APPLICATION NOTE

Characteristic Impedance of Coaxial Resonators

The characteristic impedance of a dielectric-filled coaxial transmission line with a square outer conductor can be found using the following formula:

$$Z_0 = \text{Characteristic Impedance} = Z_0 = \frac{60}{\sqrt{\varepsilon_R}} \ln\left(1.079\ \frac{W}{d}\right)$$

Where:

W = Width of the resonator

d = Diameter of the inner conductor

εR = Dielectric constant

The above formula shows that changes in W, d, and εR affect the characteristic impedance. The following table provides an analysis of characteristic impedance using Skyworks manufacturing tolerances.

Profile	Width (W)	Diameter (d)	Z_0 for Materials (ε_R)			
			1000	2000	8800	9000
HP	0.476 ± 0.005	0.131 ± 0.004	25.3 Ω	18.1 Ω	13.1 Ω	8.6 Ω
EP	0.316 ± 0.005	0.101 ± 0.004	22.5 Ω	16.1 Ω	11.7 Ω	7.7 Ω
SP	0.237 ± 0.004	0.095 ± 0.004	18.3 Ω	13.1 Ω	9.5 Ω	6.3 Ω
LS	0.155 ± 0.004	0.062 ± 0.004	18.4 Ω	13.1 Ω	9.5 Ω	6.3 Ω
LP	0.155 ± 0.004	0.038 ± 0.003	27.4 Ω	19.6 Ω	14.2 Ω	9.4 Ω
SP	0.119 ± 0.004	0.032 ± 0.003	25.7 Ω	18.4 Ω	13.3 Ω	8.8 Ω
SM	0.080 ± 0.003	0.032 ± 0.003	18.4 Ω	13.1 Ω	9.5 Ω	6.3 Ω