



1. INTRODUCTION

1.1 Purpose

Testing was performed on High Density+ Card Edge Power Connector with 5.08mm pitch power contact design to determine its conformance to requirements of product specification 108-128091, Revision A.

1.2 Scope

This report covers the electrical, mechanical, and environmental performance of the High Density+ Card Edge Power Connector with 5.08mm pitch power contact design. Testing was performed at TE Shanghai Testing Laboratory between 08-May-2019 and 09-Jul-2019.

1.3 Conclusion

High Density+ Card Edge Power Connector with 5.08mm pitch power contact design (part number 2345246-1, 2340165-1 and 2381935-1 for representative) conformed to the electrical, mechanical, and environmental performance requirements of product specification 108-128091, Revision A1.

1.4 Test Specimens

Test specimens were representative of normal production lots. Specimens identified with the following part numbers were used for test:

Test Group	Quantity	Part Number	Description
#1	6 pcs	2340165-1	High Density+ Card Edge Power Connector, Straddle mount,
	6 pcs	2349021-1	Mating side test PCB, 2layers, 2oZ copper on each layer.
	6 pcs	2349022-1	Mounting side test PCB, 2layers, 2oZ copper on each layer.
	6 pcs	2345246-1	High Density+ Card Edge Power Connector, Vertical,
	6 pcs	2348134-1	Mating side test PCB, 6layers, 2oZ copper on each layer
	6 pcs	2348135-1	Mounting side test PCB, 6layers, 2oZ copper on each layer
	6 pcs	2381935-1	High Density+ Card Edge Power Connector, Straddle mount,
	6 pcs	1-2381935-1	Mating test PCB
	6 pcs	1-2381935-2	Mount test PCB
#2,4,5	9 pcs (3 ea.)	2345246-1	High Density+ Card Edge Power Connector, Vertical,
	9 pcs (3 ea.)	2348134-1	Mating side test PCB, 6layers, 2oZ copper on each layer
	9 pcs (3 ea.)	2348135-1	Mounting side test PCB, 6layers, 2oZ copper on each layer
	9 pcs (3 ea.)	2381935-1	High Density+ Card Edge Power Connector, Straddle mount,
	9 pcs (3 ea.)	1-2381935-1	Mating test PCB
	9 pcs (3 ea.)	1-2381935-2	Mount test PCB

#3,6,7	3 pcs	2340165-1	High Density+ Card Edge Power Connector, Straddle mount,
	3 pcs	2345246-1	High Density+ Card Edge Power Connector, Vertical,
	3 pcs	2381935-1	High Density+ Card Edge Power Connector, Straddle mount,

* Notes: both 2348134-1 and 2348135-1 are 6layers, 2oz copper on each layer test PCB
 both 2349021-1 and 2349022-1 are 2layers, 2oz copper on each layer test PCB
 1-2381935-1 Mating test PCB: 4 layers, 2oz per layer, (total: 8oz)
 1-2381935-2 Mount test PCB: 2 layers, 2oz per layer; 8 layers, 1oz per layer , (total: 12oz)

1.5 Environmental Conditions

Unless otherwise stated, the following environmental conditions prevailed during testing:
 Temperature: 15°C to 35°C Relative Humidity 25% to 75%

1.6 Qualification Test Sequence

Test Description	Test group						
	1	2	3	4	5	6	7
	Test sequence (a)						
Initial examination of product	1	1	1	1	1	1	1
Low level contact resistance	3,7	2,6		2,5	2,5		
Contact resistance (power contact)		3,7		3,6			
Insulation resistance			2,6				
Dielectric Withstanding Voltage			3,7				
Temperature rise vs current		4					
Vibration, sinusoidal	5						
Mechanical shock	6						
Mating force	2						
Un-mating force	8						
Durability	4						
Contact retention force						2	
Solderability							2
Thermal shock			4		3		
Humidity/temperature cycling.			5		4		
Temperature life				4(b)			
Mixed flowing gas		5(b)					
Final examination	9	8	8	6	6	3	3

Note

- (a) Numbers indicate sequence in which tests are performed.
- (b) Precondition specimens with 10 durability cycles

2. SUMMARY OF TESTING

2.1 Initial examination– All Test Groups

All specimens submitted for testing were representative of normal production lots. A Certificate of Conformance was issued by Product Assurance. Where specified, specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2 Low Level Contact Resistance- Test Group 1, 2, 4, 5.

