

74LVC1G175

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

Rev. 10 — 27 January 2022

Product data sheet

1. General description

The 74LVC1G175 is a low-power, low-voltage single positive edge triggered D-type flip-flop with individual data (D) input, clock (CP) input, master reset (\overline{MR}) input, and Q output.

The master reset (\overline{MR}) is an asynchronous active LOW input and operates independently of the clock input. Information on the data input is transferred to the Q output on the LOW-to-HIGH transition of the clock pulse. The D input must be stable one set-up time prior to the LOW-to-HIGH clock transition for predictable operation.

The inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of this device in a mixed 3.3 V and 5 V environment.

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.

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

2. Features and benefits

- Wide supply voltage range from 1.65 V to 5.5 V
- High noise immunity
- Overvoltage tolerant inputs to 5.5 V
- ± 24 mA output drive ($V_{CC} = 3.0$ V)
- CMOS low power dissipation
- Direct interface with TTL levels
- I_{OFF} circuitry provides partial Power-down mode operation
- Latch-up performance exceeds 250 mA
- Complies with JEDEC standard:
 - JESD8-7 (1.65 V to 1.95 V)
 - JESD8-5 (2.3 V to 2.7 V)
 - JESD8C (2.7 V to 3.6 V)
 - JESD36 (4.5 V to 5.5 V)
- ESD protection:
 - HBM JESD22-A114F exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 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			Version
	Temperature range	Name	Description	
74LVC1G175GW	-40 °C to +125 °C	TSSOP6	plastic thin shrink small outline package; 6 leads; body width 1.25 mm	SOT363-2
74LVC1G175GV	-40 °C to +125 °C	SC-74; TSOP6	plastic surface-mounted package; 6 leads	SOT457
74LVC1G175GM	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886
74LVC1G175GN	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 0.9 × 1.0 × 0.35 mm	SOT1115
74LVC1G175GS	-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]
74LVC1G175GW	YT
74LVC1G175GV	V75
74LVC1G175GM	YT
74LVC1G175GN	YT
74LVC1G175GS	YT

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

5. Functional diagram

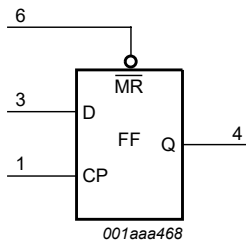


Fig. 1. Logic symbol

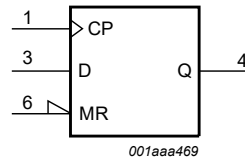


Fig. 2. IEC logic symbol

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

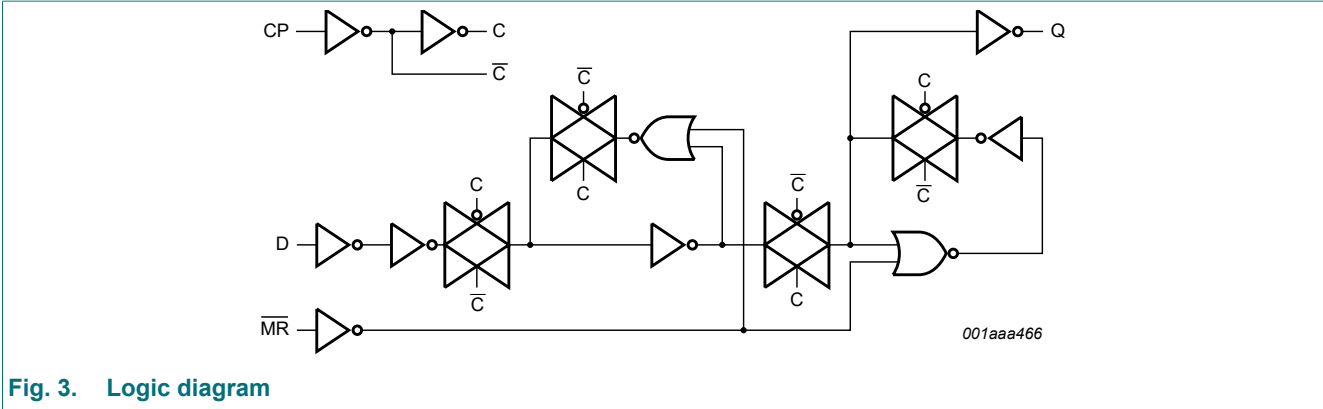


Fig. 3. Logic diagram

6. Pinning information

6.1. Pinning

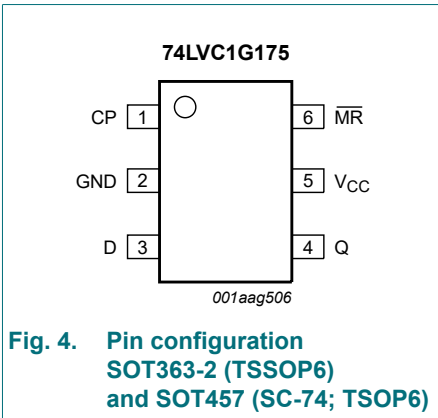


Fig. 4. Pin configuration SOT363-2 (TSSOP6) and SOT457 (SC-74; TSOP6)

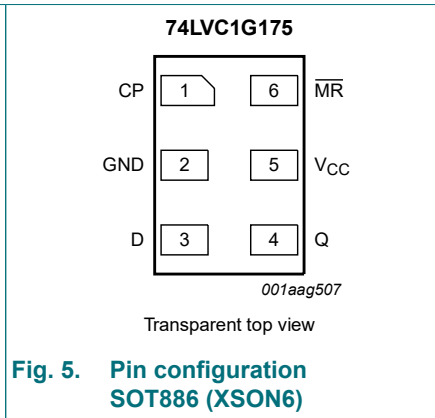


Fig. 5. Pin configuration SOT886 (XSON6)

