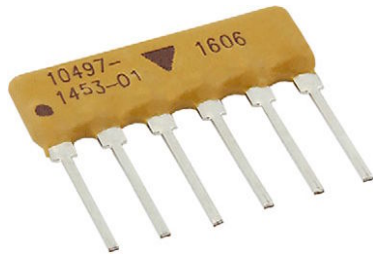


Conformal, Single In-Line Thin Film Resistor, Through Hole Network (Standard)



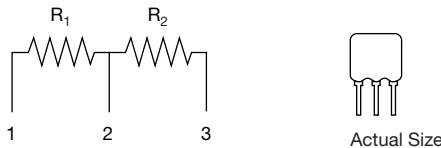
Vishay Dale Thin Film resistor networks are designed to be used in analog circuits in conjunction with operational amplifiers. Engineers can use these circuits to achieve an infinite number of very low noise and high stability circuits for industrial, medical and scientific instrumentation.

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

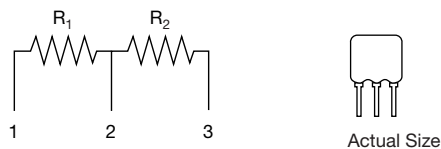
$$R_1 = R_2$$



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



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 ₁ =) | |
|---|----------------|
| 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

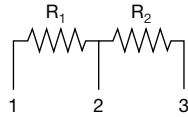
| ORDERING INFORMATION (R ₁ + R ₂ =) |
|--|
| 9K + 1K = 10K: VTF280UF |
| 90K + 10K = 100K: VTF193UF |
| 900K + 100K = 1M: VTF281UF |

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



$R_1 = 100K, 1M$

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



Actual Size

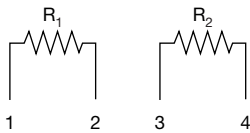
L = total length = 0.320" (8.13 mm) max.
H = seated height = 0.280" (7.11 mm) max.
Except PN 283 where seated height = 0.362" (9.19 mm) max.

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 ($R_1 =$)

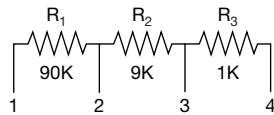
| | |
|----------------|-----------------|
| 1K: VTF365UF | 50K: VTF1000UF |
| 2K: VTF997UF | 100K: VTF348UF |
| 5K: VTF998UF | 200K: VTF1105UF |
| 10K: VTF363UF | 500K: VTF1106UF |
| 20K: VTF1104UF | 1M: VTF1103UF |
| 25K: VTF999UF | |

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

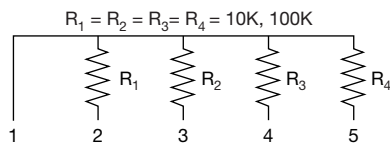
L = total length = 0.420" (10.67 mm) max.
H = seated height = 0.280" (7.11 mm) max.

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 ($R_1 =$)

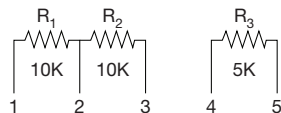
| |
|----------------|
| 10K: VTF366UF |
| 100K: VTF367UF |

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

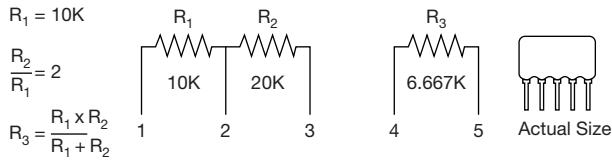
L = 0.520 (13.21 mm), H = 0.280 (7.11 mm) max.

DIVIDER NETWORK 2:1

ORDERING INFORMATION

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

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



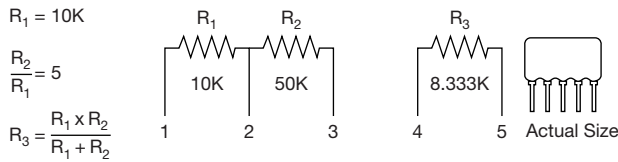
L = 0.520" (13.21 mm), H = 0.280" (7.11 mm) max.

DIVIDER NETWORK 2:1

ORDERING INFORMATION

VTF1088UF

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



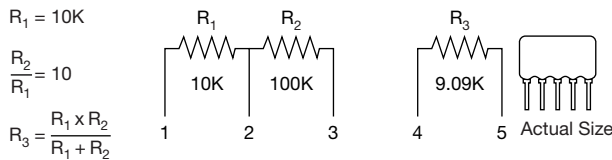
L = 0.520" (13.21 mm), H = 0.280" (7.11 mm) max.

