

# 74AUP1G14

## Low-power Schmitt trigger inverter

Rev. 6 — 28 June 2012

Product data sheet

### 1. General description

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The 74AUP1G14 provides a single inverting Schmitt trigger which accepts standard input signals. It is capable of transforming slowly changing input signals into sharply defined, jitter-free output signals.

This device ensures a very low static and dynamic power consumption across the entire  $V_{CC}$  range from 0.8 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.

The inputs switch at different points for positive and negative-going signals. The difference between the positive voltage  $V_{T+}$  and the negative voltage  $V_{T-}$  is defined as the input hysteresis voltage  $V_H$ .

### 2. Features and benefits

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- Wide supply voltage range from 0.8 V to 3.6 V
- High noise immunity
- ESD protection:
  - ◆ HBM JESD22-A114F Class 3A exceeds 5000 V
  - ◆ MM JESD22-A115-A exceeds 200 V
  - ◆ CDM JESD22-C101E exceeds 1000 V
- Low static power consumption;  $I_{CC} = 0.9 \mu\text{A}$  (maximum)
- Latch-up performance exceeds 100 mA per JESD 78 Class II
- Inputs accept voltages up to 3.6 V
- Low noise overshoot and undershoot < 10 % of  $V_{CC}$
- $I_{OFF}$  circuitry provides partial Power-down mode operation
- Multiple package options
- Specified from  $-40 \text{ }^\circ\text{C}$  to  $+85 \text{ }^\circ\text{C}$  and  $-40 \text{ }^\circ\text{C}$  to  $+125 \text{ }^\circ\text{C}$

### 3. Applications

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- Wave and pulse shaper
- Astable multivibrator
- Monostable multivibrator



## 4. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
74AUP1G14GW	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1
74AUP1G14GM	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886
74AUP1G14GF	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1 × 0.5 mm	SOT891
74AUP1G14GN	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 0.9 × 1.0 × 0.35 mm	SOT1115
74AUP1G14GS	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 1.0 × 1.0 × 0.35 mm	SOT1202
74AUP1G14GX	-40 °C to +125 °C	X2SON5	X2SON5: plastic thermal enhanced extremely thin small outline package; no leads; 5 terminals; body 0.8 × 0.8 × 0.35 mm	SOT1226

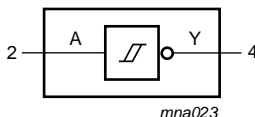
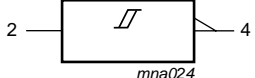
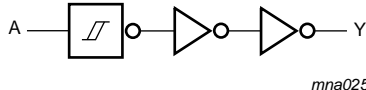
## 5. Marking

Table 2. Marking

Type number	Marking code <sup>[1]</sup>
74AUP1G14GW	pF
74AUP1G14GM	pF
74AUP1G14GF	pF
74AUP1G14GN	pF
74AUP1G14GS	pF
74AUP1G14GX	pF

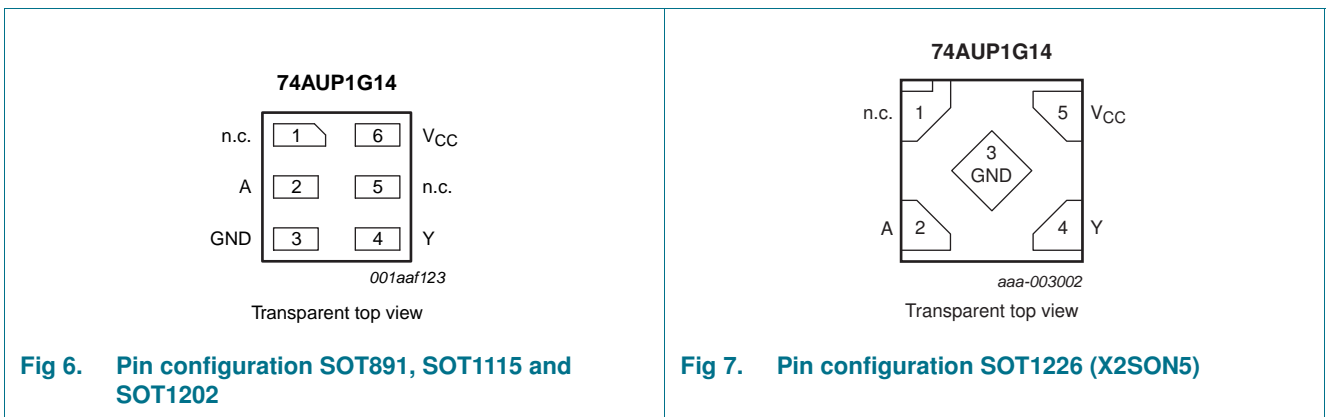
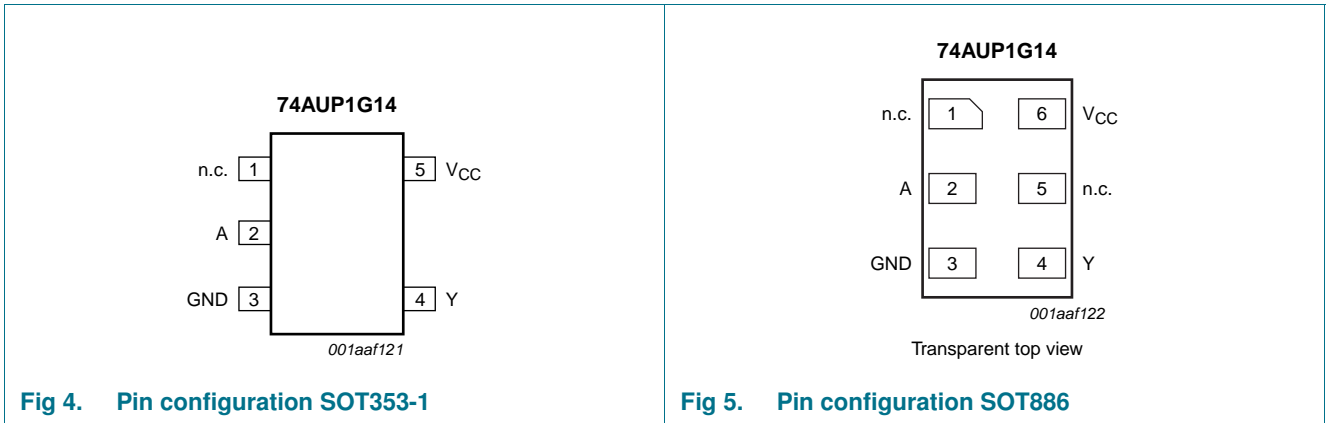
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

## 6. Functional diagram

 <p><i>mna023</i></p>	 <p><i>mna024</i></p>	 <p><i>mna025</i></p>
<b>Fig 1. Logic symbol</b>	<b>Fig 2. IEC logic symbol</b>	<b>Fig 3. Logic diagram</b>

## 7. Pinning information

### 7.1 Pinning



### 7.2 Pin description

**Table 3. Pin description**

Symbol	Pin		Description
	TSSOP5 and X2SON5	XSON6	
n.c.	1	1	not connected
A	2	2	data input
GND	3	3	ground (0 V)
Y	4	4	data output
n.c.	-	5	not connected
V <sub>CC</sub>	5	6	supply voltage

## 8. Functional description

Table 4. Function table<sup>[1]</sup>

Input	Output
<b>A</b>	<b>Y</b>
L	H
H	L

- [1] H = HIGH voltage level;  
L = LOW voltage level.

