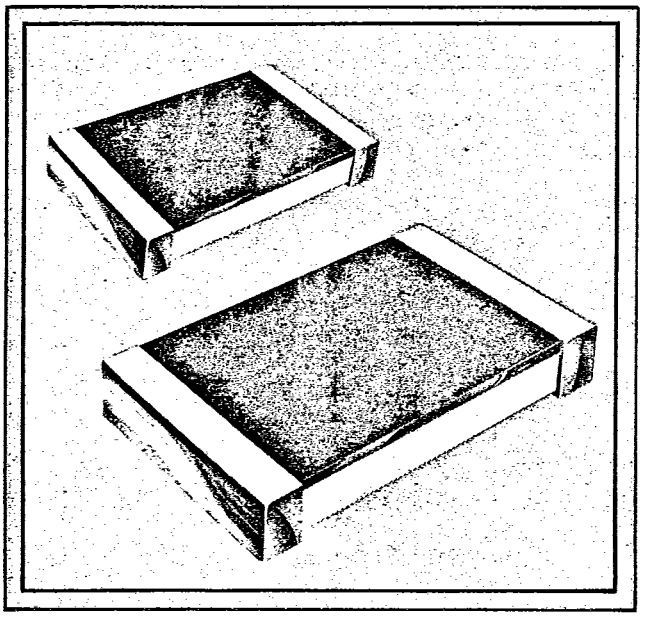
# Types AC,BC Thick Film Chip Resistors

Type AC – 1/10 Watt at 70°C
Type BC – 1/8 Watt at 70°C
±5%, 300 PPM/°C
±2%, ±5%, 200 PPM/°C
±1%, 100 PPM/°C
Zero Ohm Jumper



## FEATURES

- Standard Sizes: AC – 2.10 x 1.25 x 0.5 mm (0805)
  BC – 3.20 x 1.60 x 0.6 mm (1206)
- Thick Film Resistance Element
- High Purity Alumina Substrate
- Glass Passivated
- Laser Trimmed
- Tight TCR
- Wrap-Around Termination
- Inner Electrode Protection
- Wave or Reflow Solderable
- Surface Mountable
- Nickel Barrier Construction

## Outstanding Characteristics

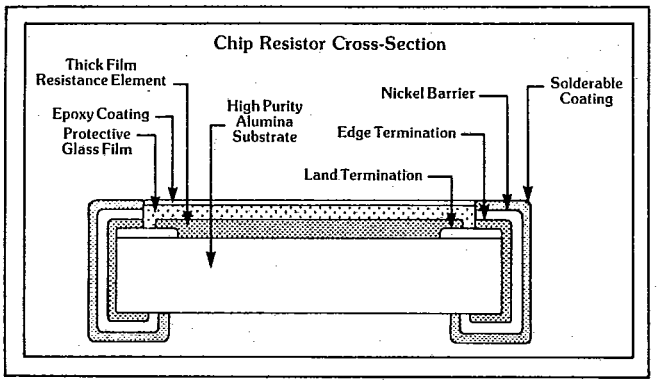
Small standard size — Utilizes the internationally standardized 3.20 x 1.60 x 0.6 mm and 2.10 x 1.25 x 0.5 mm sizes. Compatible with automatic placement equipment for surface mount assemblies and hybrid circuits.

Proven technology — Thick film resistance element on high purity alumina substrate. Over 20 years of technological experience in ink formulation and thick film resistor manufacturing.

Precision performance — Excellent performance characteristics provided by the thick film resistance material, resulting in tight tolerance, tight TCR and outstanding environmental performance.

Cost effective — Enables size reduction, weight reduction, reduced total material cost and reduced assembly cost.

High reliability — Automated manufacturing and process control, 200% electrical inspection and packaging integrity assure high reliability.



## Standard Specifications

Resistor tolerance — ±1%, ±2% or ±5%.

Temperature coefficient of resistance – ±100 ppm/°C, ±200 ppm/°C or ±300 ppm°C, ±50 ppm/°C available on ±1% tolerance.

Operating temperature range – −55°C to ±125°C.

| Power dissipation ratings – Chip resistor type designation | Power dissipation rating up to 70°C ambient [1] |
|---|---|
| AC – 2.10 × 1.25 mm | 100mW |
| BC – 3.20 × 1.60 mm | 125mW [2] |

[1] At 70°C power derates linearly from full rated power to 0 wattage at 125°C.

