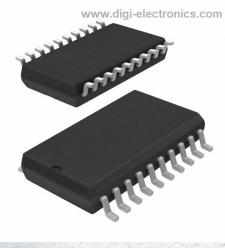


74HC7541D-Q100J Datasheet

Di

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iGi Electronics Part Number	74HC7541D-Q100J-DG
Manufacturer	Nexperia USA Inc.
nufacturer Product Number	74HC7541D-Q100J
Description	IC BUFFER NON-INVERT 6V 20SO
Detailed Description	Buffer, Non-Inverting 1 Element 8 Bit per Element 3 -State Output 20-SO

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Purchase and inquiry

Manufacturer Product Number:	Manufacturer:
74HC7541D-Q100J	Nexperia USA Inc.
Series:	Product Status:
74HC	Active
Logic Type:	Number of Elements:
Buffer, Non-Inverting	1
Number of Bits per Element:	Input Type:
8	Schmitt Trigger
Output Type:	Current - Output High, Low:
3-State	7.8mA, 7.8mA
Voltage - Supply:	Operating Temperature:
2V ~ 6V	-40°C ~ 125°C (TA)
Grade:	Qualification:
Automotive	AEC-Q100
Mounting Type:	Package / Case:
Surface Mount	20-SOIC (0.295", 7.50mm Width)
Supplier Device Package:	Base Product Number:
20-50	74HC7541

Environmental & Export classification

RoHS Status:	Moisture Sensitivity Level (MSL):
ROHS3 Compliant	1 (Unlimited)
REACH Status:	ECCN:
REACH Unaffected	EAR99
HTSUS:	
8542.39.0001	

74HC7541-Q100; 74HCT7541-Q100

Octal Schmitt trigger buffer/line driver; 3-state

Rev. 3 — 5 August 2024

Product data sheet

1. General description

The 74HC7541-Q100; 74HCT7541-Q100 is an 8-bit buffer/line driver with Schmitt-trigger inputs and 3-state outputs. The device features two output enables ($\overline{OE1}$ and $\overline{OE2}$). A HIGH on \overline{OEn} causes the outputs to assume a high-impedance OFF-state. Inputs include clamp diodes that enable 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.

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

2. Features and benefits

- Automotive product qualification in accordance with AEC-Q100 (Grade 1)

 Specified from -40 °C to +85 °C and from -40 °C to +125 °C
- 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-Q100: 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

3. Ordering information

Table 1. Ordering information

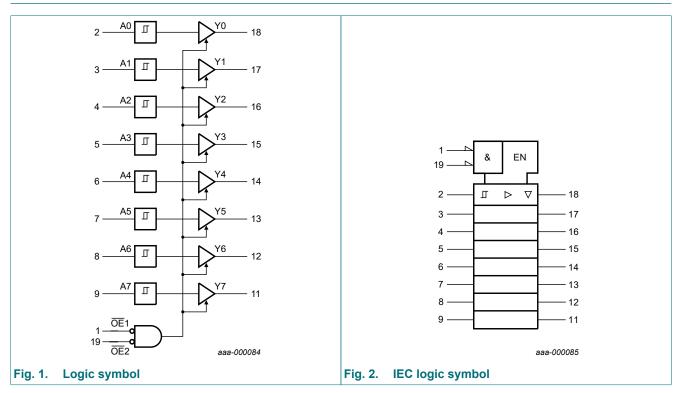
Type number	Package			
	Temperature range	Name	Description	Version
74HC7541D-Q100 74HCT7541D-Q100	-40 °C to +125 °C	SO20	plastic small outline package; 20 leads; body width 7.5 mm	<u>SOT163-1</u>
74HC7541PW-Q100 74HCT7541PW-Q100	-40 °C to +125 °C	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	<u>SOT360-1</u>

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74HC7541-Q100; 74HCT7541-Q100

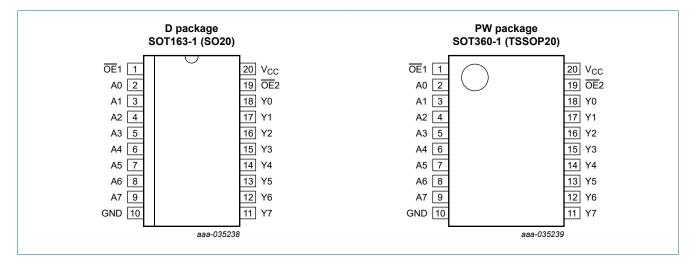
Octal Schmitt trigger buffer/line driver; 3-state

4. Functional diagram



5. Pinning information

5.1. Pinning



5.2. 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.

