Double delay ディエンベディングにおけるコンタクト位置ばらつきの影響の検討

Evaluation of Double delay De-embedding Method with Misalignment of Contact Positions

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1. Introduction

At millimeter-wave (MMW) circuit designs, the models provided by foundries are not accurate any more, so device modeling becomes very important. Test Elementary Group (TEG) of passive and active devices including text fixture such as pads and interconnects for measurement have been implemented before circuit design. In order to obtain the characteristic of the device under test (DUT), a proper de-embedding method is required to eliminate the parasitic elements.

Double delay de-embedding method is proposed in [1] and the validity up to 110 GHz is proved [2]. However, as is known, measurement results have errors, which are caused by probing misalignment of contact position in MMW range. In this study, an evaluation of double delay de-embedding method with considering of misalignment contact position is carried out.

2. Issues of Misalignment Contact Position

Contact pad is necessary for on-wafer measurement. In MMW device measurement, the size of contact should be minimized as much as possible to reduce parasitic inductance and capacitance. On the other hand, in order to get the connection between the DUT and the microprobe tips, the contact pad must have enough area. In general, the contact pad area is several times larger than the probe area used in on-wafer measurement. Therefore, probing position on contact pad is uncertain when using the probe to measure device. Fig.1 shows the misalignment of contact position of measurement. So the de-embedded results may be inaccuracy when the probe is contacted at different locations on the pad. In order to evaluate the influence of misalignment, the error verification is investigated in this study.

3. Error Verification with Misalignment of Contact Positions

In double delay de-embedding method, two transmission lines, the length of one is twice longer than the other, are employed. The de-embedding process is shown in Fig.2. The shunt conductance and the series impedance of pad can be obtained from the π -type lumped model with a zero-length through-line.

In order to estimate the double delay de-embedding method, an illustrated approach shown in Fig.3 is assumed. An additional series impedance △Zs at one side is used in this approach. The 200µm and 400µm guided micro-strip transmission lines (MSTL) are employed in the structure. The results de-embedded by the double delay de-embedding method is shown in Fig.4.

4. Conclusion

From the comparisons, the de-embedding error can be calculated. The errors in the characteristic impedance and quality factor about 1% and 2% at 60GHz, while attenuation and phase constants are matched very well.

Acknowledgements

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References

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[2] N. Li, *et al*., *IEICE Trans. Electron*, Vol. E93-A, No. 2, pp. 431-439, Feb. 2010.

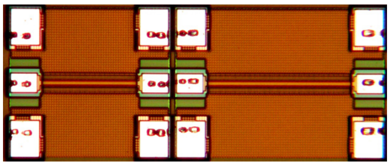

Fig. 1. Misalignment of contact position

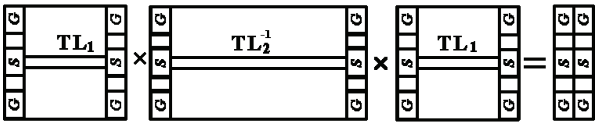

Fig.2. Process of double delay de-embedding method

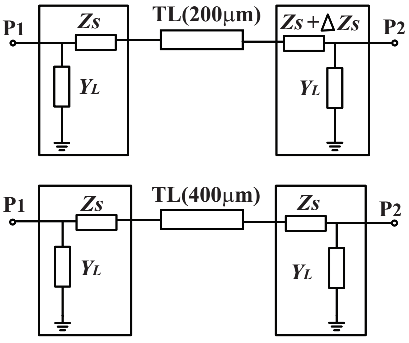

Fig.3.Illustrated approach of error verifications

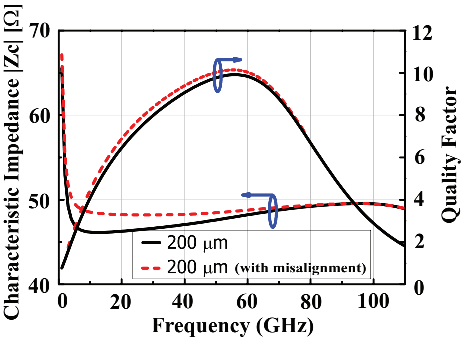

Fig.4. The parameters of 200µm CPWTL