74AUP1G175
Low-power D-type flip-flop with reset; positive-edge trigger

Rev. 5 — 3 July 2012 **Product data sheet**

1. General description

The 74AUP1G175 provides a low-power, low-voltage positive-edge triggered D-type flip-flop with individual data (D) input, clock (CP) input, master reset ($\overline{MR}$) input, and Q output. The master reset ($\overline{MR}$) is an asynchronous active LOW input and operates independently of the clock input. Information on the data input is transferred to the Q output on the LOW-to-HIGH transition of the clock pulse. The D input must be stable one set-up time prior to the LOW-to-HIGH clock transition, for predictable operation.

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

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3.   Ordering information

Table 1.   Ordering information

| Type number	Package				
	Temperature range	Name	Description		Version
74AUP1G175GW	−40 °C to +125 °C	SC-88	plastic surface-mounted package; 6 leads		SOT363
74AUP1G175GM	−40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm		SOT886
74AUP1G175GF	−40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1 × 0.5 mm		SOT891
74AUP1G175GN	−40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 0.9 × 1.0 × 0.35 mm		SOT1115
74AUP1G175GS	−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]
74AUP1G175GW	aT
74AUP1G175GM	aT
74AUP1G175GF	aT
74AUP1G175GN	aT
74AUP1G175GS	aT

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

5.   Functional diagram
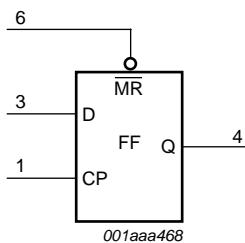
Fig 1.   Logic symbol
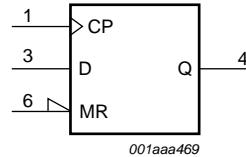
Fig 2.   IEC logic symbol
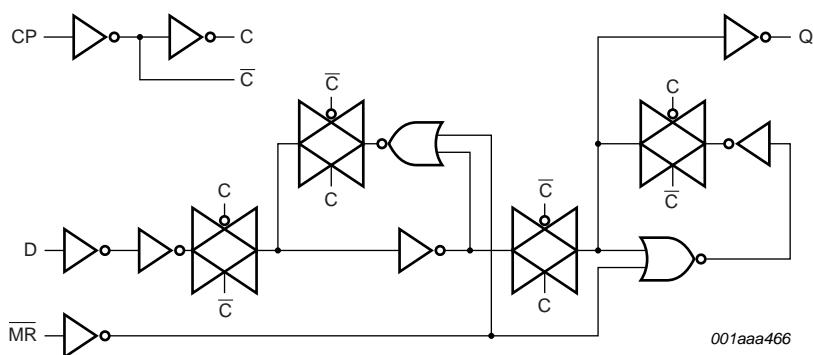
Fig 3.   Logic diagram

6.   Pinning information

6.1   Pinning
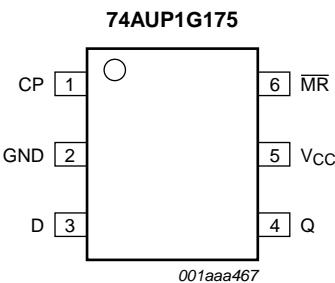
Fig 4.   Pin configuration SOT363
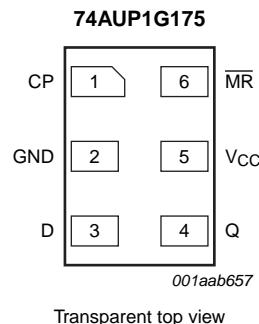
Fig 5.   Pin configuration SOT886

Transparent top view
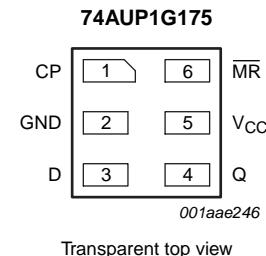
Fig 6.   Pin configuration SOT891, SOT1115 and SOT1202

Transparent top view

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	flip-flop output
V_{CC}	5	supply voltage
$\overline{MR}$	6	master reset input (active LOW)

7. Functional description

Table 4. Function table[1]

Operating mode	Input			Output
	$\overline{MR}$	CP	D	Q
Reset (clear)	L	X	X	L
Load '1'	H	↑	h	H
Load '0'	H	↑	l	L

[1] H = HIGH voltage level;

    h = HIGH voltage level one set-up time prior to the LOW-to-HIGH CP transition;

    L = LOW voltage level;

    l = LOW voltage level one set-up time prior to the LOW-to-HIGH CP transition;

    ↑ = LOW-to-HIGH CP transition;

    X = don't care.

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 packages: above 118 °C the value of P_{tot} derates linearly with 7.8 mW/K.

