Innovative Service Around the Globe YAGEO

# 25-05440

# DATA SHEET

## ARRAY CHIP RESISTORS

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

5%, 1%

**sizes 4 × 0603**

YAGEO

Product specification – Mar 01, 2005 V.2

## 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.

### YAGEO ORDERING CODE

**CTC CODE** TC164-JR-0710KL

**YC / TC 164 – X (1) X (2) X (3) XX (4) XXXX (5) L (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.

### NOTE

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

## MARKING

YC164

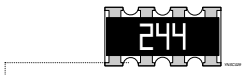


Fig. 1 Value = 240 KΩ

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.

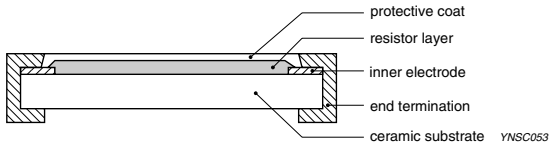


Fig. 2 Chip resistor construction

## DIMENSIONS

Table 1

| 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 |
| $H_2$ (mm) | 0.50 ±0.15 | 0.60 ±0.15 |
| T (mm) | 0.60 ±0.10 | 0.60 ±0.10 |
| $W_1$ (mm) | 0.30 ±0.15 | 0.30 ±0.15 |
| $W_2$ (mm) | 1.60 ±0.15 | 1.60 ±0.15 |

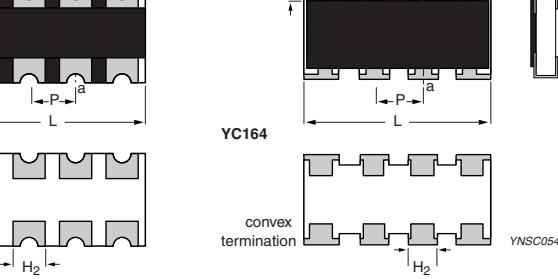


Fig. 3 YC/TC164 series chip resistors dimension

For dimension see Table 1

## SCHEMATIC

For dimension see Fig. 2 and Table 1

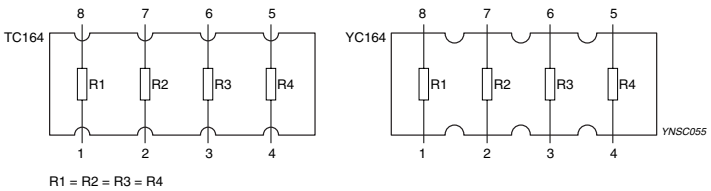


Fig. 4 Equivalent circuit diagram

R1 = R2 = R3 = R4

## 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)

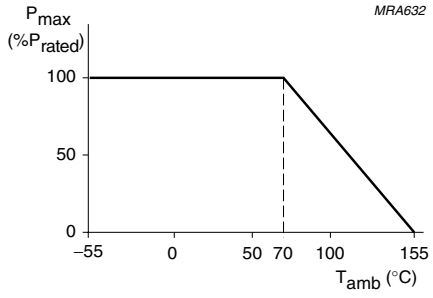


**Fig. 5** Maximum dissipation ($P_{max}$) in percentage of rated power as a function of the operating ambient temperature ($T_{amb}$)

## 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; JIS C 5202-4.8 | At +25/–55 °C and +25/+125 °C<br>**Formula:**<br>$T.C.R = \frac{R_2 - R_1}{R_1 (t_2 - t_1)} \times 10^6$ (ppm/°C)<br>Where<br>$t_1$ = +25 °C or specified room temperature<br>$t_2$ = –55 °C or +125 °C test temperature<br>$R_1$ = resistance at reference temperature in ohms<br>$R_2$ = resistance at test temperature in ohms | Refer to table 2 |
| 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.<br>±(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 .<br>±(1.0% +0.05 Ω) for 5% tol.<br>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.<br>±(2.0% +0.05 Ω) for 5% tol.<br>No visible damage |
| Insulation Resistance | MIL-STD-202F-method 302; IEC 60115-1 4.6.1.1 | RCOV for 1 minute<br>Type: YC/TC164<br>Voltage (DC): 100 V | ≥10 GΩ |
| Dielectric Withstand Voltage | MIL-STD-202F-method 301; IEC 60115-1 4.6.1.1 | Maximum voltage ($V_{rms}$) applied for 1 minute<br>Type: YC/TC164<br>Voltage (AC): 100 $V_{rms}$ | No breakdown or flashover |
| 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.<br>±(1.0% +0.05 Ω) for 5% tol.<br>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.<br>±(3% +0.05 Ω) for 5% tol. |