Test Group	Test Condition	LLCR (mΩ)		Spec	Jud.	
		AVG	MAX			
#1	Power (Vertical)	Initial	0.28	0.34	Signal: 30 mΩ max. Power: 0.8 mΩ max.	OK
		Final	0.31	0.39		OK
	Signal (Vertical)	Initial	15.81	17.34		OK
		Final	16.06	17.14		OK
	Power (straddle)	Initial	0.40	0.59		OK
		Final	0.44	0.68		OK
Signal (straddle)	Initial	19.25	23.50	OK		
	Final	19.84	21.55	OK		
#2	Power (Vertical)	Initial	0.27	0.33		OK
		Final	0.30	0.45		OK
	Signal (Vertical)	Initial	16.22	17.87		OK
		Final	16.37	18.08		OK
	Power (straddle)	Initial	0.37	0.47	OK	
		Final	0.41	0.62	OK	
Signal (straddle)	Initial	12.49	13.93	OK		
	Final	13.23	17.49	OK		
#4	Power (Vertical)	Initial	0.29	0.42	OK	
		Final	0.35	0.43	OK	
	Signal (Vertical)	Initial	15.80	17.21	OK	
		Final	15.96	17.94	OK	
	Power (straddle)	Initial	0.37	0.49	OK	
		Final	0.40	0.61	OK	
Signal (straddle)	Initial	12.89	14.56	OK		
	Final	13.52	17.92	OK		
#5	Power (Vertical)	Initial	0.31	0.54	OK	
		Final	0.36	0.58	OK	
	Signal (Vertical)	Initial	16.55	19.22	OK	
		Final	16.86	27.61	OK	
	Power (straddle)	Initial	0.39	0.50	OK	
		Final	0.41	0.63	OK	
Signal (straddle)	Initial	13.02	13.53	OK		
	Final	14.23	18.29	OK		

2.3 Contact resistance (power contact only) - Test Group 2, 4,

Test Group		Test Condition	CR(mΩ)		Spec	Jud.
			AVG	MAX		
#2	Power (Vertical)	Initial	0.30	0.35	0.6 mΩ max.	OK
		Final	0.31	0.36		OK
	Power (straddle)	Initial	0.39	0.47		OK
		Final	0.46	0.57		OK
#4	Power (Vertical)	Initial	0.29	0.32		OK
		Final	0.35	0.50		OK
	Power (straddle)	Initial	0.40	0.46		OK
		Final	0.47	0.56		OK

2.4 Insulation resistance– Test Group 3

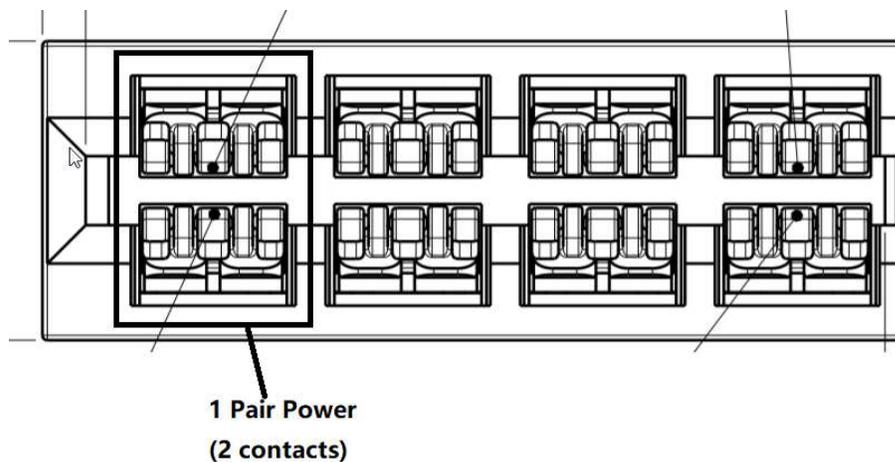
All insulation resistance measurements between power conductors were greater than 5000 megohms, and all insulation resistance measurements between signal conductors were greater than 500 megohms.

