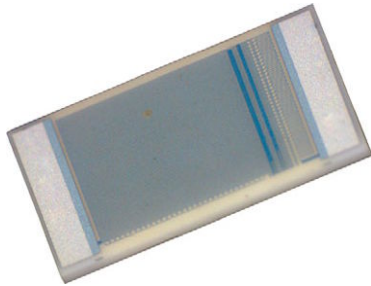




High Temperature (230 °C) Wirebondable Thin Film Chip Resistors and Resistor Networks



LINKS TO ADDITIONAL RESOURCES



INTRODUCTION

For applications such as down hole applications, the need for parts able to withstand very severe conditions (temperature as high as 215 °C powered or up to 230 °C un-powered) has led Vishay Sfernice to push out the limit of the thin film technology.

Designers might read the application note “Power Dissipation Considerations in High Precision Vishay Sfernice Thin Film Chip Resistors and Arrays (P, PRA, etc...) (High Temperature Application)” www.vishay.com/doc?53047 in conjunction with this datasheet to help them to properly design their PCBs and get the best performances of the RMKHT.

Vishay Sfernice research and development engineers will be willing to support any customer design considerations.

FEATURES

- Operating temperature range: -55 °C; +215 °C
- Storage temperature: -55 °C; +230 °C
- Wirebondable (aluminum pads)
- Aluminum pads
- Large selection of sizes available
- Custom networks available on request (CNHT)
- Temperature coefficient down to ± 15 ppm/°C (-55 °C; +215 °C)
- Tolerance down to ± 0.05 %
- Temperature coefficient remains at ± 15 ppm/°C after long term storage at 230 °C
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



TYPICAL PERFORMANCE

| | ABS | TRACKING ⁽¹⁾ |
|------|-----------------|-------------------------|
| TCR | ± 25 ppm/°C | 2 ppm/°C |
| | ABS | RATIO ⁽¹⁾ |
| TOL. | ± 0.05 % | 0.02 % |

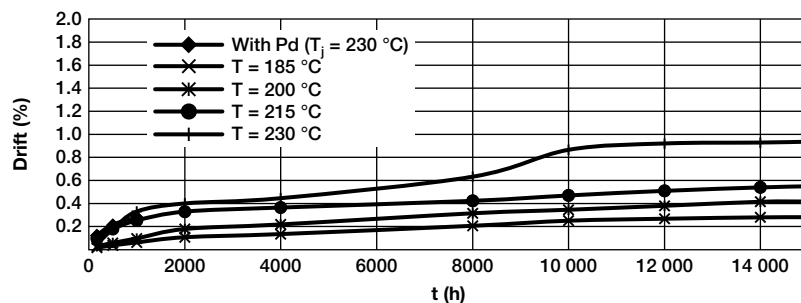
Note

(1) When applicable (networks only)

| MECHANICAL SPECIFICATIONS | |
|-----------------------------------|--|
| Resistive element | Nichrome (NiCr) |
| Substrate material | Silicon (size 22, 33, 55, 515) - alumina (other sizes) |
| Bonding pads | Aluminum (Al) |
| Passivation | Silicon nitride (Si ₃ N ₄) |
| Back metallization ⁽¹⁾ | Gold (thickness = 0.5 μ m typical) on nickel barrier (1 μ m typical) |

Note

(1) When applicable (only on alumina substrate)

