

# 74AUP1T97

Low-power configurable gate with voltage-level translator

Rev. 6 — 28 March 2017

Product data sheet

## 1 General description

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The 74AUP1T97 provides low-power, low-voltage configurable logic gate functions. The output state is determined by eight patterns of 3-bit input. The user can choose the logic functions MUX, AND, OR, NAND, NOR, inverter and buffer. All inputs can be connected to  $V_{CC}$  or GND.

This device ensures a very low static and dynamic power consumption across the entire  $V_{CC}$  range from 2.3 V to 3.6 V.

The 74AUP1T97 is designed for logic-level translation applications with input switching levels that accept 1.8 V low-voltage CMOS signals, while operating from either a single 2.5 V or 3.3 V supply voltage.

The wide supply voltage range ensures normal operation as battery voltage drops from 3.6 V to 2.3 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.

Schmitt trigger inputs make the circuit tolerant to slower input rise and fall times across the entire  $V_{CC}$  range.

## 2 Features and benefits

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- Wide supply voltage range from 2.3 V to 3.6 V
- High noise immunity
- ESD protection:
  - HBM JESD22-A114F Class 3A exceeds 5 000 V
  - MM JESD22-A115-A exceeds 200 V
  - CDM JESD22-C101E exceeds 1 000 V
- Low static power consumption;  $I_{CC} = 1.5 \mu\text{A}$  (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 °C to +85 °C and -40 °C to +125 °C

### 3 Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74AUP1T97GW	-40 °C to +125 °C	SC-88	plastic surface-mounted package; 6 leads	SOT363
74AUP1T97GM	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1.45 x 0.5 mm	SOT886
74AUP1T97GF	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1 x 0.5 mm	SOT891
74AUP1T97GN	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 0.9 x 1.0 x 0.35 mm	SOT1115
74AUP1T97GS	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 1.0 x 1.0 x 0.35 mm	SOT1202
74AUP1T97GX	-40 °C to +125 °C	X2SON6	plastic thermal extremely thin small outline package; no leads; 6 terminals; body 1 x 0.8 x 0.35 mm	SOT1255
74AUP1T97UK	-40 °C to +125 °C	WLCSP6	wafer level chip-scale package; 6 bumps; 0.65 x 0.44 x 0.27 mm	SOT1454-1

### 4 Marking

Table 2. Marking

Type number	Marking code <sup>[1]</sup>
74AUP1T97GW	59
74AUP1T97GM	59
74AUP1T97GF	59
74AUP1T97GN	59
74AUP1T97GS	59
74AUP1T97GX	59
74AUP1T97UK	9

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

5 Pinning information

5.1 Pinning

Table 3. Pinning

<p style="text-align: center;"><b>74AUP1T97</b></p> <p style="text-align: center;">001aag500</p>	<p style="text-align: center;"><b>74AUP1T97</b></p> <p style="text-align: center;">001aag501</p> <p style="text-align: center;">Transparent top view</p>
<p style="text-align: center;"><b>74AUP1T97</b></p> <p style="text-align: center;">001aag502</p> <p style="text-align: center;">Transparent top view</p>	<p style="text-align: center;"><b>74AUP1T97</b></p> <p style="text-align: center;">aaa-019832</p> <p style="text-align: center;">Transparent top view</p>
<p style="text-align: center;"><b>74AUP1T97UK</b></p> <p style="text-align: center;">ball A1 index area</p> <p style="text-align: center;">aaa-018292</p> <p style="text-align: center;">Transparent top view</p>	<p style="text-align: center;"><b>74AUP1T97UK</b></p> <p style="text-align: center;">aaa-018293</p> <p style="text-align: center;">Transparent top view</p>

## 5.2 Pin description

Table 4. Pin description

Symbol	Pin		Description
	SC88, XSON6 and X2SON6	WLCSP6	
B	1	A1	data input
GND	2	B1	ground (0 V)
A	3	C1	data input
Y	4	C2	data output
V <sub>CC</sub>	5	B2	supply voltage
C	6	A2	data input

## 6 Functional description

Table 5. Function table <sup>[1]</sup>

Input			Output
C	B	A	Y
L	L	L	L
L	L	H	L
L	H	L	H
L	H	H	H
H	L	L	L
H	L	H	H
H	H	L	L
H	H	H	H

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

## 7 Functional diagram

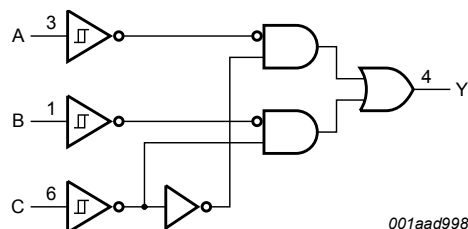


Figure 7. Logic symbol

## 8 Logic configurations

Table 6. Function selection table

Logic function	Figure
2-input MUX	see <a href="#">Figure 8</a>
2-input AND	see <a href="#">Figure 9</a>
2-input OR with one input inverted	see <a href="#">Figure 10</a>
2-input NAND with one input inverted	see <a href="#">Figure 10</a>
2-input AND with one input inverted	see <a href="#">Figure 11</a>
2-input NOR with one input inverted	see <a href="#">Figure 11</a>
2-input OR	see <a href="#">Figure 12</a>
Inverter	see <a href="#">Figure 13</a>
Buffer	see <a href="#">Figure 14</a>

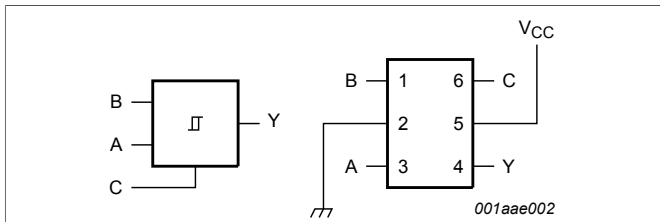


Figure 8. 2-input MUX

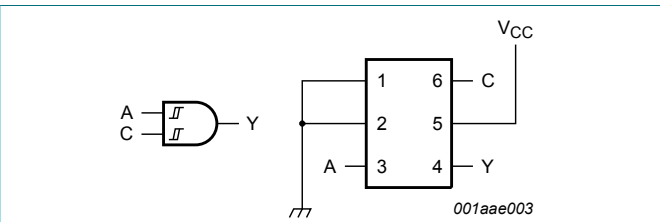


Figure 9. 2-input AND gate

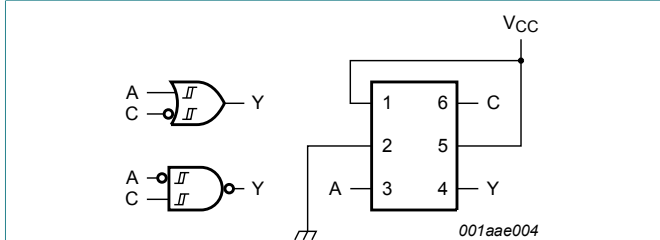


Figure 10. 2-input NAND gate with input A inverted or 2-input OR gate with input C inverted

