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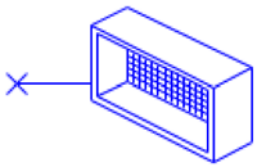
Rectangular Waveguide Termination (TEmn): RWGT_TEmn

Symbol



Summary

RWG_TEmn models an input of a transmission line of infinite length. This line represents an equivalent of a transverse electric waveguide mode of the order mn (TEmn) existing in a rectangular waveguide. The mode may be either propagating or evanescent (non-propagating); waveguide metal has a final conductivity and is filled with lossy dielectric.

Parameters

Name	Description	Unit Type	Default
Wa	Width of rectangular waveguide	Length	22860 um
Wb	Height of rectangular waveguide t	Length	10160 um
M	Mode order (along Wa)		1
N	Mode order (along Wb		0
Er	Relative dielectric constant of dielectric filling the waveguide		1
Rho	Metal bulk resistivity of waveguide metal normalized to copper		1
Tand	Loss tangent of dielectric filling the waveguide		0
*Mur	Relative permeability of dielectric filling the waveguide		1

Name	Description	Unit Type	Default
*Tanm	Magnetic loss tangent of dielectric filling the waveguide		0
*Sigma	Conductivity of dielectric filling the waveguide	Siemens/m	0
*ZCalc	Switch - selector of TE10 characteristic impedance definition ("Power-Voltage"/"Voltage-Current"/"Normalized")		Power-Voltage

** indicates a secondary parameter*

Parameter Details

M, N. Parameters M and N make a pair of indices that define the TEmn mode selected for modeling. M represents the number of field variation along the dimension Wa; N provides the same relative to Wb.

Rho. The bulk resistivity of the waveguide metal. Note that this parameter is dimensionless because it represents the resistivity normalized to that of copper (i.e. to 1.7E-8 ohm/m.)

Er, Tand, Mur, Tanm, Sigma. The material properties of media filling the waveguide.

Zcalc. Allows you to select a definition of characteristic impedance of the TE10 mode propagating in a rectangular waveguide with dimensions Wa*Wb. Options include "Power-Voltage" ,"Voltage-Current", and "Normalized." This model uses the value of characteristic impedance to denormalize the computed normalized y-matrix of modeled discontinuity. Note that this selection must match the selection of the same parameter in the RWGIRIS_TE10 and RWG_TEmn elements used around the same schematic.

The following characteristic impedance definitions are used [1]:

$$Z_{\text{power-voltage}} = Z\frac{2W_b}{W_a}$$

$$Z_{\text{voltage-current}} = Z\pi\frac{W_b}{2W_a}$$

$$Z = \frac{\eta}{\sqrt{1-(\frac{f_c}{f})^2}}$$

Here, f_c is the cutoff frequency for TE10 and f is the operational frequency; η is the wave impedance of the open space filled with the waveguide dielectric.

$Z_{Normalized}=1$

Layout

This element does not have an assigned layout cell. You can assign artwork cells to any element. See "Assigning Artwork Cells to Layout of Schematic Elements" for details.

Recommendations for Use

This model may be used as a subcircuit referenced in the PORT_TN port. This usage provides a port with a frequency-depended termination.

NOTE: Results depend on the selected definition of waveguide characteristic impedance.

Normalized characteristic impedance implies that waveguide mode is propagating. **Never set ZCalc to "Normalized" if your operational frequency gets into below-cutoff region.**

Ensure that the bulk resistivity of waveguide metal is normalized to the correct value of **copper** resistivity (**not gold**).

References

[1] K. C. Gupta, Ramesh Garg, Rakesh Chadha, Computer Aided Design of Microwave Circuits, Artech House, Mass., 1981.

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