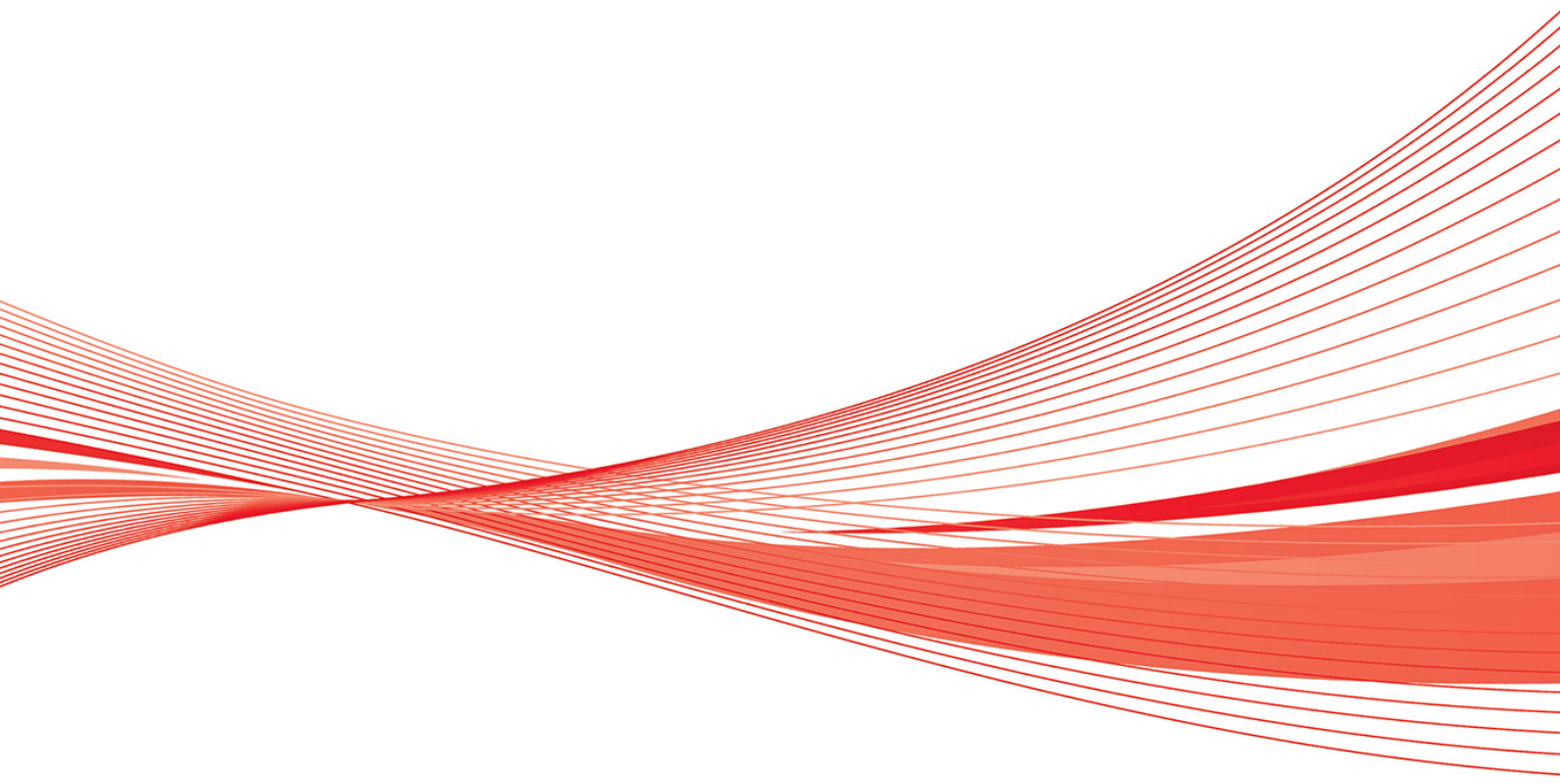
Harwin Test Report Summary

HT08401

Archer .5 (M58-X50 Series)

Electrical, Mechanical & Environmental Testing



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1. Introduction

1.1. Description and Purpose

Archer .5 (M58 Series) is a range of board-to-board mezzanine 0.5mm pitch connectors in a double row format with polarized, shrouded housings. The connectors are available in male and female vertical connector styles for surface mount soldering, with contact counts up to 100 (50+50).

The Archer .5 range offers a low profile, high density connector in tape & reel ready for high volume automated assembly, and high speed signal transmission. The following tests were performed to confirm the connectors meet the proposed specifications under the EIA-364 electrical connector standards.

1.2. Conclusion

The following data has been taken from Harwin Test report QA000350. The results were used to define the Component Specification C053XX for the Archer .5 range. The tests indicate that the Archer .5 range performs as required, suitable for a wide range of applications calling for high density, high speed, board-to-board connectors.

