

74LVC2G74

Single D-type flip-flop with set and reset;
positive edge trigger

Rev. 15 — 22 August 2023

Product data sheet

1. General description

The 74LVC2G74 is a single positive edge triggered D-type flip-flop with individual data (D), clock (CP), set ($\overline{SD}$) and reset ($\overline{RD}$) inputs, and complementary Q and $\overline{Q}$ outputs. Data at the D-input that meets the set-up and hold time requirements on the LOW-to-HIGH clock transition will be stored in the flip-flop and appear at the Q output. Inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of these devices as translators in mixed 3.3 V and 5 V environments.

Schmitt-trigger action at all inputs makes the circuit tolerant of slower input rise and fall times.

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

2. Features and benefits

- Wide supply voltage range from 1.65 V to 5.5 V
- Overvoltage tolerant inputs to 5.5 V
- High noise immunity
- Complies with JEDEC standard:
 - JESD8-7 (1.65 V to 1.95 V)
 - JESD8-5 (2.3 V to 2.7 V)
 - JESD8-B/JESD36 (2.7 V to 3.6 V)
- ± 24 mA output drive ($V_{CC} = 3.0$ V)
- CMOS low power consumption
- Latch-up performance exceeds 250 mA
- Direct interface with TTL levels
- I_{OFF} circuitry provides partial Power-down mode operation
- 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 -40 °C to +125 °C

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74LVC2G74DP	-40 °C to +125 °C	TSSOP8	plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm	SOT505-2
74LVC2G74DC	-40 °C to +125 °C	VSSOP8	plastic very thin shrink small outline package; 8 leads; body width 2.3 mm	SOT765-1
74LVC2G74GT	-40 °C to +125 °C	XSON8	plastic extremely thin small outline package; no leads; 8 terminals; body 1 × 1.95 × 0.5 mm	SOT833-1
74LVC2G74GN	-40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body 1.2 × 1.0 × 0.35 mm	SOT1116
74LVC2G74GS	-40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body 1.35 × 1.0 × 0.35 mm	SOT1203

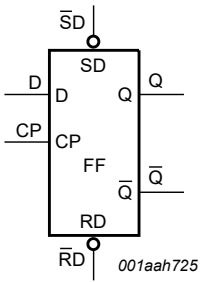
4. Marking

Table 2. Marking codes

Type number	Marking code [1]
74LVC2G74DP	V74
74LVC2G74DC	V74
74LVC2G74GT	V74
74LVC2G74GN	Y4
74LVC2G74GS	Y4

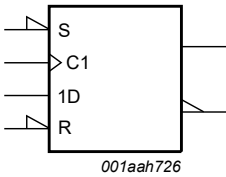
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram



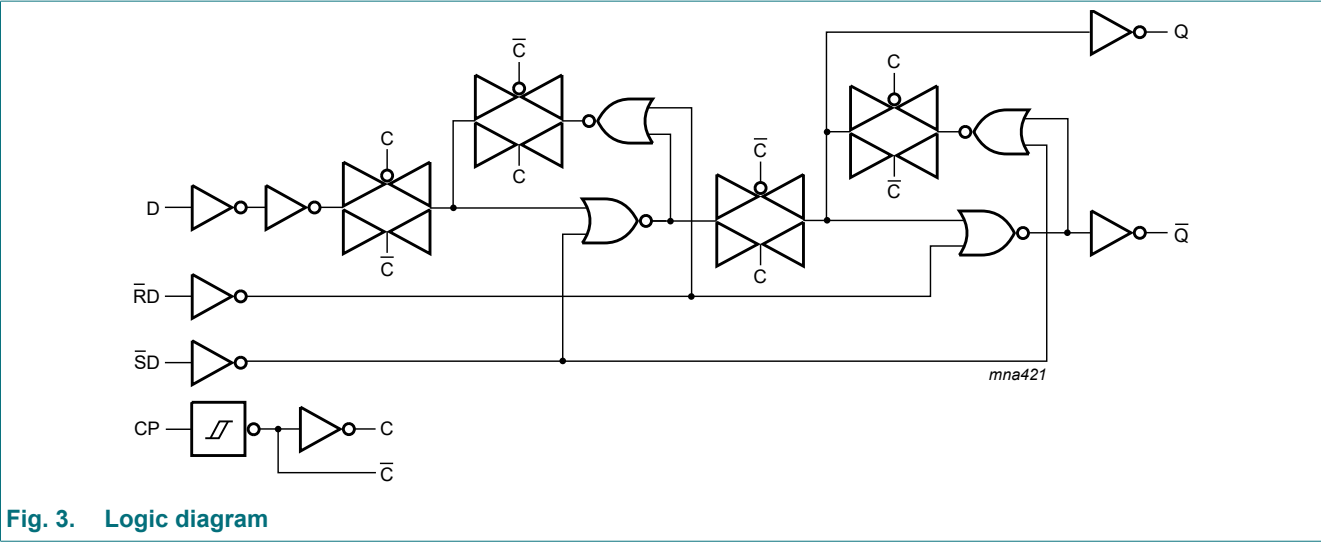
The logic symbol for the 74LVC2G74 flip-flop is a rectangular block. It has two inputs on the left: 'D' and 'CP'. The 'D' input is connected to a buffer 'D' inside the block. The 'CP' input is connected to a buffer 'CP' inside the block. There are two outputs on the right: 'Q' and 'Q-bar'. Inside the block, there is a 'FF' (flip-flop) symbol and a 'RD' (reset) input at the bottom. The 'RD' input is connected to a buffer 'RD' inside the block. The symbol is labeled '001aah725' at the bottom right.

