

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



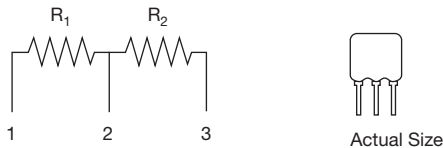
Vishay Dale Thin Film resistor networks are designed to be used in analog circuits in conjunction with operational amplifiers. Engineers can use these circuits to achieve an infinite number of very low noise and high stability circuits for industrial, medical and scientific instrumentation.

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

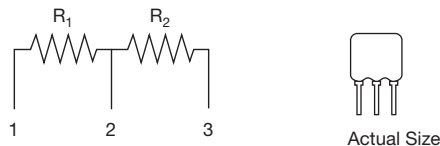
$$R_1 = R_2$$



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

\* Lead (Pb)-containing terminations are not RoHS-compliant. Exemptions may apply.

### 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: VTF209BX	50K: VTF214BX
2K: VTF210BX	100K: VTF215BX
5K: VTF211BX	200K: VTF216BX
10K: VTF212BX	500K: VTF217BX
20K: VTF213BX	1M: VTF218BX

Lead (Pb)-free option add "S" after part number, e.g: VTF209SBX

### RATIO DIVIDER 10:1

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

9K + 1K = 10K: VTF280BX
90K + 10K = 100K: VTF193BX
900K + 100K = 1M: VTF281BX

Lead (Pb)-free option add "S" after part number, e.g: VTF280SBX



$R_1 = 100K, 1M$

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



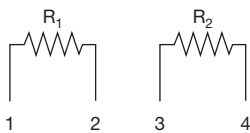
L = Total length = 0.320" (8.13 mm) max.  
H = Seated height = 0.280" (7.11 mm) max.  
Except PN 283 where seated height = 0.362" (9.19 mm) max.

### DIVIDER NETWORK 10:1

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

100K: VTF282BX
1M: VTF283BX

$R_1 = R_2$



L = Total length = 0.420" (10.67 mm) max.  
H = Seated height = 0.280" (7.11 mm) max.

### TWO EQUAL RESISTORS - ISOLATED

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

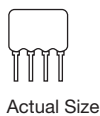
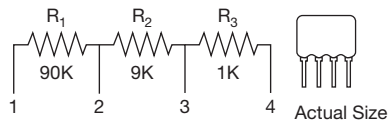
1K: VTF365BX	50K: VTF1000BX
2K: VTF997BX	100K: VTF348BX
5K: VTF998BX	200K: VTF1105BX
10K: VTF363BX	500K: VTF1106BX
20K: VTF1104BX	1M: VTF1103BX
25K: VTF999BX	

Lead (Pb)-free option add "S" after part number, e.g: VTF209SBX

$R_1 + R_2 + R_3 = 100K$

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

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



L = Total length = 0.420" (10.67 mm) max.  
H = Seated height = 0.280" (7.11 mm) max.

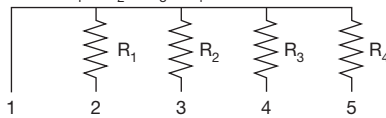
### RATIO DIVIDER 10:1 AND 100:1

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

100K: VTF330BX
----------------

Lead (Pb)-free option add "S" after part number, e.g: VTF330SBX

$R_1 = R_2 = R_3 = R_4 = 10K, 100K$



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 ( $R_1 =$ )

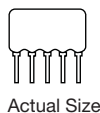
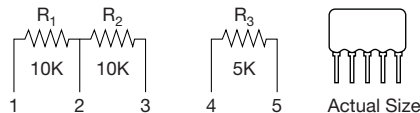
10K: VTF366BX
100K: VTF367BX

Lead (Pb)-free option add "S" after part number, e.g: VTF366SBX

$R_1 = 10K$

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

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



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

### DIVIDER NETWORK 2:1

#### ORDERING INFORMATION

VTF1087BX
-----------

Lead (Pb)-free option add "S" after part number, e.g: VTF1087SBX



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

### DIVIDER NETWORK 2:1

#### ORDERING INFORMATION

VTF1088BX

Lead (Pb)-free option add "S" after part number, e.g: VTF1088SBX



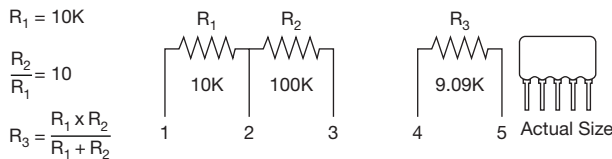
L = 0.520" (13.21 mm), H = 0.280" (7.11 mm) max.

### DIVIDER NETWORK 5:1

#### ORDERING INFORMATION

VTF1089BX

Lead (Pb)-free option add "S" after part number, e.g: VTF1089SBX



Note:  
• R<sub>2</sub> TCR Tracking 3 ppm/°C

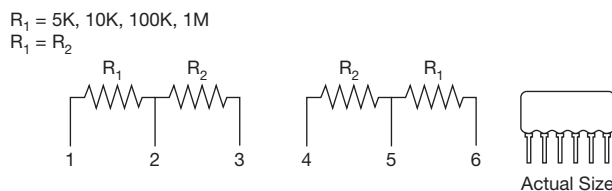
L = 0.520" (13.21 mm), H = 0.280" (7.11 mm) max.

