

# 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

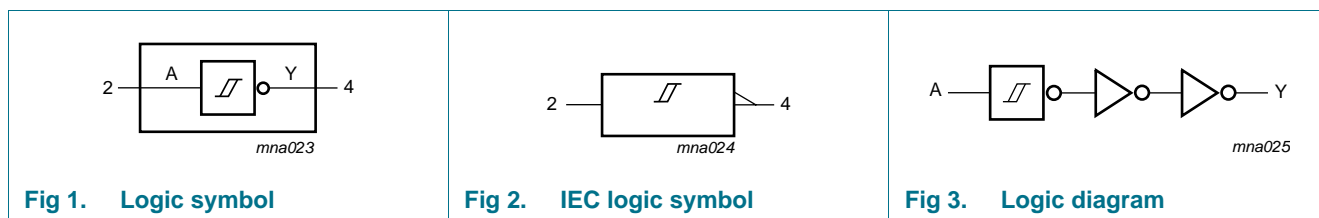
## 5. Marking

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



## 7. Pinning information

### 7.1 Pinning

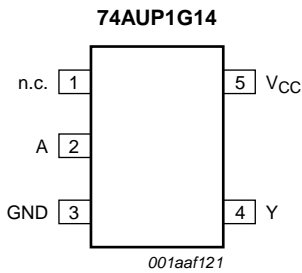


Fig 4. Pin configuration SOT353-1

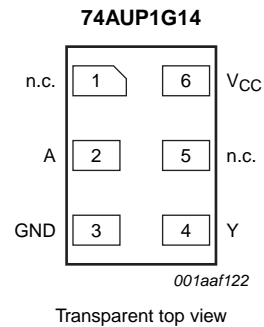


Fig 5. Pin configuration SOT886

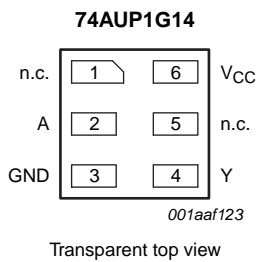


Fig 6. Pin configuration SOT891, SOT1115 and SOT1202

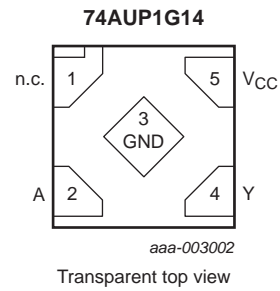


Fig 7. Pin configuration SOT1226 (X2SON5)

### 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
A	Y
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

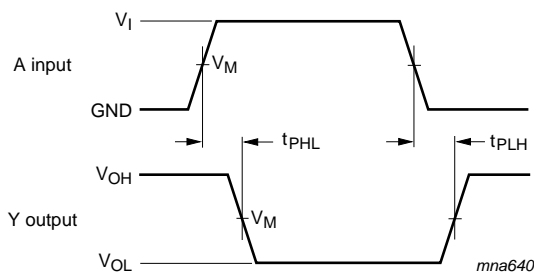
### $C_L = 30$ pF

**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



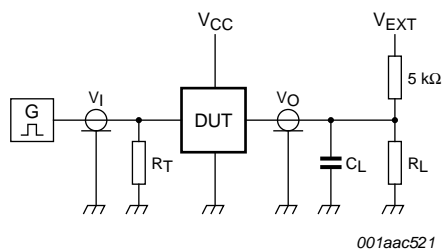
Measurement points are given in [Table 9](#).  
 Logic levels:  $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

