74AHC1G79-Q100; 74AHCT1G79-Q100

Single D-type flip-flop; positive-edge trigger

Rev. 4 — 11 January 2022

Product data sheet

1. General description

The 74AHC1G79-Q100; 74AHCT1G79-Q100 is a single positive-edge triggered D-type flip-flop. Data at the D-input that meets the set-up and hold time requirements on the LOW-to-HIGH clock transition will be stored in the flip-flop and appear at the Q output. Inputs are overvoltage tolerant. This feature allows the use of these devices as translators in mixed voltage environments.

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 to 5.5 V
- Overvoltage tolerant inputs to 5.5 V
- High noise immunity
- CMOS low power dissipation
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level A
- · Symmetrical output impedance
- · Balanced propagation delays
- Input levels:
 - For 74AHC1G79-Q100: CMOS level
 - For 74AHCT1G79-Q100: TTL level
- 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	number Package								
	Temperature range	Name	Description	Version					
74AHC1G79GW-Q100	-40 °C to +125 °C	TSSOP5							
74AHCT1G79GW-Q100			5 leads; body width 1.25 mm						
74AHC1G79GV-Q100	-40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753					
74AHCT1G79GV-Q100									



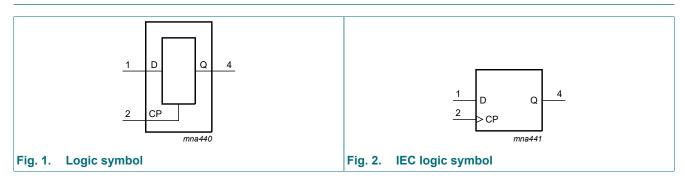
4. Marking

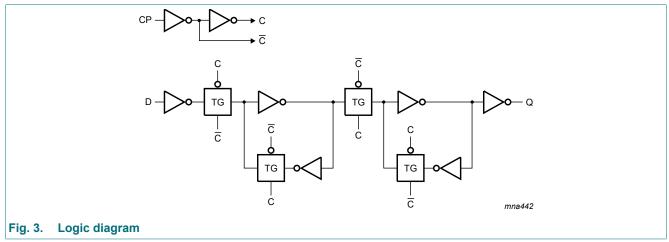
Table 2. Marking codes

Type number	Marking[1]
74AHC1G79GW-Q100	AP
74AHCT1G79GW-Q100	CP
74AHC1G79GV-Q100	A79
74AHCT1G79GV-Q100	C79

^[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

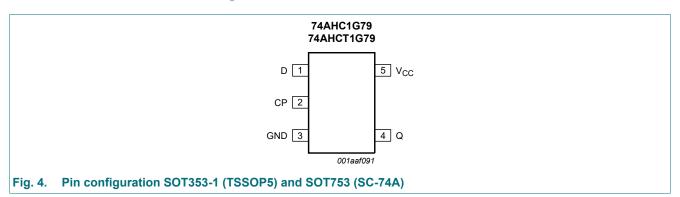
5. Functional diagram





6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

Symbol	Pin	Description	
D	1	data input	
СР	2	clock pulse input	
GND	3	ground (0 V)	
Q	4	data output	
Vcc	5	supply voltage	

7. Functional description

Table 4. Function table

 $H = HIGH \ voltage \ level; \ L = LOW \ voltage \ level; \ \uparrow = LOW-to-HIGH \ CP \ transition; \ X = don't \ care;$

Q + 1 = state after the next LOW-to-HIGH CP transition.

Inputs	Output	
СР	D	Q + 1
↑	L	L
\uparrow	Н	Н
L	X	Q

8. Limiting values

Table 5. 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	+7.0	V
VI	input voltage		-0.5	+7.0	V
I _{IK}	input clamping current	V _I < -0.5 V	-20	-	mA
I _{OK}	output clamping current	$V_O < -0.5 \text{ V or } V_O > V_{CC} + 0.5 \text{ V}$ [1]	-	±20	mA
Io	output current	-0.5 V < V _O < V _{CC} + 0.5 V	-	±25	mA
I _{CC}	supply current		-	75	mA
I_{GND}	ground current		-75	-	mA
T _{stg}	storage temperature		-65	+150	°C
P _{tot}	total power dissipation	$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$ [2]	-	250	mW

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

9. Recommended operating conditions

Table 6. Recommended operating conditions

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

Symbol	Parameter Conditions 74AH			1C1G79-	Q100	74AH	Unit		
			Min	Тур	Max	Min	Тур	Max	
V_{CC}	supply voltage		2.0	5.0	5.5	4.5	5.0	5.5	V
VI	input voltage		0	-	5.5	0	-	5.5	V
Vo	output voltage		0	-	V _{CC}	0	-	V _{CC}	V
T _{amb}	ambient temperature		-40	+25	+125	-40	+25	+125	°C
Δt/ΔV	input transition rise and	$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$	-	-	100	-	-	-	ns/V
fall rate	V _{CC} = 5.0 V ± 0.5 V	-	-	20	-	-	20	ns/V	