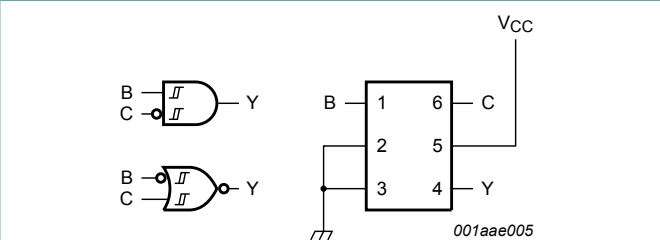


Figure 11. 2-input NOR gate with input B inverted or 2-input AND gate with input C inverted

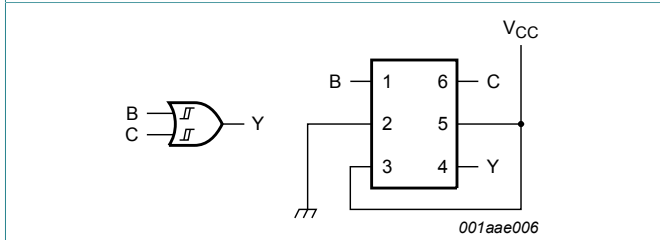


Figure 12. 2-input OR gate

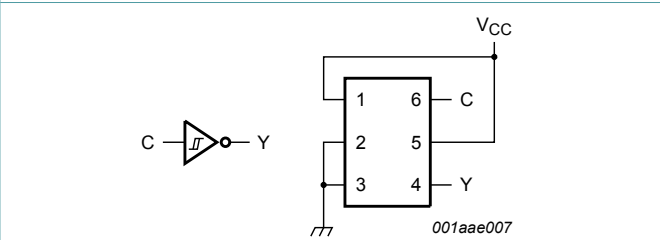


Figure 13. Inverter

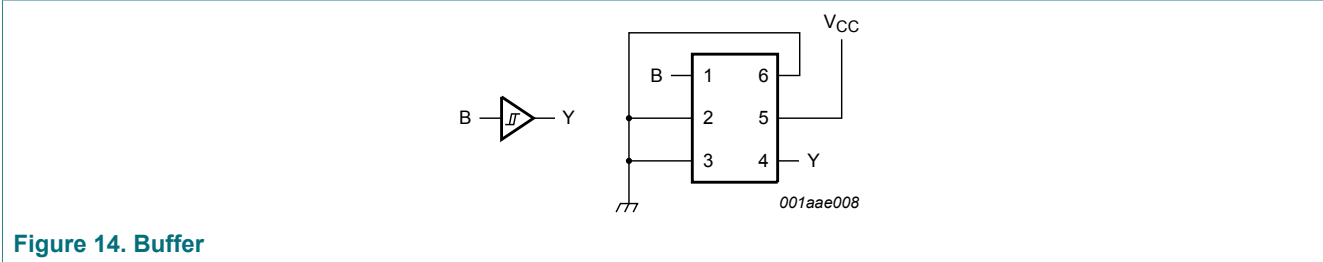


Figure 14. Buffer

## 9 Limiting values

Table 7. 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		[1] -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	[1] -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	[2] -	250	mW

[1] The minimum input and output voltage ratings may be exceeded if the input and output current ratings are observed.

[2] For SC-88 package: above 87.5 °C the value of  $P_{tot}$  derates linearly with 4.0 mW/K.  
 For X2SON6 and XSON6 packages: above 118 °C the value of  $P_{tot}$  derates linearly with 7.8 mW/K.  
 For WLCSP6 package: above 102.5 °C the value of  $P_{tot}$  derates linearly with 5.3 mW/K.

## 10 Recommended operating conditions

Table 8. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage		2.3	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 9. Static characteristics**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$T_{amb} = 25\text{ }^{\circ}\text{C}$						
$V_{T+}$	positive-going threshold voltage	$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	0.60	-	1.10	V
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	0.75	-	1.16	V
$V_{T-}$	negative-going threshold voltage	$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	0.35	-	0.60	V
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	0.50	-	0.85	V
$V_H$	hysteresis voltage	$(V_H = V_{T+} - V_{T-})$				
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	0.23	-	0.60	V
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	0.25	-	0.56	V
$V_{OH}$	HIGH-level output voltage	$V_I = V_{T+}$ or $V_{T-}$				
		$I_O = -20\text{ }\mu\text{A}$ ; $V_{CC} = 2.3\text{ V to }3.6\text{ V}$	$V_{CC} - 0.1$	-	-	V
		$I_O = -2.3\text{ mA}$ ; $V_{CC} = 2.3\text{ V}$	2.05	-	-	V
		$I_O = -3.1\text{ mA}$ ; $V_{CC} = 2.3\text{ V}$	1.9	-	-	V
		$I_O = -2.7\text{ mA}$ ; $V_{CC} = 3.0\text{ V}$	2.72	-	-	V
		$I_O = -4.0\text{ mA}$ ; $V_{CC} = 3.0\text{ V}$	2.6	-	-	V
$V_{OL}$	LOW-level output voltage	$V_I = V_{T+}$ or $V_{T-}$				
		$I_O = 20\text{ }\mu\text{A}$ ; $V_{CC} = 2.3\text{ V to }3.6\text{ V}$	-	-	0.10	V
		$I_O = 2.3\text{ mA}$ ; $V_{CC} = 2.3\text{ V}$	-	-	0.31	V
		$I_O = 3.1\text{ mA}$ ; $V_{CC} = 2.3\text{ V}$	-	-	0.44	V
		$I_O = 2.7\text{ mA}$ ; $V_{CC} = 3.0\text{ V}$	-	-	0.31	V
		$I_O = 4.0\text{ mA}$ ; $V_{CC} = 3.0\text{ V}$	-	-	0.44	V
$I_I$	input leakage current	$V_I = \text{GND to }3.6\text{ V}$ ; $V_{CC} = 0\text{ V to }3.6\text{ V}$	-	-	$\pm 0.1$	$\mu\text{A}$
$I_{OFF}$	power-off leakage current	$V_I$ or $V_O = 0\text{ V to }3.6\text{ V}$ ; $V_{CC} = 0\text{ V}$	-	-	$\pm 0.1$	$\mu\text{A}$
$\Delta I_{OFF}$	additional power-off leakage current	$V_I$ or $V_O = 0\text{ V to }3.6\text{ V}$ ; $V_{CC} = 0\text{ V to }0.2\text{ V}$	-	-	$\pm 0.2$	$\mu\text{A}$
$I_{CC}$	supply current	$V_I = \text{GND or }V_{CC}$ ; $I_O = 0\text{ A}$ ; $V_{CC} = 2.3\text{ V to }3.6\text{ V}$	-	-	1.2	$\mu\text{A}$
$C_I$	input capacitance	$V_{CC} = 0\text{ V to }3.6\text{ V}$ ; $V_I = \text{GND or }V_{CC}$	-	0.8	-	pF
$C_O$	output capacitance	$V_O = \text{GND}$ ; $V_{CC} = 0\text{ V}$	-	1.7	-	pF
$T_{amb} = -40\text{ }^{\circ}\text{C to }+85\text{ }^{\circ}\text{C}$						
$V_{T+}$	positive-going threshold voltage	$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	0.60	-	1.10	V
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	0.75	-	1.19	V