**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
$V_{T-}$	negative-going threshold voltage	see <a href="#">Figure 10</a> and <a href="#">Figure 11</a>				
		$V_{CC} = 0.8 \text{ V}$	0.10	-	0.60	V
		$V_{CC} = 1.1 \text{ V}$	0.26	-	0.65	V
		$V_{CC} = 1.4 \text{ V}$	0.39	-	0.75	V
		$V_{CC} = 1.65 \text{ V}$	0.47	-	0.84	V
		$V_{CC} = 2.3 \text{ V}$	0.69	-	1.04	V
		$V_{CC} = 3.0 \text{ V}$	0.88	-	1.24	V
$V_H$	hysteresis voltage	see <a href="#">Figure 10</a> , <a href="#">Figure 11</a> , <a href="#">Figure 12</a> and <a href="#">Figure 13</a>				
		$V_{CC} = 0.8 \text{ V}$	0.07	-	0.50	V
		$V_{CC} = 1.1 \text{ V}$	0.08	-	0.46	V
		$V_{CC} = 1.4 \text{ V}$	0.18	-	0.56	V
		$V_{CC} = 1.65 \text{ V}$	0.27	-	0.66	V
		$V_{CC} = 2.3 \text{ V}$	0.53	-	0.92	V
		$V_{CC} = 3.0 \text{ V}$	0.79	-	1.31	V
<b><math>T_{amb} = -40 \text{ }^\circ\text{C}</math> to <math>+85 \text{ }^\circ\text{C}</math></b>						
$V_{T+}$	positive-going threshold voltage	see <a href="#">Figure 10</a> and <a href="#">Figure 11</a>				
		$V_{CC} = 0.8 \text{ V}$	0.30	-	0.60	V
		$V_{CC} = 1.1 \text{ V}$	0.53	-	0.90	V
		$V_{CC} = 1.4 \text{ V}$	0.74	-	1.11	V
		$V_{CC} = 1.65 \text{ V}$	0.91	-	1.29	V
		$V_{CC} = 2.3 \text{ V}$	1.37	-	1.77	V
		$V_{CC} = 3.0 \text{ V}$	1.88	-	2.29	V
$V_{T-}$	negative-going threshold voltage	see <a href="#">Figure 10</a> and <a href="#">Figure 11</a>				
		$V_{CC} = 0.8 \text{ V}$	0.10	-	0.60	V
		$V_{CC} = 1.1 \text{ V}$	0.26	-	0.65	V
		$V_{CC} = 1.4 \text{ V}$	0.39	-	0.75	V
		$V_{CC} = 1.65 \text{ V}$	0.47	-	0.84	V
		$V_{CC} = 2.3 \text{ V}$	0.69	-	1.04	V
		$V_{CC} = 3.0 \text{ V}$	0.88	-	1.24	V
$V_H$	hysteresis voltage	see <a href="#">Figure 10</a> , <a href="#">Figure 11</a> , <a href="#">Figure 12</a> and <a href="#">Figure 13</a>				
		$V_{CC} = 0.8 \text{ V}$	0.07	-	0.50	V
		$V_{CC} = 1.1 \text{ V}$	0.08	-	0.46	V
		$V_{CC} = 1.4 \text{ V}$	0.18	-	0.56	V
		$V_{CC} = 1.65 \text{ V}$	0.27	-	0.66	V
		$V_{CC} = 2.3 \text{ V}$	0.53	-	0.92	V
		$V_{CC} = 3.0 \text{ V}$	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

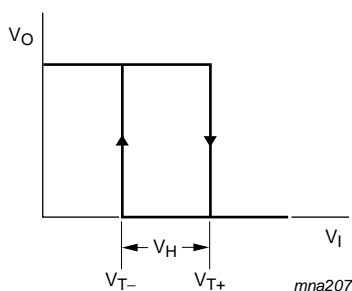
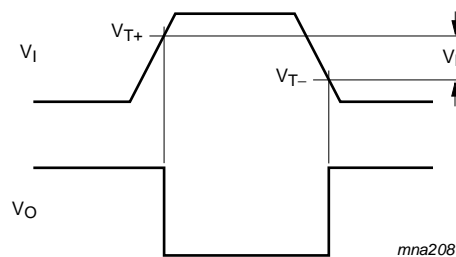


Fig 10. Transfer characteristic



V<sub>T+</sub> and V<sub>T-</sub> limits at 70 % and 20 %.