2. Test Method and Requirements

2.1. Specification Parameters

Tests were carried out in general accordance with EIA-364 standards. The list of tests covered in this summary are as follows:

Testing Standard	Description of Test	Section	Page No.
EIA-364-23B: 2000	Contact Resistance	3.1	3
EIA-364-70A: 1998	Current Rating	3.2	3-4
EIA-364-09C: 1999	Durability	3.3	5
EIA-364-20C: 2004	Withstand Voltage	3.4	5
EIA-364-21C: 2000	Insulation Resistance	3.4	5
N/A	Temperature Life (without load)	3.5	6
EIA-364-32C: 2000	Thermal Shock (Temperature Cycling)	3.6	6
EIA-364-26B: 1999	Salt Spray	3.7	6
EIA-364-31B: 1999	Humidity	3.8	6
EIA-364-28D: 1999 (BS EN 60068-2-6: 2008 Test Fc)	Vibration	3.9	6
EIA-364-27B: 1996	Mechanical Shock	3.10	6
N/A (Signal Integrity – 3.11 [9])	Differential Insertion Loss	3.11.1	7-8
	Differential Return Loss	3.11.2	9
	Impedance	3.11.3	10
	Crosstalk (Near-end)	3.11.4	11

2.2. List of Connectors

The following connectors are used throughout the testing:

- M58-2500342R – Female 30 contact SMT connector
- M58-3500342R – Male 30 contact SMT connector
- M58-2500442R – Female 40 contact SMT connector
- M58-3500442R – Male 40 contact SMT connector
- M58-2500842R – Female 80 contact SMT connector
- M58-3500842R – Male 80 contact SMT connector
- M58-2501042R – Female 100 contact SMT connector
- M58-3501042R – Male 100 contact SMT connector

3. Test Results

3.1. Contact Resistance to EIA-364-23: 2000

Specification: **Initial:** 60mΩ max. per contact.
Post-Conditioned: 80mΩ max. per contact.

Methodology: A minimum of 5 contact pairs in fully assembled mated connectors were measured using a precision milli/mico-ohmeter for resistance prior to any electrical, mechanical, or environmental testing. The pre-conditioned samples tested are detailed below.

Initial Contact Resistance (mΩ)			
Mated Pair	Max	Min	Average
Sample 1	54.6	43.86	50.06
Sample 2	58.2	44.56	50.79
Sample 3	59.1	45.23	50.87
Sample 4	55.5	50.87	50.73

Post conditioned samples were subjected to contact resistance testing. The results are detailed below.

Post Conditioned Contact Resistance (mΩ)			
Condition	Max	Min	Average
Temperature Life	59.3	53.3	55.8
Thermal Shock	58.4	53.3	55.6
Humidity	64.7	57.8	61.1
Salt Spray	58.8	51.5	54.8
Vibration	56.6	54.1	55.3
Mechanical Shock	57.2	53.7	55.1
Durability	58.4	54.1	55.6

3.2. Power Rating (Current vs Temperature Rise) to EIA-364-70A: 1998

Specification: Current Rating = 0.5A per contact.

Methodology: The test demonstrates the current carrying capacity of pre-conditioned Archer .5 connectors, using test methodology EIA-364-70A: 1998. The mated connector pairing had contacts linked in series through traces on custom test PCBs. The thermocouple was positioned in the middle of the outer face of the female connector to avoid damaging contacts in the measurement process.

Current was applied in 0.1A steps from 0A to 0.5A (minimum). The results are detailed in the following graphs.

