



# HARWIN

## Test Report Summary

HT09001

Electrical, Mechanical & Environmental Testing  
FLECTO - Floating Connectors  
0.5mm, 0.635mm and 0.8mm Pitch

## 1. Introduction

### 1.1. Description and Purpose

FLECTO is a range of board-to-board connectors with three pitch options: 0.5mm, 0.635mm and 0.8mm. The connectors are available in male and female connector styles for surface mount soldering, with contact counts up to 160.

This range offers high density connectors in tape & reel, ready for high volume automated assembly. 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 Reports QA000559, QA000572 and QA000573. The results confirm the parts achieved our required specifications, as detailed in the Component Specification C057XX. The tests indicate that the FLECTO range is suitable for a wide range of applications requiring high density, board-to-board connectors with the flexibility of a floating system.

## 2. Test Method and Requirements

### 2.1. Specification Parameters

Tests were carried out in general accordance with EIA-364 and EN standards.

Testing Standard	Description of Test	Section	Page No.
EIA-364-23	Contact Resistance	3.1	3
EIA-364-70	Power Rating	3.2	4
EIA-364-09	Durability	3.3	5
EIA-364-20	Withstand Voltage	3.4	6
EIA-364-21	Insulation Resistance	3.5	6
EIA-364-17/ EN 60512-5-2	Temperature Life (without load)	3.6	7
EIA-364-32	Thermal Shock (Temperature Cycling)	3.7	8
EIA-364-26/EN 60068-2-52	Salt Spray	3.8	9
EIA-364-31	Humidity	3.9	10
EIA-364-28	Mechanical Vibration	3.10	11
EIA-364-27	Mechanical Shock	3.11	12
N/A: Signal Integrity	Differential Insertion Loss	3.12.1	13-14
	Differential Return Loss	3.12.2	15
	Impedance	3.12.3	16
	Crosstalk	3.12.4	17-18

**3. Test Results**

**3.1. Contact Resistance to EIA-364-23**

Methodology: A minimum of 5 contact pairs in fully assembled mated connectors were measured using a precision milli/micro-ohmmeter for resistance prior to any electrical, mechanical, or environmental testing.

Specification:

Range	Initial	After Conditioning
F10-100, F10-101 Female	80mΩ max	Additional 10mΩ max variation
F10 Male F10-102 Female	100mΩ max	
F12 Male/Female		
F11 Signal contacts	70mΩ max	Additional 10mΩ max variation
F11 Power contacts	20mΩ max	
F20 Male/Female	100mΩ max	
F30 Male/Female		

Results: Initial Contact Resistance

Range	Mated Pair	Max (mΩ)	Min (mΩ)	Average (mΩ)	
F10 / F11 / F12 series	Signal	Sample 1	17.94	16.31	17.15
		Sample 2	17.98	16.28	17.17
		Sample 3	17.98	16.29	17.20
		Sample 4	17.94	16.32	17.14
		Sample 5	17.96	16.29	17.19
	Power	Sample 1	8.63	8.08	8.35
		Sample 2	8.85	8.14	8.51
		Sample 3	8.66	8.17	8.43
		Sample 4	8.77	8.12	8.55
		Sample 5	8.90	8.09	8.54
F20 series	Sample 1	63.67	55.63	59.59	
	Sample 2	63.38	55.39	59.42	
	Sample 3	63.75	55.42	59.55	
	Sample 4	63.80	55.38	60.27	
	Sample 5	63.58	55.52	59.90	
F30 series	Sample 1	51.66	43.62	47.35	
	Sample 2	51.68	43.77	47.90	
	Sample 3	51.67	43.66	47.69	
	Sample 4	51.43	43.60	47.57	
	Sample 5	51.66	43.56	47.45	

Post conditioned samples were subjected to contact resistance testing. The results are detailed in the applicable sections.

### 3.2. Power Rating (Current vs Temperature)

Methodology: F10 / F12 / F20 / F30 Series were tested to EIA-364-70, Method 1. The test samples were energized to a specific current until thermal stability was achieved; the temperature rise was then measured.

