

XC7SH125

Bus buffer/line driver; 3-state

Rev. 5 — 3 January 2024

Product data sheet

1. General description

XC7SH125 is a high-speed Si-gate CMOS device. It provides one non-inverting buffer/line driver with 3-state output. The 3-state output is controlled by the output enable input (\overline{OE}). A HIGH at \overline{OE} causes the output to assume a high-impedance OFF-state.

2. Features and benefits

- Symmetrical output impedance
- High noise immunity
- Low power dissipation
- Balanced propagation delays
- CMOS input levels
- ESD protection:
 - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
 - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V
- Multiple package options
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
XC7SH125GW	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1
XC7SH125GV	-40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753
XC7SH125GM	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886

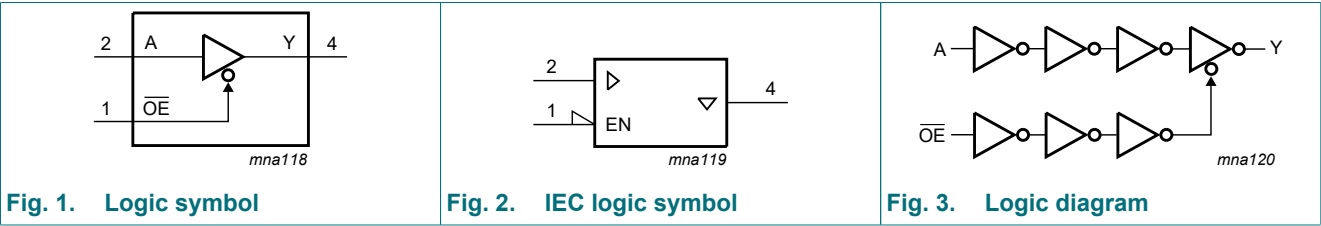
4. Marking

Table 2. Marking codes

Type number	Marking [1]
XC7SH125GW	fM
XC7SH125GV	f25
XC7SH125GM	fM

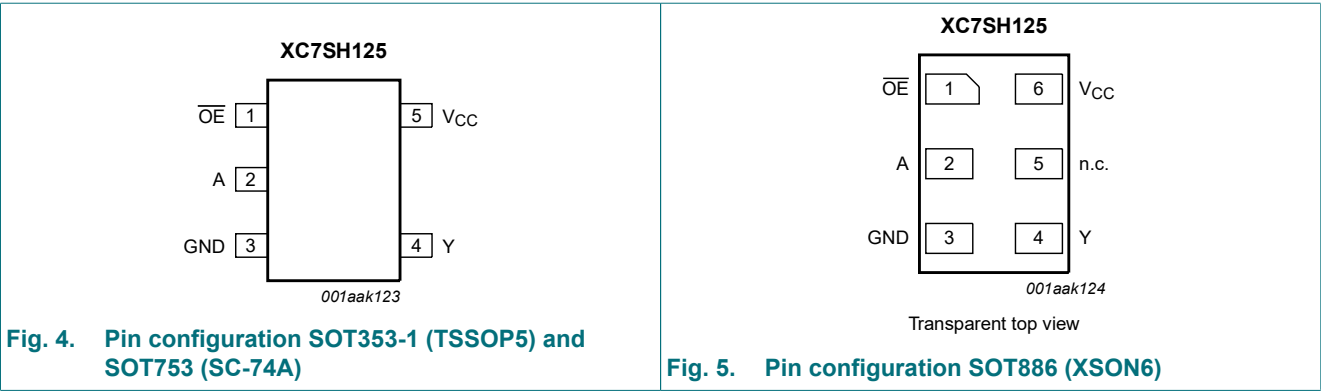
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram



6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

Symbol	Pin		Description
	SOT353-1 (TSSOP5) and SOT753 (SC-74A)	SOT886 (XSON6)	
OE	1	1	output enable input
A	2	2	data input
GND	3	3	ground (0 V)
Y	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		Output
OE	A	Y
L	L	L
L	H	H
H	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
V _I	input voltage		-0.5	+7.0	V
I _{IK}	input clamping current	V _I < -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	-0.5 V < V _O < V _{CC} + 0.5 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 °C to +125 °C [2]	-	250	mW

- [1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
[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.
For SOT886 (XSON6) package: P_{tot} derates linearly with 3.3 mW/K above 74 °C.

