

74HC2G17; 74HCT2G17

Dual non-inverting Schmitt trigger

Rev. 3 — 4 December 2023

Product data sheet

1. General description

The 74HC2G17; 74HCT2G17 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.

2. Features and benefits

- 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: CMOS level
 - For 74HCT2G17: 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:
 - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
 - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V
- Specified from -40 °C to +85 °C and -40 °C to +125 °C

3. Applications

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

4. Ordering information

Table 1. Ordering information

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

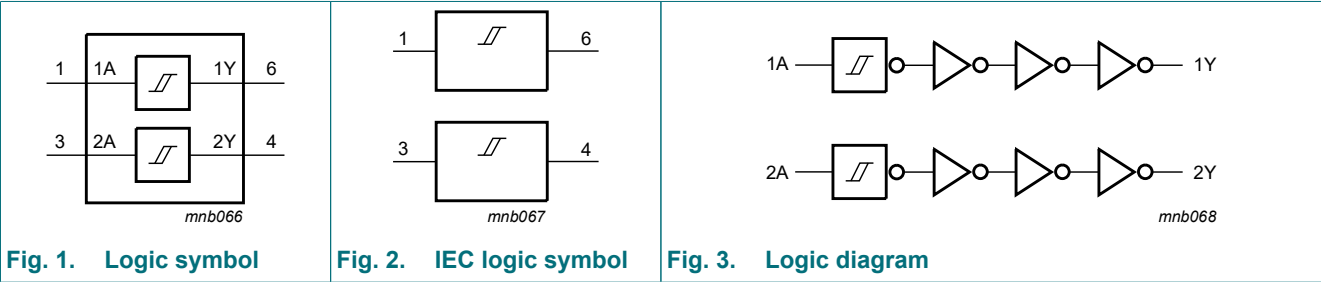
5. Marking

Table 2. Marking

Type number	Marking code[1]
74HC2G17GW	HV
74HCT2G17GW	TV
74HC2G17GV	HV
74HCT2G17GV	TV

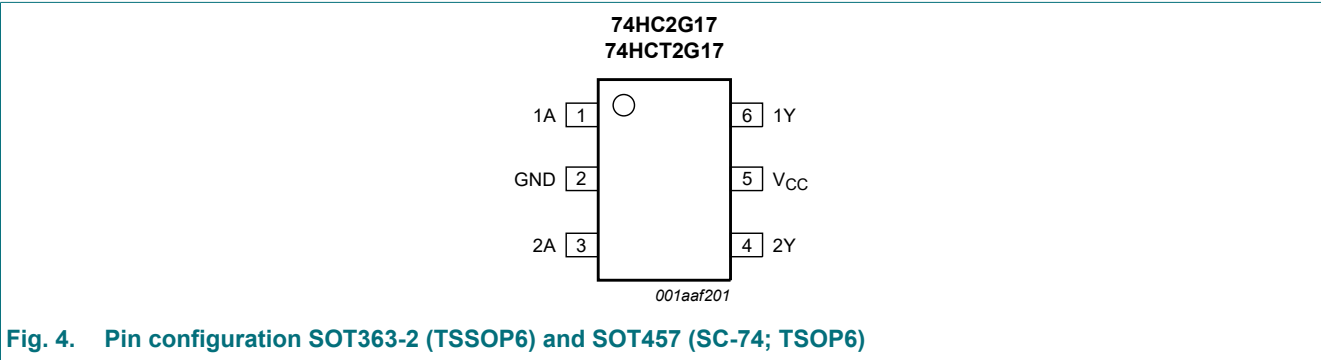
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

6. Functional diagram



7. Pinning information

7.1. Pinning



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
H	H

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 _I < -0.5 V or V _I > V _{CC} + 0.5 V [1]	-	±20	mA
I _{OK}	output clamping current	V _O < -0.5 V or V _O > V _{CC} + 0.5 V [1]	-	±20	mA
I _O	output current	V _O = -0.5 V to V _{CC} + 0.5 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: P_{tot} derates linearly with 4.1 mW/K above 89 °C.

10. Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
74HC2G17						
V _{CC}	supply voltage		2.0	5.0	6.0	V
V _I	input voltage		0	-	V _{CC}	V
V _O	output voltage		0	-	V _{CC}	V
T _{amb}	ambient temperature		-40	+25	+125	°C
74HCT2G17						
V _{CC}	supply voltage		4.5	5.0	5.5	V
V _I	input voltage		0	-	V _{CC}	V
V _O	output voltage		0	-	V _{CC}	V
T _{amb}	ambient temperature		-40	+25	+125	°C

11. Static characteristics

Table 7. Static characteristics for 74HC2G17

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
T_{amb} = 25 °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 or V _{CC} ; I _O = 0 A; V _{CC} = 6.0 V	-	-	1.0	µA
C _I	input capacitance		-	2.0	-	pF
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 _I	input leakage current	V _I = GND or V _{CC} ; V _{CC} = 6.0 V	-	-	±1.0	µA
I _{CC}	supply current	V _I = GND or V _{CC} ; I _O = 0 A; V _{CC} = 6.0 V	-	-	10.0	µA

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
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 _O = -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
I _I	input leakage current	V _I = GND or V _{CC} ; V _{CC} = 6.0 V	-	-	±1.0	µA
I _{CC}	supply current	V _I = GND or V _{CC} ; I _O = 0 A; V _{CC} = 6.0 V	-	-	20.0	µA

Table 8. Static characteristics for 74HCT2G17

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
T_{amb} = 25 °C						
V _{OH}	HIGH-level output voltage	V _I = V _{T+} or V _{T-} ; V _{CC} = 4.5 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+} or V _{T-} ; V _{CC} = 4.5 V				
		I _O = -20 µA	-	0	0.1	V
		I _O = -4.0 mA	-	0.15	0.26	V
I _I	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 to 5.5 V; I _O = 0 A	-	-	300	µA
C _I	input capacitance		-	2.0	-	pF
T_{amb} = -40 °C to +85 °C						
V _{OH}	HIGH-level output voltage	V _I = V _{T+} or V _{T-} ; V _{CC} = 4.5 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+} or V _{T-} ; V _{CC} = 4.5 V				
		I _O = -20 µA	-	-	0.1	V
		I _O = -4.0 mA	-	-	0.33	V
I _I	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 to 5.5 V; I _O = 0 A	-	-	375	µA

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
T_{amb} = -40 °C to +125 °C						
V _{OH}	HIGH-level output voltage	V _I = V _{T+} or V _{T-} ; V _{CC} = 4.5 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+} or V _{T-} ; V _{CC} = 4.5 V				
		I _O = -20 µA	-	-	0.1	V
		I _O = -4.0 mA	-	-	0.4	V
I _I	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	-	-	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 +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74HC2G17										
t _{pd}	propagation delay	nA to nY; see Fig. 5 [1]								
		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 time	nY; see Fig. 5 [2]								
		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
74HCT2G17										
t _{pd}	propagation delay	nA to nY; see Fig. 5 [1]								
		V _{CC} = 4.5 V; C _L = 50 pF	-	21	29	-	36	-	45	ns
t _t	transition time	nY; see Fig. 5 [2]								
		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 µW). P_D = C_{PD} × V_{CC}² × f_i × N + Σ(C_L × V_{CC}² × 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;

