

74CBTLV1G125

Single bus switch

Rev. 6 — 4 January 2021

Product data sheet

1. General description

The 74CBTLV1G125 provides a single high-speed line switch. The switch is disabled when the output enable (\overline{OE}) input is high.

To ensure the high-impedance OFF-state during power-up or power-down, tie \overline{OE} to the V_{CC} through a pull-up resistor. The current-sinking capability of the driver determines the minimum value of the resistor.

Schmitt trigger action at control input makes the circuit tolerant to slower input rise and fall times across the entire V_{CC} range from 2.3 V to 3.6 V.

This device is fully specified for partial power-down applications using I_{OFF} . The I_{OFF} circuitry disables the output, preventing the damaging backflow current through the device when it is powered down.

2. Features and benefits

- Supply voltage range from 2.3 V to 3.6 V
- High noise immunity
- Complies with JEDEC standard:
 - JESD8-5 (2.3 V to 2.7 V)
 - JESD8-B/JESD36 (2.7 V to 3.6 V)
- ESD protection:
 - HBM JESD22-A114F exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V
 - CDM JESD22-C101E exceeds 1000 V
- 5 Ω switch connection between two ports
- Rail to rail switching on data I/O ports
- CMOS low power consumption
- Latch-up performance meets requirements of JESD78 Class I
- I_{OFF} circuitry provides partial power-down mode operation
- 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
74CBTLV1G125GW	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1
74CBTLV1G125GV	-40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753
74CBTLV1G125GM	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886
74CBTLV1G125GN	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 0.9 × 1.0 × 0.35 mm	SOT1115
74CBTLV1G125GS	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 1.0 × 1.0 × 0.35 mm	SOT1202

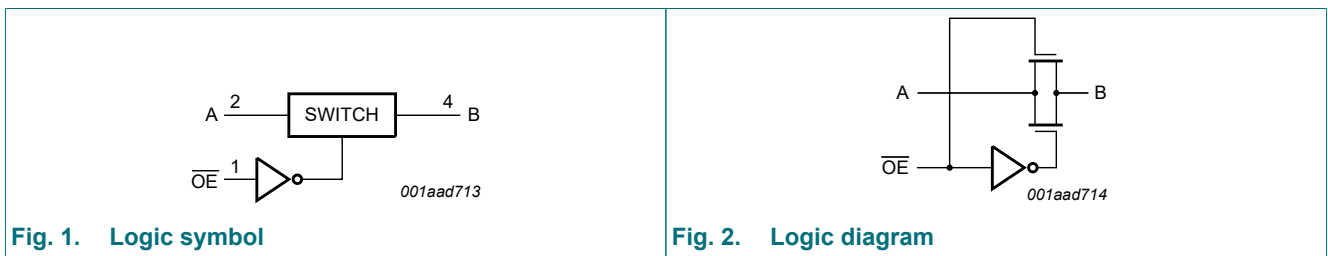
4. Marking

Table 2. Marking

Type number	Marking code ^[1]
74CBTLV1G125GW	bM
74CBTLV1G125GV	b25
74CBTLV1G125GM	bM
74CBTLV1G125GN	bM
74CBTLV1G125GS	bM

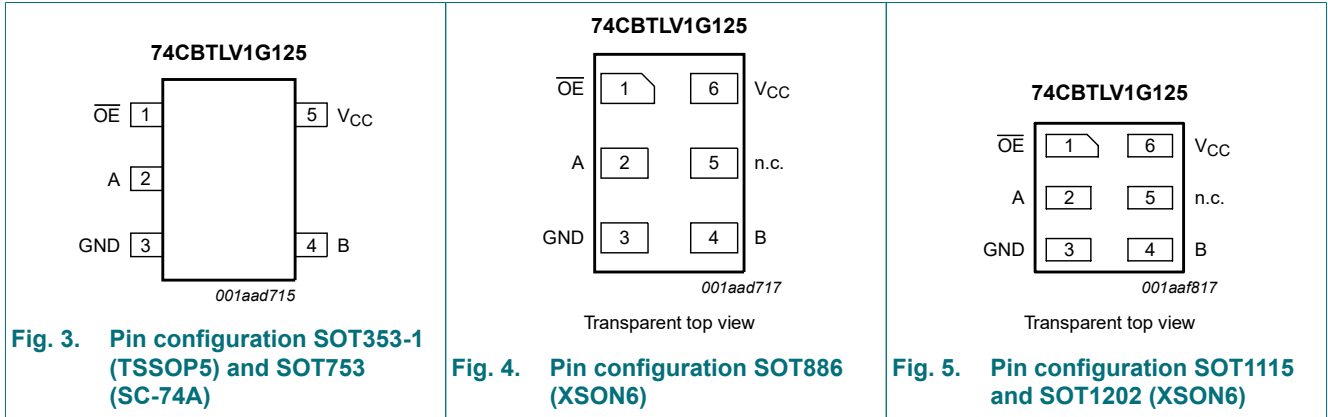
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

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, SOT1115 and SOT1202	
OE	1	1	output enable input \overline{OE} (active LOW)
A	2	2	data input or output A
GND	3	3	ground (0 V)
B	4	4	data input or output B
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.

Output enable input \overline{OE}	Function switch
L	ON-state
H	OFF-state

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	+4.6	V
V_I	input voltage	[1]	-0.5	+4.6	V
V_{SW}	switch voltage	enable and disable mode	-0.5	$V_{CC} + 0.5$	V
I_{IK}	input clamping current	$V_{IO} < -0.5$ V	-50	-	mA
I_{SK}	switch clamping current	$V_I < -0.5$ V or $V_I > V_{CC} + 0.5$ V	-	± 50	mA
I_{SW}	switch current	$V_{SW} = 0$ V to V_{CC}	-	± 128	mA
I_{CC}	supply current		-	+50	mA
I_{GND}	ground current		-50	-	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 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_{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.

For SOT1115 (XSON6) package: P_{tot} derates linearly with 3.2 mW/K above 71 °C.

For SOT1202 (XSON6) package: P_{tot} derates linearly with 3.3 mW/K above 74 °C.

9. Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CC}	supply voltage		2.3	-	3.6	V
V_I	input voltage		0	-	3.6	V
V_{SW}	switch voltage	enable and disable mode	0	-	V_{CC}	V
T_{amb}	ambient temperature		-40	-	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 2.3$ V to 3.6 V [1]	0	-	20	ns/V

[1] Applies to control signal levels.

