

# 74AUP2G98

Low-power dual PCB configurable multiple function gate

Rev. 2 — 2 December 2015

Product data sheet

## 1. General description

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The 74AUP2G98 is a dual configurable multiple function gate with Schmitt-trigger inputs. Each gate within the device can be configured as any of the following logic functions MUX, AND, OR, NAND, NOR, inverter and buffer; using the 3-bit input. All inputs can be connected directly to  $V_{CC}$  or GND.

This device ensures 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 potentially 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
- ESD protection:
  - ◆ HBM JESD22-A114F 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. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74AUP2G98DP	-40 °C to +125 °C	TSSOP10	plastic thin shrink small outline package; 10 leads; body width 3 mm	SOT552-1
74AUP2G98GU	-40 °C to +125 °C	XQFN10	plastic, extremely thin quad flat package; no leads; 10 terminals; body 1.40 × 1.80 × 0.50 mm	SOT1160-1
74AUP2G98GF	-40 °C to +125 °C	XSON10	plastic extremely thin small outline package; no leads; 10 terminals; body 1.0 × 1.7 × 0.5 mm	SOT1081-2

### 4. Marking

Table 2. Marking

Type number	Marking code <sup>[1]</sup>
74AUP2G98DP	a9
74AUP2G98GU	a9
74AUP2G98GF	a9

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

### 5. Functional diagram

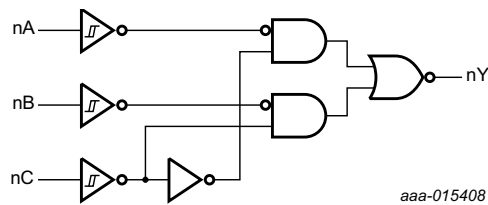
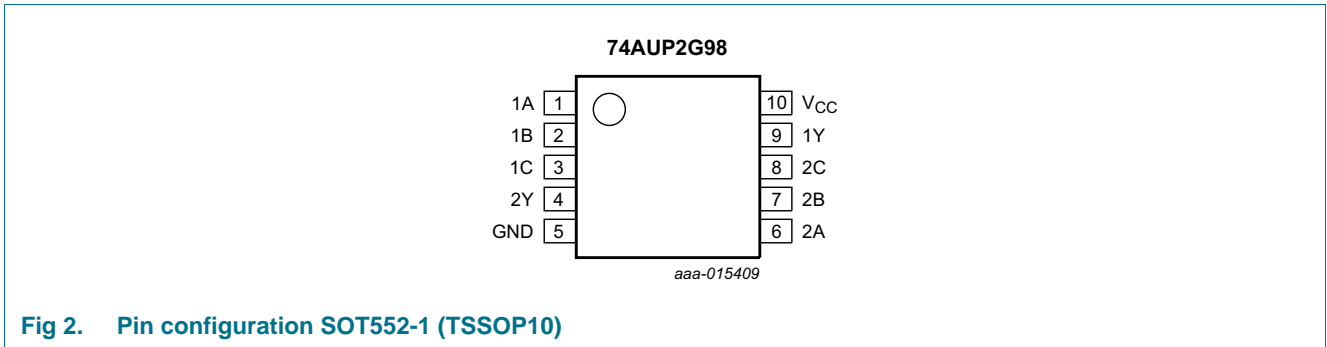


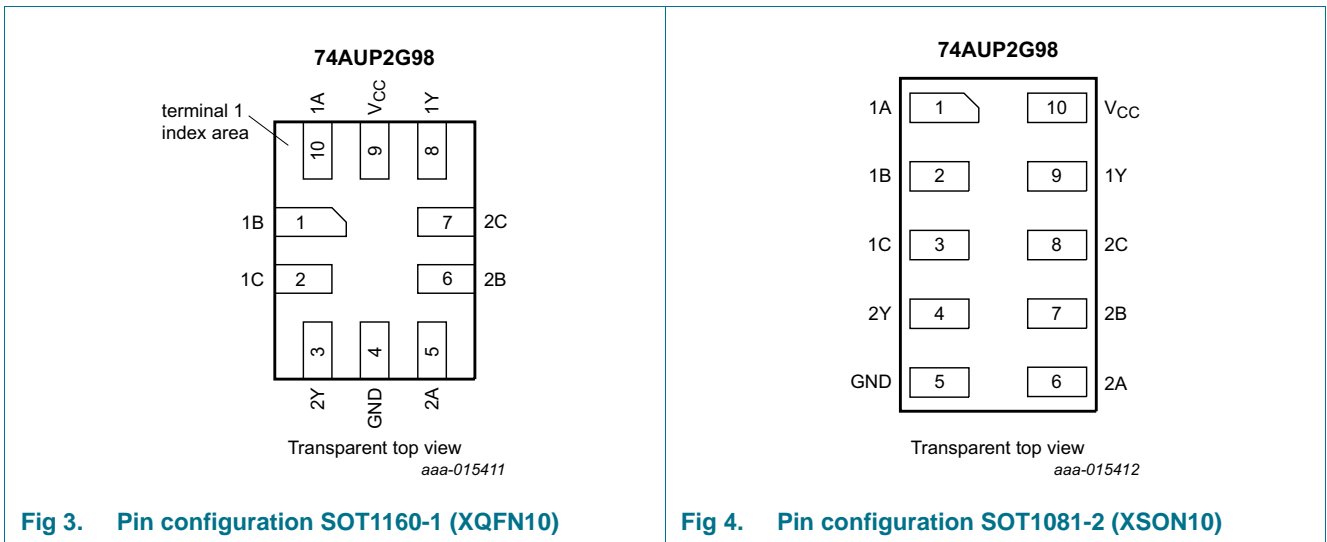
Fig 1. Logic diagram (one gate)