74AUP1G175

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Product data sheet

Rev. 5 — 3 July 2012

4 of 23

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	-	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	$0.70 \times V_{CC}$	-	-	V
		V_{CC} = 0.9 V to 1.95 V	$0.65 \times V_{CC}$	-	-	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	-	-	$0.30 \times V_{CC}$	V
		V_{CC} = 0.9 V to 1.95 V	-	-	$0.35 \times V_{CC}$	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	$0.75 \times V_{CC}$	-	-	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	-	-	$0.3 \times V_{CC}$	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

Table 7. Static characteristics *…continued*

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

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_I	input leakage current	V_I = GND 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
C_O	output capacitance	V_O = GND; V_{CC} = 0 V		-	1.7	-	pF
T_{amb} = −40 °C to +85 °C							
V_{IH}	HIGH-level input voltage	V_{CC} = 0.8 V		$0.70 \times V_{CC}$	-	-	V
		V_{CC} = 0.9 V to 1.95 V		$0.65 \times V_{CC}$	-	-	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		-	-	$0.30 \times V_{CC}$	V
		V_{CC} = 0.9 V to 1.95 V		-	-	$0.35 \times V_{CC}$	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		$0.7 \times V_{CC}$	-	-	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		-	-	$0.3 \times V_{CC}$	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_{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

74AUP1G175

Product data sheet **Rev. 5 — 3 July 2012** 6 of 23

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

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
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
T_{amb} = −40 °C to +125 °C						
V_{IH}	HIGH-level input voltage	V_{CC} = 0.8 V	$0.75 \times V_{CC}$	-	-	V
		V_{CC} = 0.9 V to 1.95 V	$0.70 \times V_{CC}$	-	-	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	-	-	$0.25 \times V_{CC}$	V
		V_{CC} = 0.9 V to 1.95 V	-	-	$0.30 \times V_{CC}$	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	$0.6 \times V_{CC}$	-	-	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	-	-	$0.33 \times V_{CC}$	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_{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.

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Product data sheet **Rev. 5 — 3 July 2012** **7 of 23**

