Abstracts

An ultra-broad-band reflection-type phase-shifter MMIC with series and parallel LC circuits

K. Miyaguchi, M. Hieda, K. Nakahara, H. Kurusu, M. Nii, M. Kasahara, T. Takagi and S. Urasaki. "An ultra-broad-band reflection-type phase-shifter MMIC with series and parallel LC circuits." 2001 Transactions on Microwave Theory and Techniques 49.12 (Dec. 2001 [T-MTT] (Special Issue on 2001 International Microwave Symposium)): 2446-2452.

An ultra-broad-band reflection-type phase shifter is proposed. Theoretically, the proposed phase shifter has frequency-independent characteristics in the case of 180/spl deg/ phase shift. The phase shifter is composed of a 3-dB hybrid coupler and a pair of novel reflective terminating circuits. The reflective terminating circuit switches two states of series and parallel LC circuits. Using an ideal circuit model without parasitic circuit elements, we have derived the determining condition of frequency independence of circuit elements. Extending the concept, we can also obtain a broad-band phase shifter for other phase difference as well. In this case, for a given phase difference and an operating frequency, we also derive a condition to obtain minimum variation of phase difference around the operating frequency. This enables the broad-band characteristics for arbitrary phase difference. The fabricated 180/spl deg/ reflective terminating circuit monolithic microwave integrated circuit (MMIC) has achieved a phase difference of 183/spl deg/ /spl plusmn/ 3 over 0.5-30 GHz. The 180/spl deg/ phase-shifter MMIC has demonstrated a phase shift of 187/spl deg/ /spl plusmn/ 7/spl deg/ over 0.5-20 GHz. The 90/spl deg/ reflective terminating circuit MMIC has performed a phase difference of 93/spl deg/ /spl plusmn/ 7/spl deg/ over 4-12 GHz.

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