Innovative Service Around the Globe YAGEO

# 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**


YAGEO Phycomp

Product Specification – February 21, 2019 V.9

## SCOPE

This specification describes YC (convex, flat) and TC (concave) series chip resistor arrays with lead-free terminations made by thick film process.

## APPLICATIONS

- Terminal for SDRAM and DDRAM
- Computer applications: laptop computer, desktop computer
- Consume electronic equipments: PDAs, PNDs
- Mobile phone, telecom…

## FEATURES

- AEC-Q200 qualified
- More efficient in pick & place application
- Low assembly costs
- RoHS compliant
- Products with lead free terminations meet RoHS requirements
- Pb-glass contained in electrodes
- Resistor element and glass are exempted by RoHS
- Reducing environmentally hazardous wastes
- High component and equipment reliability
- Saving of PCB space
- None forbidden-materials used in products/production
- Halogen Free Epoxy

## ORDERING INFORMATION - GLOBAL PART NUMBER & 12NC

Both part numbers are identified by the series, size, tolerance, packing type, temperature coefficient, taping reel and resistance value.

**YAGEO BRAND ordering code**

**GLOBAL PART NUMBER (PREFERSRED)**

| YC<br>TC | XXXX | X | X | X | X | XX | XXXX | L/T |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |

### (1) SIZE

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

TC: 122/124/164

### (2) ARRAYS OR NETWORKS

Array YC102/104/122/124/162/164/248/324: -

Network YC158T/YC358L/YC358T: NA

### (3) TOLERANCE

F = ±1% J = ±5% (for Jumper ordering, use code of J)

### (4) PACKAGING TYPE

R = Paper taping reel K = Embossed plastic tape reel

### (5) TEMPERATURE COEFFICIENT OF RESISTANCE

– = Base on spec

### (6) TAPING REEL

07 = 7 inch dia. Reel

13 = 13 inch dia. Reel

### (7) RESISTANCE VALUE

There are 2~4 digits indicated the resistor value. Letter R/K/M is decimal point.

Detailed resistance rules show in table of "Resistance rule of global part number".

### (8) DEFAULT CODE

Letter L is the system default code for ordering only. (Note)

Letter T is the only default code for YC102.

### ORDERING EXAMPLE

The ordering code of a YC122 convex chip resistor array, value 1,000 Ω with ±5% tolerance, supplied in 7-inch tape reel is: YC122-JR-071KL.

YC158T network, value 100,000Ω with 5% tolerance, supplied in 7-inch tape reel is: YC158TJR-07100KL

### NOTE

1. All our RSMD products meet 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 / 12NC can be added (both are on customer request)

Resistance rule of global part number

| Resistance code rule | Example |
|---|---|
| 0R | 0R = Jumper |
| XRXX<br>(1 to 9.76 Ω) | 1R = 1 Ω<br>1R5 = 1.5 Ω<br>9R76 = 9.76 Ω |
| XXRX<br>(10 to 97.6 Ω) | 10R = 10 Ω<br>97R6 = 97.6 Ω |
| XXXR<br>(100 to 976 Ω) | 100R = 100 Ω |
| XKXX<br>(1 to 9.76 KΩ) | 1K = 1,000 Ω<br>9K76 = 9760 Ω |
| XM<br>(1 MΩ) | 1M = 1,000,000 Ω |

**PHYCOMP BRAND ordering codes**

Both GLOBAL PART NUMBER (preferred) and 12NC (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.

**12NC CODE**

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

| TYPE/ 2×0402 | START IN (1) | TOL. (%) | RESISTANCE RANGE | PAPER / PE TAPE ON REEL (units) (2) | |
|---|---|---|---|---|---|
| | | | | 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 | - |

(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 12NC".

(4) "L" is optional symbol (Note).

**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: 2350131111102(L) or YC122-JR-071KL.

Last digit of 12NC

| Resistance decade (3) | 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 |

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**

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 / 12NC can be added (both are on customer request)

## MARKING

### YC102

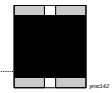

Fig. 1

No marking

### YC122

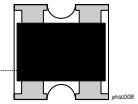

Fig. 2

No marking

### YC104

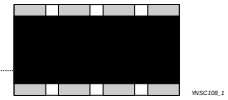

Fig. 3

No marking

### YC124 / 162 / 164 / 324

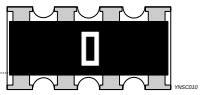


Fig. 4 Jumper=0Ω

1-Digit marking


Fig. 4-1 Value=240KΩ

E-24 series: 3 digits, 5%
First two digits for significant figure and 3rd digit for number of zeros

### YC248

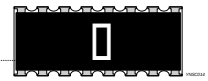


Fig. 5 Jumper=0Ω

1-Digit marking


Fig. 5-1 Value=240KΩ

E-24 series: 3 digits, 5%
First two digits for significant figure and 3rd digit for number of zeros

### YC158T/358L/358T

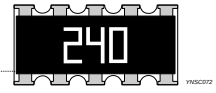


Fig. 6 Value=24Ω


Fig. 6-1 Value=240KΩ

E-24 series: 3 digits
First two digits for significant figure and 3rd digit for number of zeros

