

## Wirewound Resistors, Industrial Power, Flat



### LINKS TO ADDITIONAL RESOURCES



### 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<br>RANGE $\Omega$<br>$\pm 5\%$ | RESISTANCE<br>RANGE $\Omega$<br>$\pm 10\%$ | WEIGHT<br>(typical)<br>g |
|--------------------------------------------------------|----------------------------------------------|-----------------------------------------------|-------------------------------------------|--------------------------------------------|--------------------------|
| FSOT10<br>FSOT10-NI                                    | FSOT-10<br>FSOT-10-NI                        | 10                                            | 1.0 to 15K<br>1.0 to 1.8K                 | 0.10 to 15K<br>1.0 to 1.8K                 | 0.41                     |
| FSOT15<br>FSOT15-NI                                    | FSOT-15<br>FSOT-15-NI                        | 15                                            | 1.0 to 26K<br>1.0 to 3.6K                 | 0.10 to 26K<br>1.0 to 3.6K                 | 0.47                     |
| FSOT20<br>FSOT20-NI                                    | FSOT-20<br>FSOT-20-NI                        | 20                                            | 1.0 to 71K<br>1.0 to 9.8K                 | 0.10 to 71K<br>1.0 to 9.8K                 | 0.74                     |
| 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, 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

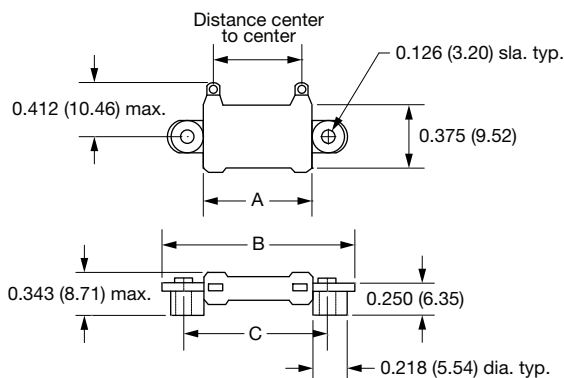
Global Part Numbering Example: FSOT3009E10R00JE14

F S O T 3 0 0 9 E 1 0 R 0 0 J E 1 4

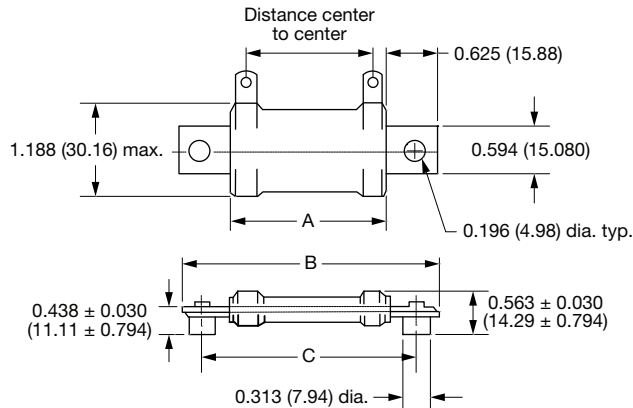
| GLOBAL MODEL<br>(6 digits)                                                                               | TERMINAL<br>DESIGNATION<br>(2 digits)                                 | TERMINAL<br>FINISH<br>(1 digit) | RESISTANCE<br>VALUE<br>(5 digits)                                                                          | TOLERANCE                                         | PACKAGING CODE                                  | SPECIAL                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|---------------------------------|------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FSOT30</b><br>(see "Standard<br>Electrical<br>Specifications"<br>table above for<br>additional P/N's) | <b>09</b><br><b>16</b><br><b>11 (only FSOT10,<br/>FSOT15, FSOT20)</b> | <b>E</b> = lead<br>(Pb)-free    | <b>R</b> = decimal<br><b>K</b> = thousand<br><b>10R00</b> = 10.0 $\Omega$<br><b>1K500</b> = 1.5 k $\Omega$ | <b>J</b> = $\pm 5.0\%$<br><b>K</b> = $\pm 10.0\%$ | <b>E</b> = lead (Pb)-free cell<br>and bulk pack | (dash number)<br>(up to 2 digits)<br>From <b>1 to 99</b><br>as applicable;<br>leave empty if<br>11 terminal<br><b>NI</b> = non-inductive<br>(11 terminal only)<br><b>14</b> = standard,<br>09 terminal<br><b>15</b> = non-inductive,<br>09 terminal<br><b>16</b> = standard,<br>16 terminal<br><b>17</b> = non-inductive,<br>16 terminal |

