



# 74HC9115-Q100

Nine wide Schmitt trigger buffer; open drain outputs

Rev. 1 — 9 November 2023

Product data sheet

## 1. General description

The 74HC9115-Q100 is a 9-bit buffer with Schmitt trigger inputs and open drain outputs. 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.

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

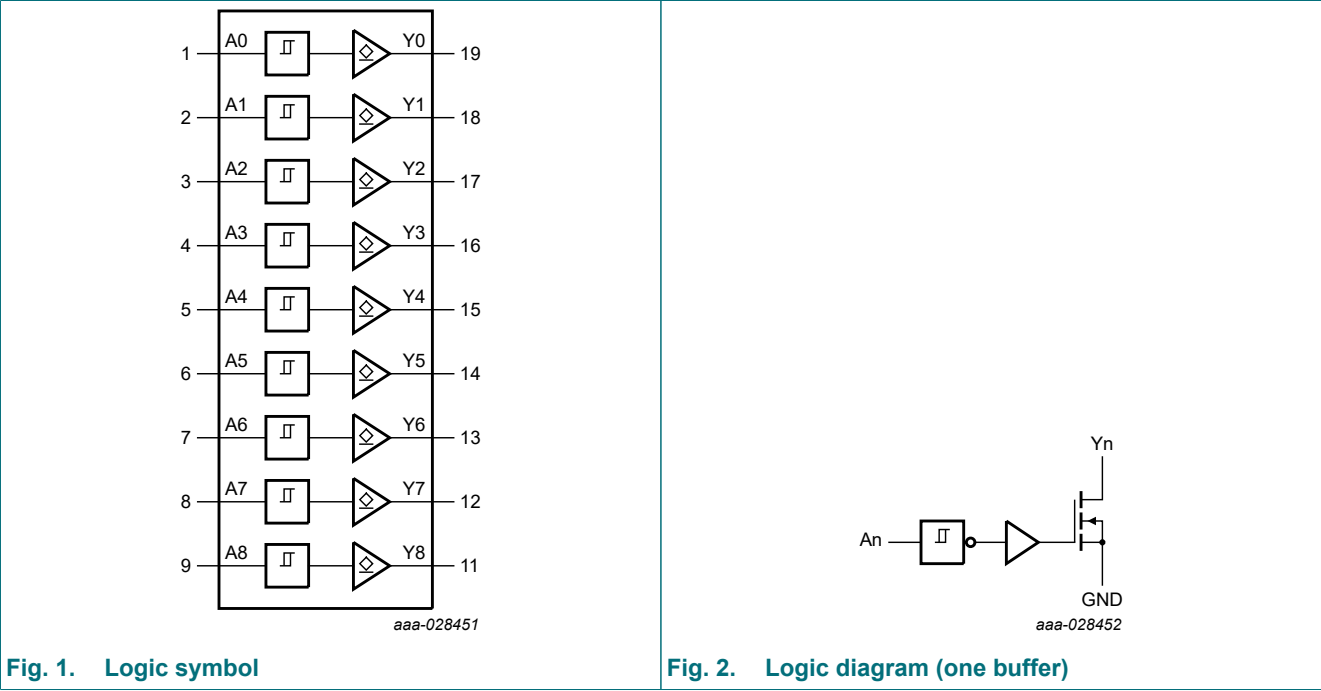
- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
  - Specified from -40 °C to +85 °C and from -40 °C to +125 °C
- Wide operating voltage 2.0 V to 6.0 V
- Schmitt trigger action on all data inputs
- CMOS low power dissipation
- High noise immunity
- Unlimited input rise and fall 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)
- ESD protection:
  - HBM JESD22-A114-A exceeds 2 kV
  - MM JESD22-A115-A exceeds 200 V