10. Static characteristics

Table 7. Static characteristics

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

Symbol	Parameter	Conditions	25 °C		25 °C -40 °C to +85 °C		-40 °C to	+125 °C	Unit	
			Min	Тур	Max	Min	Max	Min	Max	
74AHC1	G79-Q100									
V_{IH}	HIGH-level	V _{CC} = 2.0 V	1.5	-	-	1.5	-	1.5	-	V
	input voltage	V _{CC} = 3.0 V	2.1	-	-	2.1	-	2.1	-	V
		V _{CC} = 5.5 V	3.85	-	-	3.85	-	3.85	-	V
V_{IL}	LOW-level	V _{CC} = 2.0 V	-	-	0.5	-	0.5	-	0.5	V
	input voltage	V _{CC} = 3.0 V	-	-	0.9	-	0.9	-	0.9	V
		V _{CC} = 5.5 V	-	-	1.65	-	1.65	-	1.65	V

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^[2] For SOT353-1 (TSSOP5) package: P_{tot} derates linearly with 3.3 mW/K above 74 °C. For SOT753 (SC-74A) package: P_{tot} derates linearly with 3.8 mW/K above 85 °C.

Symbol	Parameter	r Conditions		25 °C		-40 °C t	o +85 °C	-40 °C to +125 °C		Unit
			Min	Тур	Max	Min	Max	Min	Max	
V _{OH}	HIGH-level	V _I = V _{IH} or V _{IL}								
	output voltage	I_{O} = -50 μ A; V_{CC} = 2.0 V	1.9	2.0	-	1.9	-	1.9	-	V
		I _O = -50 μA; V _{CC} = 3.0 V	2.9	3.0	-	2.9	-	2.9	-	V
		I _O = -50 μA; V _{CC} = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
		I_{O} = -4.0 mA; V_{CC} = 3.0 V	2.58	-	-	2.48	-	2.40	-	V
		I_{O} = -8.0 mA; V_{CC} = 4.5 V	3.94	-	-	3.8	-	3.70	-	V
V _{OL}	LOW-level	$V_I = V_{IH}$ or V_{IL}								
	output voltage	I _O = 50 μA; V _{CC} = 2.0 V	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 50 \mu A; V_{CC} = 3.0 V$	-	0	0.1	-	0.1	-	0.1	V
		I _O = 50 μA; V _{CC} = 4.5 V	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 4.0 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.36	-	0.44	-	0.55	V
		$I_O = 8.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	-	0.36	-	0.44	-	0.55	V
l _l	input leakage current	V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V	-	-	0.1	-	1.0	-	2.0	μA
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5 \text{ V}$	-	-	1.0	-	10	-	40	μΑ
C _I	input capacitance		-	1.5	10	-	10	-	10	pF
74AHCT	1G79-Q100							1		
V _{IH}	HIGH-level input voltage	V _{CC} = 4.5 V to 5.5 V	2.0	-	-	2.0	-	2.0	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 4.5 V to 5.5 V	-	-	0.8	-	0.8	-	8.0	V
V _{OH}	HIGH-level	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 \text{ V}$								
	output voltage	I _O = -50 μA	4.4	4.5	-	4.4	-	4.4	-	V
		I _O = -8.0 mA	3.94	-	-	3.8	-	3.70	-	V
V _{OL}	LOW-level	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 \text{ V}$								
	output voltage	I _O = 50 μA	-	0	0.1	-	0.1	-	0.1	V
		I _O = 8.0 mA	-	-	0.36	-	0.44	-	0.55	V
lį	input leakage current	V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V	-	-	0.1	-	1.0	-	2.0	μA
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5 \text{ V}$	-	-	1.0	-	10	-	40	μA
ΔI _{CC}	additional supply current	per input pin; $V_1 = 3.4 \text{ V}$; other inputs at V_{CC} or GND; $I_O = 0 \text{ A}$; $V_{CC} = 5.5 \text{ V}$	-	-	1.35	-	1.5	-	1.5	mA
C _I	input capacitance		-	1.5	10	-	10	-	10	pF

11. Dynamic characteristics

Table 8. Dynamic characteristics

GND = 0 V; $t_r = t_f = \le 3.0$ ns. For test circuit see Fig. 6. For waveform see Fig. 5.

