

# DATA SHEET

## ARRAY CHIP RESISTORS

YC/TC

5%, 1%

sizes

YC: 102/104/122/124/162/164/248/324/158T/358L/358T

TC: 122/124/164

RoHS compliant





**PHYCOMP BRAND ordering codes**

Both GLOBAL PART NUMBER (preferred) and I2NC (traditional) codes are acceptable to order Phycomp brand products.

**GLOBAL PART NUMBER (PREFERRED)**

For detailed information of GLOBAL PART NUMBER and ordering example, please refer to page 2. TC122 series is supplied and ordered by global part number only.

**I2NC CODE**

| TYPE/<br>2×0402 | 2350 | XXX XXXXX L |            |     |           | PAPER / PE TAPE ON REEL (units) <sup>(2)</sup> |  |
|-----------------|------|-------------|------------|-----|-----------|--|--|
|                 | (1)  | (2)         | (3)        | (4) | 10,000    | 50,000   |  |
| ARV321          | 2350 | ±5%         | 1 to 1 MΩ  |     | 013 11xxx | 013 12xxx                                      |  |
| ARV322          | 2350 | ±1%         | 10 to 1 MΩ |     | 013 2xxxx | 013 3xxxx                                      |  |
| Jumper          | 2350 | -           | 0 Ω        |     | 013 91001 | -  |  |

| Last digit of I2NC<br>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          |

- (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" is optional symbol <sup>(Note)</sup>.

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 |

**ORDERING EXAMPLE**

The ordering code of a ARV321 resistor, value 1,000Ω with ±5% tolerance, supplied in tape of 10,000 units per reel is: 235001311102(L) or YC122-JR-071KL.

**NOTE**

- 1. All our RSMD products are RoHS compliant. "LFP" of the internal 2D reel label mentions "Lead Free Process"
- 2. On customized label, "LFP" or specific symbol printed and the optional "L" at the end of GLOBAL PART NUMBER / I2NC can be added (both are on customer request)

**MARKING**

**YCI02**



**YCI22**



**YCI04**



**YCI24 / 162 / 164 / 324**



**YC248**



**YCI58T/358L/358T**



**TCI22**



**TCI24**



TCI64



I-Digit marking

Fig. 9 Jumper=0Ω



E-24 series: 3 digits, 5%

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

Fig. 9-1 Value=240KΩ

For further marking information, please refer to data sheet “Chip resistors marking”.

**CONSTRUCTION**

The resistor is constructed on top of a high-grade ceramic body. Internal metal electrodes are added on each end to make the contacts to the thick film resistive element. The composition of the resistive element is a noble metal imbedded into a glass and covered by a second glass to prevent environment influences. The resistor is laser trimmed to the rated resistance value. The resistor is covered with a protective epoxy coat, finally the two external terminations (matte tin on Ni-barrier) are added as shown in Fig.9.