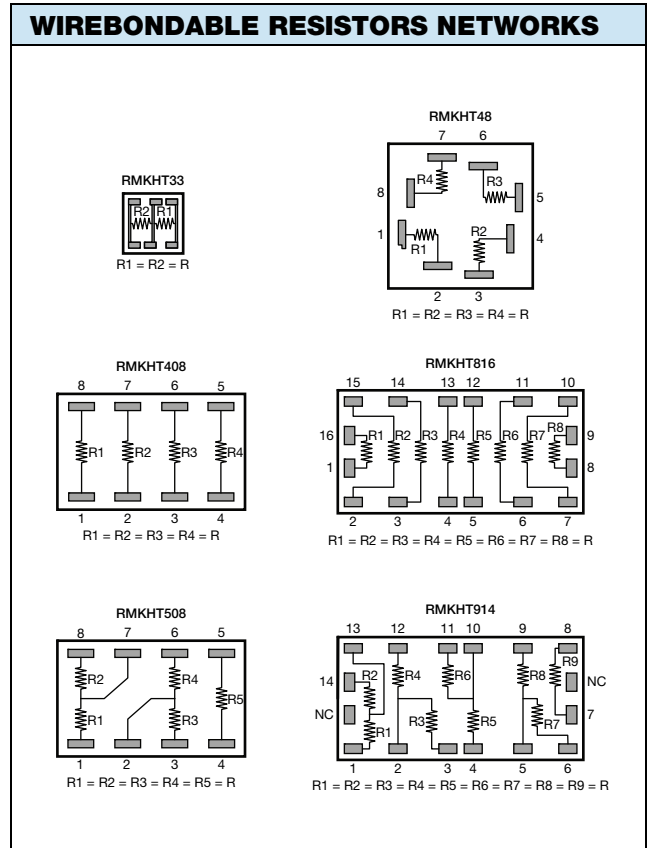
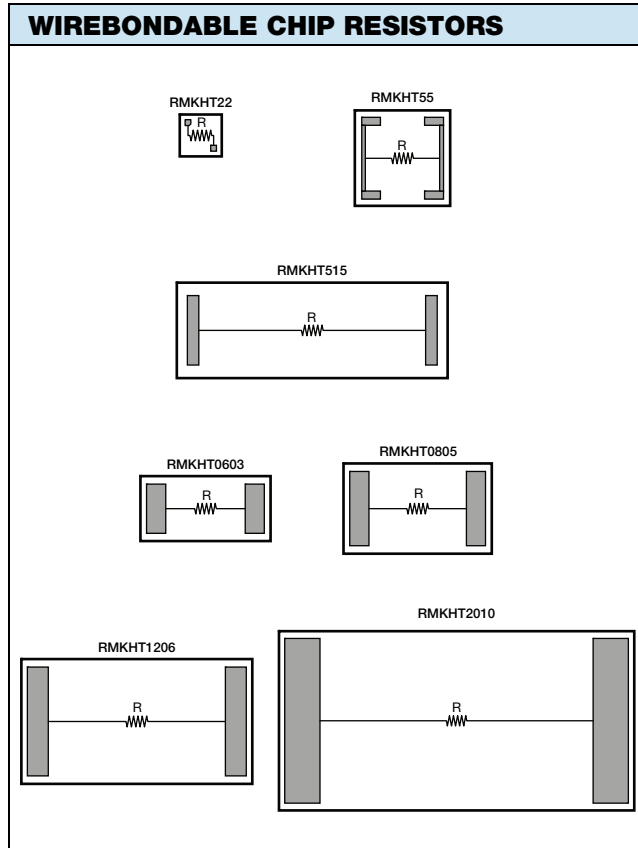


Note

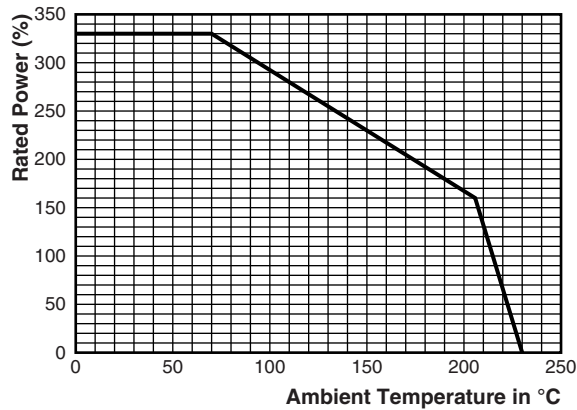
- TCR (-55 °C; +215 °C) remains unchanged after 15 000 h storage

