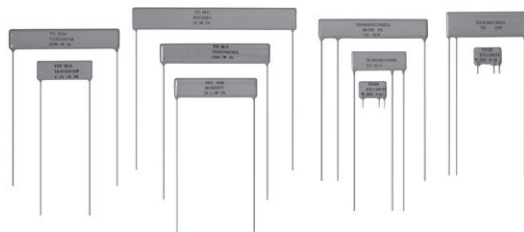


# Thick Film Planar Resistors and Dividers, Through-Hole, High Voltage



## APPLICATIONS

Applications include power supplies, transformers and any application requiring operation within an environment where high voltages are used.

## FEATURES

- 30 000 V capability
- Very low voltage coefficient to less than 1 ppm/V
- Outstanding stability under adverse conditions
- Stable cermet resistive element bonded to a high-purity alumina substrate
- Tough epoxy-based coating and high voltage stability
- Designs built from customer supplied schematics
- Dividers available leaded or non-leaded
- Typical resistance ratios of 1000:1, 2000:1, etc.
- TCR tracking to  $\pm 5$  ppm/ $^{\circ}$ C depending on values
- TD series dividers available, contact factory
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



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

## Note

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

| STANDARD ELECTRICAL SPECIFICATIONS |                                                |                                                |                                         |                  |                                        |
|------------------------------------|------------------------------------------------|------------------------------------------------|-----------------------------------------|------------------|----------------------------------------|
| GLOBAL MODEL/<br>SIZE              | POWER RATING<br><i>P</i> <sub>25 °C</sub><br>W | MAXIMUM WORKING<br>VOLTAGE <sup>(1)</sup><br>V | RESISTANCE<br>RANGE <sup>(2)</sup><br>Ω | TOLERANCE<br>± % | TEMPERATURE<br>COEFFICIENT<br>± ppm/°C |
| TR03C                              | 0.25                                           | 0.8K                                           | 300 to 3M                               | 1, 2, 5, 10, 20  | 100                                    |
|                                    |                                                |                                                | 300 to 25M                              | 1, 2, 5, 10, 20  | 200, 300                               |
| TR03X                              |                                                | 2.5K                                           | 25M to 250M                             | 1, 2, 5, 10, 20  | 200, 300                               |
|                                    |                                                |                                                | 260M to 2G                              | 5, 10, 20        | 200, 300                               |
|                                    |                                                |                                                | 2.1G to 10G                             | 5, 10, 20        | <sup>(3)</sup>                         |
| TR05D                              | 0.5                                            | 4K                                             | 500 to 25M                              | 1, 2, 5, 10, 20  | 100                                    |
|                                    |                                                |                                                | 3K to 200M                              | 1, 2, 5, 10, 20  | 200, 300                               |
| TR05X                              |                                                | 5K                                             | 30M to 1G                               | 1, 2, 5, 10, 20  | 200, 300                               |
|                                    |                                                |                                                | 1.1G to 20G                             | 5, 10, 20        | 200, 300                               |
|                                    |                                                |                                                | 21G to 100G                             | 5, 10, 20        | <sup>(3)</sup>                         |
| TR10F                              | 1                                              | 6.5K                                           | 1K to 16M                               | 1, 2, 5, 10, 20  | 100                                    |
|                                    |                                                |                                                | 2K to 120M                              | 1, 2, 5, 10, 20  | 200, 300                               |
| TR10X                              |                                                | 10K                                            | 20M to 1G                               | 1, 2, 5, 10, 20  | 200, 300                               |
|                                    |                                                |                                                | 1.1G to 15G                             | 5, 10, 20        | 200, 300                               |
|                                    |                                                |                                                | 16G to 1T                               | 5, 10, 20        | <sup>(3)</sup>                         |
| TR15G                              | 1.5                                            | 12.5K                                          | 1.5K to 45M                             | 1, 2, 5, 10, 20  | 100                                    |
|                                    |                                                |                                                | 5K to 340M                              | 1, 2, 5, 10, 20  | 200, 300                               |
| TR15X                              |                                                | 15K                                            | 60M to 1G                               | 1, 2, 5, 10, 20  | 200, 300                               |
|                                    |                                                |                                                | 1.1G to 35G                             | 5, 10, 20        | 200, 300                               |
|                                    |                                                |                                                | 36G to 1.5T                             | 5, 10, 20        | <sup>(3)</sup>                         |
| TR20H                              | 2                                              | 17.5K                                          | 2K to 64M                               | 1, 2, 5, 10, 20  | 100                                    |
|                                    |                                                |                                                | 8K to 480M                              | 1, 2, 5, 10, 20  | 200, 300                               |
| TR20X                              |                                                | 20K                                            | 80M to 1G                               | 1, 2, 5, 10, 20  | 200, 300                               |
|                                    |                                                |                                                | 1.1G to 50G                             | 5, 10, 20        | 200, 300                               |
|                                    |                                                |                                                | 51G to 2T                               | 5, 10, 20        | <sup>(3)</sup>                         |
| TR30J                              | 3                                              | 25K                                            | 3K to 82M                               | 1, 2, 5, 10, 20  | 100                                    |
|                                    |                                                |                                                | 8.5K to 620M                            | 1, 2, 5, 10, 20  | 200, 300                               |
| TR30X                              |                                                | 30K                                            | 80M to 1G                               | 1, 2, 5, 10, 20  | 200, 300                               |
|                                    |                                                |                                                | 1.1G to 60G                             | 5, 10, 20        | 200, 300                               |
|                                    |                                                |                                                | 61G to 3T                               | 5, 10, 20        | <sup>(3)</sup>                         |

