



## Molded, 25 mil or 50 mil Pitch, Dual-In-Line Thin Film Resistor, Surface Mount Network

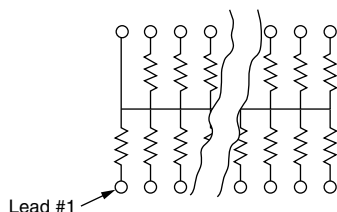


Vishay Dale Thin Film resistor networks are designed to be used in either analog or digital circuits. The use of thin film resistive elements within the network allows you to achieve an infinite number of very low noise and high stability circuits for industrial, medical and scientific instrumentation. Vishay Dale Thin Film resistor networks are packaged in molded plastic packages with sizes that are recognized throughout the world. The rugged packaging offers superior environmental protection and consistent dimensions for ease of placement with automatic SMT equipment. Vishay Dale Thin Film stocks many designs and values for off-the-shelf convenience. With Vishay Dale Thin Film you can depend on quality products delivered on time with service backing the product.

### SCHEMATICS

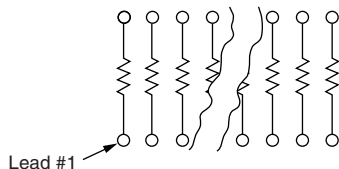
#### 01 SCHEMATIC

Resistance Range:  
10  $\Omega$  to 47 k $\Omega$

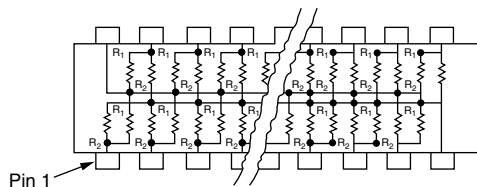


#### 03 SCHEMATIC

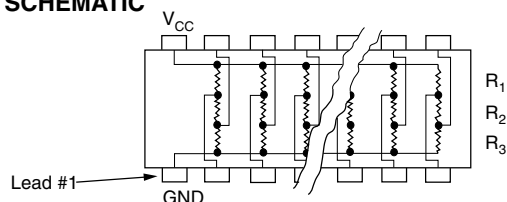
Resistance Range:  
10  $\Omega$  to 47 k $\Omega$



#### 05 SCHEMATIC



#### 47 SCHEMATIC



### FEATURES

- Reduces total assembly costs
- Compatible with automatic surface mounting equipment
- UL 94 V-0 flame resistant
- Thin film tantalum nitride on silicon
- Choice of package sizes: VTSR (TSSOP) JEDEC MC-153, VSSR (SSOP or QSOP) JEDEC MS-137, VSOR (SOIC narrow) JEDEC MS-012
- Moisture sensitivity level 1 (per IPC/JEDEC STD-20C)
- Isolated/bussed/dual terminator/differential terminator circuits
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



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

### TYPICAL PERFORMANCE

|      | ABSOLUTE | TRACKING |
|------|----------|----------|
| TCR  | 100      | NA       |
|      | ABSOLUTE | RATIO    |
| TOL. | 5, 2, 1  | NA       |

### RESISTORS WITH ONE PIN COMMON

The 01 circuit provides nominally equal resistors connected between a common pin and a discrete PC board pin.

Commonly used in the following applications:

- MOS/ROM pull-up/-down
- Open collector pull-up
- "Wired OR" pull-up
- Power driven pull-up
- TTL input pull-down
- Digital pulse squaring
- TTL unused gate pull-up
- High speed parallels pull-up

Broad selection of standard values available

### ISOLATED RESISTORS

The 03 circuit provides nominally equal resistors isolated from all others and wired directly across.

Commonly used in the following applications:

- "Wired OR" pull-up
- Power driven pull-up
- Powergate pull-up
- Line termination
- Long-line impedance balancing
- LED current limiting
- ECL output pull-down
- TTL input pull-down

Broad selection of standard values available

### DUAL-LINE TERMINATOR; PULSE SQUARING

The 05 circuit contains pairs of resistors connected between ground and a common line. The junctions of these resistor pairs are connected to the input leads. The 05 circuits are designed for dual-line termination and pulse squaring.

