

DATA SHEET

ATV321 series
Surface-mount ceramic
50 Ω , 1 to 20 dB attenuators

Preliminary specification

2001 Jul 25 Rev.0

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ATV321 series

FEATURES

- Reduced system size
- Low assembly cost
- Higher component and system reliability
- Series includes twelve preset attenuation values.

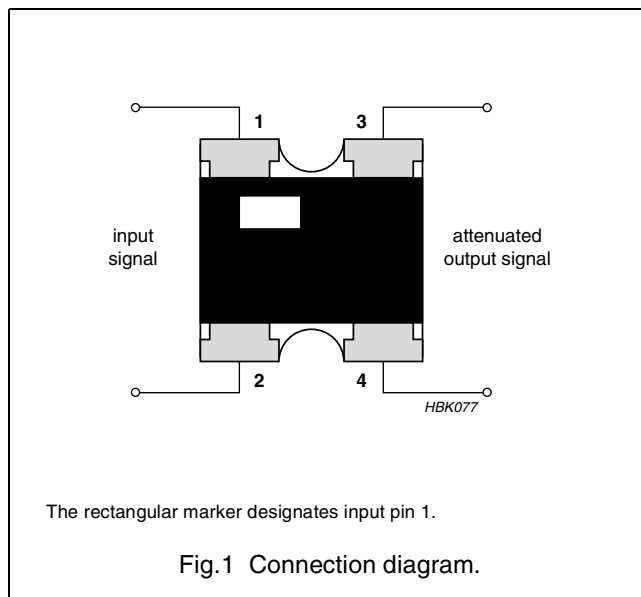
APPLICATIONS

- Cellular phones
- Pagers
- Palmtop computers
- PDAs.

DESCRIPTION

The attenuators are constructed on a high grade ceramic body (aluminium oxide). The internal circuit is applied to the top surface of the substrate, and its design determines the required attenuation value. The attenuation layer is covered with a protective coating and a rectangular marker indicates input pin 1 as shown in the connection diagram of Fig.1.

Finally, the four external end terminations are added. To guarantee optimum solderability the outer layer of the terminations consists of a lead-tin alloy.



QUICK REFERENCE DATA

DESCRIPTION	VALUE
	ATV321
Attenuation range	1 dB to 20 dB
Attenuation tolerance	1 to 5 dB : ± 0.3 dB (optional ± 0.2 dB) 6 to 10 dB : ± 0.5 dB (optional ± 0.3 dB) 15 dB : ± 1.0 dB (optional ± 0.5 dB) 20 dB : ± 2.0 dB (optional ± 1.0 dB)
Characteristic impedance	50 Ω typ.
Frequency range	1 to 10 dB : DC to 2.5 GHz 15 and 20 dB : DC to 2.0 GHz
VSWR	1.3 max.
Maximum permissible voltage	50 V (DC or RMS)
Power rating	40 mW
Climatic category (IEC 60068)	55/125/56
Basic specification	IEC 60 115-8

