

74HC151-Q100; 74HCT151-Q100

8-input multiplexer

Rev. 4 — 14 January 2021

Product data sheet

1. General description

The 74HC151-Q100; 74HCT151-Q100 are 8-bit multiplexer with eight binary inputs (I0 to I7), three select inputs (S0 to S2) and an enable input (\bar{E}). One of the eight binary inputs is selected by the select inputs and routed to the complementary outputs (Y and \bar{Y}). A HIGH on \bar{E} forces the output Y LOW and output \bar{Y} HIGH. Inputs also include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of V_{CC} .

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
- Specified in compliance with JEDEC standard no. 7A
- Input levels:
 - For 74HC151-Q100: CMOS level
 - For 74HCT151-Q100: TTL level
- Low-power dissipation
- Non-inverting data path
- ESD protection:
 - MIL-STD-883, method 3015 exceeds 2000 V
 - HBM JESD22-A114F exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V (C = 200 pF, R = 0 Ω)

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74HC151D-Q100	-40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1
74HCT151D-Q100				
74HC151PW-Q100	-40 °C to +125 °C	TSSOP16	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	SOT403-1
74HCT151PW-Q100				

4. Functional diagram

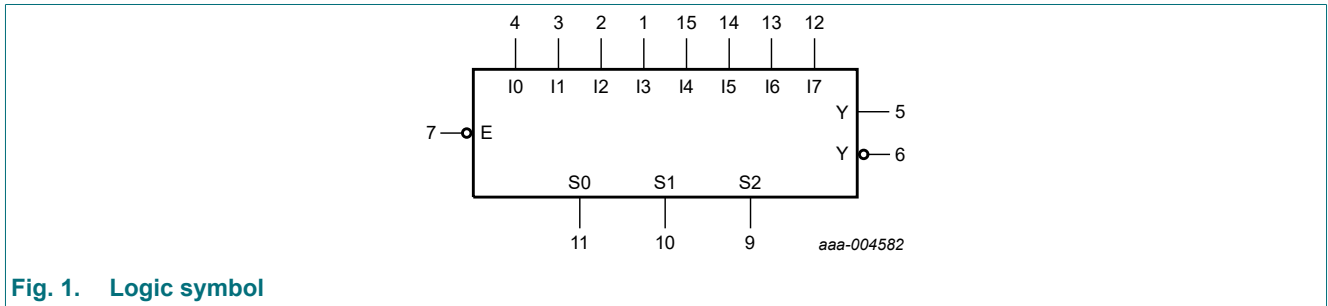


Fig. 1. Logic symbol

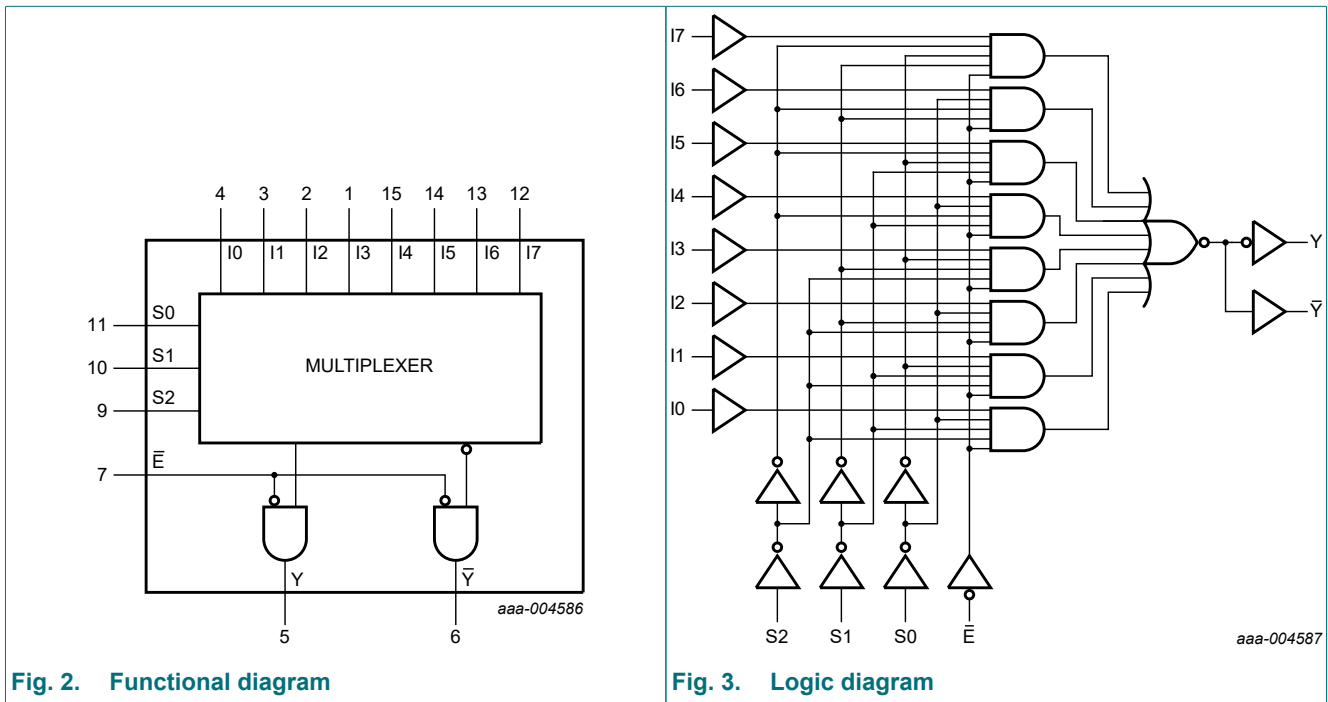


Fig. 2. Functional diagram

Fig. 3. Logic diagram

5. Pinning information

5.1. Pinning

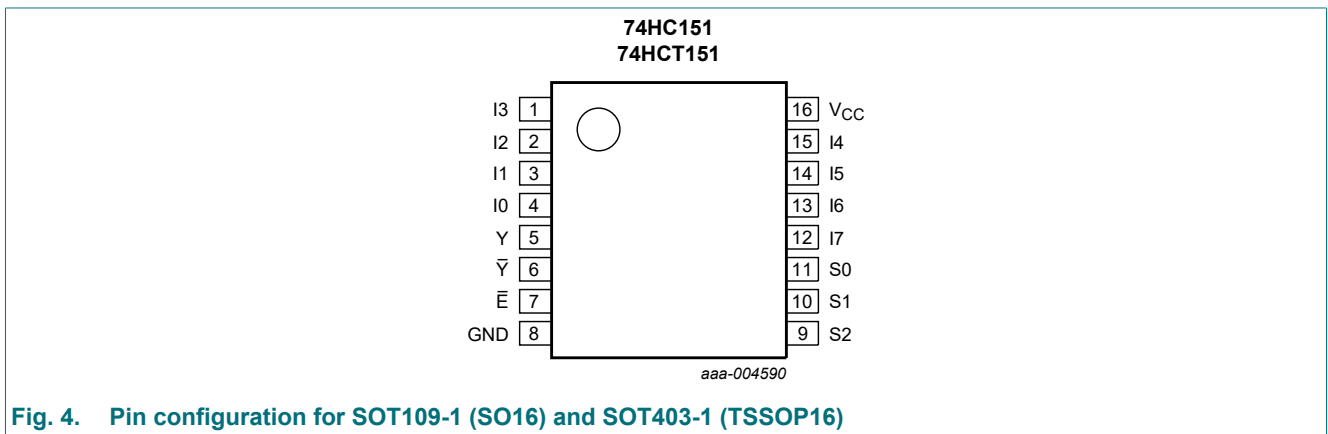


Fig. 4. Pin configuration for SOT109-1 (SO16) and SOT403-1 (TSSOP16)

5.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
I0 to I7	4, 3, 2, 1, 15, 14, 13, 12	data inputs
Y	5	multiplexer output
\bar{Y}	6	complementary multiplexer output
\bar{E}	7	enable input (active LOW)
GND	8	ground (0 V)
S0, S1, S2	11, 10, 9	common data select inputs
V _{CC}	16	supply voltage

6. Functional description

Table 3. Function table

H = HIGH voltage level; L = LOW voltage level; X = don't care.

