

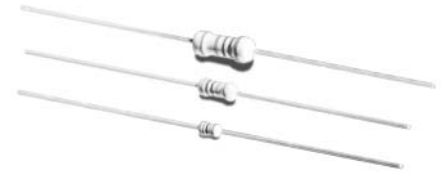


Metal Film Fixed Resistors (RoHS Compliant)

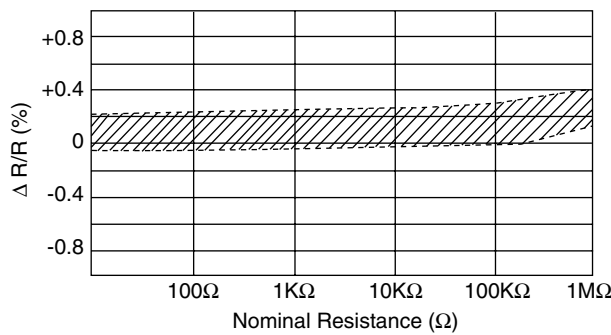
MF-RC Series

FEATURES

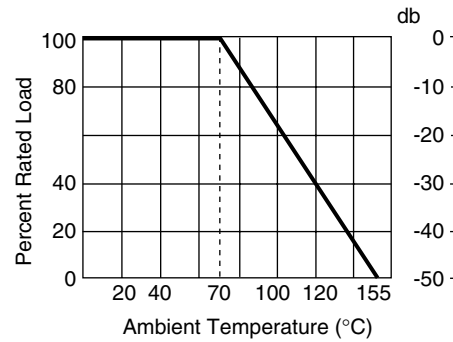
- Temperature Range: -55°C ~ +155°C
- ±1% tolerance
- Epoxy coated miniature resistors
- Nickel chromium ceramic substrate
- Alloy coated leads
- Welded end caps
- EIA standard color coding



LOAD LIFE



DERATING CURVE

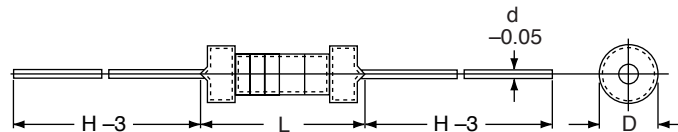


PART NUMBERING SYSTEM



| | |
|--------------|---------------|
| Code: | Package: |
| | Bulk |
| REEL | Tape and Reel |
| AP | Ammo Pack |

SERIES, WATTAGE, SIZE, VOLTAGE, DIMENSIONS, AND AVAILABLE PACKAGING



| Series | Watts | Standard Range of Values (Ω) | Voltage (max.) | | Dimensions (mm) | | | | Standard Quantities Available | | |
|--------|-------|------------------------------|----------------|------|-----------------|--------|----|------|-------------------------------|---------------|-----------|
| | | | W.V. | O.V. | L max. | D max. | H | d | Bulk | Tape and Reel | Ammo Pack |
| 270 | 1/8 | 1~10M | 200 | 400 | 3.5 | 1.85 | 28 | 0.45 | 1,000 | 5,000 | 2,000 |
| 271 | 1/4 | 1~10M | 250 | 500 | 6.8 | 2.5 | 28 | 0.54 | 1,000 | 5,000 | 1,000 |
| 273 | 1/2 | 1~10M | 350 | 700 | 10 | 3.5 | 28 | 0.54 | 1,000 | 3,000 | 1,000 |





Metal Film Fixed Resistors (RoHS Compliant)

MF-RC Series

STANDARD VALUES (Ω)

