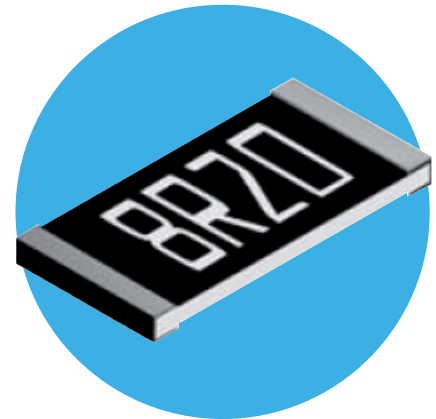



## Precision Thin Film Nichrome Chip Resistors

### PCF Series

- Precision thin film technology
- Extended ohmic range 1R - 3M
- Precision to  $\pm 0.01\%$  and 5ppm/ $^{\circ}\text{C}$
- Passivated range for superior humidity performance
- Load life stability and humidity to 0.05%
- RoHS compliant Pb-free terminations



 All parts are Pb-free and comply with EU Directive 2011/65/EU (RoHS2)

## Electrical Data - Standard Range

Type	TCR (ppm/ $^{\circ}\text{C}$ )	Power (W)	Limiting Element Voltage (V)	Ohmic Value Range <sup>1</sup>					
				1% & 0.5%	0.25%	0.1%	0.05%	0.01%	
PCF0201	50	0.031	15	49R9-33K					
	25			49R9-5K					
PCF0402	50	0.063	25	10R-205K			-		
	25								
	15						49R9-33K		
	10						49R9-12K		
PCF0603	5	0.063	50				49R9-5K		
	50			2R-1M			4R7-1M		-
	25						4R7-332K		4R7-332K
	15								24R9-100K
	10						24R9-15K		
PCF0805	5	0.1	100	1R-2M			4R7-2M		-
	50						4R7-511K		4R7-511K
	25								24R9-200K
	15						24R9-30K <sup>2</sup>		
	10						24R9-30K		
PCF1206	5	0.125	150	1R-2M5			4R7-2M5		-
	50						4R7-511K		
	25						4R7-1M		24R9-500K
	15						24R9-50K <sup>2</sup>		
	10						24R9-50K		
PCF1210	5	0.2	150	1R-2M5			4R7-2M5		-
	50						4R7-1M		4R7-1M
	25								24R9-500K
	15						24R9-50K <sup>2</sup>		
	10						24R9-50K		
PCF2010	5	0.25	150	1R-3M			4R7-3M		-
	50						4R7-1M		4R7-1M
	25								24R9-500K
	15						24R9-100K		
	10						24R9-100K		
PCF2512	5	0.5	150	1R-3M			4R7-3M		-
	50						4R7-1M		4R7-1M
	25								24R9-500K
	15						24R9-100K		
	10						24R9-100K		

Note 1: Standard values E24 or E96. Other values may be available by request.

Note 2: Higher values available on request.

### General Note

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PCF Series

## Electrical Data - High Power Range

Type	TCR (ppm/°C)	Power (W)	Limiting Element Voltage (V)	Ohmic Value Range *				
				0.5%	0.25%	0.1%	0.05%	0.01%
PCF0603H	50	0.1	75	4R7-1M		4R7-332K	24R9-100K	
	25			4R7-332K				
	15			24R9-15K				
	10			1R-1M	4R7-1M	4R7-511K	24R9-200K	
	5			4R7-1M 4R7-511K				
PCF0805H	50	0.125	150	24R9-30K		24R9-500K		
	25			4R7-1M				
	15			4R7-511K				
	10			24R9-50K				
	5			4R7-1M				
PCF1206H	50	0.25	200	4R7-1M		24R9-500K		
	25			24R9-50K				
	15			4R7-1M				
	10			24R9-50K				
	5			4R7-1M				
PCF1210H	50	0.33	200	4R7-1M		24R9-500K		
	25			24R9-50K				
	15			4R7-1M				
	10			24R9-50K				
	5			4R7-1M				
PCF2010H	50	0.33	200	4R7-1M		24R9-500K		
	25			24R9-50K				
	15			4R7-1M				
	10			24R9-50K				
	5			4R7-1M				
PCF2512H	50	0.75	200	1R-2K	4R7-2K	24R9-2K		
	25							
	15							
	10							
	5							

\* Standard values E24 or E96. Other values may be available by request.