## 9. 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
$I_{IK}$	input clamping current	$V_I < 0$ V	-50	-	mA
$V_I$	input voltage		<sup>[1]</sup> -0.5	+4.6	V
$I_{OK}$	output clamping current	$V_O < 0$ V	-50	-	mA
$V_O$	output voltage	Active mode and Power-down mode	<sup>[1]</sup> -0.5	+4.6	V
$I_O$	output current	$V_O = 0$ V to $V_{CC}$	-	±20	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	<sup>[2]</sup> -	250	mW

- [1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.  
 [2] For TSSOP5 packages: above 87.5 °C the value of  $P_{tot}$  derates linearly with 4.0 mW/K.  
 For XSON6 and X2SON5 packages: above 118 °C the value of  $P_{tot}$  derates linearly with 7.8 mW/K.

## 10. Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage		0.8	3.6	V
$V_I$	input voltage		0	3.6	V
$V_O$	output voltage	Active mode	0	$V_{CC}$	V
		Power-down mode; $V_{CC} = 0$ V	0	3.6	V
$T_{amb}$	ambient temperature		-40	+125	°C

## 11. Static characteristics

**Table 7. Static characteristics**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>T<sub>amb</sub> = 25 °C</b>						
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>T+</sub> or V <sub>T-</sub>				
		I <sub>O</sub> = -20 µA; V <sub>CC</sub> = 0.8 V to 3.6 V	V <sub>CC</sub> - 0.1	-	-	V
		I <sub>O</sub> = -1.1 mA; V <sub>CC</sub> = 1.1 V	0.75 × V <sub>CC</sub>	-	-	V
		I <sub>O</sub> = -1.7 mA; V <sub>CC</sub> = 1.4 V	1.11	-	-	V
		I <sub>O</sub> = -1.9 mA; V <sub>CC</sub> = 1.65 V	1.32	-	-	V
		I <sub>O</sub> = -2.3 mA; V <sub>CC</sub> = 2.3 V	2.05	-	-	V
		I <sub>O</sub> = -3.1 mA; V <sub>CC</sub> = 2.3 V	1.9	-	-	V
		I <sub>O</sub> = -2.7 mA; V <sub>CC</sub> = 3.0 V	2.72	-	-	V
		I <sub>O</sub> = -4.0 mA; V <sub>CC</sub> = 3.0 V	2.6	-	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>T+</sub> or V <sub>T-</sub>				
		I <sub>O</sub> = 20 µA; V <sub>CC</sub> = 0.8 V to 3.6 V	-	-	0.1	V
		I <sub>O</sub> = 1.1 mA; V <sub>CC</sub> = 1.1 V	-	-	0.3 × V <sub>CC</sub>	V
		I <sub>O</sub> = 1.7 mA; V <sub>CC</sub> = 1.4 V	-	-	0.31	V
		I <sub>O</sub> = 1.9 mA; V <sub>CC</sub> = 1.65 V	-	-	0.31	V
		I <sub>O</sub> = 2.3 mA; V <sub>CC</sub> = 2.3 V	-	-	0.31	V
		I <sub>O</sub> = 3.1 mA; V <sub>CC</sub> = 2.3 V	-	-	0.44	V
		I <sub>O</sub> = 2.7 mA; V <sub>CC</sub> = 3.0 V	-	-	0.31	V
		I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 3.0 V	-	-	0.44	V
I <sub>I</sub>	input leakage current	V <sub>I</sub> = GND to 3.6 V; V <sub>CC</sub> = 0 V to 3.6 V	-	-	±0.1	µA
I <sub>OFF</sub>	power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V	-	-	±0.2	µA
ΔI <sub>OFF</sub>	additional power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V to 0.2 V	-	-	±0.2	µA
I <sub>CC</sub>	supply current	V <sub>I</sub> = GND or V <sub>CC</sub> ; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 0.8 V to 3.6 V	-	-	0.5	µA
ΔI <sub>CC</sub>	additional supply current	V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 3.3 V	-	-	40	µA
C <sub>I</sub>	input capacitance	V <sub>I</sub> = GND or V <sub>CC</sub> ; V <sub>CC</sub> = 0 V to 3.6 V	-	1.1	-	pF
C <sub>O</sub>	output capacitance	V <sub>O</sub> = GND; V <sub>CC</sub> = 0 V	-	1.7	-	pF
<b>T<sub>amb</sub> = -40 °C to +85 °C</b>						
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>T+</sub> or V <sub>T-</sub>				
		I <sub>O</sub> = -20 µA; V <sub>CC</sub> = 0.8 V to 3.6 V	V <sub>CC</sub> - 0.1	-	-	V
		I <sub>O</sub> = -1.1 mA; V <sub>CC</sub> = 1.1 V	0.7 × V <sub>CC</sub>	-	-	V
		I <sub>O</sub> = -1.7 mA; V <sub>CC</sub> = 1.4 V	1.03	-	-	V
		I <sub>O</sub> = -1.9 mA; V <sub>CC</sub> = 1.65 V	1.30	-	-	V
		I <sub>O</sub> = -2.3 mA; V <sub>CC</sub> = 2.3 V	1.97	-	-	V
		I <sub>O</sub> = -3.1 mA; V <sub>CC</sub> = 2.3 V	1.85	-	-	V
		I <sub>O</sub> = -2.7 mA; V <sub>CC</sub> = 3.0 V	2.67	-	-	V
		I <sub>O</sub> = -4.0 mA; V <sub>CC</sub> = 3.0 V	2.55	-	-	V

**Table 7. Static characteristics ...continued**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>T+</sub> or V <sub>T-</sub>				
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V	-	-	0.1	V
		I <sub>O</sub> = 1.1 mA; V <sub>CC</sub> = 1.1 V	-	-	0.3 × V <sub>CC</sub>	V
		I <sub>O</sub> = 1.7 mA; V <sub>CC</sub> = 1.4 V	-	-	0.37	V
		I <sub>O</sub> = 1.9 mA; V <sub>CC</sub> = 1.65 V	-	-	0.35	V
		I <sub>O</sub> = 2.3 mA; V <sub>CC</sub> = 2.3 V	-	-	0.33	V
		I <sub>O</sub> = 3.1 mA; V <sub>CC</sub> = 2.3 V	-	-	0.45	V
		I <sub>O</sub> = 2.7 mA; V <sub>CC</sub> = 3.0 V	-	-	0.33	V
I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 3.0 V	-	-	0.45	V		
I <sub>I</sub>	input leakage current	V <sub>I</sub> = GND to 3.6 V; V <sub>CC</sub> = 0 V to 3.6 V	-	-	±0.5	μA
I <sub>OFF</sub>	power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V	-	-	±0.5	μA
ΔI <sub>OFF</sub>	additional power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V to 0.2 V	-	-	±0.6	μA
I <sub>CC</sub>	supply current	V <sub>I</sub> = GND or V <sub>CC</sub> ; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 0.8 V to 3.6 V	-	-	0.9	μA
ΔI <sub>CC</sub>	additional supply current	V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 3.3 V	-	-	50	μA
<b>T<sub>amb</sub> = -40 °C to +125 °C</b>						
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>T+</sub> or V <sub>T-</sub>				
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V	V <sub>CC</sub> - 0.11	-	-	V
		I <sub>O</sub> = -1.1 mA; V <sub>CC</sub> = 1.1 V	0.6 × V <sub>CC</sub>	-	-	V
		I <sub>O</sub> = -1.7 mA; V <sub>CC</sub> = 1.4 V	0.93	-	-	V
		I <sub>O</sub> = -1.9 mA; V <sub>CC</sub> = 1.65 V	1.17	-	-	V
		I <sub>O</sub> = -2.3 mA; V <sub>CC</sub> = 2.3 V	1.77	-	-	V
		I <sub>O</sub> = -3.1 mA; V <sub>CC</sub> = 2.3 V	1.67	-	-	V
		I <sub>O</sub> = -2.7 mA; V <sub>CC</sub> = 3.0 V	2.40	-	-	V
I <sub>O</sub> = -4.0 mA; V <sub>CC</sub> = 3.0 V	2.30	-	-	V		
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>T+</sub> or V <sub>T-</sub>				
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V	-	-	0.11	V
		I <sub>O</sub> = 1.1 mA; V <sub>CC</sub> = 1.1 V	-	-	0.33 × V <sub>CC</sub>	V
		I <sub>O</sub> = 1.7 mA; V <sub>CC</sub> = 1.4 V	-	-	0.41	V
		I <sub>O</sub> = 1.9 mA; V <sub>CC</sub> = 1.65 V	-	-	0.39	V
		I <sub>O</sub> = 2.3 mA; V <sub>CC</sub> = 2.3 V	-	-	0.36	V
		I <sub>O</sub> = 3.1 mA; V <sub>CC</sub> = 2.3 V	-	-	0.50	V
		I <sub>O</sub> = 2.7 mA; V <sub>CC</sub> = 3.0 V	-	-	0.36	V
I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 3.0 V	-	-	0.50	V		
I <sub>I</sub>	input leakage current	V <sub>I</sub> = GND to 3.6 V; V <sub>CC</sub> = 0 V to 3.6 V	-	-	±0.75	μA
I <sub>OFF</sub>	power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V	-	-	±0.75	μA

