74HC2G17-Q100; 74HCT2G17-Q100

Dual non-inverting Schmitt trigger Rev. 2 — 2 February 2022

Product data sheet

1. General description

The 74HC2G17-Q100; 74HCT2G17-Q100 are dual buffers with Schmitt-trigger inputs. 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 supply voltage range from 2.0 V to 6.0 V
- CMOS low power dissipation
- High noise immunity
- Unlimited input rise and fall times
- Balanced propagation delays
- Input levels:
 - For 74HC2G17-Q100: CMOS level
 - For 74HCT2G17-Q100: TTL level
- 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:
 - 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. Applications

- Wave and pulse shaper for highly noisy environments
- Astable multivibrators
- Monostable multivibrators



4. Ordering information

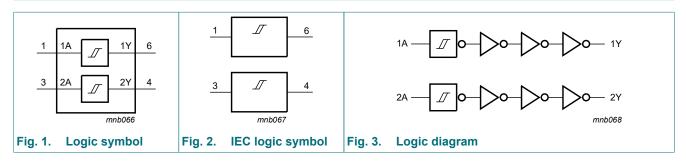
Type number	Package								
	Temperature range	Name	Description	Version					
74HC2G17GW-Q100	-40 °C to +125 °C	TSSOP6	plastic thin shrink small outline package; 6 leads;	SOT363-2					
74HCT2G17GW-Q100			body width 1.25 mm						
74HC2G17GV-Q100	-40 °C to +125 °C	SC-74;	plastic surface-mounted package; 6 leads	SOT457					
74HCT2G17GV-Q100		TSOP6							

5. Marking

Table 2. Marking						
Type number	Marking code[1]					
74HC2G17GW-Q100	HV					
74HCT2G17GW-Q100	TV					
74HC2G17GV-Q100	HV					
74HCT2G17GV-Q100	TV					

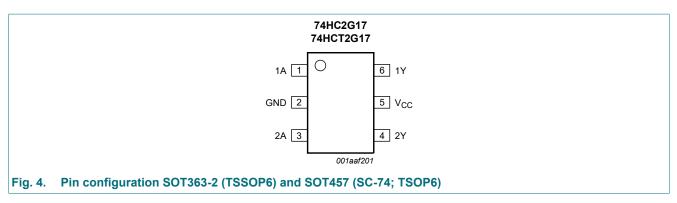
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

6. Functional diagram



7. Pinning information

7.1. Pinning



74HC_HCT2G17_Q100

Product data sheet

7.2. Pin description

Table 3. Pin description							
Symbol	Pin	Description					
1A	1	data input					
GND	2	ground (0 V)					
2A	3	data input					
2Y	4	data output					
V _{CC}	5	supply voltage					
1Y	6	data output					

8. Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level.

Input	Output
nA	nY
L	L
Н	Н

9. 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
I _{IK}	input clamping current	$V_{\rm I} < -0.5 \ V \ {\rm or} \ V_{\rm I} > V_{\rm CC} + 0.5 \ V$ [1]	-	±20	mA
I _{ОК}	output clamping current	$V_{\rm O} < -0.5 \text{ V or } V_{\rm O} > V_{\rm CC} + 0.5 \text{ V}$ [1]	-	±20	mA
lo	output current	$V_{\rm O} = -0.5 \text{ V to } V_{\rm CC} + 0.5 \text{ V}$ [1]	-	±25	mA
I _{CC}	supply current	[1]	-	50	mA
I _{GND}	ground current	[1]	-	-50	mA
T _{stg}	storage temperature		-65	+150	°C
P _{tot}	total power dissipation	[2]	-	250	mW

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

[2] For SOT363-2 (TSSOP6) package: P_{tot} derates linearly with 3.7 mW/K above 83 °C.

For SOT457 (SC-74; TSOP6) package: Ptot derates linearly with 4.1 mW/K above 89 °C.

