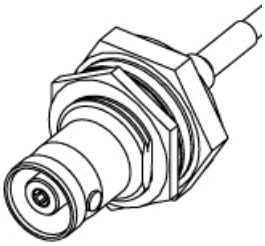
RF Characterization Report

MBNC7-J-P-XX-ST-TH1

Mated with:
RF179-74BJ3-79SP3-0100



Description:
75-Ω Optimized Mini BNC Board Mount Jack

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Introduction

This testing was performed to evaluate the electrical performance of the MBNC7 series of 75-Ω Optimized Board Mount Jacks.

Return Loss, VSWR and Isolation measurements were made over the frequency range from 130 MHz to 6 GHz for mated pairs of connectors. All measurements were made utilizing a 4-layer 75-Ω test board specifically designed for this project. The board is referred to as "test board" in this report. The test board was identified as PCB-102843-TST MBNC7 75-Ohm Mini BNC Evaluation Board. The board had four traces connecting four pairs of MBNC7 jacks in a 2-row pattern. The connectors within a row were on 0.5-inch centers, and the center-to-center spacing between rows was 1.0 inch. One set of four jacks on the board had Layer 1 signal launches, and the other set had Layer 4 signal launches. Layer 1 is the top or component side of the board, and Layer 4 is the bottom or solder side of the board. The measured results include not only the mated connectors but also the termination and board effects.

Product Description

The test sample was mounted to the test board, which has 75-Ω nominal impedance traces. The connector has an optimized launch (compensation) incorporated into the PCB design to facilitate improved impedance match over the frequency range of interest. The test board traces are approximately one inch long.

The MBNC7 jacks were tested by mating to a MBNC7 plug, which was part of a RF179-74BJ3-79SP3-0100 cable assembly having a 75- Ω BNC (f) connector at its second end. Two (2) MBNC7 jacks (a Layer 1 launch and a Layer 4 launch) were tested for Return Loss and VSWR. Isolation between a pair of Layer 1 launch jacks and between a pair of Layer 4 launch jacks was also measured. The actual part numbers that were tested are shown in Table 1. A representative sample picture is shown in Figure 1.

Part Number	Board Mount Connector Type
MBNC7-J-P-XX-ST-TH1	Standard Straight Through-Hole Jack

