



PRODUCT SPECIFICATION

Description: CRGH Series High Power Thick Film Chip Resistors

Product Type: (Resistance range: 1.0Ω ~ 10MΩ)

| | |
|--------------|-----------------------------------|
| CRGH0603_XXX | (CRGH0603 1/5W +/- 1% & 5% Taped) |
| CRGH0805_XXX | (CRGH0805 1/3W +/- 1% & 5% Taped) |
| CRGH1206_XXX | (CRGH1206 1/2W +/- 1% & 5% Taped) |
| CRGH2010JXXX | (CRGH2010 1W +/- 1% & 5% Taped) |
| CRGH2512JXXX | (CRGH2512 2W +/- 1% & 5% Taped) |



Parts corresponding to RoHS Compliant: 2005-Apr.-1

High Power Thick Film Chip Resistors

1. Scope:

This specification relates to the Tyco Electronics Thick Film Chip Resistors (Lead Free)

2. Type designation:

The type designation shall be in the following form:

Ex.

| Type | Power Rating | Resistance tolerance | Nominal Resistance |
|----------|--------------|----------------------|--------------------|
| CRGH0603 | 1/5W | F (1%) J (5%) | 1K0 |
| CRGH0805 | 1/3W | | |
| CRGH1206 | 1/2W | | |
| CRGH2010 | 1W | | |
| CRGH2512 | 2W | | |

3. Ratings:

| Type | CRGH0603 | CRGH0805 | CRGH1206 | CRGH2010 | CRGH2512 |
|---------------------------------|----------------|----------|----------|----------|----------|
| Power Rating | 0.20W | 0.33W | 0.50W | 1.0W | 2.0W |
| Max. Working Voltage | 50 V | 150 V | 200 V | 200 V | 250 V |
| Max. Overload Voltage | 100 V | 300 V | 400 V | 400 V | 500 V |
| Dielectric Withstanding Voltage | 300 V | 500 V | 500 V | 500 V | 500 V |
| Temperature Range | -55°C ~ +155°C | | | | |
| Ambient Temperature | 70°C | | | | |

3.1 Power rating:

Resistors shall have a power rating based on continuous load operation at an ambient temperature of 70°C. For temperature in excess of 70°C, the load shall be derate as shown in fig. 1.

Figure 1



3.2 Voltage Rating:

Resistors shall have a rated direct-current (DC) continuous working voltage or an approximate sine-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial-line frequency and waveform corresponding to the power rating, as determined from the following formula:

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

Where : RCWV = Rated DC or RMS AC continuous working voltage at commercial-line frequency and waveform (volt)

P = Power Rating (watt)

R = Nominal Resistance (ohm)

In no case shall the rated DC or RMS AC continuous working voltage be greater than the applicable maximum value.

High Power Thick Film Chip Resistors

4. Construction :



5. Power rating and dimensions



Dimension :

| Type | Dimension (mm) | | | | |
|----------|----------------|-----------------------|-------------|-------------|-------------|
| | L | W | H | l1 | l2 |
| CRGH0603 | 1.60 ± 0.10 | 0.80 + 0.15 - 0.10 | 0.45 ± 0.10 | 0.30 ± 0.20 | 0.30 ± 0.20 |
| CRGH0805 | 2.00 ± 0.15 | 1.25 + 0.15 - 0.10 | 0.55 ± 0.10 | 0.40 ± 0.20 | 0.40 ± 0.20 |
| CRGH1206 | 3.10 ± 0.15 | 1.55 + 0.15 - 0.10 | 0.55 ± 0.10 | 0.45 ± 0.20 | 0.45 ± 0.20 |
| CRGH2010 | 5.00 ± 0.20 | 2.50 ± 0.15 | 0.55 ± 0.10 | 0.60 ± 0.25 | 0.50 ± 0.20 |
| CRGH2512 | 6.35 ± 0.10 | 3.20 ± 0.15 | 0.55 ± 0.10 | 0.60 ± 0.25 | 1.80 ± 0.20 |