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FUNCTIONAL DESCRIPTION

Product characterization

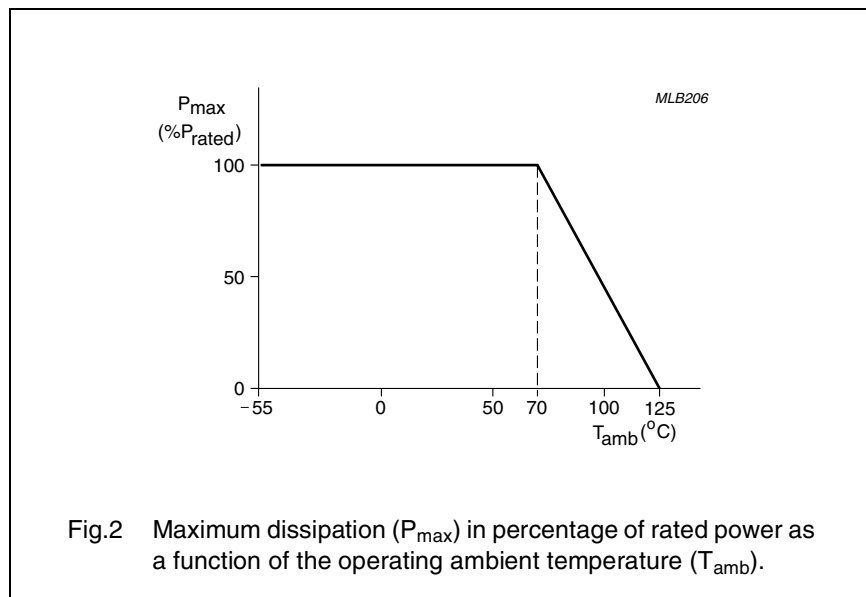
Standard attenuation values include 1 dB to 5 dB with a tolerance of ± 0.3 dB (optional ± 0.2 dB), 6 dB to 10 dB with a tolerance of ± 0.5 dB (optional ± 0.3 dB), 15 dB with a tolerance of ± 1.0 dB (optional ± 0.5 dB), and 20 dB with a tolerance of ± 2.0 dB (optional ± 1.0 dB).

Limiting values

TYPE	LIMITING VOLTAGE (V)	LIMITING POWER (W)
ATV321	50	0.040

DERATING

The power that the attenuator can dissipate depends on the operating ambient temperature; see Fig.2.



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MECHANICAL DATA

Mass per 100 units

TYPE	MASS (g)
ATV321	0.116

Marking

The ATV321 is marked with a rectangle that indicates input pin 1 (see Fig.3).

PACKAGE MARKING

The packing is marked and includes attenuation value, tolerance, catalogue number, quantity, production period, batch number and source code.

Outlines

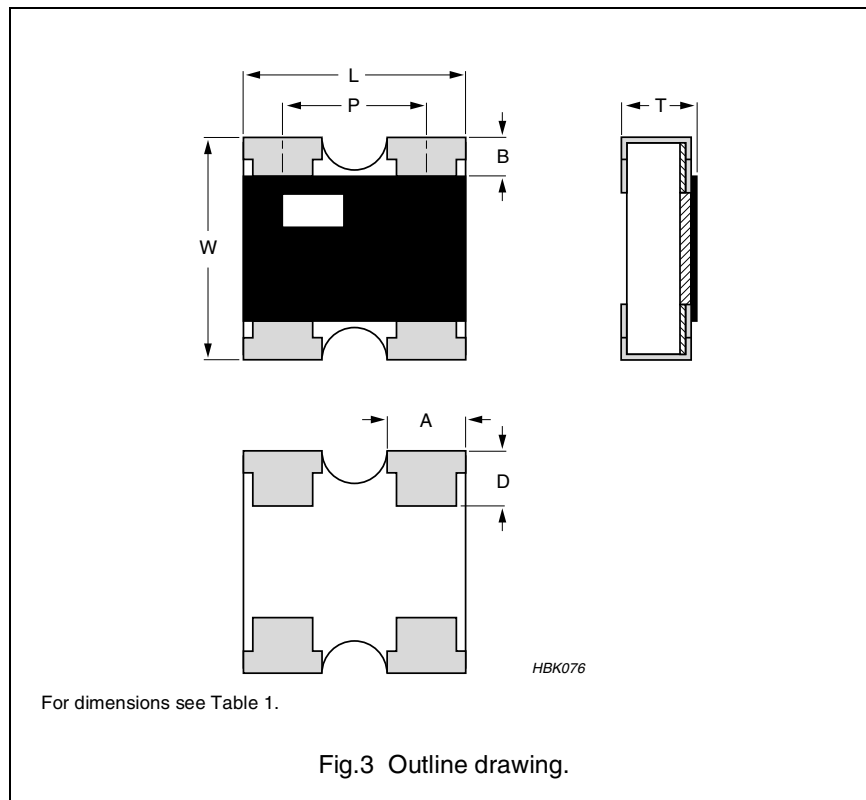


Table 1 Physical dimensions; see Fig.3

SYMBOL	ATV321		UNIT
	VALUE	TOL.	
L	1.00	± 0.10	mm
W	1.00	± 0.10	mm
T	0.35	± 0.05	mm
A	0.33	± 0.10	mm
B	0.15	± 0.10	mm
P	0.65	± 0.10	mm
D	0.25	± 0.10	mm