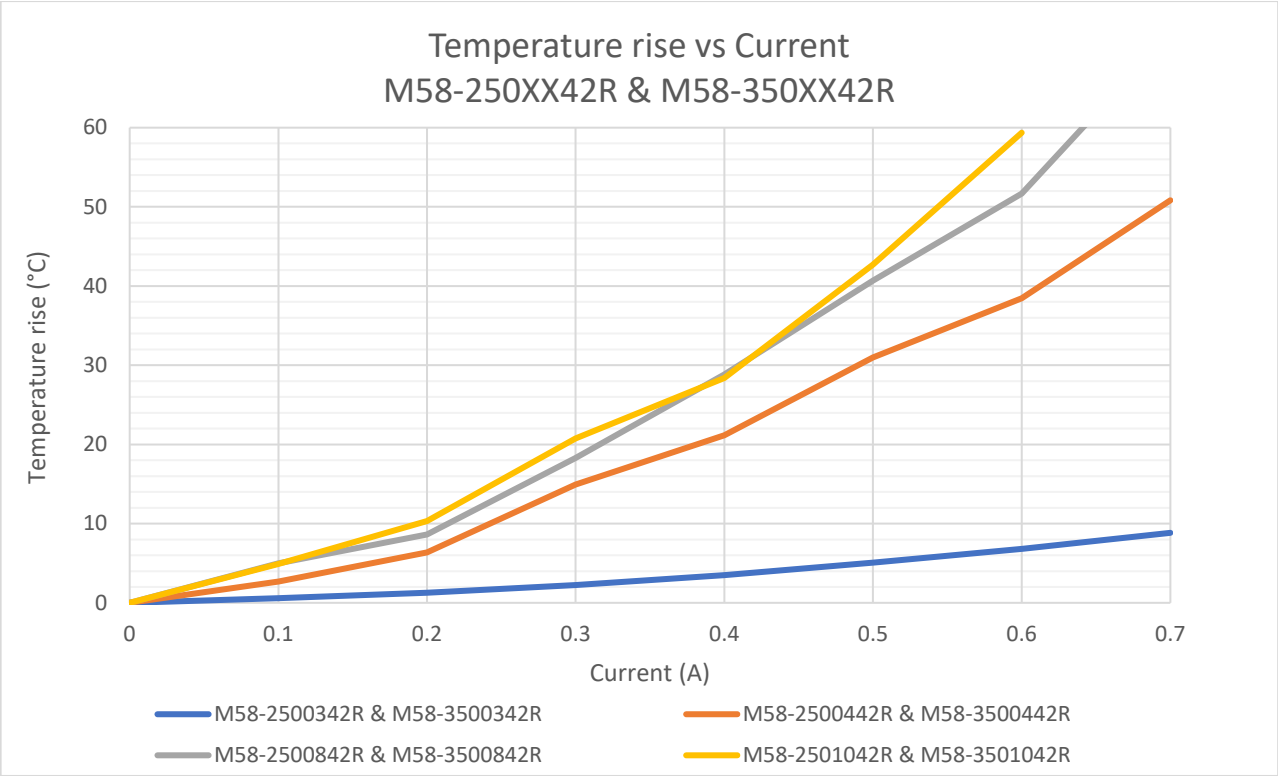

Figure 1: Temperature Rise vs Current for Different Contact Counts

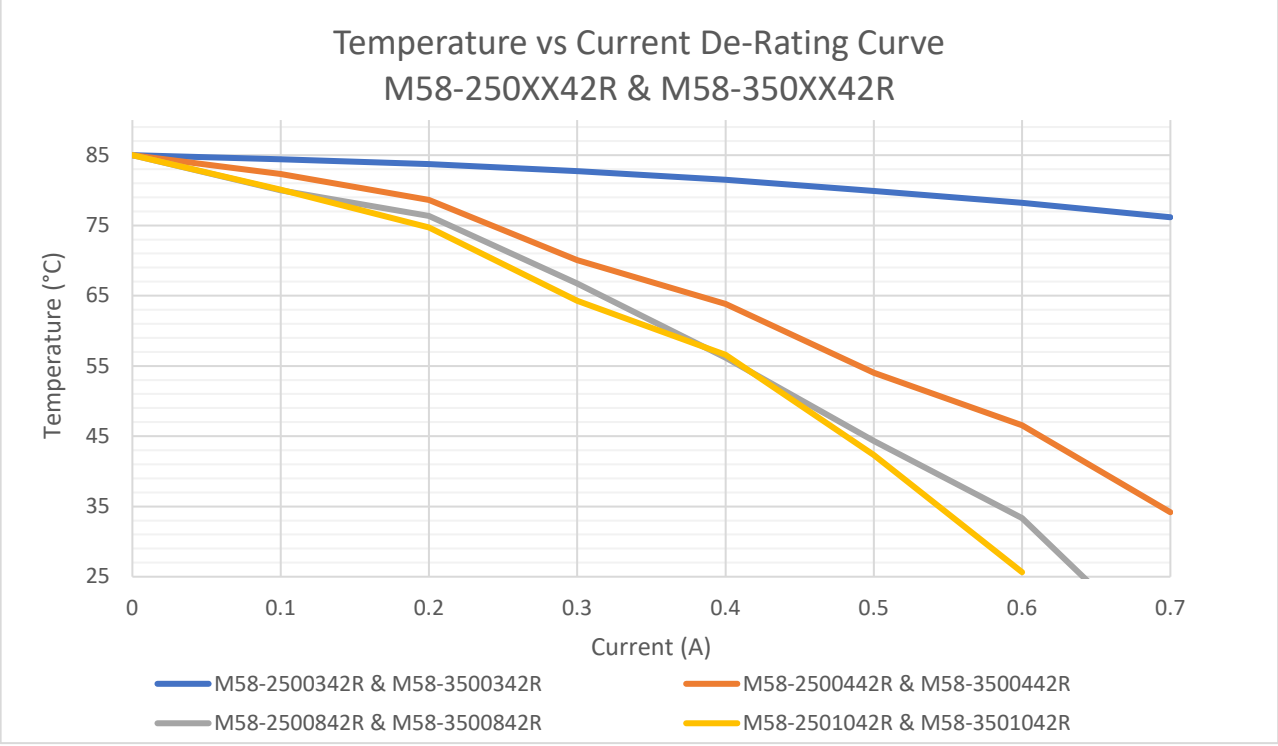

Figure 2: De-rate Curve for Different Contact Counts

3.3. Durability to EIA-364-09C: 1999

Specification: 1.0N maximum insertion force per contact, 0.1N minimum withdrawal force per contact.

