

# 74AHCT1G04GW,165 Datasheet

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DiGi Electronics Part Number Manufacturer Manufacturer Product Number Description Detailed Description

74AHCT1G04GW,165-DG Nexperia USA Inc. 74AHCT1G04GW,165 IC INVERTER 1CH 1-INP 5TSSOP Inverter IC 1 Channel 5-TSSOP

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# Purchase and inquiry

Manufacturer Product Number:	Manufacturer:
74AHCT1G04GW,165	Nexperia USA Inc.
Series:	Product Status:
74AHCT	Obsolete
Logic Type:	Number of Circuits:
Inverter	1
Number of Inputs:	Features:
1	
Voltage - Supply:	Current - Quiescent (Max):
4.5V ~ 5.5V	1 μΑ
Current - Output High, Low:	Input Logic Level - Low:
8mA, 8mA	0.8V
Input Logic Level - High:	Max Propagation Delay @ V, Max CL:
2V	7.7ns @ 5V, 50pF
Operating Temperature:	Mounting Type:
-40°C ~ 125°C	Surface Mount
Supplier Device Package:	Package / Case:
5-TSSOP	5-TSSOP, SC-70-5, SOT-353
Base Product Number:	
74AHCT1G04	

# **Environmental & Export classification**

RoHS Status:	Moisture Sensitivity Level (MSL):
ROHS3 Compliant	1 (Unlimited)
REACH Status:	ECCN:
REACH Unaffected	EAR99
HTSUS:	
8542.39.0001	



### 1. General description

The 74AHC1G04: 74AHCT1G04 is a single inverter. Inputs are overvoltage tolerant. This feature allows the use of these devices as translators in mixed voltage environments.

The AHC device has CMOS input switching levels and supply voltage range 2 V to 5.5 V.

The AHCT device has TTL input switching levels and supply voltage range 4.5 V to 5.5 V.

### 2. Features and benefits

- Wide supply voltage range from 2.0 V 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 74AHC1G04: CMOS level
  - For 74AHCT1G04: TTL level
- Multiple package options
- 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 +125 °C

### 3. Ordering information

Type number	Package									
	Temperature range	Name	Description	Version						
74AHC1G04GW 74AHCT1G04GW	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	<u>SOT353-1</u>						
74AHC1G04GV 74AHCT1G04GV	-40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	<u>SOT753</u>						
74AHC1G04GM 74AHCT1G04GM	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	<u>SOT886</u>						
74AHC1G04GZ 74AHCT1G04GZ	-40 °C to +125 °C	XSON5	plastic thermal enhanced extremely thin small outline package with side-wettable flanks (SWF); no leads; 5 terminals; body 1.1 × 0.85 × 0.5 mm	<u>SOT8065-1</u>						

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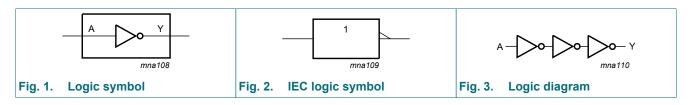
Inverter

### 4. Marking

Type number	Marking [1]
74AHC1G04GW	AC
74AHCT1G04GW	CC
74AHC1G04GV	A04
74AHCT1G04GV	C04
74AHC1G04GM	AC
74AHCT1G04GM	CC
74AHC1G04GZ	AC
74AHCT1G04GZ	СВ

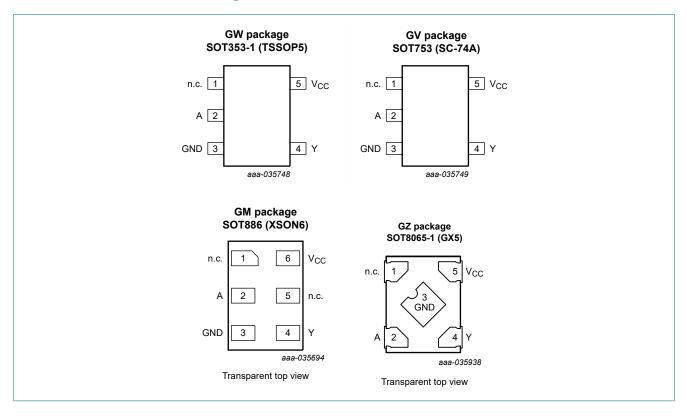
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

