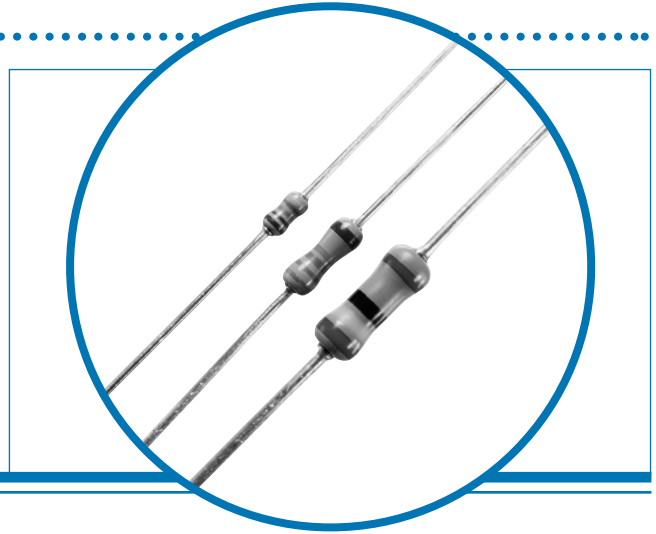


# Metal Film Resistors

## MFR Series

- **Approved to BSCECC 40101-803 and 019**
- **Tolerances down to 0.5%**
- **Temperature coefficient down to 50ppm/°C**



## Electrical Data

| Commercial               |        | MFR3                                 | MFR4      | MFR5             |
|--------------------------|--------|--------------------------------------|-----------|------------------|
| Power rating at 70°C     | watts  | 0.4                                  | 0.5       | 0.75             |
| Resistance range         | ohms   | 1R0 - 1M                             | 1R0 - 10M | 1R0 - 1M         |
| Limiting element voltage | volts  | 200                                  | 350       | 350              |
| TCR                      | ppm/°C | <10 and >150K: 100*<br>10 to 150K:50 | 50        | ≤10:150 >10:100* |
| Resistance tolerance     | %      | 1,2                                  | 0.5, 1,2  | 0.5, 1,2         |

\* Note:- Tighter TCR'S are available, consult factory for details.

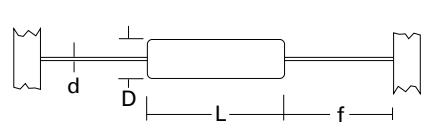
| Approved CECC 40101 - 019 Style |        | GZ                            | GX                            | FZ                      | FX                      | EZ        | EX       |
|---------------------------------|--------|-------------------------------|-------------------------------|-------------------------|-------------------------|-----------|----------|
| Power rating at 70°C            | watts  | 0.125                         | 0.125                         | 0.25                    | 0.25                    | 0.5       | 0.5      |
| Resistance range.               | ohms   | 1 to 1M                       | 1 to 1M                       | 1 to 1M                 | 1 to 1M                 | 10 to 1M0 | 10 to 1M |
| Limiting element voltage        | volts  | 175                           | 175                           | 250                     | 250                     | 350       | 350      |
| TCR                             | ppm/°C | 5.1 to 9.1 : 200<br>≥10 : 100 | 5.1 to 9.1 : 500<br>≥10 : 250 | 100<br>5.1 to 9.1 : 200 | 250<br>5.1 to 9.1 : 500 | 100       | 250      |
| Resistance tolerance            | %      | 1,2                           | 1,2                           | 1,2                     | 1,2                     | 1,2       | 1,2      |

| Approved CECC 40101 - 803 Style |        | BC        | BK        | CC        | CK        |
|---------------------------------|--------|-----------|-----------|-----------|-----------|
| Power rating at 70°C            | watts  | 0.125     | 0.125     | 0.25      | 0.25      |
| Resistance range.               | ohms   | 10 to 1M  | 10 to 1M  | 10 to 1M  | 10 to 1M  |
| Limiting element voltage        | volts  | 200       | 200       | 250       | 250       |
| TCR                             | ppm/°C | 50        | 100       | 50        | 100       |
| Resistance tolerance            | %      | 0.5, 1, 2 | 0.5, 1, 2 | 0.5, 1, 2 | 0.5, 1, 2 |

|                           |         |     |                    |     |
|---------------------------|---------|-----|--------------------|-----|
| Standard values           |         |     | E24, E96 preferred |     |
| Thermal impedance         | °C/watt | 150 | 140                | 112 |
| Ambient temperature range | °C      |     | -55 to 155         |     |

## Physical Data

| Dimensions (mm) & Weight (g) |       |       |       |       |                      |                 |         |
|------------------------------|-------|-------|-------|-------|----------------------|-----------------|---------|
| Type                         | L Max | D Max | f min | d nom | PCB mounting centres | Min Bend Radius | Wt. nom |
| MFR3                         | 3.5   | 1.8   | 22.4  | 0.5   | 7.6                  | 0.5             | 0.1     |
| MFR4                         | 6.2   | 2.5   | 21.0  | 0.6   | 10.2                 | 0.6             | 0.3     |
| MFR5                         | 9.0   | 3.6   | 19.6  | 0.8   | 12.7                 | 1.2             | 0.5     |



### General Note

Welwyn Components reserves the right to make changes in product specification without notice or liability. All information is subject to Welwyn's own data and is considered accurate at time of going to print.