9. Recommended operating conditions

Table 6. Recommended operating conditions

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _{CC}	supply voltage		2.0	5.0	5.5	V
V _I	input voltage		0	-	5.5	V
V _O	output voltage		0	-	V _{CC}	V
T _{amb}	ambient temperature		-40	+25	+125	°C
Δt/ΔV	input transition rise and fall rate	V _{CC} = 3.3 V ± 0.3 V	-	-	100	ns/V
		V _{CC} = 5.0 V ± 0.5 V	-	-	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 to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
V _{IH}	HIGH-level input voltage	V _{CC} = 2.0 V	1.5	-	-	1.5	-	1.5	-	V
		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 input voltage	V _{CC} = 2.0 V	-	-	0.5	-	0.5	-	0.5	V
		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 output voltage	V _I = V _{IH} or V _{IL}								
		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 output voltage	V _I = V _{IH} or V _{IL}								
		I _O = 50 µA; V _{CC} = 2.0 V	-	0	0.1	-	0.1	-	0.1	V
		I _O = 50 µA; 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
I _{OZ}	OFF-state output current	V _I = V _{CC} or GND; V _{CC} = 5.5 V	-	-	0.25	-	2.5	-	10	µA
I _I	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 V	-	-	1.0	-	10	-	40	µA
C _I	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	Typ	Max	Min	Max	Min	Max	
t _{pd}	propagation delay	A to Y; see Fig. 6 [1]								
		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
t _{dis}	disable time	OE to Y; see Fig. 7 [1]								
		V _{CC} = 3.0 V to 3.6 V; C _L = 15 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

[1] t_{pd} is the same as t_{PLH} and t_{PHL}.
t_{en} is the same as t_{PZL} and t_{PZH}.
t_{dis} is the same as t_{PLZ} and t_{PHZ}.
[2] Typical values are measured at V_{CC} = 3.3 V.
[3] Typical values are measured at V_{CC} = 5.0 V.
[4] C_{PD} is used to determine the dynamic power dissipation P_D (μW).
 $P_D = C_{PD} \times V_{CC}^2 \times f_i + \Sigma(C_L \times V_{CC}^2 \times f_o)$ 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 Volts.