10. Static characteristics

Table 7. Static characteristics

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

Symbol	Parameter	Conditions	Min	Typ[1]	Max	Unit
T_{amb} = -40 °C to +85 °C						
V _{IH}	HIGH-level input voltage	V _{CC} = 2.3 V to 2.7 V	1.7	-	-	V
		V _{CC} = 2.7 V to 3.6 V	2.0	-	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 2.3 V to 2.7 V	-	-	0.7	V
		V _{CC} = 2.7 V to 3.6 V	-	-	0.8	V
I _I	input leakage current	V _I = GND to V _{CC} ; V _{CC} = 3.6 V	-	-	±1.0	µA
I _{S(OFF)}	OFF-state leakage current	V _I = V _{IH} or V _{IL} ; V _O = V _{CC} - GND; V _{CC} = 3.6 V; see Fig. 6	-	±0.1	±5	µA
I _{S(ON)}	ON-state leakage current	V _I = V _{IH} or V _{IL} ; V _{CC} = 3.6 V; see Fig. 7	-	±0.1	±5	µA
I _{OFF}	power-off leakage current	V _I or V _O = 0 V to 3.6 V; V _{CC} = 0 V	-	-	±10	µA
I _{CC}	supply current	V _I = GND or V _{CC} ; I _O = 0 A; V _{CC} = 3.6 V	-	-	10	µA
ΔI _{CC}	additional supply current	control input; V _I = V _{CC} - 0.6 V; V _{CC} = 3.6 V [2]	-	-	300	µA
C _I	input capacitance	control input; V _I = 0 V or 3 V	-	2.5	-	pF
C _{sw}	switch capacitance	OFF-state	-	7.0	-	pF
		ON-state	-	10.3	-	pF
T_{amb} = -40 °C to +125 °C						
V _{IH}	HIGH-level input voltage	V _{CC} = 2.3 V to 2.7 V	1.7	-	-	V
		V _{CC} = 2.7 V to 3.6 V	2.0	-	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 2.3 V to 2.7 V	-	-	0.7	V
		V _{CC} = 2.7 V to 3.6 V	-	-	0.8	V
I _I	input leakage current	V _I = GND to V _{CC} ; V _{CC} = 3.6 V	-	-	±100	µA
I _{S(OFF)}	OFF-state leakage current	V _I = V _{IH} or V _{IL} ; V _O = V _{CC} - GND; V _{CC} = 3.6 V; see Fig. 6	-	-	±200	µA
I _{S(ON)}	ON-state leakage current	V _I = V _{IH} or V _{IL} ; V _{CC} = 3.6 V; see Fig. 7	-	-	±200	µA
I _{OFF}	power-off leakage current	V _I or V _O = 0 V to 3.6 V; V _{CC} = 0 V	-	-	±10	µA
I _{CC}	supply current	V _I = GND or V _{CC} ; I _O = 0 A; V _{CC} = 3.6 V	-	-	200	µA
ΔI _{CC}	additional supply current	control input; V _I = V _{CC} - 0.6 V; V _{CC} = 3.6 V [2]	-	-	5000	µA

[1] Typical values are measured at T_{amb} = 25 °C and at V_{CC} = 3.3 V.

[2] One input at 3 V, other inputs at V_{CC} or GND.

Table 8. Resistance R_{ON}

At recommended operating conditions; voltages are referenced to GND (ground = 0 V); see test circuit Fig. 8.

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
R_{ON}	ON resistance	$V_{CC} = 2.3 \text{ V}$; see Fig. 9 [2]						
		$I_{SW} = 64 \text{ mA}$; $V_I = 0 \text{ V}$	-	4.7	10	-	15.0	Ω
		$I_{SW} = 24 \text{ mA}$; $V_I = 0 \text{ V}$	-	4.5	10	-	15.0	Ω
		$I_{SW} = 15 \text{ mA}$; $V_I = 1.7 \text{ V}$	-	11	25	-	38.0	Ω
		$V_{CC} = 3.0 \text{ V}$; see Fig. 10						
		$I_{SW} = 64 \text{ mA}$; $V_I = 0 \text{ V}$	-	4.2	7	-	11.0	Ω
		$I_{SW} = 24 \text{ mA}$; $V_I = 0 \text{ V}$	-	4.1	7	-	11.0	Ω
		$I_{SW} = 15 \text{ mA}$; $V_I = 2.4 \text{ V}$	-	7.3	15	-	25.5	Ω

[1] Typical values are measured at $T_{amb} = 25 \text{ }^\circ\text{C}$.

[2] Measured by the voltage drop between the A and B terminals at the indicated current through the switch. ON-state resistance is determined by the lower of the voltages of the two (A or B) terminals.

