

STEREO IMPACT

PROBLEM REPORT

PR-1021

FM2 SWEASTED Therm.

27 September 2004

PR Numbers: 1xxx=UCB, 2xxx=Caltech/JPL, 3xxx=UMd, 4xxx=GSFC/SEP, 5xxx=GSFC/Mag,
6xxx=CESR, 7xxx=Keil, 8xxx=ESTEC, 9xxx=MPAe

Assembly : IMPACT SWEA/STE-D	SubAssembly : DAC board
Component/Part Number: RT1	Serial Number: FM2
Originator: David Curtis	Organization: U.C. Berkeley
Phone : 510-642-5998	Email : dwc@ssl.berkeley.edu

Failure Occurred During (Check one)

Functional test Qualification test S/C Integration Launch operations

Environment when failure occurred:

Ambient Vibration Shock Acoustic
 Thermal Vacuum Thermal-Vacuum EMI/EMC

Problem Description

During board-level tests it was discovered that the thermistor on the FM2 STE-D DAC board was not functioning properly. There is no evidence that this part ever worked after it was installed. Part type 311P18-08S7R6, LDC 9839, identical to the parts installed in FM1 and the STE-U Interface in the IDPU. This part was installed in the board by Jackson & Tull.

Analyses Performed to Determine Cause

Part removed and found to be low impedance. Part submitted to failure analysis at GSFC. Reference F/A #Q40371_t, confirmed that the failure of the device was due to solder overflow during assembly to the board. Thermistors are heat sensitive and require a heat sink to the leads during installation.

Corrective Action/ Resolution

Rework Repair Use As Is Scrap

The part was replaced by a spare from stock. Normal installation precautions (heat-syncing the part during soldering) were observed.

Date Action Taken: 23 September 2004

Retest Results: Success

Corrective Action Required/Performed on other Units: N/a

Closure Approvals

Subsystem Lead:	_____	Date: _____
IMPACT Project Manager:	_____	Date: _____
IMPACT QA:	_____	Date: _____
NASA IMPACT Instrument Manager:	_____	Date: _____

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GODDARD SPACE FLIGHT CENTER

Failure Analysis Report

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Thermistor

Mfr.: YSI

P/N: 311P18-08S7R6

DC: 9839

Investigator

Alexander Teverovsky (562)

Project

STEREO

System

IMPACT

Requester

Antonio Reyes (562)

Report Date

12/10/2004

Background

One [311P18-08S7R6 thermistor](#) failed during board-level testing of the FM2 STE-D DAC assembly. Per the problem report PR-1021 there is no evidence that the part ever worked after it was installed. The failed part was submitted to the GSFC Parts Analysis Laboratory for investigations.

Part Description

The [311P18-08S7R6](#) is a YSI 44900 series NASA space-qualified thermistor. The temperature-sensitive element in this part is a ceramic disk, which is made of a sintered mixture of metal oxides, with a negative temperature coefficient of resistance. To form the device two wires are soldered to silver contact electrodes on the surface of the disk and encapsulated with a droplet of epoxy. Figure 1 shows external views of the failed part as received.

Analysis

Electrical testing showed that the part was short-circuited with a resistance below 1 Ohm.

Radiography (see Figure 2) did not reveal any obvious anomalies.

After decapsulation of the part in hot m-Pyrol, a short between the electrodes was found. Figure 3 shows several SEM views of the part. EDS analysis (see Figure 4) identified the short as a low temperature Sn/Pb solder.

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Conclusion

A failure of 311P18-08S7R6 thermistor was confirmed. The part failed short circuited most likely during soldering onto the board due to solder reflow, which resulted in solder bridging between the electrodes of the ceramic disk. Both factors, a use of low-temperature solder to bond wires to the disk by the manufacturer and overheating of the part during soldering onto the board by a technician, have contributed to this failure.