Methodology: For this test fully-assembled connector pairs were mated at a speed of 25±3 mm/min for 30 cycles minimum, in general accordance with EIA-364-09C.

Mated Pair	Pre-conditioned
M58-2500342R & M58-3500342R	PASS
M58-2500442R & M58-3500442R	PASS
M58-2500842R & M58-3500842R	PASS
M58-2500842R & M58-3500842R	PASS

3.4. Withstand Voltage to EIA-364-20C: 2004 & Insulation Resistance to EIA-364-21C: 2000

Withstand Voltage

Specification: Voltage Proof = 150V AC/DC for 60 seconds, Current leakage: 1mA max.

Methodology: A minimum of 150V AC (60Hz) was applied to connector pairs in two series cicuits for 60 seconds to determine whether breakdown or flashover occurred. Current leakage was measured during the test. Samples were visually inspected following the test, with no obvious changes to the connectors occuring.

Mated Pair	Pre-conditioned
M58-2500342R & M58-3500342R	PASS
M58-2500442R & M58-3500442R	PASS
M58-2500842R & M58-3500842R	PASS
M58-2500842R & M58-3500842R	PASS

Insulation Resistance

Specification: 1000MΩ min at 150V.

Methodology: 150V was applied to connector pairs in two series circuits to determine whether the resistance satisfies the required specifcation values of >1000MΩ. Samples were visually inspected following the test, with no obvious changes to the connectors occuring.

Mated Pair	Pre-conditioned
M58-2500342R & M58-3500342R	PASS
M58-2500442R & M58-3500442R	PASS
M58-2500842R & M58-3500842R	PASS
M58-2500842R & M58-3500842R	PASS

3.5. Temperature Life (Without Load)

Specification: Operating temperature = -55°C to +85°C.

Methodology: All connectors tested were mounted to boards through solder reflow and so were subjected to temperatures exceeding 150°C prior to any testing. The connectors were subjected to 96 hours at +85°C and 96 hours at -55°C. Samples were visually inspected following the test, with no obvious changes to the connectors occurring. Contact resistance was measured, see section 3.1 for results.

3.6. Thermal Shock (Temperature Cycling) in general accordance with EIA-364-32C: 2000

Specification: 5 cycles: -55°C for 30 minutes, +85°C for 30 minutes.

Methodology: Samples were tested in general accordance with EIA-364-32C: 2000 Test Condition 1. This test was conducted by cycling the temperature between the two extremes (-55°C to +85°C) for 5 cycles with a dwell time of 30 minutes at each extreme. Samples were visually inspected following the test, with no obvious changes to the connectors occurring. Contact resistance was measured, see section 3.1 for results.

3.7. Salt Spray in general accordance with EIA-364-26B: 1999

Specification: 24hrs continuous salt spray, Salt Solution: 5% NaCl, Salt Mist Chamber Temp.: +35°C±2°C.

Methodology: Samples were tested in general accordance with and EIA-364-26B. The samples were rinsed clean following testing and were visually inspected following the test, with no obvious changes to the connectors occurring. Contact resistance was measured, see section 3.1 for results.

3.8. Humidity to EIA-364-31B: 1999

Specification: 24 hours pre-conditioning at +50°C, Relative Humidity: 90-95%, Temperature: +40°C, Duration: 96hrs

Methodology: Samples were tested in general accordance with EIA-364-31B: 2000 Method 2 Test Condition A. The samples were preconditioned for 24 hours at 50°C, then conditioned in a humidity chamber for 96 hours at 40°C with 90-95% relative humidity. The connectors were subjected to a visual inspection post-testing. There were no obvious changes as a result.

Post conditioned testing was performed for Contact Resistance (section 3.1) and Withstand Voltage and Insulation Resistance (section 3.4).

3.9. Vibration to EIA-364-28D: 1999 (BS EN 60068-2-6: 2008 Test Fc)

Specification: 10Hz to 55Hz, 1.5mm pk-pk displacement, 198m/s^2 (20G), 2 hours in each of three axes.

Methodology: Samples were tested in general accordance with BS EN 60068-2-6: 2008 Test Fc and EIA-364-28D Test Condition 4. The pre-conditioned samples were subjected to a Swept Sine Test with continuous monitoring at ≥1 microsecond. Upon completion of testing the samples were visually inspected; no obvious changes to the samples were noted.

3.10. Mechanical Shock to EIA-364-27B: 1996

Specification: Acceleration: 50G (gn), Peak value 490m/s^2, Shock Shape: Half Sine Pulse, 3 shocks in each axis.

