MCM6570
MCM6571
MCM6571A
MCM6572
thru
MCM6579

8192-BIT READ ONLY MEMORIES
ROW SELECT CHARACTER GENERATORS

The MCM6570 is a mask-programmable 8192-bit horizontal-scan (row select) character generator. It contains 128 characters in a 7 x 9 matrix, and has the capability of shifting certain characters that normally extend below the baseline, such as j, y, g, p, and q. Circuitry is supplied internally to effectively lower the whole matrix for this type of character -- a feature previously requiring external circuitry.

A seven-bit address code is used to select one of the 128 available characters. Each character is defined as a specific combination of logic "1"s and "0"s stored in a 7 x 9 matrix. When a specific four-bit binary row select code is applied, a word of seven parallel bits appears at the output. The rows can be sequentially selected, providing a nine-word sequence of seven parallel bits per word for each character selected by the address inputs. As the row select inputs are sequentially addressed, the devices will automatically place the 7 x 9 character in one of two pre-programmed positions on the 16-row matrix, with the positions defined by the four row select inputs. Rows that are not part of the character are automatically blanked.

The MCM6571, MCM6571A, and MCM6572 thru MCM6579 are pre-programmed versions of the MCM6570. They contain various sets of characters to meet the requirements of diverse applications. The complete patterns of these devices are contained in this data sheet.

- Static Operation
- TTL Compatibility
- CMOS Compatibility (5 V)
- Shifted Character Capability (Except MCM6572, MCM6573)
- Maximum Access Time = 500 ns

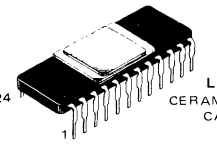
MOS

(N-CHANNEL, LOW THRESHOLD)

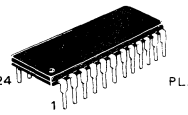
8 K
READ ONLY MEMORIES

HORIZONTAL-SCAN
CHARACTER GENERATORS
WITH SHIFTED CHARACTERS

3



L SUFFIX
CERAMIC PACKAGE
CASE 684



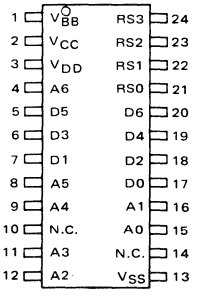
P SUFFIX
PLASTIC PACKAGE
CASE 709

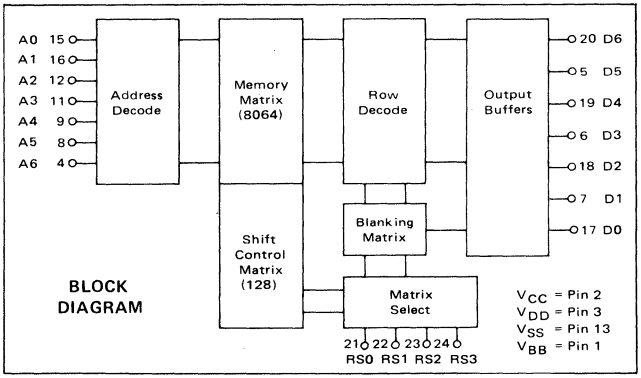
ABSOLUTE MAXIMUM RATINGS (See Note 1, Voltages referenced to V_{SS})

Rating	Symbol	Value	Unit
Supply Voltages	V_{CC} V_{DD} V_{BB}	-0.3 to +6.0 -0.3 to +15 -10 to +0.3	Vdc
Data Input Voltage	V_{in}	-0.3 to +15	Vdc
Operating Temperature Range	T_A	0 to +70	°C
Storage Temperature Range	T_{stg}	-55 to +125	°C

NOTE 1: Permanent device damage may occur if ABSOLUTE MAXIMUM RATINGS are exceeded. Functional operation should be restricted to RECOMMENDED OPERATING CONDITIONS. Exposure to higher than recommended voltages for extended periods of time could affect device reliability.

PIN ASSIGNMENT





BLOCK DIAGRAM

This device contains circuitry to protect the inputs against damage due to high static voltages or electric fields; however, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high-impedance circuit.

DC OPERATING CONDITIONS AND CHARACTERISTICS

(Full operating voltage and temperature range unless otherwise noted.)

RECOMMENDED DC OPERATING CONDITIONS (Referenced to V_{SS})

Parameter	Symbol	Min	Nom	Max	Unit
Supply Voltage	V_{DD}	10.8	12	13.2	Vdc
	V_{CC}	4.75	5.0	5.25	Vdc
	V_{SS}	0	0	0	Vdc
	V_{BB}	-3.3	-3.0	-2.7	Vdc
Input Logic "1" Voltage (Driven by TTL)	V_{IH}*	3.0	–	V_{CC}	Vdc
(Driven by Other Than TTL)		4.0	–	V_{CC}	Vdc
Input Logic "0" Voltage	V_{IL}	0	–	0.8	Vdc

*A 4.0 V V_{IH} is required at the chip regardless of the type of driver used. However, internal MOS pullup devices on the chip can pull one TTL driver from 3.0 V to 4.0 V, without affecting access time. These pullup devices may not pull non-TTL drivers above 3.0 V.

3

DC CHARACTERISTICS

Characteristic	Symbol	Min	Typ	Max	Unit
Input Forward Current (V_{IL} = 0.4 Vdc)	I_{IL}	--	–	-1.6	mAdc
Input Leakage Current (V_{IH} = 5.25 Vdc, V_{CC} = 4.75 Vdc)	I_{IH}	–	–	100	μAdc
Output Low Voltage (Blank) (I_{OL} = 1.6 mAdc)	V_{OL}	0	–	0.4	Vdc
Output High Voltage (Dot) (I_{OH} = -40 μAdc)	V_{OH}	3.0	–	–	Vdc
Power Supply Current	I_{DD}	–	–	10	mAdc
	I_{CC}	–	–	125	mAdc
	I_{BB}	–	–	100	μAdc
Power Dissipation	P_D	–	600	800	mW

CAPACITANCE (Periodically sampled rather than 100% tested)

Characteristic	Symbol	Min	Typ	Max	Unit
Input Capacitance (f = 1.0 MHz)	C_{in}	–	4.0	7.0	pF
Output Capacitance (f = 1.0 MHz)	C_{out}	–	4.0	7.0	pF

AC CHARACTERISTICS

(Full operating voltage and temperature range unless otherwise noted.)