11.1. Waveforms and test circuit

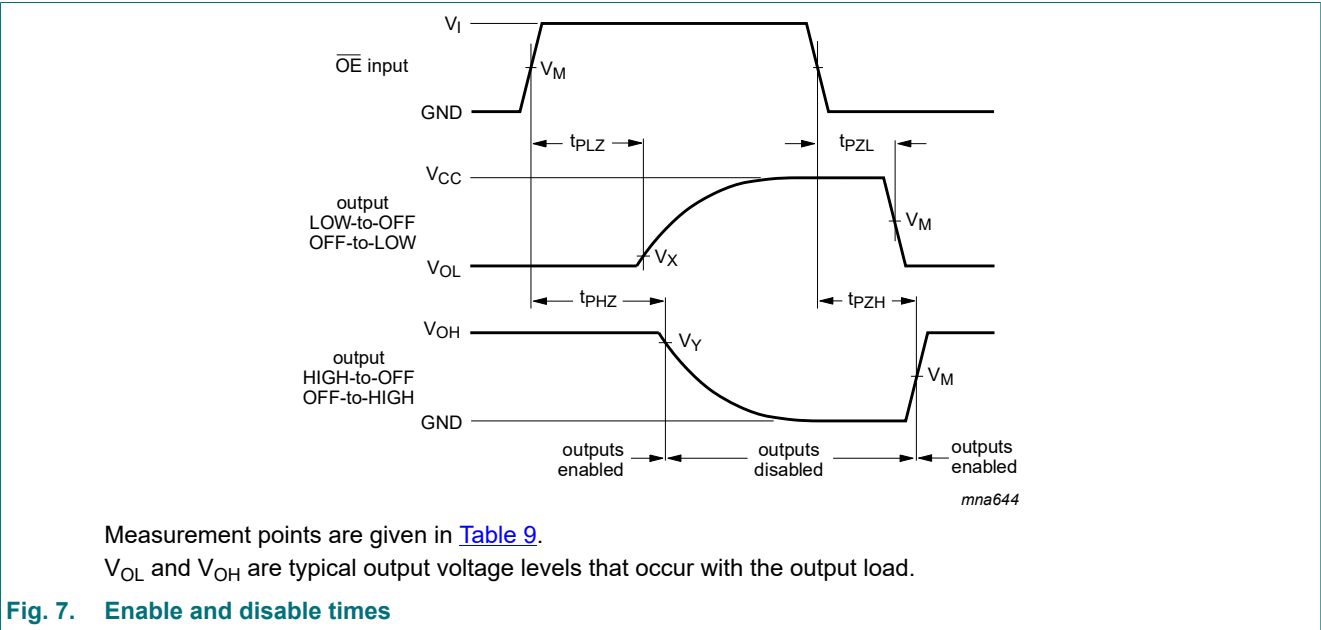
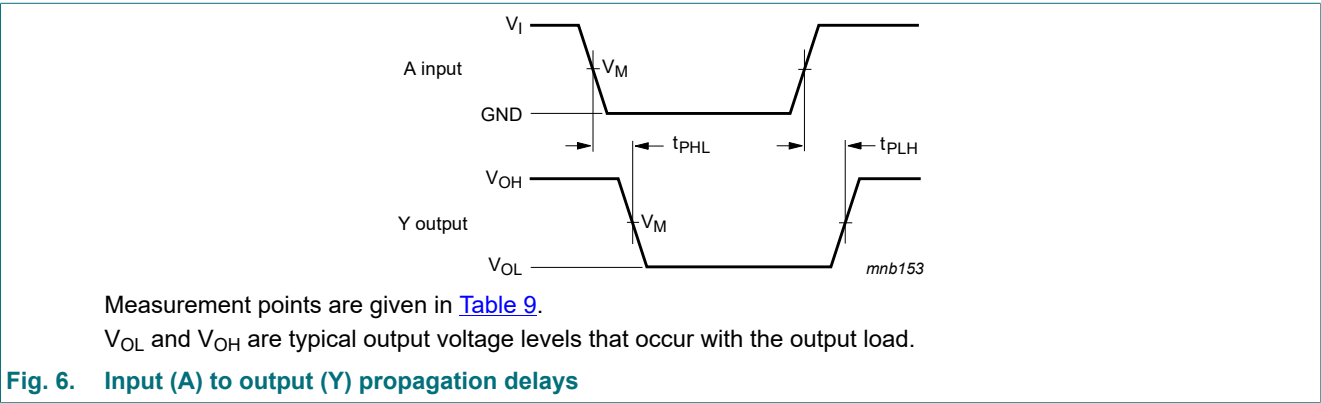


Table 9. Measurement points

Input	Output		
V_M	V_M	V_X	V_Y
$0.5V_{CC}$	$0.5V_{CC}$	$V_{OL} + 0.3\text{ V}$	$V_{OH} - 0.3\text{ V}$