		Input	Output
OE1	1 OE2 A		Yn
L	L	L	L
L	L	Н	Н
Х	Н	Х	Z
Н	Х	Х	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	Мах	Unit
V _{CC}	supply voltage			-0.5	+7	V
I _{IK}	input clamping current	$V_{\rm I}$ < -0.5 V or $V_{\rm I}$ > $V_{\rm CC}$ + 0.5 V	[1]	-	±20	mA
I _{ОК}	output clamping current	$V_{\rm O}$ < -0.5 V or $V_{\rm O}$ > $V_{\rm CC}$ + 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

The input and output voltage ratings may be exceeded if the input and output current ratings are observed. [1] [2]

For SOT163-1 (SO20) package: Ptot derates linearly with 12.3 mW/K above 109 °C.

For SOT360-1 (TSSOP20) package: Ptot 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-Q100			74H0	Unit		
			Min	Тур	Max	Min	Тур	Max]
V _{CC}	supply voltage		2.0	5.0	6.0	4.5	5.0	5.5	V
VI	input voltage		0	-	V _{CC}	0	-	V _{CC}	V
Vo	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	Тур	Max	Min	Мах	Min	Max	
74HC754	41-Q100							1		1
V _{OH}	HIGH-level	$V_{I} = V_{T+}$ or V_{T-}								
	output voltage	I _O = -20 μA; V _{CC} = 2.0 V	1.9	2.0	-	1.9	-	1.9	-	V
		I _O = -20 μA; V _{CC} = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
		I _O = -20 μA; 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 μA; V _{CC} = 2.0 V	-	0	0.1	-	0.1	-	0.1	V
		I _O = 20 μA; V _{CC} = 4.5 V	-	0	0.1	-	0.1	-	0.1	V
		I _O = 20 μA; 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	$V_{I} = V_{T+} \text{ or } V_{T-}; V_{CC} = 6.0 \text{ V};$ $V_{O} = V_{CC} \text{ or GND}$	-	-	±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
CI	input capacitance		-	3.5	-	-	-	-	-	pF

74HC7541-Q100; 74HCT7541-Q100

Octal Schmitt trigger buffer/line driver; 3-state

Symbol	Parameter	Conditions		25 °C		-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Тур	Max	Min	Мах	Min	Max	
74HCT7	541-Q100	1								
V _{OH}	HIGH-level	$V_{I} = V_{T+} \text{ or } V_{T-}; V_{CC} = 4.5 \text{ V}$								
output voltage	output voltage	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	$V_{I} = V_{T+} \text{ or } V_{T-}; V_{CC} = 4.5 \text{ V}$								
	output voltage	I _O = 20 μA;	-	0	0.1	-	0.1	-	0.1	V
		I _O = 6.0 mA;	-	0.15	0.26	-	0.33	-	•	V
lı	input leakage current	$V_1 = V_{CC}$ or GND; $V_{CC} = 5.5$ V	-	-	±0.1	-	±1.0	-	±1.0	μA
I _{OZ}	OFF-state output current	$V_1 = V_{T+}$ 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
		OEn input	-	130	468	-	585	-	637	μA
Cı	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	Тур	Max	Min	Max	Min	Max	1
74HC754	41-Q100					1	1		1	
t _{pd}	propagation	An to Yn; see Fig. 3 [1]								
	delay	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	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	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

