

MEMORY EXPANSION FOR THE VIC-20

Most microcomputer owners will probably agree that memory, and the need for more of it, lies at the root of current microcomputer software. Our first aim is therefore to expand the Ram area available; this will enable you to run Basic programs or to set aside memory for screen buffer, word processing, accounting and cataloguing work. It allows you to run different programs alternately.

In theory, there is no limit to expanding the Ram space available by paging the memory. (Our 64K and 128K expansion modules can exploit this technique very effectively). Mention must also be made here of the possibilities of data retention and storage, which can now be achieved with CMOS RAM; the memory which we write into this is at the speed of 400,000 bytes per second. With this device, the program is maintained when the computer is not in use, and each time the program is needed, it can be called back within a fraction of a second, or used in place of the game cartridges, it will run when you power on your Vic.

The operating system will look for a predefined pattern when the Vic is powered on. This is stored at locations \$A004 to \$A008, which is 'A O C B M'. (See page 102 of Nich Hampshire's 'Vic Revealed'). If it finds the correct pattern, the operating system simply performs a JMP (A000). If the preset pattern is not found, the operating system will do a RAM test to count the number of bytes between \$0000 and \$7FFF, initialize these and then display the greeting message. The unexpanded Vic, as you well know, greets you with the following:

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* * * C B M BASIC V2 * * *
3583 BYTES FREE
READY.
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Our first products made specifically for the Vic 20 are for memory expansion only, and you will find more details, together with current prices, overleaf. The Vic fitted with a further 16K (on our VCR cartridge) will display instead:

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* * * C B M BASIC V2 * * *
19967 BYTES FREE
READY
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And if 16K isn't enough, we are now producing a 64K board especially for the Vic, putting it in the same league as many highly sophisticated models on the market. Please read on for details.

THANK YOU FOR THE INTEREST SHOWN IN OUR PRODUCTS

VCR-20 CMOS RAM FOR THE VIC-20

CMOS RAM is static, fast, reliable and consumes very little power, this is to say, ideal to be used with a modern micro-computer such as the Vic.

The data sheet for the part we use in our memory cartridges is reproduced overleaf as a comparison chart showing how our products are placed against the standard products sold by the Vic manufacturers CBM. While page 4 will show our products against U.K main manufacturers: Stack Computer Services Limited and Afon Micro-Electronics Limited.

The VCR-20 is exceptionally flexible, allowing you to choose the right amount of memory you require.

From the start, you can buy the VCR-20 with any quantity of RAM, and at a later date, add more memory part to your VCR. This for example allows you to start with as little as £24.00. This is the price for the VCR with 4K of RAM. Every extra chip you add to it will increase the memory another 2K bytes (cost £5.00).

The VCR-20 when fitted with all the RAM chips offers you 20K bytes of additional RAM, capable of any plotting command, predefined keys and 20K of basic program.

The VCR can take the cheaper NMOS equivalent RAM in place of the CMOS RAM. We do not advise the use of NMOS equivalent (Toshiba 2016-P) because the latter consumes on average 10 times more power than the Hitachi HM6116 that we use.

The Vic fitted with the 16K (or more) VCR will display:

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* * * * C B M BASIC V2 * * * *
19967  BYTES FREE
READY.

```

2 special sockets on the VCR allow you to use any utility Eprom/Rom available. Socket No.1 is usually assigned to memory block 3 (HEX 6000 to 7FFF) and socket No.2 to memory block 5 (HEX A000 to BFFF). However, it can be set to any other block by a jumper wire. The photograph on the back of this brochure shows the VCR with 20K of RAM and 2 x 2K Eproms.

THE VCS (CMOS CARTRIDGE SIMULATOR FOR THE VIC-20)

The cartridge simulator fulfills the need for back-plane expansion for the intensive user who wishes to add not only more memory to the Vic-20 but also more peripheral devices.

The VCS firsts provides 3 slots for other add-ons and cartridges with a separate battery back-up line connected to pin Y of all the slots.

The VCS itself offers 8K of RAM, arranged in such a way that it can add to the basic Vic, providing 11775 bytes free for basic, or in conjunction with the VCR-20. In this case you get 28159 bytes free for basic or in cartridge mode where the program stored in its 8K RAM will automatically run when the machine is powered on.

The VCS can ~~also~~ be used in conjunction with the VDR-64.

You can buy the VCS as a motherboard, that is without any RAM part, or buy it already fitted with 8K of CMOS RAM. In both cases, the battery is not included (this can be any ordinary 4.5V battery only needed if you want to battery back-up the VCS RAM).

THE VDR-64 (DYNAMIC RAM FOR THE VIC-20)

