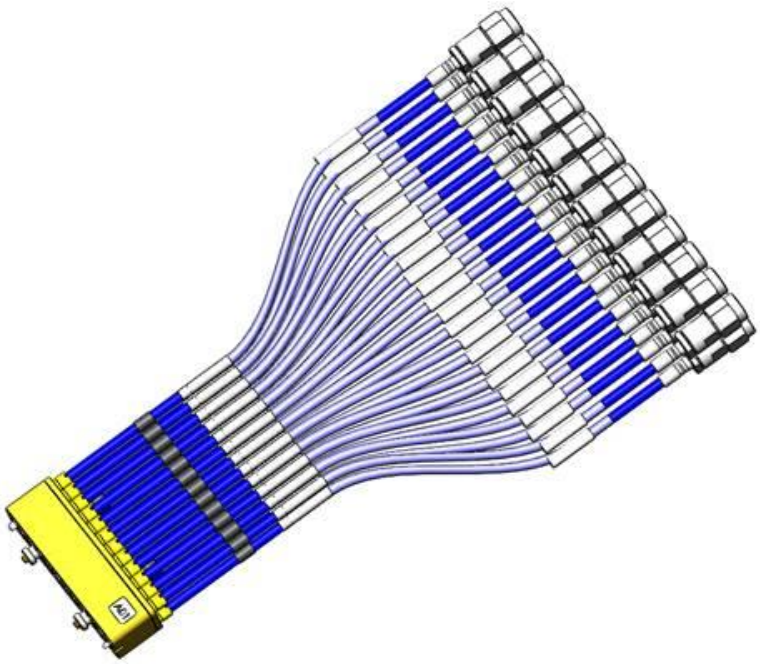
Project Number: Design Qualification Test Report	Tracking Code: 1224452_Report_Rev_1
Requested by: Alvin Wang	Date: 10/25/2017
Part #: BE40A-505050-10-12-0153/MATING BOARD	Tech: Tony Wagoner
Part description: BE40A/MATING BOARD	Qty to test: 14
Test Start: 08/09/2017	Test Completed: 08/31/2017



DESIGN QUALIFICATION TEST REPORT

BE40A/MATING BOARD
BE40A-505050-10-12-0153/MATING BOARD

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
10/19/2017	**1**	**Initial Issue**	**PC**

CERTIFICATION

All instruments and measuring equipment were calibrated to National Institute for Standards and Technology (NIST) traceable standards according to IS0 10012-l and ANSI/NCSL 2540-1, as applicable.

SCOPE

To perform the following tests: Design Qualification test. Please see test plan.

APPLICABLE DOCUMENTS

Standards: EIA Publication 364

TEST SAMPLES AND PREPARATION

1) All materials were manufactured in accordance with the applicable product specification.
2) All test samples were identified and encoded to maintain traceability throughout the test sequences.
3) After soldering, the parts to be used for LLCR and DWV/IR testing were cleaned according to TLWI-0001.
4) Either an automated cleaning procedure or an ultrasonic cleaning procedure may be used.
5) The automated procedure is used with aqueous compatible soldering materials.
6) Parts not intended for testing LLCR and DWV/IR are visually inspected and cleaned if necessary.
7) Any additional preparation will be noted in the individual test sequences.
8) Solder Information: Lead free
9) Samtec Test PCBs used: PCB-108221-TST/ PCB-108222-TST.

FLOWCHARTS

IR/DWV

Signal-to-Ground

Group 1
BE40A-505050-10-12-0153
MATING BOARD
2 Assemblies

Note: One cable each housing

Step	Description
1.	DWV Breakdown (2)

Group 2
BE40A-505050-10-12-0153
2 Assemblies

Note: One cable each housing

Step	Description
1.	DWV Breakdown (2)

Group 3
MATING BOARD
2 Assemblies

Step	Description
1.	DWV Breakdown (2)