| | | | | | | | | | | | | | | | | | | | | | |
|------|------|------|------|------|-----|-----|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|
| 10 | 18 | 30.1 | 51 | 84.5 | 154 | 267 | 432 | 715 | 1.27K | 2.26K | 3.83K | 6.49K | 11.3K | 20K | 33.6K | 56K | 95.3K | 174K | 294K | 487K | 845K |
| 10.2 | 18.2 | 30.9 | 51.1 | 86.6 | 158 | 270 | 442 | 732 | 1.3K | 2.32K | 3.9K | 6.65K | 11.5K | 20.5K | 34K | 56.2K | 97.6K | 178K | 300K | 499K | 866K |
| 10.5 | 18.7 | 31.6 | 52.3 | 88.7 | 160 | 274 | 453 | 750 | 1.33K | 2.37K | 3.92K | 6.8K | 11.8K | 21K | 34.8K | 57.6K | 100K | 180K | 301K | 511K | 887K |
| 10.7 | 19.1 | 32.4 | 53.6 | 90.9 | 162 | 280 | 464 | 768 | 1.37K | 2.4K | 4.02K | 6.81K | 12K | 21.5K | 35.7K | 59K | 102K | 182K | 309K | 523K | 909K |
| 11 | 19.6 | 33 | 54.9 | 91 | 165 | 287 | 470 | 787 | 1.4K | 2.43K | 4.12K | 6.98K | 12.1K | 22K | 36K | 60.4K | 105K | 187K | 316K | 536K | 910K |
| 11.3 | 20 | 33.2 | 56 | 93.1 | 169 | 294 | 475 | 806 | 1.43K | 2.49K | 4.22K | 7.15K | 12.4K | 22.1K | 36.5K | 61.9K | 107K | 191K | 324K | 549K | 931K |
| 11.5 | 20.5 | 34 | 56.2 | 95.3 | 174 | 300 | 487 | 820 | 1.47K | 2.55K | 4.32K | 7.32K | 12.7K | 22.6K | 37.4K | 62K | 110K | 192K | 330K | 560K | 953K |
| 11.8 | 21 | 34.8 | 57.6 | 97.6 | 178 | 301 | 499 | 825 | 1.5K | 2.61K | 4.42K | 7.5K | 13K | 23.2K | 38.3K | 63.4K | 113K | 196K | 332K | 562K | 976K |
| 12 | 21.5 | 35.7 | 59 | 100 | 180 | 309 | 510 | 845 | 1.54K | 2.67K | 4.53K | 7.68K | 13.3K | 23.7K | 39K | 64.9K | 115K | 200K | 340K | 576K | 1.0M |
| 12.1 | 22 | 36 | 60.4 | 102 | 182 | 316 | 511 | 866 | 1.58K | 2.7K | 4.64K | 7.87K | 13.7K | 24K | 39.2K | 66.5K | 118K | 205K | 348K | 590K | 1.5M |
| 12.4 | 22.1 | 36.5 | 61.9 | 105 | 187 | 324 | 523 | 887 | 1.6K | 2.74K | 4.7K | 8.06K | 14K | 24.3K | 40.2K | 68K | 120K | 210K | 357K | 604K | 2.2M |
| 12.7 | 22.6 | 37.4 | 62 | 107 | 191 | 330 | 536 | 909 | 1.62K | 2.8K | 4.75K | 8.2K | 14.3K | 24.9K | 41.2K | 68.1K | 121K | 215K | 360K | 619K | |
| 13 | 23.2 | 38.3 | 63.4 | 110 | 196 | 332 | 549 | 910 | 1.65K | 2.87K | 4.87K | 8.25K | 14.7K | 25.5K | 42.2K | 69.8K | 124K | 220K | 365K | 620K | |
| 13.3 | 23.7 | 39 | 64.9 | 113 | 200 | 340 | 560 | 931 | 1.69K | 2.94K | 4.99K | 8.45K | 15K | 26.1K | 43K | 71.5K | 127K | 221K | 374K | 634K | |
| 13.7 | 24 | 39.2 | 66.5 | 115 | 205 | 348 | 562 | 953 | 1.74K | 3.0K | 5.1K | 8.66K | 15.4K | 26.7K | 43.2K | 73.2K | 130K | 226K | 383K | 649K | |
| 14 | 24.3 | 40.2 | 68 | 118 | 210 | 350 | 565 | 976 | 1.78K | 3.01K | 5.11K | 8.8K | 15.8K | 27K | 44.2K | 75K | 133K | 232K | 390K | 665K | |
| 14.3 | 24.7 | 41.2 | 68.1 | 120 | 215 | 357 | 576 | 1K | 1.8K | 3.09K | 5.23K | 8.87K | 16K | 27.4K | 45.3K | 76.8K | 137K | 237K | 392K | 680K | |
| 14.7 | 24.9 | 42.2 | 69.8 | 121 | 220 | 360 | 590 | 1.02K | 1.82K | 3.16K | 5.36K | 9.09K | 16.2K | 28K | 46.4K | 78.7K | 140K | 240K | 402K | 681K | |
| 15 | 25.5 | 43 | 71.5 | 124 | 221 | 365 | 604 | 1.05K | 1.87K | 3.24K | 5.49K | 9.1K | 16.5K | 28.7K | 47K | 80.6K | 143K | 243K | 412K | 698K | |
| 15.4 | 26.1 | 43.2 | 73.2 | 127 | 226 | 374 | 619 | 1.07K | 1.91K | 3.3K | 5.6K | 9.31K | 16.9K | 29.4K | 47.5K | 82K | 147K | 249K | 422K | 715K | |
| 15.8 | 26.7 | 44.2 | 75 | 130 | 232 | 383 | 620 | 1.1K | 1.96K | 3.32K | 5.62K | 9.53K | 17.4K | 30K | 48.7K | 82.5K | 150K | 255K | 430K | 732K | |
| 16 | 27 | 45.3 | 75.5 | 133 | 237 | 390 | 634 | 1.13K | 2K | 3.4K | 5.76K | 9.76K | 17.8K | 30.1K | 49.9K | 84.5K | 154K | 261K | 432K | 750K | |
| 16.2 | 27.4 | 46.4 | 76.8 | 137 | 240 | 392 | 649 | 1.15K | 2.05K | 3.48K | 5.9K | 10K | 18K | 30.9K | 51K | 86.6K | 158K | 267K | 442K | 768K | |
| 16.5 | 28 | 47 | 78.7 | 140 | 243 | 402 | 665 | 1.18K | 2.1K | 3.57K | 6.04K | 10.2K | 18.2K | 31.6K | 51.1K | 88.7K | 160K | 270K | 453K | 787K | |
| 16.9 | 28.7 | 47.5 | 80.6 | 143 | 249 | 412 | 680 | 1.2K | 2.15K | 3.6K | 6.19K | 10.5K | 18.7K | 32.4K | 52.3K | 90.9K | 162K | 274K | 464K | 806K | |
| 17.4 | 29.4 | 48.7 | 82 | 147 | 255 | 422 | 681 | 1.21K | 2.2K | 3.65K | 6.2K | 10.7K | 19.1K | 33K | 53.6K | 91K | 165K | 280K | 470K | 820K | |
| 17.8 | 30 | 49.9 | 82.5 | 150 | 261 | 430 | 698 | 1.24K | 2.21K | 3.74K | 6.34K | 11K | 19.6K | 33.2K | 54.9K | 93.1K | 169K | 287K | 475K | 825K | |