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>T-</sub>	negative-going threshold voltage	V <sub>CC</sub> = 2.3 V to 2.7 V	0.35	-	0.60	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	0.50	-	0.85	V
V <sub>H</sub>	hysteresis voltage	(V <sub>H</sub> = V <sub>T+</sub> - V <sub>T-</sub> )				
		V <sub>CC</sub> = 2.3 V to 2.7 V	0.10	-	0.60	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	0.15	-	0.56	V
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> = 2.3 V to 3.6 V	V <sub>CC</sub> - 0.1	-	-	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
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> = 2.3 V to 3.6 V	-	-	0.1	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	-	-	±0.5	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> = 2.3 V to 3.6 V	-	-	1.5	μA
ΔI <sub>CC</sub>	additional supply current	V <sub>CC</sub> = 2.3 V to 2.7 V; I <sub>O</sub> = 0 A [1]	-	-	4	μA
		V <sub>CC</sub> = 3.0 V to 3.6 V; I <sub>O</sub> = 0 A [2]	-	-	12	μA
T <sub>amb</sub> = -40 °C to +125 °C						
V <sub>T+</sub>	positive-going threshold voltage	V <sub>CC</sub> = 2.3 V to 2.7 V	0.60	-	1.10	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	0.75	-	1.19	V
V <sub>T-</sub>	negative-going threshold voltage	V <sub>CC</sub> = 2.3 V to 2.7 V	0.33	-	0.64	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	0.46	-	0.85	V
V <sub>H</sub>	hysteresis voltage	(V <sub>H</sub> = V <sub>T+</sub> - V <sub>T-</sub> )				
		V <sub>CC</sub> = 2.3 V to 2.7 V	0.10	-	0.60	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	0.15	-	0.56	V
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> = 2.3 V to 3.6 V	V <sub>CC</sub> - 0.11	-	-	V



Symbol	Parameter	Conditions	Min	Typ	Max	Unit
		$I_O = -2.3 \text{ mA}; V_{CC} = 2.3 \text{ V}$	1.77	-	-	V
		$I_O = -3.1 \text{ mA}; V_{CC} = 2.3 \text{ V}$	1.67	-	-	V
		$I_O = -2.7 \text{ mA}; V_{CC} = 3.0 \text{ V}$	2.40	-	-	V
		$I_O = -4.0 \text{ mA}; V_{CC} = 3.0 \text{ V}$	2.30	-	-	V
$V_{OL}$	LOW-level output voltage	$V_I = V_{T+}$ or $V_{T-}$				
		$I_O = 20 \text{ }\mu\text{A}; V_{CC} = 2.3 \text{ V to } 3.6 \text{ V}$	-	-	0.11	V
		$I_O = 2.3 \text{ mA}; V_{CC} = 2.3 \text{ V}$	-	-	0.36	V
		$I_O = 3.1 \text{ mA}; V_{CC} = 2.3 \text{ V}$	-	-	0.50	V
		$I_O = 2.7 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.36	V
		$I_O = 4.0 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.50	V
$I_I$	input leakage current	$V_I = \text{GND to } 3.6 \text{ V};$ $V_{CC} = 0 \text{ V to } 3.6 \text{ V}$	-	-	$\pm 0.75$	$\mu\text{A}$
$I_{OFF}$	power-off leakage current	$V_I$ or $V_O = 0 \text{ V to } 3.6 \text{ V}; V_{CC} = 0 \text{ V}$	-	-	$\pm 0.75$	$\mu\text{A}$
$\Delta I_{OFF}$	additional power-off leakage current	$V_I$ or $V_O = 0 \text{ V to } 3.6 \text{ V};$ $V_{CC} = 0 \text{ V to } 0.2 \text{ V}$	-	-	$\pm 0.75$	$\mu\text{A}$
$I_{CC}$	supply current	$V_I = \text{GND or } V_{CC}; I_O = 0 \text{ A};$ $V_{CC} = 2.3 \text{ V to } 3.6 \text{ V}$	-	-	3.5	$\mu\text{A}$
$\Delta I_{CC}$	additional supply current	$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}; I_O = 0 \text{ A}$ <sup>[1]</sup>	-	-	7	$\mu\text{A}$
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}; I_O = 0 \text{ A}$ <sup>[2]</sup>	-	-	22	$\mu\text{A}$

[1] One input at 0.3 V or 1.1 V, other input at  $V_{CC}$  or GND.

[2] One input at 0.45 V or 1.2 V, other input at  $V_{CC}$  or GND.