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ORDERING INFORMATION

Table 2 Ordering code indicating attenuator type

TYPE	ATTENUATION VALUE	TOL. (%)	ORDERING CODE 2350	
			PAPER TAPE ON REEL	PAPER TAPE ON REEL
			5000 units	10000 units
ARV321	1 dB to 20 dB	see Table 3	703 10...	703 11...

Ordering code (12NC)

- The attenuators have a 12-digit ordering code starting with 2350
- The subsequent five digits indicate the attenuator type and packing; see Table 2
- The remaining three digits indicate the attenuation value and tolerance; see Table 3
 - The first 2 digits indicate the attenuation value
 - The last digit indicates the attenuation tolerance.

Table 3 Attenuation value, tolerance and ordering code (12NC)

ATTENUATION VALUE (dB)	STANDARD		OPTIONAL	
	TOLERANCE (dB)	12NC	TOLERANCE (dB)	12NC
1	± 0.3	2350 703 10012	± 0.2	2350 703 10011
2	± 0.3	2350 703 10022	± 0.2	2350 703 10021
3	± 0.3	2350 703 10032	± 0.2	2350 703 10031
4	± 0.3	2350 703 10042	± 0.2	2350 703 10041
5	± 0.3	2350 703 10052	± 0.2	2350 703 10051
6	± 0.5	2350 703 10063	± 0.3	2350 703 10062
7	± 0.5	2350 703 10073	± 0.3	2350 703 10072
8	± 0.5	2350 703 10083	± 0.3	2350 703 10082
9	± 0.5	2350 703 10093	± 0.3	2350 703 10092
10	± 0.5	2350 703 10103	± 0.3	2350 703 10102
15	± 1.0	2350 703 10154	± 0.5	2350 703 10153
20	± 2.0	2350 703 10205	± 1.0	2350 703 10204

ORDERING EXAMPLE

The ordering code of an ATV321 with 2 ± 0.3 dB attenuation, supplied on paper tape of 5000 units per reel is: 2350 703 10022; the ordering code of the same attenuator supplied on paper tape of 10000 units per reel is: 2350 703 11022.

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TESTS AND REQUIREMENTS

Essentially all tests are carried out in accordance with the schedule of "IEC publication 60115-8", category **LCT/UCT/56** (rated temperature range: **Lower Category Temperature**, **Upper Category Temperature**; damp heat, long term, 56 days). The testing also covers the requirements specified by EIA and EIAJ.

The tests are carried out in accordance with IEC publication 60068, "Recommended basic climatic and mechanical robustness testing procedure for electronic components" and under standard atmospheric conditions in accordance with "IEC 60068-1", subclause 5.3.

Unless otherwise specified the following values apply:

Temperature: 15 °C to 35 °C

Relative humidity: 25% to 75%

Air pressure: 86 kPa to 106 kPa
(860 mbar to 1060 mbar).

In Table 4 the tests and requirements are listed with reference to the relevant clauses of "IEC publications 60115-8 and 60068"; a short description of the test procedure is also given.

In some instances deviations from the IEC recommendations were necessary for our method of specifying.