© **Welwyn Components Limited** · Bedlington, Northumberland NE22 7AA, UK  
Telephone: +44 (0) 1670 822181 · Facsimile: +44 (0) 1670 829465 · Email: info@welwyn-tt.com · Website: www.welwyn-tt.com

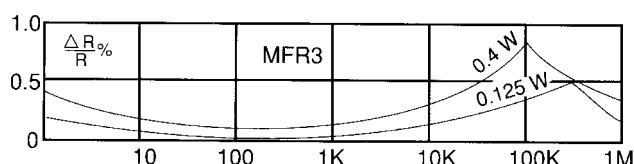
**Welwyn**

A subsidiary of  
TT electronics plc

Issue B · 03.02

## Performance Data - Type MFR 3

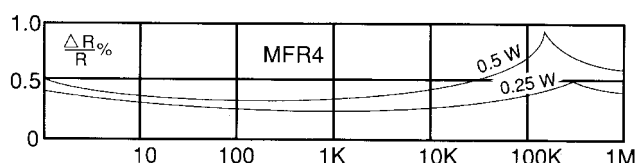
|  |       | CECC 40101-019 Requirements | Actual Performance          |             |
|--|-------|-----------------------------|-----------------------------|-------------|
|  |       |                             | Maximum                     | Typical     |
| Load at commercial rating : 1000 hours at 70°C | ΔR %  |                             | 0.8                         | See Graph 1 |
| Load at CECC rating : 1000 hours at 70°C       | ΔR %  | 2                           | 0.5                         | See Graph 1 |
| Shelf life : 12 months at room temperature     | ΔR %  | Not Specified               | 0.1                         | 0.07        |
| Derating                                       |       | zero at 155°C               |                             |             |
| Short term overload                            | ΔR %  | 0.5                         | 0.25                        | 0.03        |
| Climatic                                       | ΔR %  | 2                           | 0.5                         | 0.2         |
| Climatic category                              |       | 55/125/56                   |                             |             |
| Long term damp heat                            | ΔR %  | 2                           | 0.5                         | 0.3         |
| Temperature rapid change                       | ΔR %  | 0.5                         | 0.25                        | 0.05        |
| Resistance to solder heat                      | ΔR %  | 0.5                         | 0.25                        | 0.02        |
| Vibration and bump                             | ΔR %  | 0.5                         | 0.1                         | 0.01        |
| Noise. (in a decade of frequency)              | μV/V  | Not specified               | 0.1                         | 0.07        |
| Insulation resistance                          | ohms  | >1G                         | >1G                         | >1G         |
| Voltage proof                                  | volts | 350 min                     | 400 min                     | 400 min     |
| Pulse handling                                 |       |                             | Data available upon request |             |



Graph 1 – Load for 1000 hours at 70°C: maximum changes

## Performance Data - Type MFR 4

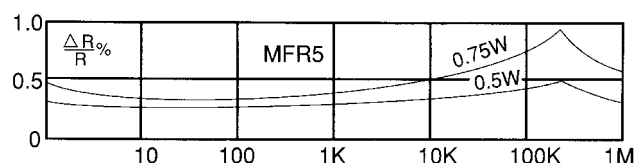
|  |       | CECC 40101-019 Requirements | CECC 40101-803 Requirements | Actual Performance          |             |
|--|-------|-----------------------------|-----------------------------|-----------------------------|-------------|
|  |       |                             |                             | Maximum                     | Typical     |
| Load at commercial rating : 1000 hours at 70°C | ΔR %  |                             |                             | 0.8                         | See Graph 2 |
| Load at CECC rating : 1000 hours at 70°C       | ΔR %  | 2                           | 1                           | 0.5                         | See Graph 2 |
| Shelf life : 12 months at room temperature     | ΔR %  | Not specified               | Not Specified               | 0.1                         | 0.07        |
| Derating                                       |       | zero at 155°C               | zero at 155°C               |                             |             |
| Short term overload                            | ΔR %  | 0.5                         | 0.25                        | 0.25                        | 0.01        |
| Climatic                                       | ΔR %  | 2                           | 1                           | 0.5                         | 0.2         |
| Climatic category                              |       | 55/125/56                   | 55/125/56                   |                             |             |
| Long term damp heat                            | ΔR %  | 2                           | 1                           | 0.5                         | 0.3         |
| Temperature rapid change                       | ΔR %  | 0.5                         | 0.25                        | 0.25                        | 0.04        |
| Resistance to solder heat                      | ΔR %  | 0.5                         | 0.25                        | 0.25                        | 0.07        |
| Vibration and bump                             | ΔR %  | 0.5                         | 0.25                        | 0.1                         | 0.01        |
| Noise. (in a decade of frequency)              | μV/V  | Not Specified               | Not Specified               | 0.1                         | 0.1         |
| Insulation resistance                          | ohms  | >1G                         | >1G                         | >1G                         | >1G         |
| Voltage proof                                  | volts | 500 min                     | 400 min                     | 500 min                     | 500 min     |
| Pulse handling                                 |       |                             |                             | Data available upon request |             |