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

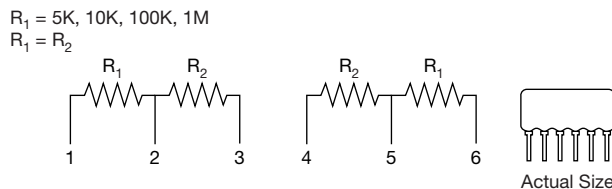
ORDERING INFORMATION

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 ($R_1 =$)

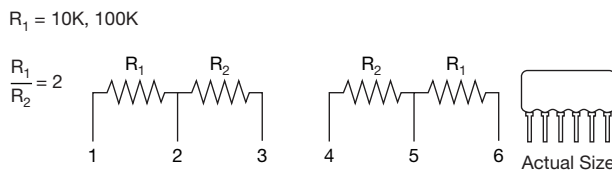
5K: VTF225UF

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 ($R_1 =$)

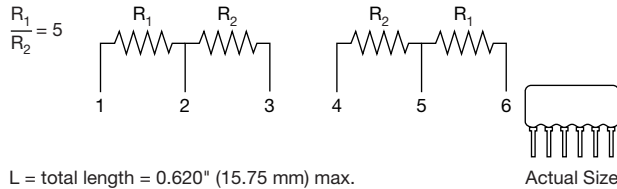
10K: VTF1009UF

100K: VTF1010UF

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



R₁ = 10K, 100K



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

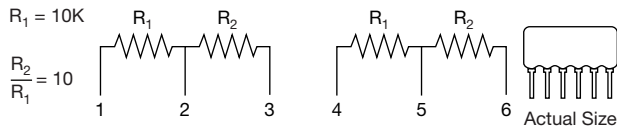
DIVIDER NETWORK 5:1

ORDERING INFORMATION (R₁ =)

10K: VTF1007UF

100K: VTF1008UF

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



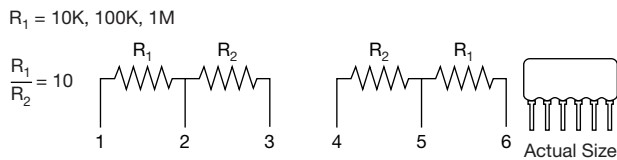
L = total length = 0.620" (15.75 mm) max.
H = seated height = 0.280" (7.11 mm) max.

DIVIDER NETWORK 10:1

ORDERING INFORMATION (R₁ =)

10K: VTF220UF

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



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

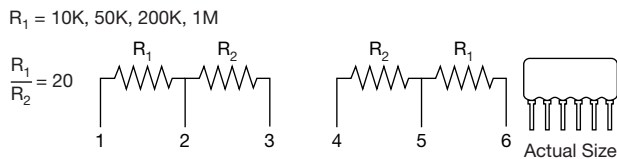
ORDERING INFORMATION (R₁ =)

10K: VTF328UF

100K: VTF284UF

1M: VTF285UF

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



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

DIVIDER NETWORK 20:1

ORDERING INFORMATION (R₁ =)

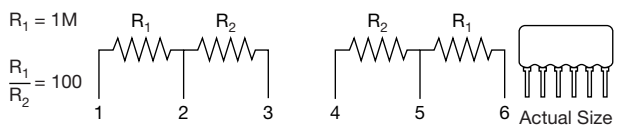
10K: VTF1073UF

50K: VTF1074UF

200K: VTF1107UF

1M: VTF1108UF

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



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

DIVIDER NETWORK 100:1

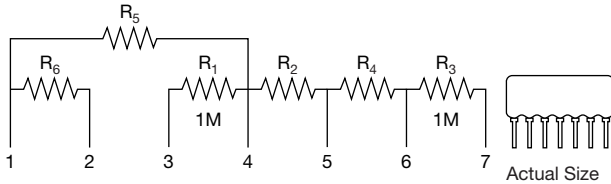
ORDERING INFORMATION (R₁ =)

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

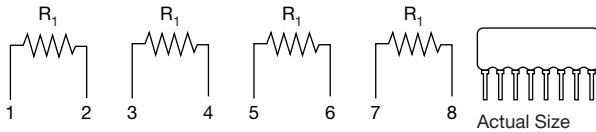
(Designed for unity gain/high common mode voltage rejection differential amplifier)

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.