The VDR-64 is the answer to a need for massive memory, in other words, if you feel that 32K of basic RAM is not enough. For nearly a year now, we have been producing the 64K and 128 add-on, for the Vic predecessors: the Pet series 2001, 3000 and 4000. This has allowed us to be the first to offer a 64K and 128K RAM expansion for the Vic-20.

As you probably know, only 32K of direct memory address is available for RAM, from ~~\$0000~~ to ~~\$7FFF~~.

The VDR-64 first of all makes full use of this direct memory; the 48K of RAM is available as secondary memory.

When the Vic is powered on, it will display 28159 bytes free; this is the main memory, from ~~\$0000~~ to ~~\$7FFF~~.

To access the secondary memory, 3 extra address lines are needed. These are taken from the Vic user port whose address is decimal 37136. Selecting the secondary memory can be done within basic program by POKE but this is a lengthy process. We provide a demotape which contains the subroutines to read/write screen-fulls of data or picture, read/write files to tape and read/write programs allowing you to run 2 different programs at the same time. Naturally, any software written for the Vic and any cartridges made for the Vic will run normally.

The availability of the massive secondary memory is very important for using the Vic in the office. Take a simple example: if you wish to use the Vic as Name/Telephone/Directory, 32K bytes of main memory will give you about 100 personal files each around 200 bytes long, using around 20K bytes of the 28K bytes available.