Group 4
BE40A-505050-10-12-0153
MATING BOARD
2 Assemblies

Note: One cable each housing

Step	Description
1.	IR (4)
2.	DWV at Test Voltage (1)
3.	Thermal Shock (5)
4.	IR (4)
5.	DWV at Test Voltage (1)
6.	Humidity (3)
7.	IR (4)
8.	DWV at Test Voltage (1)

(1) DWV at Test Voltage = EIA-364-20
Test Condition = 1 (Sea Level)
DWV test voltage is equal to 75% of the lowest breakdown voltage
Test voltage applied for 60 seconds

(2) DWV Breakdown = EIA-364-20
Test Condition = 1 (Sea Level)
DWV test voltage is equal to 75% of the lowest breakdown voltage
Test voltage applied for 60 seconds

(3) Humidity = EIA-364-31
Test Condition = B (240 Hours)
Test Method = III (+25°C to +65°C @ 90% RH to 98% RH)
Test Exceptions: ambient pre-condition and delete steps 7a and 7b

(4) IR = EIA-364-21
Test Condition = 500 Vdc, 2 Minutes Max

(5) Thermal Shock = EIA-364-32
Exposure Time at Temperature Extremes = 1/2 Hour
Method A, Test Condition = I (-55°C to +85°C)
Test Duration = A-3 (100 Cycles)

FLOWCHARTS Continued

Mating/Unmating/Durability

Note:
a. No cleaning of board or probe between cycles.
b. No changing of board between cycles.

Group 1
BE40A-505050-10-12-0153
MATING BOARD
3 Assemblies

Note: Full populated

Step	Description
1.	Contact Gaps *Note: Inspect height of signal pin & two ground pins.*
2.	LLCR (2) *Note: Signal and ground.*
3.	Cycles Quantity = 1000 Cycles *Note: By hand.*
4.	Contact Gaps *Note: Inspect height of signal pin & two ground pins.*
5.	LLCR (2) Max Delta = 15 mOhm *Note: Signal and ground.*
6.	Thermal Shock (3)
7.	LLCR (2) Max Delta = 15 mOhm *Note: Signal and ground.*
8.	Humidity (1)
9.	LLCR (2) Max Delta = 15 mOhm *Note: Signal and ground.*

(1) Humidity = EIA-364-31
Test Condition = B (240 Hours)
Test Method = III (+25°C to +65°C @ 90% RH to 98% RH)
Test Exceptions: ambient pre-condition and delete steps 7a and 7b

(2) LLCR = EIA-364-23
Open Circuit Voltage = 20 mV Max
Test Current = 100 mA Max

(3) Thermal Shock = EIA-364-32
Exposure Time at Temperature Extremes = 1/2 Hour
Method A, Test Condition = I (-55°C to +85°C)
Test Duration = A-3 (100 Cycles)

ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

THERMAL SHOCK:

1) EIA-364-32, *Thermal Shock (Temperature Cycling) Test Procedure for Electrical Connectors.*
2) Test Condition 1: -55℃ to +85℃
3) Test Time: ½ hour dwell at each temperature extreme
4) Number of Cycles: 100
5) All test samples are pre-conditioned at ambient.
6) All test samples are exposed to environmental stressing in the mated condition.

HUMIDITY:

1) Reference document: EIA-364-31, *Humidity Test Procedure for Electrical Connectors.*
2) Test Condition B, 240 Hours.
3) Method III, +25° C to + 65° C, 90% to 98% Relative Humidity excluding sub-cycles 7a and 7b.
4) All samples are pre-conditioned at ambient.
5) All test samples are exposed to environmental stressing in the mated condition.

LLCR:

1) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
2) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
3) The following guidelines are used to categorize the changes in LLCR as a result from stressing
    a. <= +5.0 mOhms:---------- Stable
    b. +5.1 to +10.0 mOhms:---------- Minor
    c. +10.1 to +15.0 mOhms: ---------- Acceptable
    d. +15.1 to +50.0 mOhms: ---------- Marginal
    e. +50.1 to +2000 mOhms: ---------- Unstable
    f. >+2000 mOhms:---------- Open Failure

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes

INSULATION RESISTANCE (IR):

To determine the resistance of insulation materials to leakage of current through or on the surface of these materials when a DC potential is applied.

