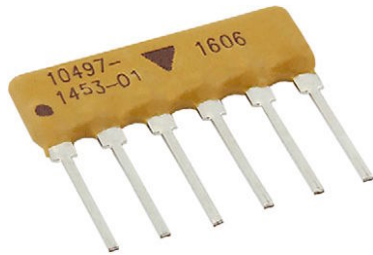


## Conformal, Single In-Line Thin Film Resistor, Through Hole Network (Standard)



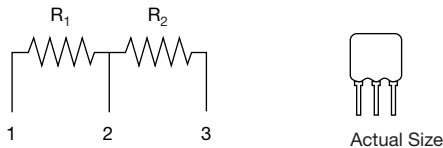
Vishay Dale Thin Film resistor networks are designed to be used in analog circuits in conjunction with operational amplifiers. Engineers can use these circuits to achieve an infinite number of very low noise and high stability circuits for industrial, medical and scientific instrumentation.

This family of standard resistor networks will continually be expanded with new and innovative designs, and Vishay Dale Thin Film stocks most designs in house for off-the-shelf convenience. However, if you can not find the standard network you need, call applications engineering at (716) 283-4025, as we may be able to meet your requirements with a semicustom “match” for a quick delivery.

For standard networks with tighter specifications, or for custom networks, contact Applications Engineering at the above number. For a quick review of typical applications, request Vishay’s guide to understanding and using thin film precision networks.

### SCHEMATIC

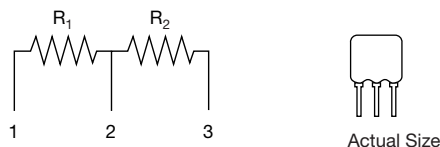
$$R_1 = R_2$$



L = total length = 0.320" (8.13 mm) max.  
 H = seated height = 0.280" (7.11 mm) max.  
 Except PN 218 where seated height = 0.342" (8.69 mm) max.

$$R_1 + R_2 = 10K, 100K, 1M$$

$$\frac{R_1 + R_2}{R_2} = 10$$



L = total length = 0.320" (8.13 mm) max.  
 H = seated height = 0.280" (7.11 mm) max.  
 Except PN 281 where seated height = 0.362" (9.19 mm) max.

### FEATURES

- Off-the-shelf delivery
- Wide variety of standards
- Small size (SIP)
- Standard designs - no NRE
- Low capacitance < 0.1 pF/PIN
- Flame resistant (UL 94 V-0 rating)
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



### Note

\* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details

### TYPICAL PERFORMANCE

|      | ABSOLUTE | TRACKING |
|------|----------|----------|
| TCR  | 10       | 2        |
|      | ABSOLUTE | RATIO    |
| TOL. | 0.1      | 0.02     |

Complete electrical specifications at the end of schematics.

### TWO EQUAL RESISTORS

#### ORDERING INFORMATION (R<sub>1</sub> =)

|               |                |
|---------------|----------------|
| 1K: VTF209UF  | 50K: VTF214UF  |
| 2K: VTF210UF  | 100K: VTF215UF |
| 5K: VTF211UF  | 200K: VTF216UF |
| 10K: VTF212UF | 500K: VTF217UF |
| 20K: VTF213UF | 1M: VTF218UF   |

Lead (Pb)-free option add “S” after part number, e.g: VTF209SUF

### RATIO DIVIDER 10:1

#### ORDERING INFORMATION (R<sub>1</sub> + R<sub>2</sub> =)

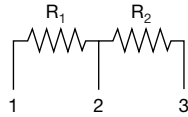
|                            |
|----------------------------|
| 9K + 1K = 10K: VTF280UF    |
| 90K + 10K = 100K: VTF193UF |
| 900K + 100K = 1M: VTF281UF |

Lead (Pb)-free option add “S” after part number, e.g: VTF280SUF



$R_1 = 100K, 1M$

$$\frac{R_1}{R_2} = 10$$



Actual Size

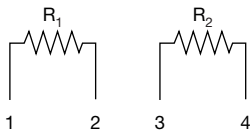
L = total length = 0.320" (8.13 mm) max.  
H = seated height = 0.280" (7.11 mm) max.  
Except PN 283 where seated height = 0.362" (9.19 mm) max.

