

# Metal Foil on Ceramic Chip Resistors

## MFC Series

### Features:

- Small size down to 0402
- Tolerance to 0.5%
- TCR to  $\pm 50 \text{ ppm}/^\circ\text{C}$
- High power density
- AEC-Q200 qualified



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

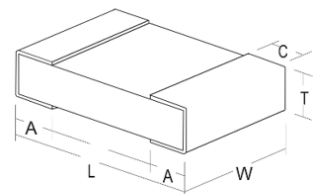
## Electrical Data

		0402	0603	0805	1206	2010	2512
Power rating at 70°C	W	0.25	0.5	0.75	1	1.5 <sup>1</sup>	2
Overload rating 5s	W	1.25	2.5	3.75	5	7.5 <sup>2</sup>	8
Resistance range	mΩ	10 - 50	5 - 100	3 - 100		2 - 100	
Resistance tolerance	%	< R03; 1, 2, 5    ≥R03; 0.5, 1, 2, 5					
TCR (-55 to +125°C)	ppm/°C	100	<R01; 200 ≥R01; 100	<R01; 100    ≥R01; 50		R002; 200    >R002 & <R01; 100 	

Note 1: 1W below R01    Note 2: 5W below R01

## Physical Data

Dimensions in mm and weight in mg							
	Value	L	W	T max.	A	C	Wt. nom.
0402	All	1.05 ±0.1	0.55 ±0.1	0.55	0.27 ±0.1	-	0.8 – 1.1
0603	5 - 9	1.6 ±0.2	0.8 ±0.2	0.85	0.35 ±0.2	≤0.6	2.5 – 3.2
	≥10	1.7 ±0.15	1 ±0.15	0.77	0.35 ±0.25		
0805	3 - 4	2±0.2	1.25 ±0.15	0.85	0.7 ±0.3	0.4 ±0.25	5.6 – 8.1
	5 - 9				0.4 ±0.3		
	≥10	2.15 ±0.15	1.4 ±0.15	0.9	0.4 ±0.25		
1206	3 - 4	3.2 ±0.2	1.6 ±0.2		0.9 ±0.3	0.5 ±0.3	11.6 - 13.2
	5 - 9				0.5 ±0.3		
	≥10	3.2 ±0.15	1.7 ±0.15	0.5 ±0.25			
2010	2	5 ±0.2	2.5 ±0.2	0.95	1.8 ±0.3	0.6 ±0.3	28.3 - 33.2
	3				1.6 ±0.3		
	4 – 5				1.3 ±0.3		
	5 – 9				0.8 ±0.3		
	≥10			0.85	0.6 ±0.3		
2512	2	6.4 ±0.2	3.2 ±0.2	0.95	2.3 ±0.3	0.9 ±0.3	43 - 46
	3				1.9 ±0.3		
	4				1.7 ±0.3		
	5 – 6				1.2 ±0.3		
	7				1.1 ±0.3		
	8 – 9				0.9 ±0.3		
	≥10			0.85	0.7 ±0.3		



## Construction

Metal foil resistor material is bonded onto an alumina substrate and connected to wraparound terminations with nickel barrier and 100% Sn finish. Protection and marking are applied and each resistor is measured immediately before packing into tape.

## Marking

MFC parts larger than 0402 are marked indicating ohmic value. Where possible "R" is used to indicate the decimal point location but if it is omitted, the value is in milliohms. MFC0603 is marked with 3 characters, e.g. "R01" = 10mΩ, "047" = 47mΩ. Larger sizes are marked with 4 characters, e.g. "R010" = 10mΩ, "R047" = 47mΩ. Reels are marked with type, value, tolerance, date code and quantity.

### General Note

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

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### Solvent Resistance

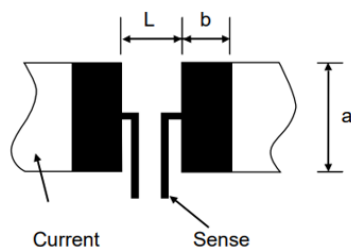
The body protection and marking are resistant to all normal industrial cleaning solvents suitable for printed circuits.