Product data sheet

10. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
74HC2G	17-Q100			1		
V _{CC}	supply voltage		2.0	5.0	6.0	V
VI	input voltage		0	-	V _{CC}	V
Vo	output voltage		0	-	V _{CC}	V
T _{amb}	ambient temperature		-40	+25	+125	°C
74HCT2	G17-Q100		L. L			
V _{CC}	supply voltage		4.5	5.0	5.5	V
VI	input voltage		0	-	V _{CC}	V
Vo	output voltage		0	-	V _{CC}	V
T _{amb}	ambient temperature		-40	+25	+125	°C

11. Static characteristics

Table 7. Static characteristics for 74HC2G17-Q100

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
T _{amb} = 2	5 °C					
V _{OH}	HIGH-level output voltage	$V_{I} = V_{T+}$ or V_{T-}				
		I_{O} = -20 µA; V_{CC} = 2.0 V	1.9	2.0	-	V
		I_{O} = -20 µA; V_{CC} = 4.5 V	4.4	4.5	-	V
		I_{O} = -20 µA; V_{CC} = 6.0 V	5.9	6.0	-	V
		I _O = -4.0 mA; V _{CC} = 4.5 V	4.18	4.32	-	V
		I _O = -5.2 mA; V _{CC} = 6.0 V	5.68	5.81	-	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	V
		I _O = 20 μA; V _{CC} = 4.5 V	-	0	0.1	V
		I _O = 20 μA; V _{CC} = 6.0 V	-	0	0.1	V
		I _O = 4.0 mA; V _{CC} = 4.5 V	-	0.15	0.26	V
		I _O = 5.2 mA; V _{CC} = 6.0 V	-	0.16	0.26	V
I _I	input leakage current	V_{I} = GND or V_{CC} ; V_{CC} = 6.0 V	-	-	±0.1	μA
I_{CC} supply current $V_I = GND \text{ or } V_{CC}; I_O = V_{CC} = 6.0 \text{ V}$		$V_I = GND \text{ or } V_{CC}; I_O = 0 \text{ A};$ $V_{CC} = 6.0 \text{ V}$	-	-	1.0	μA
CI	input capacitance		-	2.0	-	pF

Product data sheet

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
T _{amb} = -	40 °C to +85 °C					
V _{OH}	HIGH-level output voltage	$V_I = V_{T+}$ or V_{T-}				
		I_{O} = -20 µA; V_{CC} = 2.0 V	1.9	-	-	V
		I_{O} = -20 µA; V_{CC} = 4.5 V	4.4	-	-	V
		I_{O} = -20 µA; V_{CC} = 6.0 V	5.9	-	-	V
		I _O = -4.0 mA; V _{CC} = 4.5 V	4.13	-	-	V
		I _O = -5.2 mA; V _{CC} = 6.0 V	5.63	-	-	V
V _{OL}	LOW-level output voltage	$V_{I} = V_{T+}$ or V_{T-}				
		I _O = 20 μA; V _{CC} = 2.0 V	-	-	0.1	V
		I _O = 20 μA; V _{CC} = 4.5 V	-	-	0.1	V
		I _O = 20 μA; V _{CC} = 6.0 V	-	-	0.1	V
		I _O = 4.0 mA; V _{CC} = 4.5 V	-	-	0.33	V
		I _O = 5.2 mA; V _{CC} = 6.0 V	-	-	0.33	V
I	input leakage current	$V_I = GND \text{ or } V_{CC}; V_{CC} = 6.0 \text{ V}$	-	-	±1.0	μA
I _{CC}	supply current	$V_I = GND \text{ or } V_{CC}; I_O = 0 \text{ A};$ $V_{CC} = 6.0 \text{ V}$	-	-	10.0	μA
T _{amb} = -	40 °C to +125 °C					
V _{OH}	HIGH-level output voltage	$V_{I} = V_{T+}$ or V_{T-}				
		I_{O} = -20 µA; V_{CC} = 2.0 V	1.9	-	-	V
		I_{O} = -20 µA; V_{CC} = 4.5 V	4.4	-	-	V
		I _O = -20 μA; V _{CC} = 6.0 V	5.9	-	-	V
		I _O = -4.0 mA; V _{CC} = 4.5 V	3.7	-	-	V
		I_0 = -5.2 mA; V_{CC} = 6.0 V	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	-	-	0.1	V
		I _O = 20 μA; V _{CC} = 4.5 V	-	-	0.1	V
		I _O = 20 μA; V _{CC} = 6.0 V	-	-	0.1	V
		I _O = 4.0 mA; V _{CC} = 4.5 V	-	-	0.4	V
		I _O = 5.2 mA; V _{CC} = 6.0 V	-	-	0.4	V
l	input leakage current	V_{I} = GND or V_{CC} ; V_{CC} = 6.0 V	-	-	±1.0	μA
I _{CC}	supply current	$V_I = GND \text{ or } V_{CC}; I_O = 0 \text{ A};$ $V_{CC} = 6.0 \text{ V}$	-	-	20.0	μA

