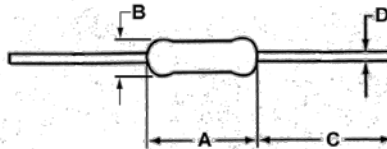


- Features:
- General purpose resistor ideal for commercial/industrial applications
 - Flame retardant coatings standard
 - Flameproof version available as CFF
 - Panasert available on selected sizes; contact factory
 - Auto sequencing/insertion compatible
 - CFM (mini) ideal choice when size constraints apply
 - Cut and formed product is available on select sizes; contact factory
 - Standard lead wire for CF/CFM is copper plated steel, with 100% tin over plate
 - 100% tin plate on copper wire is available as type CFQ/CFQM
 - RoHS compliant / lead-free



Electrical Specifications							
Type / Code	Power Rating (Watts) @ 70°C	Maximum Working Voltage (1)	Maximum Overload Voltage	Dielectric Withstanding Voltage	Resistance Temperature Coefficient per Ohmic Range	Ohmic Range (Ω) and Tolerance	
						2%	5%
CF18	0.125W	250V	500V	350V	<10Ω = ±400ppm/°C 10Ω to 9.99KΩ = 0 ~ -400ppm/°C 10KΩ to 99KΩ = 0 ~ -500ppm/°C 100KΩ to 999KΩ = 0 ~ -850ppm/°C 1MΩ and above = 0 ~ -1500ppm/°C	10 - 1M	1 - 22M
CF14	0.25W	350V	600V	350V		1 - 1M	1 - 22M
CF12	0.5W	350V	700V	600V		10 - 1M	1 - 22M
CF1	1W	500V	1,000V	600V		1 - 1M	1 - 10M
CF2	2W	500V	1,000V	600V		10 - 1M	1 - 10M
CFM14	0.25W	250V	500V	350V		10 - 1M	1 - 10M
CFM12	0.5W	350V	600V	350V		10 - 1M	1 - 10M
CFM1	1W	600V	1,000V	600V		10 - 1M	1 - 10M

(1) Lesser of √PR or maximum working voltage.

