74AUP1G374

Low-power D-type flip-flop; positive-edge trigger; 3-state

Rev. 8 — 29 November 2012 Product data sheet

1. General description

The 74AUP1G374 provides the single D-type flip-flop with 3-state output. The flip-flop will store the state of data input (D) that meet the set-up and hold times requirements on the LOW-to-HIGH CP transition. When pin $\overline{OE}$ is LOW, the contents of the flip-flop is available at the (Q) output. When pin $\overline{OE}$ is HIGH, the output goes to the high-impedance OFF-state. Operation of input pin $\overline{OE}$ does not affect the state of the flip-flop.

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

- 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 μA (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

nexperia

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74AUP1G374GW	–40 °C to +125 °C	SC-88	plastic surface-mounted package; 6 leads	SOT363
74AUP1G374GM	–40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886
74AUP1G374GF	–40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1 × 0.5 mm	SOT891
74AUP1G374GN	–40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 0.9 × 1.0 × 0.35 mm	SOT1115
74AUP1G374GS	–40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 1.0 × 1.0 × 0.35 mm	SOT1202

4. Marking

Table 2. Marking

Type number	Marking code[1]
74AUP1G374GW	aX
74AUP1G374GM	aX
74AUP1G374GF	aX
74AUP1G374GN	aX
74AUP1G374GS	aX

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

5. Functional diagram

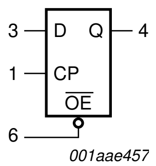


Fig 1. Logic symbol

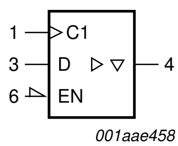


Fig 2. IEC logic symbol

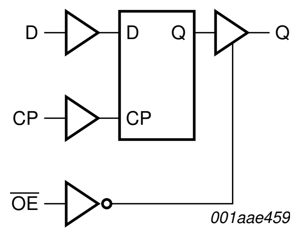


Fig 3. Logic diagram

6. Pinning information

6.1 Pinning

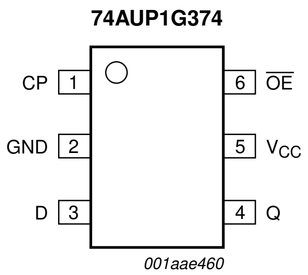


Fig 4. Pin configuration SOT363

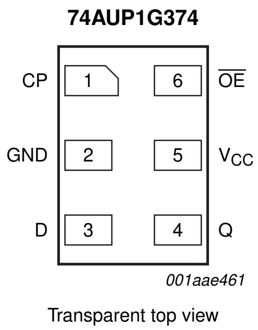


Fig 5. Pin configuration SOT886

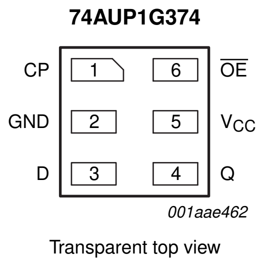


Fig 6. Pin configuration SOT891, SOT1115 and SOT1202

6.2 Pin description

Table 3. Pin description

Symbol	Pin	Description
CP	1	clock input (LOW-to-HIGH, edge-triggered)
GND	2	ground (0 V)
D	3	data input
Q	4	3-state flip-flop output
V_{CC}	5	supply voltage
$\overline{OE}$	6	output enable input (active LOW)

7. Functional description

Table 4. Function table[1]

Operating mode	Input			Internal flip-flop	Output
	$\overline{OE}$	CP	D		Q
Load and read register	L	↑	l	L	L
	L	↑	h	H	H
Load register and disable output	H	↑	l	L	Z
	H	↑	h	H	Z

[1] H = HIGH voltage level;
h = HIGH voltage level one set-up time prior to the HIGH-to-LOW LE transition;
L = LOW voltage level;
l = LOW voltage level one set-up time prior to the HIGH-to-LOW LE transition;
Z = high-impedance OFF-state;
↑ = LOW-to-HIGH clock transition.