Standard values are:

VSSR1605:  
 $R_1 = 220 \Omega$ ,  $R_2 = 330 \Omega$   
 $R_1 = 330 \Omega$ ,  $R_2 = 470 \Omega$

VSSR2005:  
 $R_1 = 220 \Omega$ ,  $R_2 = 330 \Omega$   
 $R_1 = 220 \Omega$ ,  $R_2 = 1.8 \text{ k}\Omega$   
 $R_1 = 1.5 \text{ k}\Omega$ ,  $R_2 = 3.3 \text{ k}\Omega$

### DIFFERENTIAL TERMINATOR

The 47 schematic consists of series resistor sections connected between  $V_{CC}$  and ground. Each contains 3 resistors of 2 different resistance values.

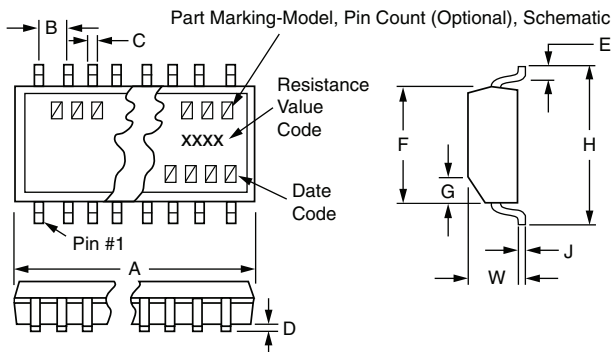
Standard values are:

VSSR20 and VTSR20:  
 $R_1 = 270 \Omega$ ,  $R_2 = 120 \Omega$

VSSR16 and VTSR16:  
 $R_1 = 330 \Omega$ ,  $R_2 = 150 \Omega$   
 $R_1 = 330 \Omega$ ,  $R_2 = 220 \Omega$

**STANDARD ELECTRICAL SPECIFICATIONS**

| TEST                           | SPECIFICATIONS                                                                  | CONDITIONS                              |
|--------------------------------|---------------------------------------------------------------------------------|-----------------------------------------|
| Material                       | Tantalum nitride                                                                | -                                       |
| Pin/Lead Number                | 16, 20, 24                                                                      | -                                       |
| Resistance Range               | 10 $\Omega$ to 47 k $\Omega$                                                    | Per E-24 table                          |
| TCR: Absolute                  | $\pm 100$ ppm/ $^{\circ}$ C                                                     | - 55 $^{\circ}$ C to + 125 $^{\circ}$ C |
| TCR: Tracking                  | n/a                                                                             | -                                       |
| Tolerance: Absolute            | $\pm 5$ % standard ( $\pm 2$ % available)<br>$\pm 1$ % standard (check factory) | Per E-24 table<br>Per E-96 table        |
| Tolerance: Ratio               | NA                                                                              | -                                       |
| Power Rating: Resistor         | 100 mW max.                                                                     | At + 70 $^{\circ}$ C                    |
| Power Rating: Package          | 16 = 1.0 W, 20 = 1.2 W, 24 = 1.4 W                                              | 0 $^{\circ}$ C to + 70 $^{\circ}$ C     |
| Stability: Absolute            | -                                                                               | -                                       |
| Stability: Ratio               | -                                                                               | -                                       |
| Voltage Coefficient            | 5 ppm/V (typical)                                                               | -                                       |
| Working Voltage                | 50 V <sub>DC</sub>                                                              | -                                       |
| Operating Temperature Range    | - 55 $^{\circ}$ C to + 125 $^{\circ}$ C                                         | -                                       |
| Storage Temperature Range      | - 55 $^{\circ}$ C to + 150 $^{\circ}$ C                                         | -                                       |
| Noise                          | < - 35 dB                                                                       | -                                       |
| Thermal EMF                    | -                                                                               | -                                       |
| Shelf Life Stability: Absolute | -                                                                               | -                                       |
| Shelf Life Stability: Ratio    | -                                                                               | -                                       |