Input												Output	
\bar{E}	S2	S1	S0	I0	I1	I2	I3	I4	I5	I6	I7	\bar{Y}	Y
H	X	X	X	X	X	X	X	X	X	X	X	H	L
L	L	L	L	L	X	X	X	X	X	X	X	H	L
L	L	L	L	H	X	X	X	X	X	X	X	L	H
L	L	L	H	X	L	X	X	X	X	X	X	H	L
L	L	L	H	X	H	X	X	X	X	X	X	L	H
L	L	H	L	X	X	L	X	X	X	X	X	H	L
L	L	H	L	X	X	H	X	X	X	X	X	L	H
L	L	H	H	X	X	X	L	X	X	X	X	H	L
L	L	H	H	X	X	X	H	X	X	X	X	L	H
L	H	L	L	X	X	X	X	L	X	X	X	H	L
L	H	L	L	X	X	X	X	H	X	X	X	L	H
L	H	L	H	X	X	X	X	X	L	X	X	H	L
L	H	L	H	X	X	X	X	X	H	X	X	L	H
L	H	H	L	X	X	X	X	X	X	L	X	H	L
L	H	H	L	X	X	X	X	X	X	H	X	L	H
L	H	H	H	X	X	X	X	X	X	X	L	H	L
L	H	H	H	X	X	X	X	X	X	X	H	L	H

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 $V_I > V_{CC} + 0.5\text{ V}$	-	± 20	mA
I_{OK}	output clamping current	$V_O < -0.5\text{ V}$ or $V_O > V_{CC} + 0.5\text{ V}$	-	± 20	mA
I_O	output current	$V_O = -0.5\text{ V}$ to $(V_{CC} + 0.5\text{ V})$	-	± 25	mA
I_{CC}	supply current		-	+50	mA
I_{GND}	ground current		-50	-	mA
T_{stg}	storage temperature		-65	+150	°C
P_{tot}	total power dissipation	$T_{amb} = -40\text{ °C}$ to $+125\text{ °C}$ [1]	-	500	mW

- [1] For SOT109-1 (SO16) package: P_{tot} derates linearly with 12.4 mW/K above 110 °C.
For SOT403-1 (TSSOP16) package: P_{tot} derates linearly with 8.5 mW/K above 91 °C.

8. Recommended operating conditions

Table 5. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V)

Symbol	Parameter	Conditions	74HC151-Q100			74HCT151-Q100			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
$\Delta t/\Delta V$	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

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	
74HC151-Q100										
V_{IH}	HIGH-level input voltage	$V_{CC} = 2.0\text{ V}$	1.5	1.2	-	1.5	-	1.5	-	V
		$V_{CC} = 4.5\text{ V}$	3.15	2.4	-	3.15	-	3.15	-	V
		$V_{CC} = 6.0\text{ V}$	4.2	3.2	-	4.2	-	4.2	-	V
V_{IL}	LOW-level input voltage	$V_{CC} = 2.0\text{ V}$	-	0.8	0.5	-	0.5	-	0.5	V
		$V_{CC} = 4.5\text{ V}$	-	2.1	1.35	-	1.35	-	1.35	V
		$V_{CC} = 6.0\text{ V}$	-	2.8	1.8	-	1.8	-	1.8	V

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL}								
		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 = -4.0 mA; V _{CC} = 4.5 V	3.98	4.32	-	3.84	-	3.7	-	V
		I _O = -5.2 mA; V _{CC} = 6.0 V	5.48	5.81	-	5.34	-	5.2	-	V
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL}								
		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 = 4.0 mA; V _{CC} = 4.5 V	-	0.15	0.26	-	0.33	-	0.4	V
		I _O = 5.2 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 _{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
74HCT151-Q100										
V _{IH}	HIGH-level input voltage	V _{CC} = 4.5 V to 5.5 V	2.0	1.6	-	2.0	-	2.0	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 4.5 V to 5.5 V	-	1.2	0.8	-	0.8	-	0.8	V
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL} ; V _{CC} = 4.5 V								
		I _O = -20 µA	4.4	4.5	-	4.4	-	4.4	-	V
		I _O = -4 mA	3.98	4.32	-	3.84	-	3.7	-	V
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL} ; V _{CC} = 4.5 V								
		I _O = 20 µA	-	0	0.1	-	0.1	-	0.1	V
		I _O = 4.0 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 _{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	V _I = V _{CC} - 2.1 V; other inputs at V _{CC} or GND; V _{CC} = 4.5 V to 5.5 V; I _O = 0 A								
		per input pin; In inputs	-	45	162	-	203	-	221	µA
		per input pin; \bar{E} input	-	30	108	-	135	-	147	µA
		per input pin; Sn input	-	150	540	-	675	-	735	µA
C _I	input capacitance		-	3.5	-	-	-	-	-	pF

