CCD Camera Module Impedance Analysis for Research In Motion (RIM)

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This report describes how to make Impedance measurements of five differential interconnect pairs that interface to a CCD camera module via a flex interface circuit using the GigaProbes®, a true odd mode 30 GHz differential probe, a Tektronix 20GHz differential TDR system and the IConnect® SI Software. Also discussed is how to design a fixture for the CCD module to make these measurements repeatable.

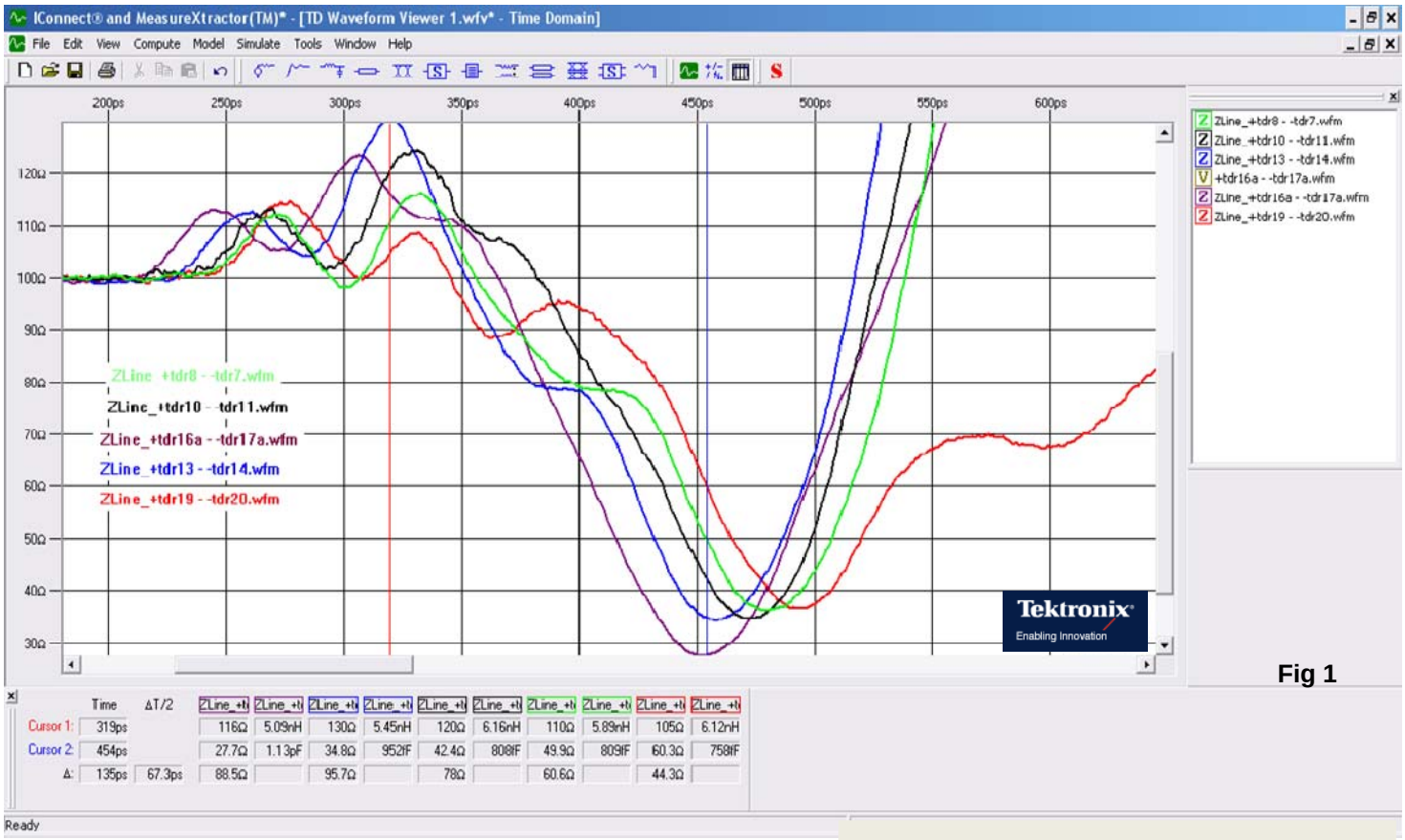


Fig 1

Fig 2

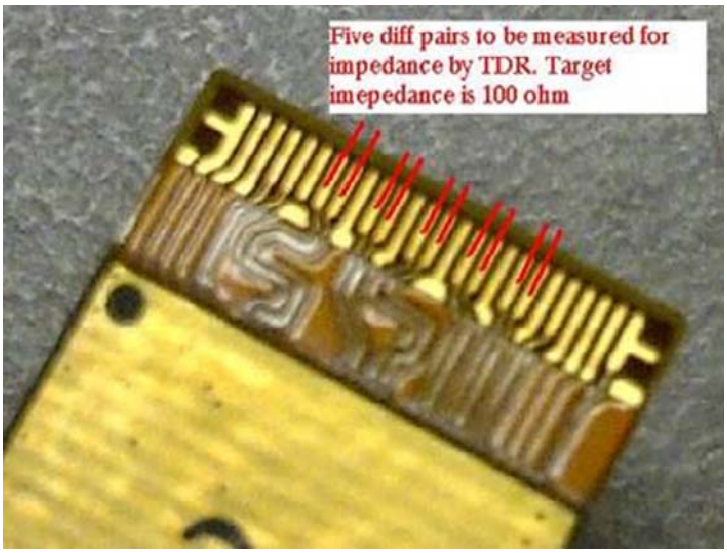


Figure 1) *is a differential impedance plot of each of the five differential pairs. Each differential pair impedance goal is to be 100 ohms.* ***Figure 2)*** *show the differential pad locations marked in red. The GigaProbes® Differential TDR probe was used to probe each pad pair. These pads are located on a flex PCB affixed atop the CCD camera assembly and juts out 3mm. In order to probe these pads, a fixture was developed to support the bottom side of the flex circuit or they will bend away from the probe and not make adequate contact with the pads.*