Graph 2 – Load for 1000 hours at 70°C: maximum changes

## Performance Data - Type MFR 5

|                                   |               | CECC 40101-019 Requirements | CECC 40101-803 Requirements | Actual Performance          |             |
|-----------------------------------|---------------|-----------------------------|-----------------------------|-----------------------------|-------------|
|                                   |               |                             |                             | Maximum                     | Typical     |
| Load at commercial rating :       | $\Delta R \%$ |                             |                             | 0.9                         | See Graph 3 |
| 1000 hours at 70°C                |               |                             |                             |                             |             |
| Load at CECC rating :             | $\Delta R \%$ | 2                           | 1                           | 0.5                         | See Graph 3 |
| 1000 hours at 70°C                |               |                             |                             |                             |             |
| Shelf life :                      | $\Delta R \%$ | Not specified               | Not Specified               | 0.1                         | 0.07        |
| 12 months at room temperature     |               |                             |                             |                             |             |
| Derating                          |               | zero at 155°C               | zero at 155°C               |                             |             |
| Short term overload               | $\Delta R \%$ | 0.5                         | 0.25                        | 0.25                        | 0.01        |
| Climatic                          | $\Delta R \%$ | 2                           | 1                           | 0.5                         | 0.2         |
| Climatic category                 |               | 55/125/56                   | 55/125/56                   |                             |             |
| Long term damp heat               | $\Delta R \%$ | 2                           | 1                           | 0.5                         | 0.3         |
| Temperature rapid change          | $\Delta R \%$ | 0.5                         | 0.25                        | 0.25                        | 0.04        |
| Resistance to solder heat         | $\Delta R \%$ | 0.5                         | 0.25                        | 0.25                        | 0.07        |
| Vibration and bump                | $\Delta R \%$ | 0.5                         | 0.25                        | 0.1                         | 0.01        |
| Noise. (in a decade of frequency) | $\mu V/V$     | Not Specified               | Not Specified               | 0.1                         | 0.07        |
| Insulation resistance             | ohms          | >1G                         | >1G                         | >1G                         | >1G         |
| Voltage proof                     | volts         | 700 min                     | 500 min                     | 700 min                     | 700 min     |
| Pulse handling                    |               |                             |                             | Data available upon request |             |

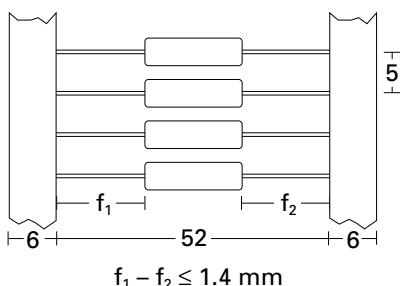


Graph 3 – Load for 1000 hours at 70°C: maximum changes

### Packaging

All MFR resistors are supplied tape packed ready for loading on to automatic sequencing and insertion machines. Component wires will not protrude beyond the outside edge of the tapes.

Alternative packaging available by request.



Lead Formed resistors can also be supplied. Standard options of Lancet, Radial and Goalpost forming are shown in Lead Form Information section.

### Standard Quantities Per Package

| Type            | MFR3 | MFR4 | MFR5 |
|-----------------|------|------|------|
| Large ammo pack | 5000 | 5000 | 2500 |

### Construction

The resistance element is a precisely controlled thin film of metal alloy sputtered on to a high purity ceramic core, protected by a moisture-resistant, high dielectric strength coating applied so that terminations remain completely clear.

### Terminations

**Material** Solder-coated copper wire.

**Strength** The terminations meet the requirements of IEC 68.2.21

**Solderability** The terminations meet the requirements of IEC 115-1, Clause 4.17.3.2

### Marking

0.5% and 1% tolerance resistors are colour coded with 5 bands, 2% tolerance has 4. IEC 62 colours are used.

### Solvent Resistance

The body protection and marking are resistant to all normal industrial cleaning solvents suitable for printed circuits.