### TC122

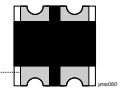

Fig. 7

No marking

### TC124

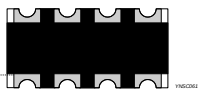

Fig. 8

No marking

TC164

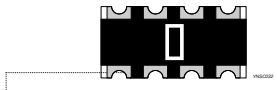


Fig. 9 Jumper=0Ω

1-Digit marking

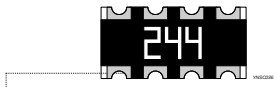


Fig. 9-1 Value=240KΩ

E-24 series: 3 digits, 5%

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

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

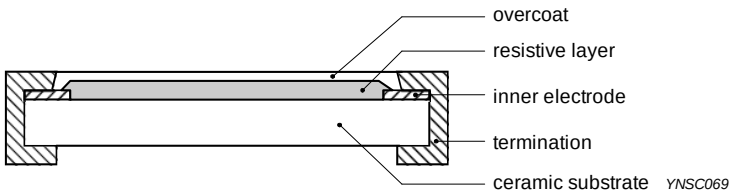


Fig. 10 Chip resistor outlines

## SCHEMATIC

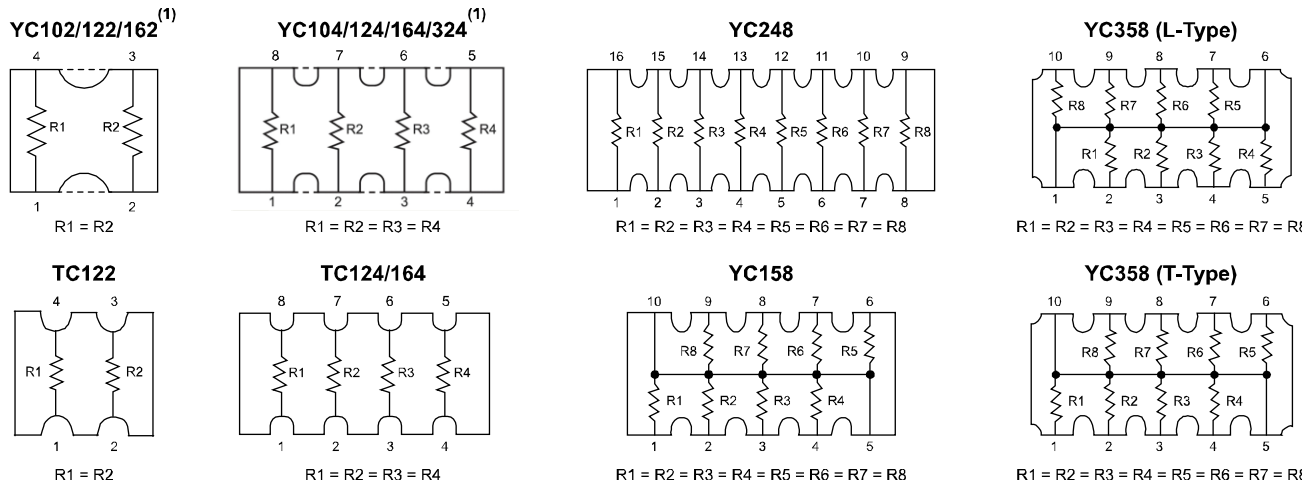


**Fig. 11** Equivalent circuit diagram
Note: 1. YC102/104 is flat type

For dimension, please refer to Table 1

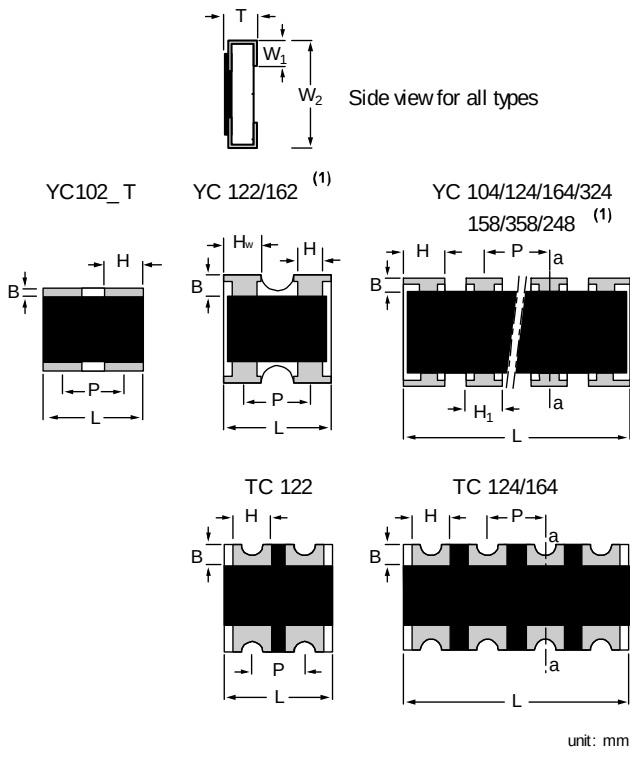


**Fig. 12** YC/TC122 series chip resistors dimension
Note: (1) YC102/104 is flat type

## DIMENSIONS

Table 1

| TYPE | H / $H_I$ / $H_W$ | B | P | L | T | W1 | W2 |
|---|---|---|---|---|---|---|---|
| YC102 | 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 |
| YC104 | 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 |
| YC122 | H : 0.21+0.10 / -0.05<br>$H_W$ : 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 |
| YC124 | H: 0.40 ± 0.15<br>$H_I$: 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 |
| YC162 | H : 0.30 ±0.10<br>$H_W$ : 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 |
| YC164 | H : 0.65 ±0.05<br>$H_I$: 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>$H_I$: 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>$H_I$: 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 |
| TC122 | 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 |
| TC124 | 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 |
| TC164 | 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 |
| YC158T | H : 0.45±0.05<br>$H_I$: 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<br>YC358T | H : 1.10±0.15<br>$H_I$: 0.90±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 |

## ELECTRICAL CHARACTERISTICS

Table 2

| TYPE | POWER $P_{70}$ | OPERATING TEMP. RANGE | MWV | RCOV | DWV | RESISTANCE RANGE & TOLERANCE | T. C. R. | Jumper criteria (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 ±250 ppm/°C<br>10Ω ≤ R ≤ 1MΩ ±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>E/24/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/ 104 | YC/TC 122 | YC/TC 124 | YC162 | YC/TC 164 | YC248 | YC324 | YC158T | YC358L 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**