## Notes

- Custom sizes available
  - Voltage coefficient: Typically less than 1 ppm/V (tested per MIL-STD-202)
  - Ratio tolerance for dividers: 1 % to 20 %
  - Ratio TCR for dividers: To  $\pm 5$  ppm/ $^{\circ}$ C (ratio over 1000:1, contact factory)
- <sup>(1)</sup> Continuous working voltage shall be  $\sqrt{P \times R}$  or maximum working voltage, whichever is less.  
<sup>(2)</sup> All resistance values are calibrated at 100 V<sub>DC</sub>. Calibration at other voltages available upon request.  
<sup>(3)</sup> Contact factory

**GLOBAL PART NUMBER INFORMATION**

New Global Part Numbering: TR20H1K00FKEB (preferred part number format)

|              |                                                                                                                                                                                                                                                                                                                                                |          |          |                                                                                                                                                                                                              |          |          |                                                                                                                                  |          |                                                                |                                          |          |                                    |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|----------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------|------------------------------------------|----------|------------------------------------|
| <b>T</b>     | <b>R</b>                                                                                                                                                                                                                                                                                                                                       | <b>2</b> | <b>0</b> | <b>H</b>                                                                                                                                                                                                     | <b>1</b> | <b>K</b> | <b>0</b>                                                                                                                         | <b>0</b> | <b>F</b>                                                       | <b>K</b>                                 | <b>E</b> | <b>B</b>                           |
| GLOBAL MODEL | SIZE/POWER RATING                                                                                                                                                                                                                                                                                                                              |          |          | RESISTANCE VALUE                                                                                                                                                                                             |          |          | TOLERANCE                                                                                                                        |          | TCR                                                            | TERMINAL FINISH                          |          | PACKAGING                          |
| TR           | <b>03C</b> = 0.25 W<br><b>03X</b> = 0.25 W, max. voltage<br><b>05D</b> = 0.5 W<br><b>05X</b> = 0.5 W, max. voltage<br><b>10F</b> = 1 W<br><b>10X</b> = 1 W, max. voltage<br><b>15G</b> = 1.5 W<br><b>15X</b> = 1.5 W, max. voltage<br><b>20H</b> = 2 W<br><b>20X</b> = 2 W, max. voltage<br><b>30J</b> = 3 W<br><b>30X</b> = 3 W, max. voltage |          |          | <b>R</b> = $\Omega$<br><b>K</b> = $k\Omega$<br><b>M</b> = $M\Omega$<br><b>G</b> = $G\Omega$<br><b>T</b> = $T\Omega$<br><b>400R</b> = 400 $\Omega$<br><b>10M0</b> = 10 $M\Omega$<br><b>1T00</b> = 1 $T\Omega$ |          |          | <b>F</b> = $\pm 1.0\%$<br><b>G</b> = $\pm 2.0\%$<br><b>J</b> = $\pm 5.0\%$<br><b>K</b> = $\pm 10.0\%$<br><b>M</b> = $\pm 20.0\%$ |          | <b>K</b> = 100 ppm<br><b>N</b> = 200 ppm<br><b>M</b> = 300 ppm | <b>E</b> = Sn100<br><b>R</b> = Sn60/Pb40 |          | <b>B</b> = Bag<br><b>S</b> = Strip |

