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Radiation Hardened Electronics and Semiconductors Market Forecasts to 2030 – Global Analysis By Component (Semiconductors, Passive Components and Other Components), Technology, Application, End User and By Geography

https://marketpublishers.com/r/RC20CBC8C418EN.html
Date: January 2025
Pages: 150
Price: US$ 4,150.00 (Single User License)
ID: RC20CBC8C418EN

Abstracts

According to Stratistics MRC, the Global Radiation Hardened Electronics and Semiconductors Market is accounted for $1.8 billion in 2024 and is expected to reach $2.8 billion by 2030 growing at a CAGR of 7.7% during the forecast period. Radiation-hardened electronics and semiconductors are designed to withstand the harmful effects of radiation, such as cosmic rays and solar radiation, which can cause physical damage or malfunction in standard electronic devices. These devices are crucial in applications like space exploration, nuclear power plants, military operations, and high-altitude flights. To achieve radiation hardness, these devices undergo specific design techniques, material selections, and manufacturing processes.

According to the Satellite Industry Association approximately 7,316 active satellites were orbiting the Earth, marking a 51% increase from the previous year and a 321% increase over the past five years.

Market Dynamics:

Driver:

Increasing space exploration activities

As space exploration continues, there is a growing demand for rad-hard components that can withstand high radiation levels. Key missions like NASA's Artemis program,

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space telescopes, Mars rovers, and private ventures like SpaceX's Starship require reliable electronics that can withstand cosmic rays and other space phenomena. This diversification leads to a broader spectrum of applications for rad-hard electronics, including satellite communication, earth observation, navigation, and scientific exploration boosting the market growth.

Restraint:

High cost of radiation-hardened components

The high cost of radiation-hardened semiconductors can hinder smaller organizations and startups from entering the space exploration or defense sectors. Large space agencies can absorb the cost, but smaller satellite or aerospace players may struggle to afford the required components. Moreover increased component costs can lead to fewer missions, smaller payloads, or delayed projects for government and private space programs with limited budgets resulting in more limited budgets for scientific research and exploration hampering the market.

Opportunity:

Technological advancements and miniaturization

Advancements in semiconductor materials, fabrication techniques, and circuit designs have significantly improved the performance of radiation-hardened components. New materials like silicon carbide and gallium nitride are being used to replace traditional silicon-based materials, resulting in higher performance, reduced energy consumption, and better thermal management. Miniaturization also contributes to improved performance, as smaller components have shorter signal paths, reducing radiation-induced errors enhancing the market.

Threat:

Challenges in achieving high performance

High performance in rad-hard electronics often involves trade-offs like higher power consumption, larger form factors, or increased heat generation, which can be challenging for space applications. Balancing high-performance requirements with harsh conditions like radiation, temperature extremes, and vacuum becomes a complex challenge. Manufacturers struggle to create high-performance rad-hard components

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that meet space missions' demands while maintaining SWaP constraints.

Covid-19 Impact

Supply chain disruptions, delays in production, and project setbacks in the space and defense sectors. Reduced manufacturing capacity and logistical challenges affected the timely delivery of radiation-hardened components for satellites, space missions, and defense systems. However, the pandemic also accelerated the adoption of advanced technologies and spurred investment in space exploration and defense, creating long-term growth opportunities for the market as demand for reliable, durable components remained strong.

The semiconductors segment is expected to be the largest during the forecast period

During the forecast period, the semiconductors segment is anticipated to register the largest market share owing to their function reliability in environments with high levels of ionizing radiation, such as outer space, nuclear power plants, and military applications. These semiconductors are crucial for space missions, satellites, and aerospace systems, where failure due to radiation exposure can lead to mission failure, data loss, or system degradation. Traditional semiconductor materials like silicon are more vulnerable to radiation-induced effects, requiring specialized materials, designs, and processes to enhance the resilience of rad-hard devices.

The total dose radiation hardening segment is expected to have the highest CAGR during the forecast period

The total dose radiation hardening segment is expected to register lucrative growth during the estimation period due to the increasing number of space missions, satellite operations, and military systems exposed to ionizing radiation. For extended missions, such as Mars missions or deep-space probes, total dose radiation -hardened components are needed to prevent performance degradation from accumulated radiation. This growing demand for radiation-hardened electronics in space exploration, scientific missions, and national defense drives the market for total dose radiation -hardened semiconductors.