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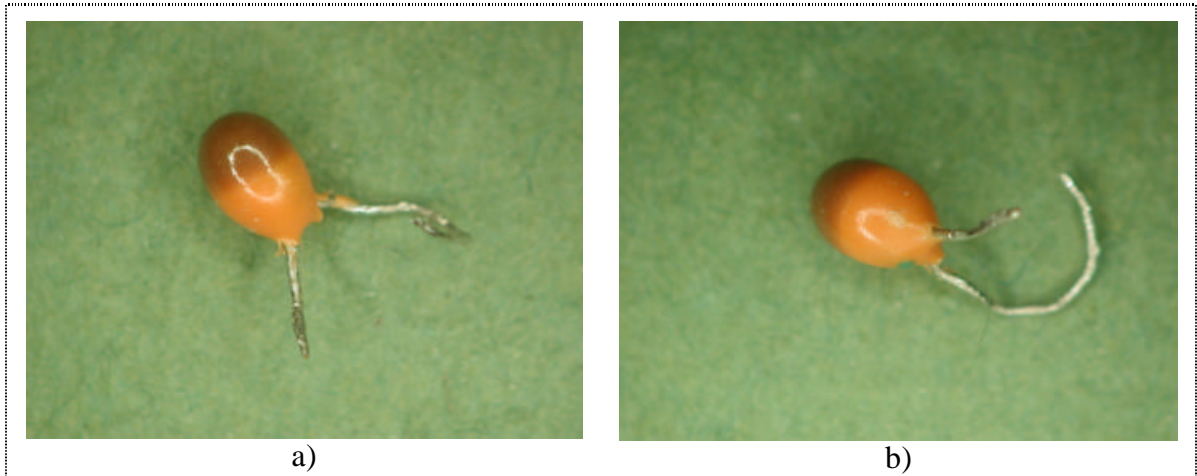


Figure 1. Two external views of the failed part as received.

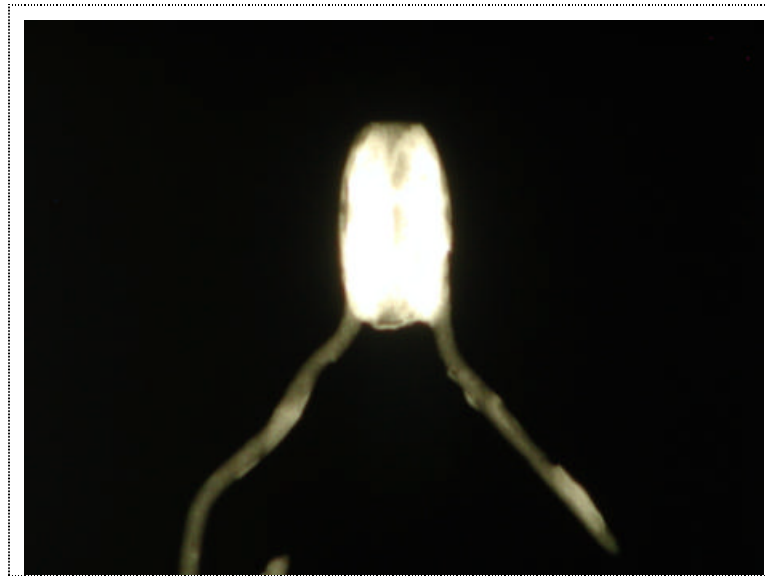


Figure 2. An X-ray view of the failed part.

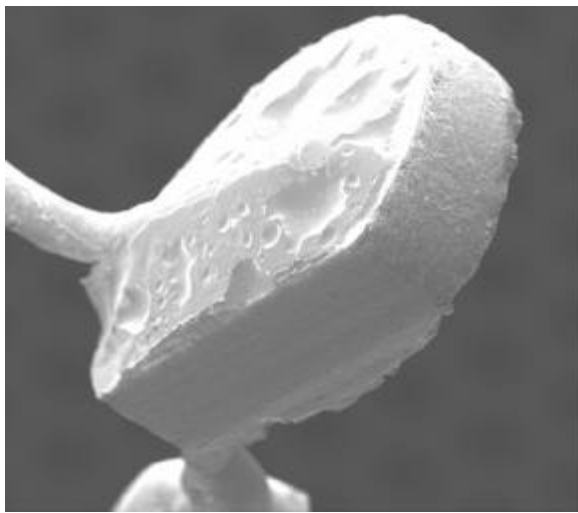
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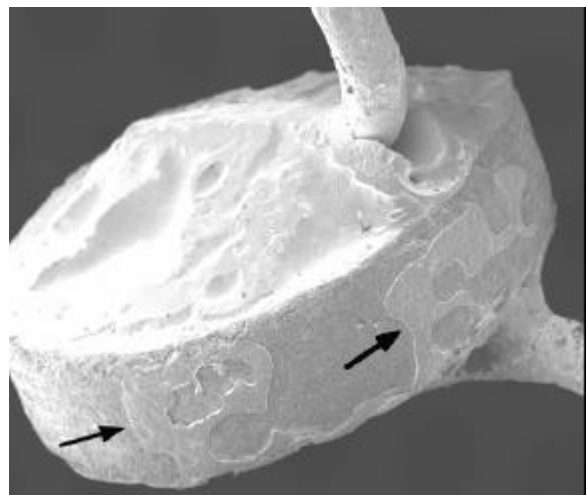
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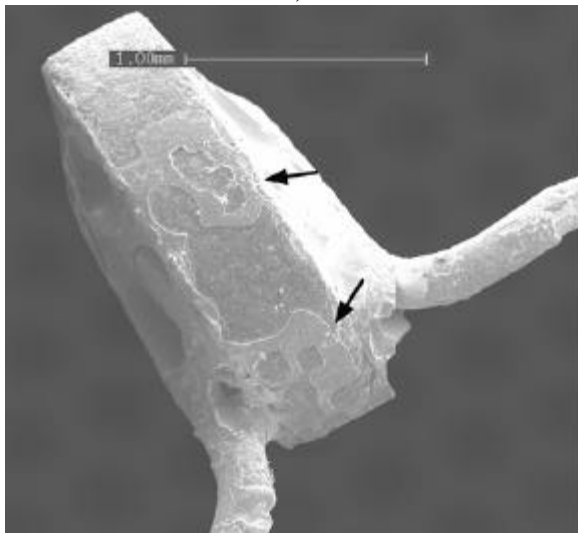
27 September 2004



