74AHC1G125; 74AHCT1G125

Bus buffer/line driver; 3-state Rev. 12 — 26 May 2021

Product data sheet

1. General description

The 74AHC1G125/74AHCT1G125 is a single buffer/line driver with 3-state output. Inputs are overvoltage tolerant. This feature allows the use of these devices as translators in mixed voltage environments.

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
- Symmetrical output impedance
- CMOS low power dissipation
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level A
- · Balanced propagation delays
- Multiple package options
- Input levels:
 - For 74AHC1G125: CMOS level
 - For 74AHCT1G125: TTL level
- ESD protection:
 - HBM JESD22-A114F: exceeds 2000 V
 - MM JESD22-A115-A: exceeds 200 V
 - CDM JESD22-C101E: exceeds 1000 V
- 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					
74AHC1G125GW	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads;	SOT353-1					
74AHCT1G125GW			body width 1.25 mm						
74AHC1G125GV	-40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753					
74AHCT1G125GV									
74AHC1G125GM	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package;	SOT886					
74AHCT1G125GM			no leads; 6 terminals; body 1 × 1.45 × 0.5 mm						



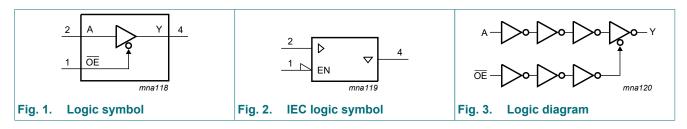
4. Marking

Table 2. Marking codes

Type number	Marking [1]
74AHC1G125GW	AM
74AHCT1G125GW	CM
74AHC1G125GV	A25
74AHCT1G125GV	C25
74AHC1G125GM	AM
74AHCT1G125GM	CM

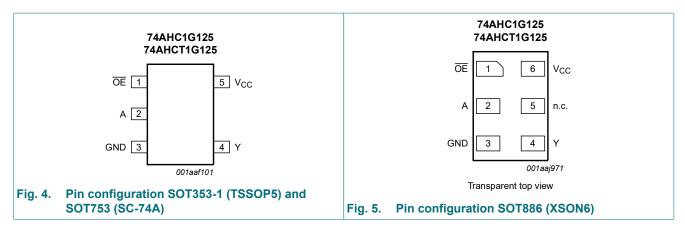
^[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram



6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

Symbol	Pin		Description
	SOT353-1 and SOT753	SOT886	
ŌĒ	1	1	output enable input
A	2	2	data input
GND	3	3	ground (0 V)
Υ	4	4	data output
n.c.	-	5	not connected
V _{CC}	5	6	supply voltage

7. Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance OFF-state

Inputs OE	Output	
ŌĒ	A	Υ
L	L	L
L	Н	Н
Н	X	Z

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	$V_1 < -0.5 \text{ V}$ [1]	-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	$-0.5 \text{ V} < \text{V}_{\text{O}} < \text{V}_{\text{CC}} + 0.5 \text{ V}$	-	±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.

For SOT886 (XSON6) package: P_{tot} derates linearly with 3.3 mW/K above 74 °C.

^[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.

9. Recommended operating conditions

Table 6. Recommended operating conditions

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

Symbol	Parameter	Conditions	74	AHC1G1	25	74.	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		-40 °C	to +85 °C	-40 °C t	o +125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	1
74AHC1	G125		'							_
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
V _{OH}	HIGH-level	V _I = V _{IH} or V _{IL}								
	output voltage	I _O = -50 μA; 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 mA; V _{CC} = 3.0 V	-	-	0.36	-	0.44	-	0.55	V
		I _O = 8.0 mA; V _{CC} = 4.5 V	-	-	0.36	-	0.44	-	0.55	V
l _{OZ}	OFF-state output current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	-	0.25	-	2.5	-	10	μΑ
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	μA
C _I	input capacitance		-	1.5	10	-	10	-	10	pF

