

In this paper, a miniature switched beamformer module for 2.4-GHz applications is proposed. The proposed beamformer module is based on the integrated passive device technology, and it integrates a 4×4 Butler matrix, a single-pole four-throw beam-selection switch, and a p-i-n diode-based transmit/receive (T/R) switch into a compact module size of only 4.9 mm x 5 mm x 0.9 mm. To achieve the compact module size, bridged-T coils are used to replace the transmission line sections in the 4×4 Butler matrix and the T/R switch. The measured insertion loss at the center frequency of 2.4 GHz is within 10.89 ± 1.13 dB for the receive path and 11.33 ± 0.69 dB for the transmit path. The measured phase error is less than 8.4° at 2.4 GHz. The proposed beamformer features low cost, compact size, and low profile. It can help enable the use of phased array technique in handheld mobile devices.