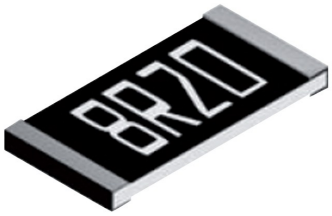
Precision Thin Film Nichrome Chip Resistors

PCF Series

Features:

- Precision thin film technology
- Extended ohmic range 1R0 to 3M0
- Precision to ±0.01% and 1ppm/°C
- Passivated range for superior humidity performance
- Load life stability and humidity to 0.05%
- AEC-Q200 grade available



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

Electrical Data

Range & Grade		Size							
		0201	0402	0603	0805	1206	1210	2010	2512
Standard Range		**PCF0201**	**PCF0402**	**PCF0603**	**PCF0805**	**PCF1206**	**PCF1210**	**PCF2010**	**PCF2512**
Power rating @70°C	W	0.031	0.063		0.1	0.125	0.2	0.25	0.5
Limiting element voltage	V	15	25	50	100	150			
Resistance range	ohms	49R9 – 33K	10R – 205K	2R0 – 1M0	1R0 – 2M0	1R0 – 2M5		1R0 – 3M0	
Resistance tolerance [1]	%	0.5, 1	0.01, 0.05, 0.1, 0.25, 0.5, 1						
TCR [1]	ppm/°C	25, 50	1, 2, 3, 5, 10, 15, 25, 50						
Ambient temperature range	°C	-55 to 125							
Standard values		E24 & E96 preferred							
Standard Range AEC-Q200			**PCF0402…A**	**PCF0603…A**	**PCF0805…A**	**PCF1206…A**	**PCF1210…A**	**PCF2010…A**	**PCF2512…A**
Power rating @70°C	W		0.063		0.1	0.125	0.25		0.5
Limiting element voltage	V		25	50	100	150			
Resistance range	ohms		49R9 – 221K	10R – 680K	10R – 1M0	10R – 1M5	10R – 1M0		
Resistance tolerance [1]	%		0.05, 0.1, 0.25, 0.5, 1						
TCR [1]	ppm/°C		10, 15, 25, 50						
Ambient temperature range	°C		-55 to 125						
Standard values			E24 & E96 preferred						
High Power Range				**PCF0603H**	**PCF0805H**	**PCF1206H**	**PCF1210H**	**PCF2010H**	**PCF2512H**
Power rating @70°C	W			0.1	0.125	0.25	0.33		0.75
Limiting element voltage	V			75	150	200			
Resistance range	ohms			4R7 – 1M0	1R0 – 1M0	4R7 – 1M0			1R0 – 2K0
Resistance tolerance [1]	%			0.01, 0.05, 0.1, 0.25, 0.5					
TCR [1]	ppm/°C			1, 2, 3, 5, 10, 15, 25, 50					10, 15, 25, 50
Ambient temperature range	°C			-55 to 155					
Standard values				E24 & E96 preferred					
High Power Range AEC-Q200				**PCF0603H…A**	**PCF0805 H…A**	**PCF1206 H…A**	**PCF1210 H…A**	**PCF2010 H…A**	
Power rating @70°C	W			0.1	0.125	0.25	0.33		
Limiting element voltage	V			75	150	200			
Resistance range	ohms			10R – 332K	10R – 1M0				
Resistance tolerance [1]	%			0.05, 0.1, 0.25, 0.5, 1					
TCR [1]	ppm/°C			10, 15, 25, 50					
Ambient temperature range	°C			-55 to 155					
Standard values				E24 & E96 preferred					
Passivated Range			**PCF0402P**	**PCF0603P**	**PCF0805P**	**PCF1206P**		**PCF2010P**	**PCF2512P**
Power rating @70°C	W		0.063		0.1	0.125		0.25	0.5
Limiting element voltage	V		25	50	100	150		150	
Resistance range	ohms		25R – 25K	25R – 332K	10R – 1M0			10R – 1M5	
Resistance tolerance [1]	%		0.1, 0.25, 0.5					0.1, 0.25, 0.5	
TCR [1]	ppm/°C		15, 25, 50					15, 25, 50	
Ambient temperature range	°C		-55 to 125					-55 to 125	
Standard values			E24 & E96 preferred					E24 & E96 preferred	

Note 1: See Manufacturing Capability tables.

