

# DIMMs: Reasons to use only Cisco Qualified Memory on Cisco UCS Servers

## What You Will Learn

This document explains why you should use memory that has been qualified to work with the Cisco Unified Computing System™ (Cisco UCS®) on Cisco UCS servers. Included are real-world images showing a Cisco UCS server damaged by using nonqualified memory.

Cisco UCS servers use only dual in-line memory modules (DIMMs) that Cisco carefully selects, qualifies, and screens. Each DIMM must pass extensive hardware, software, and manufacturing tests to make sure it meets the highest standards and can perform reliably in Cisco UCS servers. Cisco UCS teams use only qualified DIMMs to optimize system design, firmware, and software development.

Not all memory modules are created equal, and memory parts that have not been qualified by Cisco can result in issues and faults that can be difficult to trace to the DIMM itself.

For each server CPU, Intel always tests and validates enterprise-class DIMMs from various DRAM vendors. Cisco further carefully selects and qualifies DIMMs from Intel's tested and certified DIMMs. DIMMs that do not meet Cisco standards may also fail to meet Intel's DIMM certification criteria for its CPUs. In fact, DIMMs that Cisco does not qualify are often specifically rejected by Cisco vendors for one of many reasons and are sold to other suppliers on the gray market at a reduced price.

Here are three reasons to use only qualified memory on Cisco UCS servers.

## 1. Nonqualified memory can cause DIMM and server damage

The industry has diverse requirements for memory, and what may seem to be an equivalent DIMM from one vendor may be vastly different from another vendor's. Physical and electrical differences in DIMMs can result in immediate or eventual damage to the DIMM or server. In many cases, both the DIMM and the server are damaged when using memory that has not been qualified by Cisco. Please refer to the failure-analysis section of this document for real-life examples of this damage.

Here are some differences between DIMMs that are qualified by Cisco and those that are not:

- Vendors who sell qualified DIMMs build both DRAM and DIMM. This fact helps ensure that Cisco vendors use the best DRAM to build the modules and that they apply the strictest criteria for selecting, testing, and screening the highest-yield wafers and the DRAMs from these wafers for DIMM manufacturing.
- DIMMs qualified by Cisco have 2D barcode that allows traceability all the way from the DRAM wafer to the customer's system. This traceability is not possible with nonqualified DIMMs.
- DIMMs qualified by Cisco meet all IPC rules for printed circuit assembly and inspection and are manufactured in a strict clean-room environment. Please refer to Figure 2 to see a nonqualified DIMM that was not manufactured in a clean room meeting these specifications.

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- DIMMs qualified by Cisco are manufactured using PCB that the Joint Electron Device Engineering Council defines as meeting all requirements for performing the most stressful operations. This includes 30 microinches of gold on the DIMM fingers. Flash gold, or 15 microinches of gold, is used on nonqualified DIMMs.

## 2. Cisco UCS warranty policy is void with nonqualified memory

Because of the severe technical problems inherent in using nonqualified DIMMs with Cisco UCS servers, Cisco cannot provide field and warranty support for nonqualified DIMMs or Cisco UCS servers that use those DIMMs. Cisco support may require users to replace any nonqualified memory with qualified memory prior to providing support.

## 3. Cisco UCS Manager is not compatible with nonqualified memory

Cisco UCS Manager and other Cisco and partner management software cannot inventory, monitor, and manage nonqualified DIMMs. Cisco UCS Manager can inventory, monitor, and manage only DIMMs qualified by Cisco.

## Failure Analysis of a Cisco UCS Server with Nonqualified Memory

This section provides the actual failure analysis done by a systems integrity engineering firm to analyze a returned Cisco UCS server that used nonqualified DIMMs. The following images and results are excerpted from its findings.

Summary of results:

- Server failure was attributed to a DIMM that Cisco had not qualified. Its connector pins were bent.
- Two distinct differences between qualified DIMMs and nonqualified DIMMs contributed to the failure:
  - The nonqualified DIMM was approximately 2 millimeters thicker than the qualified DIMM.
  - The nonqualified DIMM used a thick hard-nickel plate over the copper with squared corner lands that flared slightly upward over the edge of the PCA (burrs). Hard nickel will not yield during impact, in contrast to the copper with thin nickel used on the DIMMs qualified by Cisco.

