L-Network Impedance Matching (Resistive Source and Load)

Loaded Q, series and shunt reactances and component values of a low-pass L network that matches a resistive source to a resistive load at a frequency.

Method: L-network matching of resistive impedances

Input parameters

Unit system: SI

Parameter	Value	Unit
Source resistance	50.000	Ω
Load resistance	10.000	Ω
Frequency	14.000	MHz

Calculated results

Parameter	Value	Unit
Loaded Q of the network	2.0000	
Series reactance (inductor)	20.000	Ω
Shunt reactance (capacitor, on the higher-resistance side)	25.000	Ω
Series inductance	0.22736	µH
Shunt capacitance	454.73	pF
Approximate 3 dB bandwidth f/Q	7.0000	MHz

Notes for this case

• An L network has one series and one shunt element; the shunt element goes across the higher resistance. Its Q is fixed by the resistance ratio, Q = √(R_high/R_low − 1), giving X_s = Q R_low and X_p = R_high/Q. The low-pass form (series inductor, shunt capacitor) also filters harmonics. For a wider or narrower bandwidth than f/Q allows, use a pi or T network; for complex loads, absorb the load reactance into the elements.

Formula and method

$$Q = \sqrt{\frac{R_{high}}{R_{low}} - 1}, \quad X_s = Q R_{low}, \quad X_p = \frac{R_{high}}{Q}$$

Variables

R_s	Source resistance	Ω
R_L	Load resistance	Ω
f	Frequency	1/s
Q	Loaded Q of the network	-
X_s	Series reactance (inductor)	Ω
X_p	Shunt reactance (capacitor, on the higher-resistance side)	Ω
L	Series inductance	H
C	Shunt capacitance	F
BW	Approximate 3 dB bandwidth f/Q	1/s

Method and standards

L network.

Assumptions and limits

- Resistive source and load; ideal components.

References

L-network matching of resistive impedances

Report details

Report reference	FCC-0XVC-YT34 (the same inputs always give the same reference)
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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/electrical/electronics/l-network-impedance-matching

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.