## 3. Ordering information

Table 1. Ordering information

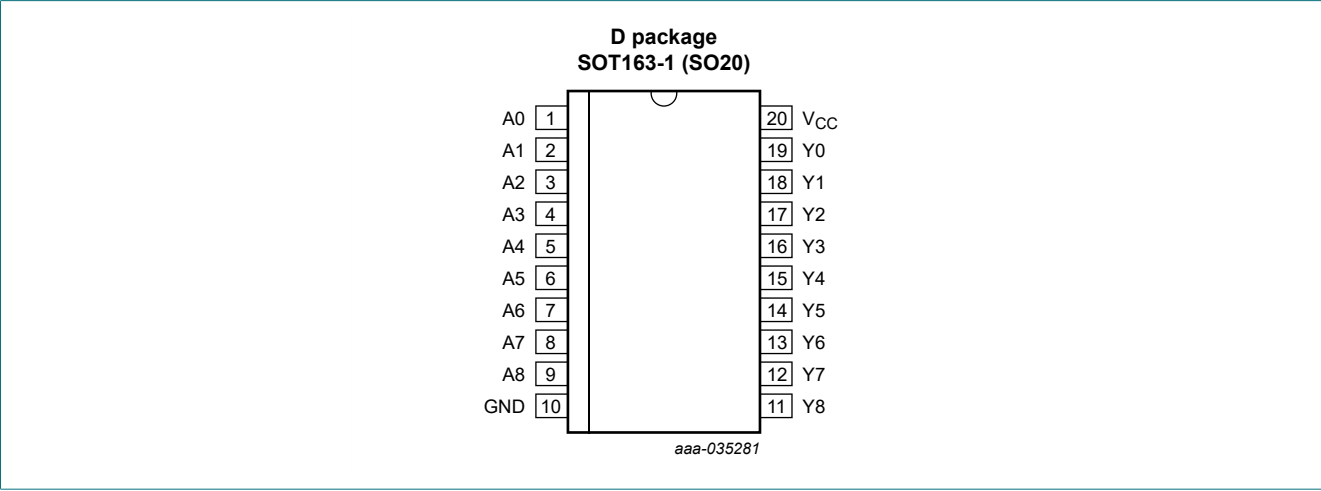
Type number	Package			
	Temperature range	Name	Description	Version
<a href="#">74HC9115D-Q100</a>	-40 °C to +125 °C	SO20	plastic small outline package; 20 leads; body width 7.5 mm	<a href="#">SOT163-1</a>

4. Functional diagram



5. Pinning information

5.1. Pinning



5.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
A0, A1, A2, A3, A4, A5, A6, A7, A8	1, 2, 3, 4, 5, 6, 7, 8, 9	data inputs
GND	10	ground (0 V)
Y0, Y1, Y2, Y3, Y4, Y5, Y6, Y7, Y8	19, 18, 17, 16, 15, 14, 13, 12, 11	data outputs
V <sub>CC</sub>	20	supply voltage

6. Functional description

Table 3. Function table

H = HIGH voltage level; L = LOW voltage level; Z = high-impedance OFF-state.

Input	Output
A <sub>n</sub>	Y <sub>n</sub>
L	L
H	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 <sub>CC</sub>	supply voltage		-0.5	+7.0	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 [1]	-	±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 [1]	-	±20	mA
I <sub>O</sub>	output current	-0.5 V < V <sub>O</sub> < V <sub>CC</sub> + 0.5 V [1]	-	±25	mA
I <sub>CC</sub>	supply current		-	50	mA
I <sub>GND</sub>	ground current		-50	-	mA
T <sub>stg</sub>	storage temperature		-65	+150	°C
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = -40 °C to +125 °C [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<sub>tot</sub> derates linearly with 12.3 mW/K above 109 °C.