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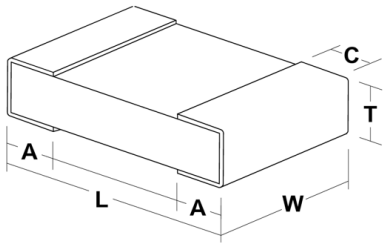
Physical Data

Dimensions in mm and weight in mg						
	L	W	T_{max}	A	C	$Wt._{nom}$
0201	0.58 ±0.05	0.29 ±0.05	0.26	0.15 ±0.05	0.12 ±0.05	0.14
0402	1 ±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 ±0.25	1.8
0805	2 ±0.2	1.25 ±0.2		0.4 ±0.25		4.7
1206	3.05 ±0.15	1.55 ±0.15		0.35 ±0.25	0.42 ±0.3	9
1210	3.1 ±0.15	2.5 ±0.25		0.55 ±0.25	0.4 ±0.3	10
2010	4.9 ±0.2	2.4 ±0.25		0.55 ±0.3	0.6 ±0.4	24
2512	6.3 ±0.2	3.1 ±0.25		0.7 ±0.45		38



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 Pb-free wrap-around terminations suitable for soldering.

Solderability

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

Manufacturing Capability

Standard Range		Tolerance (%)					
Type	**TCR** (ppm/°C)	**1**	**0.5**	**0.25**	**0.1**	**0.05**	**0.01**
PCF0201	**50**	49R9 – 33K					
	25	49R9 – 5K0					
PCF0402	**25, 50**	10R – 205K					
	15				49R9 – 70K	49R9 – 12K	
	10						
	5				49R9 – 5K0	49R9 – 3K0	
	1, 2, 3				49R9 – 4K99		
PCF0603	**25, 50**	2R0 – 1M0			4R7 – 1M0	4R7 – 332K	
	10, 15						
	5					24R9 – 100K	
	1, 2, 3				24R9 – 15K		
PCF0805	**25, 50**	1R0 – 2M0			4R7 – 2M5	4R7 – 1M0	
	10, 15						24R9 – 500K
	2, 3, 5				24R9 – 49K9		
	1				24R9 – 30K		
PCF1206	**25, 50**	1R0 – 2M5			4R7 – 2M5	4R7 – 1M0	
	10, 15						24R9 – 500K
	1, 2, 3, 5				24R9 – 49K9		
PCF1210	**25, 50**	1R0 – 2M5			4R7 – 2M5		
	10, 15				4R7 – 1M0		
	2, 3, 5				24R9 – 50K		
	1				24R9 – 49K9		
PCF2010	**25, 50**	1R0 – 3M0			4R7 – 3M0	4R7 – 1M0	
	10, 15						24R9 – 500K
	1, 2, 3, 5				24R9 – 100K		
PCF2512	**25, 50**	1R0 – 3M0			4R7 – 3M0	4R7 – 1M0	
	10, 15						24R9 – 500K
	1, 2, 3, 5				24R9 – 100K		

Manufacturing Capability Continued

Standard Range AEC-Q200		Tolerance (%)					
Type	TCR (ppm/°C)	1	0.5	0.25	0.1	0.05	0.01
PCF0402...A	25, 50	49R9 – 221K				49R9 – 12K	
	10, 15	49R9 – 69K8					
PCF0603...A	25, 50	10R – 680K				10R – 49K9	
	10, 15	10R – 332K					
PCF0805...A	10, 15, 25, 50	10R – 1M0				10R – 100K	
PCF1206...A	25, 50	10R – 1M5				10R – 200K	
	10, 15	10R – 1M0					
PCF1210...A	10, 15, 25, 50					10R – 499K	
PCF2010...A	10, 15, 25, 50						
PCF2512...A	10, 15, 25, 50						