Power Rating :

| Type | Power Rating at 70°C | Tolerance % | Resistance Range | Standard Series | TCR |
|----------|----------------------|-------------|------------------|-----------------|-----------------------|
| CRGH0603 | 0.20W | ± 1 | 1Ω ~ 10MΩ | E-96 | ≤ 10Ω ±200PPM/°C < |
| | | ± 5 | 1Ω ~ 10MΩ | E-24 | 10Ω ±100PPM/°C |
| CRGH0805 | 0.33W | ± 1 | 1Ω ~ 10MΩ | E-96 | ≤ 10Ω ±200PPM/°C < |
| | | ± 5 | 1Ω ~ 10MΩ | E-24 | |
| CRGH1206 | 0.50W | ± 1 | 1Ω ~ 10MΩ | E-96 | ≤ 10Ω ±200PPM/°C < |
| | | ± 5 | 1Ω ~ 10MΩ | E-24 | |
| CRGH2010 | 1.00W | ± 1 | 1Ω ~ 10MΩ | E-24 | < 10Ω ±200PPM/°C < |
| | | ± 5 | 1Ω ~ 10MΩ | | |
| CRGH2512 | 2.00W | ± 1 | 1Ω ~ 9.76Ω | E-96 | < 10Ω ±200PPM/°C < |
| | | ± 5 | 1.1MΩ ~ 10MΩ | E-24 | |

Customer:

Part No.: CRGH Series

High Power Thick Film Chip Resistors

5.1 PCB Layout Plan:



Dimension :

| Type | Dimension (mm) | | |
|----------|----------------|------|------|
| | A | B | C |
| CRGH0603 | 1.00 | 1.00 | 0.60 |
| CRGH0805 | 1.30 | 1.20 | 1.00 |
| CRGH1206 | 1.80 | 1.20 | 2.20 |
| CRGH2010 | 3.00 | 1.50 | 3.80 |
| CRGH2512 | 3.50 | 1.90 | 5.00 |

High Power Thick Film Chip Resistors

6. Marking :

6.1 Resistors

A. $\pm 5\%$ Tolerance : the first two digits are significant figures of resistance and the third denoted number of zeros.

Ex.

| | | |
|--|-----|--|
| | 333 | |
|--|-----|--|

 33K Ω

B. For ohmic values below 10 Ω , read letter "R" as decimal point.

Ex.

| | | |
|--|-----|--|
| | 2R2 | |
|--|-----|--|

 2.2 Ω

C. For E-96 series [$\pm 1\%$ (F) tolerance] in CRGH0603 size 3 digit system (due to space restrictions) please refer to page 4. for coding formula

Ex.

| | | |
|--|-----|--|
| | 02C | |
|--|-----|--|

 10.2K Ω

D. $\pm 1\%$ Toler CRGH0805_XXX (CRGH0805 1/3W +/- 1% & 5% Taped) resistance and the fourth digit denoted number of zeros. Letter "R" is for decimal point.

Ex.

| | | |
|------|------|--|
| CRGH | 2701 | |
|------|------|--|

 2.7K Ω

| | | |
|--|------|--|
| | 10R5 | |
|--|------|--|

 10.5 Ω



6.2 Labels

Label shall be marked with the following item :

Label shall be marked with the following item :

- A. Nominal Resistance and Resistance Tolerance
- B. Power Rating and Size
- C. Quantity
- D. Part No.
- E. P.O.No.
- F. Lot No.

Ex.

| | | |
|---|----------------|---|
| tyco / Electronics | |  |
| CHIP RESISTORS | | |
| RESISTANCE: 330K | Ω | $\pm 5\%$ |
| WATTAGE: 1/2W | SIZE: CRGH0603 | |
| QUANTITY: 5,000 | PCS | Pb-Free |
| PART NO.: CRGH0603F330K | RoHS | 2002/95/EC |
| LOT NO. : 825723 | REF # | 2456319325 |
|  | | |

Remark : **For CRGH0603** $\pm 1\%$: Label is 332K, value is 332K Ω , marking is 51D

$\pm 5\%$: Label is 330K, value is 330K Ω , marking is 334

$\pm 1\%$: Label is 330K, value is 330K Ω , marking is 3303

Customer:

Part No.: CRGH Series

High Power Thick Film Chip Resistors

Mutiplier Code :

| Code | A | B | C | D | E | F | G | H | X | Y | Z |
|------------|----|----|----|----|----|----|----|----|----|----|----|
| Multiplier | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | -1 | -2 | -3 |
| | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |

Coding

Formula

Example : 10K2 = 102 X 10² = 02C

XX

X

Resistance Code

Multiplier Code

$$\begin{array}{ccc} 102 & & X & 10^2 & = & 02C \\ \downarrow & & & \downarrow & & \\ 02 & & & C & & \end{array}$$

$$\begin{array}{ccc} 33R2 = 332 & & X & 10^{-1} & = & 51X \\ \downarrow & & & \downarrow & & \\ 51 & & & X & & \end{array}$$

| Value | Code | Value | Code | Value | Code | Value | Code | Value | Code |
|-------|------|-------|------|-------|------|-------|------|-------|------|
| 100 | 01 | 162 | 21 | 261 | 41 | 422 | 61 | 681 | 81 |
| 102 | 02 | 165 | 22 | 267 | 42 | 432 | 62 | 698 | 82 |
| 105 | 03 | 169 | 23 | 274 | 43 | 442 | 63 | 715 | 83 |
| 107 | 04 | 174 | 24 | 280 | 44 | 453 | 64 | 732 | 84 |
| 110 | 05 | 178 | 25 | 287 | 45 | 464 | 65 | 750 | 85 |
| 113 | 06 | 182 | 26 | 294 | 46 | 475 | 66 | 768 | 86 |
| 115 | 07 | 187 | 27 | 301 | 47 | 487 | 67 | 787 | 87 |
| 118 | 08 | 191 | 28 | 309 | 48 | 499 | 68 | 806 | 88 |
| 121 | 09 | 196 | 29 | 316 | 49 | 511 | 69 | 825 | 89 |
| 124 | 10 | 200 | 30 | 324 | 50 | 523 | 70 | 845 | 90 |
| 127 | 11 | 205 | 31 | 332 | 51 | 536 | 71 | 866 | 91 |
| 130 | 12 | 210 | 32 | 340 | 52 | 549 | 72 | 887 | 92 |
| 133 | 13 | 215 | 33 | 348 | 53 | 562 | 73 | 909 | 93 |
| 137 | 14 | 221 | 34 | 357 | 54 | 576 | 74 | 931 | 94 |
| 140 | 15 | 226 | 35 | 365 | 55 | 590 | 75 | 953 | 95 |
| 143 | 16 | 232 | 36 | 374 | 56 | 604 | 76 | 976 | 96 |
| 147 | 17 | 237 | 37 | 383 | 57 | 619 | 77 | | |
| 150 | 18 | 243 | 38 | 392 | 58 | 634 | 78 | | |
| 154 | 19 | 249 | 39 | 402 | 59 | 649 | 79 | | |
| 158 | 20 | 255 | 40 | 412 | 60 | 665 | 80 | | |

*Marking for CRGH0603 E-96 series, the resistance value that no have multiplier code indicate marking follow this:
The first two digits are significant figures of resistance and the third one denoted number of zeros and under line the marking letters.

Ex.

