CCC TEST REPORT

PART DESCRIPTION

SEAM-40-02.0-S-10-2-A-K-TR

Mated with

SEAF-40-05.0-S-10-2-A
CERTIFICATION

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

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SCOPE

To perform the following tests: Standard CCC test per Cray Inc.

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) Re-Flow Time/Temp: See accompanying profile.
10) Samtec Test PCBs used: PCB-101653-TST-XX
TYPICAL OVEN PROFILE (Soldering Parts to Test Boards)

Kester Lead Free Reflow Profile
Alloys: Sn96.5/Ag3.0/Cu0.5 and Sn96.5/Ag3.5

Temperature (°C)

Time (sec.)

- Peak Temp. 235 - 265 °C
- Soaking Zone (2.0 min. max.) 60-80 sec. typical
- Reflow Zone time above 217 °C (90 sec max) 40-70 sec. typical
- Pre-heating Zone (2.0-4.0 min. max.)

<2.5 °C/Sec
**FLOWCHARTS**

**Current Carrying Capacity**

<table>
<thead>
<tr>
<th>TEST STEP</th>
<th>GROUP A</th>
<th>GROUP B</th>
<th>GROUP C</th>
<th>GROUP D</th>
<th>GROUP E</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>10 CONTACT POWERED</td>
<td>20 CONTACTS POWERED</td>
<td>30 CONTACTS POWERED</td>
<td>40 CONTACTS POWERED</td>
<td>ALL CONTACTS POWERED</td>
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<td>CCC</td>
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</tbody>
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(TIN PLATING) - Tabulate calculated current at RT, 65° C, 75° C and 95° C after derating 20% and based on 105° C

(GOLD PLATING) - Tabulate calculated current at RT, 85° C, 95° C and 115° C after derating 20% and based on 125° C

CCC, Temp rise = EIA-364-70
 ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

TEMPERATURE RISE (Current Carrying Capacity, CCC):

1) EIA-364-70, Temperature Rise versus Current Test Procedure for Electrical Connectors and Sockets.

2) When current passes through a contact, the temperature of the contact increases as a result of $I^2R$ (resistive) heating.

3) The number of contacts being investigated plays a significant part in power dissipation and therefore temperature rise.

4) The size of the temperature probe can affect the measured temperature.

5) Copper traces on PC boards will contribute to temperature rise:
   a. Self heating (resistive)
   b. Reduction in heat sink capacity affecting the heated contacts

6) A de-rating curve, usually 20%, is calculated.

7) Calculated de-rated currents at three temperature points are reported:
   a. Ambient
   b. $80^\circ$ C
   c. $95^\circ$ C
   d. $115^\circ$ C

8) Typically, neighboring contacts (in close proximity to maximize heat build up) are energized.

9) The thermocouple (or temperature measuring probe) will be positioned at a location to sense the maximum temperature in the vicinity of the heat generation area.

10) A computer program, TR 803.exe, ensures accurate stability for data acquisition.

11) Hook-up wire cross section is larger than the cross section of any connector leads/PC board traces, jumpers, etc.

12) Hook-up wire length is longer than the minimum specified in the referencing standard.
RESULTS

Temperature Rise, CCC at a 20% de-rating

- CCC for a 30°C Temperature Rise ----------------------- 1.8A per contact with 10 adjacent contacts powered
- CCC for a 30°C Temperature Rise ----------------------- 1.4A per contact with 20 adjacent contacts powered
- CCC for a 30°C Temperature Rise ----------------------- 1.14A per contact with 30 adjacent contacts powered
- CCC for a 30°C Temperature Rise ----------------------- 1.09A per contact with 40 adjacent contacts powered
- CCC for a 30°C Temperature Rise ----------------------- 0.6A per contact with 400 adjacent contacts powered
**DATA SUMMARIES**

