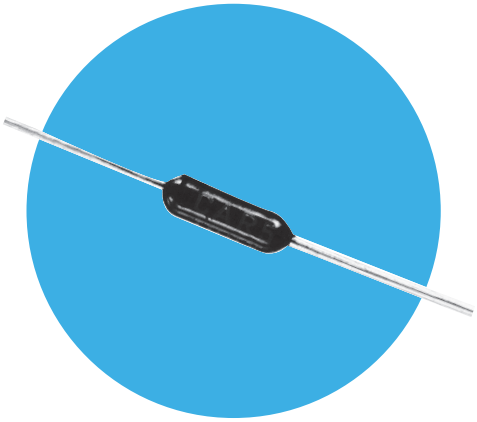
Ultra Precision Metal Film Resistors



CAR series

- Tolerance down to 0.01%
- Low TCR's
- High reliability
- Superior moisture performance
- Non standard values available
- Highest stability metal film available
- Matched sets and networks

All Pb-free parts comply with EU Directive 2011/65/EU amended by (EU) 2015/863 (RoHS3)

Electrical Data

		CAR5	CAR6	CAR7	Notes
Power rating at 70°C	watts	0.25	0.33	0.5	
Power rating at 85°C	watts	0.125	0.25	0.33	
Resistance range	ohms	10R0 to 3M	10R0 to 5M	10R0 to 10M	
Limiting element voltage	volts	250	350	500	
TCR (20 to +70°C)	ppm/°C	5, 10, 15, 25, 50			See tolerance/TCR
Resistance tolerance	%	0.01, 0.02, 0.05, 0.1, 0.25, 0.5 & 1			combinations
Standard values		E24, E96 preferred			below
Thermal impedance	°C/watt	110	70	60	
Ambient temperature range	°C	-55 to +155			

Table of Resistance Restrictions

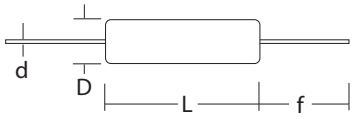
	Tolerance								
TCR	**CAR5**			**CAR6**			**CAR7**		
ppm/°C	**0.01-0.02%**	**0.05%**	**0.1-1%**	**0.01/0.02%**	**0.05%**	**0.1-1%**	**0.01-0.02%**	**0.05%**	**0.1-1%**
5[1]	50 to 300k	10 to 500k	10 to 500k	50 to 500k	10 to 500k	10 to 500k	50 to 750k	10 to 750k	10 to 750k
10	50 to 300k	10 to 1M	10 to 1M	50 to 500k	10 to 1M	10 to 1M	50 to 750k	10 to 1M	10 to 1.5M
15	50 to 300k	10 to 1M	10 to 1M	50 to 500k	10 to 1M	10 to 1M	50 to 750k	10 to 1M	10 to 3.5M
25	50 to 300k	10 to 1M	10 to 1.5M	50 to 500k	10 to 1M	10 to 3M	50 to 750k	10 to 1M	10 to 5M
50	50 to 300k	10 to 1M	10 to 3M	50 to 500k	10 to 1M	10 to 5M	50 to 750k	10 to 1M	10 to 10M

Note1: Based on sampling. 100% screened product is available.

Physical Data

Dimensions (mm) and Weight (g)

Type	L Max	D Max	f min	d nom.	PCB mounting centres	Min Bend Radius	Wt. nom.
CAR5	7.2	2.5	30	0.6	10.2	0.6	0.24
CAR6	10.0	3.7	30	0.6	12.7	0.6	0.40
CAR7	15.5	5.5	30	0.8	18.4	1.2	1.15



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.

Construction

Ceramic rods are coated with a metal film and plated steel caps are force fitted. A helical cut is used to adjust the film to its final value.
Termination wires are welded to the caps and the resistor is protected with a specially formulated epoxy coating.

Terminations

Material Solderable finish copper wire.
Strength The terminations meet the requirements of IEC 68.2.21
Solderability The terminations meet the requirements of IEC 115-1, Clause 4.17.3.2

Marking

Type reference, TCR code, resistance value and tolerance code.
The resistance value marking conforms to IEC 62.

Solvent Resistance

The body protection and marking are resistant to all normal industrial cleaning fluids suitable for printed circuits.