8. Recommended operating conditions

Table 5. Recommended operating conditions

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>CC</sub>	supply voltage		2.0	5.0	6.0	V
V <sub>I</sub>	input voltage		0	-	V <sub>CC</sub>	V
V <sub>O</sub>	output voltage		0	-	V <sub>CC</sub>	V
T <sub>amb</sub>	ambient temperature		-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	T <sub>amb</sub> = 25 °C			T <sub>amb</sub> = -40 °C to +85 °C		T <sub>amb</sub> = -40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>T+</sub> or V <sub>T-</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> = -4.0 mA; V <sub>CC</sub> = 4.5 V	3.98	4.32	-	3.84	-	3.7	-	V
		I <sub>O</sub> = -5.2 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>T+</sub> or V <sub>T-</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> = 4.0 mA; V <sub>CC</sub> = 4.5 V	-	0.15	0.26	-	0.33	-	0.4	V
		I <sub>O</sub> = 5.2 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>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

10. Dynamic characteristics

Table 7. Dynamic characteristics  
GND = 0 V; C<sub>L</sub> = 50 pF; for test circuit see Fig. 4.

Symbol	Parameter	Conditions	T <sub>amb</sub> = 25 °C			T <sub>amb</sub> = -40 °C to +85 °C		T <sub>amb</sub> = -40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
t <sub>pd</sub>	propagation delay	An to Y <sub>n</sub> ; see Fig. 3 [1]								
		V <sub>CC</sub> = 2.0 V	-	36	115	-	140	-	165	ns
		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	-	12	-	-	-	-	-	ns
		V <sub>CC</sub> = 6.0 V	-	10	19	-	24	-	28	ns
t <sub>THL</sub>	HIGH to LOW output transition time	Y <sub>n</sub> ; see Fig. 3								
		V <sub>CC</sub> = 2.0 V	-	19	75	-	95	-	110	ns
		V <sub>CC</sub> = 4.5 V	-	7	15	-	19	-	22	ns
		V <sub>CC</sub> = 6.0 V	-	6	13	-	16	-	19	ns
C <sub>PD</sub>	power dissipation capacitance	per buffer; V <sub>I</sub> = GND to V <sub>CC</sub> [2]	-	5	-	-	-	-	-	pF

- [1] t<sub>pd</sub> is the same as t<sub>PLZ</sub> and t<sub>PZL</sub>.
- [2] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW):  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum (C_L \times V_{CC}^2 \times f_o)$  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 V;  
N = number of inputs switching;  
 $\sum (C_L \times V_{CC}^2 \times f_o)$  = sum of outputs.