## 6. Pinning information

### 6.1 Pinning



**Fig 2. Pin configuration SOT552-1 (TSSOP10)**



**Fig 3. Pin configuration SOT1160-1 (XQFN10)**

**Fig 4. Pin configuration SOT1081-2 (XSON10)**

## 6.2 Pin description

Table 3. Pin description

Symbol	Pin		Description
	SOT552-1 and SOT1081-2	SOT1160-1	
1A, 2A	1, 6	10, 5	data input
1B, 2B	2, 7	1, 6	data input
1C, 2C	3, 8	2, 7	data input
1Y, 2Y	9, 4	8, 3	data output
GND	5	4	ground (0 V)
V <sub>CC</sub>	10	9	supply voltage

## 7. Functional description

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

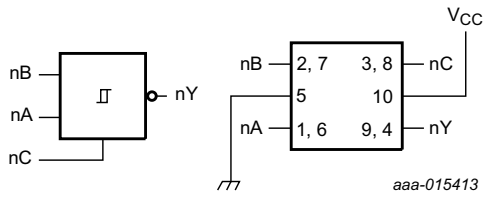
Input				Output
nC	nB	nA	nY	nY
L	L	L	L	H
L	L	H	H	H
L	H	L	L	L
L	H	H	H	L
H	L	L	L	H
H	L	H	H	L
H	H	L	L	H
H	H	H	H	L

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

### 7.1 Logic configurations

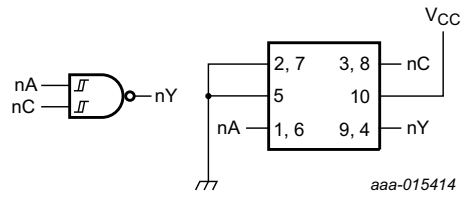
Table 5. Function selection table

Logic function	Figure
2-input MUX with inverted output	see <a href="#">Figure 5</a>
2-input NAND	see <a href="#">Figure 6</a>
2-input NOR with one input inverted	see <a href="#">Figure 7</a>
2-input AND with one input inverted	see <a href="#">Figure 7</a>
2-input NAND with one input inverted	see <a href="#">Figure 8</a>
2-input OR with one input inverted	see <a href="#">Figure 8</a>
2-input NOR	see <a href="#">Figure 9</a>
Buffer	see <a href="#">Figure 10</a>
Inverter	see <a href="#">Figure 11</a>



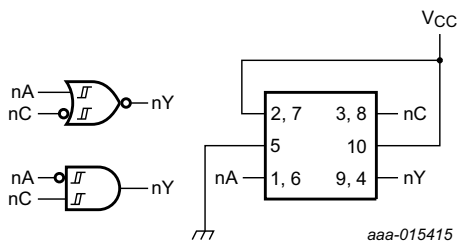
Pin numbers are not valid for SOT1160-1 package

**Fig 5. 2-input MUX with inverted output**



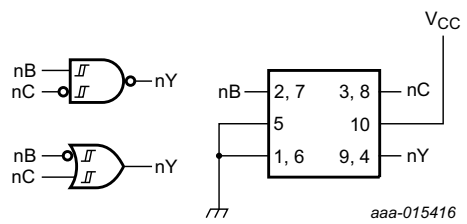
Pin numbers are not valid for SOT1160-1 package

