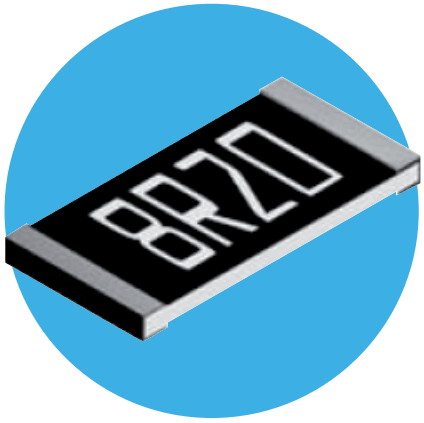
Precision Thin Film Nichrome Chip Resistors



PCF Series

- Precision thin film technology
- Extended ohmic range 1R - 3M
- Precision to ±0.01% and 2ppm/°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 amended by (EU) 2015/863 (RoHS3)

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			-		49R9-70K	49R9-12K	
	10					49R9-12K		
	5					49R9-5K	49R9-3K	
	3					49R9 - 4K99		
	2							
PCF0603	50	0.063	50	2R-1M		4R7-1M	4R7-332K	-
	25							
	15			-		4R7-332K		
	10							
	5					24R9-15K	24R9-100K	
	3					24R9 – 15K		
	2							
PCF0805	50	0.1	100	1R-2M		4R7-2M	24R9-200K	-
	25							
	15			-		4R7-511K	-	24R9-200K
	10						24R9-200K	
	5					24R9-30K		
	3							
	2							
PCF1206	50	0.125	150	1R-2M5		4R7-2M5	4R7-1M	-
	25							
	15			-		4R7–1M		24R9-500K
	10							
	5					24R9-49K9		
	3							
	2							
PCF1210	50	0.2	150	1R-2M5		4R7-2M5	-	
	25							
	15			-		4R7–1M		
	10							
	5					24R9-50K		
	3							
	2							
PCF2010	50	0.25	150	1R-3M		4R7-3M	4R7-1M	-
	25							
	15			-		4R7-1M		24R9-500K
	10							
	5					24R9-100K		
	3							
	2							
PCF2512	50	0.5	150	1R – 3M		4R7-3M	4R7-1M	-
	25							
	15			-		4R7-1M		24R9-500K
	10							
	5					24R9-100K		
	3							
	2							

Note 1: 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.

PCF Series

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				
	3 2			-		24R9-15K		
PCF0805H	50 25	0.125	150	1R-1M		4R7-1M	4R7-511K	24R9-200K
	15 10			4R7-332K 4R7-511K				
	5			24R9-30K				
	3 2			-		24R9-30K		
PCF1206H	50 25 15 10	0.25	200	4R7-1M				24R9-500K
	5			24R9-50K				
	3 2			-		24R9-49K9		
PCF1210H	50 25 15 10	0.33	200	4R7-1M				24R9-500K
	5			24R9-50K				
	3 2			-		24R9-49K9		
PCF2010H	50 25 15 10	0.33	200	4R7-1M				24R9-500K
	5			24R9-50K				
	3 2			-		24R9-49K9		
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.

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PCF Series

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 - 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		
PCF0805P	50 25 15	0.1	100	10R - 1M		
PCF1206P	50 25 15	0.125	150	10R-1M		
PCF2010P	50 25 15	0.25	150	10R - 1M5		
				25R - 1M		
PCF2512P	50 25 15	0.5	150	10R - 1M5		
				25R - 1M		

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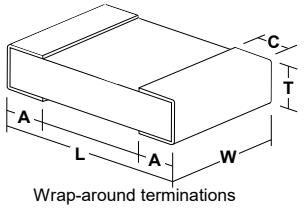
PCF Series

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	0.14
0402	1.0 ± 0.1	0.5 ± 0.05	0.55	0.25 ± 0.15	0.2 ± 0.15	0.54
0603	1.6 ± 0.2	0.8 ± 0.2	0.65	0.35 ± 0.25	0.3 ± 0.2	1.8
0805	2.0 ± 0.2	1.25 ± 0.2	0.65	0.4 ± 0.25	0.3 ± 0.2	4.7
1206	3.05 ± 0.15	1.55 ± 0.15	0.65	0.35 ± 0.25	0.42 ± 0.2	9.0
1210	3.10 ± 0.15	2.5 ± 0.25	0.65	0.55 ± 0.25	0.4 ± 0.3	10
2010	4.9 ± 0.2	2.4 ± 0.25	0.65	0.55 ± 0.3	0.6 ± 0.3	24
2512	6.3 ± 0.2	3.1 ± 0.25	0.65	0.7 ± 0.45	0.6 ± 0.3	38



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
PCF1206	50	0.125	150	10R – 500K
	25			10R – 200K
	15			10R – 200K

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

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

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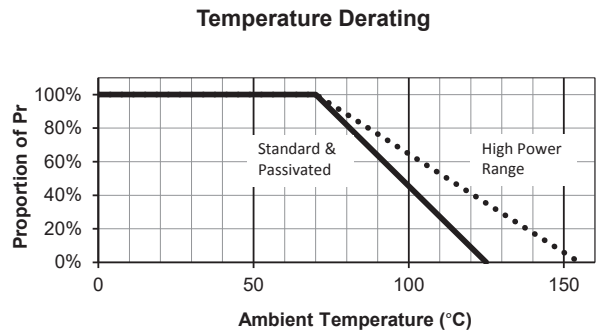
PCF Series

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℃ (see performance above) (155℃ 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.