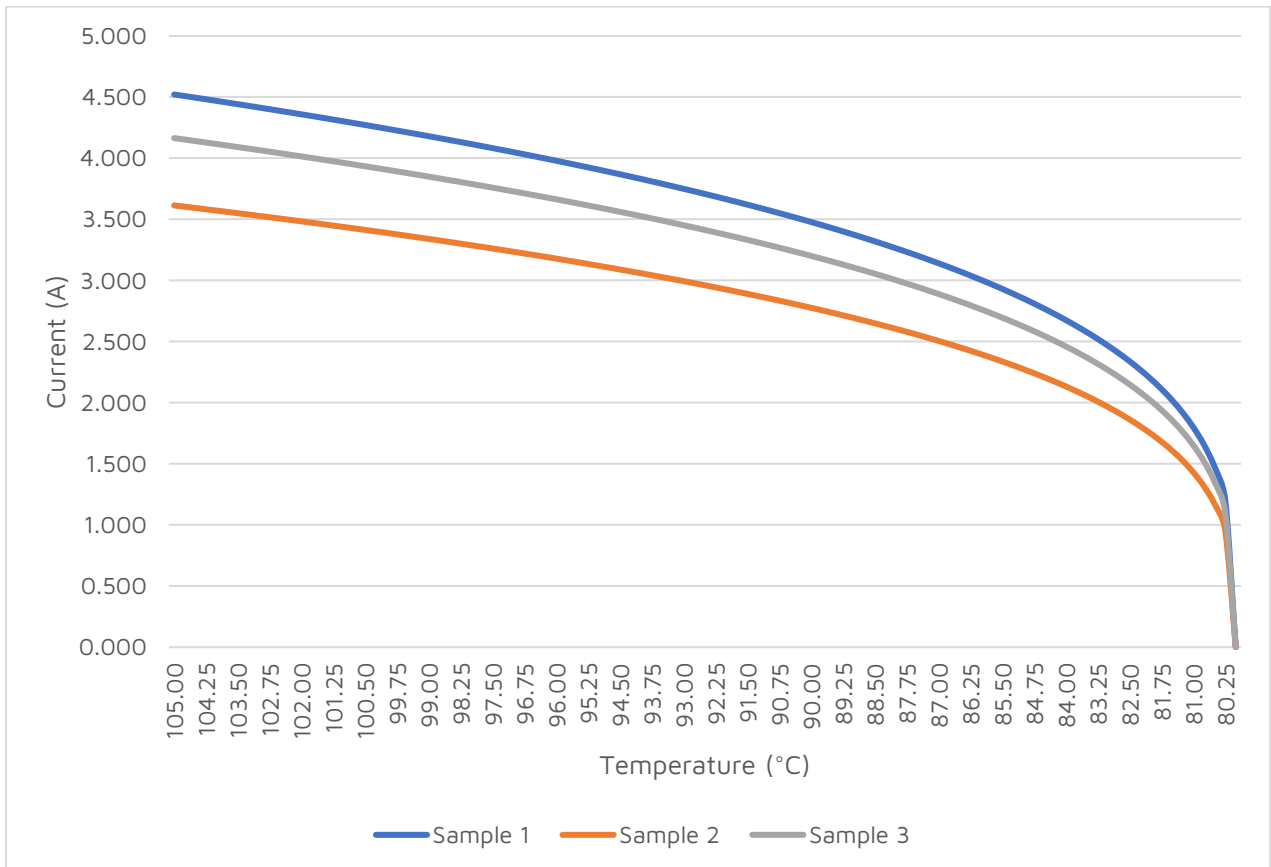
F11 Series were tested to EN 60512-5-2 and subjected to a 40°C temperature rise from an ambient temperature of 80°C. The current was measured throughout the test.

Specification: Maximum temperature rise of 30°C allowed.

Range	Current (max per contact)
F10 / F12 series	0.4A
F11 series - signal contacts	0.5A
F11 series - power contacts	3.0A
F20 / F30 series	0.5A

Results: Temperature rise at set current.

Range	Set Current	Temperature Rise (°C)				
		Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
F10 / F12 Series	0.4A	3.245	2.759	4.528	3.674	3.097
F20 Series	0.5A	6.372	5.324	7.228	6.319	4.058
F30 Series	0.4A	4.637	5.085	4.917	5.983	7.225



**F11 Series Power Contacts Derating Graph**

### 3.3. Durability to EIA-364-09

Methodology: Fully assembled connector pairs were mated at a speed of 25.4 mm/min for the specified number of mating cycles, in accordance with EIA-364-09.

