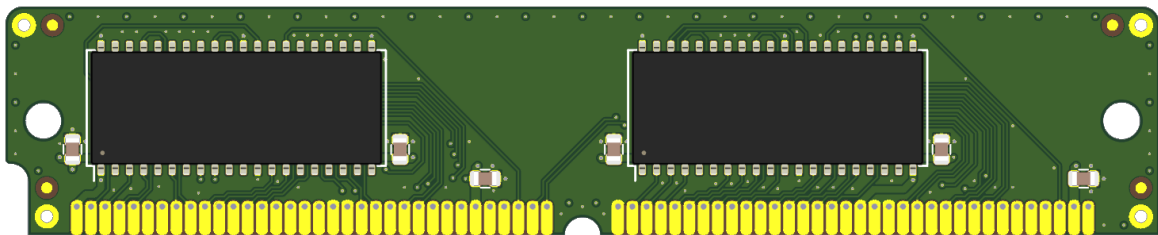
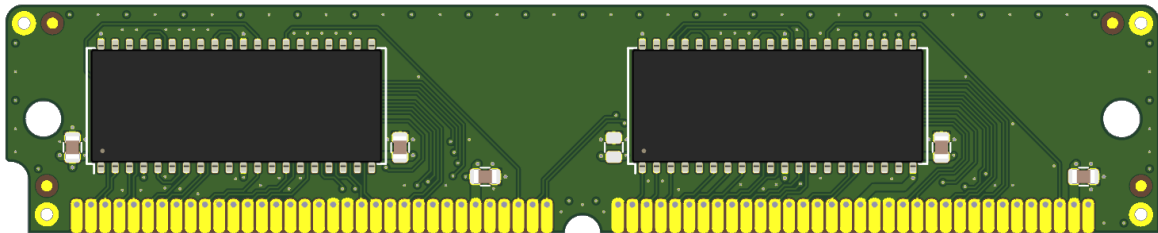


Garrett's Workshop

GW4404A / GW4405A

256 kB / 512 kB 68-pin VRAM SIMM for Macintosh

User's Guide



Overview

GW4404A and GW4405A are 68-pin VRAM SIMMs which provide Apple Macintosh computers with 256 kB or 512 kB of VRAM, respectively.

High-Quality PCB

GW4404A and GW4405A are built with an ENIG gold-plated, 4-layer PCB, and only new parts are used to build the VRAM SIMMs. All units are tested extensively before shipment, and all SIMMs conform to 80 ns timing or better, ensuring compatibility with all Macintosh models which support 68-pin VRAM SIMMs.

Excellent Signal Integrity

GW4404A and GW4405A feature solid power and ground planes. Particular attention was paid to signal integrity, ensuring reliable performance on the fastest machines. The address bus traces are run as asymmetric striplines shielded inside the SIMM PCB, reducing interference generated by large VRAM SIMM arrays such as on the Quadra 700. Ample separation is provided between the DQ and SDQ buses routed on the front-side of the board. Particular attention was paid to the edge-sensitive RAS, CAS, and SCLK signals. These are optimized for minimum length, with large spacing between these edge-sensitive signals and all other signals and buses.

Open-Source Design

GW4404A and GW4405A's designs are fully open-source. The schematics and board layouts are all freely available for commercial and noncommercial use. To download the design files, visit the Garrett's Workshop GitHub page: <https://github.com/garrettsworkshop>

Physical Dimensions

Parameter	Value
Height	20.32 mm \pm 0.2 mm
Width	102.87 mm \pm 0.2 mm
Thickness	< 8 mm
Weight	< 28 g

Compatibility

All possible VRAM configurations are listed below by machine. Supported video resolutions and color depths are listed below each VRAM configuration.

Macintosh Color Classic, Color Classic II, Macintosh Performa 250/275

256 kB built-in VRAM supports these resolutions:

- 512x384: 256 colors (8bpp)

512 kB VRAM—**install 1x 256 kB SIMM**
to support these resolutions:

- 512x384: 32,768 colors (15bpp)

Macintosh LC, LC II, Macintosh Performa 400/405/410/430

Requires 1x VRAM SIMM; no built-in VRAM

256 kB VRAM—**install 1x 256 kB SIMM**
to support these resolutions:

- 640x480: 16 colors (4bpp)
- 512x384: 256 colors (8bpp)

512 kB VRAM—**install 1x 512 kB SIMM**
to support these resolutions:

- 640x480: 256 colors (8bpp)
- 512x384: 32,768 colors (15bpp)

Macintosh IIfx and IIfx

Requires 2x VRAM SIMMs; no built-in VRAM

512 kB VRAM—**install 2x 256 kB SIMMs**
to support these resolutions:

- 512x384: 32,768 colors (15bpp)
- 640x480: 256 colors (8bpp)

1 MB VRAM—**install 2x 512 kB SIMMs**
to support these resolutions:

- 512x384: 32,768 colors (15bpp)
- 640x480: 32,768 colors (15bpp)

Macintosh LC/Performa 520/550/560

512 kB built-in VRAM supports these resolutions:

- 640x480: 256 colors (8bpp)

768 kB VRAM—**install 1x 256 kB SIMM**
to support these resolutions:

- 640x480: 32,768 colors (15bpp)

Macintosh LC III, LC III+, Macintosh Performa 450/460/466/467

512 kB built-in VRAM supports these resolutions:

- 512x384: 32,768 colors (15bpp)
- 640x480: 256 colors (8bpp)
- 832x624: 256 colors (8bpp)
- 640x870: 16 colors (4bpp)

768 kB VRAM—**install 1x 256 kB SIMM**
to support these resolutions:

- 512x384: 32,768 colors (15bpp)
- 640x480: 32,768 colors (15bpp)
- 832x624: 256 colors (8bpp)
- 640x870: 256 colors (8bpp)

Macintosh Quadra 700

512 kB built-in VRAM supports these resolutions:

- 512x384: 256 colors (8bpp)
- 640x480: 256 colors (8bpp)
- 832x624: 256 colors (8bpp)
- 640x870: 16 colors (4bpp)
- 1152x870: 16 colors (4bpp)

1 MB VRAM—**install 2x 256 kB SIMMs**
to support these resolutions:

- 512x384: millions of colors (24bpp)
- 640x480: 256 colors (8bpp)
- 832x624: 256 colors (8bpp)
- 640x870: 256 colors (8bpp)
- 1152x870: 256 colors (8bpp)

2 MB VRAM—**install 6x 256 kB SIMMs**
to support these resolutions:

- 512x384: millions of colors (24bpp)
- 640x480: millions of colors (24bpp)
- 832x624: millions of colors (24bpp)
- 640x870: 256 colors (8bpp)
- 1152x870: 256 colors (8bpp)

Macintosh Quadra 900

1 MB built-in VRAM supports these resolutions:

- 512x384: millions of colors (24bpp)
- 640x480: 256 colors (8bpp)
- 832x624: 256 colors (8bpp)
- 640x870: 256 colors (8bpp)
- 1152x870: 256 colors (8bpp)

2 MB VRAM—**install 4x 256 kB SIMMs**

to support these resolutions:

- 512x384: millions of colors (24bpp)
- 640x480: millions of colors (24bpp)
- 832x624: millions of colors (24bpp)
- 640x870: 256 colors (8bpp)
- 1152x870: 256 colors (8bpp)

Macintosh Quadra 950

1 MB built-in VRAM supports these resolutions:

- 512x384: millions of colors (24bpp)
- 640x480: 32,768 colors (15bpp)
- 832x624: 32,768 colors (15bpp)
- 640x870: 256 colors (8bpp)
- 1024x768: 256 colors (8bpp)
- 1152x870: 256 colors (8bpp)

2 MB VRAM—**install 4x 256 kB SIMMs**

to support these resolutions:

- 512x384: millions of colors (24bpp)
- 640x480: millions of colors (24bpp)
- 832x624: millions of colors (24bpp)
- 640x870: 32,768 colors (15bpp)
- 1024x768: 32,768 colors (15bpp)
- 1152x870: 32,768 colors (15bpp)

Macintosh LC 575,

Macintosh Performa 575/577/578

Requires 2x VRAM SIMMs; no built-in VRAM

512 kB VRAM—**install 2x 256 kB SIMMs**

to support these resolutions:

- 640x480: 256 colors (8bpp)

1 MB VRAM—**install 2x 512 kB SIMMs**

to support these resolutions:

- 640x480: 32,768 colors (15bpp)

Macintosh Quadra 610/650/800, Macintosh Centris 610/650

512 kB built-in VRAM supports these resolutions:

- 512x384: 32,768 colors (15bpp)
- 640x480: 256 colors (8bpp)
- 800x600: 256 colors (8bpp)
- 832x624: 256 colors (8bpp)
- 640x870: 16 colors (4bpp)
- 1024x768: 16 colors (4bpp)
- 1152x870: 16 colors (4bpp)

1 MB VRAM—**install 2x 256 kB SIMMs**

to support these resolutions:

- 512x384: 32,768 colors (15bpp)
- 640x480: 32,768 colors (15bpp)
- 800x600: 32,768 colors (15bpp)
- 832x624: 32,768 colors (15bpp)
- 640x870: 256 colors (8bpp)
- 1024x768: 256 colors (8bpp)
- 1152x870: 256 colors (8bpp)

Macintosh Quadra 605, LC 475,

Macintosh Performa 475/476

Requires 2x VRAM SIMMs; no built-in VRAM

512 kB VRAM—**install 2x 256 kB SIMMs**

to support these resolutions:

- 512x384: 32,768 colors (15bpp)
- 640x480: 256 colors (8bpp)
- 832x624: 256 colors (8bpp)
- 640x870: 16 colors (4bpp)
- 1024x768: 16 colors (4bpp)
- 1152x870: 16 colors (4bpp)

1 MB VRAM—**install 2x 512 kB SIMMs**

to support these resolutions:

- 512x384: 32,768 colors (15bpp)
- 640x480: 32,768 colors (15bpp)
- 832x624: 32,768 colors (15bpp)
- 640x870: 256 colors (8bpp)
- 1024x768: 256 colors (8bpp)
- 1152x870: 256 colors (8bpp)

Power Macintosh High-Performance Video Card (1 MB, expandable to 2 MB, part number 820-0522-A)

1 MB built-in VRAM supports these resolutions:

- 512x384: millions of colors (24bpp)
- 640x480: 32,768 colors (15bpp)
- 800x600: 32,768 colors (15bpp)
- 832x624: 32,768 colors (15bpp)
- 640x870: 256 colors (8bpp)
- 1024x768: 256 colors (8bpp)
- 1152x870: 256 colors (8bpp)

2 MB VRAM—**install 4x 256 kB SIMMs**

to support these resolutions:

- 512x384: millions of colors (24bpp)
- 640x480: millions of colors (24bpp)
- 800x600: millions of colors (24bpp)
- 832x624: millions of colors (24bpp)
- 640x870: 256 colors (8bpp)
- 1024x768: 32,768 colors (15bpp)
- 1152x870: 32,768 colors (15bpp)

Macintosh Quadra 840AV

1 MB built-in VRAM supports these resolutions:

- 512x384: 32,768 colors (15bpp)
- 640x480: 32,768 colors (15bpp)
- 800x600: 32,768 colors (15bpp)
- 832x624: 32,768 colors (15bpp)
- 640x870: 256 colors (8bpp)
- 1024x768: 256 colors (8bpp)
- 1152x870: 256 colors (8bpp)

2 MB VRAM—**install 4x 256 kB SIMMs**

to support these resolutions:

- 512x384: 32,768 colors (15bpp)
- 640x480: 32,768 colors (15bpp)
- 800x600: 32,768 colors (15bpp)
- 832x624: 32,768 colors (15bpp)
- 640x870: 256 colors (8bpp)
- 1024x768: 256 colors (8bpp)
- 1152x870: 256 colors (8bpp)

Power Macintosh High-Performance Video Card (2 MB, expandable to 4 MB, part number 820-0509-A)

2 MB built-in VRAM supports these resolutions:

- 512x384: millions of colors (24bpp)
- 640x480: millions of colors (24bpp)
- 800x600: millions of colors (24bpp)
- 832x624: millions of colors (24bpp)
- 640x870: 256 colors (8bpp)
- 1024x768: 32,768 colors (15bpp)
- 1152x870: 32,768 colors (15bpp)

4 MB VRAM—**install 4x 512 kB SIMM**

to support these resolutions:

- 512x384: millions of colors (24bpp)
- 640x480: millions of colors (24bpp)
- 800x600: millions of colors (24bpp)
- 832x624: millions of colors (24bpp)
- 640x870: 256 colors (8bpp)
- 1024x768: millions of colors (24bpp)
- 1152x870: millions of colors (24bpp)

VRAM Speed

GW4404A and GW4405A are always built with 80ns or faster VRAM chips, ensuring compatibility with all Macintosh models. For reference, the Quadra 650, Quadra 800, Quadra 840AV, Quadra 950, and the Power Macintosh High-Performance Video Cards require 80 ns VRAM speed or faster. All other machines require only 100 ns VRAM. Contact us if you require 70ns SIMMs.

512 kB / 256 kB SIMM Substitution

On machines which only call for 256 kB VRAM SIMMs, 512 kB SIMMs are supported, but only 256 kB of the total 512 kB capacity can be used. However, do not mix VRAM SIMM sizes on machines which call for either 256 kB or 512 kB VRAM SIMMs. For example, the LC 575 requires either two 256 kB SIMMs or two 512 kB SIMMs. Do not mix sizes in this machine.