Historical Part Numbering: TR20H1001FKe3 (will continue to be accepted)

|                  |                   |                  |           |          |                 |
|------------------|-------------------|------------------|-----------|----------|-----------------|
| <b>TR</b>        | <b>20H</b>        | <b>1001</b>      | <b>F</b>  | <b>K</b> | <b>e3</b>       |
| HISTORICAL MODEL | SIZE/POWER RATING | RESISTANCE VALUE | TOLERANCE | TCR      | TERMINAL FINISH |

**Note**

- For additional information on packaging, refer to the Through Hole Resistor Packaging document ([www.vishay.com/doc?31544](http://www.vishay.com/doc?31544)).

**MECHANICAL SPECIFICATIONS**
**Resistive Element:** Thick film

**Substrate:** 96 % pure alumina

**Encapsulation:** Epoxy base, conformal coating

**Terminals:** Tin plated copper leads

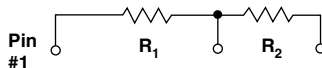
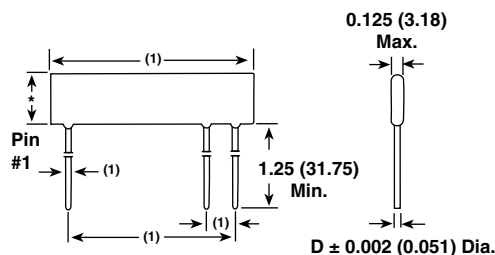
**Terminal Strength:** 4.5 pounds pull-test

**Power:** Derated from ambient temperature + 25 °C

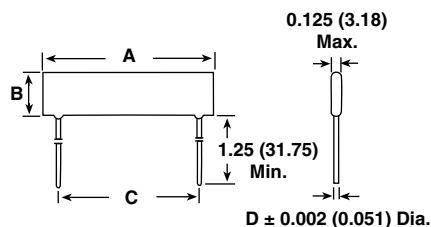
**ENVIRONMENTAL SPECIFICATIONS**
**Temperature Range:** - 55 °C to + 125 °C (for higher temperature range, consult factory)

**Load Life:** Less than 0.15 %, 1000 h

**DIMENSIONS** in inches (millimeters)

**Typical Resistor Schematic for Divider**

**Typical High Voltage Divider**

**Note**

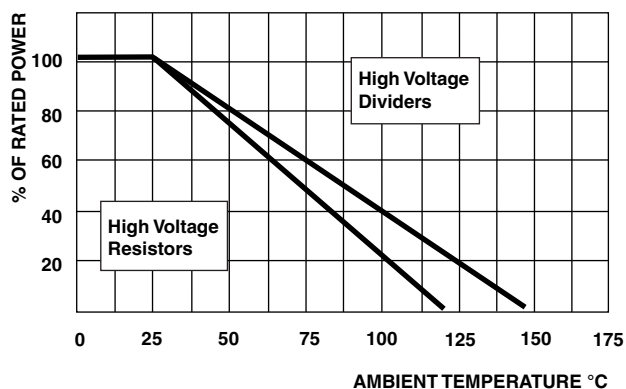
(1) Specified by application

**Standard High Voltage Resistor**

**DIMENSIONS ( $\pm 10\%$ )**

| MODEL | A<br>(LENGTH) | B<br>(HEIGHT) | C<br>(LEAD SPACING) | D<br>(LEAD DIA.) |
|-------|---------------|---------------|---------------------|------------------|
| TR03  | 0.300 (7.62)  | 0.210 (5.33)  | 0.200 (5.08)        | 0.025            |
| TR05  | 0.500 (12.70) | 0.300 (7.62)  | 0.400 (10.16)       | 0.025            |
| TR10  | 1.00 (25.40)  | 0.350 (8.89)  | 0.900 (22.86)       | 0.032            |
| TR15  | 1.50 (38.10)  | 0.350 (8.89)  | 1.40 (35.56)        | 0.032            |
| TR20  | 2.00 (50.80)  | 0.350 (8.89)  | 1.90 (48.26)        | 0.032            |
| TR30  | 3.00 (76.20)  | 0.400 (10.16) | 2.90 (73.66)        | 0.032            |



## DERATING





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