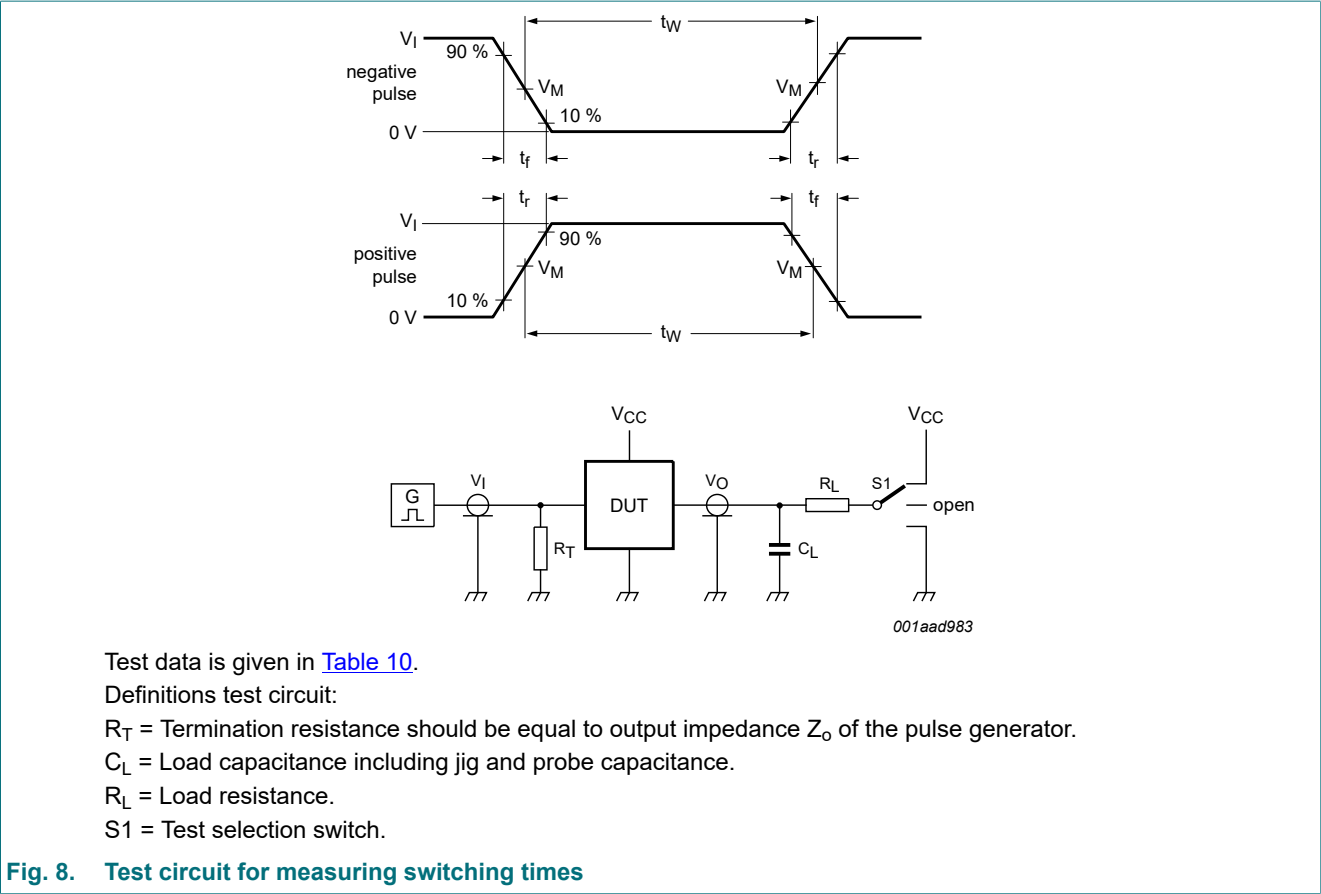


Table 10. Test data

Input		Load		S1 position		
V_I	t_r, t_f	C_L	R_L	t_{PHL}, t_{PLH}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ}
V_{CC}	$\leq 3 \text{ ns}$	15 pF, 50 pF	1 k Ω	open	GND	V_{CC}