## Electrical Data - Extended High Power Range

Type	TCR (ppm/°C)	Power (W)	Limiting Element Voltage (V)	Ohmic Value Range *				
				0.5%	0.25%	0.1%	0.05%	0.01%
PCF0603X	50	0.166	100	10R-332K				
PCF0805X	50	0.25	150	10R-500K				
	25			10R-1M				
PCF1206X	50	0.333	200	10R-1M				
PCF2512X	50	1	200	1R-100R	4R7-100R			
	25							

## Electrical Data - Passivated Range

Type	TCR (ppm/°C)	Power (W)	Limiting Element Voltage (V)	Ohmic Value Range *		
				0.5%	0.25%	0.1%
PCF0402P	50	0.063	25	25R-25K		
	25			49R9-12K		
	15			25R-332K		
PCF0603P	50	0.063	50	25R-100K		
	25			10R-800K		
	15			25R-200K		
PCF0805P	50	0.1	100	10R-1M		
	25			25R-500K		
	15			10R-1M		
PCF1206P	50	0.125	150	25R-500K		
	25			10R-1M		
	15			25R-500K		
PCF2010P	50	0.25	150	10R-1M		
	25			25R-500K		
	15			10R-1M		
PCF2512P	50	0.5	150	10R-1M		
	25			10R-1M		
	15			10R-1M		

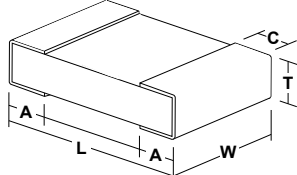
\* Standard values E24 or E96. Other values may be available by request.

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## Physical Data

Dimensions (mm) and Weight						
	L	W	T max	A	C	Wt
0201	0.58 ± 0.05	0.29 ± 0.05	0.26	0.15 ± 0.05	0.12 ± 0.05	1
0402	1.0 ± 0.05	0.5 ± 0.05	0.40	0.2 ± 0.1	0.2 ± 0.1	3
0603	1.6 ± 0.2	0.8 ± 0.2	0.55	0.3 ± 0.2	0.3 ± 0.2	6
0805	2.0 ± 0.2	1.25 ± 0.2	0.65	0.4 ± 0.25	0.3 ± 0.2	9
1206	3.05 ± 0.15	1.55 ± 0.15	0.65	0.35 ± 0.25	0.42 ± 0.2	20
1210	3.10 ± 0.15	2.4 ± 0.15	0.50	0.55 ± 0.25	0.4 ± 0.2	25
2010	4.9 ± 0.2	2.4 ± 0.2	0.65	0.5 ± 0.25	0.6 ± 0.3	36
2512	6.3 ± 0.2	3.1 ± 0.2	0.65	0.5 ± 0.25	0.6 ± 0.3	55



Wrap-around terminations (3 faces)

### Construction

A thin-film material is selectively deposited on a 96% alumina substrate together with metallic contacts at each end of the resistor. The unadjusted resistors are heat treated to give the required TCR and stability, then a precisely controlled laser trim process adjusts the resistance value. Epoxy protection is applied and wrap-around terminations are added and plated with Nickel then Tin. Each resistor is measured immediately before packing into tape.

### Terminations

The chips are supplied with 100% Sn matte plated wrap-around terminations suitable for soldering.

## Performance Data - Standard Range

Test Parameters	Conditions	Maximum change (+0.05R)		
		>0.05% tolerance 0603 to 2512	Chip size 0201, 0402	≤0.05% tolerance 0603 to 2512
Load life	1000 hours rated load @ 70°C	0.25%	0.5%	0.05%
Humidity	1000 hours @ 40°C, 90 - 95%RH	0.3%	0.3%	0.05%
Short term overload	6.25 x rated Power, or 2 x LEV, for 5 sec	0.5%	0.5%	0.05%
High temperature operation	1000 hours at 125°C	0.25%	0.25%	0.25%
Temperature cycle	5 cycles -55 C, 125°C	0.1%	0.1%	0.05%
Resistance to solder heat	270°C, 10 sec	0.2%	0.2%	0.05%
Solderability	235°C, 2 sec	95% minimum coverage		

## Performance Data - High Power Range/Extended High Power Range

Test Parameters	Conditions	Maximum change (+0.05R)
Load life	1000 hours rated load @ 70°C	0.5%
Humidity	1000hrs @ 40°C, 90 - 95%RH	0.5%
Short term overload	6.25 x rated Power, or 2 x LEV, for 5 sec	0.5%
High temperature operation	1000 hours at 155°C	0.5%
Temperature cycle	5 cycles -55°C, 150°C	0.25%
Resistance to solder heat	270°C, 10 sec	0.2%
Solderability	235°C, 2 sec	95% minimum coverage

