

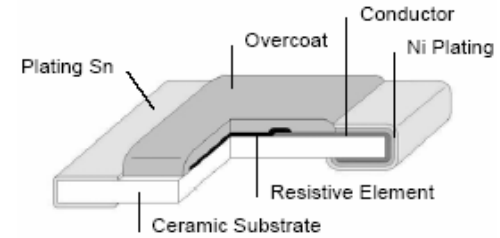
RESISTOR Material Composition

The contents of this specification may change without notice 5/20/08



CR, CJ Series - Thick Film Chip Resistor (non precision type)

This statement pertains to the following directive: 2002/95/EC of the European Parliament and of the Council of the European Union of January 27, 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment regarding Article 4 and its subsequent annex on the exemption of lead in glass. No. 5 in the annex states that lead in glass of cathode ray tubes, electronic components and fluorescent tubes are exempt from RoHS requirements. Therefore any lead oxide in glass of any size resistor is exempt and all resistors meet RoHS requirements.



| CAS no. | Material | Substance | 0201 | | 0402 | | 0603 | | 0805 | | 1206 | | 1210 | | 2010 | | 2512 | |
|--|--------------------------|-----------|---------|--------|---------|--------|---------|--------|---------|--------|---------|--------|---------|--------|---------|--------|---------|--------|
| | | | Mass mg | % | Mass mg | % | Mass mg | % | Mass mg | % | Mass mg | % | Mass mg | % | Mass mg | % | Mass mg | % |
| 1344-28-1 | Ceramic Substrate | Al2O3 | 0.1349 | 80.59% | 0.4109 | 80.61% | 1.5952 | 83.02% | 3.6667 | 86.04% | 7.4778 | 87.54% | 12.4631 | 84.80% | 19.5421 | 87.33% | 32.4533 | 86.64% |
| 14808-82-7 | | SiO2 | 0.0056 | 3.36% | 0.0171 | 3.36% | 0.0665 | 3.46% | 0.1528 | 3.58% | 0.3116 | 3.65% | 0.5193 | 3.53% | 0.8143 | 3.64% | 1.3522 | 3.61% |
| 7440-22-4 | Conductor Layer (Bottom) | Ag | 0.0017 | 1.05% | 0.0053 | 1.05% | 0.0121 | 0.63% | 0.0233 | 0.55% | 0.0266 | 0.31% | 0.0581 | 0.40% | 0.0581 | 0.26% | 0.0775 | 0.21% |
| -- | | Glass | 0.0001 | 0.06% | 0.0003 | 0.06% | 0.0006 | 0.03% | 0.0012 | 0.03% | 0.0014 | 0.02% | 0.0031 | 0.02% | 0.0031 | 0.01% | 0.0041 | 0.01% |
| 7440-22-4 | Conductor Layer (Top) | Ag | 0.0013 | 0.80% | 0.0041 | 0.80% | 0.0252 | 1.31% | 0.0456 | 1.07% | 0.0919 | 1.08% | 0.1801 | 1.23% | 0.2203 | 0.98% | 0.3416 | 0.91% |
| 7440-05-03 | | Pd | 0.0000 | 0.01% | 0.0001 | 0.01% | 0.0003 | 0.02% | 0.0006 | 0.01% | 0.0012 | 0.01% | 0.0023 | 0.02% | 0.0028 | 0.01% | 0.0043 | 0.01% |
| -- | | Glass | 0.0003 | 0.20% | 0.0010 | 0.20% | 0.0064 | 0.33% | 0.0116 | 0.27% | 0.0233 | 0.27% | 0.0456 | 0.31% | 0.0558 | 0.25% | 0.0865 | 0.23% |
| 12036-10-1 | Resistive Element | RuO2 | 0.0004 | 0.23% | 0.0012 | 0.23% | 0.0033 | 0.17% | 0.0049 | 0.11% | 0.0109 | 0.13% | 0.0227 | 0.15% | 0.0373 | 0.17% | 0.0653 | 0.17% |
| 7440-22-4 | | Ag | 0.0006 | 0.37% | 0.0019 | 0.37% | 0.0053 | 0.27% | 0.0078 | 0.18% | 0.0174 | 0.20% | 0.0363 | 0.25% | 0.0596 | 0.27% | 0.1045 | 0.28% |
| 1317-36-8 | | Pb | 0.0002 | 0.14% | 0.0007 | 0.14% | 0.0020 | 0.10% | 0.0029 | 0.07% | 0.0065 | 0.08% | 0.0136 | 0.09% | 0.0224 | 0.10% | 0.0392 | 0.10% |
| -- | | Glass | 0.0003 | 0.18% | 0.0009 | 0.18% | 0.0026 | 0.14% | 0.0039 | 0.09% | 0.0087 | 0.10% | 0.0182 | 0.12% | 0.0298 | 0.13% | 0.0523 | 0.14% |
| 25068-38-6 | Over-Coating | Epoxy | 0.0034 | 2.05% | 0.0105 | 2.05% | 0.0304 | 1.58% | 0.0665 | 1.56% | 0.1121 | 1.31% | 0.2100 | 1.43% | 0.3943 | 1.76% | 0.6565 | 1.75% |
| 25068-38-6 | Marking | Epoxy | 0.0000 | 0.00% | 0.0000 | 0.00% | 0.0031 | 0.16% | 0.0036 | 0.08% | 0.0115 | 0.13% | 0.0115 | 0.08% | 0.0244 | 0.11% | 0.0421 | 0.11% |
| 7440-02-0 | End Terminal | Ni | 0.0005 | 0.29% | 0.0015 | 0.29% | 0.0020 | 0.10% | 0.0027 | 0.06% | 0.0038 | 0.04% | 0.0076 | 0.05% | 0.0074 | 0.03% | 0.0095 | 0.03% |
| 1308-38-9 | | Cr | 0.0001 | 0.07% | 0.0004 | 0.07% | 0.0005 | 0.03% | 0.0007 | 0.02% | 0.0010 | 0.01% | 0.0019 | 0.01% | 0.0018 | 0.01% | 0.0024 | 0.01% |
| 7440-02-0 | Nickel Plating | Ni | 0.0094 | 5.60% | 0.0285 | 5.60% | 0.0877 | 4.57% | 0.1411 | 3.31% | 0.2310 | 2.70% | 0.5835 | 3.97% | 0.5835 | 2.61% | 1.1447 | 3.06% |
| 7440-31-5 | Tin Plating | Sn | 0.0084 | 4.99% | 0.0255 | 4.99% | 0.0783 | 4.07% | 0.1259 | 2.95% | 0.2060 | 2.41% | 0.5205 | 3.54% | 0.5205 | 2.33% | 1.0213 | 2.73% |
| All of the above are approximate values by the component parts of the material | | | 0.1674 | 100 | 0.5098 | 100 | 1.9216 | 100 | 4.2617 | 100 | 8.5426 | 100 | 14.6973 | 100 | 22.3774 | 100 | 37.4572 | 100 |

* The Tin finished as Matte Tin through the Electro Deposited Process.



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