# Precision Metal Film Resistors

## TT electronics

### RC series

- **CECC released products with low TCRs over a wide resistance range**
- **Resistance tolerance down to 0.05%**
- **Express delivery available**
- **Low noise and negligible voltage coefficient**
- **Screened parts available for critical applications**
- **Temperature Coefficient of Resistance down to 5 ppm/°C**
- **Options for RoHS compliant and Lead bearing wire finishes**
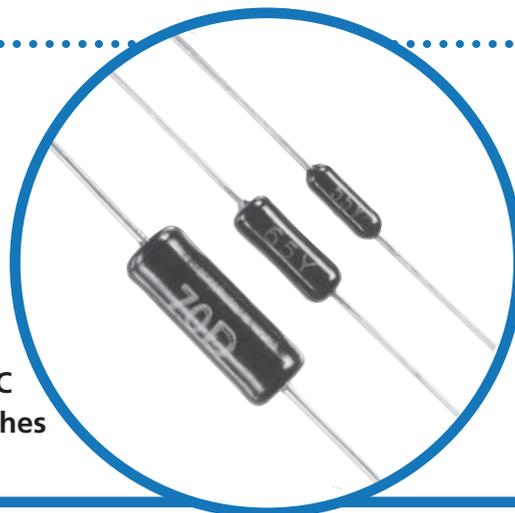
## Electrical Data

| | | RC55 | RC65 | RC70 | Notes |
|---|---|---|---|---|---|
| **Commercial** | | | | | |
| Power rating at 70°C | watts | 0.25 | 0.5 | 1.0 | |
| Resistance range | ohm | 1R to 4M | 1R to 4M | 1R to 10M | |
| Limiting element voltage | volts | 350 | 350 | 500 | |
| Isolation voltage | volts | 500 | 500 | 700 | |
| TCR (20 to +70°C) & codes | ppm/°C | 5(V), 10(T), 15(Y), 25(D), 50(C), 100(Z) | | | See resistance |
| Resistance tolerance | % | 0.05(W), 0.1(B), 0.25.(C), 0.5(D) & 1(F) | | | restrictions |

| | | H | J | K | K | L | |
|---|---|---|---|---|---|---|---|
| **CECC 40101-004 Requirements** | | | | | | | |
| Power rating at 70°C | watts | 0.063 | 0.125 | 0.25 | 0.25 | 0.5 | |
| Resistance range | ohms | 1R to 1M | 1R to 1M | 1R to 1M | 10R to 1M | 10R to 1M | |
| Limiting element voltage | volts | 200 | 200 | 250 | 250 | 350 | |
| Isolation voltage | volts | 280 | 280 | 350 | 350 | 500 | |
| TCR & codes | ppm/°C | 15(Y), 25(D), 50(C), 100(Z) | | | | | See resistance |
| Resistance tolerance (code) | % | 0.05(W), 0.1(B), 0.25.(C), 0.5(D) & 1(F) | | | | | restrictions |

| | | A | B | B | C | |
|---|---|---|---|---|---|---|
| **CECC 40101-804 Requirements** | | | | | | |
| Power rating at 70°C | watts | 0.125 | 0.25 | 0.25 | 0.5 | |
| Resistance range | ohms | 1R to 1M | 1R to 1M | 10R to 1M | 10R to 1M | |
| Limiting element voltage | volts | 200 | 250 | 250 | 350 | |
| Isolation voltage | volts | 280 | 350 | 350 | 500 | |
| TCR & codes | ppm/°C | 15(Y), 25(D), 50(C), 100(Z) | | | | See resistance |
| Resistance tolerance (code) | % | 0.05(W), 0.1(B), 0.25.(C), 0.5(D) & 1(F) | | | | restrictions |

These tables indicate the CECC specification requirements, and these are met or exceeded by the corresponding RC series products.