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	Max (85 °C)	Max (125 °C)		
C_L = 5 pF										
t_{pd}	propagation delay	CP to Q; see Figure 7	[2]							
		V_{CC} = 0.8 V	-	21.1	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V	2.4	5.9	11.7	2.2	11.9	12.0	ns
		V_{CC} = 1.4 V to 1.6 V	2.0	4.1	6.8	1.8	7.3	7.6	ns
		V_{CC} = 1.65 V to 1.95 V	1.6	3.3	5.4	1.3	5.9	6.2	ns
		V_{CC} = 2.3 V to 2.7 V	1.3	2.5	3.6	1.1	4.0	4.2	ns
		V_{CC} = 3.0 V to 3.6 V	1.2	2.1	2.9	1.0	3.3	3.5	ns
		$\overline{MR}$ to Q; see Figure 8	[2]							
		V_{CC} = 0.8 V	-	17.4	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V	2.4	5.2	9.7	2.2	10.0	12.0	ns
		V_{CC} = 1.4 V to 1.6 V	2.3	3.8	5.2	2.1	6.4	6.6	ns
		V_{CC} = 1.65 V to 1.95 V	1.8	3.1	4.9	1.7	5.4	5.6	ns
		V_{CC} = 2.3 V to 2.7 V	1.8	2.6	3.6	1.5	4.0	4.0	ns
		V_{CC} = 3.0 V to 3.6 V	1.6	2.4	3.1	1.3	3.3	3.6	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	-	200	-	170	-	-	MHz
		V_{CC} = 1.4 V to 1.6 V	-	345	-	310	-	-	MHz
		V_{CC} = 1.65 V to 1.95 V	-	435	-	400	-	-	MHz
		V_{CC} = 2.3 V to 2.7 V	-	550	-	490	-	-	MHz
		V_{CC} = 3.0 V to 3.6 V	-	615	-	550	-	-	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	Max (85 °C)	Max (125 °C)	
C$_L$ = 10 pF										
t$_{pd}$	propagation delay	CP to Q; see Figure 7	[2]							
		V$_{CC}$ = 0.8 V		-	24.7	-	-	-	-	ns
		V$_{CC}$ = 1.1 V to 1.3 V		2.6	6.8	13.3	2.4	13.6	13.6	ns
		V$_{CC}$ = 1.4 V to 1.6 V		2.3	4.8	7.9	2.0	8.4	8.7	ns
		V$_{CC}$ = 1.65 V to 1.95 V		2.1	3.9	6.1	1.8	6.6	6.9	ns
		V$_{CC}$ = 2.3 V to 2.7 V		1.7	3.0	4.3	1.5	4.7	5.0	ns
		V$_{CC}$ = 3.0 V to 3.6 V		1.6	2.7	3.6	1.3	4.0	4.2	ns
		$\overline{MR}$ to Q; see Figure 8	[2]							
		V$_{CC}$ = 0.8 V		-	21.0	-	-	-	-	ns
		V$_{CC}$ = 1.1 V to 1.3 V		2.6	6.2	11.5	2.6	11.7	13.6	ns
		V$_{CC}$ = 1.4 V to 1.6 V		2.5	4.4	6.1	2.4	7.6	7.8	ns
		V$_{CC}$ = 1.65 V to 1.95 V		2.5	3.7	5.7	2.2	6.3	6.3	ns
		V$_{CC}$ = 2.3 V to 2.7 V		2.1	3.2	4.3	1.9	4.7	4.9	ns
		V$_{CC}$ = 3.0 V to 3.6 V		2.0	3.0	3.9	1.8	4.1	4.3	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		-	190	-	150	-	-	MHz
		V$_{CC}$ = 1.4 V to 1.6 V		-	320	-	280	-	-	MHz
		V$_{CC}$ = 1.65 V to 1.95 V		-	420	-	310	-	-	MHz
		V$_{CC}$ = 2.3 V to 2.7 V		-	485	-	370	-	-	MHz
		V$_{CC}$ = 3.0 V to 3.6 V		-	550	-	410	-	-	MHz
C$_L$ = 15 pF										
t$_{pd}$	propagation delay	CP to Q; see Figure 7	[2]							
		V$_{CC}$ = 0.8 V		-	28.1	-	-	-	-	ns
		V$_{CC}$ = 1.1 V to 1.3 V		3.0	7.6	14.8	2.8	15.2	15.4	ns
		V$_{CC}$ = 1.4 V to 1.6 V		2.7	5.3	8.7	2.3	9.4	9.9	ns
		V$_{CC}$ = 1.65 V to 1.95 V		2.3	4.4	6.8	2.1	7.4	7.9	ns
		V$_{CC}$ = 2.3 V to 2.7 V		2.1	3.5	5.0	1.9	5.3	5.6	ns
		V$_{CC}$ = 3.0 V to 3.6 V		2.0	3.1	4.3	1.7	4.7	4.9	ns
		$\overline{MR}$ to Q; see Figure 8	[2]							
		V$_{CC}$ = 0.8 V		-	24.6	-	-	-	-	ns
		V$_{CC}$ = 1.1 V to 1.3 V		3.2	7.0	13.2	2.9	13.5	15.2	ns
		V$_{CC}$ = 1.4 V to 1.6 V		3.1	5.0	6.8	2.6	8.6	9.1	ns
		V$_{CC}$ = 1.65 V to 1.95 V		2.5	4.3	6.5	2.5	7.2	7.4	ns
		V$_{CC}$ = 2.3 V to 2.7 V		2.6	3.7	5.0	2.2	5.4	5.5	ns
		V$_{CC}$ = 3.0 V to 3.6 V		2.4	3.5	4.4	2.1	4.8	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	Max (85 °C)	Max (125 °C)	
f_{max}	maximum frequency	CP; see Figure 7							
		V_{CC} = 0.8 V	-	50	-	-	-	-	MHz
		V_{CC} = 1.1 V to 1.3 V	-	180	-	120	-	-	MHz
		V_{CC} = 1.4 V to 1.6 V	-	300	-	190	-	-	MHz
		V_{CC} = 1.65 V to 1.95 V	-	405	-	240	-	-	MHz
		V_{CC} = 2.3 V to 2.7 V	-	420	-	300	-	-	MHz
		V_{CC} = 3.0 V to 3.6 V	-	480	-	320	-	-	MHz
C_L = 30 pF									
t_{pd}	propagation delay	CP to Q; see Figure 7 [2]							
		V_{CC} = 0.8 V	-	38.4	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V	3.6	9.8	19.5	3.4	20.6	21.0	ns
		V_{CC} = 1.4 V to 1.6 V	3.3	6.9	11.2	3.2	12.4	13.0	ns
		V_{CC} = 1.65 V to 1.95 V	3.1	5.7	8.8	2.9	9.6	10.2	ns
		V_{CC} = 2.3 V to 2.7 V	3.0	4.6	6.4	2.6	6.9	7.3	ns
		V_{CC} = 3.0 V to 3.6 V	2.8	4.2	5.7	2.5	6.5	6.9	ns
		$\overline{MR}$ to Q; see Figure 8 [2]							
		V_{CC} = 0.8 V	-	35.1	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V	3.9	9.3	18.0	3.7	18.6	19.8	ns
		V_{CC} = 1.4 V to 1.6 V	3.9	6.6	8.9	3.6	11.6	12.2	ns
		V_{CC} = 1.65 V to 1.95 V	3.6	5.6	8.6	3.4	9.6	9.7	ns
		V_{CC} = 2.3 V to 2.7 V	3.5	4.8	6.4	2.9	7.2	7.2	ns
		V_{CC} = 3.0 V to 3.6 V	3.3	4.6	5.7	3.1	6.4	6.9	ns
f_{max}	maximum frequency	CP; see Figure 7							
		V_{CC} = 0.8 V	-	35	-	-	-	-	MHz
		V_{CC} = 1.1 V to 1.3 V	-	130	-	70	-	-	MHz
		V_{CC} = 1.4 V to 1.6 V	-	200	-	120	-	-	MHz
		V_{CC} = 1.65 V to 1.95 V	-	240	-	150	-	-	MHz
		V_{CC} = 2.3 V to 2.7 V	-	275	-	190	-	-	MHz
		V_{CC} = 3.0 V to 3.6 V	-	300	-	200	-	-	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	Max (85 °C)	Max (125 °C)	
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	-	5.25	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V	-	1.6	-	1.5	-	-	ns
		V_{CC} = 1.4 V to 1.6 V	-	1.0	-	0.9	-	-	ns
		V_{CC} = 1.65 V to 1.95 V	-	0.75	-	0.7	-	-	ns
		V_{CC} = 2.3 V to 2.7 V	-	0.6	-	0.4	-	-	ns
		V_{CC} = 3.0 V to 3.6 V	-	0.55	-	0.4	-	-	ns
		$\overline{MR}$; LOW; see Figure 8							
		V_{CC} = 0.8 V	-	9.0	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V	-	3.0	-	4.9	-	-	ns
		V_{CC} = 1.4 V to 1.6 V	-	1.75	-	2.5	-	-	ns
		V_{CC} = 1.65 V to 1.95 V	-	1.35	-	1.8	-	-	ns
		V_{CC} = 2.3 V to 2.7 V	-	0.9	-	1.1	-	-	ns
		V_{CC} = 3.0 V to 3.6 V	-	0.8	-	0.8	-	-	ns
t_{rec}	recovery time	$\overline{MR}$; see Figure 8							
		V_{CC} = 0.8 V	-	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V	-	−1.1	-	−1.2	-	-	ns
		V_{CC} = 1.4 V to 1.6 V	-	−2.0	-	−0.8	-	-	ns
		V_{CC} = 1.65 V to 1.95 V	-	−0.5	-	−0.7	-	-	ns
		V_{CC} = 2.3 V to 2.7 V	-	−0.9	-	−0.4	-	-	ns
		V_{CC} = 3.0 V to 3.6 V	-	−1.0	-	−0.2	-	-	ns
$t_{su(H)}$	set-up time HIGH	D to CP; see Figure 7							
		V_{CC} = 0.8 V	-	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V	-	0.5	-	1.2	-	-	ns
		V_{CC} = 1.4 V to 1.6 V	-	0.4	-	0.8	-	-	ns
		V_{CC} = 1.65 V to 1.95 V	-	0.3	-	0.6	-	-	ns
		V_{CC} = 2.3 V to 2.7 V	-	0.3	-	0.5	-	-	ns
		V_{CC} = 3.0 V to 3.6 V	-	0.2	-	0.5	-	-	ns
$t_{su(L)}$	set-up time LOW	D to CP; see Figure 7							
		V_{CC} = 0.8 V	-	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V	-	0.8	-	1.7	-	-	ns
		V_{CC} = 1.4 V to 1.6 V	-	0.6	-	1.1	-	-	ns
		V_{CC} = 1.65 V to 1.95 V	-	0.4	-	0.9	-	-	ns
		V_{CC} = 2.3 V to 2.7 V	-	0.4	-	0.9	-	-	ns
		V_{CC} = 3.0 V to 3.6 V	-	0.5	-	0.9	-	-	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	Max (85 °C)	Max (125 °C)	
t_h	hold time	D to CP; see Figure 7							
		V_{CC} = 0.8 V	-	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V	-	−0.7	-	0.2	-	-	ns
		V_{CC} = 1.4 V to 1.6 V	-	−0.5	-	0	-	-	ns
		V_{CC} = 1.65 V to 1.95 V	-	−0.5	-	0	-	-	ns
		V_{CC} = 2.3 V to 2.7 V	-	−0.3	-	0	-	-	ns
		V_{CC} = 3.0 V to 3.6 V	-	−0.4	-	0	-	-	ns
C_{PD}	power dissipation capacitance	f_i = 1 MHz; V_I = GND to V_{CC} [3]							
		V_{CC} = 0.8 V	-	1.6	-	-	-	-	pF
		V_{CC} = 1.1 V to 1.3 V	-	1.7	-	-	-	-	pF
		V_{CC} = 1.4 V to 1.6 V	-	1.8	-	-	-	-	pF
		V_{CC} = 1.65 V to 1.95 V	-	1.9	-	-	-	-	pF
		V_{CC} = 2.3 V to 2.7 V	-	2.2	-	-	-	-	pF
		V_{CC} = 3.0 V to 3.6 V	-	2.7	-	-	-	-	pF

