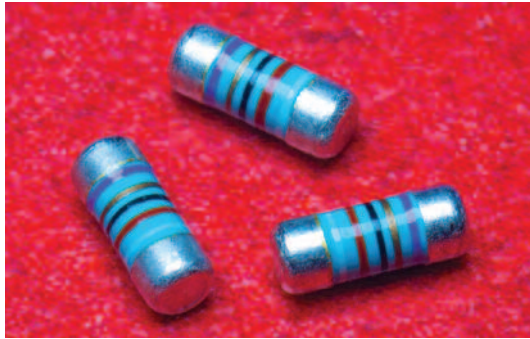


RN41: MELF type fixed metal film resistors
RD41: MELF type fixed carbon film resistors
CC: MELF type cross-conductors



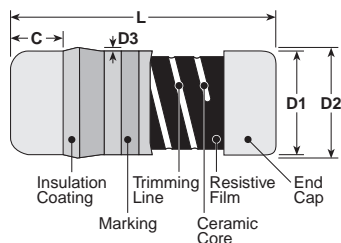
features

- Free direction for mounting due to cylindrical design
- High precision products (Resistance tolerance $\pm 0.1\%$ and T.C.R. $\pm 25 \times 10^{-6}/K$) available (RN41)
- The electrode strength is firm
- The noise characteristics are excellent
- Suitable for reflow, flow and iron soldering
- Products meet EU RoHS requirements
- AEC-Q200 tested (RN41 2ES/3AS, CC 12M/25)

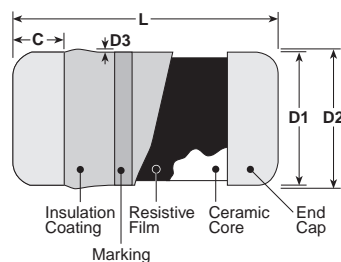
current sense

dimensions and construction

RN41, RD41



CC



| Type (Inch/DIN Size Code) | Dimensions inches (mm) | | | | |
|------------------------------|------------------------------------|---------------------------|------------------------------------|----------------|----------------|
| | L | C | D1 | D2 (max.) | D3 (max.) |
| 2ES (1406/0204) | .138 \pm .008 (3.5 \pm 0.2) | .02 ~ .035 (0.5 ~ 0.9) | .055 \pm .004 (1.4 \pm 0.1) | .061 (1.55) | .004 (0.1) |
| CC12M (1406/0204) | .138 \pm .008 (3.5 \pm 0.2) | .02 ~ .035 (0.5 ~ 0.9) | .055 \pm .004 (1.4 \pm 0.1) | .061 (1.55) | .004 (0.1) |
| 2E (2309/0207) | .232 \pm .008 (5.9 \pm 0.2) | .02 (0.5 min.) | .087 \pm .004 (2.2 \pm 0.1) | .094 (2.4) | .006 (0.15) |
| 3AS (2309/0207) | .232 \pm .008 (5.9 \pm 0.2) | .02 (0.5 min.) | .087 \pm .004 (2.2 \pm 0.1) | .094 (2.4) | .006 (0.15) |
| CC25 (2309/0207) | .232 \pm .008 (5.9 \pm 0.2) | .02 (0.5 min.) | .087 \pm .004 (2.2 \pm 0.1) | .094 (2.4) | .006 (0.15) |

ordering information

| RN41 | 2ES | T | TE | 1001 | F | 50* |
|--------------|--|-----------------------------|---|---|---|---|
| Type | Size | Termination Material | Packaging | Nominal Resistance | Tolerance | T.C.R. (ppm/°C) |
| RN41 RD41 | 2ES: 0.25W, 0.4W 2E: 0.25W 3AS: 1W | T: Sn | TE: 7" embossed plastic (2ES - 3,000 pieces/reel) (2E, 3AS - 1,500 pieces/reel) | $\pm 2\%$, $\pm 5\%$: 2 significant figures + 1 multiplier. "R" indicates decimal on values $< 10\Omega$ $\pm 0.1\%$, $\pm 0.25\%$, $\pm 0.5\%$, $\pm 1\%$: 3 significant figures + 1 multiplier. "R" indicates decimal on values $< 100\Omega$ | B: $\pm 0.1\%$ C: $\pm 0.25\%$ D: $\pm 0.5\%$ F: $\pm 1\%$ G: $\pm 2\%$ J: $\pm 5\%$ | 25: ± 25 50: ± 50 Nil: RD41 |

| CC12M | T | TE |
|---------------|-----------------------------|-------------------------|
| Type | Termination Material | Packaging |
| CC12M CC25 | T: Sn | TE: 7" embossed plastic |

* T.C.R. noted for RN41 only

For further information on packaging, please refer to Appendix A.