### 5. Functional diagram



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### 6. Pinning information



#### 6.1. Pinning

### 6.2. Pin description

Symbol	Pin		Description
	SOT353-1, SOT753 and SOT886 SOT8065-1		
n.c.	1	1	not connected
A	2	2	data input
GND	3	3	ground (0 V)
Y	4	4	data output
n.c.	-	5	not connected
V <sub>CC</sub>	5	6	supply voltage

### 7. Functional description

#### Table 4. Function table

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

Input	Output
A	Y
L	Н
Н	L

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### 8. Limiting values

#### Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Мах	Unit
V <sub>CC</sub>	supply voltage		-0.5	+7.0	V
VI	input voltage		-0.5	+7.0	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < -0.5 V	-20	-	mA
I <sub>OK</sub>	output clamping current	$V_{\rm O} < -0.5 \text{ V or } V_{\rm O} > V_{\rm CC} + 0.5 \text{ V}$ [1]	-	±20	mA
I <sub>O</sub>	output current	$-0.5 V < V_O < V_{CC} + 0.5 V$	-	±25	mA
I <sub>CC</sub>	supply current		-	75	mA
I <sub>GND</sub>	ground current		-75	-	mA
T <sub>stg</sub>	storage temperature		-65	+150	°C
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = -40 °C to +125 °C [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 SOT353-1 (TSSOP5) package: P<sub>tot</sub> 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. For SOT886 (XSON6) package:  $P_{tot}$  derates linearly with 3.3 mW/K above 74 °C.

For SOT8065-1 (XSON5) package: Ptot derates linearly with 3.2 mW/K above 72 °C.

### 9. Recommended operating conditions

#### Table 6. Recommended operating conditions

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

Symbol	Parameter	Conditions	74AHC1G04			74	Unit		
			Min	Тур	Max	Min	Тур	Мах	
V <sub>CC</sub>	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 <sub>CC</sub>	0	-	V <sub>CC</sub>	V
T <sub>amb</sub>	ambient temperature		-40	+25	+125	-40	+25	+125	°C
Δt/ΔV	input transition rise and	$V_{CC} = 3.3 V \pm 0.3 V$	-	-	100	-	-	-	ns/V
	fall rate	$V_{CC} = 5.0 V \pm 0.5 V$	-	-	20	-	-	20	ns/V

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## **10. Static characteristics**

