

# 74AUP1G04

Low-power inverter

Rev. 7 — 27 June 2012

Product data sheet

## 1. General description

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The 74AUP1G04 provides the single inverting buffer.

Schmitt trigger action at all inputs makes the circuit tolerant to slower input rise and fall times across the entire  $V_{CC}$  range from 0.8 V to 3.6 V.

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.

## 2. Features and benefits

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- Wide supply voltage range from 0.8 V to 3.6 V
- High noise immunity
- Complies with JEDEC standards:
  - ◆ JESD8-12 (0.8 V to 1.3 V)
  - ◆ JESD8-11 (0.9 V to 1.65 V)
  - ◆ JESD8-7 (1.2 V to 1.95 V)
  - ◆ JESD8-5 (1.8 V to 2.7 V)
  - ◆ JESD8-B (2.7 V to 3.6 V)
- 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 78B 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. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
74AUP1G04GV	-40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753
74AUP1G04GW	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1
74AUP1G04GM	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886
74AUP1G04GF	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1 × 0.5 mm	SOT891
74AUP1G04GN	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 0.9 × 1.0 × 0.35 mm	SOT1115
74AUP1G04GS	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 1.0 × 1.0 × 0.35 mm	SOT1202
74AUP1G04GX	-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

### 4. Marking

Table 2. Marking

Type number	Marking code <sup>[1]</sup>
74AUP1G04GV	p04
74AUP1G04GW	pC
74AUP1G04GM	pC
74AUP1G04GF	pC
74AUP1G04GN	pC
74AUP1G04GS	pC
74AUP1G04GX	pC

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

### 5. Functional diagram

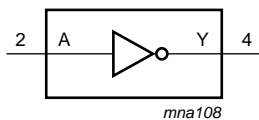


Fig 1. Logic symbol



Fig 2. IEC logic symbol

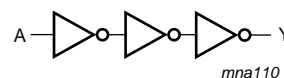
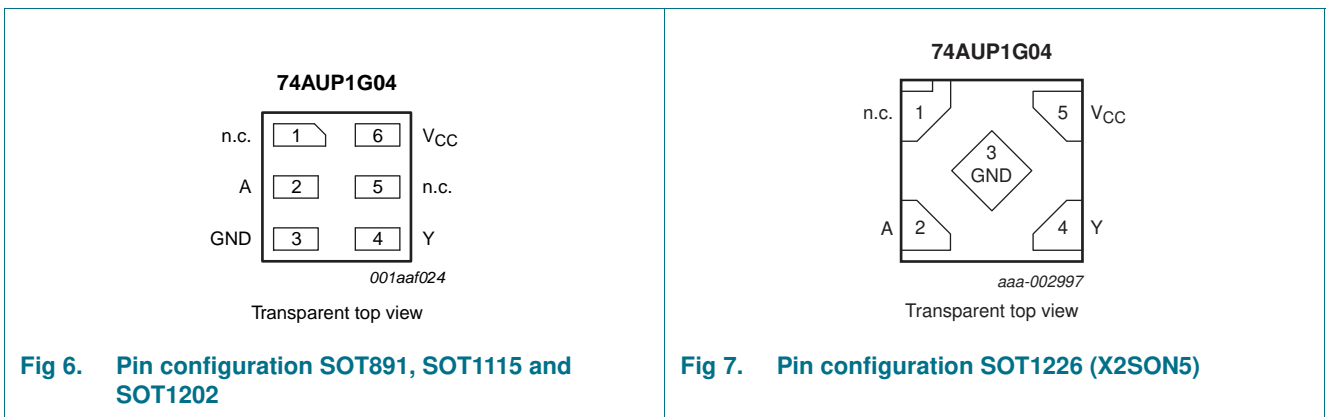
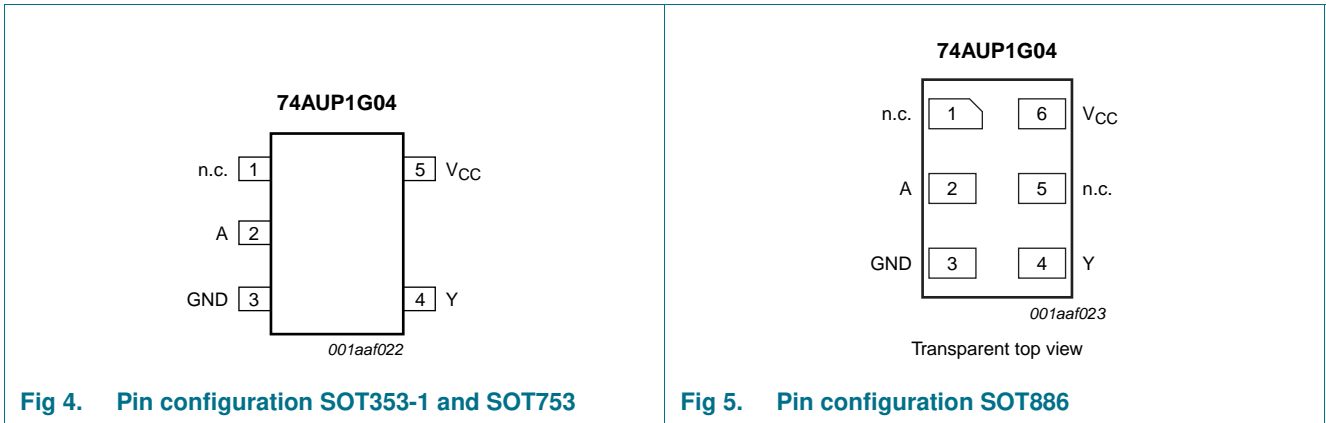


Fig 3. Logic diagram

## 6. Pinning information

### 6.1 Pinning



### 6.2 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

## 7. 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.

## 8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage		-0.5	+4.6	V
$I_{IK}$	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	<sup>[1]</sup> -0.5	$V_{CC} + 0.5$	V
		power-down mode	<sup>[1]</sup> -0.5	+4.6	V
$I_O$	output current	$V_O = 0$ V to $V_{CC}$	-	$\pm 20$	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 minimum input and output voltage ratings may be exceeded if the input and output current ratings are observed.

