

## Type CPF Series

### Key Features

- Thin film precision resistors with TC's of 15ppm, 25ppm and 50ppm and tolerances to 0.1%. Applications in measurement, telemetry and for sensing circuits.
- Wide range of case sizes from 0201 to 2512
- CPF chip resistors are suitable for all applications where close accuracy and stability are essential
- Terminal finish - electroplated 100% matte Sn



### Applications

- Communications
- Industrial Controls
- Instrumentation
- Medical

The CPF series is a high stability precision chip resistor range offering various power dissipations relating to a wide range of chip sizes. The CPF series offers TCR's down to 15ppm/°C and resistance tolerances to 0.1%. Standard values are within the IEC 63 E96 and E24 value grids. The CPF has accurate and uniform physical dimensions to facilitate placement.

### Characteristics - Electrical

	0201				0402				0402					
Rated Power @ 70°C:	0.03125W				0.063W				0.063W					
Resistance Range (Ohms)	Min:	49R9	49R9	49R9	49R9	10R	10R	49R9	10R	1R0	49R9	10R	1R0	
	Max:	5K0	33K	5K0	33K	70K	255K	205K	70K	255K	205K	70K	255K	205K
Tolerance (%):	0.5		1		0.1		0.5		1		1		1	
Code letter:	D		F		B		D		F		F		F	
Selection Series:	E24 & E96				E24 & E96				E24 & E96					
Temp. Coefficient (ppm/°C):	25	50	25	50	15	25	50	15	25	50	15	25	50	
Code Letter:	E	C	E	C	D	E	C	D	E	C	D	E	C	
Limiting Element Voltage:	15V				25V				25V					
Max. Overload Voltage:	30V				50V				50V					
Operating Temp. Range:	-55 to +155°C				-55 to +155°C				-55 to +155°C					
Climatic Category (°C):	55/125/55				55/125/55				55/125/55					
Insulation Resistance Dry Min:	1000MΩ				1000MΩ				1000MΩ					
Stability:	0.5%				0.5%				0.5%					

	0603				0805				0805				
Rated Power @ 70°C:	0.063W				0.1W				0.1W				
Resistance Range (Ohms)	Min:	4R7	4R7	4R7	2R0	4R7	2R0	4R3	4R7	4R3	1R0	4R3	1R0
	Max:	332K	1M0	332K	1M0	332K	1M0	511K	2M0	511K	2M0	511K	2M0
Tolerance (%):	0.1		0.5		1		0.1		0.5		1		
Code letter:	B		D		F		B		D		F		
Selection Series:	E24 & E96				E24 & E96				E24 & E96				
Temp. Coefficient (ppm/°C):	15	25	50	15	25	50	15	25	50	15	25	50	
Code Letter:	D	E	C	D	E	C	D	E	C	D	E	C	
Limiting Element Voltage:	50V				100V				100V				
Max. Overload Voltage:	100V				200V				200V				
Operating Temp. Range:	-55 to +155°C				-55 to +155°C				-55 to +155°C				
Climatic Category (°C):	55/125/55				55/125/55				55/125/55				
Insulation Resistance Dry Min:	1000MΩ				1000MΩ				1000MΩ				
Stability:	0.5%				0.5%				0.5%				

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	1206						1210					
<b>Rated Power @ 70°C:</b>	0.125W						0.2W					
<b>Resistance Range (Ohms)</b>	4R7	4R7	4R7	1R0	4R7	1R0	4R7	4R7	4R7	1R0	4R7	1R0
<b>Min:</b>	1M0	2M5	1M0	2M5	1M0	2M5	1M0	2M5	1M0	2M5	1M0	2M5
<b>Max:</b>												
<b>Tolerance (%):</b>	0.1		0.5		1		0.1		0.5		1	
<b>Code Letter:</b>	B		D		F		B		D		F	
<b>Selection Series:</b>	E24 & E96						E24 & E96					
<b>Temp. Coefficient (ppm/°C):</b>	15	25	50	15	25	50	15	25	50	15	25	50
<b>Code Letter:</b>	D	E	C	D	E	C	D	E	C	D	E	C
<b>Limiting Element Voltage:</b>	150V						150V					
<b>Max. Overload Voltage:</b>	300V						300V					
<b>Operating Temp. Range:</b>	-55 to +155°C						-55 to +155°C					
<b>Climatic Category (°C):</b>	55/125/55						55/125/55					
<b>Insulation Resistance Dry Min:</b>	1000MΩ						1000MΩ					
<b>Stability:</b>	0.5%						0.5%					