Supporting evidence can be seen in Figures 1 through 12.

Figure 1. Nonqualified and Qualified Memory Under a Scanning Electron Microscope: View 1

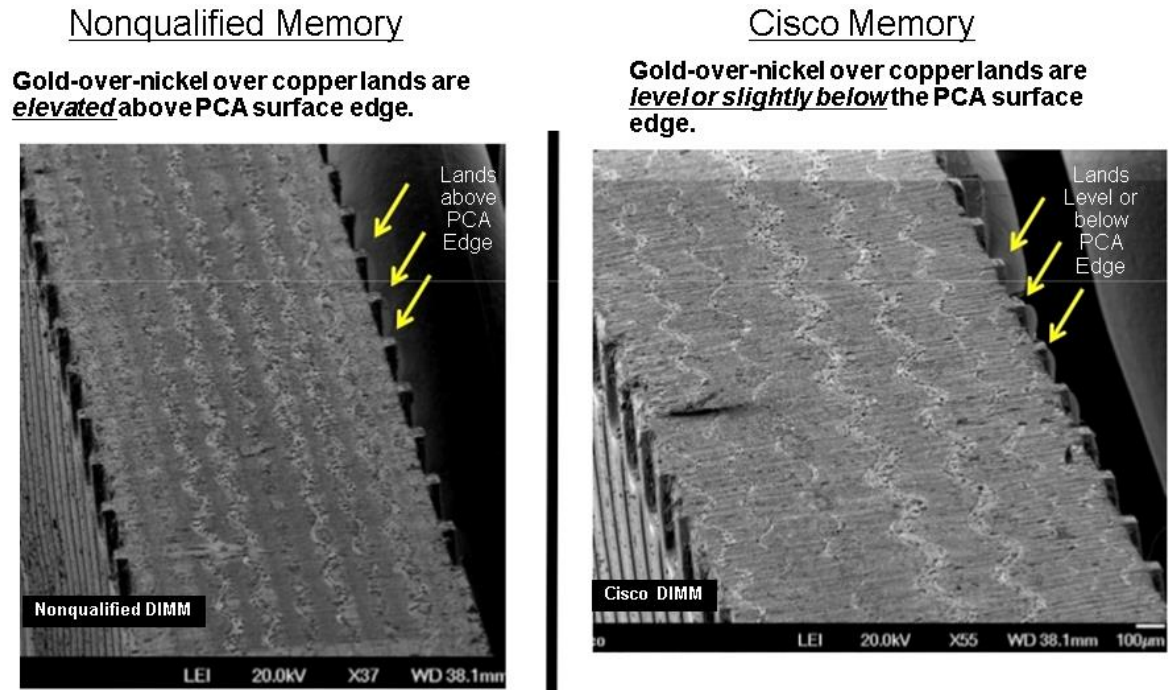


Figure 2. Nonqualified and Qualified Memory Under a Scanning Electron Microscope: View 2