[2] For TSSOP5 and SC-74A 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.

## 9. 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
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 0.8$ V to 3.6 V	0	200	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	Max	Unit
<b>T<sub>amb</sub> = 25 °C</b>						
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 0.8 V	0.70 × V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 0.9 V to 1.95 V	0.65 × V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.6	-	-	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.0	-	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 0.8 V	-	-	0.30 × V <sub>CC</sub>	V
		V <sub>CC</sub> = 0.9 V to 1.95 V	-	-	0.35 × V <sub>CC</sub>	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	0.7	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	-	0.9	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</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>IH</sub> or V <sub>IL</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>CC</sub> = 0 V to 3.6 V; V <sub>I</sub> = GND or V <sub>CC</sub>	-	0.8	-	pF
C <sub>O</sub>	output capacitance	V <sub>O</sub> = GND; V <sub>CC</sub> = 0 V	-	1.7	-	pF

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

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>T<sub>amb</sub> = -40 °C to +85 °C</b>						
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 0.8 V	0.70 × V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 0.9 V to 1.95 V	0.65 × V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.6	-	-	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.0	-	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 0.8 V	-	-	0.30 × V <sub>CC</sub>	V
		V <sub>CC</sub> = 0.9 V to 1.95 V	-	-	0.35 × V <sub>CC</sub>	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	0.7	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	-	0.9	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</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
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</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>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

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

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>T<sub>amb</sub> = -40 °C to +125 °C</b>						
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 0.8 V	0.75 × V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 0.9 V to 1.95 V	0.70 × V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.6	-	-	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.0	-	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 0.8 V	-	-	0.25 × V <sub>CC</sub>	V
		V <sub>CC</sub> = 0.9 V to 1.95 V	-	-	0.30 × V <sub>CC</sub>	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	0.7	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	-	0.9	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</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
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</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>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
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	-	-	±0.75	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	-	-	1.4	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	-	-	75	μA

## 11. Dynamic characteristics

**Table 8. Dynamic characteristics**

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

Symbol	Parameter	Conditions	Min	Typ [1]	Max	Unit
<b><math>T_{amb} = 25\text{ }^{\circ}\text{C}</math>; <math>C_L = 5\text{ pF}</math></b>						
$t_{pd}$	propagation delay	A to Y; see <a href="#">Figure 8</a>		[2]		
		$V_{CC} = 0.8\text{ V}$	-	16.0	-	ns
		$V_{CC} = 1.1\text{ V to }1.3\text{ V}$	2.4	5.0	10.3	ns
		$V_{CC} = 1.4\text{ V to }1.6\text{ V}$	1.8	3.6	6.4	ns
		$V_{CC} = 1.65\text{ V to }1.95\text{ V}$	1.5	2.9	5.0	ns
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	1.2	2.4	3.9	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	1.1	2.1	3.2	ns
<b><math>T_{amb} = 25\text{ }^{\circ}\text{C}</math>; <math>C_L = 10\text{ pF}</math></b>						
$t_{pd}$	propagation delay	A to Y; see <a href="#">Figure 8</a>		[2]		
		$V_{CC} = 0.8\text{ V}$	-	19.8	-	ns
		$V_{CC} = 1.1\text{ V to }1.3\text{ V}$	2.8	5.9	12.2	ns
		$V_{CC} = 1.4\text{ V to }1.6\text{ V}$	2.3	4.2	7.5	ns
		$V_{CC} = 1.65\text{ V to }1.95\text{ V}$	2.0	3.5	5.9	ns
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	1.7	2.9	4.6	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	1.6	2.7	3.8	ns
<b><math>T_{amb} = 25\text{ }^{\circ}\text{C}</math>; <math>C_L = 15\text{ pF}</math></b>						
$t_{pd}$	propagation delay	A to Y; see <a href="#">Figure 8</a>		[2]		
		$V_{CC} = 0.8\text{ V}$	-	23.3	-	ns
		$V_{CC} = 1.1\text{ V to }1.3\text{ V}$	3.2	6.7	13.0	ns
		$V_{CC} = 1.4\text{ V to }1.6\text{ V}$	2.6	4.7	8.6	ns
		$V_{CC} = 1.65\text{ V to }1.95\text{ V}$	2.3	4.0	6.7	ns
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	2.1	3.3	5.1	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	2.0	3.1	4.2	ns
<b><math>T_{amb} = 25\text{ }^{\circ}\text{C}</math>; <math>C_L = 30\text{ pF}</math></b>						
$t_{pd}$	propagation delay	A to Y; see <a href="#">Figure 8</a>		[2]		
		$V_{CC} = 0.8\text{ V}$	-	33.6	-	ns
		$V_{CC} = 1.1\text{ V to }1.3\text{ V}$	4.4	8.9	16.0	ns
		$V_{CC} = 1.4\text{ V to }1.6\text{ V}$	3.6	6.3	10.8	ns
		$V_{CC} = 1.65\text{ V to }1.95\text{ V}$	3.2	5.3	9.0	ns
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	2.9	4.5	6.5	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	2.9	4.2	5.4	ns



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

Symbol	Parameter	Conditions	Min	Typ [1]	Max	Unit
<b>T<sub>amb</sub> = 25 °C</b>						
C <sub>PD</sub>	power dissipation capacitance	f = 1 MHz; V <sub>I</sub> = GND to V <sub>CC</sub> [3]				
		V <sub>CC</sub> = 0.8 V	-	2.5	-	pF
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	2.7	-	pF
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	2.8	-	pF
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	3.0	-	pF
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	3.5	-	pF
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	4.0	-	pF

- [1] All typical values are measured at nominal V<sub>CC</sub>.
- [2] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.
- [3] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$  where:  
 f<sub>i</sub> = input frequency in MHz;  
 f<sub>o</sub> = output frequency in MHz;  
 C<sub>L</sub> = output load capacitance in pF;  
 V<sub>CC</sub> = supply voltage in V;  
 N = number of inputs switching;  
 $\Sigma(C_L \times V_{CC}^2 \times f_o)$  = sum of the outputs.