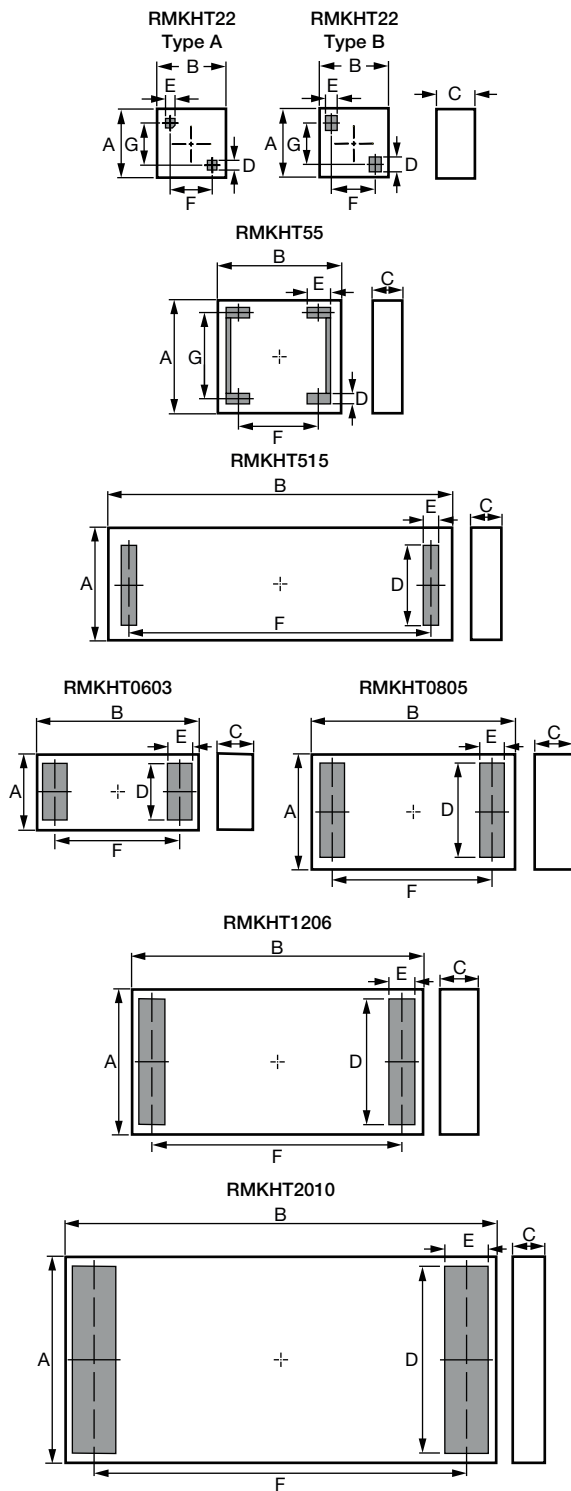
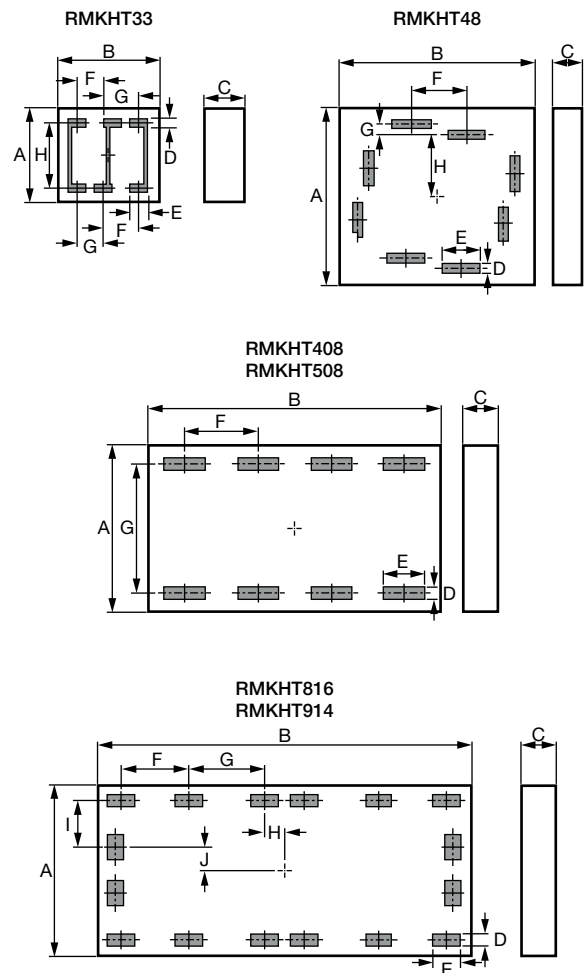


