Heat Transfer from Extended Surfaces (Fins), Critical Thickness of Insulation and Thermal Resistance Formulas...





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## Heat Transfer from Extended Surfaces (Fins), Critical Thickness of Insulation and Thermal Resistance Formulas

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Examples

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#### List of 20 Heat Transfer from Extended Surfaces (Fins), Critical Thickness of Insulation and Thermal Resistance Formulas

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# Heat Transfer from Extended Surfaces (Fins), Critical Thickness of Insulation and Thermal Resistance 🗗

#### Heat Transfer from Extended Surfaces (Fins), Critical Thickness of Insulation and Thermal Resistance Formulas...

6) Critical Radius of Insulation of Hollow Sphere

fx 
$$\mathrm{R_c} = 2 \cdot rac{\mathrm{K_{insulation}}}{\mathrm{h_{outside}}}$$

ex

ex 
$$4.285714 m = 2 \cdot \frac{21 W/(m^*K)}{9.8 W/m^{2*}K}$$

7) Heat Dissipation from Fin Insulated at End Tip

$$\label{eq:Q_fin} \begin{split} \textbf{K} & \textbf{Open Calculator C} \\ \hline \textbf{Q}_{fin} = \left( \sqrt{(\textbf{P}_{fin} \cdot \textbf{h}_{transfer} \cdot \textbf{k}_{fin} \cdot \textbf{A}_c)} \right) \cdot (\textbf{T}_w - \textbf{T}_s) \cdot \tanh\left( \left( \sqrt{\frac{\textbf{P}_{fin} \cdot \textbf{h}_{transfer}}{\textbf{k}_{fin} \cdot \textbf{A}_c}} \right) \cdot \textbf{L}_{fin} \right) \end{split}$$

$$37945.93 \mathrm{W} = \left(\sqrt{(25 \mathrm{m} \cdot 13.2 \mathrm{W}/\mathrm{m}^{2} * \mathrm{K} \cdot 10.18 \mathrm{W}/(\mathrm{m}^{*} \mathrm{K}) \cdot 10.2 \mathrm{m}^{2})}
ight) \cdot (305 \mathrm{K} - 100 \mathrm{K}) \cdot anh\left(\left(\sqrt{rac{25 \mathrm{m} \cdot 1}{10.18 \mathrm{W}/\mathrm{m}^{2} + \mathrm{K} \cdot 10.18 \mathrm{W}/\mathrm{m}^{2} + \mathrm{K} \cdot 10.2 \mathrm{m}^{2}}
ight)
ight)$$

8) Heat Dissipation from Fin Losing Heat at End Tip 🚰

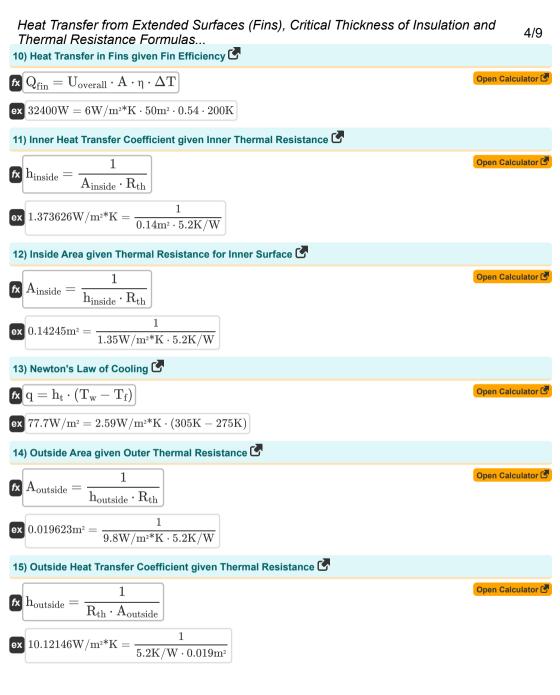
$$\begin{split} \hline \textbf{K} & \textbf{Open Calculator C} \\ Q_{fin} &= \left(\sqrt{P_{fin} \cdot h_{transfer}} \cdot k_{fin} \cdot A_c}\right) \cdot (T_w - T_s) \cdot \frac{\left( \tanh\left(\left(\sqrt{\frac{P_{fin} \cdot h_{transfer}}{k_{fin} \cdot A_c}}\right) \cdot L_{fin}\right) + \frac{h_{transfer}}{k_{fin} \cdot \left(\sqrt{P_{fin} \cdot h_{transfer}}\right)} \right) \cdot L_{fin} \right)}{1 + \tanh\left(\left(\sqrt{\frac{P_{fin} \cdot h_{transfer}}{k_{fin} \cdot A_c}}\right) \cdot L_{fin} \cdot \frac{h_{transfer}}{k_{fin} \cdot \left(\sqrt{\frac{P_{fin} \cdot h_{transfer}}{k_{fin} \cdot A_c}}\right)} \right) \cdot L_{fin} \cdot \frac{h_{transfer}}{k_{fin} \cdot \left(\sqrt{\frac{P_{fin} \cdot h_{transfer}}{k_{fin} \cdot A_c}}\right)} \\ \textbf{ex} \end{split}$$