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

12.1. Waveforms and test circuit

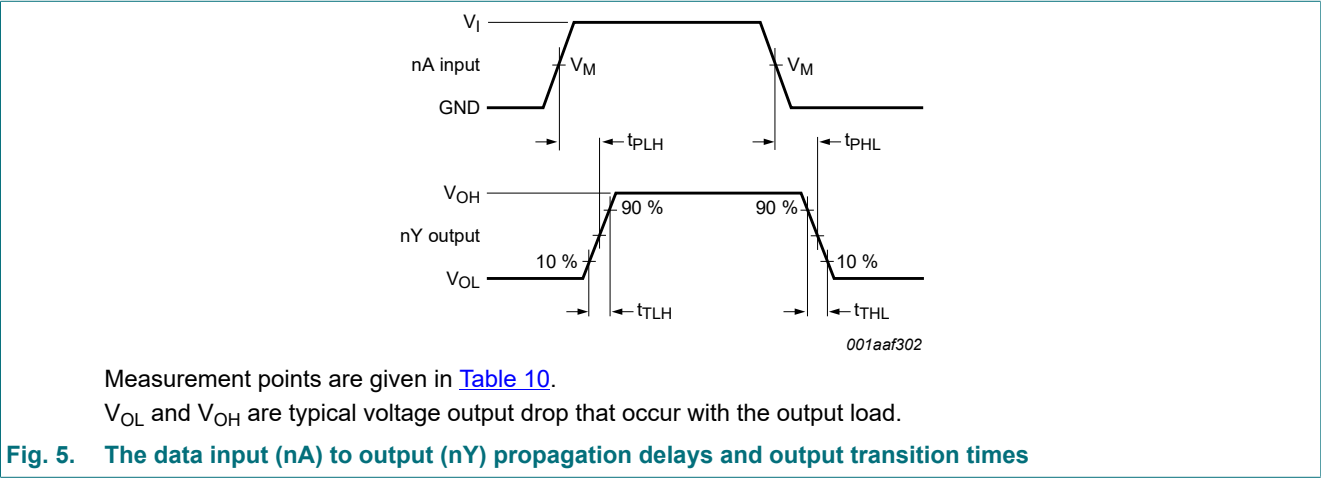


Table 10. Measurement points

Type	Input			Output
	V_M	V_I	$t_r = t_f$	V_M
74HC2G17	$0.5V_{CC}$	GND to V_{CC}	6.0 ns	$0.5V_{CC}$
74HCT2G17	1.3 V	GND to 3.0 V	6.0 ns	1.3 V

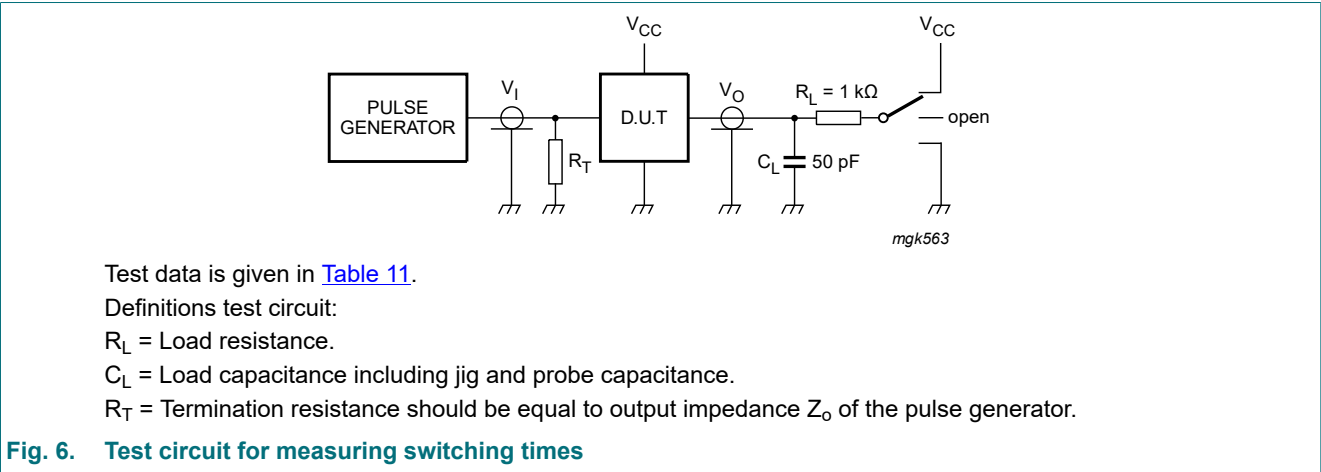


Table 11. Test data

Type	Input		Test
	V_I	t_r, t_f	t_{PHL}, t_{PLH}
74HC2G17	GND to V_{CC}	6 ns	open
74HCT2G17	GND to 3.0 V	6 ns	open

