Apacer

Anti-sulfuration Protection

White Paper

April 16, 2020

Version 1.1

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1. Introduction

In the past, it was common for computing devices and peripherals to operate in clean, quiet, stable environments, such as server rooms and office desks. However, with the rapid development of the Internet of Things (IoT) and the Industrial Internet of Things (IIoT), the demand for computing devices and peripherals that can operate in more challenging environments is increasing daily.

There are many pollutants and irritants that can corrupt computing circuits, but one of the most common is sulfur. Many manufacturers of industrial computing products have been informed of unexpectedly early product failures, only to trace the problem to sulfur in the atmosphere where the industrial device was being used.

Luckily, Apacer's talented engineers have developed a unique, value-adding solution to this problem. Their solution is so unique, in fact, that it has been awarded international patents. This white paper will explore the development of Apacer's anti-sulfuration technology in detail.

2. The Problem: Corrosion

It's a standard practice in the electronics industry to use silver electrodes in resistors when producing DRAM modules. Silver is prized for its excellent conductivity. However, as many industrial manufacturers have discovered to their chagrin, high levels of sulfur in the operating environment can lead to problems with silver electrodes.

The silver in the electrodes reacts with the sulfur in the air in a simple chemical reaction. The result is silver sulfide, which usually appears as a dark black discoloration on the surface of the electrode. This is the same substance which plagued homeowners for decades, who found themselves having to scrub even unused silverware regularly to remove corrosion and blackening.

When it comes to resistors, the problem is not that corrosion is unsightly, but rather that it impairs conductivity and leads to early failures: DRAM modules may find their lifespans significantly shortened if employed in an environment with high levels of sulfur in the air. This process can be seen in Figure 1-1.

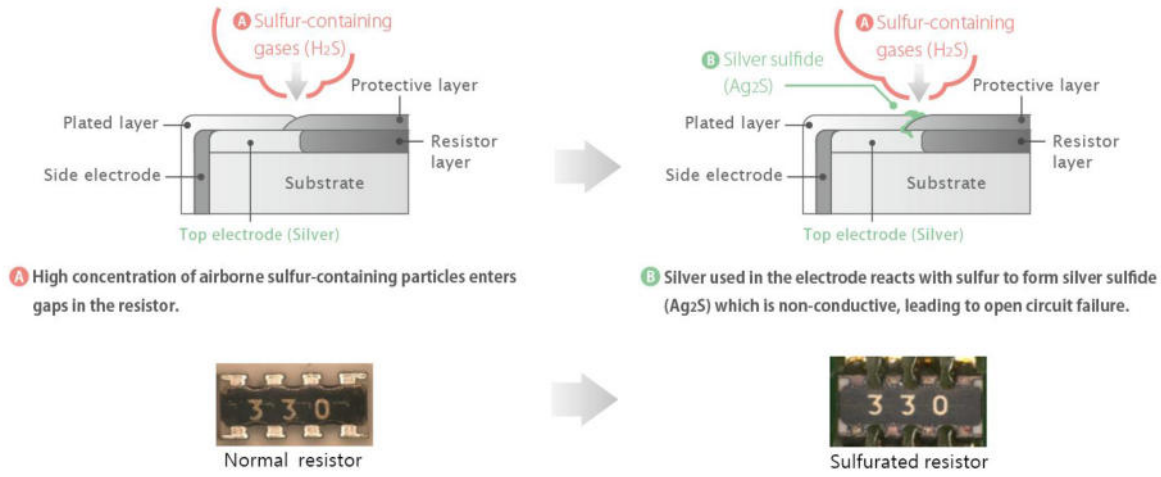

Figure 1-1 The Process of Silver Sulfide Corrosion

Luckily, as an experienced industrial manufacturer, Apacer was able to identify this problem and develop a solution.

2.1 Sulfur Levels in the Atmosphere

Examples of industries where sulfur concentrations are high include the mining and industrial manufacturing industries. Due to restrictive conditions and poor ventilation, sulfur concentrations in the air may rise rapidly. But even defense manufacturers are finding that they require anti-sulfuration DRAM modules, because there are many geographical locations worldwide where high levels of sulfur can be found near the surface. And defense vehicles need to go where the circumstances require.

Areas of the world where surface concentrations of sulfur in the atmosphere are particularly high include the western United States, continental and eastern Europe, India and east Asia.

3. A Patented Solution

Apacer's engineers spent years carrying out experiments with various alloys and simulated high-sulfur environments, searching for a solution to the problem of corrosion. Finally, their efforts paid off. They adopted a unique, top-secret alloy which is now used to produce resistors for use in anti-sulfuration DRAM modules.

The technology behind Apacer's patented solution can be seen in Figure 1-2.