#### Table 7. Static characteristics

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

Symbol	Parameter	Conditions	25 °C				°C to 5 °C	-40 °C to +125 °C		Unit
			Min	Тур	Max	Min	Max	Min	Мах	
74AHC1	G04									
V <sub>IH</sub>	HIGH-level	V <sub>CC</sub> = 2.0 V	1.5	-	-	1.5	-	1.5	-	V
	input voltage	V <sub>CC</sub> = 3.0 V	2.1	-	-	2.1	-	2.1	-	V
		V <sub>CC</sub> = 5.5 V	3.85	-	-	3.85	-	3.85	-	V
V <sub>IL</sub>	LOW-level	V <sub>CC</sub> = 2.0 V	-	-	0.5	-	0.5	-	0.5	V
	input voltage	V <sub>CC</sub> = 3.0 V	-	-	0.9	-	0.9	-	0.9	V
		V <sub>CC</sub> = 5.5 V	-	-	1.65	-	1.65	-	1.65	V
V <sub>OH</sub>	HIGH-level	$V_{I} = V_{IH} \text{ or } V_{IL}$								
	output voltage	I <sub>O</sub> = -50 μA; V <sub>CC</sub> = 2.0 V	1.9	2.0	-	1.9	-	1.9	-	V
		I <sub>O</sub> = -50 μA; V <sub>CC</sub> = 3.0 V	2.9	3.0	-	2.9	-	2.9	-	V
		I <sub>O</sub> = -50 μA; V <sub>CC</sub> = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
		I <sub>O</sub> = -4.0 mA; V <sub>CC</sub> = 3.0 V	2.58	-	-	2.48	-	2.40	-	V
		I <sub>O</sub> = -8.0 mA; V <sub>CC</sub> = 4.5 V	3.94	-	-	3.8	-	3.70	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>								
		I <sub>O</sub> = 50 μA; V <sub>CC</sub> = 2.0 V	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 50 μA; V <sub>CC</sub> = 3.0 V	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 50 μA; V <sub>CC</sub> = 4.5 V	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 3.0 V	-	-	0.36	-	0.44	-	0.55	V
		I <sub>O</sub> = 8.0 mA; V <sub>CC</sub> = 4.5 V	-	-	0.36	-	0.44	-	0.55	V
I	input leakage current	V <sub>1</sub> = 5.5 V or GND; V <sub>CC</sub> = 0 V to 5.5 V	-	-	0.1	-	1.0	-	2.0	μA
I <sub>CC</sub>	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5$ V	-	-	1.0	-	10	-	40	μA
CI	input capacitance		-	1.5	10	-	10	-	10	pF
74АНСТ	1G04									
V <sub>IH</sub>	HIGH-level input voltage	$V_{CC}$ = 4.5 V to 5.5 V	2.0	-	-	2.0	-	2.0	-	V
V <sub>IL</sub>	LOW-level input voltage	$V_{CC}$ = 4.5 V to 5.5 V	-	-	0.8	-	0.8	-	0.8	V
V <sub>OH</sub>	HIGH-level	$V_{I} = V_{IH} \text{ or } V_{IL}; V_{CC} = 4.5 \text{ V}$								
	output voltage	I <sub>O</sub> = -50 μA	4.4	4.5	-	4.4	-	4.4	-	V
		I <sub>O</sub> = -8.0 mA	3.94	-	-	3.8	-	3.70	-	V
V <sub>OL</sub>	LOW-level	$V_{I} = V_{IH} \text{ or } V_{IL}; V_{CC} = 4.5 \text{ V}$								
	output voltage	I <sub>O</sub> = 50 μA	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 8.0 mA	-	-	0.36	-	0.44	-	0.55	V

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Symbol Parameter		Conditions	25 °C			-40 ° +85	℃ to 5 °C	-40 °C to +125 °C		Unit
			Min	Тур	Max	Min	Max	Min	Max	
l <sub>l</sub>	input leakage current	V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 0 V to 5.5 V	-	-	0.1	-	1.0	-	2.0	μA
I <sub>CC</sub>	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5$ V	-	-	1.0	-	10	-	40	μA
ΔI <sub>CC</sub>	additional supply current	per input pin; V <sub>I</sub> = 3.4 V; other inputs at V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 5.5 V	-	-	1.35	-	1.5	-	1.5	mA
CI	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. 5.

Symbol	Parameter	Conditions		25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
				Min	Тур	Max	Min	Max	Min	Max	-
74AHC1	G04										
t <sub>pd</sub>	propagation	A to Y; see Fig. 4	[1]								
	delay	$V_{CC}$ = 3.0 V to 3.6 V; C <sub>L</sub> = 15 pF	[2]	-	4.3	7.1	1.0	8.5	1.0	11.0	ns
		$V_{CC}$ = 3.0 V to 3.6 V; C <sub>L</sub> = 50 pF	[2]	-	6.1	10.6	1.0	12	1.0	14.5	ns
		$V_{CC}$ = 4.5 V to 5.5 V; C <sub>L</sub> = 15 pF	[3]	-	3.1	5.5	1.0	6.5	1.0	7.0	ns
		$V_{CC}$ = 4.5 V to 5.5 V; C <sub>L</sub> = 50 pF	[3]	-	4.5	7.5	1.0	8.5	1.0	9.5	ns
C <sub>PD</sub>	power dissipation capacitance	per buffer; $C_L$ = 50 pF; f = 1 MHz; V <sub>I</sub> = GND to V <sub>CC</sub>	[4]	-	15	-	-	-	-	-	pF
74AHCT	1G04										
t <sub>pd</sub>	propagation	A to Y; see Fig. 4	[1]								
	delay	$V_{CC}$ = 4.5 V to 5.5 V; C <sub>L</sub> = 15 pF	[3]	-	3.4	6.7	1.0	7.5	1.0	8.5	ns
		$V_{CC}$ = 4.5 V to 5.5 V; C <sub>L</sub> = 50 pF	[3]	-	4.9	7.7	1.0	8.5	1.0	10.0	ns
C <sub>PD</sub>	power dissipation capacitance	per buffer; $C_L$ = 50 pF; f = 1 MHz; V <sub>I</sub> = GND to V <sub>CC</sub>	[4]	-	16	-	-	-	-	-	pF

