

Bypass Capacitor in Power Distribution Systems: An Overview

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Abstract

Power distribution systems (PDS) need to provide impedance response with specified shape/value over a wide frequency band using a sufficient number of capacitors placed in parallel to create the required impedance profile. The bypass or decoupling capacitors used in power distribution systems are the focus of this article. Bypass capacitors with different values, and capacitors and planes may create resonance peaks, unless the capacitor parameters are selected properly. The simple model of bypass capacitors is a series R-L-C network with frequency independent parameter. Ceramic capacitors equivalent series resistance (ESR) and equivalent series inductance (ESL) are extremely important parameters in determining how many capacitors are required. There is introduced the concept of quality factor (BQF).