Fig. 1. Logic symbol



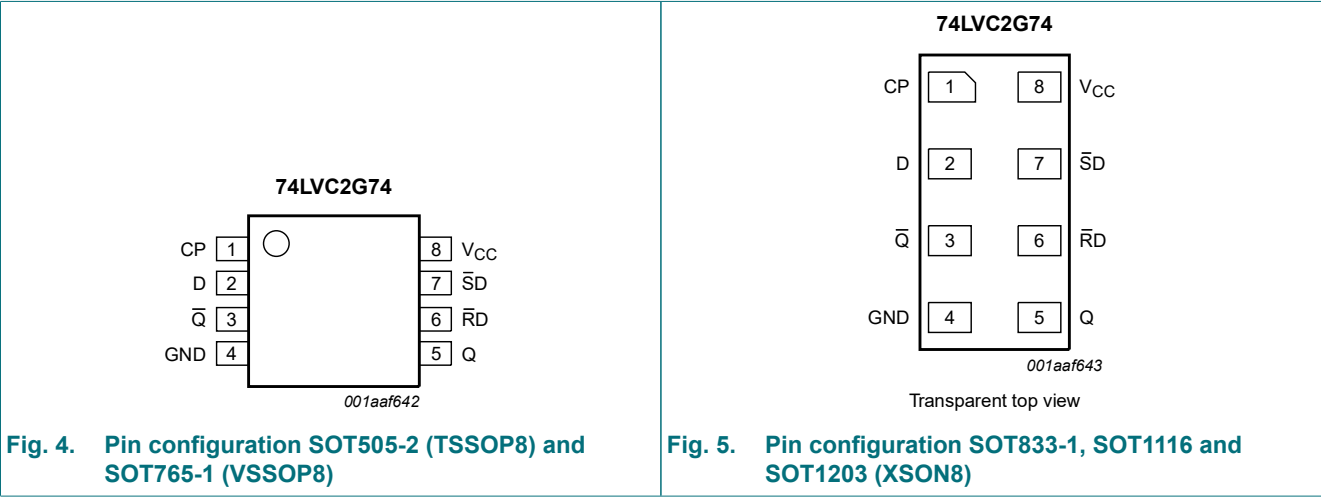
The IEC logic symbol for the 74LVC2G74 flip-flop is a rectangular block. It has three inputs on the left: 'S' (set), 'C1' (clock), and '1D' (data). There are two outputs on the right: 'Q' and 'Q-bar'. Inside the block, there is a 'R' (reset) input at the bottom. The symbol is labeled '001aah726' at the bottom right.

Fig. 2. IEC logic symbol



6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

Symbol	Pin	Description
CP	1	clock input (LOW-to-HIGH, edge-triggered)
D	2	data input
$\bar{Q}$	3	complement output
GND	4	ground (0 V)
Q	5	true output
$\bar{RD}$	6	asynchronous reset-direct input (active LOW)
$\bar{SD}$	7	asynchronous set-direct input (active LOW)
V_{CC}	8	supply voltage

7. Functional description

Table 4. Function table for asynchronous operation

H = HIGH voltage level; L = LOW voltage level; X = don't care.

Input				Output	
SD	RD	CP	D	Q	Q̄
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H	H

Table 5. Function table for synchronous operation

H = HIGH voltage level; L = LOW voltage level; ↑ = LOW-to-HIGH CP transition;
Q_{n+1} = state after the next LOW-to-HIGH CP transition.

Input				Output	
SD	RD	CP	D	Q _{n+1}	Q̄ _{n+1}
H	H	↑	L	L	H
H	H	↑	H	H	L

8. Limiting values

Table 6. 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	+6.5	V
I _{IK}	input clamping current	V _I < 0 V	-50	-	mA
V _I	input voltage	[1]	-0.5	+6.5	V
I _{OK}	output clamping current	V _O > V _{CC} or V _O < 0 V	-	±50	mA
V _O	output voltage	Active mode [1]	-0.5	V _{CC} + 0.5	V
		Power-down mode; V _{CC} = 0 V [1]	-0.5	+6.5	V
I _O	output current	V _O = 0 V to V _{CC}	-	±50	mA
I _{CC}	supply current		-	100	mA
I _{GND}	ground current		-100	-	mA
P _{tot}	total power dissipation	T _{amb} = -40 °C to +125 °C [2]	-	250	mW
T _{stg}	storage temperature		-65	+150	°C

- [1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
[2] For SOT505-2 (TSSOP8) package: P_{tot} derates linearly with 4.6 mW/K above 96 °C.
For SOT765-1 (VSSOP8) package: P_{tot} derates linearly with 4.9 mW/K above 99 °C.
For SOT833-1 (XSON8) package: P_{tot} derates linearly with 3.1 mW/K above 68 °C.
For SOT1116 (XSON8) package: P_{tot} derates linearly with 4.2 mW/K above 90 °C.
For SOT1203 (XSON8) package: P_{tot} derates linearly with 3.6 mW/K above 81 °C.

9. Recommended operating conditions

Table 7. Operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	supply voltage		1.65	5.5	V
V_I	input voltage		0	5.5	V
V_O	output voltage	Active mode	0	V_{CC}	V
		Power-down mode; $V_{CC} = 0$ V	0	5.5	V
T_{amb}	ambient temperature		-40	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 1.65$ V to 2.7 V	-	20	ns/V
		$V_{CC} = 2.7$ V to 5.5 V	-	10	ns/V

10. Static characteristics

Table 8. Static characteristics

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

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	
V_{IH}	HIGH-level input voltage	$V_{CC} = 1.65$ V to 1.95 V	$0.65V_{CC}$	-	-	$0.65V_{CC}$	-	V
		$V_{CC} = 2.3$ V to 2.7 V	1.7	-	-	1.7	-	V
		$V_{CC} = 2.7$ V to 3.6 V	2.0	-	-	2.0	-	V
		$V_{CC} = 4.5$ V to 5.5 V	$0.7V_{CC}$	-	-	$0.7V_{CC}$	-	V
V_{IL}	LOW-level input voltage	$V_{CC} = 1.65$ V to 1.95 V	-	-	$0.35V_{CC}$	-	$0.35V_{CC}$	V
		$V_{CC} = 2.3$ V to 2.7 V	-	-	0.7	-	0.7	V
		$V_{CC} = 2.7$ V to 3.6 V	-	-	0.8	-	0.8	V
		$V_{CC} = 4.5$ V to 5.5 V	-	-	$0.3V_{CC}$	-	$0.3V_{CC}$	V
V_{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL}						
		$I_O = -100$ μ A; $V_{CC} = 1.65$ V to 5.5 V	$V_{CC} - 0.1$	-	-	$V_{CC} - 0.1$	-	V
		$I_O = -4$ mA; $V_{CC} = 1.65$ V	1.2	1.54	-	0.95	-	V
		$I_O = -8$ mA; $V_{CC} = 2.3$ V	1.9	2.15	-	1.7	-	V
		$I_O = -12$ mA; $V_{CC} = 2.7$ V	2.2	2.50	-	1.9	-	V
		$I_O = -24$ mA; $V_{CC} = 3.0$ V	2.3	2.62	-	2.0	-	V
		$I_O = -32$ mA; $V_{CC} = 4.5$ V	3.8	4.11	-	3.4	-	V
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}						
		$I_O = 100$ μ A; $V_{CC} = 1.65$ V to 5.5 V	-	-	0.10	-	0.10	V
		$I_O = 4$ mA; $V_{CC} = 1.65$ V	-	0.07	0.45	-	0.70	V
		$I_O = 8$ mA; $V_{CC} = 2.3$ V	-	0.12	0.30	-	0.45	V
		$I_O = 12$ mA; $V_{CC} = 2.7$ V	-	0.17	0.40	-	0.60	V
		$I_O = 24$ mA; $V_{CC} = 3.0$ V	-	0.33	0.55	-	0.80	V
		$I_O = 32$ mA; $V_{CC} = 4.5$ V	-	0.39	0.55	-	0.80	V