| | | |
|--|------------|--|
| | <u>122</u> | |
|--|------------|--|

1.2KΩ

| Customer: | | Part No.: CRGH Series | | | | | | | | | | | | | | | |
|---|---|--|-------------|--------------|------|---|-------------|---------|---|------------|--------------|---|--------------|---------|---|------------|--------------|
| High Power Thick Film Chip Resistors | | | | | | | | | | | | | | | | | |
| 7. Performance specification : | | | | | | | | | | | | | | | | | |
| Characteristics | Limits | Test Methods (JIS C 5201-1) | | | | | | | | | | | | | | | |
| Dielectric withstanding voltage | No evidence of flashover mechanical damage, arcing or insulation break down | 4.7 Clamped in the trough of a 90°C metallic v-block and shall be tested at ac potential respectively specified in the type for 60-70 seconds | | | | | | | | | | | | | | | |
| Temperature Coefficient | See Page 2 | 4.8 Natural resistance change per temp. degree centigrade. $\frac{R2-R1}{R1(t2-t1)} \times 10^6 \quad (\text{PPM}/^\circ\text{C})$ R1: Resistance value at room temperature (T1) R2: Resistance value at room temp. plus 100°C (T2) Test pattern: room temp. (T1), room temp. +100°C (T2) | | | | | | | | | | | | | | | |
| Short time Overload | Resistance change rate is ± 5% (2.0% + 0.1Ω) Max. ± 1% (1.0% + 0.1Ω) Max. | 4.13 Permanent resistance change after the application of a potential of 2.5 times RCWV for 5 seconds. | | | | | | | | | | | | | | | |
| Solderability | 95 % coverage Min. | Wave Solder: Test temperature of solder: 245°C ±3°C dipping time in solder : 2-3 seconds. Reflow Solder:  | | | | | | | | | | | | | | | |
| Soldering heat | Resistance change rate is: ±(1%+0.05Ω) Max. | 4.18 Dip the resistor into a solder bath having a temperature of 260°C ± 3°C and hold it for 10 ± 1 seconds. | | | | | | | | | | | | | | | |
| Temperature cycling | Resistance Change Rate Is ± 5% (1.0% + 0.05Ω) Max. ± 1% (0.5% + 0.05Ω) Max. | 4.19 Resistance change after continuous 5 cycles for duty cycle specified below : | | | | | | | | | | | | | | | |
| | | <table border="1"> <thead> <tr> <th>Step</th> <th>Temperature</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td align="center">1</td> <td align="center">-55°C ± 3°C</td> <td align="center">30 mins</td> </tr> <tr> <td align="center">2</td> <td align="center">Room temp.</td> <td align="center">10 ~ 15 mins</td> </tr> <tr> <td align="center">3</td> <td align="center">+155°C ± 2°C</td> <td align="center">30 mins</td> </tr> <tr> <td align="center">4</td> <td align="center">Room temp.</td> <td align="center">10 ~ 15 mins</td> </tr> </tbody> </table> | Step | Temperature | Time | 1 | -55°C ± 3°C | 30 mins | 2 | Room temp. | 10 ~ 15 mins | 3 | +155°C ± 2°C | 30 mins | 4 | Room temp. | 10 ~ 15 mins |
| | | Step | Temperature | Time | | | | | | | | | | | | | |
| | | 1 | -55°C ± 3°C | 30 mins | | | | | | | | | | | | | |
| | | 2 | Room temp. | 10 ~ 15 mins | | | | | | | | | | | | | |
| 3 | +155°C ± 2°C | 30 mins | | | | | | | | | | | | | | | |
| 4 | Room temp. | 10 ~ 15 mins | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| Humidity | Resistance change rate is ± 5% (3.0% + 0.1Ω) Max. ± 1% (1.0% + 0.1Ω) Max. | 4.24 Temporary resistance change after 240 hours exposure in a humidity test chamber controlled at 40±2°C and 90-95% relative humidity | | | | | | | | | | | | | | | |
| Load life in Humidity | Resistance change rate is ± 5% (3.0% + 0.1Ω) Max. ± 1% (1.0% + 0.1Ω) Max. | 7.9 Resistance change after 1,000 hours (1.5 hours "on", 0.5 hour "off") at RCWV in a humidity chamber controlled at 40°C ± 2°C and 90 to 95% relative humidity | | | | | | | | | | | | | | | |
| Load Life | Resistance change rate is ± 5% (3.0% + 0.1Ω) Max. ± 1% (1.0% + 0.1Ω) Max. | 4.25.1 Permanent resistance change after 1,000 hours operating at RCWV, with duty cycle of (1.5 hours "on", 0.5 hour "off") at 70°C ± 2°C ambient | | | | | | | | | | | | | | | |
| Terminal Bending | Resistance change rate is ± (1.0% + 0.05Ω) Max. | 4.33 Twist of Test Board : Y/X = 3/90 mm for 60 seconds | | | | | | | | | | | | | | | |