SCHEMATIC



POWER DERATING CURVE



PATTERN
WIREBONDABLE CHIP RESISTORS

WIREBONDABLE RESISTORS NETWORKS

DIMENSIONS in millimeters

| SERIES | A ± 0.05 | B ± 0.05 | C max. | D | E | F | G |
|-------------------|-------------|-------------|-----------|-------|-------|-------|-------|
| RMKHT22 Type A | 0.58 | 0.58 | 0.4 | 0.08 | 0.08 | 0.354 | 0.354 |
| RMKHT22 Type B | 0.58 | 0.58 | 0.4 | 0.125 | 0.1 | 0.374 | 0.349 |
| RMKHT55 | 1.32 | 1.32 | 0.4 | 0.11 | 0.26 | 0.87 | 1.02 |
| RMKHT515 | 1.32 | 3.75 | 0.4 | 0.96 | 0.16 | 3.3 | |
| RMKHT0603 | 0.9 | 1.8 | 0.45 | 0.68 | 0.265 | 1.365 | |
| RMKHT0805 | 1.25 | 2.05 | 0.45 | 1.03 | 0.265 | 1.615 | |
| RMKHT1206 | 1.725 | 3.2 | 0.45 | 1.505 | 0.29 | 2.74 | |
| RMKHT2010 | 2.64 | 5.23 | 0.45 | 2.42 | 0.518 | 4.54 | |

DIMENSIONS in millimeters

| SERIES | A ± 0.05 | B ± 0.05 | C max. | D | E | F | G | H | I | J |
|----------|-------------|-------------|-----------|------|------|------|------|-------|------|-------|
| RMKHT33 | 0.83 | 0.83 | 0.4 | 0.08 | 0.16 | 0.3 | 0.22 | 0.6 | | |
| RMKHT48 | 2 | 2 | 0.4 | 0.1 | 0.39 | 0.57 | 0.12 | 0.69 | | |
| RMKHT408 | 1.6 | 2.6 | 0.4 | 0.11 | 0.36 | 0.65 | 1.25 | | | |
| RMKHT508 | | | | | | | | | | |
| RMKHT816 | 1.7 | 3.4 | 0.4 | 0.13 | 0.25 | 0.62 | 0.69 | 0.175 | 0.47 | 0.225 |
| RMKHT914 | | | | | | | | | | |