$$20334.46\mathrm{W} = \left(\sqrt{25\mathrm{m} \cdot 13.2\mathrm{W}/\mathrm{m}^{2}\mathrm{*K} \cdot 10.18\mathrm{W}/(\mathrm{m}^{*}\mathrm{K}) \cdot 10.2\mathrm{m}^{2}}\right) \cdot (305\mathrm{K} - 100\mathrm{K}) \cdot \frac{\left(\tanh\left(\left(\sqrt{\frac{25\mathrm{m} \cdot 13.2\mathrm{W}}{10.18\mathrm{W}/(\mathrm{m}^{*}\mathrm{K})}}\right) + 10.2\mathrm{m}^{2}\mathrm{K} \cdot 10.18\mathrm{W}/(\mathrm{m}^{*}\mathrm{K})\right)}{1 + \tanh\left(\left(\sqrt{\frac{25\mathrm{m}}{10.18\mathrm{W}}}\right) + 10.2\mathrm{m}^{2}\mathrm{K} \cdot 10.2\mathrm{M}^{2}\mathrm{K}\right)}$$





Open Calculator 🕑

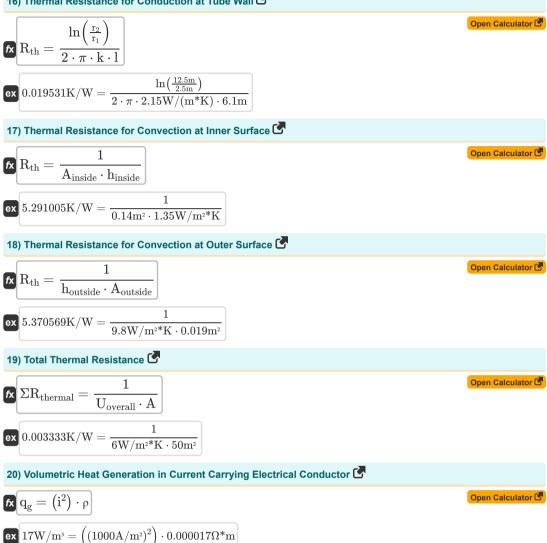






#### Heat Transfer from Extended Surfaces (Fins), Critical Thickness of Insulation and Thermal Resistance Formulas...

16) Thermal Resistance for Conduction at Tube Wall







## Heat Transfer from Extended Surfaces (Fins), Critical Thickness of Insulation and Thermal Resistance Formulas...

## Variables Used

- A Area (Square Meter)
- Ac Cross Sectional Area (Square Meter)
- Ainside Inside Area (Square Meter)
- Aoutside Outside Area (Square Meter)
- Bi Biot Number
- d<sub>fin</sub> Diameter of Cylindrical Fin (Meter)
- hinside Inside Convection Heat Transfer Coefficient (Watt per Square Meter per Kelvin)
- houtside External Convection Heat Transfer Coefficient (Watt per Square Meter per Kelvin)
- ht Heat Transfer Coefficient (Watt per Square Meter per Kelvin)
- htransfer Heat Transfer Coefficient (Watt per Square Meter per Kelvin)
- i Electric Current Density (Ampere per Square Meter)
- **k** Thermal Conductivity (Watt per Meter per K)
- k<sub>fin</sub> Thermal Conductivity of Fin (Watt per Meter per K)
- Kinsulation Thermal Conductivity of Insulation (Watt per Meter per K)
- I Length of Cylinder (Meter)
- Lchar Characteristic Length (Meter)
- Lcylindrical Correction Length for Cylindrical Fin (Meter)
- L<sub>fin</sub> Length of Fin (Meter)
- Lrectangular Correction Length for Thin Rectangular Fin (Meter)
- Lsgaure Correction Length for Sqaure Fin (Meter)
- Pfin Perimeter of Fin (Meter)
- **q** Heat Flux (Watt per Square Meter)
- Q<sub>fin</sub> Fin Heat Transfer Rate (Watt)
- **q**g Volumetric Heat Generation (Watt Per Cubic Meter)
- r1 Inner Radius of Cylinder (Meter)
- r2 Outer Radius of Cylinder (Meter)
- R<sub>c</sub> Critical Radius of Insulation (Meter)
- Rth Thermal Resistance (Kelvin per Watt)
- T<sub>f</sub> Temperature of Characteristic Fluid (Kelvin)
- t<sub>fin</sub> Thickness of Fin (Meter)
- **T<sub>s</sub>** Surrounding Temperature (Kelvin)
- T<sub>w</sub> Surface Temperature (Kelvin)
- T<sub>w</sub> Surface Temperature (Kelvin)