| TEST | TEST METHOD | PROCEDURE | REQUIREMENTS |
|---|---|---|---|
| Solderability | MIL-STD-202F-method 208A;<br>IEC 60115-1 4.17 | Solder bath at 245 ±3 °C<br>Dipping time: 2 ±0.5 seconds | Well tinned (≥95% covered)<br>No visible damage |
| Bending Strength | JIS C 5202.6.14;<br>IEC 60115-1 4.15 | Resistors mounted on a 90 mm glass epoxy resin PCB (FR4)<br>Bending: 1 mm | ±(1.0% +0.05 Ω) for 1% tol.<br>±(1.0% +0.05 Ω) for 5% tol.<br>No visible damage |
| Resistance to Solvent | MIL-STD-202F-method 215;<br>IEC 60115-1 4.29 | Isopropylalcohol ($C_3H_7OH$) or dichloromethane ($CH_2Cl_2$) followed by brushing | No smeared |
| Noise | JIS C 5202 5.9;<br>IEC 60115-1 4.12 | Maximum voltage ($V_{rms}$) applied. | Resistors range / Value:<br>R < 100 Ω: 10 dB<br>100 Ω ≤ R < 1 KΩ: 20 dB<br>1 KΩ ≤ R < 10 KΩ: 30 dB<br>10 KΩ ≤ R < 100 KΩ: 40 dB<br>100 KΩ ≤ R < 1 MΩ: 46 dB<br>1 MΩ ≤ R ≤ 22 MΩ: 48 dB |
| Humidity (steady state) | JIS C 5202 7.5;<br>IEC 60115-8 4.24.8 | 1,000 hours; 40 ±2 °C; 93(+2/–3)% RH<br>RCWV applied for 1.5 hours on and 0.5 hour off | ±(0.5% +0.05 Ω) for 1% tol.<br>±(2.0% +0.05 Ω) for 5% tol. |
| Leaching | EIA/IS 4.13B;<br>IEC 60115-8 4.18 | Solder bath at 260 ±5 °C<br>Dipping time: 30 ±1 seconds | No visible damage |
| Intermittent Overload | 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.<br>±(2.0% +0.05 Ω) for 5% tol. |
| Resistance to Vibration | On request | On request | |
| Moisture Resistance Heat | MIL-STD-202F-method 106F;<br>IEC 60115-1 4.24.2 | 42 cycles; total 1,000 hours<br>Shown as Fig. 6 | ±(0.5% +0.05Ω) for 1% tol.<br>±(2.0% +0.05Ω) for 5% tol.<br>No visible damage |

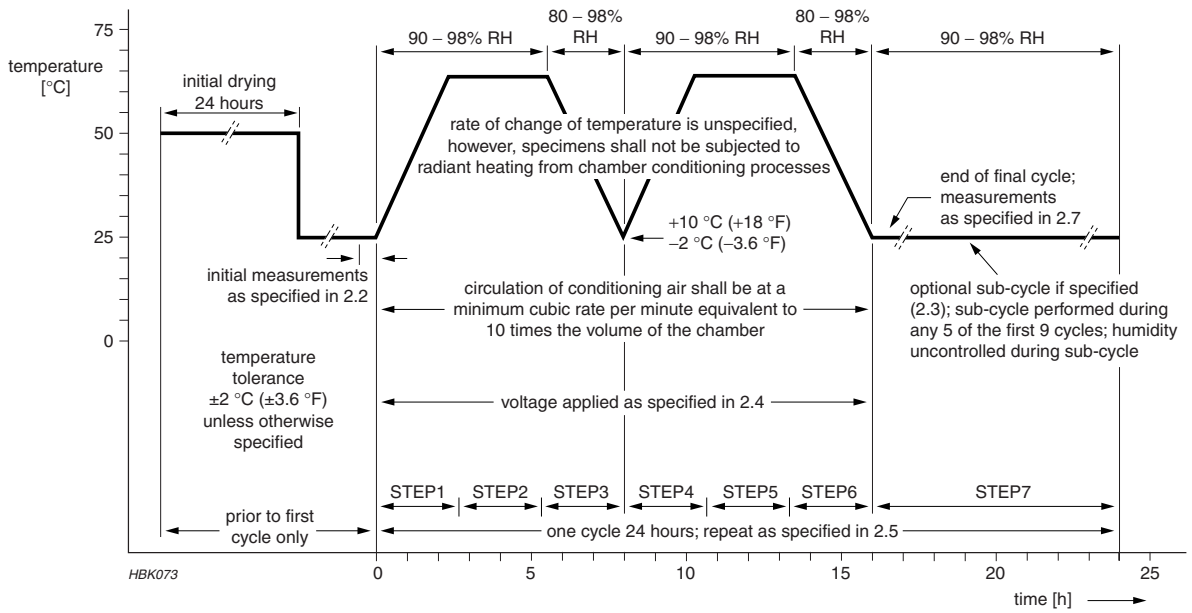


**Fig. 6** Moisture resistance test requirements

## REVISION HISTORY

| REVISION | DATE | CHANGE NOTIFICATION | DESCRIPTION |
|---|---|---|---|
| Version 2 | Mar 01, 2005 | - | - Test method and procedure updated<br>- TC164, the concave chip resistor arrays combined |
| Version 1 | Apr. 22, 2004 | - | - 13" taping and Jumper added, delete G in ordering code, and test & requirement (Pb free) updated |
| Version 0 | Nov. 10, 2003 | - | - First issue of this specification |