### DIVIDER NETWORK 10:1

#### ORDERING INFORMATION ( $R_1 =$ )

|                |
|----------------|
| 100K: VTF282UF |
| 1M: VTF283UF   |

$R_1 = R_2$



Actual Size

L = total length = 0.420" (10.67 mm) max.  
H = seated height = 0.280" (7.11 mm) max.

### TWO EQUAL RESISTORS - ISOLATED

#### ORDERING INFORMATION ( $R_1 =$ )

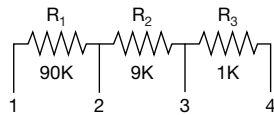
|                |                 |
|----------------|-----------------|
| 1K: VTF365UF   | 50K: VTF1000UF  |
| 2K: VTF997UF   | 100K: VTF348UF  |
| 5K: VTF998UF   | 200K: VTF1105UF |
| 10K: VTF363UF  | 500K: VTF1106UF |
| 20K: VTF1104UF | 1M: VTF1103UF   |
| 25K: VTF999UF  |                 |

Lead (Pb)-free option add "S" after part number, e.g: VTF209SUF

$R_1 + R_2 + R_3 = 100K$

$$\frac{R_1 + R_2 + R_3}{R_3} = 100$$

$$\frac{R_1 + R_2 + R_3}{R_2 + R_3} = 10$$



Actual Size

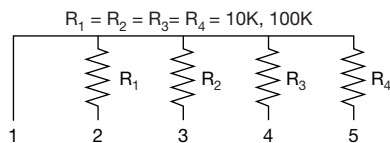
L = total length = 0.420" (10.67 mm) max.  
H = seated height = 0.280" (7.11 mm) max.

### RATIO DIVIDER 10:1 AND 100:1

#### ORDERING INFORMATION ( $R_1 + R_2 + R_3 =$ )

|                |
|----------------|
| 100K: VTF330UF |
|----------------|

Lead (Pb)-free option add "S" after part number, e.g: VTF330SUF



Actual Size

L = total length = 0.520" (13.21 mm) max.  
H = seated height = 0.280" (7.11 mm) max.

### FOUR EQUAL RESISTORS ONE COMMON

#### ORDERING INFORMATION ( $R_1 =$ )

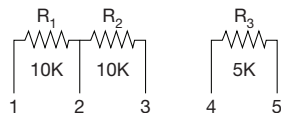
|                |
|----------------|
| 10K: VTF366UF  |
| 100K: VTF367UF |

Lead (Pb)-free option add "S" after part number, e.g: VTF366SUF

$R_1 = 10K$

$$\frac{R_2}{R_1} = 1$$

$$R_3 = \frac{R_1 \times R_2}{R_1 + R_2}$$



Actual Size

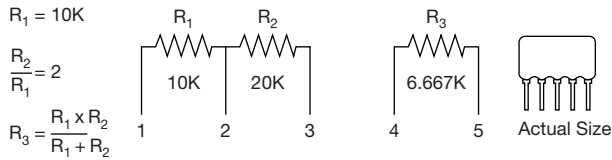
L = 0.520 (13.21 mm), H = 0.280 (7.11 mm) max.

### DIVIDER NETWORK 2:1

#### ORDERING INFORMATION

|           |
|-----------|
| VTF1087UF |
|-----------|

Lead (Pb)-free option add "S" after part number, e.g: VTF1087SUF



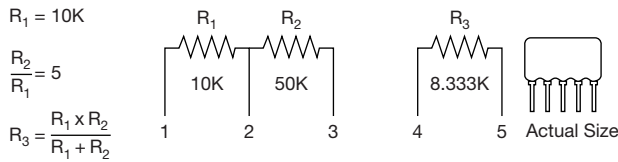
L = 0.520" (13.21 mm), H = 0.280" (7.11 mm) max.