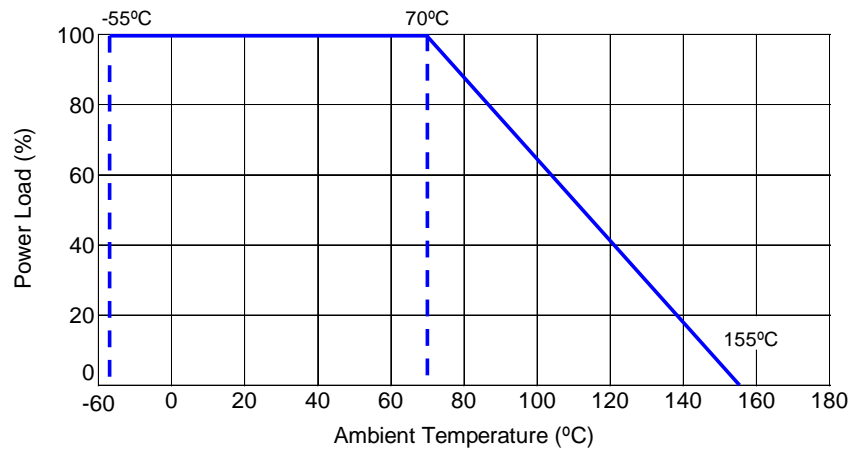


Mechanical Specifications					
Type / Code	A Body Length	B Body Diameter	C Lead Length(Bulk)	D Lead Diameter	Unit
CF18	0.130 ± 0.012	0.067 ± 0.012	1.102 ± 0.118	0.018 ± 0.003	inches mm
	3.30 ± 0.30	1.70 ± 0.30	28.00 ± 3.00	0.45 ± 0.08	
CF14	0.236 ± 0.012	0.091 ± 0.012	1.102 ± 0.118	0.022 ± 0.003	inches mm
	6.00 ± 0.30	2.30 ± 0.30	28.00 ± 3.00	0.55 ± 0.08	
CF12	0.335 ± 0.039	0.106 ± 0.020	1.102 ± 0.118	0.028 ± 0.002	inches mm
	8.50 ± 1.00	2.70 ± 0.50	28.00 ± 3.00	0.70 ± 0.05	
CF1	0.433 ± 0.039	0.177 ± 0.020	1.181 ± 0.118	0.028 ± 0.002	inches mm
	11.00 ± 1.00	4.50 ± 0.50	30.00 ± 3.00	0.70 ± 0.05	
CF2	0.591 ± 0.039	0.197 ± 0.020	1.339 ± 0.157	0.028 ± 0.002	inches mm
	15.00 ± 1.00	5.00 ± 0.50	34.00 ± 4.00	0.70 ± 0.05	
CFM14	0.130 ± 0.012	0.067 ± 0.012	1.102 ± 0.118	0.018 ± 0.003	inches mm
	3.30 ± 0.30	1.70 ± 0.30	28.00 ± 3.00	0.45 ± 0.08	
CFM12	0.236 ± 0.012	0.091 ± 0.012	1.102 ± 0.118	0.022 ± 0.003	inches mm
	6.00 ± 0.30	2.30 ± 0.30	28.00 ± 3.00	0.55 ± 0.08	
CFM1	0.354 ± 0.020	0.138 ± 0.020	1.102 ± 0.118	0.028 ± 0.002	inches mm
	9.00 ± 0.50	3.50 ± 0.50	28.00 ± 3.00	0.70 ± 0.05	

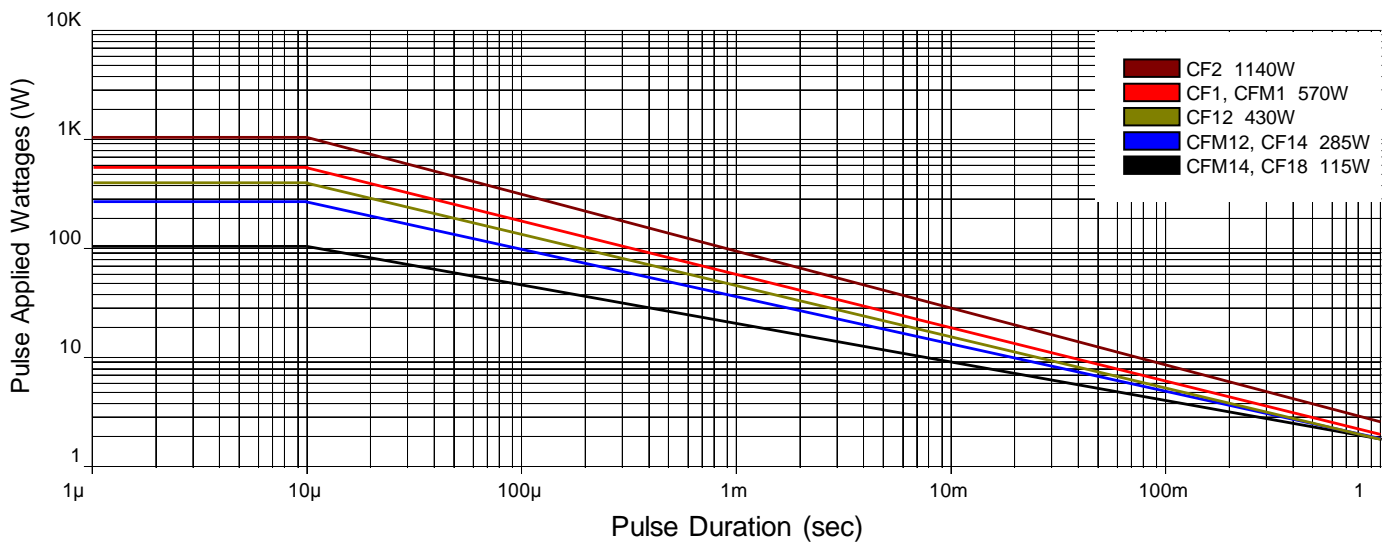
Performance Characteristics		
Test	Standard / Method	Test Results
Short Time Overload	EIA-RS-172-B 3.2.6	± 0.5%
Resistance to Solder Heat	MIL-STD 202 Method 210	± 0.5%
Dielectric Withstanding Voltage	JIS C 5202 5.6	± 0.5%
Load Life	MIL-STD 202 Method 108	± 1%
Terminal Strength	MIL-STD 202 Method 211	± 0.2%
Moisture Resistance	MIL-STD 202 Method 106	± 0.5%