Single D-type flip-flop with set and reset; positive edge trigger

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	
I_I	input leakage current	$V_I = 5.5 \text{ V}$ or GND; $V_{CC} = 0 \text{ V}$ to 5.5 V	-	± 0.1	± 1	-	± 1	μA
I_{OFF}	power-off leakage current	V_I or $V_O = 5.5 \text{ V}$; $V_{CC} = 0 \text{ V}$	-	± 0.1	± 2	-	± 2	μA
I_{CC}	supply current	$V_I = 5.5 \text{ V}$ or GND; $V_{CC} = 1.65 \text{ V}$ to 5.5 V ; $I_O = 0 \text{ A}$	-	0.1	4	-	4	μA
ΔI_{CC}	additional supply current	per pin; $V_I = V_{CC} - 0.6 \text{ V}$; $I_O = 0 \text{ A}$; $V_{CC} = 2.3 \text{ V}$ to 5.5 V	-	5	500	-	500	μA
C_I	input capacitance		-	4.0	-	-	-	pF

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

11. Dynamic characteristics

Table 9. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 8.

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	
t_{pd}	propagation delay	CP to Q, $\bar{Q}$; see Fig. 6 [2]						
		$V_{CC} = 1.65 \text{ V}$ to 1.95 V	1.5	6.0	13.4	1.5	13.4	ns
		$V_{CC} = 2.3 \text{ V}$ to 2.7 V	1.0	3.5	7.1	1.0	7.1	ns
		$V_{CC} = 2.7 \text{ V}$	1.0	3.5	7.1	1.0	7.1	ns
		$V_{CC} = 3.0 \text{ V}$ to 3.6 V	1.0	3.5	5.9	1.0	5.9	ns
		$V_{CC} = 4.5 \text{ V}$ to 5.5 V	1.0	2.5	4.1	1.0	4.1	ns
		$\bar{S}D$ to Q, $\bar{Q}$; see Fig. 7 [2]						
		$V_{CC} = 1.65 \text{ V}$ to 1.95 V	1.5	6.0	12.9	1.5	12.9	ns
		$V_{CC} = 2.3 \text{ V}$ to 2.7 V	1.0	3.5	7.0	1.0	7.0	ns
		$V_{CC} = 2.7 \text{ V}$	1.0	3.5	7.0	1.0	7.0	ns
		$V_{CC} = 3.0 \text{ V}$ to 3.6 V	1.0	3.0	5.9	1.0	5.9	ns
		$V_{CC} = 4.5 \text{ V}$ to 5.5 V	1.0	2.5	4.1	1.0	4.1	ns
		$\bar{R}D$ to Q, $\bar{Q}$; see Fig. 7 [2]						
		$V_{CC} = 1.65 \text{ V}$ to 1.95 V	1.5	5.0	12.9	1.5	12.9	ns
		$V_{CC} = 2.3 \text{ V}$ to 2.7 V	1.0	3.5	7.0	1.0	7.0	ns
		$V_{CC} = 2.7 \text{ V}$	1.0	3.5	7.0	1.0	7.0	ns
		$V_{CC} = 3.0 \text{ V}$ to 3.6 V	1.0	3.0	5.9	1.0	5.9	ns
		$V_{CC} = 4.5 \text{ V}$ to 5.5 V	1.0	2.5	4.1	1.0	4.1	ns

Single D-type flip-flop with set and reset; positive edge trigger

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	
t_W	pulse width	CP HIGH or LOW; see Fig. 6						
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	6.2	-	-	6.2	-	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	2.7	-	-	2.7	-	ns
		$V_{CC} = 2.7 \text{ V}$	2.7	-	-	2.7	-	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	2.7	1.3	-	2.7	-	ns
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	2.0	-	-	2.0	-	ns
		SD and RD LOW; see Fig. 7						
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	6.2	-	-	6.2	-	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	2.7	-	-	2.7	-	ns
		$V_{CC} = 2.7 \text{ V}$	2.7	-	-	2.7	-	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	2.7	1.6	-	2.7	-	ns
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	2.0	-	-	2.0	-	ns
t_{rec}	recovery time	SD or RD; see Fig. 7						
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	1.9	-	-	1.9	-	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	1.4	-	-	1.4	-	ns
		$V_{CC} = 2.7 \text{ V}$	1.3	-	-	1.3	-	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	+1.2	-3.0	-	+1.2	-	ns
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	1.0	-	-	1.0	-	ns
t_{su}	set-up time	D to CP; see Fig. 6						
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	2.9	-	-	2.9	-	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	1.7	-	-	1.7	-	ns
		$V_{CC} = 2.7 \text{ V}$	1.7	-	-	1.7	-	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	1.3	0.5	-	1.3	-	ns
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	1.1	-	-	1.1	-	ns
t_h	hold time	D to CP; see Fig. 6						
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	1.5	-	-	1.5	-	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	1.0	-	-	1.0	-	ns
		$V_{CC} = 2.7 \text{ V}$	1.0	-	-	1.0	-	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	1.0	0.6	-	1.0	-	ns
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	1.0	-	-	1.0	-	ns
f_{max}	maximum frequency	CP; see Fig. 6						
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	80	-	-	80	-	MHz
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	175	-	-	175	-	MHz
		$V_{CC} = 2.7 \text{ V}$	175	-	-	175	-	MHz
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	175	280	-	175	-	MHz
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	200	-	-	200	-	MHz
C_{PD}	power dissipation capacitance	$V_I = \text{GND to } V_{CC}; V_{CC} = 3.3 \text{ V}$ [3]	-	15	-	-	-	pF

[1] Typical values are measured at $T_{amb} = 25 \text{ °C}$ and $V_{CC} = 1.8 \text{ V}, 2.5 \text{ V}, 2.7 \text{ V}, 3.3 \text{ V}$ and 5.0 V respectively.

