74HC2G16; 74HCT2G16

Dual buffer gate

Rev. 1 — 2 November 2015

Product data sheet

1. General description

The 74HC2G16; 74HCT2G16 is a high-speed Si-gate CMOS device.

The 74HC2G16; 74HCT2G16 provides two buffers.

2. Features and benefits

- Wide supply voltage range from 2.0 V to 6.0 V
- Complies with JEDEC standard no. 7A
- High noise immunity
- ESD protection:
 - ♦ HBM JESD22-A114-D exceeds 2000 V
 - ♦ MM JESD22-A115-A exceeds 200 V
- Low power dissipation
- Balanced propagation delays
- Unlimited input rise and fall times
- Multiple package options
- Specified from -40 °C to +85 °C and -40 °C to +125 °C

3. Ordering information

Table 1. Ordering information

Type number	Package						
	Temperature range	Name	Description	Version			
74HC2G16GW	–40 °C to +125 °C	SC-88	plastic surface-mounted package; 6 leads	SOT363			
74HC2G16GV	–40 °C to +125 °C	SC-74	plastic surface-mounted package (TSOP6); 6 leads	SOT457			
74HCT2G16GW	–40 °C to +125 °C	SC-88	plastic surface-mounted package; 6 leads	SOT363			
74HCT2G16GV	–40 °C to +125 °C	SC-74	plastic surface-mounted package (TSOP6); 6 leads	SOT457			

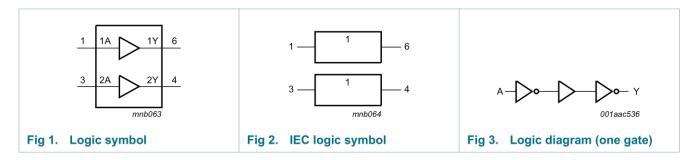
4. Marking

Table 2. Marking

Type number	Marking code
74HC2G16GW	P6
74HC2G16GV	P6
74HCT2G16GW	U6
74HCT2G16GV	U6

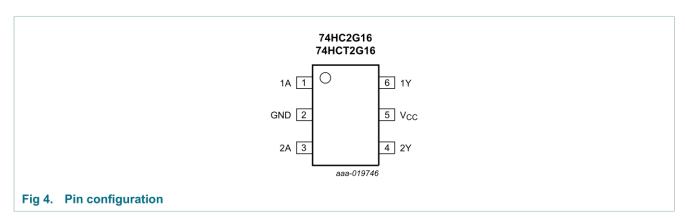


5. Functional diagram



6. Pinning information

6.1 Pinning



6.2 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

7. Functional description

Table 4. Function table[1]

Input	Output
nA	nY
L	L
Н	Н

^[1] H = HIGH voltage level;

L = LOW voltage level.

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
I _{IK}	input clamping current	$V_1 < -0.5 \text{ V or } V_1 > V_{CC} + 0.5 \text{ V}$	[1]	-	±20	mA
lok	output clamping current	$V_{O} < -0.5 \text{ V or } V_{O} > V_{CC} + 0.5 \text{ V}$	<u>[1]</u>	-	±20	mA
Io	output current	$V_{O} = -0.5 \text{ V to } V_{CC} + 0.5 \text{ V}$	[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.

9. Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Type 74HC2	2G16		'			
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
t _r	rise time	except for Schmitt trigger inputs				
		V _{CC} = 2.0 V	-	-	1000	ns
		V _{CC} = 4.5 V	-	-	500	ns
		V _{CC} = 6.0 V	-	-	400	ns
t _f	fall time	except for Schmitt trigger inputs				
		V _{CC} = 2.0 V	-	-	1000	ns
		V _{CC} = 4.5 V	-	-	500	ns
		V _{CC} = 6.0 V	-	-	400	ns

74HC_HCT2G16

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^[2] For SC-88 and SC-74 packages: above 87.5 °C the value of Ptot derates linearly with 4.0 mW/K.