Fig 11. Definition of V<sub>T+</sub>, V<sub>T-</sub> and V<sub>H</sub>

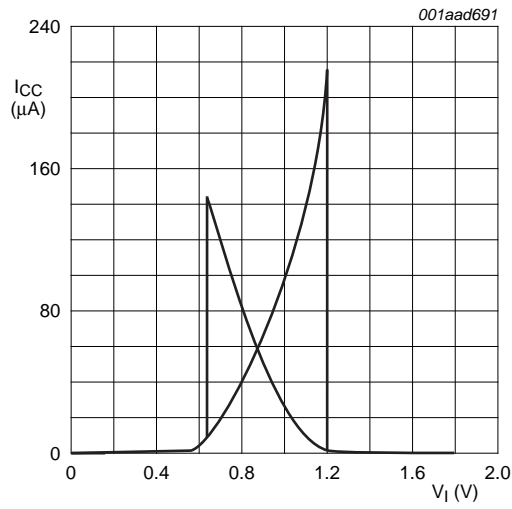


Fig 12. Typical transfer characteristics;  $V_{CC} = 1.8 V$

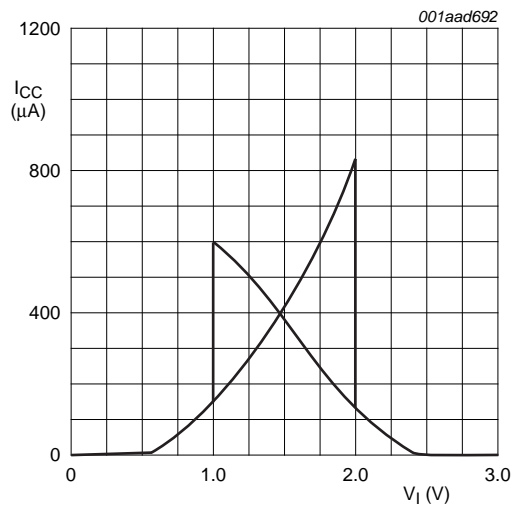


Fig 13. Typical transfer characteristics;  $V_{CC} = 3.0 V$

### 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 ( $\mu W$ );

$f_i$  = input frequency (MHz);

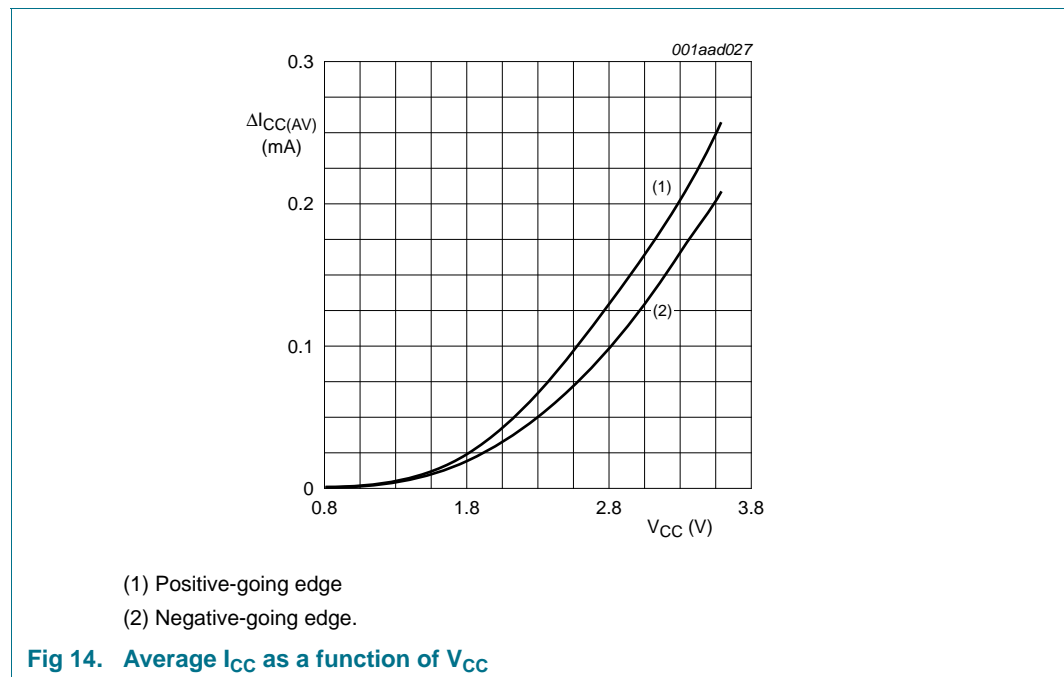
$t_r$  = input rise time (ns); 10 % to 90 %;

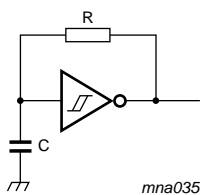
$t_f$  = input fall time (ns); 90 % to 10 %;