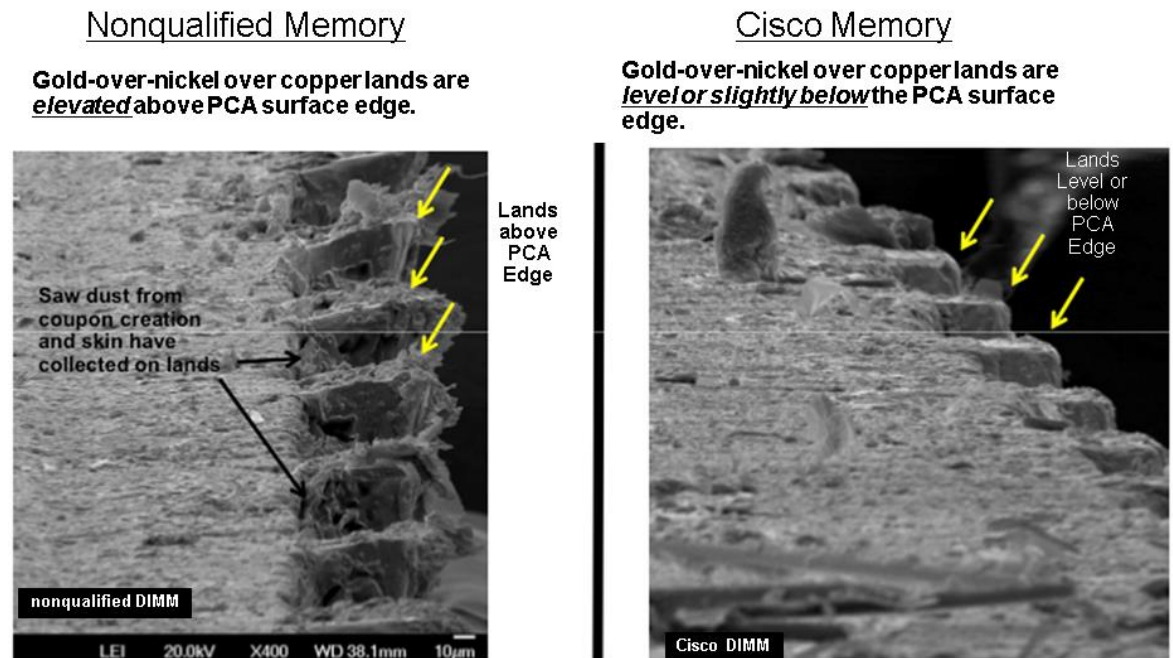


Figure 3. Nonqualified and Qualified Memory Under a Scanning Electron Microscope: View #3

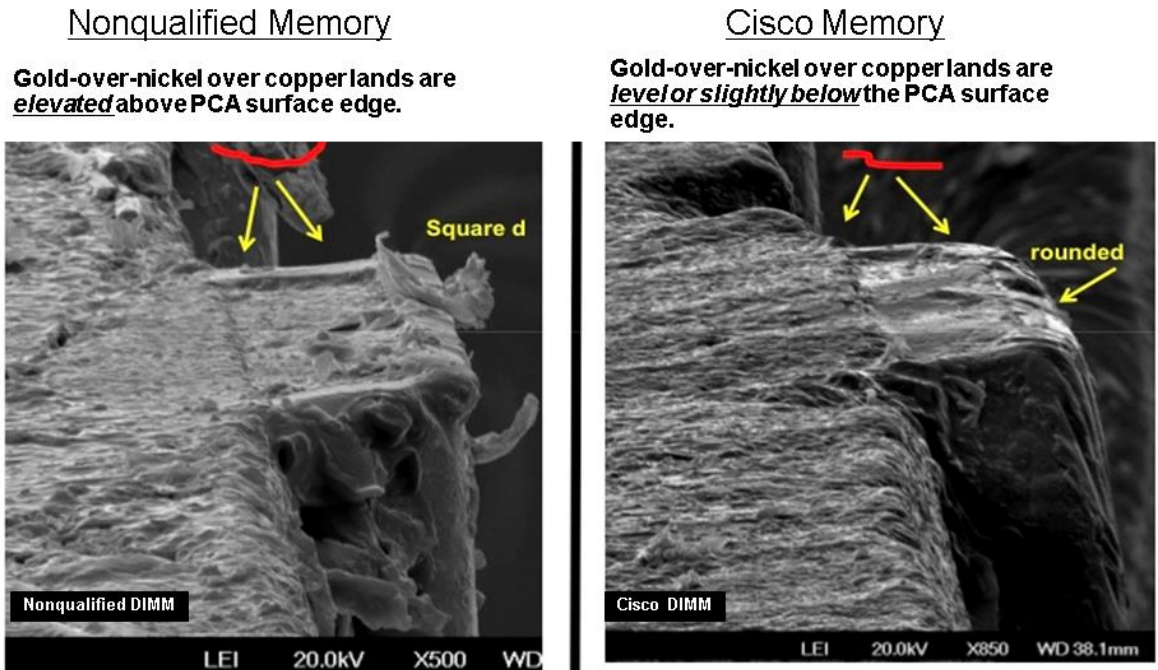


Figure 4. Nonqualified and Qualified Memory Under a Scanning Electron Microscope: View 4