**Table 7. Static characteristics ...continued**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$\Delta I_{OFF}$	additional power-off leakage current	$V_I$ or $V_O = 0$ V to 3.6 V; $V_{CC} = 0$ V to 0.2 V	-	-	$\pm 0.75$	$\mu A$
$I_{CC}$	supply current	$V_I = GND$ or $V_{CC}$ ; $I_O = 0$ A; $V_{CC} = 0.8$ V to 3.6 V	-	-	1.4	$\mu A$
$\Delta I_{CC}$	additional supply current	$V_I = V_{CC} - 0.6$ V; $I_O = 0$ A; $V_{CC} = 3.3$ V	-	-	75	$\mu A$

## 12. Dynamic characteristics

**Table 8. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 9](#).

Symbol	Parameter	Conditions	25 °C			-40 °C to +125 °C			Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max (85 °C)	Max (125 °C)	

### $C_L = 5$ pF

$t_{pd}$	propagation delay	A to Y; see <a href="#">Figure 8</a>	<a href="#">[2]</a>						
		$V_{CC} = 0.8$ V	-	19.9	-	-	-	-	ns
		$V_{CC} = 1.1$ V to 1.3 V	2.7	5.9	11.0	2.4	11.1	11.2	ns
		$V_{CC} = 1.4$ V to 1.6 V	2.6	4.3	6.6	2.4	7.1	7.4	ns
		$V_{CC} = 1.65$ V to 1.95 V	2.1	3.7	5.4	2.0	6.0	6.2	ns
		$V_{CC} = 2.3$ V to 2.7 V	2.0	3.0	4.1	1.7	4.5	4.7	ns
		$V_{CC} = 3.0$ V to 3.6 V	1.9	2.8	3.6	1.5	3.9	4.0	ns

### $C_L = 10$ pF

$t_{pd}$	propagation delay	A to Y; see <a href="#">Figure 8</a>	<a href="#">[2]</a>						
		$V_{CC} = 0.8$ V	-	23.4	-	-	-	-	ns
		$V_{CC} = 1.1$ V to 1.3 V	2.9	6.8	12.7	2.8	12.8	12.9	ns
		$V_{CC} = 1.4$ V to 1.6 V	2.8	5.0	7.7	2.6	8.2	8.6	ns
		$V_{CC} = 1.65$ V to 1.95 V	2.7	4.2	6.2	2.5	6.7	7.1	ns
		$V_{CC} = 2.3$ V to 2.7 V	2.3	3.6	4.8	2.1	5.2	5.5	ns
		$V_{CC} = 3.0$ V to 3.6 V	2.1	3.3	4.3	2.0	4.5	4.7	ns

### $C_L = 15$ pF

$t_{pd}$	propagation delay	A to Y; see <a href="#">Figure 8</a>	<a href="#">[2]</a>						
		$V_{CC} = 0.8$ V	-	26.9	-	-	-	-	ns
		$V_{CC} = 1.1$ V to 1.3 V	3.3	7.6	14.3	3.0	14.5	14.7	ns
		$V_{CC} = 1.4$ V to 1.6 V	3.3	5.5	8.6	2.9	9.4	9.8	ns
		$V_{CC} = 1.65$ V to 1.95 V	2.8	4.7	7.0	2.8	7.7	8.1	ns
		$V_{CC} = 2.3$ V to 2.7 V	2.7	4.0	5.5	2.4	5.9	6.2	ns
		$V_{CC} = 3.0$ V to 3.6 V	2.6	3.8	4.8	2.2	5.2	5.4	ns

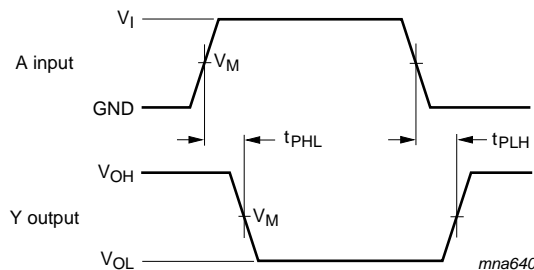
### $C_L = 30$ pF

**Table 8. Dynamic characteristics ...continued**  
 Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 9](#).

Symbol	Parameter	Conditions	25 °C			-40 °C to +125 °C			Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max (85 °C)	Max (125 °C)	
$t_{pd}$	propagation delay	A to Y; see <a href="#">Figure 8</a> <sup>[2]</sup>							
		$V_{CC} = 0.8\text{ V}$	-	37.3	-	-	-	-	ns
		$V_{CC} = 1.1\text{ V to }1.3\text{ V}$	4.0	9.8	18.7	3.9	19.6	20.0	ns
		$V_{CC} = 1.4\text{ V to }1.6\text{ V}$	3.7	7.1	11.2	3.8	12.3	12.9	ns
		$V_{CC} = 1.65\text{ V to }1.95\text{ V}$	3.6	6.0	9.1	3.6	10.0	10.6	ns
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	3.5	5.2	6.9	3.2	7.5	7.9	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	3.3	4.8	6.1	3.1	7.1	7.4	ns
<b><math>C_L = 5\text{ pF}, 10\text{ pF}, 15\text{ pF}</math> and <math>30\text{ pF}</math></b>									
$C_{PD}$	power dissipation capacitance	$f_i = 1\text{ MHz}; V_I = \text{GND to }V_{CC}$ <sup>[3]</sup>							
		$V_{CC} = 0.8\text{ V}$	-	2.6	-	-	-	-	pF
		$V_{CC} = 1.1\text{ V to }1.3\text{ V}$	-	2.7	-	-	-	-	pF
		$V_{CC} = 1.4\text{ V to }1.6\text{ V}$	-	2.9	-	-	-	-	pF
		$V_{CC} = 1.65\text{ V to }1.95\text{ V}$	-	3.1	-	-	-	-	pF
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	-	3.7	-	-	-	-	pF
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	-	4.3	-	-	-	pF	

- [1] All typical values are measured at nominal  $V_{CC}$ .
- [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  $\mu\text{W}$ ).  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$  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 V;  
 $N$  = number of inputs switching;  
 $\Sigma(C_L \times V_{CC}^2 \times f_o)$  = sum of the outputs.

### 13. Waveforms



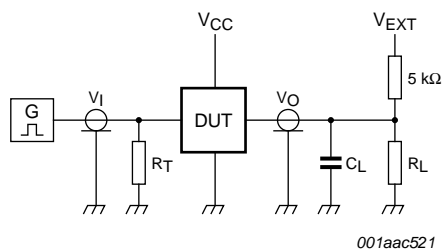
Measurement points are given in [Table 9](#).  
 Logic levels:  $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

**Fig 8. The data input (A) to output (Y) propagation delays**



Table 9. Measurement points

Supply voltage	Output	Input		
$V_{CC}$	$V_M$	$V_M$	$V_I$	$t_r = t_f$
0.8 V to 3.6 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{CC}$	$\leq 3.0$ ns



Test data is given in [Table 10](#).

