

Mini-Universal MATE-N-LOK* Connector

1. INTRODUCTION

1.1 Purpose

Testing was performed on MINI UMNL CONNECTOR's to determine its conformance related to the requirements of product specification 108-1542 Rev. D. The verification is performed to qualify 'Additional resin' option because of Resin shortage.

1.2 Scope

This specification covers the electrical, mechanical, and environmental performance for Mini UMNL- EXISTING and PROPOSED RESIN on 2P and 15P Plug HSG and Panel mount Cap. Testing was performed at TE Connectivity Shanghai Electrical Test Laboratory (Building ID 554) between 2021-05-06 and 2021-05-20. The associated test number is TP-21-00967. Re-tested 2P Plug and Panel mount cap at the Harrisburg Electrical Components Test Laboratory on October 21, 2021 for 'Housing Locking Mechanism Strength Test' under EA20210451T Rev B.

Re-tested 15P Plug and Panel mount Cap made from 'Existing Resin' at the Harrisburg Electrical Components Test Laboratory on April 19, 2022 for 'Housing Locking Mechanism Strength Test' under EA20220079T Rev A.

1.3 Conclusion

Based on the test results, all samples meet the requirement according to product specification 108-1542 Rev D.

1.4 Test Specimens

Specimens with the following part numbers were used for test:

Test Group	Part No.	Description	Qty. (pcs)	Comments
1	172165-1	2 CIR UNIV M-N-L PLUG NATL	10	5no's in EXISTING RESIN and 5no's in PROPOSED RESIN
	172157-1	2CIR MINI U-M-N-L CAP NATL	10	5no's in EXISTING RESIN and 5no's in PROPOSED RESIN
	172171-1	15 CIR UNIV M-N-L PLUG	10	5no's in EXISTING RESIN and 5no's in PROPOSED RESIN
	172163-1	15 CIR UNIV M-N-L CAP	10	5no's in EXISTING RESIN and 5no's in PROPOSED RESIN
	794406-1	MINI UMNL CONT 20-16AWG SN	180	/
	794407-1	MINI UNML SCKT 20-16 AWG SN	180	/
2	172165-1	2 CIR UNIV M-N-L PLUG NATL	10	5no's in EXISTING RESIN and 5no's in PROPOSED RESIN
	172157-1	2CIR MINI U-M-N-L CAP NATL	10	5no's in EXISTING RESIN and 5no's in PROPOSED RESIN
	172171-1	15 CIR UNIV M-N-L PLUG	10	5no's in EXISTING RESIN and 5no's in PROPOSED RESIN
	172163-1	15 CIR UNIV M-N-L CAP	10	5no's in EXISTING RESIN and 5no's in PROPOSED RESIN
	794406-1	MINI UMNL CONT 20-16AWG SN	180	/
	794407-1	MINI UNML SCKT 20-16 AWG SN	180	/
3	172157-1	2CIR MINI U-M-N-L CAP NATL	10	5no's in EXISTING RESIN and 5no's in PROPOSED RESIN
	172163-1	15 CIR UNIV M-N-L CAP	10	5no's in EXISTING RESIN and 5no's in PROPOSED RESIN

1.5 Test Sequence

Test Item	Test Group		
	1	2	3
	Test Sequence		
Examination of Product	1,9	1,11	1,3
Contact Insertion Force		2	
Dielectric Withstanding Voltage		4,8	
Durability Test	5		
Housing Locking Mechanism Strength Test		9	
Humidity and Temperature Cycling		6	
Insulation Resistance		3,7	
Low Level Contact Resistance	4,8		
Contact Retention Force		10	
Mating Force	2,6		
Housing panel retention			2
Thermal Shock		5	
Unmating Force	3,7		

Note: a). Test group defined per customer requirement.
 b). Numbers indicate sequence in which tests are performed.