**OUTLINES**



**SCHEMATIC**



**DIMENSIONS**

Table I

| TYPE   | H / H <sub>I</sub> / H <sub>W</sub>                  | B           | P           | L           | T           | W1          | W2          |
|--------|--|-------------|-------------|-------------|-------------|-------------|-------------|
| YCI02  | H: 0.25 ± 0.10                                       | 0.15 ± 0.10 | 0.55 ± 0.10 | 0.80 ± 0.10 | 0.35 ± 0.10 | 0.15 ± 0.10 | 0.60 ± 0.10 |
| YCI04  | H: 0.20 ± 0.10                                       | 0.15 ± 0.05 | 0.40 ± 0.10 | 1.40 ± 0.10 | 0.35 ± 0.10 | 0.15 ± 0.10 | 0.60 ± 0.10 |
| YCI22  | H: 0.21+0.10 / -0.05<br>H <sub>W</sub> : 0.35 ± 0.10 | 0.20 ± 0.10 | 0.67 ± 0.05 | 1.00 ± 0.10 | 0.30 ± 0.10 | 0.25 ± 0.10 | 1.00 ± 0.10 |
| YCI24  | H: 0.45 ± 0.05<br>H <sub>I</sub> : 0.30 ± 0.05       | 0.20 ± 0.15 | 0.50 ± 0.05 | 2.00 ± 0.10 | 0.45 ± 0.10 | 0.30 ± 0.15 | 1.00 ± 0.10 |
| YCI62  | H: 0.30 ± 0.10<br>H <sub>W</sub> : 0.65 ± 0.15       | 0.30 ± 0.10 | 0.80 ± 0.05 | 1.60 ± 0.10 | 0.40 ± 0.10 | 0.30 ± 0.10 | 1.60 ± 0.10 |
| YCI64  | H: 0.65 ± 0.05<br>H <sub>I</sub> : 0.50 ± 0.15       | 0.30 ± 0.15 | 0.80 ± 0.05 | 3.20 ± 0.15 | 0.60 ± 0.10 | 0.30 ± 0.15 | 1.60 ± 0.15 |
| YC248  | H: 0.45 ± 0.05<br>H <sub>I</sub> : 0.30 ± 0.05       | 0.30 ± 0.15 | 0.50 ± 0.05 | 4.00 ± 0.20 | 0.45 ± 0.10 | 0.40 ± 0.15 | 1.60 ± 0.15 |
| YC324  | H: 1.10 ± 0.15<br>H <sub>I</sub> : 0.90 ± 0.15       | 0.50 ± 0.20 | 1.27 ± 0.05 | 5.08 ± 0.20 | 0.60 ± 0.10 | 0.50 ± 0.15 | 3.20 ± 0.20 |
| TCI22  | H: 0.30 ± 0.05                                       | 0.25 ± 0.15 | 0.50 ± 0.05 | 1.00 ± 0.10 | 0.30 ± 0.10 | 0.25 ± 0.15 | 1.00 ± 0.10 |
| TCI24  | H: 0.30 ± 0.10                                       | 0.20 ± 0.10 | 0.50 ± 0.05 | 2.00 ± 0.10 | 0.40 ± 0.10 | 0.25 ± 0.10 | 1.00 ± 0.10 |
| TCI64  | H: 0.50 ± 0.15                                       | 0.30 ± 0.15 | 0.80 ± 0.05 | 3.20 ± 0.15 | 0.60 ± 0.10 | 0.30 ± 0.15 | 1.60 ± 0.15 |
| YCI58T | H: 0.45 ± 0.05<br>H <sub>I</sub> : 0.32 ± 0.05       | 0.30 ± 0.15 | 0.64 ± 0.05 | 3.20 ± 0.20 | 0.60 ± 0.10 | 0.35 ± 0.15 | 1.60 ± 0.15 |
| YC358L | H: 1.10 ± 0.15                                       | 0.50 ± 0.15 | 1.27 ± 0.05 | 6.40 ± 0.20 | 0.60 ± 0.10 | 0.50 ± 0.15 | 3.20 ± 0.20 |
| YC358T | H <sub>I</sub> : 0.90 ± 0.15                         |             |             |             |             |             |             |