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.

$V_{EXT}$  = External voltage for measuring switching times.

Fig 9. Load circuitry for switching times

Table 10. Test data

Supply voltage	Load		$V_{EXT}$		
$V_{CC}$	$C_L$	$R_L$ [1]	$t_{PLH}, t_{PHL}$	$t_{PZH}, t_{PHZ}$	$t_{PZL}, t_{PLZ}$
0.8 V to 3.6 V	5 pF, 10 pF, 15 pF and 30 pF	5 kΩ or 1 MΩ	open	GND	$2 \times V_{CC}$

[1] For measuring enable and disable times  $R_L = 5$  kΩ, for measuring propagation delays, setup and hold times and pulse width  $R_L = 1$  MΩ.

## 14. Transfer characteristics

Table 11. Transfer characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 9](#).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$T_{amb} = 25$ °C						
$V_{T+}$	positive-going threshold voltage	see <a href="#">Figure 10</a> and <a href="#">Figure 11</a>				
		$V_{CC} = 0.8$ V	0.30	-	0.60	V
		$V_{CC} = 1.1$ V	0.53	-	0.90	V
		$V_{CC} = 1.4$ V	0.74	-	1.11	V
		$V_{CC} = 1.65$ V	0.91	-	1.29	V
		$V_{CC} = 2.3$ V	1.37	-	1.77	V
		$V_{CC} = 3.0$ V	1.88	-	2.29	V

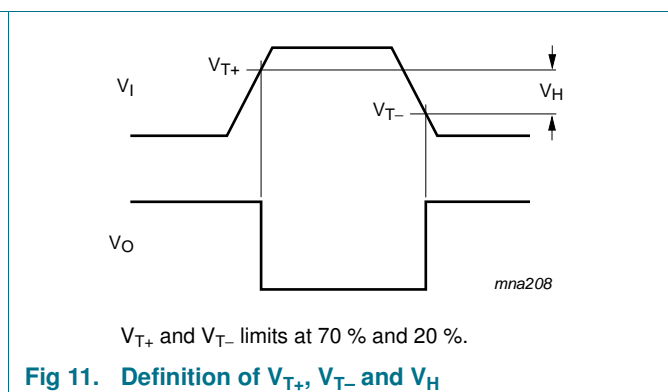
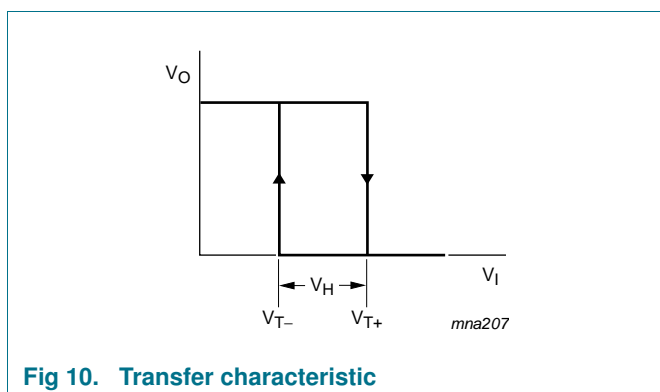
**Table 11. Transfer characteristics ...continued**Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 9](#).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>T-</sub>	negative-going threshold voltage	see <a href="#">Figure 10</a> and <a href="#">Figure 11</a>				
		V <sub>CC</sub> = 0.8 V	0.10	-	0.60	V
		V <sub>CC</sub> = 1.1 V	0.26	-	0.65	V
		V <sub>CC</sub> = 1.4 V	0.39	-	0.75	V
		V <sub>CC</sub> = 1.65 V	0.47	-	0.84	V
		V <sub>CC</sub> = 2.3 V	0.69	-	1.04	V
		V <sub>CC</sub> = 3.0 V	0.88	-	1.24	V
V <sub>H</sub>	hysteresis voltage	see <a href="#">Figure 10</a> , <a href="#">Figure 11</a> , <a href="#">Figure 12</a> and <a href="#">Figure 13</a>				
		V <sub>CC</sub> = 0.8 V	0.07	-	0.50	V
		V <sub>CC</sub> = 1.1 V	0.08	-	0.46	V
		V <sub>CC</sub> = 1.4 V	0.18	-	0.56	V
		V <sub>CC</sub> = 1.65 V	0.27	-	0.66	V
		V <sub>CC</sub> = 2.3 V	0.53	-	0.92	V
		V <sub>CC</sub> = 3.0 V	0.79	-	1.31	V
<b>T<sub>amb</sub> = -40 °C to +85 °C</b>						
V <sub>T+</sub>	positive-going threshold voltage	see <a href="#">Figure 10</a> and <a href="#">Figure 11</a>				
		V <sub>CC</sub> = 0.8 V	0.30	-	0.60	V
		V <sub>CC</sub> = 1.1 V	0.53	-	0.90	V
		V <sub>CC</sub> = 1.4 V	0.74	-	1.11	V
		V <sub>CC</sub> = 1.65 V	0.91	-	1.29	V
		V <sub>CC</sub> = 2.3 V	1.37	-	1.77	V
		V <sub>CC</sub> = 3.0 V	1.88	-	2.29	V
V <sub>T-</sub>	negative-going threshold voltage	see <a href="#">Figure 10</a> and <a href="#">Figure 11</a>				
		V <sub>CC</sub> = 0.8 V	0.10	-	0.60	V
		V <sub>CC</sub> = 1.1 V	0.26	-	0.65	V
		V <sub>CC</sub> = 1.4 V	0.39	-	0.75	V
		V <sub>CC</sub> = 1.65 V	0.47	-	0.84	V
		V <sub>CC</sub> = 2.3 V	0.69	-	1.04	V
		V <sub>CC</sub> = 3.0 V	0.88	-	1.24	V
V <sub>H</sub>	hysteresis voltage	see <a href="#">Figure 10</a> , <a href="#">Figure 11</a> , <a href="#">Figure 12</a> and <a href="#">Figure 13</a>				
		V <sub>CC</sub> = 0.8 V	0.07	-	0.50	V
		V <sub>CC</sub> = 1.1 V	0.08	-	0.46	V
		V <sub>CC</sub> = 1.4 V	0.18	-	0.56	V
		V <sub>CC</sub> = 1.65 V	0.27	-	0.66	V
		V <sub>CC</sub> = 2.3 V	0.53	-	0.92	V
		V <sub>CC</sub> = 3.0 V	0.79	-	1.31	V

**Table 11. Transfer characteristics ...continued**  
 Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 9](#).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>T<sub>amb</sub> = -40 °C to +125 °C</b>						
V <sub>T+</sub>	positive-going threshold voltage	see <a href="#">Figure 10</a> and <a href="#">Figure 11</a>				
		V <sub>CC</sub> = 0.8 V	0.30	-	0.62	V
		V <sub>CC</sub> = 1.1 V	0.53	-	0.92	V
		V <sub>CC</sub> = 1.4 V	0.74	-	1.13	V
		V <sub>CC</sub> = 1.65 V	0.91	-	1.31	V
		V <sub>CC</sub> = 2.3 V	1.37	-	1.80	V
		V <sub>CC</sub> = 3.0 V	1.88	-	2.32	V
V <sub>T-</sub>	negative-going threshold voltage	see <a href="#">Figure 10</a> and <a href="#">Figure 11</a>				
		V <sub>CC</sub> = 0.8 V	0.10	-	0.60	V
		V <sub>CC</sub> = 1.1 V	0.26	-	0.65	V
		V <sub>CC</sub> = 1.4 V	0.39	-	0.75	V
		V <sub>CC</sub> = 1.65 V	0.47	-	0.84	V
		V <sub>CC</sub> = 2.3 V	0.69	-	1.04	V
		V <sub>CC</sub> = 3.0 V	0.88	-	1.24	V
V <sub>H</sub>	hysteresis voltage	see <a href="#">Figure 10</a> , <a href="#">Figure 11</a> , <a href="#">Figure 12</a> and <a href="#">Figure 13</a>				
		V <sub>CC</sub> = 0.8 V	0.07	-	0.50	V
		V <sub>CC</sub> = 1.1 V	0.08	-	0.46	V
		V <sub>CC</sub> = 1.4 V	0.18	-	0.56	V
		V <sub>CC</sub> = 1.65 V	0.27	-	0.66	V
		V <sub>CC</sub> = 2.3 V	0.53	-	0.92	V
		V <sub>CC</sub> = 3.0 V	0.79	-	1.31	V