[2] Optional 1/4 watt power rating permissible when resistor temperature is maintained at less than 150°C and the substrate temperature at the chip base is less than 120°C.

Nominal resistance ranges —

5% – 10 ohms to 2.2 megohms, E24 series.
2% – 22 ohms to 2.2 megohms, E24 series.
1% – 49.9 ohms to 2.21 megohms, E96 series.

Zero ohm jumper – .05 ohms max.

Rated continuous working voltage (RCWV) — Rated continuous working voltage (RCWV) based on nominal resistance (R) in ohms, is $\sqrt{\text{rated power} \times R}$ or 150 volts for Type AC and 200 volts for Type BC, whichever is less.

User-trimmable option — Allen-Bradley chip resistors can be designed to permit the user to actively calibrate the resistor in a system. Resistors can be laser trimmed under actual circuit operating conditions, providing active system adjustment capability.

## Standard Resistance Values

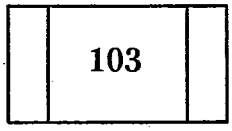
**Series E24 – 5%**

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

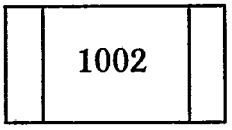
**Series E96 – 1%**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 10.0 | 13.0 | 16.9 | 22.1 | 28.7 | 37.4 | 48.7 | 63.4 | 82.5 |
| 10.2 | 13.3 | 17.4 | 22.6 | 29.4 | 38.3 | 49.9 | 64.9 | 84.5 |
| 10.5 | 13.7 | 17.8 | 23.2 | 30.1 | 39.2 | 51.1 | 66.5 | 86.6 |
| 10.7 | 14.0 | 18.2 | 23.7 | 30.9 | 40.2 | 52.3 | 68.1 | 88.7 |
| 11.0 | 14.3 | 18.7 | 24.3 | 31.6 | 41.2 | 53.6 | 69.8 | 90.9 |
| 11.3 | 14.7 | 19.1 | 24.9 | 32.4 | 42.2 | 54.9 | 71.5 | 93.1 |
| 11.5 | 15.0 | 19.6 | 25.5 | 33.2 | 43.2 | 56.2 | 73.2 | 95.3 |
| 11.8 | 15.4 | 20.0 | 26.1 | 34.0 | 44.2 | 57.6 | 75.0 | 97.6 |
| 12.1 | 15.8 | 20.5 | 26.7 | 34.8 | 45.3 | 59.0 | 76.8 | |
| 12.4 | 16.2 | 21.0 | 27.4 | 35.7 | 46.4 | 60.4 | 78.7 | |
| 12.7 | 16.5 | 21.5 | 28.0 | 36.5 | 47.5 | 61.9 | 80.6 | |

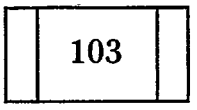
## Optional Marking Diagrams




Type BC
5% marking




Type BC
1% marking




Type AC
5% marking

Type AC
1% marking
Consult Factory

Marking – Standard marking is no marking on the chip itself. Marked chips are available. All other required marking is on the unit package.

Marking explanation – 5% tolerance: 3 digit, first two digits significant, third digit is number of zeros. Letter R is decimal point.

Packaging – Standard packaging is 8 mm tape reel per EIA 481. Standard quantities are – Paper tape: 5,000 or 10,000 per reel. Embossed tape: 4,000 or 8,000 per reel. Bulk: 2,500 per plastic bag.

1% tolerance: Four digit, first three digits significant, third digit is number of zeros. Letter R is decimal point.