### DIVIDER NETWORK 2:1

#### ORDERING INFORMATION

VTF1088UF

Lead (Pb)-free option add "S" after part number, e.g: VTF1088SUF



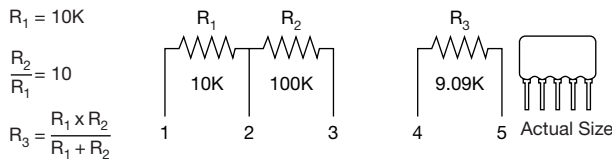
L = 0.520" (13.21 mm), H = 0.280" (7.11 mm) max.

### DIVIDER NETWORK 5:1

#### ORDERING INFORMATION

VTF1089UF

Lead (Pb)-free option add "S" after part number, e.g: VTF1089SUF



L = 0.520" (13.21 mm), H = 0.280" (7.11 mm) max.

### DIVIDER NETWORK 10:1

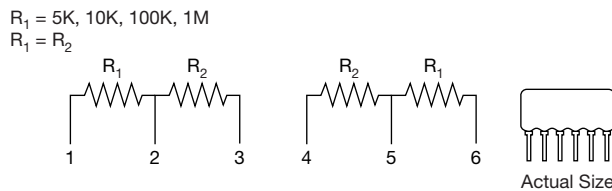
#### ORDERING INFORMATION

VTF1090UF

Lead (Pb)-free option add "S" after part number, e.g: VTF1090SUF

**Note**

- $R_2$  TCR tracking 3 ppm/°C



L = total length = 0.620" (15.75 mm) max.  
 H = seated height = 0.280" (7.11 mm) max.  
 Except PN 287 seated height = 0.362" (9.19 mm) max.

### DIVIDER NETWORK 1:1

#### ORDERING INFORMATION (R<sub>1</sub> =)

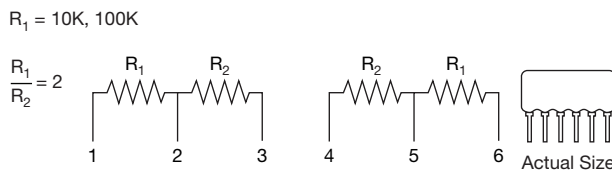
5K: VTF225UF

10K: VTF286UF

100K: VTF219UF

1M: VTF287UF

Lead (Pb)-free option add "S" after part number, e.g: VTF225SUF



L = total length = 0.620" (15.75 mm) max.  
 H = seated height = 0.280" (7.11 mm) max.

### DIVIDER NETWORK 2:1

#### ORDERING INFORMATION (R<sub>1</sub> =)

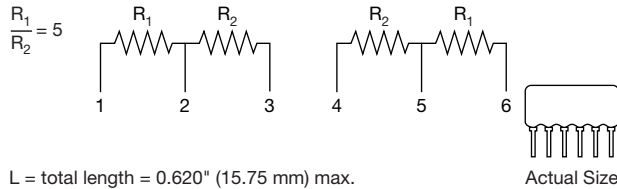
10K: VTF1009UF

100K: VTF1010UF

Lead (Pb)-free option add "S" after part number, e.g: VTF1009SUF



R<sub>1</sub> = 10K, 100K



L = total length = 0.620" (15.75 mm) max.  
H = seated height = 0.280" (7.11 mm) max.

### DIVIDER NETWORK 5:1

#### ORDERING INFORMATION (R<sub>1</sub> =)

10K: VTF1007UF

100K: VTF1008UF

Lead (Pb)-free option add "S" after part number, e.g: VTF1007SUF

R<sub>1</sub> = 10K



L = total length = 0.620" (15.75 mm) max.  
H = seated height = 0.280" (7.11 mm) max.

### DIVIDER NETWORK 10:1

#### ORDERING INFORMATION (R<sub>1</sub> =)

10K: VTF220UF

Lead (Pb)-free option add "S" after part number, e.g: VTF220SUF

R<sub>1</sub> = 10K, 100K, 1M



L = total length = 0.620" (15.75 mm) max.  
H = seated height = 0.280" (7.11 mm) max.  
Except PN 285 seated height = 0.320" (8.13 mm) max.

### DIVIDER NETWORK 10:1

#### ORDERING INFORMATION (R<sub>1</sub> =)

10K: VTF328UF

100K: VTF284UF

1M: VTF285UF

Lead (Pb)-free option add "S" after part number, e.g: VTF328SUF

R<sub>1</sub> = 10K, 50K, 200K, 1M



L = total length = 0.620" (15.75 mm) max.  
H = seated height = 0.280" (7.11 mm) max.

