
# Low Latency Memory Performance on Apple MacBook Pro

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## Introduction

Memory bandwidth has a critical impact on the performance of many advanced computing applications. By developing a memory module with low latencies specifically tuned for Mac computers, we are able to provide significant performance improvements when using many common applications. This paper will present a selection of these test results.

## Background

All memory modules contain configuration data called Serial Presence Detect (SPD). The SPD is used to specify many of the performance characteristics of the memory, and is used by the host computer to configure memory performance. By developing a module with SPD data specifically tuned to current Mac computers, we are able to have the system configure itself for increased memory performance. Using this specially designed memory (Corsair part number **VSA4GSDSKIT667C4**) will result in significantly improved performance on many applications, as we will show below.

## Test Setup

A standard off-the-shelf MacBook Pro was used for testing. This system is powered by a 2.16 GHz Core2Duo processor from Intel. The computer was originally supplied with 1 GByte of memory, composed of two 512 MByte memory SODIMMs

Side-by-side testing was conducted with three different memory configurations. These configurations consisted of the following:

- 2x 512Mbyte SODIMMs (total 1 GByte), the memory that came with the system
- 2x 2GByte SODIMMs (total 4 GByte) standard latency memory (667MHz 5-5-5-15)

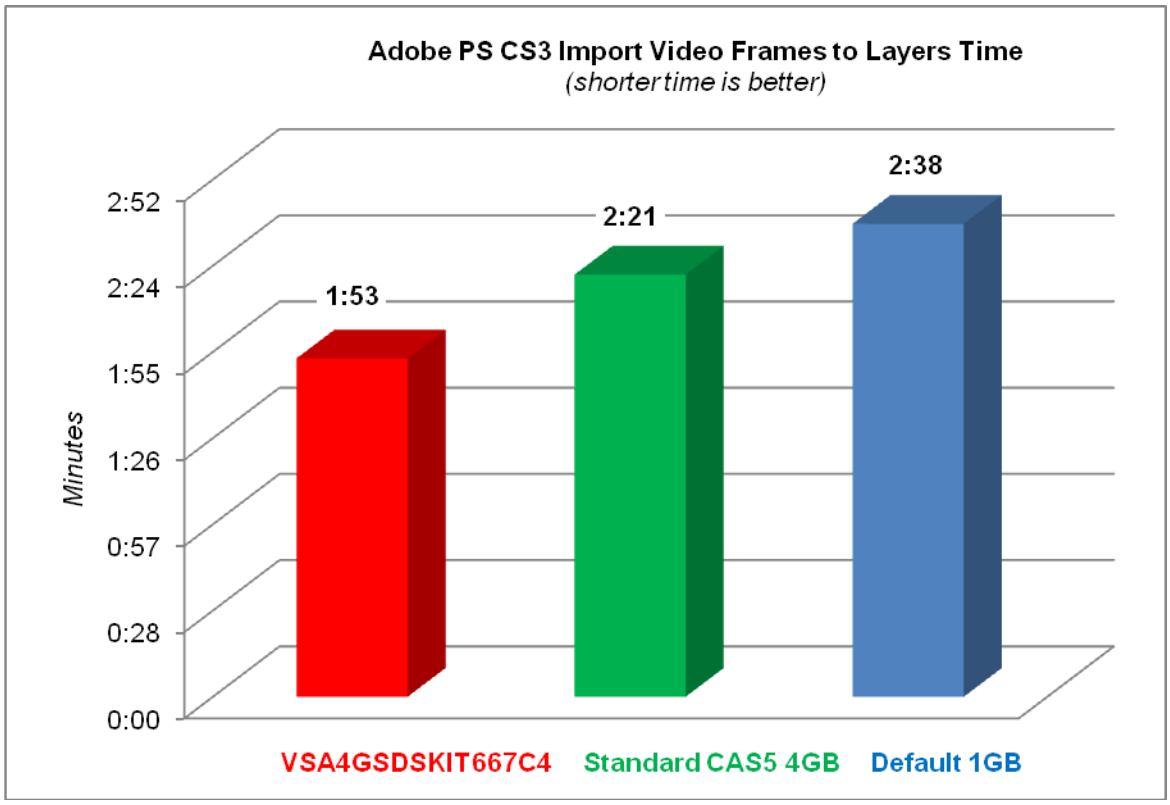
- 2x 2GB2GByte SODIMMs (total 4 GByte) **VSA4GSDSKIT667C4** (667MHz 4-4-4-12)

The following tests were run, and will be described in more detail later in this document:

- Photoshop Import Video
- Photo Compression
- XBench Memory
- VMware Fusion Vista tests
- Bootcamp Vista tests

