

# DATA SHEET

**ARV321/ARV322**  
**5%; 1%**  
Array chip resistors  
size  $2 \times 0402$

Product specification  
Supersedes data of 30th August 2000

2001 Apr 28 Rev.2

# Array chip resistors

## size 2 × 0402

# ARV321/ARV322

## 5%; 1%

### FEATURES

- Reduced size of final equipment
- Low assembly costs
- Higher component and equipment reliability.

### APPLICATIONS

- Camcorders
- Cellular phones
- Hearing aids
- Advanced pagers
- Palmtop computers.

### DESCRIPTION

The resistors are constructed on a high grade ceramic body (aluminium oxide). Internal metal electrodes are added at each end and connected by a resistive paste which is applied to the top surface of the substrate. The composition of the paste is adjusted to give the approximate resistance required and the value is trimmed to within tolerance, by laser cutting of this resistive layer.

The resistive layer is covered with a protective coating and printed with the resistance value. Finally, external end terminations are added. For ease of soldering the outer layer of these end terminations is a lead-tin alloy.

### QUICK REFERENCE DATA

DESCRIPTION	VALUE	
	ARV321	ARV322
Resistance range and E-series	10 Ω to 1 MΩ; jumper; E24/E96 series	
Resistance tolerance	±5%	±1%
Temperature coefficient	≤±200 × 10 <sup>-6</sup> /K	
Absolute maximum dissipation per resistive element at T <sub>amb</sub> = 70 °C	0.063 W	
Maximum permissible voltage	50 V (DC or RMS)	
Operating temperature range	-55 to +125 °C	
Climatic category (IEC 60068)	55/125/56	
Basic specification	IEC 60115-8	

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## ORDERING INFORMATION

**Table 1** Ordering code indicating resistor type

TYPE	RESISTANCE VALUE	TOL. (%)	ORDERING CODE 2350 0.. .....
			PAPER TAPE ON REEL
			10000 units
ARV321	10 Ω to 1 MΩ	5	13 11...
ARV322		1	13 2....
<b>Jumper 0 Ω</b>			
ARV321; note 1	–	–	13 91001

### Note

- The jumper has a maximum resistance  $R_{max} = 50 \text{ m}\Omega$  and a rated current  $I_R = 1 \text{ A}$ .

### Ordering code (12NC)

- The resistors have a 12-digit ordering code starting with 2350 0
- The subsequent three or four digits indicate the resistor termination style, tolerance and packing; see Table 1.
- The remaining digits indicate the resistance value:
  - The first 2 digits for 5% or 3 digits for 1% tolerance products indicate the resistance value.
  - The last digit indicates the resistance decade in accordance with Table 2.

**Table 2** Last digit of 12NC

RESISTANCE DECADE	LAST DIGIT
10 to 91 Ω	9
100 to 910 Ω	1
1 to 9.1 kΩ	2
10 to 91 kΩ	3
100 to 910 kΩ	4
1 MΩ	5

### ORDERING EXAMPLE

The ordering code of an ARV321 convex type array chip resistor, value 100 Ω, 5% tolerance, supplied on paper tape of 10000 units per reel is: 2350 013 11101.

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### FUNCTIONAL DESCRIPTION

#### Product characterization

Standard values of nominal resistance are taken from the E24 or E96 series for resistors with a tolerance of  $\pm 5\%$  or  $\pm 1\%$ . The values of the E24/E96 series are in accordance with "IEC publication 60063".

#### Limiting values

TYPE	LIMITING VOLTAGE <sup>(1)</sup> (V)	LIMITING POWER (W)
ARV321	50	0.063
ARV322		

#### Note

1. This is the maximum voltage that may be continuously applied to the resistor element, see "IEC publication 60115-8".

### DERATING

The power that the resistor can dissipate depends on the operating ambient temperature; see Fig.1.