### DIVIDER NETWORK 20:1

#### ORDERING INFORMATION (R<sub>1</sub> =)

10K: VTF1073UF

50K: VTF1074UF

200K: VTF1107UF

1M: VTF1108UF

Lead (Pb)-free option add "S" after part number, e.g: VTF1073SUF

R<sub>1</sub> = 1M



L = total length = 0.620" (15.75 mm) max.  
H = seated height = 0.280" (7.11 mm) max.

### DIVIDER NETWORK 100:1

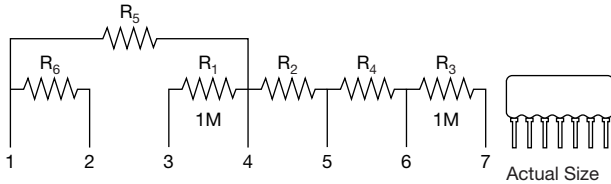
#### ORDERING INFORMATION (R<sub>1</sub> =)

1M: VTF1109UF

Lead (Pb)-free option add "S" after part number, e.g: VTF1109SUF



Common mode  
 Division ratio 250, 100, 50  
 $R_1 = R_3 = 1M$   
 $R_2 = 4K, 10K, 20K$   
 $R_4 = 3.984K, 9.901K, 19.608K$   
 $R_5 = 900K, 950K, 975K$   
 $R_6 = 100K, 50K, 25K$



L = total length = 0.720" (18.29 mm) max.  
 H = seated height = 0.360" (9.14 mm) max.  
 Maximum voltage to pins 3 and 7 is 300 V

### SIX RESISTOR NETWORK

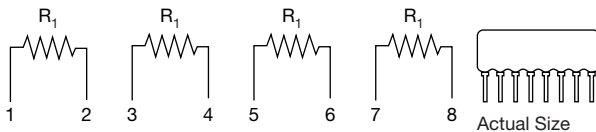
(Designed for unity gain/high common mode voltage rejection differential amplifier)

#### ORDERING INFORMATION ( $R_1/R_2 =$ )

|                                |
|--------------------------------|
| Devision Ratio = 250: VTF442UF |
| 100: VTF443UF                  |
| 50: VTF444UF                   |

Lead (Pb)-free option add "S" after part number, e.g: VTF442SUF

$R_1 = 1K, 10K, 25K, 50K, 100K$



L = total length = 0.820" (20.83 mm) max.  
 H = seated height = 0.280" (7.11 mm) max.

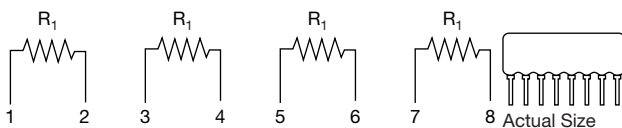
### FOUR EQUAL RESISTORS ISOLATED

#### ORDERING INFORMATION ( $R_1 =$ )

|                |
|----------------|
| 1K: VTF329UF   |
| 2K: VTF1001UF  |
| 5K: VTF1002UF  |
| 10K: VTF158UF  |
| 25K: VTF1003UF |
| 50K: VTF1004UF |
| 100K: VTF288UF |

Lead (Pb)-free option add "S" after part number, e.g: VTF329SUF

$R_1 = 1K, 10K, 100K$



Absolute tolerance = 0.1 %  
 Ratio tolerance = 0.1 %  
 L = total length = 0.820" (20.83 mm) max.  
 H = seated height = 0.280" (7.11 mm) max.