Performance Data

		Values 10 ≤ 250k		Values > 250k	
		Actual Performance		Actual Performance	
		Maximum	Typical	Maximum	Typical
Load at rated power : 1000 hrs at 70°C (or 85°C)	ΔR %	0.05	0.02	0.25	0.05
Load at rated power : 8000 hrs at 70°C (or 85°C)	ΔR %	0.1	0.04	0.5	0.1
Dry heat : 1000 hrs at 155°C	ΔR %	0.15	0.08	1	0.2
Shelf life : 12 months at room temperature	ΔR %	0.01	0.003	0.04	0.02
Derating from rated power at 70°C (or 85°C)		Zero at 155°C		Zero at 155°C	
Short term overload	ΔR %	0.01	0.001	0.08	0.01
Climatic	ΔR %	0.05	0.02	0.2	0.05
Climatic category		55/155/56		55/155/56	
Long term damp heat	ΔR %	0.05	0.02	0.2	0.05
Temperature rapid change	ΔR %	0.04	0.02	0.25	0.05
Resistance to solder heat	ΔR %	0.02	0.003	0.05	0.005
Vibration and bump	ΔR %	0.02	0.002	0.06	0.02
Noise (in a decade of frequency)	μV/V	0.2	0.03	1	0.1
Voltage coefficient of resistance	ppm/V	0.3	<0.05	0.2	<0.05

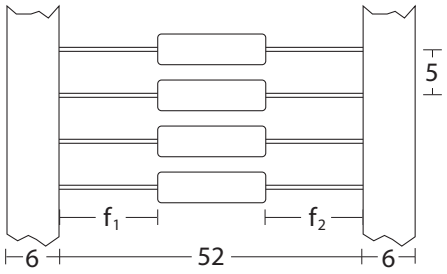
Application Notes

Resistors can be supplied matched for tolerance and TCR down to ±0.005% and ±1ppm/°C, respectively, either as separate resistors or pre-assembled and encapsulated within a plastic box.

The individual resistors within a set or module can be manufactured with a tolerance of ±0.01% and a TCR of ±5ppm/°C.

Packaging

CAR5 and CAR6 standard packing is in tape, as shown below, whilst CAR7 is bulk packed.



Body location $f_1 - f_2 \leq 1.4$ mm

Ordering Procedure

This product has two valid part numbers:

European (Welwyn) Part Number: CAR5V-31K6PI (CAR5 with TCR ±5ppm/°C at 31.6 kilohms ±0.02%, Pb-free)

C	A	R	5	V	-	3	1	K	6	P	I
1				2		3				4	5

1 Type	2 TCR (ppm/°C)	3 Value	4 Tolerance	5 Finish, Screening & Packing		
CAR5	V = ±5	E24 = 3/4 characters E96 = 4/5 characters R = ohms K = kilohms M = megohms	L = ±0.01%	I = Standard packing & Pb-free		
CAR6	T = ±10		P = ±0.02%	SC = Standard packing & Pb-free with 5ppm/°C screened		
CAR7	Y = ±15		W = ±0.05%			
	D = ±25		B = ±0.1%	PB = Standard packing & SnPb		
	C = ±50		C = ±0.25%	CAR5	Ammo	Up to 5000/box
			D = ±0.5%	CAR6	Ammo	Up to 2500/box
			F = ±1%	CAR7	Bulk	250/box

USA (IRC) Part Number: CAR5LFV3162PA (CAR5 with TCR ±5ppm/°C at 31.6 kilohms ±0.02%, Pb-free)

C	A	R	5	L	F	V	3	1	6	2	P	A
1				2		3	4				5	6

1 Type	2 Termination	3 TCR (ppm/°C)	4 Value	5 Tolerance	6 Packing		
CAR5	Omit for SnPb	V = ±5	3 digits + multiplier	L = ±0.01%	A	CAR5	Ammo up to 5000/box
CAR6	LF = Pb-free	T = ±10	R = ohms for values <100 ohms	P = ±0.02%		CAR6	Ammo up to 2500/box
CAR7		Y = ±15		W = ±0.05%	B	CAR7	Bulk 250/box
		D = ±25		B = ±0.1%			
		C = ±50		C = ±0.25%			
				D = ±0.5%			
				F = ±1%			