Project Number: Design Qualification Test Report	Tracking Code: 325949_Report_Rev_1
Requested by: Travis Newton	Date: 8/8/2014
Part #: MCR-8-02-L-00.25-S-BC/HR30-8P-12PC-71	
Part description: MCP/HR30	Tech: Peter Chen
Test Start: 05/15/2014	Test Completed: 06/17/2014

DESIGN QUALIFICATION TEST REPORT

MCR/HR30
MCR-8-02-L-00.25-S-BC/HR30-8P-12PC-71

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
8/7/2014	**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.

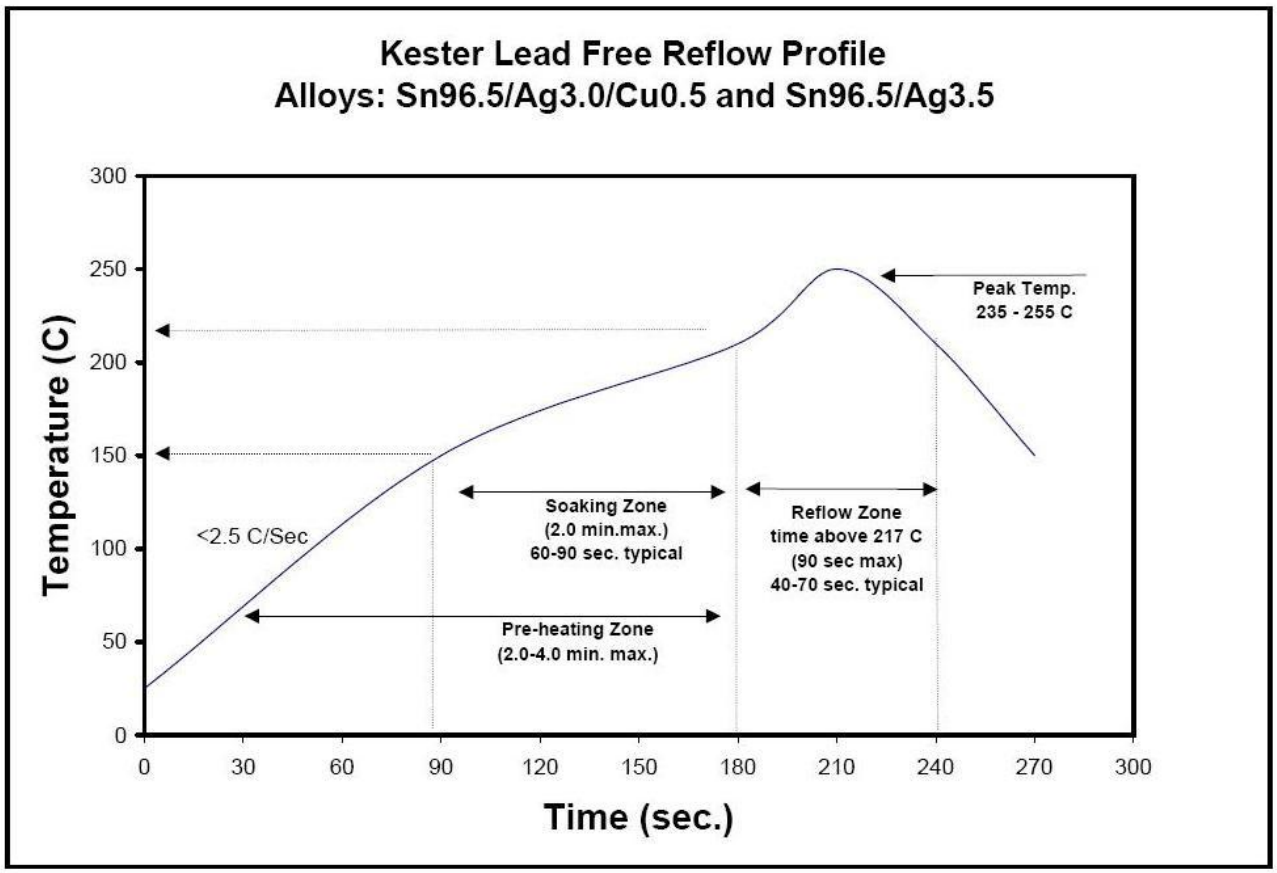
APPLICABLE DOCUMENTS

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 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 is visually inspected and cleaned if necessary.
7) Any additional preparation will be noted in the individual test sequences.
8) Solder Information: Lead Free
9) Re-Flow Time/Temp: See accompanying profile.
10) Samtec Test PCBs used: PCB-103219-TST.