### 15. Waveforms transfer characteristics



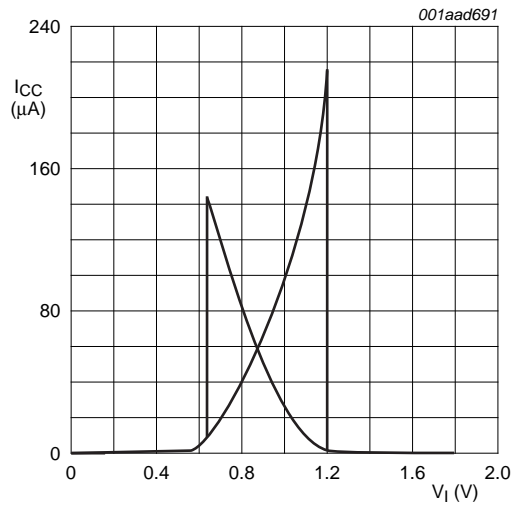


Fig 12. Typical transfer characteristics;  $V_{CC} = 1.8 V$

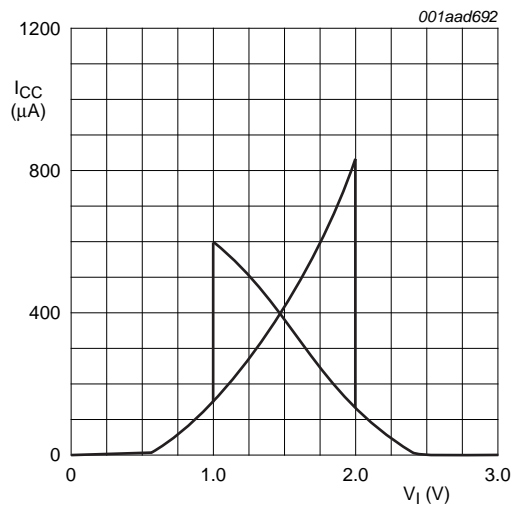


Fig 13. Typical transfer characteristics;  $V_{CC} = 3.0 V$

## 16. Application information

The slow input rise and fall times cause additional power dissipation, this can be calculated using the following formula:

$$P_{ad} = f_i \times (t_r \times I_{CC(AV)} + t_f \times I_{CC(AV)}) \times V_{CC} \text{ where:}$$

$P_{ad}$  = additional power dissipation ( $\mu\text{W}$ );

$f_i$  = input frequency (MHz);

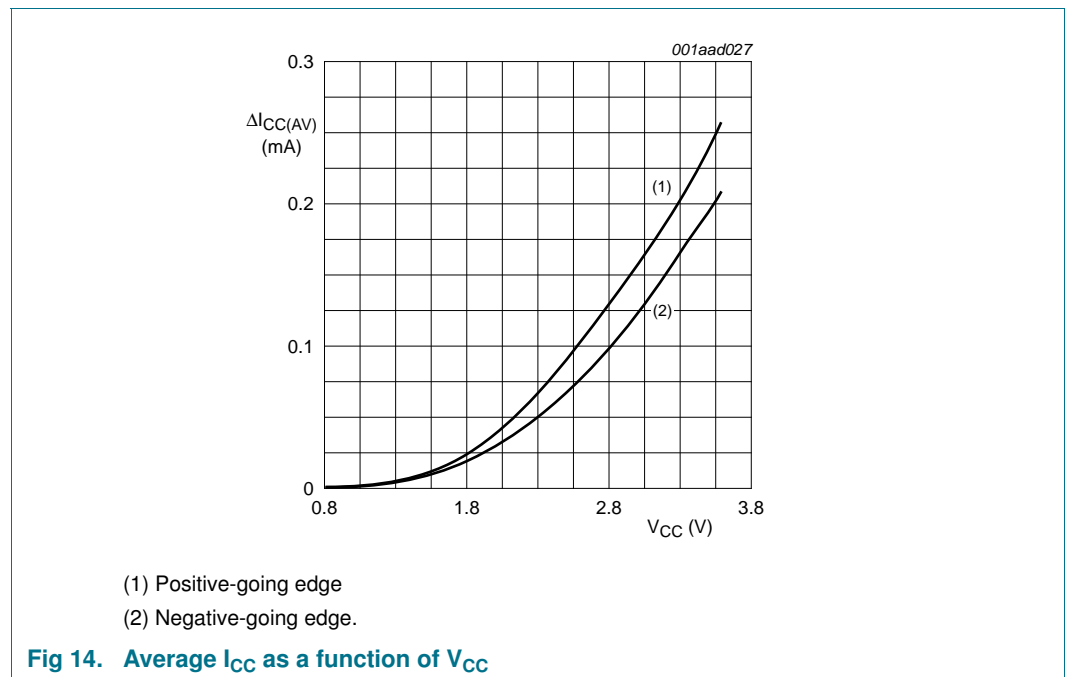
$t_r$  = input rise time (ns); 10 % to 90 %;

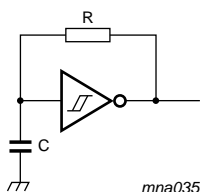
$t_f$  = input fall time (ns); 90 % to 10 %;

$I_{CC(AV)}$  = average additional supply current ( $\mu\text{A}$ ).

Average  $I_{CC}$  differs with positive or negative input transitions, as shown in [Figure 14](#).

An example of a relaxation circuit using the 74AUP1G14 is shown in [Figure 15](#).





$$f = \frac{1}{T} \approx \frac{1}{a \times RC}$$

Average values for variable a are given in [Table 12](#).