	2010						2512					
<b>Rated Power @ 70°C:</b>	0.25W						0.5W					
<b>Resistance Range (Ohms)</b>	4R7	4R7	4R7	1R0	4R7	1R0	4R7	4R7	4R7	1R0	4R7	1R0
<b>Min:</b>	1M0	3M0	1M0	3M0	1M0	3M0	1M0	3M0	1M0	3M0	1M0	3M0
<b>Max:</b>												
<b>Tolerance (%):</b>	0.1		0.5		1		0.1		0.5		1	
<b>Code letter:</b>	B		D		F		B		D		F	
<b>Selection Series:</b>	E24 & E96						E24 & E96					
<b>Temp. Coefficient (ppm/°C):</b>	15	25	50	15	25	50	15	25	50	15	25	50
<b>Code Letter:</b>	D	E	C	D	E	C	D	E	C	D	E	C
<b>Limiting Element Voltage:</b>	150V						150V					
<b>Max. Overload Voltage:</b>	300V						300V					
<b>Operating Temp. Range:</b>	-55 to +155°C						-55 to +155°C					
<b>Climatic Category (°C):</b>	55/125/55						55/125/55					
<b>Insulation Resistance Dry Min:</b>	1000MΩ						1000MΩ					
<b>Stability:</b>	0.5%						0.5%					

### Characteristics - Environmental

Item	Requirement		Test Method
	Tol. ≤ 0.05%	Tol. > 0.05%	
<b>Temperature Coefficient of Resistance (TCR):</b>	AS per TCRs specified in value range table on page 1		+25/-55/+25/+125/+25°C
<b>Short Time Overload:</b>	$\Delta R \pm 0.05\%$	$\Delta R \pm 0.2\%$	RCWV* 2.5 or max. overload voltage for 5 seconds
<b>Insulation Resistance:</b>	$\Delta R \pm 0.2\%$ for high power rating >1000MΩ		Apply 100VDC for 1 minute
<b>Endurance:</b>	$\Delta R \pm 0.05\%$	$\Delta R \pm 0.2\%$	70 ±2°C, max. working voltage for 1000hrs with 1.5hrs "ON" and 0.5 hrs "OFF"
<b>Damp Heat with Load:</b>	$\Delta R \pm 0.05\%$	$\Delta R \pm 0.3\%$	40 ±2°C, 90 - 95% R.H. max. working voltage hrs with 1.5hrs "ON" and 0.5hrs "OFF"
<b>Bending Strength:</b>	$\Delta R \pm 0.5\%$ for high power rating		Bending amplitude 3mm for 10 seconds
<b>Solderability:</b>	95% min. coverage		245 ±5°C for 3 seconds
<b>Resistance to Soldering Heat:</b>	$\Delta R \pm 0.05\%$	$\Delta R \pm 0.2\%$	260 ±5°C for 10 seconds
<b>Dielectric Withstand Voltage:</b>	By Type		Max. overload voltage for 1 minute
<b>Thermal Shock:</b>	$\Delta R \pm 0.05\%$	$\Delta R \pm 0.25\%$	-55°C to +150°C, 100 cycles
<b>Low Temperature Operation:</b>	$\Delta R \pm 0.05\%$	$\Delta R \pm 0.2\%$	1 hour, -65°C, followed by 45 minutes of RCWV
	$\Delta R \pm 0.5\%$ for high power rating		

Reference Standards: MIL-STD-202, JIS-C 5201-1

Storage Temperature: 25±3°C; Humidity < 80%RH

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### Marking Codes - Case Sizes 0805 to 2512