## Performance Data - Passivated Range

Test Parameters	Conditions	Maximum change (+0.05R)	
		0603 to 2512	0402
Load life	1000 hours rated load @ 70°C	0.05%	0.25%
Humidity	1000hrs @ 40°C, 90 - 95%RH	0.05%	0.5%
Short term overload	6.25 x rated Power, or 2 x LEV, for 5 sec	0.02%	0.1%
High temperature operation	1000 hours at 125°C	0.05%	0.5%
Temperature cycle	5 cycles -55 C, 125°C	0.02%	0.1%
Resistance to solder heat	270°C, 10 sec	0.02%	0.1%
Solderability	235°C, 2 sec	95% minimum coverage	

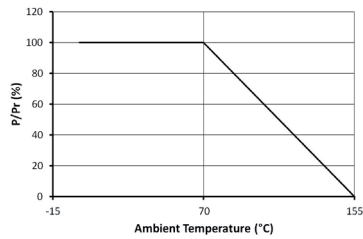
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**PCF Series**

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**Derating Curve**



**Solderability**

The terminations have an electroplated nickel barrier and tin coating. This ensures excellent 'leach' resistance properties and solderability.

**Packaging**

PCF Resistors are supplied taped and reeled as per IEC 286-3. Sizes 2010 and 2512 are in embossed plastic tape. Smaller sizes are in paper tape.

**Application Notes**

PCF resistors are ideally suited for handling by automatic methods due to their rectangular shape and the small dimensional tolerances. Electrical connection to a ceramic substrate or to a printed circuit board can be made by reflow or wave soldering of wrap-around terminations.

Wrap-around terminations provide good leach properties and ensure reliable contact. Due to the robust construction, the PCF can be immersed in the solder bath for 30 seconds at 260 C. This enables the resistor to be mounted on one side of a printed circuit board and wire-leaded components applied on the other side.

PCF resistors themselves can operate at a maximum temperature of 125 C (see performance above) (155 C for High Power grades). For soldered resistors, the joint temperature should not exceed 110 C. This condition is met when the stated power levels at 70 C are used.

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PCF Series

## Ordering Procedure

This product has two valid part numbers:

**European (Welwyn) Part Number: PCF0603-11-1K54BI** (0603, standard, 15ppm/°C, 1.54 kilohm ±0.1%, Pb-free)

P	C	F	0	6	0	3	-	1	1	-	1	K	5	4	B	I
1	2		3	4		5			6	7						

1 Type	2 Size	3 Range	4 TCR	5 Value	6 Tolerance	7 Termination & Packing	
PCF	0201	Omit for Standard	-13 = ±5ppm/°C	E24 = 3/4 characters	L = ±0.01%	Pb-free only	
	0402		-12 = ±10ppm/°C	E96 = 3/4 characters	W = ±0.05%	I = Standard Packing	
	0603	H = High Power	-11 = ±15ppm/°C	R = ohms	B = ±0.1%	0201, 0402	10,000/reel
	0805	X = Extended	R = ±25ppm/°C	K = kilohms	C = ±0.25%	0603 to 1210	5000/reel
	1206	P = Passivated	-02 = ±50ppm/°C	M = megohms	D = ±0.5%	2010, 2512	4000/reel
	1210				F = ±1%	T1*	
	2010					0201 to 1206, 2010, 2512	1000/reel
	2512						

\* Non-standard; enquire to confirm availability

**USA (IRC) Part Number\*: PCF-W0603LF-11-1541-B-P-LT** (0603, standard, 15ppm/°C, 1.54 kilohm ±0.1%, Pb-free)

P	C	F	-	W	0	6	0	3	L	F	-	1	1	-	1	5	4	1	-	B	-	P	-	L	T
1	2				3	4		5			6	7	8												

1 Type	2 Model	3 Termination	4 TCR	5 Value	6 Tolerance	7 Tape	8 Packing	
PCF	W0201	LF = Pb-free (100%Sn)	13 = ±5ppm/°C	3 digits + multiplier	T = ±0.01%	P = Paper (0201 to 1210)	LT = Tape & Reel	
	W0402		12 = ±10ppm/°C	R = ohms for values <100 ohms	A = ±0.05%		0201, 0402	10,000/reel
	W0603		11 = ±15ppm/°C		B = ±0.1%	E = Embossed (2010, 2512)	0603 to 1210	5000/reel
	W0805		03 = ±25ppm/°C		C = ±0.25%		2010, 2512	4000/reel
	W1206		02 = ±50ppm/°C			D = ±0.5%		
	W1210					F = ±1%		
	W2010							
	W2512							

\* Applies only to Standard Range parts.

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