BiSon64-ET Sun Sensor

Interface Control Document

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DOCUMENT CHANGE RECORD

Issue	Date	Total pages	Pages affected	Brief description of change
1	14/08/2020	9	All	New document
2	22/02/2022	9	4	Applicable documents updated

Contents

List of photos

Abbreviations

AD	Applicable Document
BOM	Bill Of Material
COTS	Commercial Of The Shelf
CSS	Coarse Sun Sensor
ECSS	European Cooperation for Space Standardization
ESA	European Space Agency
FOV	Field Of View
FSS	Fine Sun Sensor
IC-Doc	Interface Control Document
IC-Drw	Interface Control Drawing
LOS	Line Of Sight
NTC	Negative Temperature Coefficient resistor (thermistor)
RD	Reference Document
TRR	Test Readiness Review

Applicable Documents

AD	Document title	Document number	Issue
AD-01	BiSon64-ET product specification	22-LRD-SP-0014	2
AD-02	BiSon64-ET Interface Control Drawing	110T701	05
AD-03	Precision fastener	500M085	01
AD-04	Washer vented	500M086	01

Reference Documents

RD	Document title	Document number	Issue
RD-01	Space engineering Interface management	ECSS-E-ST-10-24	C
RD-02	BiSon64-ET(-B) Delivery-Packing-Storage-Handling and Transportation procedure	19-LRD-PR-0052	1

1 Introduction

The BiSon64-ET sun sensor, see Photo 1, is a high reliability Sunsensor with a nominal field of view of >64 degrees in diagonal, specifically designed for demanding satellite applications and an extended temperature (-ET) range. The high temperature range is obtained through using different materials with as good as possible matching temperature coefficients of extensions and a glue specifically designed for this application.

Photo 1 BiSon64-ET

This document specifies the sensor's interfaces and shall be read in conjunction with the interface control drawing [AD-02]. It is written in line with the ESA Space engineering Interface management ECSS-E-ST-10-24 C [RD-01].

2 BiSon64-ET Interface data

2.1 Electrical

The Circuit diagram is given on [AD-02] sheet 3.

2.1.1 Grounding and isolation

- There is no grounding stud and grounding of the housing will be performed via the mounting feet
- Between common ground and the RTN signal a resistance as identified by “R2” is present as indicated on [AD-02] sheet 3 to avoid electrical charging of the floating interior when the sensor is not connected.
- The isolation impedance is as specified in par 5.1 of [AD01]

2.1.2 Signal interface data

2.1.2.1 Diode signal

- The measurement sensor is identified by “D1” as mentioned on [AD-02] sheet 3.
- Sensor “D1” will generate 4 analogue currents, Q1 …. Q4 as a function of the incoming light and its orientation.
- The generated current will be as specified in [AD01] par 5

2.1.2.2 Thermistor signal

- The internal thermistor is bipolar and identified by “R1” as mentioned on [AD-02] sheet 3.
- Thermistor “R1” has a nominal value of 10kΩ ± 1% @ 25°C.
- The material constant B of the thermistor is 3930K ± 1%.

$$B_{(T1/T2)} = \frac{T2 \times T1}{T2 - T1} \times \ln\left(\frac{R1}{R2}\right)$$

- Where:
  - T1 is the first temperature point in Kelvin.
  - T2 is the second temperature point in Kelvin.
  - R1 is the thermistor resistance at temperature T1 in Ohms.
  - R2 is the thermistor resistance at temperature T2 in Ohms.

2.1.3 Harness interfaces

2.1.3.1 Connector interface data – per pin

The connector location is mentioned on [AD-02] sheet 1, position: (I – 3/4) and identified as “J1” on [AD-02] sheet 3, is a 7-pin female connector for which the pins are identified as follows:

PIN number	Component	Output		Function	Polarity
		signal	type		
J1-1	R1-1	Thermistor	Analogue	Measurement	B -bipolar
J1-2	R1-2	Thermistor	Analogue	Measurement	B -bipolar
J1-3	Q2	Diode	Analogue	Measurement	N -negative
J1-4	RTN	Diode return	Analogue	Measurement	N/A
J1-5	Q3	Diode	Analogue	Measurement	N -negative
J1-6	Q4	Diode	Analogue	Measurement	N -negative
J1-7	Q1	Diode	Analogue	Measurement	N -negative

2.2 Optical

The optical interfaces are defined by means of a right-hand orthogonal coordinate system defined by the X axis running through the center of the reference hole (right side bottom hole “z” on sheet 1 of [AD-02]) and the slotted hole. Consequently, the Z axis is defined orthogonal to the mounting plane of the sensor.

Sheet 2 of [AD-02] defines the fields of view of the sensor with respect to the mounting plane in cross sections A-A, B-B and C-C. For each of these cross sections there are two fields of view given for which the smaller one is the measurement field of view and the larger one is the Sun exclusion field of view.

Within the measurement field of view the defined accuracies will be obtained after the appropriate calibration compensation.

Outside of the specified Sun exclusion field of view, the sensor will not be sensitive to Sun light.

2.3 Thermal control

- Baseplate thermal contact area are mentioned as “mounting feet contact area” on [AD-02] sheet 4.
- Temperature range is mentioned in [AD-01].
- Contact area flatness is mentioned on [AD-02] sheet 1.
- Overall roughness Ra is <1.6µm according to DIN ISO 1302 as mentioned on [AD-02] sheet 1 up to 5.
- Thermal design of the mounting interface shall be such that the temperature is kept within the specified temperature ranges at the sensor side of the TRP as indicated on [AD-02] page 4 through conduction.
- The housing is made of bare ASTM grade V Titanium as mentioned on [AD-02] sheet 4.
- The window has a measured α of 0.56
- The window has a measured ε of 0.76
- Thermal mass for the sensor is 12.62J/°C ±5%.

2.4 Structural

In order to achieve the specified accuracy and environmental withstanding capability, the precision fastener 500M08501 [AD-03] shall be used and fastened as per [AD01] par 3.2.

More applicable information:

- The mechanical reference hole is identified by “Temperature Reference Point” (TRP) as mentioned on [AD-02] sheet 1.
- Envelope dimensions are mentioned on [AD-02] sheet 1.
- Mass is mentioned on [AD-02] sheet 1 up to 5 .
- Centre of gravity is identified by “COG” as mentioned on [AD-02] sheet 1.
- Calculated Moment of inertia is mentioned on [AD-02] sheet 4.
- The mounting holes size and location are mentioned on [AD-02] sheet 1.
- Geometrical tolerance is mentioned on [AD-02] sheet 1.
- Venting holes have a 1mm diameter, their positions are indicated on [AD-2] sheet 4.

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