[All timing with t_r,t_f = 20 ns; Load = 1 TTL Gate (MC7400 Series), C_L = 30 pF]

TIMING (Typical values measured at 25°C and nominal supplies)

Characteristic	Symbol	Min	Typ	Max	Unit
Address Access Time (See Figure 1A)	$t_{acc(A)}$	–	350	500	ns
Row Select Access Time (See Figure 1B)	$t_{acc(RS)}$	–	300	500	ns

FIGURE 1 – TIMING DIAGRAMS

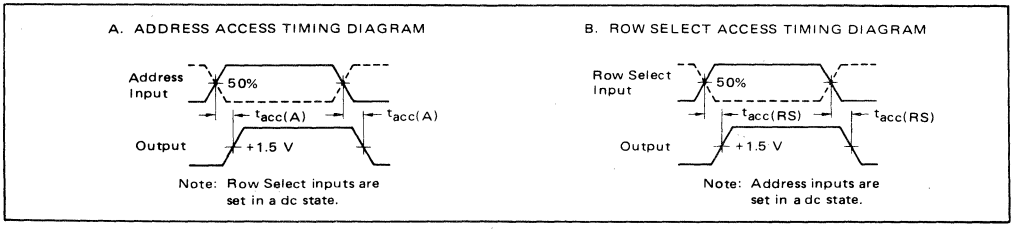


FIGURE 2 – V_{CC} SUPPLY CURRENT versus TEMPERATURE

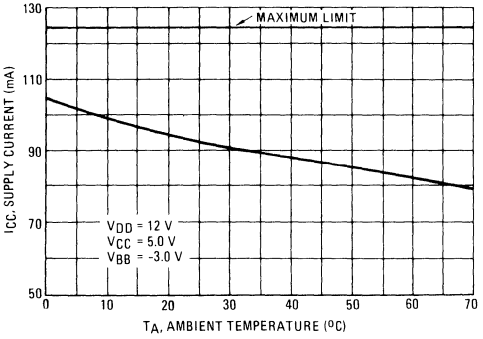


FIGURE 3 – V_{DD} SUPPLY CURRENT versus TEMPERATURE

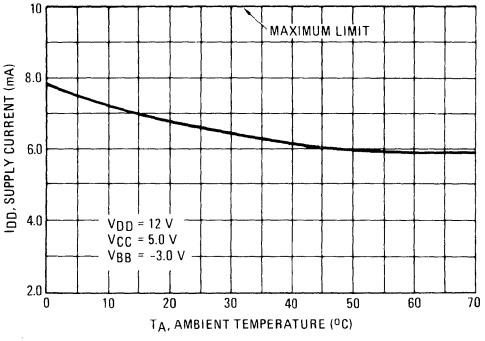


FIGURE 4 – OUTPUT SINK CURRENT versus OUTPUT VOLTAGE

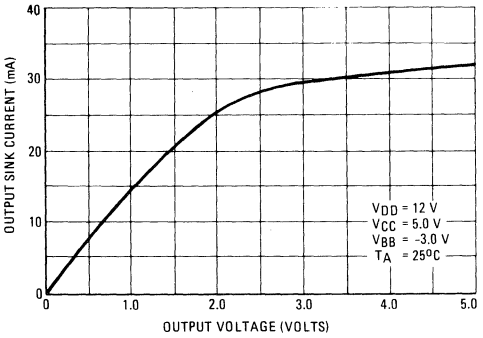


FIGURE 5 – POWER DISSIPATION versus V_{DD} SUPPLY VOLTAGE

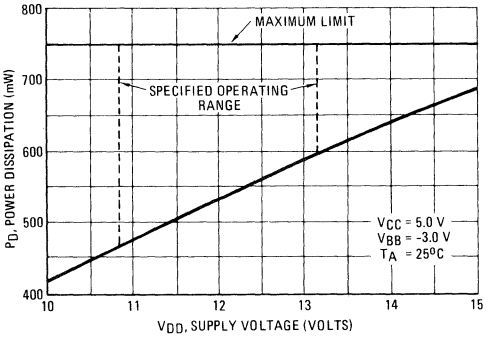


FIGURE 6 – ACCESS TIME versus V_{DD} SUPPLY VOLTAGE

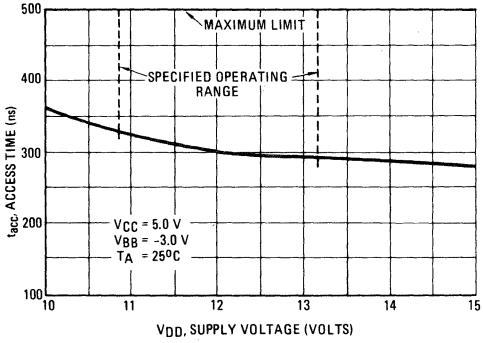
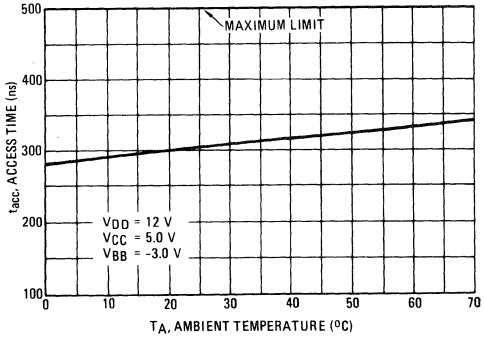


FIGURE 7 – ACCESS TIME versus TEMPERATURE



MEMORY OPERATION (Using Positive Logic)

Most positive level = 1, most negative level = 0

Address

To select one of the 128 characters, apply the appropriate binary code to the Address inputs (A0 thru A6).

Row Select

To select one of the rows of the addressed character to appear at the seven output lines, apply the appropriate binary code to the Row Select inputs (RS1 thru RS4).

Shifted Characters

These devices have the capability of displaying characters that descend below the bottom line (such as lower case letters j, y, g, p, and q). Internal circuitry effectively drops the whole matrix for this type of character. Any character can be programmed to occupy either of the two positions in a 7 x 16 matrix. (Shifted characters are not available on MCM6572 or MCM6573.)

Output

For these devices, an output dot is defined as a logic "1" level, and an output blank is defined as a logic "0" level.