**DIMENSIONS AND IMPRINTING** in inches (millimeters)


| DIMENSION  | VTSR-xxxx                           | VSSR-xxxx                            | VSOR-xxxx                           |
|------------|-------------------------------------|--------------------------------------|-------------------------------------|
| A - 16 PIN | 0.206 $\pm$ 0.003 (5.23 $\pm$ 0.08) | 0.193 $\pm$ 0.004 (4.90 $\pm$ 0.010) | 0.390 $\pm$ 0.010 (9.91 $\pm$ 0.25) |
| A - 20 PIN | 0.256 $\pm$ 0.003 (6.50 $\pm$ 0.08) | 0.341 $\pm$ 0.003 (8.66 $\pm$ 0.08)  | NA                                  |
| A - 24 PIN | 0.306 $\pm$ 0.003 (7.77 $\pm$ 0.08) | 0.341 $\pm$ 0.003 (8.66 $\pm$ 0.08)  | NA                                  |
| B (Ref.)   | 0.0256 (0.65)                       | 0.025 (0.64)                         | 0.050 (1.27)                        |
| C (Ref.)   | 0.0087 (0.22)                       | 0.010 (0.25)                         | 0.016 (0.41)                        |
| D          | 0.004 (0.10)                        | 0.006 (0.15)                         | 0.008 (0.20)                        |
| E (Typ.)   | 0.024 (0.61)                        | 0.025 (0.64)                         | 0.030 (0.76)                        |
| F          | 0.173 $\pm$ 0.003 (4.39 $\pm$ 0.08) | 0.154 $\pm$ 0.003 (3.91 $\pm$ 0.08)  | 0.152 $\pm$ 0.003 (3.86 $\pm$ 0.08) |
| G          | 0.015 $\times$ 45 $^{\circ}$ (0.38) | 0.015 $\times$ 45 $^{\circ}$ (0.38)  | 0.015 $\times$ 45 $^{\circ}$ (0.38) |
| H          | 0.252 $\pm$ 0.005 (6.40 $\pm$ 0.13) | 0.236 $\pm$ 0.008 (5.99 $\pm$ 0.20)  | 0.236 $\pm$ 0.005 (5.99 $\pm$ 0.13) |
| J (Ref.)   | 0.005 (0.13)                        | 0.010 (0.25)                         | 0.008 (0.20)                        |
| W          | 0.043 $\pm$ 0.005 (1.09 $\pm$ 0.13) | 0.064 $\pm$ 0.005 (1.63 $\pm$ 0.13)  | 0.064 $\pm$ 0.005 (1.63 $\pm$ 0.13) |

**MARKING**

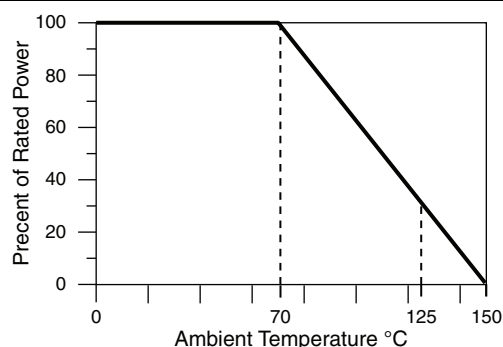
| MODEL       | PIN COUNT (Optional) | SCHEMATIC | RESISTANCE                                                                                                          | RESISTANCE                                                                                          | DATE CODE   |
|-------------|----------------------|-----------|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-------------|
| <b>VXXX</b> | <b>XX</b>            | <b>XX</b> | <b>XXXX</b>                                                                                                         | <b>XXX</b>                                                                                          | <b>XXXX</b> |
| VSOR        | 16                   | 01, 03,   | 1 % RESISTANCE                                                                                                      | 1 %, 2 %, 5 % RESISTANCE                                                                            |             |
| VSSR        | 20                   | 05 or 47  | e.g.: 43R2                                                                                                          | e.g.: 103 = 10K                                                                                     |             |
| VTSR        | 24                   |           | 4 digits are used to express ohmic values only less than 100 $\Omega$ . R is used to designate the decimal position | The first 2 digits are significant figures, the last digit specifies the number of zeros to follow. |             |