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

[3] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

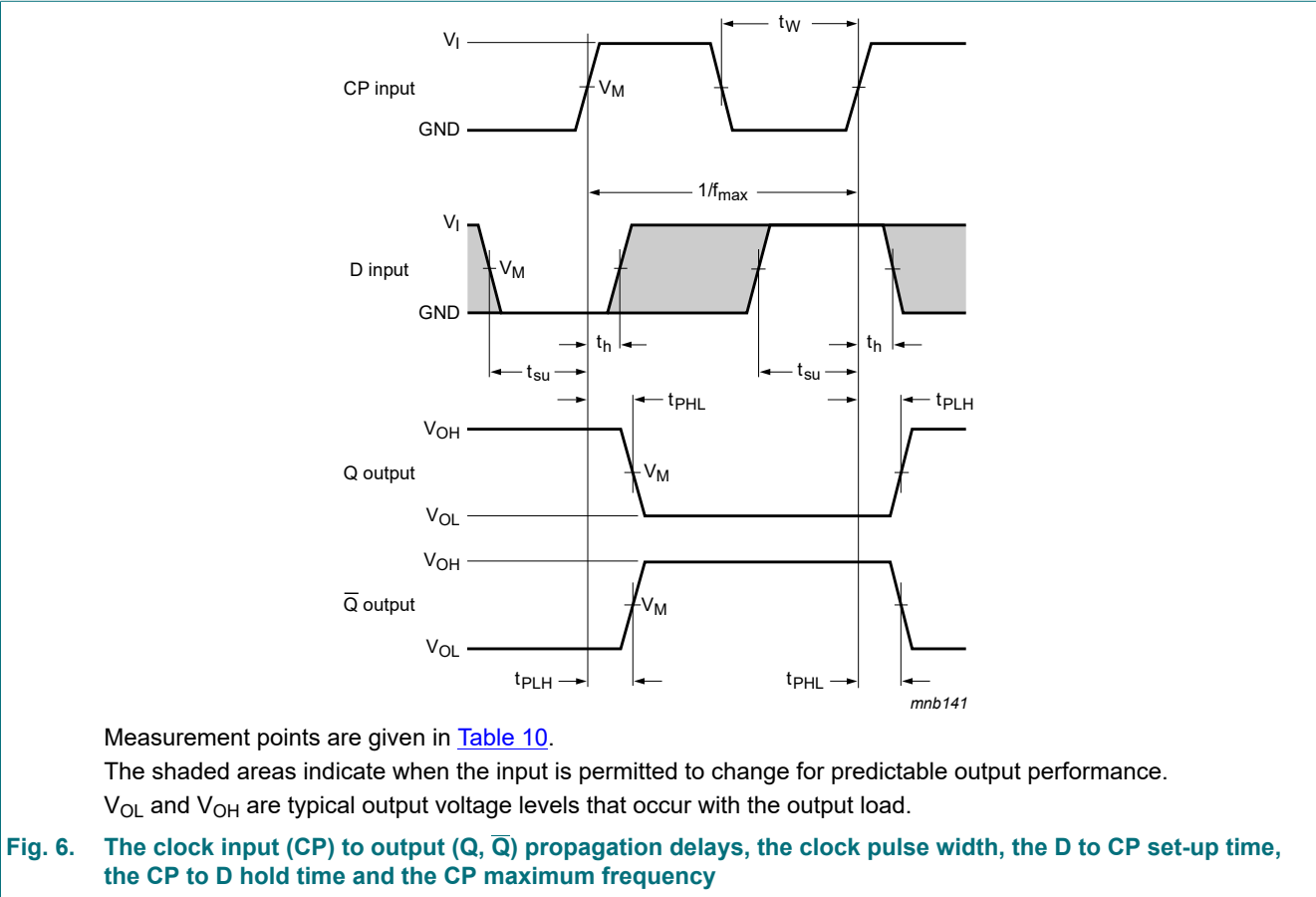
$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum (C_L \times V_{CC}^2 \times f_o)$ where:

f_i = input frequency in MHz; f_o = output frequency in MHz;

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

N = number of inputs switching; $\sum (C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