**Fig 15. Relaxation oscillator**

**Table 12. Variable values**

Supply voltage	Variable a
1.1 V	1.28
1.5 V	1.22
1.8 V	1.24
2.8 V	1.34
3.3 V	1.45

17. Package outline

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

SOT353-1

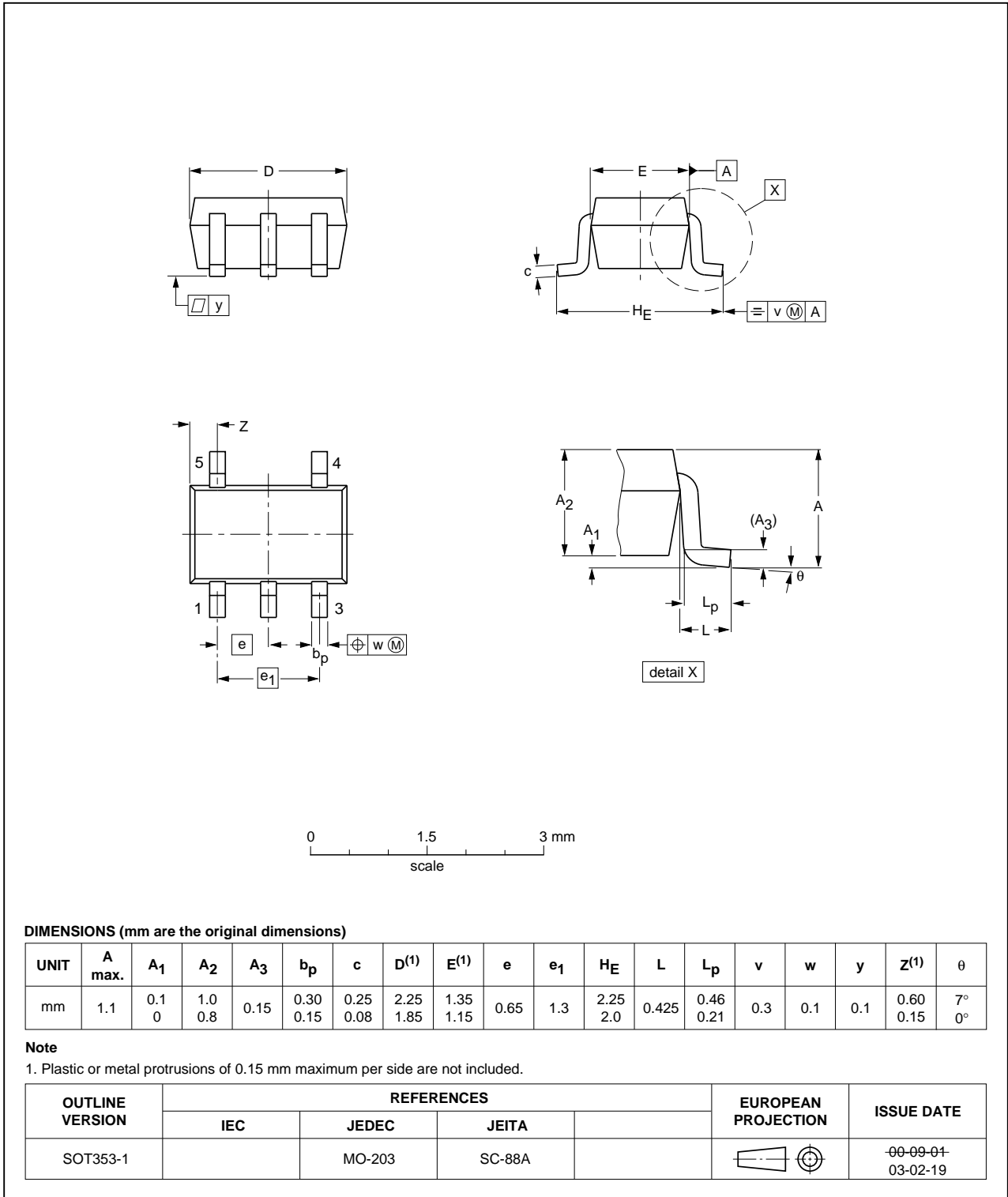


Fig 16. Package outline SOT353-1 (TSSOP5)

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

SOT886

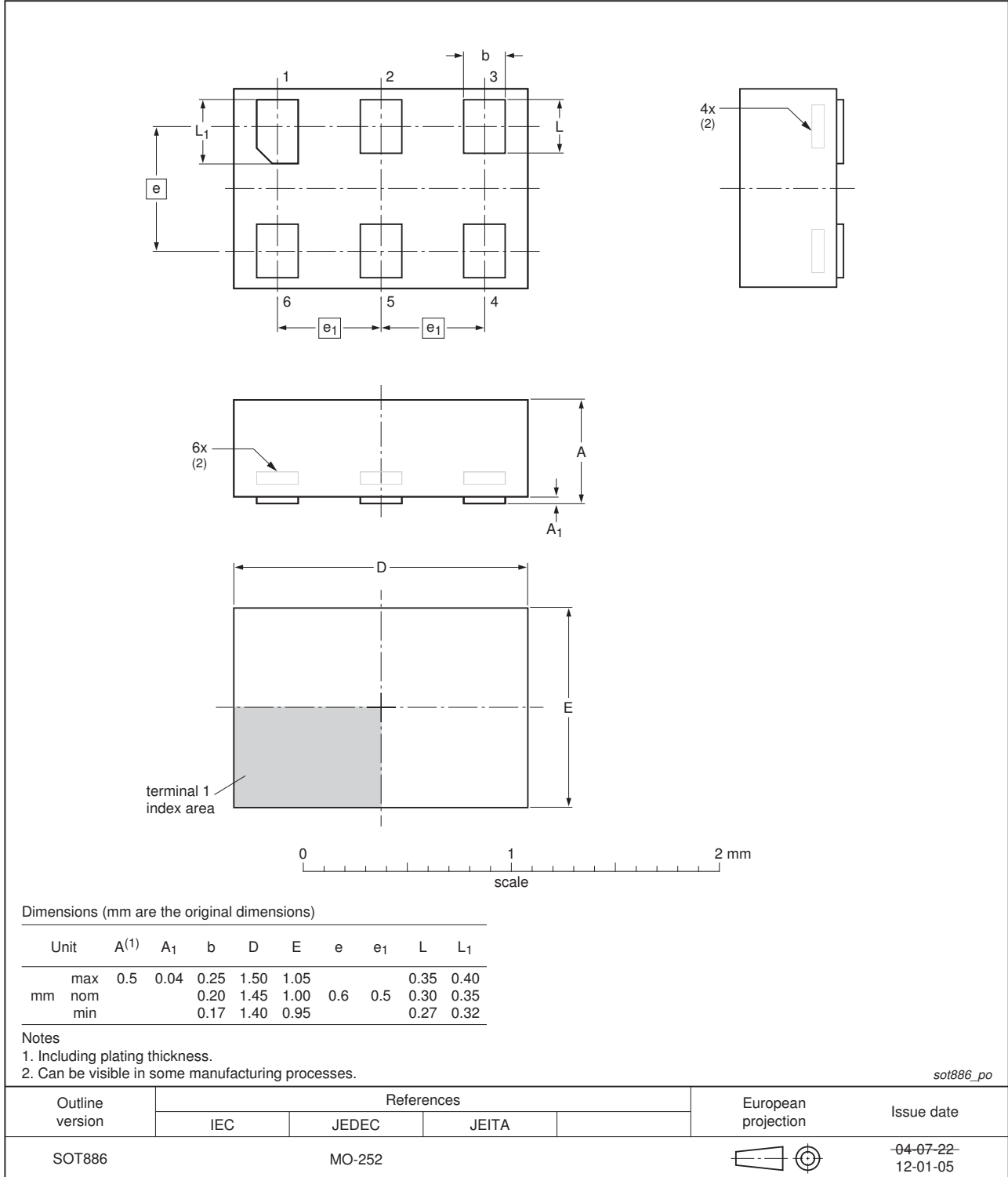


Fig 17. Package outline SOT886 (XSON6)