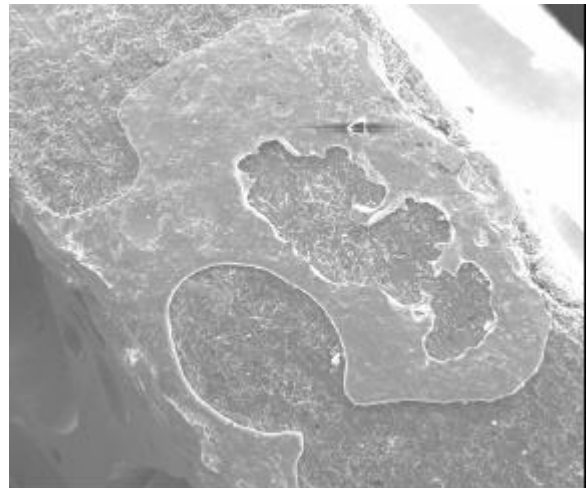
a)



b)



c)



d)

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Figure 3. SEM views of the failed part. Arrows indicate areas with solder reflow; Fig. 3d shows a close-up of the solder bridge.

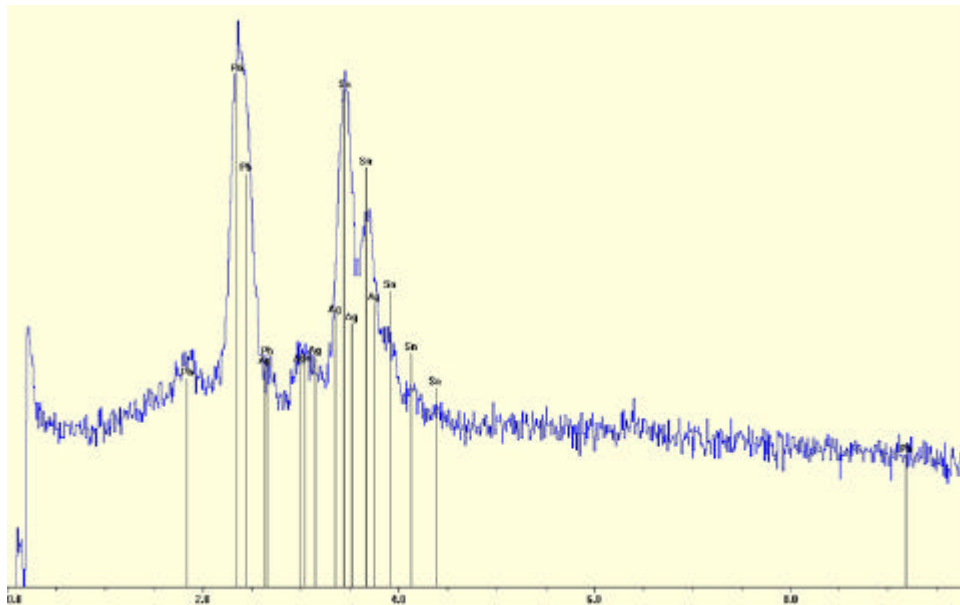


Figure 4. EDS of the solder bridge. Analysis indicated a composition close to low-temperature solder 60Sn/40Pb with a melting temperature of 183 °C.