

## Type CRG Series

### Key Features

- Thick film resistors with a high power to size ratio, ideally suited to industrial and general purpose use. A range from 1 ohm to 10M and tolerances of 1% and 5%. Also including zero ohm links.
- Suitable for most applications, including high frequency operation, owing to the short lead structure and low capacitance.
- Seven Package Sizes
- Terminal finish: Matte Sn
- MSL Level 2



Precious metal terminations are screen printed onto a ceramic base and fired. The resistive element is screen printed and fired and the passivation layer added. Each resistor is trimmed to tolerance by laser. The pre-scribed tile is broken into strips, the end plating is fired on and the strips broken into individual components. Final termination is made by electroplating.

### Characteristics – Electrical

|                            | 0201 |      |      | 0402  |      |      | 0603 |      |      | 0805  |      |      |      |      |     |
|----------------------------|------|------|------|-------|------|------|------|------|------|-------|------|------|------|------|-----|
| Rated Power @ 70 °C (W)    | 0.05 |      |      | 0.063 |      |      | 0.1  |      |      | 0.125 |      |      |      |      |     |
| Resistance Range (Ohms)    | Min  | 10   | 1    | 11    | 10   | 1    | 11   | 1    | 101  | 1     | 11   | 1    | 101  | 1    | 11  |
|                            | Max  | 1M0  | 10   | 1M0   | 2M0  | 10   | 3M3  | 100  | 1M0  | 10    | 10M  | 100  | 1M0  | 10   | 10M |
| Tolerance (%)              | 1    | 5    | 5    | 1     | 5    | 5    | 1    | 1    | 5    | 5     | 1    | 1    | 5    | 5    |     |
| Code letter                | F    | J    | J    | F     | J    | J    | F    | F    | J    | J     | F    | F    | F    | J    | J   |
| Selection Series           | E24  | E24  | E24  | E24   | E24  | E24  | E24  | E24  | E24  | E24   | E24  | E24  | E24  | E24  | E24 |
|                            | E96  |      |      | E96   |      |      | E96  |      |      |       | E96  |      |      | E96  |     |
| Temp. Coefficient (ppm/°C) | ±200 | ±400 | ±200 | ±100  | ±400 | ±200 | ±200 | ±100 | ±200 | ±200  | ±200 | ±100 | ±400 | ±200 |     |

|                            | 1206 |      |      | 2010 |      |      | 2512 |      |      |      |      |      |     |
|----------------------------|------|------|------|------|------|------|------|------|------|------|------|------|-----|
| Rated Power @ 70 °C (W)    | 0.25 |      |      | 0.5  |      |      | 1    |      |      |      |      |      |     |
| Resistance Range (Ohms)    | Min  | 1    | 101  | 1    | 11   | 1    | 101  | 1    | 11   | 1    | 101  | 1    | 11  |
|                            | Max  | 100  | 1M0  | 10   | 10M  | 100  | 1M0  | 10   | 10M  | 100  | 1M0  | 10   | 10M |
| Tolerance (%)              | 1    | 1    | 5    | 5    | 1    | 1    | 5    | 5    | 1    | 1    | 5    | 5    |     |
| Code letter                | F    | F    | J    | J    | F    | F    | J    | J    | F    | F    | J    | J    |     |
| Selection Series           | E24  | E24  | E24  | E24  | E24  | E24  | E24  | E24  | E24  | E24  | E24  | E24  |     |
|                            | E96  |      |      | E96  |      |      | E96  |      |      | E96  |      |      |     |
| Temp. Coefficient (ppm/°C) | ±200 | ±100 | ±400 | ±200 | ±200 | ±100 | ±400 | ±200 | ±200 | ±100 | ±400 | ±200 |     |

|                                       | 0201        | 0402 | 0603 | 0805     | 1206 | 2010 | 2512 |
|---------------------------------------|-------------|------|------|----------|------|------|------|
| Working Voltage (V)                   | 25          | 50   | 50   | 150      | 200  | 200  | 200  |
| Max. Overload Voltage (V)             | 50          | 100  | 100  | 300      | 400  | 400  | 400  |
| Operating Temp. Range (°C)            | -55 to +125 |      |      |          |      |      |      |
| Climatic Category (°C)                | 55/125/56   |      |      |          |      |      |      |
| Insulation Resistance Dry Min (Mohms) | 1000        |      |      |          |      |      |      |
| Stability (%)                         | 3           |      |      |          |      |      |      |
| Zerohm (A) Current Max                | 0.5         | 1    | 1    | 2        | 2    | 2    | 2    |
| Resistance Max                        | <50 mOhm    |      |      | <50 mOhm |      |      |      |