## 12 Dynamic characteristics

**Table 10. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 16](#).

Symbol	Parameter	Conditions	25 °C			-40 °C to +125 °C			Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max (85 °C)	Max (125 °C)	
$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}; V_I = 1.65 \text{ V to } 1.95 \text{ V}$									
$t_{pd}$	propagation delay	A, B, C to Y; see <a href="#">Figure 15</a> <sup>[2]</sup>							
		$C_L = 5 \text{ pF}$	2.2	3.5	5.5	0.5	6.8	7.5	ns
		$C_L = 10 \text{ pF}$	2.6	4.1	6.3	1.0	7.9	8.7	ns
		$C_L = 15 \text{ pF}$	2.9	4.6	6.9	1.0	8.7	9.6	ns
		$C_L = 30 \text{ pF}$	3.7	5.8	8.4	1.5	10.8	11.9	ns
$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}; V_I = 2.3 \text{ V to } 2.7 \text{ V}$									
$t_{pd}$	propagation delay	A, B, C to Y; see <a href="#">Figure 15</a> <sup>[2]</sup>							
		$C_L = 5 \text{ pF}$	1.8	3.4	5.5	0.5	6.0	6.6	ns
		$C_L = 10 \text{ pF}$	2.2	4.0	6.2	1.0	7.1	7.9	ns
		$C_L = 15 \text{ pF}$	2.5	4.4	6.8	1.0	7.9	8.7	ns
		$C_L = 30 \text{ pF}$	3.2	5.6	8.3	1.5	10.0	11.0	ns
$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}; V_I = 3.0 \text{ V to } 3.6 \text{ V}$									
$t_{pd}$	propagation delay	A, B, C to Y; see <a href="#">Figure 15</a> <sup>[2]</sup>							
		$C_L = 5 \text{ pF}$	1.4	3.1	5.0	0.5	5.5	6.1	ns
		$C_L = 10 \text{ pF}$	1.8	3.7	5.7	1.0	6.5	7.2	ns
		$C_L = 15 \text{ pF}$	2.2	4.2	6.3	1.0	7.4	8.2	ns
		$C_L = 30 \text{ pF}$	2.9	5.3	7.9	1.5	9.5	10.5	ns
$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}; V_I = 1.65 \text{ V to } 1.95 \text{ V}$									
$t_{pd}$	propagation delay	A, B, C to Y; see <a href="#">Figure 15</a> <sup>[2]</sup>							
		$C_L = 5 \text{ pF}$	2.1	2.9	3.9	0.5	8.0	8.8	ns
		$C_L = 10 \text{ pF}$	2.5	3.4	4.6	1.0	8.5	9.4	ns
		$C_L = 15 \text{ pF}$	2.9	3.9	5.2	1.0	9.1	10.1	ns
		$C_L = 30 \text{ pF}$	3.6	5.0	6.7	1.5	9.8	10.8	ns
$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}; V_I = 2.3 \text{ V to } 2.7 \text{ V}$									
$t_{pd}$	propagation delay	A, B, C to Y; see <a href="#">Figure 15</a> <sup>[2]</sup>							
		$C_L = 5 \text{ pF}$	1.7	2.8	4.2	0.5	5.3	5.9	ns
		$C_L = 10 \text{ pF}$	2.1	3.4	5.0	1.0	6.1	6.8	ns
		$C_L = 15 \text{ pF}$	2.4	3.8	5.6	1.0	6.8	7.5	ns
		$C_L = 30 \text{ pF}$	3.2	5.0	7.1	1.5	8.5	9.4	ns
$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}; V_I = 3.0 \text{ V to } 3.6 \text{ V}$									
$t_{pd}$	propagation delay	A, B, C to Y; see <a href="#">Figure 15</a> <sup>[2]</sup>							

Symbol	Parameter	Conditions	25 °C			-40 °C to +125 °C			Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max (85 °C)	Max (125 °C)	
		$C_L = 5 \text{ pF}$	1.4	2.7	4.2	0.5	4.7	5.2	ns
		$C_L = 10 \text{ pF}$	1.8	3.3	5.0	1.0	5.7	6.3	ns
		$C_L = 15 \text{ pF}$	2.1	3.8	5.6	1.0	6.2	6.9	ns
		$C_L = 30 \text{ pF}$	2.9	4.9	7.1	1.5	7.8	8.6	ns
$T_{\text{amb}} = 25 \text{ °C}$									
$C_{\text{PD}}$	power dissipation capacitance	$f_i = 1 \text{ MHz}; V_I = \text{GND to } V_{\text{CC}} \text{ [3]}$							
		$V_{\text{CC}} = 2.3 \text{ V to } 2.7 \text{ V}$	-	3.6	-	-	-	-	pF
		$V_{\text{CC}} = 3.0 \text{ V to } 3.6 \text{ V}$	-	4.3	-	-	-	-	pF

- [1] All typical values are measured at nominal  $V_{\text{CC}}$ .
- [2]  $t_{\text{pd}}$  is the same as  $t_{\text{PLH}}$  and  $t_{\text{PHL}}$ .
- [3]  $C_{\text{PD}}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).  
 $P_D = C_{\text{PD}} \times V_{\text{CC}}^2 \times f_i \times N + \sum(C_L \times V_{\text{CC}}^2 \times f_o)$  where:  
 $f_i$  = input frequency in MHz;  
 $f_o$  = output frequency in MHz;  
 $C_L$  = output load capacitance in pF;  
 $V_{\text{CC}}$  = supply voltage in V;  
 $N$  = number of inputs switching;  
 $\sum(C_L \times V_{\text{CC}}^2 \times f_o)$  = sum of the outputs.