**Fig 6. 2-input NAND gate**



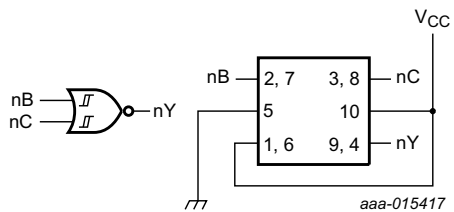
Pin numbers are not valid for SOT1160-1 package

**Fig 7. 2-input AND gate with input A inverted or 2-input NOR gate with inverted C input**



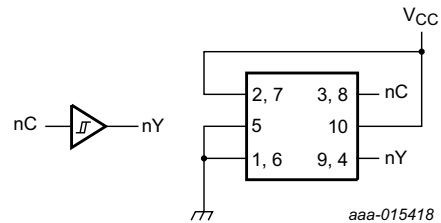
Pin numbers are not valid for SOT1160-1 package

**Fig 8. 2-input OR gate with input B inverted or 2-input NAND gate with input C inverted**



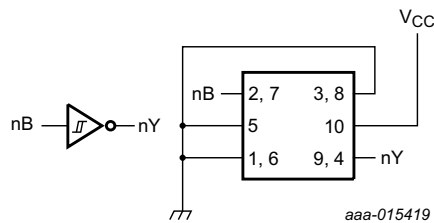
Pin numbers are not valid for SOT1160-1 package

**Fig 9. 2-input NOR gate**



Pin numbers are not valid for SOT1160-1 package

**Fig 10. Buffer**



Pin numbers are not valid for SOT1160-1 package

**Fig 11. Inverter**

## 8. Limiting values

**Table 6. 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 $V_{CC}$	-	$\pm 20$	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	[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 TSSOP10 package: above 125°C the value of  $P_{tot}$  derates linearly with 8.33 mW/K.

For XQFN10 (SOT1160-1) package: above 128 °C the value of  $P_{tot}$  derates linearly with 11.5 mW/K.

For XSON10 package: above 45 °C the value of  $P_{tot}$  derates linearly with 2.4 mW/K.

## 9. Recommended operating conditions

**Table 7. 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

## 10. Static characteristics

**Table 8. 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	<a href="#">[1]</a>	-	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>	-	1.1	-	pF
C <sub>O</sub>	output capacitance	V <sub>O</sub> = GND; V <sub>CC</sub> = 0 V	-	1.7	-	pF

**Table 8. 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>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
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	[1]	-	50	μA



**Table 8. 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>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
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	[1]	-	75	μA

[1] One input at V<sub>CC</sub> - 0.6 V, other input at V<sub>CC</sub> or GND.

## 11. Dynamic characteristics

**Table 9. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V); for test circuit, see [Figure 13](#).

Symbol	Parameter	Conditions	T <sub>amb</sub> = 25 °C			T <sub>amb</sub> = -40 °C to +125 °C			Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max (85 °C)	Max (125 °C)	
<b>C<sub>L</sub> = 5 pF</b>									
t <sub>pd</sub>	propagation delay	nA, nB, nC to nY; see <a href="#">Figure 12</a> <sup>[2]</sup>							
		V <sub>CC</sub> = 0.8 V	-	23.3	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	2.9	6.7	12.9	2.7	13.2	13.4	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	2.4	4.8	7.7	2.4	8.3	8.7	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.2	4.0	6.3	1.9	7.0	7.4	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	2.0	3.2	4.6	1.8	5.2	5.4	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.9	2.9	4.0	1.6	4.2	4.4	ns
<b>C<sub>L</sub> = 10 pF</b>									
t <sub>pd</sub>	propagation delay	nA, nB, nC to nY; see <a href="#">Figure 12</a> <sup>[2]</sup>							
		V <sub>CC</sub> = 0.8 V	-	27.1	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	3.3	7.6	14.5	3.0	15.1	15.3	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	2.7	5.4	8.8	2.8	9.5	9.9	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.5	4.6	7.2	2.3	8.0	8.4	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	2.4	3.8	5.3	2.2	5.9	6.2	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.3	3.5	4.7	2.0	4.9	5.2	ns
<b>C<sub>L</sub> = 15 pF</b>									
t <sub>pd</sub>	propagation delay	nA, nB, nC to nY; see <a href="#">Figure 12</a> <sup>[2]</sup>							
		V <sub>CC</sub> = 0.8 V	-	30.6	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	3.6	8.4	16.1	3.3	16.9	17.2	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	3.0	6.0	9.7	3.1	10.5	11.0	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.8	5.1	7.9	2.5	8.9	9.3	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	2.7	4.2	5.9	2.5	6.6	7.0	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.5	3.9	5.2	2.2	5.5	5.8	ns
<b>C<sub>L</sub> = 30 pF</b>									
t <sub>pd</sub>	propagation delay	nA, nB, nC to nY; see <a href="#">Figure 12</a> <sup>[2]</sup>							
		V <sub>CC</sub> = 0.8 V	-	38.7	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	4.5	10.7	21.1	4.1	22.0	22.4	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	3.8	7.6	12.3	3.8	13.5	14.2	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	3.5	6.3	10.1	3.1	11.3	11.9	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	3.4	5.3	7.5	3.2	8.4	8.9	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	3.2	5.0	6.7	2.9	7.1	7.5	ns