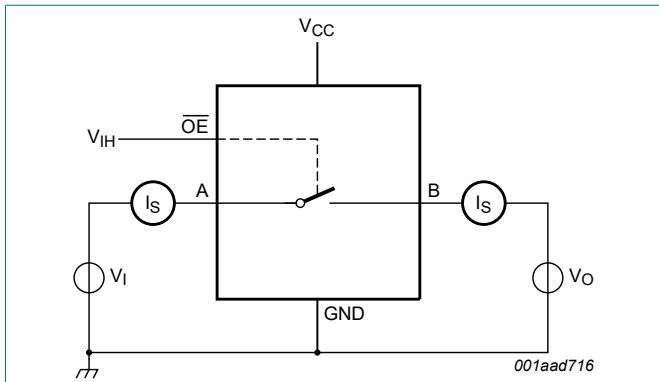


Fig. 6. Test circuit for measuring OFF-state leakage current

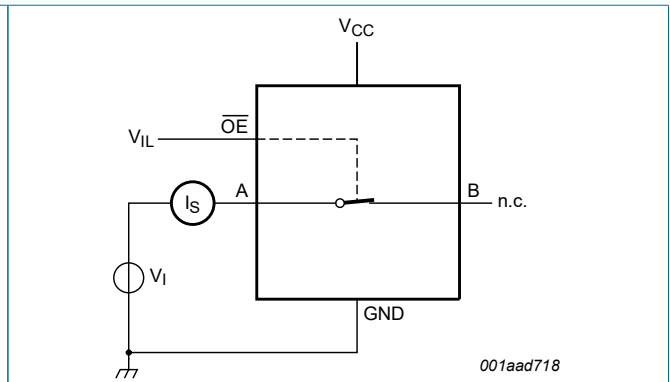


Fig. 7. Test circuit for measuring ON-state leakage current

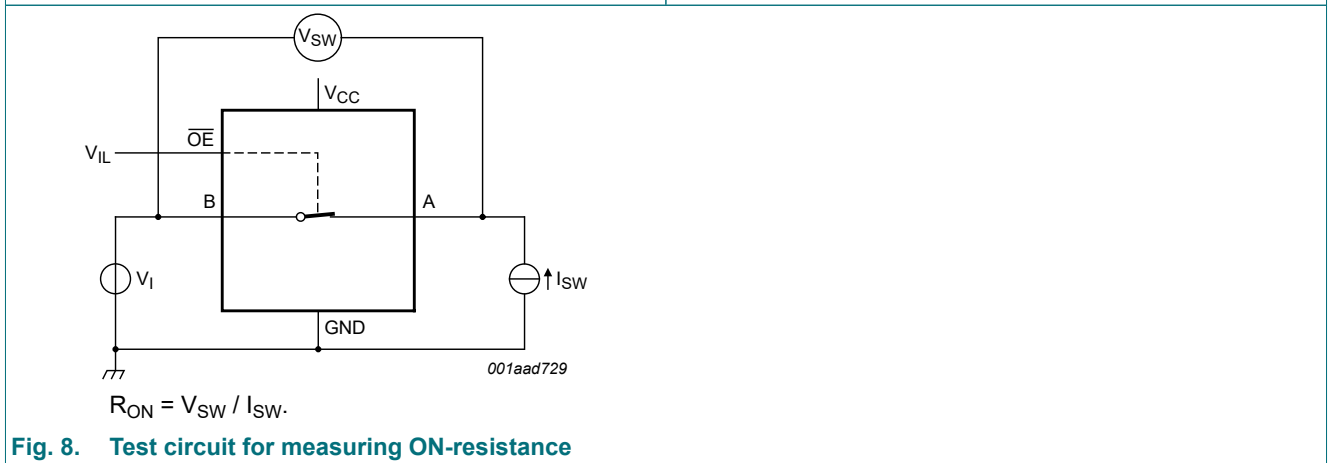
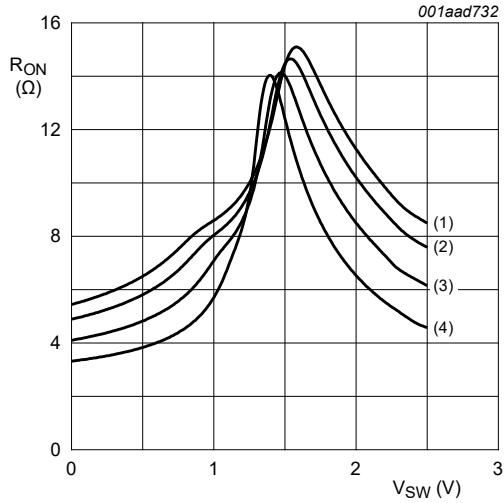
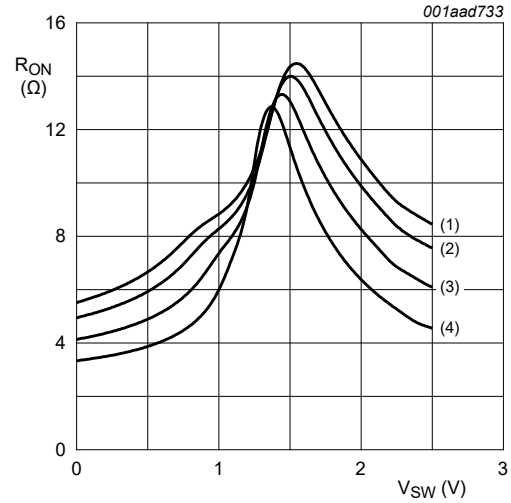


Fig. 8. Test circuit for measuring ON-resistance



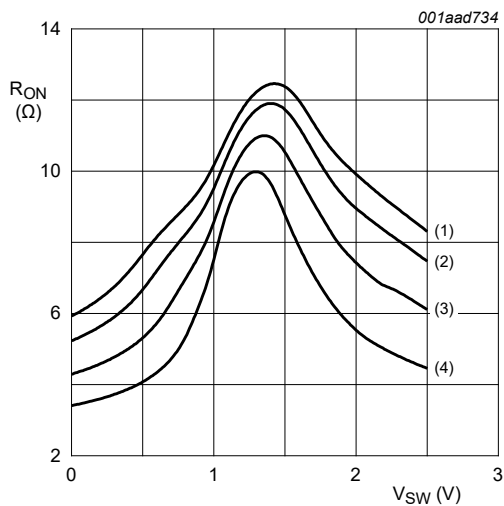
- (1) $T_{amb} = 125\text{ °C}$
- (2) $T_{amb} = 85\text{ °C}$
- (3) $T_{amb} = 25\text{ °C}$
- (4) $T_{amb} = -40\text{ °C}$

a. $V_{CC} = 2.5\text{ V}$; $I_{SW} = 15\text{ mA}$; $V_{SW} = 1.7\text{ V}$



- (1) $T_{amb} = 125\text{ °C}$
- (2) $T_{amb} = 85\text{ °C}$
- (3) $T_{amb} = 25\text{ °C}$
- (4) $T_{amb} = -40\text{ °C}$

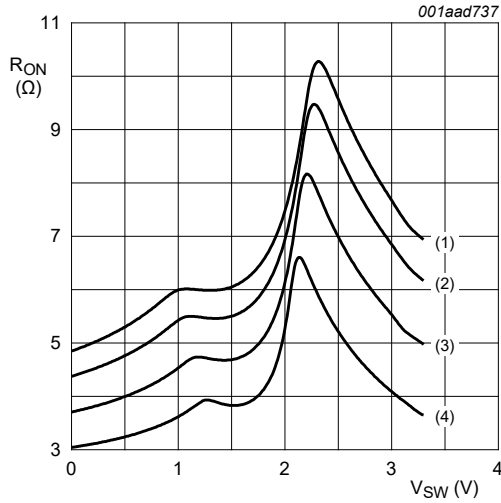
b. $V_{CC} = 2.5\text{ V}$; $I_{SW} = 24\text{ mA}$; $V_{SW} = 0\text{ V}$



- (1) $T_{amb} = 125\text{ °C}$
- (2) $T_{amb} = 85\text{ °C}$
- (3) $T_{amb} = 25\text{ °C}$
- (4) $T_{amb} = -40\text{ °C}$