High Power Range		Tolerance (%)					
Type	TCR (ppm/°C)	1	0.5	0.25	0.1	0.05	0.01
PCF0603H	25, 50		4R7 – 1M0				24R9 – 100K
	10, 15		4R7 – 332K				
	5		24R9 – 15K				
	1, 2, 3						
PCF0805H	25, 50		1R0 – 1M0		4R7 – 1M0		24R9 – 200K
	15		4R7 – 332K				
	10		4R7 – 511K				
	5		24R9 – 30K				
	1, 2, 3						
PCF1206H PCF1210H PCF2010H	10, 15, 25, 50		4R7 – 1M0				24R9 – 500K
	5		24R9 – 50K				
	1, 2, 3				24R9 – 49K9		
PCF2512H	10, 15, 25, 50		1R0 – 2K0		4R7 – 2K0		24R9 – 2K0
	1, 2, 3, 5						

High Power Range AEC-Q200		Tolerance (%)					
Type	TCR (ppm/°C)	1	0.5	0.25	0.1	0.05	0.01
PCF0603H...A	10, 15, 25, 50	10R – 332K				10R – 49K9	
PCF0805H...A	15, 25, 50	10R – 1M0				10R – 100K	
	10	10R – 511K					
PCF1206H...A	10, 15, 25, 50					10R – 200K	
PCF1210H...A	10, 15, 25, 50	10R – 1M0				10R – 499K	
PCF2010H...A	10, 15, 25, 50						

Passivated Range		Tolerance (%)					
Type	TCR (ppm/°C)	1	0.5	0.25	0.1	0.05	0.01
PCF0402P	25, 50		25R – 25K				
	15		49R9 – 12K				
PCF0603P	15, 25, 50		25R – 332K				
PCF0805P	15, 25, 50		10R – 1M0				
PCF1206P	15, 25, 50						
PCF2010P	25, 50		10R – 1M5				
	15		25R – 1M0				
PCF2512P	25, 50		10R – 1M5				
	15		25R – 1M0				

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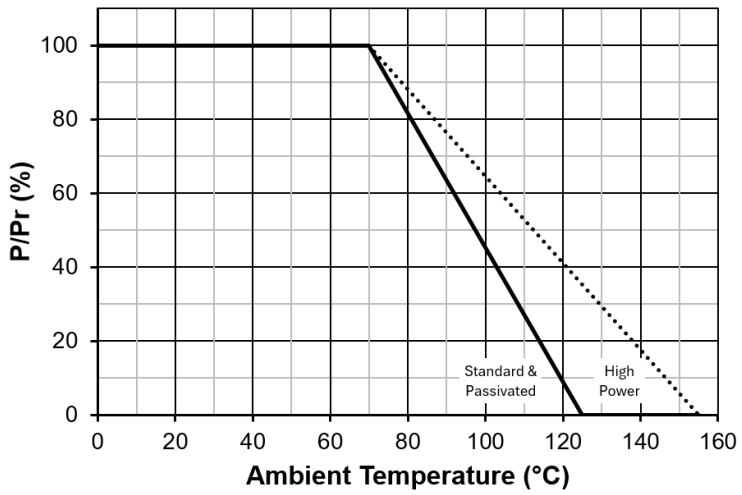
Performance Data

Standard Range		Maximum (+0.05Ω)		
Test		0201 & 0402	0603 to 2512	
			Tolerance >0.05%	Tolerance ≤0.05%
Load at rated power: 1000 hours rated power at 70°C	±ΔR%	0.5	0.25	0.05
Humidity: 1000 hours at 40°C, 90 to 95%RH	±ΔR%	0.3		
Short term overload: 6.25 x rated power or 2 x LEV for 5s	±ΔR%	0.5		
High temperature operation: 1000 hours at 125°C	±ΔR%	0.25		
Temperature cycle: 5 cycles, -55 to +125°C	±ΔR%	0.1		0.05
Resistance to solder heat: 270°C, 10s	±ΔR%	0.2		
Solderability: 235°C, 2s		95% minimum coverage		