74HC7541-Q100; 74HCT7541-Q100

Octal Schmitt trigger buffer/line driver; 3-state

Symbol	Parameter	Conditions		25 °C		-40 °C t	-40 °C to +85 °C		-40 °C to +125 °C	
			Min	Тур	Мах	Min	Max	Min	Max	
tt	transition time	see <u>Fig. 3</u> [2	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; [3 V _I = GND to V _{CC}	3] -	30	-	-	-	-	-	pF
74HCT7	541-Q100		_						-	
t _{pd}	propagation delay	An to Yn; see Fig. 3]							
		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	OEn to Yn; see Fig. 4 []							
		V _{CC} = 4.5 V	-	18	32	-	40	-	48	ns
t _{dis}	disable time	OEn to Yn; see Fig. 4 []							
		V _{CC} = 4.5 V	-	20	32	-	40	-	48	ns
t _t	transition time	V _{CC} = 4.5 V; see <u>Fig. 3</u> [2	2] -	5	12	-	15	-	18	ns
C _{PD}	power dissipation capacitance	per package; [3 V _I = GND to V _{CC} - 1.5 V	3] -	32	-	-	-	-	-	pF

 $\label{eq:tpd} [1] \quad t_{pd} \text{ is the same as } t_{PLH} \text{ and } t_{PHL}.$ t_{en} is the same as t_{PZL} and $t_{\text{PZH}}.$ t_{dis} is the same as t_{PLZ} and $t_{\text{PHZ}}.$

[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 μ W): $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ 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 V;

N = number of inputs switching;

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

10.1. Waveforms and test circuit

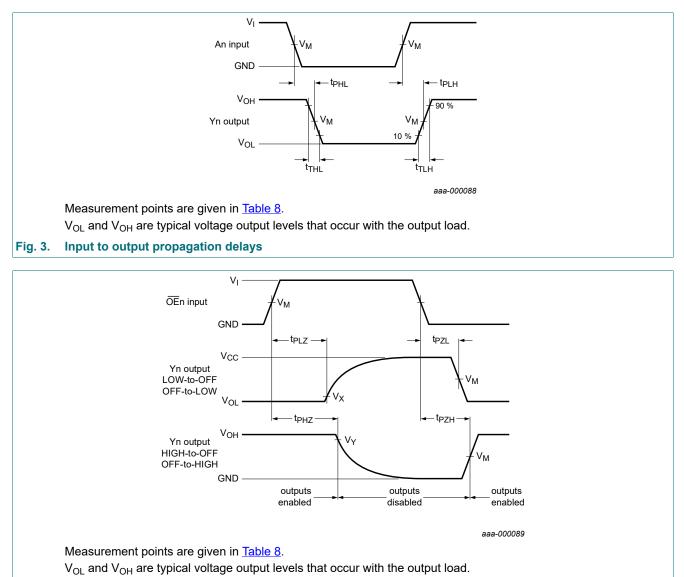


Fig. 4. 3-state enable and disable times

Table 8. Measurement points

Туре	Input	Output		
	V _M	V _M	V _X	V _Y
74HC7541-Q100	0.5 × V _{CC}	0.5 × V _{CC}	0.1 × V _{CC}	$0.9 \times V_{CC}$
74HCT7541-Q100	1.3 V	1.3 V	0.1 × V _{CC}	$0.9 \times V_{CC}$