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

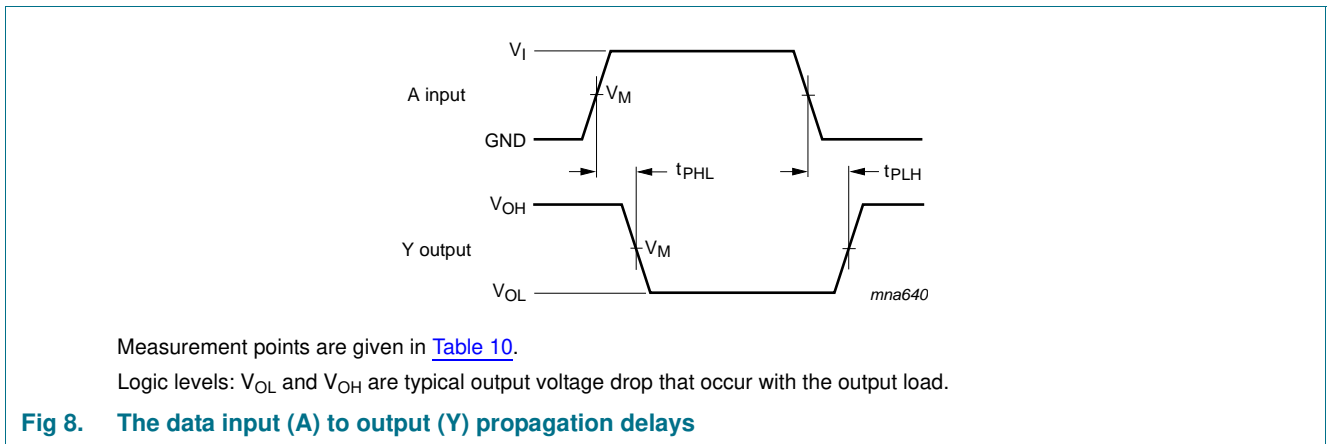
Symbol	Parameter	Conditions	-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Max	Min	Max	
<b>C<sub>L</sub> = 5 pF</b>							
t <sub>pd</sub>	propagation delay	A to Y; see <a href="#">Figure 8</a> [1]					
		V <sub>CC</sub> = 1.1 V to 1.3 V	2.1	11.4	2.1	12.6	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	1.6	7.4	1.6	8.2	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.4	5.9	1.4	6.5	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.1	4.5	1.1	5.0	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.0	3.9	1.0	4.3	ns
<b>C<sub>L</sub> = 10 pF</b>							
t <sub>pd</sub>	propagation delay	A to Y; see <a href="#">Figure 8</a> [1]					
		V <sub>CC</sub> = 1.1 V to 1.3 V	2.6	13.7	2.6	15.1	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	2.1	8.7	2.1	9.6	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.8	7.0	1.8	7.7	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.5	5.4	1.5	6.0	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.4	4.5	1.4	5.0	ns

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

Symbol	Parameter	Conditions	-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Max	Min	Max	
<b><math>C_L = 15 \text{ pF}</math></b>							
$t_{pd}$	propagation delay	A to Y; see <a href="#">Figure 8</a> <span style="float:right">[1]</span>					
		$V_{CC} = 1.1 \text{ V to } 1.3 \text{ V}$	3.0	15.8	3.0	17.4	ns
		$V_{CC} = 1.4 \text{ V to } 1.6 \text{ V}$	2.4	10.0	2.4	11.0	ns
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	2.1	8.0	2.1	8.8	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	1.8	6.1	1.8	6.8	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	1.8	5.0	1.8	5.5	ns
<b><math>C_L = 30 \text{ pF}</math></b>							
$t_{pd}$	propagation delay	A to Y; see <a href="#">Figure 8</a> <span style="float:right">[1]</span>					
		$V_{CC} = 1.1 \text{ V to } 1.3 \text{ V}$	4.0	19.0	4.0	20.9	ns
		$V_{CC} = 1.4 \text{ V to } 1.6 \text{ V}$	3.2	12.9	3.2	14.2	ns
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	2.9	10.5	2.9	11.6	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	2.6	7.6	2.6	8.4	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	2.6	6.2	2.6	6.9	ns

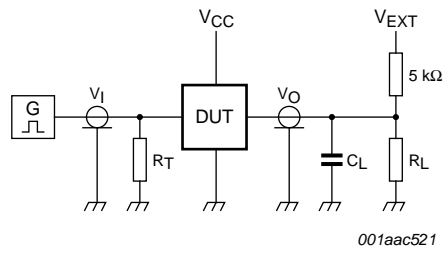
[1]  $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ .

## 12. Waveforms



**Table 10. 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	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{CC}$	$\leq 3.0 \text{ ns}$



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

Definitions for test circuit:

$R_L$  = Load resistance.

$C_L$  = Load capacitance including jig and probe capacitance

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

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

**Fig 9. Load circuitry for switching times**

**Table 11. 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  $R_L = 5 \text{ k}\Omega$ , for measuring propagation delays, setup and hold times and pulse width  $R_L = 1 \text{ M}\Omega$ .