Symbol	Parameter	Conditions		25 °C		-40 °C t	o +85 °C	-40 °C to	+125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	
74AHC1	G79-Q100				'	1				
t _{pd}	propagation	CP to Q [1]								
	delay	V _{CC} = 3.0 V to 3.6 V [2]								
		C _L = 15 pF	-	4.9	8.4	1.0	9.8	1.0	11.5	ns
		C _L = 50 pF	-	6.9	12.0	1.0	14.0	1.0	15.5	ns
		V _{CC} = 4.5 V to 5.5 V [3]								
		C _L = 15 pF	-	3.5	5.6	1.0	7.0	1.0	8.0	ns
		C _L = 50 pF	-	5.1	8.0	1.0	10.0	1.0	11.0	ns
t _{su}	set-up time	D to CP	3.0	1.0	-	3.0	-	4.0	-	ns
t _h	hold time	D to CP	+2.0	-1.0	-	2.0	-	3.0	-	ns
t _W	pulse width	clock HIGH or LOW	3.0	-	-	3.0	-	4.0	-	ns
f _{max}	maximum frequency		90	-	-	90	-	70	-	MHz
C _{PD}	power dissipation capacitance	per buffer; $C_L = 50 \text{ pF}$; [4] f = 1 MHz; $V_I = GND \text{ to } V_{CC}$	-	15	-	-	-	-	-	pF
74AHCT	1G79-Q100					ı	l		'	
t _{pd}	propagation	CP to Q [1]								
	delay	V _{CC} = 4.5 V to 5.5 V [3]								
		C _L = 15 pF	-	3.5	5.0	1.0	6.0	1.0	8.0	ns
		C _L = 50 pF	-	5.0	8.0	1.0	10.0	1.0	11.0	ns
t _{su}	set-up time	D to CP	3.0	1.0	-	3.0	-	4.0	-	ns
t _h	hold time	D to CP	+2.0	-1.0	-	2.0	-	3.0	-	ns
t _W	pulse width	clock HIGH or LOW	3.0	-	-	3.0	-	4.0	-	ns
f _{max}	maximum frequency		90	-	-	90	-	70	-	MHz
C _{PD}	power dissipation capacitance	per buffer; $C_L = 50 \text{ pF}$; [4] f = 1 MHz; $V_I = GND \text{ to } V_{CC}$	-	16	-	-	-	-	-	pF

- t_{pd} is the same as t_{PLH} and t_{PHL} . Typical values are measured at V_{CC} = 3.3 V.
- Typical values are measured at $V_{CC} = 5.0 \text{ V}$. Typical values are measured at $V_{CC} = 5.0 \text{ V}$. C_{PD} is used to determine the dynamic power dissipation P_D (μ W). $P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o)$ where:

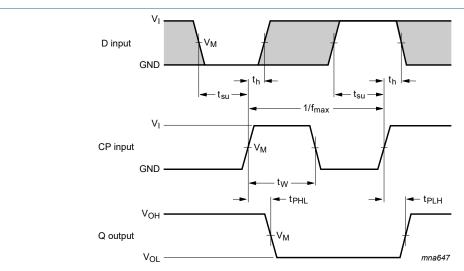
f_i = input frequency in MHz;

f_o = output frequency in MHz;

C_L = output load capacitance in pF;

V_{CC} = supply voltage in Volt.

11.1. Waveform and test circuit



Measurement points are given in Table 9.

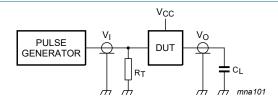
The shaded areas indicate when the input is permitted to change for predictable output performance.

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

Fig. 5. Clock (CP) to output (Q) propagation delay times, clock pulse width, D to set-up times, the CP to D hold times and maximum clock pulse frequency

Table 9. Measurement points

Туре	Inputs	Output	
	V _I V _M		V _M
74AHC1G79-Q100	GND to V _{CC}	0.5 x V _{CC}	0.5 x V _{CC}
74AHCT1G79-Q100	GND to 3.0 V	1.5 V	0.5 x V _{CC}



Test data is given in <u>Table 8</u>. Definitions for test circuit:

C_L = Load capacitance including jig and probe capacitance.

 R_T = Termination resistance should be equal to output impedance Z_o of the pulse generator.