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

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

[3] C_{PD} is used to determine the dynamic power dissipation (P_D in 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;

N = number of inputs switching;

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

12. Waveforms
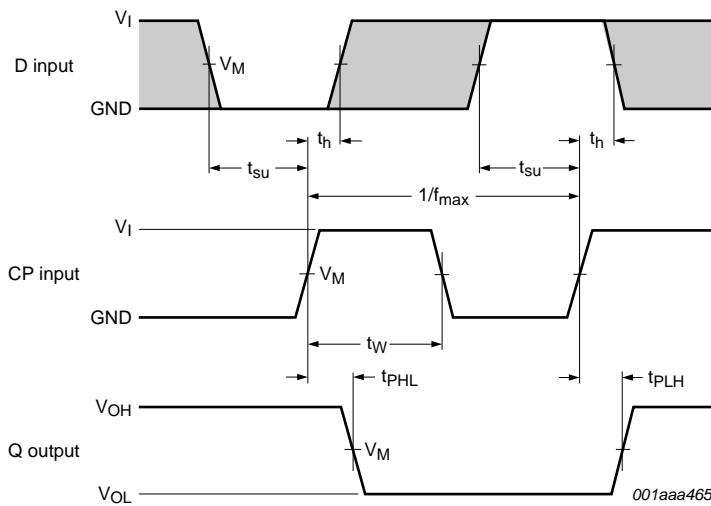
Measurement points are given in Table 9.

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

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

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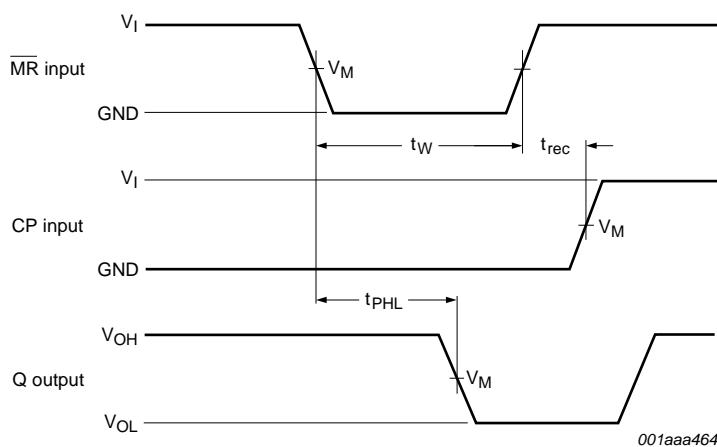

Measurement points are given in Table 9.