STANDARD ELECTRICAL SPECIFICATIONS - Bare Resistors Chips

| MODEL | SIZE | RESISTANCE RANGE ⁽¹⁾ Ω | TCR ⁽²⁾ -55 °C; +215 °C ± ppm/°C | TOLERANCE ± % | POWER RATING ⁽³⁾ P _{70 °C} W | POWER RATING ⁽³⁾ P _{215 °C} W |
|-----------|------|--------------------------------------|---|-------------------|--|---|
| RMKHT22 | 0202 | 10 to 500K | 15, 30 | 0.05, 0.1, 0.5, 1 | 0.05 | 0.005 |
| RMKHT55 | 0505 | 150 to 2M | 15, 30 | 0.05, 0.1, 0.5, 1 | 0.25 | 0.025 |
| RMKHT515 | 0515 | 100 to 5M | 15, 30 | 0.05, 0.1, 0.5, 1 | 0.5 | 0.05 |
| RMKHT0603 | 0603 | 10 to 320K | 15, 30 | 0.05, 0.1, 0.5, 1 | 0.125 | 0.0375 |
| RMKHT0805 | 0805 | 10 to 720K | 15, 30 | 0.05, 0.1, 0.5, 1 | 0.2 | 0.06 |
| RMKHT1206 | 1206 | 10 to 2.7M | 15, 30 | 0.05, 0.1, 0.5, 1 | 0.33 | 0.1 |
| RMKHT2010 | 2010 | 10 to 7.5M | 15, 30 | 0.05, 0.1, 0.5, 1 | 1 | 0.2 ⁽⁵⁾ |

PERFORMANCES - Bare Resistors Chips

| TEST | SPECIFICATIONS | CONDITIONS |
|------------------------------------|---|---------------------------------|
| Limiting voltage | From 75 V to 300 V (depending on size) ⁽⁴⁾ | |
| Operating temperature range | -55 °C; +215 °C | |
| Max. temperature resistive element | 220 °C | |
| Max. substrate temperature | 230 °C | |
| Load life stability | ± 0.35 % | 2000 h / 220 °C (ambient) at Pn |
| Storage temperature range | -55 °C; +230 °C | |
| Shelf life stability | ± 0.6 % typ. (± 0.8 % max.) | 15 000 h / 230 °C |

STANDARD ELECTRICAL SPECIFICATIONS - Bare Resistors Networks

| MODEL | SIZE | RESISTANCE RANGE ⁽¹⁾ Ω | ABSOLUTE TOLERANCE ± % | RATIO TOLERANCE ± % | ABSOLUTE TCR ⁽²⁾ -55 °C; +215 °C ± ppm/°C | RATIO TCR -55 °C; +215 °C ± ppm/°C | POWER RATING ⁽³⁾ P _{70 °C} W PER RESISTOR | POWER RATING ⁽³⁾ P _{215 °C} W PER RESISTOR |
|----------|------|--------------------------------------|---------------------------|------------------------|--|--|--|---|
| RMKHT33 | 0303 | 100 to 500K | 0.05, 0.1, 0.5, 1 | 0.02, 0.05, 0.5, 0.1 | 15, 30 | 2, 5 | 0.10 | 0.010 |
| RMKHT48 | 0808 | 100 to 800K | 0.05, 0.1, 0.5, 1 | 0.02, 0.05, 0.5, 0.1 | 15, 30 | 2, 5 | 0.10 | 0.010 |
| RMKHT408 | 0610 | 100 to 400K | 0.05, 0.1, 0.5, 1 | 0.02, 0.05, 0.5, 0.1 | 15, 30 | 2, 5 | 0.10 | 0.010 |
| RMKHT508 | 0610 | 500 to 400K | 0.05, 0.1, 0.5, 1 | 0.02, 0.05, 0.5, 0.1 | 15, 30 | 2, 5 | 0.10 | 0.010 |
| RMKHT816 | 0714 | 100 to 400K | 0.05, 0.1, 0.5, 1 | 0.02, 0.05, 0.5, 0.1 | 15, 30 | 2, 5 | 0.10 | 0.010 |
| RMKHT914 | 0714 | 500 to 200K | 0.05, 0.1, 0.5, 1 | 0.02, 0.05, 0.5, 0.1 | 15, 30 | 2, 5 | 0.10 | 0.010 |

PERFORMANCES - Bare Resistors Networks

| TEST | SPECIFICATIONS | CONDITIONS |
|------------------------------------|---|---------------------------------|
| Limiting voltage | 100 V on each resistor (except RMKHT33 50 V on each resistor) | |
| Operating temperature range | -55 °C; +215 °C | |
| Max. temperature resistive element | 220 °C | |
| Max. substrate temperature | 230 °C | |
| Load life stability | ± 0.35 % | 2000 h / 220 °C (ambient) at Pn |
| Load life stability on ratio | ± 0.35 % | 2000 h / 220 °C (ambient) at Pn |
| Storage temperature range | -55 °C; +230 °C | |
| Shelf life stability | ± 0.6 % typ. (± 0.8 % max.) | 15 000 h/230 °C |

Notes

(1) For ohmic range vs. tolerance and TCR see detailed table on next page.