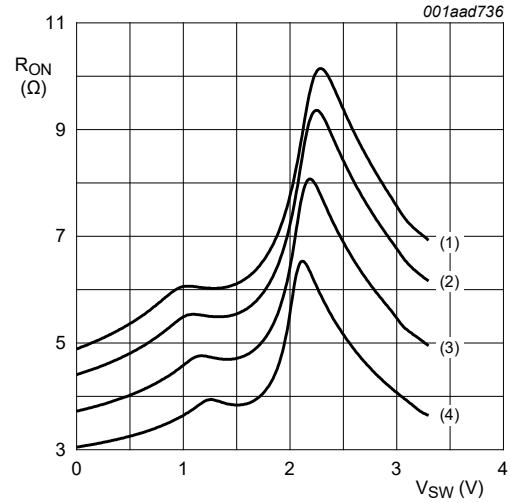
c. $V_{CC} = 2.5\text{ V}$; $I_{SW} = 64\text{ mA}$; $V_{SW} = 0\text{ V}$

Fig. 9. Switch ON-resistance as a function of input voltage at $V_{CC} = 2.5\text{ V}$



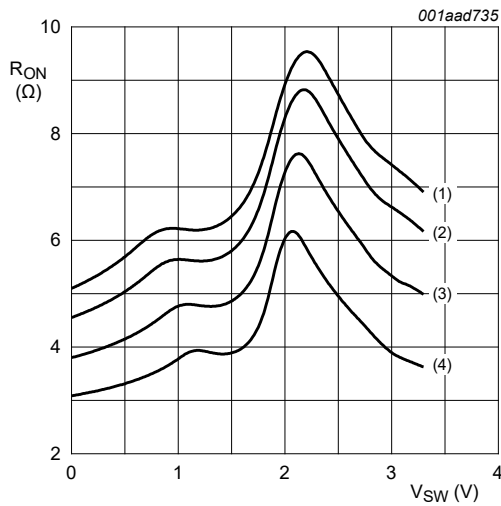
- (1) $T_{amb} = 125\text{ °C}$
- (2) $T_{amb} = 85\text{ °C}$
- (3) $T_{amb} = 25\text{ °C}$
- (4) $T_{amb} = -40\text{ °C}$

a. $V_{CC} = 3.3\text{ V}$; $I_{SW} = 15\text{ mA}$; $V_{SW} = 2.4\text{ V}$



- (1) $T_{amb} = 125\text{ °C}$
- (2) $T_{amb} = 85\text{ °C}$
- (3) $T_{amb} = 25\text{ °C}$
- (4) $T_{amb} = -40\text{ °C}$

b. $V_{CC} = 3.3\text{ V}$; $I_{SW} = 24\text{ mA}$; $V_{SW} = 0\text{ V}$



- (1) $T_{amb} = 125\text{ °C}$
- (2) $T_{amb} = 85\text{ °C}$
- (3) $T_{amb} = 25\text{ °C}$
- (4) $T_{amb} = -40\text{ °C}$

c. $V_{CC} = 3.3\text{ V}$; $I_{SW} = 64\text{ mA}$; $V_{SW} = 0\text{ V}$

Fig. 10. Switch ON-resistance as a function of input voltage at $V_{CC} = 3.3\text{ V}$

11. Dynamic characteristics

Table 9. Dynamic characteristics

$GND = 0\text{ V}$; see Fig. 13.

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
t_{pd}	propagation delay	A to B or B to A; see Fig. 11; $R_L = \infty\ \Omega$ [2] [3]						
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	-	-	0.21	-	0.32	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	-	0.16	0.25	-	0.39	ns
t_{en}	enable time	\overline{OE} to A or B; see Fig. 12; $R_L = 500\ \Omega$ [4]						
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	1.0	2.50	4.00	1.0	5.00	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	1.0	2.05	4.00	1.0	5.00	ns
t_{dis}	disable time	\overline{OE} to A or B; see Fig. 12; $R_L = 500\ \Omega$ [5]						
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	1.0	2.80	5.00	1.0	6.30	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	1.0	3.40	4.10	1.0	5.40	ns

[1] All typical values are measured at $T_{amb} = 25\text{ °C}$ and at nominal V_{CC} .

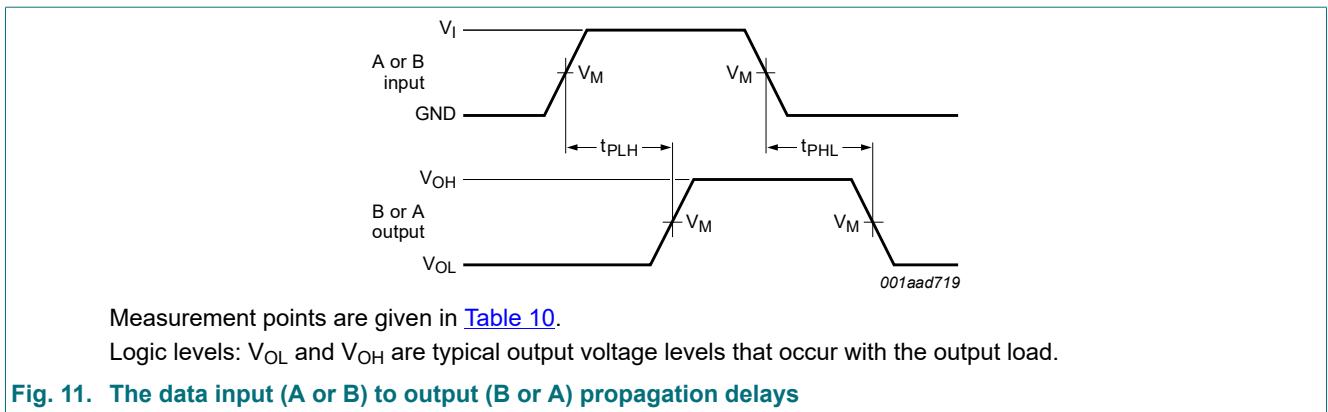
[2] The propagation delay is the calculated RC time constant of the maximum on-state resistance of the switch and the load capacitance, when driven by an ideal voltage source (zero output impedance).