Table 6. Recommended operating conditions ...continued

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Type 74HC	T2G16	'				
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
t _r	rise time	except for Schmitt trigger inputs				
		V _{CC} = 4.5 V	-	-	500	ns
t _f	fall time	except for Schmitt trigger inputs				
		V _{CC} = 4.5 V	-	-	500	ns

10. Static characteristics

Table 7. Static characteristics for 74HC2G16

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

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
T _{amb} = 25	°C	'				
V _{IH}	HIGH-level input voltage	V _{CC} = 2.0 V	1.5	1.2	-	V
		V _{CC} = 4.5 V	3.15	2.4	-	V
		V _{CC} = 6.0 V	4.2	3.2	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 2.0 V	-	0.8	0.5	V
		V _{CC} = 4.5 V	-	2.1	1.35	V
		V _{CC} = 6.0 V	-	2.8	1.8	V
V _{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		$I_{O} = -20 \mu A; V_{CC} = 2.0 V$	1.9	2.0	-	V
		$I_{O} = -20 \mu A; V_{CC} = 4.5 V$	4.4	4.5	-	V
		$I_{O} = -20 \mu A; V_{CC} = 6.0 V$	5.9	6.0	-	V
		$I_{O} = -4.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	4.18	4.32	-	V
		$I_{O} = -5.2 \text{ mA}; V_{CC} = 6.0 \text{ V}$	5.68	5.81	-	V
V _{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		I_{O} = 20 μ A; V_{CC} = 2.0 V	-	0	0.1	V
		$I_O = 20 \mu A; V_{CC} = 4.5 V$	-	0	0.1	V
		I_{O} = 20 μ A; 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
l _l	input leakage current	V_I = GND or V_{CC} ; V_{CC} = 6.0 V	-	-	±0.1	μΑ
I _{CC}	supply current	$V_I = GND \text{ or } V_{CC}; I_O = 0 \text{ A};$	-	-	1.0	μΑ
		V _{CC} = 6.0 V				
Cı	input capacitance		-	1.5	-	pF

 Table 7.
 Static characteristics for 74HC2G16 ...continued

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

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
T _{amb} = -40) °C to +85 °C		'			
V _{IH}	HIGH-level input voltage	V _{CC} = 2.0 V	1.5	-	-	V
		V _{CC} = 4.5 V	3.15	-	-	V
		V _{CC} = 6.0 V	4.2	-	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 2.0 V	-	-	0.5	V
V IL		V _{CC} = 4.5 V	-	-	1.35	V
		V _{CC} = 6.0 V	-	-	1.8	V
V _{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		$I_{O} = -20 \mu A; V_{CC} = 2.0 V$	1.9	-	-	V
		$I_{O} = -20 \mu A; V_{CC} = 4.5 V$	4.4	-	-	V
		$I_{O} = -20 \mu A; V_{CC} = 6.0 V$	5.9	-	-	V
		$I_{O} = -4.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	4.13	-	-	V
		$I_{O} = -5.2 \text{ mA}; V_{CC} = 6.0 \text{ V}$	5.63	-	-	V
V _{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		$I_{O} = 20 \mu A; V_{CC} = 2.0 V$	-	-	0.1	V
		$I_{O} = 20 \mu A; V_{CC} = 4.5 V$	-	-	0.1	V
		$I_{O} = 20 \mu A; V_{CC} = 6.0 V$	-	-	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
l _l	input leakage current	V_I = GND or V_{CC} ; V_{CC} = 6.0 V	-	-	±1.0	μΑ
I _{CC}	supply current	$V_I = GND \text{ or } V_{CC}; I_O = 0 \text{ A};$	-	-	10.0	μΑ
		$V_{CC} = 6.0 \text{ V}$				
T _{amb} = -40) °C to +125 °C					
V _{IH}	HIGH-level input voltage	V _{CC} = 2.0 V	1.5	-	-	V
		V _{CC} = 4.5 V	3.15	-	-	V
		V _{CC} = 6.0 V	4.2	-	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 2.0 V	-	-	0.5	V
		V _{CC} = 4.5 V	-	-	1.35	V
		V _{CC} = 6.0 V	-	-	1.8	V
V _{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		$I_{O} = -20 \mu A; V_{CC} = 2.0 V$	1.9	-	-	V
		$I_{O} = -20 \mu A; V_{CC} = 4.5 V$	4.4	-	-	V
		$I_{O} = -20 \mu A; V_{CC} = 6.0 V$	5.9	-	-	V
		I_{O} = -4.0 mA; V_{CC} = 4.5 V	3.7	-	-	V
		$I_{O} = -5.2 \text{ mA}; V_{CC} = 6.0 \text{ V}$	5.2	-	-	V

