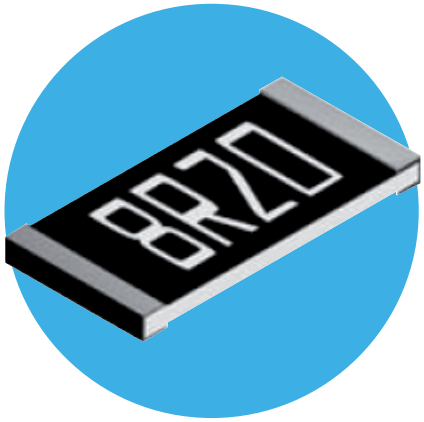
Resistors

Precision Thin Film Nichrome Chip Resistors



PCF Series

- Precision thin film technology
- Extended ohmic range 1R - 3M
- Precision to ±0.01% and 5ppm/°C
- Passivated range for superior humidity performance
- Load life stability and humidity to 0.05%
- Pb-free standard with SnPb option
- AEC-Q200 grade available

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

Electrical Data - Standard Range

Type	TCR (ppm/°C)	Power (W)	Limiting Element Voltage (V)	Ohmic Value Range[1]				
				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		
	5					49R9-5K		
PCF0603	50	0.063	50	2R-1M		4R7-1M	4R7-332K	-
	25							
	15			-		4R7-332K		24R9-100K
	10							
	5					24R9-15K		
PCF0805	50	0.1	100	1R-2M		4R7-2M	4R7-511K	-
	25							
	15			-		4R7-511K		24R9-200K
	10							
	5					24R9-30K [2]		24R9-30K
PCF1206	50	0.125	150	1R–2M5		4R7-2M5	4R7-511K	-
	25							
	15			-		4R7-1M		24R9-500K
	10							
	5					24R9-50K [2]		24R9-50K
PCF1210	50	0.2	150	1R–2M5		4R7-2M5	4R7-1M	-
	25							
	15			-		4R7-1M		24R9-500K
	10							
	5					24R9-50K [2]		24R9-50K
PCF2010	50	0.25	150	1R–3M		4R7-3M	4R7-1M	-
	25							
	15			-		4R7-1M		24R9-500K
	10							
	5					24R9-100K		
PCF2512	50	0.5	150	1R–3M		4R7-3M	4R7-1M	-
	25							
	15			-		4R7-1M		24R9-500K
	10							
	5					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

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.

Electrical Data - AEQ-Q200 Grade - Standard Range

Type	TCR (ppm/°C)	Power (W)	Limiting Element Voltage (V)	Ohmic Value Range *				
				1%	0.5%	0.25%	0.1%	0.05%
PCF0402…A	50 25	0.063	25	49R9 – 100K				49R9 – 10K
PCF0603…A	50 25	0.063	50	10R – 332K				10R – 49K9
PCF0805…A	50 25	0.1	100	10R – 1M0				10R – 100K
PCF1206…A	50 25	0.125	150					10R – 200K
PCF1210…A	50 25	0.25	150					10R – 499K
PCF2010…A	50 25	0.25	150					
PCF2512…A	50 25	0.5	150					

* Standard values E24 or E96.

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 25	0.1	75	4R7-1M			4R7-332K	24R9-100K
	15 10			4R7-332K				
	5			24R9-15K				
PCF0805H	50 25	0.125	150	1R-1M		4R7–1M	4R7-511K	24R9-200K
	15 10			4R7-1M 4R7-511K				
	5			24R9-30K				
PCF1206H	50 25 15 10	0.25	200	4R7-1M				24R9-500K
	5			24R9-50K				
PCF1210H	50 25 15 10	0.33	200	4R7-1M				24R9-500K
	5			24R9-50K				
PCF2010H	50 25 15 10	0.33	200	4R7-1M				24R9-500K
	5			24R9-50K				
PCF2512H	50 25 15 10	0.75	200	1R-2K		4R7-2K		24R9-2K

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

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.