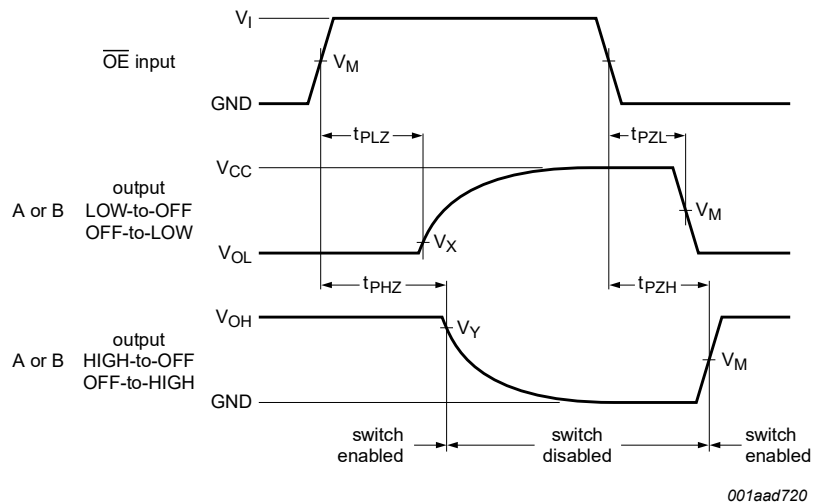
[3] t_{pd} is the same as t_{PLH} and t_{PHL} .

[4] t_{en} is the same as t_{PZH} and t_{PZL} .

[5] t_{dis} is the same as t_{PHZ} and t_{PLZ} .

11.1. Waveforms and test circuit





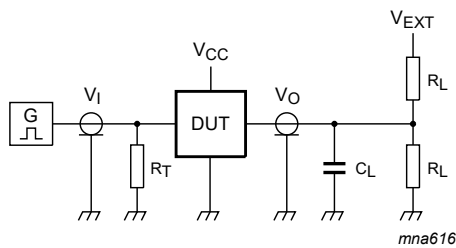
Measurement points are given in [Table 10](#).

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

Fig. 12. Enable and disable times

Table 10. Measurement points

Supply voltage	Inputs			Output		
V_{CC}	V_M	V_I	$t_r = t_f$	V_M	V_X	V_Y
2.3 V to 2.7 V	$0.5V_{CC}$	V_{CC}	≤ 2.0 ns	$0.5V_{CC}$	$V_{OL} + 0.15$ V	$V_{OH} - 0.15$ V
3.0 V to 3.6 V	$0.5V_{CC}$	V_{CC}	≤ 2.0 ns	$0.5V_{CC}$	$V_{OL} + 0.3$ V	$V_{OH} - 0.3$ V



Test data is given in [Table 11](#).

Definitions for test circuit:

R_L = Load resistance.

C_L = Load capacitance including jig and probe capacitance.

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

V_{EXT} = Test voltage for switching times.

Fig. 13. Test circuit for measuring switching times

Table 11. Test data

Supply voltage	Load	V_{EXT}		
V_{CC}	C_L	t_{PLH}, t_{PHL}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ}
2.3 V to 2.7 V	30 pF	open	GND	$2V_{CC}$
3.0 V to 3.6 V	50 pF	open	GND	$2V_{CC}$

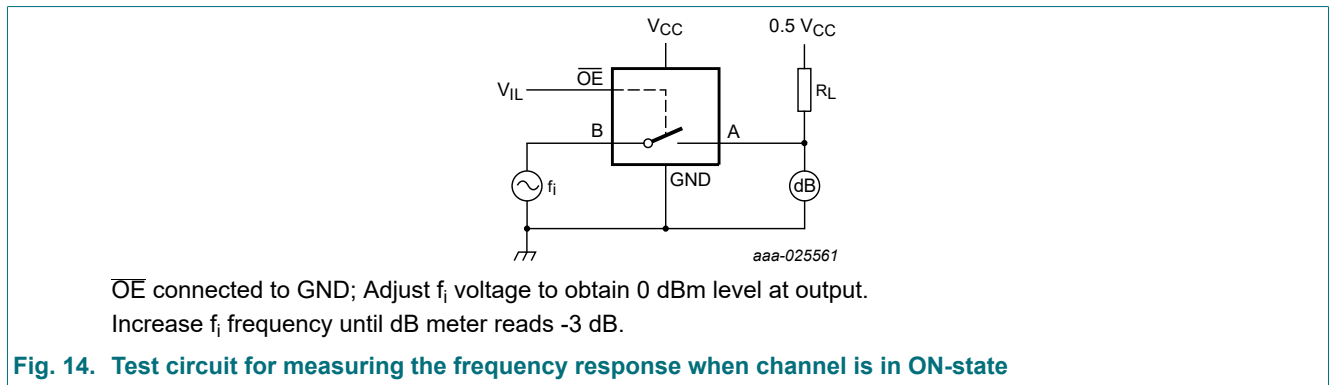
12. Additional dynamic characteristics

Table 12. Additional dynamic characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V);
 $V_I = \text{GND}$ or V_{CC} (unless otherwise specified); $t_r = t_f \leq 2.5 \text{ ns}$.

Symbol	Parameter	Conditions	$T_{\text{amb}} = 25 \text{ }^\circ\text{C}$			Unit
			Min	Typ	Max	
$f_{(-3\text{dB})}$	-3 dB frequency response	$V_{CC} = 3.3 \text{ V}$; $R_L = 50 \text{ } \Omega$; see Fig. 14 [1]	-	263	-	MHz

[1] f_i is biased at $0.5V_{CC}$.