 Table 7.
 Static characteristics for 74HC2G16 ...continued

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

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		I_{O} = 20 μ A; V_{CC} = 2.0 V	-	-	0.1	V
		I_{O} = 20 μ A; V_{CC} = 4.5 V	-	-	0.1	V
		I_{O} = 20 μ A; 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	$V_I = GND \text{ or } V_{CC}; V_{CC} = 6.0 \text{ V}$	-	-	±1.0	μΑ
I _{CC}	supply current	$V_I = GND \text{ or } V_{CC}; I_O = 0 \text{ A};$	-	-	20.0	μΑ
		$V_{CC} = 6.0 \text{ V}$				

Table 8. Static characteristics for 74HCT2G16

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

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
T _{amb} = 25	°C					
V_{IH}	HIGH-level input voltage	V _{CC} = 4.5 V to 5.5 V	2.0	1.6	-	V
V_{IL}	LOW-level input voltage	V _{CC} = 4.5 V to 5.5 V	-	1.2	8.0	V
V _{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		$I_{O} = -20 \mu A; V_{CC} = 4.5 V$	4.4	4.5	-	V
V _{OL}		$I_{O} = -4.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	4.18	4.32	-	V
V _{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}				
	input leakage current supply current	I_{O} = 20 μ A; V_{CC} = 4.5 V	-	0	0.1	V
•		I_{O} = 4.0 mA; V_{CC} = 4.5 V	-	0.15	0.26	V
I _I	input leakage current	$V_I = GND \text{ or } V_{CC}; V_{CC} = 5.5 \text{ V}$	-	-	±0.1	μΑ
I _{CC}	supply current	V_I = GND or V_{CC} ; I_O = 0 A; V_{CC} = 5.5 V	-	-	1.0	μА
Δl _{CC}	additional supply current	$V_1 = V_{CC} - 2.1 \text{ V};$ $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}; I_O = 0 \text{ A}$	-	-	300	μА
C _I	input capacitance		-	1.5	-	pF
T _{amb} = -40	°C to +85 °C	<u>'</u>				
V _{IH}	HIGH-level input voltage	V _{CC} = 4.5 V to 5.5 V	2.0	-	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 4.5 V to 5.5 V	-	-	8.0	V
V _{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		$I_{O} = -20 \mu A; V_{CC} = 4.5 V$	4.4	-	-	V
		$I_{O} = -4.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	4.13	-	-	V
V _{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		I_{O} = 20 μ A; V_{CC} = 4.5 V	-	-	0.1	V
		I_{O} = 4.0 mA; V_{CC} = 4.5 V	-	-	0.33	V
l _l	input leakage current	$V_I = GND \text{ or } V_{CC}; V_{CC} = 5.5 \text{ V}$	-	-	±1.0	μΑ
I _{CC}	supply current	V_I = GND or V_{CC} ; I_O = 0 A; V_{CC} = 5.5 V	-	-	10.0	μА
ΔI_{CC}	additional supply current	$V_1 = V_{CC} - 2.1 \text{ V};$ $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}; I_O = 0 \text{ A}$	-	-	375	μА

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 Table 8.
 Static characteristics for 74HCT2G16 ...continued

