



RF Characterization Report

IJ5H-04-0305-L-2-01SP1

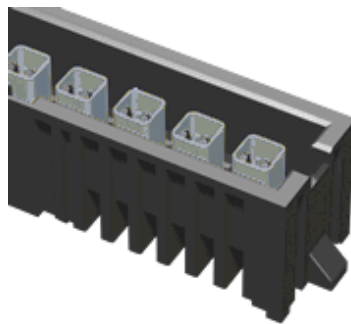
IJ5H-04-0305-L-2-02SP2

IJ5H-04-0305-L-2-03SP3

IJ5H-04-0305-L-2-07SP2



Mated with:
IP5-04-S



Description:
IsoRate™ 50-Ω Cable Assembly

Series: IsoRate™
Description: 50-Ω Cable Assembly

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Series: IsoRate™**Description:** 50-Ω Cable Assembly

Introduction

This testing was performed to evaluate the electrical performance of the IsoRate™ series of 50-Ohm Cable Assemblies. Return Loss, VSWR, Insertion Loss and Isolation measurements of the cable assemblies were made over the frequency range from 130 MHz to 10 GHz. All measurements were made utilizing a test board specifically designed for this project; it is referred to as “test board” in this report. The test board was identified as PCB-101957-TST-22. A calibration board, PCB-101957-TST-99 was also utilized. The measured results include the effects of the entire cable assembly. This includes the coaxial cable plus the mated connectors at each end of the assembly.

Product Description

Each test sample consists of an IJ5-04-S Jack with four RG316 coaxial cables that are terminated in coaxial connectors at the 2nd end. Table 1 below details the 2nd end options for the four assemblies.

Each assembly was tested by mating it to an IsoRate™ IP5-04-S plug, which was part of the test board. One assembly of each type was tested. The actual part numbers that were tested are shown in Table 1. A representative sample picture is shown in Figure 1.

Part Number	2nd End Option
IJ5H-04-0305-L-2-01SP1	SMA Plug
IJ5H-04-0305-L-2-02SP2	MCX Plug
IJ5H-04-0305-L-2-03SP3	MMCX Plug
IJ5H-04-0305-L-2-07SP2	SMB5 Plug