10.1. Waveforms and test circuit

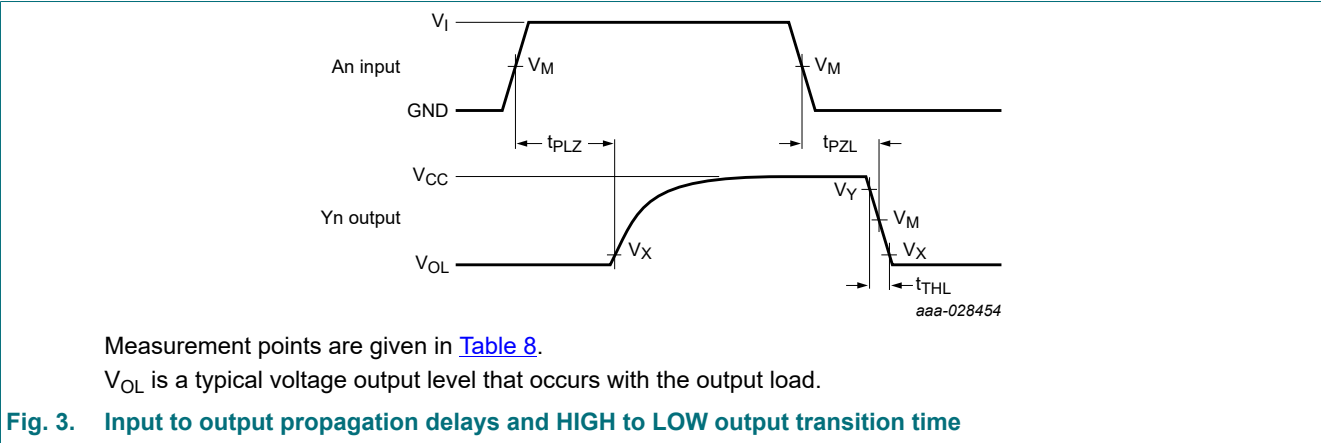
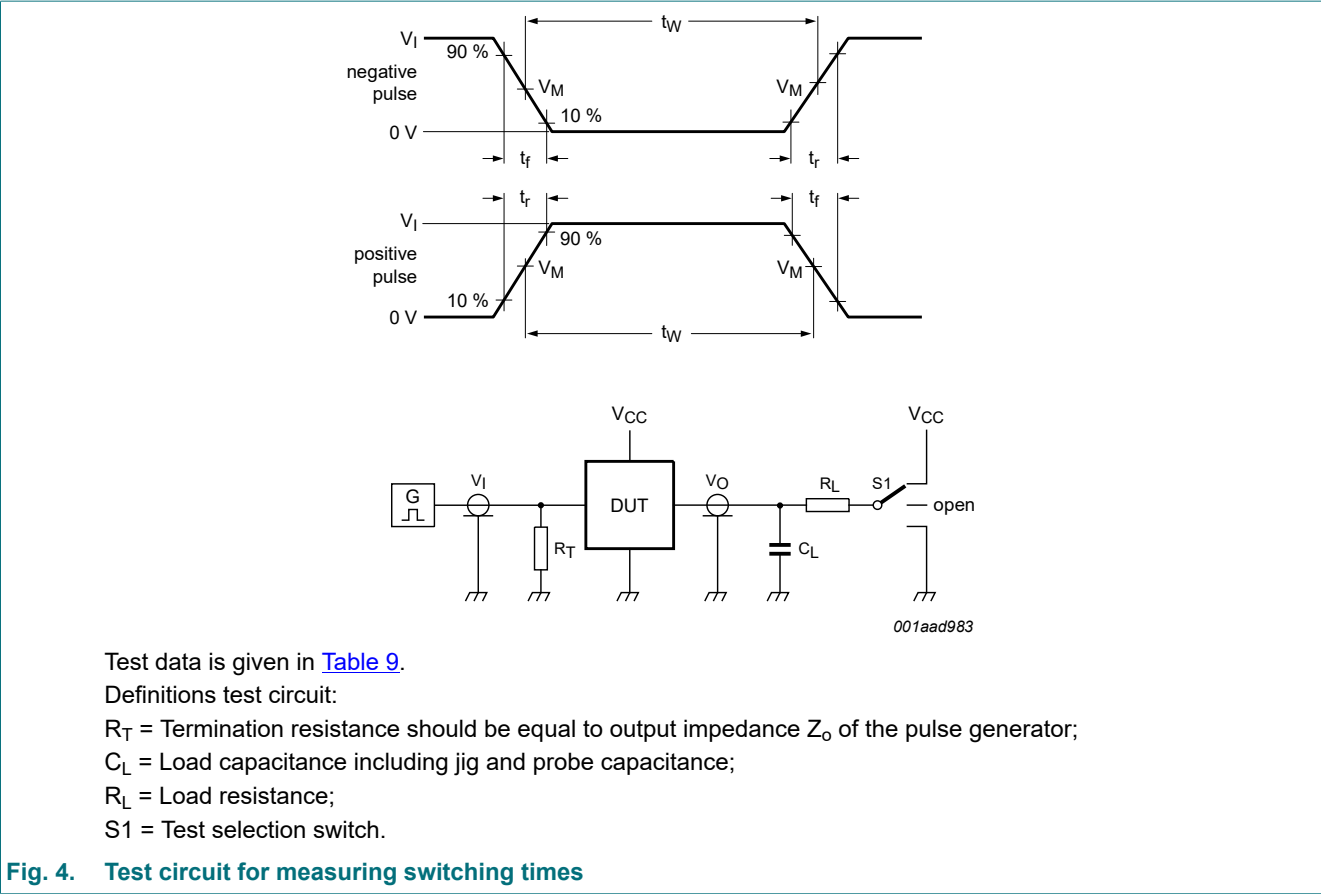