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

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

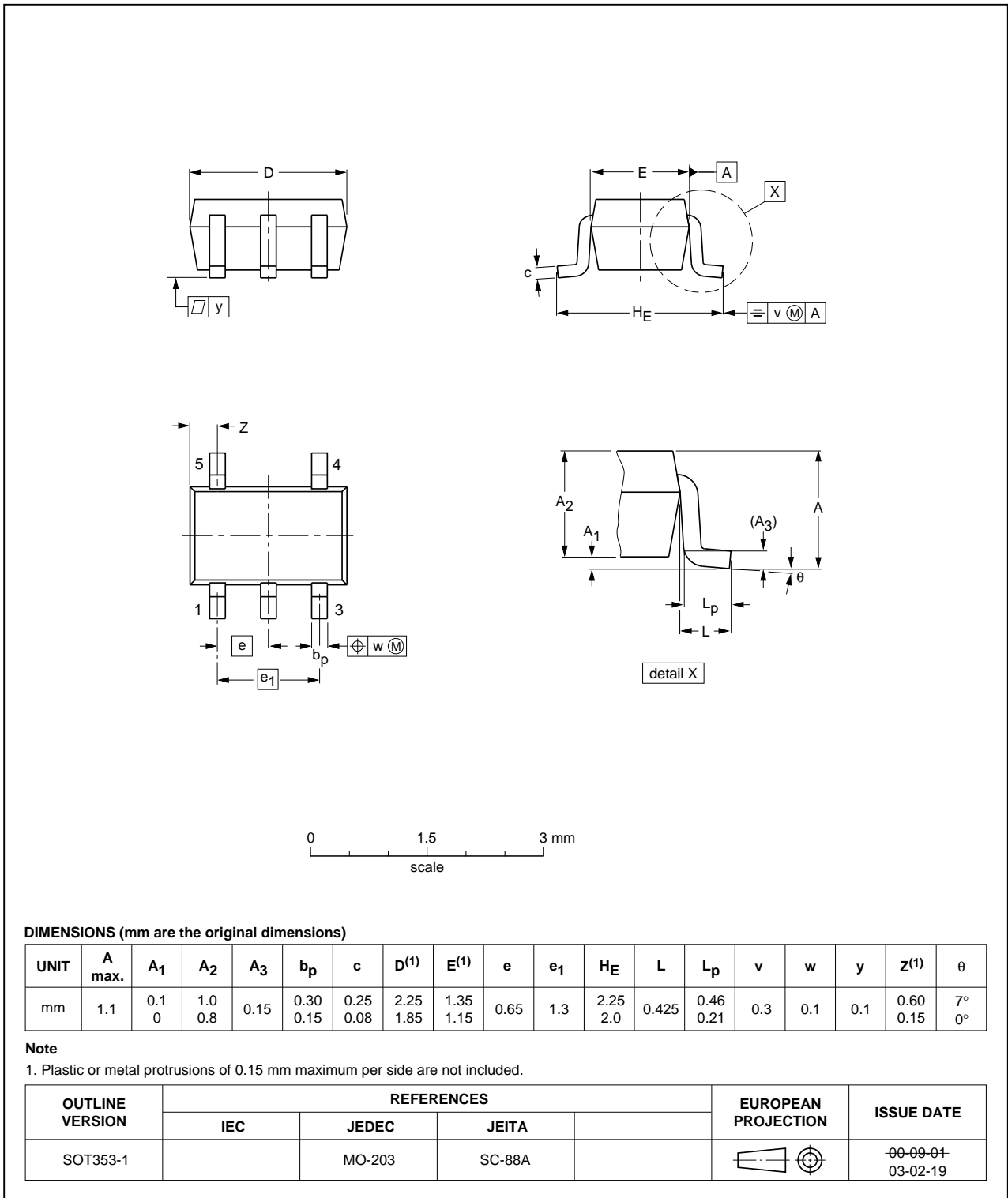


Fig 16. Package outline SOT353-1 (TSSOP5)