**MECHANICAL SPECIFICATIONS**

|                                |                                                |
|--------------------------------|------------------------------------------------|
| Resistive Element              | Tantalum nitride                               |
| Substrate Material             | Silicon                                        |
| Body                           | Molded epoxy                                   |
| Terminals                      | Copper alloy                                   |
| Plating                        | 100 % matte tin                                |
| Lead Coplanarity               | 0.0005"                                        |
| Marking Resistance to Solvents | Permanency testing per MIL-STD-202, method 215 |

**PACKAGING INFORMATION**

| MODEL        | LEADS | TAPE AND REEL | TUBES |
|--------------|-------|---------------|-------|
| VTSR (TSSOP) | 16    | 2500          | 94    |
|              | 20    | 2500          | 74    |
|              | 24    | 2500          | 62    |
| VSSR (QSOP)  | 16    | 2500          | 98    |
|              | 20    | 2500          | 55    |
|              | 24    | 2500          | 55    |
| VSOR (SOIC)  | 16    | 2500          | 48    |

**DERATING CURVE****GLOBAL PART NUMBER INFORMATION**

New Global Part Numbering: VTSR1601103JTF

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| V | T | S | R | 1 | 6 | 0 | 1 |   |   | 1 | 0 | 3 |   |   | J | T | F |
| V | S | O | R | 1 | 6 | 0 | 5 | 3 | 3 | 1 | 4 | 7 | 1 | G | T | F |   |

| GLOBAL MODEL                                                                         | PIN COUNT                                    | SCHEMATIC                                        | RESISTANCE<br>(3, 4 or 6 digits)                                                                                                                                                                                                               | TOLERANCE                                                | PACKAGING                                                               |
|--------------------------------------------------------------------------------------|----------------------------------------------|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------------------------|
| <b>VTSR</b><br><b>VSSR</b><br><b>VSOR</b><br>Lead (Pb)-free (e3)<br>date code > 2705 | <b>20</b> (not VSOR)<br><b>24</b> (not VSOR) | <b>01</b> (bussed)<br><b>03</b> (isolated)       | XXX: ≥ 100R and all 1 %, 2 % and 5 %<br>First 2 digits are significant figures. Last digit specifies number of zeros to follow.<br>XXXX: < 100R 1 %<br>First 3 digits are significant figures. Last digit specifies number of zeros to follow. | <b>F</b> = 1.0 %<br><b>G</b> = 2.0 %<br><b>J</b> = 5.0 % | <b>TAPE AND REEL</b><br><b>TF</b> = Full reel 2500<br><b>UF</b> = Tubed |
|                                                                                      | <b>16</b> (not VTSR)<br><b>20</b> (not VSOR) | <b>05</b> (terminator)<br><b>47</b> (terminator) | xxx xxx<br>First 2 digits are significant figures. Last digit specifies number of zeros.                                                                                                                                                       | <b>G</b> = 2.0 %<br><b>J</b> = 5.0 %                     |                                                                         |

Historical Part Number example: VSSR2001102GT/R (for reference purposes only)

|       |           |           |            |           |           |
|-------|-----------|-----------|------------|-----------|-----------|
| VSSR  | 20        | 01        | 102        | G         | T/R       |
| MODEL | PIN COUNT | SCHEMATIC | RESISTANCE | TOLERANCE | PACKAGING |



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