Symbol	Parameter	Conditions		25 °C		-40 °C	to +85 °C	-40 °C t	o +125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	
74AHCT	1G125			'						'
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	-	0.8	V
V _{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 V$								
		Ι _Ο = -50 μΑ	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 output voltage	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 V$								
		Ι _Ο = 50 μΑ	-	0	0.1	-	0.1	-	0.1	V
		I _O = 8.0 mA	-	-	0.36	-	0.44	-	0.55	V
l _{OZ}	OFF-state output current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	-	0.25	-	2.5	-	10	μΑ
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	μΑ
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
ΔI _{CC}	additional supply current	per input pin; V_I = 3.4 V; other inputs at V_{CC} or GND; I_O = 0 A; V_{CC} = 5.5 V	-	-	1.35	-	1.5	-	1.5	mA
Cı	input capacitance		-	1.5	10	-	10	-	10	pF

11. Dynamic characteristics

Table 8. Dynamic characteristics

GND = 0 V; For test circuit see Fig. 8.

Symbol	Parameter	Conditions		25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
				Min	Тур	Max	Min	Max	Min	Max	
74AHC1	G125									•	•
t _{pd}	propagation	A to Y; see Fig. 6	[1]								
	delay	V _{CC} = 3.0 V to 3.6 V; C _L = 15 pF	[2]	-	4.7	8.0	1.0	9.5	1.0	11.5	ns
		V _{CC} = 3.0 V to 3.6 V; C _L = 50 pF	[2]	-	6.6	11.5	1.0	13.0	1.0	14.5	ns
		V _{CC} = 4.5 V to 5.5 V; C _L = 15 pF	[3]	-	3.4	5.5	1.0	6.5	1.0	7.0	ns
		V_{CC} = 4.5 V to 5.5 V; C_L = 50 pF	[3]	-	4.8	7.5	1.0	8.5	1.0	9.5	ns
t _{en}	enable time	OE to Y; see Fig. 7	[1]								
		V _{CC} = 3.0 V to 3.6 V; C _L = 15 pF	[2]	-	5.0	8.0	1.0	9.5	1.0	11.5	ns
		V _{CC} = 3.0 V to 3.6 V; C _L = 50 pF	[2]	-	6.9	11.5	1.0	13.0	1.0	14.5	ns
		V _{CC} = 4.5 V to 5.5 V; C _L = 15 pF	[3]	-	3.6	5.1	1.0	6.0	1.0	6.5	ns
		V _{CC} = 4.5 V to 5.5 V; C _L = 50 pF	[3]	-	4.9	7.5	1.0	8.5	1.0	9.5	ns

Symbol	Parameter	Conditions		25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
				Min	Тур	Max	Min	Max	Min	Max	
t _{dis}	disable time	OE to Y; see Fig. 7	[1]								
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V; } C_L = 15 \text{ pF}$ [2]		-	6.0	9.7	1.0	11.5	1.0	12.5	ns
		V _{CC} = 3.0 V to 3.6 V; C _L = 50 pF	[2]	-	8.3	13.2	1.0	15.0	1.0	16.5	ns
		V _{CC} = 4.5 V to 5.5 V; C _L = 15 pF	[3]	-	4.1	6.8	1.0	8.0	1.0	8.5	ns
		V _{CC} = 4.5 V to 5.5 V; C _L = 50 pF	[3]	-	5.7	8.8	1.0	10.0	1.0	11.0	ns
C _{PD}	power dissipation capacitance	per buffer; C_L = 50 pF; f = 1 MHz; V_I = GND to V_{CC}	[4]	-	9	-	-	-	-	-	pF
74AHCT	1G125	_						'		'	
t _{pd}	propagation	A to Y; see Fig. 6	[1]								
	delay	V _{CC} = 4.5 V to 5.5 V; C _L = 15 pF [3		-	3.4	5.5	1.0	6.5	1.0	7.0	ns
		V _{CC} = 4.5 V to 5.5 V; C _L = 50 pF	[3]	-	4.8	7.5	1.0	8.5	1.0	9.5	ns
t _{en}	enable time	OE to Y; see Fig. 7	[1]								
		V _{CC} = 4.5 V to 5.5 V; C _L = 15 pF	[3]	-	3.9	5.1	1.0	6.0	1.0	6.5	ns
		V _{CC} = 4.5 V to 5.5 V; C _L = 50 pF	[3]	-	5.1	7.5	1.0	8.5	1.0	9.5	ns
t _{dis}	disable time	OE to Y; see Fig. 7	[1]								
		V _{CC} = 4.5 V to 5.5 V; C _L = 15 pF	[3]	-	4.5	6.8	1.0	8.0	1.0	8.5	ns
		V_{CC} = 4.5 V to 5.5 V; C_L = 50 pF	[3]	-	6.1	8.8	1.0	10.0	1.0	11.0	ns
C _{PD}	power dissipation capacitance	per buffer; C_L = 50 pF; f = 1 MHz; V_I = GND to V_{CC}	[4]	-	11	-	-	-	-	-	pF