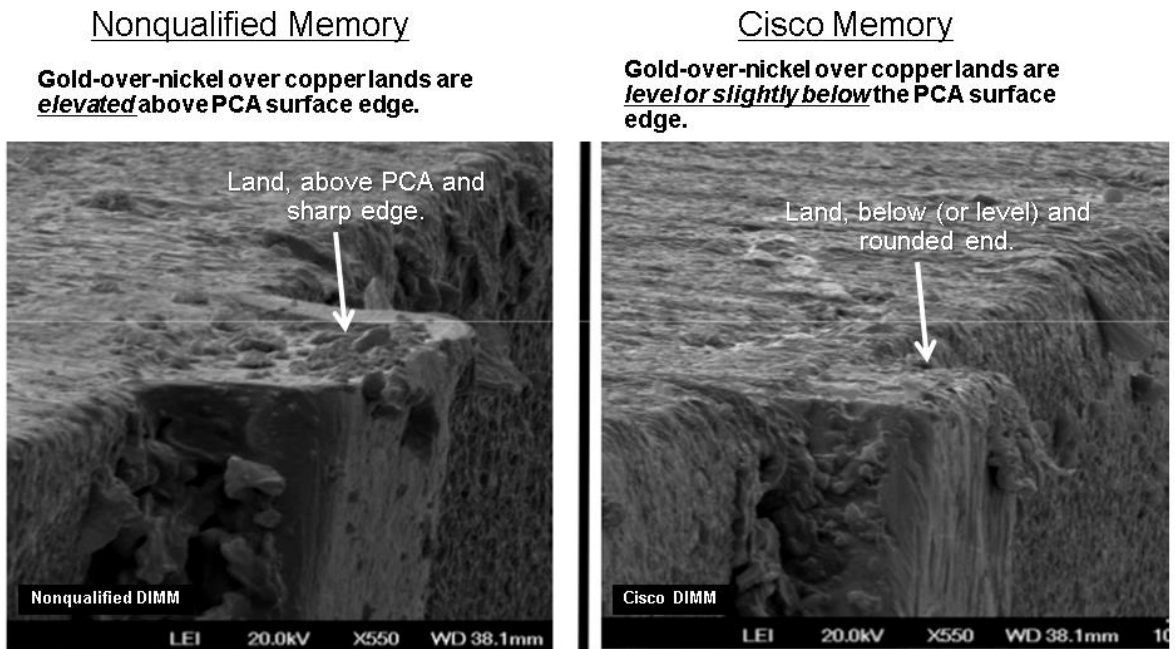




Figure 5. Memory Width Comparison

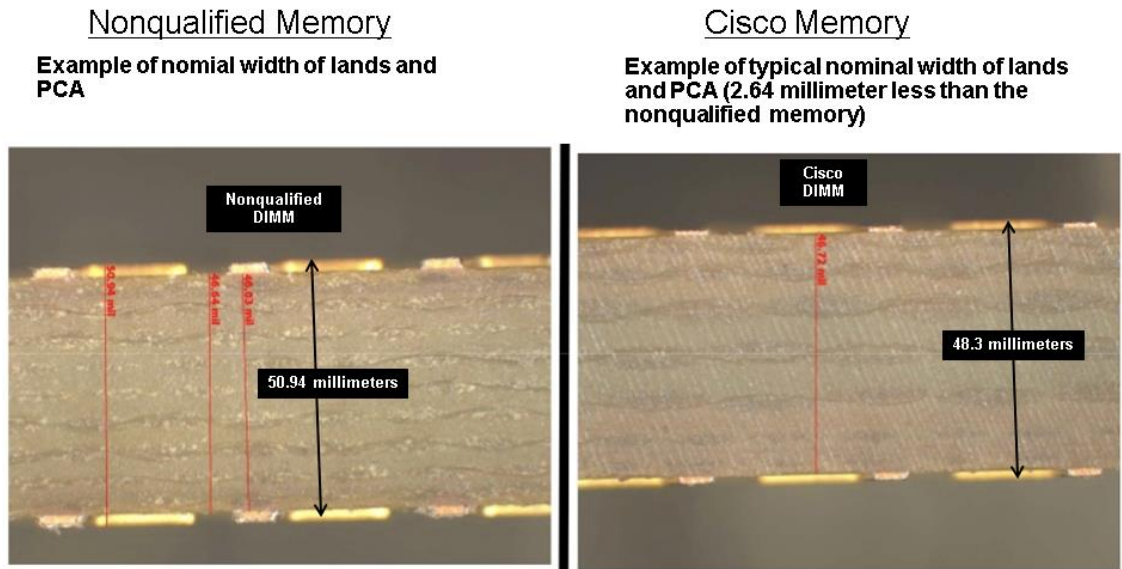