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		[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 packages: above 87.5 °C the value of P_{tot} derates linearly with 4.0 mW/K.
For XSON6 package: 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
T_{amb} = 25 °C							
V_{IH}	HIGH-level input voltage	V_{CC} = 0.8 V		0.70 × V_{CC}	-	-	V
		V_{CC} = 0.9 V to 1.95 V		0.65 × V_{CC}	-	-	V
		V_{CC} = 2.3 V to 2.7 V		1.6	-	-	V
		V_{CC} = 3.0 V to 3.6 V		2.0	-	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 0.8 V		-	-	0.30 × V_{CC}	V
		V_{CC} = 0.9 V to 1.95 V		-	-	0.35 × V_{CC}	V
		V_{CC} = 2.3 V to 2.7 V		-	-	0.7	V
		V_{CC} = 3.0 V to 3.6 V		-	-	0.9	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}					
		I_O = −20 μA; V_{CC} = 0.8 V to 3.6 V		V_{CC} − 0.1	-	-	V
		I_O = −1.1 mA; V_{CC} = 1.1 V		0.75 × V_{CC}	-	-	V
		I_O = −1.7 mA; V_{CC} = 1.4 V		1.11	-	-	V
		I_O = −1.9 mA; V_{CC} = 1.65 V		1.32	-	-	V
		I_O = −2.3 mA; V_{CC} = 2.3 V		2.05	-	-	V
		I_O = −3.1 mA; V_{CC} = 2.3 V		1.9	-	-	V
		I_O = −2.7 mA; V_{CC} = 3.0 V		2.72	-	-	V
		I_O = −4.0 mA; V_{CC} = 3.0 V		2.6	-	-	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}					
		I_O = 20 μA; V_{CC} = 0.8 V to 3.6 V		-	-	0.1	V
		I_O = 1.1 mA; V_{CC} = 1.1 V		-	-	0.3 × V_{CC}	V
		I_O = 1.7 mA; V_{CC} = 1.4 V		-	-	0.31	V
		I_O = 1.9 mA; V_{CC} = 1.65 V		-	-	0.31	V
		I_O = 2.3 mA; V_{CC} = 2.3 V		-	-	0.31	V
		I_O = 3.1 mA; V_{CC} = 2.3 V		-	-	0.44	V
		I_O = 2.7 mA; V_{CC} = 3.0 V		-	-	0.31	V
		I_O = 4.0 mA; V_{CC} = 3.0 V		-	-	0.44	V
I_I	input leakage current	V_I = GND to 3.6 V; V_{CC} = 0 V to 3.6 V		-	-	±0.1	μA
I_{OZ}	OFF-state output current	V_I = V_{IH} or V_{IL}; V_O = 0 V to 3.6 V; V_{CC} = 0 V to 3.6 V		-	-	±0.1	μA
I_{OFF}	power-off leakage current	V_I or V_O = 0 V to 3.6 V; V_{CC} = 0 V		-	-	±0.2	μA
ΔI_{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		-	-	±0.2	μA
I_{CC}	supply current	V_I = GND or V_{CC}; I_O = 0 A; V_{CC} = 0.8 V to 3.6 V		-	-	0.5	μA
ΔI_{CC}	additional supply current	V_I = V_{CC} − 0.6 V; I_O = 0 A; V_{CC} = 3.3 V	[1]	-	-	40	μA
C_I	input capacitance	V_{CC} = 0 V to 3.6 V; V_I = GND or V_{CC}		-	0.8	-	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
C_O	output capacitance	output enabled; V_O = GND; V_{CC} = 0 V		-	1.7	-	pF
		output disabled; V_{CC} = 0 V to 3.6 V; V_O = GND or V_{CC}		-	1.5	-	pF
T_{amb} = −40 °C to +85 °C							
V_{IH}	HIGH-level input voltage	V_{CC} = 0.8 V		0.70 × V_{CC}	-	-	V
		V_{CC} = 0.9 V to 1.95 V		0.65 × V_{CC}	-	-	V
		V_{CC} = 2.3 V to 2.7 V		1.6	-	-	V
		V_{CC} = 3.0 V to 3.6 V		2.0	-	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 0.8 V		-	-	0.30 × V_{CC}	V
		V_{CC} = 0.9 V to 1.95 V		-	-	0.35 × V_{CC}	V
		V_{CC} = 2.3 V to 2.7 V		-	-	0.7	V
		V_{CC} = 3.0 V to 3.6 V		-	-	0.9	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}					
		I_O = −20 μA; V_{CC} = 0.8 V to 3.6 V		V_{CC} − 0.1	-	-	V
		I_O = −1.1 mA; V_{CC} = 1.1 V		0.7 × V_{CC}	-	-	V
		I_O = −1.7 mA; V_{CC} = 1.4 V		1.03	-	-	V
		I_O = −1.9 mA; V_{CC} = 1.65 V		1.30	-	-	V
		I_O = −2.3 mA; V_{CC} = 2.3 V		1.97	-	-	V
		I_O = −3.1 mA; V_{CC} = 2.3 V		1.85	-	-	V
		I_O = −2.7 mA; V_{CC} = 3.0 V		2.67	-	-	V
		I_O = −4.0 mA; V_{CC} = 3.0 V		2.55	-	-	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}					
		I_O = 20 μA; V_{CC} = 0.8 V to 3.6 V		-	-	0.1	V
		I_O = 1.1 mA; V_{CC} = 1.1 V		-	-	0.3 × V_{CC}	V
		I_O = 1.7 mA; V_{CC} = 1.4 V		-	-	0.37	V
		I_O = 1.9 mA; V_{CC} = 1.65 V		-	-	0.35	V
		I_O = 2.3 mA; V_{CC} = 2.3 V		-	-	0.33	V
		I_O = 3.1 mA; V_{CC} = 2.3 V		-	-	0.45	V
		I_O = 2.7 mA; V_{CC} = 3.0 V		-	-	0.33	V
		I_O = 4.0 mA; V_{CC} = 3.0 V		-	-	0.45	V
I_I	input leakage current	V_I = GND to 3.6 V; V_{CC} = 0 V to 3.6 V		-	-	±0.5	μA
I_{OZ}	OFF-state output current	V_I = V_{IH} or V_{IL}; V_O = 0 V to 3.6 V; V_{CC} = 0 V to 3.6 V		-	-	±0.5	μA
I_{OFF}	power-off leakage current	V_I or V_O = 0 V to 3.6 V; V_{CC} = 0 V		-	-	±0.5	μA
ΔI_{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		-	-	±0.6	μA
I_{CC}	supply current	V_I = GND or V_{CC}; I_O = 0 A; V_{CC} = 0.8 V to 3.6 V		-	-	0.9	μA
ΔI_{CC}	additional supply current	V_I = V_{CC} − 0.6 V; I_O = 0 A; V_{CC} = 3.3 V	[1]	-	-	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
T_{amb} = –40 °C to +125 °C							
V_{IH}	HIGH-level input voltage	V_{CC} = 0.8 V		0.75 × V_{CC}	-	-	V
		V_{CC} = 0.9 V to 1.95 V		0.70 × V_{CC}	-	-	V
		V_{CC} = 2.3 V to 2.7 V		1.6	-	-	V
		V_{CC} = 3.0 V to 3.6 V		2.0	-	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 0.8 V		-	-	0.25 × V_{CC}	V
		V_{CC} = 0.9 V to 1.95 V		-	-	0.30 × V_{CC}	V
		V_{CC} = 2.3 V to 2.7 V		-	-	0.7	V
		V_{CC} = 3.0 V to 3.6 V		-	-	0.9	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}					
		I_O = –20 μA; V_{CC} = 0.8 V to 3.6 V		V_{CC} – 0.11	-	-	V
		I_O = –1.1 mA; V_{CC} = 1.1 V		0.6 × V_{CC}	-	-	V
		I_O = –1.7 mA; V_{CC} = 1.4 V		0.93	-	-	V
		I_O = –1.9 mA; V_{CC} = 1.65 V		1.17	-	-	V
		I_O = –2.3 mA; V_{CC} = 2.3 V		1.77	-	-	V
		I_O = –3.1 mA; V_{CC} = 2.3 V		1.67	-	-	V
		I_O = –2.7 mA; V_{CC} = 3.0 V		2.40	-	-	V
		I_O = –4.0 mA; V_{CC} = 3.0 V		2.30	-	-	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}					
		I_O = 20 μA; V_{CC} = 0.8 V to 3.6 V		-	-	0.11	V
		I_O = 1.1 mA; V_{CC} = 1.1 V		-	-	0.33 × V_{CC}	V
		I_O = 1.7 mA; V_{CC} = 1.4 V		-	-	0.41	V
		I_O = 1.9 mA; V_{CC} = 1.65 V		-	-	0.39	V
		I_O = 2.3 mA; V_{CC} = 2.3 V		-	-	0.36	V
		I_O = 3.1 mA; V_{CC} = 2.3 V		-	-	0.50	V
		I_O = 2.7 mA; V_{CC} = 3.0 V		-	-	0.36	V
		I_O = 4.0 mA; V_{CC} = 3.0 V		-	-	0.50	V
I_I	input leakage current	V_I = GND to 3.6 V; V_{CC} = 0 V to 3.6 V		-	-	±0.75	μA
I_{OZ}	OFF-state output current	V_I = V_{IH} or V_{IL}; V_O = 0 V to 3.6 V; V_{CC} = 0 V to 3.6 V		-	-	±0.75	μA
I_{OFF}	power-off leakage current	V_I or V_O = 0 V to 3.6 V; V_{CC} = 0 V		-	-	±0.75	μA
ΔI_{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		-	-	±0.75	μA
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	μA
ΔI_{CC}	additional supply current	V_I = V_{CC} – 0.6 V; I_O = 0 A; V_{CC} = 3.3 V	[1]	-	-	75	μA