Operating Temperature Range: -55°C to +155°C

Power Derating Curve:



Single Pulse Power:



Typical performance for reference only.

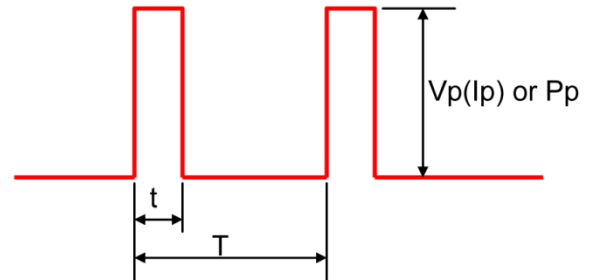
Repetitive Pulse Data:

If repetitive pulses are applied to resistors, pulse wave form must be less than “Pulse limiting voltage”, “Pulse limiting current” or “Pulse limiting wattage” calculated by the formula below.

$$V_p = K\sqrt{P \times R \times T/t}$$

$$I_p = K\sqrt{P/R \times T/t}$$

$$P_p = K^2 \times P \times T/t$$



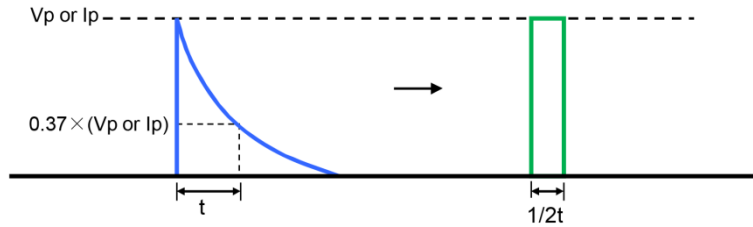
- Where:
- Vp: Pulse limiting voltage (V)
 - Ip: Pulse limiting current (A)
 - Pp: Pulse limiting wattage (W)
 - P: Power rating (W)
 - R: Nominal resistance (ohm)
 - T: Repetitive period (sec)
 - t: Pulse duration (sec)
 - K: Coefficient by resistors type (refer to below matrix)
 - [Vr: Rated Voltage (V), Ir: Rated Current (A)]

- Note 1: If $T > 10 \rightarrow T = 10$ (sec), $T/t > 1000 \rightarrow T/t = 1000$
- Note 2: If $T > 10$ and $T/t > 1000$, “Pulse Limiting power (Single pulse) is applied
- Note 3: If $V_p < V_r$ ($I_p < I_r$ or $P_p < P$), V_r (I_r , P) is V_p (I_p , P_p)
- Note 4: Pulse limiting voltage (Current, Wattage) is applied at less than rated ambient temperature. If ambient temperature is more than the rated temperature (70°), please decrease power rating according to “Power Derating Curve”
- Note 5: Please assure sufficient margin for use period and conditions for “Pulse limiting voltage”
- Note 6: If the pulse waveform is not square wave, please judge after transform the waveform into square wave according to the “Waveform Transformation to Square Wave”.

