World Academy of Science, Engineering and Technology
International Journal of Electrical and Computer Engineering
Vol:9, No:08, 2015

Design and Implementation of a 94 GHz CMOS Double-Balanced Up-Conversion Mixer for 94 GHz Imaging Radar Sensors

Authors : Yo-Sheng Lin, Run-Chi Liu, Chien-Chu Ji, Chih-Chung Chen, Chien-Chin Wang

Abstract : A W-band double-balanced mixer for direct up-conversion using standard 90 nm CMOS technology is reported. The mixer comprises an enhanced double-balanced Gilbert cell with PMOS negative resistance compensation for conversion gain (CG) enhancement and current injection for power consumption reduction and linearity improvement, a Marchand balun for converting the single LO input signal to differential signal, another Marchand balun for converting the differential RF output signal to single signal, and an output buffer amplifier for loading effect suppression, power consumption reduction and CG enhancement. The mixer consumes low power of 6.9 mW and achieves LO-port input reflection coefficient of -17.8~ -38.7 dB and RF-port input reflection coefficient of -16.8~ -27.9 dB for frequencies of 90~100 GHz. The mixer achieves maximum CG of 3.6 dB at 95 GHz, and CG of 2.1±1.5 dB for frequencies of 91.9~99.4 GHz. That is, the corresponding 3 dB CG bandwidth is 7.5 GHz. In addition, the mixer achieves LO-RF isolation of 36.8 dB at 94 GHz. To the authors' knowledge, the CG, LO-RF isolation and power dissipation results are the best data ever reported for a 94 GHz CMOS/BiCMOS up-conversion mixer.

Keywords : CMOS, W-band, up-conversion mixer, conversion gain, negative resistance compensation, output buffer amplifier
Conference Title : ICEEE 2015 : International Conference on Electrical and Electronics Engineering
Conference Location : Paris, France
Conference Dates : August 27-28, 2015