[1] One input at V_{CC} – 0.6 V, other input at V_{CC} or GND.

11. 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[1]	Max	Min (85 °C)	Max (85 °C)	Min (125 °C)	Max (125 °C)	
C_L = 5 pF										
t_{pd}	propagation delay	CP to Q; see Figure 7 [2]								
		V_{CC} = 0.8 V	-	23.6	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V	2.4	6.3	13.1	2.3	13.3	2.3	13.4	ns
		V_{CC} = 1.4 V to 1.6 V	2.1	4.3	7.4	1.8	8.0	1.8	8.2	ns
		V_{CC} = 1.65 V to 1.95 V	1.6	3.4	5.8	1.4	6.4	1.4	6.7	ns
		V_{CC} = 2.3 V to 2.7 V	1.4	2.5	3.8	1.1	4.3	1.1	4.5	ns
		V_{CC} = 3.0 V to 3.6 V	1.2	2.1	3.0	1.0	3.4	1.0	3.6	ns
t_{en}	enable time	$\overline{OE}$ to Q; see Figure 8 [3]								
		V_{CC} = 0.8 V	-	21.7	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V	3.3	5.2	8.1	3.0	9.1	3.0	10.0	ns
		V_{CC} = 1.4 V to 1.6 V	2.6	4.1	5.6	2.4	6.1	2.4	6.7	ns
		V_{CC} = 1.65 V to 1.95 V	2.3	3.4	4.6	2.0	5.1	2.0	5.6	ns
		V_{CC} = 2.3 V to 2.7 V	2.0	2.8	3.7	1.8	4.0	1.8	4.4	ns
		V_{CC} = 3.0 V to 3.6 V	1.9	2.6	3.4	1.8	3.5	1.8	3.9	ns
t_{dis}	disable time	$\overline{OE}$ to Q; see Figure 8 [4]								
		V_{CC} = 0.8 V	-	9.8	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V	2.9	4.5	7.0	2.8	7.2	2.8	7.9	ns
		V_{CC} = 1.4 V to 1.6 V	2.3	3.3	4.9	2.1	5.1	2.1	5.6	ns
		V_{CC} = 1.65 V to 1.95 V	2.2	3.2	4.5	2.1	4.7	2.1	5.2	ns
		V_{CC} = 2.3 V to 2.7 V	1.6	2.3	3.1	1.5	3.4	1.5	3.7	ns
		V_{CC} = 3.0 V to 3.6 V	1.9	2.6	3.4	1.8	3.6	1.8	4.0	ns
f_{max}	maximum frequency	CP; see Figure 7								
		V_{CC} = 0.8 V	-	53	-	-	-	-	-	MHz
		V_{CC} = 1.1 V to 1.3 V	-	203	-	170	-	170	-	MHz
		V_{CC} = 1.4 V to 1.6 V	-	347	-	310	-	300	-	MHz
		V_{CC} = 1.65 V to 1.95 V	-	435	-	400	-	390	-	MHz
		V_{CC} = 2.3 V to 2.7 V	-	550	-	490	-	480	-	MHz
		V_{CC} = 3.0 V to 3.6 V	-	619	-	550	-	510	-	MHz

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[1]	Max	Min (85 °C)	Max (85 °C)	Min (125 °C)	Max (125 °C)	
C_L = 10 pF											
t_{pd}	propagation delay	CP to Q; see Figure 7	[2]								
		V_{CC} = 0.8 V		-	27.1	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		2.7	7.2	14.7	2.5	15.0	2.5	15.1	ns
		V_{CC} = 1.4 V to 1.6 V		2.3	4.9	8.6	2.0	9.1	2.0	9.4	ns
		V_{CC} = 1.65 V to 1.95 V		2.1	4.0	6.5	1.9	7.0	1.9	7.3	ns
		V_{CC} = 2.3 V to 2.7 V		1.8	3.1	4.4	1.5	4.9	1.5	5.1	ns
		V_{CC} = 3.0 V to 3.6 V		1.6	2.7	3.7	1.3	4.0	1.3	4.2	ns
t_{en}	enable time	$\overline{OE}$ to Q; see Figure 8	[3]								
		V_{CC} = 0.8 V		-	25.1	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		3.8	6.5	10.2	3.5	10.6	3.5	11.7	ns
		V_{CC} = 1.4 V to 1.6 V		3.1	4.7	6.5	2.7	7.1	2.7	7.8	ns
		V_{CC} = 1.65 V to 1.95 V		2.7	4.0	5.4	2.5	6.0	2.5	6.6	ns
		V_{CC} = 2.3 V to 2.7 V		2.4	3.4	4.5	2.2	4.7	2.2	5.2	ns
		V_{CC} = 3.0 V to 3.6 V		2.3	3.1	4.1	2.1	4.2	2.1	4.6	ns
t_{dis}	disable time	$\overline{OE}$ to Q; see Figure 8	[4]								
		V_{CC} = 0.8 V		-	11.7	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		3.9	5.6	8.3	3.9	8.4	3.9	9.2	ns
		V_{CC} = 1.4 V to 1.6 V		3.1	4.2	5.8	3.0	6.1	3.0	6.7	ns
		V_{CC} = 1.65 V to 1.95 V		3.2	4.3	5.7	3.1	5.9	3.1	6.5	ns
		V_{CC} = 2.3 V to 2.7 V		2.3	3.1	4.0	2.2	4.2	2.2	4.6	ns
		V_{CC} = 3.0 V to 3.6 V		3.0	3.8	4.8	2.9	5.0	2.9	5.5	ns
f_{max}	maximum frequency	CP; see Figure 7									
		V_{CC} = 0.8 V		-	52	-	-	-	-	-	MHz
		V_{CC} = 1.1 V to 1.3 V		-	192	-	150	-	150	-	MHz
		V_{CC} = 1.4 V to 1.6 V		-	324	-	280	-	230	-	MHz
		V_{CC} = 1.65 V to 1.95 V		-	421	-	310	-	250	-	MHz
		V_{CC} = 2.3 V to 2.7 V		-	486	-	370	-	360	-	MHz
		V_{CC} = 3.0 V to 3.6 V		-	550	-	410	-	360	-	MHz
C_L = 15 pF											
t_{pd}	propagation delay	CP to Q; see Figure 7	[2]								
		V_{CC} = 0.8 V		-	30.6	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		3.0	8.0	16.2	2.8	16.5	2.8	16.6	ns
		V_{CC} = 1.4 V to 1.6 V		2.8	5.5	9.3	2.4	10.1	2.4	10.4	ns
		V_{CC} = 1.65 V to 1.95 V		2.3	4.5	7.2	2.1	7.9	2.1	8.2	ns
		V_{CC} = 2.3 V to 2.7 V		2.1	3.5	5.0	1.9	5.5	1.9	5.7	ns
		V_{CC} = 3.0 V to 3.6 V		2.0	3.1	4.3	1.7	4.7	1.7	5.0	ns