2.5 Dielectric Withstanding Voltage – Test Group 3

No dielectric breakdown or flashover occurred.

2.6 Temperature rise vs current – Test Group 2

All specimens were soldered on TE mounting test PCB 2348135-1 and mated with TE mating side PCB 2348134-1. the temp rise results for all test condition are within the requirement of $\Delta t_{max} = 30^{\circ}\text{C}$,



Test Group	Test Condition	T-rise(°C)		Spec	Jud.
		AVG	MAX		
#2	28A @ 20 contacts (10 Pair)	23.75	25.63	30.0°C Max	OK

30A @ 16 contacts (8 Pair)	24.15	24.83	30.0°C Max	OK
33A@ 14 contacts (7 Pair)	27.92	28.82	30.0°C Max	OK
34A @ 8 contacts (4 Pair)	19.37	21.86	30.0°C Max	OK
50A @ 4 contacts (2 Pair)	25.49	27.73	30.0°C Max	OK

**34A @ 8 contacts (4 Pair) means only 8 adjacent power contacts were energized with 34A current per contacts simultaneously.*

2.7 Vibration, sinusoidal – Test Group 1

No discontinuity greater than 1microsecond were detected; No physical damage.

2.8 Mechanical shock – Test Group 1

No discontinuity greater than 1microsecond were detected; No physical damage.

2.9 Mating force and Unmating force – Test Group 1

All specimens were soldered on mounting PCB when tested.

Test Group	Mating force(N)		Spec	Un-Mating (N)		Spec	Jud.	
	AVG	MAX		AVG	MIN			
#1	Power Contact Pair (Vertical)	8.70	10.94	15N max	4.58	4.21	1.5N min	OK
	Signal Contact Pair (Vertical)	0.36	0.37	1.15N max	0.27	0.18	0.12 N min	OK
	Power Contact Pair (Straddle)	14.19	16.31	20N max	4.12	3.89	1.5N min	OK
	Signal Contact Pair (Straddle)	0.37	0.44	1.15N max	0.15	0.12	0.12 N min	OK
#1	Only for 2381935-*	69.07	73.0	82N(Total) Max	40.21	42.21	11.7N(Total) Min	OK

2.10 Durability – Test Group 1

- a) No physical damage occurred to the specimens as a result of mating and un-mating the specimens 200 times.
- b) No physical damage occurred to the specimens as a result of mating and un-mating the specimens 250 times (only for 2381935-*)

2.11 Contact retention force – Test Group 6

All retention force measurements for Power contact were more than 15N per contact.
 All retention force measurements for Signal contact were more than 3N per contact.

2.12 Solderability – Test Group 7

All of test specimens get more than 95% coverage.

2.13 Thermal shock – Test Group 3, 6

No evidence of physical damage was visible as a result of exposure to thermal shock.

2.14 Humidity-temperature cycling – Test Group 3, 5

No evidence of physical damage was visible as a result of exposure to Humidity-temperature cycling

2.15 Temperature life– Test Group 4

No evidence of physical damage was visible as a result of exposure to 250hours at 105°C temperature life.

2.16 Mixed flowing gas– Test Group 2

No evidence of physical damage was visible as a result of the Class IIA MFG exposure for 14days.

