

## Wirewound Resistors, Industrial Power, Flat



### FEATURES

- High temperature silicon coating
- Mounting accommodations ideally suited to high density packaging
- Self-stacking hardware for horizontal or vertical placement
- Withstands high vibrations without loosening
- Mounting hardware functions as a heat sink allowing greater heat dissipation and less derating of stacked units
- Material categorization: for definitions of compliance please see [www.vishay.com/doc299912](http://www.vishay.com/doc299912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
**GREEN**  
(5-2008)

### STANDARD ELECTRICAL SPECIFICATIONS

| GLOBAL MODEL                                           | HISTORICAL MODEL                             | POWER RATING<br>$P_{25^{\circ}\text{C}}$<br>W | RESISTANCE RANGE $\Omega$<br>$\pm 5\%$ | RESISTANCE RANGE $\Omega$<br>$\pm 10\%$ | WEIGHT (typical)<br>g |
|--------------------------------------------------------|----------------------------------------------|-----------------------------------------------|----------------------------------------|-----------------------------------------|-----------------------|
| FSOT30...14 / FSOT30...16<br>FSOT30...15 / FSOT30...17 | HL-24-09 / HL-24-16<br>NHL-24-09 / NHL-24-16 | 30                                            | 1.0 to 11K<br>1.0 to 1.2K              | 0.10 to 11K<br>1.0 to 1.2K              | 20.14                 |
| FSOT40...14 / FSOT40...16<br>FSOT40...15 / FSOT40...17 | HL-40-09 / HL-40-16<br>NHL-40-09 / NHL-40-16 | 40                                            | 1.0 to 26K<br>1.0 to 3K                | 0.10 to 26K<br>1.0 to 3K                | 30.07                 |
| FSOT55...14 / FSOT55...16<br>FSOT55...15 / FSOT55...17 | HL-55-09 / HL-55-16<br>NHL-55-09 / NHL-55-16 | 55                                            | 1.0 to 54K<br>1.0 to 6.8K              | 0.10 to 54K<br>1.0 to 6.8K              | 51.25                 |
| FSOT70...14 / FSOT70...16<br>FSOT70...15 / FSOT70...17 | HL-70-09 / HL-70-16<br>NHL-70-09 / NHL-70-16 | 70                                            | 1.0 to 77K<br>1.0 to 9.4K              | 0.10 to 77K<br>1.0 to 9.4K              | 60.48                 |
| FSOT95...14 / FSOT95...16<br>FSOT95...15 / FSOT95...17 | HL-95-09 / HL-95-16<br>NHL-95-09 / NHL-95-16 | 95                                            | 1.0 to 99.9K<br>1.0 to 12.4K           | 0.10 to 99.9K<br>1.0 to 12.4K           | 76.51                 |

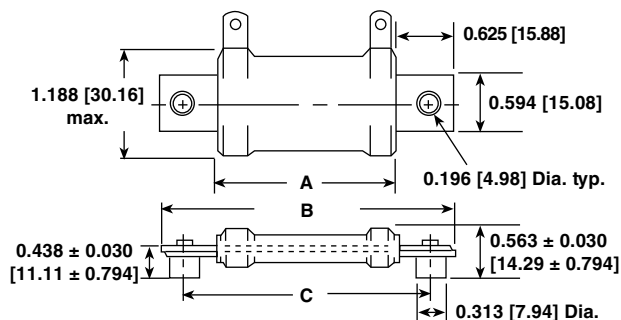
### TECHNICAL SPECIFICATIONS

| PARAMETER                       | UNIT                    | FSOT...XX FLAT RESISTOR CHARACTERISTICS                                                                                   |
|---------------------------------|-------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Temperature Coefficient         | ppm/ $^{\circ}\text{C}$ | $\pm 90$ for 0.1 $\Omega$ to 0.99 $\Omega$ ; $\pm 50$ for 1 $\Omega$ to 9.9 $\Omega$ ; $\pm 30$ for 10 $\Omega$ and above |
| Dielectric Withstanding Voltage | $V_{AC}$                | 1000, from terminal to mounting hardware                                                                                  |
| Short Time Overload             | -                       | 10 x rated power for 5 s                                                                                                  |
| Maximum Working Voltage         | V                       | $(P \times R)^{1/2}$                                                                                                      |
| Insulation Resistance           | $\Omega$                | 1000 M $\Omega$ minimum dry, 100 M $\Omega$ minimum after moisture test                                                   |
| Operating Temperature Range     | $^{\circ}\text{C}$      | -55 to +350                                                                                                               |

### GLOBAL PART NUMBER INFORMATION

Global Part Numbering example: **FSOT3009E10R00JE14**

|                                                                                       |   |                      |                    |                                                               |   |                             |   |                                       |   |   |   |                                                                                                                                                                                             |   |   |   |   |   |
|---------------------------------------------------------------------------------------|---|----------------------|--------------------|---------------------------------------------------------------|---|-----------------------------|---|---------------------------------------|---|---|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|---|
| F                                                                                     | S | O                    | T                  | 3                                                             | 0 | 0                           | 9 | E                                     | 1 | 0 | R | 0                                                                                                                                                                                           | 0 | J | E | 1 | 4 |
| GLOBAL MODEL                                                                          |   | TERMINAL DESIGNATION | TERMINAL FINISH    | RESISTANCE VALUE                                              |   | TOLERANCE                   |   | PACKAGING CODE                        |   |   |   | SPECIAL                                                                                                                                                                                     |   |   |   |   |   |
| FSOT30<br>(see “Standard Electrical Specifications” table above for additional P/N’s) |   | 09<br>16             | E = lead (Pb)-free | R = decimal<br>K = thousand<br>10R00 = 10.0 Ω<br>1K000 = 1 kΩ |   | J = ± 5.0 %<br>K = ± 10.0 % |   | E = lead (Pb)-free cell and bulk pack |   |   |   | (dash number) (up to 2 digits) from 1 to 99 as applicable<br>14 = standard, 09 terminal<br>15 = non-inductive, 09 terminal<br>16 = standard, 16 terminal<br>17 = non-inductive, 16 terminal |   |   |   |   |   |