Region with largest share:

During the estimation period, the North America region is expected to capture the largest market share owing to the United States, which is a global leader in space

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exploration, satellite communications, and space infrastructure development. Major space agencies require reliable and durable components to withstand harsh radiation environments in space. NASA's deep-space missions, such as Mars and outer planets, require radiation-hardened components for prolonged exposure. Commercial satellite operators like Iridium Communications, Intelsat, and SES Networks also rely on radiation-hardened electronics for uninterrupted communications and data transmission.

Region with highest CAGR:

The Asia Pacific region is expected to grow at the highest CAGR over the forecast period owing to leading global semiconductor manufacturing, with advanced foundries like TSMC, Samsung Electronics, and Intel. As radiation-hardened electronics become crucial for space, defense, and aerospace sectors, these countries are investing in developing and manufacturing rad-hard components. Taiwan, a global leader in semiconductor manufacturing, is investing in advanced materials and process technologies to enhance radiation resistance encouraging the regions market growth.

Key players in the market

Some of the key players in Radiation Hardened Electronics and Semiconductors market include 3D Plus, Analog Devices, Atmel Corporation, BAE Systems, Cobham Limited, Honeywell Aerospace, Infineon Technologies, Intersil Corporation, Linear Technology Corporation, Maxwell Technologies, Microchip Technology, Micropac Industries, Microsemi Corporation, PSemi Corporation, Renesas Electronics, ST Microelectronics, Teledyne E2V Semiconductors, Texas Instruments, The Boeing Company and Xilinx Incorporation

Key Developments:

In December 2024, Australian and UK Governments have announced a significant milestone between the Australian Submarine Agency (ASA) and industry partners that will support the delivery of the SSN AUKUS fleet of conventionally armed, nuclear-powered submarines for the Royal Australian Navy.

In December 2024, BAE Systems, Leonardo, and Japan Aircraft Industrial Enhancement Co Ltd (JAIEC), have reached an agreement to form a new company under a business joint venture for the Global Combat Air Programme (GCAP), subject to regulatory approvals.

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In December 2024, Honeywell announced that it has signed a memorandum of understanding (MoU) with Sino Jet at the Middle East and North Africa Business Aviation Association (MEBAA) show.

Components Covered:

- Semiconductors
- Passive Components
- Other Components

Technologies Covered:

- Total Dose Radiation Hardening
- Single Event Effects (SEE) Protection
- Radiation Hardened by Design (RHBD)
- Packaging Solutions
- Other Technologies

Applications Covered:

- Space & Satellite
- Nuclear Power Plants
- Medical Equipment
- High-Energy Physics
- Other Applications

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End Users Covered:

- Military & Defense
- Automotive & Transportation
- Government & Aerospace
- Other End Users

Regions Covered:

- North America
  - US
  - Canada
  - Mexico
- Europe
  - Germany
  - UK
  - Italy
  - France
  - Spain
  - Rest of Europe
- Asia Pacific
  - Japan

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China

India

Australia

New Zealand

South Korea

Rest of Asia Pacific

South America

Argentina

Brazil

Chile

Rest of South America

Middle East & Africa

Saudi Arabia

UAE

Qatar

South Africa

Rest of Middle East & Africa

What our report offers:
- Market share assessments for the regional and country-level segments
- Strategic recommendations for the new entrants
- Covers Market data for the years 2022, 2023, 2024, 2026, and 2030

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- Market Trends (Drivers, Constraints, Opportunities, Threats, Challenges, Investment Opportunities, and recommendations)
- Strategic recommendations in key business segments based on the market estimations
- Competitive landscaping mapping the key common trends
- Company profiling with detailed strategies, financials, and recent developments
- Supply chain trends mapping the latest technological advancements

Free Customization Offerings:

All the customers of this report will be entitled to receive one of the following free customization options:

Company Profiling

Comprehensive profiling of additional market players (up to 3)

SWOT Analysis of key players (up to 3)

Regional Segmentation

Market estimations, Forecasts and CAGR of any prominent country as per the client's interest (Note: Depends on feasibility check)

Competitive Benchmarking

Benchmarking of key players based on product portfolio, geographical presence, and strategic alliances

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Note: Tables for North America, Europe, APAC, South America, and Middle East & Africa Regions are also represented in the same manner as above.

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