A Multi-Stage 60GHz CMOS LNA Using Dual Noise-Matching Technique

Ning Li¹, Kenichi Okada¹, Toshihide Suzuki², Tatsuya Hirose² and Akira Matsuzawa¹
1. Tokyo Institute of Technology, Japan
2. Advanced Devices Lab, Fujitsu Laboratories Ltd, Japan

Background
• 7 GHz unlicensed band at 60 GHz
• Gbps data transfer

• Short range
• Good isolation

RF Front-end

Atmospheric Absorption

LNA Circuit Design Technique

Small signal equivalent circuit

CS+CG Small signal equivalent circuit

Noise Circles
Available Gain Circles
Source Stability Circle

Using source degeneration to adjust the value of the input impedance.

Circuits and Simulation Results

Multi-stage
Higher gain
Dual noise-matching topology
Lower noise
The same stage used
Cascade topology

Performance Comparison

Conclusions

A three-stage LNA employing a dual noise-matching topology

Noise matching optimized by using source degeneration

A 5dB NF realized by dual noise-matching technique

Comparing with the conventional

1.4dB NF improvement

1dB gain decrease

3mW power consumption increase