## DIMENSIONS in inches [millimeters]

### FSOT10 / FSOT15 / FSOT20

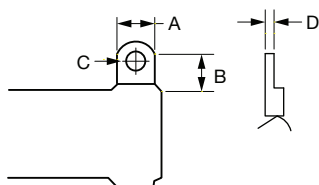
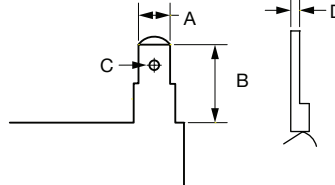


### FSOT...XX FLAT 30 / 40 / 55 / 70 / 95



| MODEL       | A<br>$\pm 0.063$<br>[1.59] | B<br>$\pm 0.063$<br>[1.59] | C<br>$\pm 0.031$<br>[0.79] | DISTANCE<br>CENTER TO CENTER<br>(ref.) | TERMINAL DESIGNATION |          |
|-------------|----------------------------|----------------------------|----------------------------|----------------------------------------|----------------------|----------|
|             |                            |                            |                            |                                        | STANDARD             | OPTIONAL |
| FSOT10      | 0.750<br>[19.05]           | 1.3125<br>[33.34]          | 1.000<br>[25.40]           | 0.531<br>[13.49]                       | 11E                  | -        |
| FSOT15      | 1.000<br>[25.40]           | 1.5625<br>[39.69]          | 1.250<br>[31.75]           | 0.781<br>[19.84]                       | 11E                  | -        |
| FSOT20      | 2.062<br>[52.37]           | 2.625<br>[66.68]           | 2.313<br>[58.75]           | 1.843<br>[46.81]                       | 11E                  | -        |
| FSOT30...XX | 1.250<br>[31.75]           | 2.500<br>[63.50]           | 2.000<br>[50.80]           | 0.718<br>[18.24]                       | 09E                  | 16E      |
| FSOT40...XX | 2.000<br>[50.80]           | 3.250<br>[82.55]           | 2.750<br>[69.85]           | 1.468<br>[37.29]                       | 09E                  | 16E      |
| FSOT55...XX | 3.500<br>[88.90]           | 4.750<br>[120.65]          | 4.250<br>[107.95]          | 2.968<br>[75.39]                       | 09E                  | 16E      |
| FSOT70...XX | 4.750<br>[120.65]          | 6.000<br>[152.40]          | 5.500<br>[139.70]          | 4.218<br>[107.14]                      | 09E                  | 16E      |
| FSOT95...XX | 6.000<br>[152.40]          | 7.250<br>[184.15]          | 6.750<br>[171.45]          | 5.468<br>[138.89]                      | 09E                  | 16E      |

**TERMINAL DIMENSIONS** in inches [millimeters]

**STYLE 09, STYLE 11**

**STYLE 16**


| DIMENSION | STYLE 09      | STYLE 11     | STYLE 16      |
|-----------|---------------|--------------|---------------|
| A         | 0.188 [4.78]  | 0.125 [3.18] | 0.188 [4.76]  |
| B         | 0.458 [11.63] | 0.255 [6.48] | 0.563 [14.29] |
| C         | 0.104 [2.64]  | 0.081 [2.06] | 0.050 [1.27]  |
| D         | 0.020 [0.51]  | 0.020 [0.51] | 0.020 [0.51]  |

**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:** alloy 42

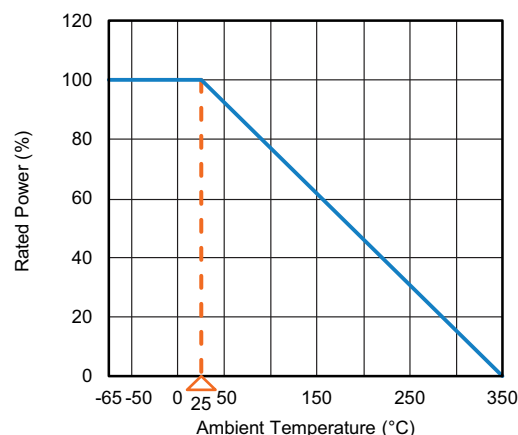
**Part Marking:** HEI, model, wattage, value, tolerance, date code

**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             | 10 x 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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