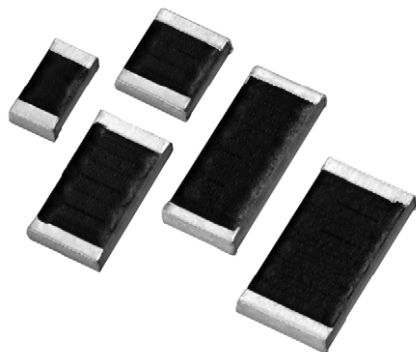


## Thick Film Chip Resistors, Medium Voltage



### FEATURES

- AEC-Q200 qualified
- Voltages up to 1415 V
- Automatic placement capability
- Termination style: 3-sided wraparound termination or single termination flip chip available
- Tape and reel packaging available
- Internationally standardized sizes, custom sizes available
- Termination material: solder-coated nickel barrier or solder coated non-magnetic terminations standard
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS\***  
Available  
**HALOGEN  
FREE**

### Note

\* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details

### STANDARD ELECTRICAL SPECIFICATIONS

| GLOBAL MODEL | CASE SIZE | POWER RATING<br>$P_{70^{\circ}\text{C}}$<br>W | MAX. WORKING VOLTAGE <sup>(2)</sup><br>V | RESISTANCE RANGE <sup>(1)</sup><br>$\Omega$ | TOLERANCE<br>$\pm \%$ | TEMPERATURE COEFFICIENT <sup>(3)</sup><br>$\pm \text{ppm}/^{\circ}\text{C}$ |
|--------------|-----------|-----------------------------------------------|------------------------------------------|---------------------------------------------|-----------------------|-----------------------------------------------------------------------------|
| CRMA1206     | 1206      | 0.30                                          | 550                                      | 150 to 15M                                  | 0.5, 1, 2, 5, 10      | 100                                                                         |
| CRMA1210     | 1210      | 0.35                                          | 650                                      | 300 to 20M                                  | 0.5, 1, 2, 5, 10      | 100                                                                         |
| CRMA2010     | 2010      | 0.50                                          | 895                                      | 500 to 40M                                  | 0.5, 1, 2, 5, 10      | 100                                                                         |
| CRMA2510     | 2510      | 0.80                                          | 1265                                     | 1K to 60M                                   | 0.5, 1, 2, 5, 10      | 100                                                                         |
| CRMA2512     | 2512      | 1.0                                           | 1415                                     | 1K to 75M                                   | 0.5, 1, 2, 5, 10      | 100                                                                         |

### Notes

- For non-standard sizes, lower values or higher power rating requirement, contact factory
- <sup>(1)</sup> Resistance values calibrated at 10 V<sub>DC</sub>. Calibration at other voltages available upon request
- <sup>(2)</sup> Continuous working voltage shall be  $\sqrt{P \times R}$  or Maximum Working Voltage, whichever is less
- <sup>(3)</sup> Reference only: Not for all values specified. Consult factory for your size and value

### TECHNICAL SPECIFICATIONS

| PARAMETER                  | UNIT           | CRMA1206       | CRMA1210       | CRMA2010       | CRMA2510       | CRMA2512       |
|----------------------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Rated dissipation at 70 °C | W              | 0.30           | 0.35           | 0.50           | 0.80           | 1.0            |
| Limiting element voltage   | V <sub>≡</sub> | 550            | 650            | 895            | 1265           | 1415           |
| Insulation resistance      | $\Omega$       | $\geq 10^{11}$ | $\geq 10^{11}$ | $\geq 10^{11}$ | $\geq 10^{11}$ | $\geq 10^{11}$ |
| Category temperature range | °C             | -55 to +155    | -55 to +155    | -55 to +155    | -55 to +155    | -55 to +155    |
| Weight/1000 (typical)      | g              | 12.2           | 19.6           | 32.2           | 39.8           | 49.7           |
| VCR (typical)              | ppm/V          | < 2            | < 2            | < 2            | < 2            | < 2            |

## GLOBAL PART NUMBER INFORMATION

Global Part Numbering: CRMA1210AF1K00FLET (preferred part number format)

| GLOBAL MODEL | SIZE                                 | TERMINAL STYLE              | TERMINAL MATERIAL                      | RESISTANCE VALUE                                                                                                          | TOLERANCE                                                                            | TCR         | SOLDER TERMINATION           | PACKAGING                                                                                                                       |
|--------------|--------------------------------------|-----------------------------|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-------------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| CRMA         | 1206<br>1210<br>2010<br>2510<br>2512 | A = 3-sided<br>B = top only | F = nickel barrier<br>G = non-magnetic | R = $\Omega$<br>K = k $\Omega$<br>M = M $\Omega$<br>110R = 110 $\Omega$<br>49K9 = 49.9 k $\Omega$<br>10M0 = 10 M $\Omega$ | D = $\pm 0.5\%$<br>F = $\pm 1\%$<br>G = $\pm 2\%$<br>J = $\pm 5\%$<br>K = $\pm 10\%$ | K = 100 ppm | E = Sn100<br>T = Sn90 / Pb10 | B = bulk<br>F = T / R (full reel)<br>1 = T / R (1000 pcs)<br>5 = T / R (500 pcs)<br>T = T / R (250 pcs min.)<br>W = waffle tray |