**DIMENSIONS** in inches [millimeters]**TYPE FSOT...XX FLAT STYLE**

| MODEL  | DIMENSIONS in inches [millimeters] |                |                |                                   | TERMINAL DESIGNATION |          |
|--------|------------------------------------|----------------|----------------|-----------------------------------|----------------------|----------|
|        | A                                  | B              | C              | DISTANCE BETWEEN TERMINALS (ref.) | STANDARD             | OPTIONAL |
|        | ± 0.063 [1.59]                     | ± 0.063 [1.59] | ± 0.031 [0.79] |                                   |                      |          |
| FSOT30 | 1.250 [31.75]                      | 2.500 [63.50]  | 2.000 [50.80]  | 0.718 [18.24]                     | 09E                  | 16E      |
| FSOT40 | 2.000 [50.80]                      | 3.250 [82.55]  | 2.750 [69.85]  | 1.468 [37.29]                     | 09E                  | 16E      |
| FSOT55 | 3.500 [88.90]                      | 4.750 [120.65] | 4.250 [107.95] | 2.968 [75.39]                     | 09E                  | 16E      |
| FSOT70 | 4.750 [120.65]                     | 6.000 [152.40] | 5.500 [139.70] | 4.218 [107.14]                    | 09E                  | 16E      |
| FSOT95 | 6.000 [152.40]                     | 7.250 [184.15] | 6.750 [171.45] | 5.468 [138.89]                    | 09E                  | 16E      |

**POWER RATING**

Vishay FSOT flat resistor wattage ratings are based on mounting horizontally to 10" x 10" x 0.04" [254.0 mm x 254.0 mm x 1.02 mm] steel plate in 25 °C ambient with no air flow.

**EXCLUSIVE BRACKET DESIGN**

Mounting strap fits snugly through resistor core and is bound against unit by two eccentric spacers. The bracket eliminates expensive cements and improves heat transfer and power handling capabilities.

**MATERIAL SPECIFICATIONS**

**Element:** copper-nickel alloy of nickel-chrome alloy, depending on resistance value

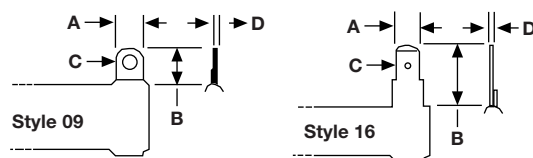
**Core:** ceramic, steatite

**Coating:** special high temperature silicone

**Standard Terminals:** model "E" terminals are tinned steel

**Terminal Bands:** steel

**Part Marking:** HEI, model, wattage, value, tolerance, date code

**TERMINAL DIMENSIONS**

| DIMENSION | DIMENSIONS in inches [millimeters] |               |
|-----------|------------------------------------|---------------|
|           | STYLE 09                           | STYLE 16      |
| A         | 0.188 [4.76]                       | 0.188 [4.76]  |
| B         | 0.500 [12.70]                      | 0.563 [14.29] |
| C         | 0.104 [2.64]                       | 0.050 [1.27]  |
| D         | 0.020 [0.51]                       | 0.020 [0.51]  |

**TERMINAL FINISH**

"E" Finish - 100 % Sn coated steel.

**NON-INDUCTIVE**

Models of equivalent physical and electrical specifications are available with non-inductive (Aryton-Perry) winding. For non-inductive models, maximum resistance values are lower, see STANDARD ELECTRICAL SPECIFICATIONS table.

**DERATING**

Derating is required for ambient temperatures above 25 °C per the above graph.

| PERFORMANCE                     |                                                                                |                       |
|---------------------------------|--------------------------------------------------------------------------------|-----------------------|
| TEST                            | CONDITIONS OF TEST                                                             | TEST LIMITS           |
| Thermal Shock                   | Rated power applied until thermally stable, then a minimum of 15 min at -55 °C | ± (2.0 % + 0.05 Ω) ΔR |
| Short Time Overload             | 10x rated power for 5 s                                                        | ± (2.0 % + 0.05 Ω) ΔR |
| Dielectric Withstanding Voltage | 1000 V <sub>RMS</sub> , 1 min                                                  | ± (0.1 % + 0.05 Ω) ΔR |
| Low Temperature Storage         | -55 °C for 24 h                                                                | ± (2.0 % + 0.05 Ω) ΔR |
| High Temperature Exposure       | 250 h at + 350 °C                                                              | ± (2.0 % + 0.05 Ω) ΔR |
| Moisture Resistance             | MIL-STD-202 Method 106, 7b not applicable                                      | ± (2.0 % + 0.05 Ω) ΔR |
| Shock, Specified Pulse          | MIL-STD-202 Method 213, 100 g's for 6 ms, 10 shocks                            | ± (0.2 % + 0.05 Ω) ΔR |
| Vibration, High Frequency       | Frequency varied 10 Hz to 2000 Hz, 20 g peak, 2 directions 6 h each            | ± (0.2 % + 0.05 Ω) ΔR |
| Load Life                       | 1000 h at rated power, + 25 °C, 1.5 h "ON", 0.5 h "OFF"                        | ± (3.0 % + 0.05 Ω) ΔR |



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