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

Fig 8. **The master reset ($\overline{MR}$) input to output (Q) propagation delays, the master reset pulse width and the $\overline{MR}$ to CP recovery time**

Table 9.   **Measurement points**

Supply voltage	Output	Input		
V_{CC}	V_M	V_M	V_I	$t_r = t_f$
0.8 V to 3.6 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	V_{CC}	≤ 3.0 ns

001aac521
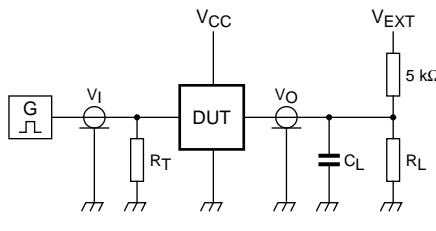
Test data is given in Table 10.

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	$2 \times V_{CC}$

[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

Plastic surface-mounted package; 6 leads   SOT363
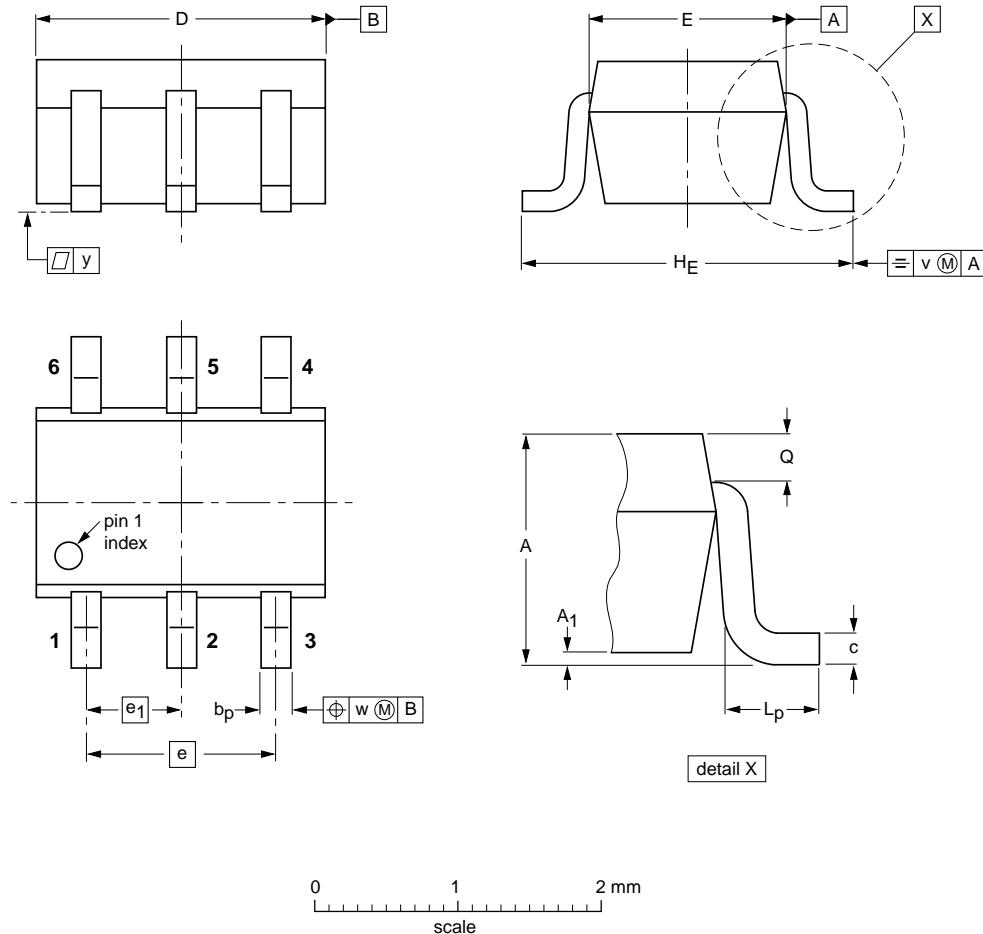
DIMENSIONS (mm are the original dimensions)

