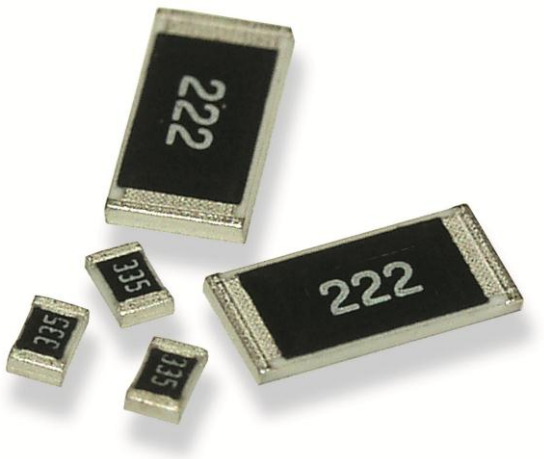
# PRODUCT SPECIFICATION

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**

| CHANGE NOTIFICATION HISTORY | | | |
|---|---|---|---|
| **Version** | **Date of Version** | **History** | **Remark** |
| 1 | 2008/12/19 | CRGH Series | |
| 2 | 18/09/2013 | Change to Terminal pad 2512 size | |
| | | | |
| | | | |
| | |

| Customer: | Part No.: CRGH Series |
|---|---|

# 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%)<br>J (5%) | 1K0 |
| CRGH0805 | 1/3W | | |
| CRGH1206 | 1/2W | | |
| CRGH2010 | 1W | | |
| CRGH2512 | 2W | | |

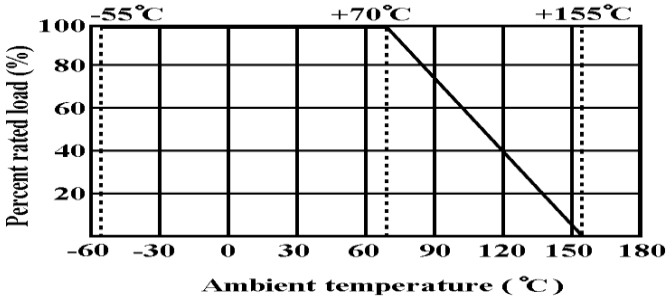
3. Ratings:

| 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 curresponding 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)

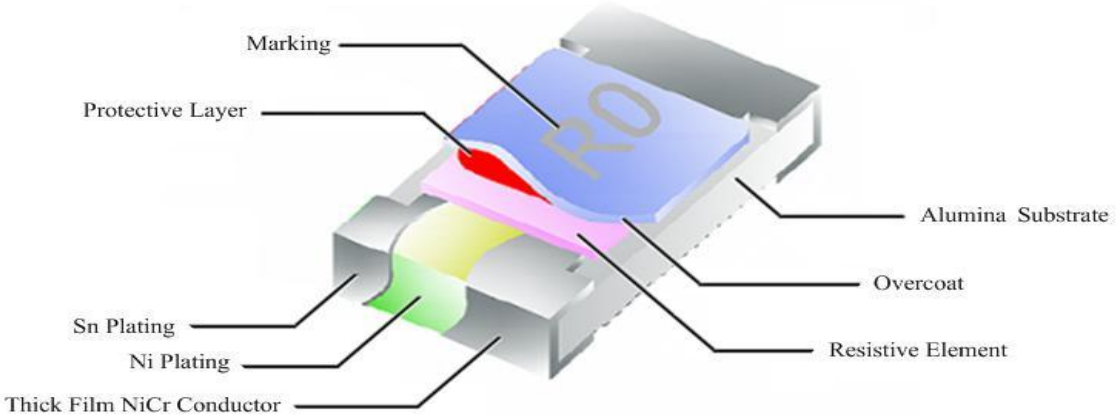
P = Power Rating (watt)

R = Nominal Resistance (ohm)

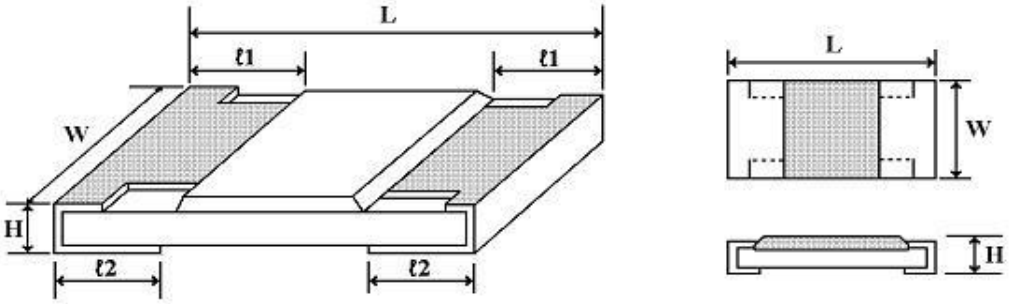
In no case shall the rated DC or RMS AC continuous working voltage be greater than the applicable maximum value.