## Test #1: Adobe Photoshop CS3 Import Video Frames to Layers

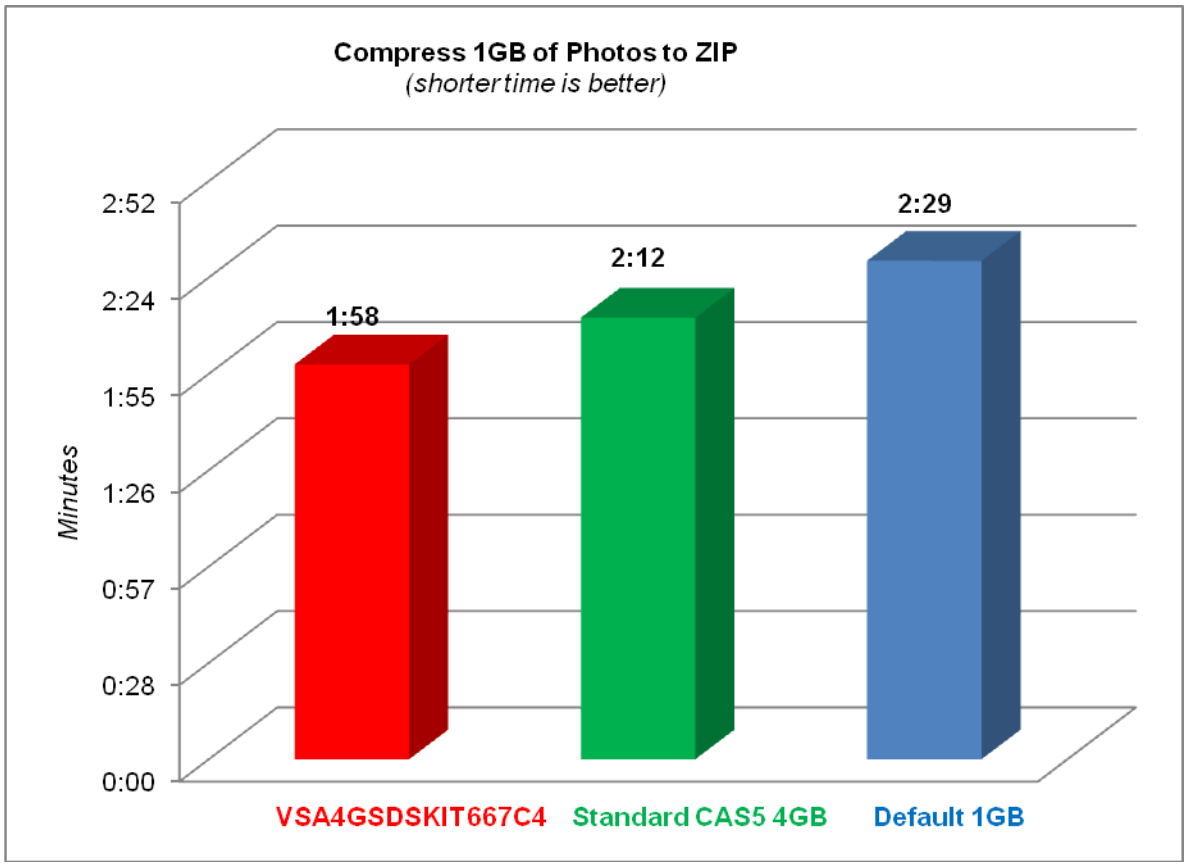
In this test we used Adobe Photoshop to import a six minute Quicktime video and convert it into Photoshop layers. The following table summarizes the results we achieved.




These results demonstrate that you can save up to 28% in processing time with the **VSA4GSDSKIT667C4** RAM versus the default 1GB (2x512MB) RAM and up to 19% versus a standard 4GB (2x2GB) memory configuration.