TYPICAL OVEN PROFILE (Soldering Parts to Test Boards)



FLOWCHARTS

Mating/Unmating/Durability

Group 1
MCR-8-02-L-00.25-S-BC
HR30-8P-12PC-71
8 Assemblies

Step	Description
1.	LLCR (2) Max Delta = 15 mOhm
2.	Mating/Unmating Force (3)
3.	Cycles Quantity = 25 Cycles
4.	Mating/Unmating Force (3)
5.	Cycles Quantity = 25 Cycles
6.	Mating/Unmating Force (3)
7.	Cycles Quantity = 25 Cycles
8.	Mating/Unmating Force (3)
9.	Cycles Quantity = 25 Cycles
10.	Mating/Unmating Force (3)
11.	LLCR (2) Max Delta = 15 mOhm
12.	Thermal Shock (4) - Non Standard
13.	LLCR (2) Max Delta = 15 mOhm
14.	Humidity (1)
15.	LLCR (2) Max Delta = 15 mOhm
16.	Mating/Unmating Force (3)

(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) Mating/Unmating Force = EIA-364-13

(4) Thermal Shock = Other
Exposure Time at Temperature Extremes = 1/2 Hour
Method A, Test Condition = -20°C to +80°C
Test Duration = A-3 (100 Cycles)
EIA-364-32

FLOWCHARTS Continued

Dust/Water

IPx7 Water Submersion

Group 1
MCR-8-02-L-00.25-S-BC
HR30-8P-12PC-71
6 Assemblies

Step	Description
1.	Water Submersion - IPX7 (2) Depth = 1 meters
2.	Visual Inspection

Group 2
DC-MCP-8
HR30-8P-12PC-71
6 Assemblies

Step	Description
1.	Water Submersion - IPX7 (2) Depth = 1 meters
2.	Visual Inspection

IPx8 Deep Water Submersion

Group 3
MCR-8-02-L-00.25-S-BC
HR30-8P-12PC-71
3 Assemblies

Step	Description
1.	Water Submersion - IPX8 (3) Depth = 2 meters Duration = 30 min
2.	Visual Inspection

Group 4
DC-MCP-8
HR30-8P-12PC-71
3 Assemblies

Step	Description
1.	Water Submersion - IPX8 (3) Depth = 2 meters Duration = 30 min
2.	Visual Inspection

Group 5
MCR-8-02-L-00.25-S-BC
HR30-8P-12PC-71
3 Assemblies

Step	Description
1.	Water Submersion - IPX8 (3) Depth = 3 meters Duration = 30 min
2.	Visual Inspection

Group 6
DC-MCP-8
HR30-8P-12PC-71
3 Assemblies

Step	Description
1.	Water Submersion - IPX8 (3) Depth = 3 meters Duration = 30 min
2.	Visual Inspection

Group 7
MCR-8-02-L-00.25-S-BC
HR30-8P-12PC-71
3 Assemblies

Step	Description
1.	Water Submersion - IPX8 (3) Depth = 4 meters Duration = 30 min
2.	Visual Inspection

Group 8
DC-MCP-8
HR30-8P-12PC-71
3 Assemblies

Step	Description
1.	Water Submersion - IPX8 (3) Depth = 4 meters Duration = 30 min
2.	Visual Inspection

Group 9
MCR-8-02-L-00.25-S-BC
HR30-8P-12PC-71
3 Assemblies

Step	Description
1.	Water Submersion - IPX8 (3) Depth = 5 meters Duration = 30 min
2.	Visual Inspection

Group 10
DC-MCP-8
HR30-8P-12PC-71
3 Assemblies

Step	Description
1.	Water Submersion - IPX8 (3) Depth = 5 meters Duration = 30 min
2.	Visual Inspection

FLOWCHARTS Continued

Group 11
MCR-8-02-L-00.25-S-BC
HR30-8P-12PC-71
3 Assemblies

Step	Description
1.	Water Submersion - IPX8(3) Depth = 6 meters Duration = 30 min
2.	Visual Inspection

Group 12
DC-MCP-8
HR30-8P-12PC-71
3 Assemblies

Step	Description
1.	Water Submersion - IPX8(3) Depth = 6 meters Duration = 30 min
2.	Visual Inspection

Group 13
MCR-8-02-L-00.25-S-BC
HR30-8P-12PC-71
3 Assemblies

Step	Description
1.	Water Submersion - IPX8(3) Depth = 7 meters Duration = 30 min
2.	Visual Inspection

Group 14
DC-MCP-8
HR30-8P-12PC-71
3 Assemblies

Step	Description
1.	Water Submersion - IPX8(3) Depth = 7 meters Duration = 30 min
2.	Visual Inspection

Group 15
MCR-8-02-L-00.25-S-BC
HR30-8P-12PC-71
3 Assemblies

Step	Description
1.	Water Submersion - IPX8(3) Depth = 8 meters Duration = 30 min
2.	Visual Inspection

