

## 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

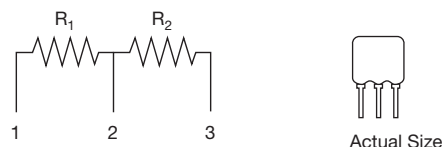
$$R_1 = R_2$$



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.



**RoHS\***  
COMPLIANT  
HALOGEN  
**FREE**

### 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: 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 ( $R_1 + R_2 =$ )

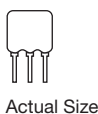
|                            |
|----------------------------|
| 9K + 1K = 10K: VTF280BX    |
| 90K + 10K = 100K: VTF193BX |
| 900K + 100K = 1M: VTF281BX |

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



$$R_1 = 100K, 1M$$

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



Actual Size

L = Total length = 0.320" (8.13 mm) max.

H = Seated height = 0.280" (7.11 mm) max.

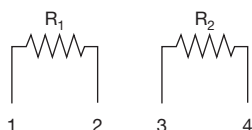
Except PN 283 where seated height = 0.362" (9.19 mm) max.

**DIVIDER NETWORK 10:1****ORDERING INFORMATION ( $R_1 =$ )**

100K: VTF282BX

1M: VTF283BX

$$R_1 = R_2$$



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: VTF365BX

50K: VTF1000BX

2K: VTF997BX

100K: VTF348BX

5K: VTF998BX

200K: VTF1105BX

10K: VTF363BX

500K: VTF1106BX

20K: VTF1104BX

1M: VTF1103BX

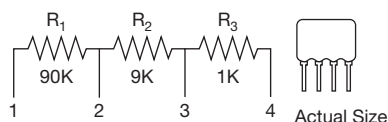
25K: VTF999BX

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

$$R_1 + R_2 + R_3 = 100K$$

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

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



Actual Size

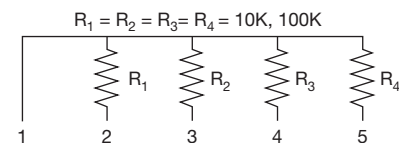
L = Total length = 0.420" (10.67 mm) max.

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: VTF330BX

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



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: VTF366BX

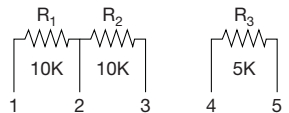
100K: VTF367BX

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

$$R_1 = 10K$$

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

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



Actual Size

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

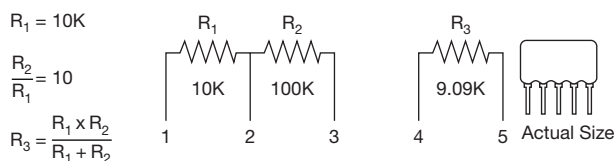


L = 0.520" (13.21 mm), H = 0.280" (7.11 mm) max.

**DIVIDER NETWORK 5:1****ORDERING INFORMATION**

VTF1089BX

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



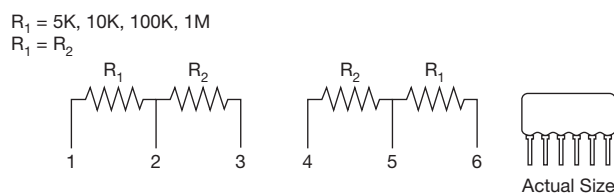
**Note:**  
•  $R_2$  TCR Tracking 3 ppm/°C

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 ( $R_1 =$ )**

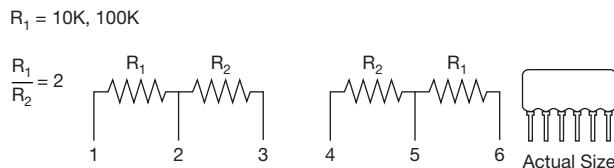
5K: VTF225BX

10K: VTF286BX

100K: VTF219BX

1M: VTF287BX

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



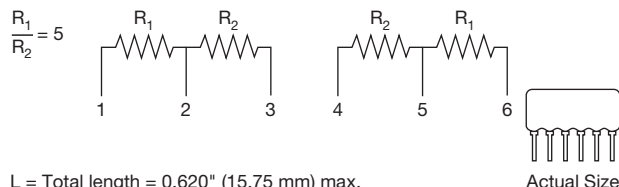
L = Total length = 0.620" (15.75 mm) max.  
H = Seated height = 0.280" (7.11 mm) max.

**DIVIDER NETWORK 2:1****ORDERING INFORMATION ( $R_1 =$ )**

10K: VTF1009BX

100K: VTF1010BX

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

 $R_1 = 10K, 100K$ 

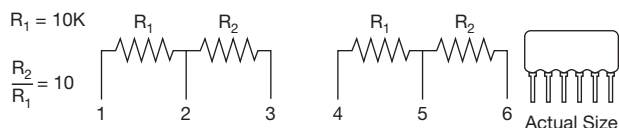
L = Total length = 0.620" (15.75 mm) max.  
 H = Seated height = 0.280" (7.11 mm) max.