Table 8. Measurement points

Input	Output		
V <sub>M</sub>	V <sub>M</sub>	V <sub>X</sub>	V <sub>Y</sub>
0.5 × V <sub>CC</sub>	0.5 × V <sub>CC</sub>	0.1 × V <sub>CC</sub>	0.9 × V <sub>CC</sub>



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. 4. Test circuit for measuring switching times

Table 9. Test data

Input		Load		S1 position
$V_I$	$t_r, t_f$	$C_L$	$R_L$	$t_{pZL}, t_{pLZ}$
$V_{CC}$	6 ns	15 pF, 50 pF	1 k $\Omega$	$V_{CC}$

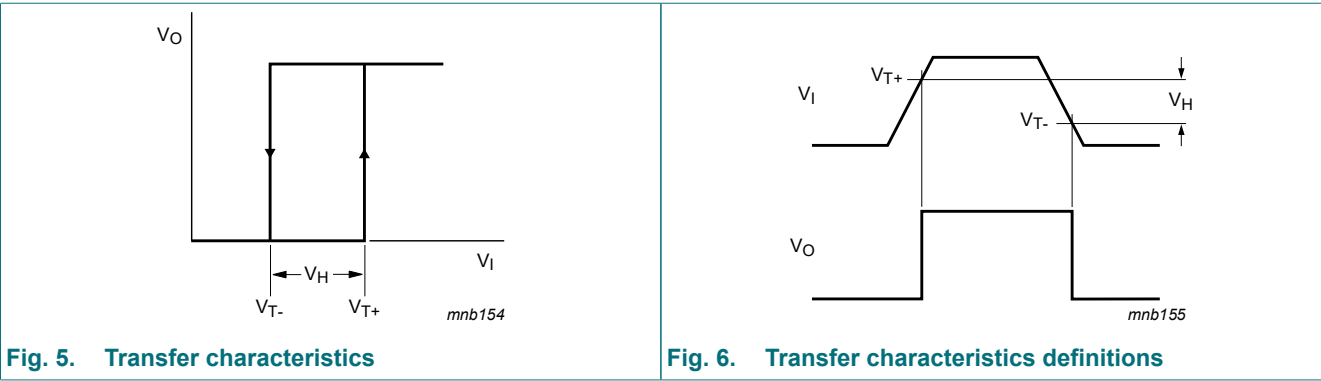
11. Transfer characteristics

Table 10. Transfer characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V); see Fig. 5 and Fig. 6.

Symbol	Parameter	Conditions	T <sub>amb</sub> = 25 °C			T <sub>amb</sub> = -40 °C to +85 °C		T <sub>amb</sub> = -40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
V <sub>T+</sub>	positive-going threshold voltage	V <sub>CC</sub> = 2.0 V	0.70	1.13	1.50	0.70	1.50	0.70	1.50	V
		V <sub>CC</sub> = 4.5 V	1.75	2.37	3.15	1.75	3.15	1.75	3.15	V
		V <sub>CC</sub> = 6.0 V	2.30	3.11	4.20	2.30	4.20	2.30	4.20	V
V <sub>T-</sub>	negative-going threshold voltage	V <sub>CC</sub> = 2.0 V	0.30	0.70	1.10	0.30	1.10	0.30	1.10	V
		V <sub>CC</sub> = 4.5 V	1.35	1.80	2.40	1.35	2.40	1.35	2.40	V
		V <sub>CC</sub> = 6.0 V	1.8	2.43	3.30	1.80	3.30	1.80	3.30	V
V <sub>H</sub>	hysteresis voltage	V <sub>CC</sub> = 2.0 V	0.2	0.43	0.80	0.18	0.80	0.15	0.80	V
		V <sub>CC</sub> = 4.5 V	0.4	0.57	1.00	0.40	1.00	0.40	1.00	V
		V <sub>CC</sub> = 6.0 V	0.5	0.68	1.10	0.50	1.10	0.50	1.10	V