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

SOT886

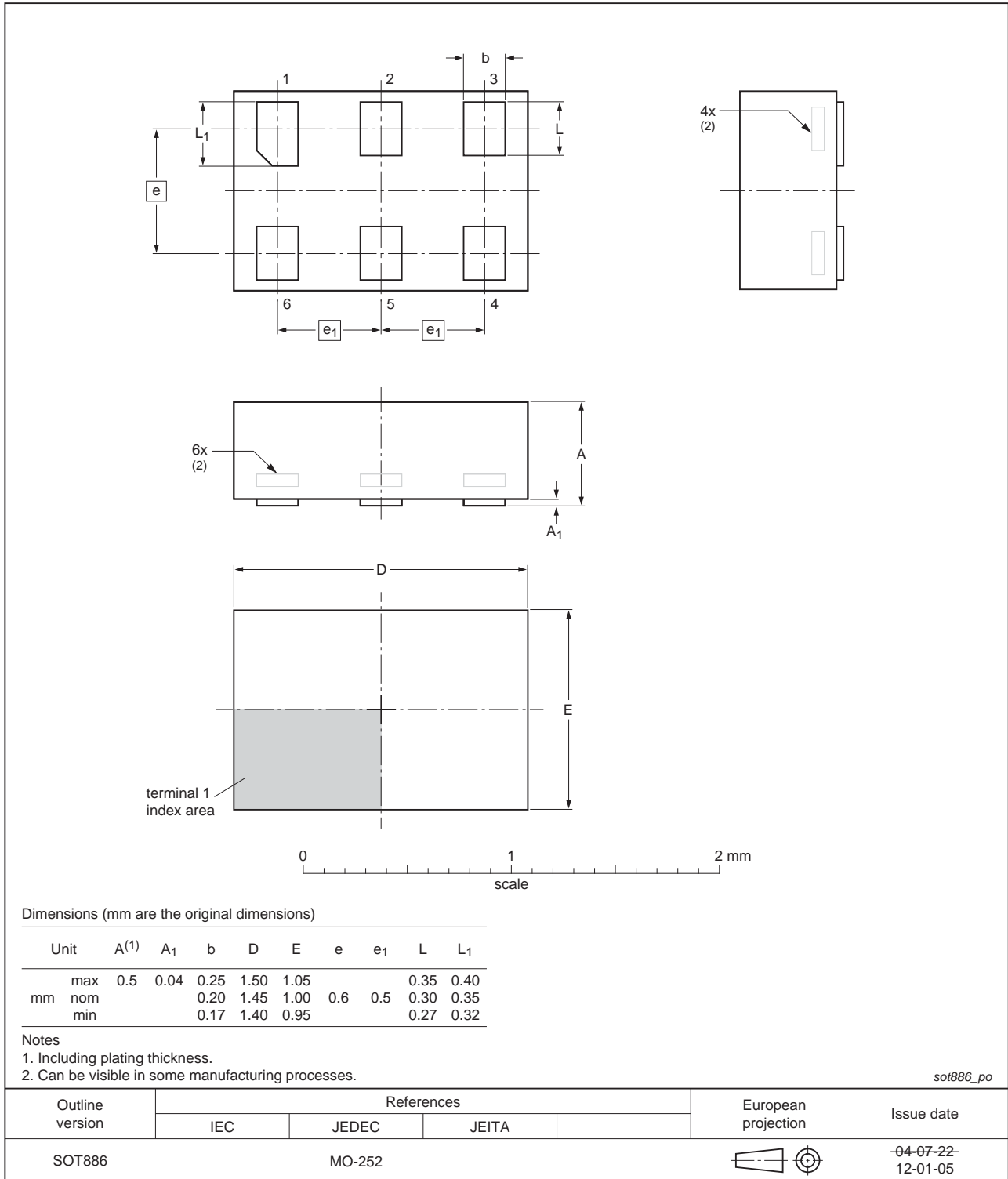


Fig 17. Package outline SOT886 (XSON6)