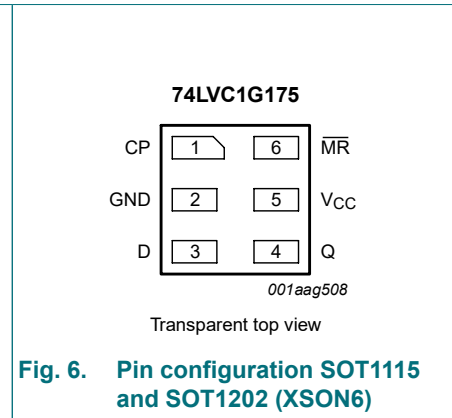


Fig. 6. Pin configuration SOT1115 and SOT1202 (XSON6)

6.2. Pin description

Table 3. Pin description

Symbol	Pin	Description
CP	1	clock input (LOW-to-HIGH, edge-triggered)
GND	2	ground (0 V)
D	3	data input
Q	4	output Q
V _{CC}	5	supply voltage
MR	6	master reset input (active LOW)

7. Functional description

Table 4. Function table

*H = HIGH voltage level; h = HIGH voltage level one set-up time prior to the LOW-to-HIGH CP transition;
L = LOW voltage level; l = LOW voltage level one set-up time prior to the LOW-to-HIGH CP transition;
↑ = LOW-to-HIGH CP transition; X = don't care.*

Operating mode	Input			Output
	MR	CP	D	Q
Reset (clear)	L	X	X	L
Load '1'	H	↑	h	H
Load '0'	H	↑	l	L

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	+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 SOT363-2 (TSSOP6) package: P_{tot} derates linearly with 3.7 mW/K above 83 °C.

For SOT457 (SC-74; TSOP6) package: P_{tot} derates linearly with 4.1 mW/K above 89 °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		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 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} = 1.65 V to 1.95 V	0.65 × V _{CC}	-	-	V
		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 _{CC} = 4.5 V to 5.5 V	0.7 × V _{CC}	-	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 1.65 V to 1.95 V	-	-	0.35 × V _{CC}	V
		V _{CC} = 2.3 V to 2.7 V	-	-	0.7	V
		V _{CC} = 2.7 V to 3.6 V	-	-	0.8	V
		V _{CC} = 4.5 V to 5.5 V	-	-	0.3 × V _{CC}	V
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL}				
		I _O = -100 μA; V _{CC} = 1.65 V to 5.5 V	V _{CC} - 0.1	-	-	V
		I _O = -4 mA; V _{CC} = 1.65 V	1.2	1.54	-	V
		I _O = -8 mA; V _{CC} = 2.3 V	1.9	2.15	-	V
		I _O = -12 mA; V _{CC} = 2.7 V	2.2	2.50	-	V
		I _O = -24 mA; V _{CC} = 3.0 V	2.3	2.62	-	V
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL}				
		I _O = 100 μA; V _{CC} = 1.65 V to 5.5 V	-	-	0.10	V
		I _O = 4 mA; V _{CC} = 1.65 V	-	0.07	0.45	V
		I _O = 8 mA; V _{CC} = 2.3 V	-	0.12	0.30	V
		I _O = 12 mA; V _{CC} = 2.7 V	-	0.17	0.40	V
		I _O = 24 mA; V _{CC} = 3.0 V	-	0.33	0.55	V
I _I	input leakage current	V _{CC} = 0 V to 5.5 V; V _I = 5.5 V or GND [2]	-	±0.1	±1	μA
		V _{CC} = 0 V; V _I or V _O = 5.5 V	-	±0.1	±2	μA
I _{OFF}	power-off leakage current	V _{CC} = 0 V; V _I or V _O = 5.5 V	-	±0.1	±2	μA
I _{CC}	supply current	V _{CC} = 1.65 V to 5.5 V; I _O = 0 A; V _I = 5.5 V or GND	-	0.1	4	μA
ΔI _{CC}	additional supply current	V _{CC} = 2.3 V to 5.5 V; V _I = V _{CC} - 0.6 V; I _O = 0 A [2]	-	5	500	μA
C _I	input capacitance	V _{CC} = 3.3 V; V _I = GND to V _{CC}	-	2.5	-	pF

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

Symbol	Parameter	Conditions	Min	Typ [1]	Max	Unit
T_{amb} = -40 °C to +125 °C						
V _{IH}	HIGH-level input voltage	V _{CC} = 1.65 V to 1.95 V	0.65 × V _{CC}	-	-	V
		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 _{CC} = 4.5 V to 5.5 V	0.7 × V _{CC}	-	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 1.65 V to 1.95 V	-	-	0.35 × V _{CC}	V
		V _{CC} = 2.3 V to 2.7 V	-	-	0.7	V
		V _{CC} = 2.7 V to 3.6 V	-	-	0.8	V
		V _{CC} = 4.5 V to 5.5 V	-	-	0.3 × V _{CC}	V
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL}				
		I _O = -100 μA; V _{CC} = 1.65 V to 5.5 V	V _{CC} - 0.1	-	-	V
		I _O = -4 mA; V _{CC} = 1.65 V	0.95	-	-	V
		I _O = -8 mA; V _{CC} = 2.3 V	1.7	-	-	V
		I _O = -12 mA; V _{CC} = 2.7 V	1.9	-	-	V
		I _O = -24 mA; V _{CC} = 3.0 V	2.0	-	-	V
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL}				
		I _O = 100 μA; V _{CC} = 1.65 V to 5.5 V	-	-	0.10	V
		I _O = 4 mA; V _{CC} = 1.65 V	-	-	0.70	V
		I _O = 8 mA; V _{CC} = 2.3 V	-	-	0.45	V
		I _O = 12 mA; V _{CC} = 2.7 V	-	-	0.60	V
		I _O = 24 mA; V _{CC} = 3.0 V	-	-	0.80	V
I _I	input leakage current	V _{CC} = 0 V to 5.5 V; V _I = 5.5 V or GND	-	-	±1	μA
		V _{CC} = 0 V; V _I or V _O = 5.5 V	-	-	±2	μA
I _{OFF}	power-off leakage current	V _{CC} = 0 V; V _I or V _O = 5.5 V	-	-	±2	μA
I _{CC}	supply current	V _{CC} = 1.65 V to 5.5 V; I _O = 0 A; V _I = 5.5 V or GND	-	-	4	μA
ΔI _{CC}	additional supply current	V _{CC} = 2.3 V to 5.5 V; V _I = V _{CC} - 0.6 V; I _O = 0 A	-	-	500	μA

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

[2] These typical values are measured at V_{CC} = 3.3 V.

11. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 9.

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; see Fig. 7 [2]						
		V _{CC} = 1.65 V to 1.95 V	1.5	4.9	13.4	1.5	17	ns
		V _{CC} = 2.3 V to 2.7 V	1.0	3.1	7.1	1.0	9.0	ns
		V _{CC} = 2.7 V	1.0	3.2	7.1	1.0	9.0	ns
		V _{CC} = 3.0 V to 3.6 V	1.0	3.1	5.7	0.5	7.5	ns
		V _{CC} = 4.5 V to 5.5 V	1.0	2.2	4.0	0.5	5.5	ns
		MR to Q; see Fig. 8						
		V _{CC} = 1.65 V to 1.95 V	1.5	4.3	12.9	1.5	17	ns
		V _{CC} = 2.3 V to 2.7 V	1.0	2.8	7.0	1.0	9.0	ns
		V _{CC} = 2.7 V	1.0	3.0	7.0	1.0	9.0	ns
		V _{CC} = 3.0 V to 3.6 V	1.0	2.5	5.8	0.5	7.5	ns
		V _{CC} = 4.5 V to 5.5 V	1.0	2.0	4.1	0.5	5.5	ns
t _w	pulse width	CP HIGH or LOW; see Fig. 7						
		V _{CC} = 1.65 V to 1.95 V	6.2	-	-	6.2	-	ns
		V _{CC} = 2.3 V to 2.7 V	2.7	-	-	2.7	-	ns
		V _{CC} = 2.7 V	2.7	-	-	2.7	-	ns
		V _{CC} = 3.0 V to 3.6 V	2.7	1.3	-	2.7	-	ns
		V _{CC} = 4.5 V to 5.5 V	2.0	-	-	2.0	-	ns
		MR LOW; see Fig. 8						
		V _{CC} = 1.65 V to 1.95 V	6.2	-	-	6.2	-	ns
		V _{CC} = 2.3 V to 2.7 V	2.7	-	-	2.7	-	ns
		V _{CC} = 2.7 V	2.7	-	-	2.7	-	ns
		V _{CC} = 3.0 V to 3.6 V	2.7	1.6	-	2.7	-	ns
		V _{CC} = 4.5 V to 5.5 V	2.0	-	-	2.0	-	ns
t _{rec}	recovery time	MR; see Fig. 8						
		V _{CC} = 1.65 V to 1.95 V	1.9	-	-	1.9	-	ns
		V _{CC} = 2.3 V to 2.7 V	1.4	-	-	1.4	-	ns
		V _{CC} = 2.7 V	1.3	-	-	1.3	-	ns
		V _{CC} = 3.0 V to 3.6 V	1.2	0.4	-	1.2	-	ns
		V _{CC} = 4.5 V to 5.5 V	1.0	-	-	1.0	-	ns
t _{su}	set-up time	D to CP; see Fig. 7						
		V _{CC} = 1.65 V to 1.95 V	2.9	-	-	2.9	-	ns
		V _{CC} = 2.3 V to 2.7 V	1.7	-	-	1.7	-	ns
		V _{CC} = 2.7 V	1.7	-	-	1.7	-	ns
		V _{CC} = 3.0 V to 3.6 V	1.3	0.5	-	1.3	-	ns
		V _{CC} = 4.5 V to 5.5 V	1.1	-	-	1.1	-	ns

Single D-type flip-flop with 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 _h	hold time	D to CP; see Fig. 7						
		V _{CC} = 1.65 V to 1.95 V	0.0	-	-	0.0	-	ns
		V _{CC} = 2.3 V to 2.7 V	0.3	-	-	0.3	-	ns
		V _{CC} = 2.7 V	0.5	-	-	0.5	-	ns
		V _{CC} = 3.0 V to 3.6 V	1.2	0.2	-	1.2	-	ns
		V _{CC} = 4.5 V to 5.5 V	0.5	-	-	0.5	-	ns
f _{max}	maximum frequency	CP; see Fig. 7						
		V _{CC} = 1.65 V to 1.95 V	80	125	-	80	-	MHz
		V _{CC} = 2.3 V to 2.7 V	175	-	-	175	-	MHz
		V _{CC} = 2.7 V	175	-	-	175	-	MHz
		V _{CC} = 3.0 V to 3.6 V	175	300	-	175	-	MHz
		V _{CC} = 4.5 V to 5.5 V	200	-	-	200	-	MHz
C _{PD}	power dissipation capacitance	V _I = GND to V _{CC} ; V _{CC} = 3.3 V [3]	-	14	-	-	-	pF

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

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

f_i = input frequency in MHz;

f_o = output frequency in MHz;