## Heat Transfer from Extended Surfaces (Fins), Critical Thickness of Insulation and Thermal Resistance Formulas... • U<sub>overall</sub> Overall Heat Transfer Coefficient (Watt per Square Meter per Kelvin)

- Wfin Width of Fin (Meter)
- **ΔT** Overall Difference in Temperature (Kelvin)
- **n** Fin Efficiency
- **p** Resistivity (Ohm Meter)
- ΣR<sub>thermal</sub> Total Thermal Resistance (Kelvin per Watt)



## Heat Transfer from Extended Surfaces (Fins), Critical Thickness of Insulation and Thermal Resistance Formulas...

### **Constants, Functions, Measurements used**

- Constant: pi, 3.14159265358979323846264338327950288
   Archimedes' constant
- Function: In, In(Number)

The natural logarithm, also known as the logarithm to the base e, is the inverse function of the natural exponential function.

Function: sqrt, sqrt(Number)
 A square root function is a function that takes a non-n

A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.

- Function: tanh, tanh(Number) The hyperbolic tangent function (tanh) is a function that is defined as the ratio of the hyperbolic sine function (sinh) to the hyperbolic cosine function (cosh).
- Measurement: Length in Meter (m) Length Unit Conversion
- Measurement: Temperature in Kelvin (K) Temperature Unit Conversion
- Measurement: Area in Square Meter (m<sup>2</sup>) Area Unit Conversion
- Measurement: Power in Watt (W) Power Unit Conversion
- Measurement: Surface Current Density in Ampere per Square Meter (A/m<sup>2</sup>) Surface Current Density Unit Conversion
- Measurement: Thermal Resistance in Kelvin per Watt (K/W)
   Thermal Resistance Unit Conversion
- Measurement: Thermal Conductivity in Watt per Meter per K (W/(m\*K)) Thermal Conductivity Unit Conversion
- Measurement: Electric Resistivity in Ohm Meter (Ω\*m) Electric Resistivity Unit Conversion
- Measurement: Heat Flux Density in Watt per Square Meter (W/m<sup>2</sup>) Heat Flux Density Unit Conversion
- Measurement: Heat Transfer Coefficient in Watt per Square Meter per Kelvin (W/m<sup>2\*</sup>K) Heat Transfer Coefficient Unit Conversion
- Measurement: Power Density in Watt Per Cubic Meter (W/m<sup>3</sup>) Power Density Unit Conversion



### Check other formula lists

- Basics of Heat Transfer Formulas
- Co Relation of Dimensionless Numbers Formulas
- Heat Exchanger Formulas
- Heat Exchanger and its Effectiveness Formulas C 

   Thermal Resistance Formulas C
- Heat Transfer from Extended Surfaces (Fins) Formulas 🚺
- Heat Transfer from Extended Surfaces (Fins), Critical Thickness of Insulation and Thermal Resistance Formulas
- Unsteady State Heat Conduction Formulas

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