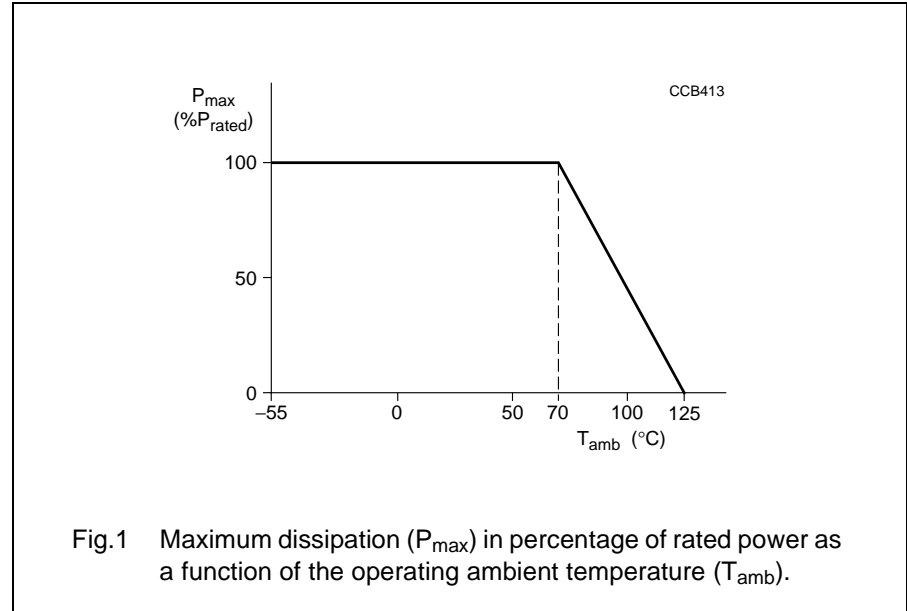


Fig.1 Maximum dissipation ( $P_{max}$ ) in percentage of rated power as a function of the operating ambient temperature ( $T_{amb}$ ).

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### MECHANICAL DATA

#### Mass per 100 units

TYPE	MASS (g)
ARV321	0.095
ARV322	0.095

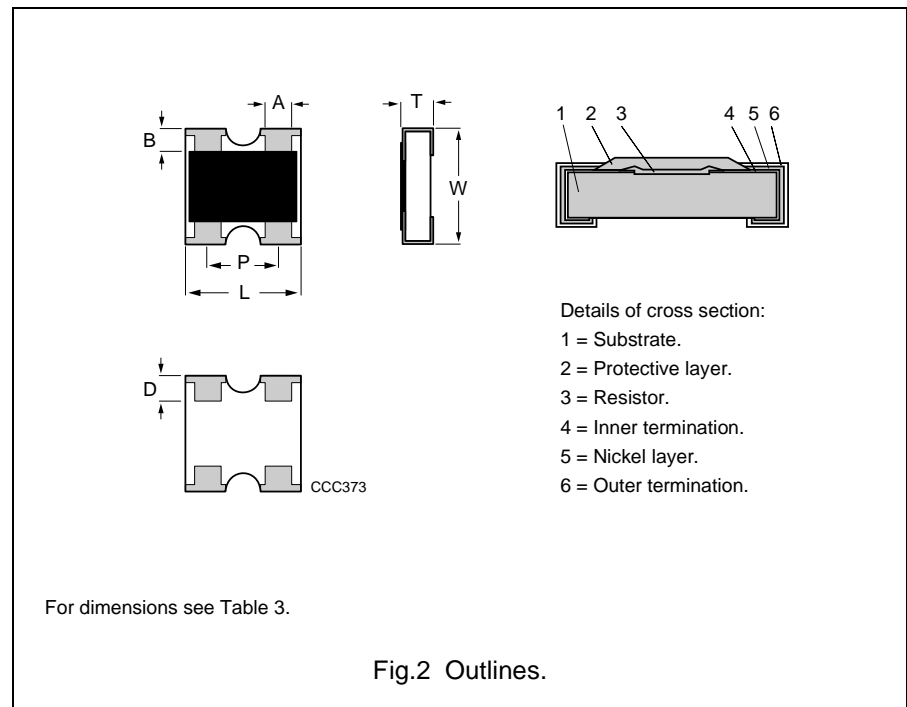
#### Marking

There is no marking on these products.

#### PACKAGE MARKING

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

### Outlines



Details of cross section:

- 1 = Substrate.
- 2 = Protective layer.
- 3 = Resistor.
- 4 = Inner termination.
- 5 = Nickel layer.
- 6 = Outer termination.

**Table 3** Physical dimensions; see Fig.2

SYMBOL	ARV321/ARV322		UNIT
	VALUE	TOL.	
L	1.00	±0.10	mm
W	1.00	±0.10	mm
T	0.35	±0.10	mm
A	0.25	±0.15	mm
B	0.20	±0.15	mm
P	0.65	±0.15	mm
D	0.25	±0.15	mm