2.17 Final examination of product – All Test Groups

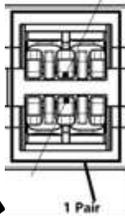
Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

3. TEST REQUIREMENTS AND PROCEDURES SUMMARY

Test Description	Requirement	Procedure
Initial examination of product	Meets requirements of product drawing.	EIA-364-18 Visual and dimensional (C of C) inspection per product drawing.

ELECTRICAL		
Low Level Contact Resistance	Signal contact: 30 mΩ max. Power contact: 0.8 mΩ max.	EIA-364-23 Subject specimens to 100 mA maximum and 20 mV maximum open circuit voltage
Contact resistance	At 25A for power, 0.6 mΩ Max	EIA-364-06

(power contact only)		
Insulation Resistance	5000 MΩ minimum between all power conductors, 500 MΩ minimum between all signal conductors;	EIA-364-21 500+/-10% VDC, 2 minutes hold. Test between adjacent contacts
Dielectric Withstanding Voltage	One-minute hold with no breakdown or flashover	EIA-364-20, Condition I. 1200 V for power contact and 400V for signal contact at sea level. Test between adjacent contacts.
Temperature rise vs current	Temperature rise: 30°C max. over ambient temperature	EIA-364-70, Method 1. Stabilize at a single current level until 3 readings at 5-minute intervals are within 1°C See table 2

MECHANICAL		
Vibration, sinusoidal	No discontinuities of 1 microsecond or longer duration. See Note	EIA-364-28, Test condition I, Subject mated specimens to 10-55-10 Hz Traversed in 1 minutes at 1.52mm amplitude 2 hours each of 3 mutually perpendicular planes;
Mechanical shock	No discontinuities of 1 microsecond or longer duration. See Note	EIA-364-27, Test Condition A. Subject mated specimens to 50 G's half-sine shock pulses of 11 milliseconds duration. Three shocks in each direction applied along 3 mutually perpendicular planes, 18 total shocks
Mating force	15N max—Power contact pair (Vertical and Right-angle type) 20N max—Power contact pair (Straddle mount type)  Power contact pair → 1 Pair 1.15N max—Signal contact pair Total mating force: 82N Max(only for 2381935-*)	EIA-364-13, Method A. Measure force necessary to mate specimens at a maximum rate of 12.7 mm per minute
Un-mating force	1.5N min—Power contact pair 0.12N min—Signal contact pair	EIA-364-13, Method A. Measure force necessary to mate specimens at a maximum rate of 12.7 mm per minute

Durability	200 cycles See Note 250cycles (only for 2381935-*) See Note	EIA-364-9, Mate and un-mate specimens for 200 cycles(250cycles only for 2381935-*) at a maximum rate of 500 cycles per hour
Contact retention force	15N min. per power pin 3N min. per signal pin	EIA-364-29 Measure force necessary to remove individual contact from the housing at a maximum rate of 12.7mm per minute
Solderability	Solderable area shall have a minimum of 95% solder coverage. See Note.	TE Spec. 109-11-11, Test Method A.

ENVIRONMENTAL		
Thermal shock	See Note	EIA-364-32, Method A, Test condition I, Subject specimens to 5cycles between -55 and 105°C with 30 minute dwells at temperature extremes and 1 minute maximum transition between temperatures
Temperature life	See Note	EIA-364-17, Method A, Test condition 4, Test condition C. Subject mated specimens to 105°C for 250 hours
Humidity/temperature cycling.	See Note	EIA-364-31, Method III. Subject mated specimens to 10 cycles (10 days) between 25 and 65°C at 90 to 95% RH
Mixed flowing gas	See Note	EIA-364-65, Class IIA (4 gas). Subject mated specimens to environmental Class IIA for 14 days--(7 days unmated, LLCR, followed by 7 days mated)

NOTE

Shall meet visual requirements, show no physical damage, and meet requirements of additional tests as specified in the Product Qualification and Requalification Test Sequence