

# DATA SHEET

## ARRAY CHIP RESISTORS

YC/TC 164 (8Pin/4R; Pb Free)

5%, 1%

sizes 4 × 0603



**SCOPE**

This specification describes YC164 (convex) and TC164 (concave) series chip resistor arrays with lead-free terminations made by thick film process.

**ORDERING INFORMATION**

Part number is identified by the series, size, tolerance, packing type, temperature coefficient, taping reel and resistance value.

**PHYCOMP ORDERING CODE**

**I2NC CODE**

**2350**      **XXX XXXXX L**  
 (1)                      (2)      (3)      (4)

TYPE/ 4×0603	START IN <sup>(1)</sup>	TOL. (%)	RESISTANCE RANGE	PAPER / PE TAPE ON REEL (units) <sup>(2)</sup>	
				5,000	20,000
ARV241	2350	±5%	10 to 1 MΩ	035 10xxx	035 12xxx
ARV242	2350	±1%	10 to 1 MΩ	025 1xxxx	025 3xxxx
ARC241	2350	±5%	10 to 1 MΩ	034 10xxx	013 3xxxx
ARC242	2350	±1%	10 to 1 MΩ	024 1xxxx	013 3xxxx
Jumper	2350	-	0 Ω	ARV241/YC164 035 91001	-
				ARC241/TC164 034 91001	-

- (1) The resistors have a 12-digit ordering code starting with 2350.
- (2) The subsequent 4 or 5 digits indicate the resistor tolerance and packaging.
- (3) The remaining 4 or 3 digits represent the resistance value with the last digit indicating the multiplier as shown in the table of "Last digit of I2NC".
- (4) "L" means lead-free terminations.

Last digit of I2NC	
Resistance decade <sup>(3)</sup>	Last digit
0.01 to 0.0976 Ω	0
0.1 to 0.976 Ω	7
1 to 9.76 Ω	8
10 to 97.6 Ω	9
100 to 976 Ω	1
1 to 9.76 kΩ	2
10 to 97.6 kΩ	3
100 to 976 kΩ	4
1 to 9.76 MΩ	5
10 to 97.6 MΩ	6

**ORDERING EXAMPLE**

The ordering code of an ARV241 convex chip resistor array, value 1,000 Ω with ±5% tolerance, supplied in tape of 5,000 units per reel is: 235003510102L.

Example:

0.02 Ω	=	0200 or 200
0.3 Ω	=	3007 or 307
1 Ω	=	1008 or 108
33 kΩ	=	3303 or 333
10 MΩ	=	1006 or 106

**NOTE**

- The "L" at the end of the code is only for ordering. On the reel label, the standard CTC or I2NC will be mentioned an additional stamp "LFP"= lead free production.
- Products with lead in terminations fulfil the same requirements as mentioned in this datasheet.
- Products with lead in terminations will be phased out in the coming months (before July 1st, 2006)

**CTC CODE**

**YC**      **164 - X X X XX XXXX L**  
**TC**                      (1) (2) (3) (4)      (5)      (6)

**(1) TOLERANCE**

F = ±1%  
 J = ±5%

**(2) PACKAGING TYPE**

R = Paper/PE taping reel

**(3) TEMPERATURE COEFFICIENT OF RESISTANCE**

-- = Base on spec

**(4) TAPING REEL**

07 = 7 inch dia. Reel  
 13 = 13 inch dia. Reel

**(5) RESISTANCE VALUE**

56R, 560R, 5K6, 56K, 1M  
 0R = Jumper

**(6) RESISTOR TERMINATIONS**

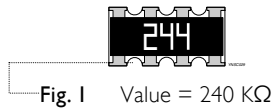
L = Lead free terminations (pure Tin)

**ORDERING EXAMPLE**

The ordering code of a YC164 convex chip resistor array, value 1,000 Ω with ±5% tolerance, supplied in 7-inch tape reel is: YC164-JR-071KL.

**MARKING**

YC164



E-24 series: 3 digits

First two digits for significant figure and 3rd digit for number of zeros

For marking codes, please see EIA-marking code rules in data sheet “Chip resistors marking”.