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DISPLAY FORMAT

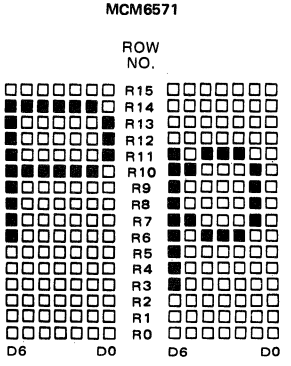
Figure 8 shows the relationship between the logic levels at the row select inputs and the character row at the outputs. The MCM6570 allows the user to locate the basic 7 x 9 font anywhere in the 7 x 16 array. In addition, a shifted font can be placed anywhere in the same 7 x 16 array. For example, the basic MCM6571 font is established in rows R14 thru R6. All other rows are automatically blanked. The shifted font is established in rows R11 thru R3, with all other rows blanked. Thus, while any one character is contained in a 7 x 9 array, the MCM6571 requires a 7 x 12 array on the CRT screen to contain both normal and descending characters. Other uses of the shift option may require as much as the full 7 x 16 array, or as little as the basic 7 x 9 array (when no shifting occurs, as in the MCM6572).

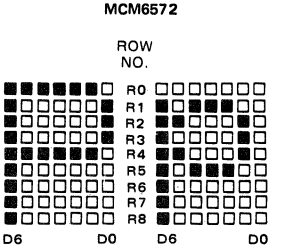
The MCM6570 can be programmed to be scanned either from bottom to top or from top to bottom. This is achieved through the option of assigning row numbers in ascending or descending count, as long as both the basic font and the shifted font are the same. For example, an up counter will scan the MCM6571 from bottom to top, whereas an up counter will scan the MCM6571A from top to bottom (see Figures 14 and 15 for row designation).

FIGURE 8 – ROW SELECT INPUT CODE AND SAMPLE CHARACTERS FOR MCM6571 AND MCM6572

ROW SELECT TRUTH TABLE

RS3	RS2	RS1	RS0	OUTPUT
0	0	0	0	R0
0	0	0	1	R1
0	0	1	0	R2
0	0	1	1	R3
0	1	0	0	R4
0	1	0	1	R5
0	1	1	0	R6
0	1	1	1	R7
1	0	0	0	R8
1	0	0	1	R9
1	0	1	0	R10
1	0	1	1	R11
1	1	0	0	R12
1	1	0	1	R13
1	1	1	0	R14
1	1	1	1	R15





CUSTOM PROGRAMMING FOR MCM6570

By the programming of a single photomask, the customer may specify the content of the MCM6570. Encoding of the photomask is done with the aid of a computer to provide quick, efficient implementation of the custom bit pattern while reducing the cost of implementation.

Information for the custom memory content may be sent to Motorola in the following forms, in order of preference:*

1. Hexadecimal coding using IBM Punch Cards (Figures 10 and 11).
2. Hexadecimal coding using ASCII Paper Tape Punch (Figure 12).

Programming of the MCM6570 can be achieved by using the following sequence:

1. Create the 128 characters in a 7 x 9 font using the format shown in Figure 9. Note that information at output D6 appears in column one, D5 in column two, thru D0 information in column seven. The dots filled in and programmed as a logic "1" will appear at the outputs as V_{OH}; the dots left blank will be at V_{OL}. (Blank formats appear at the end of this data sheet for your convenience; they are not to be submitted to Motorola, however.)

2. Indicate which characters are shifted by filling in the extra square (dot) in the top row, at the left (column S).

3. Convert the characters to hexadecimal coding treating dots as ones and blanks as zeros, and enter this information in the blocks to the right of the character font format. High order bits are at the left, in columns S and D3. For the bottom eight rows, the bit in column S must be zero, so these locations have been omitted. For the top row, the bit in column S will be zero for an unshifted character, and one for a shifted character.

4. Transfer the hexadecimal figures either to punched cards (Figure 10) or to paper tape (Figure 12).

5. Assign row numbers to the unshifted font. These must be nine sequential numbers (values 0 thru 15) assigned consecutively to the rows. The shifted font is similarly placed in any position in the 16 rows.

6. Provide, in writing, the information indicated in Figure 13 (a copy of Figure 13 may be used for this purpose). Submit this information to Motorola together with the punched cards or paper tape.

FIGURE 9 – CHARACTER FORMAT

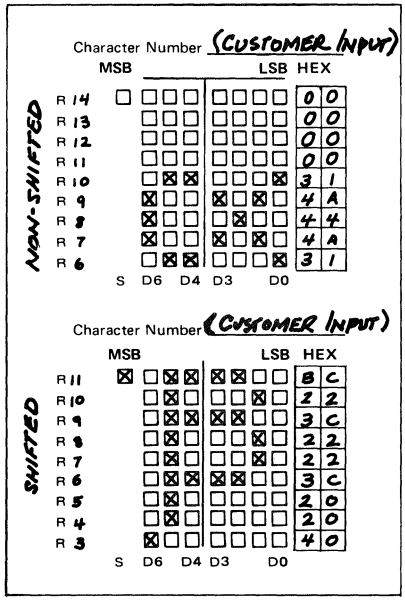


FIGURE 10 – CARD PUNCH FORMAT

Columns	
1 - 10	Blank
11	Asterisk (*)
12 - 29	Hex coding for first character
30	Slash (/)
31 - 48	Hex coding for second character
49	Slash (/)
50 - 67	Hex coding for third character
68	Slash (/)
69 - 76	Blank
77 - 78	Card number (starting 01; thru 43)
79 - 80	Blank

Column 12 on the first card contains the hexadecimal equivalent of column S and D6 thru D4 for the top row of the first character. Column 13 contains D3 thru D0. Columns 14 and 15 contain the information for the next row. The entire first character is coded in columns 12 thru 29. Each card contains the coding for three characters. 43 cards are required to program the entire 128 characters, the last card containing only two characters. The characters must be programmed in sequence from the first character to the last in order to establish proper addressing for the part. As an example, the first nine characters of the MCM6571 are correctly coded and punched in Figure 11.

*Note: Motorola can accept magnetic tape and truth table formats. For further information contact your local Motorola sales representative.