Table 1: Sample Descriptions

Series: IsoRate™

Description: 50-Ω Cable Assembly

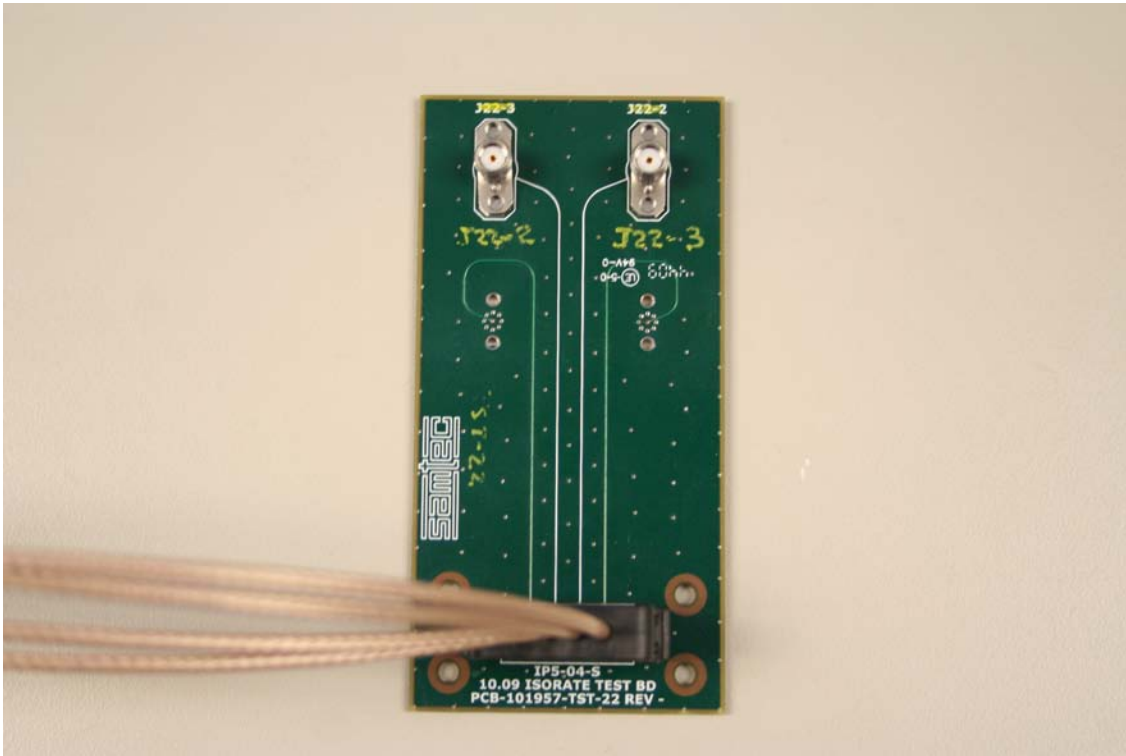


Figure 1: Test Sample Configuration

Series: IsoRate™
 Description: 50-Ω Cable Assembly

Results Summary

Return Loss & VSWR Data

VSWR measurements were performed over the frequency range from 130 MHz to 10 GHz. All measurements were performed with the assembly mated to an IsoRate™ plug, which was part of the test board. The 2nd end of the assembly was mated to an appropriate type of coaxial connector jack, which was connected to a 50-Ω termination. The table below lists the maximum (worst case) Return Loss and VSWR together with the corresponding frequency for each assembly over the frequency range tested.

Test Sample	Max RL (dB)	Max VSWR	Freq (GHz)
IJ5H-04-0305-L-2-01SP1	-9.6	1.98	10.0
IJ5H-04-0305-L-2-02SP2	-8.8	2.15	10.0
IJ5H-04-0305-L-2-03SP3	-9.0	2.10	9.43
IJ5H-04-0305-L-2-07SP2	-8.3	2.25	10.0

Table 2: Return Loss & VSWR Data

VSWR Data Plots

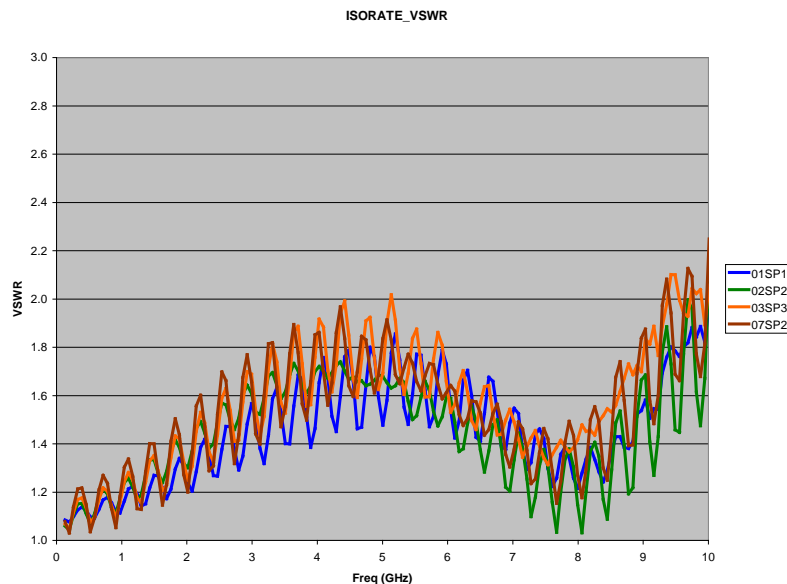


Figure 2: IJ5H-04-0305-L-2-XXXXX VSWR

Series: IsoRate™
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Return Loss Data Plots