[1]

[2]

[3]

 $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ . Typical values are measured at  $V_{CC} = 3.3 \text{ V}$ . Typical values are measured at  $V_{CC} = 5.0 \text{ V}$ .  $C_{PD}$  is used to determine the dynamic power dissipation  $P_D$  ( $\mu$ W).  $P_D = C_{PD} \times V_{CC}^2 \times f_i + \Sigma (C_L \times V_{CC}^2 \times f_0)$  where:  $f_i = \text{input frequency in MHz}; f_0 = \text{output frequency in MHz};$ [4]

 $C_L$  = output load capacitance in pF;  $V_{CC}$  = supply voltage in V;

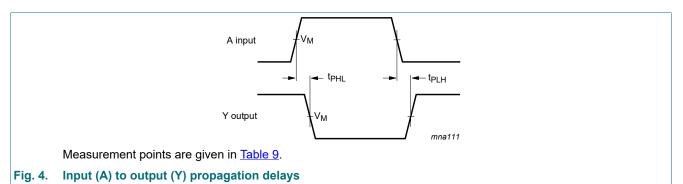
N = total load switching outputs;

 $\Sigma(C_L \times V_{CC}^2 \times f_0) = \text{sum of outputs.}$ 

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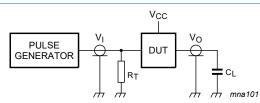
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### 11.1. Waveforms and test circuit



#### Table 9. Measurement point

Туре	Input	Input	Output
	VI	V <sub>M</sub>	V <sub>M</sub>
74AHC1G04	GND to V <sub>CC</sub>	0.5V <sub>CC</sub>	0.5V <sub>CC</sub>
74AHCT1G04	GND to 3.0 V	1.5 V	0.5V <sub>CC</sub>



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

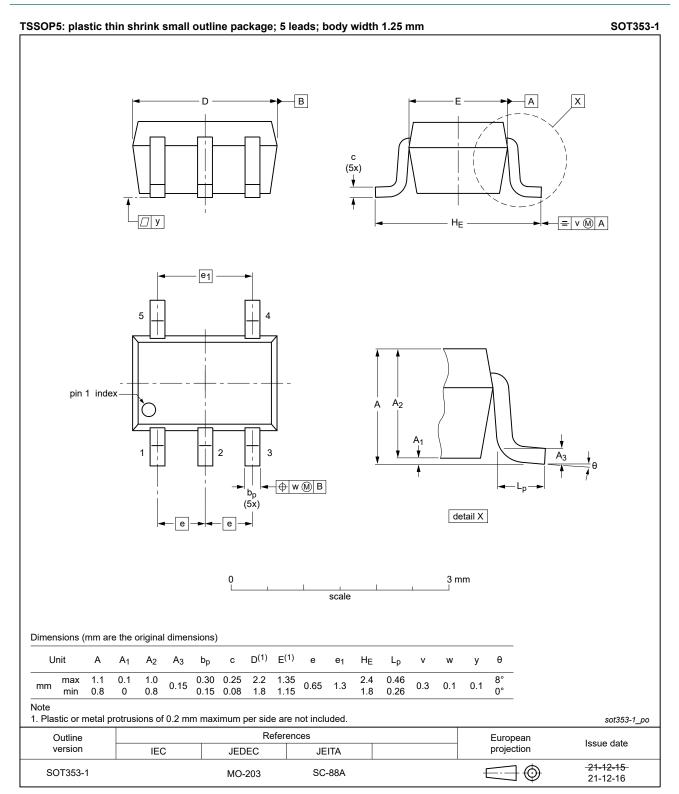
 $C_L$  = Load capacitance including jig and probe capacitance;