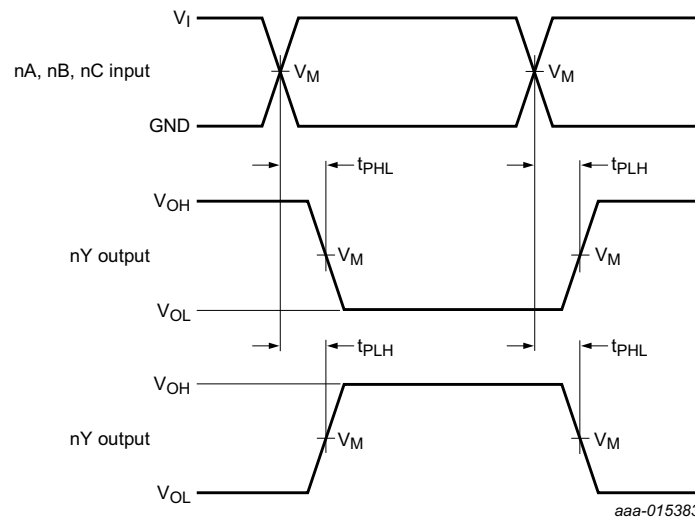
**Table 9. Dynamic characteristics ...continued**

Voltages are referenced to GND (ground = 0 V); for test circuit, see [Figure 13](#).

Symbol	Parameter	Conditions	T <sub>amb</sub> = 25 °C			T <sub>amb</sub> = -40 °C to +125 °C			Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max (85 °C)	Max (125 °C)	
<b>C<sub>L</sub> = 5 pF, 10 pF, 15 pF and 30 pF</b>									
C <sub>PD</sub>	power dissipation capacitance	f <sub>i</sub> = 1 MHz; V <sub>I</sub> = GND to V <sub>CC</sub> <sup>[3]</sup>							
		V <sub>CC</sub> = 0.8 V	-	2.7	-	-	-	-	pF
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	2.9	-	-	-	-	pF
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	3.0	-	-	-	-	pF
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	3.2	-	-	-	-	pF
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	3.8	-	-	-	-	pF
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	4.4	-	-	-	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;  
 Σ(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = sum of the outputs.

## 12. Waveforms

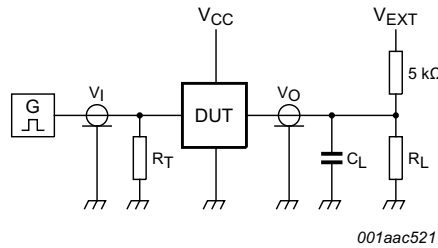


Measurement points are given in [Table 10](#).  
 V<sub>OL</sub> and V<sub>OH</sub> are typical output voltage levels that occur with the output load.

**Fig 12. Input nA, nB and nC to output nY propagation delay times.**

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	$0.5V_{CC}$	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$\leq 3.0$ 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 13. Test circuit for measuring 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	$2V_{CC}$

[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.

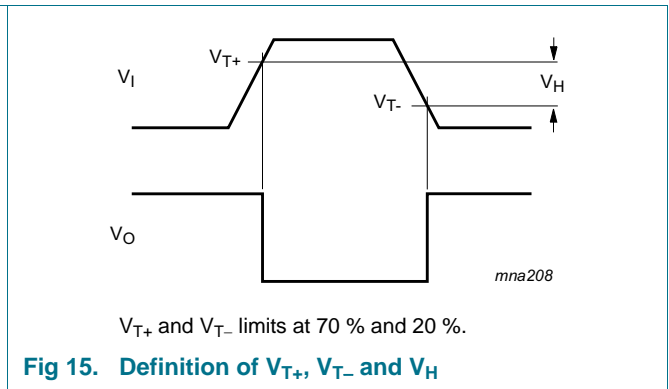
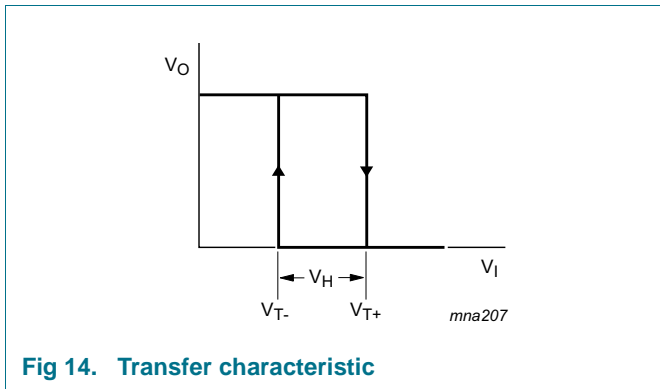
### 13. Transfer characteristics