**CONSTRUCTION**

The resistors are constructed out of a high-grade ceramic body. Internal metal electrodes are added at each end and connected by a resistive paste. The composition of the paste is adjusted to give the approximate required resistance and laser cutting of this resistive layer that achieves tolerance trims the value. The resistive layer is covered with a protective coat. Finally, the eight external terminations (pure Tin) are added. See fig. 2.

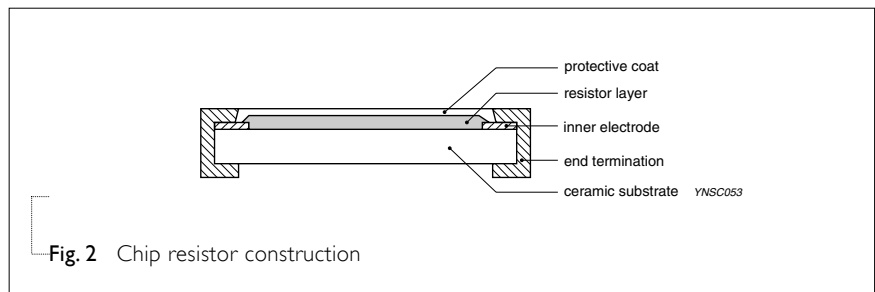


Fig. 2 Chip resistor construction

**DIMENSIONS**

Table I

TYPE	YC164	TC164
B (mm)	0.30 ±0.15	0.30 ±0.15
H (mm)	0.65 ±0.05	---
P (mm)	0.80 ±0.05	0.80 ±0.05
L (mm)	3.20 ±0.15	3.20 ±0.15
H <sub>2</sub> (mm)	0.50 ±0.15	0.60 ±0.15
T (mm)	0.60 ±0.10	0.60 ±0.10
W <sub>1</sub> (mm)	0.30 ±0.15	0.30 ±0.15
W <sub>2</sub> (mm)	1.60 ±0.15	1.60 ±0.15

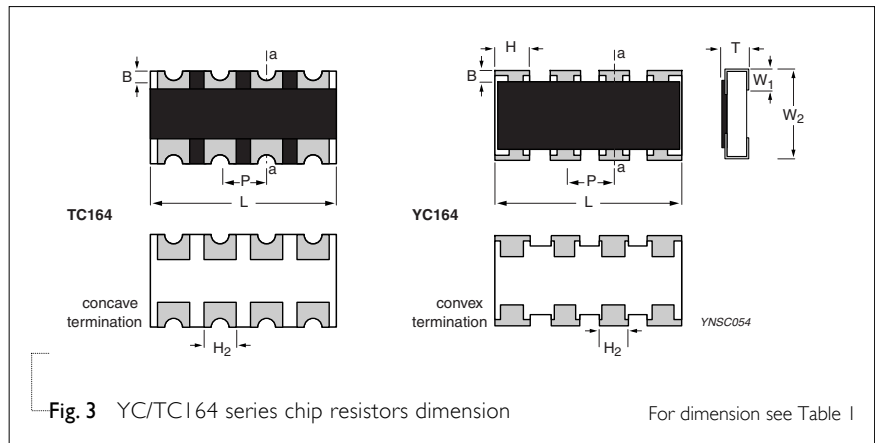


Fig. 3 YC/TC164 series chip resistors dimension

For dimension see Table I

**SCHEMATIC**

For dimension see Fig. 2 and Table I

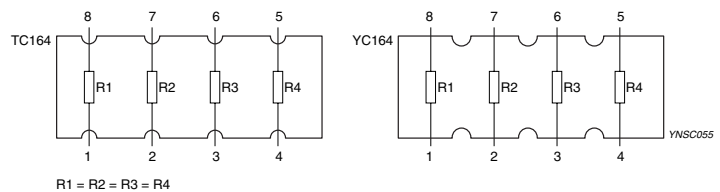


Fig. 4 Equivalent circuit diagram

**ELECTRICAL CHARACTERISTICS**

Table 2

CHARACTERISTICS	YC/TC164 1/16 W
Operating Temperature Range	-55 °C to +155 °C
Maximum Working Voltage	50 V
Maximum Overload Voltage	100 V
Dielectric Withstanding Voltage	100 V
Number of Resistors	4
Resistance Range	5% (E24) 10 Ω to 1 MΩ
	1% (E24/E96) 10 Ω to 1 MΩ
	Zero Ohm Jumper < 0.05 Ω
Temperature Coefficient	±200 ppm/°C
Jumper Criteria	Rated Current 1.0 A

**FOOTPRINT AND SOLDERING PROFILES**

For recommended footprint and soldering profiles, please see the special data sheet “Chip resistors mounting”.