UNIT	A	A₁ max	bp	c	D	E	e	e₁	H_E	Lp	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
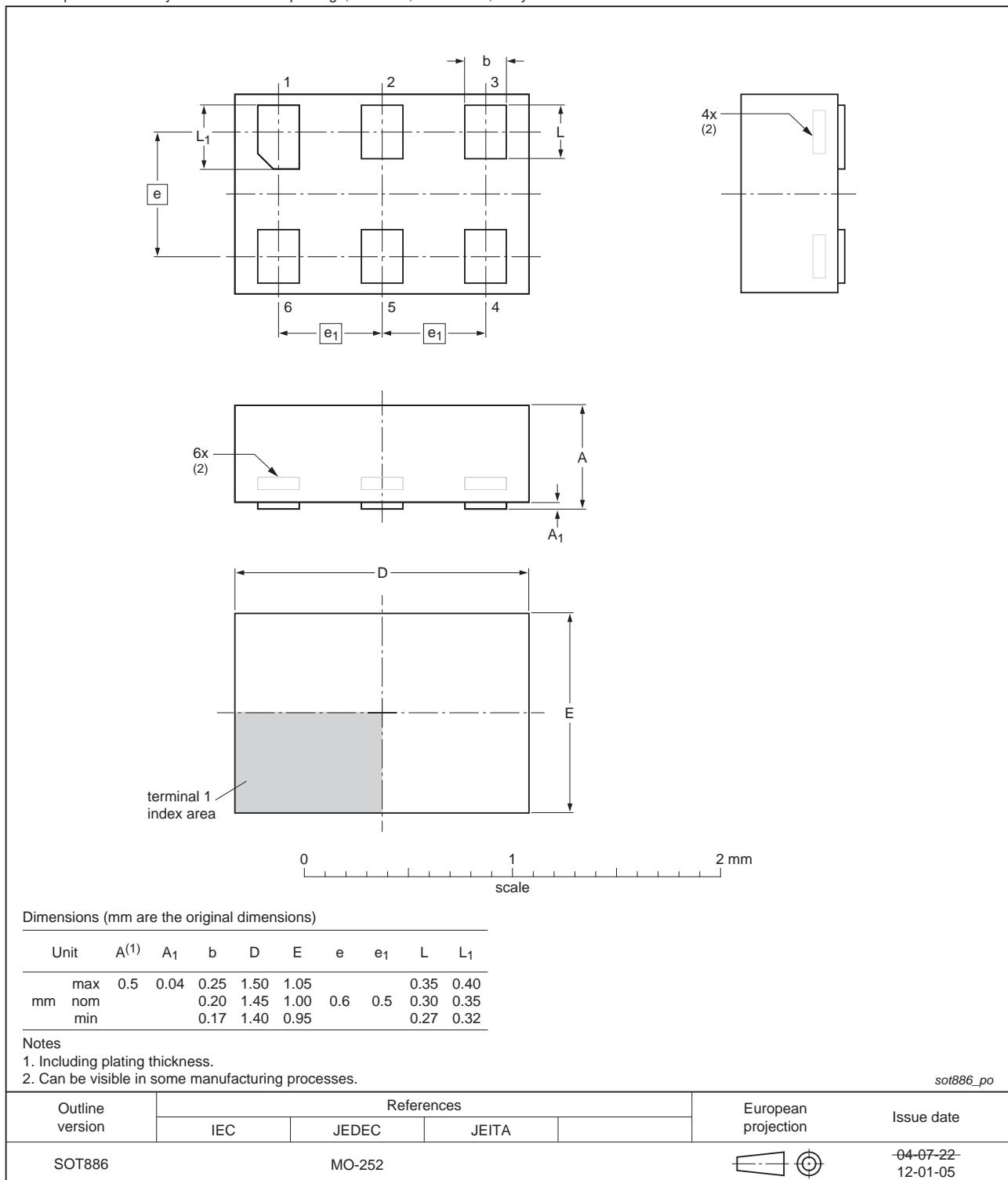
Fig 11.   Package outline SOT886 (XSON6)

XSON6: plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1 x 0.5 mm   SOT891
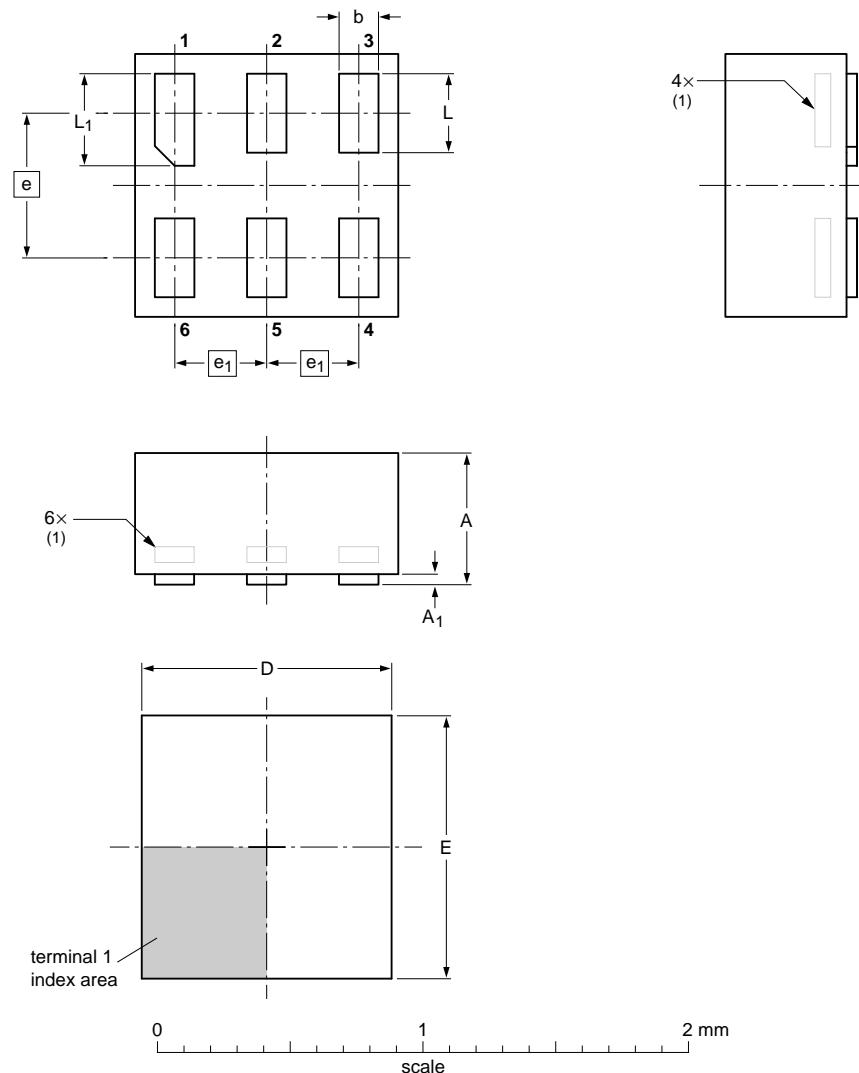
DIMENSIONS (mm are the original dimensions)