**Table 12. Transfer characteristics**

Voltages are referenced to GND (ground = 0 V; for test circuit, see [Figure 13](#).)

Symbol	Parameter	Conditions	T <sub>amb</sub> = 25 °C			T <sub>amb</sub> = -40 °C to +125 °C			Unit
			Min	Typ	Max	Min	Max (85 °C)	Max (125 °C)	
V <sub>T+</sub>	positive-going threshold voltage	see <a href="#">Figure 14</a> and <a href="#">Figure 15</a>							
		V <sub>CC</sub> = 0.8 V	0.30	-	0.60	0.30	0.60	0.62	V
		V <sub>CC</sub> = 1.1 V	0.53	-	0.90	0.53	0.90	0.92	V
		V <sub>CC</sub> = 1.4 V	0.74	-	1.11	0.74	1.11	1.13	V
		V <sub>CC</sub> = 1.65 V	0.91	-	1.29	0.91	1.29	1.31	V
		V <sub>CC</sub> = 2.3 V	1.37	-	1.77	1.37	1.77	1.80	V
V <sub>T-</sub>	negative-going threshold voltage	see <a href="#">Figure 14</a> and <a href="#">Figure 15</a>							
		V <sub>CC</sub> = 0.8 V	0.10	-	0.60	0.10	0.60	0.60	V
		V <sub>CC</sub> = 1.1 V	0.26	-	0.65	0.26	0.65	0.65	V
		V <sub>CC</sub> = 1.4 V	0.39	-	0.75	0.39	0.75	0.75	V
		V <sub>CC</sub> = 1.65 V	0.47	-	0.84	0.47	0.84	0.84	V
		V <sub>CC</sub> = 2.3 V	0.69	-	1.04	0.69	1.04	1.04	V
V <sub>H</sub>	hysteresis voltage	(V <sub>T+</sub> - V <sub>T-</sub> ); see <a href="#">Figure 14</a> , <a href="#">Figure 15</a> , <a href="#">Figure 16</a> and <a href="#">Figure 17</a>							
		V <sub>CC</sub> = 0.8 V	0.07	-	0.50	0.07	0.50	0.50	V
		V <sub>CC</sub> = 1.1 V	0.08	-	0.46	0.08	0.46	0.46	V
		V <sub>CC</sub> = 1.4 V	0.18	-	0.56	0.18	0.56	0.56	V
		V <sub>CC</sub> = 1.65 V	0.27	-	0.66	0.27	0.66	0.66	V
		V <sub>CC</sub> = 2.3 V	0.53	-	0.92	0.53	0.92	0.92	V
V <sub>H</sub>	hysteresis voltage	V <sub>CC</sub> = 3.0 V	0.79	-	1.31	0.79	1.31	1.31	V