### Note

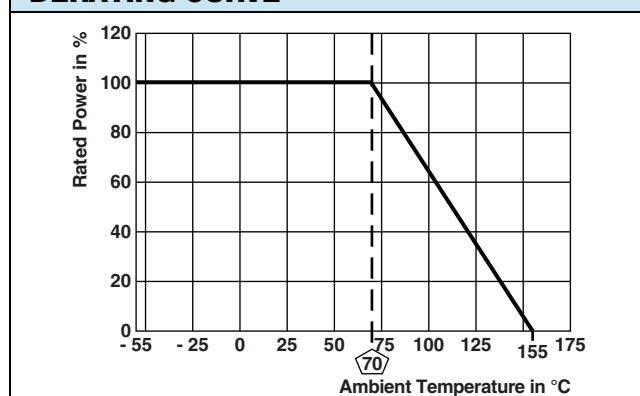
- For additional information on packaging, refer to the Surface Mount Resistor Packaging document ([www.vishay.com/doc?31543](http://www.vishay.com/doc?31543))

## DIMENSIONS in inches (millimeters)

| TERMINATION STYLE A<br>(3-SIDED WRAPAROUND) | TERMINATION STYLE B<br>(TOP CONDUCTOR ONLY) | MODEL    | LENGTH<br>(L)                          | WIDTH<br>(W)                           | THICKNESS<br>(T)                       |
|---------------------------------------------|---------------------------------------------|----------|----------------------------------------|----------------------------------------|----------------------------------------|
|                                             |                                             | CRMA1206 | 0.125 $\pm$ 0.006<br>(3.18 $\pm$ 0.15) | 0.063 $\pm$ 0.006<br>(1.60 $\pm$ 0.15) | 0.025 $\pm$ 0.004<br>(0.64 $\pm$ 0.10) |
|                                             |                                             | CRMA1210 | 0.125 $\pm$ 0.006<br>(3.18 $\pm$ 0.15) | 0.100 $\pm$ 0.006<br>(2.54 $\pm$ 0.15) | 0.025 $\pm$ 0.004<br>(0.64 $\pm$ 0.10) |
|                                             |                                             | CRMA2010 | 0.200 $\pm$ 0.006<br>(5.08 $\pm$ 0.15) | 0.100 $\pm$ 0.006<br>(2.54 $\pm$ 0.15) | 0.025 $\pm$ 0.004<br>(0.64 $\pm$ 0.10) |
|                                             |                                             | CRMA2510 | 0.250 $\pm$ 0.006<br>(6.35 $\pm$ 0.15) | 0.100 $\pm$ 0.006<br>(2.54 $\pm$ 0.15) | 0.025 $\pm$ 0.004<br>(0.64 $\pm$ 0.10) |
|                                             |                                             | CRMA2512 | 0.250 $\pm$ 0.006<br>(6.35 $\pm$ 0.15) | 0.126 $\pm$ 0.006<br>(3.20 $\pm$ 0.15) | 0.025 $\pm$ 0.004<br>(0.64 $\pm$ 0.10) |

| TYPE       | TERMINATION MATERIAL | TERMINATION STYLE    | TERMINATION STYLE / MATERIAL CODE | SOLDER TERMINATION CODE |
|------------|----------------------|----------------------|-----------------------------------|-------------------------|
| Solderable | Nickel barrier       | 3-sided (wraparound) | AF                                | E or T                  |
|            |                      | Top only (flip chip) | BF                                |                         |
| Solderable | Non-magnetic         | 3-sided (wraparound) | AG                                | E or T                  |
|            |                      | Top only (flip chip) | BG                                |                         |

## DERATING CURVE



## MATERIAL SPECIFICATIONS

|                   |                                               |
|-------------------|-----------------------------------------------|
| Resistive element | Ruthenium oxide                               |
| Encapsulation     | Epoxy                                         |
| Substrate         | 96 % alumina                                  |
| Termination       | Solder-coated nickel barrier                  |
| Solder finish     | Pure tin or tin / lead solder alloys standard |



| PERFORMANCE               |                                                                   |                                  |
|---------------------------|-------------------------------------------------------------------|----------------------------------|
| TEST                      | CONDITIONS OF TEST                                                | TEST RESULTS (TYPICAL TEST LOTS) |
| Thermal shock             | -55 °C to +150 °C, 1000 cycles,<br>15 min at each extreme         | $\pm (1.0 \% + 0.05 \Omega)$     |
| High temperature exposure | 1000 h at +170 °C                                                 | $\pm (1.0 \% + 0.05 \Omega)$     |
| Bias humidity             | +85 °C, 85 % RH, 10 % bias, 1000 h                                | $\pm (1.0 \% + 0.0005 \Omega)$   |
| Mechanical shock          | 100 g's for 6 ms, 5 pulses                                        | $\pm (0.5 \% + 0.0005 \Omega)$   |
| Vibration                 | Frequency varied 10 Hz to 2000 Hz in 1 min,<br>3 directions, 12 h | $\pm (0.5 \% + 0.0005 \Omega)$   |
| Load life                 | 1000 h at rated power, +70 °C,<br>1.5 h "ON", 0.5 h "OFF"         | $\pm (1.0 \% + 0.0005 \Omega)$   |
| Resistance to solder heat | +260 °C solder, 10 s to 12 s dwell,<br>25 mm/s emergence          | $\pm (1.0 \% + 0.0005 \Omega)$   |
| Moisture resistance       | MIL-STD-202, method 106, 0 % power,<br>7a and 7b not required     | $\pm (1.0 \% + 0.0005 \Omega)$   |



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