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[1]	Max	Min (85 °C)	Max (85 °C)	Min (125 °C)	Max (125 °C)	
t_{en}	enable time	$\overline{OE}$ to Q; see Figure 8	[3]								
		V_{CC} = 0.8 V		-	28.6	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		4.3	7.4	11.6	3.9	12.1	3.9	13.3	ns
		V_{CC} = 1.4 V to 1.6 V		3.5	5.3	7.2	3.1	8.0	3.1	8.8	ns
		V_{CC} = 1.65 V to 1.95 V		3.1	4.5	6.1	2.8	6.7	2.8	7.4	ns
		V_{CC} = 2.3 V to 2.7 V		2.7	3.8	5.0	2.5	5.4	2.5	5.9	ns
		V_{CC} = 3.0 V to 3.6 V		2.7	3.6	4.7	2.5	4.9	2.5	5.4	ns
t_{dis}	disable time	$\overline{OE}$ to Q; see Figure 8	[4]								
		V_{CC} = 0.8 V		-	13.5	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		5.0	6.8	9.5	4.9	9.6	4.9	10.6	ns
		V_{CC} = 1.4 V to 1.6 V		3.9	5.1	6.8	3.8	7.0	3.8	7.7	ns
		V_{CC} = 1.65 V to 1.95 V		4.3	5.4	7.0	4.1	7.2	4.1	7.9	ns
		V_{CC} = 2.3 V to 2.7 V		3.0	3.9	4.9	2.9	5.1	2.9	5.6	ns
		V_{CC} = 3.0 V to 3.6 V		4.1	5.1	6.2	4.0	6.4	4.0	7.0	ns
f_{max}	maximum frequency	CP; see Figure 7									
		V_{CC} = 0.8 V		-	50	-	-	-	-	-	MHz
		V_{CC} = 1.1 V to 1.3 V		-	181	-	120	-	120	-	MHz
		V_{CC} = 1.4 V to 1.6 V		-	301	-	190	-	160	-	MHz
		V_{CC} = 1.65 V to 1.95 V		-	407	-	240	-	190	-	MHz
		V_{CC} = 2.3 V to 2.7 V		-	422	-	300	-	270	-	MHz
		V_{CC} = 3.0 V to 3.6 V		-	481	-	320	-	300	-	MHz
C_L = 30 pF											
t_{pd}	propagation delay	CP to Q; see Figure 7	[2]								
		V_{CC} = 0.8 V		-	40.8	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		3.7	10.3	20.5	3.5	21.2	3.5	21.6	ns
		V_{CC} = 1.4 V to 1.6 V		3.3	7.0	11.6	3.2	12.6	3.2	13.3	ns
		V_{CC} = 1.65 V to 1.95 V		3.2	5.8	9.1	2.9	9.8	2.9	10.4	ns
		V_{CC} = 2.3 V to 2.7 V		3.0	4.7	6.5	2.6	7.0	2.6	7.4	ns
		V_{CC} = 3.0 V to 3.6 V		2.9	4.2	5.8	2.5	6.6	2.5	6.9	ns
t_{en}	enable time	$\overline{OE}$ to Q; see Figure 8	[3]								
		V_{CC} = 0.8 V		-	39.0	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		5.6	9.8	15.7	5.0	16.5	5.0	18.2	ns
		V_{CC} = 1.4 V to 1.6 V		4.6	7.0	9.5	4.1	10.6	4.1	11.7	ns
		V_{CC} = 1.65 V to 1.95 V		4.1	5.9	7.9	3.7	8.6	3.7	9.5	ns
		V_{CC} = 2.3 V to 2.7 V		3.7	5.0	6.6	3.3	7.1	3.3	7.8	ns
		V_{CC} = 3.0 V to 3.6 V		3.5	4.8	6.2	3.2	6.5	3.2	7.2	ns