### 14. Waveforms transfer characteristics



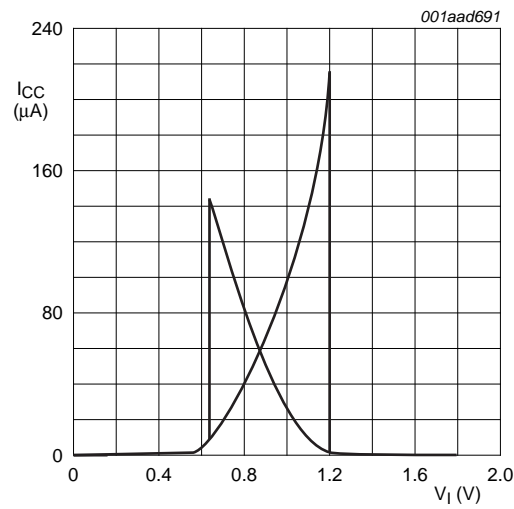


Fig 16. Typical transfer characteristics;  $V_{CC} = 1.8$  V

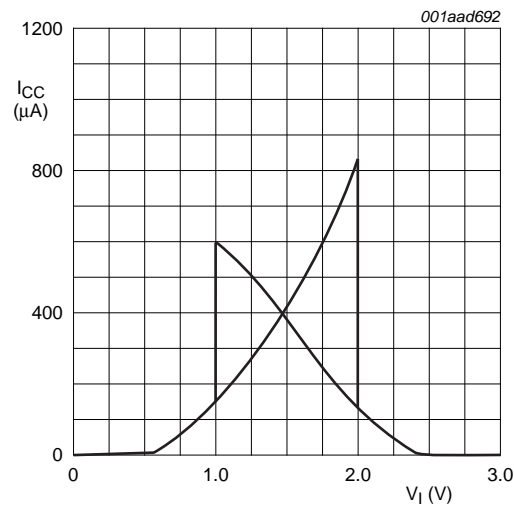


Fig 17. Typical transfer characteristics;  $V_{CC} = 3.0$  V

15. Package outline

TSSOP10: plastic thin shrink small outline package; 10 leads; body width 3 mm

SOT552-1

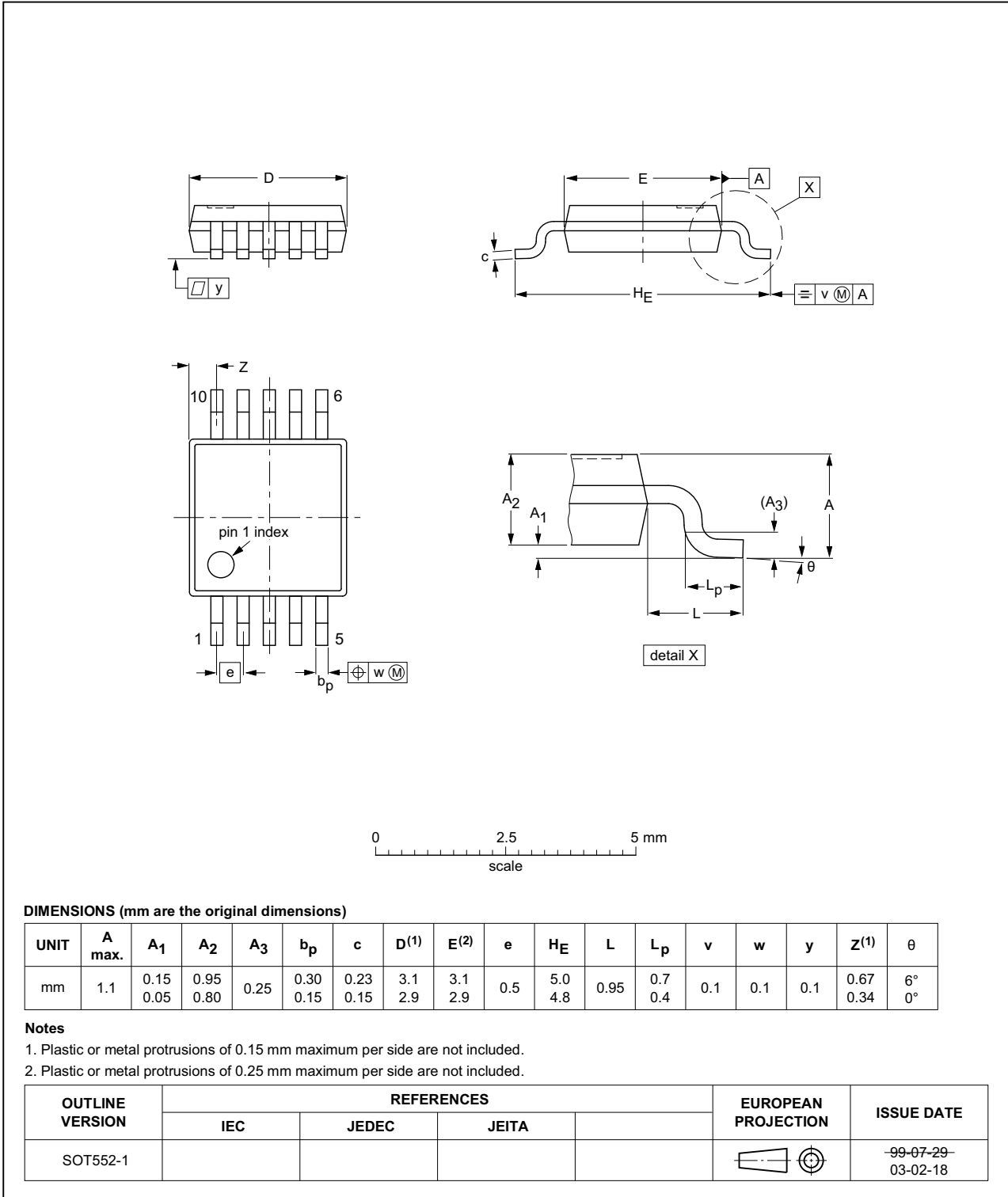


Fig 18. Package outline SOT552-1 (TSSOP10)