13. Package outline

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

SOT353-1

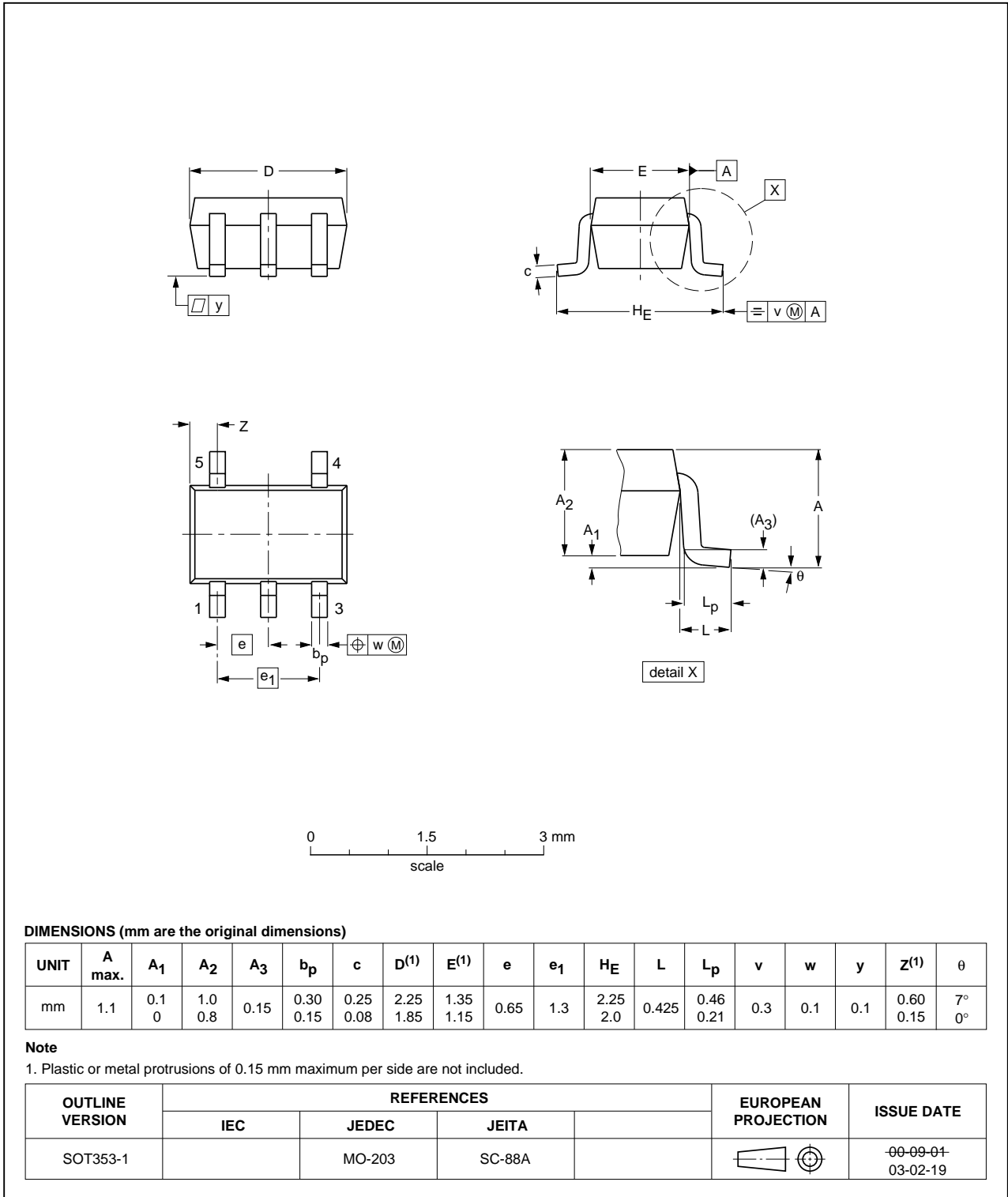


Fig 10. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads

SOT753

