XMM Optical Monitor

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DETAIL SPECIFICATION FOR HIGH VOLTAGE THICK FILM RESISTORS

DOCUMENT: XMM-OM/MSSL/SP/0052.05 13 June 1995

CHANGE RECORD

ISSUE	DATE	PAGES CHANGED	COMMENTS
01	11 October 1994	All New	
02	9 December 1994	4,5,6,table	References to Leak Test deleted. Par 8 clarified. Table revised
03	18 January 1995	3,4,5,	Result of visit to Welwyn
04	1 February 1995	Table 1	Minor changes to Table 1
05	13 June 1995	Table 1	Minor changes to dimensions and dielectric withstanding voltage

CONTENTS

1. SCOPE

This specification defines the requirements for circuit type approval, procurement, lot-acceptance testing and delivery of thick film high voltage resistors and resistor dividers. The testing identified in this specification relates only to that quantity of components referred to as "Full Spec" in Table 1.
These components are for use in the Blue Detector high voltage electronics in the Optical Monitor on the XMM Project.

2. APPLICABLE DOCUMENTS

ESA PSS-01-608	Generic Specification for Hybrid Microcircuits
Mil Std 883	Test Methods and Procedures for Microelectronics
Mil Std 202	Test Methods for Electronic and Electrical Component Parts

3. GENERAL

The manufacturer shall have a stable process, quality approved by a nationally recognised organisation. Any changes to this baseline process shall be notified to MSSL prior to the manufacture of any items, whether it be for engineering or full specification parts.
The manufacturer shall be responsible for the performance of all tests and inspections required by this specification.
MSSL reserves the right to witness processing and testing of parts it has ordered.

4. TESTS

Circuit type approval will be achieved by the design, fabrication and testing of components made using the manufacturer's approved process. An operational life test to 1000 hours shall be conducted on a samples of each type, together with Destructive Physical Analysis (DPA) on 2 pieces.
The test requirement for the procurement of the resistors shall comprise:-

- Final Production Tests
- Burn-in and Electrical Measurements
- Lot-acceptance Tests

5. REQUIREMENTS

Table 1 Requirements
The requirements for all the resistor types are shown on a separate sheet.
Voltage coefficient tests need only be conducted on R7, RD1, RD2, RD3 and RD4. Vmax should be used for these tests, with the exception of R7, which should be tested using Vmax/2.
The temperature coefficient tests need only be conducted on R7, RD1, RD2, RD3 and RD4.

Table 2 The conditions for burn-in
Burn-in shall be conducted at ambient temperature. Currents shall be passed through the resistors to produce loads which shall not exceed the maximum power rating for each resistor. Potentials to achieve this shall not exceed Vmax/2.

6. PROCUREMENT

All resistor pieces of a particular value and delivered to this specification shall come from one identifiable production lot and be traceable to it.
Components delivered to this specification shall have completed satisfactorily all tests including the lot-acceptance procedure.
All components shall be marked clearly with their part number, together with a code allowing traceability.

7. PRODUCTION CONTROL

Production shall follow the approved process.
Traceability shall be maintained throughout the process from incoming inspection to final test.

8. FINAL PRODUCTION TESTS

Final Production Tests shall meet, as a minimum, the requirements below. The sequence of tests shall be as shown, unless the manufacturer has formally requested and obtained permission from MSSL to deviate from this sequence. All components for delivery to this specification and all components used for environmental and endurance tests shall meet all of the relevant final production test requirements. Any component that does not meet these requirements shall be removed from the lot and at no time be resubmitted to the requirements of this specification. The applicable tests methods and conditions are specified below and are to be carried out on every piece:-

Pre-encapsulation

8.1 Electrical Test (Manufacturer's Specification)
8.2 Pre-encapsulation Visual Inspection (Mil Std 883, method 2017 class S)

Vacuum bakeout, followed by encapsulation

8.3 Stabilisation Bakeout; 72 hours at 125°C
8.4 Thermal Cycling; 10 cycles of -55 to+125°C (Mil Std 883, method 1010 Test Condition B)
8.5 Vibration; (Mil Std 202 Method 204 Test Condition D)
8.6 Electrical Measurements (as par 5, Table 1)

Five pieces shall be checked for physical dimensions.

9. BURN-IN AND ELECTRICAL MEASUREMENTS

Burn-in and electrical measurements shall be performed only after Final Production Tests. The burn-in period shall be 168 hours and the conditions shall be as in par 5, Table 2. The measurement point for post burn-in electrical measurements shall be 168+24–0 hours.

The post burn-in tests to be conducted are as follows:-

9.1 Electrical Measurements, Ambient Temperature (par 5, Table 1)
9.2 External Visual Inspection (Mil-Std-883, method 2009).

A component shall be considered as failed if it exhibits one or more of the failure modes listed in this section

9.3 Parameter Limit Failure. A limit failure is a failure when one or more parameters exceed the limits shown in par 5, Table 1. Any component which exhibits a limit failure prior to the burn-in sequence shall be rejected, but not counted when determining lot rejection.

9.4 Other Failures. A component shall be considered as having failed if any of the following cases apply:-
- catastrophic failure
- mechanical failure
- handling failure
- lost component

9.5 Lot Rejection. If the number of failed components, on the basis of the failure criteria described above (excluding handling failure and lost components), exceeds 20% (rounded up to the nearest whole number) of the number of components submitted to burn-in and electrical measurements, the lot shall be considered as failed.

10. LOT ACCEPTANCE TESTING

Lot Acceptance Testing shall be performed on a sample which is a function of the lot size:

Lot Size	Sample Size(n+1)
1-25	4
26-50	5
51-90	6

N.B. The extra component sample shall be kept as a reference for electrical measurements and if necessary, for performing additional tests in order to resolve discrepancies.

The following tests shall be conducted on the samples:-

10.1 Operating Life Test. This shall be performed on n – 1 components for 1000 hours. The conditions shall be at an ambient temperature of 125°C, with as close to maximum load as possible. The parameters measured before and after the test shall be those in par 5, Table 1, with the exception of power dissipation. No failures are allowed.
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10.2 Destructive Physical Analysis (DPA). This analysis shall be performed on one component chosen at random from the fully screened lot and one chosen at random from 10.1
DPA shall be conducted by MSSL, or by an independent laboratory selected by MSSL. The manufacturer shall supply a schematic layout of the component for this exercise.
The specific tests to be conducted shall be agreed between MSSL and the manufacturer.

11. PART IDENTITY

Ideally the resistor identity shall be this specification number, together with the relevant resistor designation. For example, the first resistor in Table 1 would be :- XMM-OM/MSSL/SP/0052.05 R1. However, a simplified version such as OM52.05R1F (F for the full specification version, and no letter for the engineering version) would be acceptable.

12. DOCUMENTATION

A documentation package shall be provided by the manufacturer for each delivery lot. As a minimum this shall include :-

- identification of the part type, manufacturer, lot and date on which the document was issued
- a certificate of conformity to this specification
- details of the testing conducted, together with all the results

13. DELIVERY

The manufacturer shall be responsible for the packing of components and use the appropriate methods to prevent degradation, or damage due to corrosion, deterioration or physical damage. He shall ensure safe delivery to MSSL and shall be responsible for any damage resulting from faulty packing.
The documentation detailed in par 12 shall be delivered together with each delivery lot.