## Test #2: Compress 1GB of Photos

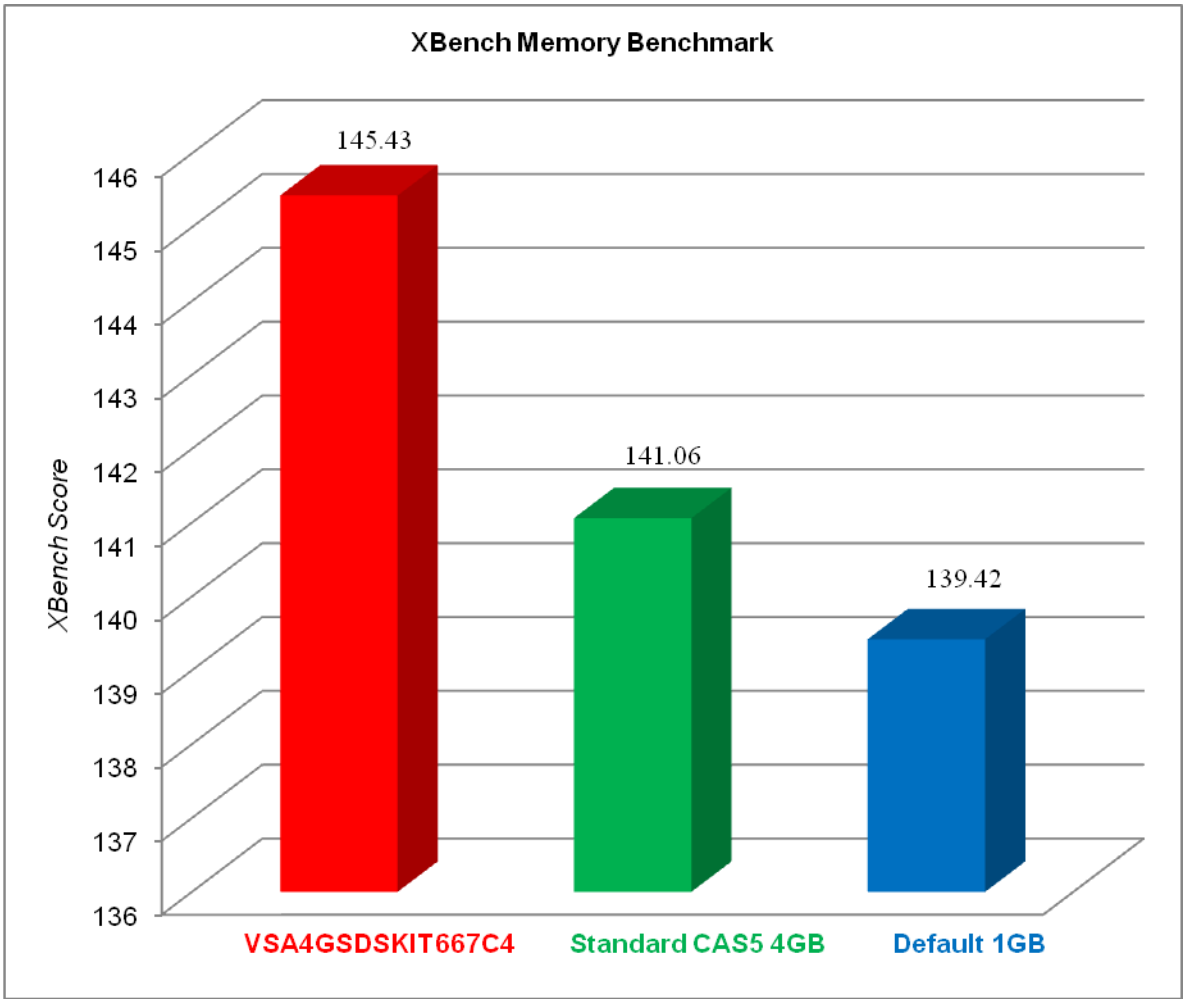
In this test we compressed one gigabyte of photos (consisting of 911 JPEG photos) into a single ZIP file. The test results are shown in the following graph.




The results clearly show you can save up to 20% in time with the low latency VSA4GSDSKIT667C4 memory versus the default 1GB (2x512MB) RAM and up to 9% versus a Standard CAS5 4GB (2x2GB) RAM configuration.

## Test#3: XBench Memory Score

After running 2 time based tests in Mac OSX here is a popular MAC synthetic benchmark. The results seen here are fairly representative of gains seen on other platforms when moving to low latency memory.




## Test #4: VMware Fusion Tests

Since virtual machine software is becoming more and more popular, VMware Fusion was used to run the following tests. Because it is a virtual machine, it relies heavily on RAM. Here we compared the bootup and shutdown times, as well as file compression performance. Note that the default 1GB does not provide sufficient amount of RAM to run this test. The following table shows the results that were achieved.

| | VMware Fusion Vista32 Bootup Time | VMware Fusion Vista32 Shutdown Time | VMware Fusion Vista32 WinRAR |
|---|---|---|---|
| **Default 1GB** | Insufficient RAM | Insufficient RAM | Insufficient RAM |
| **Standard CAS5 4GB** | 43Sec | 24Sec | KB/s= 487<br>Time=4Min 18Sec |

| | | | |
|---|---|---|---|
| **VSA4GSDSKIT667C4** | 39Sec | 21Sec | KB/s= 526<br>Time= 3Min 59Sec |

## Test#5: Windows Vista Benchmarks

We also ran some familiar benchmark tests run in native Windows Vista via Bootcamp on MacBook Pro. Results of these tests are shown in the following table.

| | **Bootcamp Vista32**<br>**Everest Memory Benchmark** | **Bootcamp Vista32**<br>**Sandra Memory Benchmark** | **Bootcamp Vista32**<br>**WINRAR 128MB Benchmark** |
|---|---|---|---|
| **Default 1GB** | Read= 4889<br>Write= 3481<br>Latency= 96.6 | ALU= 3671<br>FPU= 3687 | KB/s= 901<br>Time= 2Min 21Sec |
| **Standard CAS5 4GB** | Read= 4890<br>Write= 3471<br>Latency= 97.6 | ALU= 3760<br>FPU= 3784 | KB/s= 930<br>Time= 2Min 17Sec |
| **VSA4GSDSKIT667C4** | Read= 4906<br>Write= 3502<br>Latency= 90.8 | ALU= 3840<br>FPU= 3868 | KB/s= 996<br>Time= 2Min 7Sec |

## Summary

The testing of multiple memory configurations in the MacBook Pro made it very clear that overall system performance is heavily influenced by the memory configuration. Two aspects of the memory subsystem had a critical impact on performance: the amount of memory in the system, and the performance settings of that memory. By designing the **VSA4GSDSKIT667C4** with memory settings that are optimized for current Apple platforms, Corsair has enabled a new level of Mac system performance.