10. Dynamic characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); $C_L = 50$ pF unless otherwise specified; for test circuit see 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	
74HC151-Q100										
t_{pd}	propagation delay	In to Y; see Fig. 5 [1]								
		$V_{CC} = 2.0$ V	-	52	170	-	215	-	255	ns
		$V_{CC} = 4.5$ V	-	19	34	-	43	-	51	ns
		$V_{CC} = 5$ V; $C_L = 15$ pF	-	17	-	-	-	-	-	ns
		$V_{CC} = 6.0$ V	-	15	29	-	37	-	43	ns
		In to \bar{Y} ; see Fig. 5 [1]								
		$V_{CC} = 2.0$ V	-	58	185	-	230	-	280	ns
		$V_{CC} = 4.5$ V	-	21	37	-	46	-	56	ns
		$V_{CC} = 5$ V; $C_L = 15$ pF	-	17	-	-	-	-	-	ns
		$V_{CC} = 6.0$ V	-	17	31	-	39	-	48	ns
		Sn to Y; see Fig. 6 [1]								
		$V_{CC} = 2.0$ V	-	61	185	-	230	-	280	ns
		$V_{CC} = 4.5$ V	-	22	37	-	46	-	56	ns
		$V_{CC} = 5$ V; $C_L = 15$ pF	-	19	-	-	-	-	-	ns
		$V_{CC} = 6.0$ V	-	18	31	-	39	-	48	ns
		Sn to \bar{Y} ; see Fig. 6 [1]								
		$V_{CC} = 2.0$ V	-	61	205	-	255	-	310	ns
		$V_{CC} = 4.5$ V	-	22	41	-	51	-	62	ns
		$V_{CC} = 5$ V; $C_L = 15$ pF	-	19	-	-	-	-	-	ns
		$V_{CC} = 6.0$ V	-	18	35	-	43	-	53	ns
		\bar{E} to Y; see Fig. 6								
		$V_{CC} = 2.0$ V	-	41	125	-	155	-	190	ns
		$V_{CC} = 4.5$ V	-	15	25	-	31	-	38	ns
		$V_{CC} = 5$ V; $C_L = 15$ pF	-	12	-	-	-	-	-	ns
$V_{CC} = 6.0$ V	-	12	21	-	26	-	32	ns		
\bar{E} to \bar{Y} ; see Fig. 6										
$V_{CC} = 2.0$ V	-	47	145	-	180	-	220	ns		
$V_{CC} = 4.5$ V	-	17	29	-	36	-	44	ns		
$V_{CC} = 5$ V; $C_L = 15$ pF	-	14	-	-	-	-	-	ns		
$V_{CC} = 6.0$ V	-	14	25	-	31	-	38	ns		
t_t	transition time	Y, \bar{Y} ; see Fig. 5 [2]								
		$V_{CC} = 2.0$ V	-	19	75	-	95	-	110	ns
		$V_{CC} = 4.5$ V	-	7	15	-	19	-	22	ns
		$V_{CC} = 6.0$ V	-	6	13	-	16	-	19	ns
C_{PD}	power dissipation capacitance	$C_L = 50$ pF; $f = 1$ MHz; $V_I = \text{GND to } V_{CC}$ [3]	-	40	-	-	-	-	pF	

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74HCT151-Q100										
t _{pd}	propagation delay	In to Y; see Fig. 5 [1]								
		V _{CC} = 4.5 V	-	22	38	-	48	-	57	ns
		V _{CC} = 5 V; C _L = 15 pF	-	19	-	-	-	-	-	ns
		In to \bar{Y} ; see Fig. 5 [1]								
		V _{CC} = 4.5 V	-	22	38	-	48	-	57	ns
		V _{CC} = 5 V; C _L = 15 pF	-	19	-	-	-	-	-	ns
		S _n to Y; see Fig. 6 [1]								
		V _{CC} = 4.5 V	-	23	41	-	51	-	62	ns
		V _{CC} = 5 V; C _L = 15 pF	-	20	-	-	-	-	-	ns
		S _n to \bar{Y} ; see Fig. 6 [1]								
		V _{CC} = 4.5 V	-	25	43	-	54	-	65	ns
		V _{CC} = 5 V; C _L = 15 pF	-	20	-	-	-	-	-	ns
		\bar{E} to Y; see Fig. 6 [1]								
		V _{CC} = 4.5 V	-	16	29	-	36	-	44	ns
V _{CC} = 5 V; C _L = 15 pF	-	13	-	-	-	-	-	ns		
\bar{E} to \bar{Y} ; see Fig. 6 [1]										
V _{CC} = 4.5 V	-	21	36	-	45	-	54	ns		
V _{CC} = 5 V; C _L = 15 pF	-	18	-	-	-	-	-	ns		
t _t	transition time	Y, \bar{Y} ; see Fig. 5 [2]								
		V _{CC} = 4.5 V	-	7	15	-	19	-	22	ns
C _{PD}	power dissipation capacitance	C _L = 50 pF; f = 1 MHz; V _I = GND to V _{CC} - 1.5 V [3]	-	40	-	-	-	-	-	pF