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

SOT891

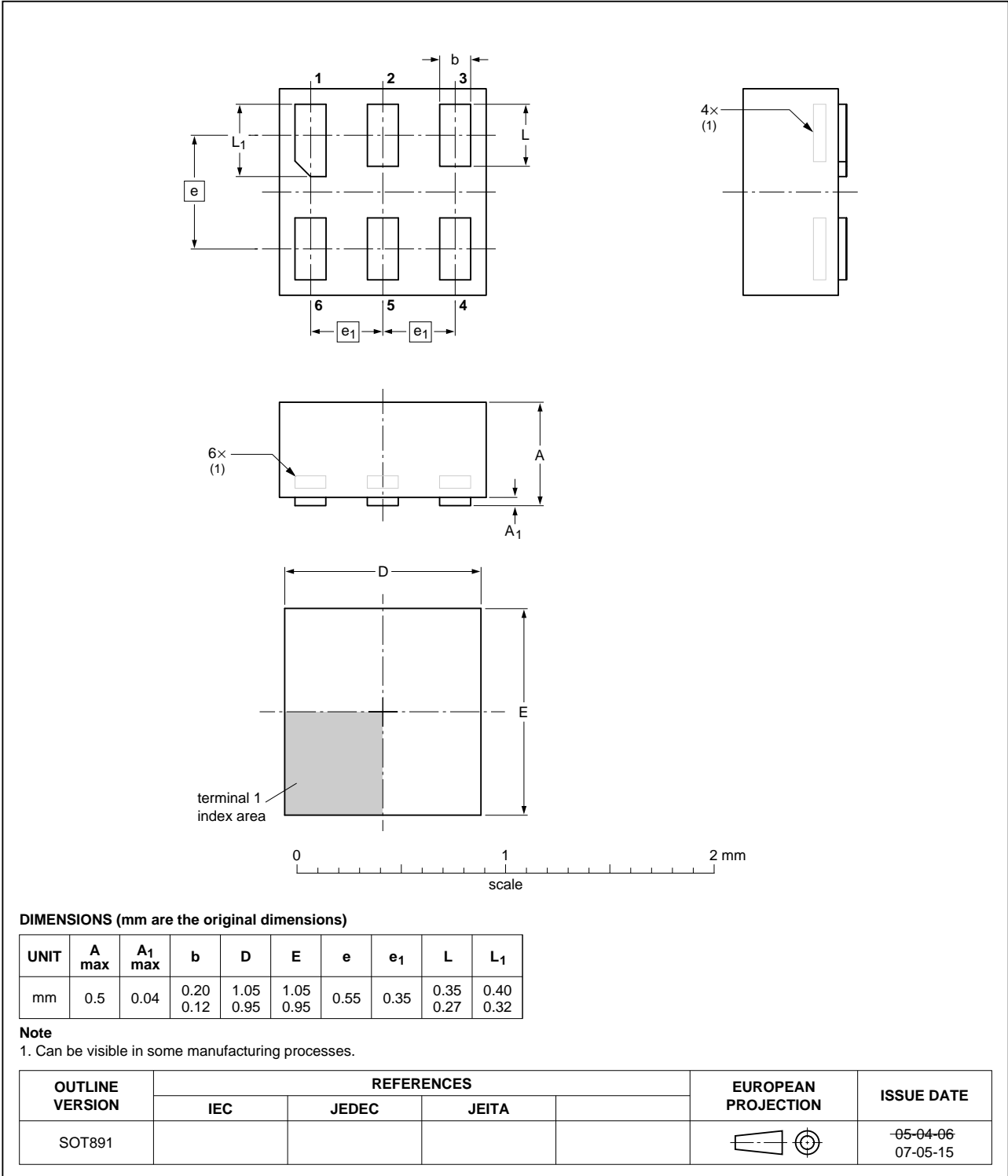


Fig 18. Package outline SOT891 (XSON6)