With the VDR-64, the size of the book can be nearly 3 times bigger. The secondary memory is used to store only data. The secondary memory can also find the use in scientific applications where the Vic is used to plot a shape for different sets of parameters and to display the different pictures. The total memory available for the Vic fitted with a VDR-64 is 64K.

We think that one of the aims of documentation is to give a clear outline of our products in relation to ~~similar products~~ currently on the market. In this way, you can estimate technical and practical advantages together with value for money.

We have produced a chart overleaf which compares our products to those currently available through Commodore.

COMPARISON CHART

THE VIC MEMORY MAP	THE CBM SUPER EXPANDER	THE CBM 8K RAM CARTRIDGE	THE CBM SIM CARTRIDGE	AUDIO COMS' VCR-20	AUDIO COMS' VCS	AUDIO COMS' VDR-64	AUDIO COMS' VDR-128
\$0400 - 1K YES	YES	NO	NO	YES	NO	YES	YES
\$0FFF - 4K \$1FFF - 8K NO	NO	YES	NO	YES	YES ¹	YES	YES
\$3FFF - 16K NO	NO	NO	NO	YES	NO	YES	YES
\$5FFF - 24K NO	NO	NO	NO	YES ²	NO	YES	YES
\$7FFF - 32K \$9FFF - 40K \$BFFF - 48K NO	NO	NO	YES	YES ³	YES ⁴	YES	YES

KERNAL ROM + BASIC ROM.

\$FFFF - 64K

PRICE: £29.95 £44.95

Note 1: Mode select in 'BASIC' position. Note 3. Accepts 2764 Eprom or 2364 ROM (optional).

Note 2: Accepts 2764 Eprom or 2364 ROM (opt) Note 4. Mode select in 'copy' position.

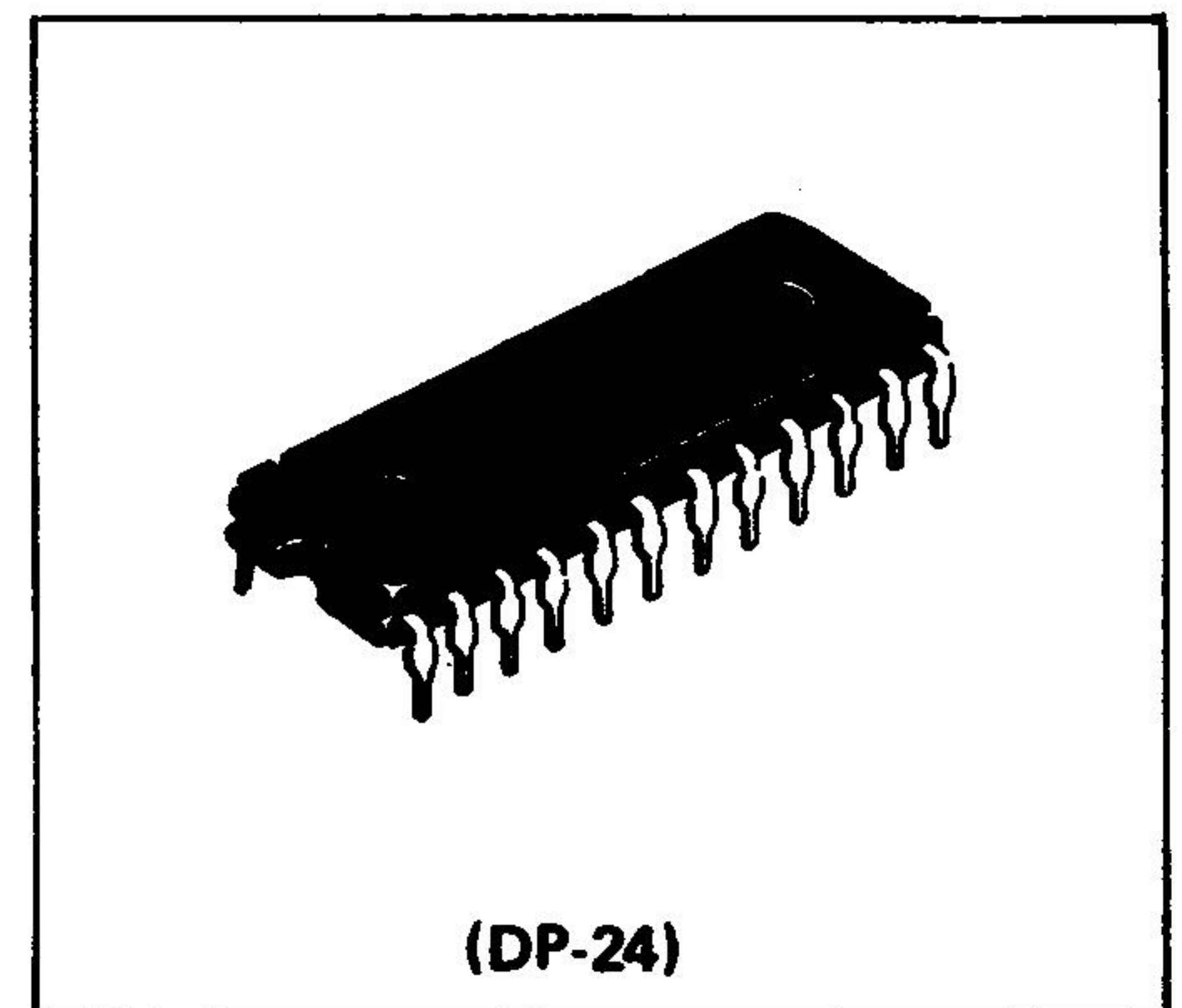
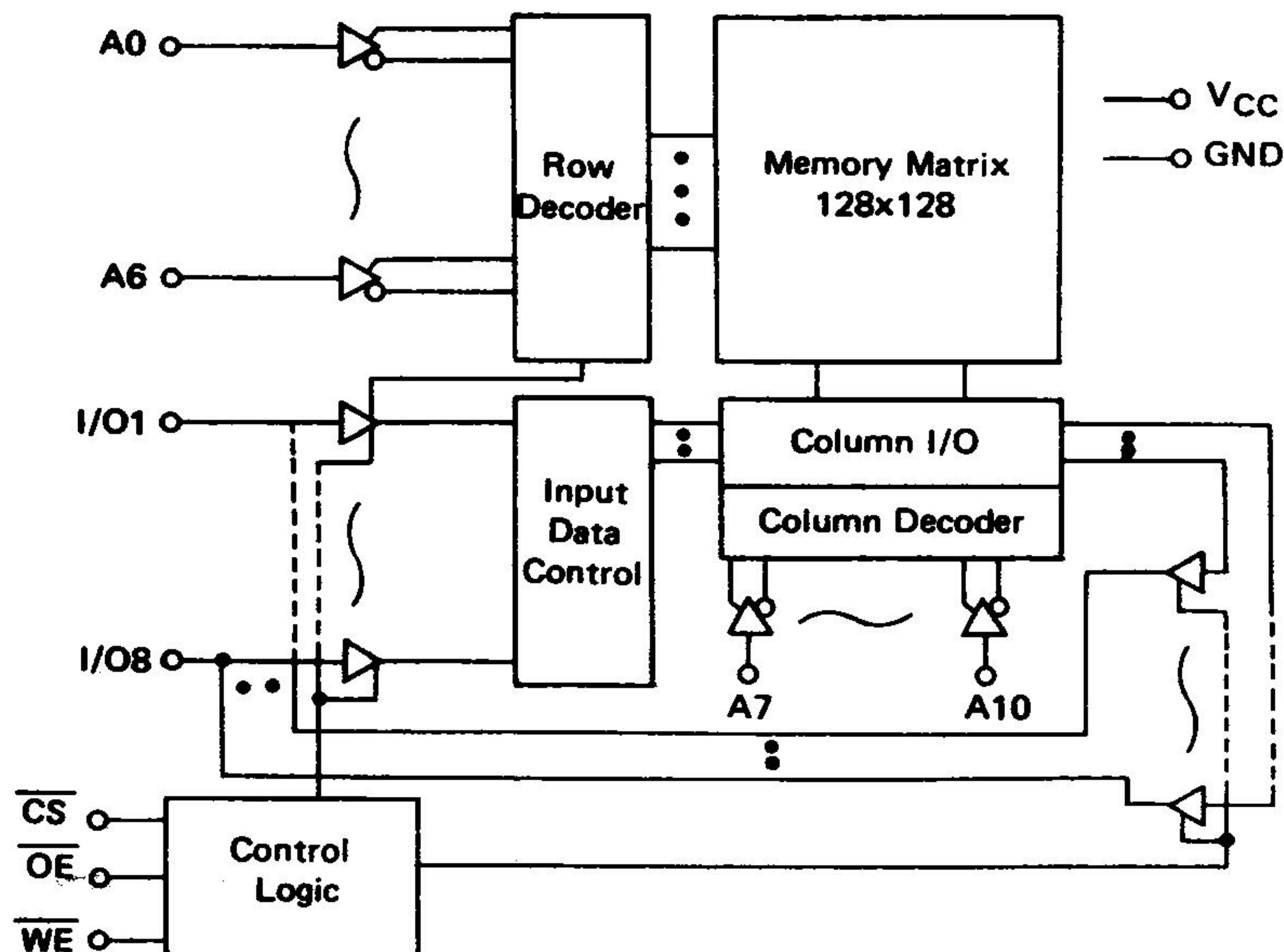