**ELECTRICAL CHARACTERISTICS**

Table 2

| TYPE             | POWER<br>P <sub>70</sub> | OPERATING<br>TEMP. RANGE | MWV   | RCOV | DWV  | RESISTANCE RANGE &<br>TOLERANCE                                      | T. C. R.  | Jumper criteria<br>(unit: A)           |
|------------------|--------------------------|--------------------------|-------|------|------|--|---|--|
| YC102            | 1/32W                    | -55°C to +125°C          | 15V   | 30V  | 30V  | E24 ±5% 10Ω ≤ R ≤ 1MΩ<br>E24/E96 ±1% 10Ω ≤ R ≤ 1MΩ<br>Jumper < 0.05Ω | ±200 ppm/°C   | Rated current 0.5<br>Max. current 1.0  |
| YC104            | 1/32W                    | -55°C to +125°C          | 12.5V | 25V  | 25V  | E24 ±5% 10Ω ≤ R ≤ 1MΩ<br>E24/E96 ±1% 10Ω ≤ R ≤ 1MΩ<br>Jumper < 0.05Ω |   | Rated current 0.5<br>Max. current 1.0  |
| YC122            | 1/16W                    | -55°C to +155°C          | 50V   | 100V | 100V | E24 ±5% 1Ω ≤ R ≤ 1MΩ<br>E24/E96 ±1% 1Ω ≤ R ≤ 1MΩ<br>Jumper < 0.05Ω   | 1Ω ≤ R ≤ 10Ω<br>±250 ppm/°C<br>10Ω ≤ R ≤ 1MΩ<br>±200 ppm/°C | Rated current 0.5<br>Max. current 1.0  |
| YC124            | 1/16W                    | -55°C to +155°C          | 25V   | 50V  | 100V | E24 ±5% 1Ω ≤ R ≤ 1MΩ<br>E24/E96 ±1% 1Ω ≤ R ≤ 1MΩ<br>Jumper < 0.05Ω   |   | Rated current 1.0<br>Max. current 2.0  |
| YC162            | 1/16W                    | -55°C to +155°C          | 50V   | 100V | 100V | E24 ±5% 1Ω ≤ R ≤ 1MΩ<br>E24/E96 ±1% 1Ω ≤ R ≤ 1MΩ<br>Jumper < 0.05Ω   |   | Rated current 1.0<br>Max. current 2.0  |
| YC164            | 1/16W                    | -55°C to +155°C          | 50V   | 100V | 100V | E24 ±5% 1Ω ≤ R ≤ 1MΩ<br>E24/E96 ±1% 1Ω ≤ R ≤ 1MΩ<br>Jumper < 0.05Ω   |   | Rated current 1.0<br>Max. current 2.0  |
| YC248            | 1/16W                    | -55°C to +155°C          | 50V   | 100V | 100V | E24 ±5% 10Ω ≤ R ≤ 1MΩ<br>E24/E96 ±1% 10Ω ≤ R ≤ 1MΩ<br>Jumper < 0.05Ω |   | Rated current 2.0<br>Max. current 10.0 |
| YC324            | 1/8W                     | -55°C to +155°C          | 200V  | 500V | 500V | E24 ±5% 10Ω ≤ R ≤ 1MΩ<br>E24/E96 ±1% 10Ω ≤ R ≤ 1MΩ                   |   | ---                                    |
| TC122            | 1/16W                    | -55°C to +125°C          | 50V   | 100V | 100V | E24 ±5% 10Ω ≤ R ≤ 1MΩ<br>E24/E96 ±1% 10Ω ≤ R ≤ 1MΩ<br>Jumper < 0.05Ω | ±200 ppm/°C   | Rated current 1.0<br>Max. current 1.5  |
| TC124            | 1/16W                    | -55°C to +125°C          | 50V   | 100V | 100V | E24 ±5% 10Ω ≤ R ≤ 1MΩ<br>E24/E96 ±1% 10Ω ≤ R ≤ 1MΩ<br>Jumper < 0.05Ω |   | Rated current 1.0<br>Max. current 1.5  |
| TC164            | 1/16W                    | -55°C to +155°C          | 50V   | 100V | 100V | E24 ±5% 10Ω ≤ R ≤ 1MΩ<br>E24/E96 ±1% 10Ω ≤ R ≤ 1MΩ<br>Jumper < 0.05Ω |   | Rated current 1.0<br>Max. current 2.0  |
| YC158T           | 1/16W                    | -55°C to +155°C          | 25V   | 50V  | 50V  | E24 ±5% 10Ω ≤ R ≤ 100KΩ  |   | ---                                    |
| YC358L<br>YC358T | 1/16W                    | -55°C to +155°C          | 50V   | 100V | 100V | E24 ±5% 10Ω ≤ R ≤ 330KΩ  |   | ---                                    |

**FOOTPRINT AND SOLDERING PROFILES**

For recommended footprint and soldering profiles, please refer to data sheet “Chip resistors mounting”.

**PACKING STYLE AND PACKAGING QUANTITY**

Table 3 Packing style and packaging quantity

| PACKING STYLE              | PACKING STYLE | YC102/<br>104 | YC/TC<br>122 | YC/TC<br>124 | YC162 | YC/TC<br>164 | YC248 | YC324 | YC158T | YC358L<br>YC358T |
|----------------------------|---------------|---------------|--------------|--------------|-------|--------------|-------|-------|--------|------------------|
| Paper taping reel ( R )    | 7" (178mm)    | 10,000        | 10,000       | 10,000       | 5,000 | 5,000        | 5,000 | ---   | 5,000  | ---              |
|                            | 13" (254mm)   | 50,000        | 50,000       | 40,000       | ---   | 20,000       | ---   | ---   | 20,000 | ---              |
| Embossed taping reel ( K ) | 7" (178mm)    | ---           | ---          | ---          | ---   | ---          | 4,000 | 4,000 | ---    | 4,000            |

**NOTE**

I. For tape and reel specification/dimensions, please refer to data sheet “Chip resistors packing”.



**FUNCTIONAL DESCRIPTION**

**OPERATING TEMPERATURE RANGE**

YC102/104/122/162, TC122/124 Range:

-55°C to +125°C (Fig.13)

YC124/164/248/324/158T/358L/358T, TC164 Range:

-55°C to +155°C(Fig.14)

**POWER RATING**

Each type rated power at 70°C

YC102/104 = 1/32 W

YC122/124/162/164/248/158T/358L/358T = 1/16 W

YC324 = 1/8 W

TC122/124/164 = 1/16 W

**RATED VOLTAGE**

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

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

or max. working voltage whichever is less

Where

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

P=Rated power (W)

R=Resistance value (Ω)