Table 8. Static characteristics for 74HCT2G17-Q100

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbo	ol Parameter	Conditions	Min	Тур	Max	Unit
T _{amb} =	25 °C				1	
V _{OH}	HIGH-level output voltage	$V_{I} = V_{T+} \text{ or } V_{T-}; V_{CC} = 4.5 \text{ V}$				
		I _O = -20 μA	4.4	4.5	-	V
		I _O = -4.0 mA	4.18	4.32	-	V
V _{OL}	LOW-level output voltage	$V_{I} = V_{T+} \text{ or } V_{T-}; V_{CC} = 4.5 \text{ V}$				
		I _O = -20 μA	-	0	0.1	V
		I _O = -4.0 mA	-	0.15	0.26	V
l _l	input leakage current	V_{I} = GND or V_{CC} ; V_{CC} = 5.5 V	-	-	±0.1	μA
I _{CC}	supply current	V_I = GND or V_{CC} ; I_O = 0 A; V_{CC} = 5.5 V	-	-	1.0	μA
ΔI _{CC}	additional supply current	$V_{I} = V_{CC} - 2.1 V; - V_{CC} = 4.5 V \text{ to } 5.5 V; I_{O} = 0 \text{ A}$		-	300	μA
CI	input capacitance		-	2.0	-	pF
T _{amb} =	-40 °C to +85 °C					
V _{OH}	HIGH-level output voltage	$V_{I} = V_{T+} \text{ or } V_{T-}; V_{CC} = 4.5 \text{ V}$				
		I _O = -20 μA	4.4	-	-	V
		I _O = -4.0 mA	4.13	-	-	V
V _{OL}	LOW-level output voltage	$V_{I} = V_{T+} \text{ or } V_{T-}; V_{CC} = 4.5 \text{ V}$				
		I _O = -20 μA	-	-	0.1	V
		I _O = -4.0 mA	-	-	0.33	V
l _l	input leakage current	V_{I} = GND or V_{CC} ; V_{CC} = 5.5 V	-	-	±1.0	μA
I _{CC}	supply current	V_I = GND or V_{CC} ; I_O = 0 A; V_{CC} = 5.5 V	-	-	10.0	μA
ΔI _{CC}	additional supply current	$V_{I} = V_{CC} - 2.1 V;$ $V_{CC} = 4.5 V \text{ to } 5.5 V; I_{O} = 0 \text{ A}$	-	-	375	μA
T _{amb} =	-40 °C to +125 °C	, ,				
V _{OH}	HIGH-level output voltage	$V_{I} = V_{T+} \text{ or } V_{T-}; V_{CC} = 4.5 \text{ V}$				
		I _O = -20 μA	4.4	-	-	V
		I _O = -4.0 mA	3.7	-	-	V
V _{OL}	LOW-level output voltage	$V_{I} = V_{T+} \text{ or } V_{T-}; V_{CC} = 4.5 \text{ V}$				
		I _O = -20 μA	-	-	0.1	V
		I _O = -4.0 mA	-	-	0.4	V
l _l	input leakage current	V_1 = GND or V_{CC} ; V_{CC} = 5.5 V	-	-	±1.0	μA
I _{CC}	supply current	V_I = GND or V_{CC} ; I_O = 0 A; V_{CC} = 5.5 V	-	-	20.0	μA
ΔI _{CC}	additional supply current	V _I = V _{CC} - 2.1 V; V _{CC} = 4.5 V to 5.5 V; I _O = 0 A	-	-	410	μA

12. Dynamic characteristics

Table 9. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 6.

Symbol	Parameter	Conditions			25 °C		-40 °C to	o +85 °C	-40 °C to +125 °C		Unit
				Min	Тур	Мах	Min	Max	Min	Max	
74HC2G	17-Q100										
t _{pd}	propagation	nA to nY; see <u>Fig. 5</u>	[1]								
	delay	V _{CC} = 2.0 V; C _L = 50 pF		-	36	115	-	140	-	175	ns
		V _{CC} = 4.5 V; C _L = 50 pF		-	12	22	-	27	-	34	ns
		V _{CC} = 6.0 V; C _L = 50 pF		-	10	18	-	22	-	28	ns
t _t	transition	nY; see <u>Fig. 5</u>	[2]								
	time	V _{CC} = 2.0 V; C _L = 50 pF		-	20	75	-	95	-	110	ns
		V _{CC} = 4.5 V; C _L = 50 pF		-	7	15	-	19	-	22	ns
		V _{CC} = 6.0 V; C _L = 50 pF		-	5	13	-	16	-	19	ns
C _{PD}	power dissipation capacitance	$V_I = GND$ to V_{CC}	[3]	-	10	-	-	-	-	-	pF
74HCT2	G17-Q100				1					1	
t _{pd}	propagation	nA to nY; see <u>Fig. 5</u>	[1]								
	delay	V _{CC} = 4.5 V; C _L = 50 pF		-	21	29	-	36	-	45	ns
t _t	transition	nY; see <u>Fig. 5</u>	[2]								
	time	V _{CC} = 4.5 V; C _L = 50 pF		-	6	15	-	19	-	22	ns
C _{PD}	power dissipation capacitance	V_{I} = GND to V_{CC} - 1.5 V	[3]	-	10	-	-	-	-	-	pF