(2) **Temperature Coefficient of Resistance**

Bare Resistors Chips

| | | |
|---|-------------|-----------------|
| Y | ± 10 ppm/°C | -55 °C; +155 °C |
| | ± 15 ppm/°C | -55 °C; +215 °C |
| E | ± 25 ppm/°C | -55 °C; +155 °C |
| | ± 30 ppm/°C | -55 °C; +215 °C |

Bare Resistors Networks

| | | | |
|---|------------------|-------------------|-----------------|
| Y | ± 10 ppm/°C abs. | 1 ppm/°C tracking | -55 °C; +155 °C |
| | ± 15 ppm/°C abs. | 2 ppm/°C tracking | -55 °C; +215 °C |
| E | ± 25 ppm/°C abs. | 2 ppm/°C tracking | -55 °C; +155 °C |
| | ± 30 ppm/°C abs. | 5 ppm/°C tracking | -55 °C; +215 °C |

(3) Pn is intended with no back side metallized. For power handling improvement, please refer to application note 53047 "Power Dissipation Considerations in High Precision Vishay Sfernice Thin Film Chip Resistors and Arrays (High Temperature Applications)" www.vishay.com/doc?53047 and consult Vishay Sfernice.

(4) See Limiting Voltage table on next page.

(5) It is possible to dissipate up to 0.3 W, but there will be an additional drift of 0.1 % after load life.



| BEST TOLERANCE AND TCR VS. OHMIC VALUE - Bare Resistors Chips | | | | |
|--|----------------------------|--------|-------|--------|
| SERIES | OHMIC RANGE ⁽¹⁾ | | | |
| | CT: Y | | CT: E | |
| | MIN. | MAX. | MIN. | MAX. |
| 22 | 50 Ω | 300 kΩ | 10 Ω | 500 kΩ |
| 55 | 1 kΩ | 1.5 MΩ | 150 Ω | 2 MΩ |
| 515 | 1 kΩ | 2 MΩ | 100 Ω | 5 MΩ |
| 0603 | 39 Ω | 210 kΩ | 10 Ω | 320 kΩ |
| 0805 | 39 Ω | 480 kΩ | 10 Ω | 720 kΩ |
| 1206 | 39 Ω | 1.8 MΩ | 10 Ω | 2.7 MΩ |
| 2010 | 39 Ω | 5 MΩ | 10 Ω | 7.5 MΩ |

| BEST TOLERANCE AND TCR VS. OHMIC VALUE - Bare Resistors Networks | | | | |
|---|-------------|--------|-------|--------|
| SERIES | OHMIC RANGE | | | |
| | CT: Y | | CT: E | |
| | MIN. | MAX. | MIN. | MAX. |
| 33 | 1 kΩ | 250 kΩ | 100 Ω | 500 kΩ |
| 48 | 1 kΩ | 200 kΩ | 100 Ω | 800 kΩ |
| 408 | 1 kΩ | 200 kΩ | 100 Ω | 400 kΩ |
| 508 | 1 kΩ | 200 kΩ | 500 Ω | 400 kΩ |
| 816 | 1 kΩ | 200 kΩ | 100 Ω | 400 kΩ |
| 914 | 1 kΩ | 100 kΩ | 500 Ω | 200 kΩ |