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[1]	Max	Min (85 °C)	Max (85 °C)	Min (125 °C)	Max (125 °C)	
t_{dis}	disable time	$\overline{OE}$ to Q; see Figure 8 [4]								
		V_{CC} = 0.8 V	-	19.0	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V	8.1	10.2	13.3	8.0	13.5	8.0	14.9	ns
		V_{CC} = 1.4 V to 1.6 V	6.4	7.8	9.7	6.3	10.0	6.3	11.0	ns
		V_{CC} = 1.65 V to 1.95 V	7.4	8.8	10.7	7.2	10.9	7.2	12.0	ns
		V_{CC} = 2.3 V to 2.7 V	5.2	6.3	7.5	5.1	7.8	5.1	8.6	ns
		V_{CC} = 3.0 V to 3.6 V	7.5	8.8	10.3	7.4	10.5	7.4	11.6	ns
f_{max}	maximum frequency	CP; see Figure 7								
		V_{CC} = 0.8 V	-	28	-	-	-	-	-	MHz
		V_{CC} = 1.1 V to 1.3 V	-	128	-	70	-	70	-	MHz
		V_{CC} = 1.4 V to 1.6 V	-	206	-	120	-	110	-	MHz
		V_{CC} = 1.65 V to 1.95 V	-	262	-	150	-	120	-	MHz
		V_{CC} = 2.3 V to 2.7 V	-	269	-	190	-	170	-	MHz
		V_{CC} = 3.0 V to 3.6 V	-	309	-	200	-	190	-	MHz
C_L = 5 pF, 10 pF, 15 pF and 30 pF										
t_W	pulse width	CP; HIGH or LOW; see Figure 7								
		V_{CC} = 0.8 V	-	5.1	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V	-	1.5	-	3.2	-	3.5	-	ns
		V_{CC} = 1.4 V to 1.6 V	-	0.9	-	1.5	-	1.7	-	ns
		V_{CC} = 1.65 V to 1.95 V	-	0.7	-	1.0	-	1.1	-	ns
		V_{CC} = 2.3 V to 2.7 V	-	0.5	-	0.8	-	0.8	-	ns
		V_{CC} = 3.0 V to 3.6 V	-	0.5	-	0.7	-	0.8	-	ns
$t_{su(H)}$	set-up time HIGH	D to CP; see Figure 7								
		V_{CC} = 0.8 V	-	2.1	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V	-	0.5	-	1.4	-	1.4	-	ns
		V_{CC} = 1.4 V to 1.6 V	-	0.3	-	1.0	-	1.0	-	ns
		V_{CC} = 1.65 V to 1.95 V	-	0.3	-	0.9	-	0.9	-	ns
		V_{CC} = 2.3 V to 2.7 V	-	0.3	-	0.7	-	0.7	-	ns
		V_{CC} = 3.0 V to 3.6 V	-	0.2	-	0.6	-	0.6	-	ns
$t_{su(L)}$	set-up time LOW	D to CP; see Figure 7								
		V_{CC} = 0.8 V	-	3.5	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V	-	0.8	-	1.8	-	1.8	-	ns
		V_{CC} = 1.4 V to 1.6 V	-	0.6	-	1.2	-	1.2	-	ns
		V_{CC} = 1.65 V to 1.95 V	-	0.5	-	1.1	-	1.1	-	ns
		V_{CC} = 2.3 V to 2.7 V	-	0.4	-	1.0	-	1.0	-	ns
		V_{CC} = 3.0 V to 3.6 V	-	0.5	-	1.0	-	1.0	-	ns

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[1]	Max	Min (85 °C)	Max (85 °C)	Min (125 °C)	Max (125 °C)	
t_h	hold time	D to CP; see Figure 7								
		V_{CC} = 0.8 V	-	−2.8	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V	-	−0.7	-	0	-	0	-	ns
		V_{CC} = 1.4 V to 1.6 V	-	−0.4	-	0	-	0	-	ns
		V_{CC} = 1.65 V to 1.95 V	-	−0.4	-	0	-	0	-	ns
		V_{CC} = 2.3 V to 2.7 V	-	−0.3	-	0	-	0	-	ns
		V_{CC} = 3.0 V to 3.6 V	-	−0.4	-	0	-	0	-	ns
C_{PD}	power dissipation capacitance	V_I = GND to V_{CC}; f_i = 1 MHz; output enabled [5]								
		V_{CC} = 0.8 V	-	1.7	-	-	-	-	-	pF
		V_{CC} = 1.1 V to 1.3 V	-	1.8	-	-	-	-	-	pF
		V_{CC} = 1.4 V to 1.6 V	-	1.8	-	-	-	-	-	pF
		V_{CC} = 1.65 V to 1.95 V	-	2.0	-	-	-	-	-	pF
		V_{CC} = 2.3 V to 2.7 V	-	2.3	-	-	-	-	-	pF
		V_{CC} = 3.0 V to 3.6 V	-	2.8	-	-	-	-	-	pF

[1] All typical values are measured at nominal V_{CC}.

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

[3] t_{en} is the same as t_{PZH} and t_{PZL}.

[4] t_{dis} is the same as t_{PHZ} and t_{PLZ}.

[5] C_{PD} is used to determine the dynamic power dissipation (P_D 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_i = input frequency in MHz;

f_o = output frequency in MHz;

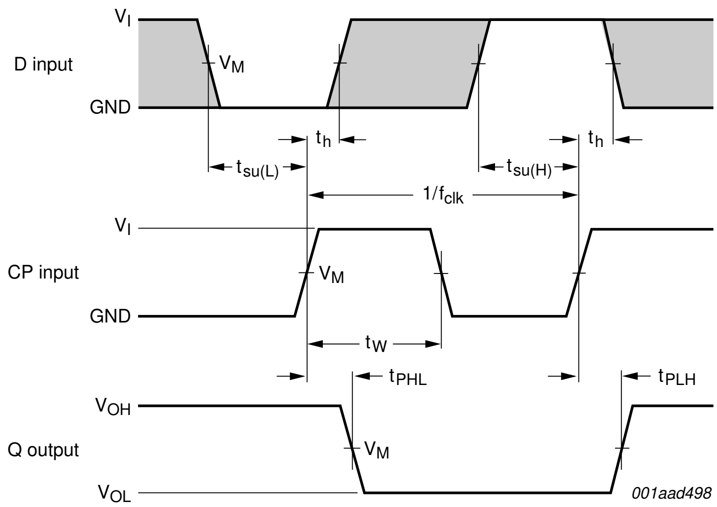
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

$\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs;

N = number of inputs switching.

12. Waveforms



Measurement points are given in Table 9.