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

[2] t_t is the same as t_{TLH} and t_{THL} [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;

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

12.1. Waveforms and test circuit

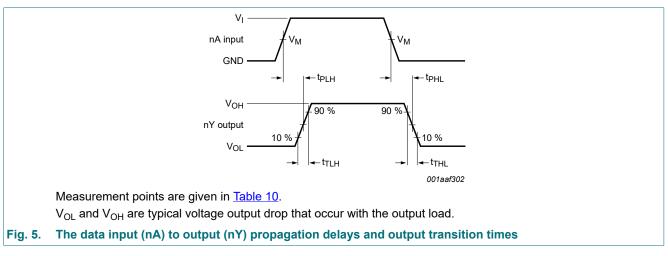


Table 10. Measurement points

Туре	Input	Output		
	V _M	VI	t _r = t _f	V _M
74HC2G17-Q100	0.5V _{CC}	GND to V _{CC}	6.0 ns	0.5V _{CC}
74HCT2G17-Q100	1.3 V	GND to 3.0 V	6.0 ns	1.3 V

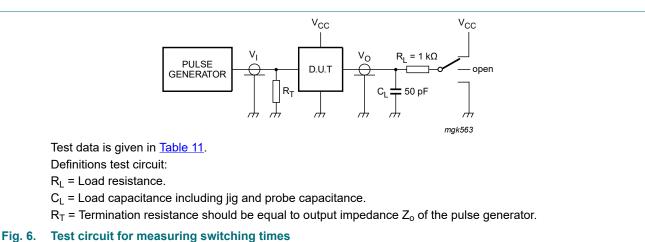


Table 11. Test data

Туре	Input	Test	
	VI	t _r , t _f	t _{PHL} , t _{PLH}
74HC2G17-Q100	GND to V _{CC}	6 ns	open
74HCT2G17-Q100	GND to 3.0 V	6 ns	open

Product data sheet

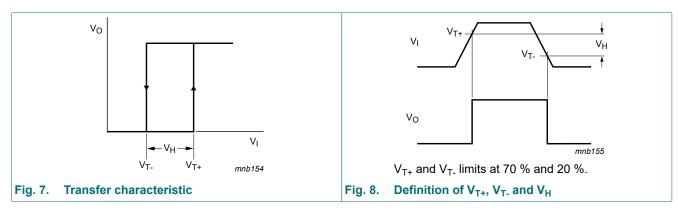
13. Transfer characteristics

Table 12. Transfer characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 6.