1.6 Environmental Conditions

Unless otherwise stated, the following environmental conditions prevailed during testing:

Temperature: 15°C to 35°C
 Relative Humidity: 25% to 75%

2. TEST PROCEDUES

2.1 Contact Insertion Force

Measure the force required to insert contact into housing. Operation Speed: 100 mm/min.
 Requirement: 13.3 N maximum per Contact
 Test Method: ECIA EIA-364-05C-2020

2.2 Dielectric Withstanding Voltage

Specimens shall be subjected to a test voltage of 2200 V ac which shall be maintained at the specified value for a period of 60 seconds. Test between adjacent circuits, between the surface of housing and contact of mated connectors.
 Requirement: No breakdown or flashover. The leakage current shall be limited to a maximum of 5 mA.
 Test Method: ECIA EIA-364-20F-2019

2.3 Durability Test

Specimens were mated and unmated 25 times at a maximum rate of 600 cycles per hour.
 Requirement: No physical damage occurred
 Test Method: Customized Requirement

2.4 Examination of Product

Visual Examination. There shall be no corrosive influence on the performance and no physical damage that would impair product performance.
 Test Method: ECIA EIA-364-18B-2007

2.5 Housing Locking Mechanism Strength Test

housing lock strength at a maximum rate of 100 mm per minute.
 Requirements: 40 N Min.
 Test Method: Customized Requirement

2.6 Humidity and Temperature Cycling

Subject specimens to 10 cycles (10 days) between 25 °C and 65 °C at 80% RH to 100% RH.
 Requirement: No evidence of physical damage was visible.

Test Method: EIA-364-31F-2019

2.7 Insulation Resistance

The insulation resistance shall be measured with a test voltage of 500 V dc for 1 minute.

Requirement:

1000 megohm minimum initial.

500 megohm minimum final.

Test Method: ECIA EIA-364-21 E-2014

2.8 Low Level Contact Resistance

Measure and record the contact resistance with a test current of 100 milliamperes maximum and 50 millivolts open circuit (source) voltage maximum.

Requirement: 4 milliohms Max

Test Method: ECIA EIA-364-23C-2006

2.9 Mating Force

This test is for "Connector Mating force". Measure force necessary to mate specimens at a maximum rate of 12.7 mm per minute with latch disengaged.

Requirements: 6.7 N [1.5 lbf] maximum per circuit.

Test Method: ECIA EIA-364-13E-2011

2.10 Housing panel retention

Determine housing lock strength at maximum rate of 12.7 mm [.5 in] per minute.

Requirement: 133.4 N min.

Test Method: Customized Requirement

2.11 Thermal Shock

Mated specimens were subjected to 25 cycles of thermal shock with each cycle consisting of 30 minutes dwells at – 55 °C and 105 °C.

Requirement: No evidence of physical damage was visible.

Test Method: EIA-364-32G-2014

2.12 Unmating Force

This test is for "Connector Unmating force". Measure force necessary to unmate specimens at a maximum rate of 12.7 mm per minute with latch disengaged.

Requirements: 0.7 N minimum per circuit.

Test Method: ECIA EIA-364-13E-2011

2.13 Contact Retention Force

Apply an axial load of 35.6 N [8 lbf] at a maximum rate of 12.7 mm [.5 in] per minute.

Requirement: 35.6 N min.

Test Method: Customized Requirement

3. SUMMARY OF TEST

Group	SN	Description	Test Item	Qty (pcs)	Test Result				Requirement	Conclusion
					Max	Min	Avg	Unit		
1	1	/	Examination of Product	5	No physical damage			/	No physical damage	Meet Spec
	2	EXISTING RESIN 2P	Mating Force	5	6.4	5.8	6.1	N	13.4 N Max.	Meet Spec
	2	PROPOSED RESIN 2P	Mating Force	5	6.5	5.8	6.2	N	13.4 N Max	Meet Spec
	2	EXISTING RESIN 15P	Mating Force	5	43.1	41.6	42.4	N	100.5 N Max	Meet Spec
	2	PROPOSED RESIN 15P	Mating Force	5	72.3	42.3	59.4	N	100.5 N Max	Meet Spec
	3	EXISTING RESIN 2P	Unmating Force	5	2.9	2.7	2.8	N	1.4 N Min.	Meet Spec
	3	PROPOSED RESIN 2P	Unmating Force	5	2.4	2.2	2.3	N	1.4 N Min.	Meet Spec
	3	EXISTING RESIN 15P	Unmating Force	5	20.2	18.8	19.6	N	10.5 N Min.	Meet Spec