Group 16
DC-MCP-8
HR30-8P-12PC-71
3 Assemblies

Step	Description
1.	Water Submersion - IPX8(3) Depth = 8 meters Duration = 30 min
2.	Visual Inspection

Group 17
MCR-8-02-L-00.25-S-BC
HR30-8P-12PC-71
3 Assemblies

Step	Description
1.	Water Submersion - IPX8(3) Depth = 9 meters Duration = 30 min
2.	Visual Inspection

Group 18
DC-MCP-8
HR30-8P-12PC-71
3 Assemblies

Step	Description
1.	Water Submersion - IPX8(3) Depth = 9 meters Duration = 30 min
2.	Visual Inspection

Group 19
MCR-8-02-L-00.25-S-BC
HR30-8P-12PC-71
3 Assemblies

Step	Description
1.	Water Submersion - IPX8(3) Depth = 10 meters Duration = 30 min
2.	Visual Inspection

Group 20
DC-MCP-8
HR30-8P-12PC-71
3 Assemblies

Step	Description
1.	Water Submersion - IPX8(3) Depth = 10 meters Duration = 30 min
2.	Visual Inspection

IP6x Dust

Group 21
MCR-8-02-L-00.25-S-BC
HR30-8P-12PC-71
6 Assemblies

Step	Description
1.	Dust - IP6X(1)
2.	Visual Inspection

Group 22
DC-MCP-8
HR30-8P-12PC-71
6 Assemblies

Step	Description
1.	Dust - IP6X(1)
2.	Visual Inspection

(1) Dust - IP6X = CEI/IEC 60529

(2) Water Submersion - IPX7 = CEI/IEC 60529

(3) Water Submersion - IPX8 = CEI/IEC 60529

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: -20°C to +80°C
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.

MATING/UNMATING:

1) Reference document: EIA-364-13, *Mating and Unmating Forces Test Procedure for Electrical Connectors*.
2) The full insertion position was to within 0.003" to 0.004" of the plug bottoming out in the receptacle to prevent damage to the system under test.
3) One of the mating parts is secured to a floating X-Y table to prevent damage during cycling.

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

.

WATER TESTING:

1) Reference document: CEI/IEC 60529 Code IPX7 and IPX8
2) MCR torque specification for PN-30-8 is 7.08 IN-LB

DUST TESTING:

1) Reference document: CEI/IEC 60529 Code IP6X
2) MCR torque specification for PN-30-8 is 7.08 IN-LB

RESULTS

Mating – Unmating Forces

Mating\Unmating Durability Group

- **Initial**
  - **Mating**
    - **Min ---------- 2.26 Lbs**
    - **Max---------- 5.01 Lbs**
  - **Unmating**
    - **Min ---------- 2.44 Lbs**
    - **Max---------- 4.07 Lbs**
- **After 25 Cycles**
  - **Mating**
    - **Min ---------- 2.48 Lbs**
    - **Max---------- 3.79 Lbs**
  - **Unmating**
    - **Min ---------- 2.43 Lbs**
    - **Max---------- 3.79 Lbs**
- **After 50 Cycles**
  - **Mating**
    - **Min ---------- 2.48 Lbs**
    - **Max---------- 4.74 Lbs**
  - **Unmating**
    - **Min ---------- 2.35 Lbs**
    - **Max---------- 3.67 Lbs**
- **After 75 Cycles**
  - **Mating**
    - **Min ---------- 2.37 Lbs**
    - **Max---------- 4.74 Lbs**
  - **Unmating**
    - **Min ---------- 2.24 Lbs**
    - **Max---------- 3.70 Lbs**
- **After 100 Cycles**
  - **Mating**
    - **Min ---------- 2.42 Lbs**
    - **Max---------- 4.81 Lbs**
  - **Unmating**
    - **Min ---------- 2.18 Lbs**
    - **Max---------- 3.64 Lbs**
- **After Humidity**
  - **Mating**
    - **Min ---------- 2.07 Lbs**
    - **Max---------- 3.83 Lbs**
  - **Unmating**
    - **Min ---------- 1.63 Lbs**
    - **Max---------- 3.76 Lbs**

RESULTS Continued

LLCR Durability (96 LLCR test points)

- **Initial ---------- 77.13 mOhms Max**
- **Durability, 100 Cycles**
  - **<= +5.0 mOhms ---------- 96 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**
  - **<= +5.0 mOhms ---------- 95 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 1 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 ---------- 89 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 7 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**

IP6X Testing (Dust)

MCR-8-02-L-00.25-S-BC/HR30-8P-12PC-71

	Initial (Before Exposure)	After Exposure
Dust	**No Dust Present**	**No Dust Present**

DC-MCP-8/HR30-8P-12PC-71

	Initial (Before Exposure)	After Exposure
Dust	**No Dust Present**	**No Dust Present**