Methodology: Shock Test Sequence was carried out on pre-conditioned samples. During the test, the samples were monitored continuously for discontinuities of ≥1 microsecond. Upon completion of testing the samples were visually inspected, no obvious changes to the samples.

3.11. Signal Integrity

Specification: Connectors were analysed on the following: Differential Insertion loss, Differential Return loss, Impedance, and Crosstalk (NEXT).

Methodology: Samples were tested for differential insertion and return loss up to 12GHz using a VNA with the mated samples connected through surface mount SMA's with impedance matched traces. Impedance profiles were produced using a rise time of 35ps.

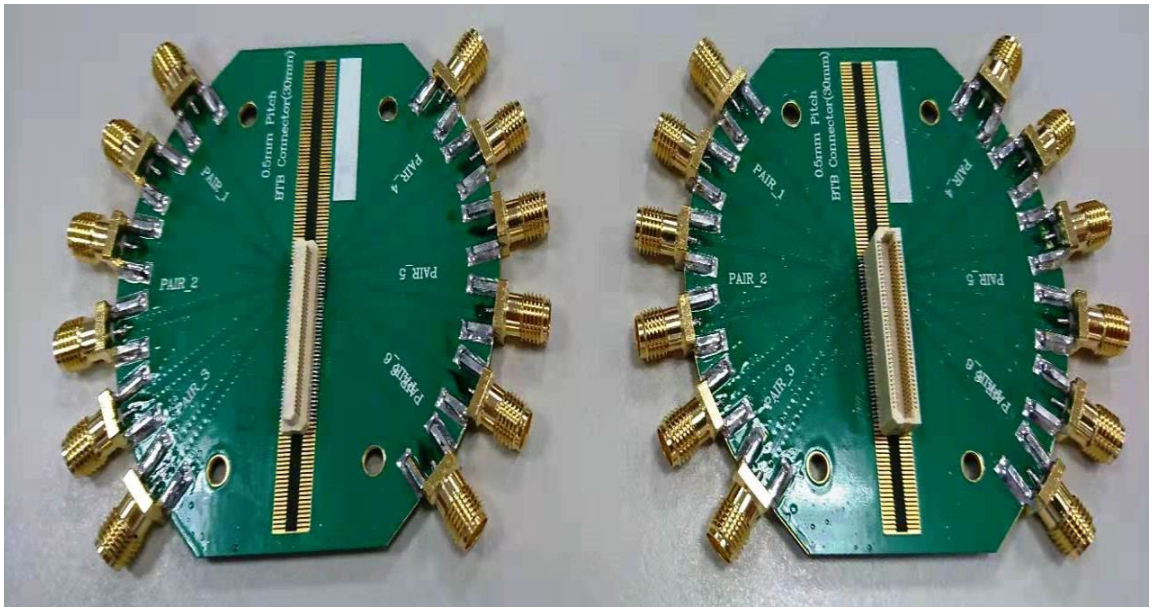

Figure 3: Signal Integrity Test PCB's

The results are shown in the following order:

Differential Insertion Loss – section 3.11.1:

- 12GHz Test (6 contact pairs, 1 contact pair per plot) .....-1.2dB @ 8GHz

Differential Return Loss – section 3.11.2:

- 12GHz Test (6 contact pairs, 1 contact pair per plot) .....-15dB @ 8GHz

Impedance – section 3.11.3:

- 35ps rise time Test.....73.5-99.3Ω @ 35ps

Crosstalk – section 3.11.4:

- 12GHz Test .....-35dB @ >12GHz (NEXT)