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

SOT1115

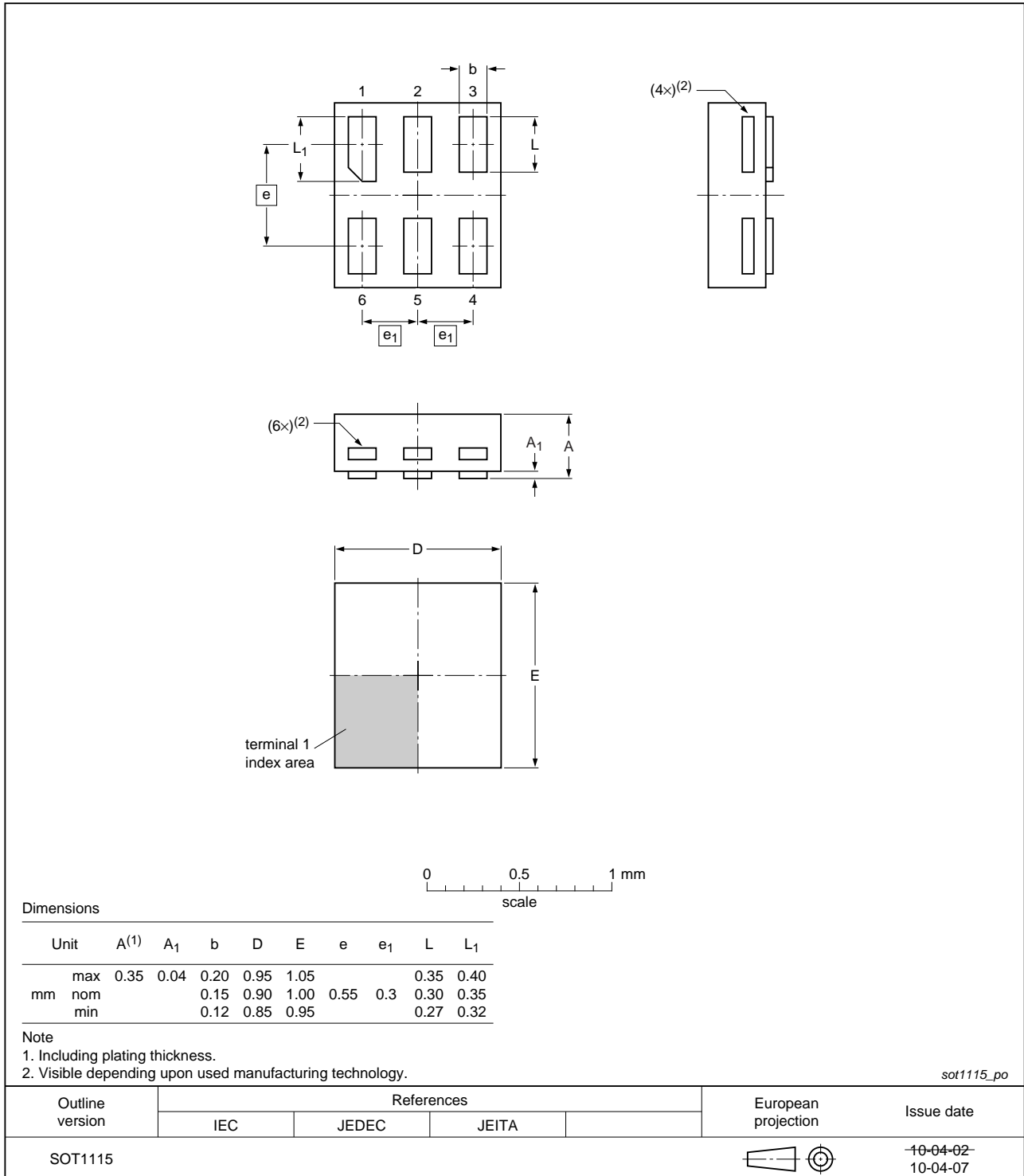


Fig 19. Package outline SOT1115 (XSON6)

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

SOT1202

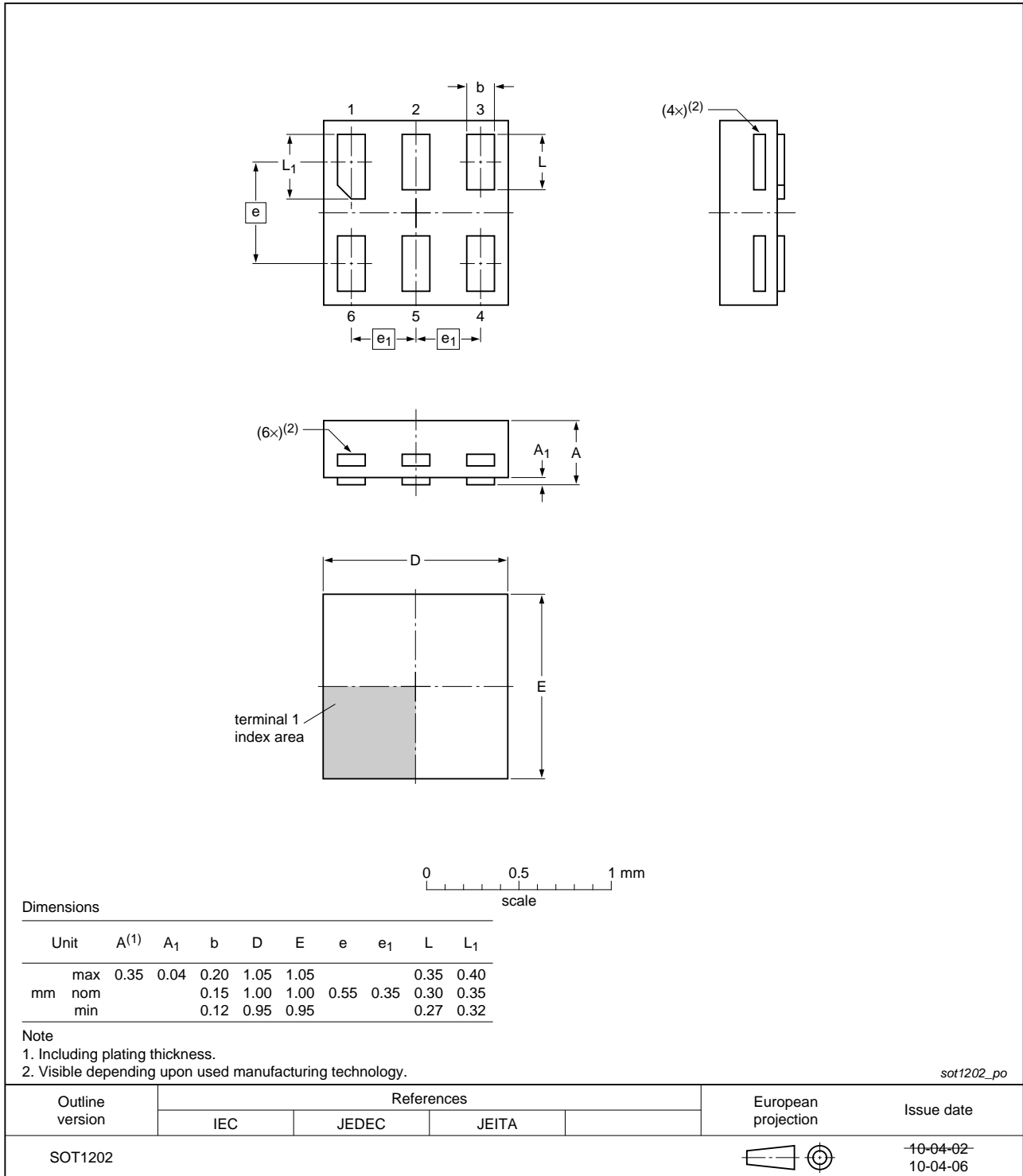


Fig 20. Package outline SOT1202 (XSON6)