**DIVIDER NETWORK 5:1****ORDERING INFORMATION ( $R_1 =$ )**

10K: VTF1007BX

100K: VTF1008BX

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

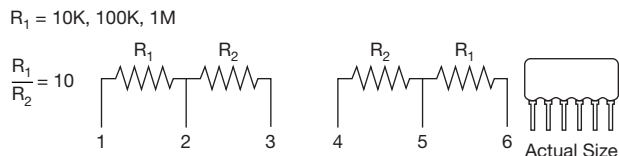


L = Total length = 0.620" (15.75 mm) max.  
 H = Seated height = 0.280" (7.11 mm) max.

**DIVIDER NETWORK 10:1****ORDERING INFORMATION ( $R_1 =$ )**

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.

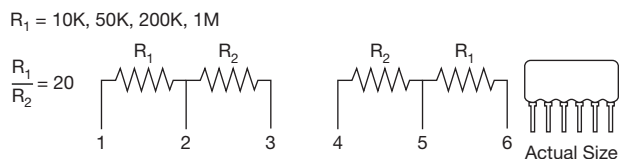
**DIVIDER NETWORK 10:1****ORDERING INFORMATION ( $R_1 =$ )**

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 ( $R_1 =$ )**

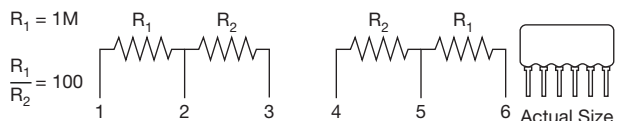
10K: VTF1073BX

50K: VTF1074BX

200K: VTF1107BX

1M: VTF1108BX

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

**DIVIDER NETWORK 100:1****ORDERING INFORMATION ( $R_1 =$ )**

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 ( $R_1/R_2 =$ )**

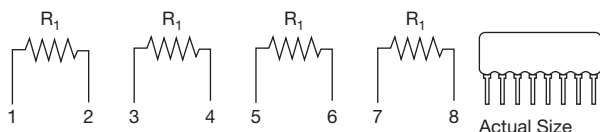
Devision Ratio = 250: VTF442BX

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.

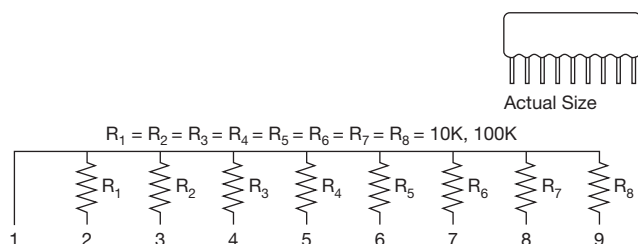
**FOUR EQUAL RESISTORS ISOLATED****ORDERING INFORMATION ( $R_1 =$ )**

1K: VTF1005BX

10K: VTF1006BX

100K: VTF1137BX

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



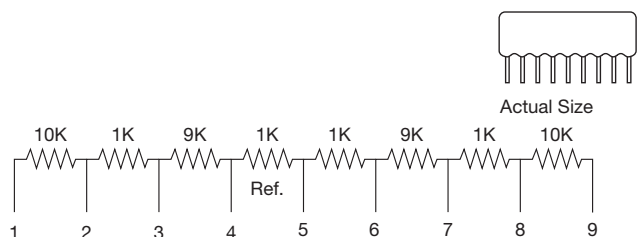
L = Total length = 0.920" (23.37 mm) max.  
H = Seated height = 0.280" (7.11 mm) max.

**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



L = Total length = 0.920" (23.37 mm) max.  
H = Seated height = 0.280" (7.11 mm) max.

**EIGHT RESISTOR NETWORK**

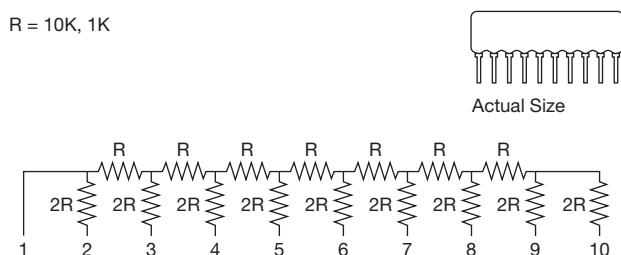
(Designed for instrument amplifier with shield driver)

**ORDERING INFORMATION**

VTF272BX

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

R = 10K, 1K



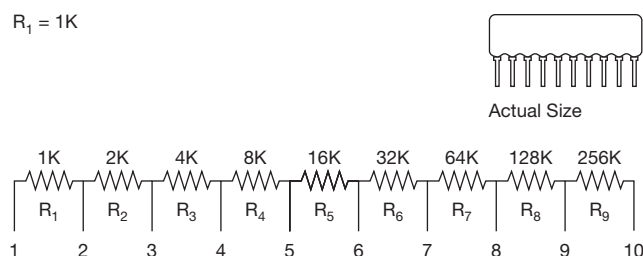
L = Total length = 1.020" (25.91 mm) max.  
H = Seated height = 0.280" (7.11 mm) max.