Table 4 Test procedures and requirements

IEC 60115-8 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS
Tests in accordance with the schedule of IEC publication 60115-8				
4.4.1		visual examination		no holes; clean surface; no damage
		attenuation		within the specified tolerance of the attenuator
		VSWR		≤ 1.3
4.18	20 (Tb)	resistance to soldering heat	unmounted chips completely immersed for 10 ± 1 s in a solder bath at 260 ± 5 °C	no visible damage; ΔdB max.: ± 0.1 dB
4.13		short time overload	room temperature; $P = 6.25 \times P_n$; 5 s ($V \leq 2 \times V_{max}$)	ΔdB max.: ± 0.3 dB
4.33		bending	attenuators mounted on a 90 mm glass epoxy resin PCB (FR4), bending: 3 mm	no visible damage; ΔdB max.: ± 0.3 dB
4.19	14 (Na)	rapid change of temperature	30 minutes at LCT and 30 minutes at UCT; 5 cycles	no visible damage; ΔdB max.: ± 0.3 dB
4.24.2	3 (Ca)	damp heat	56 days; 40 ± 2 °C; 93 +2/-3% RH; loaded with $0.01 P_n$	ΔdB max.: ± 0.3 dB
4.25.1		endurance	1000 +48/-0 hours; 70 ± 2 °C; loaded with P_n or V_{max} ; 1.5 hours on and 0.5 hours off	no visible damage; ΔdB max.: ± 0.3 dB
4.17	20 (Ta)	solderability	unmounted chips completely immersed for 5 ± 1 s in a solder bath at 235 ± 5 °C	good tinning ($\geq 95\%$ covered); no visible damage
4.6.1.1		insulation resistance	50 V (DC) after 1 minute, metal block method	R_{ins} min.: 10^3 M Ω

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IEC 60115-8 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS
Other applicable tests				
(JIS) C 5202 7.9		endurance (under damp and load)	1000 +48/-0 hours; 40 \pm 2 $^{\circ}$ C; 93 +2/-3% RH; loaded with P_n or V_{max} ; 1.5 hours on and 0.5 hours off	no visible damage; Δ dB max.: \pm 0.3 dB
EIA 575 3.13		leaching	unmounted chips; 60 \pm 1 s; 260 \pm 5 $^{\circ}$ C	good tinning; no leaching
EIA/IS 703 4.5		load humidity	1 000 +48/-0 hours; 85 \pm 2 $^{\circ}$ C; 85 \pm 5% RH; loaded with 0.01 P_n or V_{max}	no visible damage; Δ dB max.: \pm 0.3 dB

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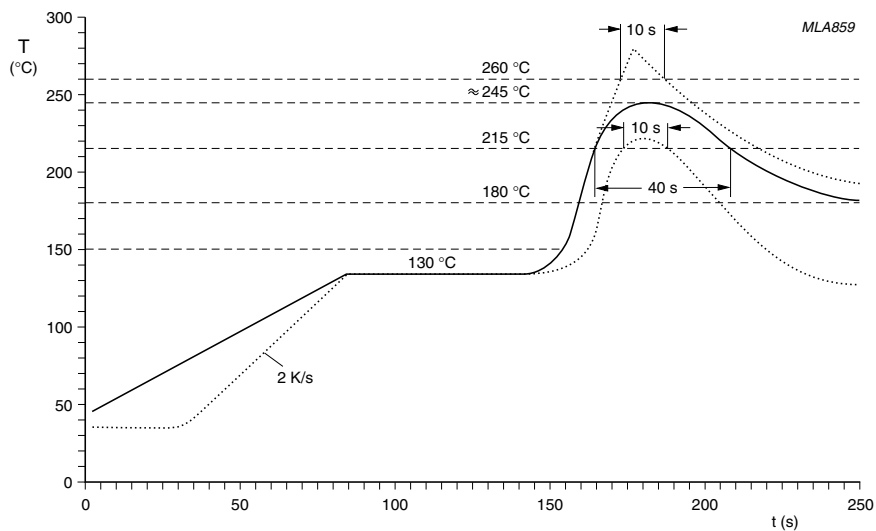
MOUNTING

Due to their rectangular shape and small dimensional tolerances, surface-mounted attenuators are suitable for handling by automatic placement systems. Chip placement can be on ceramic substrates and printed-circuit boards (PCBs). Electrical connection to the circuit is by soldering. The finishing of the end terminations guarantees a reliable contact.