| | | | | | |
|---|---|---|---|---|---|
| Standard values | | E24, E96 preferred | | | Any value |
| Thermal impedance | °C/watt | 110 | 70 | 60 | to order |
| Ambient temperature range | °C | -55 to +155 | | | |

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# Physical Data

| Dimensions (mm) & Weight (g) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Type | L max | D max | f min | d nom | PCB mounting centres | Min. Bend Radius | Wt. nom |
| **RC55** | 7.2 | 2.5 | 30 | 0.6 | 10.2 | 0.6 | 0.24 |
| **RC65** | 10.0 | 3.7 | 30 | 0.6 | 12.7 | 0.6 | 0.40 |
| **RC70** | 15.5 | 5.5 | 30 | 0.8 | 18.4 | 1.2 | 1.15 |
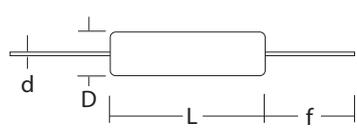
## Construction

A metal film is deposited onto a high quality ceramic former. Nickel-plated steel caps are force fitted to the former and termination wires are welded to the caps.

The resistor is adjusted to value by a helical cut in the film and the body is protected with a specially formulated epoxy coating.

## Terminations

| | |
|---|---|
| **Material** | Solder coated 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 values conform to IEC 62.

## Solvent Resistance

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

# Performance Data

| | | CECC 40101-004 Requirements | CECC 40101-804 Requirements | *Actual Performance | |
|---|---|---|---|---|---|
| | | | | Maximum | Typical |
| Load at commercial rating: 1000 hours at 70°C | ΔR% | | | 0.3 | 0.1 |
| Load at CECC rating: 1000 hours at 70°C | ΔR% | 0.5 | 0.5 | 0.3 | 0.05 |
| Dry heat: 1000 hours at 155°C | ΔR% | 0.5 | 0.5 | **1.0 | 0.15 |
| Shelf life: 12 months at room temperature | ΔR% | Not specified | Not specified | 0.1 | 0.03 |
| Derating from rated power at 70°C | | Zero at 155°C | 50% at 125°C | 50% at 125°C & Zero at 155°C | |
| Short term overload | ΔR% | 0.1 | 0.1 | 0.1 | 0.02 |
| Climatic | ΔR% | 0.5 | 0.5 | 0.3 | 0.1 |
| Climatic category | | 55/155/56 | 55/125/56 | 55/155/56 | |
| Long term damp heat | ΔR% | 0.5 | 0.5 | 0.5 | 0.1 |
| Temperature rapid change | ΔR% | 0.1 | 0.1 | **0.2 | 0.05 |
| Resistance to solder heat | ΔR% | 0.1 | 0.1 | 0.06 | 0.03 |
| Vibration and bump | ΔR% | 0.1 | 0.1 | 0.06 | 0.02 |
| Noise (in a decade of frequency) | μV/V | Not specified | Not specified | 1.0 | 0.1 |
| Voltage coefficient of resistance | ppm/V | Not specified | Not specified | | <1 |

Note: *An 0.01 ohm addition to be added to the performance claims of all resistors <10R.
** All products within the specified approved range meet CECC requirements.

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## Table of Resistance Restrictions

| TCR ppm/°C | RC55 | | | RC65 | | | RC70 | | |
|---|---|---|---|---|---|---|---|---|---|
| | **0.05%** | **0.1 - 0.25%** | **0.5%[3] - 1%[3]** | **0.05%** | **0.1 - 0.25%** | **0.5%[3] - 1%[3]** | **0.05%** | **0.1 - 0.25%** | **0.5%[3] - 1%[3]** |
| 5[1] | 10R to 500K | 10R to 500K | 1R to 500K | 10R to 500K | 10R to 500K | 1R to 500K | 10R to 750K | 10R to 750K | 10R to 750K |
| 10 | 10R to 1M | 10R to 1M | 1R to 1M | 10R to 1M | 10R to 1M | 1R to 1M | 10R to 1M | 10R to 1M | 1R to 1M |
| 15 | 10R to 1M | 2R49 to 1M | 1R to 1M | 10R to 1M | 5R to 1M | 1R to 1M | 10R to 1M | 10R to 2M | 1R to 2M |
| 25 | 10R to 1M | 2R49 to 2M | 1R to 2M | 10R to 1M | 5R to 2M | 1R to 2M | 10R to 1M | 10R to 5M | 1R to 5M |
| 50[2] | 10R to 1M | 2R49 to 2M | 1R to 4M | 10R to 1M | 5R to 2M | 1R to 4M | 10R to 1M | 5R to 10M | 1R to 10M |
| 100[2] | 10R to 1M | 1R to 2M | 1R to 4M | 10R to 1M | 1R to 2M | 1R to 4M | 10R to 1M | 1R to 10M | 1R to 10M |