**ENVIRONMENTAL DATA**

For material declaration information (IMDS-data) of the products, please see the separated info “Environmental data” conformed to EU RoHS.

**PACKING STYLE AND PACKAGING QUANTITY**

Table 3 Packing style and packaging quantity

PRODUCT TYPE	PACKING STYLE	REEL DIMENSION	QUANTITY PER REEL
YC/TC164	Paper / PE Taping Reel (R)	7" (178 mm)	5,000 units
		13" (330 mm)	20,000 units

**NOTE**

1. For Paper/PE tape and reel specification/dimensions, please see the special data sheet “Packing” document.

**FUNCTIONAL DESCRIPTION**

**POWER RATING**

YC/TC164 rated power at 70°C is 1/16 W

**RATED VOLTAGE**

The DC or AC (rms) continuous working voltage corresponding to the rated power is determined by the following formula:

$$V = \sqrt{P \times R}$$

Where

V = Continuous rated DC or AC (rms) working voltage (V)

P = Rated power (W)

R = Resistance value (Ω)

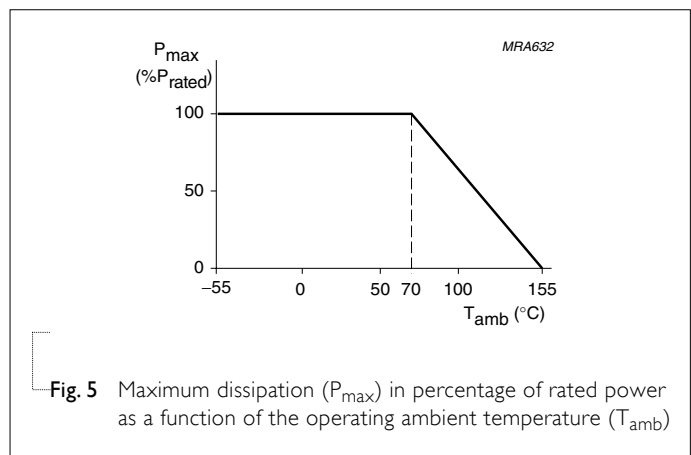


Fig. 5 Maximum dissipation (P<sub>max</sub>) in percentage of rated power as a function of the operating ambient temperature (T<sub>amb</sub>)