SOLDERING CONDITIONS

The robust construction of chip attenuators allows them to be completely immersed in a solder bath of 260 °C for one minute. Therefore, it is possible to mount surface-mount attenuators on one side of a PCB and other components on the reverse side (mixed PCBs).

Surface-mount attenuators are tested for solderability at 235 °C during 2 seconds. The test condition for no leaching is 260 °C for 60 seconds. Typical examples of soldering processes that provide reliable joints without any damage, are given in Figs 4 and 5.

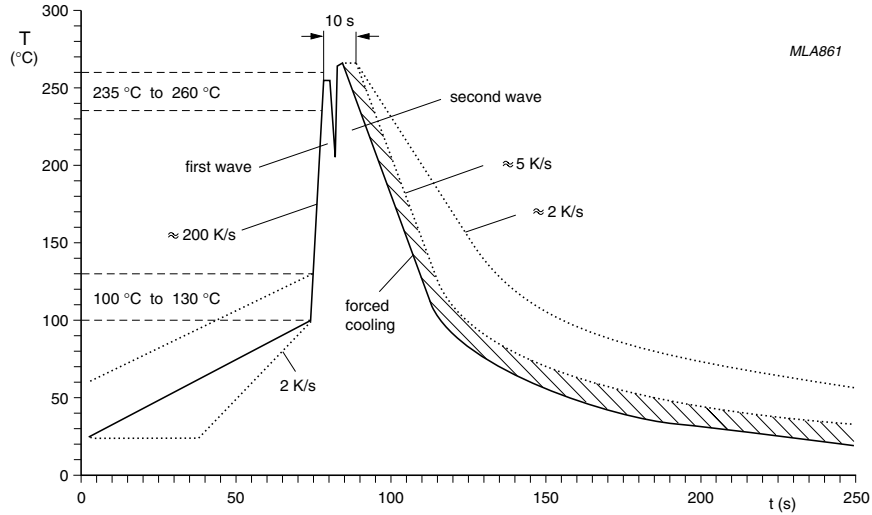


Typical values (solid line).
Process limits (dotted lines).

Fig.4 Infrared soldering.

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Typical values (solid line).

Process limits (dotted lines).

The attenuators may be soldered twice in accordance with this method if desired.

Fig.5 Double wave soldering.

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PACKING

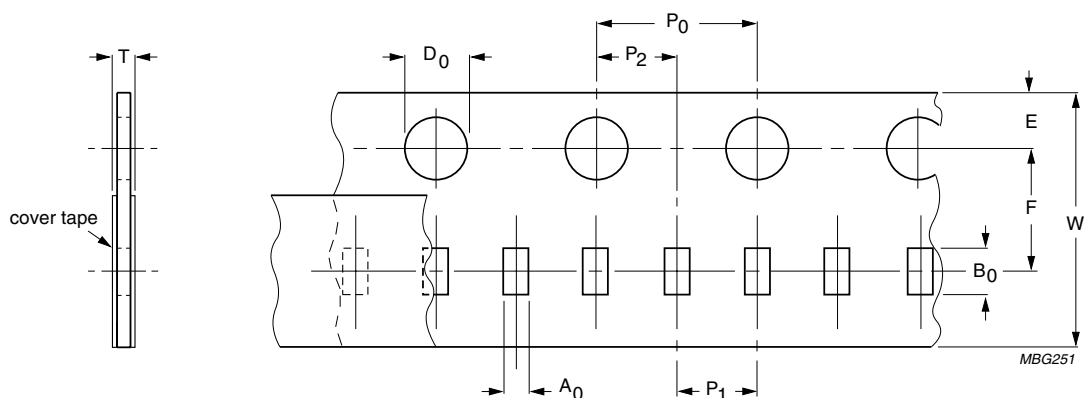
Tape and reel specifications

All tape and reel specifications are in accordance with "IEC 60286-3". Basic dimensions are given in Figs 6, 7 and 8 and Tables 5, and 6.

Peel-off force

Peel-off force of paper tape is in accordance with "IEC 60286-3"; that is, at a peel-off speed of 300 ± 10 mm/minute, 0.1 N to 1.0 N for 8 mm tape. The peel-off angle should be between 165° and 180° .

