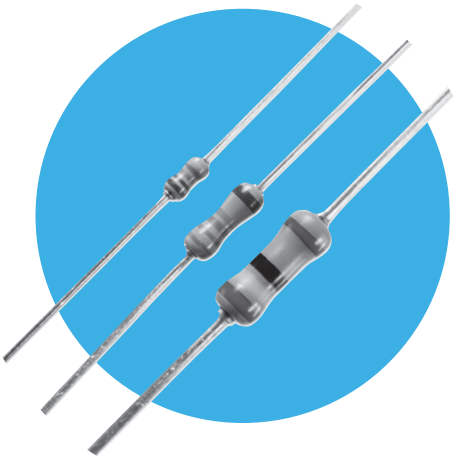
Resistors

Metal Film Resistors



MFR Series

- Professional grade approved to BSCECC 40101-803 and 019
- Tolerances down to 0.5%
- Temperature coefficient down to 50ppm/°C

All parts are Pb-free and comply with EU Directive 2011/65/EU amended by (EU) 2015/863 (RoHS3)

Electrical Data

		MFR3	MFR4	MFR5
Power rating at 70°C	watts	0.4	0.5	0.75
Resistance range	ohms	10R - 1M	1R0 - 1M	1R0 - 1M
Limiting element voltage	volts	200	350	350
TCR	ppm/°C	50	50	≤10:150 >10:100
Resistance tolerance	%	1	0.5, 1	0.5, 1

CECC 40101 - 019 Requirements			FZ	FX	EZ	EX
Power rating at 70°C	watts		0.25	0.25	0.5	0.5
Resistance range.	ohms		1 to 1M	1 to 1M	10 to 1M0	10 to 1M
Limiting element voltage	volts		250	250	350	350
TCR	ppm/°C		100 5.1 to 9.1 : 200	250 5.1 to 9.1 : 500	100	250
Resistance tolerance	%		1	1	1	1

CECC 40101 - 803 Requirements			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	0.5, 1	0.5, 1	0.5, 1

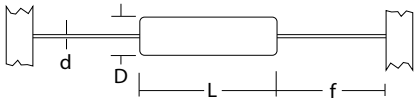
These tables indicate the CECC specification requirements, and these are met or exceeded by the corresponding MFR series products.

Standard values		E24, E96 preferred		
Thermal impedance	°C/watt	150	140	112
Ambient temperature range	°C	-55 to 155		
Product grades available		commercial	commercial, professional	professional

Physical Data

Dimensions (mm) & Weight (g)

Type		L max	D max	F min	d nom	PCB mount centres	Min bend radius	Wt. nom
MFR3	**Commercial**	3.7	2.0	22.4	0.45	7.6	0.5	0.1
MFR4	**Professional**	6.2	2.5	21.0	0.6	10.2	0.6	0.3
	Commercial	6.8	3.0	21.0	0.55	10.2	0.6	0.3
MFR5	**Professional**	9.0	3.6	19.6	0.8	12.7	1.2	0.5



General Note

TT Electronics reserves the right to make changes in product specification without notice or liability.
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BI Technologies IRC Welwyn

www.ttelectronics.com/resistors

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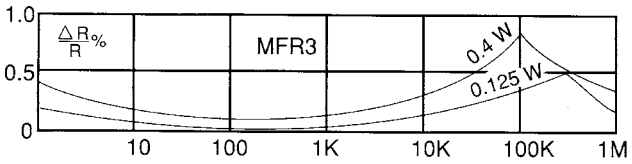
MFR Series

Performance Data - Type MFR 3

			CECC 40101-019* Requirements	Actual Performance Maximum	Actual Performance 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		

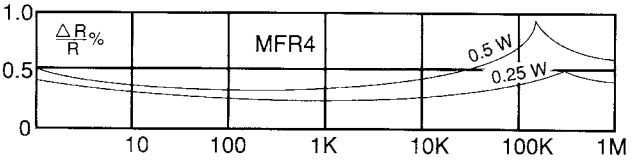
* CECC requirements are included for reference only; CECC release is not available on MFR3



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	Actual Performance 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

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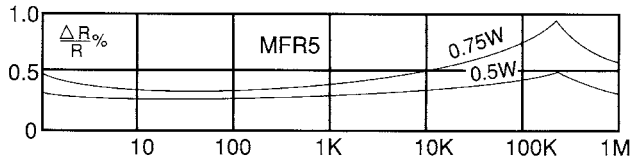
MFR Series

Performance Data - Type MFR 5

		CECC 40101-019 Requirements	CECC 40101-803 Requirements	Actual Performance	
				Maximum	Typical
Load at commercial rating : 1000 hours at 70°C	ΔR %			0.9	See Graph 3
Load at CECC rating : 1000 hours at 70°C	ΔR %	2	1	0.5	See Graph 3
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	0.07
Insulation resistance	ohms	>1G	>1G	>1G	>1G
Voltage proof	volts	700 min	500 min	700 min	700 min
Pulse handling		Data available upon request			

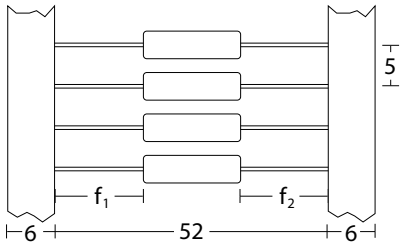


Graph 3 – Load for 1000 hours at 70°C: maximum changes

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.



$f_1 - f_2 \leq 1.4$ mm

Lead Formed resistors can also be supplied. Standard options of Lancet, Radial and Goalpost forming are available.

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 Hot tin dipped 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. IEC 62 colours are used.

Solvent Resistance

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

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MFR Series

Ordering Procedure

Example: MFR4-4K7FI (Professional grade MFR4 at 4.7 kilohms ±1%, Pb-free)

M	F	R	4	-	4	K	7	F	I	
1					2			3	4	

1 Type	2 Value	3 Tolerance	4 Grade, Finish & Packing			
MFR3	E24 = 3/4 characters E96 = 4/5 characters R = ohms K = kilohms M = megohms	D = ±0.5%	C	MFR3, 4	Commercial	Pb-free (RoHS)
MFR4		F = ±1%	I	MFR4, 5	Professional	
MFR5			All above in Standard Packing			
			MFR3, 4		Ammo	5000/box
			MFR5			2500/box

CECC release is available only for professional grade Pb-free parts (code I).
For CECC released product state on order the CECC number and style.
Example: **MFR4-4K7FI CECC40101-019 FZ**

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