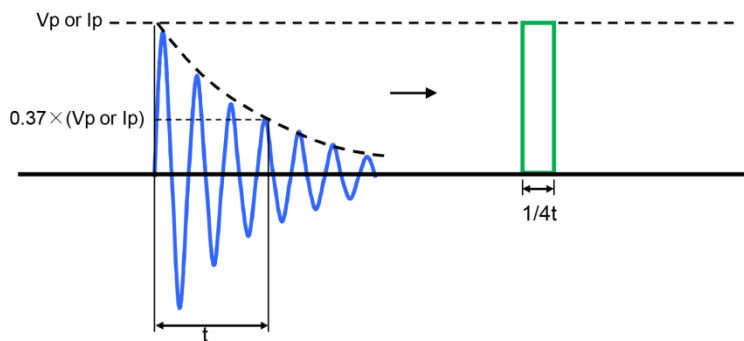
Coefficient (K) Matrix	
Resistor Type	K
RNF, RNMF	0.7
CF, CFM, HDM	0.8
ASR, SPR, ASRM, SPRM	1.0
RSPF, RSPL	0.9
RSF, RSMF	0.8
FRN	0.6

Waveform Transformation to Square Wave

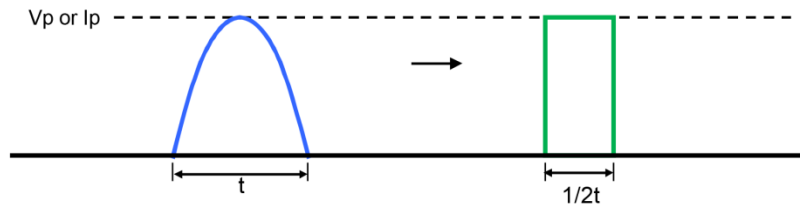
1. Discharge curve wave with time constant "t" → Square wave



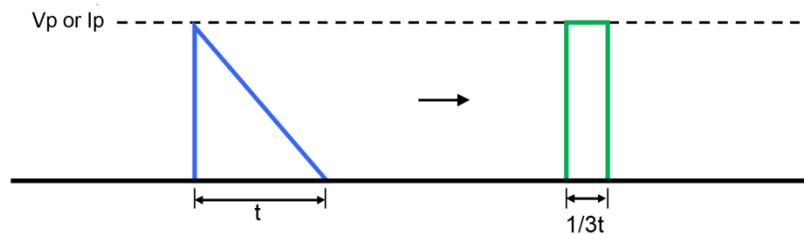
2. Damping oscillation wave with time constant of envelope "t" → Square wave



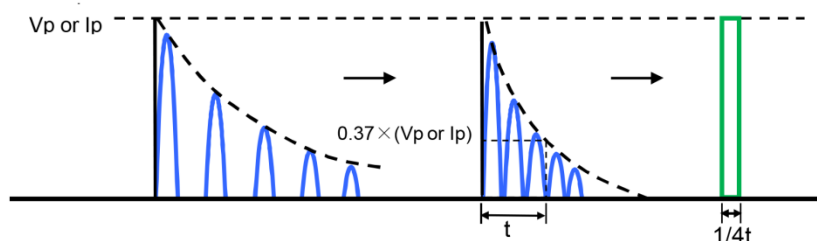
3. Half-wave rectification wave → Square wave



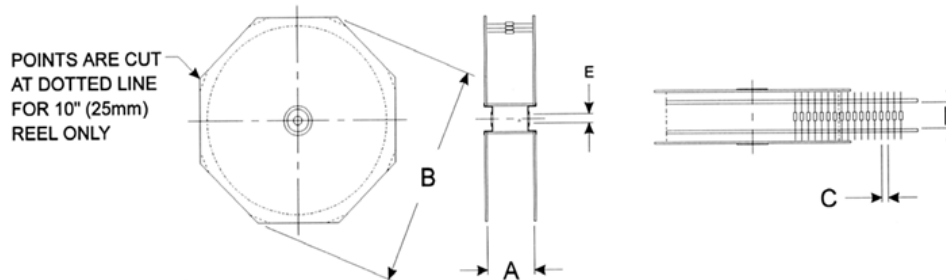
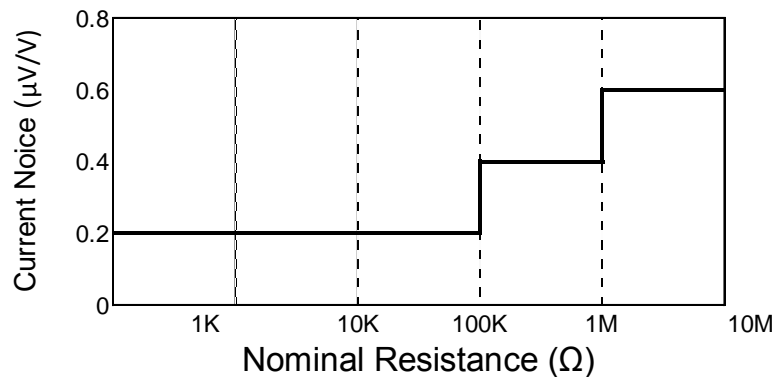
4. Triangular wave → Square wave