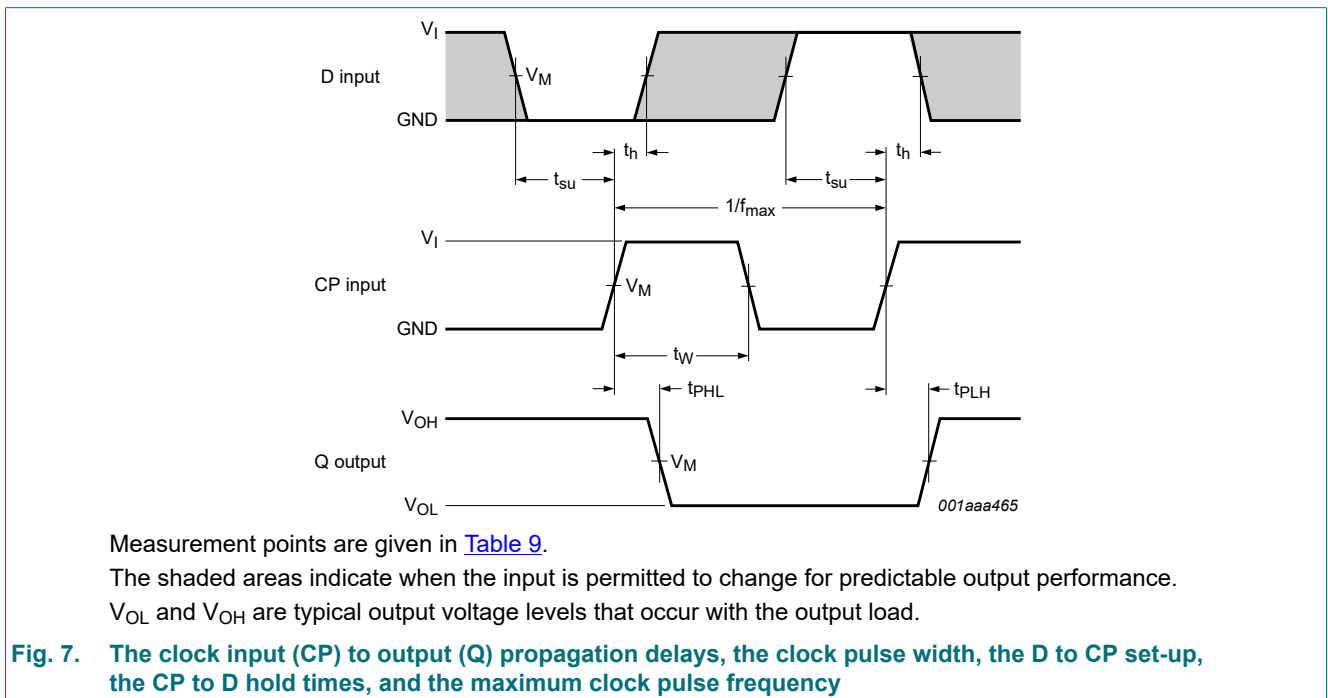
C_L = output load capacitance in pF;

V_{CC} = supply voltage in Volts;

N = number of inputs switching;

∑(C_L × V_{CC}² × f_o) = sum of the outputs.

11.1. Waveforms and test circuit



Measurement points are given in Table 9.

The shaded areas indicate when the input is permitted to change for predictable output performance.

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

Fig. 7. The clock input (CP) to output (Q) propagation delays, the clock pulse width, the D to CP set-up, the CP to D hold times, and the maximum clock pulse frequency

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

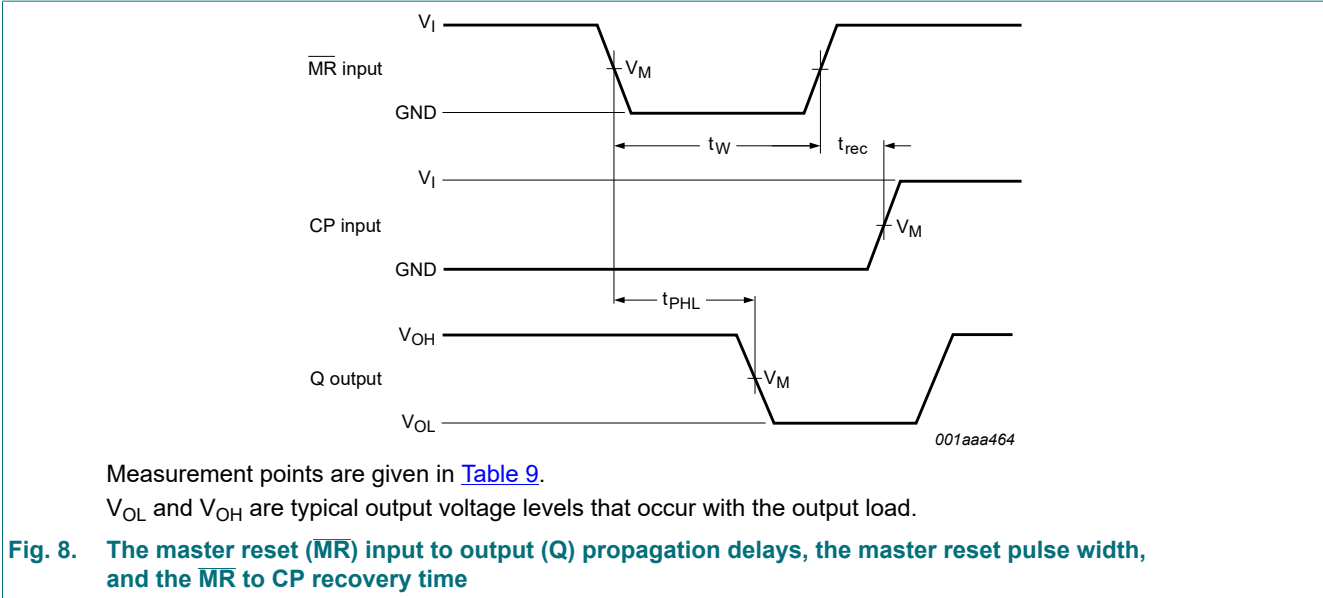


Table 9. Measurement points

Supply voltage	Input	Output
V_{CC}	V_M	V_M
1.65 V to 1.95 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
2.3 V to 2.7 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
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	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$