Specification:

Range	Durability (minimum no. of mating cycles)	Initial Insertion Force (EIA-364-13)	Withdrawal Force (EIA-364-13C)
F10 series	100	0.8N max	0.1N min
F11 series	100	0.8N max	0.1N min
F12 series	30	0.8N max	0.1N min
F20 series	100	0.5N max	0.05N min
F30 series	100	0.8N max	0.1N min

Results: Initial Forces.

Range	Test	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
F10 series	Insertion Force (N)	PASS	PASS	PASS	PASS	PASS
	Withdrawal Force (N)	PASS	PASS	PASS	PASS	PASS
F11 series	Insertion Force (N)	PASS	PASS	PASS	PASS	PASS
	Withdrawal Force (N)	PASS	PASS	PASS	PASS	PASS
F12 series	Insertion Force (N)	PASS	PASS	PASS	PASS	PASS
	Withdrawal Force (N)	PASS	PASS	PASS	PASS	PASS
F20 series	Insertion Force (N)	PASS	PASS	PASS	PASS	PASS
	Withdrawal Force (N)	PASS	PASS	PASS	PASS	PASS
F30 series	Insertion Force (N)	PASS	PASS	PASS	PASS	PASS
	Withdrawal Force (N)	PASS	PASS	PASS	PASS	PASS

Results: Contact Resistance after the Durability test.

Range	Mated Pair	Max (mΩ)	Min (mΩ)	Average (mΩ)	
F10 / F11 / F12 series	Signal	Sample 1	22.90	20.13	21.67
		Sample 2	22.93	20.09	21.45
		Sample 3	22.97	20.17	21.52
		Sample 4	22.89	20.08	21.54
		Sample 5	22.91	20.11	21.33
	Power	Sample 1	13.79	12.17	12.86
		Sample 2	13.92	13.24	13.62
		Sample 3	13.86	12.97	13.32
		Sample 4	13.81	12.86	13.31
		Sample 5	13.48	12.17	13.06
F20 series	Sample 1	71.41	59.37	65.70	
	Sample 2	71.41	59.46	66.23	
	Sample 3	71.52	59.59	66.03	
	Sample 4	71.36	59.51	66.14	
	Sample 5	71.44	59.43	66.04	
F30 series	Sample 1	62.06	52.73	57.52	
	Sample 2	62.13	52.67	57.46	
	Sample 3	62.16	52.73	57.79	
	Sample 4	62.14	52.84	57.26	
	Sample 5	62.10	52.74	57.60	

### 3.4. Withstand Voltage to EIA-364-20

Methodology: The specified Dielectric Withstanding Voltage (DWV) was applied to connector pairs for 60 seconds to determine whether breakdown or flashover occurred. Current leakage was measured during the test. Samples were visually inspected for damage after testing.

Specification:

Range	DWV
F10 / F12 / F30 series	250V AC/DC for 1 minute
F11 series	150V AC/DC for 1 minute
F20 series	200V AC/DC for 1 minute

Results:

Range	Sample size	Initial DWV	DWV after test		
			Humidity (section 3.9)	Cycling Humidity	Salt Spray (section 3.8)
F10 / F11 / F12 series	5	PASS	PASS	PASS	-
F20 series	5	PASS	PASS	PASS	PASS
F30 series	5	PASS	PASS	PASS	PASS

### 3.5. Insulation Resistance to EIA-364-21

Methodology: 250V was applied to connector pairs in two series circuits to determine whether the resistance satisfies the required specification values. Samples were visually inspected for damage after testing.

Specification:

Range	Insulation Resistance
F10 / F11 series	100MΩ min
F12 / F20 / F30 series	500MΩ min

Results:

Range	Sample size	Initial Ins. Res.	Insulation Resistance after test		
			Humidity (section 3.9)	Cycling Humidity	Salt Spray (section 3.8)
F10 / F11 / F12 series	5	PASS	PASS	PASS	-
F20 series	5	PASS	PASS	PASS	PASS
F30 series	5	PASS	PASS	PASS	PASS

### 3.6. Temperature Life (Without Load) to EIA-364-17

Methodology: The connectors were subjected to a high temperature for a specified number of hours. Samples were visually inspected for damage after testing, and contact resistance was measured.