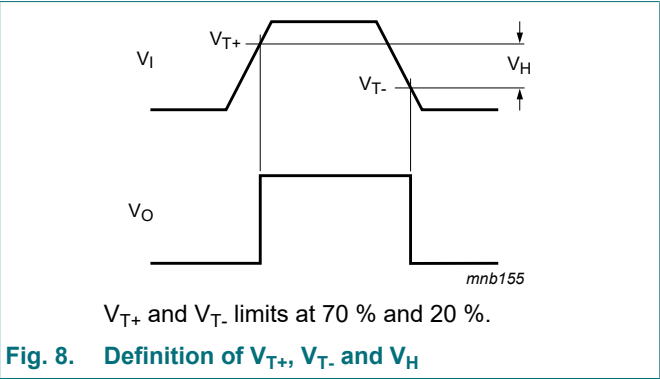
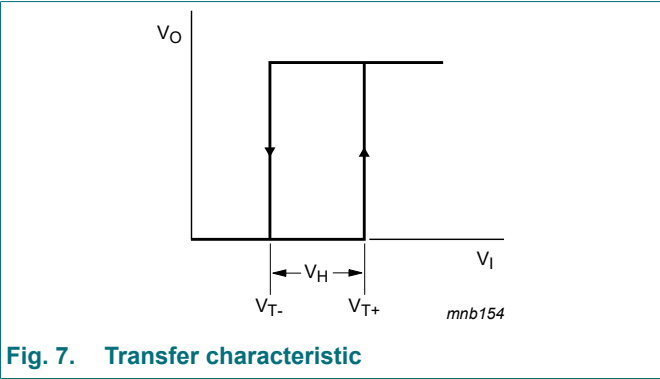
13. Transfer characteristics

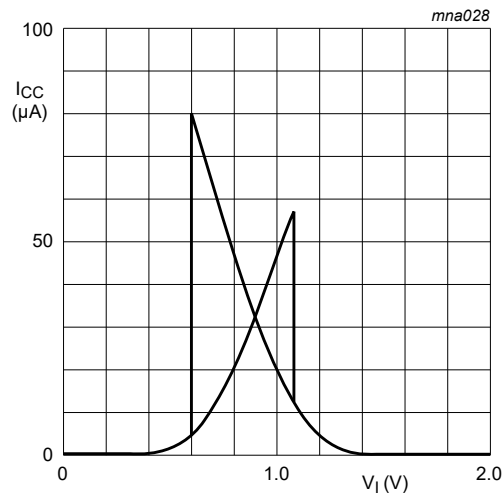
Table 12. Transfer characteristics

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

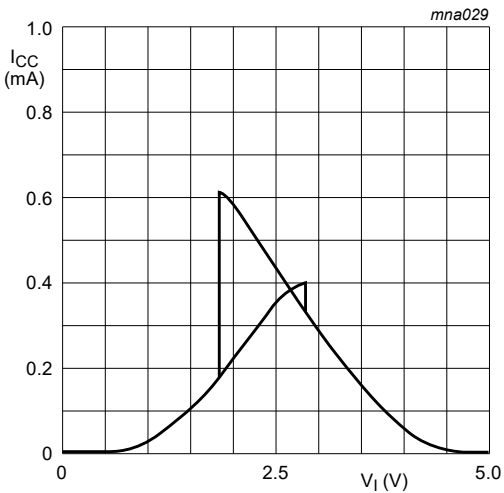
Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74HC2G17										
V _{T+}	positive-going threshold voltage	see Fig. 7 , Fig. 8								
		V _{CC} = 2.0 V	1.00	1.18	1.50	1.00	1.50	1.00	1.50	V
		V _{CC} = 4.5 V	2.30	2.60	3.15	2.30	3.15	2.30	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 threshold voltage	see Fig. 7 , Fig. 8								
		V _{CC} = 2.0 V	0.30	0.60	0.90	0.30	0.90	0.30	0.90	V
		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 Fig. 7 , Fig. 8 and Fig. 9								
		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
74HCT2G17										
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 Fig. 7 , Fig. 8 and Fig. 10								
		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