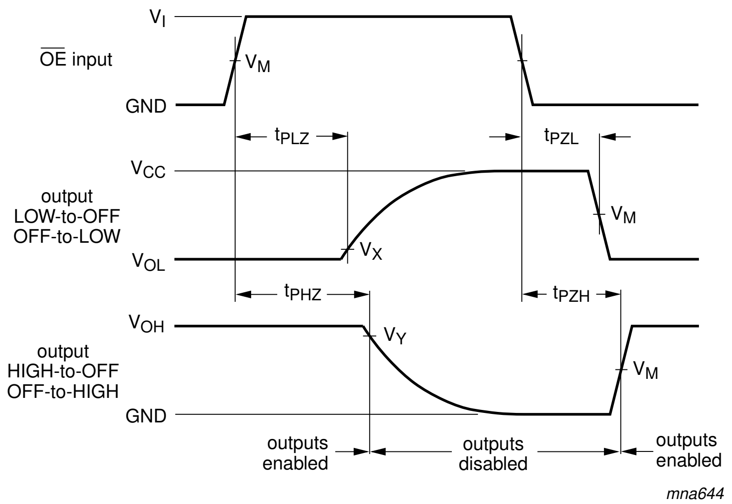
The shaded areas indicate when the input is permitted to change for predictable output performance.

Logic levels: V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig 7. The clock input (CP) to output (Q) propagation delays, clock input (CP) pulse width, data input (D) to clock input (CP) set-up times, clock input (CP) to data input (D) hold times and the maximum frequency (CP)

Table 9. Measurement points

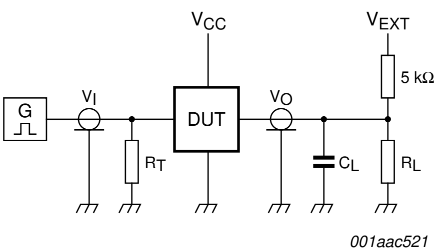
Supply voltage	Input			Output		
V_{CC}	V_M	V_I	$t_r = t_f$	V_M	V_X	V_Y
0.8 V to 1.6 V	0.5 × V_{CC}	V_{CC}	≤ 3.0 ns	0.5 × V_{CC}	V_{OL} + 0.1 V	V_{OH} − 0.1 V
1.65 V to 2.7 V	0.5 × V_{CC}	V_{CC}	≤ 3.0 ns	0.5 × V_{CC}	V_{OL} + 0.15 V	V_{OH} − 0.15 V
3.0 V to 3.6 V	0.5 × V_{CC}	V_{CC}	≤ 3.0 ns	0.5 × V_{CC}	V_{OL} + 0.3 V	V_{OH} − 0.3 V



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. Enable and disable times



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. Test circuit for measuring switching times