Fixturing Camera Module to Probe Differential Pads

Fig 3

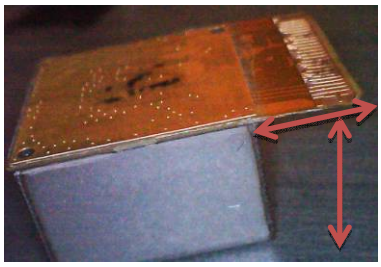


Fig 4

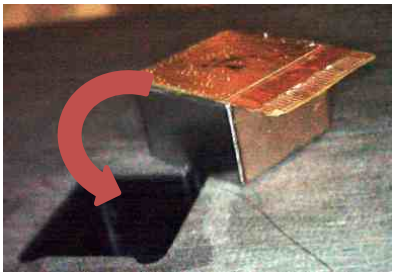


Fig 5

The CCD camera module (**Fig 3**) flex circuit test pads require a fixture to keep it stable while probing in order to acquire accurate and repeatable measurements. We used a 5"x5" piece of Delrin® Thermoplastic Polymer and cut a hole the size of the metal enclosure of the CCD camera module (**Fig 4**). The module is inserted into the hole and the flex circuit containing the differential test pads extends 3mm atop the Delrin® surface (**Fig 5**). The Delrim® base serves to support the flex pads from bending when probing. To assure the surface of the Delrin® was flat as possible, it was mechanically planarized and a piece of nonconductive tape was place over the top of the module to further keep the module from shifting when probed.