12. Package outline

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

SOT353-1

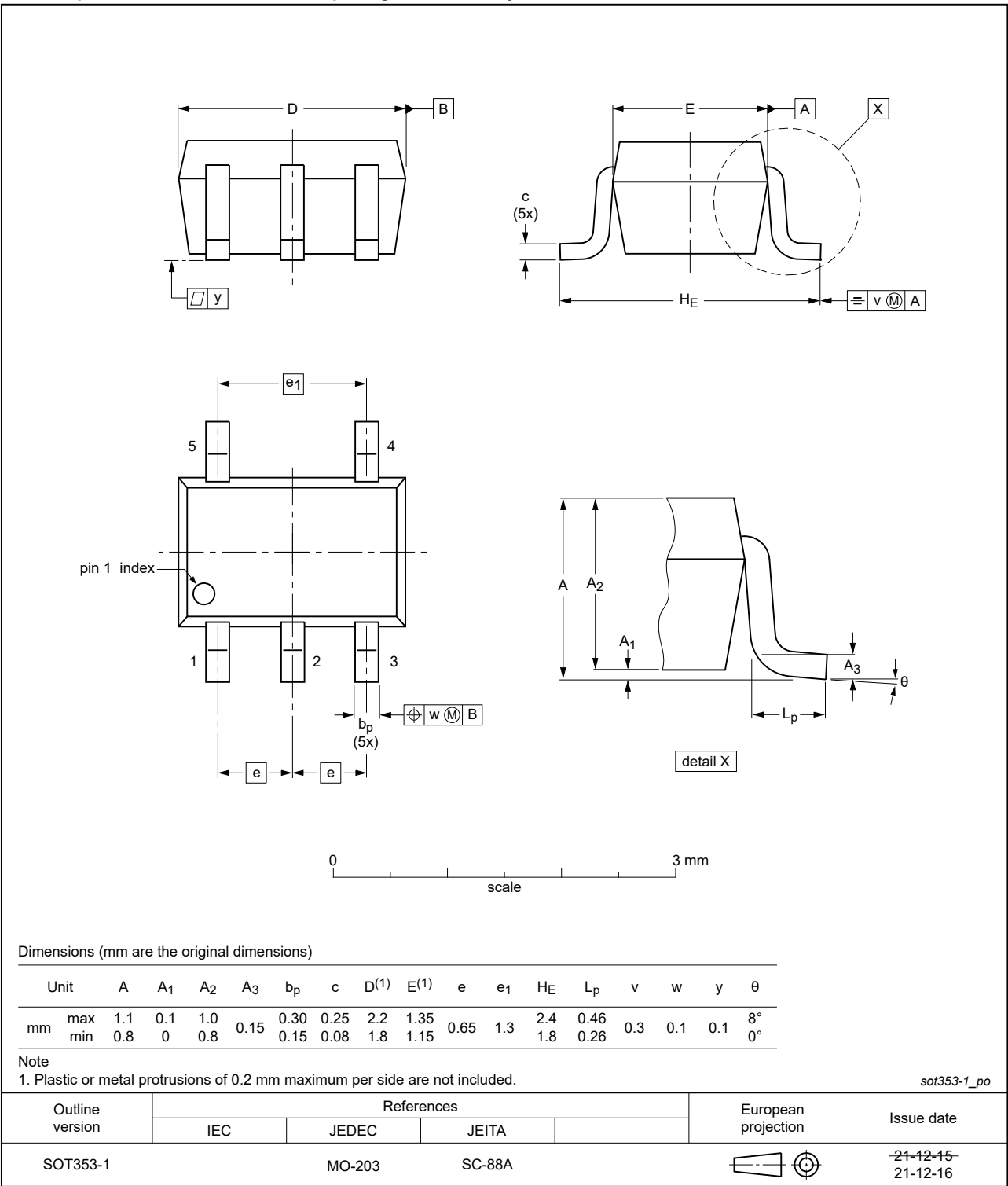