Paper tape specification



Cumulative tolerance over 10 holes: ± 0.2 mm.
 Bottom fixing tape thickness: 50 ± 10 μm .
 Top fixing tape thickness: 50 ± 10 μm .
 For dimensions see Table 5.

Fig.6 Paper tape.

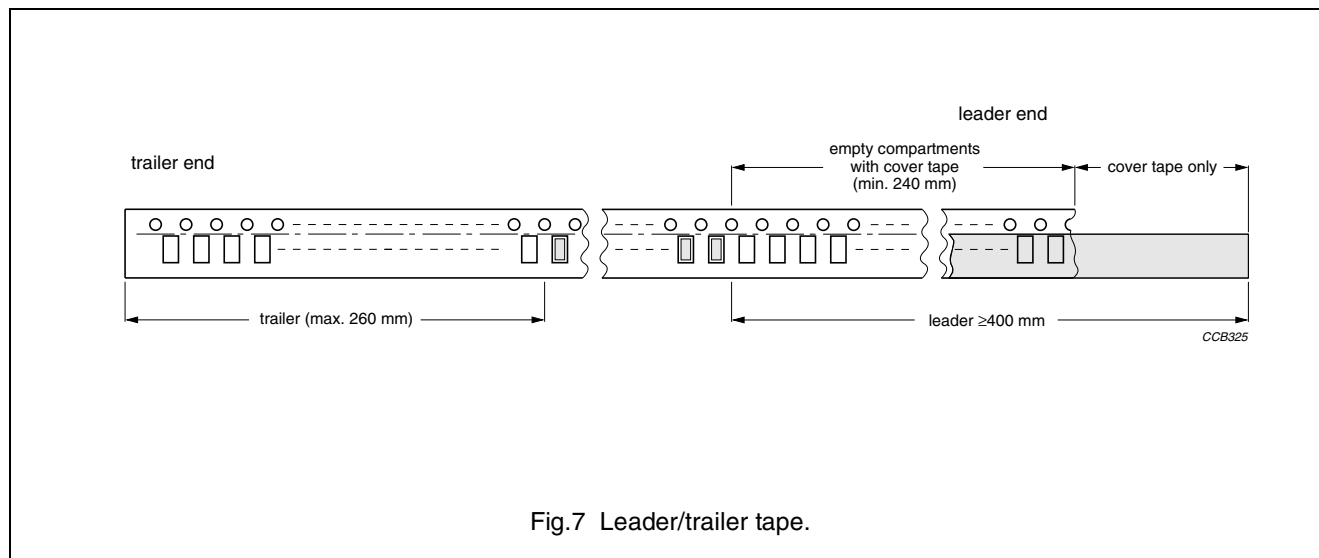
Table 5 Dimensions of paper tape; see Fig.6

SYMBOL	ATV321		UNIT
	SIZE	TOL.	
A_0	1.15	± 0.10	mm
B_0	1.15	± 0.10	mm
W	8.0	± 0.2	mm
E	1.75	± 0.10	mm
F	3.50	± 0.05	mm
D_0	1.5	$+0.1/-0$	mm
P_0	4.0	± 0.1	mm
P_1	2.0	± 0.05	mm
P_2	2.0	± 0.05	mm
T	0.45	± 0.05	mm

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Tape leader/trailer specification



Taping requirements

- Attenuator side facing up
- Component is free and not sticking to top and/or bottom tape
- Component should be easy to remove from the carrier tape and the chip cavity should have no mechanical damage.