CHARACTERISTICS

| Characteristics | Limits | Test Methods (JIS C 5201-1) |
|---------------------------------|--|---|
| DC. Resistance | Must be within the specified tolerance. | 5.1 The limit of error of measuring apparatus shall not exceed allowable range or 1% of resistance tolerance |
| Temperature coefficient | Within the temperature coefficient specified below ±50 PPM / °C | 5.2 Natural resistance change per temp. degree centigrade. R ₂ -R ₁ ————— x10 ⁶ (PPM/°C) R ₁ (t ₂ -t ₁) R ₁ : Resistance value at room temperature (t ₁) R ₂ : Resistance value at room temp.plus 100°C (t ₂) |
| Short time overload | Resistance change rate is ± (5 % + 0.05Ω) Max. with no evidence of mechanical damage | 5.5 Permanent resistance change after the application of a potential of 2.5 times RCWV for 5 seconds. |
| Dielectric withstanding voltage | No evidence of flashover mechanical damage, arcing or insulation break down. | 5.7 Resistors shall be clamped in the trough of a 90° metallic V-block and shall be tested at AC potential respectively specified in the table 1 |
| Pulse overload | Resistance change rate is ±(1% +0.05Ω) Max. with no evidence of mechanical damage | 5.8 Resistance change afther 10,000 cycles (1 second "on", 25 seconds "off") at 4 times RCWV |





Metal Film Fixed Resistors (RoHS Compliant)

MF-RC Series

CHARACTERISTICS (Cont.)

| Characteristics | Limits | | Test Methods (JIS C 5201-1) | | |
|------------------------------|--|--------------|--|--|-------------|
| Terminal strength | With no evidence of mechanical damage. | | 6.1 Direct load Resistance to a 2.5 kgs direct load for 10 secs. in the direction of the longitudinal axis of the terminal leads. Twist test : Terminal leads shall be bent through 90° at a point of about 6mm from the body of the resistor and shall be rotated through 360° about the original axis of the bent terminal in alternating direction for a total of 3 rotations. | | |
| Resistance to soldering heat | Resistance change rate is $\pm (1\% + 0.05\Omega)$ Max. with no evidence of mechanical damage. | | 6.4 Permanent resistance change when leads immersed to 3.2 to 4.8 mm from the body in $350\text{ }^\circ\text{C} \pm 10^\circ\text{C}$ solder for 3 ± 0.5 seconds | | |
| Solderability | 95 % coverage Min. | | 6.5 The area covered with a new , smooth clean , shiny and continuous surface free from concentrated pinholes. Test temp. of solder : $245^\circ\text{C} \pm 3^\circ\text{C}$ Dwell time in solder : 2 ~ 3 seconds | | |
| Resistance to solvent | No deterioration of protective coatings and markings. | | 6.9 Specimens shall be immersed in a bath of trichroethane completely for 3 minutes with ultrasonic. | | |
| Temperature cycling | Resistance change rate is $\pm (1\% + 0.05\Omega)$ Max. with no evidence of mechanical damage. | | 7.4 Resistance change after continuous 5 cycles for duty shown below: | | |
| | | | Step | Temperature | Time |
| | | | 1 | $-55^\circ\text{C} \pm 3^\circ\text{C}$ | 30 mins |
| | | | 2 | Room temp. | 10~15 mins |
| | | | 3 | $+155^\circ\text{C} \pm 2^\circ\text{C}$ | 30 mins |
| 4 | Room temp. | 10~15 mins | | | |
| Load life in humidity | Resistance value | $\Delta R/R$ | 7.9 Resistance change after 1,000 hours operating at RCWV with duty cycle of (1.5 hours "on", 0.5 hour "off") in a humidity test chamber controlled at $40^\circ\text{C} \pm 2^\circ\text{C}$ and 90 to 95 % relative humidity | | |
| | Normal type | $\pm 1.5\%$ | | | |
| Load life | Resistance value | $\Delta R/R$ | 7.10 Permanent resistance change after 1,000 hours operating at RCWV with duty cycle of (1.5 hours "on", 0.5 hour "off") at $70^\circ\text{C} \pm 2^\circ\text{C}$ ambient | | |
| | Normal type | $\pm 1.5\%$ | | | |



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