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

 t_{en} is the same as t_{PZL} and $t_{\text{PZH}}.$

- $t_{\rm dis}$ is the same as $t_{\rm PLZ}$ and $t_{\rm PHZ}$. Typical values are measured at V_{CC} = 3.3 V.
- [3] Typical values are measured at $V_{CC} = 5.0 \text{ V}$.

 [4] C_{PD} is used to determine the dynamic power dissipation P_D (μ W). $P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o) \text{ where:}$

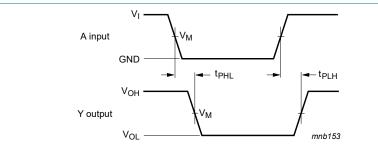
f_i = input frequency in MHz;

f_o = output frequency in MHz;

C_L = output load capacitance in pF;

V_{CC} = supply voltage in Volts.

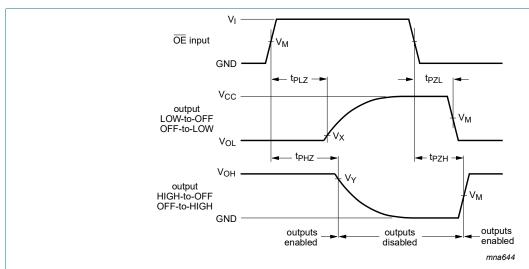
11.1. Waveforms and test circuit



Measurement points are given in Table 9.

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

Fig. 6. Input (A) to output (Y) propagation delays



Measurement points are given in <u>Table 9</u>.

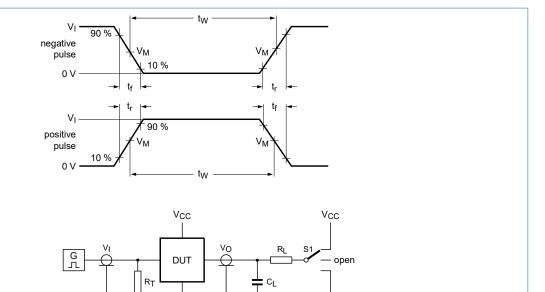
 $\ensuremath{V_{OL}}$ and $\ensuremath{V_{OH}}$ are typical output voltage levels that occur with the output load.

Fig. 7. Enable and disable times

Table 9. Measurement point

Туре	Inputs		Output	Output					
	V _I	V _M	V _M	V _X	V _Y				
74AHC1G125	GND to V _{CC}	0.5V _{CC}	0.5V _{CC}	V _{OL} + 0.3 V	V _{OH} - 0.3 V				
74AHCT1G125	GND to 3.0 V	1.5 V	0.5V _{CC}	V _{OL} + 0.3 V	V _{OH} - 0.3 V				

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Test data is given in Table 10.

Definitions test circuit:

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

C_L = Load capacitance including jig and probe capacitance.

R_L = Load resistance.

S1 = Test selection switch.