3.11.1. Differential Insertion Loss (12GHz)

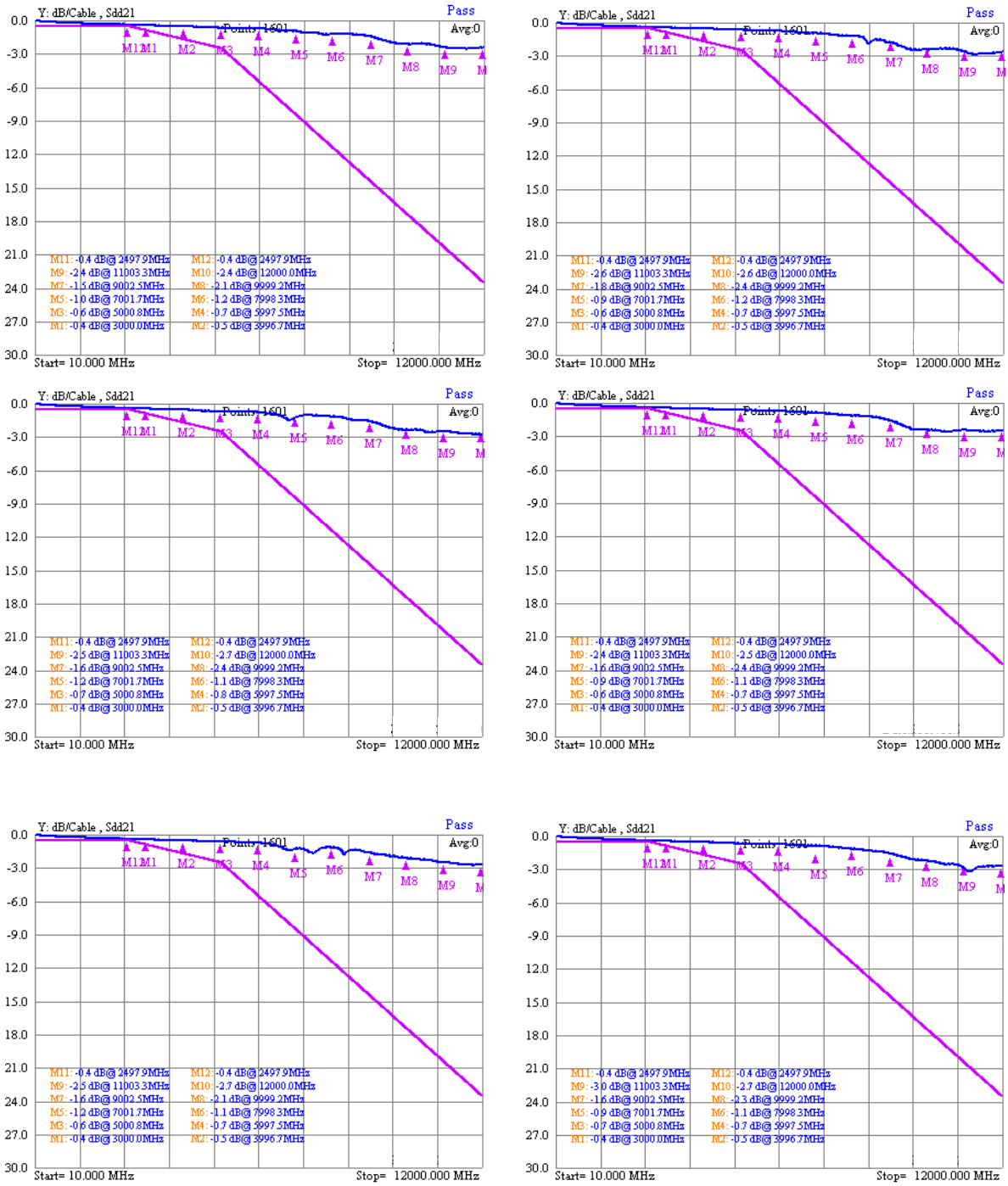

Figure 4: Differential Insertion Loss measured up to 12GHz (-1.2dB @ 8GHz)

