Garrett's Workshop

GW4301A

geoRAM-compatible RAM Expansion Cartridge for Commodore 64

User's Guide

GW4301A was designed by Zane Kaminski and Garrett Fellers

Overview

The GW4301A RAM expansion cartridge provides the Commodore 64 with 2 MB of geoRAM-compatible expansion memory. GW4301A is optionally sold with a transparent, TFW8b-brand cartridge casing. The TWF8b cartridge is well-manufactured and feels nice, especially compared to 3d-printed cases.

Compact Size, Low Power Consumption

The GW4301A RAM expansion card is small enough to fit into a "stumpy" sized C64 cartridge but provides 2 MB of geoRAM-compatible memory. Power consumption is minimized through the use of a single 16 megabit DRAM chip.

Open-Source Design

GW4301A's design is fully open-source. The schematics, board layouts, and CPLD firmware 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

Compatibility Notes

Types of C64 Memory Expansion: REU-type RAM vs. geoRAM-type RAM

Please read this section if you are unsure which programs are compatible with the extra memory provided by a geoRAM-type memory expansion cartridge such as the GW4301A.

There are two types of expansion memory for the Commodore 64: geoRAM-compatible memory and REU-compatible memory. GW4301A is a geoRAM-type memory expansion cartridge. Other geoRAM-type cartridges include the original geoRAM and the modern NeoRAM. On the other hand, REU-compatible memory carts include the original Commodore 1750 and 1764 RAM Expansion Units. GW4301A is *not* compatible with REU-type memory cartridges such as the Commodore 1750 and 1764.

In general, some programs support geoRAM-type RAM, some programs support REU-type RAM, some programs support both, and some support neither type of expansion RAM. Usually the types of supported memory expansion are noted in a program's supporting documentation. Please do note that the vast majority of C64 programs do not support any type of external memory expansion. Memory expansion is most commonly used with the GEOS operating system but is also often supported in programs such as text editors, assemblers, samplers, and graphics programs.

Using geoRAM-type Memory Expansion with GEOS

GEOS supports memory expansion using a geoRAM-type memory cartridge such as the GW4301A, but not out-of-the box. You must install a special driver on your GEOS boot disk in order to be able to use the GW4301A with GEOS. This process can be slightly complicated by the copy protection present on most original GEOS disks. The best tutorial on installing GEOS with support for geoRAM-type memory can be found here: http://cbmfiles.com/geos/

Technical Specifications

Physical Dimensions (without cartridge case)

Parameter	Value
Height	49.53 mm $\pm$ 0.2 mm
Width	57.912 mm $\pm$ 0.2 mm
Thickness	< 8 mm
Weight	< 28 g

Electrical Specifications

Specifications are valid over temperature range of $0\,°\text{C} - 85\,°\text{C}$ and $V_{CC} = 4.5\,\text{V} - 5.5\,\text{V}$.

Parameter	Value	Conditions
$V_{IH\,min}$	2.0 V	
$V_{IL\,max}$	0.8 V	
$V_{OH\,min}$	2.4 V	$I_{OH} = -2\,\text{mA}$
$V_{OL\,max}$	0.5 V	$I_{OL} = 4\,\text{mA}$
Output Slew Rate	< 1.5 V/ns	
$I_{I\,max}$	$\pm$ 20 µA	$V_{in} = 0\,\text{V} - 5.5\,\text{V}$
$C_{IO\,max}$	22 pF	
$I_{CC\,max}$	120 mA	