**TESTS AND REQUIREMENTS**

**Table 4** Test condition, procedure and requirements

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS	
Temperature Coefficient of Resistance (T.C.R.)	MIL-STD-202F-method 304;	At +25/-55 °C and +25/+125 °C	Refer to table 2	
	JIS C 5202-4.8	<p><b>Formula:</b></p> $T.C.R = \frac{R_2 - R_1}{R_1 (t_2 - t_1)} \times 10^6 \text{ (ppm/°C)}$ <p>Where  <math>t_1 = +25 \text{ °C}</math> or specified room temperature  <math>t_2 = -55 \text{ °C}</math> or +125 °C test temperature  <math>R_1 =</math> resistance at reference temperature in ohms  <math>R_2 =</math> resistance at test temperature in ohms</p>		
Thermal Shock	MIL-STD-202F-method 107G; IEC 60115-1 4.19	At -65 (+0/-10) °C for 2 minutes and at +155 (+10/-0) °C for 2 minutes; 25 cycles	±(0.5% +0.05 Ω) for 1% tol. ±(1.0% +0.05 Ω) for 5% tol.	
Low Temperature Operation	MIL-R-55342D-Para 4.7.4	At -65 (+0/-5) °C for 1 hour; RCWV applied for 45 (+5/-0) minutes	±(0.5% +0.05 Ω) for 1% tol . ±(1.0% +0.05 Ω) for 5% tol. No visible damage	
Short Time Overload	MIL-R-55342D-Para 4.7.5; IEC 60115-1 4.13	2.5 × RCWV applied for 5 seconds at room temperature	±(1.0% +0.05 Ω) for 1% tol. ±(2.0% +0.05 Ω) for 5% tol. No visible damage	
Insulation Resistance	MIL-STD-202F-method 302; IEC 60115-1 4.6.1.1	RCOV for 1 minute	≥10 GΩ	
		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"><b>Type</b></td> <td><b>YC/TC164</b></td> </tr> <tr> <td><b>Voltage (DC)</b></td> <td>100 V</td> </tr> </table>		<b>Type</b>
<b>Type</b>	<b>YC/TC164</b>			
<b>Voltage (DC)</b>	100 V			
Dielectric Withstand Voltage	MIL-STD-202F-method 301; IEC 60115-1 4.6.1.1	Maximum voltage ( $V_{rms}$ ) applied for 1 minute	No breakdown or flashover	
		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"><b>Type</b></td> <td><b>YC/TC164</b></td> </tr> <tr> <td><b>Voltage (AC)</b></td> <td>100 <math>V_{rms}</math></td> </tr> </table>		<b>Type</b>
<b>Type</b>	<b>YC/TC164</b>			
<b>Voltage (AC)</b>	100 $V_{rms}$			
Resistance to Soldering Heat	MIL-STD-202F-method 210C; IEC 60115-1 4.18	Unmounted chips; 260 ±5 °C for 10 ±1 seconds	±(0.5% +0.05 Ω) for 1% tol. ±(1.0% +0.05 Ω) for 5% tol. No visible damage	
Life	MIL-STD-202F-method 108A; IEC 60115-1 4.25.1	At 70 ±2 °C for 1,000 hours; RCWV applied for 1.5 hours on and 0.5 hour off	±(1% +0.05 Ω) for 1% tol. ±(3% +0.05 Ω) for 5% tol.	

TEST	TEST METHOD	PROCEDURE	REQUIREMENTS														
<b>Solderability</b>	MIL-STD-202F-method 208A; IEC 60115-1 4.17	Solder bath at 245 ±3 °C Dipping time: 2 ±0.5 seconds	Well tinned (≥95% covered) No visible damage														
<b>Bending Strength</b>	JIS C 5202.6.14; IEC 60115-1 4.15	Resistors mounted on a 90 mm glass epoxy resin PCB (FR4) Bending: 1 mm	±(1.0% +0.05 Ω) for 1% tol. ±(1.0% +0.05 Ω) for 5% tol. No visible damage														
<b>Resistance to Solvent</b>	MIL-STD-202F-method 215; IEC 60115-1 4.29	Isopropylalcohol (C <sub>3</sub> H <sub>7</sub> OH) or dichloromethane (CH <sub>2</sub> Cl <sub>2</sub> ) followed by brushing	No smeared														
<b>Noise</b>	JIS C 5202 5.9; IEC 60115-1 4.12	Maximum voltage (V <sub>rms</sub> ) applied.	<table border="1"> <thead> <tr> <th>Resistors range</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>R &lt; 100 Ω</td> <td>10 dB</td> </tr> <tr> <td>100 Ω ≤ R &lt; 1 KΩ</td> <td>20 dB</td> </tr> <tr> <td>1 KΩ ≤ R &lt; 10 KΩ</td> <td>30 dB</td> </tr> <tr> <td>10 KΩ ≤ R &lt; 100 KΩ</td> <td>40 dB</td> </tr> <tr> <td>100 KΩ ≤ R &lt; 1 MΩ</td> <td>46 dB</td> </tr> <tr> <td>1 MΩ ≤ R ≤ 22 MΩ</td> <td>48 dB</td> </tr> </tbody> </table>	Resistors range	Value	R < 100 Ω	10 dB	100 Ω ≤ R < 1 KΩ	20 dB	1 KΩ ≤ R < 10 KΩ	30 dB	10 KΩ ≤ R < 100 KΩ	40 dB	100 KΩ ≤ R < 1 MΩ	46 dB	1 MΩ ≤ R ≤ 22 MΩ	48 dB
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100 KΩ ≤ R < 1 MΩ	46 dB																
1 MΩ ≤ R ≤ 22 MΩ	48 dB																
<b>Humidity (steady state)</b>	JIS C 5202 7.5; IEC 60115-8 4.24.8	1,000 hours; 40 ±2 °C; 93(+2/-3)% RH RCWV applied for 1.5 hours on and 0.5 hour off	±(0.5% +0.05 Ω) for 1% tol. ±(2.0% +0.05 Ω) for 5% tol.														
<b>Leaching</b>	EIA/IS 4.13B; IEC 60115-8 4.18	Solder bath at 260 ±5 °C Dipping time: 30 ±1 seconds	No visible damage														
<b>Intermittent Overload</b>	JIS C 5202 5.8	At room temperature; 2.5 × RCWV applied for 1 second on and 25 seconds off; total 10,000 cycles	±(1.0% +0.05 Ω) for 1% tol. ±(2.0% +0.05 Ω) for 5% tol.														
<b>Resistance to Vibration</b>	On request	On request															
<b>Moisture Resistance Heat</b>	MIL-STD-202F-method 106F; IEC 60115-1 4.24.2	42 cycles; total 1,000 hours Shown as Fig. 6	±(0.5% +0.05Ω) for 1% tol. ±(2.0% +0.05Ω) for 5% tol. No visible damage														