Specifications and prices given are believed exact and fulfilled in the micro-computing press in Aprin 1982 but we cannot be held responsible for any variation.

2048-word X 8-bit High Speed Static CMOS RAM

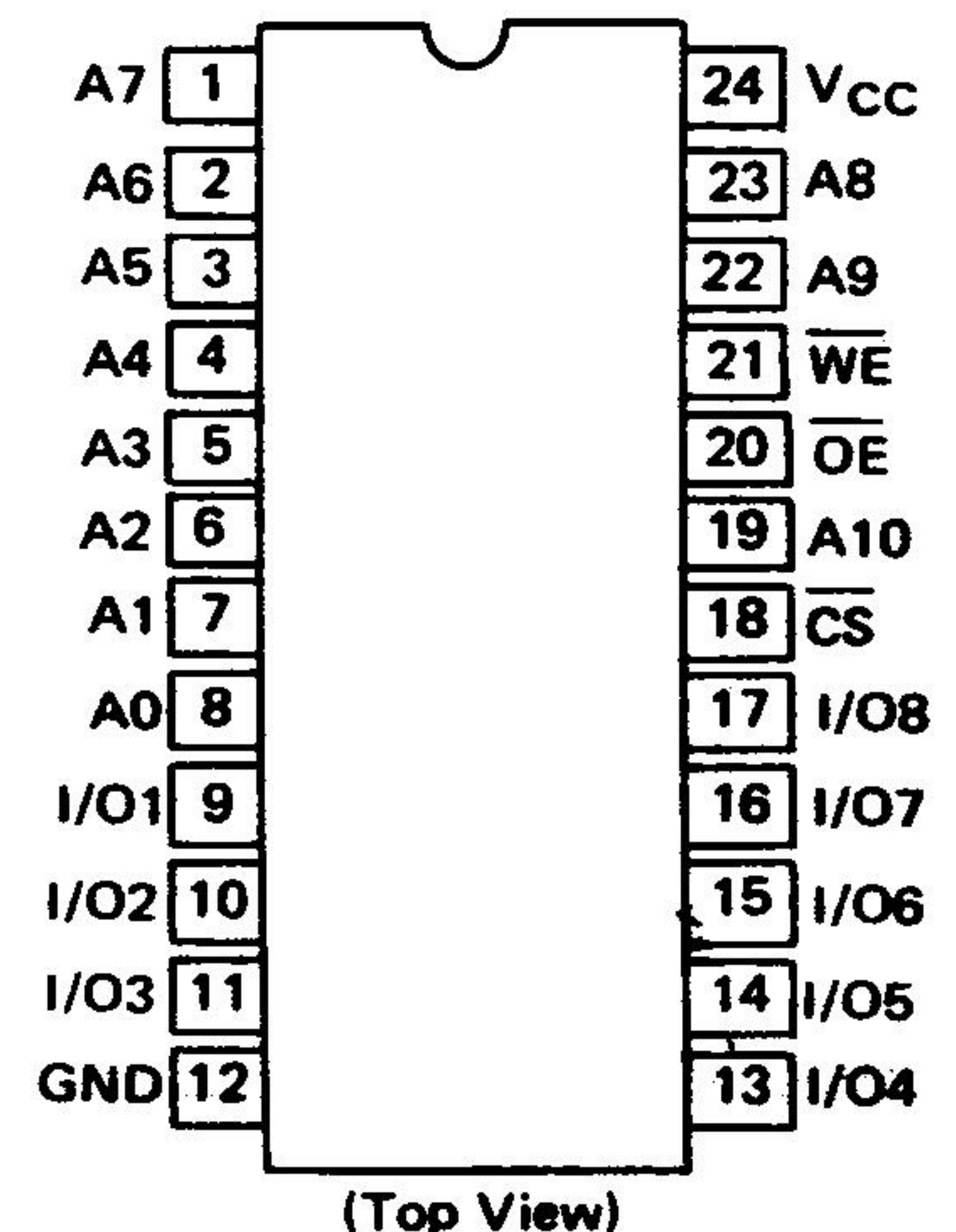
■ FEATURES

- Single 5V Supply and High Density 24 pin Package
- High Speed: Fast Access Time 120ns/150ns/200ns (max.)
- Low Power Standby and Low Power Operation; Standby: 100μW (typ.)
 Operation: 180mW (typ.)
- Completely Static RAM: No clock or Timing Strobe Required
- Directly TTL Compatible: All Input and Output
- Pin Out Compatible with Standard 16K EPROM/MASK ROM
- Equal Access and Cycle Time

■ FUNCTIONAL BLOCK DIAGRAM



■ PIN ARRANGEMENT



■ ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Rating	Unit
Voltage on Any Pin Relative to GND	V_{IN}	−0.5 to +7.0	V
Operating Temperature	T_{opr}	0 to +70	°C
Storage Temperature	T_{stg}	−55 to +125	°C
Temperature Under Bias	T_{bias}	−10 to +85	°C
Power Dissipation	P_T	1.0	W

■ TRUTH TABLE

$\overline{\text{CS}}$	$\overline{\text{OE}}$	$\overline{\text{WE}}$	Mode	V_{CC} Current	I/O Pin	Ref. Cycle
H	X	X	Not Selected	I_{SB}, I_{SB1}	High Z	
L	L	H	Read	I_{CC}	Dout	Read Cycle (1) ~ (3)
L	H	L	Write	I_{CC}	Din	Write Cycle (1)
L	L	L	Write	I_{CC}	Din	Write Cycle (2)

ORDERING INFORMATION:

- 1) Please use the coupon below if at all possible. It helps us to get your products to you much more quickly.
- 2) If you wish to come and collect, please leave your phone number so that we can advise you on the availability of your goods on our premises.

Shop Hours: Monday to Friday, from 9.30am to 5.30pm. Closed all day Saturday.