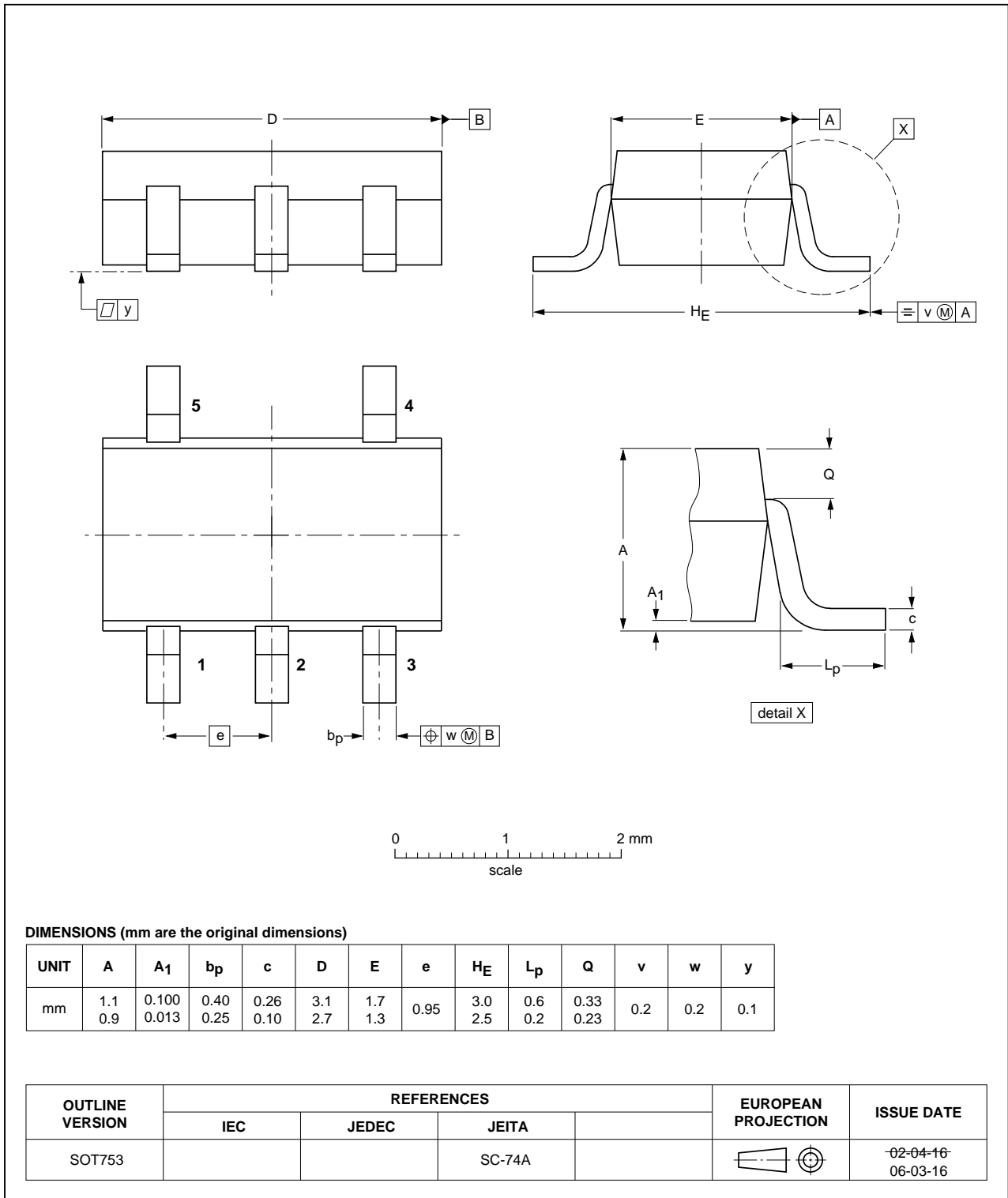


Fig 11. Package outline SOT753 (SC-74A)

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

SOT886

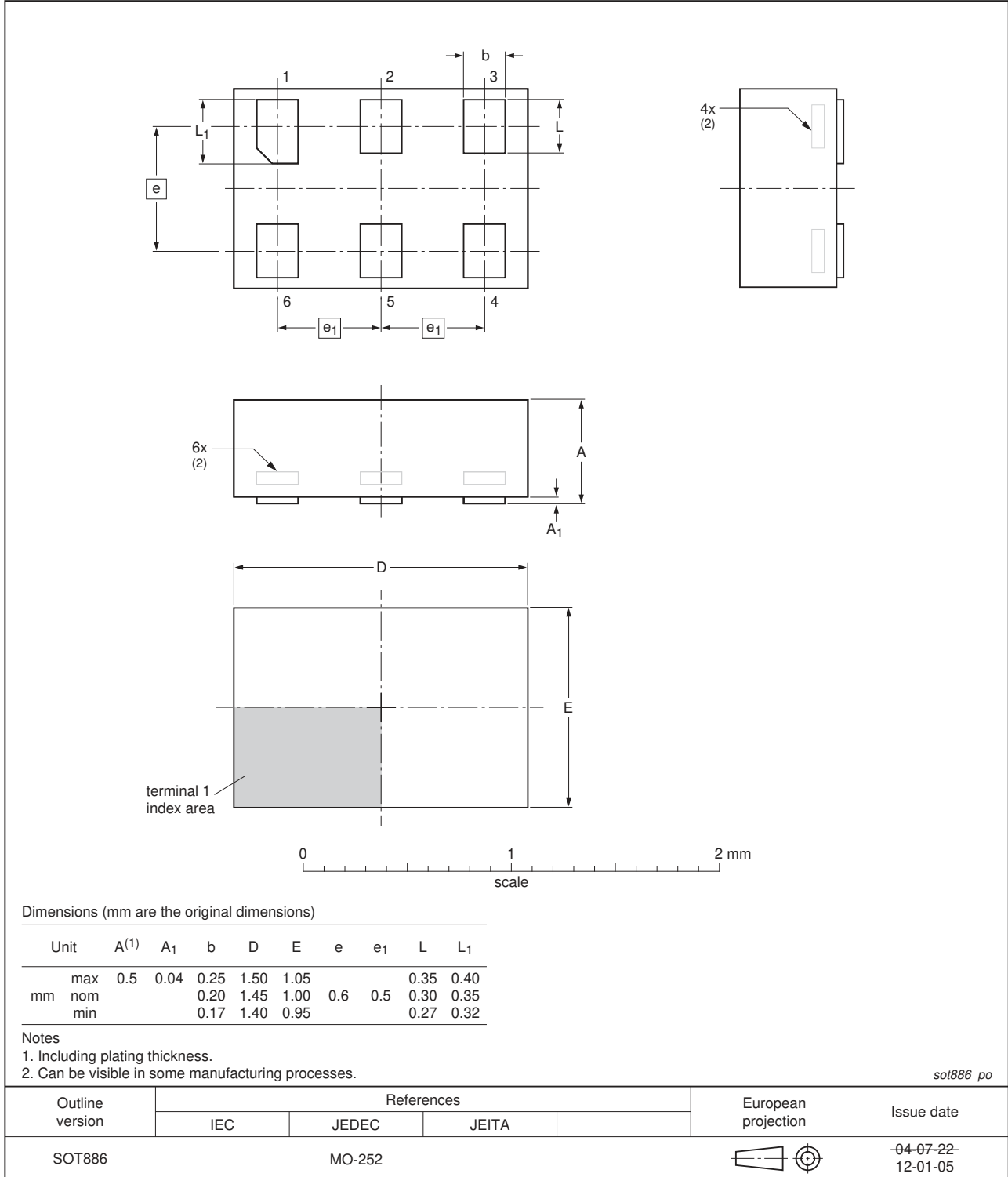


Fig 12. Package outline SOT886 (XSON6)