#### IEC 4 Digit Marking

Resistance:	100Ω	2.2KΩ	10KΩ	49.9KΩ	100KΩ
Marking Code:	1000	2201	1002	4992	1003

### Case Sizes 0603

#### E24 3 Digit Marking - Example: 101=100Ω 102=1KΩ

E24	10	11	12	13	15	16	18	20	22	24	27	30
	33	36	39	43	47	51	56	62	68	75	82	91

#### E96 3 Digit Marking - Examples: 14C=13K7Ω, 13C=13K3Ω, 68B=4K99Ω, 68X=49.9Ω



#### 0603 E96 Marking Code Table

Code	E96	Code	E96	Code	E96	Code	E96				
01	100	25	178	49	316	73	562				
02	102	26	182	50	324	74	576				
03	105	27	187	51	332	75	590				
04	107	28	191	52	340	76	604				
05	110	29	196	53	348	77	619				
06	113	30	200	54	357	78	634				
07	115	31	205	55	365	79	649				
08	118	32	210	56	374	80	665				
09	121	33	215	57	383	81	681				
10	124	34	221	58	392	82	698				
11	127	35	226	59	402	83	715				
12	130	36	232	60	412	84	732				
13	133	37	237	61	422	85	750				
14	137	38	243	62	432	86	768				
15	140	39	249	63	442	87	787				
16	143	40	255	64	453	88	806				
17	147	41	261	65	464	89	825				
18	150	42	267	66	475	90	845				
19	154	43	274	67	487	91	866				
20	158	44	280	68	499	92	887				
21	162	45	287	69	511	93	909				
22	165	46	294	70	523	94	931				
23	169	47	301	71	536	95	953				
24	174	48	309	72	549	96	976				
Code	A	B	C	D	E	F	G	H	X	Y	Z
Multiplier	10 <sup>0</sup>	10 <sup>1</sup>	10 <sup>2</sup>	10 <sup>3</sup>	10 <sup>4</sup>	10 <sup>5</sup>	10 <sup>6</sup>	10 <sup>7</sup>	10 <sup>-1</sup>	10 <sup>-2</sup>	10 <sup>-3</sup>

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### Power Derating Curve



For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with this curve.

### Dimensions



- |                          |                            |                          |
|--------------------------|----------------------------|--------------------------|
| 1. Alumina Substrate     | 4. Edge Electrode (NiCr)   | 7. Resistor Layer (NiCr) |
| 2. Bottom Electrode (Ag) | 5. Barrier Layer (Ni)      | 8. Overcoat (Epoxy)      |
| 3. Top Electrode (Ag-Pd) | 6. External Electrode (Sn) | 9. Marking               |

Part Number	L	W	H	a	b	Weight (g) 1000 pieces
CPF0201	0.58 ±0.05	0.29 ±0.05	0.23 ±0.05	0.12 ±0.05	0.15 ±0.05	0.14
CPF0402	1.00 ±0.05	0.50 ±0.05	0.30 ±0.05	0.20 ±0.10	0.20 ±0.10	0.54
CPF0603	1.55 ±0.10	0.80 ±0.10	0.45 ±0.10	0.30 ±0.20	0.30 ±0.20	1.83
CPF0805	2.00 ±0.15	1.25 ±0.15	0.55 ±0.10	0.30 ±0.20	0.40 ±0.25	4.71
CPF1206	3.05 ±0.15	1.55 ±0.15	0.55 ±0.10	0.42 ±0.20	0.35 ±0.25	9.02
CPF1210	3.10 ±0.15	2.40 ±0.15	0.55 ±0.10	0.40 ±0.20	0.55 ±0.25	10.00
CPF2010	4.90 ±0.15	2.40 ±0.15	0.55 ±0.10	0.60 ±0.30	0.50 ±0.25	23.61
CPF2512	6.30 ±0.15	3.10 ±0.15	0.55 ±0.10	0.60 ±0.30	0.50 ±0.25	38.08

### Recommend Land Pattern



Type	A	B	C
CPF0201	0.25	0.3	0.40 ±0.2
CPF0402	0.5	0.5	0.60 ±0.2
CPF0603	0.8	1.0	0.90 ±0.2
CPF0805	1.0	1.0	1.35 ±0.2
CPF1206	2.0	1.15	1.70 ±0.2
CPF1210	2.0	1.15	2.50 ±0.2
CPF2010	3.6	1.4	2.50 ±0.2
CPF2512	4.9	1.6	3.10 ±0.2

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### Packaging Quantity & Reel Specifications