3.11.2. Differential Return Loss (12GHz)

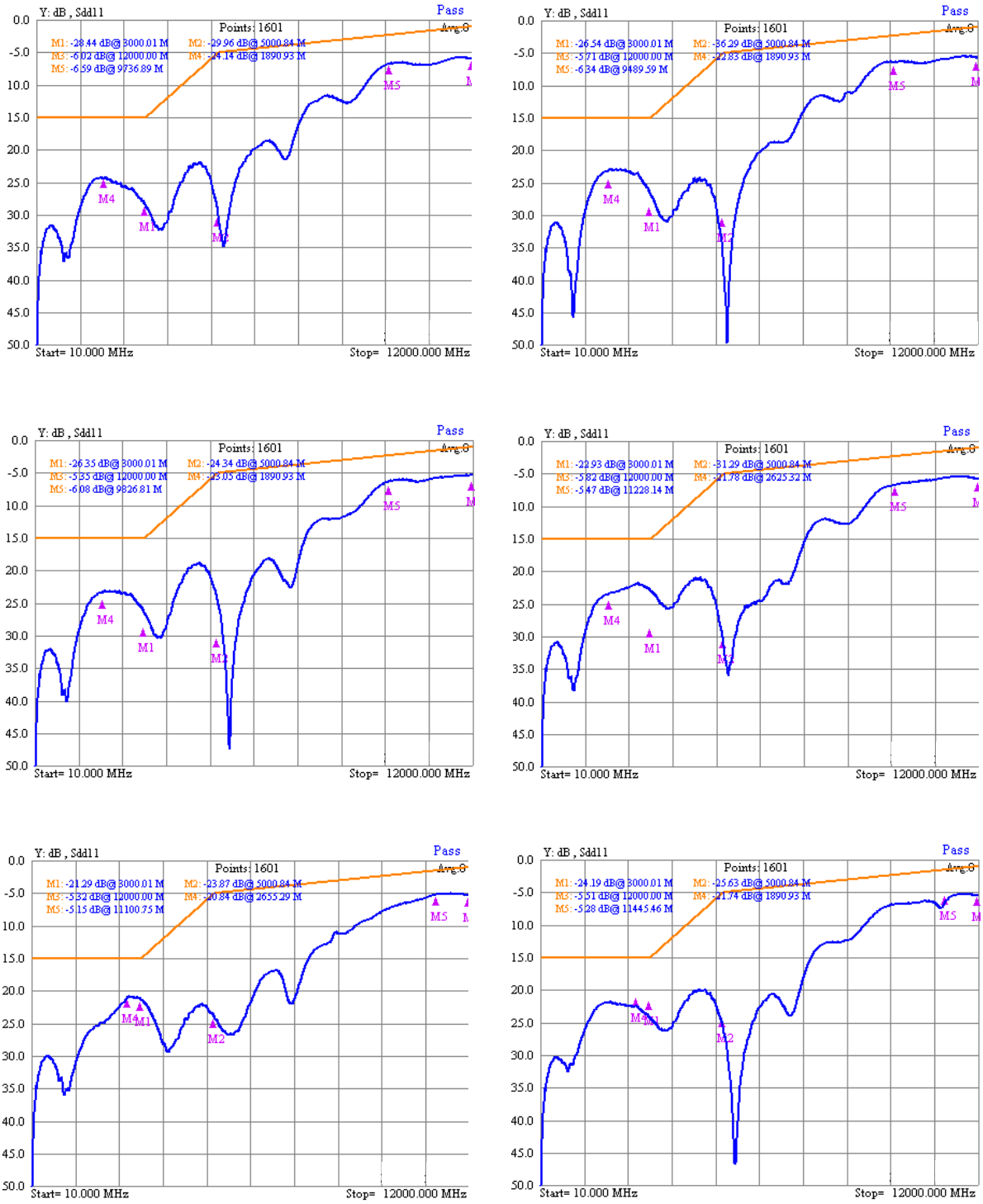

Figure 5: Differential Return Loss measured up to 12GHz (-15dB @ 8GHz)

3.11.3. **Impedance** (28.5GHz)