11.1. Waveforms and test circuit



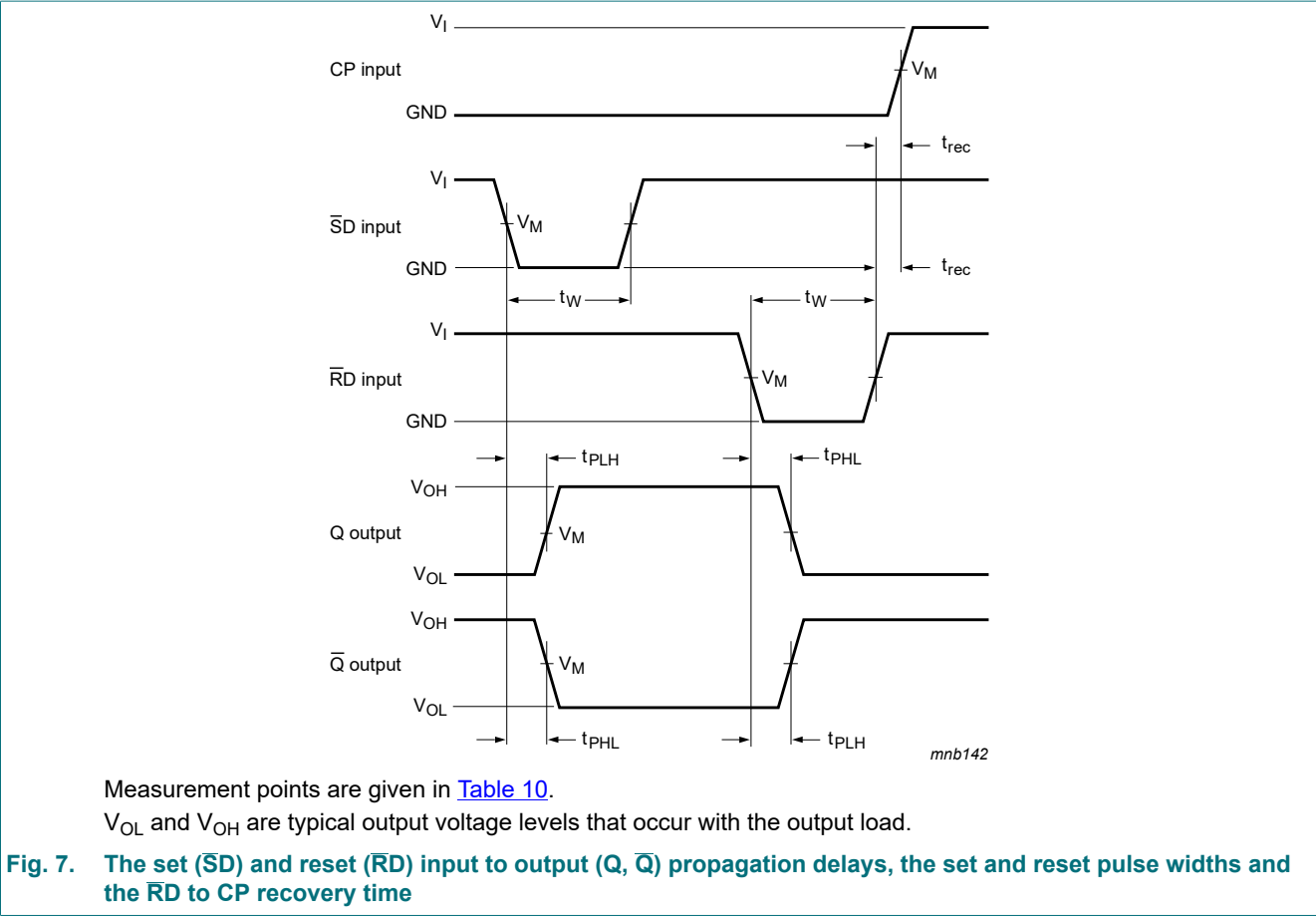


Table 10. Measurement points

Supply voltage	Input	Output
V _{CC}	V _M	V _M
1.65 V to 1.95 V	0.5 × V _{CC}	0.5 × V _{CC}
2.3 V to 2.7 V	0.5 × V _{CC}	0.5 × V _{CC}
2.7 V	1.5 V	1.5 V
3.0 V to 3.6 V	1.5 V	1.5 V
4.5 V to 5.5 V	0.5 × V _{CC}	0.5 × V _{CC}

Single D-type flip-flop with set and reset; positive edge trigger

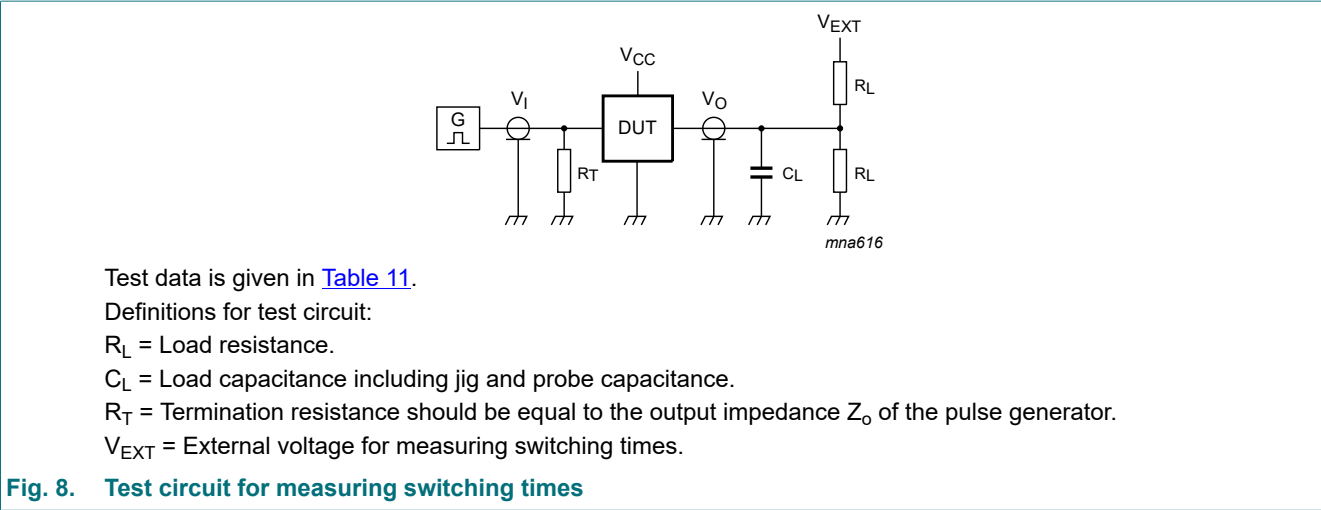


Table 11. Test data

Supply voltage	Input		Load		V_{EXT}		
V_{CC}	V_I	t_r, t_f	C_L	R_L	t_{PLH}, t_{PHL}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ}
1.65 V to 1.95 V	V_{CC}	≤ 2.0 ns	30 pF	1 k Ω	open	GND	$2V_{CC}$
2.3 V to 2.7 V	V_{CC}	≤ 2.0 ns	30 pF	500 Ω	open	GND	$2V_{CC}$
2.7 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open	GND	6 V
3.0 V to 3.6 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open	GND	6 V
4.5 V to 5.5 V	V_{CC}	≤ 2.5 ns	50 pF	500 Ω	open	GND	$2V_{CC}$