Specification:

Range	Temperature Life
F10 / F11 / F12 series	+130°C, 1000 hours
F20 / F30 series	+105°C, 96 hours

Results: Contact Resistance after temperature life

Range	Mated Pair	Max (mΩ)	Min (mΩ)	Average (mΩ)	
F10 / F11 / F12 series	Signal	Sample 1	23.97	20.07	22.11
		Sample 2	23.96	20.17	21.85
		Sample 3	23.96	20.03	22.06
		Sample 4	23.68	20.14	22.01
		Sample 5	23.86	20.13	21.95
	Power	Sample 1	11.27	9.15	9.97
		Sample 2	12.68	10.12	11.26
		Sample 3	9.65	9.16	9.45
		Sample 4	10.80	9.55	10.04
		Sample 5	10.53	10.13	10.32
F20 series	Sample 1	71.40	59.47	66.24	
	Sample 2	71.53	59.49	65.68	
	Sample 3	71.43	59.41	66.76	
	Sample 4	71.43	59.57	65.68	
	Sample 5	71.39	59.64	66.32	
F30 series	Sample 1	62.10	52.85	57.02	
	Sample 2	62.00	52.82	57.50	
	Sample 3	61.65	52.72	57.22	
	Sample 4	61.98	52.75	57.84	
	Sample 5	62.03	52.71	56.86	

### 3.7. Thermal Shock (Temperature Cycling) in general accordance with EIA-364-32

Methodology: The temperature was cycled between the two extremes for 10 cycles, with a dwell time of 30 minutes at each extreme. Samples were visually inspected for damage after testing, and contact resistance was measured.

Specification:

Range	Test Condition	Thermal Shock
F10 / F12 / F20 / F30 series	Condition 8	-40°C to +105°C, 10 cycles, 30 mins each extreme
F11 series	Condition 7	-55°C to +105°C, 10 cycles, 30 mins each extreme

Results: Contact Resistance after thermal shock.

Range	Mated Pair	Max (mΩ)	Min (mΩ)	Average (mΩ)	
F10 / F11 / F12 series	Signal	Sample 1	22.65	20.05	21.44
		Sample 2	22.96	20.07	21.56
		Sample 3	22.96	20.42	21.61
		Sample 4	22.98	20.14	21.39
		Sample 5	22.87	20.07	21.49
	Power	Sample 1	9.95	9.13	9.66
		Sample 2	10.65	9.88	10.32
		Sample 3	10.27	9.01	9.39
		Sample 4	10.95	9.58	10.05
		Sample 5	10.74	9.10	9.86
F20 series	Sample 1	71.53	60.12	66.60	
	Sample 2	71.44	59.98	65.63	
	Sample 3	71.93	59.84	66.07	
	Sample 4	71.45	60.48	66.27	
	Sample 5	71.41	59.89	65.94	
F30 series	Sample 1	62.15	52.85	57.73	
	Sample 2	62.15	52.87	57.25	
	Sample 3	62.14	52.80	57.54	
	Sample 4	61.78	52.67	57.50	
	Sample 5	61.70	52.79	57.27	



### 3.8. Salt Spray

Methodology: Samples were subjected to a salt spray test in accordance with one of two standard test methodologies. Contact resistance was measured after the test. See sections 3.4 and 3.5 for DWV and Insulation Resistance results after the test.

Specification:

Range	Salt Spray
F10 / F12 / F20 / F30 series	<b>EIA-364-26</b> Tin plated parts - 8 hours Gold plated parts - 48 hours 5±1% Salt solution
F11 series	<b>EN 60068-2-52</b> Test method 3: Spray samples with 5% salt solution at 35°C for 2hrs 40°C at 93% RH for 22hrs 23°C at 50% RH for 3 days

Results: Contact Resistance after salt spray.