[1] t_{pd} is the same as t_{PLH} and t_{PHL}.

[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).

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

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;

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

10.1. Waveforms and test circuit

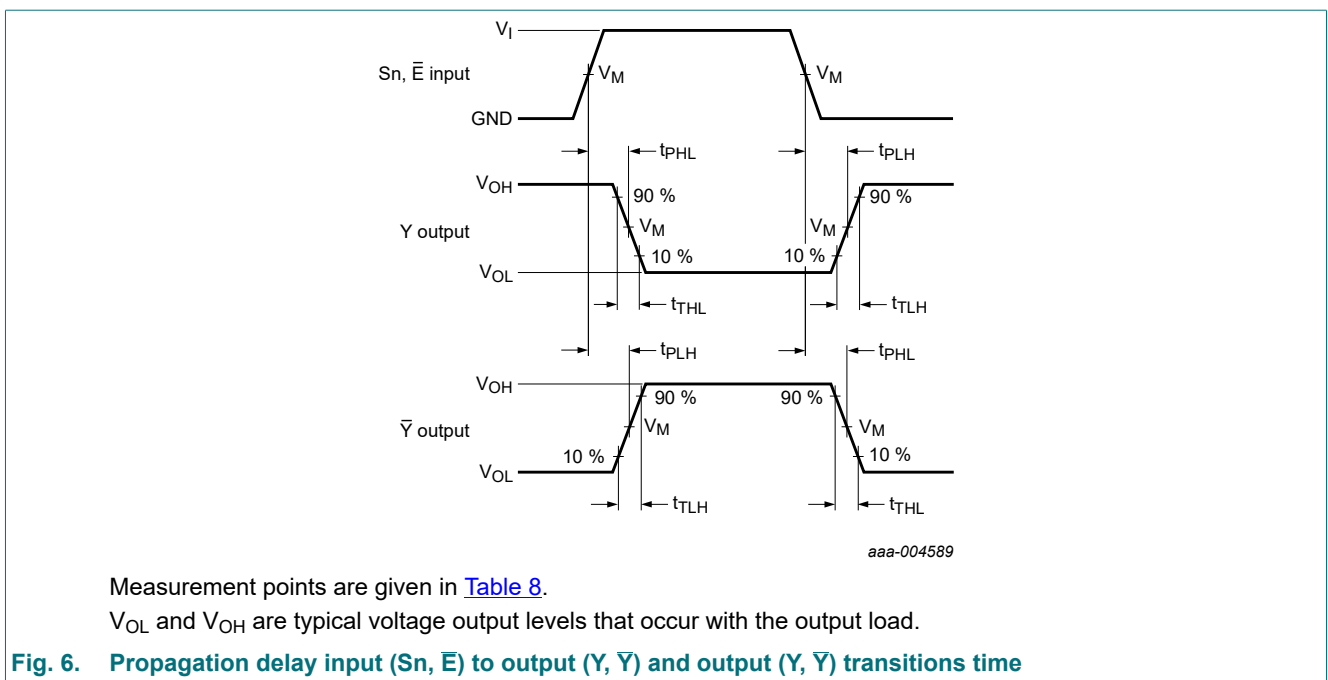
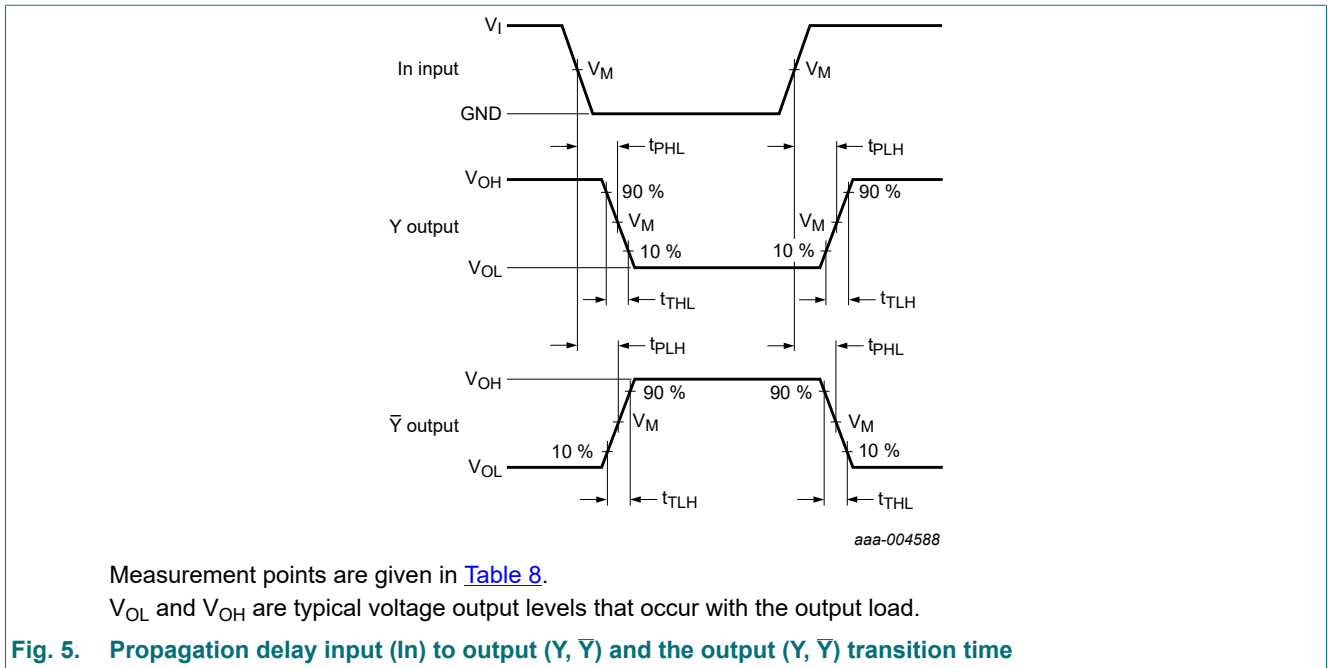
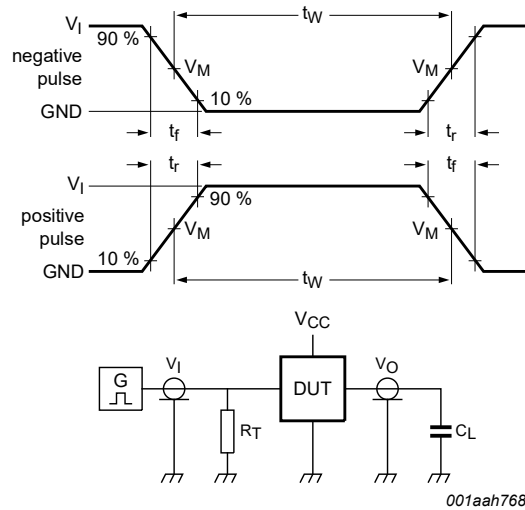