FIGURE 11 – EXAMPLE OF CARD PUNCH FORMAT
(First 9 Characters of MCM6571)

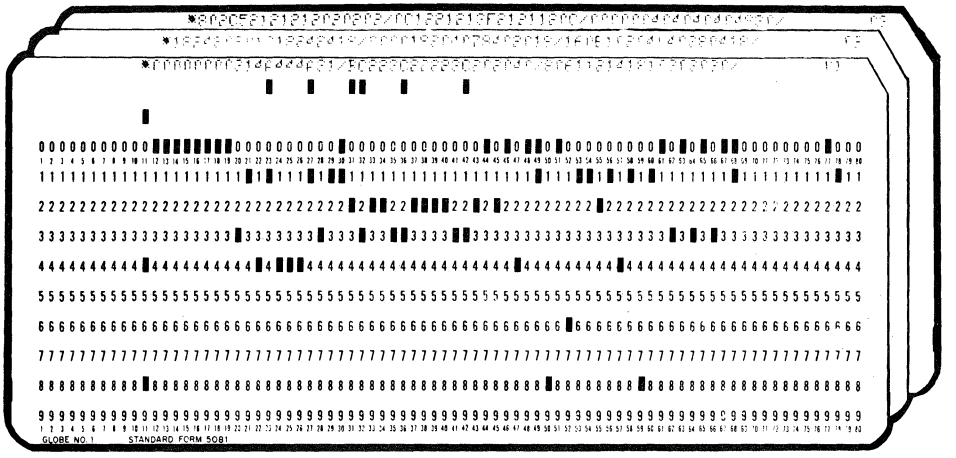


FIGURE 12 – PAPER TAPE FORMAT

Frames	
Leader	Blank Tape
1 to M	Allowed for customer use (M ⩽ 64)
M + 1, M + 2	CR; LF (Carriage Return; Line Feed)
M + 3 to M + 66	First line of pattern information (64 hex figures per line)
M + 67, M + 68	CR; LF
M + 69 to M + 2378	Remaining 35 lines of hex figures, each line followed by a Carriage Return and Line Feed

Blank Tape

Frames 1 to M are left to the customer for internal identification, where M ⩽ 64. Any combination of alpha-numerics may be used. This information is terminated with a Carriage Return and Line Feed, delineating the start of data entry. (Note that the tape cannot begin with a CR and/or LF, or the customer identification will be assumed to be programming data.)

Frame M + 3 contains the hexadecimal equivalent of column S and D6 thru D4 for the top row of the first character. Frame M + 4 contains D3 thru D0. Frames M + 5 and M + 6 program the second row of the first character. Frames M + 3 to M + 66 comprise the first line of the printout. The line is terminated with a CR and LF.

The remaining 35 lines of data are punched in sequence using the same format, each line terminated with a CR and LF. The total 36 lines of data contain 36 x 64 or 2304 hex figures. Since 18 hex figures are required to program each 7 x 9 character, the full 128 (2304 ÷ 18) characters are programmed.