## Performance Characteristics

| TYPE | | BCD BCK BCH | BCR/ACR BCA/ACA | BCX/ACX |
|---|---|---|---|---|
| Resistance Range (by Type) | | 10 Ohms to 2.2 Megohms<br>49.9 Ohms to 2.2 Megohms<br>499 Ohms to 499K Ohms | 100 Ohms to 1 Megohm<br>" | 10 Ohms to 2.2 Megohms |
| PERFORMANCE TEST | TEST METHOD | REQUIREMENT (MAX LIMIT) | | |
| Temperature Coefficient (by Type) | MIL-STD-202F, Method 304<br>-55°C to +125°C | ±200 ppm/°C<br>±100 ppm/°C<br>±50 ppm/°C | ±200 ppm/°C<br>±100 ppm/°C | ±300 ppm/°C |
| Thermal Shock | MIL-STD-202F, Method 107<br>5 cycles. –55°C to +125°C | ±0.5% max. | ±0.5% max. | ±1.0% max. |
| Low Temperature Operation | MIL-R-55342C, Para. 4.7.4<br>One hour at –55°C followed by 45 minutes RCWV | ±0.5% max. | ±0.5% max. | ±0.5% max. |
| Short Time Overload | MIL-R-55342C, Para. 4.7.5<br>2.5 times RCWV for 5 seconds. 400 volt max. | ±0.5% max. | ±1.0% max. | ±1.0% max. |
| High Temperature Exposure | MIL-R-55342C, Para. 4.7.6<br>125°C for 100 hours | ±1.0% max. | ±1.0% max. | ±2.0% max. |
| Resistance to Bonding Exposure | MIL-R-55342C, Para. 4.7.7<br>Soldered to test board at 260°C for 10 seconds | ±0.25% max. | ±0.5% max. | ±1.0% max. |
| Moisture Resistance | MIL-STD-202F, Method 106<br>10 cycles. Total 240 hours | ±0.5% max. | ±1% max. | ±2.0% max. |
| Life | MIL-STD-202F, Method 108A<br>2000 hours at 70°C. RCWV intermittent | ±1.0% max. | ±2.0% max. | ±3.0% max. |
| Solderability | MIL-STD-202F, Method 208<br>230°C for 5 seconds | 95% min. coverage | 95% min. coverage | 95% min. coverage |
| Terminal Adhesion | MIL-R-55342C, Para. 4.7.12<br>15 gram pull for 30 seconds | 15 grams min. | 15 grams min. | 15 grams min. |
| Terminal Strength, Push | 1.2 Kg push for 60 seconds from underside of mounted unit | ±1.0% max. | ±1.0% max. | ±1.0% max. |
| Bending | Unit mounted in center of 90 mm board length, deflected 5 mm in either direction for 10 seconds | ±1.0% max. | ±1.0% max. | ±1.0% max. |

**Note:** All measurements to be made in accordance with the general requirements of MIL-R-55342C, unless otherwise noted. All performance limits are understood as reading ± (x +0.05 ohms). For tests requiring mounted units, the substrate shall be G-10 epoxy board, 0.062 inches thick, or equivalent. Test mounting pads shall be 1.0 mm wide, spaced 1.75 mm apart, with substrate at least 4 times the resistor area for each test unit.

## Explanation of Part Numbers

[5] B C D 1 0 0 3 J T M

**Type**
AC (0805)
BC (1206)

**Characteristic**
A = ±100 ppm/°C
D = ±200 ppm/°C
H = ± 50 ppm/°C [3]
K = ±100 ppm/°C
R = ±200 ppm/°C
X = ±300 ppm/°C

**Resistance Value**
1st three digits are significant. 4th digit is number of zeros following. Letter R is decimal point

**Tolerance**
J = ±5%
G = ±2%
F = ±1%
D = ±.5%

**Packaging Codes**
T = Paper tape, 5,000 pieces
R = Paper tape, 10,000 pieces
K = Embossed tape, 4,000 pieces
W = Embossed tape, 8,000 pieces
B = Bulk, 2,500 pieces

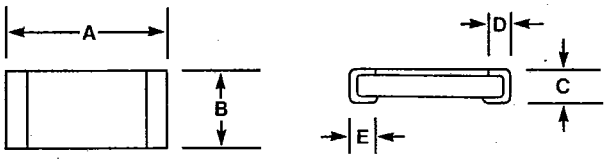
**Chip Markings**
For marked chips add M to the part number [4]