XQFN10: plastic, extremely thin quad flat package; no leads; 10 terminals; body 1.40 x 1.80 x 0.50 mm

SOT1160-1

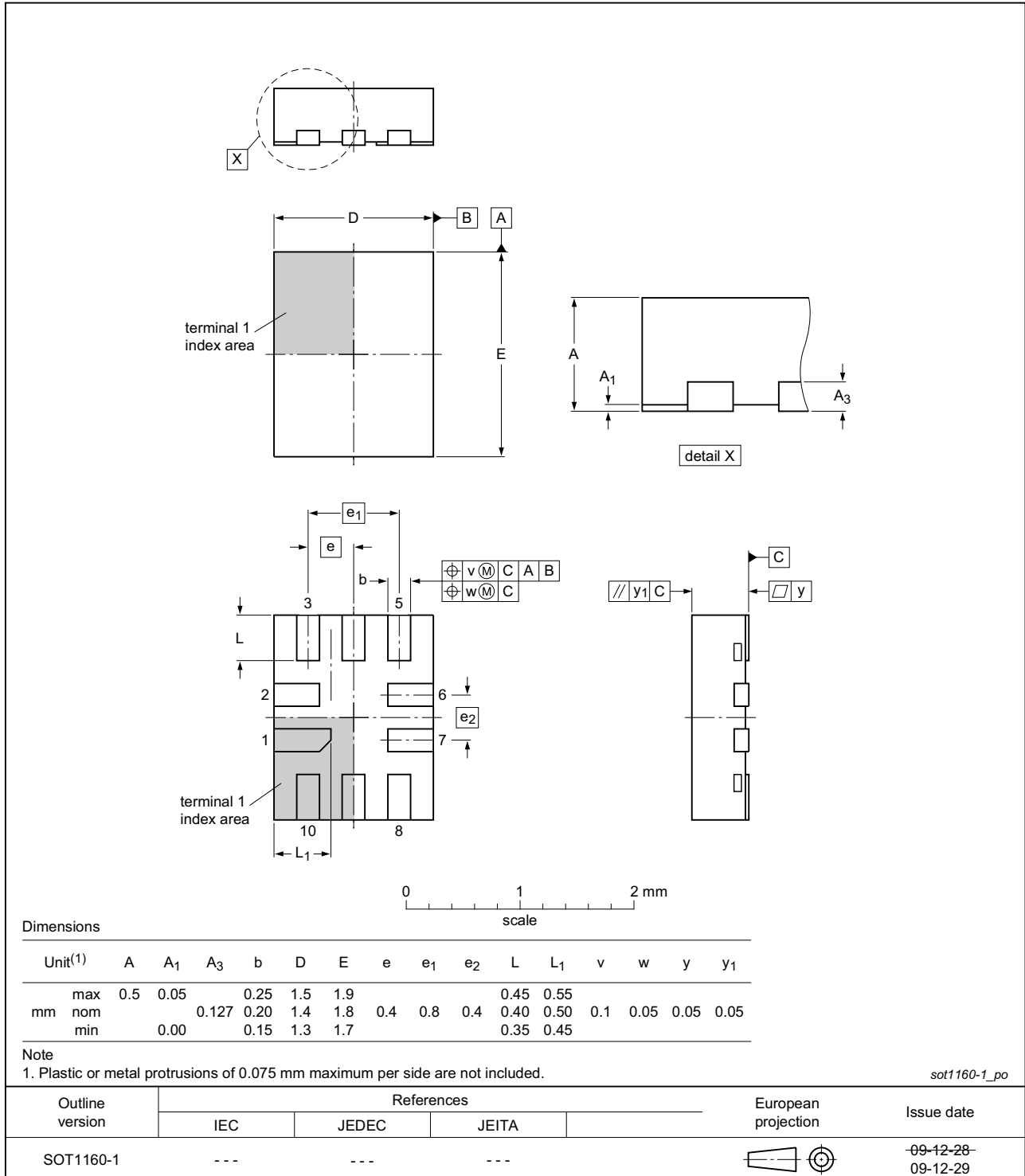


Fig 19. Package outline SOT1160-1 (XQFN10)



XSON10: plastic extremely thin small outline package; no leads;  
10 terminals; body 1.0 x 1.7 x 0.5 mm