5. Special wave → Square wave



Current Noise:



Lead-Tape Specifications: Reeled in accordance with EIA-296-F												
Type / Code	Qty per Reel	A max.(1)		B max		C		D(2)		Tape		Class
		inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	
CF18, CFM14	5,000	2.508	63.70	13.504	343.00	0.197 ± 0.020	5.00 ± 0.50	2.063 + 0.079 / -0.039	52.40 + 2.00 / -1.00	0.250	6.35	I
CF14, CFM12	5,000	2.638	67.00	13.504	343.00	0.197 ± 0.020	5.00 ± 0.50	2.063 + 0.079 / -0.039	52.40 + 2.00 / -1.00	0.250	6.35	I
CF12, CFM1	5,000	2.736	69.50	13.504	343.00	0.197 ± 0.020	5.00 ± 0.50	2.063 + 0.079 / -0.039	52.40 + 2.00 / -1.00	0.250	6.35	I
CF1	2,000	2.972	75.50	13.504	343.00	0.197 ± 0.020	5.00 ± 0.50	2.063 + 0.079 / -0.039	52.40 + 2.00 / -1.00	0.250	6.35	I
CF2	1,000	3.130	79.50	13.504	343.00	0.394 ± 0.020	10.00 ± 0.50	2.063 + 0.079 / -0.039	52.40 + 2.00 / -1.00	0.250	6.35	I

Dimension "E": This is a non-critical dimension that does not have a tolerance in the standard.

Range of diameters is from 0.547 inches (13.90 mm) to 1.500 inches (38.10 mm)

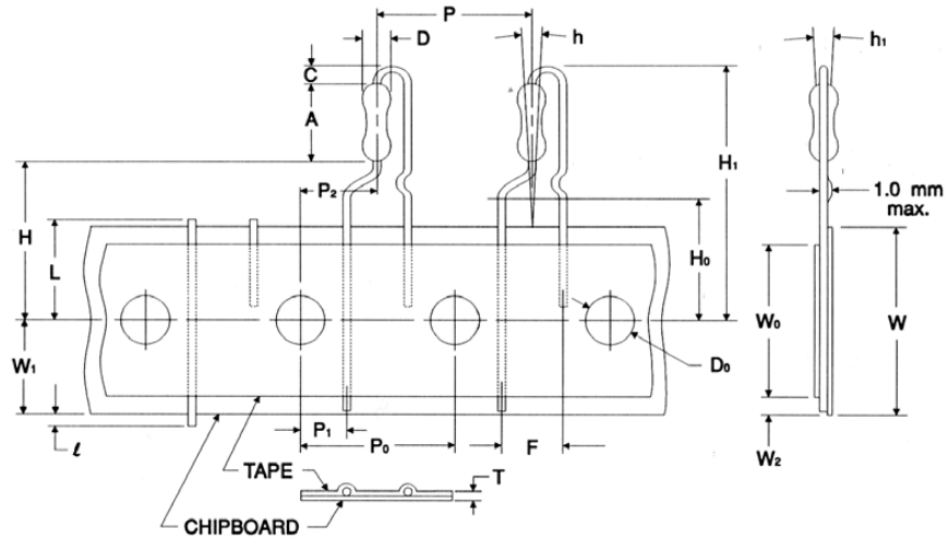
(1) Reference value only. The "A" dimension shall be governed by the overall length of the taped component.

The distance between flanges shall be 0.059 inches (1.50 mm) to 0.315 (8.00 mm) greater than the overall component.