Electrical Data - AEQ-Q200 Grade – High Power Range

Type	TCR (ppm/°C)	Power (W)	Limiting Element Voltage (V)	Ohmic Value Range *				
				1%	0.5%	0.25%	0.1%	0.05%
PCF0603H...A	50 25	0.1	75	10R – 332K				10R – 49K9
PCF0805H...A	50 25	0.125	150	10R – 1M0				10R – 100K
PCF1206H...A	50 25	0.25	200					10R – 200K
PCF1210H...A	50 25	0.33	200					10R – 499K
PCF2010H...A	50 25	0.33	200					

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 25	0.166	100	10R-332K				
PCF0805X	50 25	0.25	150	10R-500K				
PCF1206X	50 25	0.333	200	10R-1M				
PCF2512X	50 25	1	200	1R-100R		4R7-100R		

Electrical Data - Passivated Range

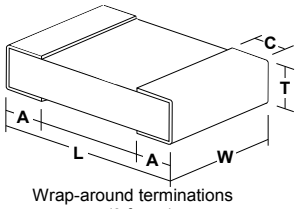
Type	TCR (ppm/°C)	Power (W)	Limiting Element Voltage (V)	Ohmic Value Range *		
				0.5%	0.25%	0.1%
PCF0402P	50 25 15	0.063	25	25R-25K		
				49R9-12K		
PCF0603P	50 25 15	0.063	50	25R-332K		
				25R-100K		
PCF0805P	50 25 15	0.1	100	10R-800K		
				25R-200K		
PCF1206P	50 25 15	0.125	150	10R-1M		
				25R-500K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

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.

Physical Data

Dimensions (mm) and Weight (mg)						
	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	0.55	0.2 ± 0.1	0.2 ± 0.1	3
0603	1.6 ± 0.2	0.8 ± 0.2	0.65	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	0.65	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 standard termination is 100% Sn matte plated wrap-around suitable for soldering. SnPb plated option is available for standard range PCF over the restricted range below.

SnPb Termination Option Range

Type	TCR (ppm/°C)	Power (W)	Limiting Element Voltage (V)	Ohmic Value Range 1% 0.5% 0.25% 0.1%
PCF0805	50	0.1	100	10R – 250K
	25			10R – 100K
	15			10R – 100K
	10			10R – 5K0
PCF1206	50	0.125	150	10R – 500K
	25			10R – 200K
	15			10R – 200K
	10			10R – 10K

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

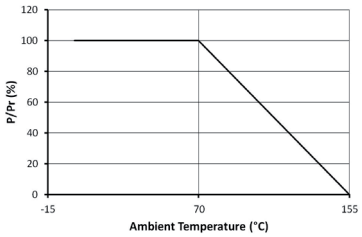
Test Parameters	Conditions	Maximum change (+0.05R)
Load life	1000 hours rated load @ 70°C	0.5%
Humidity	1000hrs @ 40°C, 90 - 95%RH	0.5%
Short term overload	6.25 x rated Power, or 2 x LEV, for 5 sec	0.5%
High temperature operation	1000 hours at 155°C	0.5%
Temperature cycle	5 cycles -55°C, 150°C	0.25%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

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.

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	

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 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.

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 E96 = 3/4 characters R = ohms K = kilohms M = megohms	L = ±0.01%	A = AEC-Q200 grade, Pb-free	
	0402		-12 = ±10ppm/°C		W = ±0.05%	I = Standard grade, Pb-free	
	0603	H = High Power	-11 = ±15ppm/°C		B = ±0.1%	PB = SnPb	
	0805	X = Extended	R = ±25ppm/°C		C = ±0.25%	0201, 0402	10,000/reel
	1206	P = Passivated	-02 = ±50ppm/°C		D = ±0.5%	0603 to 1210	5000/reel
	1210				F = ±1%	2010, 2512	4000/reel
	2010					T1* = Pb-free, 1K reel	
	2512					0201 to 1206, 2010, 2512	1000/reel

* 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	Omit for SnPb	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.