Table 8. Measurement points

Type	Input	Output
	V_M	V_M
74HC151-Q100	$0.5V_{CC}$	$0.5V_{CC}$
74HCT151-Q100	1.3 V	1.3 V



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. 7. Test circuit for measuring switching times

Table 9. Test data

Type	Input		Load	Test
	V_I	t_r, t_f	C_L	
74HC151-Q100	V_{CC}	6.0 ns	15 pF, 50 pF	t_{PLH}, t_{PHL}
74HCT151-Q100	3.0 V	6.0 ns	15 pF, 50 pF	t_{PLH}, t_{PHL}

11. Package outline

SO16: plastic small outline package; 16 leads; body width 3.9 mm

SOT109-1

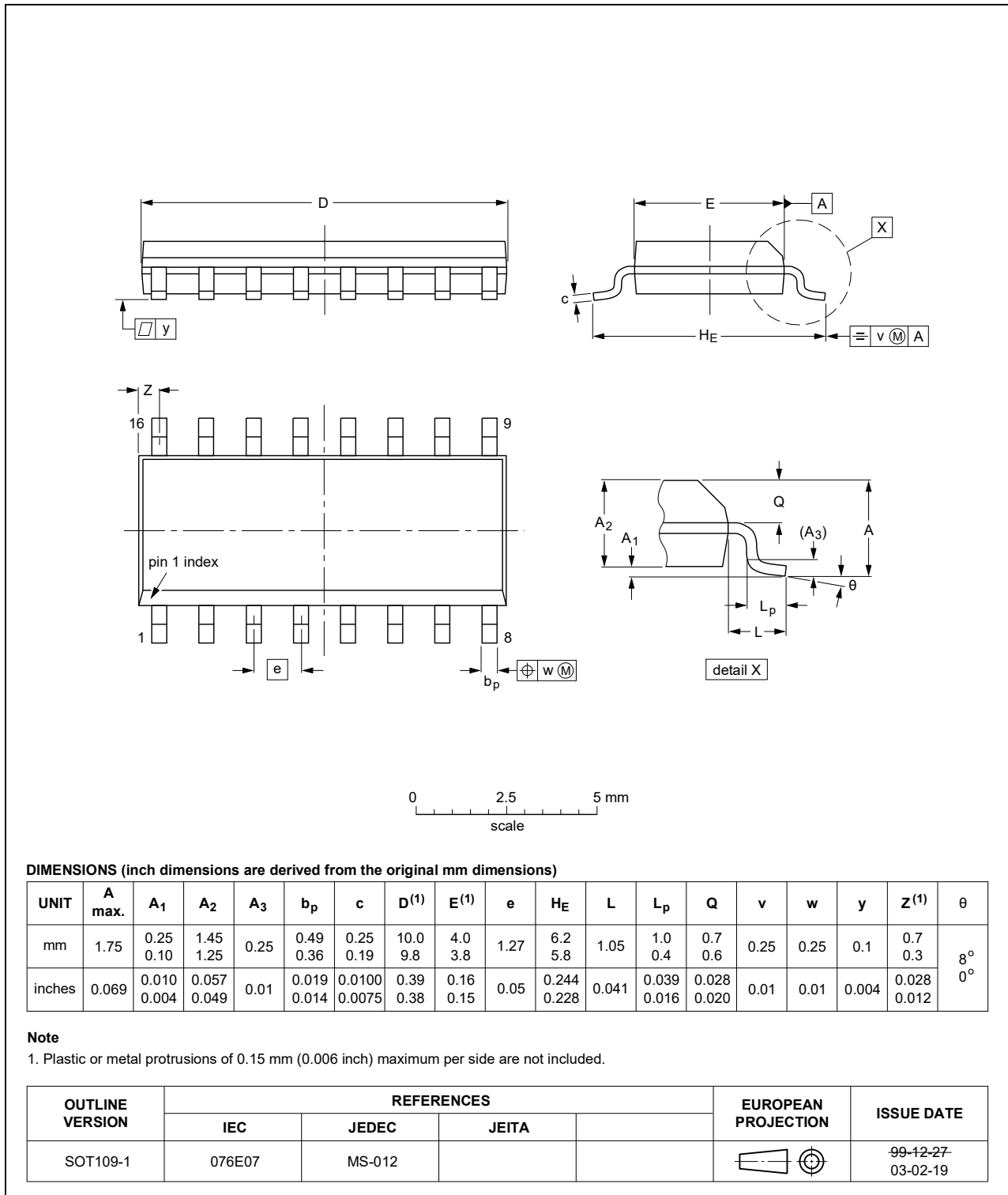


Fig. 8. Package outline SOT109-1 (SO16)

TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm

SOT403-1



Fig. 9. Package outline SOT403-1 (TSSOP16)

12. Abbreviations

Table 10. Abbreviations

Acronym	Description
CMOS	Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MIL	Military
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_HCT151_Q100 v.4	20210114	Product data sheet	-	74HC_HCT151_Q100 v.3
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. Section 7: Derating values for P_{tot} total power dissipation have been updated. 			
74HC_HCT151_Q100 v.3	20150126	Product data sheet	-	74HC_HCT151_Q100 v.2
Modifications:	<ul style="list-style-type: none"> Table 7: Power dissipation capacitance condition for 74HCT151-Q100 is corrected. 			
74HC_HCT151_Q100 v.2	20130211	Product data sheet	-	74HC_HCT151_Q100 v.1
Modifications:	<ul style="list-style-type: none"> New descriptive title (errata). 			
74HC_HCT151_Q100 v.1	20120807	Product data sheet	-	-

14. 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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