UNIT	A max	A₁ max	b	D	E	e	e₁	L	L₁
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
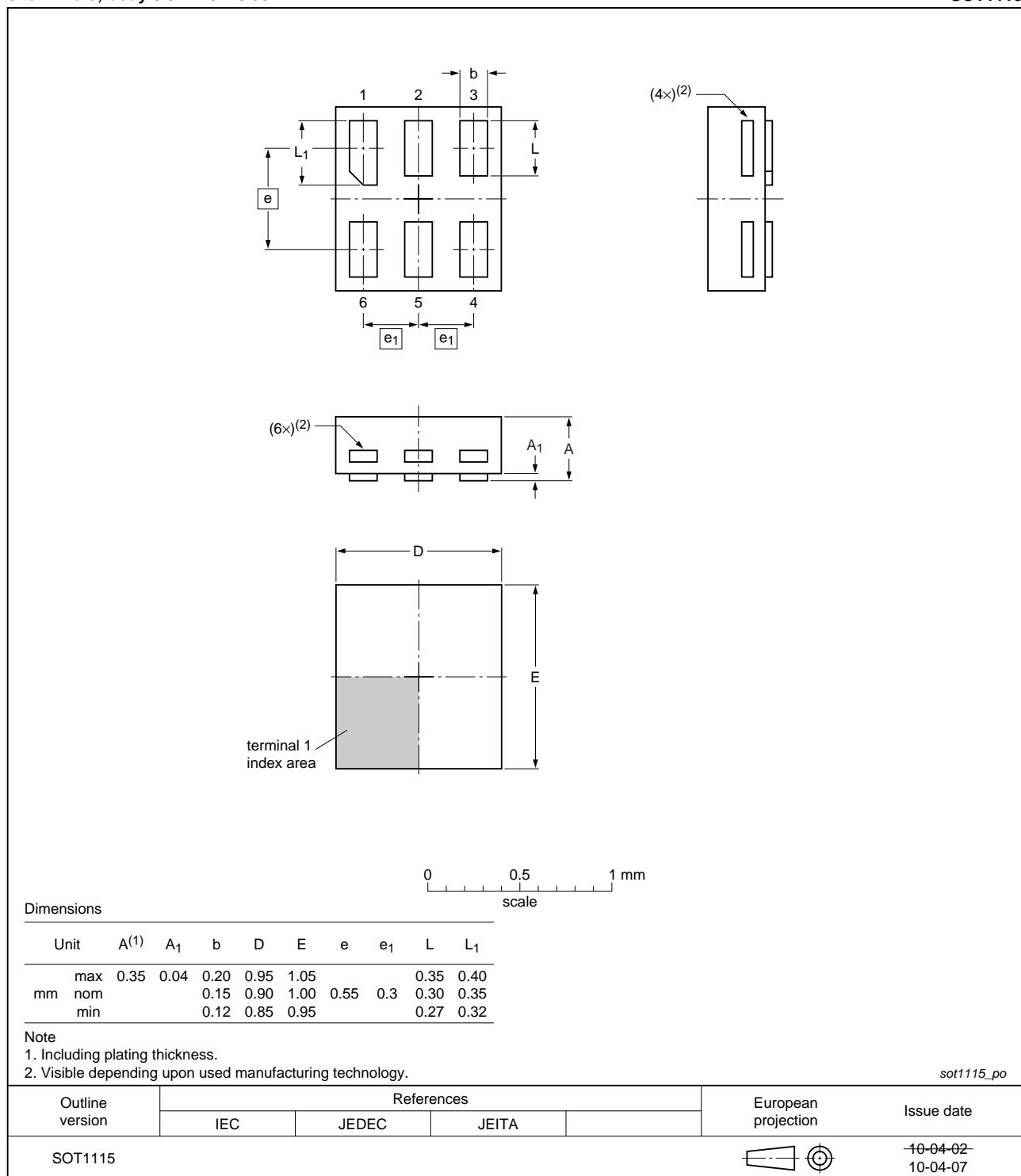
Fig 13.   Package outline SOT1115 (XSON6)

