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Timing feature of SCREEN7 and SCREEN8 video modes

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Background: GR8BIT video memory board is featuring direct video memory access (DVMA) capability, allowing user programs to have direct physical access to the video memory through 16KiB bank pages (8 pages in total). It is essential for DVMA to work with fast SRAM chips, used in the GR8BIT.

GR8BIT video memory board was tested in SCREEN modes 0 to 6, however we discovered a feature of the video processor (VDP) using different timing for bitmap screen modes 7 and 8.

VDP assumes that memory chip latches address by the negative edge (activation) of the \overline{RAS} (row address) and \overline{CAS} (column address) signals, and VDP is free to change address on memory chips inputs A0...A7 afterwards. It causes issue with SRAM chips which are "interactive" (perform immediate read from another memory array location on address change) and fast enough to put new read data onto its data pins before VDP samples data from previously valid address. The comparison of DRAM and SRAM functional diagrams is shown in fig. 1. Samsung's DRAM has address buffers, Winbond's SRAM does not and address lines go directly to the row/column decoder.

The outcome of such a discrepancy can be well seen on the screen exhibiting some minor corruption to the image (fig. 2).

Solution: This discrepancy is solved by adding two latches to hold valid column addresses for each fast memory chip throughout the whole memory access cycle. Addition of another simple logic chip allows DVMA working properly, as well as increases its reliability relative to its original design.

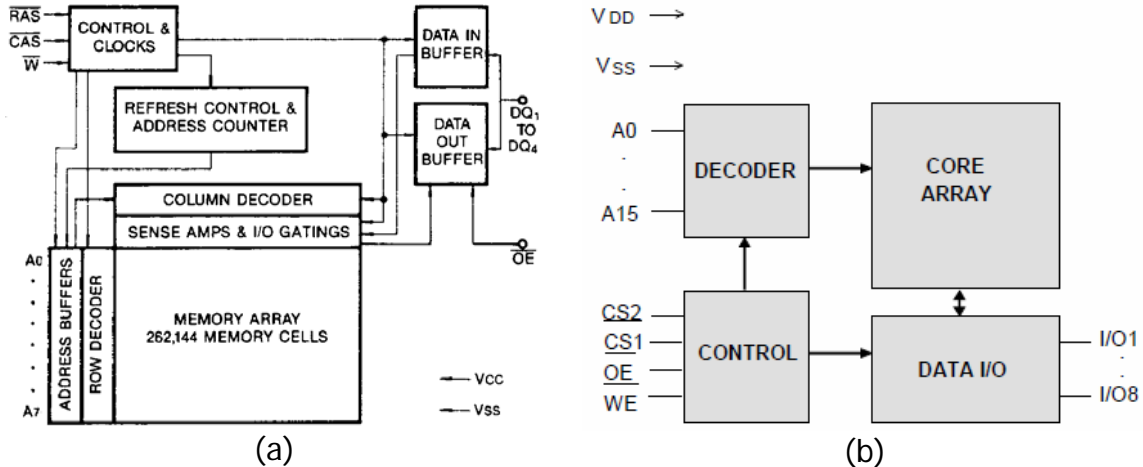
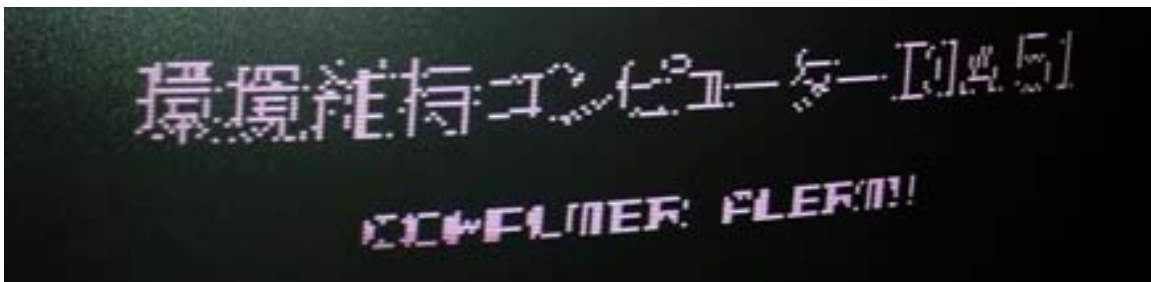


Figure 1. Functional diagrams of KM41464 (a, KM41464 datasheet, Samsung) and W24512 (b, W24512 datasheet, Winbond)



(a) "UNKNOWN REALITY: a voyage beyond the boundaries of imagination", runs in SCREEN 7 mode (*Unknown reality* by N.O.P., 1994)



(b) "Computer alert!" (*Aleste 2* by Compile, 1989)

Figure 2. Exhibition of the timing discrepancy (photos by van der Meulen, R.)

Further information

- Samsung (no date) *64Kx4 Bit Dynamic RAM with Page Mode*, available online, permalink from manufacturer is not available (use Google to locate)

- Winbond (1997) *64Kx8 High Speed CMOS Static RAM*, available online, permalink from manufacturer is not available (use Google to locate)
- ASCII/Nippon Gakki Co. (1985) *V9938 MSX-Video data processor LSI Data Sheet*, available online, permalink from manufacturer is not available (use Google to locate)