FIGURE 13 – FORMAT FOR ORGANIZATIONAL DATA

ORGANIZATIONAL DATA
MCM6570 MOS READ ONLY MEMORY

Customer _____

Customer Part No. _____ Rev. _____

Row Number for top row of non-shifted font _____

Row Number for bottom row of non-shifted font _____

Row Number for top row of shifted font _____

FIGURE 14 – MCM6571 PATTERN

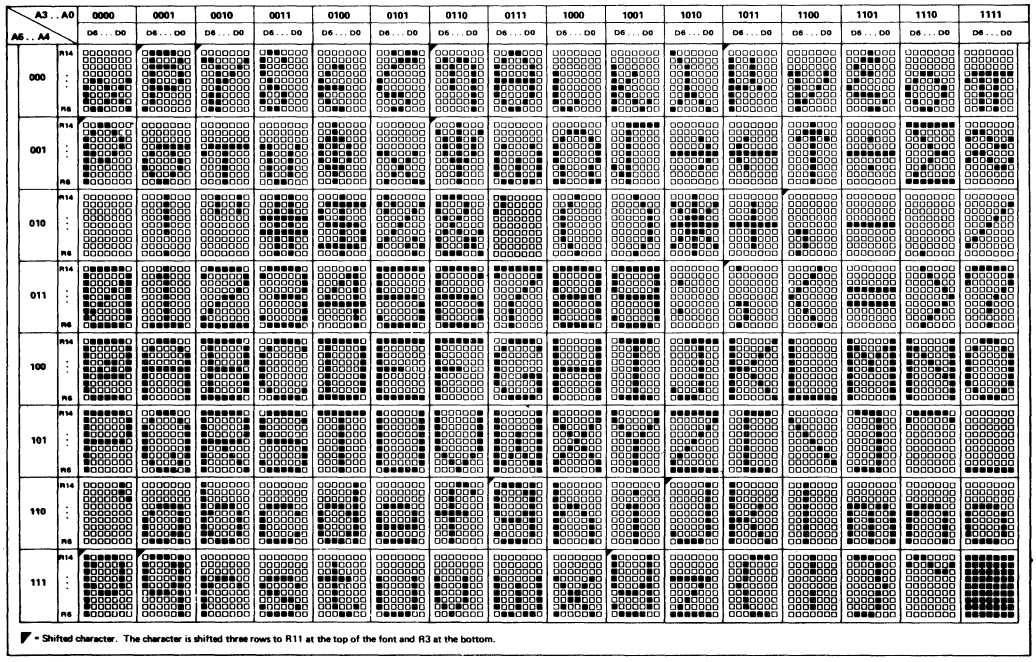


FIGURE 15 – MCM6571A PATTERN

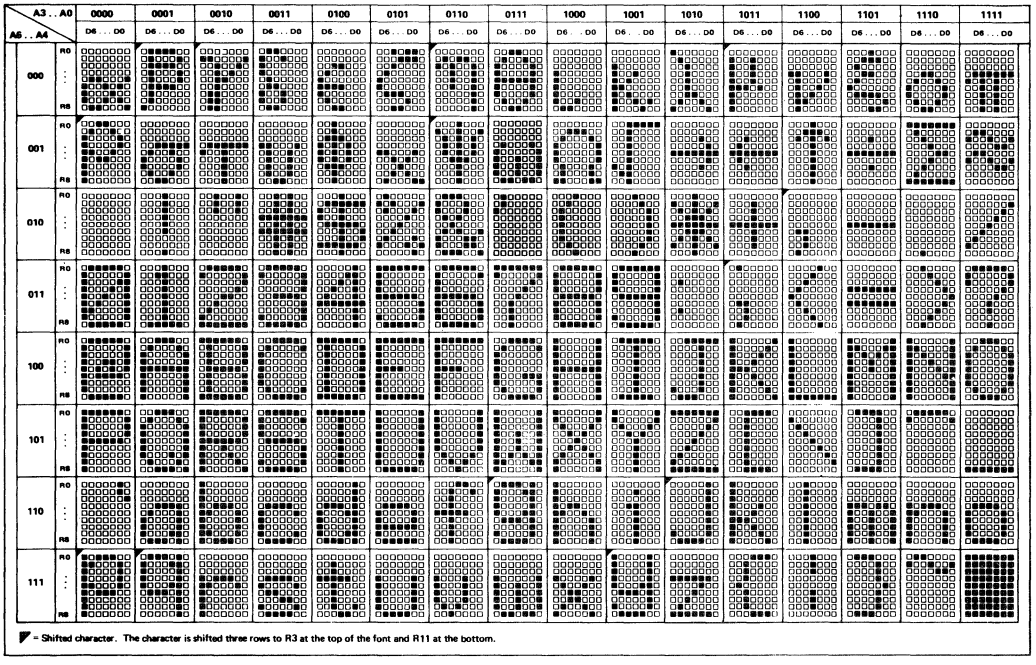
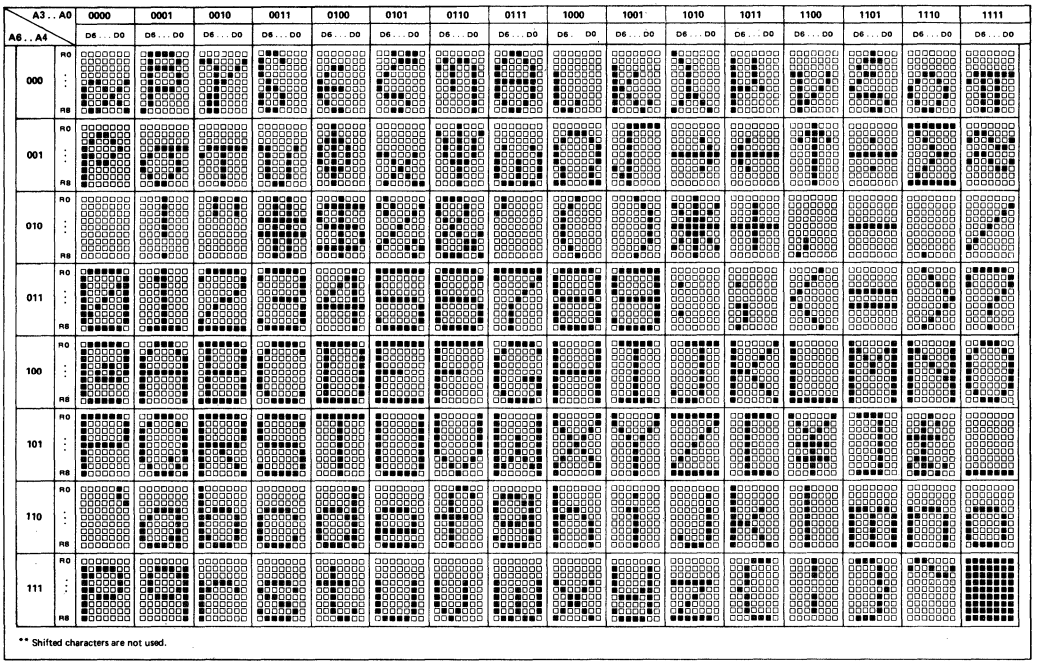
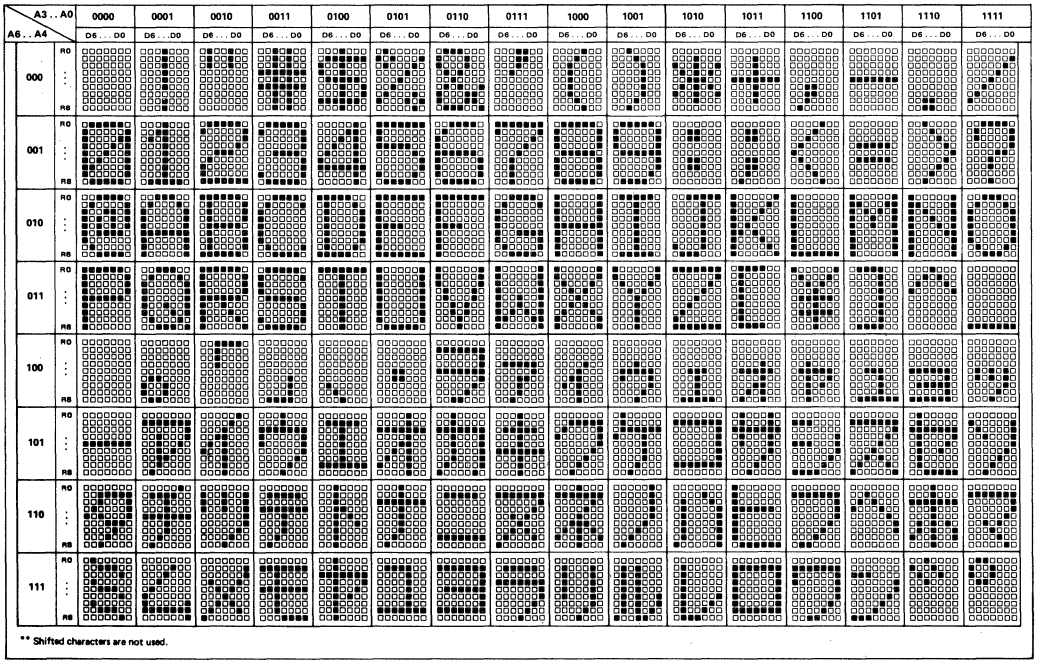