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

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
T _{amb} = -40	°C to +125 °C	'				
V _{IH}	HIGH-level input voltage	V _{CC} = 4.5 V to 5.5 V	2.0	-	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 4.5 V to 5.5 V	-	-	0.8	V
V _{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		$I_{O} = -20 \mu A; V_{CC} = 4.5 V$	4.4	-	-	V
		$I_{O} = -4.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	3.7	-	-	V
V _{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		I_{O} = 20 μ A; V_{CC} = 4.5 V	-	-	0.1	V
		I_{O} = 4.0 mA; V_{CC} = 4.5 V	-	-	0.4	V
I _I	input leakage current	V_I = GND or V_{CC} ; V_{CC} = 5.5 V	-	-	±1.0	μΑ
I _{CC}	supply current	V_I = GND or V_{CC} ; I_O = 0 A; V_{CC} = 5.5 V	-	-	20.0	μА
ΔI_{CC}	additional supply current	$V_I = V_{CC} - 2.1 \text{ V};$ $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}; I_O = 0 \text{ A}$	-	-	410	μА

11. Dynamic characteristics

Table 9. Dynamic characteristics

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

Symbol	Parameter	Conditions		25 °C		–40 °C to +125 °C			Unit	
				Min	Тур	Max	Min	Max (85 °C)	Max (125 °C)	
74HC2G1	6									
t _{pd}	propagation delay	nA to nY; see Figure 5	<u>[1]</u>							
		$V_{CC} = 2.0 \text{ V}; C_L = 50 \text{ pF}$		-	29	75	-	95	125	ns
		$V_{CC} = 4.5 \text{ V}; C_L = 50 \text{ pF}$		-	9	15	-	19	25	ns
		$V_{CC} = 6.0 \text{ V}; C_L = 50 \text{ pF}$		-	8	13	-	16	20	ns
t _t	transition time	nY; see Figure 5	[2]							
		$V_{CC} = 2.0 \text{ V}; C_L = 50 \text{ pF}$		-	18	75	-	95	125	ns
		V_{CC} = 4.5 V; C_L = 50 pF		-	6	15	-	19	25	ns
		$V_{CC} = 6.0 \text{ V}; C_L = 50 \text{ pF}$		-	5	13	-	16	20	ns
C _{PD}	power dissipation capacitance	V _I = GND to V _{CC}	[3]	-	10	-	-	-	-	pF

Table 9. Dynamic characteristics ...continued

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

Symbol	Parameter	Conditions	25 °C			-40 °C to +125 °C			Unit	
				Min	Тур	Max	Min	Max (85 °C)	Max (125 °C)	
74HCT2G	16									
t _{pd}	propagation delay	nA to nY; see Figure 5	[1]							
		V_{CC} = 4.5 V; C_L = 50 pF		-	10	18	-	23	29	ns
t _t tran	transition time	nY; see Figure 5	[2]							
		V_{CC} = 4.5 V; C_L = 50 pF		-	6	15	-	19	25	ns
C_{PD}	power dissipation capacitance	V_I = GND to V_{CC} – 1.5 V	[3]	-	9	-	-	-	-	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).

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

f_i = input frequency in MHz;

 f_0 = output frequency in MHz;

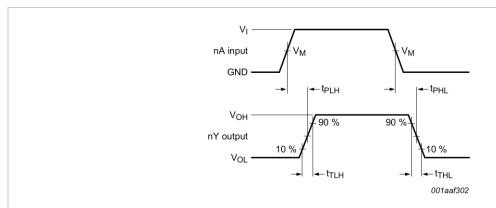
C_L = output load capacitance in pF;

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. Waveforms



Measurement points are given in $\underline{\text{Table 10}}$.

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

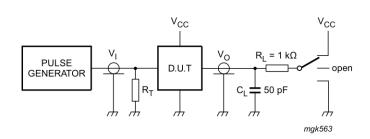
Fig 5. The data input (nA) to output (nY) propagation delays and output transition times

Table 10. Measurement points

Туре	ype Input			Output
	V_{M}	VI	$t_r = t_f$	V_{M}
74HC2G16	0.5V _{CC}	GND to V _{CC}	6.0 ns	0.5V _{CC}
74HCT2G16	1.3 V	GND to 3.0 V	6.0 ns	1.3 V

74HC_HCT2G16

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Test data is given in Table 11.

Definitions test circuit:

R_L = Load resistance.

