1. (normative)  
   Source control drawing for solar cell assembly (SCD‑SCA) ‑ DRD
   1. DRD identification
      1. Requirement identification and source document

This DRD is called from ECSS-E-ST-20-08, requirement 6.1.2b.

* + 1. Purpose and objective

The source control drawing for solar cell assembly (SCD-SCA) contains the specific project dependent requirements, and together with this Standard, which contains the general requirements, constitutes the whole set of requirements for the qualification and acceptance of solar cell assemblies.

The SCD-SCA can be produced as a standalone document or as part of a system-level specification document.

The information on traceability to high level requirements can be included in the SCD-SCA itself or in the requirements traceability in the design justification file (DJF, see ECSS-E-ST-10). In either case a cross-reference is made.

The SCD-SCA is a major input to the qualification plan.

* 1. Expected response
     1. Scope and content

Introduction

The SCD-SCA shall contain a description of the purpose, objective, content and the reason prompting its preparation.

Applicable and reference documents

The SCD-SCA shall list the applicable and reference documents to support the generation of the document.

Terms and definitions, abbreviated terms and symbols

The SCD-SCA shall include any additional definition, abbreviation or symbol used.

Deviations from ECSS-E-ST-20-08

In conformance with clause 6.1.2, the SCD-SCA shall include the justification for any deviation in the in-process, acceptance and qualification tests.

Materials

The SCD-SCA shall include the following solar cell characteristics:

For silicon solar cells:

growth technique, base resistivity, and thickness.

for ARC: materials

for metal contact materials and thickness

For GaAs single or multi-junction solar cells:

for the substrate: type of material and thickness;

for each sub-cell: materials,.

for ARC: materials

for metal contact materials and thickness

For interconnects:

materials and dimensions, all metal layers and their thickness.

joining technique, additional materials (if any) and reference to the procedure

For coverglass: material, thickness, ARC, and conductive coating.

For coverglass adhesive, material and outgassing rates and reference to the procedure for process details and cementing conditions.

1. See ECSS-Q-ST-70-02.

Test methods, conditions and measurements

Dimensions and weight

In conformance with clause 6.4.3.2, the SCD-SCA shall include:

A figure, showing the physical dimensions of the solar cell assembly, including both, the nominal values and tolerances.

The average weight (per lot) of solar cell assemblies including the interconnector, in grams.

Electrical performance

In conformance with clause 6.4.3.3, the SCD-SCA shall include, the information shown in Table B-1, extended if there are several operational voltages at a solar cell temperature of 25 C, under illumination of 1 S.C (AM0).

: Minimum current requirement for solar assemblies (25 C or operating temperature)

|  |  |  |  |
| --- | --- | --- | --- |
| Sample | Irradiation dose | Test voltage  Vt (mV) | Current at  Vt (mA) |
| Minimum for individual solar cell assemblies | BOL | [Insert value] | [Insert value] |
| EOL | [Insert value] | [Insert value] |
| Minimum average for solar cell assemblies | BOL | [Insert value] | [Insert value] |
| EOL | [Insert value] | [Insert value] |
| Test temperature: [Insert value] | | | |
| NOTE: EOL is defined as 1 MeV Φp electron dose (in conformance with 6.4.3.12) plus photon irradiation and temperature annealing (in conformance with 6.4.3.13). | | | |

Temperature coefficient

In conformance with clause 6.4.3.4, the SCD-SCA shall include the six equidistant solar cell temperatures to which the test is performed.

Spectral response

In conformance with clause 6.4.3.5, the SCD-SCA shall include for multi-junction GaAs solar cells, the number of narrow band interference filters and their wavelength.

Thermo-optical properties

In conformance with clause 6.4.3.6, the SCD-SCA shall include the following:

The maximum value of the solar absorptance as a percentage of SCAs with tolerances.

The maximum value of normal emittance as a percentage (%) of SCAs with tolerances.

Thermal cycling

In conformance with clause 6.4.3.7, the SCD-SCA shall include the number of cycles to be performed and their extreme temperatures, to simulate the number of eclipses occurring during one year in orbit for LEO missions, and 1000 thermal cycles for GEO missions, or the complete lifetime cycling for interplanetary or other mission types.

Humidity and temperature

In conformance with clause 6.4.3.8, the SCD-SCA shall include the chemical contents, type and % in the mist, to be added to the humid environment, when there are specific requirements on the contents of the environment and the voltage bias condition to be applied to the SCA.

Coating adherence

In case of coverglass with conductive coating, in conformance with clause 6.4.3.9, the SCD-SCA shall specify which of the two standards ISO 9211-4 or ECSS Q-ST-70-13 is applied

Interconnector adherence

In conformance with clause 6.4.3.10 the SCD-SCA shall include:

the value of the pull speed, in mm/min;

the pull direction

the value of the separation pull strength of interconnectors, in N.

Electron irradiation

In conformance with clause 6.4.3.11, the SCD-SCA shall include:

The three fluences at 1MeV, in e- cm2;

<<deleted>>

Surface conductivity

In conformance with clause 6.4.3.13, the SCD-SCA shall describe:

The method to perform the surface conductivity test that shall be between the contact dots or an alternative one to be specified here in the SCD-SCA.

The minimum value, in Ω, and the maximum variation after any test, in Ω, of the cover conductivity before and after qualification tests of SCA of subgroup D (in conformance with Table 6‑1).

Solar Cell reverse bias test

In conformance with clause 6.4.3.14, that is applicable only for SCAs without protection diode or with a protection diode electrically isolated form the cell, the SCD-SCA shall include:

The reverse I/V characteristics measured under illumination of 1 S.C.;

The following measurement parameters shall be clearly stated in the SCD-SCA

power supply limitation

temperature

hold time

maximum reverse bias voltage

The pass-fail criteria

the maximum change in the value of reverse current ∆I, in mA from the initial value of the same parameter when measured as delivered. Pass fail criteria shall be specified in the SCD-SCA.

the maximum absolute value of the reverse current, in mA.

Ultraviolet exposure

In conformance with clause 6.4.3.15, the SCD-SCA shall include the following:

The operational test temperature, in C.

The EOL UV loss factor.

Capacitance

In conformance with clause 6.4.3.16, the SCD-SCA shall include the test temperature, in C and the capacitance test method as specified either in clause 11.1 or 11.2 of this Standard.

Flatness

In conformance with clause 6.4.3.17, the SCD-SCA shall include the minimum flatness, as a maximum deviation given in mm.

* + 1. Special remarks

None.