- 3) Payment: If you pay by one of the following modes:

Postal orders
Cash
Bankers cheque
credit cards

No clearance is necessary, it can save you up to one week on delivery delay.

Credit cards: only Access and Barclay-cards are acceptable.

Overseas Customers: We accept bankers cheques or International Bank Transfer to our account:

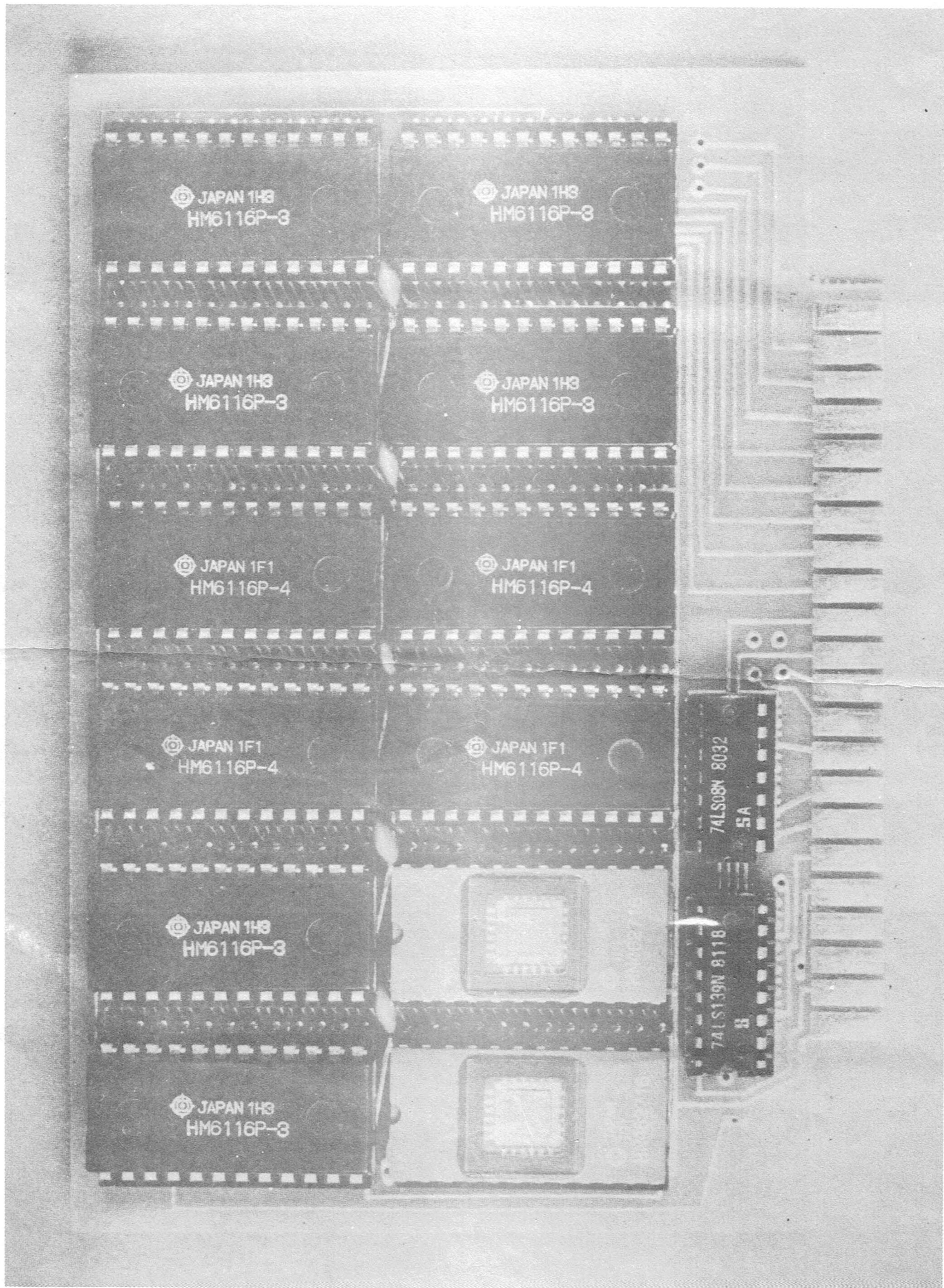
Audio Computers National Westminster Bank, Victoria Branch,
Southend-On-Sea, Essex, England.

- 4) Refund: All goods returned to us within 10 days in good condition will be refunded. However, we ask a small charge for P & P (£1.50) to be deducted from your balance.
- 5) Send-in for servicing: Please take extra care to ensure the product reaching us is in good condition. The original packing can be used again for this purpose.
- 6) Spare parts: Within guarantee period, we can arrange to send the replacement part you need without you having to send the boards back to us. Please ring us and get your order confirmed by an acknowledgement number. You can naturally order more spare-parts for your personal use with the coupon below.
- 7) Transport: We send all goods by G.P.O. services unless otherwise agreed (such as for export).
- 8) Prices and Specifications: Our prices include V.A.T., P & P, and are correct at the time going to press. However, we reserve the right to modify prices and specifications without any further notice for improvement.

Thursday 3/6/82
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