FIGURE 16 – MCM6572 PATTERN**



** Shifted characters are not used.

FIGURE 17 – MCM6573 PATTERN**



** Shifted characters are not used.

FIGURE 18 – MCM6574 PATTERN

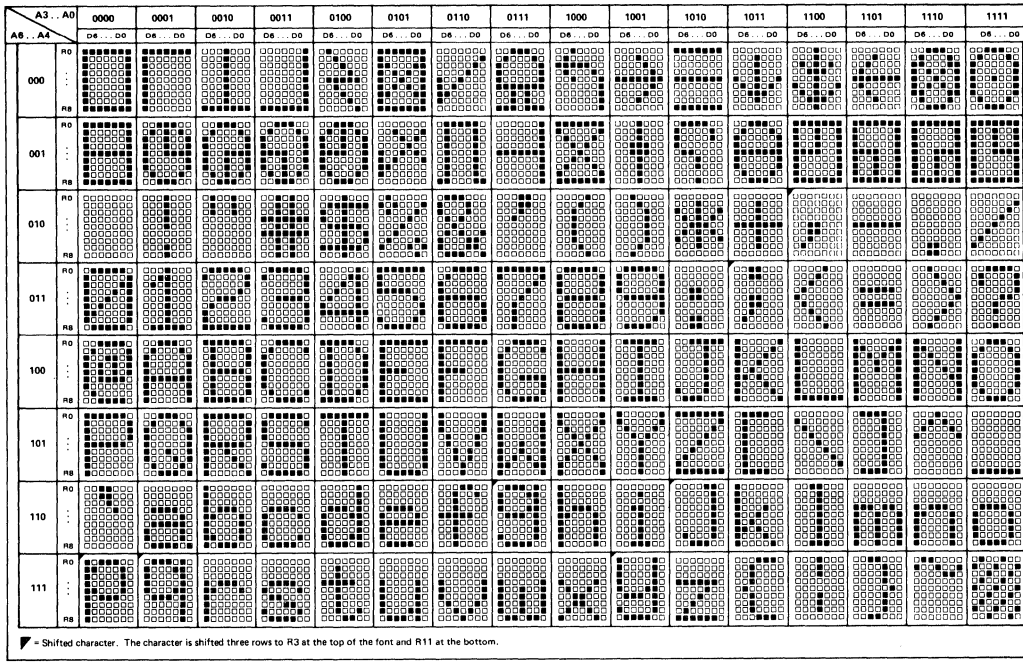


FIGURE 19 – MCM6575 PATTERN

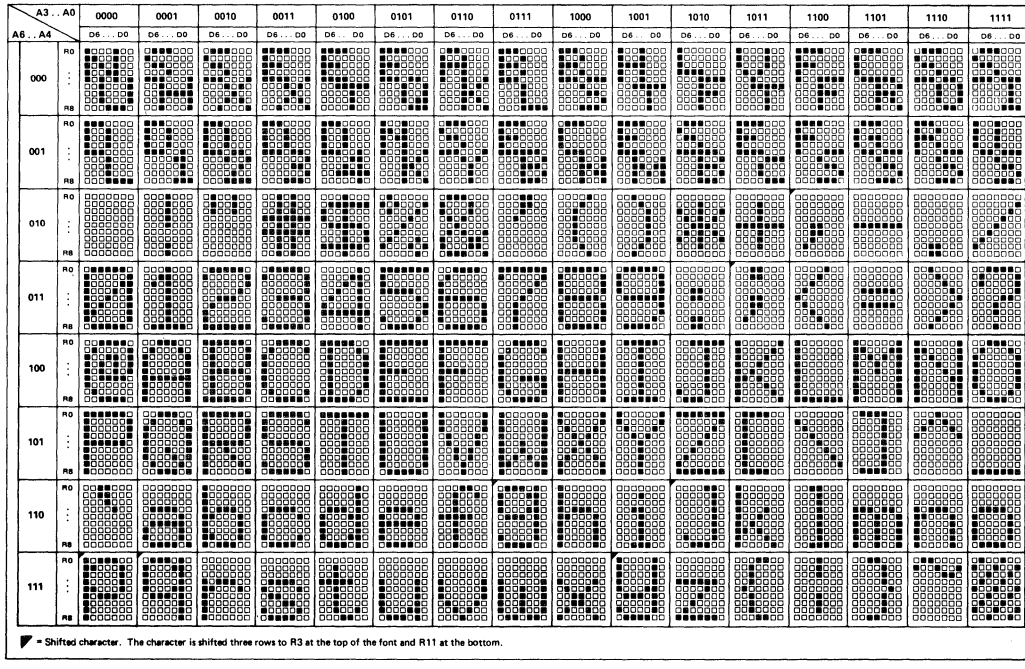


FIGURE 20 – MCM6576 PATTERN