Figure 6. Memory Corners Comparison

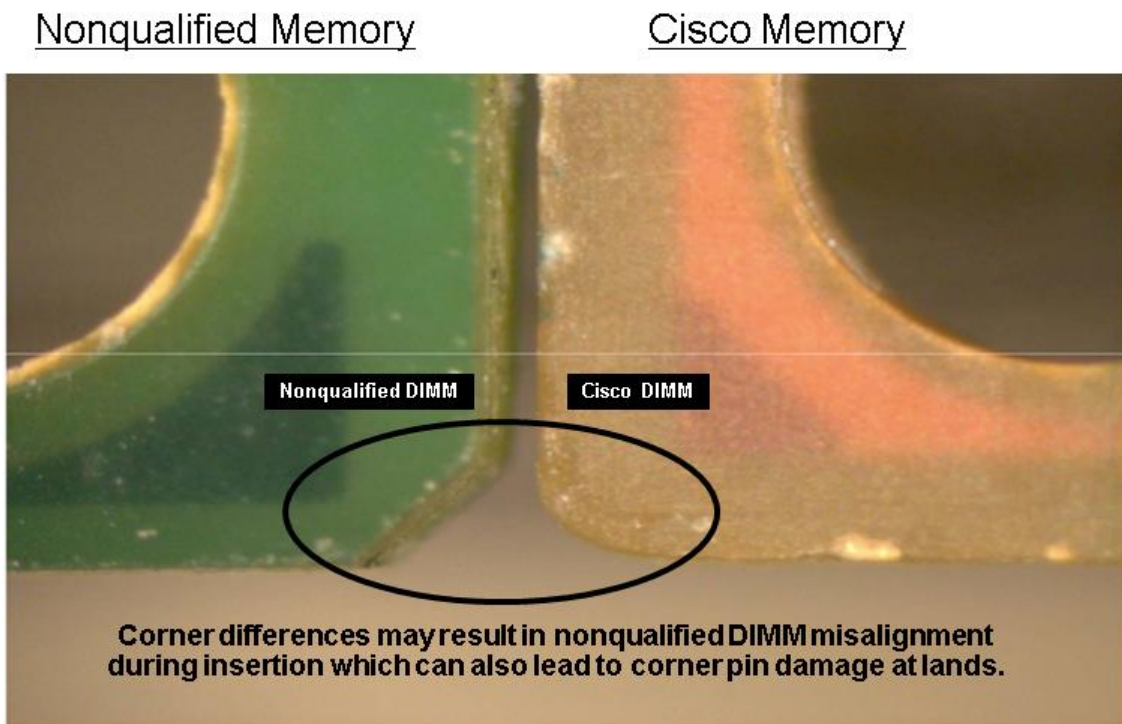


Figure 7. Land Utilization Comparison

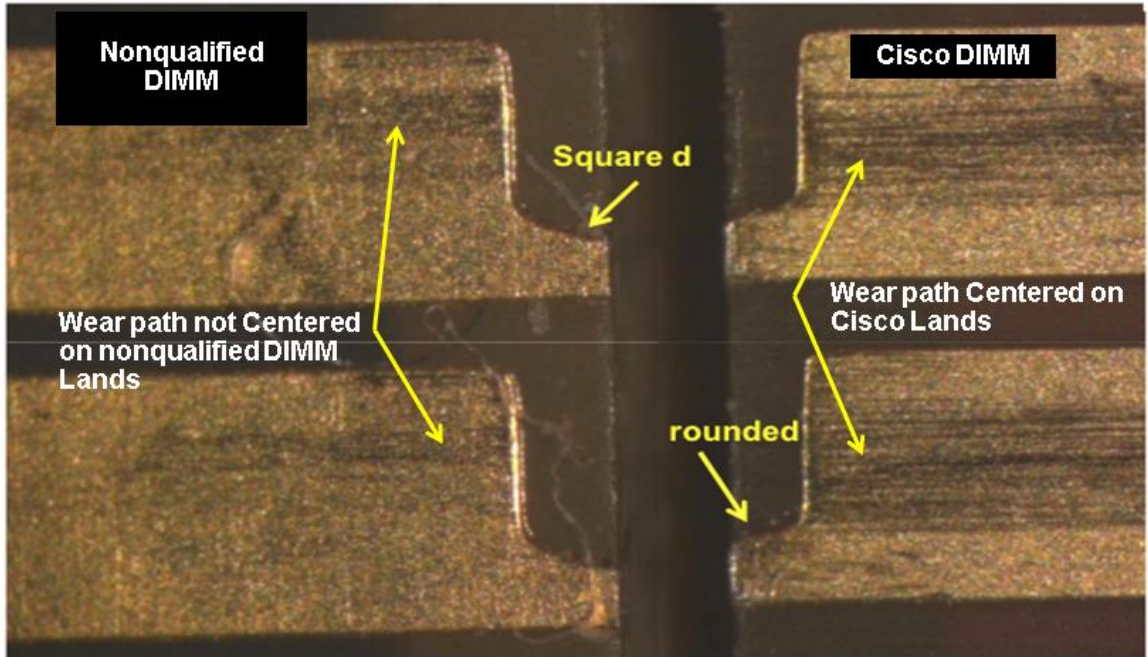
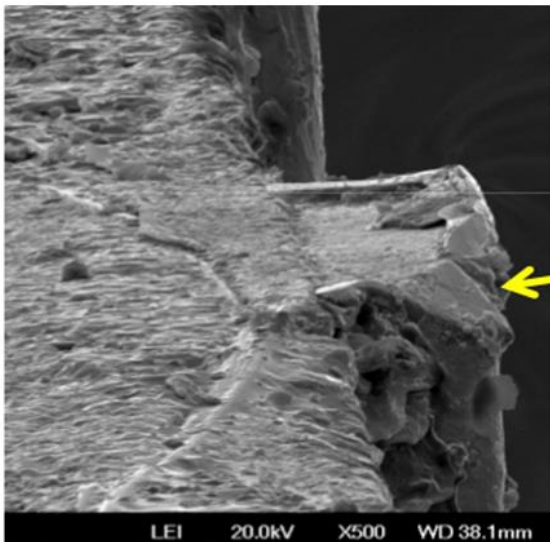


Figure 8. Cisco UCS Server Damaged Caused by Nonqualified Memory (Damaged Pins)