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

SOT891

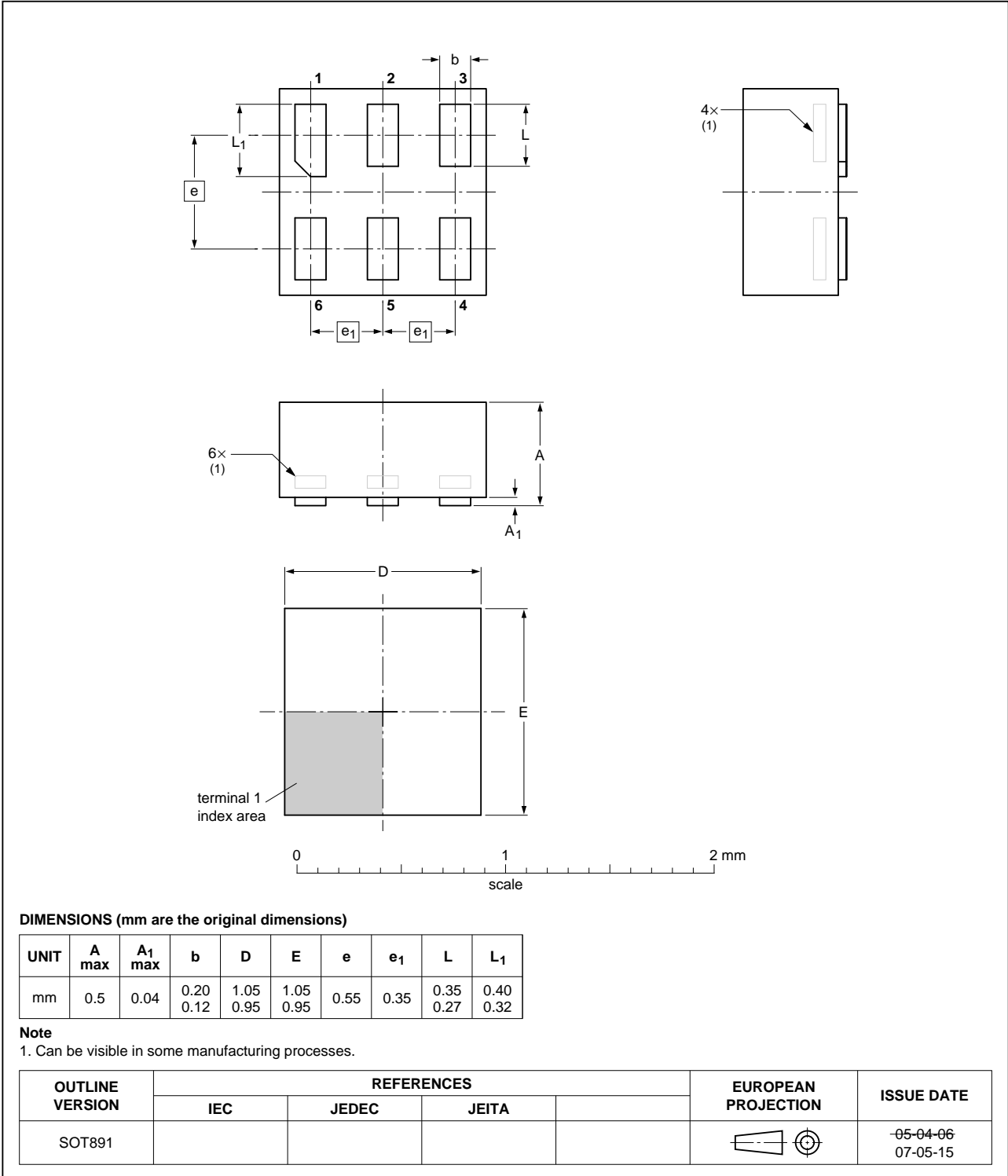


Fig 18. Package outline SOT891 (XSON6)

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

SOT1115

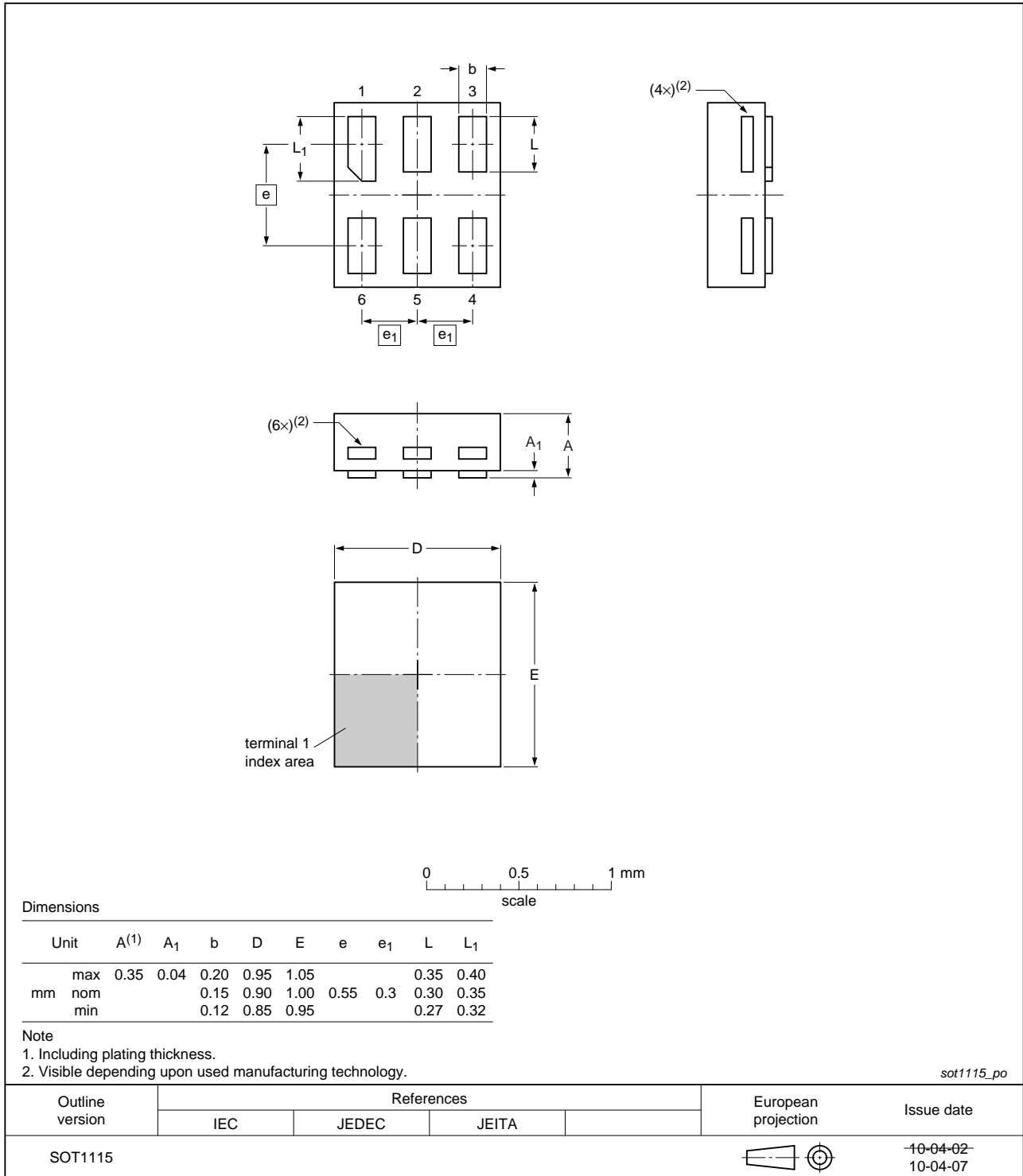
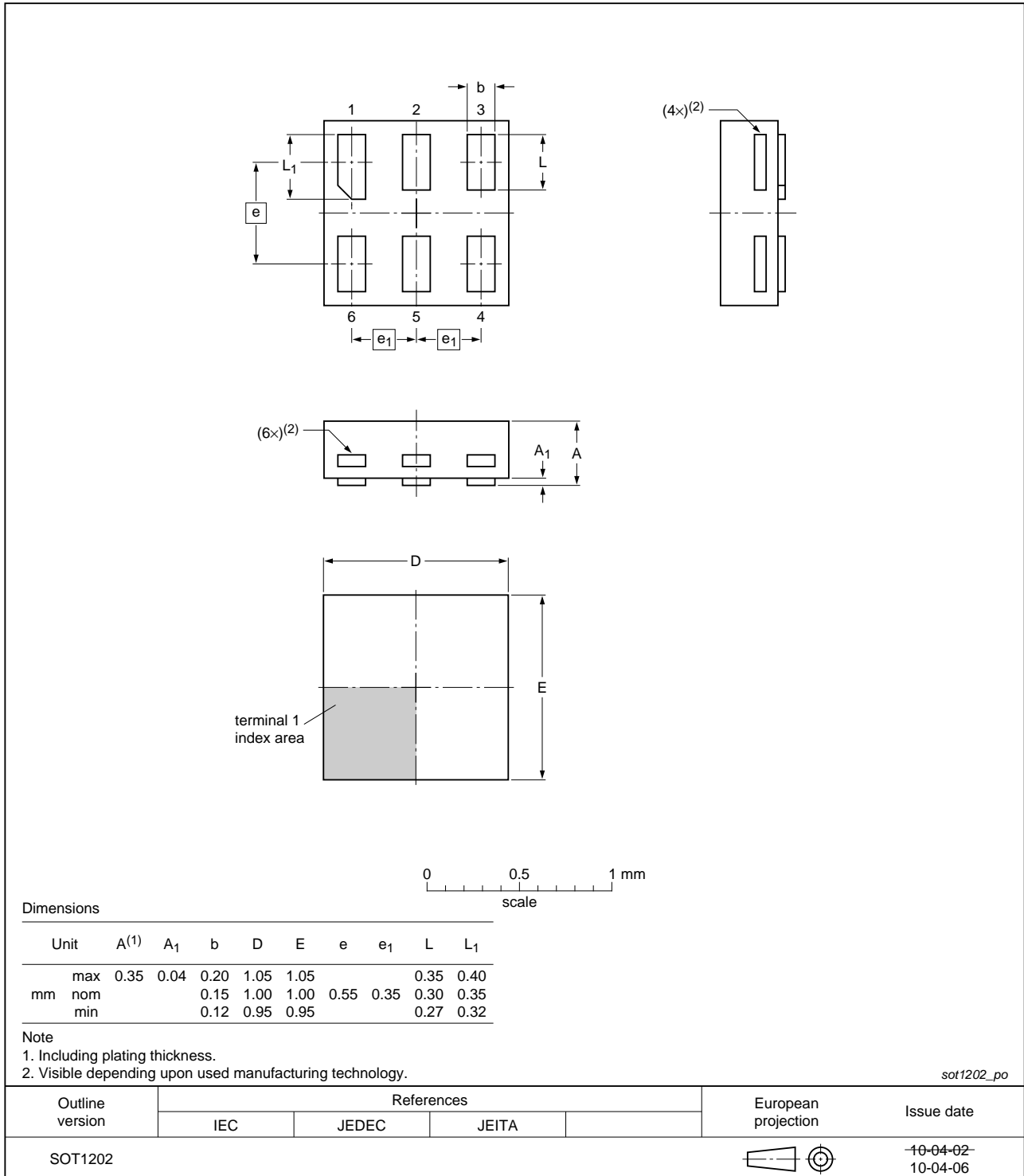