Fig. 8. Test circuit for measuring switching times

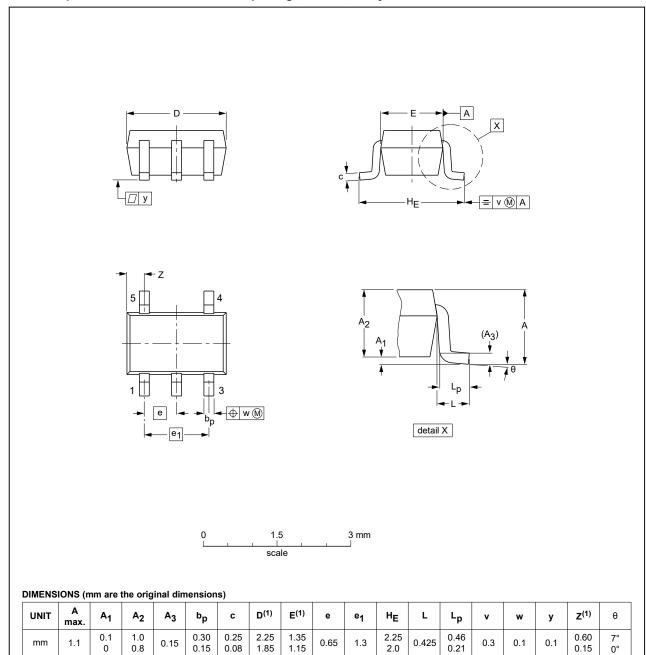
Table 10. Test data

Туре	Input		Load		S1 position			
	V _I	t _r , t _f	CL	R_L	t _{PHL} , t _{PLH}	t _{PZH} , t _{PHZ}	t_{PZL}, t_{PLZ}	
74AHC1G125	V _{CC}	≤ 3 ns	15 pF, 50 pF	1 kΩ	open	GND	V _{CC}	
74AHCT1G125	3 V	≤ 3 ns	15 pF, 50 pF	1 kΩ	open	GND	V _{CC}	

12. Package outline

TSSOP5: plastic thin shrink small outline package; 5 leads; body width 1.25 mm

SOT353-1



1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE	REFERENCES				EUROPEAN	ISSUE DATE
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
SOT353-1		MO-203	SC-88A			-00-09-01 03-02-19

Fig. 9. Package outline SOT353-1 (TSSOP5)

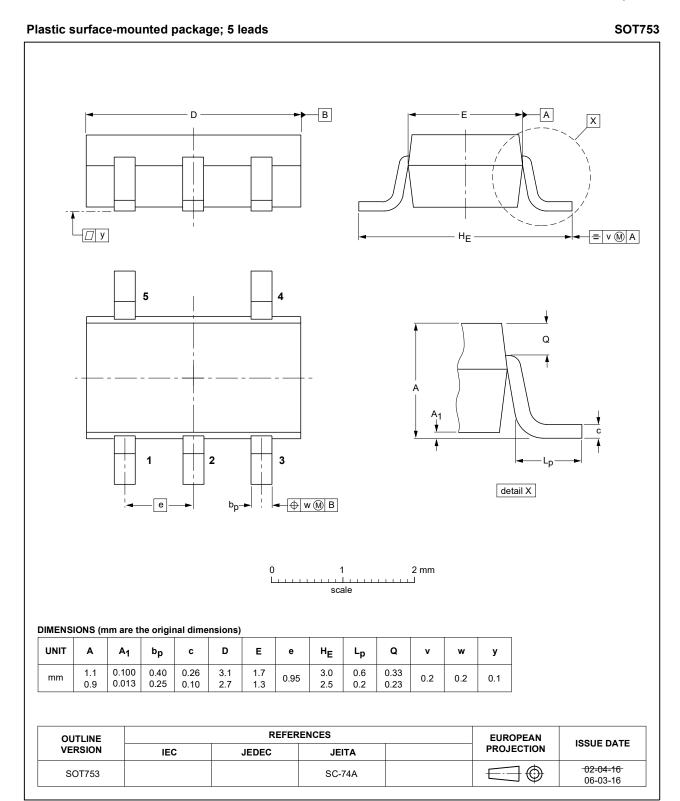


Fig. 10. Package outline SOT753 (SC-74A)