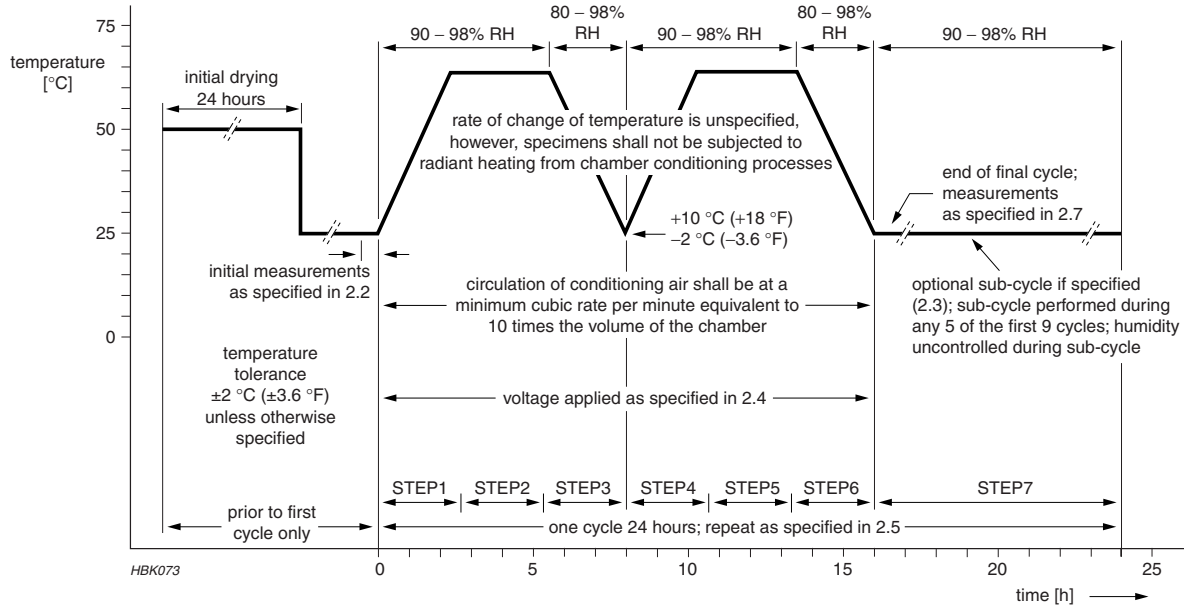


Fig. 6 Moisture resistance test requirements

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version 2	Mar 01, 2005	-	<ul style="list-style-type: none"><li>- New datasheet for 4 × 0603 thick film 1% and 5% with lead-free terminations</li><li>- Replace the 4 × 0603 part of pdf file: ARC24I_242_ARV24I_242_5I_L_0.pdf</li><li>- Test method and procedure updated</li></ul>
Version 0	Dec 05, 2003	-	-