[3] 1% Type BCH Only [4] Not Available Type BCH [5] Zero Ohm Jumper: BCD0000JXX

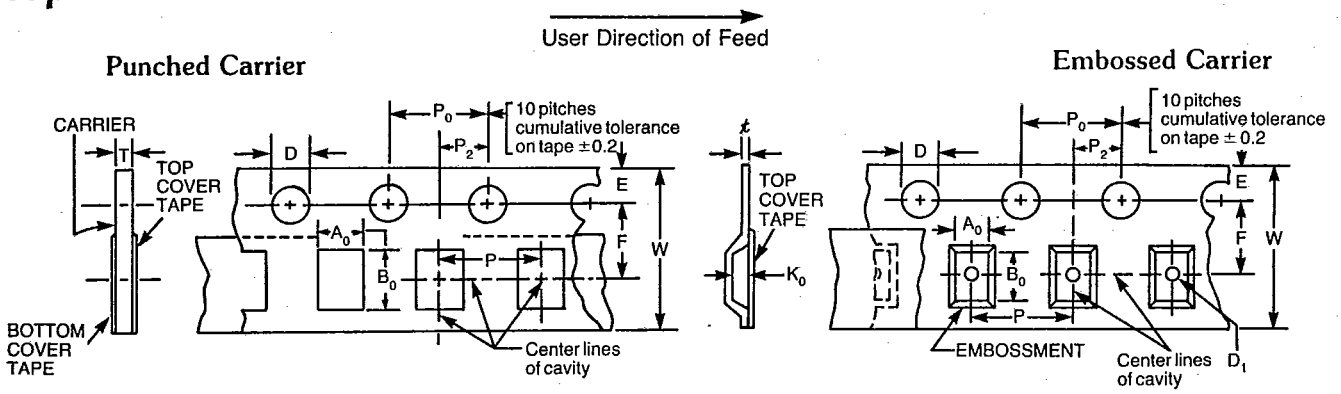
# DIMENSIONS

## Chip

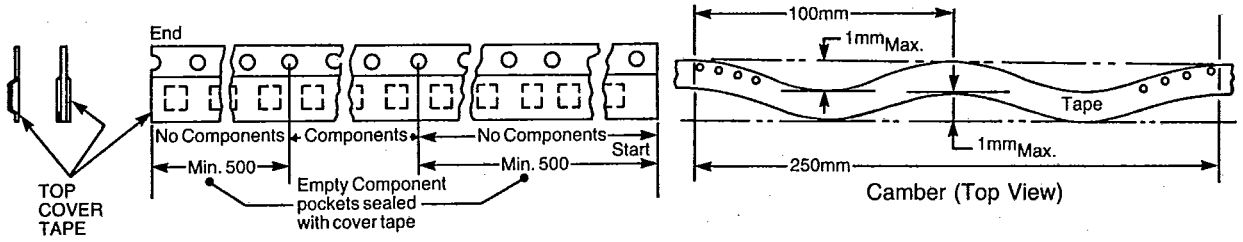
| Dimension | A | B | C | D | E |
|---|---|---|---|---|---|
| Type AC | 2.1±.15 | 1.25±.15 | .5±.15 | .38±.13 | .38±.13 |
| Type BC | 3.2±.15 | 1.6±.15 | .6±.15 | .38±.13 | .38±.13 |

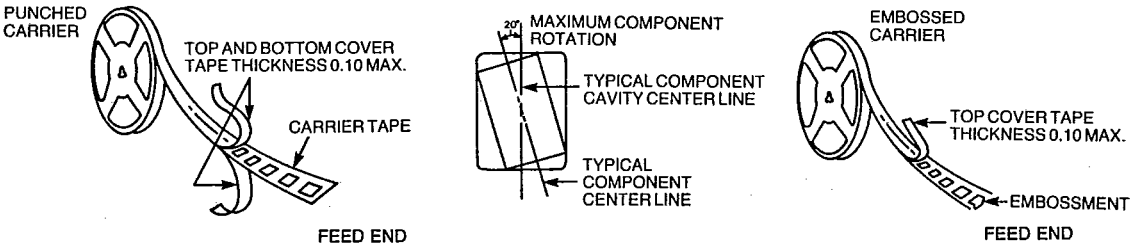



## Tape




| Dimension | W | F | E | $P, P_0$ | $P_2$ | D | $D_1$ MIN | $A_0$ | $B_0$ | $K_0$ | T | t MIN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type AC | 8.0±.3 | 3.5±.05 | 1.75±.05 | 4.0±.10 | 2.0±.05 | $1.5^{+.10}_{-.0}$ | 1.0 | 1.45–1.60 | 2.30–2.45 | .70–.85 | .70–.85 | .40 |
| Type BC | 8.0±.3 | 3.5±.05 | 1.75±.05 | 4.0±.10 | 2.0±.05 | $1.5^{+.10}_{-.0}$ | 1.0 | 1.80–1.95 | 3.40–3.55 | .80–.95 | .80–.95 | .40 |




## Reel

| "A" Maximum | Component/Reel | |
|---|---|---|
| | Paper | Embossed |
| 178 mm | 5,000 | 4,000 |
| 254 mm | 10,000 | 8,000 |

**All dimensions in millimeters.**