13. Package outline

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

SOT353-1

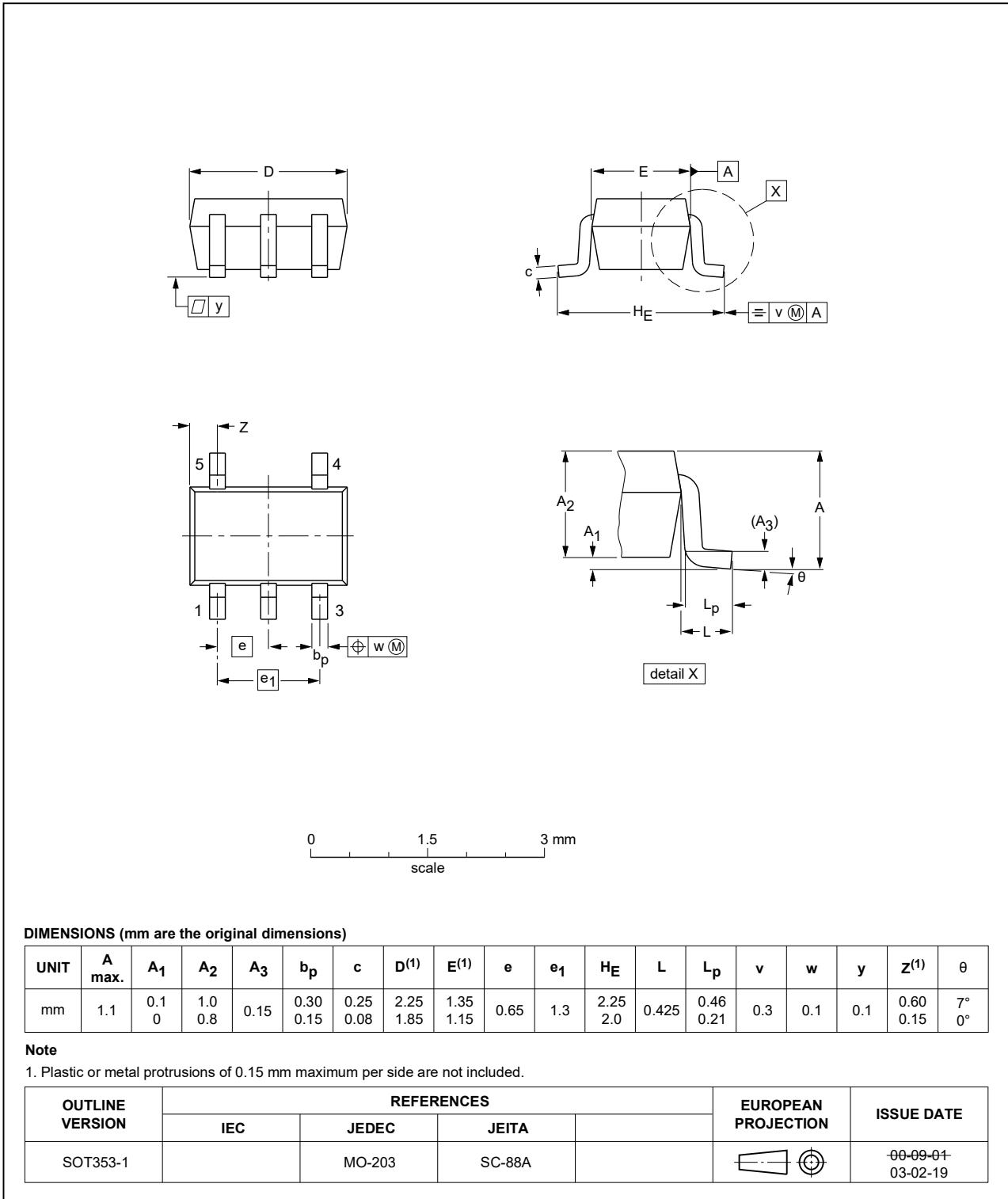


Fig. 15. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads

SOT753

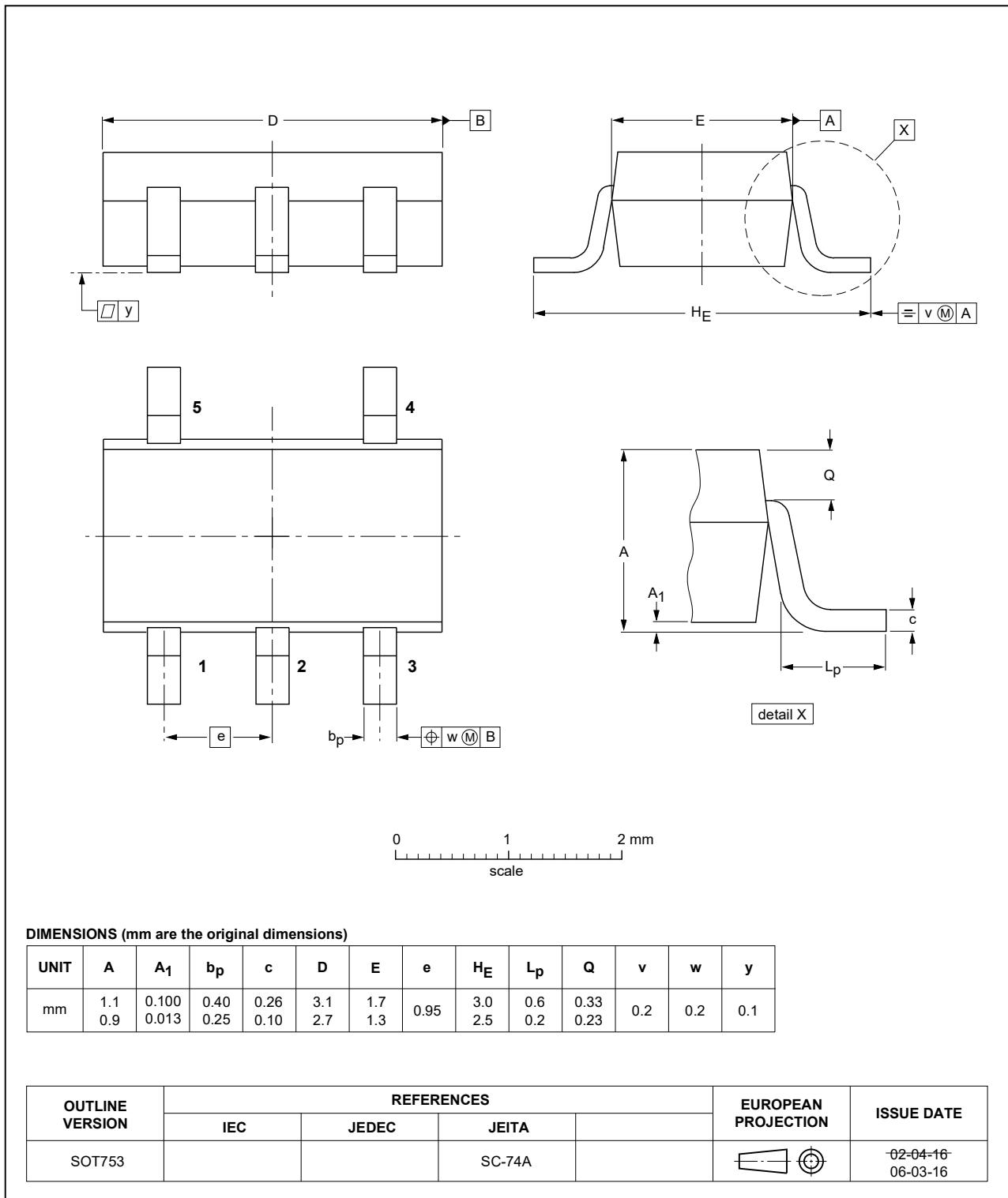


Fig. 16. Package outline SOT753 (SC-74A)