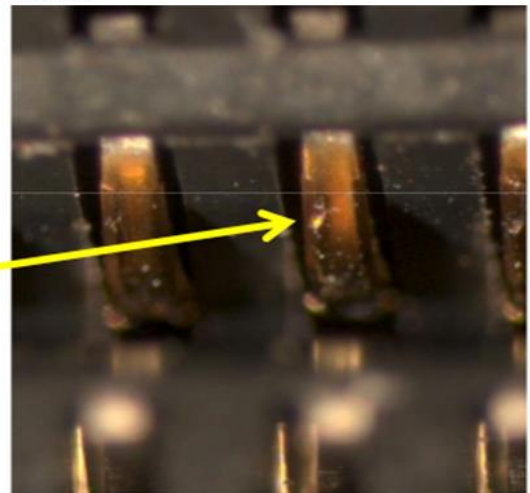
Nonqualified Memory

Corner damage on this nonqualified DIMM matches damage found on connector



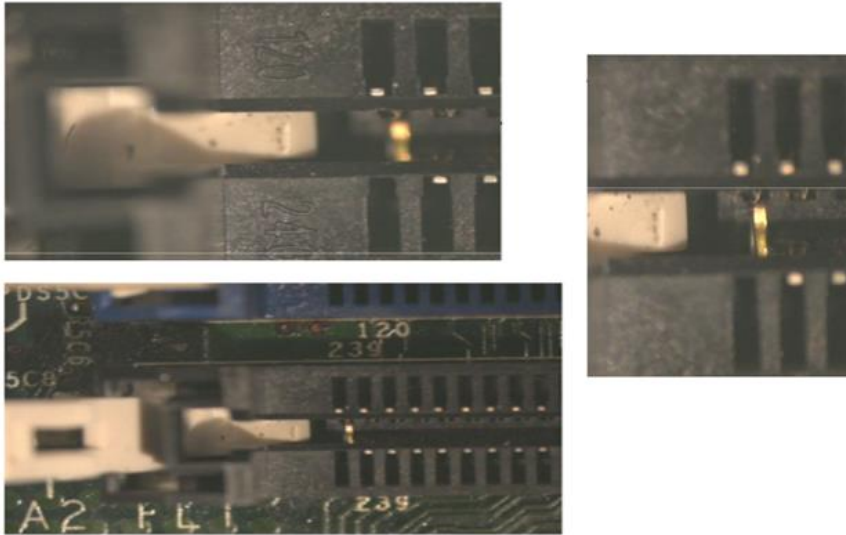
Cisco Server DIMM Slot

View of remaining intact (non-bent pins) exhibit impact damage from nonqualified DIMM



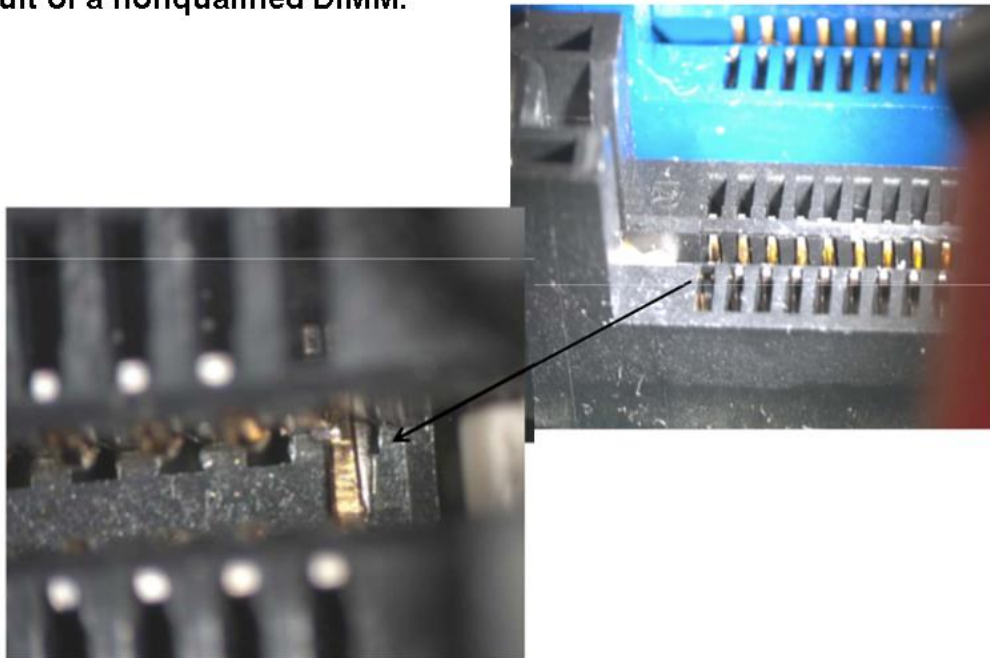
**Figure 9.** Cisco UCS Server Damaged Caused by Nonqualified Memory: Different Views of Slot

**Actual field failure connector on a Cisco server that had a nonqualified DIMM inserted into it. Different view points of same slot.**