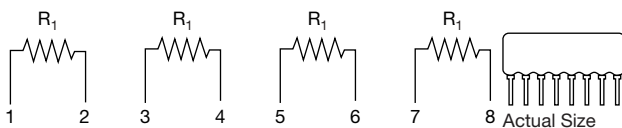
FOUR EQUAL RESISTORS ISOLATED

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



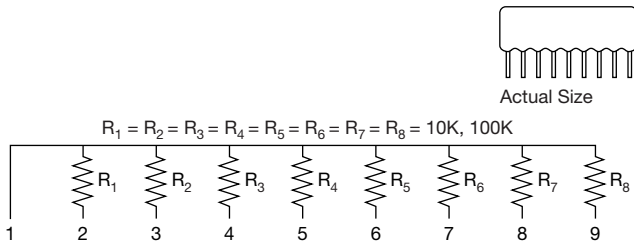
EIGHT EQUAL RESISTORS ONE COMMON

ORDERING INFORMATION (R₁ =)

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.

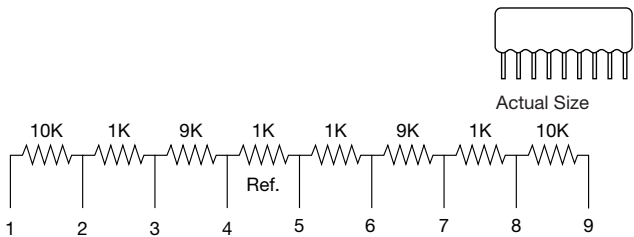
EIGHT RESISTOR NETWORK

(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 =)

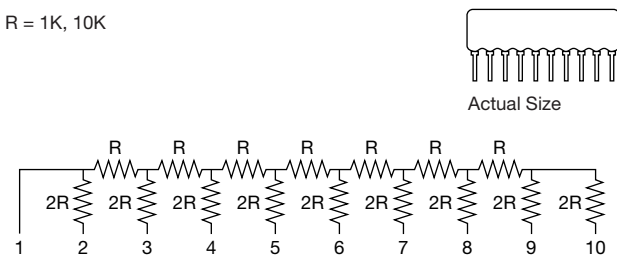
(± 1/2 LSB)

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.

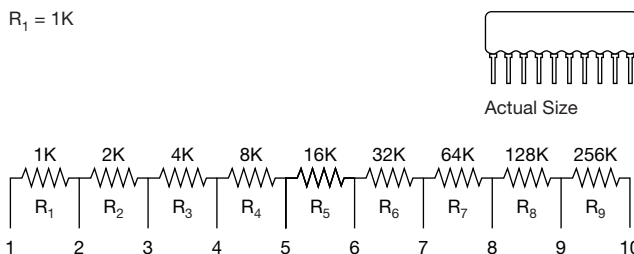
RESISTANCE DOUBLER

ORDERING INFORMATION

VTF1011UF

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

R₁ = 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 ⁽¹⁾ | 0 °C to +70 °C |
| TCR: Tracking | ± 2 ppm/°C ⁽¹⁾ | 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

⁽¹⁾ 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

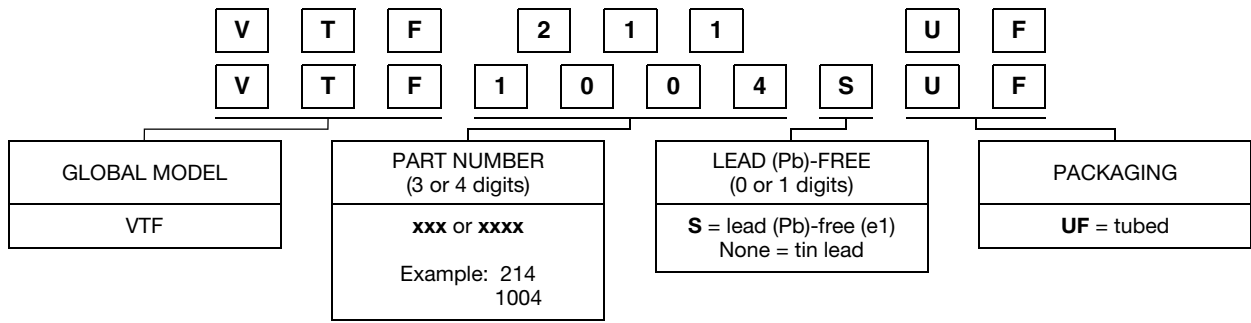
- “L” and “H” (length and height) dimensions for each model are found alongside the schematic drawing

| 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)





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.