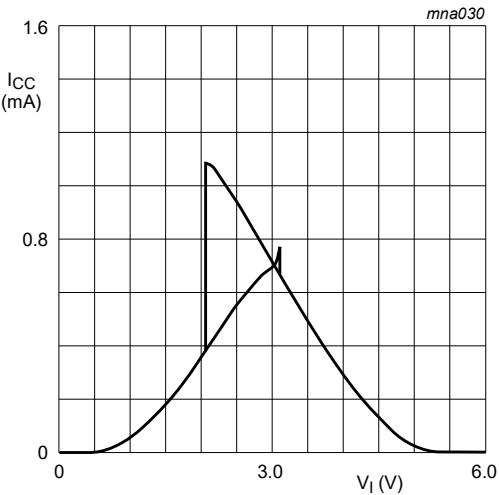




a. $V_{CC} = 2.0$ V

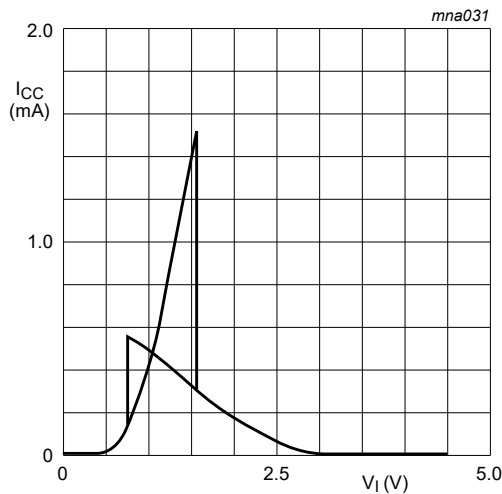


b. $V_{CC} = 4.5$ V

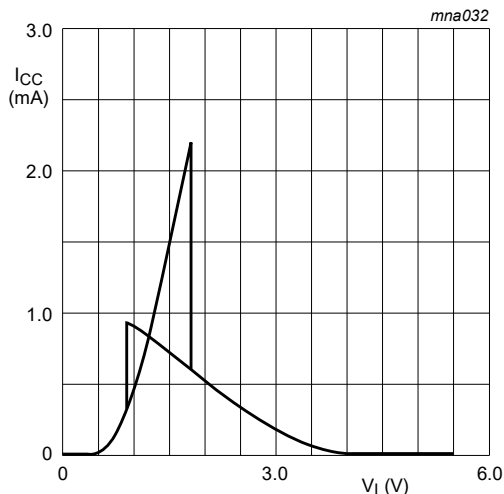


c. $V_{CC} = 6.0$ V

Fig. 9. Typical 74HC2G17 transfer characteristics



a. $V_{CC} = 4.5$ V.



b. $V_{CC} = 5.5$ V.