Table 1: Sample Description

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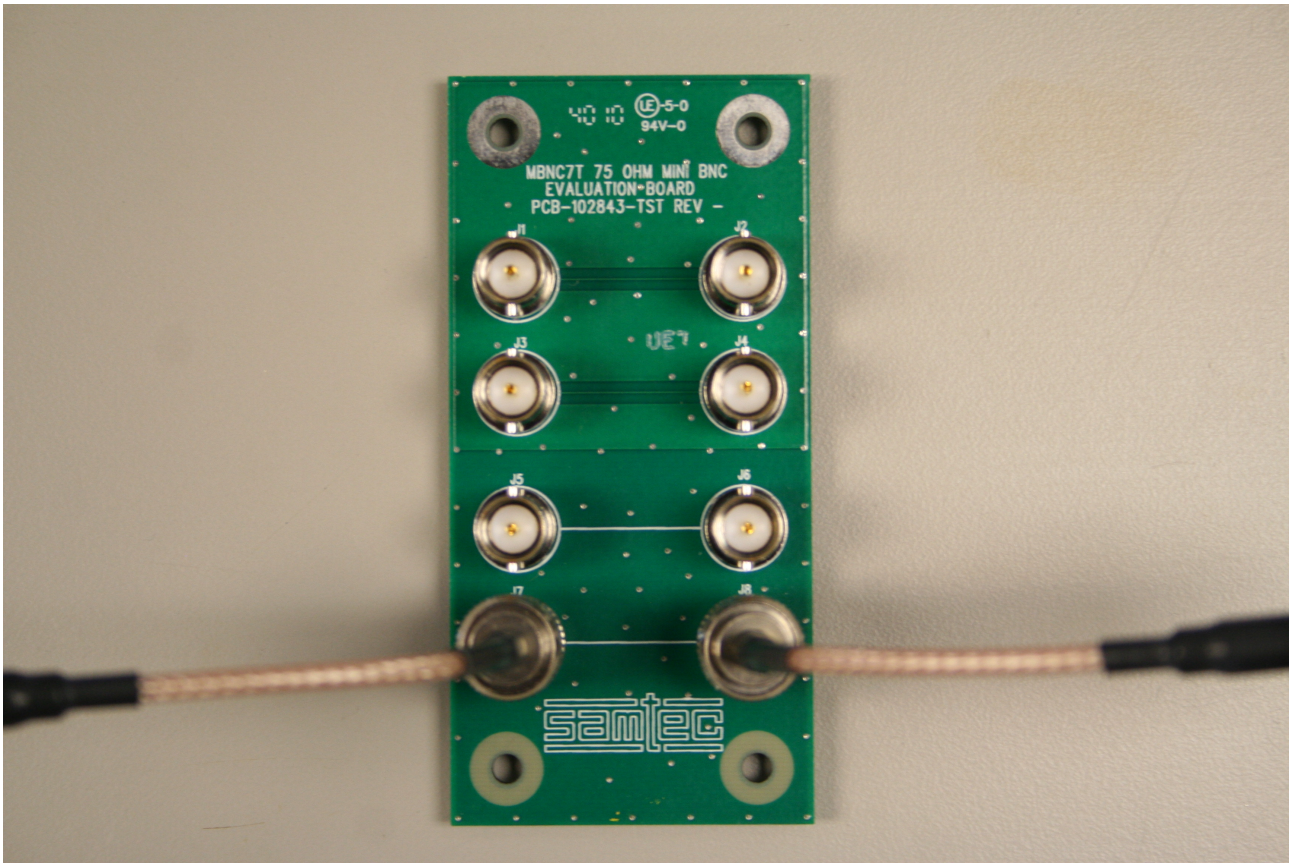

Figure 1: Test Sample Configuration

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Results Summary

Data

Return Loss, VSWR and Isolation measurements were performed over the frequency range from 130 MHz to 6 GHz. All measurements were performed with the board mount jack mated to a 75-Ω MBNC7 male connector that was part of a 75-Ω flexible cable assembly. The table below lists the worst case Return Loss, VSWR and Isolation of the connector(s) over the frequency range tested.

Board Mount Connector	Launch	Return Loss (dB)	VSWR	Isolation (dB)
MBNC7-J-P-XX-ST-TH1	Layer 1	-8.6	2.2	-55.1
MBNC7-J-P-XX-ST-TH1	Layer 4	-11.7	1.7	-44.5