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### Dimensions



| Style | L         | W          | t          | a          | b          |
|-------|-----------|------------|------------|------------|------------|
| 0201  | 0.6 ±0.03 | 0.3 ±0.03  | 0.23 ±0.03 | 0.10 ±0.05 | 0.15 ±0.05 |
| 0402  | 1.0 ±0.1  | 0.5 ±0.05  | 0.35 ±0.05 | 0.2 ±0.1   | 0.25 ±0.1  |
| 0603  | 1.6 ±0.1  | 0.8 ±0.15  | 0.45 ±0.1  | 0.3 ±0.2   | 0.3 ±0.1   |
| 0805  | 2.0 ±0.15 | 1.25 ±0.15 | 0.55 ±0.1  | 0.4 ±0.2   | 0.4 ±0.2   |
| 1206  | 3.1 ±0.15 | 1.55 ±0.15 | 0.55 ±0.1  | 0.45 ±0.2  | 0.45 ±0.2  |
| 2010  | 5.0 ±0.1  | 2.5 ±0.15  | 0.55 ±0.1  | 0.6 ±0.25  | 0.5 ±0.2   |
| 2512  | 6.35 ±0.1 | 3.2 ±0.15  | 0.55 ±0.1  | 0.6 ±0.25  | 0.5 ±0.2   |

### Marking Codes - Case Sizes 0805 to 2512

#### IEC 4 Digit Marking

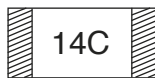
| Resistance   | 100Ω | 2.2KΩ | 10KΩ | 49.9KΩ | 100KΩ |
|--------------|------|-------|------|--------|-------|
| Marking Code | 1000 | 2201  | 1002 | 4992   | 1003  |

### Case Sizes 0603

#### E24 3 Digit Marking - Example: 101=100Ω 102=1KΩ

| E24 | 10 | 11 | 12 | 13 | 15 | 16 | 18 | 20 | 22 | 24 | 27 | 30 |
|-----|----|----|----|----|----|----|----|----|----|----|----|----|
|     | 33 | 36 | 39 | 43 | 47 | 51 | 56 | 62 | 68 | 75 | 82 | 91 |