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

SOT886

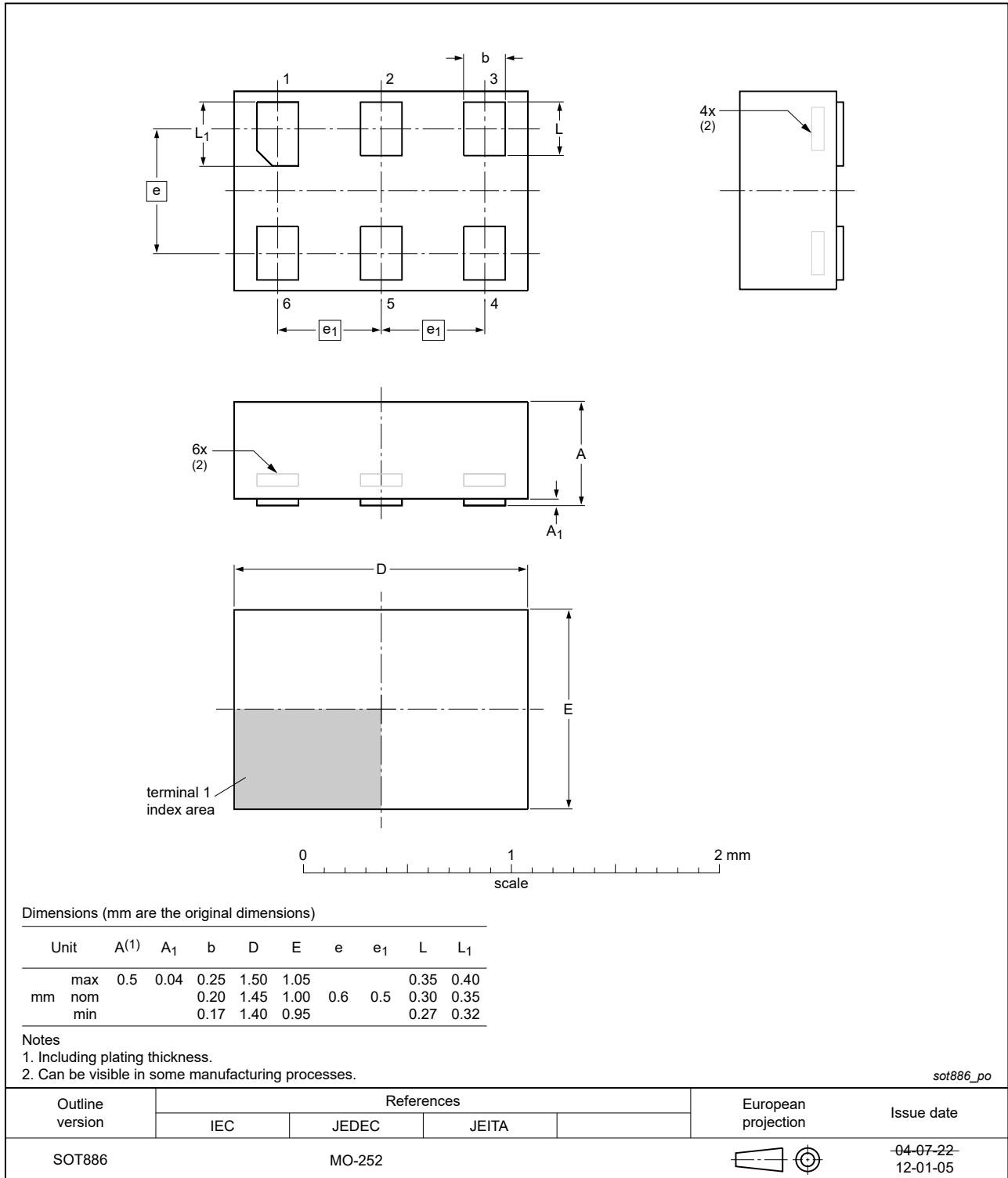


Fig. 17. Package outline SOT886 (XSON6)

XSON6: extremely thin small outline package; no leads;
6 terminals; body 0.9 x 1.0 x 0.35 mm