# High Power Thick Film Chip Resistors

4. Construction :




5. Power rating and dimensions




Dimension :

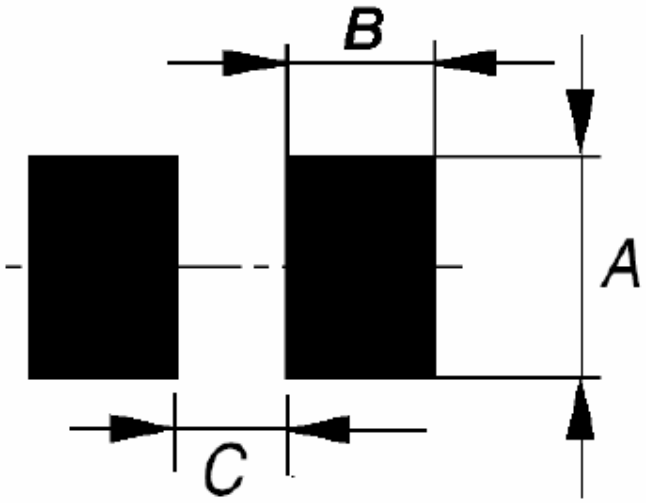
| Type | Dimension (mm) | | | | |
|---|---|---|---|---|---|
| | L | W | H | ℓ1 | ℓ2 |
| CRGH0603 | 1.60 ± 0.10 | 0.80 + 0.15 - 0.10 | 0.45 ± 0.10 | 0.30 ± 0.20 | 0.30 ± 0.20 |
| CRGH0805 | 2.00 ± 0.15 | 1.25 + 0.15 - 0.10 | 0.55 ± 0.10 | 0.40 ± 0.20 | 0.40 ± 0.20 |
| CRGH1206 | 3.10 ± 0.15 | 1.55 + 0.15 - 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 < 10Ω ±100PPM/°C |
| | | ± 5 | 1Ω ~ 10MΩ | E-24 | |
| 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 | |

# 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 |

## 6. Marking :

### 6.1 Resistors

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

Ex. | | 333 | | 33KΩ

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

Ex. | | 2R2 | | 2.2Ω

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

Ex. | | 02C | | 10.2KΩ

D. ±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 | | 2.7KΩ

| | 10R5 | | 10.5Ω

### 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 NEOHM

| | | | |
|---|---|---|---|
| RESISTANCE: | 330K | Ω | ± 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** ± 1 % : Label is 332K, value is 332KΩ, marking is 51D
± 5 % : Label is 330K, value is 330KΩ, marking is 334
± 1 % : Label is 330K, value is 330KΩ, 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | -1 | -2 | -3 |
| **Multiplier** | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |

**Coding**

**XX**

Resistance Code

**Formula**

**X**

Multiplier Code

**Example :** 10K2 = 102 X $10^{2}$ = 02C

(102 → 02; $10^{2}$ → C)

33R2 = 332 X $10^{-1}$ = 51X

(332 → 51; $10^{-1}$ → X)

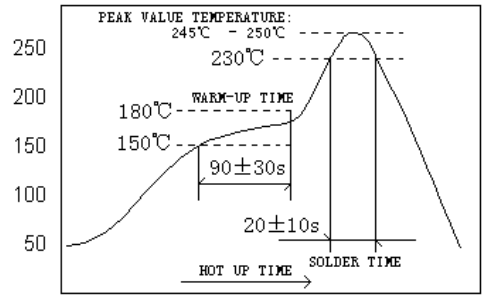
| Value | Code | Value | Code | Value | Code | Value | Code | Value | Code |
|---|---|---|---|---|---|---|---|---|---|
| 100 | **01** | 162 | **21** | 261 | **41** | 422 | **61** | 681 | **81** |
| 102 | **02** | 165 | **22** | 267 | **42** | 432 | **62** | 698 | **82** |
| 105 | **03** | 169 | **23** | 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. | | 122 | | 1.2KΩ

## 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. $\frac{R2-R1}{R1(t2-t1)} \times 10^6$ (PPM/°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 : |