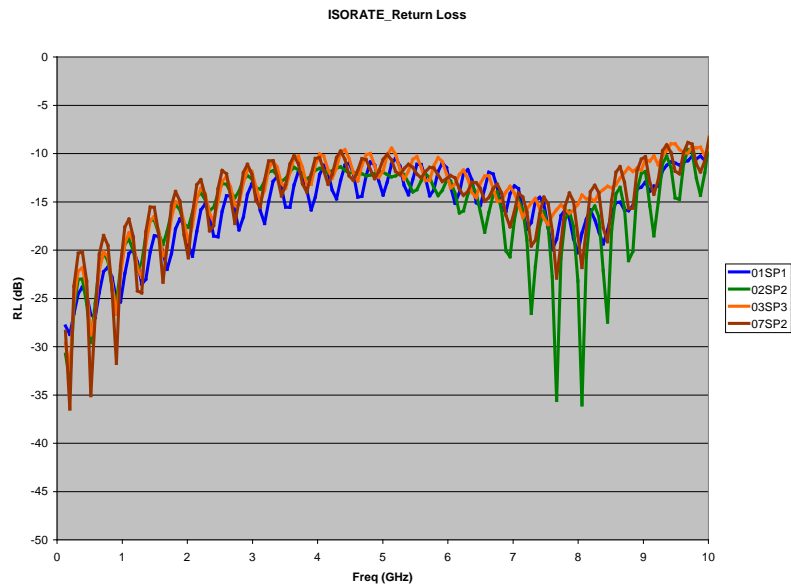


Figure 3: IJ5H-04-0305-L-2-XXXXX Return Loss

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Insertion Loss Data

Insertion Loss measurements were performed over the frequency range from 130 MHz to 10 GHz. All measurements were performed with the assembly mated to an IsoRate™ plug, which was part of the test board. The 2nd end of the assembly was mated to an appropriate adapter with an SMA jack as its 2nd end. The table below lists the maximum (worst case) Insertion Loss with the corresponding frequency for each assembly over the frequency range tested.

Test Sample	Max IL (dB)	Freq (GHz)
IJ5H-04-0305-L-2-01SP1	3.1	9.95
IJ5H-04-0305-L-2-02SP2	3.7	10.0
IJ5H-04-0305-L-2-03SP3	3.7	9.82
IJ5H-04-0305-L-2-07SP2	4.7	10.0

Table 3: Insertion Loss Data

Insertion Loss Data Plots

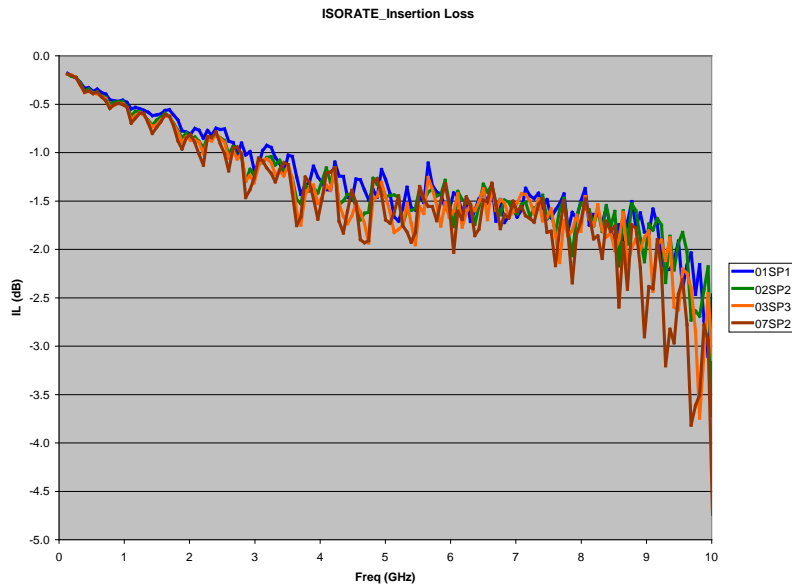


Figure 4: IJ5H-04-0305-L-2-XXXXX Insertion Loss

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Isolation Data

Isolation measurements were performed over the frequency range from 130 MHz to 10 GHz. All measurements were performed with the assembly mated to an IsoRate™ plug, which was part of the test board. The far ends of the assembly were mated to appropriate adapters, which had SMA jacks as their 2nd ends and were terminated to 50-Ω loads. The table below lists the minimum (worst case) Isolation (NEXT) with the corresponding frequency for each assembly over the frequency range tested. Isolation was measured between adjacent connector positions in the IsoRate™ connector.

Test Sample	Min Isolation (dB)	Freq (GHz)
IJ5H-04-0305-L-2-01SP1	-50.6	9.88
IJ5H-04-0305-L-2-02SP2	-48.0	9.49
IJ5H-04-0305-L-2-03SP3	-49.2	9.75
IJ5H-04-0305-L-2-07SP2	-46.3	9.04