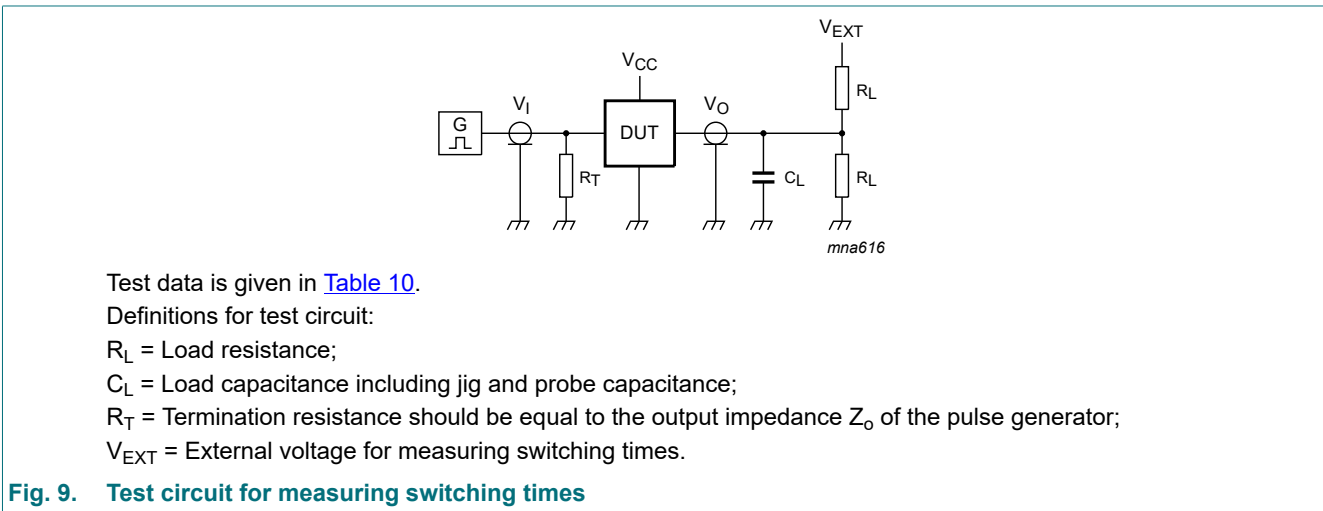


Table 10. Test data

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

12. Package information

12.1. SOT363-2 (TSSOP6) package

TSSOP6: plastic thin shrink small outline package; 6 leads; body width 1.25 mm

SOT363-2

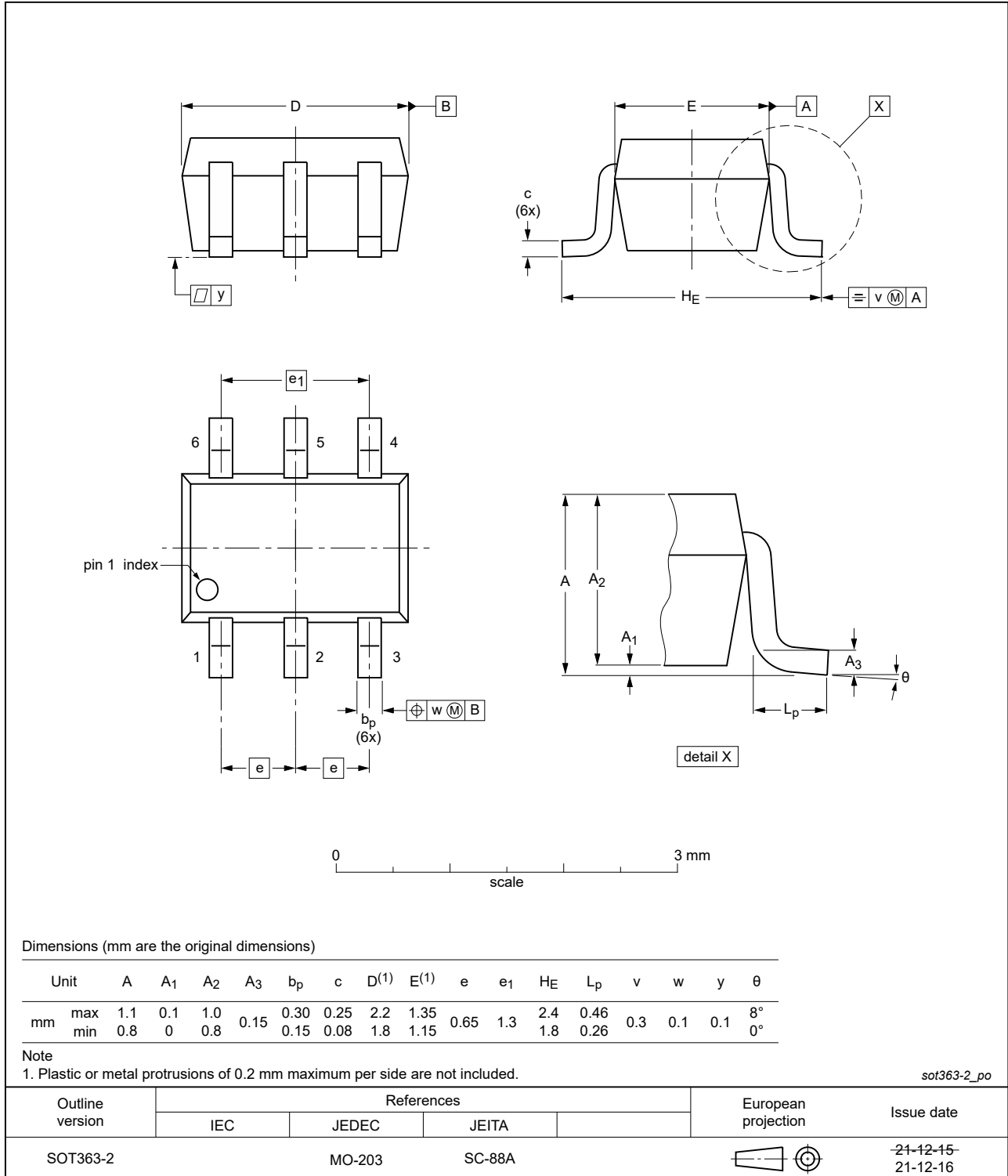


Fig. 10. Package outline SOT363-2 (TSSOP6)