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

Fig. 5. Test circuit for measuring switching times

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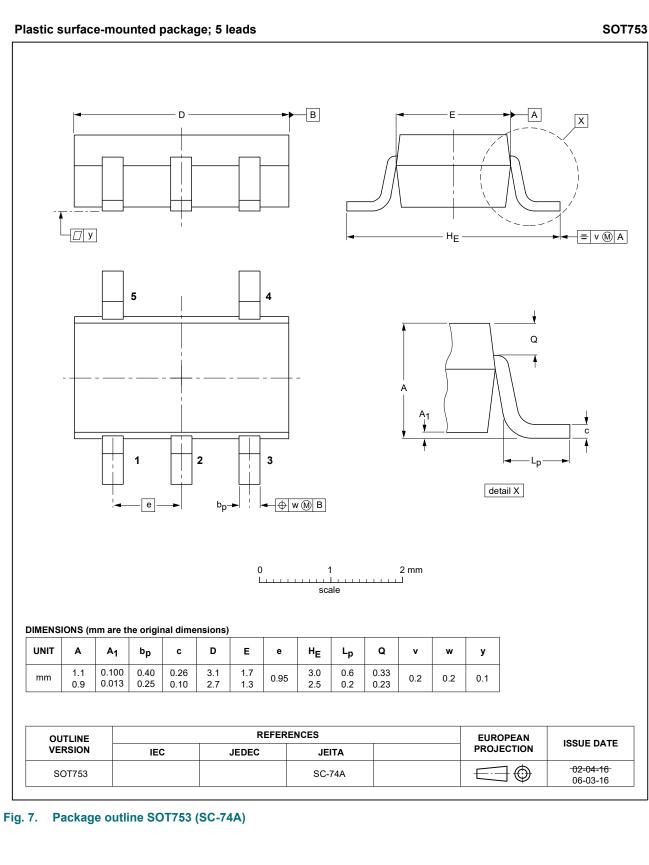
### 12. Package outline



#### Fig. 6. Package outline SOT353-1 (TSSOP5)

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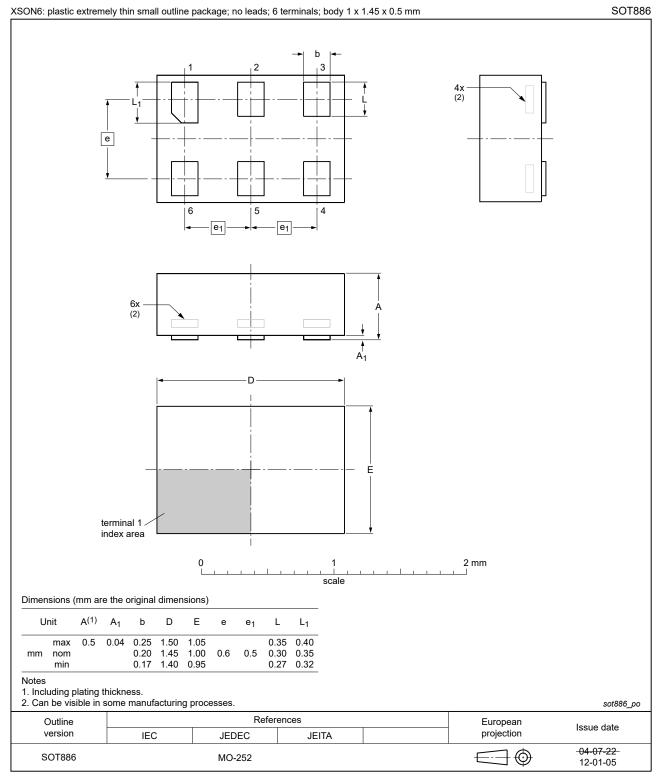
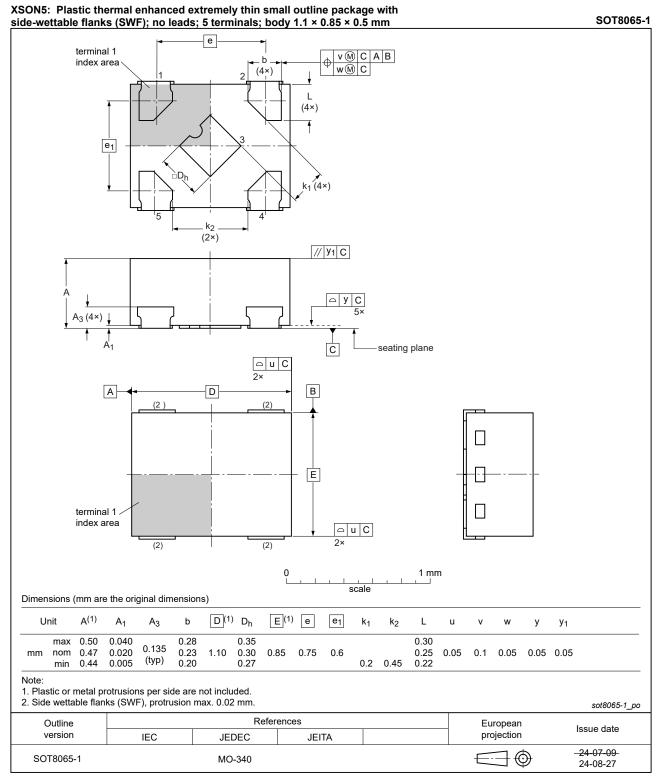


