

TERMS OF REFERENCE FOR THE R&D PROJECT

LITD 05 “Semiconductor & Other Electronic Components and Devices Sectional Committee”

- 1. Title of the Project:** Study of requirements and test methods for Fixed surface mount resistors for use in electronic equipment.
- 2. Background:**
 - 2.1.** Fixed resistors are principal electronic components composed electronic circuit. They are used in various electronic circuits and components. One of the variety of resistor are Surface Mount Resistors, which are the most popular resistors for use in electronic components because of their high reliability and small size.
 - 2.2.** Surface-mount resistors are widely used across many industries and applications, including automotive, telecommunications, medical equipment, displays, personal devices and advanced research instruments.
 - 2.3.** Recently new style of transverse resistors with wide terminals have become common in market. Also rated dissipations in resistors have been changed.
 - 2.4.** It is required to find out the usage and testing methodology for fixed surface mount resistors for use in electronic equipment.
 - 2.5.** Testing methodology like Periodic-pulse high-voltage overload test, solderability test, solvent resistance test, 'Single-pulse high-voltage overload test' and other parameters may be explored for Indian scenario.
 - 2.6.** Presently, IEC 60115-9 “Fixed resistors for use in electronic equipment - Part 9: Sectional specification: Fixed surface mount resistor networks with individually measurable resistors” is available on the subject.
- 3. Objective:** Study of requirements and test methods for Fixed surface mount resistors for use in electronic equipment.
- 4. Scope:**
 - 4.1.** Study and comparative analysis of existing literature on Fixed surface mount resistors. This includes International standards/Regional Standards/Standards published by other countries, research papers.
 - 4.2.** Analysis of best practices, Standard Operating Procedure followed by manufacturers and any other study report.

- 4.3. Study the prevalent varieties of Fixed surface mount resistors and their uses. This study will also include the types of raw material by manufacturer.
- 4.4. Collection of the data on manufacturing base of Fixed surface mount resistors in India. Details of export and import of the product.
- 4.5. Study of technical regulations and applicable standards of countries from where product is imported into India or vice-versa.
- 4.6. Collect the information on Test facilities available for the product in the country for resistors. This will help in assessing the testing infrastructure in the country to determine the availability and adequacy of facilities for conducting product testing and quality assurance.
- 4.7. Visit of at-least two different Manufacturing Units (preferably one large and one MSME unit) of resistors (components) available in the country to observe the production processes, technology used, and overall manufacturing capabilities.
- 4.8. The study to be focus on understanding important parameters:
 - i. Types of Raw materials/components used.
 - ii. Varieties/grades manufactured
 - iii. Quality parameters (Performance requirements)
 - iv. Manufacturing process,
 - v. Safety requirements
 - vi. In process quality checks
 - vii. Test facilities and test methods with reference to the standards being used.
 - viii. Marking and labelling being done
 - ix. Packaging requirement
 - x. Tests being undertaken
 - xi. Testing facilities in the plant
- 4.9. Collections of at least three random samples from different manufacturers from the market and its testing for generation of test data for important safety and performance requirements from Gov labs, MoU partner institutes, NABL accredited labs for resistors.
- 4.10. Take Feedback both from manufacturers and end users of the product by visiting them and collect data as mentioned in the scope through a questionnaire.

4.11. Sustainability impact: steps taken for energy conservations/efficiency. Sustainable processes in the production process. 3R (reduce, reuse and recycle) waste disposal mechanism, carbon foot print assessment.

5. Deliverables:

5.1. Study report covering all the aspects mentioned in the scope, including following:

- i.** Review of literature in respect of areas covered in the scope.
- ii.** Compilation, comparative analysis and summary of standards developed/referred by other countries related to Surface-mount resistors usage in various industries
- iii.** Feedback/information through structured questionnaire from user industries.
- iv.** Compilation, comparative analysis and summary of the best practices, guidelines, documents being used and referred by manufacturers;
- v.** Information on testing facilities in India for components
- vi.** Test-results of Surface-mount resistors.

5.2. Prescription of prescribe preferred ratings and characteristics, the appropriate quality assessment procedures, tests and measuring methods and general performance requirements for this type of resistor

6. Research Methodology:

6.1. Study the literature and analyse the findings.

6.2. Manufacturers, R&D experts and end users of resistors shall be consulted for the studies and discussions, through various meetings, workshops, conferences.

6.3. Visit the manufacturing unit and

- i.** observe the manufacturing process,
- ii.** examine in-process control measures,
- iii.** conduct focused group discussion with quality personnel
- iv.** collect the data as mentioned in the scope through a questionnaire.
- v.** draw samples of the grades and get it tested in BIS approved laboratories

6.4. Visit laboratories and make report on

- i.** test equipment required
- ii.** test method being used
- iii.** testing charges
- iv.** testing time required.

6.5. Visit the identified importers and exporters and collect data as mentioned in the scope through questionnaire.

6.6. Visit the users of the product and collect data as mentioned in the scope through a questionnaire

6.7. Analyse the data and test reports from diverse sources and include the same in the project report.

7. Timeframe:

7.1. The timeframe for completing the study and submission of the final report is 4 months from the date of award of the project.

7.2. Stage-wise-timeline:

- i. 0-1 Month: Literature survey report. A mid-term review to assess progress and adjust methodologies as necessary in the 2nd Month from the date of assignment.
- ii. 1-3 Month: Visits to various units and collection of sample. Discussion with manufacturers, and end users. Draft report is submitted for mid-term review to assess progress and adjust methodologies as necessary. Submission of first draft need not wait for the availability of test report.
- iii. 4 Month : Submission of final report.

8. Support:

8.1. BIS will provide access to latest available editions of Indian standards and/ or international standards relevant to the project, on request.

8.2. Facilitation/Introduction of the project leader/organization to relevant Industry and Industry association, testing lab, regulator/ministries.

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