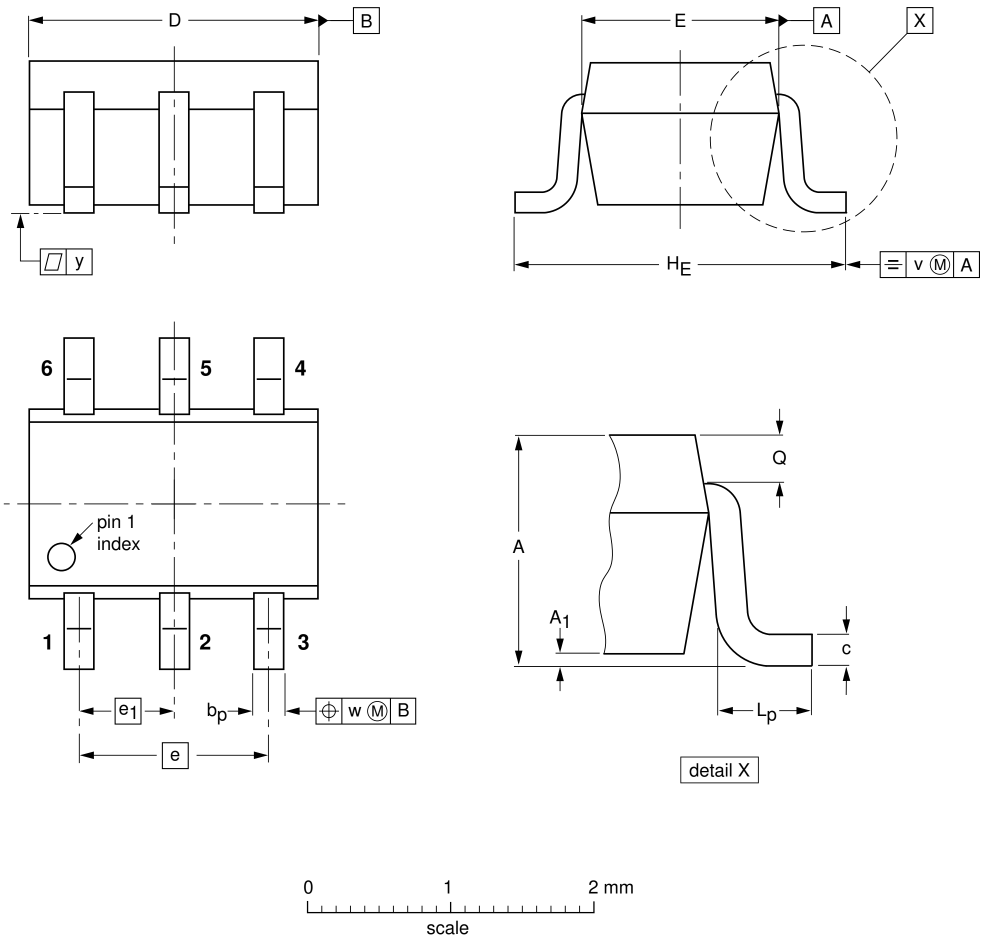
Table 10. Test data

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 × V_{CC}

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

13. Package outline

Plastic surface-mounted package; 6 leads **SOT363**



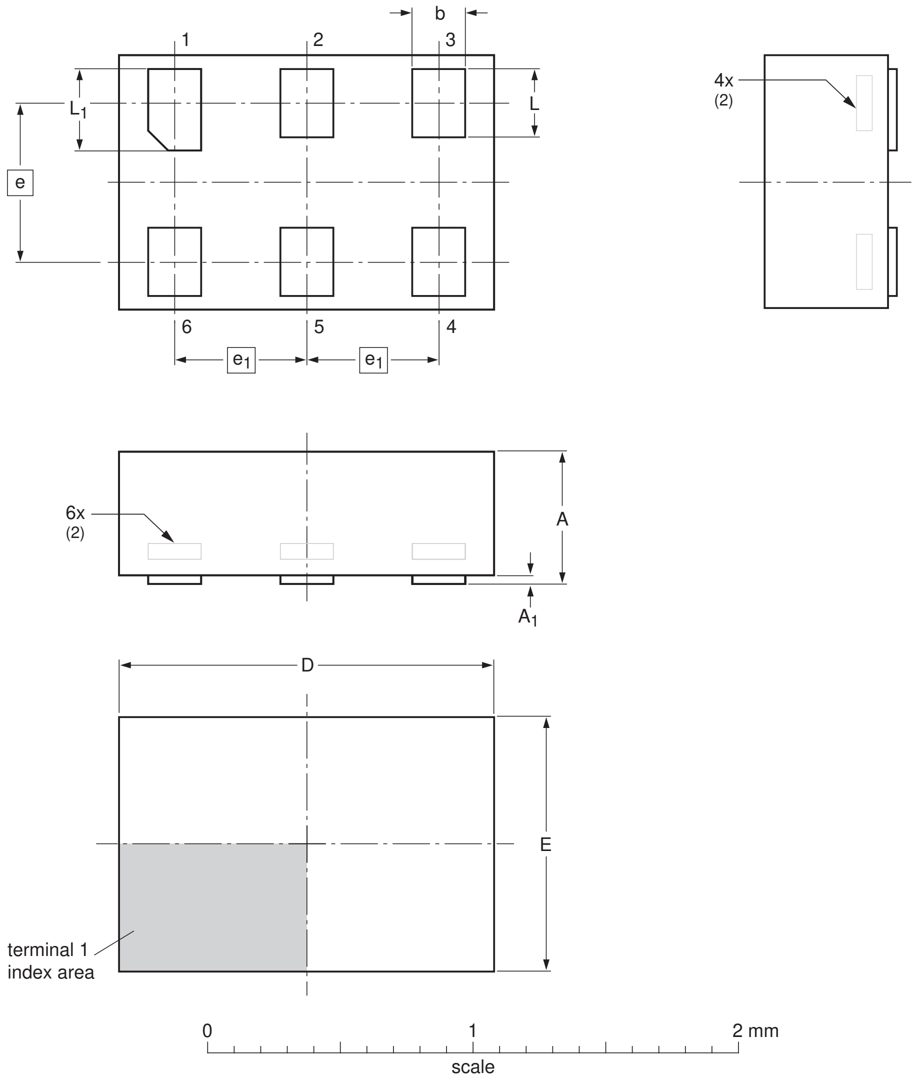
DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1 max	b_p	c	D	E	e	e_1	H_E	L_p	Q	v	w	y
mm	1.1 0.8	0.1	0.30 0.20	0.25 0.10	2.2 1.8	1.35 1.15	1.3	0.65	2.2 2.0	0.45 0.15	0.25 0.15	0.2	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT363			SC-88			~~04-11-08~~ 06-03-16

Fig 10. 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(1)	A_1	b	D	E	e	e_1	L	L_1
mm	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

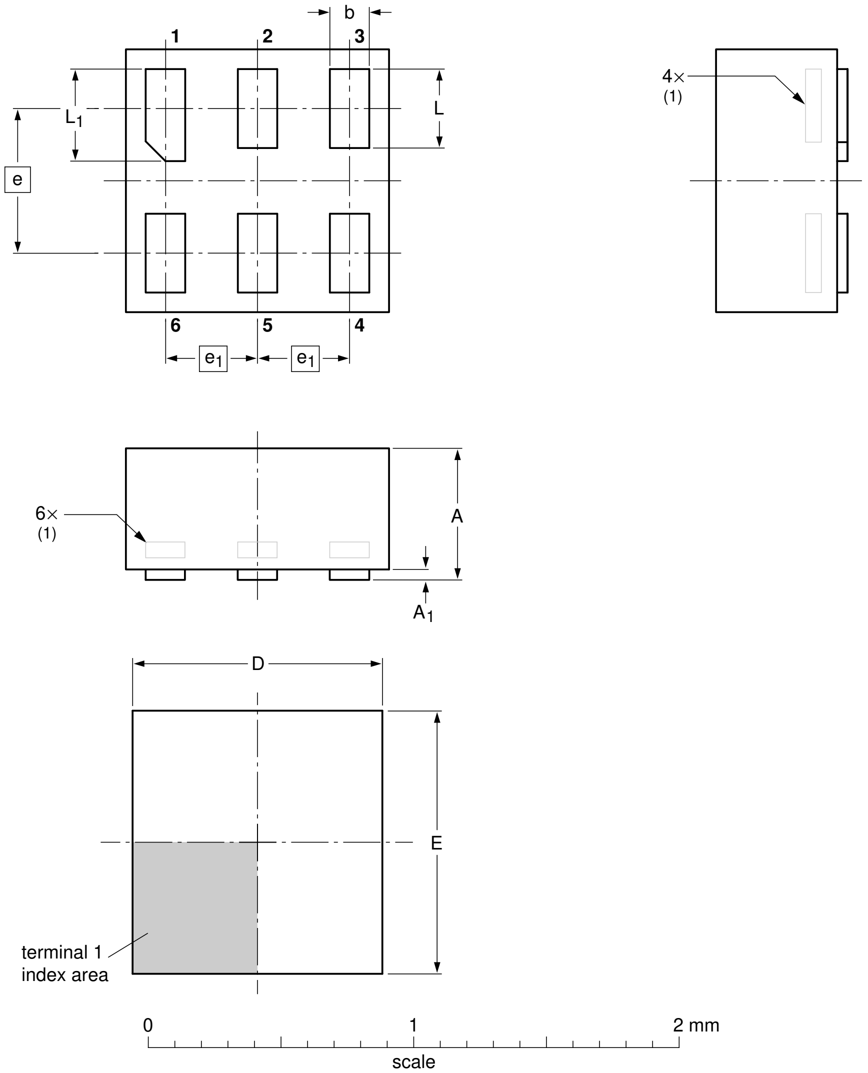
Notes
1. Including plating thickness.
2. Can be visible in some manufacturing processes.

sot886_po

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

Fig 11. 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_1 max	b	D	E	e	e_1	L	L_1
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