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

SOT891

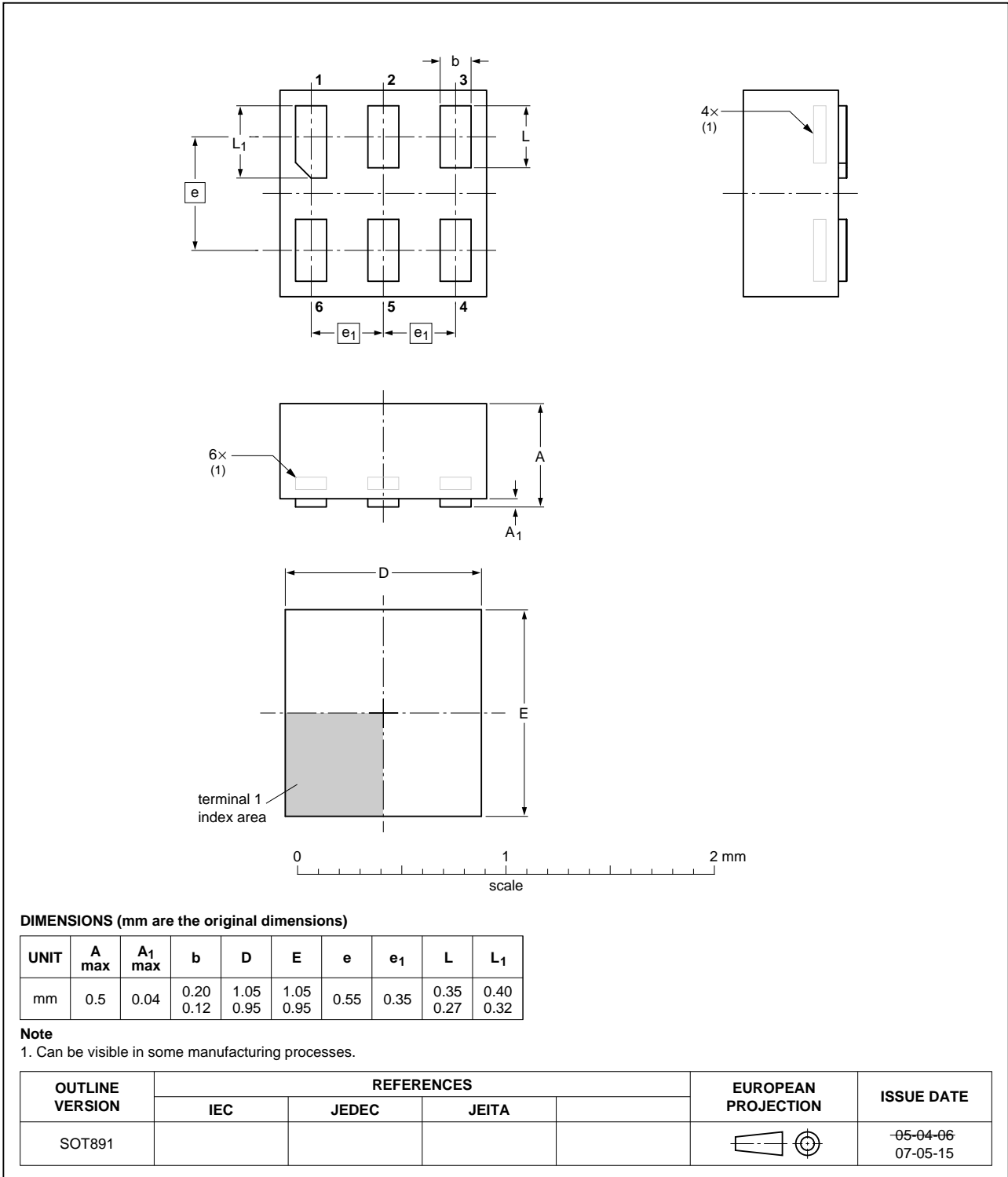


Fig 13. Package outline SOT891 (XSON6)