12. Package outline

TSSOP8: plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm SOT505-2

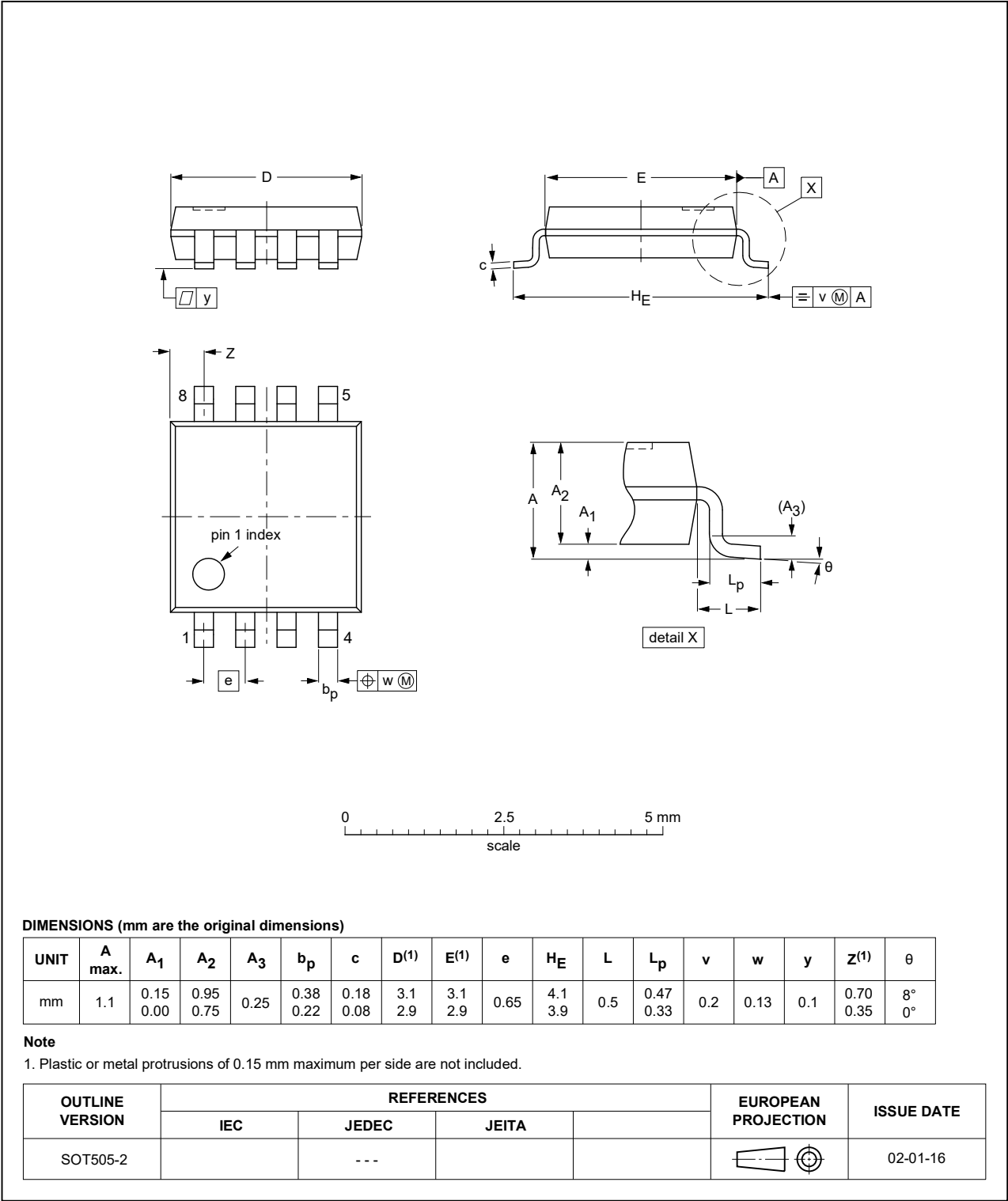


Fig. 9. Package outline SOT505-2 (TSSOP8)

VSSOP8: plastic very thin shrink small outline package; 8 leads; body width 2.3 mm

SOT765-1

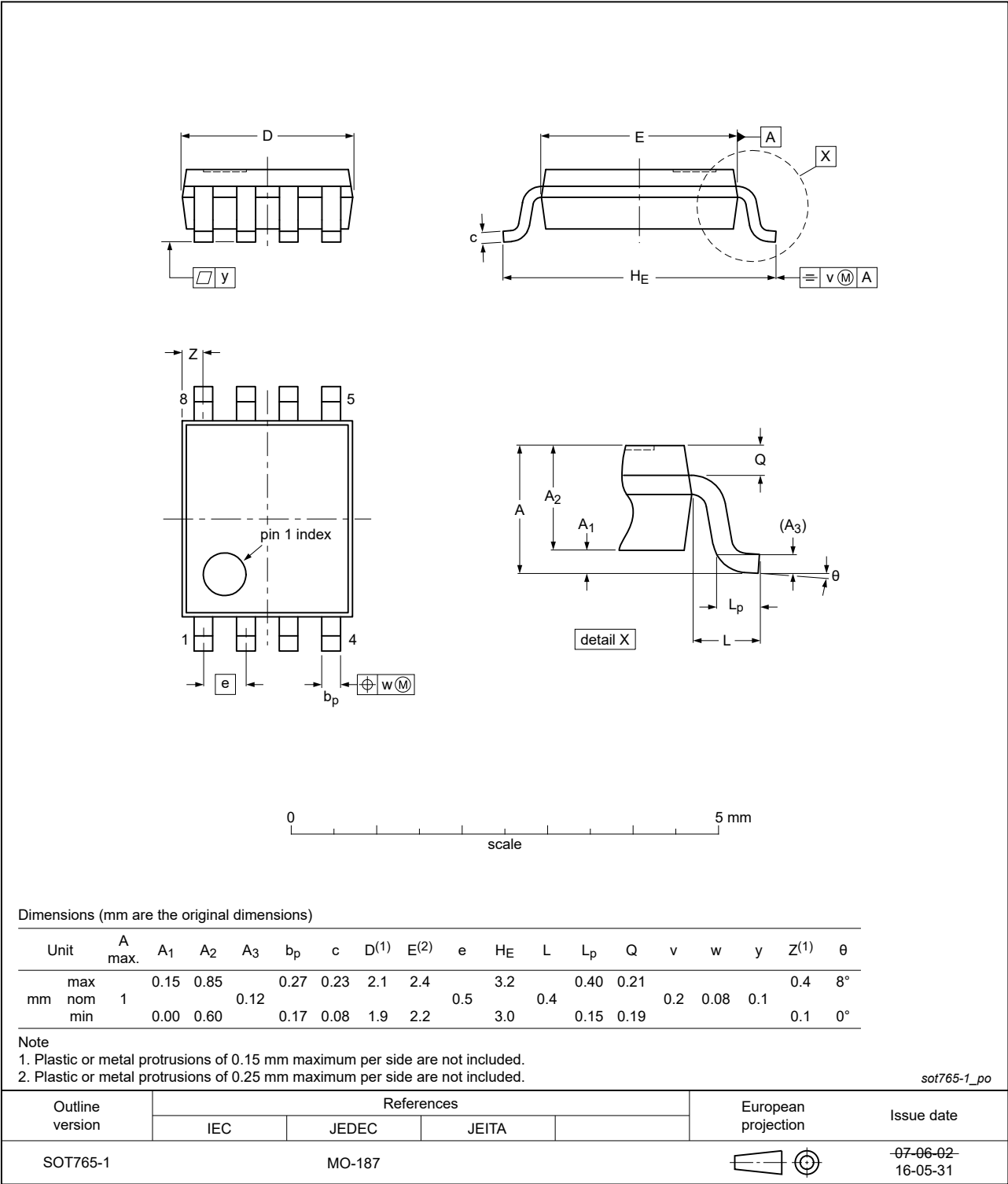


Fig. 10. Package outline SOT765-1 (VSSOP8)

XSON8: plastic extremely thin small outline package; no leads; 8 terminals; body 1 x 1.95 x 0.5 mm

