

BURIED MICROSTRIP TRANSMISSION LINES
(For comparison only! Preliminary release.)

file: bmicrost.mcd

Credits:

1st Equation developed by: Martin Maritena ~1985
2nd Equation developed by: University of Missouri-Rolla or UMR
3th Equation developed by: Motorola

Formulas included in this spreadsheet:

Martin's Microstrip characteristic impedance ZBMSTRIP()
UMR's Microstrip characteristic impedance ZBMSTRIP2()
Motorola's Microstrip characteristic impedance ZBMSTRIP3()
Both UMR and Motorola defined the "Adjusted ER" as ER'()

Variables names used:

B Overall dielectric thickness
H Trace height above ground (inch)
W Trace width (inch)
T Trace thickness (inch)
ER Relative permittivity of material between trace and
 ground plane (dimension less)

Variables values used:

Overall dielectric thickness B := .063
Height above ground (in.): H := .05
Width of trace (in.): W := .06
Thickness of trace (in.): T := .00134
Relative electric permeability: ER := 4.2

Martin's Calculation and Results:

$$\text{ZBMSTRIP} := \left[43.037 \cdot \ln\left(\frac{B}{W}\right) + 5.048 \left(\frac{T}{W}\right) + \frac{106.76}{1.09 \sqrt{\text{ER}}} \right] \quad \text{ZBMSTRIP} = 50.005$$

UMR's Calculation and Results:

$$\text{ER}' := \text{ER} \cdot \left(1 - e^{-\frac{1.55 \cdot B}{H}} \right) \quad \text{ER}' = 3.604$$

$$\text{ZBMSTRIP2} := \frac{56}{\sqrt{\text{ER}'}} \cdot \ln \left[\frac{5.98 \cdot H}{(.8 \cdot W) + T} \right] \quad \text{ZBMSTRIP2} = 53.145$$

Motorola's Calculation and Results:

$$\text{ZBMSTRIP3} := \frac{87}{\sqrt{\text{ER}' + 1.41}} \cdot \ln \left[\frac{5.98 \cdot H}{(.8 \cdot W) + T} \right] \quad \text{ZBMSTRIP3} = 70.001$$