Probing Flex Connector Pads

Fig 6

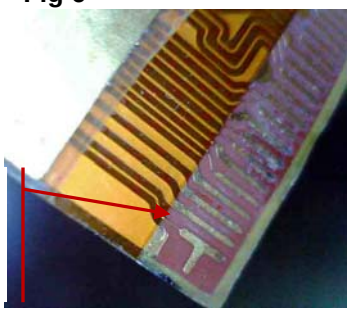


Fig 7

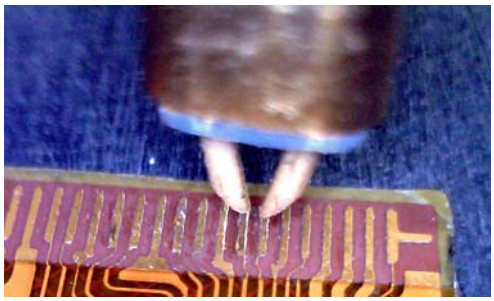
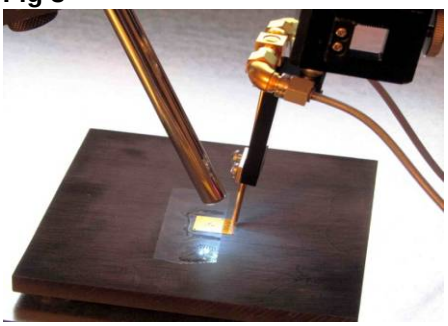