Type	øA	øB	øC	W	T	Paper Tape (EA)	Embossed Plastic Tape (EA)
CPF0201	178.0 ±1.0	60.0 +1.0	13.5 ±0.7	9.5 ±1.0	11.5 ±1.0	1000 / 5000	-
CPF0402	178.0 ±1.0	60.0 +1.0	13.5 ±0.7	9.5 ±1.0	11.5 ±1.0	1000 / 5000	-
CPF0603	178.0 ±1.0	60.0 +1.0	13.5 ±0.7	9.5 ±1.0	11.5 ±1.0	1000 / 5000	-
CPF0805	178.0 ±1.0	60.0 +1.0	13.5 ±0.7	9.5 ±1.0	11.5 ±1.0	1000 / 5000	-
CPF1206	178.0 ±1.0	60.0 +1.0	13.5 ±0.7	9.5 ±1.0	11.5 ±1.0	1000 / 5000	-
CPF1210	178.0 ±1.0	60.0 +1.0	13.5 ±0.7	9.5 ±1.0	11.5 ±1.0	1000 / 5000	-
CPF2010	178.0 ±1.0	60.0 +1.0	13.5 ±0.7	13.5 ±1.0	15.5 ±1.0	-	4000
CPF2512	178.0 ±1.0	60.0 +1.0	13.5 ±0.7	13.5 ±1.0	15.5 ±1.0	-	4000

### Paper Tape Specification



Type	A	B	W	E	F	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	øD <sub>0</sub>	T
CPF0201	0.40 ±0.05	0.70 ±0.05	8.00 ±0.10	1.75 ±0.05	3.5 ±0.05	4.00 ±0.10	2.00 ±0.05	2.00 ±0.05	1.55 ±0.03	0.42 ±0.02
CPF0402	0.70 ±0.05	1.16 ±0.05	8.00 ±0.10	1.75 ±0.05	3.5 ±0.05	4.00 ±0.10	2.00 ±0.05	2.00 ±0.05	1.55 ±0.05	0.40 ±0.03
CPF0603	1.10 ±0.05	1.90 ±0.05	8.00 ±0.10	1.75 ±0.05	3.5 ±0.05	4.00 ±0.10	4.00 ±0.10	2.00 ±0.05	1.55 ±0.05	0.60 ±0.03
CPF0805	1.60 ±0.05	2.37 ±0.05	8.00 ±0.10	1.75 ±0.05	3.5 ±0.05	4.00 ±0.10	4.00 ±0.10	2.00 ±0.05	1.55 ±0.05	0.75 ±0.05
CPF1206	2.00 ±0.05	3.55 ±0.05	8.00 ±0.10	1.75 ±0.05	3.5 ±0.05	4.00 ±0.10	4.00 ±0.10	2.00 ±0.05	1.55 ±0.05	0.75 ±0.05
CPF1210	2.75 ±0.05	3.40 ±0.05	8.00 ±0.10	1.75 ±0.05	3.5 ±0.05	4.00 ±0.05	4.00 ±0.10	2.00 ±0.05	1.60 ±0.10	0.75 ±0.05

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### Embossed Plastic Tape Specifications



Type	A	B	W	E	F	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	øD <sub>0</sub>	T
CPF2010	2.85 ±0.10	5.45 ±0.10	12.0 ±0.10	1.75 ±0.10	5.5 ±0.05	4.00 ±0.05	4.00 ±0.10	2.00 ±0.05	1.50 +0.10	1.00 ±0.20
CPF2512	3.40 ±0.10	6.65 ±0.10	12.0 ±0.10	1.75 ±0.10	5.5 ±0.05	4.00 ±0.05	4.00 ±0.10	2.00 ±0.05	1.50 +0.10	1.00 ±0.20

### How to Order

CPF	0603	B	100R	E	1
Common Part	Package Size	Tolerance	Value	TCR	Packaging
CPF - Chip precision film resistor	0201 1206 0402 1210 0603 2010 0805 2512	B - ± 0.1% D - ±0.5% F - ± 1%	100R (100 Ohms) 1K0 (1000 Ohms) 100K (100,000 Ohms)	D - 15ppm E - 25ppm C - 50ppm	1 - 1K REEL Blank - 5K REEL

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