Fig. 10. Typical 74HCT2G17 transfer characteristics

14. Application information

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

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

P_{add} = additional power dissipation (μW);

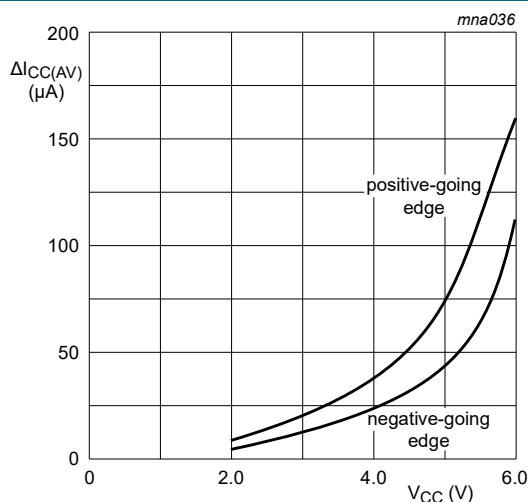
f_i = input frequency (MHz);

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

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

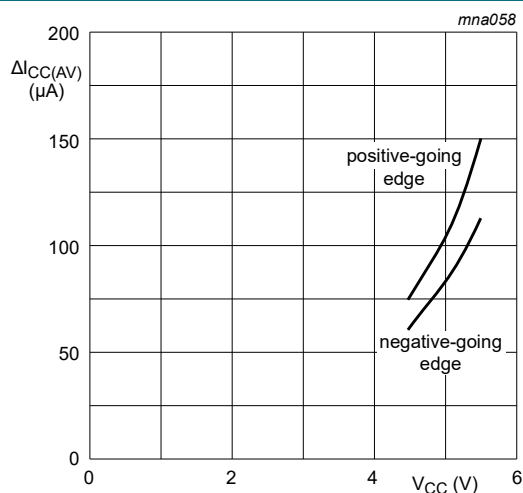
$\Delta I_{\text{CC(AV)}}$ = average additional supply current (μA).

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



Linear change of V_i between $0.1V_{\text{CC}}$ to $0.9V_{\text{CC}}$

Fig. 11. $\Delta I_{\text{CC(AV)}}$ as a function of V_{CC} for 74HC2G17



Linear change of V_i between $0.1V_{\text{CC}}$ to $0.9V_{\text{CC}}$

Fig. 12. $\Delta I_{\text{CC(AV)}}$ as a function of V_{CC} for 74HCT2G17

15. Package outline

TSSOP6: plastic thin shrink small outline package; 6 leads; body width 1.25 mmSOT363-2

