BiSon64-ET(-B) EXPRO

EXECUTIVE SUMMARY

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DOCUMENT CHANGE RECORD

Issue	Date	Total pages	Pages affected	Brief description of change
1	14/01/2023	7	All	New document

Contents

Abbreviations

AD	Applicable Document
RD	Reference Document
TRR	Test Readiness Review

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Applicable Documents

AD	Document title	Document number	Issue
AD-01	Space Testing	ECSS-E-ST-10-03	C
AD-02	BiSon64-ET product specification	22-LRD-SP-0014	2b
AD-03	BiSon64-ET product specification	22-LRD-SP-0015	2b
AD-04	Test method standard microcircuits	MIL-STD-883	K
AD-05			

Reference Documents

RD	Document title	Document number	Issue
RD-01			
RD-02			
RD-03			
RD-04			
RD-05			

1 Introduction

The BiSon64-ET sun sensor, see Figure 1, is a high reliability sun sensor originally designed to be cost effectively produced and have a field of view of >64 degrees in diagonal. (Hence the name)

The BiSon64-ET-B sun sensor, see Figure 2, is a standard BiSon64-ET with a baffle added so as to reduce Earth Albedo sensitivity and ease accommodation on the spacecraft by shielding reflections from spacecraft parts over a significant field of view.

Figure 1 BiSon64-ET

Figure 2 BiSon64-ET-B

The BiSon64-ET and BiSon64-ET-B sensors are analogue fine Sunsensors based on a radiation hardened four quadrant photodiode and sapphire membrane. The sensors are optimised for volume production by:

1. using a housing integrated, wire-bondable, connector
2. vision based pick and place assembly
3. semi-automatic wirebonding
4. membrane manufacturing on wafer scale
5. automated membrane placement

Both types of sensors have been qualified according to ESA standards as specified in [AD-01]. This document provides the executive summary of the program that has been run and its results

1.1 Environmental Qualification test flow

The ECSS specification [AD-01] only specifies the four major tests that need to be performed and a life cycle test, but not the exact test levels, while these are equipment specific. During the course of the program, environmental tests were performed at different levels in order to investigate where the limits of these test levels are in relation to the sensor performance. This resulted in the levels for the final qualification test as given in Table 1.

Test Number	Test type	Test levels
1	Humidity	Combined humidity and temperature cycles in different combinations for: • 37h • between 2°C…35°C and 12…95% test sequence and levels as per [AD-01]
2	Vibration	Sine vibration for all three axes • 40g • 1 oct/min • 1sweep up • 1 sweep down Random vibration for all three axes • RMS level: 34.26g • $2g^2/Hz$ • For 180sec
3	Shock	Shock for all three axes • up to 3000g
4	Thermal vacuum cycling	Thermal vacuum cycling: • between -65°C and +105°C • >+10°C/min • <-5°C/min • 10 cycles

Table 1 Overview – environmental qualification test program

1.2 Test results

During the tests it was found that there was a fundamental flaw in the construction of the proprietary photodiodes caused by a deficiency in the delivered raw material. As a result, the test program had to be repeated. In the end though all tests were successfully performed as reflected in the final statement as given in the qualification review board (QRB) report.

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2 BOARD CONCLUSIONS

OBJ 1: The qualification test results comply with the equipment requirements in *22-LRD-SP-0014-V2b BiSon64-ET product specification* (version without baffle) and *22-LRD-SP-0015-V2b BiSon64-ET-B product specification* (version with baffle) or any Request for Deviation (RfD) are approved.

The board notes that the qualification tests are successful and no failures are observed.

Achieved

OBJ 2: All materials, process and EEE parts are qualified.

The board notes that this qualification campaign does not include thermistor EEE part qualification at component level.

Achieved

OBJ 3: All open points after the original QR (December 2019) and delta-QR (June 2021) are closed, and all non-conformances are controlled

The board notes that all NCRs are closed, and all previous failures have been properly dealt with.

Achieved

Figure 3 Excerpt from QRB report

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