

# Global Battery Thermal Management System Market 2023

<https://marketpublishers.com/r/GA519C6435E1EN.html>

Date: August 2023

Pages: 80

Price: US\$ 2,950.00 (Single User License)

ID: GA519C6435E1EN

## Abstracts

The global market for radiation-hardened electronics for space applications is projected to reach \$2.56 billion by 2029, growing at a rate of 1.3% during the forecast period. This growth is driven by increasing demand for communication and Earth observation satellites. Semiconductors are vital components in electronic circuits, playing a crucial role in various applications, from simple timers to complex instruments like satellites and supercomputers. Radiation-hardened electronics are specifically designed to withstand high levels of radiation in industries such as defense, energy, and aerospace. Technological advancements have enabled manufacturers to operate in high-radiation environments. However, challenges arise in building semiconductor devices capable of withstanding radiation effects in the space environment. Issues such as noise and signal spikes can lead to inaccuracies and performance problems in electronic devices used in satellites and launch vehicles. Drivers of the market include the demand for radiation-hardened electronic components in communication satellites and advancements in microprocessors and field-programmable gate arrays (FPGAs). Challenges include high development costs and the impact of electronics component shortages on the space industry. Opportunities lie in adopting new materials for manufacturing space electronics to improve radiation resistance and performance.

### Market Segmentation

The market is segmented based on various factors, including platform, manufacturing technique, material type, component, and region.

#### Segmentation by Platform

Satellite

Launch Vehicle

Deep Space Probe

### Segmentation by Manufacturing Technique

Rad-Hard by Design

Rad-Hard by Process

Rad-Hard by Software

### Segmentation by Material Type

Silicon

Gallium Nitride

Silicon Carbide

Others

### Segmentation by Component

Onboard Computer, Microprocessor, and Controller

Power Source

Memory (Solid-State Recorder)

Field-Programmable Gate Array

Transmitter and Receiver (Antennas)

Application-Specific Integrated Circuit

Sensor

### Segmentation by Region

North America - U.S., and Canada

Europe - France, Germany, Russia, U.K, and Rest-of-Europe

Asia-Pacific - China, Japan, India, and Rest-of-Asia-Pacific

Rest-of-the-World - Middle East and Africa, and South America

The satellite platform is projected to dominate the global market for radiation-hardened electronics for space applications. Satellite revenue will significantly contribute to the overall market, followed by launch vehicles and deep space probes. The satellite segment is expected to grow at a CAGR of 0.6% during the forecast period, driven by the increasing deployment of small satellites and plans for deep space missions by key players. The rad-hard by design manufacturing technique slightly dominates the market, providing robust solutions suitable for extreme space applications. It is expected to hold a market share of 61.3% in 2029, growing at a CAGR of 1.1%. The rad-hard by process segment is also expected to gain prominence, growing at a CAGR of 1.4%. Silicon is the most widely used material for radiation-hardened components, followed by gallium nitride. The silicon segment is predicted to grow at a CAGR of 1.1% from 2023 to 2029.

Advancements in technology drive the use of efficient and robust microprocessor technology, including onboard computers, microprocessors, and controllers. This segment had the highest market penetration in 2022 and is expected to grow at a CAGR of 0.8%. North America held the highest market share in 2022, with 41.1%, due to the presence of numerous companies in the region. Europe accounted for a share of 25.6% in 2022 and is projected to witness significant growth, driven by space activities in the U.K., France, Germany, and Russia. Increased investments by commercial space organizations and government agencies will drive substantial market growth.

### Competitive Landscape

The companies profiled in this report were selected based on inputs from primary experts and an analysis of factors such as market coverage, product portfolio, and market penetration. The market is predominantly led by established players who offer radiation-hardened electronics for space applications, holding approximately 79% of the market share. Additionally, there are start-up entities that comprise approximately 21% of the market presence. Key companies profiled in this report include 3D Plus, Analog Devices, Inc., Apogee Semiconductor, Cobham Plc, Data Device Corporation, Exxelia, General Dynamics, GSI Technology, Inc., Infineon Technologies, Mercury Systems, Inc., Microchip Technology, Inc., Micropac Industries, Renesas Electronics Corporation, Solid State Devices, Inc., STMicroelectronics N.V., Teledyne Technologies, Texas Instruments, Vorago Technologies, and Xilinx, Inc.

### Recent Industry Developments

Mercury Systems was awarded a contract in March 2021 by NASA's Jet Propulsion Laboratory to supply solid-state data recorders for a scientific mission. These recorders will be integrated into an Earth-imaging spectrometer instrument, set to launch in 2022.

In August 2021, STMicroelectronics partnered with Xilinx, Inc. to develop a power solution for Xilinx's radiation-tolerant field-programmable gate arrays (FPGA) using QML-V qualified voltage regulators.

Exxelia introduced a high-performance space-qualified resistor in April 2021, meeting the requirements of weapons platforms, modern electronic warfare systems, and various space applications.

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