Symbol	Parameter	Conditions	25 °C		-40 °C to +85 °C		-40 °C to +125 °C		Unit	
			Min	Тур	Max	Min	Мах	Min	Мах	
74HC2G	17-Q100					1	1		1	_
th	positive-going	see Fig. 7, Fig. 8								
	threshold voltage	V _{CC} = 2.0 V	1.00	1.18	1.50	1.00	1.50	1.00	1.50	V
		V _{CC} = 4.5 V	2.30	2.60	3.15	2.30	3.15	2.30	3.15	V
		V _{CC} = 6.0 V	3.00	3.46	4.20	3.00	4.20	3.00	4.20	V
V _{T-}	negative-going	see <u>Fig. 7, Fig. 8</u>								
	threshold voltage	V _{CC} = 2.0 V	0.30	0.60	0.90	0.30	0.90	0.30	0.90	V
	Voltago	V _{CC} = 4.5 V	1.13	1.47	2.00	1.13	2.00	1.13	2.00	V
		V _{CC} = 6.0 V	1.50	2.06	2.60	1.50	2.60	1.50	2.60	V
V _H	hysteresis voltage	V _{T+} - V _{T-} ; see <u>Fig. 7,</u> <u>Fig. 8</u> and <u>Fig. 9</u>								
		V _{CC} = 2.0 V	0.30	0.60	1.00	0.30	1.00	0.30	1.00	V
		V _{CC} = 4.5 V	0.60	1.13	1.40	0.60	1.40	0.60	1.40	V
		V _{CC} = 6.0 V	0.80	1.40	1.70	0.80	1.70	0.80	1.70	V
74HCT2	G17-Q100						·	·		
V _{T+}	positive-going threshold voltage	see Fig. 7 and Fig. 8								
		V _{CC} = 4.5 V	1.20	1.58	1.90	1.20	1.90	1.20	1.90	V
		V _{CC} = 5.5 V	1.40	1.78	2.10	1.40	2.10	1.40	2.10	V
V _{T-}	negative-going threshold voltage	see Fig. 7 and Fig. 8								
		V _{CC} = 4.5 V	0.50	0.87	1.20	0.50	1.20	0.50	1.20	V
		V _{CC} = 5.5 V	0.60	1.11	1.40	0.60	1.40	0.60	1.40	V
V _H	hysteresis voltage	V _{T+} - V _{T-} ; see <u>Fig. 7,</u> <u>Fig. 8</u> and <u>Fig. 10</u>								
		V _{CC} = 4.5 V	0.40	0.71	-	0.40	-	0.40	-	V
		V _{CC} = 5.5 V	0.40	0.67	-	0.40	-	0.40	-	V

13.1. Waveforms transfer characteristics



74HC_HCT2G17_Q100

2.5

1.0

0.8

0.6

0.4

0.2

0

0

b. V_{CC} = 4.5 V

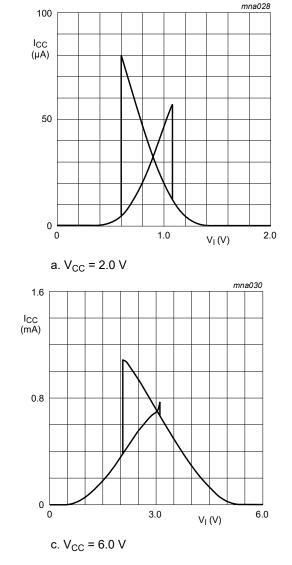
I_{CC} (mA)

Dual non-inverting Schmitt trigger

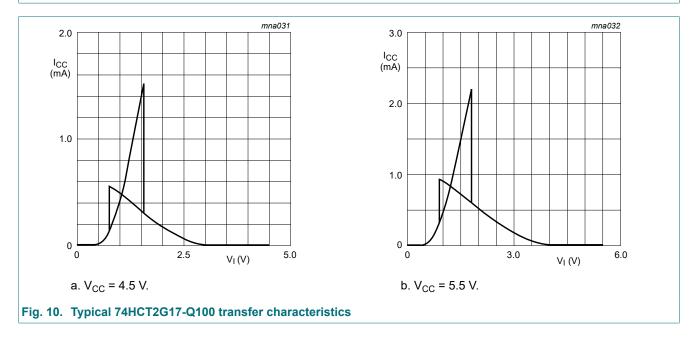
mna029

5.0

 $V_{I}(V)$







74HC_HCT2G17_Q100

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14. Application information

The slow input rise and fall times cause additional power dissipation, this can be calculated using the following formula:

 $P_{add} = f_i \times (t_r \times \Delta I_{CC(AV)} + t_f \times \Delta I_{CC(AV)}) \times V_{CC} \text{ where:}$

 P_{add} = additional power dissipation (μ W);

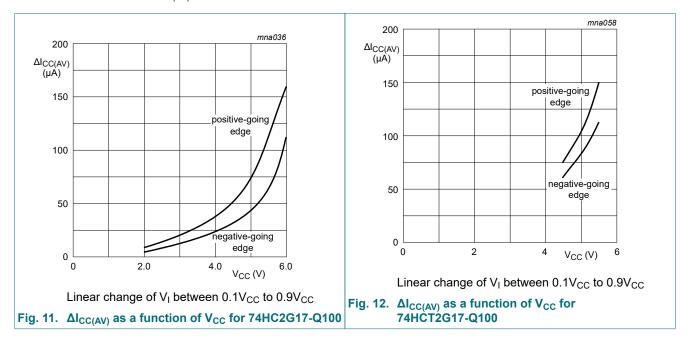
f_i = input frequency (MHz);

 t_r = input rise time (ns); 10 % to 90 %;

 t_f = input fall time (ns); 90 % to 10 %;

 $\Delta I_{CC(AV)}$ = average additional supply current (µA).

