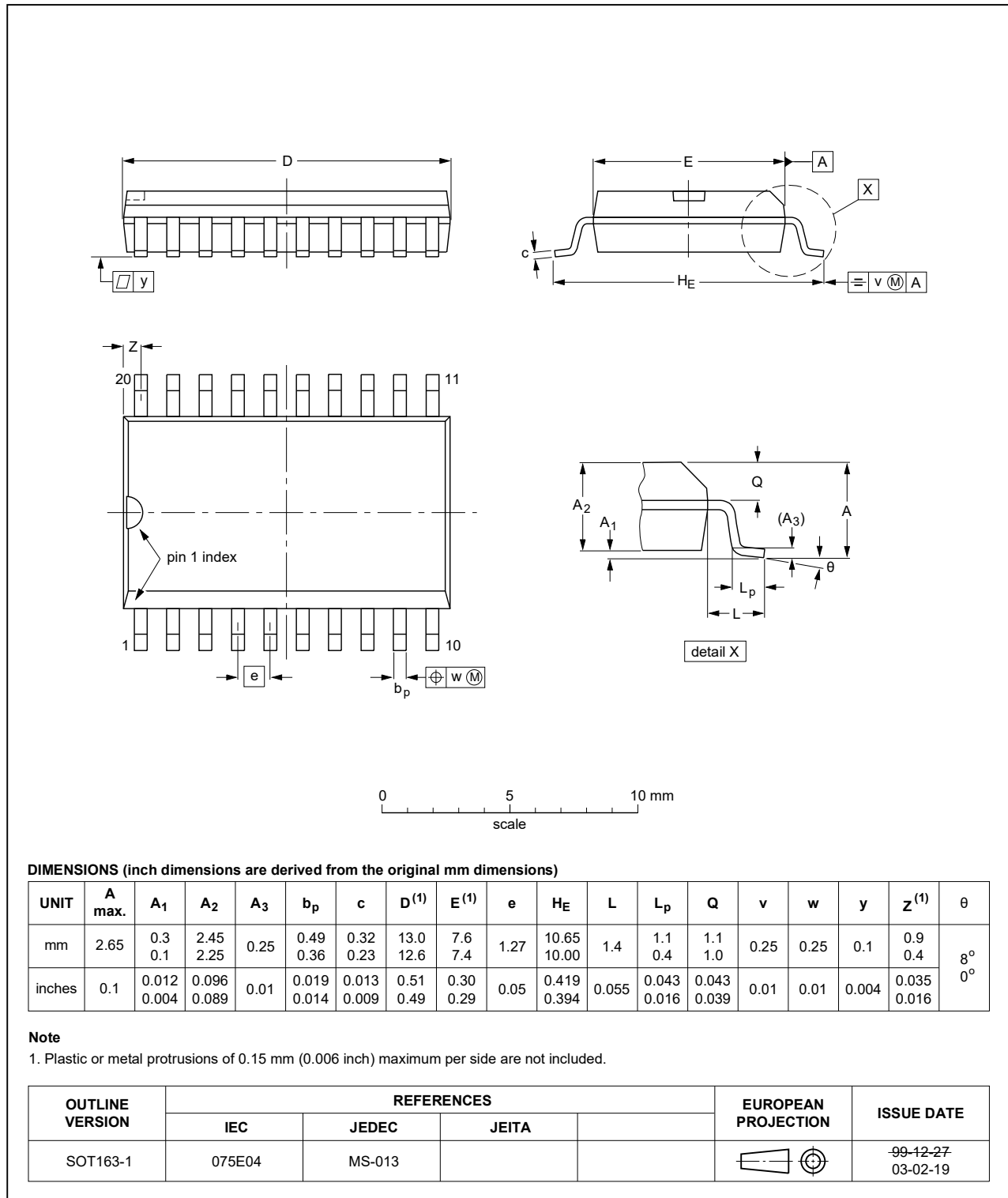


Fig. 8. Package outline SOT163-1 (SO20)