### 12.1 Waveforms and test circuit

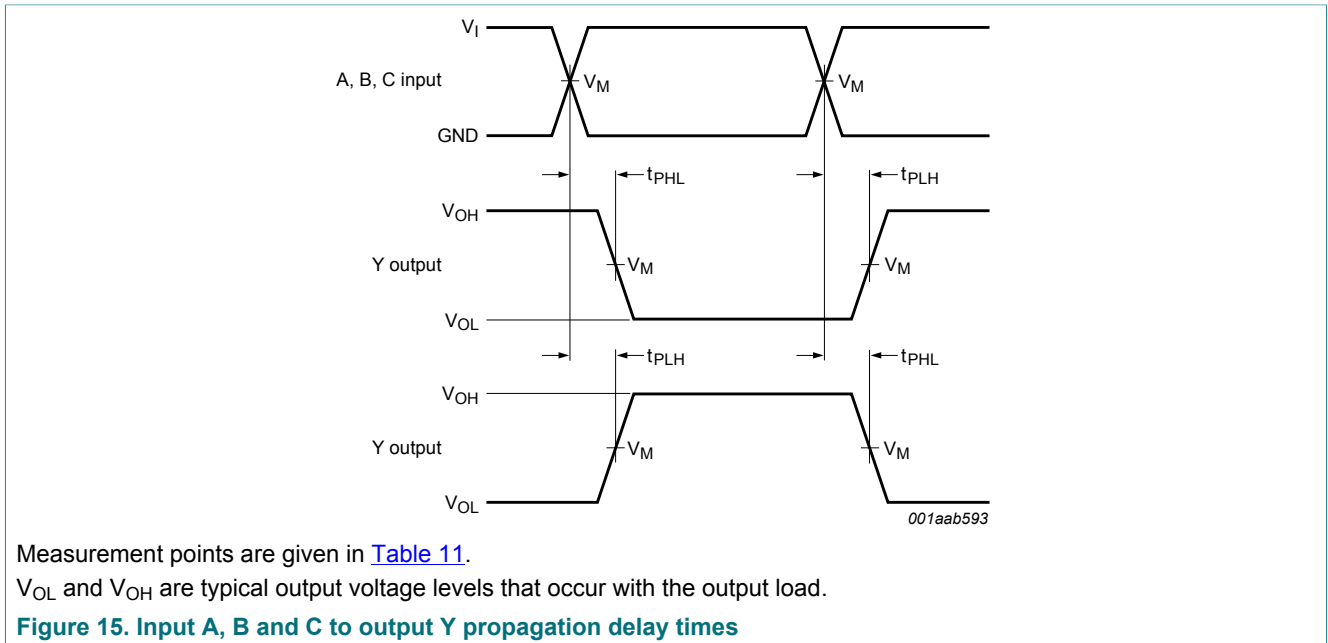
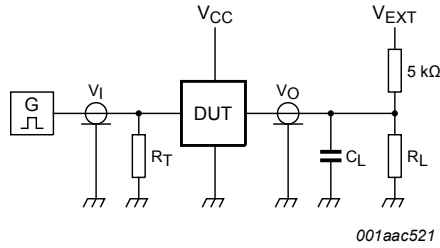


Table 11. Measurement points

Supply voltage	Output	Input		
$V_{CC}$	$V_M$	$V_M$	$V_I$	$t_r = t_f$
2.3 V to 3.6 V	$0.5V_{CC}$	$0.5V_I$	1.65 V to 3.6 V	$\leq 3.0$ ns



Test data is given in [Table 12](#).

Definitions test circuit:

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

$C_L$  = load capacitance including jig and probe capacitance.

$R_L$  = load resistance.

Figure 16. Test circuit for measuring switching times

Table 12. Test data

Supply voltage	Load		$V_{EXT}$		
$V_{CC}$	$C_L$	$R_L^{[1]}$	$t_{PLH}, t_{PHL}$	$t_{PZH}, t_{PHZ}$	$t_{PZL}, t_{PLZ}$
2.3 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.