12.2. SOT457 (SC-74; TSOP6) package

Plastic, surface-mounted package (SC-74; TSOP6); 6 leads

SOT457

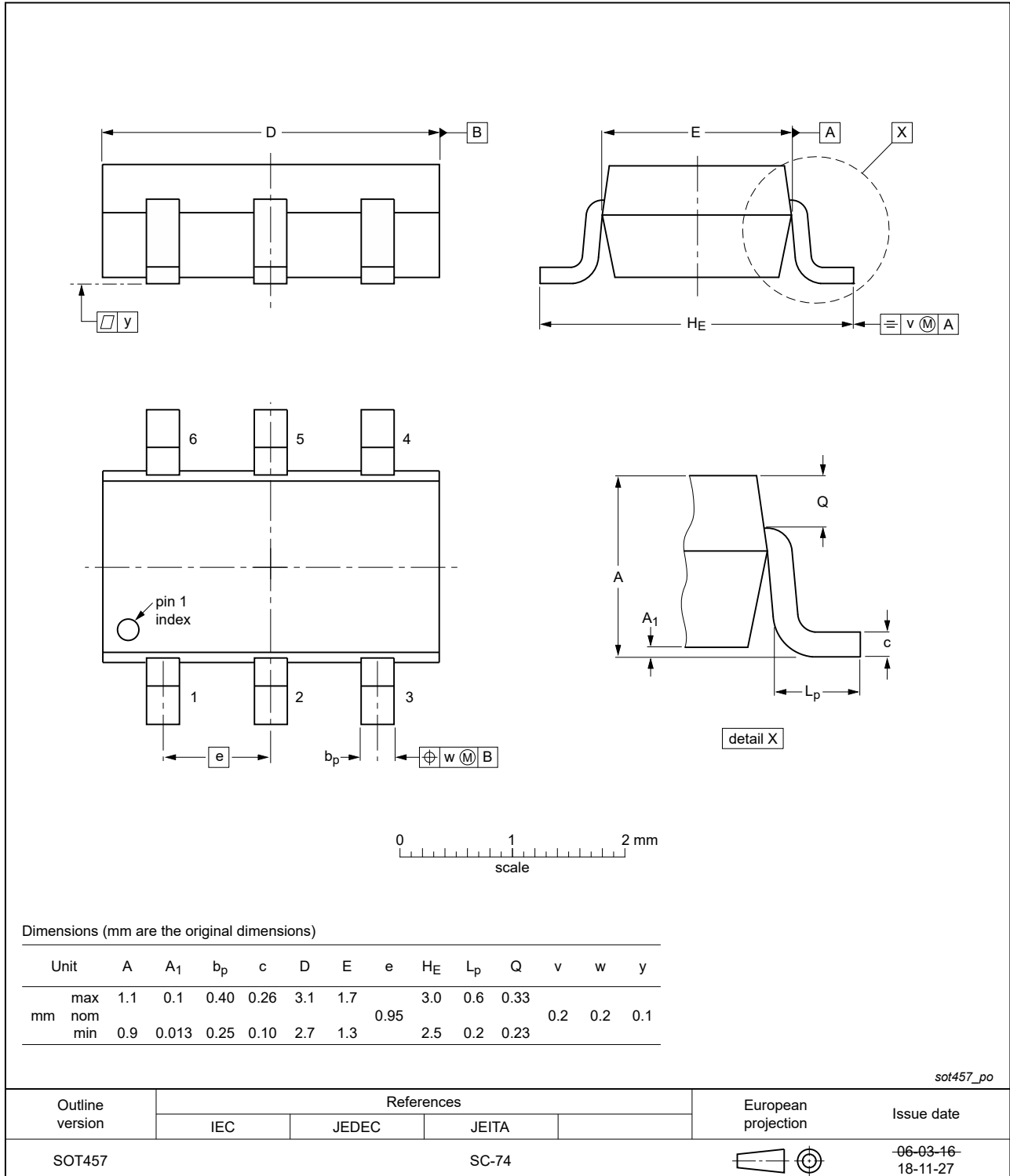


Fig. 11. Package outline SOT457 (SC-74; TSOP6)