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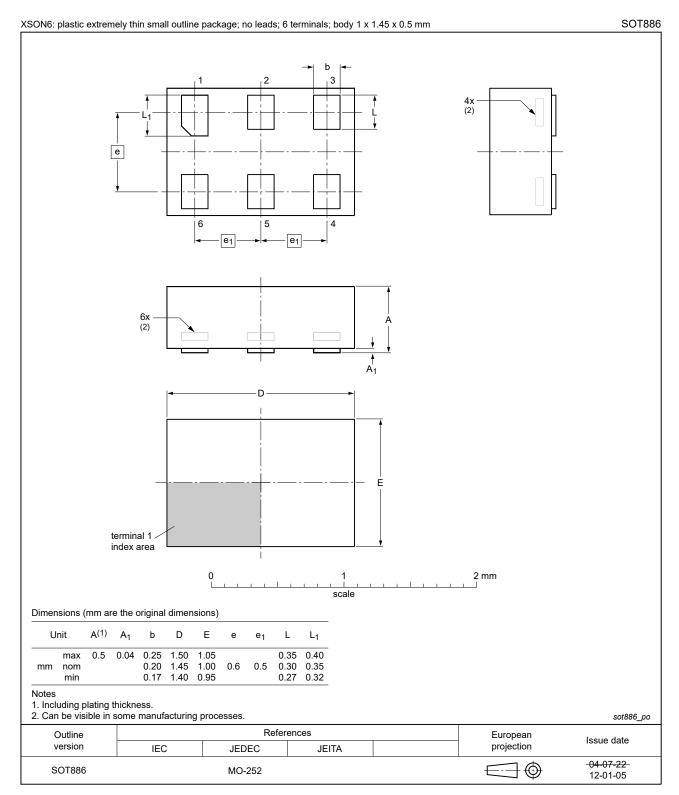


Fig. 11. Package outline SOT886 (XSON6)

13. Abbreviations

Table 11. Abbreviations

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

14. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes	
74AHC_AHCT1G125 v.12	20210526	Product data sheet	-	74AHC_AHCT1G125 v.11	
Modifications:	Type number 74AHCT1G125GF (SOT891 / XSON6) removed.				
74AHC_AHCT1G125 v.11	20201013	Product data sheet	-	74AHC_AHCT1G125 v.10	
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. Type number 74AHC1G125GF (SOT891 / XSON6) removed. Section 1 and Section 2 updated. Table 5: Derating values for Ptot total power dissipation updated. 				
74AHC_AHCT1G125 v.10	20120823	Product data sheet	-	74AHC_AHCT1G125 v.9	
Modifications:	Package outline drawing of SOT886 (Fig. 11) modified.				
74AHC_AHCT1G125 v.9	20090622	Product data sheet	-	74AHC_AHCT1G125 v.8	
74AHC_AHCT1G125 v.8	20090409	Product data sheet	-	74AHC_AHCT1G125 v.7	
74AHC_AHCT1G125 v.7	20070707	Product data sheet	-	74AHC_AHCT1G125 v.6	
74AHC_AHCT1G125 v.6	20020606	Product specification	-	74AHC_AHCT1G125 v.5	
74AHC_AHCT1G125 v.5	20020322	Product specification	-	74AHC_AHCT1G125 v.4	
74AHC_AHCT1G125 v.4	20010222	Product specification	-	74AHC_AHCT1G125 v.3	
74AHC_AHCT1G125 v.3	19990615	Product specification	-	74AHC_AHCT1G125_N v.2	
74AHC_AHCT1G125_N v.2	19981207	Preliminary specification	-	74AHC_AHCT1G125_N v.1	
74AHC_AHCT1G125_N v.1	19981125	Preliminary specification	-	-	

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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.

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