13 Package outline

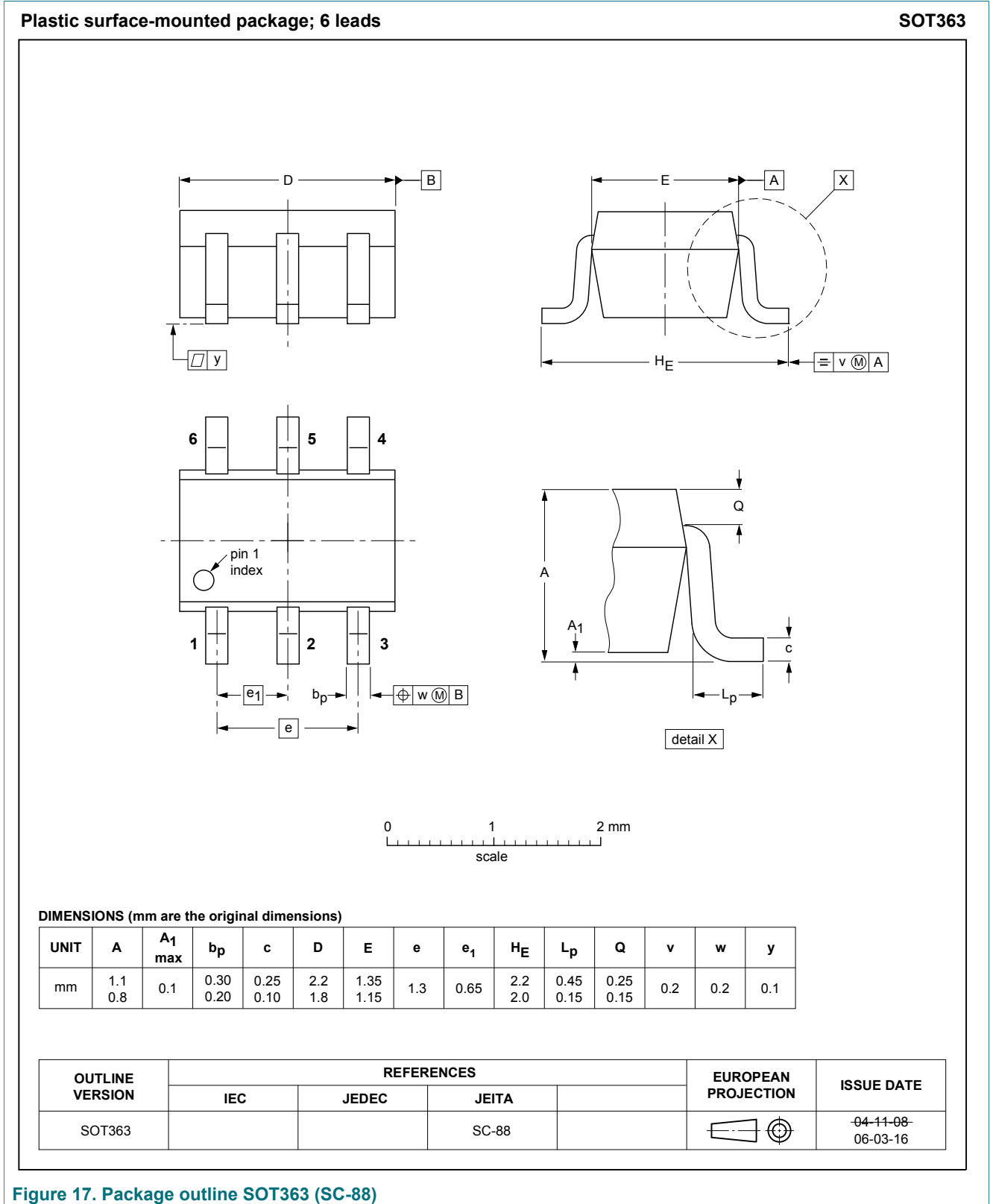
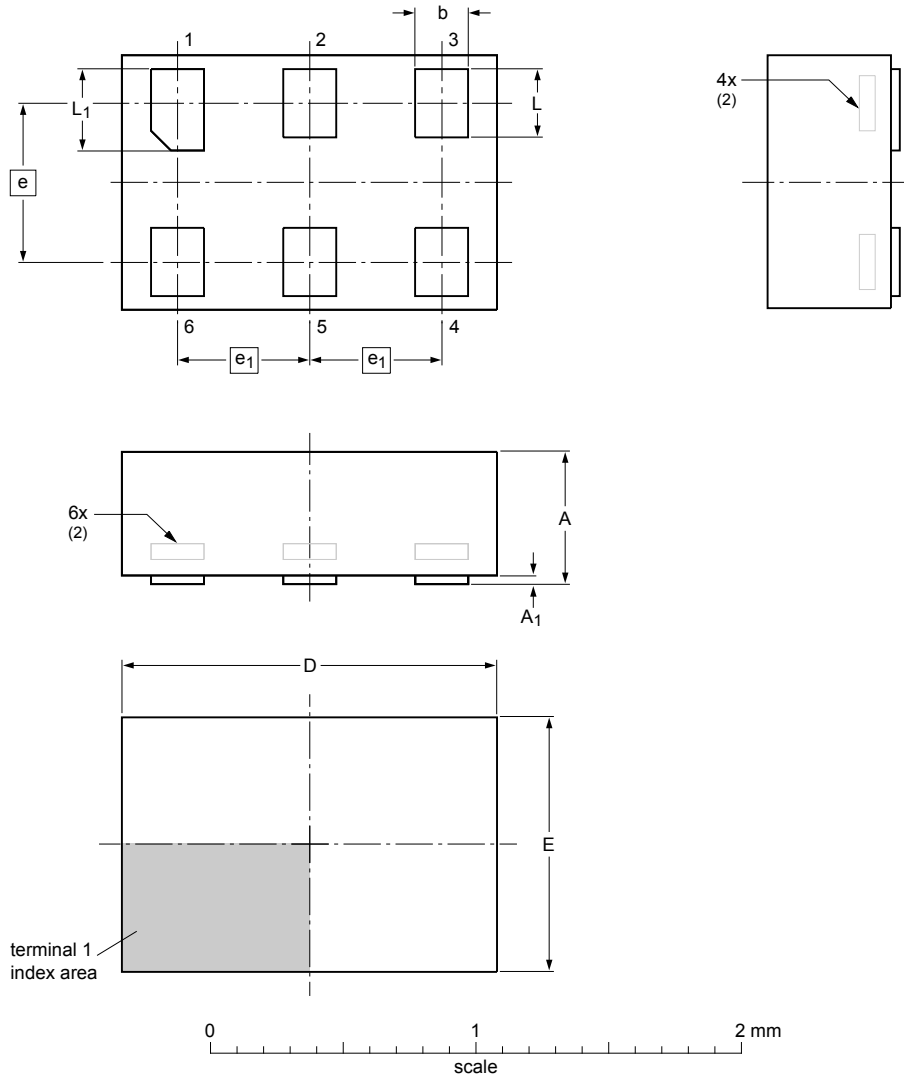


Figure 17. Package outline SOT363 (SC-88)

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

SOT886



Dimensions (mm are the original dimensions)

Unit	A <sup>(1)</sup>	A <sub>1</sub>	b	D	E	e	e <sub>1</sub>	L	L <sub>1</sub>
max	0.5	0.04	0.25	1.50	1.05			0.35	0.40
nom			0.20	1.45	1.00	0.6	0.5	0.30	0.35
min			0.17	1.40	0.95			0.27	0.32

Notes

- 1. Including plating thickness.
- 2. Can be visible in some manufacturing processes.

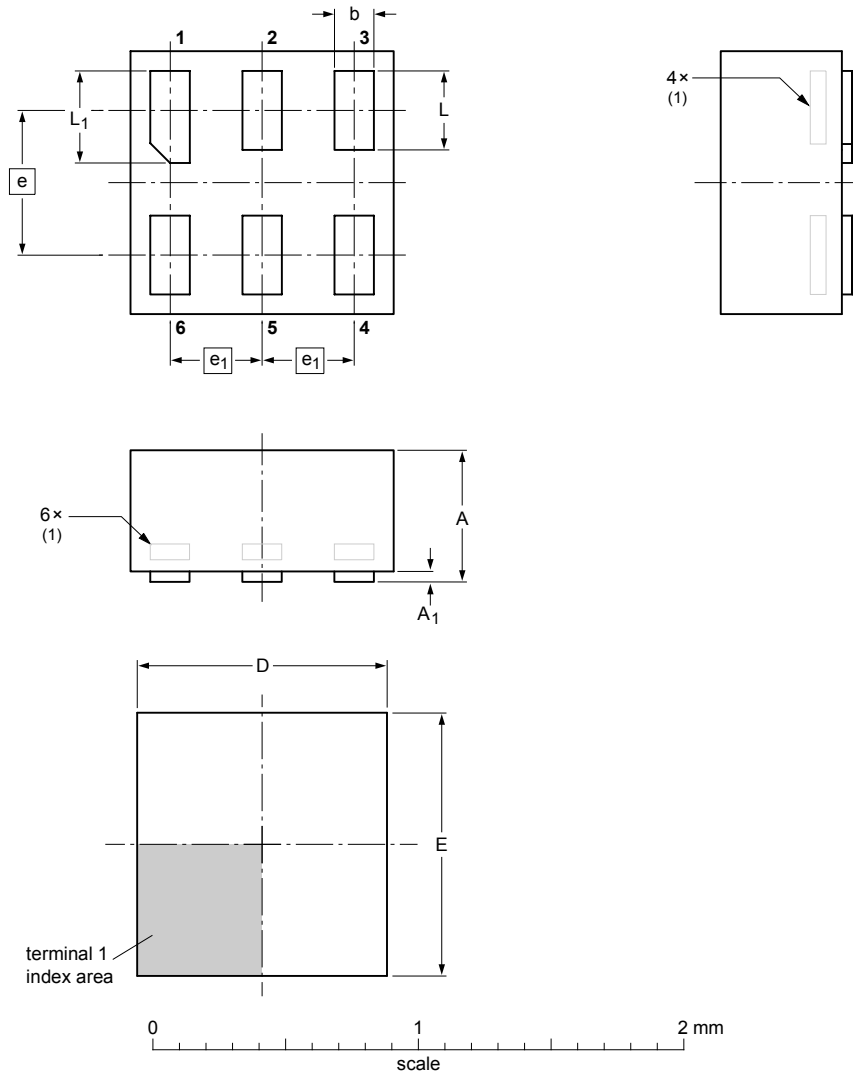
sot886\_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT886		MO-252				04-07-22 12-01-05