SOT833-1

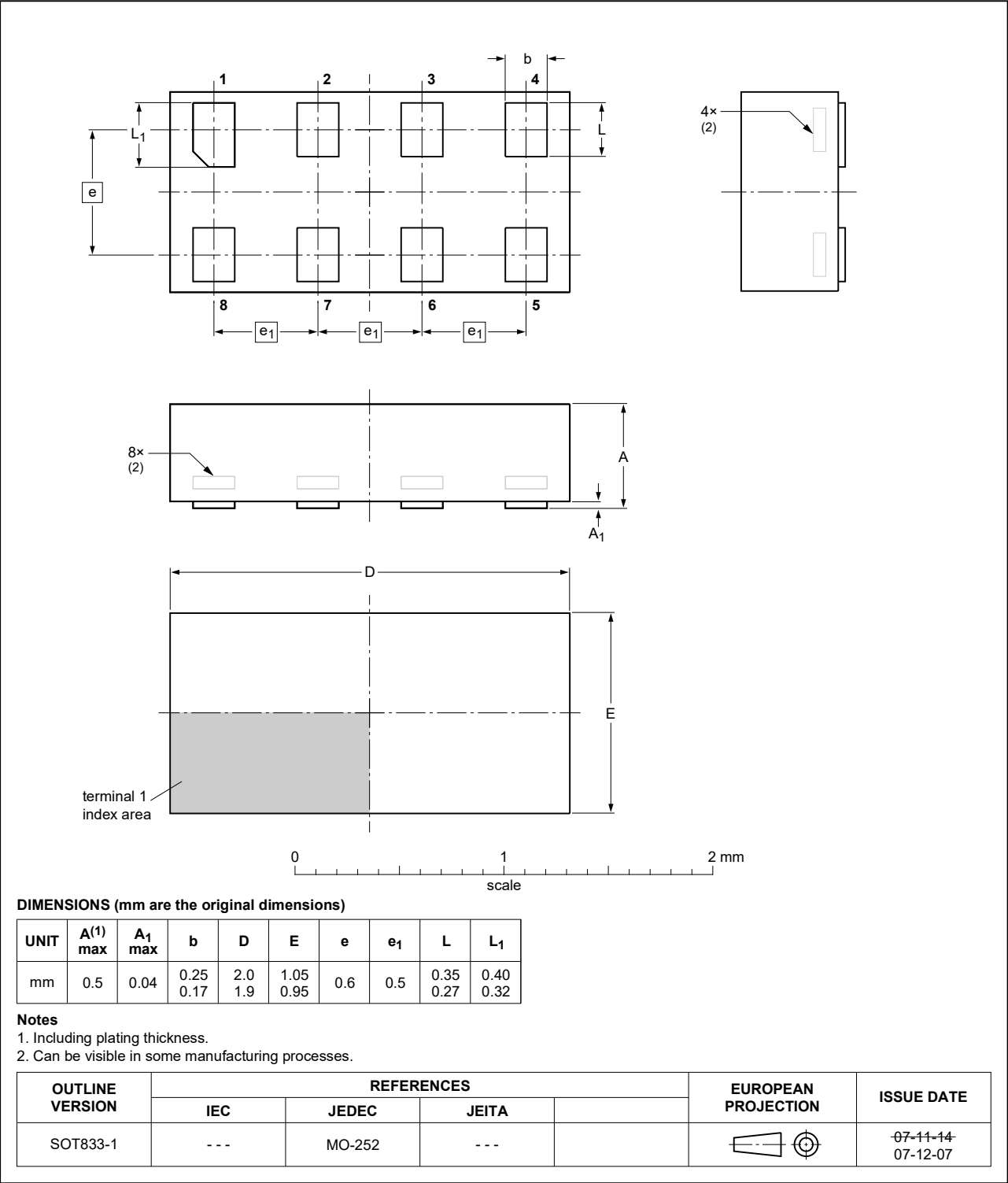


Fig. 11. Package outline SOT833-1 (XSON8)

XSON8: extremely thin small outline package; no leads;
8 terminals; body 1.2 x 1.0 x 0.35 mm

SOT1116

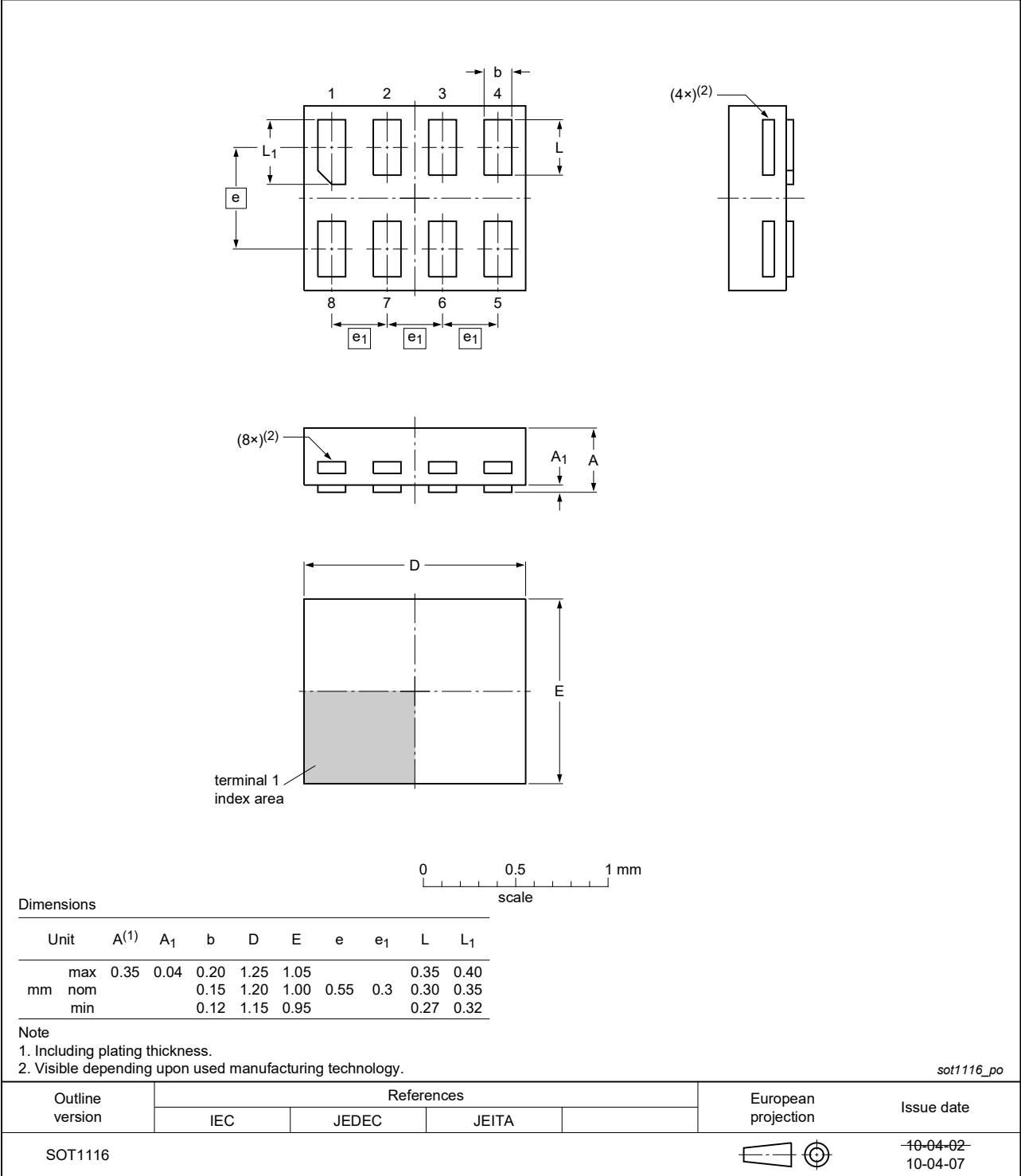


Fig. 12. Package outline SOT1116 (XSON8)