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

11/16/22

applications and ratings

| Part Designation | Power Rating @ 70°C | Rated Ambient Temp. | Rated Terminal Part Temp. | T.C.R. (ppm/°C) Max. | Resistance Range (Ω) | | | | | | Max. Working Voltage | Max. Overload Voltage |
|------------------|----------------------------|---------------------|---------------------------|----------------------|----------------------|----------------------|---------------------|-------------------|-------------|-------------|----------------------|-----------------------|
| | | | | | E-24, E-96 (B±0.1%) | E-24, E-96 (C±0.25%) | E-24, E-96 (D±0.5%) | E-24, E-96 (F±1%) | E-24 (G±2%) | E-24 (J±5%) | | |
| RN412ES | 1/4W (.25W) | 70°C | 90°C | ±25 | 43-511k | 100-100k | 100-604k | — | — | — | 200V | 400V |
| | | 70°C | 90°C | ±50 | — | — | — | 1-5.11M | — | 0.22-0.91 | | |
| RN412ES | 2/5W (.4W) ^{*1*2} | — | 90°C | ±50 | — | — | — | 1-5.11M | — | 0.22-0.91 | 200V | 400V |
| RN413AS | 1W ^{*1*2} | 70°C | — | ±50 | — | — | — | 1-1M | — | 0.22-0.91 | 400V | 600V |
| RD412ES | 1/4W (.25W) | 70°C | — | — ^{*3} | — | — | — | — | 2.2 - 1.0M | 2.2 - 1.0M | 200V | 400V |
| RD412E | 1/4W (.25W) | 70°C | — | — ^{*3} | — | — | — | — | 1.0 - 2.2M | 1.0 - 2.2M | 300V | 600V |

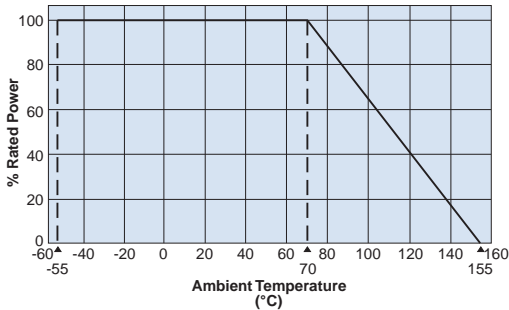
Rated voltage = $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$ or Maximum Working Voltage, whichever is lower
 Operating Temperature Range: -55°C to +155°C

- *1 A power rating is guaranteed at the terminal part temperature
 If any questions should arise whether to use the "Rated Ambient Temperature" or the "Rated Terminal Part Temperature," please give priority to the "Rated Terminal Part Temperature." Prior to use and for more details refer to "Introduction of the derating curves on the terminal part temperature" in the beginning of the catalog.
- *2 A power rating shall be guaranteed with a method shown in the Performance Characteristics. Please contact factory prior to use.
- *3 Please contact factory for T.C.R. of RD41

| Part Designation | Current Rating | Rated Ambient Temp. | Maximum Resistance |
|------------------|----------------|---------------------|--------------------|
| CC12M | 2A | +70°C | 20 mΩ or less |
| CC25 | 5A | | |

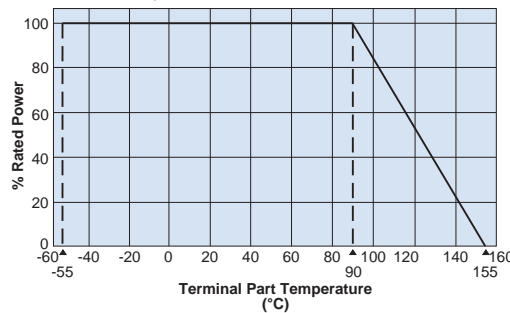
environmental applications

Derating Curve



For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.
 Please contact us about CC series' derating curve.