**Figure 10.** Cisco UCS Server Damaged Caused by Nonqualified Memory

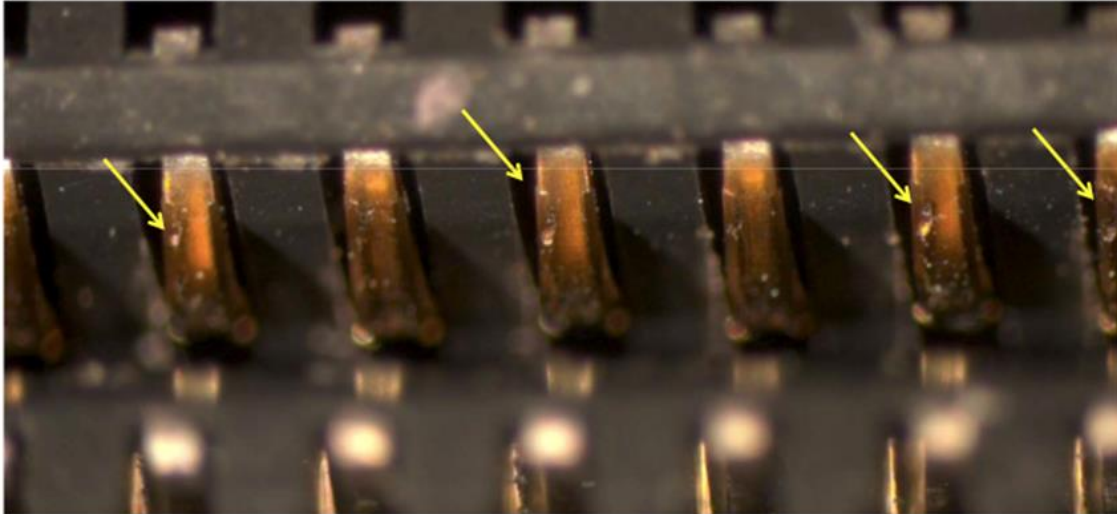
**Top down view of connector and tilted view illustrating the end pin and how it was knocked over and was folded on the floor of the DIMM slot as a result of a nonqualified DIMM.**





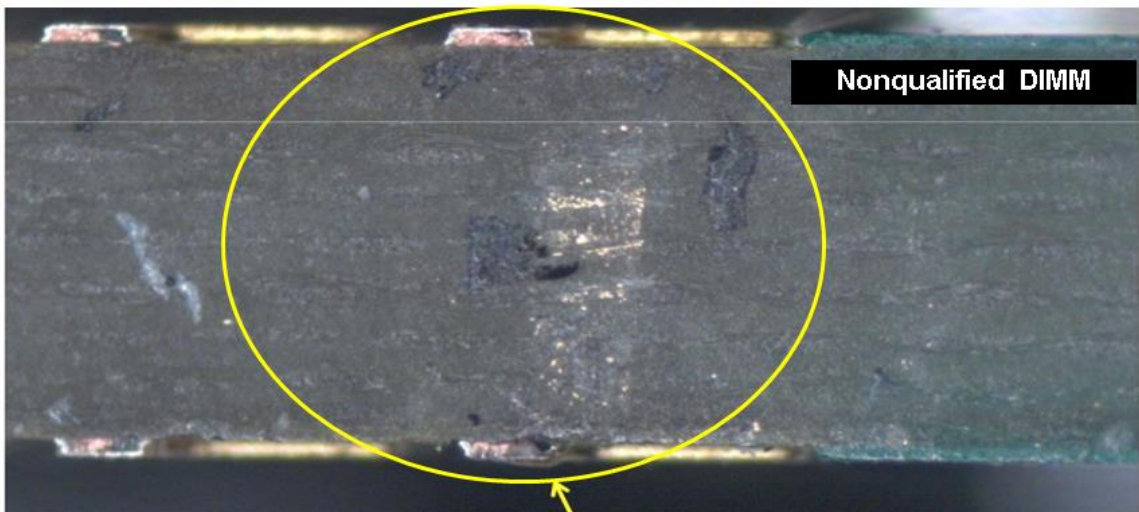
**Figure 11.** Cisco UCS Server Damaged Caused by Nonqualified Memory: Adjacent Pins

**Although the pins are not folded over, the pins next to the folded over pin exhibit impact damage as a result of the nonqualified DIMM**



**Figure 12.** Cisco UCS Server Damaged Caused by Nonqualified DIMMs: Nonqualified DIMM PCA damage

**A closer look at the DIMM on the previous slide. This nonqualified DIMM PCA and lands are damaged due to insertion into the Server's DIMM slot. Note transfer of gold plating and black connector mold is seen on the bottom of the DIMM itself.**



**The lower land has large "chunk" of copper knocked out of land.**



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## Conclusion

DIMMs qualified by Cisco are enterprise class and rigorously certified and tested to provide optimal reliability and performance in Cisco UCS servers. Customers may gain modest upfront cost savings by purchasing nonqualified DIMMs of uncertain quality. However, these savings will be more than lost due to systems downtime and possible server damage.



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