### DIVIDER NETWORK 10:1

#### ORDERING INFORMATION

VTF1090BX

Lead (Pb)-free option add "S" after part number, e.g: VTF1090SBX



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: VTF225BX
10K: VTF286BX
100K: VTF219BX
1M: VTF287BX

Lead (Pb)-free option add "S" after part number, e.g: VTF225SBX



L = Total length = 0.620" (15.75 mm) max.  
H = Seated height = 0.280" (7.11 mm) max.

### DIVIDER NETWORK 2:1

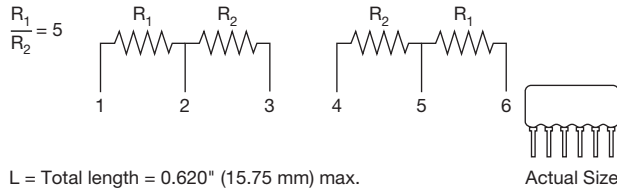
#### ORDERING INFORMATION (R<sub>1</sub> =)

10K: VTF1009BX
100K: VTF1010BX

Lead (Pb)-free option add "S" after part number, e.g: VTF1009SBX



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



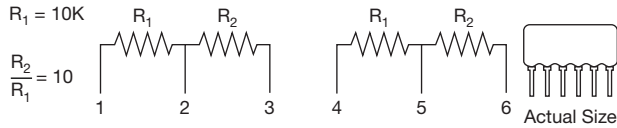
L = Total length = 0.620" (15.75 mm) max.  
H = Seated height = 0.280" (7.11 mm) max.

### DIVIDER NETWORK 5:1

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

10K: VTF1007BX
100K: VTF1008BX

Lead (Pb)-free option add "S" after part number, e.g: VTF1007SBX



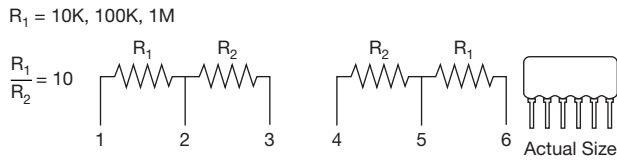
L = Total length = 0.620" (15.75 mm) max.  
H = Seated height = 0.280" (7.11 mm) max.

### DIVIDER NETWORK 10:1

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

10K: VTF220BX
---------------

Lead (Pb)-free option add "S" after part number, e.g: VTF220SBX



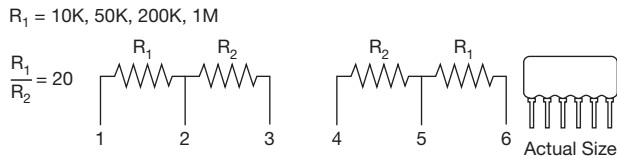
L = Total length = 0.620" (15.75 mm) max.  
H = Seated height = 0.280" (7.11 mm) max.  
Except PN 285 seated height = 0.320" (8.13 mm) max.

### DIVIDER NETWORK 10:1

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

10K: VTF328BX
100K: VTF284BX
1M: VTF285BX

Lead (Pb)-free option add "S" after part number, e.g: VTF328SBX



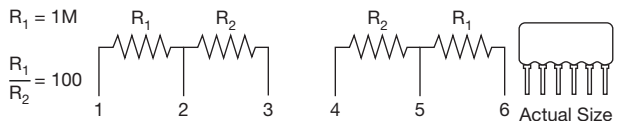
L = Total length = 0.620" (15.75 mm) max.  
H = Seated height = 0.280" (7.11 mm) max.

### DIVIDER NETWORK 20:1

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

10K: VTF1073BX
50K: VTF1074BX
200K: VTF1107BX
1M: VTF1108BX

Lead (Pb)-free option add "S" after part number, e.g: VTF1073SBX



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: VTF1109BX
---------------

Lead (Pb)-free option add "S" after part number, e.g: VTF1109SBX



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: VTF442BX
100: VTF443BX
50: VTF444BX

Lead (Pb)-free option add "S" after part number, e.g: VTF442SBX

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



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: VTF329BX
2K: VTF1001BX
5K: VTF1002BX
10K: VTF158BX
25K: VTF1003BX
50K: VTF1004BX
100K: VTF288BX

Lead (Pb)-free option add "S" after part number, e.g: VTF329SBX

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



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.