1) PROCEDURE:
    a. Reference document: EIA-364-21, *Insulation Resistance Test Procedure for Electrical Connectors*.
    b. Test Conditions:
        i. Between Adjacent Contacts or Signal-to-Ground
        ii. Electrification Time 2.0 minutes
        iii. Test Voltage (500 VDC) corresponds to calibration settings for measuring resistances.
2) MEASUREMENTS:
3) When the specified test voltage is applied (VDC), the insulation resistance shall not be less than 1000 megohms.

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

To determine if the sockets can operate at its rated voltage and withstand momentary over potentials due to switching, surges, and other similar phenomenon. Separate samples are used to evaluate the effect of environmental stresses so not to influence the readings from arcing that occurs during the measurement process.

1) PROCEDURE:
    a. Reference document: EIA-364-20, *Withstanding Voltage Test Procedure for Electrical Connectors*.
    b. Test Conditions:
        i. Between Adjacent Contacts or Signal-to-Ground
        ii. Barometric Test Condition 1
        iii. Rate of Application 500 V/Sec
        iv. Test Voltage (VAC) until breakdown occurs
2) MEASUREMENTS/CALCULATIONS
    a. The breakdown voltage shall be measured and recorded.
    b. The dielectric withstanding voltage shall be recorded as 75% of the minimum breakdown voltage.
    c. The working voltage shall be recorded as one-third (1/3) of the dielectric withstanding voltage (one-fourth of the breakdown voltage).

RESULTS

Insulation Resistance minimums, IR

Signal to Ground

- **Initial**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**
  - **Unmated ---------- 45000 Meg Ω ---------- Passed**
- **Thermal Shock**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**
  - **Unmated ---------- 45000 Meg Ω ---------- Passed**
- **Humidity**
  - **Mated ---------- 45000 Meg Ω ---------- Passed**
  - **Unmated ---------- 45000 Meg Ω ---------- Passed**

Dielectric Withstanding Voltage minimums, DWV

- **Minimums**
  - **Breakdown Voltage ---------- 674 VAC**
  - **Test Voltage ---------- 510 VAC**
  - **Working Voltage ---------- 165 VAC**

Signal to Ground

- **Initial DWV ---------- Passed**
- **Thermal DWV ---------- Passed**
- **Humidity DWV ---------- Passed**

RESULTS Continued

LLCR Mating/Unmating Durability Group (136 LLCR test points)

Signal Pin:

- **Initial ---------- 49.55 mOhms Max**
- **Durability, 1000 Cycles**
  - **<= +5.0 mOhms ---------- 42 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 15 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 10 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 1 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+2000 mOhms ---------- 0 Points ---------- Open Failure**
- **Thermal Shock**
  - **<= +5.0 mOhms ---------- 42 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 14 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 7 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 5 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+2000 mOhms ---------- 0 Points ---------- Open Failure**
- **Humidity**
  - **<= +5.0 mOhms ---------- 30 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 24 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 8 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 6 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+2000 mOhms ---------- 0 Points ---------- Open Failure**

Ground Pin:

- **Initial ---------- 6.56mOhms Max**
- **Durability, 1000 Cycles**
  - **<= +5.0 mOhms ---------- 68 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 0 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+2000 mOhms ---------- 0 Points ---------- Open Failure**
- **Thermal Shock**
  - **<= +5.0 mOhms ---------- 68 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 0 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+2000 mOhms ---------- 0 Points ---------- Open Failure**
- **Humidity**
  - **<= +5.0 mOhms ---------- 68 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 0 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+2000 mOhms ---------- 0 Points ---------- Open Failure**

DATA SUMMARIES

INSULATION RESISTANCE (IR):

	Pin to Ground		
	Mated	Unmated	Unmated
Minimum	**BE40A/MATING BOARD**	**BE40A**	**MATING BOARD**
Initial	45000	45000	45000
Thermal	45000	45000	45000
Humidity	45000	45000	45000