XSON8: extremely thin small outline package; no leads;
8 terminals; body 1.35 x 1.0 x 0.35 mm

SOT1203

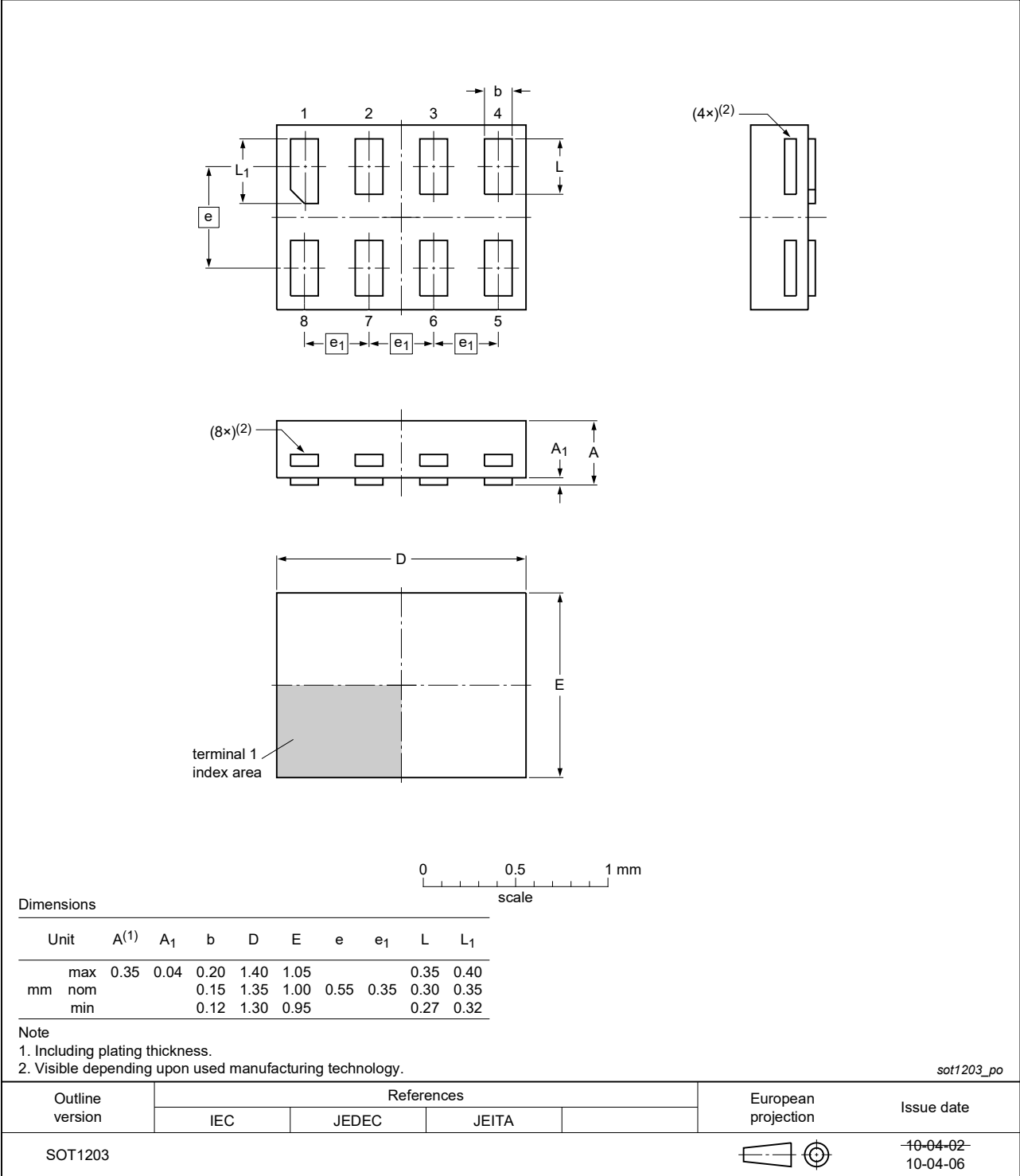


Fig. 13. Package outline SOT1203 (XSON8)

13. Abbreviations

Table 12. Abbreviations

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

14. Revision history

Table 13. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVC2G74 v.15	20230822	Product data sheet	-	74LVC2G74 v.14
Modifications:	Section 2: ESD specification updated according to the latest JEDEC standard.			
74LVC2G74 v.14	20210827	Product data sheet	-	74LVC2G74 v.13
Modifications:	Type number 74LVC2G74GM (SOT902-2/XQFN8) removed.			
74LVC2G74 v.13	20210421	Product data sheet	-	74LVC2G74 v.12
Modifications:	- Type number 74LVC2G74GF (SOT1089 / XSON8) removed. Section 1 and Section 2 updated. Section 8: P_{tot} total power dissipation and it's derating values updated.			
74LVC2G74 v.12	20181003	Product data sheet	-	74LVC2G74 v.11
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 74LVC2G74GD (SOT996-2) removed.			
74LVC2G74 v.11	20161215	Product data sheet	-	74LVC2G74 v.10
Modifications:	Table 8: The maximum limits for leakage current and supply current have changed.			
74LVC2G74 v.10	20130402	Product data sheet	-	74LVC2G74 v.9
Modifications:	For type number 74LVC2G74GD XSON8U has changed to XSON8.			
74LVC2G74 v.9	20120522	Product data sheet	-	74LVC2G74 v.8
Modifications:	For type number 74LVC2G74GM the sot code has changed to SOT902-2.			
74LVC2G74 v.8	20111128	Product data sheet	-	74LVC2G74 v.7
Modifications:	Legal pages updated.			
74LVC2G74 v.7	20101011	Product data sheet	-	74LVC2G74 v.6
74LVC2G74 v.6	20091223	Product data sheet	-	74LVC2G74 v.5
74LVC2G74 v.5	20080630	Product data sheet	-	74LVC2G74 v.4
74LVC2G74 v.4	20080207	Product data sheet	-	74LVC2G74 v.3
74LVC2G74 v.3	20070809	Product data sheet	-	74LVC2G74 v.2
74LVC2G74 v.2	20061214	Product data sheet	-	74LVC2G74 v.1
74LVC2G74 v.1	20051103	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.
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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- [2] The term 'short data sheet' is explained in section "Definitions".
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