OCTOBER 31,1996

TEST REPORT #96552

DURABILITY TESTING
(3000 CYCLES)

SMM/MMT SERIES CONNECTOR

SAMTEC CORPORATION

APPROVED BY: THOMAS PEEL
VICE PRESIDENT AND
DIRECTOR OF TEST PROGRAM DEVELOPMENT
CONTECH RESEARCH, INC.

Contech Research

CERTIFICATION

This is to certify that the evaluation described herein was designed and executed by personnel of Contech Research, Inc. It was performed in concurrence of Samtec Corporation of New Albany, IN who was the test sponsor.

All equipment and measuring instruments used during testing were calibrated and traceable to NIST according to ISO 10012-1 and ANSI/NCSL Z540-1, as applicable.

All data, raw and summarized, analysis and conclusions presented herein are the property of the test sponsor. No copy of this report, in part or in full, shall be forwarded to any agency, customer, etc., by Contech Research without the written approval of the test sponsor.

Thomas Peel
Vice President and
Director of Test Program Development

TP:js

SCOPE

To perform Durability testing on the SMM/MMT Series Connector as manufactured and submitted by the test sponsor, Samtec Corporation.

APPLICABLE DOCUMENTS

1. Unless otherwise specified, the following documents of issue in effect at the time of testing performed form a part of this report to the extent as specified herein. The requirements of sub-tier specifications and/or standards apply only when specifically referenced in this report.

2. Standards: MIL-STD-1344

TEST SAMPLES AND PREPARATION

1. The following test samples were submitted by the test sponsor, Samtec Corporation, for the evaluation to be performed by Contech Research, Inc.

   Description

   a) SMM Connector
   b) MMT Connector

2. Unless otherwise indicated, all materials were certified by the manufacturer to be in accordance with the applicable product specification.

3. Test boards for mounting test samples were supplied by the test sponsor.

4. The test samples were assembled to test boards then exposed to the vapor soldering process as follows:

   a) The vapor phase unit was manufactured by BTU Systems, Model Number VPR 12/6.

   b) The primary vapor was Galden LS/230, manufactured by Ausimont,USA. The vapor was maintained at a temperature of 419°F (215°C).

   c) The secondary vapor was 3M SF2 which was maintained at a temperature of approximately 117°F (47°C).

TEST SAMPLES AND PREPARATION - Continued

d) The samples were lowered through the secondary vapor into the primary vapor and allowed to dwell for 60 seconds.

e) During the removal cycle, the samples were allowed to dwell for 30 seconds in the secondary vapor and then removed totally.

f) The samples were allowed to dwell for 15 seconds in the entrance area of the chamber.

g) After removal, the samples were cleaned in hot vapors for 30 seconds (trichloroethane 1-1-1) followed by a 15 second spray.

h) Since flux is an integral part of the solder paste, no external flux was applied.

5. All test samples were coded and identified to maintain continuity throughout the test sequences. Upon initiating testing, mated test samples remained with each other throughout the test sequences for which they were designated.

6. Unless otherwise specified in the test procedures used, no further preparation was used.

TEST SELECTION

The following test groups were established, see Test Plan Flow Diagram, Figure #1.

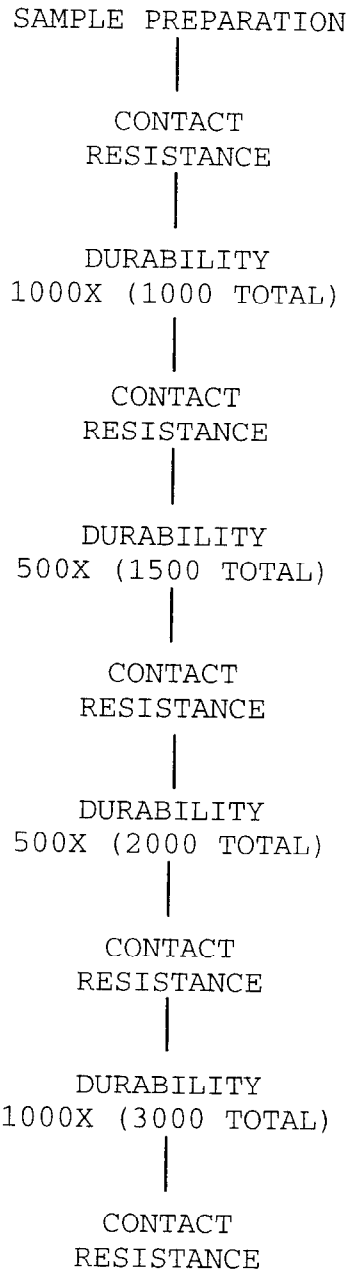
SAMPLE CODING

The test samples were coded in the following manner:

- ID# 1, 2

FIGURE #1

TEST PLAN FLOW DIAGRAM



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DATA SUMMARY

TEST	REQUIREMENT	RESULTS
CONTACT RESISTANCE	RECORD	12.2 mΩ MAX.
DURABILITY (1000 CYCLES)	NO DAMAGE	PASSED
CONTACT RESISTANCE	+10.0 mΩ MAX.CHG.	+1.5 mΩ MAX.CHG.
DURABILITY (1500 CYCLES)	NO DAMAGE	PASSED
CONTACT RESISTANCE	+10.0 mΩ MAX.CHG.	+1.6 mΩ MAX.CHG.
DURABILITY (2000 CYCLES)	NO DAMAGE	PASSED
CONTACT RESISTANCE	+10.0 mΩ MAX.CHG.	+2.9 mΩ MAX.CHG.
DURABILITY (3000 CYCLES)	NO DAMAGE	PASSED
CONTACT RESISTANCE	+10.0 mΩ MAX.CHG.	+3.3 mΩ MAX.CHG.

TEST RESULTS

ID#	Last Cal	Next Cal	Equipment Name	Manufacturer	Accuracy	Model #	Serial #	Freq Cal
25	7/25/96	7/25/97	Power Supply 0-10 Amps	Hewlett Packard	See specification	6002A	2113A-05285	12 months
199			Cycling Machine	Contech Research	N/A	PM925A11	2407	N/A
340			X-Y Table	N.E. Affiliated Tech.	N/A	XY-6060	N/A	N/A
413			Computer	Myriad	N/A	386SX	911897	N/A
580	5/9/96	11/9/96	Digital Multimeter	Hewlett Packard Co.	See Manual	3478A	2545A22620	6 Months

PROJECT NO.: 96552	SPECIFICATION: N/A
PART NO.: SMM/MMT Series	PART DESCRIPTION: 2.0 mm Conn.
SAMPLE SIZE: ID# 1,2	TECHNICIAN: LL
START DATE: 10/24/96	COMPLETE DATE: 10/24/96
ROOM AMBIENT: 22°C	RELATIVE HUMIDITY: 56%
EQUIPMENT ID#: 25, 413, 580	

CONTACT RESISTANCE

PURPOSE:

To determine the electrical resistance of the contact system under conditions where the applied current levels are at the rated current of the contact.

PROCEDURE:

1. The test was performed in accordance with MIL-STD-1344, Method 3004.

2. The points of application were in accordance with Figure #2.

3. Test Conditions:

   a) Test Current : 0.5 Amps
   b) Voltage : 1.0 VDC
   c) No. of Observations : 22 Per Test Sample

REQUIREMENTS:

The contact resistance shall be measured and recorded.

RESULTS: See next page.

RESULTS:

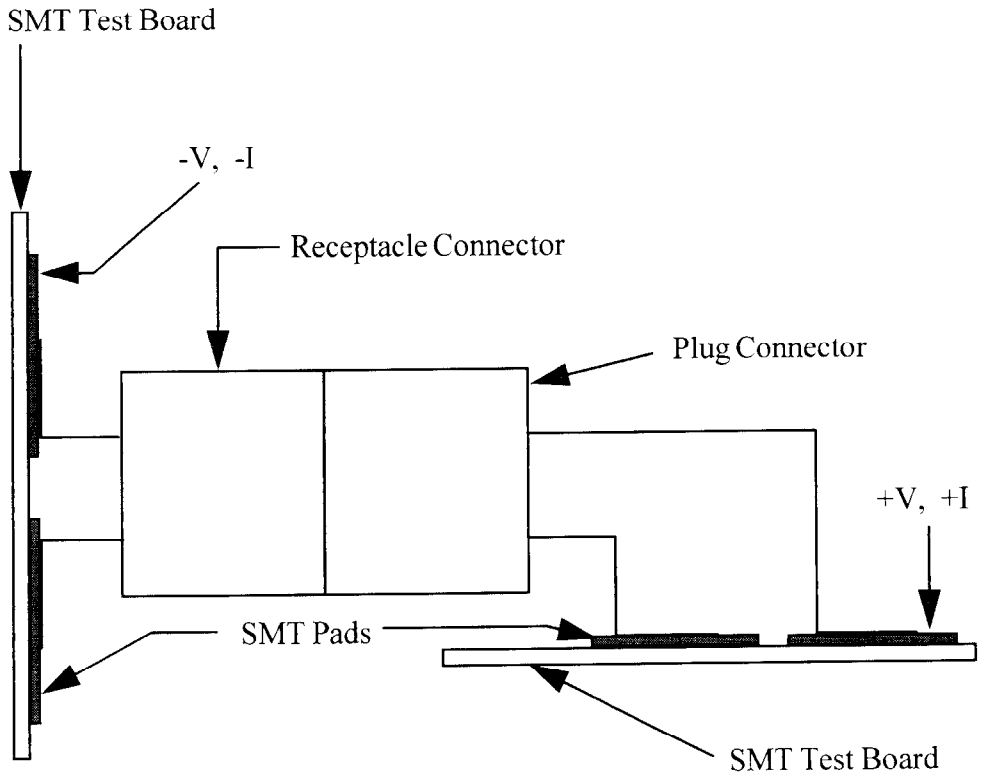
1. The following is a summary of the data observed:

Sample ID#	CONTACT RESISTANCE (Milliohms) Avg.	Max.	Min.
1	11.1	11.5	10.6
2	10.5	12.2	8.1

2. See pages 10a and 10b for individual data points.

Figure #2

Typical Contact Resistance Set-up



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PROJECT NO.: 96552 SPECIFICATION: N/A

PART NO.: SMM/MMT Series PART DESCRIPTION: 2.0 mm Conn.

SAMPLE SIZE: ID# 1,2 TECHNICIAN: LL

START DATE: 10/25/96 COMPLETE DATE: 10/28/96

ROOM AMBIENT: 24°C RELATIVE HUMIDITY: 48%

EQUIPMENT ID#: 25, 199, 340, 413, 580

DURABILITY

PURPOSE:

This is a conditioning sequence which is used to induce the type of wear on the contacting surfaces which may occur under normal service conditions. The connectors are mated and unmated a predetermined number of cycles.

PROCEDURE:

1. The test was performed in accordance with MIL-STD-1344, Method 2016 with the following test conditions:

2. Test Conditions:

   a) No. of Cycles : 3000
   b) Rate : 500 Cycles Per Hour

3. The test samples were assembled to special holding devices and attached to the automatic cycling equipment utilizing constant speed control and counter systems.

4. The test samples were axially aligned to accomplish the mating and unmating function allowing for self-centering movement.

5. Care was taken to prevent the mating faces of the test samples from contacting each other.

6. All subsequent attribute testing was performed in accordance with the procedures previously indicated.

REQUIREMENTS: See next page.

REQUIREMENTS:

1. There shall be no evidence of physical damage to the test samples so tested.

2. The change in contact resistance shall not exceed 10.0 milliohms when measured at 1000, 1500, 2000 and 3000 cycles of durability.

RESULTS:

1. There was no evidence of physical damage to the test samples as tested.

2. The following is a summary of the data observed:

CONTACT RESISTANCE
(Milliohms)

	1000 CYCLES		1500 CYCLES		2000 CYCLES		3000 CYCLES	
SAMPLE ID#	AVG. CHG.	MAX. CHG.	AVG. CHG.	MAX. CHG.	AVG. CHG.	MAX. CHG.	AVG. CHG.	MAX. CHG.
1	-0.2	+0.1	-0.3	+0.0	-0.1	+0.5	-0.0	+0.4
2	+0.0	+1.5	-0.1	+1.6	+0.1	+2.9	+0.4	+3.3

2. See pages 10a and 10b for individual data points.

CONTACT RESISTANCE

Project #: 96552
Customer: SAMTEC
Product: SMM/MMT SERIES CONNECTOR
Description: 2.0 MM CONNECTOR
Open circuit voltage: 1.0 volts