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Reel specification

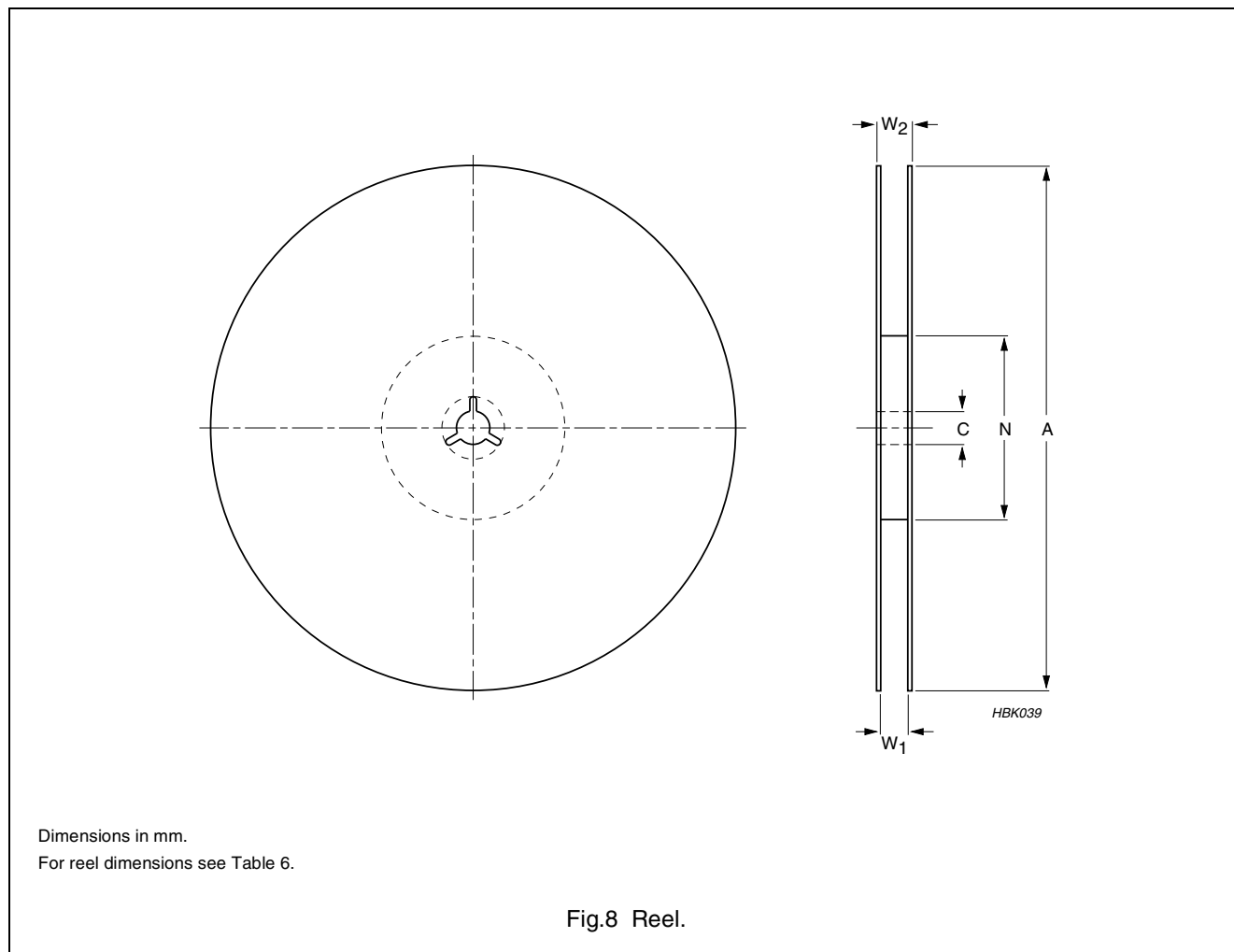


Table 6 Reel dimensions; see Fig.8

PRODUCT	UNITS PER REEL	TAPE WIDTH (mm)	A (mm)	N (mm)	C (mm)	W ₁ (mm)	W ₂ MAX. (mm)
ATV321	5000	8.0	180 +0/-3	62 ±1.5	12.75 +0.15/-0.0	8.4 +0.15/-0.0	11.4
	10000						

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REVISION HISTORY

Revision	Date	Change Notification	Description
Rev.0	2001 Jul 25	–	- First issue of this specification