74HC7541-Q100; 74HCT7541-Q100

Octal Schmitt trigger buffer/line driver; 3-state

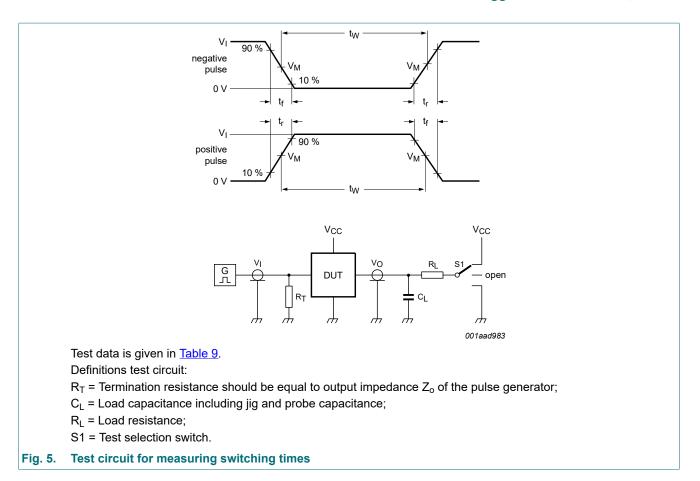


Table 9. Test data

Туре	pe Input		Load		S1 position		
	VI	t _r , t _f	CL	RL	t _{PHL} , t _{PLH}	t _{PZH} , t _{PHZ}	t _{PZL} , t _{PLZ}
74HC7541-Q100	V _{CC}	6 ns	15 pF, 50 pF	1 kΩ	open	GND	V _{CC}
74HCT7541-Q100	3 V	6 ns	15 pF, 50 pF	1 kΩ	open	GND	V _{CC}

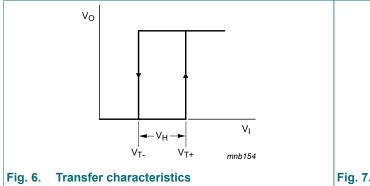
11. Transfer characteristics

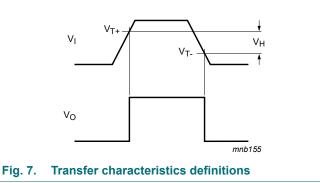
Table 10. Transfer characteristics

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	Тур	Мах	Min	Max	Min	Мах	
74HC75	41-Q100	1	_				<u> </u>		-	
V _{T+}	positive-going	V _{CC} = 2.0 V	-	-	1.5	-	1.5	-	1.5	V
	threshold voltage	V _{CC} = 4.5 V	-	-	3.15	-	3.15	-	3.15	V
		V _{CC} = 6.0 V	-	-	4.2	-	4.2	-	4.2	V
V _{T-}	negative-going	V _{CC} = 2.0 V	0.3	-	-	0.3	-	0.3	-	V
	threshold voltage	V _{CC} = 4.5 V	1.35	-	-	1.35	-	1.35	-	V
		V _{CC} = 6.0 V	1.8	-	-	1.8	-	1.8	-	V
V _H	hysteresis	V _{CC} = 2.0 V 0.1 0.20 - 0.1 - 0.1 -	V							
	voltage	V _{CC} = 4.5 V	0.25	0.40	-	0.25	-	0.25	-	V
		V _{CC} = 6.0 V	0.3	0.5	-	0.3	-	0.3	-	V
74HCT7	541-Q100		_							
V _{T+}	positive-going	V _{CC} = 4.5 V	-	-	2.0	-	2.0	-	2.0	V
	threshold voltage	V _{CC} = 5.5 V	-	-	2.1	-	2.1	-	2.1	V
V _{T-}	negative-going	V _{CC} = 4.5 V	0.7	-	-	0.64	-	0.6	-	V
	threshold voltage	V _{CC} = 5.5 V	0.8	-	-	0.74	-	0.7	-	V
V _H	hysteresis	V _{CC} = 4.5 V	0.17	0.23	-	-	-	-	-	V
	voltage	V _{CC} = 5.5 V	0.17	0.23	-	-	-	-	-	V