SOT1081-2

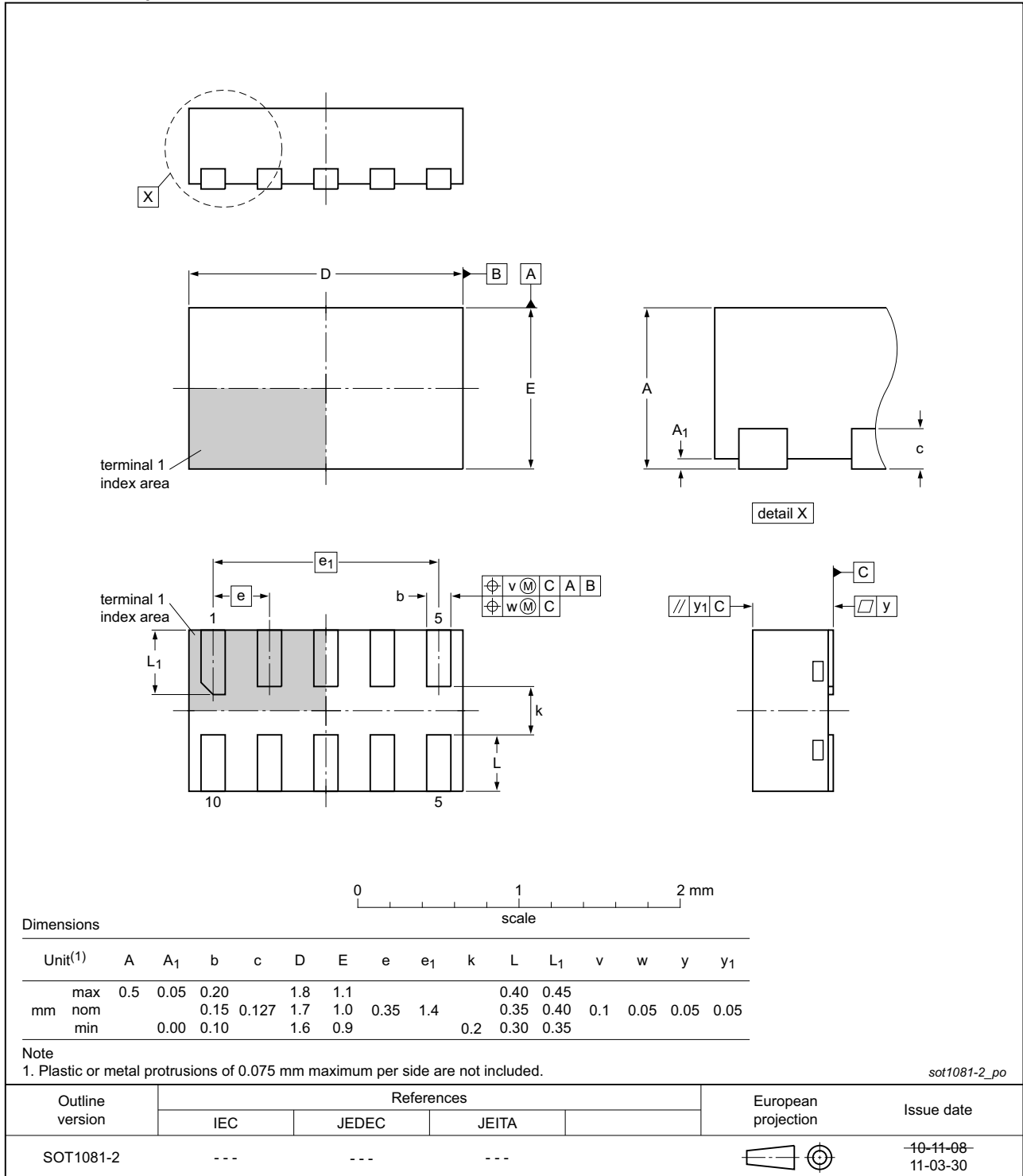


Fig 20. Package outline SOT1081-2 (XSON10)

## 16. Abbreviations

Table 13. Abbreviations

Acronym	Description
CDM	Charged Device Model
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model
PCB	Printed-Circuit Board

## 17. Revision history

Table 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AUP2G98 v.2	20151202	Product data sheet	-	74AUP2G98 v.1
Modifications:	<ul style="list-style-type: none"> <li>Maximum value temperature range TSSOP10 (74AUP2G98DP) changed from 85 °C to 125 °C.</li> <li>Removed 74AUP2G98GM (SOT1049-3).</li> </ul>			
74AUP2G98 v.1	20141104	Product data sheet	-	-

## 18. Legal information

### 18.1 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.nexperia.com>.

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