Table 2: Return Loss, VSWR & Isolation Worst Case Data

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Data Plots

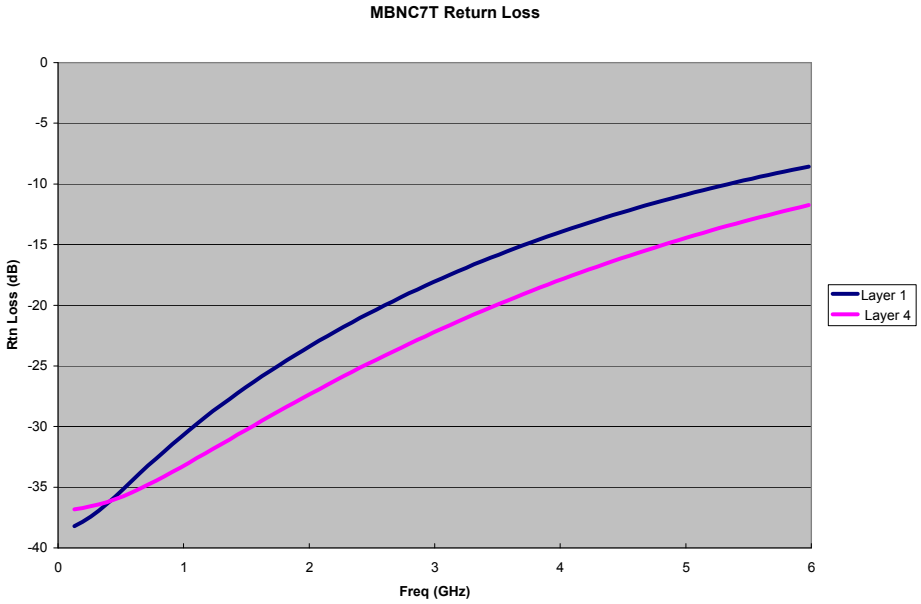

Figure 2: MBNC7-J-P-XX-ST-TH1 Return Loss

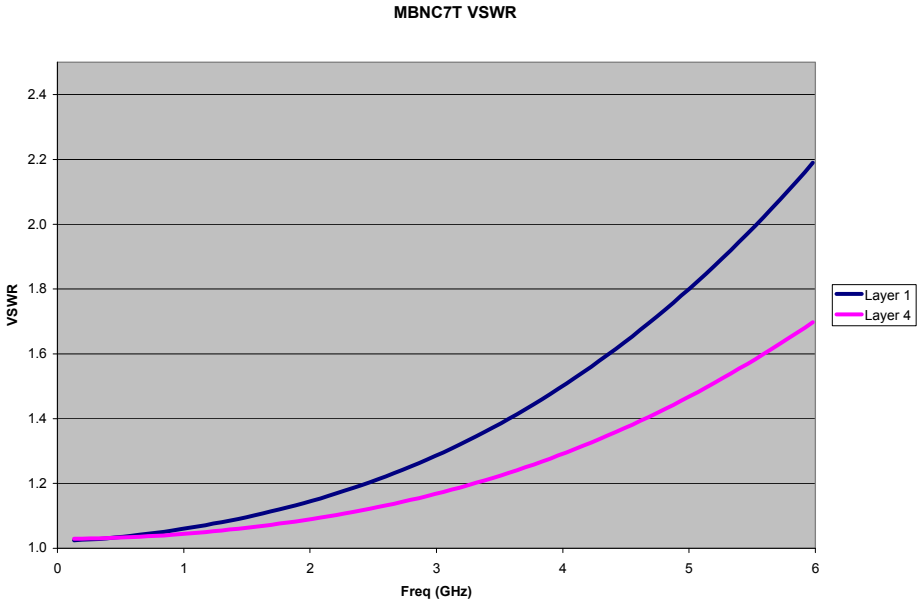

Figure 3: MBNC7-J-P-XX-ST-TH1 VSWR

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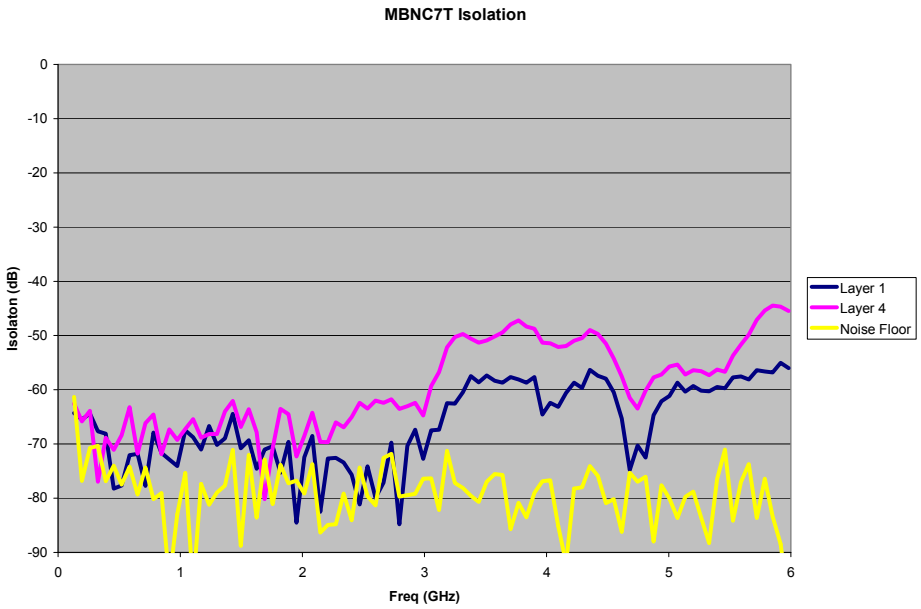