1. For tape and reel specification/dimensions, please refer to data sheet "Chip resistors packing".

## FUNCTIONAL DESCRIPTION

### OPERATING TEMPERATURE RANGE

YC102/104, TC122/124 Range:

-55℃ to +125℃ (Fig.13)

YC122/124/162/164/248/324/158T/358L/358T, TC164 Range:

-55℃ to +155℃(Fig.14)

### POWER RATING

Each type rated power at 70℃

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

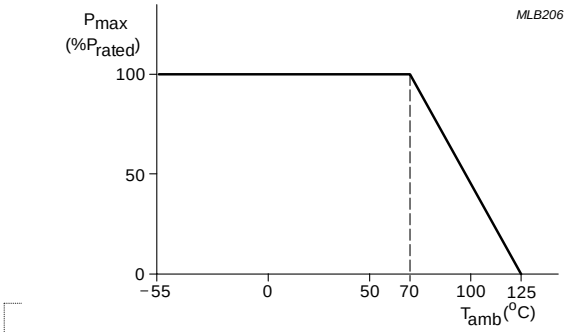


**Fig. 13** Maximum dissipation (P) in percentage of rated power as a function of the operating ambient temperature ($T_{amb}$)

### 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)

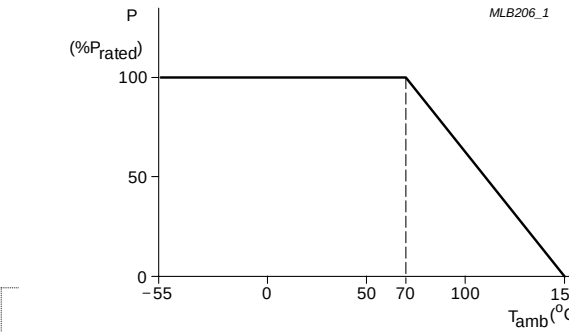


**Fig. 14** Maximum dissipation (P) in percentage of rated power as a function of the operating ambient temperature ($T_{amb}$)

## TESTS AND REQUIREMENTS

Table 4 Test condition, procedure and requirements

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

| TEST | TEST METHOD | PROCEDURE | REQUIREMENTS |
|---|---|---|---|
| Solderability<br>- Wetting | J-STD-002 test | Electrical Test not required<br>Magnification 50X<br>SMD conditions:<br>1st step: method B, aging 4 hours at 155 °C dry heat<br>2nd step: leadfree solder bath at 245±3 °C<br>Dipping time: 3±0.5 seconds | Well tinned (≥95% covered)<br>No visible damage |
| - Leaching | J-STD-002 test | Leadfree solder, 260 °C, 30 seconds immersion time | No visible damage |
| - Resistance to Soldering Heat | MIL-STD-202-method 210 | Condition B, no pre-heat of samples<br>Leadfree solder, 260 °C, 10 seconds immersion time<br>Procedure 2 for SMD: devices fluxed and cleaned with isopropanol | ±(1%+0.05 Ω)<br><50 mΩ for Jumper<br>No visible damage |
| Biased Humidity | AEC-Q200 Test 7<br>MIL-STD-202-Method 103 | 1,000 hours; 85 °C / 85% RH<br>10% of operating power<br>Measurement at 24± 4 hours after test conclusion. | ± (5.0%+0.05 Ω) |

## REVISION HISTORY

| REVISION | DATE | CHANGE NOTIFICATION | DESCRIPTION |
|---|---|---|---|
| Version 9 | Feb.19, 2019 | - | - Update H dimension for YC124 |
| Version 8 | Dec. 24. 2018 | - | - Update AEC-Q200 qualified |
| 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 TC164 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 |