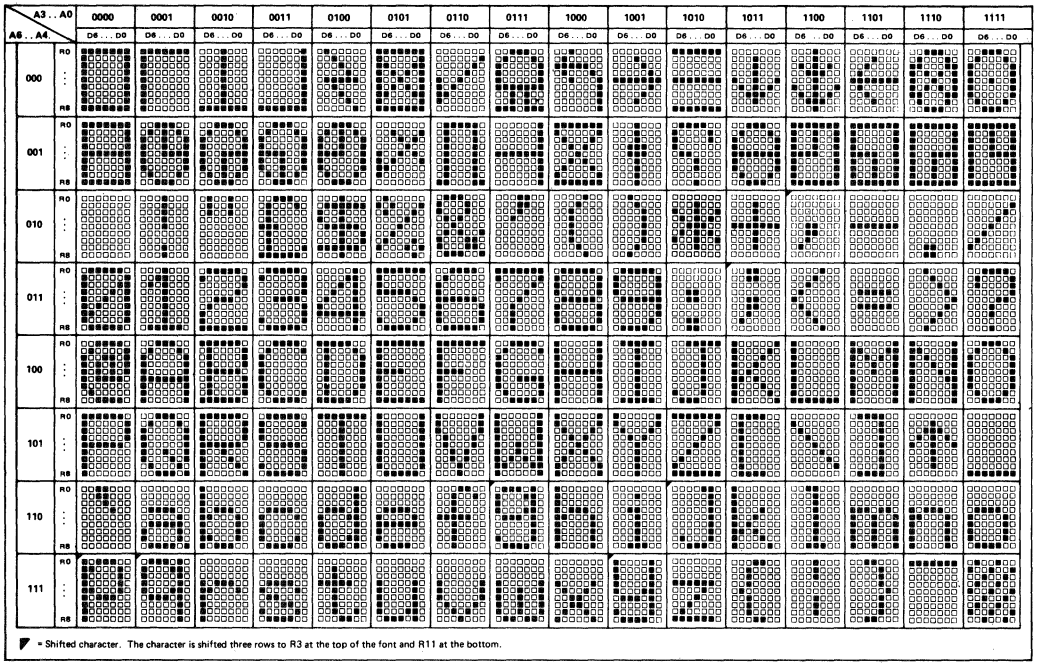


FIGURE 21 – MCM6577 PATTERN

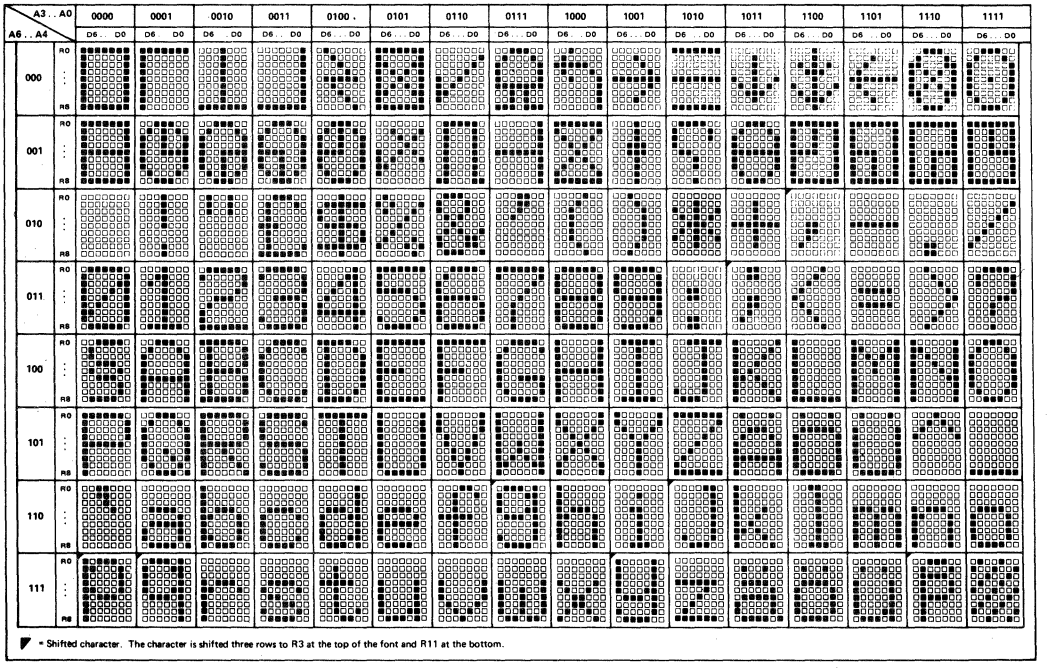
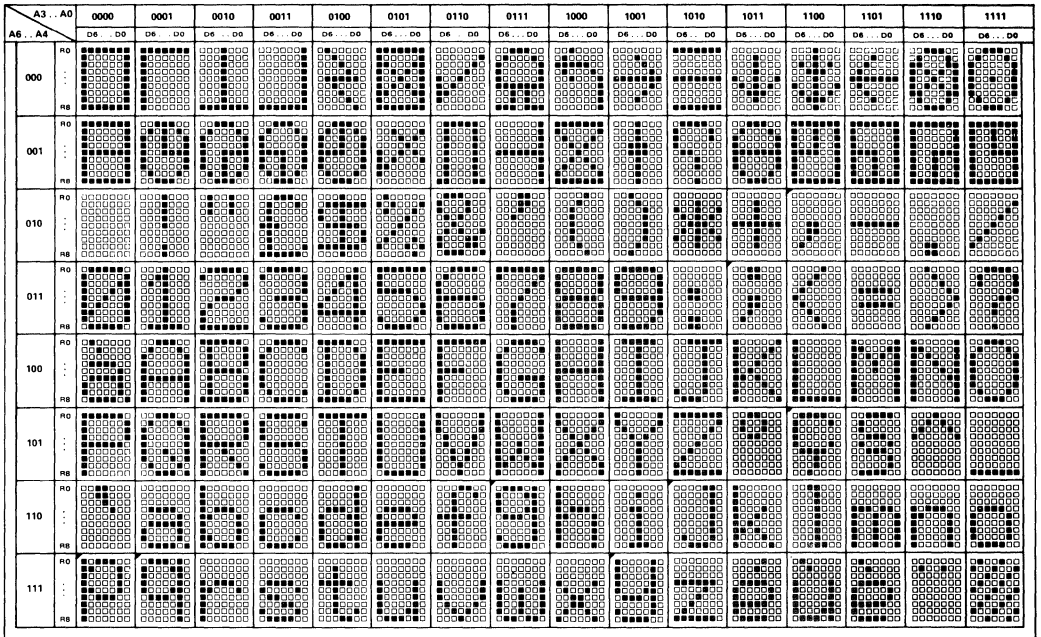
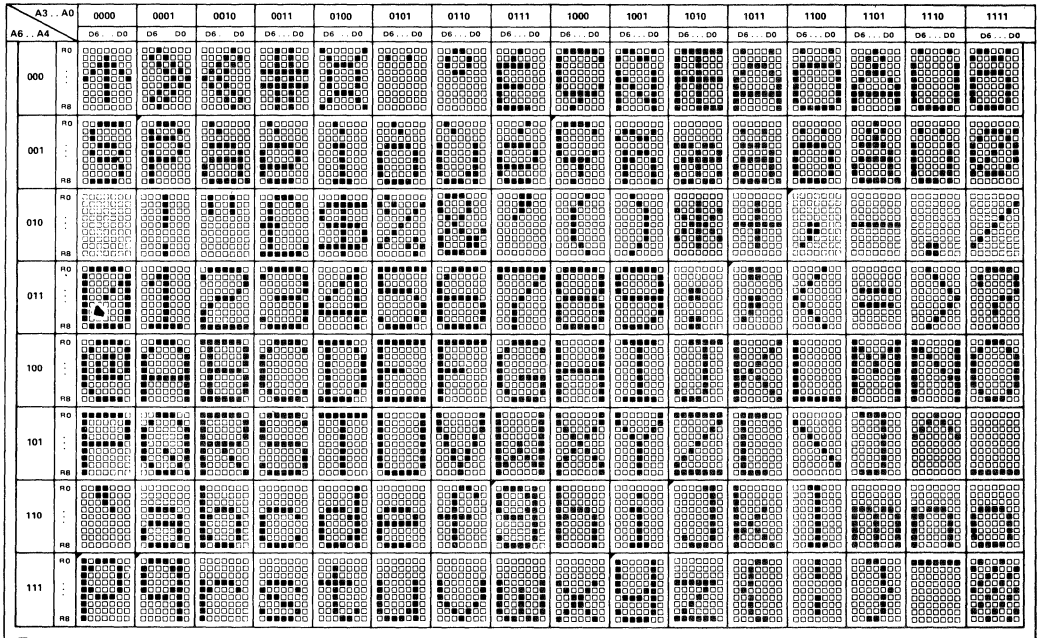


FIGURE 22 – MCM6578 PATTERN



◤ = Shifted character. The character is shifted three rows to R3 at the top of the font and R11 at the bottom.