Figure 18. Package outline SOT886 (XSON6)

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

SOT891



**DIMENSIONS (mm are the original dimensions)**

UNIT	A max	A <sub>1</sub> max	b	D	E	e	e <sub>1</sub>	L	L <sub>1</sub>
mm	0.5	0.04	0.20 0.12	1.05 0.95	1.05 0.95	0.55	0.35	0.35 0.27	0.40 0.32

**Note**

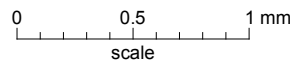
1. Can be visible in some manufacturing processes.

OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA		
SOT891					-05-04-06 07-05-15

Figure 19. 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



Dimensions

Unit	A <sup>(1)</sup>	A <sub>1</sub>	b	D	E	e	e <sub>1</sub>	L	L <sub>1</sub>
mm	max 0.35	0.04	0.20	0.95	1.05			0.35	0.40
	nom 0.15	0.90	1.00	0.55	0.3	0.30	0.35		
	min 0.12	0.85	0.95			0.27	0.32		

Note

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

sot1115\_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1115						-10-04-02- 10-04-07

Figure 20. 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



Dimensions

Unit	A <sup>(1)</sup>	A <sub>1</sub>	b	D	E	e	e <sub>1</sub>	L	L <sub>1</sub>
mm	max 0.35	0.04	0.20	1.05	1.05	0.35	0.40	0.35	0.40
	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.

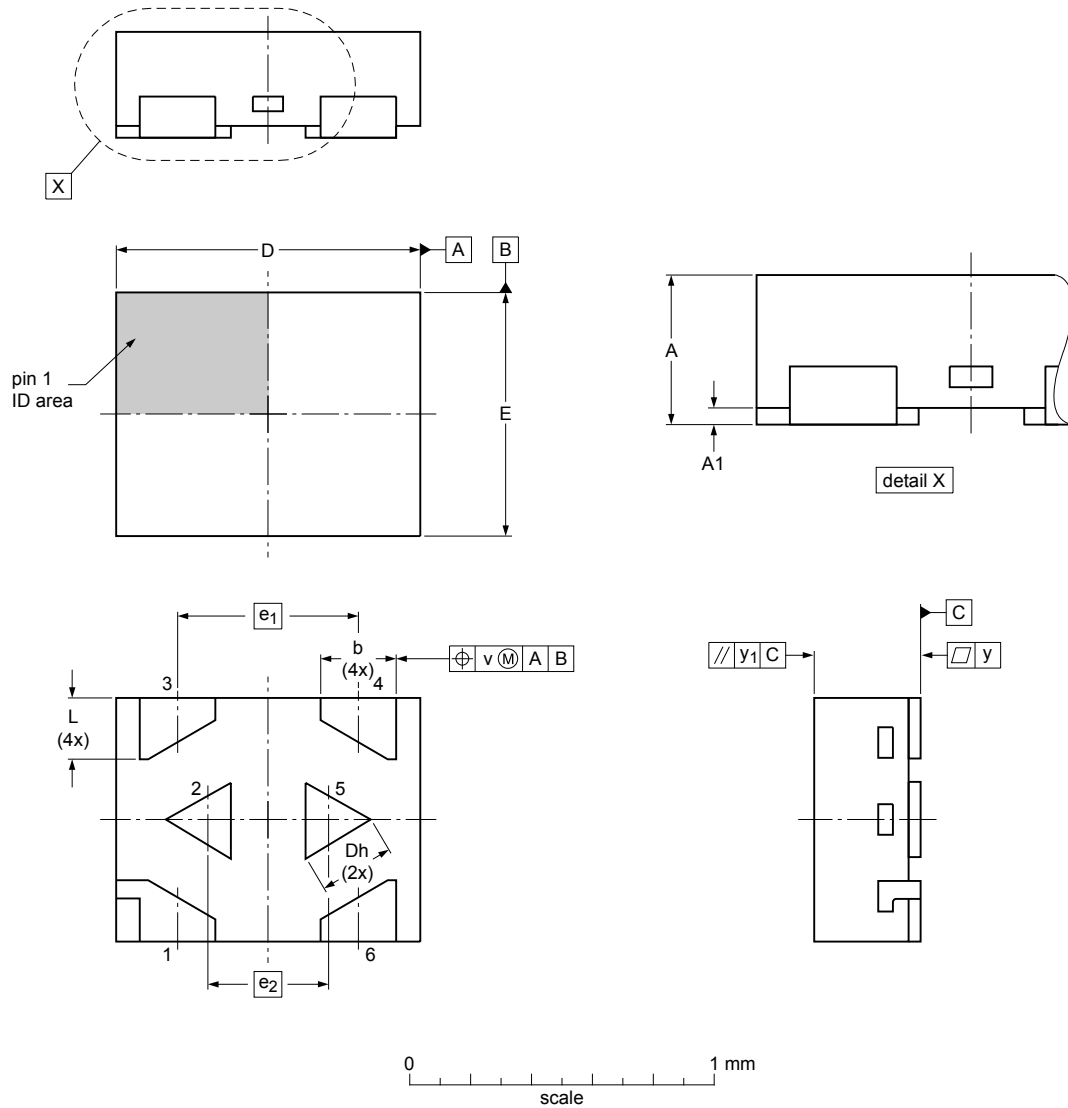
sot1202\_po

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

Figure 21. Package outline SOT1202 (XSON6)