### FOUR EQUAL RESISTORS ISOLATED

#### ORDERING INFORMATION ( $R_1 =$ )

|                 |
|-----------------|
| 1K: VTF1005UF   |
| 10K: VTF1006UF  |
| 100K: VTF1137UF |

Lead (Pb)-free option add "S" after part number, e.g: VTF1005SUF



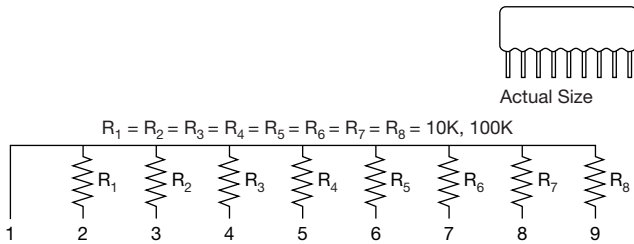
### EIGHT EQUAL RESISTORS ONE COMMON

#### ORDERING INFORMATION (R<sub>1</sub> =)

10K: VTF368UF

100K: VTF369UF

Lead (Pb)-free option add "S" after part number, e.g: VTF368SUF



L = total length = 0.920" (23.37 mm) max.  
H = seated height = 0.280" (7.11 mm) max.

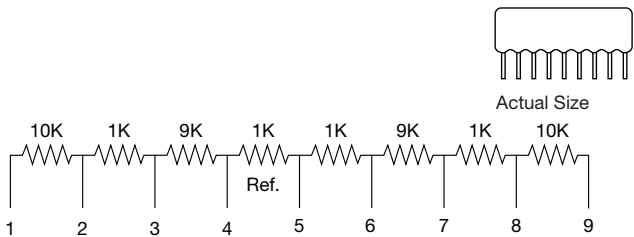
### EIGHT RESISTOR NETWORK

(Designed for instrument amplifier with shield driver)

#### ORDERING INFORMATION

VTF272UF

Lead (Pb)-free option add "S" after part number, e.g: VTF272SUF



L = total length = 0.920" (23.37 mm) max.  
H = seated height = 0.280" (7.11 mm) max.

### EIGHT BIT R/2R LADDER NETWORK

#### ORDERING INFORMATION (R =)

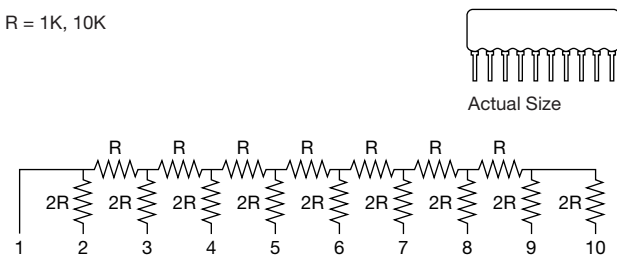
(± 1/2 LSB)

1K: VTF1072UF

10K: VTF267UF

Lead (Pb)-free option add "S" after part number, e.g: VTF1072SUF

R = 1K, 10K



L = total length = 1.020" (25.91 mm) max.  
H = seated height = 0.280" (7.11 mm) max.

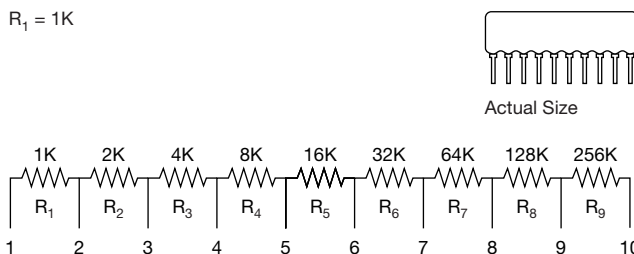
### RESISTANCE DOUBLER

#### ORDERING INFORMATION

VTF1011UF

Lead (Pb)-free option add "S" after part number, e.g: VTF1011SUF

R<sub>1</sub> = 1K



Absolute tolerance = ± 0.1 %  
Ratio tolerance = ± 0.1 %  
TCR tracking = ± 3 ppm/°C  
L = total length = 1.02" (25.91 mm) max.  
H = seated height = 0.280" (7.11 mm) max.