11.1. Transfer characteristics waveforms





12. Package outline

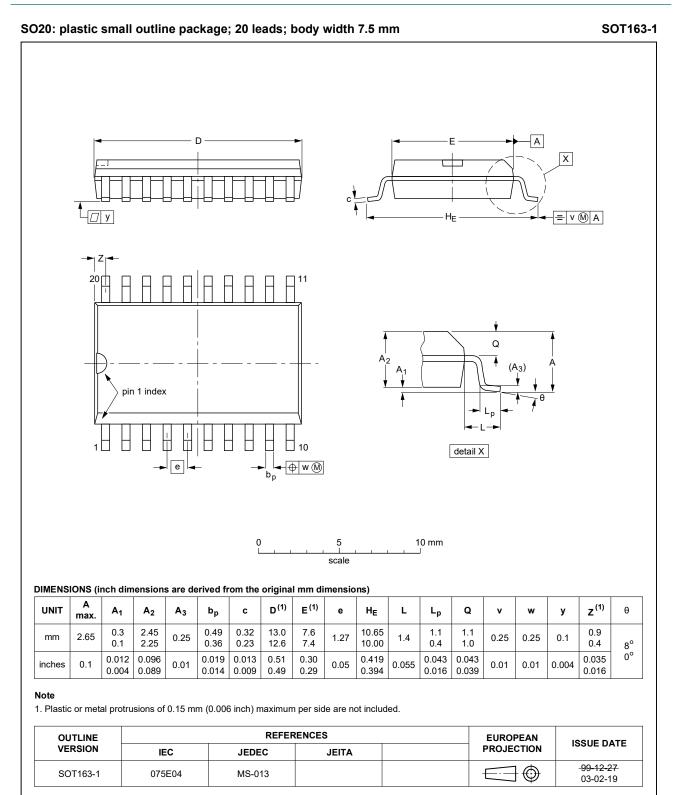


Fig. 8. Package outline SOT163-1 (SO20)

74HC7541-Q100; 74HCT7541-Q100

Octal Schmitt trigger buffer/line driver; 3-state

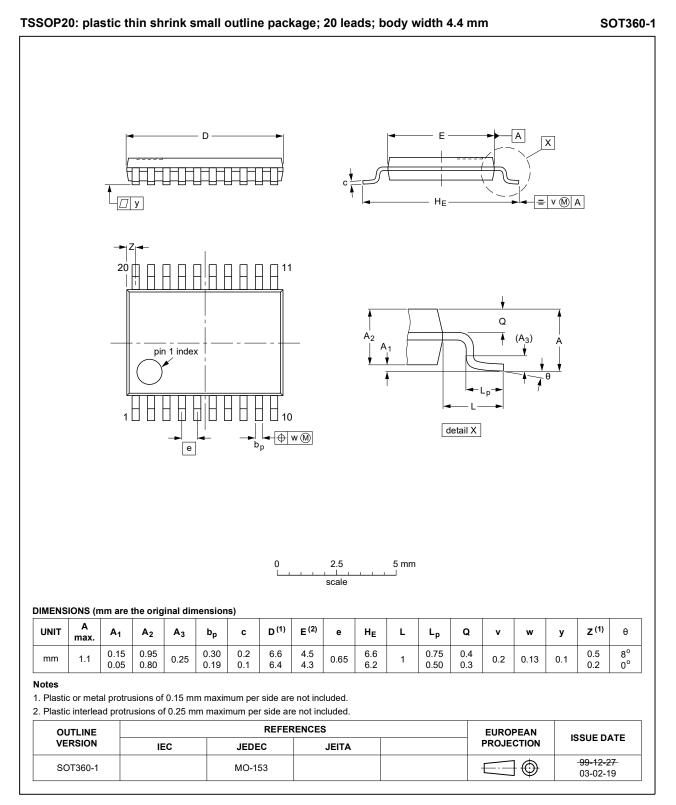


Fig. 9. Package outline SOT360-1 (TSSOP20)

13. Abbreviations

A	Description
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_Q100 v.3	20240805	Product data sheet	-	74HC_HCT7541_Q100 v.2		
Modifications:	<u>Section 2</u> : Es	Section 2: ESD specification updated according to the latest JEDEC standard.				
74HC_HCT7541_Q100 v.2	20210803	Product data sheet	-	74HC_HCT7541_Q100 v.1		
Modifications:	of Nexperia. • Legal texts h • <u>Section 2</u> up	ave been adapted to the	new company name v			
74HC_HCT7541_Q100 v.1	20140324	Product data sheet	-	-		

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.

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

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74HC7541-Q100; 74HCT7541-Q100

Octal Schmitt trigger buffer/line driver; 3-state

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