Range	Mated Pair	Max (mΩ)	Min (mΩ)	Average (mΩ)	
F10 / F11 / F12 series	Signal	Sample 1	22.35	20.56	21.46
		Sample 2	22.35	20.60	21.42
		Sample 3	22.34	20.56	21.47
		Sample 4	22.37	20.61	21.52
		Sample 5	22.35	20.67	21.56
	Power	Sample 1	12.24	11.05	11.64
		Sample 2	11.80	10.78	11.21
		Sample 3	11.88	10.75	11.33
		Sample 4	11.95	11.41	11.67
		Sample 5	12.08	10.94	11.29
F20 series	Sample 1	71.23	59.32	65.80	
	Sample 2	71.24	60.39	66.22	
	Sample 3	71.20	60.05	65.94	
	Sample 4	71.49	59.83	65.67	
	Sample 5	71.05	59.43	65.39	
F30 series	Sample 1	65.48	52.74	57.30	
	Sample 2	62.17	53.05	57.33	
	Sample 3	62.17	52.76	57.54	
	Sample 4	62.10	52.68	56.67	
	Sample 5	62.05	52.70	57.07	

### 3.9. Humidity to EIA-364-31, Condition A

Methodology: The samples were conditioned in a humidity chamber for the specified number of hours and temperature, at 90-95% relative humidity. Samples were visually inspected for damage after testing. Contact resistance was checked after the test; F10/F11/F12 have numerical results and F20/F30 series on a Pass/Fail basis against the specification stated in section 3.1. See sections 3.4 and 3.5 for DWV and Insulation Resistance results after the test.

Specification:

Range	Humidity
F10 / F11 / F12 series	90-95% RH at +60°C for 96 hours
F20 / F30 series	90-95% RH at +40°C for 96 hours

Results: Contact Resistance after humidity.

Range	Mated Pair	Max (mΩ)	Min (mΩ)	Average (mΩ)	
F10 / F11 / F12 series	Signal	Sample 1	22.98	20.04	21.42
		Sample 2	22.91	20.14	21.42
		Sample 3	22.98	20.09	21.33
		Sample 4	22.93	20.04	21.32
		Sample 5	22.98	20.02	21.53
	Power	Sample 1	11.40	10.14	10.79
		Sample 2	10.68	10.07	10.37
		Sample 3	10.64	9.06	9.77
		Sample 4	9.76	9.15	9.49
		Sample 5	10.86	9.32	10.24
F20 series	All 5 samples	PASS	PASS	PASS	
F30 series	All 5 samples	PASS	PASS	PASS	

### 3.10. Mechanical Vibration to EIA-364-28, Condition I

Methodology: The pre-conditioned samples were subjected to a simple harmonic motion. Contact resistance was measured after the test.

Specification: 10-55Hz, 1.52mm amplitude, duration 2 hours each axis.

Results: Contact Resistance after vibration.

Range	Mated Pair	Max (mΩ)	Min (mΩ)	Average (mΩ)	
F10 / F11 / F12 series	Signal	Sample 1	22.86	20.25	21.62
		Sample 2	22.84	20.22	21.66
		Sample 3	22.86	20.18	21.54
		Sample 4	22.85	20.22	21.31
		Sample 5	22.83	20.32	21.52
	Power	Sample 1	12.12	10.21	11.55
		Sample 2	12.27	10.29	11.70
		Sample 3	12.72	10.75	11.71
		Sample 4	12.01	10.21	11.06
		Sample 5	11.96	10.50	11.12
F20 series	Sample 1	76.53	63.51	70.66	
	Sample 2	76.50	63.38	69.27	
	Sample 3	76.40	63.39	70.41	
	Sample 4	76.52	63.61	69.61	
	Sample 5	76.23	63.38	69.56	
F30 series	Sample 1	65.01	52.75	57.43	
	Sample 2	62.17	52.76	57.23	
	Sample 3	62.16	52.75	57.45	
	Sample 4	62.10	52.86	57.73	
	Sample 5	62.17	52.73	57.52	

### 3.11. Mechanical Shock to EIA-364-27

Methodology: The Shock test sequence was carried out on pre-conditioned samples. During the test, the samples were monitored continuously for discontinuities of  $\geq 1$  microsecond. Upon completion of testing the samples were visually inspected.

Specification:

- Acceleration:  $490\text{m/s}^2(50\text{g})$
- Duration: 11ms
- Sine half-wave for 3 cycles, 3-axes, both directions (18 total)

Results: Contact Resistance after shock.

