# Non-Contact, On-Wafer Characterization of Schottky Diodes

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Millimeter-wave (mmW) and THz radiation is poised to play a proggresively important role in many key applications in the near future, including high-speed communications, sensing and imaging as well as spectroscopy and non-destructive evaluation. Testing and characterization of such mmW and THz ICs at their intended operation frequency has long been a challenge due to several bottlenecks. Particularly in the THz band, existing tools such as contact probes exhibit diminishing performance. Moreover, the physical fragility of such probes results in high maintenance costs and repeatability issues for large scale testing (e.g. over 10000 test cycle).

As an alternative to conventional contact-probe testing of integrated devices and ICs, we recently proposed a non-contact on-wafer device characterization approach that is both low-cost and wear/tear free (Caglayan et. al, *IEEE Transactions on Microwave Theory and Techniques*, vol. 62, no. 11, pp. 2791-2801, 2014). This non-contact method is based on radiative coupling of standard network analyzer test ports onto the wafer environment of typical monolithic THz devices enabled by planar on-chip antennas integrated with the device. Here, we present –for the first time- active non-contact measurements via characterization of an on-chip mounted (flip-chip) Schottky diode in the 140-325 GHz band. The flip-chipped diode is soldered to lithographically defined coplanar waveguide (CPW) test fixtures connected to non-contact probe tips on a high resistivity silicon substrate. Experimental results are fitted to a lumped element circuit model including the parasitic elements.