High Power Thick Film Chip Resistors

6. Packing specification :

6.1 Taping Dimension (mm)

A. Paper tape



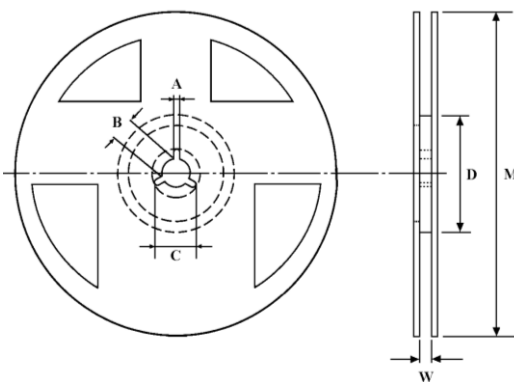
B. Plastic tape



| Type | A ± 0.2 | B ± 0.2 | C ± 0.05 | $\phi D \begin{smallmatrix} +0.1 \\ -0 \end{smallmatrix}$ | E ± 0.1 | F ± 0.05 | G ± 0.1 | W ± 0.2 | T ± 0.1 |
|----------|---------|---------|----------|---|---------|----------|---------|---------|---------|
| CRGH0603 | 1.10 | 1.90 | 2.0 | 1.5 | 1.75 | 3.5 | 4.0 | 8.0 | 0.67 |
| CRGH0805 | 1.65 | 2.40 | 2.0 | 1.5 | 1.75 | 3.5 | 4.0 | 8.0 | 0.81 |
| CRGH1206 | 2.00 | 3.60 | 2.0 | 1.5 | 1.75 | 3.5 | 4.0 | 8.0 | 0.81 |
| CRGH2010 | 2.80 | 5.50 | 2.0 | 1.5+0.25 | 1.75 | 5.5 | 4.0 | 12.0 | 1.2±0.0 |
| CRGH2512 | 3.60 | 6.90 | 2.0 | 1.5+0.25 | 1.75 | 5.5 | 4.0 | 12.0 | 1.2±0.0 |

7.2 Reel Dimension (mm)

A. Paper tape



B. Plastic tape

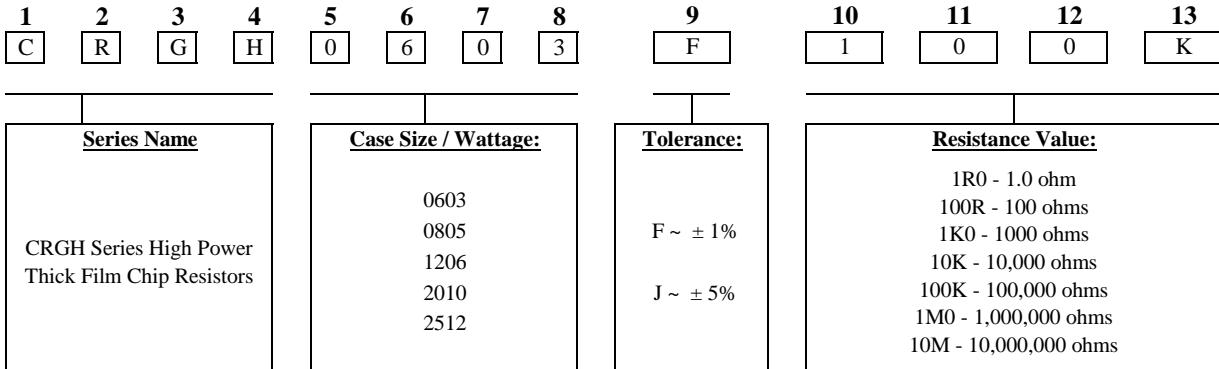


| Type | Packaging | Quantity Per Reel | A | B | C | D | M ± 2 | W ± 1 | T ± 1 |
|----------|-----------|-------------------|---------|--------|--------|--------|---------|----------|----------|
| CRGH0603 | Paper | 5,000 pcs. | 2±0.5 | 13±0.5 | 21±0.5 | 60±1.0 | 178±2.0 | 10±1.0 | - |
| CRGH0805 | Paper | 5,000 pcs. | 2±0.5 | 13±0.5 | 21±0.5 | 60±1.0 | 178±2.0 | 10±1.0 | - |
| CRGH1206 | Paper | 5,000 pcs. | 2±0.5 | 13±0.5 | 21±0.5 | 60±1.0 | 178±2.0 | 10±1.0 | - |
| CRGH2010 | Plastic | 4,000 pcs. | 180-3.0 | 60+1.0 | 13±0.2 | - | - | 13.5±0.5 | 15.4±1.0 |
| CRGH2512 | Plastic | 4,000 pcs. | 180-3.0 | 60+1.0 | 13±0.2 | - | - | 13.5±0.5 | 15.4±1.0 |

High Power Thick Film Chip Resistors

Part Number System

Explanation of Part Number System



CRGH0805_XXX (CRGH0805 1/3W +/- 1% & 5% Taped)

CRGH2512JXXX (CRGH2512 2W +/- 1% & 5% Taped)