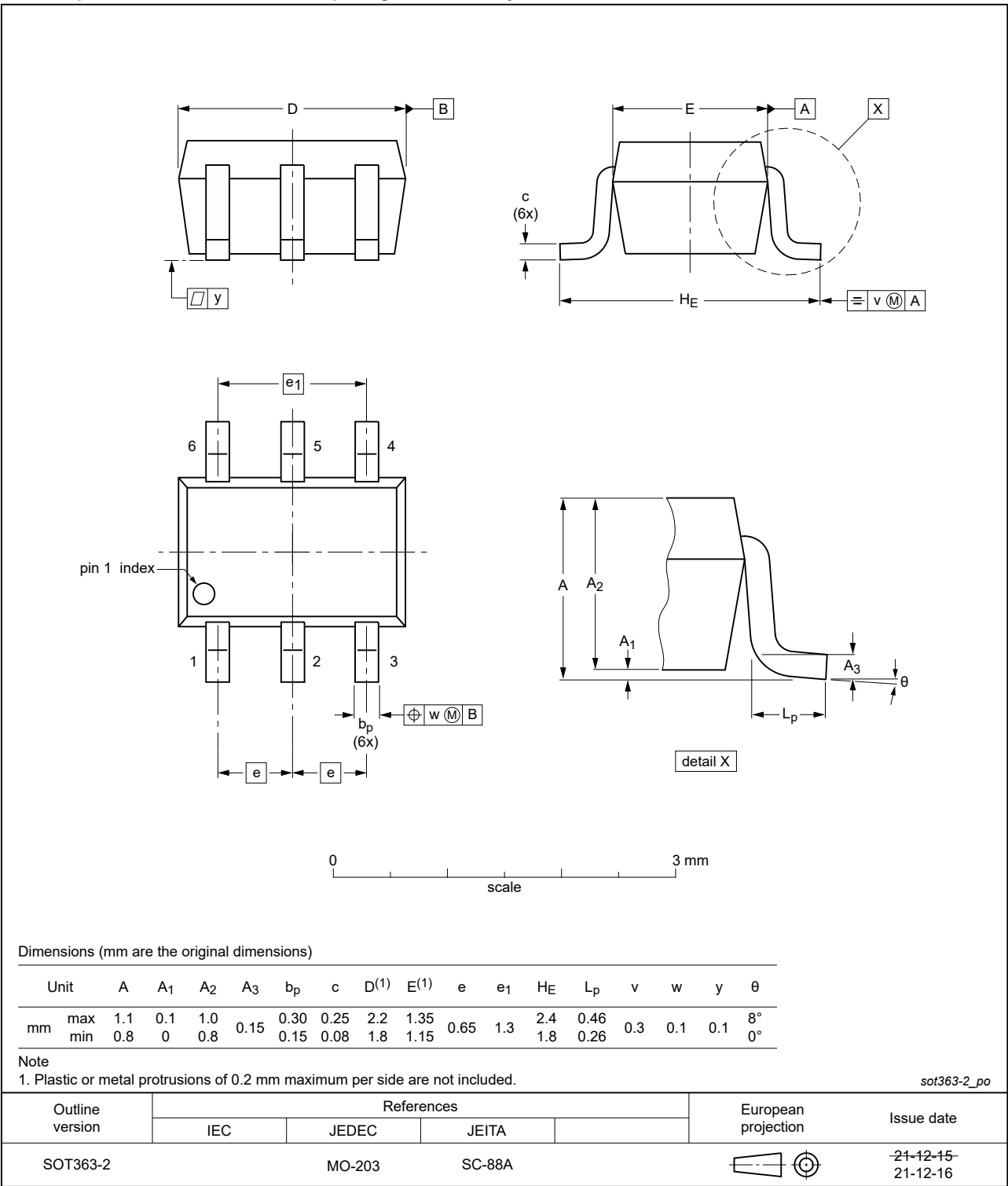


Fig. 13. Package outline SOT363-2 (TSSOP6)