Fig 19. Package outline SOT1115 (XSON6)

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

**SOT1202**



**Fig 20. Package outline SOT1202 (XSON6)**

X2SON5: plastic thermal enhanced extremely thin small outline package; no leads;  
5 terminals; body 0.8 x 0.8 x 0.35 mm

SOT1226

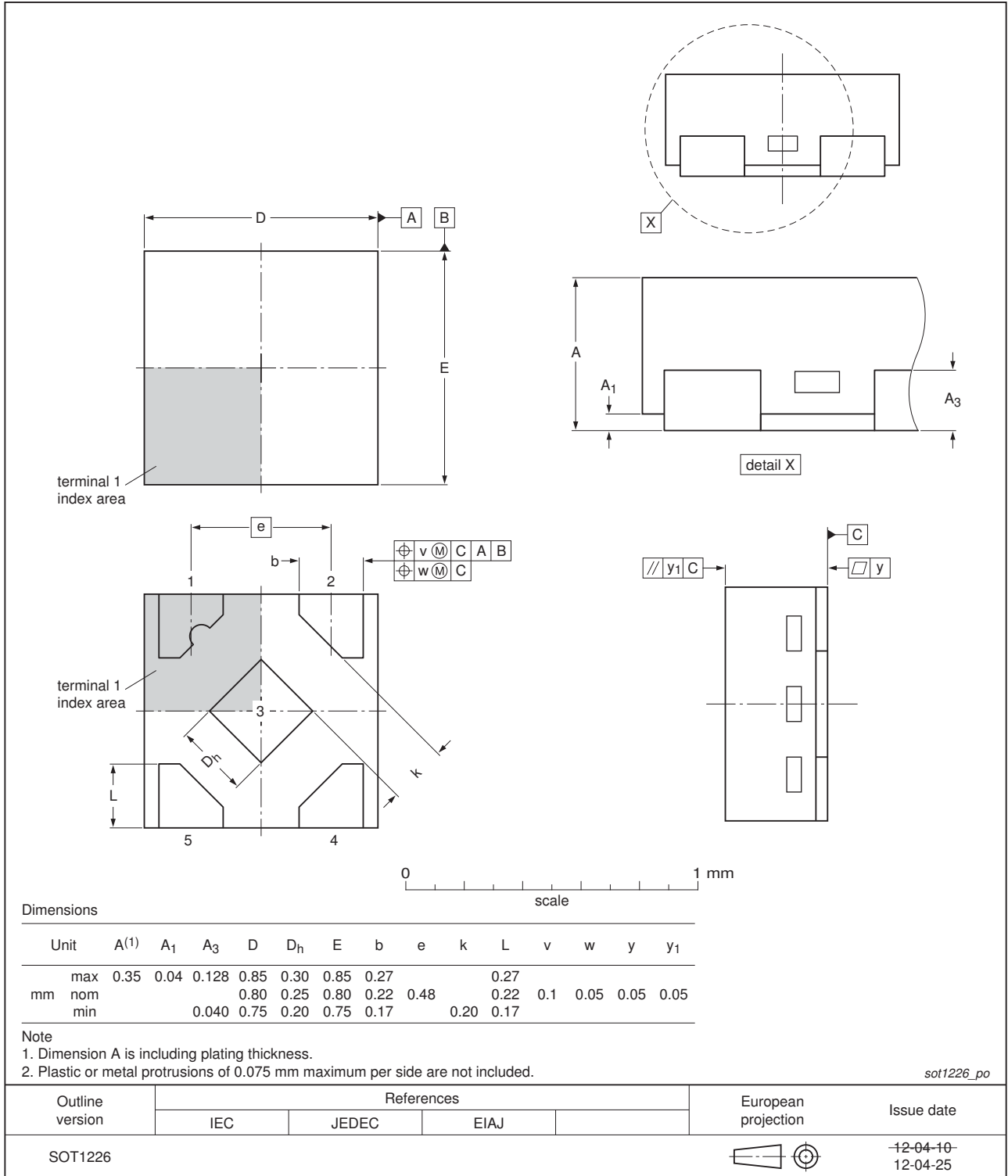


Fig 21. Package outline SOT1226 (X2SON5)

## 18. Abbreviations

Table 13. Abbreviations

Acronym	Description
CDM	Charged Device Model
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model

## 19. Revision history

Table 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AUP1G14 v.6	20120628	Product data sheet	-	74AUP1G14 v.5
Modifications:	<ul style="list-style-type: none"> <li>Added type number 74AUP1G14GX (SOT1226)</li> <li>Package outline drawing of SOT886 (<a href="#">Figure 17</a>) modified.</li> </ul>			
74AUP1G14 v.5	20111128	Product data sheet	-	74AUP1G14 v.4
Modifications:	<ul style="list-style-type: none"> <li>Legal pages updated.</li> </ul>			
74AUP1G14 v.4	20100713	Product data sheet	-	74AUP1G14 v.3
74AUP1G14 v.3	20090708	Product data sheet	-	74AUP1G14 v.2
74AUP1G14 v.2	20060828	Product data sheet	-	74AUP1G14 v.1
74AUP1G14 v.1	20050718	Product data sheet	-	-

## 20. Legal information

### 20.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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 URL <http://www.nxp.com>.

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