Spec: MIL-STD-1344 3004
SubGroup: ID# 1
File #: 655201.CRD

Test current: 0.5 amps

Units: milliohms
Delta values

Temp °C	+22	+22	+22	+24	+24
R.H.%	56	48	48	48	48
Date	240ct96	250ct96	250ct96	280ct96	280ct96
Pos ID	INITIAL	1KxDUR	1500X	2000X	3000X
1	10.6	-0.4	-0.0	-0.8	+0.3
2	11.1	-0.2	-0.1	-0.0	+0.1
3	11.5	-0.1	-0.2	-0.3	+0.1
4	11.2	-0.1	-0.4	-0.2	-0.2
5	11.5	-0.2	-0.7	-0.4	-0.2
6	11.2	-0.6	-0.6	-0.4	-0.3
7	11.4	-0.4	-0.4	-0.3	+0.0
8	10.9	-0.3	-0.3	-0.8	+0.1
9	11.0	-0.3	-0.2	+0.0	+0.1
10	11.1	-0.2	-0.3	-0.0	-0.1
11	11.1	-0.1	-0.1	+0.0	+0.0
12	10.9	-0.0	-0.2	+0.0	-0.1
13	10.9	-0.2	-0.3	+0.1	+0.0
14	11.0	-0.3	-0.5	+0.0	+0.0
15	11.2	-0.4	-0.4	+0.1	+0.2
16	11.2	-0.1	-0.5	+0.4	-0.1
17	10.9	+0.1	+0.0	+0.5	+0.4
18	11.3	-0.3	-0.5	-0.2	-0.2
19	11.3	-0.4	-0.6	-0.1	-0.2
20	11.0	-0.3	-0.2	-0.1	+0.0
21	11.0	-0.1	-0.1	+0.0	+0.2
22	11.1	-0.5	-0.7	-0.4	-0.7
HIGH	11.5	+0.1	+0.0	+0.5	+0.4
LOW	10.6	-0.6	-0.7	-0.8	-0.7
AVG	11.1	-0.2	-0.3	-0.1	-0.0
STD DEV	0.2	0.2	0.2	0.3	0.2
OPENS	0	0	0	0	0
INITIALS	LL	LL	LL	LL	LL

NOTES:

1 - An asterisk (*) indicates an open circuit or a value greater than 10 ohms.

CONTACT RESISTANCE

Project #: 96552
Customer: SAMTEC
Product: SMM/MMT SERIES CONNECTOR
Description: 2.0 MM CONNECTOR
Open circuit voltage: 1.0 volts

Spec: MIL-STD-1344 3004
SubGroup: ID# 2
File #: 655202.CRD

Test current: 0.5 amps

Units: milliohms
Delta values

Temp °C	+22	+22	+22	+24	+24
R.H.%	56	48	48	48	48
Date	24Oct96	25Oct96	25Oct96	28Oct96	28Oct96
Pos ID	INITIAL	1KxDUR	1500X	2000X	3000X
1	10.6	+0.4	+0.3	+0.5	+0.6
2	9.8	+1.1	+1.6	+1.1	+1.4
3	10.8	+0.1	+0.6	+0.5	+0.6
4	10.7	+0.5	+0.1	+0.4	+0.6
5	11.0	-0.1	-0.0	+0.1	+0.2
6	10.1	+0.4	-0.8	-2.1	+1.3
7	10.4	+0.2	-0.0	+0.2	+0.3
8	11.2	-0.4	-0.3	-0.0	-0.0
9	10.5	-0.2	-0.1	+0.1	+0.3
10	10.7	+0.1	-0.2	+0.1	+0.4
11	10.8	-0.3	-0.2	-0.0	+0.1
12	11.4	-0.2	-0.1	+0.1	-0.0
13	11.1	+0.1	-0.3	+0.2	-0.0
14	10.4	+0.3	-0.1	+0.2	-0.1
15	11.0	-0.3	-0.7	-0.6	-0.3
16	12.2	-1.1	-1.4	-1.4	-1.1
17	8.1	+0.5	+0.4	+0.8	+3.3
18	8.1	+0.7	+0.5	+2.9	+3.0
19	8.1	+1.5	-0.0	+2.2	+1.2
20	12.2	-1.4	-0.7	-1.6	-1.7
21	10.8	-0.3	-0.4	-0.6	-0.3
22	11.6	-0.6	-0.7	-0.7	-0.3
HIGH	12.2	+1.5	+1.6	+2.9	+3.3
LOW	8.1	-1.4	-1.4	-2.1	-1.7
AVG	10.5	+0.0	-0.1	+0.1	+0.4
STD DEV	1.1	0.6	0.6	1.1	1.1
OPENS	0	0	0	0	0
INITIALS	LL	LL	LL	LL	LL

NOTES:
1 - An asterisk (*) indicates an open circuit or a value greater than 2 ohms.