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

SOT1115

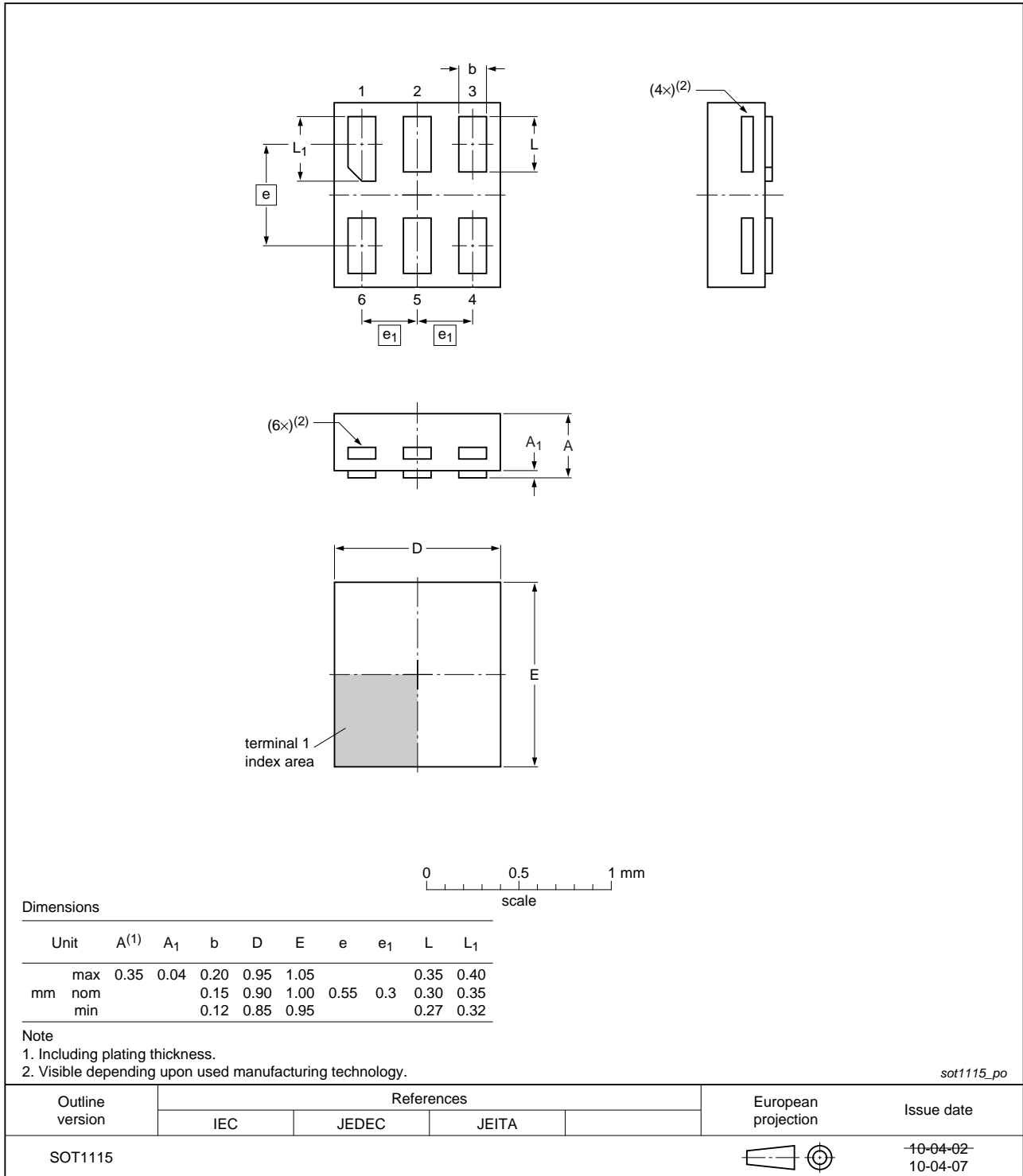
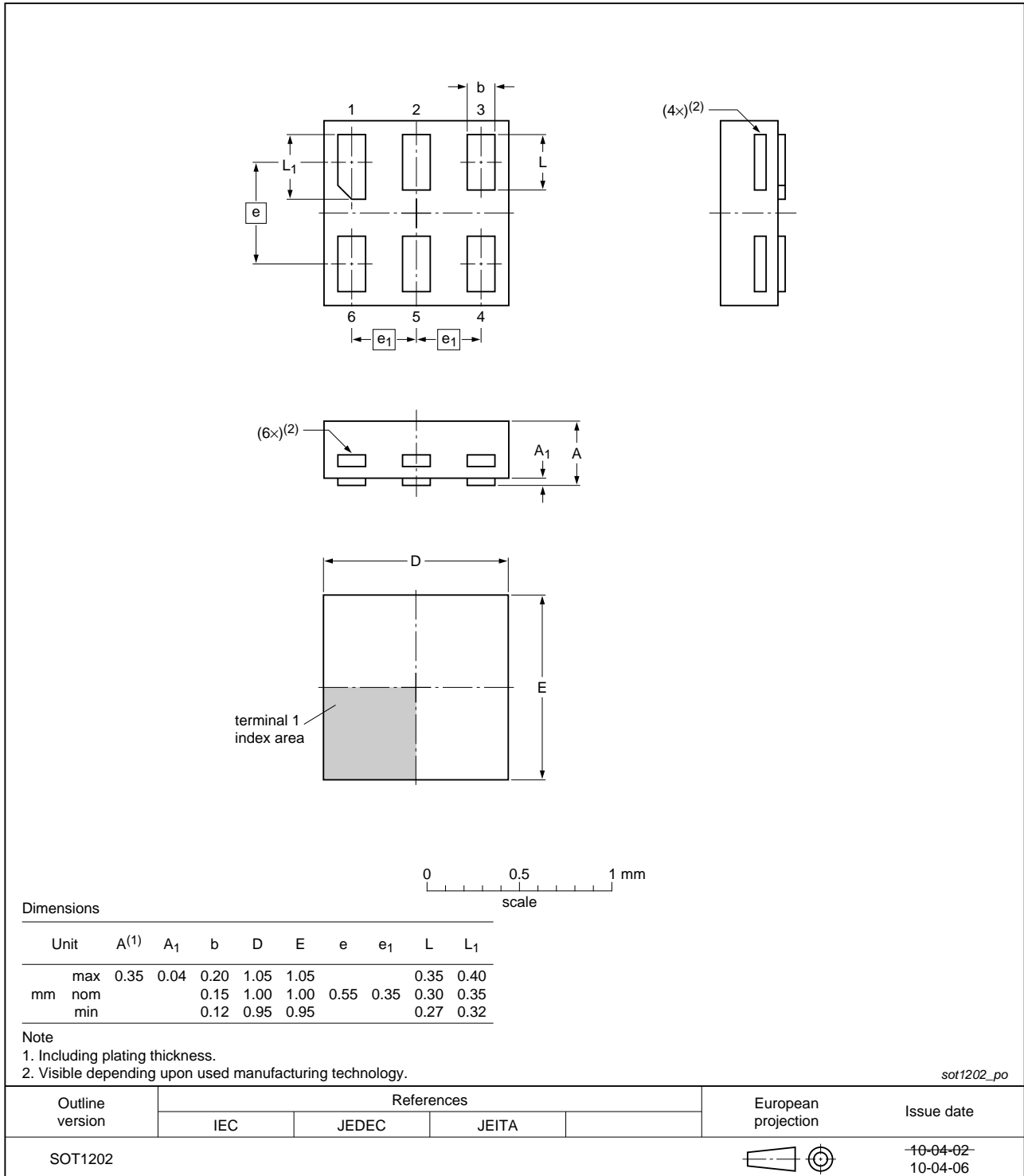


