# 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/doc?99912

Pb-free

e3

RoHS COMPLIANT

HALOGEN FREE GREEN (5-2008)

## LINKS TO ADDITIONAL RESOURCES

3D Models

## STANDARD ELECTRICAL SPECIFICATIONS

| GLOBAL MODEL | HISTORICAL MODEL | POWER RATING $P_{25\,°C}$ W | RESISTANCE RANGE Ω ± 5 % | RESISTANCE RANGE Ω ± 10 % | WEIGHT (typical) g |
|---|---|---|---|---|---|
| FSOT10 | FSOT-10 | 10 | 1.0 to 15K | 0.10 to 15K | 0.41 |
| FSOT10-NI | FSOT-10-NI | | 1.0 to 1.8K | 1.0 to 1.8K | |
| FSOT15 | FSOT-15 | 15 | 1.0 to 26K | 0.10 to 26K | 0.47 |
| FSOT15-NI | FSOT-15-NI | | 1.0 to 3.6K | 1.0 to 3.6K | |
| FSOT20 | FSOT-20 | 20 | 1.0 to 71K | 0.10 to 71K | 0.74 |
| FSOT20-NI | FSOT-20-NI | | 1.0 to 9.8K | 1.0 to 9.8K | |
| FSOT30...14 / FSOT30...16 | HL-24-09 / HL-24-16 | 30 | 1.0 to 11K | 0.10 to 11K | 20.14 |
| FSOT30...15 / FSOT30...17 | NHL-24-09 / NHL-24-16 | | 1.0 to 1.2K | 1.0 to 1.2K | |
| FSOT40...14 / FSOT40...16 | HL-40-09 / HL-40-16 | 40 | 1.0 to 26K | 0.10 to 26K | 30.07 |
| FSOT40...15 / FSOT40...17 | NHL-40-09 / NHL-40-16 | | 1.0 to 3K | 1.0 to 3K | |
| FSOT55...14 / FSOT55...16 | HL-55-09 / HL-55-16 | 55 | 1.0 to 54K | 0.10 to 54K | 51.25 |
| FSOT55...15 / FSOT55...17 | NHL-55-09 / NHL-55-16 | | 1.0 to 6.8K | 1.0 to 6.8K | |
| FSOT70...14 / FSOT70...16 | HL-70-09 / HL-70-16 | 70 | 1.0 to 77K | 0.10 to 77K | 60.48 |
| FSOT70...15 / FSOT70...17 | NHL-70-09 / NHL-70-16 | | 1.0 to 9.4K | 1.0 to 9.4K | |
| FSOT95...14 / FSOT95...16 | HL-95-09 / HL-95-16 | 95 | 1.0 to 99.9K | 0.10 to 99.9K | 76.51 |
| FSOT95...15 / FSOT95...17 | NHL-95-09 / NHL-95-16 | | 1.0 to12.4K | 1.0 to 12.4K | |

## TECHNICAL SPECIFICATIONS

| PARAMETER | UNIT | FSOT, FSOT...XX FLAT RESISTOR CHARACTERISTICS |
|---|---|---|
| Temperature coefficient | ppm/°C | ± 90 for 0.1 Ω to 0.99 Ω; ± 50 for 1 Ω to 9.9 Ω; ± 30 for 10 Ω 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 | Ω | 1000 MΩ minimum dry, 100 MΩ minimum after moisture test |
| Operating temperature range | °C | -55 to +350 |

## GLOBAL PART NUMBER INFORMATION

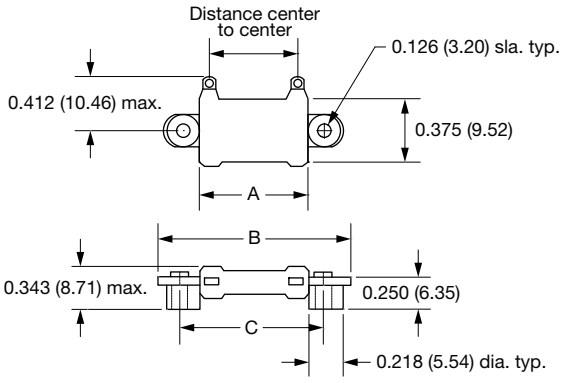
**Global Part Numbering Example: FSOT3009E10R00JE14**