Table 4: Isolation (NEXT) Data

Isolation (NEXT) Data Plots

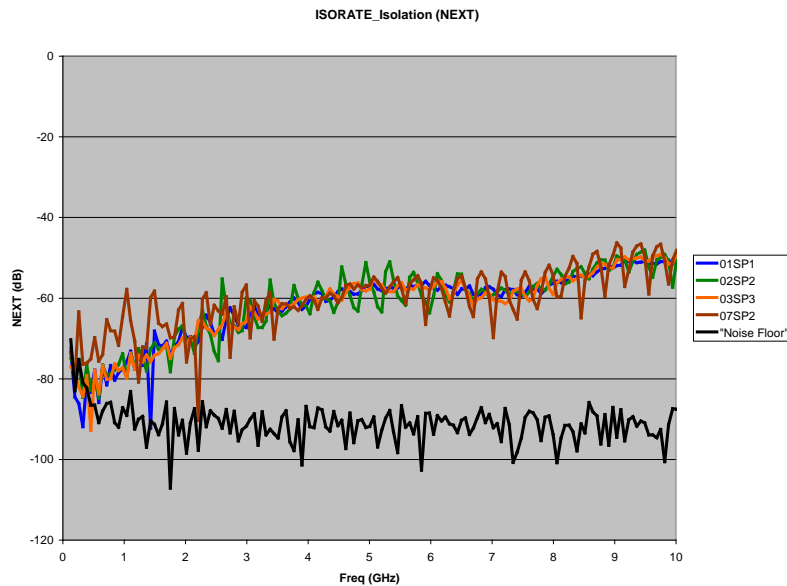


Figure 5: IJ5H-04-0305-L-2-XXXXX Isolation (NEXT)

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Test Procedures

Fixturing:

All measurements were performed with the assembly mated to the test board, which has 3-inch long 50-Ω traces (nominal impedance). The traces connect the test board IsoRate™ plug connector to field replaceable SMA female connectors. The coaxial connectors at the far end of the assembly mate to appropriate coaxial connector adapters, which have SMA female 2nd ends. The SMA female connectors facilitate connection to the test equipment or 50-Ω SMA terminations.

A vector network analyzer is used to perform the measurements and is connected to the DUT using 30-inch long 50-Ω SMA (m/m) test cables through the test card and adapters.

Return Loss & 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 13.1 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 cable was attached to the test board SMA connector, and the far end of the IsoRate™ assembly was terminated to a 50-Ω load through an appropriate adapter.

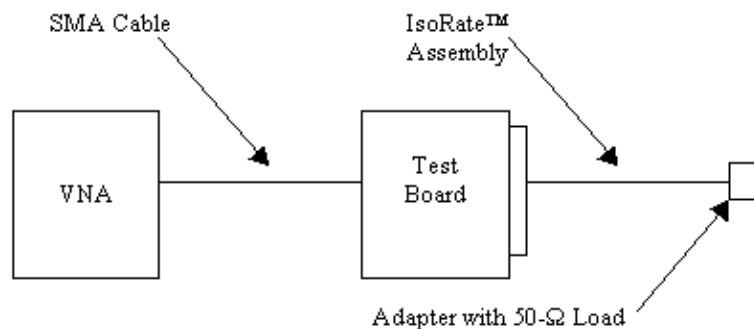


Figure 6: Test Setup for Return Loss and VSWR Measurements

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The measured response is viewed in the time domain using the low-pass step transform and the real data format. Gating is turned on. The Gate Start and Stop flags are set around the response of the assembly to help eliminate the effects of the test board. See Figure 7 below. The response format is set to linear magnitude (reflection coefficient), and the time domain transform is turned off (but the gate remains on). In converting back to the frequency domain, the effects of the response outside the Gate are removed. The reflection coefficient data are read by computer over the GPIB and used to calculate the corresponding return loss and VSWR. The uncorrected return loss and VSWR data is written in ASCII format to a data file. Data above 10 GHz is not used. The 2-way loss through the test board trace is accounted for by measuring the insertion loss of the CAL Board 2X THRU trace and applying the necessary correction to the raw return loss data. The corrected return loss data is used to calculate the corrected VSWR data.

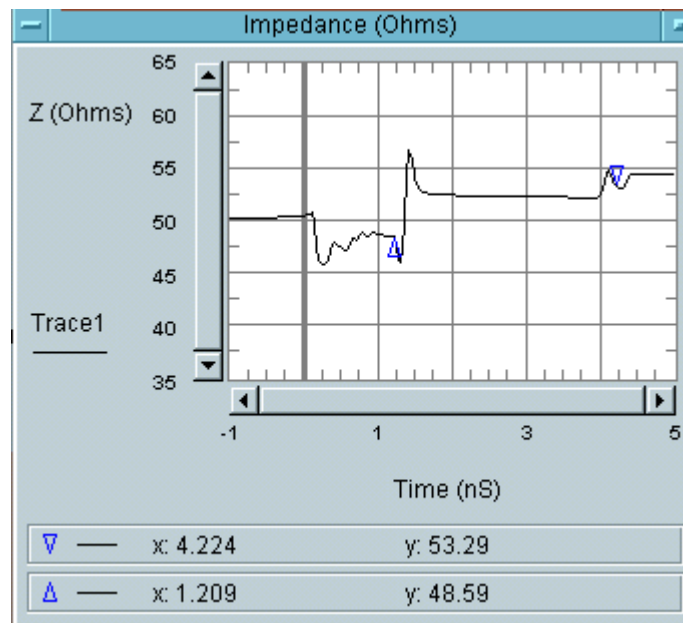


Figure 7. Typical time domain response showing gate placement.