Fig 8

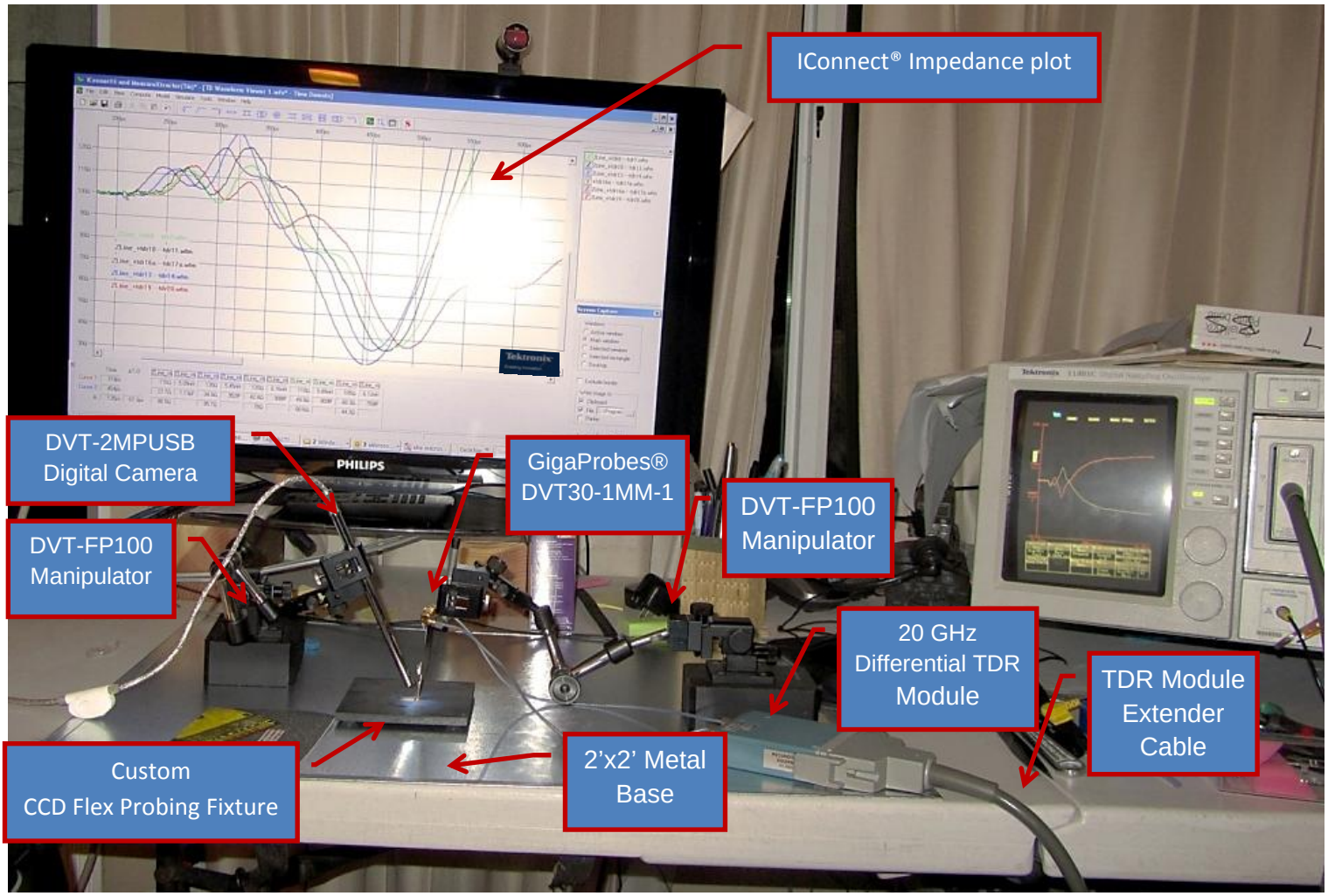


Another challenge to obtain reliable and repeatable measurement is the pads are coated with OCP which can be clearly seen in (**Fig 6**). This coating is ideal to keep the pads from oxidizing but it puts a thin nonconductive film between the probe tips and the surface of the pads, making it difficult to make repeatable TDR measurements on the pads. The GigaProbes® TDR probe have a conductive diamond plating on its probe tips that pierce the OCP required to make repeatable TDR measurements (**Fig 7**). The pitch of the pads on the flex is extremely small so we used a gauge to set the probe tips pitch to match that flex pads. This was done by using tweezers that come with the GigaProbes® to place the probe tips together and then insert the gauge between the probe tips to evenly separate them apart to match the pitch of the differential pad pairs (**Fig 7**). This technique allow for setting the probe tip to accommodate very small pitch's.

To keep the probe tips steady while probing, the GigaProbes® are installed in the manipulator adapter (GPMMA) that comes with the GigaProbes® kit and the assembly was attached to the end of the FP100 multi-axis manipulator (**Fig 9**). The FP100 has 100TPI XYZ controls allow for small movements of the probe tips to accurately set the probe tips on the Flex Pads. We used a 24"x18" metal base (**Fig 9**) to mount the fixture and the FP100 magnetic bases. A USB digital camera was required to view the pads to assure the probe tips were placed on the correct pads, reducing miss probing. We installed the USB camera in another FP100 so we could set the camera viewing angle. A picture of this setup is displayed in (**Fig 8** and **Fig 9**).

Fig 9

Total Probing and Differential Impedance Measurement Solution



System Components

- **DVT30-1MM-1 : 50/100 ohm interconnect analysis kit**
  1. Qty 1: 30GHz (Balanced) 100 ohm Differential probes with Gold Plated Conductive Diamond Probe Tips
  2. Qty 1: SMA wrench with pitch setting holes for .8mm, 1mm, 1.27 mm.
  3. Qty 1: 50 ohm conversion kit, includes ground wire, two Shorting SMA's, Shrink wrap.
  4. Qty 1: 110 mm ESD tweezers, to adjust probe tips to finer pitch's
  5. Qty 1: 5X mag lens,
  6. Qty 4: Right angle SMA adapters,
  7. Qty 2: Ez-Grips for hand probing,
  8. Qty 1: GPMMA Articulating probe holder adapter for articulating arms and support most probe holder manipulators,
  9. Qty 1: Operation manual,
  10. Qty 1: Application notes on CD
  11. Qty 2: 12" 24GHZ SMA-SMA Cables

- **Flex Positioner DVT-FP100**
- **DVT-2MPUSB Digital Camera**
- **24"x18" metal sheet**
- **20GHz TDR with Differential TDR modules**
- **IConnect® SI software**

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