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 Grade, Packing & Termination	
PCF	0201	Omit for Standard	-20 = ±2ppm/°C	E24 = 3/4 characters E96 = 3/4 characters R = ohms K = kilohms M = megohms	L = ±0.01%	A = AEC-Q200 grade, Standard pack, Pb-free I = Standard grade, Standard pack, Pb-free	
	0402		-19 = ±3ppm/°C		W = ±0.05%		
	0603	H = High Power	-13 = ±5ppm/°C		B = ±0.1%	0201, 0402	10,000/reel
	0805	P = Passivated	-12 = ±10ppm/°C		C = ±0.25%	0603 to 1210	5000/reel
	1206		-11 = ±15ppm/°C		D = ±0.5%	2010, 2512	4000/reel
	1210		R = ±25ppm/°C		F = ±1%	A1 = AEC-Q200 grade, 1K reel, Pb-free T1 = Standard grade, 1K reel, Pb-free	
	2010		-02 = ±50ppm/°C			0201 to 1206, 2010, 2512	1000/reel*
	2512					PB = Standard grade, 1K reel, SnPb	
						0805, 1206	1000/reel

* Non-standard; enquire to confirm availability

** Applies to all Ranges, Termination and Packing options.

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, Pb-Free parts

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PCF2010HR-412KBT1 PCF0805HR-5R11BT1 PCF0603PR-137KBI PCF2010HR-187KBI PCF1206HR-5K1BI PCF2010R-121KBT1 PCF2512HR-5R49BI PCF0603HR-1K18BI PCF2010HR-22R1BT1 PCF0805HR-5K49BT1 PCF2010R-2K4BT1 PCF0805R-4R87BT1 PCF2512PR-86K6BT1 PCF2512PR-562RBT1 PCF2010HR-7R15BT1 PCF0805HR-300KBT1 PCF2010R-44R2BT1 PCF1206HR-274KBI PCF1206HR-1K8BI PCF0805HR-11RBI PCF0805R-576KBT1 PCF2512PR-82RBT1 PCF2010PR-910KBI PCF2010PR-17R4BI PCF1206HR-34RBI PCF0805HR-576RBI PCF2010PR-18K2BI PCF0805HR-32K4BI PCF0805R-360RBT1 PCF2010HR-154RBT1 PCF1206HR-36K5BT1 PCF0805PR-205RBI PCF0603HR-22RBT1 PCF0805HR-620KBI PCF0805R-88R7BT1 PCF2512PR-30K9BT1 PCF1206PR-576KBT1 PCF0805PR-8K25BT1 PCF2010PR-2K67BI PCF1206PR-549RBT1 PCF0805PR-487KBT1 PCF2512HR-36R5BT1 PCF2010HR-23K7BT1 PCF2010PR-48R7BI PCF1206PR-88R7BI PCF0805HR-4K75BI PCF1206PR-1K0BT1 PCF2010PR-9K09BI PCF0805PR-16RBI PCF2010HR-1K82BI PCF1206HR-18K7BI PCF0603R-23K2BT1 PCF2010PR-16RBT1 PCF1206HR-18R2BI PCF0805PR-115KBI PCF0805PR-25R5BI PCF1206HR-11K5BI PCF1206PR-1K65BT1 PCF0603PR-287RBT1 PCF2010HR-178RBT1 PCF2512R-2K87BT1 PCF2010R-243KBT1 PCF0402PR-18K7BT1 PCF0805HR-2K94BT1 PCF0603HR-15K4BI PCF0805HR-15R8BT1 PCF2010PR-3K0BT1 PCF0402PR-68RBT1 PCF2512HR-5R49BT1 PCF0805R-2K94BT1 PCF0402R-69K8BT1 PCF2512HR-1K69BT1 PCF0603HR-3K3BT1 PCF2512PR-1K05BT1 PCF2010PR-1K87BT1 PCF1206PR-301RBT1 PCF0603PR-2K43BI PCF2512HR-1K02BT1 PCF1206HR-95R3BI PCF0805R-1K15BT1 PCF0402R-120KBT1 PCF0805HR-825KBT1 PCF2010R-15R8BT1 PCF0603HR-78R7BI PCF2512PR-49K9BI PCF1206HR-60R4BI PCF1206PR-309KBT1 PCF2512R-15R4BT1 PCF2010R-1K27BT1 PCF1206R-16R9BT1 PCF0603HR-75KBT1 PCF0603HR-49R9BI PCF2010HR-51KBT1 PCF2010R-787RBT1 PCF2512PR-11R3BI PCF2010HR-523KBI PCF2010HR-9R31BI PCF0805HR-16RBI PCF0603PR-442RBT1 PCF0603PR-30K1BT1