Range	Mated Pair	Max (mΩ)	Min (mΩ)	Average (mΩ)	
F10 / F11 / F12 series	Signal	Sample 1	22.95	20.32	21.60
		Sample 2	22.86	20.34	21.69
		Sample 3	22.95	20.34	21.66
		Sample 4	22.93	20.56	21.93
		Sample 5	22.93	20.39	21.61
	Power	Sample 1	11.80	10.59	11.21
		Sample 2	12.40	10.59	11.86
		Sample 3	12.32	11.44	11.90
		Sample 4	11.99	11.30	11.66
		Sample 5	12.75	11.46	11.98
F20 series	Sample 1	76.53	62.19	70.07	
	Sample 2	75.88	63.75	70.15	
	Sample 3	77.34	63.58	69.73	
	Sample 4	76.37	63.37	69.26	
	Sample 5	76.52	63.38	69.24	
F30 series	Sample 1	62.17	52.68	57.23	
	Sample 2	61.29	52.78	57.14	
	Sample 3	62.12	52.78	57.51	
	Sample 4	62.11	52.69	57.44	
	Sample 5	62.08	52.67	57.07	

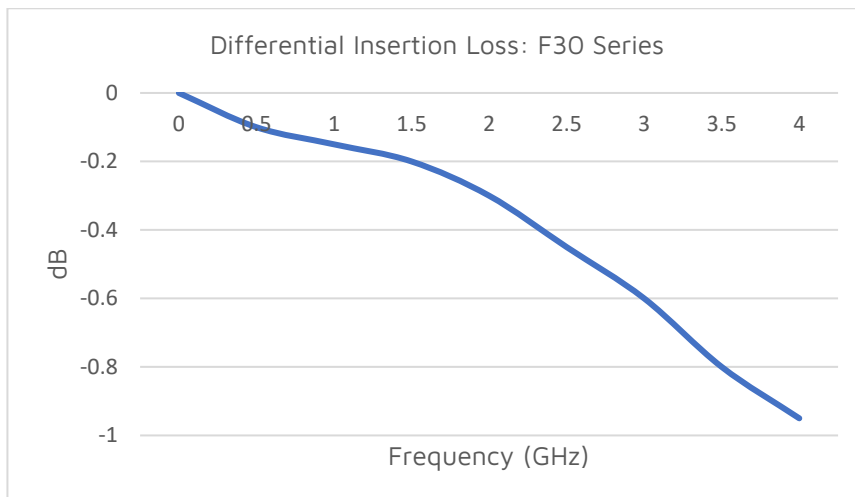
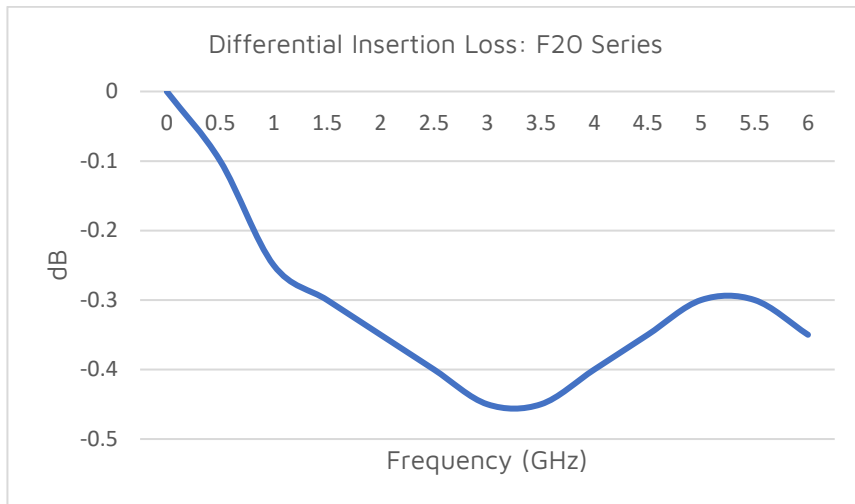
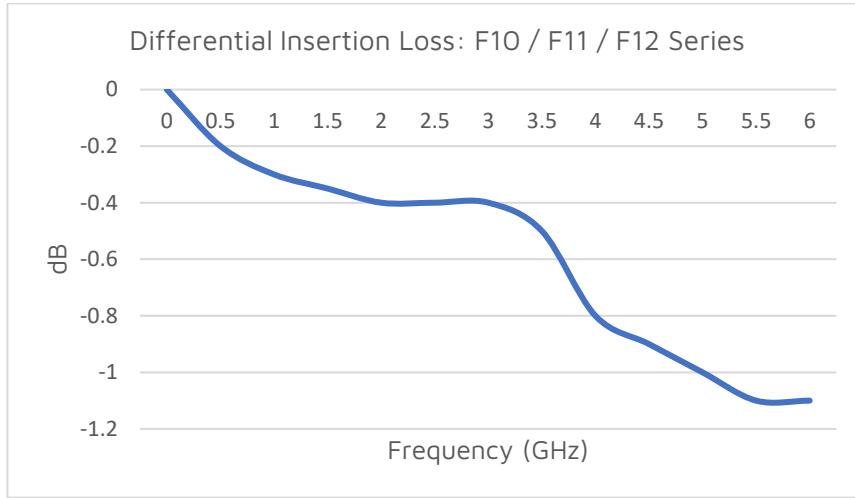
### 3.12. Signal Integrity