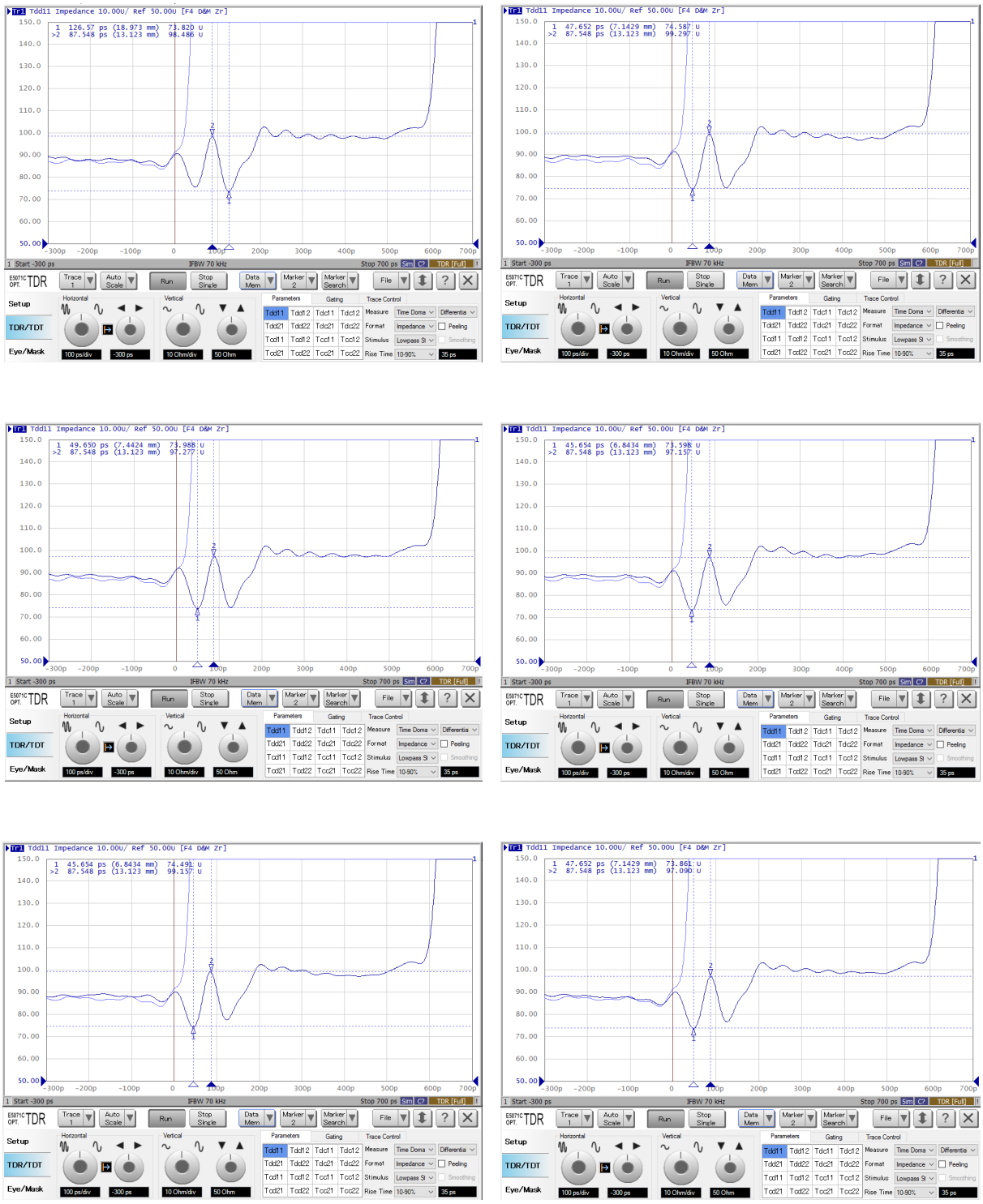

Figure 6: Impedance profile measured at 28.5GHz (73.5-99.3Ω @ 35ps)

3.11.4. **Crosstalk** (12GHz)

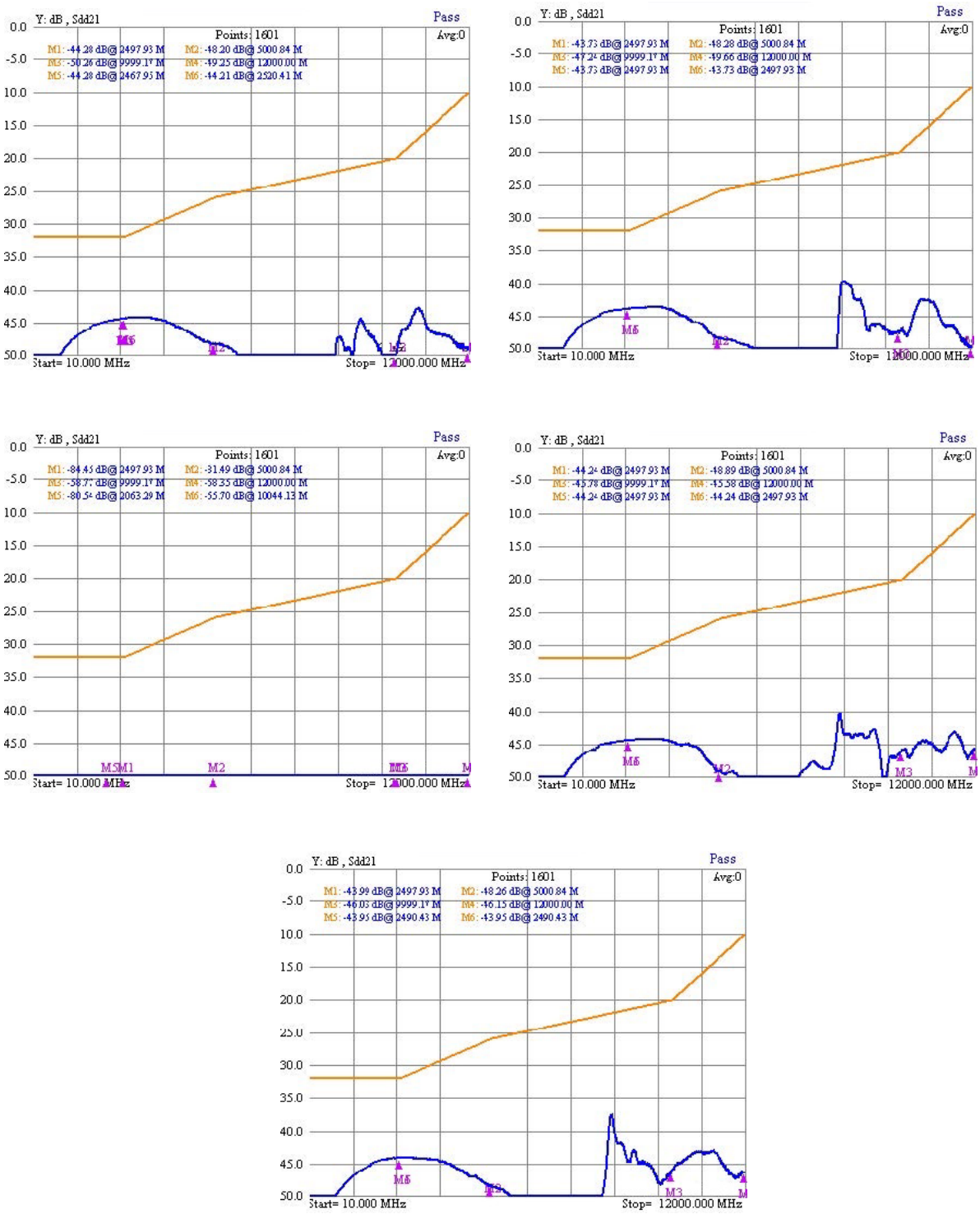

Figure 7: Near-end Crosstalk measured up to 12GHz (-35dB @ >12GHz)