SOT1115

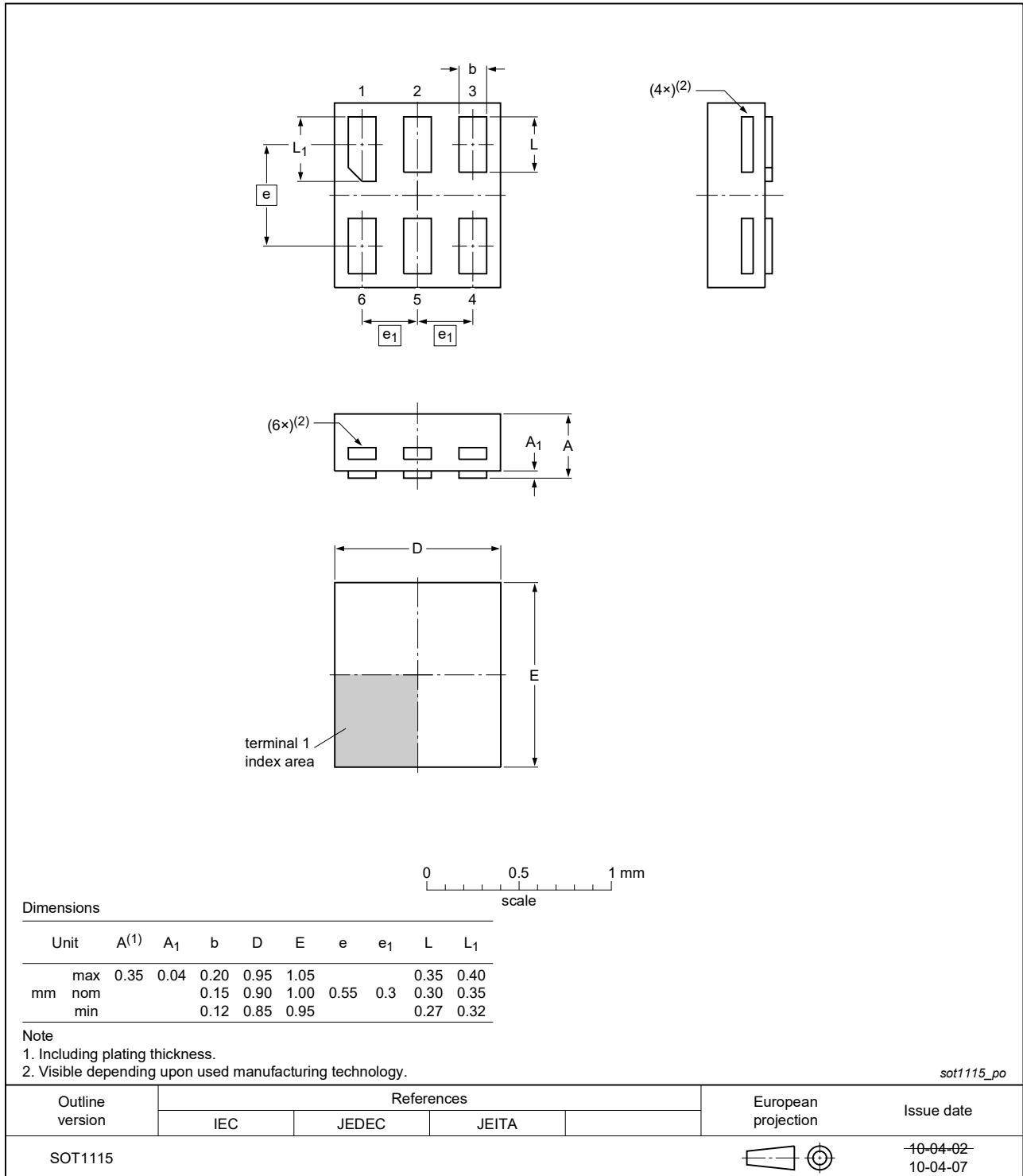


Fig. 18. Package outline SOT1115 (XSON6)

XSON6: extremely thin small outline package; no leads;
6 terminals; body 1.0 x 1.0 x 0.35 mm

SOT1202

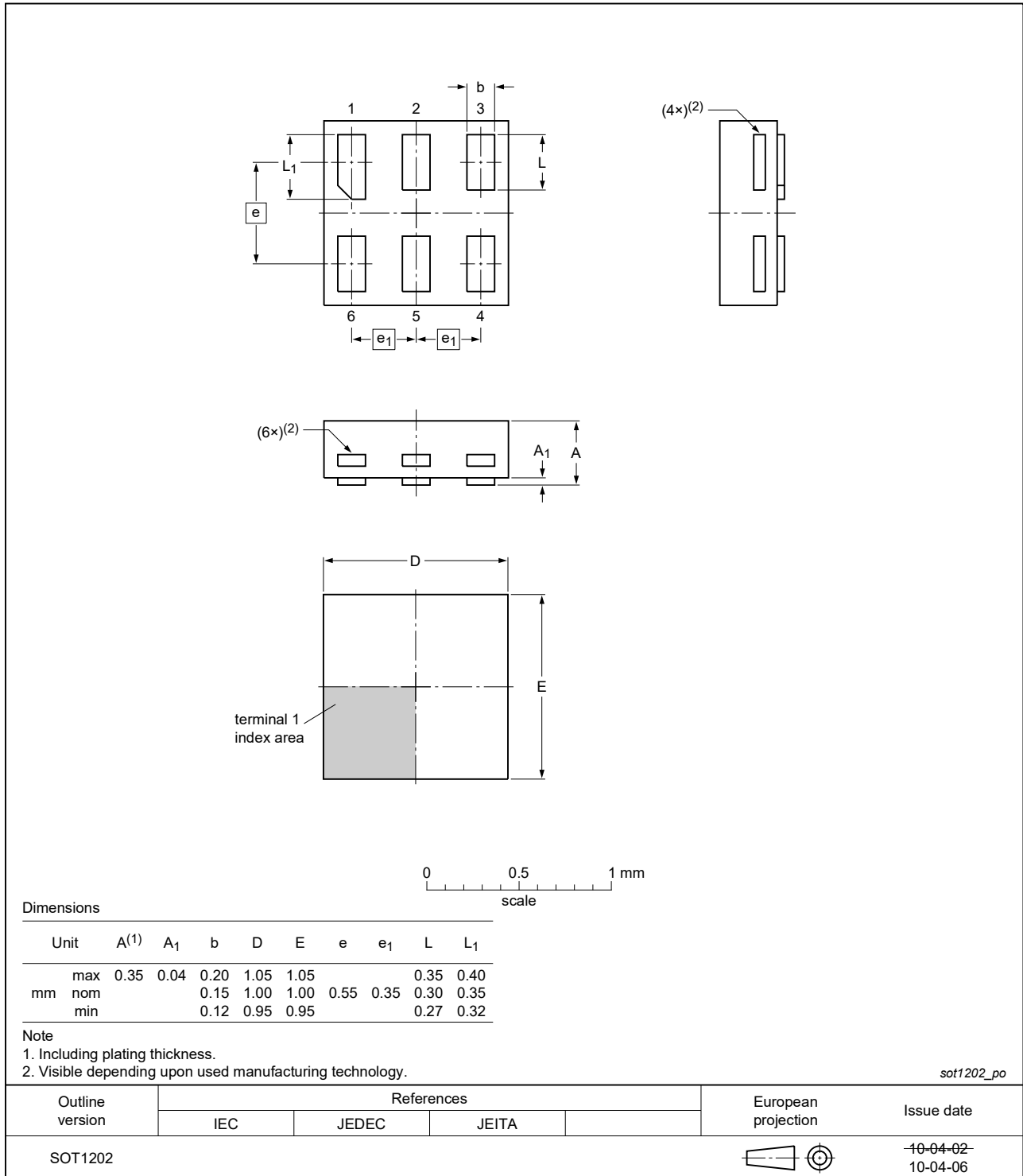


Fig. 19. Package outline SOT1202 (XSON6)

14. 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
MM	Machine Model

15. Revision history

Table 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74CBTLV1G125 v.6	20210104	Product data sheet	-	74CBTLV1G125 v.5
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 74CBTLV1G125GF (SOT891/XSON6) removed. Section 8: Derating values for P_{tot} total power dissipation updated. 			
74CBTLV1G125 v.5	20161110	Product data sheet	-	74CBTLV1G125 v.4
Modifications:	<ul style="list-style-type: none"> Section 12 added. 			
74CBTLV1G125 v.4	20120905	Product data sheet	-	74CBTLV1G125 v.3
Modifications:	<ul style="list-style-type: none"> Package outline drawing of SOT886 (Fig. 17) modified. 			
74CBTLV1G125 v.3	20111215	Product data sheet	-	74CBTLV1G125 v.2
Modifications:	<ul style="list-style-type: none"> Legal pages updated. 			
74CBTLV1G125 v.2	20100729	Product data sheet	-	74CBTLV1G125 v.1
74CBTLV1G125 v.1	20070223	Product data sheet	-	-

16. 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.

- [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".
- [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 <https://www.nexperia.com>.

Definitions

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