Fig. 9. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads

SOT753

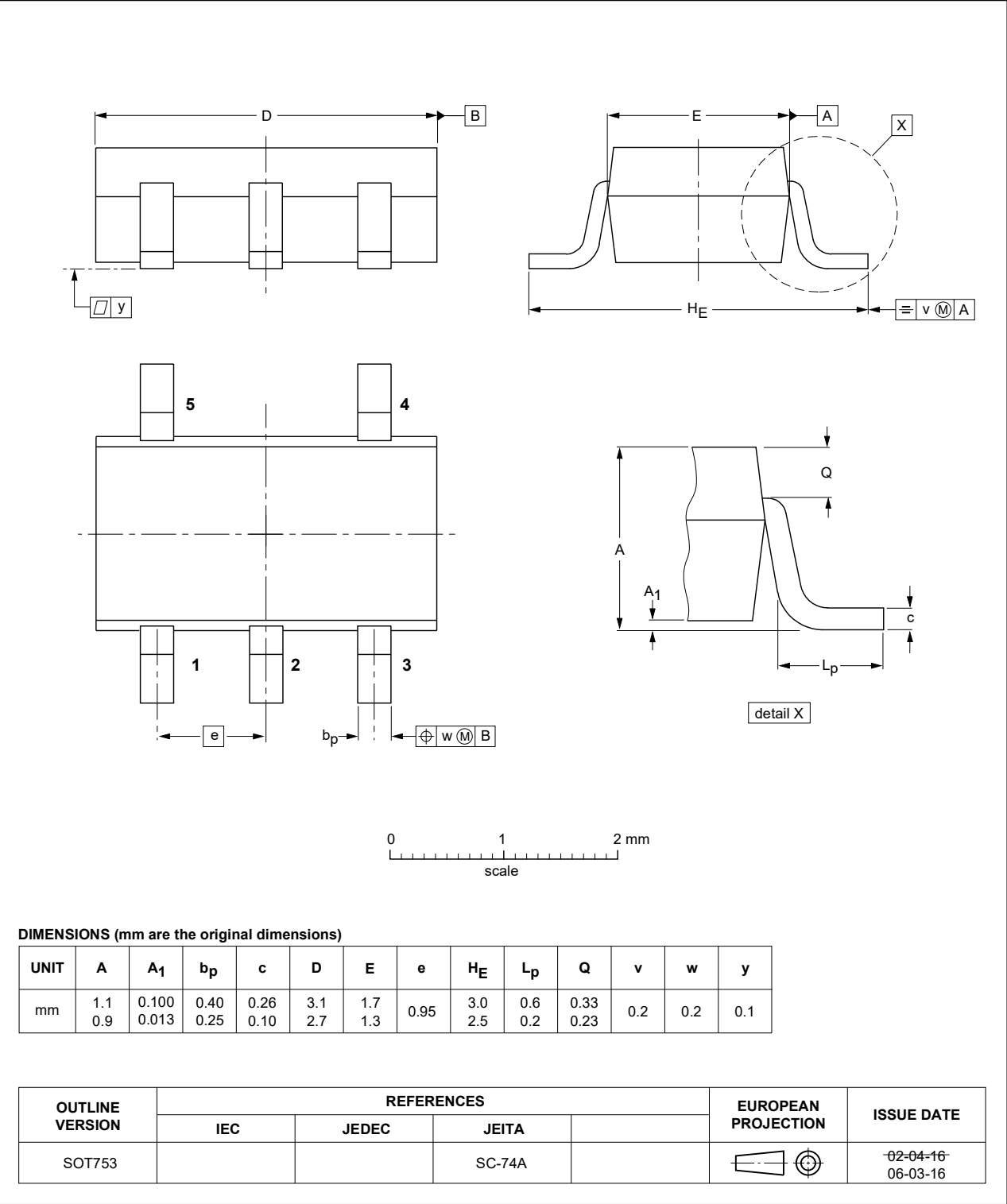


Fig. 10. Package outline SOT753 (SC-74A)