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Insertion & Isolation Testing

The Insertion Loss and Isolation measurements were made using the HP 8720A vector network analyzer. It was set for a 201-point measurement response over the frequency range from 130 MHz to 13.1 GHz. Response averaging was turned on and set to 8 for IL. For the Isolation measurements response averaging was set to 32 and resolution bandwidth was set to 300 Hz to increase dynamic range. An S21 response THRU calibration measurement was performed with the 2 SMA test cables from the VNA connected together with an SMA f/f adapter.

For Insertion Loss testing one SMA test cable attached to the test board and the 2nd SMA test cable attached to the far end of the IsoRate™ assembly through an appropriate adapter. The measured response was viewed in log magnitude format. The uncorrected insertion loss data were read by computer over the GPIB. The data is written in ASCII format to a data file. Data above 10 GHz is not used. The loss through the test board trace is accounted for by measuring the CAL Board 2X THRU trace insertion loss and applying to the necessary correction ($\frac{1}{2}$ of the dB loss of the 2X THRU trace) to the raw data.

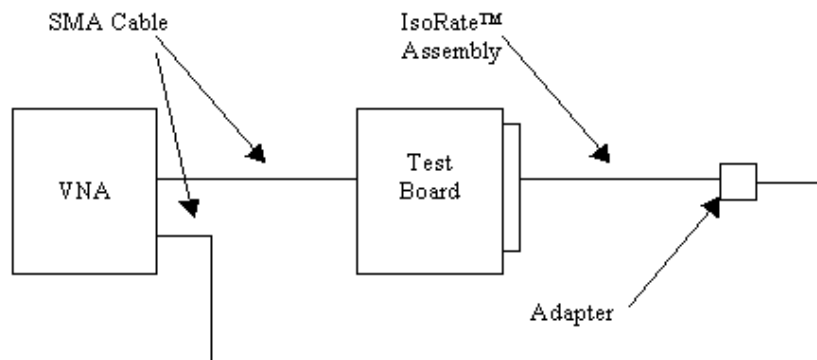


Figure 8: Test Setup for Insertion Loss Measurements

For Isolation testing the 2 SMA test cables from the VNA attached to the test board field replaceable SMA's corresponding to Positions 2 and 3 of the IsoRate™ connector (adjacent positions). The far ends of the IsoRate™ assembly were terminated in 50-Ω SMA loads through appropriate adapters. The data was viewed in log magnitude format. The uncorrected isolation data were read by computer over the GPIB. The data is written in ASCII format to a data file. Data above 10 GHz is not used. The loss through the test board traces is accounted for by measuring the CAL Board 2X THRU trace insertion loss and applying to the necessary correction (loss of the 2X THRU trace) to the raw data.

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Note that the coupling effects associated with the test board are included in the measurement.

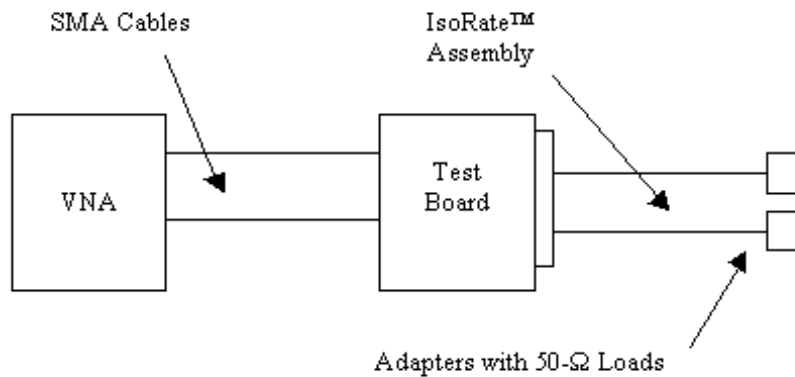


Figure 9: Test Setup Isolation Measurements

The test system isolation measurement noise floor was measured by terminating each of the SMA test cables in a 50-Ω SMA load. The noise floor data was acquired while making sure the test cables were kept apart.

Equipment

HP 8720A Network Analyzer