 $\Delta I_{CC(AV)}$ differs with positive or negative input transitions, as shown in Fig. 11 and Fig. 12.



Product data sheet

15. Package outline

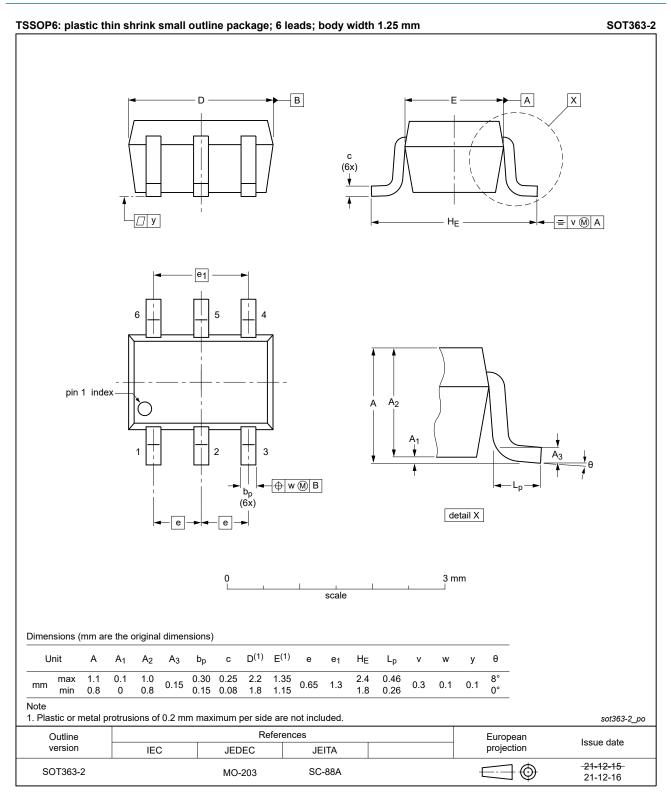
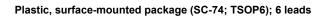


Fig. 13. Package outline SOT363-2 (TSSOP6)

74HC_HCT2G17_Q100
Product data sheet

SOT457



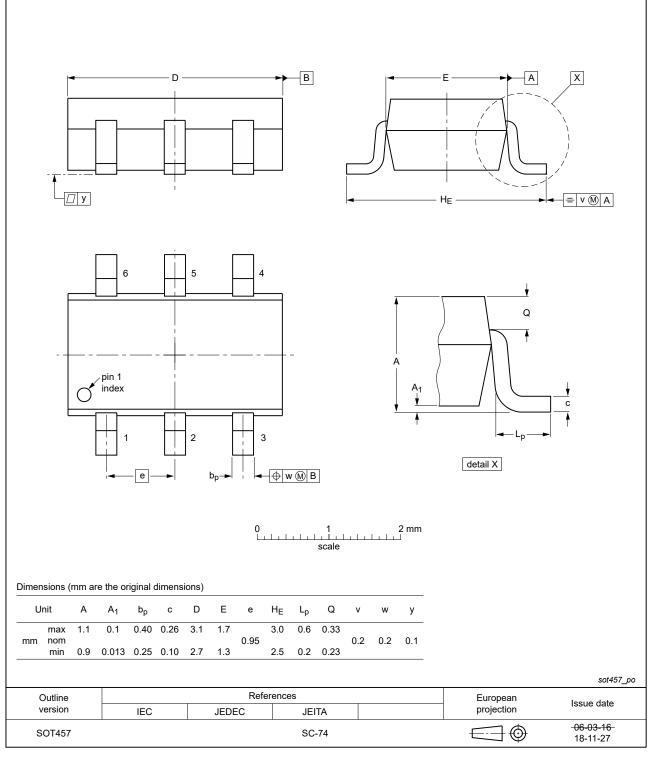


Fig. 14. Package outline SOT457 (SC-74; TSOP6)

Product data sheet

16. 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

17. Revision history

Table 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT2G17_Q100 v.2	20220202	Product data sheet - 74HC_HCT2G17		74HC_HCT2G17_Q100 v.1
Modifications:	guidelines o Legal texts I Package SC <u>Section 2</u> up <u>Section 9</u> : D	have been adapted to the i DT363 (SC-88) changed to	new company nan SOT363-2 (TSSC I power dissipatior	ne where appropriate. DP6). n updated.
74HC_HCT2G17_Q100 v.1	20130522	Product data sheet	-	-

18. 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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