Fig. 6. Test circuit for measuring switching times

12. Package outline

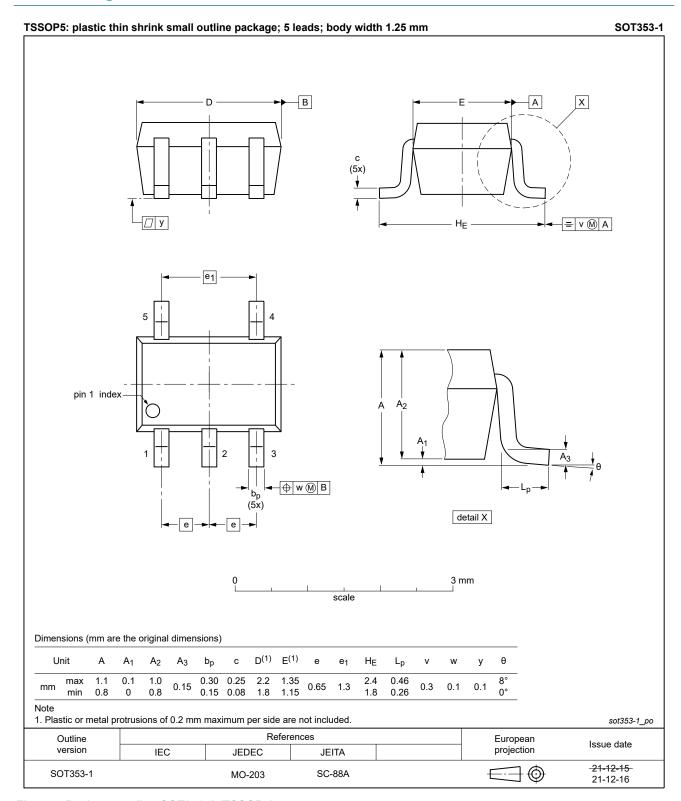


Fig. 7. Package outline SOT353-1 (TSSOP5)

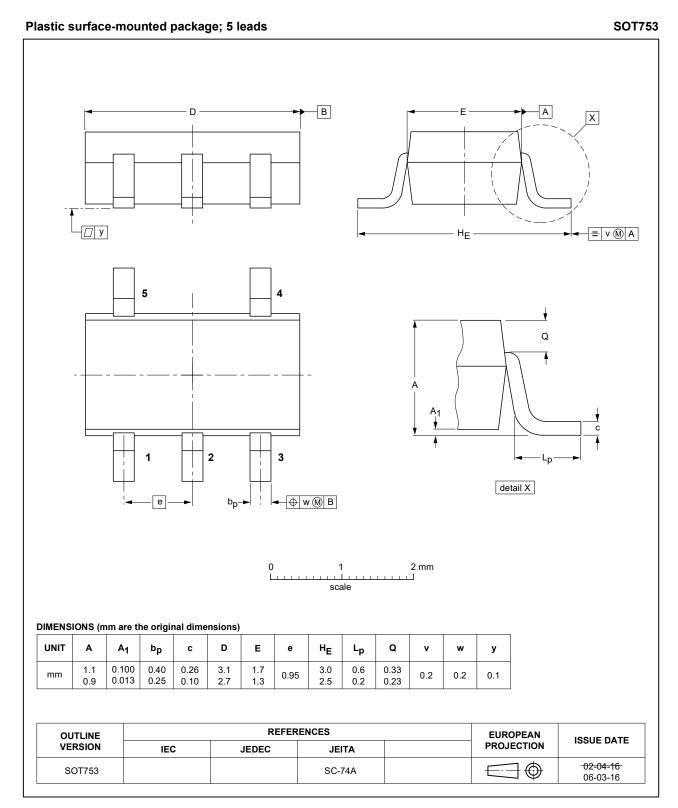


Fig. 8. Package outline SOT753 (SC-74A)

13. Abbreviations

Table 10. Abbreviations

Acronym	Description
CMOS	Complementary Metal-Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
НВМ	Human Body Model
MIL	Military
MM	Machine Model
TTL	Transistor-Transistor Logic

14. Revision history

Table 11. Revision history

Table 11. Revision mistory				I		
Document ID	Release date	Data sheet status	Change notice	Supersedes		
74AHC_AHCT1G79_Q100 v.4	20220111	Product data sheet	-	74AHC_AHCT1G79_Q100 v.3		
Modifications:	• <u>SOT353-1</u> : I	Package outline drawing u	pdated.			
74AHC_AHCT1G79_Q100 v.3	20210830	Product data sheet	-	74AHC_AHCT1G79_Q100 v.2		
Modifications:	guidelines o Legal texts I Section 1 ar Section 4: m	of this data sheet has been f Nexperia. nave been adapted to the rand Section 2 updated. narking code corrected. Derating values for Ptot total	new company nan	ne where appropriate.		
74AHC_AHCT1G79_Q100 v.2	20140923	Product data sheet	-	74AHC_AHCT1G79_Q100 v.1		
Modifications:	<u>Section 4</u> : table note added.					
74AHC_AHCT1G79_Q100 v.1	20130516	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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