The header "Tolerance" spans all the columns above.

Note1:

1. Based on sampling. 100% screened product is available.
2. For maximum availability, where the ohmic value permits, 25ppm/°C is preferred to 50 or 100ppm/°C.
3. For maximum availability, where the ohmic value permits, 0.25% is preferred to 0.5% or 1%

## Application Notes

### Matched Sets and Networks

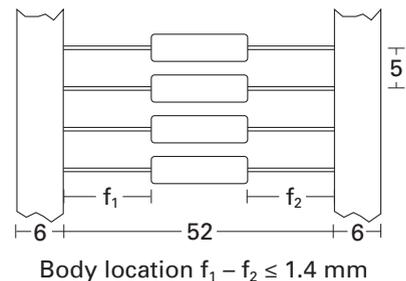TT electronics has many years experience in the supply of matched set of precision resistors.

Resistors can be supplied matched for tolerance and TCR down to ±0.02% and ±2ppm/°C, 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 ±0.05% and TCR of ±5ppm/°C.

A low inductance version is available in the range 5R0 to 1K0 at 1% tolerance. For low inductance version add suffix N.

### Packaging

RC55 and RC65 standard packing is in tape, as shown below, whilst RC70 is bulk packed. Taped resistors on reel or loose packed components can also be supplied by special request. The standard packaging for RC65 and RC70 resistors is loose in boxes. By special request the RC65 components can also be supplied taped on reel or in ammo pack. In the case of tape packed components the usable lead length is reduced by the width of the tape.

Body location $f_1 - f_2 \leq 1.4$ mm

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# Ordering Procedure

Example: RC55 with TCR of 5ppm/°C at 31.6 kilohms and 0.1% tolerance in an ammo pack box of up to 1000 pieces -

**R C 5 5  V – 3 1 K 6 B I**

Type

Trim option

| | Standard | All tolerances |
|---|---|---|
| N | Non-inductive | 1% only |

TCR

| V | 5 ppm/°C | Y | 15 ppm/°C | C | 50ppm/°C |
|---|---|---|---|---|---|
| T | 10 ppm/°C | D | 25 ppm/°C | Z | 100ppm/°C |

Value (use IEC62 code)

Tolerance (use IEC62 code)

| W | 0.05% |
|---|---|
| B | 0.1% |
| C | 0.25% |
| D | 0.5% |
| F | 1% |

Packing

| I | Ammo | RC55, RC65 | Up to1000/box | Standard |
|---|---|---|---|---|
| | Bulk | RC70 | 250/box | |

For CECC released product state on order the CECC number and style. Example: **RC55Y-31K6BI CECC40101-004 JY**

For CECC 40101-804 the TCR codes T and E relate to 15 and 25ppm/°C and are coded in the MPN as Y and D respectively
Example: **RC65Y-31K6BI CECC 40101-804BT**

For SnPb finish (nominal 5% Pb) instead of Pb-free, replace the packing suffix with **PB**. Example: **RC55V-31K6BPB**

For SnPb finish (nominal 40% Pb) instead of Pb-free, replace the packing suffix with **HL.** Example: **RC55V-31K6BHL**

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