Fig 14. Package outline SOT1115 (XSON6)



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

**SOT1202**



**Fig 15. 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

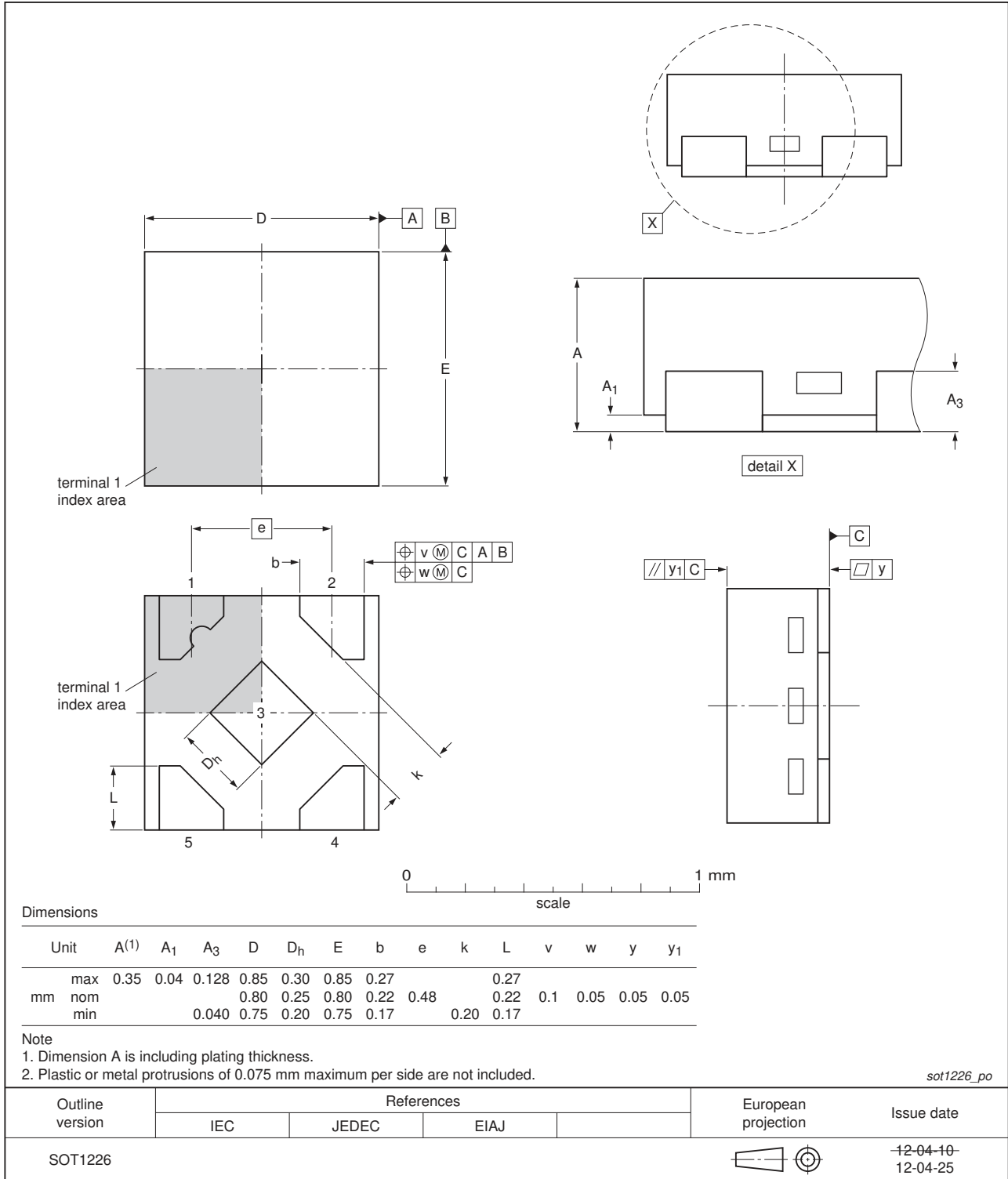


Fig 16. Package outline SOT1226 (X2SON5)

## 14. Abbreviations

Table 12. Abbreviations

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

## 15. Revision history

Table 13. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AUP1G04 v.7	20120627	Product data sheet	-	74AUP1G04 v.6
Modifications:	<ul style="list-style-type: none"> <li>Added type number 74AUP1G04GX (SOT1226)</li> </ul>			
74AUP1G04 v.6	20120214	Product data sheet	-	74AUP1G04 v.5
Modifications:	<ul style="list-style-type: none"> <li>Package outline drawing of SOT886 (<a href="#">Figure 12</a>) modified.</li> </ul>			
74AUP1G04 v.5	20111205	Product data sheet	-	74AUP1G04 v.4
Modifications:	<ul style="list-style-type: none"> <li>Legal pages updated.</li> </ul>			
74AUP1G04 v.4	20100630	Product data sheet	-	74AUP1G04 v.3
74AUP1G04 v.3	20091105	Product data sheet	-	74AUP1G04 v.2
74AUP1G04 v.2	20060628	Product data sheet	-	74AUP1G04 v.1
74AUP1G04 v.1	20050718	Product data sheet	-	-

## 16. Legal information

### 16.1 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".

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