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

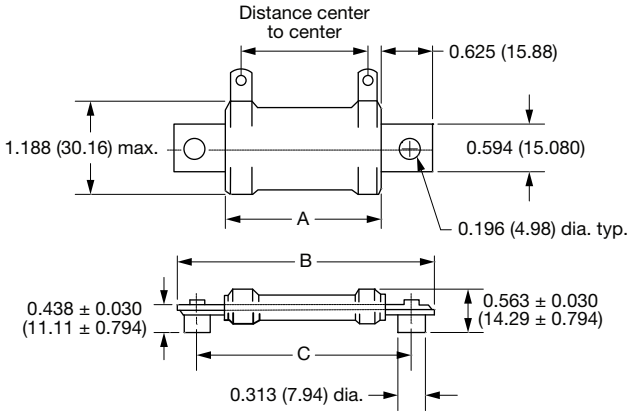
| GLOBAL MODEL (6 digits) | TERMINAL DESIGNATION (2 digits) | TERMINAL FINISH (1 digit) | RESISTANCE VALUE (5 digits) | TOLERANCE | PACKAGING CODE | SPECIAL |
|---|---|---|---|---|---|---|
| **FSOT30** (see "Standard Electrical Specifications" table above for additional P/N's) | **09**<br>**16**<br>**11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

**FSOT10 / FSOT15 / FSOT20**



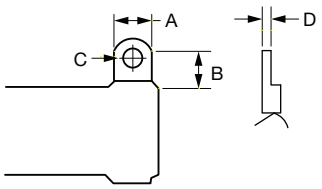

**FSOT...XX FLAT 30 / 40 / 55 / 70 / 95**



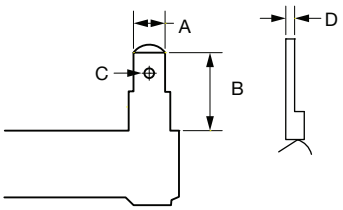

| MODEL | A ± 0.063 [1.59] | B ± 0.063 [1.59] | C ± 0.031 [0.79] | DISTANCE CENTER TO CENTER (ref.) | TERMINAL DESIGNATION | |
|---|---|---|---|---|---|---|
| | | | | | STANDARD | OPTIONAL |
| **FSOT10** | 0.750 [19.05] | 1.3125 [33.34] | 1.000 [25.40] | 0.531 [13.49] | 11E | - |
| **FSOT15** | 1.000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

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

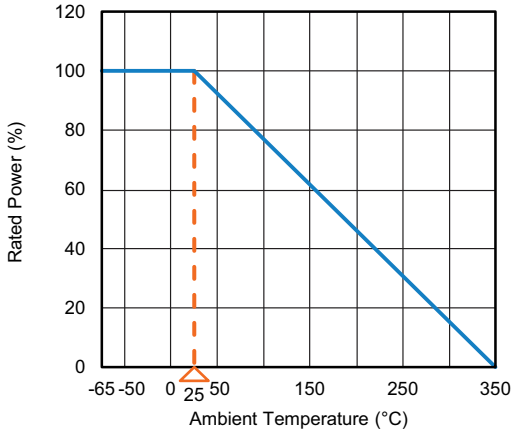
## TERMINAL FINISH

“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) Δ*R* |
| Short time overload | 10 x rated power for 5 s | ± (2.0 % + 0.05 Ω) Δ*R* |
| Dielectric withstanding voltage | 1000 $V_{RMS}$, 1 min | ± (0.1 % + 0.05 Ω) Δ*R* |
| Low temperature storage | -55 °C for 24 h | ± (2.0 % + 0.05 Ω) Δ*R* |
| High temperature exposure | 250 h at +350 °C | ± (2.0 % + 0.05 Ω) Δ*R* |
| Moisture resistance | MIL-STD-202 method 106, 7b not applicable | ± (2.0 % + 0.05 Ω) Δ*R* |
| Shock, specified pulse | MIL-STD-202 method 213, 100 *g*'s for 6 ms, 10 shocks | ± (0.2 % + 0.05 Ω) Δ*R* |
| Vibration, high frequency | Frequency varied 10 Hz to 2000 Hz, 20 *g* peak, 2 directions 6 h each | ± (0.2 % + 0.05 Ω) Δ*R* |
| Load life | 1000 h at rated power, +25 °C, 1.5 h “ON”, 0.5 h “OFF” | ± (3.0 % + 0.05 Ω) Δ*R* |

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