Fig. 8. Package outline SOT886 (XSON6)

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## 13. Abbreviations

Table 10. Abbreviati	ons
Acronym	Description
ANSI	American National Standards Institute
CDM	Charged Device Model
CMOS	Complementary Metal-Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
ESDA	ElectroStatic Discharge Association
HBM	Human Body Model
JEDEC	Joint Electron Device Engineering Council
TTL	Transistor-Transistor Logic

# 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AHC_AHCT1G04 v.14	20241112	Product data sheet	-	74AHC_AHCT1G04 v.13
Modifications:	Type numb	er 74AHC1G04GZ (SOT8	3065-1/XSON5) add	ded.
74AHC_AHCT1G04 v.13	20240919	Product data sheet	-	74AHC_AHCT1G04 v.12
Modifications:	Type number 74AHCT1G04GZ (SOT8065-1/XSON5) added.			
74AHC_AHCT1G04 v.12	20230908	Product data sheet	-	74AHC_AHCT1G04 v.11
Modifications:	• <u>Section 2</u> : ESD specification updated according to the latest JEDEC standard.			
74AHC_AHCT1G04 v.11	20220111	Product data sheet	-	74AHC_AHCT1G04 v.10
Modifications:	<ul> <li><u>Section 1</u> and <u>Section 2</u> updated.</li> <li><u>Fig. 6</u>: Package outline drawing SOT353-1 (TSSOP5) has changed.</li> </ul>			
74AHC_AHCT1G04 v.10	20190924	Product data sheet	-	74AHC_AHCT1G04 v.9
	-	ւ. have been adapted to the rating values for P <sub>tot</sub> total	• •	
74AHC_AHCT1G04 v.9	20150310	Product data sheet	-	74AHC_AHCT1G04 v.8
Modifications:	Added type numbers 74AHC1G04GM and 74AHCT1G04GM.			
74AHC_AHCT1G04 v.8	20141106	Product data sheet	-	74AHC_AHCT1G04 v.7
Modifications:	<u>Section 4</u> : table note added.			
74AHC_AHCT1G04 v.7	20070531	Product data sheet	-	74AHC_AHCT1G04 v.6
Modifications:	guidelines o Legal texts Package So	of this data sheet has been of NXP Semiconductors. have been adapted to the OT353 changed to SOT3 data and Soldering section	e new company nar 53-1 in <u>Table 1</u> and	ne where applicable.
		Product specification	-	74AHC AHCT1G04 v.5
74AHC_AHCT1G04 v.6	20030904	Froduct specification		
74AHC_AHCT1G04 v.6 74AHC_AHCT1G04 v.5	20030904 20020527	Product specification	-	74AHC_AHCT1G04 v.4

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Document ID	Release date	Data sheet status	Change notice	Supersedes
74AHC_AHCT1G04 v.3	20010131	Product specification	-	74AHC_AHCT1G04 v.2

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# 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.

 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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Inverter

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