**TEMPERATURE RISE (Current Carrying Capacity, CCC):**

1) High quality thermocouples whose temperature slopes track one another were used for temperature monitoring.
2) The thermocouples were placed at a location to sense the maximum temperature generated during testing.
3) Temperature readings recorded are those for which three successive readings, 15 minutes apart, differ less than 1° C (computer controlled data acquisition).
4) Adjacent contacts were powered:

   a. Linear configuration with 10 adjacent conductors/contacts powered

![Graph of Temperature RISE](image-url)
b. Linear configuration with 20 adjacent conductors/contacts powered

TC094--2189  
20 (10x2) Contacts in Series  
Part Numbers: SEAM-40-02.0-S-10-2-A / SEAF-40-05.0-S-10-2-A  
Current Rating per Contact (30 Deg. Rise, 20% Derated) = 1.4 Amps

Ambient Temperature, °C

Maximum Current, Amp per Contact

Useful Range

c. Linear configuration with 30 adjacent conductors/contacts powered

TC094--2189  
30 (10x3) Contacts in Series  
Part Numbers: SEAM-40-02.0-S-10-2-A / SEAF-40-05.0-S-10-2-A  
Current Rating per Contact (30 Deg. Rise, 20% Derated) = 1.14 Amps

Ambient Temperature, °C

Maximum Current, Amp per Contact

Useful Range
d. Linear configuration with 40 adjacent conductors/contacts powered

TC094–2189  
40 (10x4) Contacts in Series  
Part Numbers: SEAM-40-02.0-S-10-2-A / SEAF-40-05.0-S-10-2-A  
Current Rating per Contact (30 Deg. Rise, 20% Derated) = 1.09 Amps

Ambient Temperature, °C

Maximum Current, Amp per Contact

85 °C
95 °C
115 °C

Limit
RT Peak Amp
RT Derated Amp
Measured Current
85 ° C Peak Amp
85 ° C Derated Amp
85 ° C Peak Amp
85 ° C Derated Amp
115 ° C Peak Amp
115 ° C Derated Amp

20 40 60 80 100 120 140

85 ° C
95 ° C
115 ° C

Room Temp
Current Rating per Contact (30 Deg. Rise, 20% Derated) = 1.09 Amps

Useful Range

Room Temp= 22.6 C
Current Rating per Contact (30 Deg. Rise, 20% Derated) = 1.09 Amps

e. Linear configuration with all adjacent conductors/contacts powered

TC094–2189  
400 (All Power) Contacts in Series  
Part Numbers: SEAM-40-02.0-S-10-2-A / SEAF-40-05.0-S-10-2-A  
Current Rating per Contact (30 Deg. Rise, 20% Derated) = 0.6 Amps

Ambient Temperature, °C

Maximum Current, Amp per Contact

85 °C
95 °C
115 °C

Limit
RT Peak Amp
RT Derated Amp
Measured Current
85 ° C Peak Amp
85 ° C Derated Amp
85 ° C Peak Amp
85 ° C Derated Amp
115 ° C Peak Amp
115 ° C Derated Amp

20 40 60 80 100 120 140

85 ° C
95 ° C
115 ° C

Room Temp
Current Rating per Contact (30 Deg. Rise, 20% Derated) = 0.6 Amps

Useful Range

Room Temp= 22.4 C
Current Rating per Contact (30 Deg. Rise, 20% Derated) = 0.6 Amps
EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: PS-07
Description: 20 V, 120 A DC Power Supply - AutoRanging SO/HPIB
Manufacturer: Hewlett Packard / Agilent
Model: AT-6031A
Serial #: 2721A00648
Accuracy: See Manual Current Carrying Capacity (CCC) Chamber
… Last Cal: 06/16/2008, Next Cal: 06/16/2009

Equipment #: MO-04
Description: Multimeter /Data Acquisition System
Manufacturer: Keithley
Model: 2700
Serial #: 0798688
Accuracy: See Manual - DO NOT USE UNTIL CALIBRATED.
… Last Cal: 03/10/08, Next Cal: 03/10/09

Equipment #: TC111307-(001 - 017)
Description: CCC Chamber Thermocouples
Manufacturer: Samtec
Model:
Serial #: TC111307-(001 - 017)
Accuracy: +/- 1 Deg.