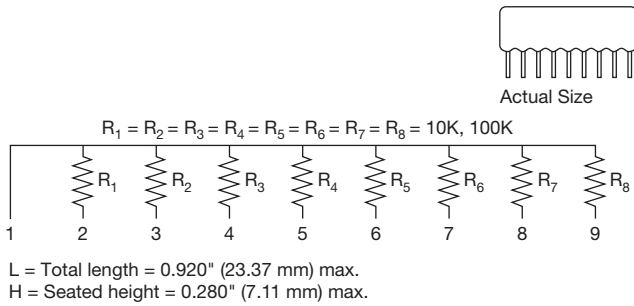
### FOUR EQUAL RESISTORS ISOLATED

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

1K: VTF1005BX
10K: VTF1006BX
100K: VTF1137BX

Lead (Pb)-free option add "S" after part number, e.g: VTF1005SBX

### EIGHT EQUAL RESISTORS ONE COMMON

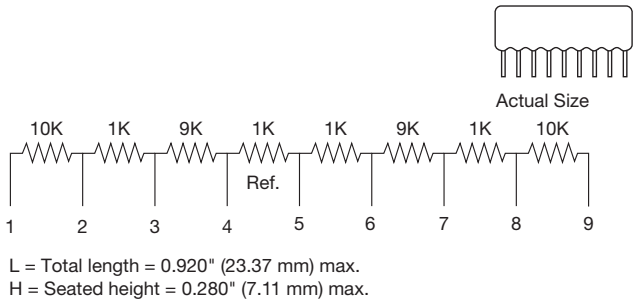


ORDERING INFORMATION ( $R_1 =$ )
10K: VTF368BX
100K: VTF369BX

Lead (Pb)-free option add "S" after part number, e.g: VTF368SBX

### EIGHT RESISTOR NETWORK

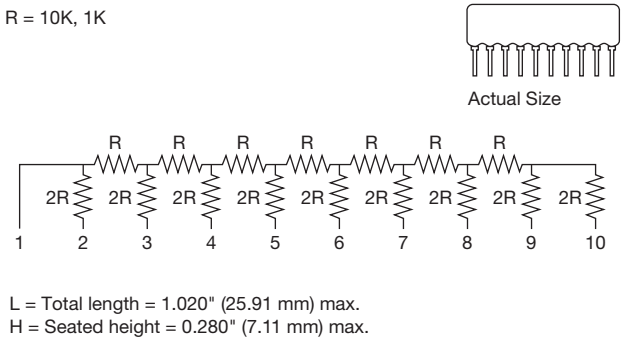
(Designed for instrument amplifier with shield driver)



ORDERING INFORMATION
VTF272BX

Lead (Pb)-free option add "S" after part number, e.g: VTF272SBX

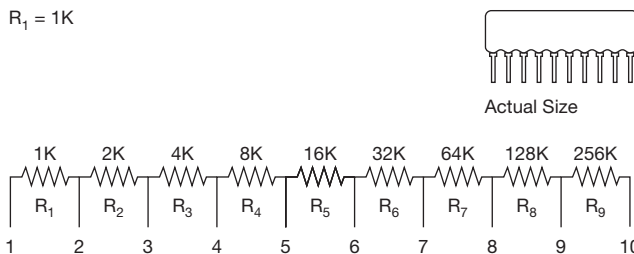
### EIGHT BIT R/2R LADDER NETWORK



ORDERING INFORMATION ( $R =$ )
( $\pm 1/2$ LSB)
10K: VTF1072BX
100K: VTF267BX

Lead (Pb)-free option add "S" after part number, e.g: VTF1072SBX

### RESISTANCE DOUBLER



ORDERING INFORMATION
VTF1011BX

Lead (Pb)-free option add "S" after part number, e.g: VTF1011SBX

Absolute tolerance =  $\pm 0.1\%$   
Ratio tolerance =  $\pm 0.1\%$   
TCR tracking =  $\pm 3$  ppm/ $^{\circ}C$   
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

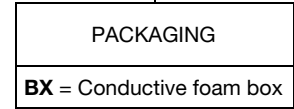
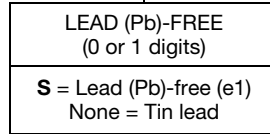
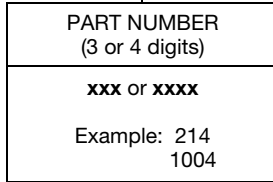
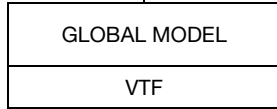
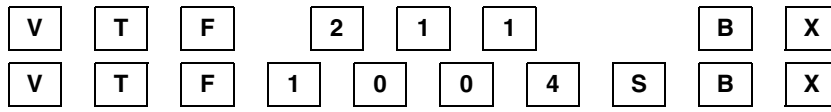
• “L” and “H” (length and height) dimensions for each model are found alongside the schematic drawing

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

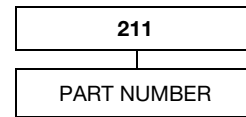
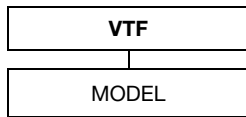


### GLOBAL PART NUMBER INFORMATION

New Global Part Numbering: VTF211BX



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







## Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

## Material Category Policy

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.**

**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.**