| STANDARD ELECTRICAL SPECIFICATIONS |                            |                  |
|------------------------------------|----------------------------|------------------|
| TEST                               | SPECIFICATIONS             | CONDITIONS       |
| Material                           | Passivated nichrome        | -                |
| Pin/Lead Number                    | 3 to 10                    | -                |
| Resistance Range                   | 100 Ω to 2 MΩ total        | -                |
| TCR: Absolute                      | ± 10 ppm/°C <sup>(1)</sup> | 0 °C to +70 °C   |
| TCR: Tracking                      | ± 2 ppm/°C <sup>(1)</sup>  | 0 °C to +70 °C   |
| Tolerance: Absolute                | ± 0.1 %                    | +25 °C           |
| Tolerance: Ratio                   | ± 0.02 %                   | +25 °C           |
| Power Rating: Resistor             | 100 mW                     | -                |
| Power Rating: Package              | 500 mW                     | -                |
| Stability: Absolute                | ΔR ± 0.05 %                | 2000 h at +70 °C |
| Stability: Ratio                   | ΔR ± 0.015 %               | 2000 h at +70 °C |
| Voltage Coefficient                | ± 0.01 ppm/V               | -                |
| Working Voltage                    | 100 V                      | -                |
| Operating Temperature Range        | 0 °C to +70 °C             | -                |
| Storage Temperature Range          | -55 °C to +125 °C          | -                |
| Noise                              | < - 35 dB                  | -                |
| Thermal EMF                        | < 0.1 μV/°C                | -                |
| Shelf Life Stability: Absolute     | ΔR ± 0.01 %                | 1 year at +25 °C |
| Shelf Life Stability: Ratio        | ΔR ± 0.002 %               | 1 year at +25 °C |

**Note**

<sup>(1)</sup> TCR over -55 °C to +125 °C ± 20 ppm/°C absolute, ± 3 ppm/°C tracking

| DIMENSIONS AND IMPRINTING in inches and millimeters |            |             |             |
|---|------------|-------------|-------------|
|   | DIMENSION  | INCHES      | MILLIMETERS |
|   | A          | 0.125 min.  | 3.17        |
| B   | 0.010 min. | 0.25        |             |
| C   | 0.100      | 2.54 typ.   |             |
| D   | 0.020 typ. | 0.48 ± 0.15 |             |
| E   | 0.100 max. | 2.54        |             |
| F   | 0.010 typ. | 0.25        |             |

**Note**

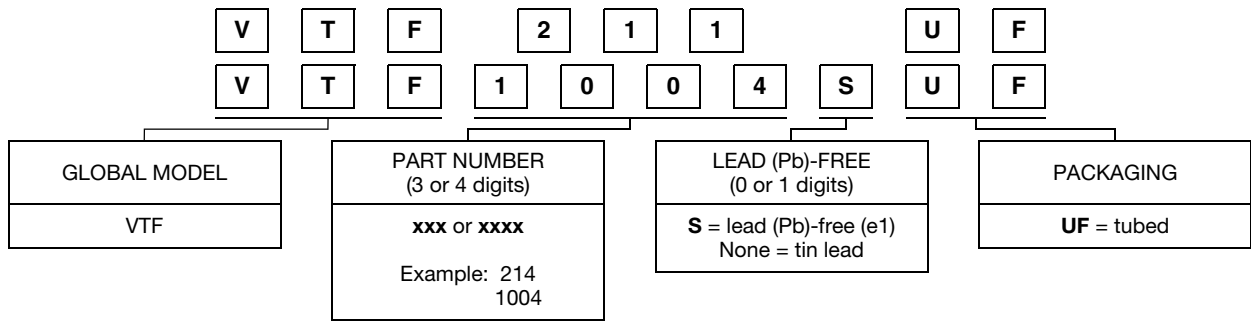
- “L” and “H” (length and height) dimensions for each model are found alongside the schematic drawing

| MECHANICAL SPECIFICATIONS            |                      |
|--------------------------------------|----------------------|
| Resistive Element                    | Passivated nichrome  |
| Substrate Material                   | Alumina              |
| Body                                 | Epoxy coated         |
| Terminals                            | Copper alloy         |
| Tin / Lead Option                    | Sn60 - Sn63          |
| Lead (Pb)-free Option                | Sn96.5, Ag3.0, Cu0.5 |
| Tin / Lead and Lead (Pb)-free Finish | Hot solder dip       |



### GLOBAL PART NUMBER INFORMATION

New Global Part Numbering: VTF211UF



Historical Part Number example: VTF 211 (for reference purposes only)







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