Figure 4: MBNC7-J-P-XX-ST-TH1 Isolation

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Test Procedures

Fixturing:

All measurements were performed using one of the test boards, which have 75-Ω traces (nominal impedance) that connect the four pairs of MBNC7 jacks. During a Return Loss/VSWR measurement the MBNC7 jack was mated to a RF179-74BJ3-79SPC-0100, a 4.2-inch long 75-Ω flexible cable assembly. The far end connector on the test board was also mated to the same type of cable assembly, which was terminated in a 75-Ω load at its second end. During an Isolation measurement two adjacent MBNC7 jacks (having the same type of signal path launch) were each mated to a RF179-74BJ3-79SP3-0100 test cable. Two additional RF179-74BJ3-79SP3-0100 cable assemblies terminated in 75-Ω loads were attached to the far end test board connectors.

A vector network analyzer was used to perform the measurements and was connected to the DUT as follows. One end of a 30-inch long 50-Ω SMA (m/m) test cable is attached to the network analyzer. The second end of the SMA test cable attaches to a SMA (f) to N(m) adapter. The adapter attaches to a 50-Ω N(f) to 75-Ω N(m) impedance matching pad. The matching pad attaches to a 75-Ω N(f) to BNC(m) adapter. The adapter attaches to the BNC (f) end of a RF179-74BJ3-79SP3-0100 75-Ω test cable. The MBNC7 plug end of the test cable attaches to the DUT. The far end of the test board trace is terminated in a 75-Ω load. The 75-Ω test cable BNC7T(m) connector and the board mount jack comprised the mated connector pair under test.

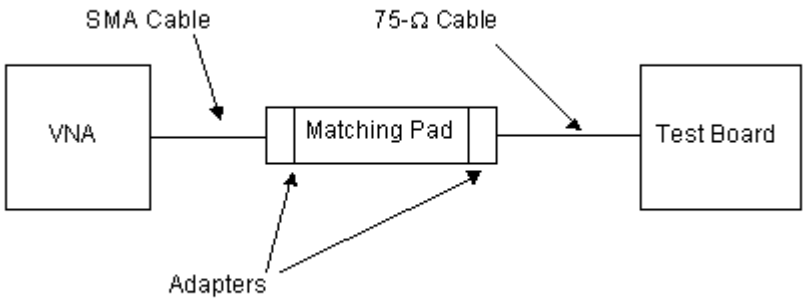

Figure 5: Test Setup for VSWR Measurement

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Return Loss and VSWR Testing

All Return Loss and VSWR measurements were made using an HP 8720A vector network analyzer. It was set for a 201-point measurement response over the frequency range from 130 MHz to 13 GHz to allow use of the low-pass step response time domain transform capability. Response averaging was turned on and set to 8. An S11 1-port measurement calibration was performed at the end of the SMA test cable. The SMA test cable was attached the type N 50-Ω to 75-Ω matching pad, which attached to the DUT by means of a 75-Ω test cable described previously. The far end of the test board was terminated in a 75-Ω load.