#### E96 3 Digit Marking - Examples: 14C=13K7Ω, 13C=13K3Ω, 68B=4K99Ω, 68X=49.9Ω



### 0603 E96 Marking Code Table

| Code       | E96             | Code            | E96             | Code            | E96             | Code            | E96             |                 |                  |                  |                  |
|------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|
| 01         | 100             | 25              | 178             | 49              | 316             | 73              | 562             |                 |                  |                  |                  |
| 02         | 102             | 26              | 182             | 50              | 324             | 74              | 576             |                 |                  |                  |                  |
| 03         | 105             | 27              | 187             | 51              | 332             | 75              | 590             |                 |                  |                  |                  |
| 04         | 107             | 28              | 191             | 52              | 340             | 76              | 604             |                 |                  |                  |                  |
| 05         | 110             | 29              | 196             | 53              | 348             | 77              | 619             |                 |                  |                  |                  |
| 06         | 113             | 30              | 200             | 54              | 357             | 78              | 634             |                 |                  |                  |                  |
| 07         | 115             | 31              | 205             | 55              | 365             | 79              | 649             |                 |                  |                  |                  |
| 08         | 118             | 32              | 210             | 56              | 374             | 80              | 665             |                 |                  |                  |                  |
| 09         | 121             | 33              | 215             | 57              | 383             | 81              | 681             |                 |                  |                  |                  |
| 10         | 124             | 34              | 221             | 58              | 392             | 82              | 698             |                 |                  |                  |                  |
| 11         | 127             | 35              | 226             | 59              | 402             | 83              | 715             |                 |                  |                  |                  |
| 12         | 130             | 36              | 232             | 60              | 412             | 84              | 732             |                 |                  |                  |                  |
| 13         | 133             | 37              | 237             | 61              | 422             | 85              | 750             |                 |                  |                  |                  |
| 14         | 137             | 38              | 243             | 62              | 432             | 86              | 768             |                 |                  |                  |                  |
| 15         | 140             | 39              | 249             | 63              | 442             | 87              | 787             |                 |                  |                  |                  |
| 16         | 143             | 40              | 255             | 64              | 453             | 88              | 806             |                 |                  |                  |                  |
| 17         | 147             | 41              | 261             | 65              | 464             | 89              | 825             |                 |                  |                  |                  |
| 18         | 150             | 42              | 267             | 66              | 475             | 90              | 845             |                 |                  |                  |                  |
| 19         | 154             | 43              | 274             | 67              | 487             | 91              | 866             |                 |                  |                  |                  |
| 20         | 158             | 44              | 280             | 68              | 499             | 92              | 887             |                 |                  |                  |                  |
| 21         | 162             | 45              | 287             | 69              | 511             | 93              | 909             |                 |                  |                  |                  |
| 22         | 165             | 46              | 294             | 70              | 523             | 94              | 931             |                 |                  |                  |                  |
| 23         | 169             | 47              | 301             | 71              | 536             | 95              | 953             |                 |                  |                  |                  |
| 24         | 174             | 48              | 309             | 72              | 549             | 96              | 976             |                 |                  |                  |                  |
| Code       | A               | B               | C               | D               | E               | F               | G               | H               | X                | Y                | Z                |
| Multiplier | 10 <sup>0</sup> | 10 <sup>1</sup> | 10 <sup>2</sup> | 10 <sup>3</sup> | 10 <sup>4</sup> | 10 <sup>5</sup> | 10 <sup>6</sup> | 10 <sup>7</sup> | 10 <sup>-1</sup> | 10 <sup>-2</sup> | 10 <sup>-3</sup> |

## Type CRG Series

### Derating Curve



### Mounting

The resistors are suitable for processing on automatic insertion equipment.

### Marking

#### CRG0805, CRG1206, CRG2010, CRG2512

E24 series resistors are marked with a three digit code.

E96 series resistors are marked with a four digit code.

Zerohm components are marked '0'.

#### CRG0603

E24 5% series are marked with a three digit code.

E24 1% series are marked with a three digit code.

E96 series are marked with the international alphanumeric three character code (available on request).

EXCEPT 10, 11, 13, 15, 20 & 75 decades which are marked as the E24 series.

CRG0201 & CRG0402 series unmarked.

### Performance Characteristics

The evaluation of the performance characteristics is carried out with reference to IECQ specifications QC 400 000 and QC 400 100.

| TEST REF | Long Term Tests $\pm(3\% + 0.1 \text{ ohm})$   |
|----------|--|
| 4.23     | Climatic sequence                              |
| 4.24     | Damp heat, steady state                        |
| 4.25.1   | Endurance at 70 °C                             |
| 4.25.3   | Endurance at 125 °C                            |
| TEST REF | Short Term Tests $\pm(1\% + 0.05 \text{ ohm})$ |
| 4.13     | Overload                                       |
| 4.32     | Adhesion                                       |
| 4.33     | Bond strength of end face plating              |
| 4.19     | Rapid change of temperature                    |
| 4.18     | Resistance to soldering heat                   |

### Storage

Unopened reels should be stored within a temperature range of +5 °C to +25 °C, separated from any dust, chemicals and solvent based materials. Non-adherence to this procedure could effect the solderability of this product.

### How to Order

| CRG                            | 0603   | J                              | 1K0   |
|--------------------------------|--|--------------------------------|---|
| <b>Common Part</b>             | <b>Size</b>                                  | <b>Tolerance</b>               | <b>Resistance Value</b>   |
| CRG - Thick Film Chip Resistor | 0201<br>0402<br>0603<br>0805<br>1206<br>2512 | F - $\pm 1\%$<br>J - $\pm 5\%$ | 1 ohm<br>(1 ohm) 1R0<br>1K ohm<br>(1000 ohms) 1K<br>100K ohm<br>(100000 ohms) 100K<br>1M ohm<br>(1000000 ohms) 1M |

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