X2SON6: plastic thermal enhanced extremely thin small outline package; no leads;  
6 terminals; body 1.0 x 0.8 x 0.35 mm

SOT1255



Dimensions (mm are the original dimensions)

Unit	A	A <sub>1</sub>	D	D <sub>h</sub>	E	e <sub>1</sub>	e <sub>2</sub>	b	L	v	y	y <sub>1</sub>
max	0.35	0.04	1.05	0.30	0.85			0.30	0.25			
mm nom	0.32	0.02	1.00	0.25	0.80	0.60	0.40	0.25	0.20	0.10	0.05	0.05
min	0.30	0.00	0.95	0.22	0.75			0.22	0.17			

sot1255\_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1255						-15-07-20- 15-07-22

Figure 22. Package outline SOT1255 (X2SON6)

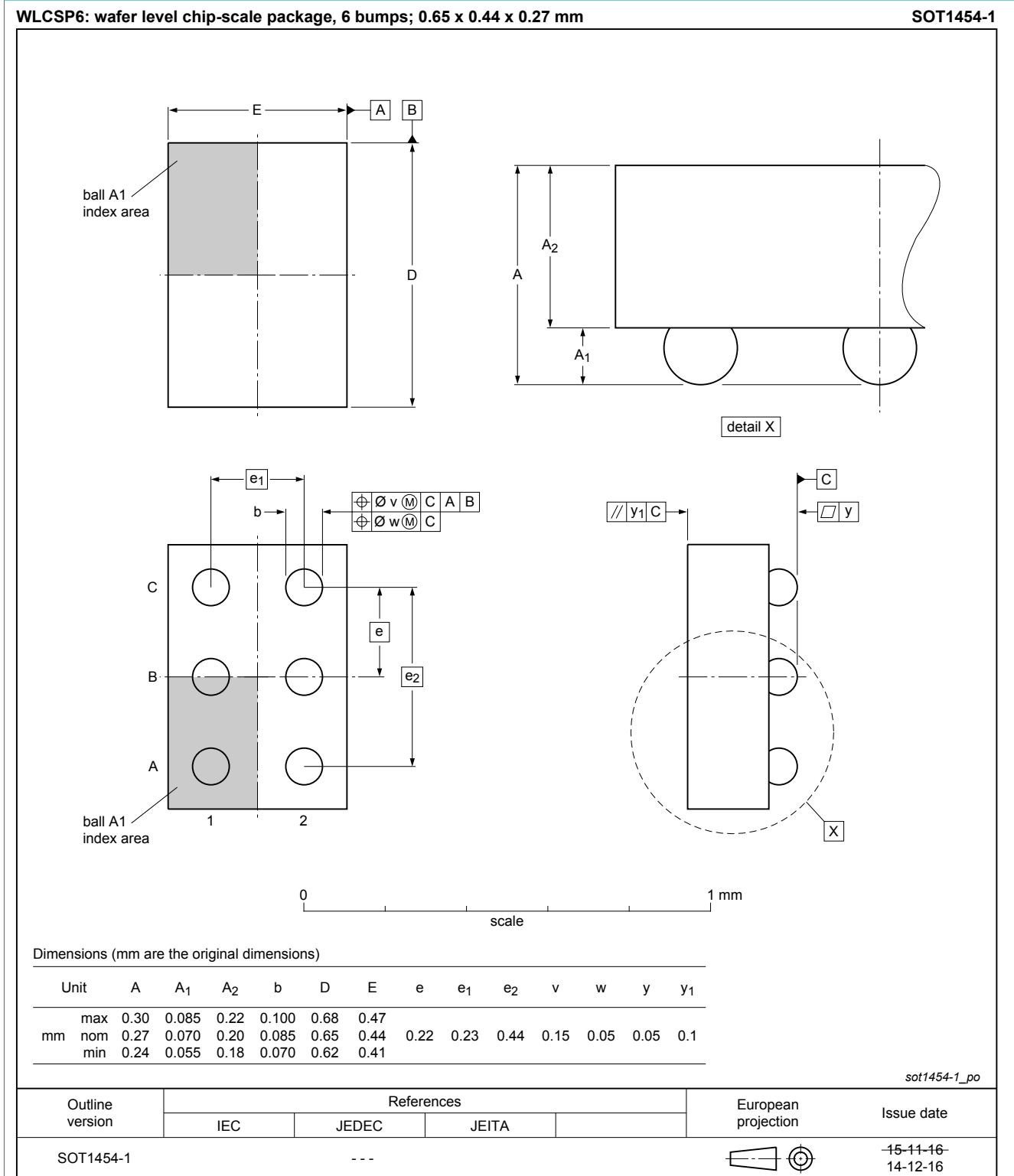


Figure 23. Package outline SOT1454-1 (WLCSP6)

## 14 Abbreviations

Table 13. Abbreviations

Acronym	Description
CDM	Charged Device Model
CMOS	Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model

## 15 Revision history

Table 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AUP1T97 v.6	20170328	Product data sheet	-	74AUP1T97 v.5
Modifications:	<ul style="list-style-type: none"> <li>Added type number 74AUP1T97UK (WLCSP6).</li> </ul>			
74AUP1T97 v.5	20150917	Product data sheet	-	74AUP1T97 v.4
Modifications:	<ul style="list-style-type: none"> <li>Added type number 74AUP1T97GX (SOT1255/X2SON6).</li> </ul>			
74AUP1T97 v.4	20120815	Product data sheet	-	74AUP1T97 v.3
Modifications:	<ul style="list-style-type: none"> <li>Package outline drawing of SOT886 (Figure 18) modified.</li> </ul>			
74AUP1T97 v.3	20111130	Product data sheet	-	74AUP1T97 v.2
74AUP1T97 v.2	20101018	Product data sheet	-	74AUP1T97 v.1
74AUP1T97 v.1	20071025	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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