The measured response was viewed in the time domain using the low-pass step transform and the real data format. Gating was turned on. The Gate Start and Stop flags were set around the response of the mated pair of interest. See Figure 6 below. The response format was set to linear magnitude (reflection coefficient), and the time domain transform was turned off (but the gate remained on). In converting back to the frequency domain, the effects of the response outside the Gate are removed. The reflection coefficient data were read by a computer over the GPIB and mathematically corrected (multiplied by a factor of 3.72) to account for the two-way attenuation of the matching pad. The data was written in ASCII format to a data file. Data above 6 GHz is not used.

The attenuation effects of the 75-Ω test cable are not taken into account and are a minor source of error. Based on published nominal attenuation values for the test cable type, it is estimated that the error in return loss measurement at 5 GHz is about 0.4 dB. This is equivalent to an error of 0.02 for a VSWR of 1.3, an error of 0.03 for a VSWR of 1.5 and an error of 0.07 for a VSWR of 2.0. The errors are negative, which means the measured results are lower than the actual values.

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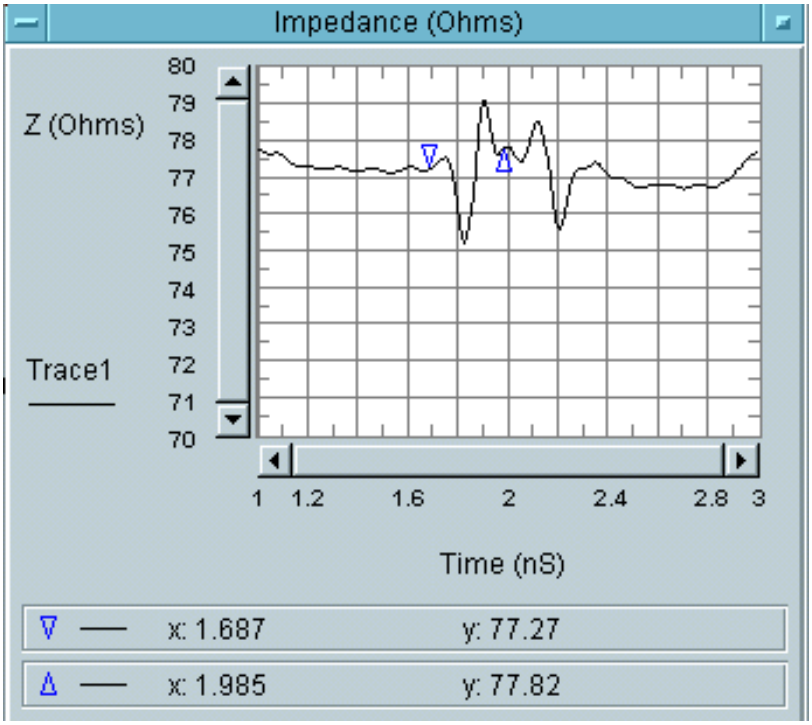

Figure 6. VNA time domain response showing gate placement.

Isolation Testing

The Isolation measurement was made using an HP 8720A vector network analyzer. It was set up the same as for Return Loss and VSWR measurements, except that response averaging was set to 32 and resolution bandwidth was set to 300 Hz to increase dynamic range. An S21 thru response measurement calibration was performed to remove the losses of the test cables and matching pads from the measurement. The SMA test cables coming from the network analyzer were attached to 75-Ω test cables through matching pads and adapters as described previously. The MBNC7 plug ends of the 75-Ω test cables connected to two adjacent jacks. The far end test board connectors were terminated to 75-Ω loads.

The measured response was viewed in log magnitude format. The isolation data was read by a computer over the GPIB and was written in ASCII format to a data file. Data was truncated at 6 GHz. Note that the coupling effects associated with the test board were included in the measurement.

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The test system isolation measurement noise floor was measured by terminating the 75-Ω end of each matching pad in a 75-Ω load. The test cables were kept apart for this measurement.

Equipment

HP 8720A Network Analyzer
Pasternack PE7083 50-Ω N(f) to 75-Ω N(m) Matching Pads