### Mounting Recommendations

Size	Value (mΩ)	L (mm)	a (mm)	b (mm)	t (μm)		
0402	10 - 50	0.5	0.6	0.5	35		
0603	5 - 9	0.6	1	1.1			
	10 - 100	0.5	0.9	1			
0805	3 - 4	0.5	1.4	1.4	70		
	5 - 9	0.8		1.2			
	10 - 100		1.3	1.3			
1206	3 - 4	0.8	1.8	1.8	105		
	5 - 9	1.8		1.3			
	10 - 100	1.5	1.7	1.4			
2010	2	1	2.9	2.7		105	
	3 - 9	1.6		2.4			
	10 - 100	2.7		1.8			
2512	2 - 4	1	3.4	3.5			105
	5 - 100	3.8		2.1			

Current Sense

t = PCB copper thickness

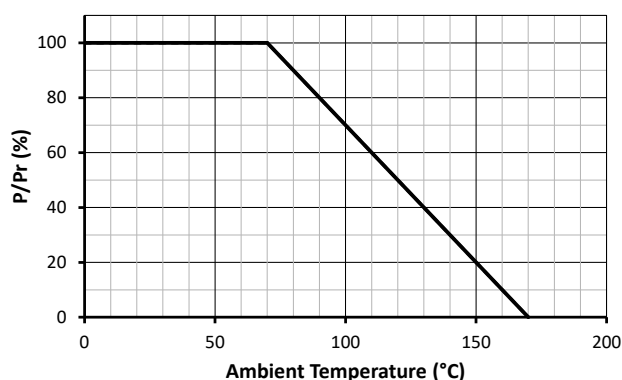


t = PCB copper thickness

### Performance Data

Test				Maximum
Load life	MIL-STD-202 Method 108	1000 hours, steady state, $T_A=125^\circ\text{C}$ , de-rated power	$\pm\Delta R\%$	1
Short term overload	IEC-60115-1 4.13	$P_r < 2W$ ; 5 x $P_r$ for 5s, $P_r = 2W$ ; 4 x $P_r$ for 5s	$\pm\Delta R\%$	1
Biased humidity	MIL-STD-202 Method 103	1000 hours, $85^\circ\text{C}$ , 85%RH, 10% of $P_r$	$\pm\Delta R\%$	1
High temperature exposure	MIL-STD-202 Method 108	1000 hours, $155^\circ\text{C}$	$\pm\Delta R\%$	1
Low temperature operation	IEC-60115-1 4.36	$-55^\circ\text{C}$ , 45 mins $P_r$ , 15 mins no load	$\pm\Delta R\%$	1
Temperature rapid change	IEC-60115-1 4.19	$-55^\circ\text{C}$ to $+155^\circ\text{C}$ , 5 cycles	$\pm\Delta R\%$	1
Voltage proof	IEC-60115-1 4.7	1.42 x max operating voltage for 1 minute	$\pm\Delta R\%$	No breakdown
Board flex	JIS-C-521-1 4.33	3mm deflection for 5 seconds	$\pm\Delta R\%$	1
Solderability	IEC-60115-1 4.17	$245 \pm 5^\circ\text{C}$ for 3 seconds		>95% coverage
Resistance to solder heat	IEC-60115-1 4.18	$260 \pm 5^\circ\text{C}$ for 10 seconds	$\pm\Delta R\%$	1
Resistance to solvents	MIL-STD-202 Method 215	Aqueous wash OKEM or equivalent. No banned solvents.		No damage

### Temperature De-rating



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### Packaging

MFC0402 is packed in flip-chip orientation (resistance element on the underside) in 8mm paper tape at 2mm component pitch.

MFC0603, 0805 & 1206 are packed on 8mm paper tape at 4mm component pitch. MFC2010 & 2512 are packed in 12mm plastic tape at 4mm component pitch. All sizes are on 178mm diameter reels.

For full details of packaging dimensions see:

<https://www.ttelectronics.com/TTElectronics/media/ProductFiles/Application-Note/PS001-Packing-of-General-Purpose-Chip-Resistors.pdf>

### Ordering Procedure

**Example: MFC0603-R015FT5** (0603, 15 milliohms  $\pm 1\%$ , Pb-free)

M	F	C	0	6	0	3	-	R	0	1	5	F	T	5	
1			2			3			4		5				

1 Type	2 Size	3 Value	4 Tolerance	5 Packing		
MFC	0402	E24 3/4 characters R = ohms	D = $\pm 0.5\%$	T10	0402	10,000/reel
	0603		F = $\pm 1\%$	T5	0603 to 1206	5000/reel
	0805		G = $\pm 2\%$	T4	2010, 2512	4000/reel
	1206		J = $\pm 5\%$			
	2010					
	2512					