XSON6: plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1.45 x 0.5 mm

SOT886

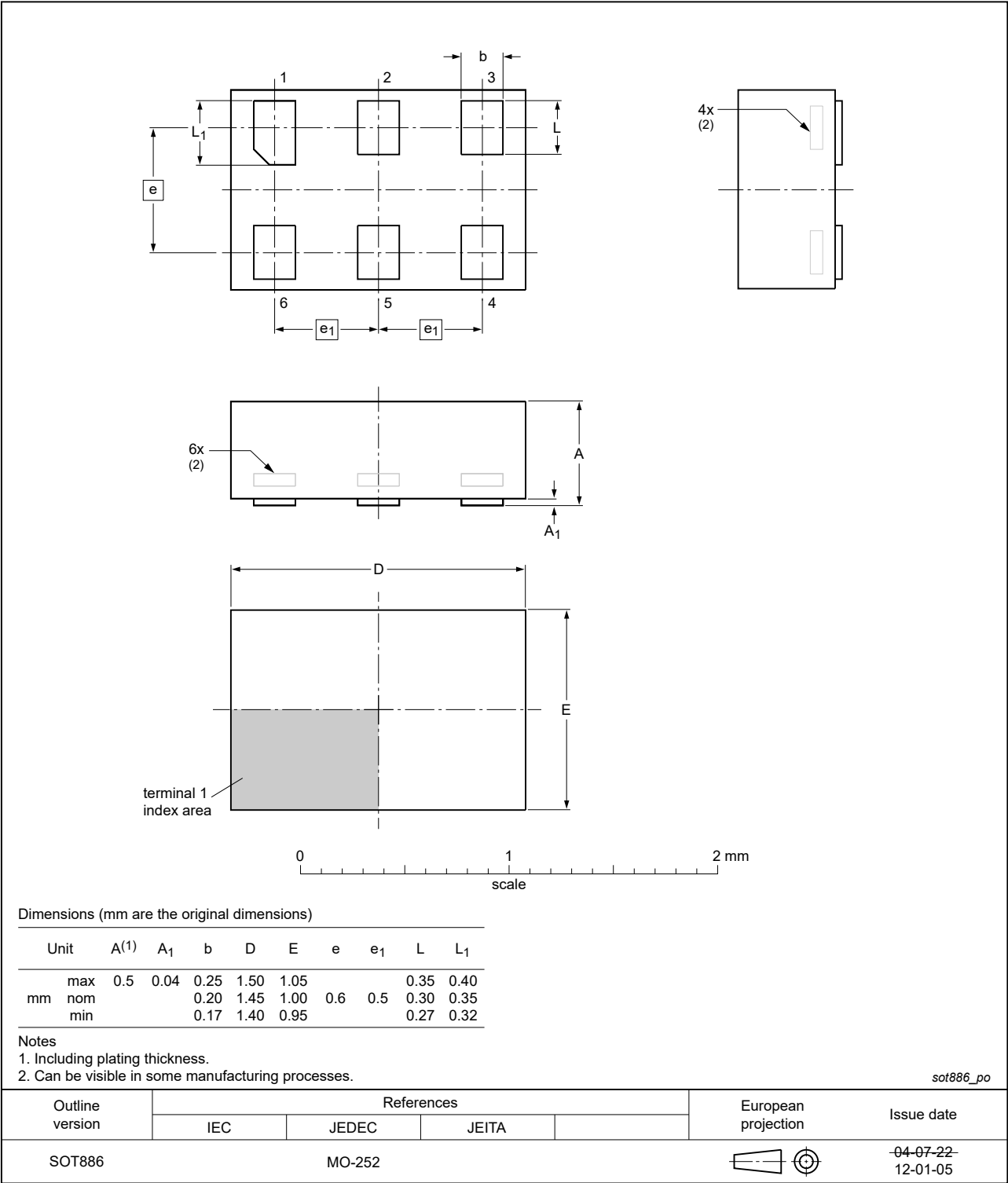


Fig. 11. Package outline SOT886 (XSON6)

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

14. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
XC7SH125 v.5	20240103	Product data sheet	-	XC7SH125 v.4
Modifications:	<ul style="list-style-type: none">Section 2: ESD specification updated according to the latest JEDEC standard.			
XC7SH125 v.4	20220107	Product data sheet	-	XC7SH125 v.3
Modifications:	<ul style="list-style-type: none">Fig. 9: Package outline drawing SOT353-1 (TSSOP5) has changed.			
XC7SH125 v.3	20210308	Product data sheet	-	XC7SH125 v.2
Modifications:	<ul style="list-style-type: none">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 XC7SH125GF (SOT891) removed.Section 2 updated.Section 8: Derating values for P_{tot} total power dissipation updated.			
XC7SH125 v.2	20151207	Product data sheet	-	XC7SH125 v.1
Modifications:	<ul style="list-style-type: none">Package outline drawing of SOT886 (Fig. 11) modified.			
XC7SH125 v.1	20090904	Product data sheet	-	-

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.
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- [2] The term 'short data sheet' is explained in section "Definitions".
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Contents

1. General description..... 1

2. Features and benefits..... 1

3. Ordering information..... 1

4. Marking..... 1

5. Functional diagram..... 2

6. Pinning information..... 2

6.1. Pinning..... 2

6.2. Pin description..... 2

7. Functional description..... 2

8. Limiting values..... 3

9. Recommended operating conditions..... 3

10. Static characteristics..... 4

11. Dynamic characteristics..... 5

11.1. Waveforms and test circuit..... 6

12. Package outline..... 8

13. Abbreviations..... 11

14. Revision history..... 11

15. Legal information..... 12

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