Hybrid SPST Switch Delivers High Isolation Over an Ultra-wide Bandwidth

Tech ID: 25937 / UC Case 2015-765-0

ABSTRACT

Researchers at the University of California, Davis have developed a hybrid, complementary metal-oxide semiconductor (CMOS) mm-wave, single-polar single-throw (SPST) switch that combines the wide bandwidth features of a distributed structure and the compact implementation of coupled lump elements for an area-efficient layout.

FULL DESCRIPTION

Within millimeter wave (mm-wave) applications, including passive imaging, short-range communications, and sensing applications, switches are essential components for transmitting/receiving, signal-routing, and modulation. Different from the traditional series-shunt switch architecture in radio frequency ranges, most published mm-wave switches remove the series switch to reduce insertion loss. However, without these series switches, isolation performance is degraded.

Researchers at the University of California, Davis have developed a hybrid, complementary metal-oxide semiconductor (CMOS) mm-wave, single-polar single-throw (SPST) switch that combines the wide bandwidth features of a distributed structure and the compact implementation of coupled lump elements for an area-efficient layout. This SPST switch achieves over 35 dB in isolation across an ultra-wide frequency range (from 54 GHz to 84 GHz), a minimum of 1.7 dB insertion loss, and less than -10 dB return loss with a 0.012 mm^2 chip area in 65 nm CMOS. Compared to other designs, this switch achieves an enhancement of more than 10 dB of isolation while maintaining similar insertion loss.

APPLICATIONS

- Passive imaging
- Short-range communication
- Sensing applications

FEATURES/BENEFITS

- Higher isolation compared with silicon optical amplifiers over a wide frequency range with small insertion loss
- Hybrid technique allows for the chip area is be conserved

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,621,152	04/11/2017	2015-765

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OTHER INFORMATION

KEYWORDS

SPST switch, SPDT switch, CMOS, high isolation, wide bandwidth, low insertion loss

CATEGORIZED AS

- **Engineering**
  - Engineering
  - Other
- **Semiconductors**
  - Design and Fabrication
  - Other

RELATED CASES

2015-765-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Passive Wideband Interferometer Enabled Error Feedback Transmitter
- High-Efficiency Broadband Doubler
- Nonlinearity Factorization for Up-Conversion Mixer Linearity Analysis
- Passive Coupling Balance Scheme for Long Traveling Complex Differential Signals
- Frequency Discriminator-based Phase Noise Filter (PNF) for Ultra-Clean LO/Clock

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