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

SOT360-1

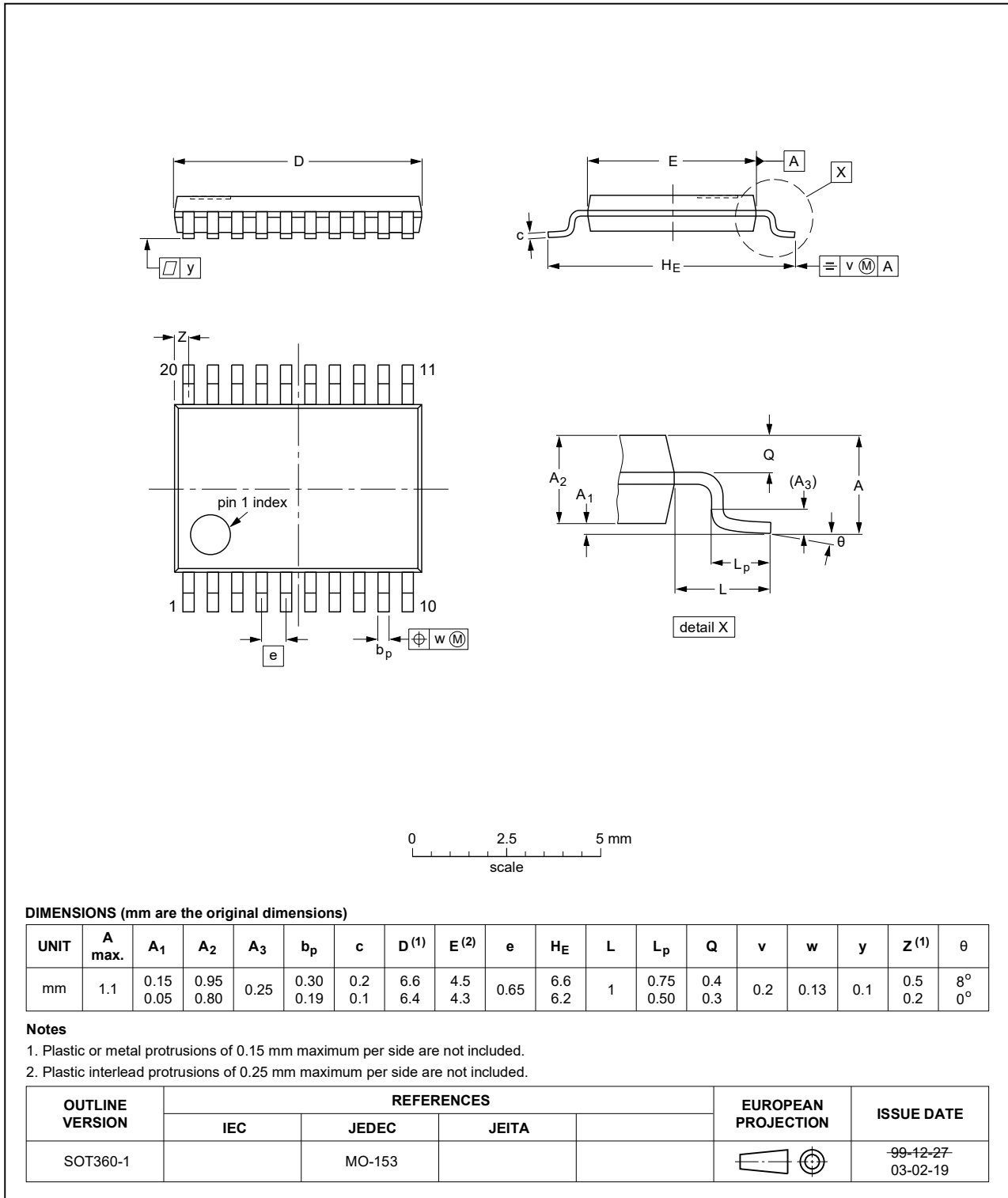


Fig. 9. Package outline SOT360-1 (TSSOP20)

13. Abbreviations

Table 11. Abbreviations

Acronym	Description
ANSI	American National Standards Institute
CDM	Charged Device Model
CMOS	Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
ESDA	ElectroStatic Discharge Association
HBM	Human Body Model
JEDEC	Joint Electron Device Engineering Council
TTL	Transistor-Transistor Logic

14. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT7541 v.9	20240805	Product data sheet	-	74HC_HCT7541 v.8
Modifications:	<ul style="list-style-type: none"> • Section 2: ESD specification updated according to the latest JEDEC standard. 			
74HC_HCT7541 v.8	20210803	Product data sheet	-	74HC_HCT7541 v.7
Modifications:	<ul style="list-style-type: none"> • 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. • Type number 74HC7541DB (SOT339-1/SSOP20) removed. • Section 2 updated. • Section 7: Derating values for P_{tot} total power dissipation updated. 			
74HC_HCT7541 v.7	20160304	Product data sheet	-	74HC_HCT7541 v.6
Modifications:	<ul style="list-style-type: none"> • Type numbers 74HC7541N and 74HCT7541N (SOT146-1) removed. 			
74HC_HCT7541 v.6	20131216	Product data sheet	-	74HC_HCT7541 v.5
Modifications:	<ul style="list-style-type: none"> • New general description (errata). 			
74HC_HCT7541 v.5	20121231	Product data sheet	-	74HC_HCT7541 v.4
Modifications:	<ul style="list-style-type: none"> • I_{OZ} added to static characteristics table. 			
74HC_HCT7541 v.4	20111219	Product data sheet	-	74HC_HCT7541 v.3
Modifications:	<ul style="list-style-type: none"> • Legal pages updated. 			
74HC_HCT7541 v.3	20110725	Product data sheet	-	74HC_HCT7541_CNV v.2
74HC_HCT7541_CNV v.2	19970917	Product specification	-	-

15. Legal information

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 <https://www.nexperia.com>.

Definitions

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