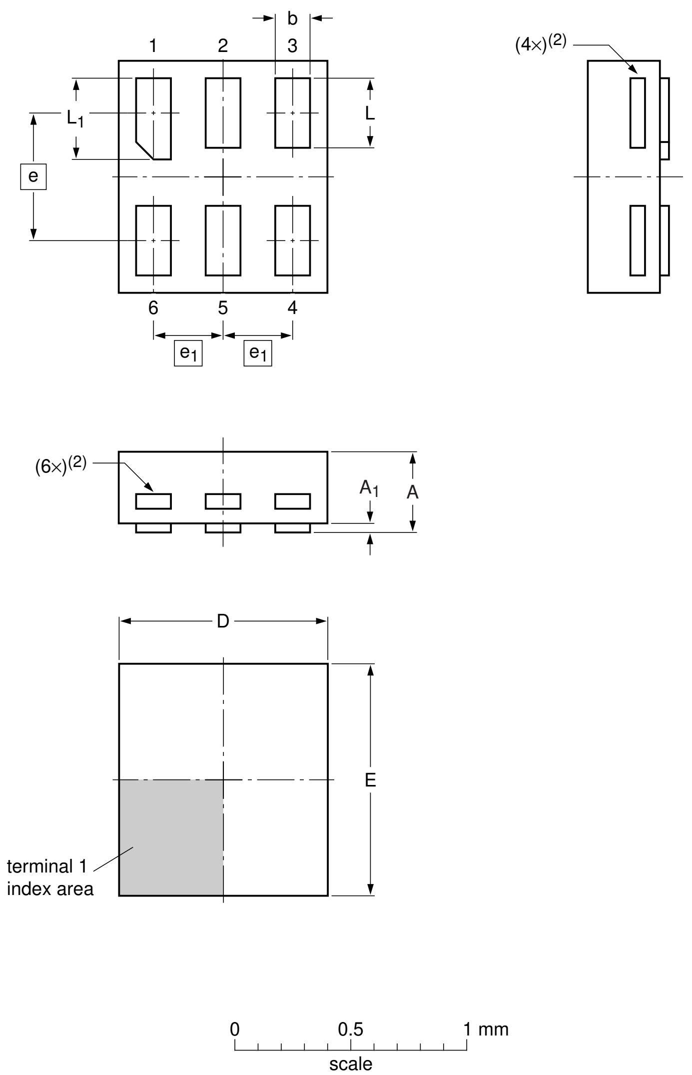
Note

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

Fig 12. 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(1)	A_1	b	D	E	e	e_1	L	L_1
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

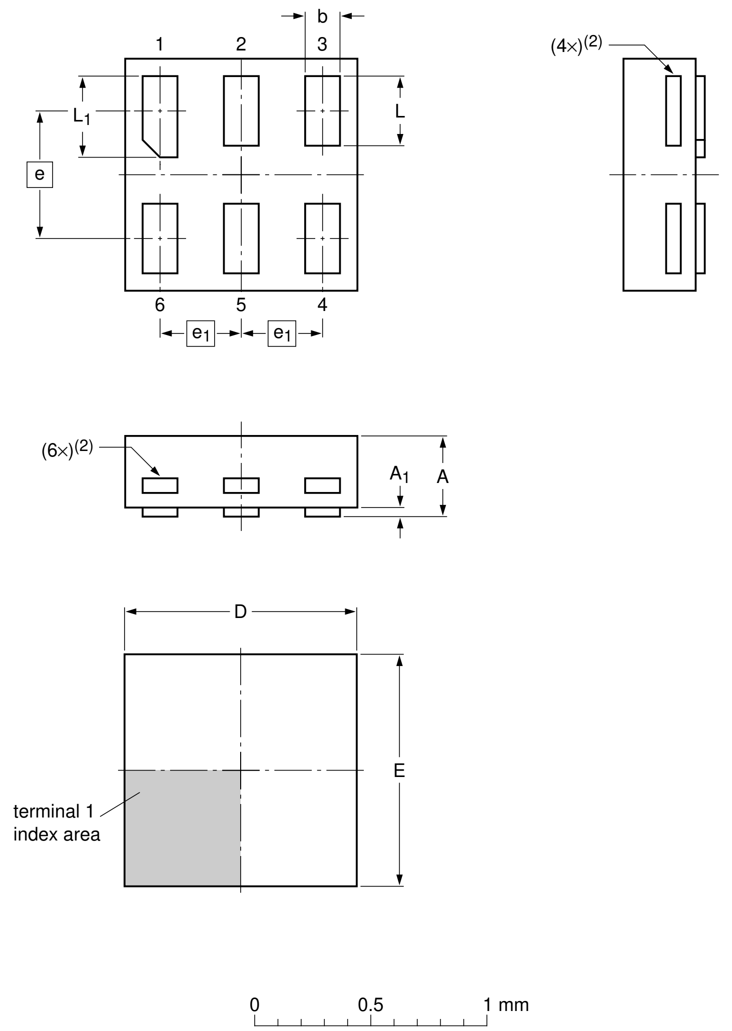
Note
1. Including plating thickness.
2. Visible depending upon used manufacturing technology.

sot1115_po

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

Fig 13. 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		$A^{(1)}$	A_1	b	D	E	e	e_1	L	L_1
	max	0.35	0.04	0.20	1.05	1.05			0.35	0.40
mm	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
1. Including plating thickness.
2. 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

Fig 14. Package outline SOT1202 (XSON6)

14. Abbreviations

Table 11. 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 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AUP1G374 v.8	20121129	Product data sheet	-	74AUP1G374 v.7
Modifications:	• Class 3A added to ESD list item.			
74AUP1G374 v.7	20120704	Product data sheet	-	74AUP1G374 v.6
Modifications:	• Package outline drawing of SOT886 (Figure 11) modified.			
74AUP1G374 v.6	20111205	Product data sheet	-	74AUP1G374 v.5
74AUP1G374 v.5	20100714	Product data sheet	-	74AUP1G374 v.4
74AUP1G374 v.4	20090626	Product data sheet	-	74AUP1G374 v.3
74AUP1G374 v.3	20090414	Product data sheet	-	74AUP1G374 v.2
74AUP1G374 v.2	20080523	Product data sheet	-	74AUP1G374 v.1
74AUP1G374 v.1	20061114	Product data sheet	-	-

16. Legal information

16.1 Data sheet status

Document status[1][2]	Product status[3]	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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17. Contact information

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For sales office addresses, please send an email to: **salesaddresses@nexperia.com**

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