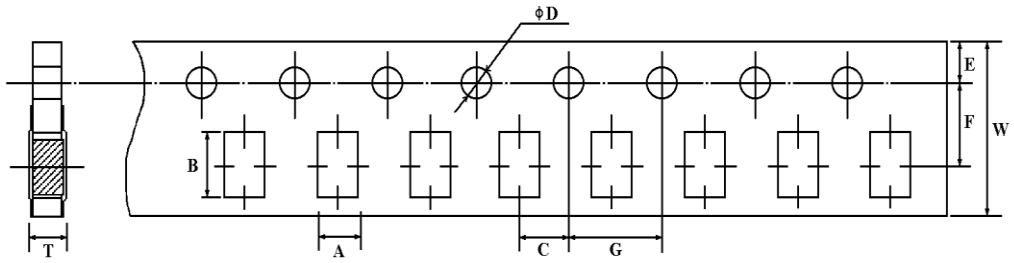
| Step | Temperature | Time |
|---|---|---|
| 1 | -55°C ± 3°C | 30 mins |
| 2 | Room temp. | 10 ~ 15 mins |
| 3 | +155°C ± 2°C | 30 mins |
| 4 | Room temp. | 10 ~ 15 mins |

| | | |
|---|---|---|
| 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 Humidty | 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 |

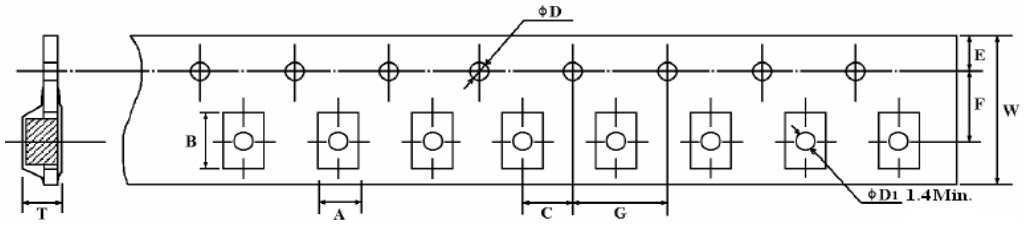
## 6. Packing specification :

6.1 Taping Dimension (mm)

A. Paper tape



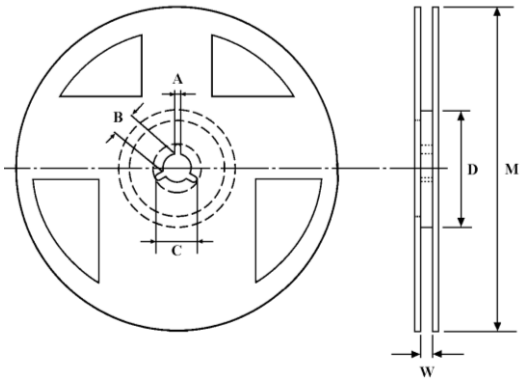

B. Plastic tape



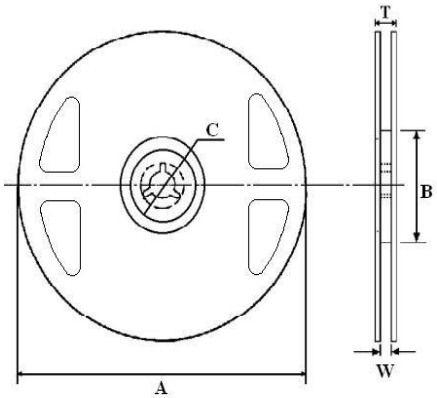

| Type | A ± 0.2 | B ± 0.2 | C ± 0.05 | $\phi$ D +0.1 - 0 | E ± 0.1 | F ± 0.05 | G ± 0.1 | W ± 0.2 | T ± 0.1 |
|---|---|---|---|---|---|---|---|---|---|
| CRGH0603 | 1.10 | 1.90 | 2.0 | 1.5 | 1.75 | 3.5 | 4.0 | 8.0 | 0.67 |
| CRGH0805 | 1.65 | 2.40 | 2.0 | 1.5 | 1.75 | 3.5 | 4.0 | 8.0 | 0.81 |
| CRGH1206 | 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

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C | R | G | H | 0 | 6 | 0 | 3 | F | 1 | 0 | 0 | K |

**Series Name**

CRGH Series High Power Thick Film Chip Resistors

**Case Size / Wattage:**

0603
0805
1206
2010
2512

**Tolerance:**

F ~ ± 1%

J ~ ± 5%

**Resistance Value:**

1R0 - 1.0 ohm
100R - 100 ohms
1K0 - 1000 ohms
10K - 10,000 ohms
100K - 100,000 ohms
1M0 - 1,000,000 ohms
10M - 10,000,000 ohms

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

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

# Mouser Electronics

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