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

SOT1226

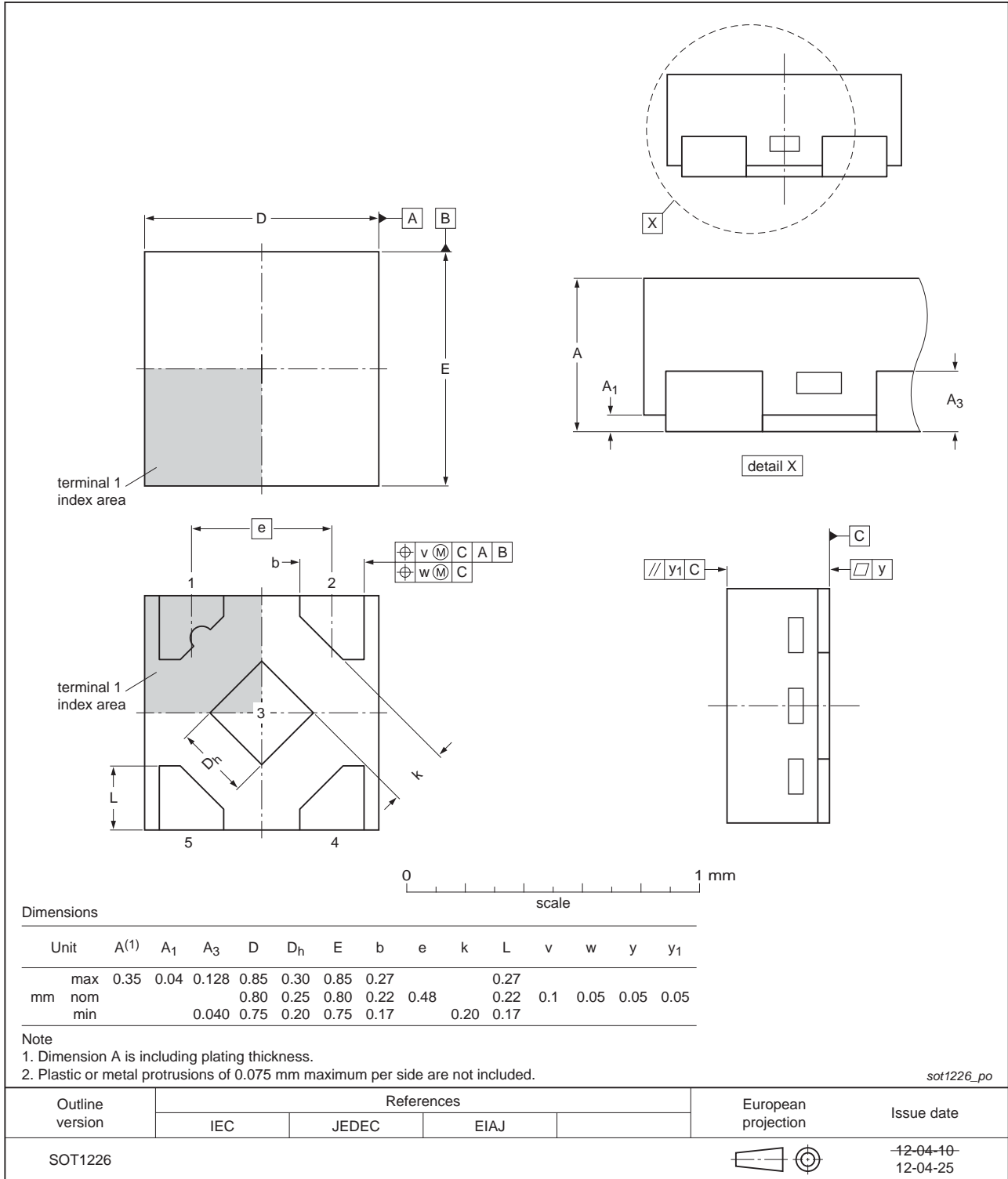


Fig 21. Package outline SOT1226 (X2SON5)

## 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.
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