Methodology: Virtual simulations were created with a mated test sample for each range, testing for Insertion & Return Losses, Impedance and Crosstalk.

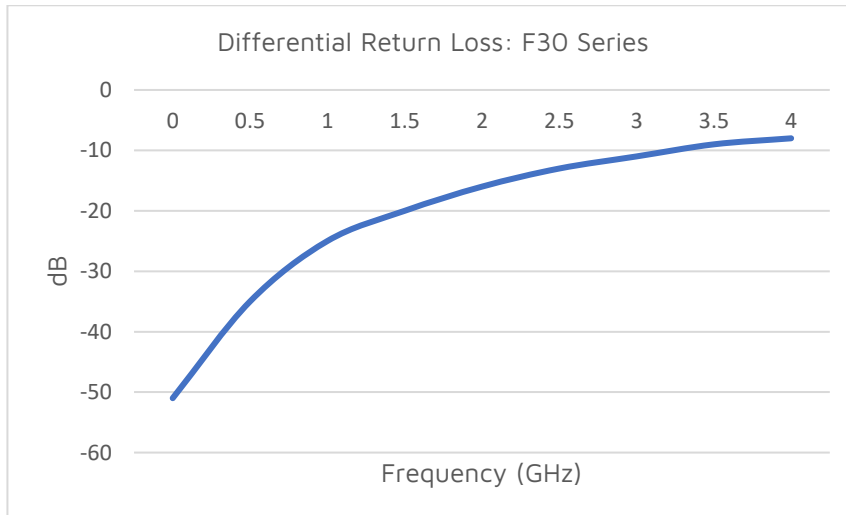
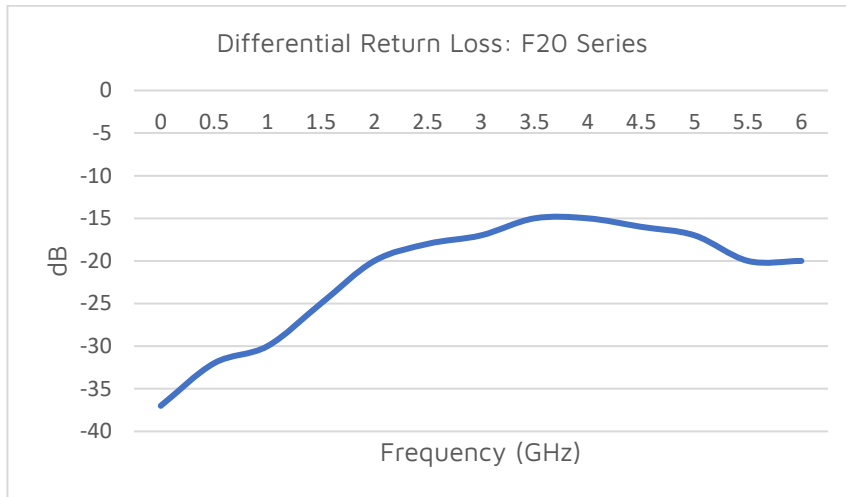
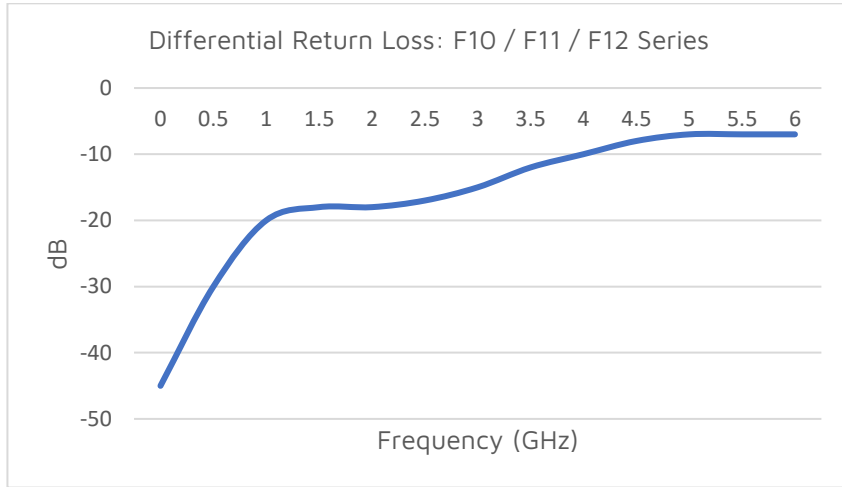
Specification:

Range	Insertion Loss	Return Loss	Impedance	Crosstalk	
				Near-End (NEXT)	Far-End (FEXT)
F10 / F11 / F12 series	<1dB @ 4GHz	>10dB @ 4GHz	100Ω	<-50dB @ 4GHz	<-50dB @ 4GHz
F20 series	<1dB @ 6GHz	>10dB @ 6GHz	100Ω	<-50dB @ 6GHz	<-50dB @ 6GHz
F30 series	<1dB @ 2.5GHz	>10dB @ 2.5GHz	100Ω	<-40dB @ 2.5GHz	<-40dB @ 2.5GHz

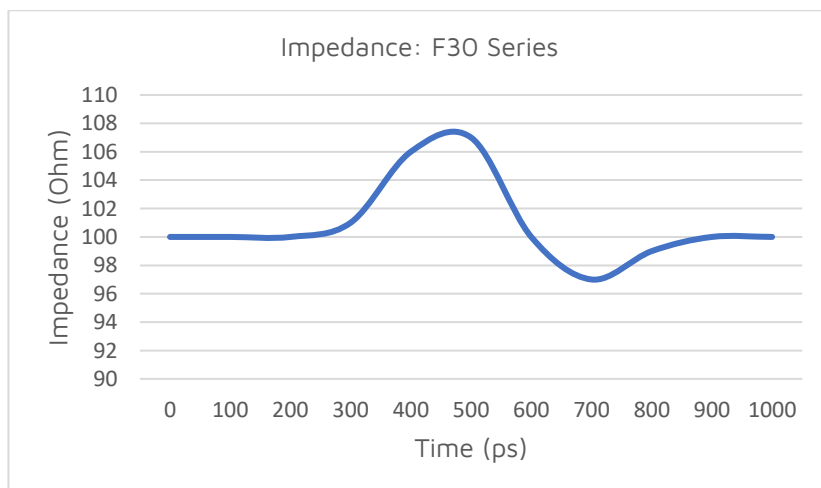
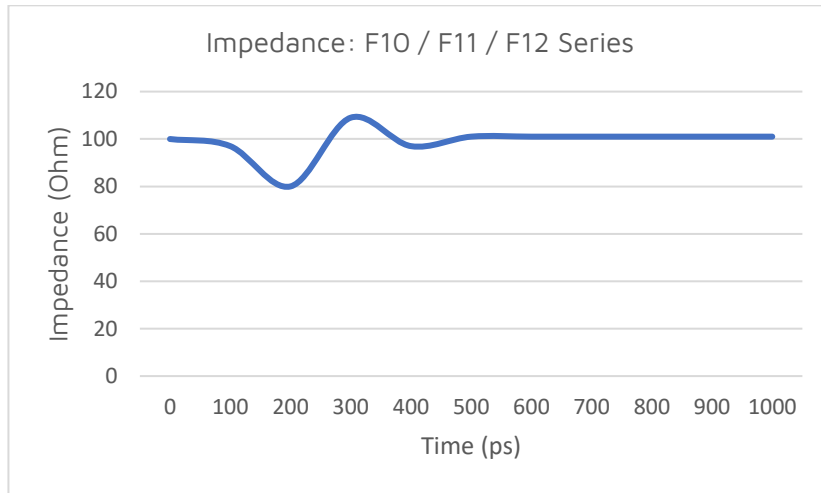
### 3.12.1. Differential Insertion Loss



### 3.12.2. Differential Return Loss



### 3.12.3. Impedance





### 3.12.4. Crosstalk