 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

Table 11. Test data

Туре	Input	Test	
	VI	t _r , t _f	t _{PHL} , t _{PLH}
74HC2G16	GND to V _{CC}	6 ns	open
74HCT2G16	GND to 3.0 V	6 ns	open

13. Package outline

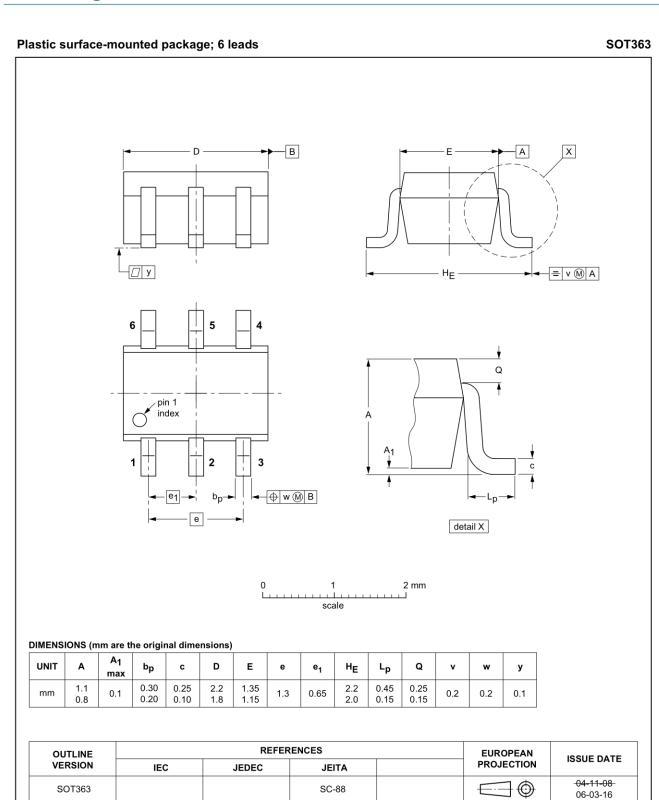


Fig 7. Package outline SOT363 (SC-88)

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Plastic surface-mounted package (TSOP6); 6 leads

SOT457

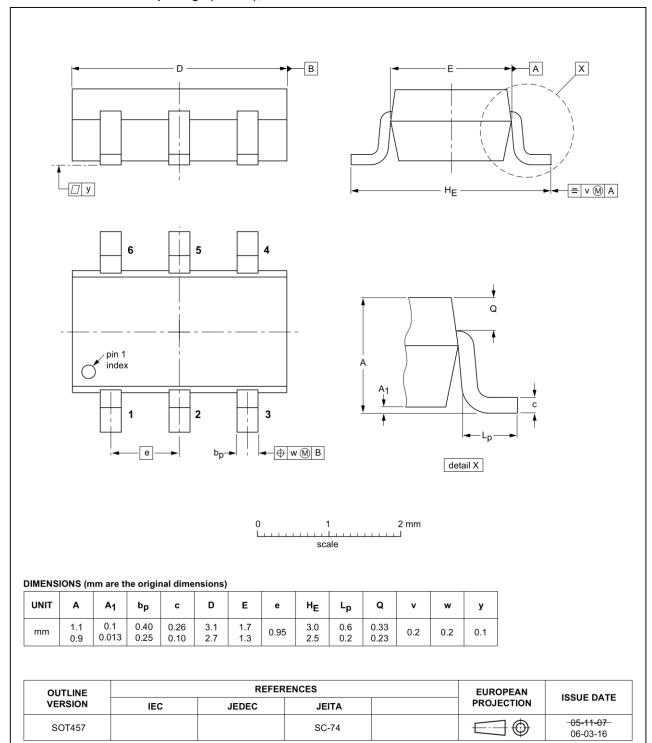


Fig 8. Package outline SOT457 (SC-74)

14. Abbreviations

Table 12. Abbreviations

Acronym	Description
CMOS	Complementary Metal Oxide Semiconductor
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model
DUT	Device Under Test

15. Revision history

Table 13. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT2G16 v.1	20151102	Product data sheet	-	-

16. Legal information

16.1 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.

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions"
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17. Contact information

For more information, please visit: http://www.nexperia.com

For sales office addresses, please send an email to: salesaddresses@nexperia.com

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