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
mm	max	0.35	0.04	0.20	1.05	1.05			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
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
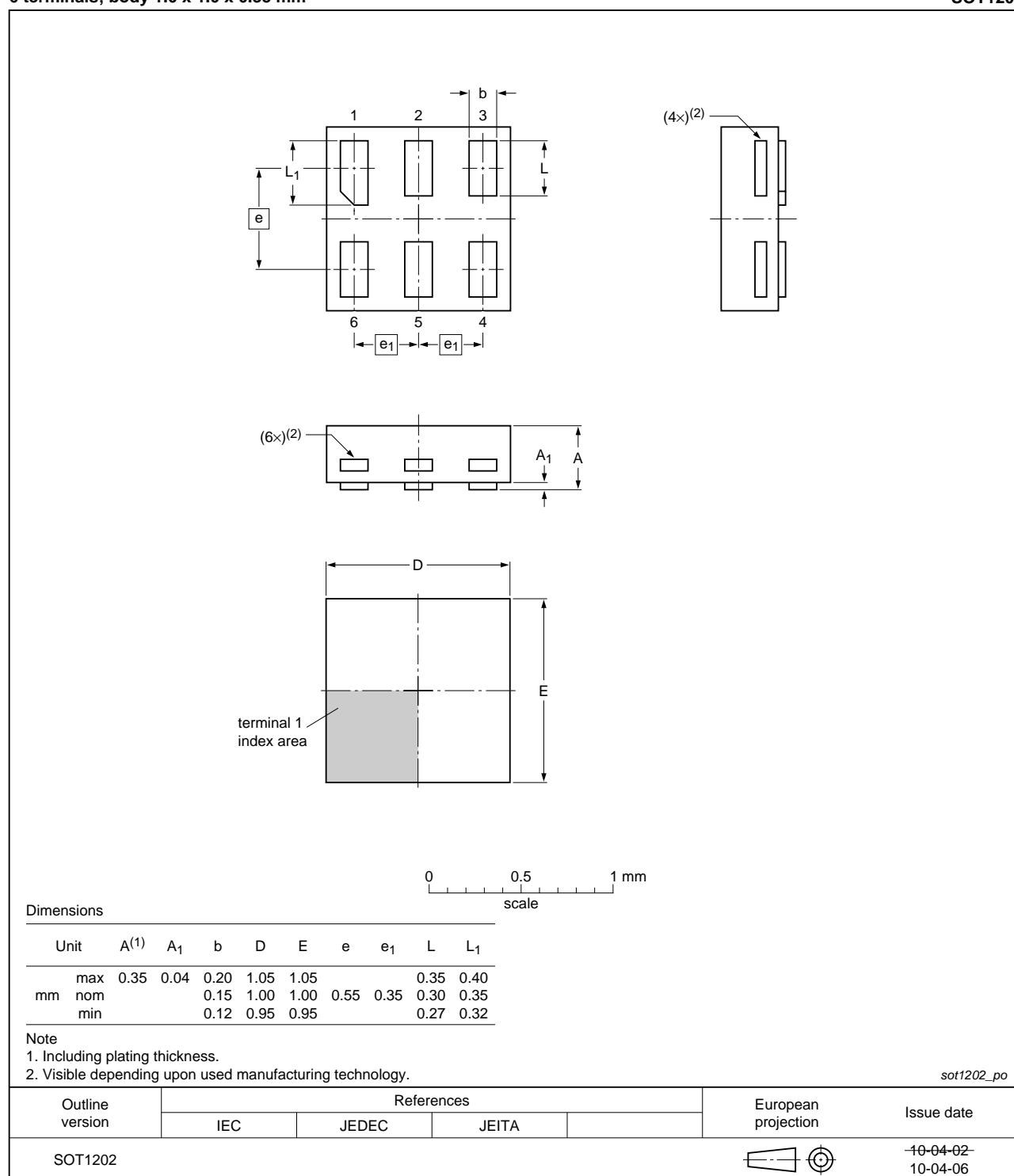
Fig 14. Package outline SOT1202 (XSON6)

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
74AUP1G175 v.5	20120703	Product data sheet	-	74AUP1G175 v.4
Modifications:	• Package outline drawing of SOT886 (Figure 11) modified.			
74AUP1G175 v.4	20111124	Product data sheet	-	74AUP1G175 v.3
Modifications:	• Legal pages updated.			
74AUP1G175 v.3	20100930	Product data sheet	-	74AUP1G175 v.2
74AUP1G175 v.2	20080228	Product data sheet	-	74AUP1G175 v.1
74AUP1G175 v.1	20061115	Product data sheet	-	-

74AUP1G175

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Product data sheet

Rev. 5 — 3 July 2012

20 of 23

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".

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Product data sheet

Rev. 5 — 3 July 2012

21 of 23

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Product data sheet

Rev. 5 — 3 July 2012

22 of 23

18. Contents

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  [74AUP1G175GF,132](#) [74AUP1G175GM,132](#) [74AUP1G175GM,115](#) [74AUP1G175GW,125](#) [74AUP1G175GN,132](#)
[74AUP1G175GS,132](#)