

JEDEC STANDARD

Test Method for Alpha Source Accelerated Soft Error Rate

JESD89-2B

Addendum No. 2 to JESD89
(Revision of JESD89-2A, October 2007)

JULY 2021

JEDEC SOLID STATE TECHNOLOGY ASSOCIATION



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Published by
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Arlington, VA 22201-3834

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TEST METHOD FOR ALPHA SOURCE ACCELERATED SOFT ERROR RATE

(From JEDEC Board Ballot JCB-20-62, formulated under the cognizance of the JC-14.1 Subcommittee on Reliability Test Methods for Packaged Devices.)

1 Scope

This test method is offered as standardized procedure to determine the alpha particle Soft Error Rate (SER) sensitivity of solid state volatile memory arrays and bistable logic elements (e.g. flip-flops) by measuring the error rate while the device is irradiated by a characterized, solid alpha source

The results of this accelerated test can be used to estimate the alpha particle induced SER for a given alpha radiation environment. JESD89 describes considerations for executing such an estimate from data collected with this test method. Refer to JESD89 for other background on the motivation for requirements in this test method and guidance for those elements left to the discretion of the tester.

NOTE 1 This test cannot be used to project thermal and high energy neutron induced SER.

NOTE 2 Special considerations apply to devices that are more than memory arrays and/or bistable logic elements. These can preclude the application of this test procedure. Refer to JESD89 for further discussion on some examples.

1.1 Applicable documents

JESD89	Measurement and Reporting of Alpha Particles and Terrestrial Cosmic Ray-Induced Soft Errors in Semiconductor Devices
JESD89-1	Test Method for Real-Time Soft Error Rate
JESD89-3	Test Method for Beam Accelerated Soft Error Rate

2 Apparatus

The performance of this test requires equipment that is capable of providing the particular test conditions to which the test samples will be subjected.

2.1 Vehicle design and operation

The biasing and operating schemes shall consider the limitations of the devices and shall not overstress the devices or contribute to thermal runaway.

2.2 Device mounting

Equipment design, if required, shall provide for mounting of devices to minimize adverse effects while parts are under test (e.g., improper heat dissipation).

2.3 Power supplies and signal sources

Instruments (e.g., oscilloscopes) used to set up and monitor power supplies and signal sources shall be calibrated and have long-term stability. Electrical noise shielding shall be in place to allow for accurate test results.

3 Terms and definitions

DUT: Device under test. In this instance, device is defined as a product IC or test chip.

absolute maximum rated voltage: The maximum voltage that may be applied to a device and beyond which damage (latent or otherwise) may occur. It is frequently specified by device manufacturers for a specific device and/or technology.

alpha activity (of a source): The number of alpha particles that decay in an alpha source per unit time.

NOTE The preferred SI unit is the becquerel (Bq), which is one disintegration per second. (1 curie = 3.7×10^{10} becquerels).

critical charge (Qc): The minimum amount of collected charge that will cause a device node to change state and result in a single event upset (SEU).