**TESTS AND REQUIREMENTS**

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

| TEST   | TEST METHOD              | PROCEDURE   | REQUIREMENTS   |
|--|--------------------------|---|--|
| Life/<br>Operational Life/<br>Endurance  | MIL-STD-202G-method 108A | 1,000 hours at 70±5 °C applied RCWV   | ±(2%+0.05 Ω)   |
|  | IEC 60115-1 4.25.1       | 1.5 hours on, 0.5 hour off, still air required  | <100 mΩ for Jumper                                     |
|  | JIS C 5202-7.10          |   |  |
| High Temperature<br>Exposure/<br>Endurance at<br>Upper Category<br>Temperature | MIL-STD-202G-method 108A | 1,000 hours at maximum operating temperature depending on specification, unpowered  | ±(1%+0.05 Ω)<br><50 mΩ for Jumper                      |
|  | IEC 60115-1 4.25.3       | No direct impingement of forced air to the parts  |  |
|  | JIS C 5202-7.11          | Tolerances: 125±3 °C  |  |
| Moisture<br>Resistance   | MIL-STD-202G-method 106F | Each temperature / humidity cycle is defined at 8 hours (method 106F), 3 cycles / 24 hours for 10d with 25 °C / 65 °C 95% R.H, without steps 7a & 7b, unpowered | ±(2%+0.05 Ω)<br><100 mΩ for Jumper                     |
|  | IEC 60115-1 4.24.2       | Parts mounted on test-boards, without condensation on parts   |  |
|  |                          | Measurement at 24±2 hours after test conclusion   |  |
| Thermal Shock  | MIL-STD-202G-method 107G | -55/+125 °C   | ±(1%+0.05 Ω)   |
|  |                          | Note: Number of cycles required is 300. Devices mounted   | <50 mΩ for Jumper                                      |
|  |                          | Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air  |  |
| Short Time<br>Overload   | MIL-R-55342D-para 4.7.5  | 2.5 times RCWV or maximum overload voltage whichever is less for 5 sec at room temperature  | ±(2%+0.05 Ω)<br><50 mΩ for Jumper<br>No visible damage |
|  | IEC60115-1 4.13          |   |  |
| Board Flex/<br>Bending   | IEC60115-1 4.33          | Device mounted on PCB test board as described, only 1 board bending required  | ±(1%+0.05 Ω)<br><50 mΩ for Jumper                      |
|  |                          | 3 mm bending  | No visible damage                                      |
|  |                          | Bending time: 60±5 seconds  |  |
|  |                          | Ohmic value checked during bending  |  |

| TEST                              | TEST METHOD                                  | PROCEDURE  | REQUIREMENTS   |
|-----------------------------------|--|--|--|
| Solderability<br>- Wetting        | IPC/JEDECJ-STD-002B test B<br>IEC 60068-2-58 | Electrical Test not required<br>Magnification 50X<br>SMD conditions:<br>1 <sup>st</sup> step: method B, aging 4 hours at 155 °C<br>dry heat<br>2 <sup>nd</sup> step: leadfree solder bath at 245±3 °C<br>Dipping time: 3±0.5 seconds | Well tinned (≥95% covered)<br>No visible damage        |
| - Leaching                        | IPC/JEDECJ-STD-002B test D<br>IEC 60068-2-58 | Leadfree solder, 260 °C, 30 seconds<br>immersion time  | No visible damage                                      |
| - Resistance to<br>Soldering Heat | MIL-STD-202G-method 210F<br>IEC 60068-2-58   | Condition B, no pre-heat of samples<br>Leadfree solder, 260 °C, 10 seconds<br>immersion time<br>Procedure 2 for SMD: devices fluxed and<br>cleaned with isopropanol  | ±(1%+0.05 Ω)<br><50 mΩ for Jumper<br>No visible damage |

REVISION HISTORY

| REVISION  | DATE          | CHANGE NOTIFICATION | DESCRIPTION  |
|-----------|---------------|---------------------|--|
| Version 7 | Aug. 22, 2017 | -                   | - Correct the typo for YC158T/358L/358T, Marking, "240" is 24ohm |
| Version 6 | Jun. 1, 2017  | -                   | - Update ordering information for networks YC158T/YC358L/YC358T  |
| Version 5 | Feb. 14, 2017 | -                   | - Update YC158 and 358 part number to YC158T , YC358L and YC358T |
| Version 4 | Dec. 22, 2016 | -                   | - Delete YC102 default code L type                               |
| Version 3 | Apr. 29, 2016 | -                   | - Update YC series and TCI64 dimension                           |
| Version 2 | Dec. 11, 2015 | -                   | - Update Operating Temperature                                   |
| Version 1 | Feb. 04, 2015 | -                   | - Update YC102 to flat type                                      |
| Version 0 | Nov. 14, 2014 | -                   | - First issue of this specification                              |

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