IPX8 Testing (Water)

MCR-8-02-L-00.25-S-BC/HR30-8P-12PC-71(10 m)

	Initial (Before Exposure)	After Exposure
Water	**No Water Present**	**No Water Present**

DC-MCP-8/HR30-8P-12PC-71(10 m)

	Initial (Before Exposure)	After Exposure
Water	**No Water Present**	**No Water Present**

DATA SUMMARIES

MATING/UNMATING FORCE:

Mating\Unmating Durability Group

	Initial				25 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	10.05	2.26	10.85	2.44	11.03	2.48	10.81	2.43
Maximum	22.28	5.01	18.10	4.07	16.86	3.79	16.86	3.79
Average	13.67	**3.07**	14.66	**3.30**	13.12	**2.95**	13.93	**3.13**
St Dev	4.14	0.93	2.67	0.60	1.91	0.43	1.92	0.43
Count	8	8	8	8	8	8	8	8

	50 Cycles				75 Cycles			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	11.03	2.48	10.45	2.35	10.54	2.37	9.96	2.24
Maximum	21.08	4.74	16.32	3.67	21.08	4.74	16.46	3.70
Average	14.13	**3.18**	12.73	**2.86**	14.17	**3.19**	13.23	**2.98**
St Dev	3.36	0.75	1.84	0.41	3.56	0.80	2.31	0.52
Count	8	8	8	8	8	8	8	8

	100 Cycles				After Humidity			
	Mating		**Unmating**		**Mating**		**Unmating**	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	10.76	2.42	9.70	2.18	9.21	2.07	7.25	1.63
Maximum	21.39	4.81	16.19	3.64	17.04	3.83	16.72	3.76
Average	14.27	**3.21**	13.09	**2.94**	11.71	**2.63**	12.23	**2.75**
St Dev	3.55	0.80	2.25	0.51	2.52	0.57	3.56	0.80
Count	8	8	8	8	8	8	8	8

DATA SUMMARIES Continued

LLCR Durability:

1) A total of 96 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

LLCR Measurement Summaries by Pin Type				
Date	5/12/2014	5/19/2014	6/2/2014	6/13/2014
Room Temp (Deg C)	22	22	22	22
Rel Humidity (%)	45	31	46	42
Technician	Aaron McKim	Aaron McKim	Aaron McKim	Aaron McKim
mOhm values	**Actual Initial**	**Delta 100 Cycles**	**Delta Therm Shck**	**Delta Humidity**
	Pin Type 1: Signal			
Average	73.04	0.39	1.00	1.64
St. Dev.	1.32	0.61	1.19	1.93
Min	68.80	0.00	0.00	0.00
Max	77.13	4.53	5.11	8.52
Summary Count	96	96	96	96
Total Count	96	96	96	96

LLCR Delta Count by Category						
	Stable	**Minor**	**Acceptable**	**Marginal**	**Unstable**	**Open**
mOhms	**<=5**	**>5 & <=10**	**>10 & <=15**	**>15 & <=50**	**>50 & <=1000**	**>1000**
100 Cycles	**96**	**0**	**0**	**0**	**0**	**0**
Therm Shck	**95**	**1**	**0**	**0**	**0**	**0**
Humidity	**89**	**7**	**0**	**0**	**0**	**0**

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: THC-02
Description: Temperature/Humidity Chamber
Manufacturer: Thermotron
Model: SE-1000-6-6
Serial #: 31808
Accuracy: See Manual
… Last Cal: 02/16/2014, Next Cal: 02/16/2015

Equipment #: TSC-01
Description: Vertical Thermal Shock Chamber
Manufacturer: Cincinnatti Sub Zero
Model: VTS-3-6-6-SC/AC
Serial #: 10-VT14993
Accuracy: See Manual
… Last Cal: 05/18/2014, Next Cal: 05/18/2015

Equipment #: MO-11
Description: Switch/Multimeter
Manufacturer: Keithley
Model: 3706
Serial #: 120169
Accuracy: See Manual
… Last Cal: 08/29/2013, Next Cal: 08/29/2014

Equipment #: TCT-01
Description: Test Stand
Manufacturer: Chatillon
Model: TCD-1000
Serial #: 05 23 00 02
Accuracy: Speed Accuracy: +/-5% of max speed; Displacement: +/-.5% or +/-.005, whichever is greater.
… Last Cal: 08/24/2013, Next Cal: 08/24/2014

Equipment #: WATER-01
Description: IP-67 1.0 Meter Water Column Chamber
Manufacturer: Samtec Machine
Model: N/A
Serial #: N/A
Accuracy: No Calibration Required

Equipment #: DUST-01
Description: IP-X6 Dust Tester
Manufacturer: Samtec Machine
Model: N/A
Serial #: N/A
Accuracy: No Calibration Required