12.3. SOT886 (XSON6) package

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

SOT886

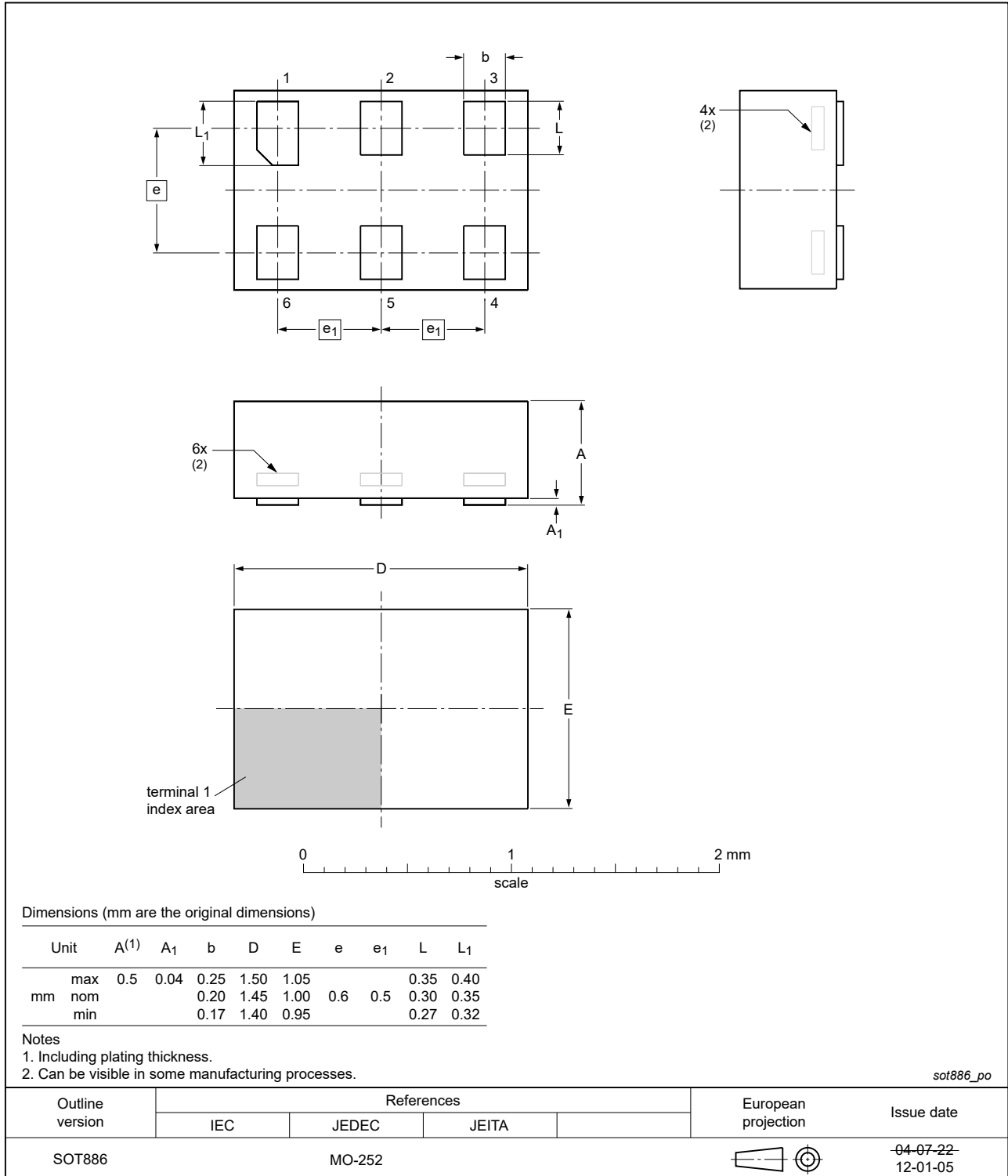


Fig. 12. Package outline SOT886 (XSON6)

12.4. SOT1115 (XSON6) package

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

SOT1115

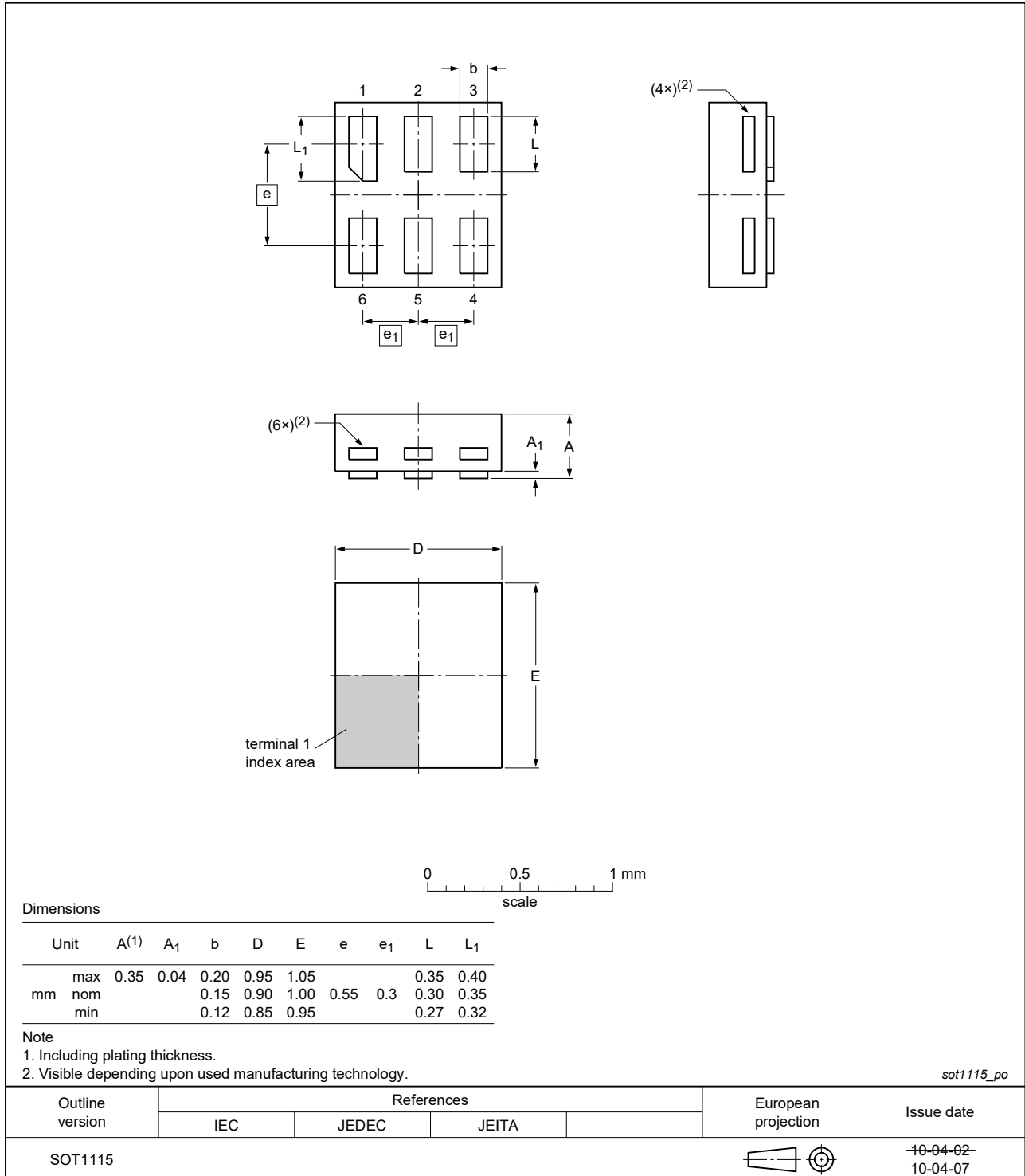
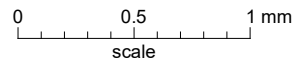
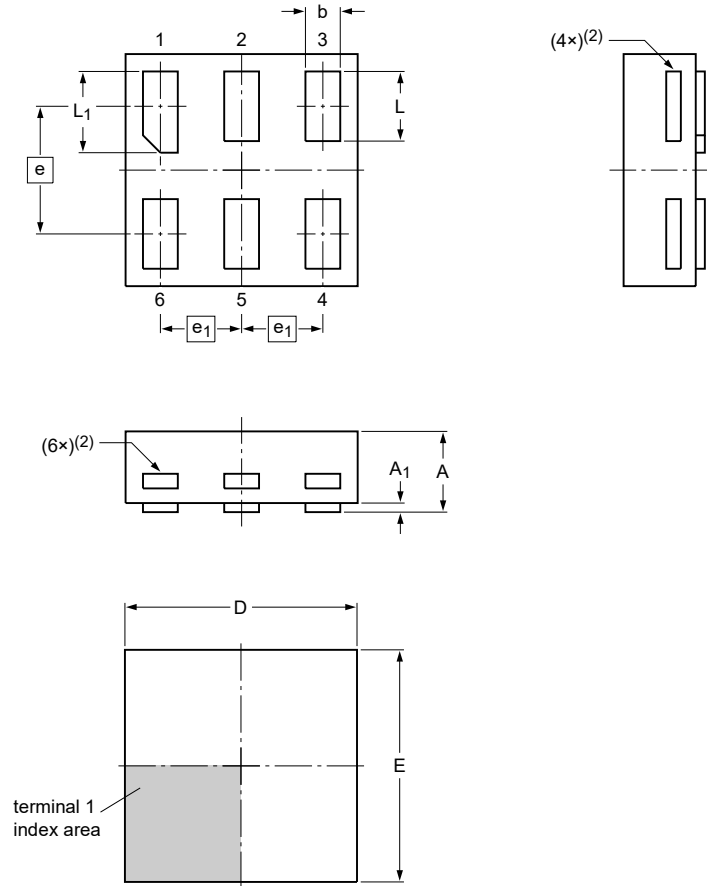