Group	SN	Description	Test Item	Qty (pcs)	Test Result				Requirement	Conclusion
					Max	Min	Avg	Unit		
	3	PROPOSED RESIN 15P	Unmating Force	5	26.3	24.3	25.5	N	10.5 N Min.	Meet Spec
	4	2P EXISTING RESIN	Low Level Contact Resistance	5	3.71	3.05	3.47	mΩ	4 mΩ Max.	Meet Spec
	4	2P PROPOSED RESIN	Low Level Contact Resistance	5	3.60	3.24	3.43	mΩ	4 mΩ Max.	Meet Spec
	4	15P EXISTING RESIN	Low Level Contact Resistance	5	3.89	3.14	3.50	mΩ	4 mΩ Max.	Meet Spec
	4	15P PROPOSED RESIN	Low Level Contact Resistance	5	3.85	3.20	3.55	mΩ	4 mΩ Max.	Meet Spec
	5	EXISTING RESIN 2P	Durability Test	5	No physical damage			/	No physical damage	Meet Spec
	5	PROPOSED RESIN 2P	Durability Test	5	No physical damage			/	No physical damage	Meet Spec
	5	EXISTING RESIN 15P	Durability Test	5	No physical damage			/	No physical damage	Meet Spec
	5	PROPOSED RESIN 15P	Durability Test	5	No physical damage			/	No physical damage	Meet Spec
	6	EXISTING RESIN 2P	Mating Force	5	4.3	3.9	4.1	N	13.4 N Max.	Meet Spec
	6	PROPOSED RESIN 2P	Mating Force	5	4.6	4.1	4.4	N	13.4 N Max.	Meet Spec
	6	EXISTING RESIN 15P	Mating Force	5	24.3	22.9	23.8	N	100.5 N Max.	Meet Spec
	6	PROPOSED RESIN 15P	Mating Force	5	31.3	26.9	29.0	N	100.5 N Max.	Meet Spec
	7	EXISTING RESIN 2P	Unmating Force	5	2.8	2.6	2.7	N	1.4 N Min.	Meet Spec
	7	PROPOSED RESIN 2P	Unmating Force	5	2.9	2.8	2.9	N	1.4 N Min.	Meet Spec
	7	EXISTING RESIN 15P	Unmating Force	5	20.7	18.7	19.8	N	10.5 N Min.	Meet Spec
	7	PROPOSED RESIN 15P	Unmating Force	5	18.3	14.3	16.6	N	10.5 N Min.	Meet Spec
	8	2P EXISTING RESIN	Low Level Contact Resistance	5	3.85	2.99	3.46	mΩ	4 mΩ Max.	Meet Spec
	8	2P PROPOSED RESIN	Low Level Contact Resistance	5	3.82	3.36	3.56	mΩ	4 mΩ Max.	Meet Spec
8	15P EXISTING RESIN	Low Level Contact Resistance	5	3.87	3.13	3.49	mΩ	4 mΩ Max.	Meet Spec	
8	15P PROPOSED RESIN	Low Level Contact Resistance	5	3.84	3.20	3.54	mΩ	4 mΩ Max.	Meet Spec	
9	/	Examination of Product	5	No physical damage			/	No physical damage	Meet Spec	
2	1	/	Examination of Product	5	No physical damage			/	No physical damage	Meet Spec
	2	2Pin Male EXISTING RESIN	Contact Insertion Force	5	8.7	7.6	8.2	N	13.3 N Max.	Meet Spec
	2	2Pin Female EXISTING RESIN	Contact Insertion Force	5	8.6	7.4	8.0	N	13.3 N Max.	Meet Spec
	2	2Pin Male PROPOSED RESIN	Contact Insertion Force	5	8.8	7.2	8.1	N	13.3 N Max.	Meet Spec
	2	2Pin Female PROPOSED RESIN	Contact Insertion Force	5	8.6	7.3	7.9	N	13.3 N Max.	Meet Spec
	2	15Pin Male	Contact Insertion	5	11.3	8.6	9.9	N	13.3 N Max.	Meet Spec