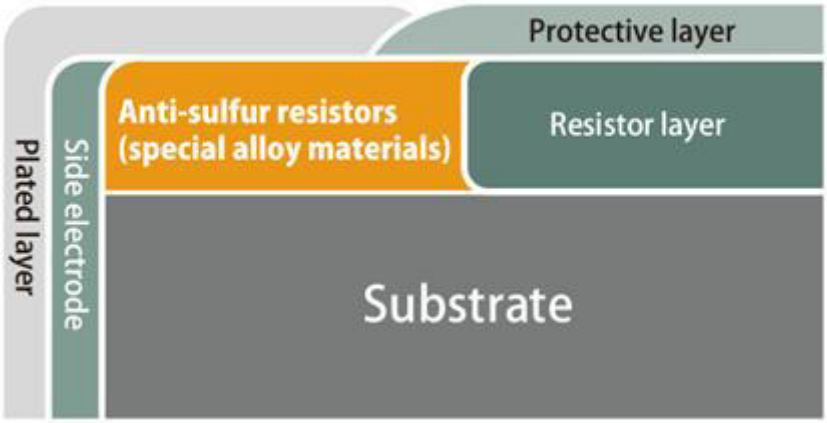

Figure 1-2 Apacer's anti-sulfuration technology

Even in environments where there's a high concentration of sulfur in the air, this alloy resists corrosion completely while still offering excellent conductivity. Apacer received patents for its anti-sulfuration DRAM module in China and the United States. Today, Apacer ships anti-sulfuration DRAM modules to buyers around the world.

3.1 Anti-sulfuration Product Testing

To illustrate just how effective the secret alloy is, observe the data from an anti-sulfuration test in Figure 1-3. Standard memory modules in high-sulfuration environments experienced failures after just 200 hours, leading to critical processing errors. But even after 1,000 hours, not a single one of Apacer's anti-sulfuration DRAM modules had failed.

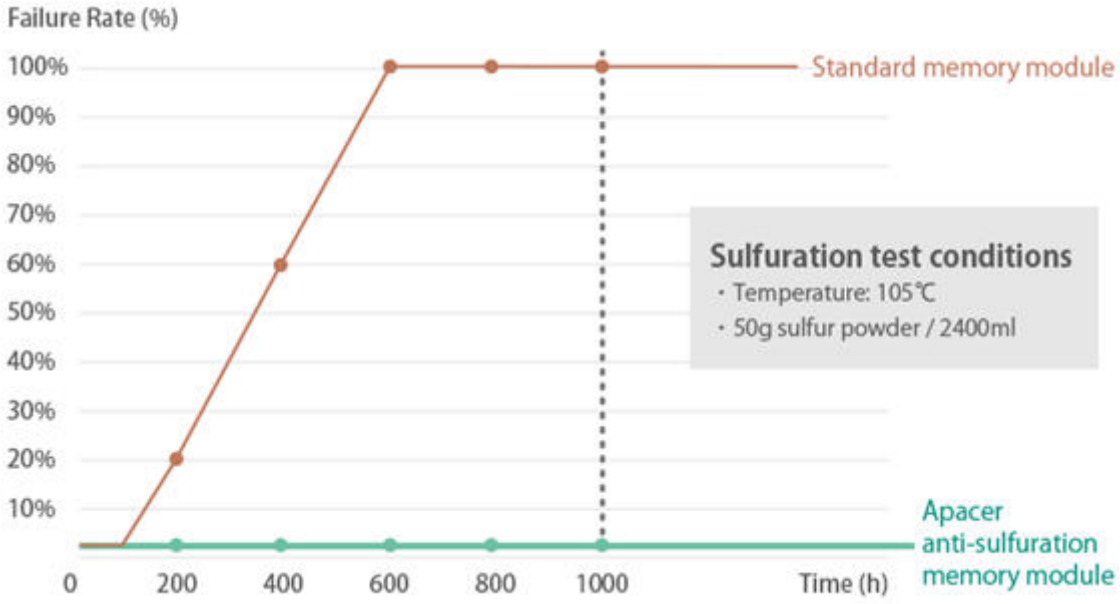

Figure 1-3 Anti-Sulfuration Test Results

4. A Unique Advantage

It's true that there are other manufacturers of DRAM modules who will claim that they offer anti-sulfuration modules. But for the most part, these manufacturers simply encase parts of their silver electrodes in a sulfur-tolerant layer. Although this may offer some protection for a limited period of time, sulfur will eventually penetrate that layer, reaching the silver underneath and corroding it. Failure rates may be slightly delayed, but cannot be prevented using this method. A comparison of the two methods can be seen in Figure 1-4.

	Apacer's advanced anti-sulfuration technology	Traditional anti-sulfuration technology
Method	Adopts exclusive and improved alloy materials replace normal electrode	Covers an sulfur-tolerant layer to protect the electrode
Advantages / Disadvantages	Reliable anti-sulfuration performance, improved product reliability and durability	Unstable anti-sulfuration performance due to process failure

Figure 1-4 Anti-sulfuration technology comparison

Only Apacer's patented anti-sulfuration modules can survive in harsh, sulfur-rich environments.

5. Conclusion

More and more industrial manufacturers are coming to the realization that sulfur in the atmosphere or in the working environment poses a threat to their electronics. With that in mind, Apacer developed its unique, approach to this problem: manufacturing resistors from a secret alloy that resists sulfuration. The result is DRAM modules that tests confirm will function smoothly even after 1,000 hours of exposure to intensely sulfurated environments. And the international patents that Apacer has received confirm the efficiency and originality of this approach. The choice is clear: Apacer's anti-sulfuration DRAM modules stand out from the crowd.

Revision History

Revision	Description	Date
1.0	Official release	9/12/2019
1.1	Removed Taiwan patent information.	4/16/2020

Global Presence

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