Fig. 13. Package outline SOT1115 (XSON6)

12.5. SOT1202 (XSON6) package

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

SOT1202



Dimensions

Unit	A ⁽¹⁾	A ₁	b	D	E	e	e ₁	L	L ₁
max	0.35	0.04	0.20	1.05	1.05			0.35	0.40
mm	nom		0.15	1.00	1.00	0.55	0.35	0.30	0.35
min			0.12	0.95	0.95			0.27	0.32

Note

- Including plating thickness.
- Visible depending upon used manufacturing technology.

sot1202_po

Outline version	References			European projection	Issue date
	IEC	JEDEC	JEITA		
SOT1202					10-04-02 10-04-06

Fig. 14. Package outline SOT1202 (XSON6)

13. Abbreviations

Table 11. Abbreviations

Acronym	Description
CMOS	Complementary Metal Oxide Semiconductor
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
74LVC1G175 v.10	20220127	Product data sheet	-	74LVC1G175 v.9
Modifications:	<ul style="list-style-type: none"> Package SOT363 (SC-88) changed to SOT363-2 (TSSOP6). 			
74LVC1G175 v.9	20210610	Product data sheet	-	74LVC1G175 v.8
Modifications:	<ul style="list-style-type: none"> Type number 74LVC1G175GF (SOT891 / XSON6) removed. 			
74LVC1G175 v.8	20191003	Product data sheet	-	74LVC1G175 v.7
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. Table 5: Derating values for P_{tot} total power dissipation updated. Package outline drawing SOT457 (SC-74) updated. 			
74LVC1G175 v.7	20161202	Product data sheet	-	74LVC1G175 v.6
Modifications:	<ul style="list-style-type: none"> Table 7: The maximum limits for leakage current and supply current have changed. 			
74LVC1G175 v.6	20131011	Product data sheet	-	74LVC1G175 v.5
Modifications:	<ul style="list-style-type: none"> Package outline drawing of SOT886 (Fig. 12) modified. 			
74LVC1G175 v.5	20111206	Product data sheet	-	74LVC1G175 v.4
Modifications:	<ul style="list-style-type: none"> Legal pages updated. 			
74LVC1G175 v.4	20101004	Product data sheet	-	74LVC1G175 v.3
74LVC1G175 v.3	20070521	Product data sheet	-	74LVC1G175 v.2
74LVC1G175 v.2	20041018	Product specification	-	74LVC1G175 v.1
74LVC1G175 v.1	20040318	Product specification	-	-

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.

- [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>.

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Contents

1. General description	1
2. Features and benefits	1
3. Ordering information	2
4. Marking	2
5. Functional diagram	2
6. Pinning information	3
6.1. Pinning.....	3
6.2. Pin description.....	3
7. Functional description	4
8. Limiting values	4
9. Recommended operating conditions	4
10. Static characteristics	5
11. Dynamic characteristics	7
11.1. Waveforms and test circuit.....	8
12. Package information	10
12.1. SOT363-2 (TSSOP6) package.....	10
12.2. SOT457 (SC-74; TSOP6) package.....	11
12.3. SOT886 (XSON6) package.....	12
12.4. SOT1115 (XSON6) package.....	13
12.5. SOT1202 (XSON6) package.....	14
13. Abbreviations	15
14. Revision history	15
15. Legal information	16

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