Note

- ⁽¹⁾ Best possible tolerance:
 0.5 %: 10 Ω to < 20 Ω
 0.1 %: 20 Ω to < 39 Ω
 0.05 %: 39 Ω to max. ohmic value

| SIZE | LIMITING VOLTAGE in V |
|------|-----------------------|
| 22 | 100 V |
| 55 | 100 V |
| 515 | 100 V |
| 0603 | 75 V |
| 0805 | 150 V |
| 1206 | 200 V |
| 2010 | 300 V |

POPULAR OPTION

Back side metallized
 Option to order: 06 (not available for sizes 22, 33, 55, 515)
 Please refer to Application Note 53047 "Power Considerations in High Precision Vishay Sfernice Thin Film Chip Resistors and Arrays (High Temperature Applications) www.vishay.com/doc?53047 to evaluate performances improvement depending on process (brazing or gluing). Choice of PCB will be determinant.

GLOBAL PART NUMBERING INFORMATION - Bare Resistors Chips

Bare Chip Resistors

R M K H T 0 6 0 3 Y 1 0 0 1 B A 0 6

| GLOBAL MODEL | SIZE | TCR | VALUE | TOLERANCE | PADS | OPTION |
|--------------|---|--------|---|---|-------------|--|
| RMKHT | 22 55 515 0603 0805 1206 2010 | Y E | The first 3 digits are significant figures and the last digit specifies the number of zeros to follow. R designates decimal point 10R0 = 10 Ω 3901 = 3900 Ω 1004 = 1 MΩ AA ⁽²⁾ | W = 0.05 % B = 0.1 % D = 0.5 % F = 1 % | A: aluminum | Blank = no option 06 = back side metallized |

GLOBAL PART NUMBERING INFORMATION - Bare Resistors Networks

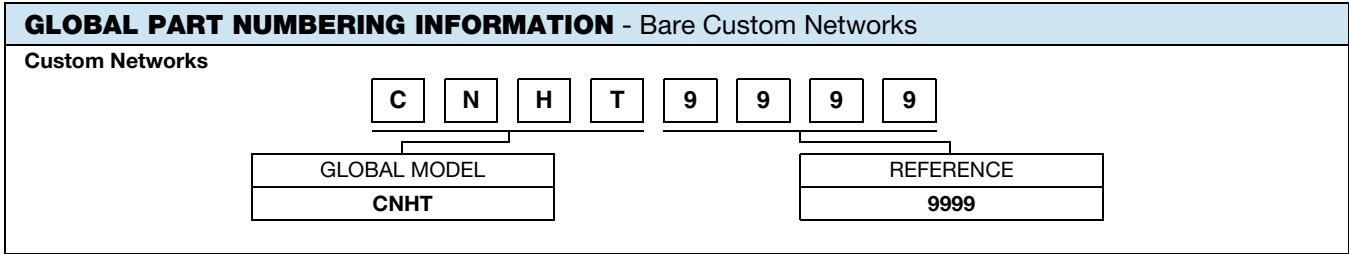
Bare Resistors Networks

R M K H T 8 1 6 E 1 0 0 1 B W A 0 6

| GLOBAL MODEL | SIZE | TCR | VALUE | ABS. TOLERANCE | TOLERANCE RATIO | PADS | OPTION |
|--------------|--------------------------------------|--------|---|---|--|-------------|--|
| RMKHT | 33 48 408 508 816 914 | Y E | The first 3 digits are significant figures and the last digit specifies the number of zeros to follow. R designates decimal point 10R0 = 10 Ω 3901 = 3900 Ω 1004 = 1 MΩ AA ⁽¹⁾ | W = 0.05 % B = 0.1 % D = 0.5 % F = 1 % | P = 0.02 % W = 0.05 % D = 0.5 % B = 0.1 % | A: aluminum | Blank = no option 06 = back side metallized |

Note

⁽¹⁾ For more than three significant digits an alphabetical code will be used (AA to ZZ) and a cross table will be provided



Note

- A specific reference number is assigned by Vishay Sfernice



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