**EIGHT BIT R/2R LADDER NETWORK****ORDERING INFORMATION ( $R =$ )** $(\pm 1/2 \text{ LSB})$ 

10K: VTF1072BX

100K: VTF267BX

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

 $R_1 = 1K$ **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 =  $\pm 3 \text{ ppm}/^\circ\text{C}$ 

L = Total length = 1.02" (25.91 mm) max.

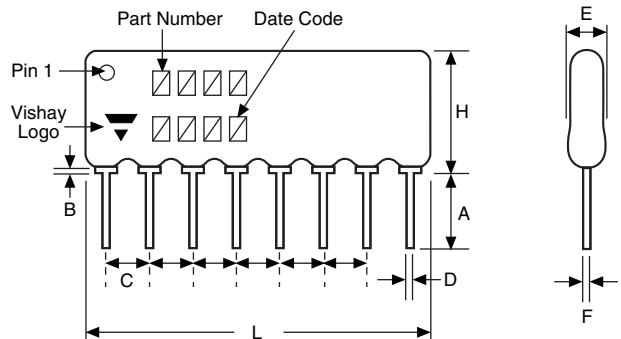
H = Seated height = 0.280" (7.11 mm) max.

**STANDARD ELECTRICAL SPECIFICATIONS**

| TEST                           | SPECIFICATIONS                                      | CONDITIONS                                      |
|--------------------------------|-----------------------------------------------------|-------------------------------------------------|
| Material                       | Passivated nichrome                                 | -                                               |
| Pin/Lead Number                | 3 to 10                                             | -                                               |
| Resistance Range               | 100 $\Omega$ to 2 M $\Omega$ total                  | -                                               |
| TCR: Absolute                  | $\pm 10$ ppm/ $^{\circ}\text{C}$ <sup>(1)</sup>     | 0 $^{\circ}\text{C}$ to + 70 $^{\circ}\text{C}$ |
| TCR: Tracking                  | $\pm 2$ ppm/ $^{\circ}\text{C}$ <sup>(1)</sup>      | 0 $^{\circ}\text{C}$ to + 70 $^{\circ}\text{C}$ |
| Tolerance: Absolute            | $\pm 0.1$ %                                         | + 25 $^{\circ}\text{C}$                         |
| Tolerance: Ratio               | $\pm 0.02$ %                                        | + 25 $^{\circ}\text{C}$                         |
| Power Rating: Resistor         | 100 mW                                              | -                                               |
| Power Rating: Package          | 500 mW                                              | -                                               |
| Stability: Absolute            | $\Delta R \pm 0.05$ %                               | 2000 h at + 70 $^{\circ}\text{C}$               |
| Stability: Ratio               | $\Delta R \pm 0.015$ %                              | 2000 h at + 70 $^{\circ}\text{C}$               |
| Voltage Coefficient            | $\pm 0.01$ ppm/V                                    | -                                               |
| Working Voltage                | 100 V                                               | -                                               |
| Operating Temperature Range    | 0 $^{\circ}\text{C}$ to + 70 $^{\circ}\text{C}$     | -                                               |
| Storage Temperature Range      | - 55 $^{\circ}\text{C}$ to + 125 $^{\circ}\text{C}$ | -                                               |
| Noise                          | < - 35 dB                                           | -                                               |
| Thermal EMF                    | < 0.1 $\mu\text{V}/^{\circ}\text{C}$                | -                                               |
| Shelf Life Stability: Absolute | $\Delta R \pm 0.01$ %                               | 1 year at + 25 $^{\circ}\text{C}$               |
| Shelf Life Stability: Ratio    | $\Delta R \pm 0.002$ %                              | 1 year at + 25 $^{\circ}\text{C}$               |

**Note**
<sup>(1)</sup> TCR over - 55  $^{\circ}\text{C}$  to + 125  $^{\circ}\text{C}$   $\pm 20$  ppm/ $^{\circ}\text{C}$  absolute,  $\pm 3$  ppm/ $^{\circ}\text{C}$  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 $\pm$ 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.

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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.

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## 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.**



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

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