RN412ES, RN413AS



For resistors operated at a terminal part temperature of described for each size or above, a power rating shall be derated in accordance with the derating curve.
 Please refer to "Introduction of the derating curve based on the terminal part temperature" in the beginning of our catalog before use.

RN41: MELF type fixed metal film resistors
RD41: MELF type fixed carbon film resistors
CC: MELF type cross-conductors

Performance Characteristics

| Parameter | Type | Requirement $\Delta R \pm(\%+0.05\Omega)^{**4}$ | | Test Method |
|------------------------------|--------------|---|---------|---|
| | | Limit | Typical | |
| Resistance | RN41 RD41 | Within specified tolerance | — | 25°C |
| T.C.R. | RN41 RD41 | Within specified T.C.R. | — | +25°C/+125°C |
| Overload (Short time) | RN41 | 2ES: Test Group D | ±0.3% | Rated voltage x 2.5 for 5 seconds or Max. overload voltage, whichever is lower, for 5 seconds |
| | RD41 | ±1% | ±0.5% | |
| Intermittent Overload | RD41 | ±1% | — | Rated voltage x 4 or Max. intermittent overload voltage, whichever is lower, 10,000 cycles |
| Resistance to Soldering Heat | RN41 | 2ES: Test Group D | — | 260°C ± 5°C, 10 seconds ± 1 second |
| | RD41 | ±1% | ±0.5% | |
| Rapid Change of Temperature | RN41 | 2ES: Test Group D | — | -55°C (30 minutes), +125°C (30 minutes), 5 cycles |
| | RD41 | ±1% | ±0.75% | |
| Moisture Resistance | RN41 | 2ES: Test Group C | — | 40°C ± 2°C, 90 ~ 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle |
| | RD41 | ±5% | ±2.5% | |
| Endurance at 70°C | RN41 | 2ES: Test Group A | — | 70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle |
| | RD41 | ±2% | ±1% | |
| Low Temperature Exposure | RD41 | ±1% | ±0.75% | -55°C, 1 hour |
| High Temperature Exposure | RN41 | 2ES: Test Group C | ±0.75% | 155°C, 2 hours |
| | RD41 | ±2% | ±1% | RN41: 2ES, 3AS: 155°C, 1000 hours |

**4 Performance requirement for RN41 3AS are different from above, so consult with KOA about the detail.

CC

| Parameter | Requirement Δ Real R | | Test Method |
|-----------------------------|-----------------------------|---------------------------|--|
| | Limit | Typical | |
| Resistance | 20mΩ Max. after the test | 7.5mΩ Max. after the test | 25°C |
| Resistance to Solder Heat | | | 260°C ± 5°C, 10 seconds ± 1 second |
| Rapid Change of Temperature | | | -55°C (30 minutes), +125°C (30 minutes), 5 cycles |
| Moisture Resistance | | | 40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle |
| Endurance at 70°C | | | 70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle |

RN41 Test Group

| Stability Class | Resistance Range | Limit Resistance Changing Attests (Test Group) | | | |
|-----------------|------------------|--|-----------------|-----------------|-----------------|
| | | A | B | C | D |
| 0.25 | 10~332kΩ | ±(0.25 + 0.05Ω) | ±(0.50 + 0.05Ω) | ±(0.25 + 0.05Ω) | ±(0.05 + 0.05Ω) |
| 0.5 | 1~<10Ω | | | ±(0.50 + 0.05Ω) | ±(0.10 + 0.05Ω) |
| 1 | 0.22~<1Ω | | | ±(1.00 + 0.05Ω) | ±(0.25 + 0.05Ω) |
| 2 | >332kΩ~5.11MΩ | ±(0.50 + 0.05Ω) | ±(1.00 + 0.05Ω) | ±(2.00 + 0.05Ω) | ±(0.50 + 0.05Ω) |