11.1. Transfer characteristics waveforms



12. Package outline

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

SOT163-1

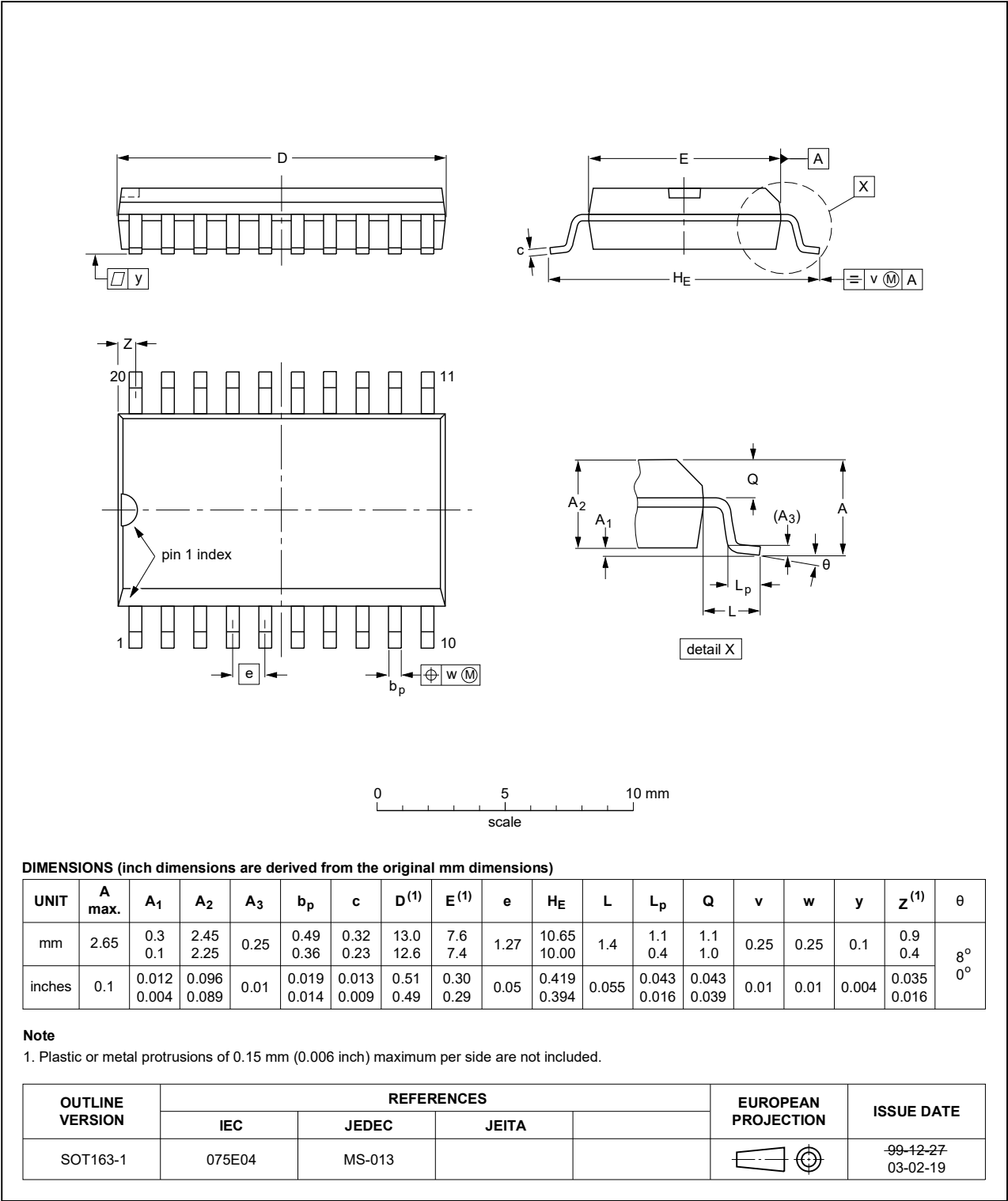


Fig. 7. Package outline SOT163-1 (SO20)



13. Abbreviations

Table 11. Abbreviations

Acronym	Description
CMOS	Complementary Metal-Oxide Semiconductor
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
74HC9115_Q100 v.1	20231109	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.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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