High Power Range		Maximum (+0.05Ω)
Test		
Load at rated power: 1000 hours rated power at 70°C	±ΔR%	0.5
Humidity: 1000 hours at 40°C, 90 to 95%RH	±ΔR%	
Short term overload: 6.25 x rated power or 2 x LEV for 5s	±ΔR%	
High temperature operation: 1000 hours at 155°C	±ΔR%	
Temperature cycle: 5 cycles, -55 to +150°C	±ΔR%	0.25
Resistance to solder heat: 270°C, 10s	±ΔR%	0.2
Solderability: 235°C, 2s		95% minimum coverage

Passivated Range		Maximum (+0.05Ω)	
Test		0402	0603 to 2512
Load at rated power: 1000 hours rated power at 70°C	±ΔR%	0.25	0.05
Humidity: 1000 hours at 40°C, 90 to 95%RH	±ΔR%	0.5	
Short term overload: 6.25 x rated power or 2 x LEV for 5s	±ΔR%	0.1	0.02
High temperature operation: 1000 hours at 125°C	±ΔR%	0.5	0.05
Temperature cycle: 5 cycles, -55 to +125°C	±ΔR%	0.1	0.02
Resistance to solder heat: 270°C, 10s	±ΔR%		
Solderability: 235°C, 2s		95% minimum coverage	

Temperature Derating



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. For full dimensional details see:
https://www.ttelectronics.com/TTElectronics/media/ProductFiles/Application-Note/PS001-Packing-of-General-Purpose-Chip-Resistors.pdf.

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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 through-hole components applied on the other side. PCF resistors themselves can operate at a maximum temperature of 125°C for Standard and Passivated ranges and 155°C for High Power range. 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

Global Part Number Example: PCF0603-11-1K54BI (0603, Standard Range, 15ppm/°C, 1.54 kilohms ±0.1%, non-AEC-Q200, 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 Series	2 Size	3 Range	4 TCR [1]	5 Value	6 Tolerance	7 Grade & Packing	
PCF	0201	Omit for Standard	-21 = ±1ppm/°C	E24 = 3/4 characters E96 = 3/4 characters R = ohms K = kilohms M = megohms	L = ±0.01%	I = non-AEC-Q200, Standard packing	
	0402	H = High Power	-20 = ±2ppm/°C		W = ±0.05%	A = AEC-Q200 grade, Standard packing	
	0603	P = Passivated	-19 = ±3ppm/°C		B = ±0.1%	0201 & 0402	10,000/reel
	0805		-13 = ±5ppm/°C		C = ±0.25%	0603 to 1210	5000/reel
	1206		-12 = ±10ppm/°C		D = ±0.5%	2010 & 2512	4000/reel
	1210		-11 = ±15ppm/°C		F = ±1%	T1 = non-AEC-Q200, 1K reel packing [2]	
	2010		R = ±25ppm/°C			A1 = AEC-Q200 grade, 1K reel packing [2]	
	2512		-02 = ±50ppm/°C			All sizes except 1210	1000/reel

Note 1: The hyphen within TCR codes is omitted if necessary to prevent the total character count from exceeding 18.
Note 2: Non-standard packing – enquire to confirm availability.

Legacy Part Numbers

This product has a legacy part number format applying only to Standard Range non-AEC-Q200 and with TCR ≥5ppm/°C in standard packing. This is still available for ordering, but for new designs use of the Global Part Number is recommended.

Legacy Part Number Example: PCF-W0603LF-11-1541-B-P-LT (0603, Standard Range, 15ppm/°C, 1.54 kilohms ±0.1%, non-AEC-Q200, 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 Series	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 R = ohms for values <100 ohms	T = ±0.01%	P = Paper	0201 to 1210	LT = Tape & reel	
	W0402		12 = ±10ppm/°C		A = ±0.05%	E = Embossed	2010 & 2512	0201 & 0402	10,000/reel
	W0603		11 = ±15ppm/°C		B = ±0.1%			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								