(2) The given dimension "D" expresses the standard width spacing. A 26mm narrow spacing is available as option "N" packaging code.

Contact factory for more details.

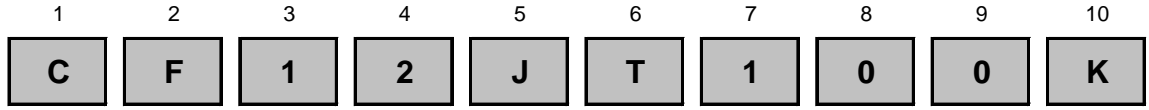
Radial Lead Taping Specification – Pana-Sert (PCF14)



Symbol	Description	PANA-SERT	Unit
A	Resistor body length	0.256 ± 0.020 6.50 ± 0.50	inches mm
C	Height of bending	0.098 ± 0.020 2.50 ± 0.50	inches mm
D	Resistor body diameter	0.091 ± 0.008 2.30 ± 0.20	inches mm
D ₀	Sprocket-hole diameter	0.157 ± 0.012 4.00 ± 0.30	inches mm
F	Resistor lead spacing	0.197 ± 0.039 5.00 ± 1.00	inches mm
H	Height to bottom of resistor	0.748 ± 0.039 19.00 ± 1.00	inches mm
H ₀	Height to lead clinch	0.630 ± 0.020 16.00 ± 0.50	inches mm
H ₁	Height of resistor	1.122 max. 28.50 max.	inches mm
h	Resistor alignment	0 ± 0.079 (0±5°) 0 ± 2.00 (0±5°)	inches mm
h ₁	Resistor alignment	0 ± 0.079 (0±5°) 0 ± 2.00 (0±5°)	inches mm
l	Lead protrusion	0.079 max. 2.00 max.	inches mm

Symbol	Description	PANA-SERT	Unit
L	Cutout Length(1)	0.433 max. 11.00 max.	inches mm
P	Resistor pitch(1)	0.500 ± 0.039 12.70 ± 1.00	inches mm
P ₀	Sprocket-hole pitch(1)	0.500 ± 0.012 12.70 ± 0.30	inches mm
P ₁	Sprocket-hole center to lead center	0.152 ± 0.028 3.85 ± 0.70	inches mm
P ₂	Sprocket-hole center to resistor center(1)	0.250 ± 0.051 6.35 ± 1.30	inches mm
T	Thickness (chipboard and tape)	0.028 ± 0.008 0.70 ± 0.20	inches mm
W	Chipboard width(1)	0.709 + 0.039 / -0.020 18.00 + 1.00 / -0.50	inches mm
W ₀	Hold-down tape width	0.49 min. 12.50 min.	inches mm
W ₁	Sprocket-hole position	0.354 + 0.030 / -0.020 9.00 + 0.75 / -0.50	inches mm
W ₂	Hold-down tape position	0.118 max. 3.00 max.	inches mm

How to Order



Product Series	
CF	Standard
CFF	Flameproof
CFM	Mini
PCF	Panasert CF14
PCFM	Panasert CF12
CFQ	Tin plating on copper wire
CFQM	Tin plating (mini)
PCFQ	Tin plating on copper wire Panasert

Size	Power Rating
18	0.125W
14	0.25W
12	0.5W
1	1W
2	2W

Tolerance	
Code	Tol
G	2%
J	5%

Code	Description	Size	Quantity
B	Bulk	CF18, CFM14, CF14, CFM12 CF12, CFM1, CF1, CF2	1,000
		CF18, CFM14, CF14, CFM12, CF12, PCF14, PCFM12	5,000
T	Tape and Reel	CFM1	2,500
		CF1	2,000
		CF2	1,000
A	Ammo	CF18, CFM14, CF14, CFM12	5,000
		CF12, CFM1, PCF14, PCFM12	2,000
		CF1, CF2	1,000

Resistance Value
Four characters with the multiplier used as the decimal holder.
10 ohm = 10R0
10.2 Kohm = 10K2
1 Mohm = 1M00