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

Voltage Rating Summary	
Minimum	**BE40A/MATING BOARD**
Break Down Voltage	674
Test Voltage	510
Working Voltage	165

Pin to Ground	
Initial Test Voltage	Passed
After Thermal Test Voltage	Passed
After Humidity Test Voltage	Passed

DATA SUMMARIES Continued

LLCR Mating/Unmating Durability Group

1). A total of 136 points were measured.
2). EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
3). A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
4). The following guidelines are used to categorize the changes in LLCR as a result from stressing.
   a. <= +5.0 mOhms:----------Stable
   b. +5.1 to +10.0 mOhms: ----------Minor
   c. +10.1 to +15.0 mOhms: ----------Acceptable
   d. +15.1 to +50.0 mOhms: ----------Marginal
   e. +50.1 to +2000 mOhms ----------Unstable
   f. > +2000 mOhms:----------Open Failure

Signal Pin

	LLCR Measurement Summaries by Pin Type			
Date	2017/8/10	2017/8/11	2017/8/21	2017/8/31
Room Temp (Deg C)	23	23	23	23
Rel Humidity (%)	44	45	47	46
Technician	Tony Wagoner	Tony Wagoner	Tony Wagoner	Tony Wagoner
mOhm values	**Actual Initial**	**Delta 1000 Cycles**	**Delta Therm Shck**	**Delta Humidity**
	Pin Type 1: Signal			
Average	34.10	4.73	5.54	7.24
St. Dev.	5.64	4.33	5.00	5.77
Min	25.32	0.05	0.06	0.70
Max	49.55	18.24	19.45	28.49
Summary Count	68	68	68	68
Total Count	68	68	68	86

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
1000 Cycles	**42**	**15**	**10**	**1**	**0**	**0**
Therm Shck	**42**	**14**	**7**	**5**	**0**	**0**
Humidity	**30**	**24**	**8**	**6**	**0**	**0**

DATA SUMMARIES Continued

Ground Pin

	LLCR Measurement Summaries by Pin Type			
Date	2017/8/9	2017/8/21	2017/8/21	2017/8/31
Room Temp (Deg C)	23	23	23	23
Rel Humidity (%)	43	45	47	46
Technician	Tony Wagoner	Tony Wagoner	Tony Wagoner	Tony Wagoner
mOhm values	**Actual Initial**	**Delta 1000 Cycles**	**Delta Therm Shck**	**Delta Humidity**
	Pin Type 1: Ground			
Average	5.13	0.31	0.74	0.48
St. Dev.	0.40	0.23	0.34	0.35
Min	4.26	0.00	0.02	0.00
Max	6.56	0.98	1.46	1.62
Summary Count	68	68	68	68
Total Count	68	68	68	68

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
1000 Cycles	**68**	**0**	**0**	**0**	**0**	**0**
Therm Shck	**68**	**0**	**0**	**0**	**0**	**0**
Humidity	**68**	**0**	**0**	**0**	**0**	**0**

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: THC-02
Description: Temperature/Humidity Chamber (SJR Room – Unit #1)
Manufacturer: Thermotron
Model: SE-1000-6-6
Serial #: 31808
Accuracy: See Manual
… Last Cal: 11/04/2016, Next Cal: 11/04/2017

Equipment #: TSC-01
Description: Vertical Thermal Shock Chamber
Manufacturer: Cincinnati Sub Zero
Model: VTS-3-6-6-SC/AC
Serial #: 10-VT14993
Accuracy: See Manual
… Last Cal: 05/03/2017, Next Cal: 05/03/2018

Equipment #: HPM-01
Description: Hipot Megommeter
Manufacturer: Hipotronics
Model: H306B-A
Serial #: M9905004
Accuracy: 2 % Full Scale Accuracy
… Last Cal: 05/24/2017, Next Cal: 05/24/2018

Equipment #: MO-03
Description: Multimeter /Data Acquisition System
Manufacturer: Keithley
Model: 2700
Serial #: 0791975
Accuracy: See Manual
… Last Cal: 05/24/2017, Next Cal: 05/24/2018