Plastic, surface-mounted package (SC-74; TSOP6); 6 leads

SOT457

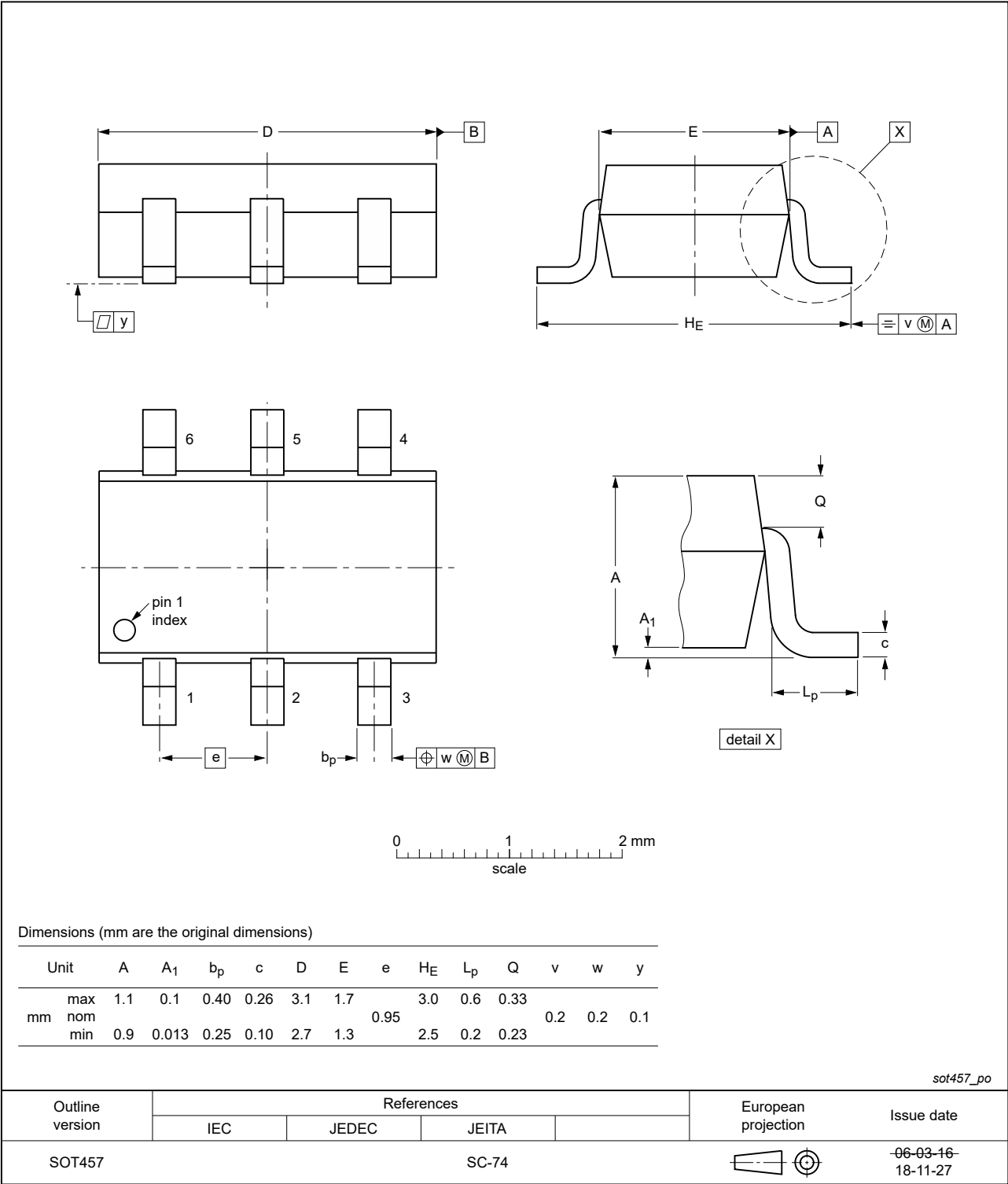


Fig. 14. Package outline SOT457 (SC-74; TSOP6)

16. Abbreviations

Table 13. Abbreviations

Acronym	Description
CDM	Charged Device Model
CMOS	Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
TTL	Transistor-Transistor Logic

17. Revision history

Table 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT2G17 v.3	20231204	Product data sheet	-	74HC_HCT2G17 v.2
Modifications:	• Section 2: ESD specification updated according to the latest JEDEC standard.			
74HC_HCT2G17 v.2	20220202	Product data sheet	-	74HC_HCT2G17 v.1
Modifications:	• 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. • Package SOT363 (SC-88) changed to SOT363-2 (TSSOP6). • Section 1 and Section 2 updated. • Section 9: Derating values for P_{tot} total power dissipation updated. • Section 11: V_{OH} and V_{OL} conditions corrected to V_I = V_{T+} or V_{T-}. (Errata) • Fig. 14: Package outline drawing SOT457 (SC-74; TSOP6) updated.			
74HC_HCT2G17 v.1	20061006	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.
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Contents

1. General description..... 1

2. Features and benefits..... 1

3. Applications..... 1

4. Ordering information..... 1

5. Marking..... 2

6. Functional diagram..... 2

7. Pinning information..... 2

7.1. Pinning..... 2

7.2. Pin description..... 2

8. Functional description..... 3

9. Limiting values..... 3

10. Recommended operating conditions..... 3

11. Static characteristics..... 4

12. Dynamic characteristics..... 6

12.1. Waveforms and test circuit..... 7

13. Transfer characteristics..... 8

13.1. Waveforms transfer characteristics..... 8

14. Application information..... 10

15. Package outline..... 11

16. Abbreviations..... 13

17. Revision history..... 13

18. Legal information..... 14

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