Group	SN	Description	Test Item	Qty (pcs)	Test Result				Requirement	Conclusion
					Max	Min	Avg	Unit		
		EXISTING RESIN	Force							
	2	15Pin Female EXISTING RESIN	Contact Insertion Force	5	12.0	8.7	10.4	N	13.3 N Max.	Meet Spec
	2	15Pin Male PROPOSED RESIN	Contact Insertion Force	5	11.9	8.3	9.9	N	13.3 N Max.	Meet Spec
	2	15Pin Female PROPOSED RESIN	Contact Insertion Force	5	11.8	8.6	10.3	N	13.3 N Max.	Meet Spec
	3	2P EXISTING RESIN	Insulation Resistance	5	2.50	0.77	1.44	E12Ω	1000 MΩ Min.	Meet Spec
	3	2P PROPOSED RESIN	Insulation Resistance	5	0.79	0.42	0.67	E12Ω	1000 MΩ Min.	Meet Spec
	3	15P EXISTING RESIN	Insulation Resistance	5	3.67	0.35	1.58	E12Ω	1000 MΩ Min.	Meet Spec
	3	15P PROPOSED RESIN	Insulation Resistance	5	5.85	0.31	1.33	E12Ω	1000 MΩ Min.	Meet Spec
	4	2P EXISTING RESIN	Dielectric Withstanding Voltage	5	No breakdown or flashover			/	No breakdown or flashover	Meet Spec
	4	2P PROPOSED RESIN	Dielectric Withstanding Voltage	5	No breakdown or flashover			/	No breakdown or flashover	Meet Spec
	4	15P EXISTING RESIN	Dielectric Withstanding Voltage	5	No breakdown or flashover			/	No breakdown or flashover	Meet Spec
	4	15P PROPOSED RESIN	Dielectric Withstanding Voltage	5	No breakdown or flashover			/	No breakdown or flashover	Meet Spec
	5	/	Thermal Shock	20	No physical damage.			/	No physical damage	Meet Spec
	6	/	Humidity and Temperature Cycling	20	No physical damage			/	No physical damage	Meet Spec
	7	2P EXISTING RESIN	Insulation Resistance	5	18.84	3.93	7.43	E9Ω	500 MΩ Min.	Meet Spec
	7	2P PROPOSED RESIN	Insulation Resistance	5	12.70	3.94	8.75	E9Ω	500 MΩ Min.	Meet Spec
	7	15P EXISTING RESIN	Insulation Resistance	5	24.46	6.58	12.11	E9Ω	500 MΩ Min.	Meet Spec
	7	15P PROPOSED RESIN	Insulation Resistance	5	15.47	3.98	8.60	E9Ω	500 MΩ Min.	Meet Spec
	8	2P EXISTING RESIN	Dielectric Withstanding Voltage	5	No breakdown or flashover.			/	No breakdown or flashover	Meet Spec
	8	2P PROPOSED RESIN	Dielectric Withstanding Voltage	5	No breakdown or flashover			/	No breakdown or flashover	Meet Spec
	8	15P EXISTING RESIN	Dielectric Withstanding Voltage	5	No breakdown or flashover			/	No breakdown or flashover	Meet Spec
	8	15P PROPOSED RESIN	Dielectric Withstanding Voltage	5	No breakdown or flashover			/	No breakdown or flashover	Meet Spec
	9	2P EXISTING RESIN	Housing Locking Mechanism Strength Test	5	99.37	81.91	91.05	N	40 N Min.	Meet Spec

Group	SN	Description	Test Item	Qty (pcs)	Test Result				Requirement	Conclusion
					Max	Min	Avg	Unit		
	9	2P PROPOSED RESIN	Housing Locking Mechanism Strength Test	5	60.8	50.1	55.6	N	40 N Min.	Meet Spec
	9	15P EXISTING RESIN	Housing Locking Mechanism Strength Test	5	120.84	103.47	112	N	40 N Min.	Meet Spec
	9	15P PROPOSED RESIN	Housing Locking Mechanism Strength Test	5	66.9	52.9	57.9	N	40 N Min.	Meet Spec
	10	EXISTING RESIN-2P	Contact Retention Force	5	103.7	39.9	77.5	N	35.6N Min.	Meet Spec
	10	PROPOSED RESIN-2P	Contact Retention Force	5	154.7	80.7	112.3	N	35.6N Min.	Meet Spec
	10	EXISTING RESIN-15P	Contact Retention Force	5	90.7	44.2	70.4	N	35.6 N Min.	Meet Spec
	10	PROPOSED RESIN-15P	Contact Retention Force	5	131.1	69.3	91.9	N	35.6 N Min.	Meet Spec
	11	/	Examination of Product	5	No physical damage			/	No physical damage	Meet Spec
	3	1	/	Examination of Product	5	No physical damage			/	No physical damage
2		2P EXISTING RESIN	Housing panel retention	5	352.0	338.9	342.5	N	133.4 N Min.	Meet Spec
2		2P PROPOSED RESIN	Housing panel retention	5	312.5	296.1	303.3	N	133.4 N Min.	Meet Spec
2		15P EXISTING RESIN	Housing panel retention	5	319.2	287.7	306.8	N	133.4 N Min.	Meet Spec
2		15P PROPOSED RESIN	Housing panel retention	5	309.2	291.7	302.2	N	133.4 N Min.	Meet Spec
3		/	Examination of Product	5	No physical damage			/	No physical damage	Meet Spec

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