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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 according to "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	
				ARV321	ARV322
<b>Tests in accordance with the schedule of IEC publication 60115-8</b>					
4.4.1		visual examination		no holes; clean surface; no visible damage	
4.5		resistance	applied voltage (+0/-10%): R < 10 Ω: 0.1 V 10 Ω ≤ R < 100 Ω: 0.3 V 100 Ω ≤ R < 1 kΩ: 1 V 1 kΩ ≤ R < 10 kΩ: 3 V 10 kΩ ≤ R < 100 kΩ: 10 V 100 kΩ ≤ R < 1 MΩ: 25 V R ≥ 1 MΩ: 50 V	R – R <sub>nom</sub> : max. ±5%	R – R <sub>nom</sub> : max. ±1%
4.18	20 (Tb)	resistance to soldering heat	unmounted chips; 10 ± 1 s; 260 ± 5 °C	no visible damage ΔR/R max.: ±(1% +0.05 Ω)	
4.29	45 (Xa)	component solvent resistance	isopropyl alcohol or H <sub>2</sub> O followed by brushing in accordance with "MIL 202 F"	no visible damage	
4.17	20 (Ta)	solderability	unmounted chips completely immersed for 2 ± 0.5 s in a solder bath at 235 ± 2 °C	good tinning (≥95% covered); no visible damage	
4.7		voltage proof on insulation	maximum voltage (RMS) during 1 minute, metal block method	no breakdown or flashover	
4.13		short time overload	room temperature; P = 6.25 × P <sub>n</sub> ; 5 s (V ≤ 2 × V <sub>max</sub> )	ΔR/R max.: ±(2% +0.1 Ω)	
4.33		bending	resistors mounted on a 90 mm glass epoxy resin PCB (FR4), bending: 5 mm	no visible damage ΔR/R max.: ±(1% +0.05 Ω)	
4.19	14 (Na)	rapid change of temperature	30 minutes at LCT and 30 minutes at UCT; 5 cycles	no visible damage ΔR/R max.: ±(2% +0.05 Ω)	

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IEC 60115-8 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS	
				ARV321	ARV322
4.24.2	3 (Ca)	damp heat (steady state)	56 days; 40 ±2 °C; 93 +2/-3% RH; loaded with 0.01 P <sub>n</sub>	ΔR/R max.: ±(3% +0.1 Ω)	ΔR/R max.: ±(2% +0.1 Ω)
4.25.1		endurance	1 000 +48/-0 hours; 70 ±2 °C; loaded with P <sub>n</sub> or V <sub>max</sub> ; 1.5 hours on and 0.5 hours off	ΔR/R max.: ±(3% +0.1 Ω)	ΔR/R max.: ±(2% +0.1 Ω)
4.23.2	27 (Ba)	endurance at upper category temperature	1 000 +48/-0 hours; no load	ΔR/R max.: ±(3% +0.1 Ω)	ΔR/R max.: ±(2% +0.1 Ω)
4.8.4.2		temperature coefficient	at 20/LCT/20 °C and 20/UCT/20 °C	≤±200 × 10 <sup>-6</sup> /K	
<b>Other tests in accordance with IEC 60115 clauses and IEC 60068 test method</b>					
4.17	20 (Ta)	solderability (after ageing)	8 hours steam or 16 hours 155 °C; unmounted chips completely immersed for 2 ±0.5 s in a solder bath at 235 ±2 °C	good tinning (≥95% covered); no damage	
4.6.1.1		insulation resistance	50 V (DC) after 1 minute, metal block method	R <sub>ins</sub> min.: 10 <sup>3</sup> MΩ	
4.12		noise	IEC publication 60195 (measured with Quantech-equipment): R ≤ 100 Ω 100 Ω < R ≤ 1 kΩ 1 kΩ < R ≤ 10 kΩ 10 kΩ < R ≤ 100 kΩ 100 kΩ < R ≤ 1 MΩ	max. 0.316 μV/V (-10 dB) max. 1 μV/V (0 dB) max. 3 μV/V (9.54 dB) max. 6 μV/V (15.56 dB) max. 10 μV/V (20 dB)	
<b>Other applicable tests</b>					
(JIS) C 5202 7.9		endurance (under damp and load)	1 000 +48/-0 hours; 40 ±2 °C; 93 +2/-3% RH; loaded with P <sub>n</sub> or V <sub>max</sub> ; 1.5 hours on and 0.5 hours off	ΔR/R max.: ±(3% +0.1 Ω)	ΔR/R max.: ±(2% +0.1 Ω)
EIA 575 3.13		leaching	unmounted chips; 60 ±1 s; 260 ±5 °C	good tinning; no leaching	
EIA/IS 703 4.5		load humidity	1 000 +48/-0 hours; 85 ±2 °C; 85 ±5% RH; loaded with 0.01 P <sub>n</sub> or V <sub>max</sub>	ΔR/R max.: ±(3% +0.1 Ω)	ΔR/R max.: ±(2% +0.1 Ω)

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**REVISION HISTORY**

Revision	Date	Change Notification	Description
Rev.2	2001 Apr 28	–	- Converted to Phycomp brand - Operation temperature range –55 to +125 °C added