FIGURE 23 – MCM6579 PATTERN



◤ = Shifted character. The character is shifted three rows to R3 at the top of the font and R11 at the bottom.

APPLICATIONS INFORMATION

One important application for the MCM6570-79 is in CRT display systems (Figure 24). A set of buffer shift registers or random access memories applies a 7-bit character code to the input of the character generator, which then supplies one row of the character according to the count at the four row select inputs. As each row is available, it is put into the TTL MC7495 shift registers. The parallel information in these shift registers is clocked serially out to the Z-axis where it modulates the raster to form the character.

The MCM6570-79 require three power supplies: -3.0 volts, +5.0 volts, and +12 volts. The character generator requires only small currents from the -3.0 volt and +12 volt supplies, such that charge pump techniques using +5.0 volts can be used.

Figure 25 shows a supply circuit that will generate the required -3.0 volts for V_{BB}. The +12-volt supply of Figure 26 will supply the 6.0 mA that is typically required. Increased current capability is possible by modifying the circuits. Use of these small, low-cost supplies makes a single +5.0-volt system possible.

When powering this device from laboratory or system power supplies, it is important that the Absolute Maximum Ratings not be exceeded or device failure can result. Some power supplies exhibit spikes or "glitches" on their outputs when the ac power is switched on and off. For example, the bench power supply programmed to deliver +12 volts may have large transients below ground when the ac power is switched on and off. If this possibility exists, it is suggested that the user switch the dc side of the power supply or protect the device power pins (+12, +5.0, and -3.0 volt) against reverse biasing with clamp diodes. A hot carrier diode such as the MBD501 is suggested for this purpose.

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FIGURE 24 – CRT DISPLAY APPLICATION USING MCM6571

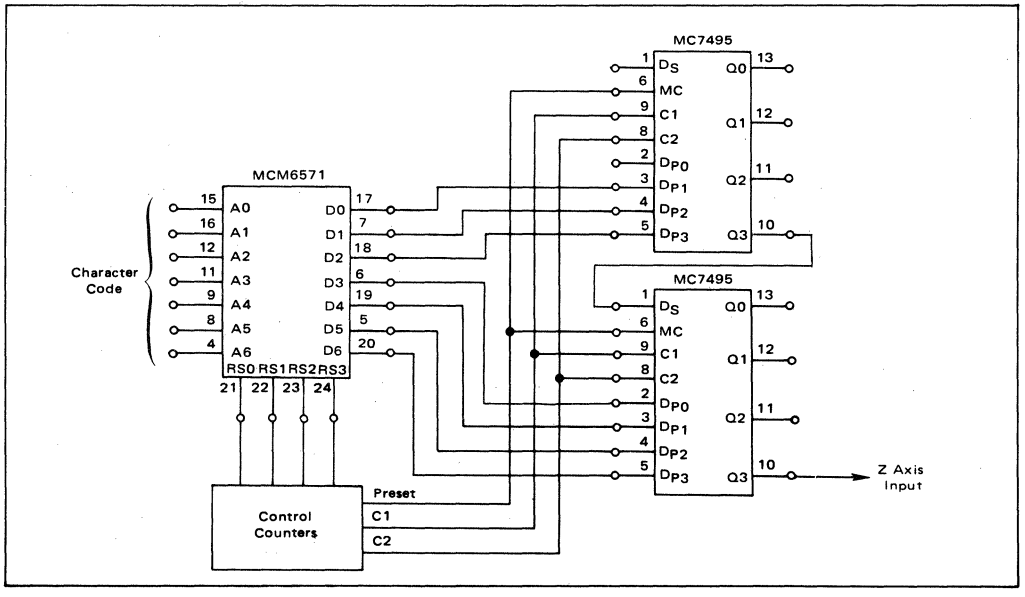


FIGURE 25 – SUBSTRATE BIAS CHARGE PUMP SUPPLY

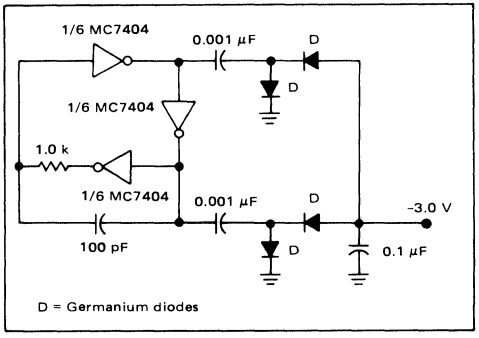
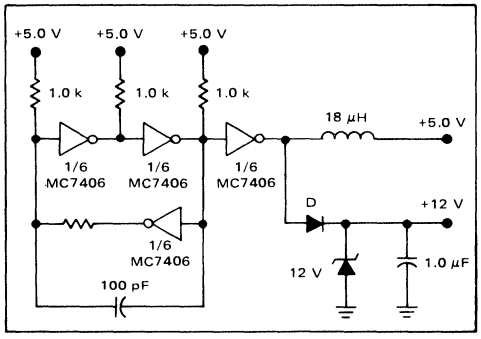


FIGURE 26 – GATE VOLTAGE CHARGE PUMP SUPPLY



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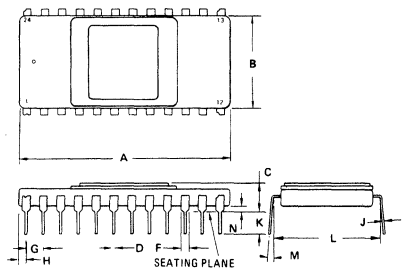
PACKAGE DIMENSIONS

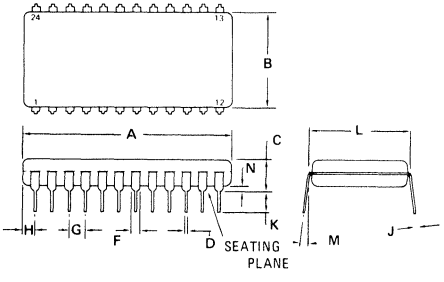
CASE 684-04



DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	29.34	30.86	1.155	1.215
B	12.70	14.22	0.500	0.560
C	3.05	3.94	0.120	0.155
D	0.38	0.51	0.015	0.020
F	0.89	1.40	0.035	0.055
G	2.54 BSC		0.100 BSC	
H	0.89	1.40	0.035	0.055
J	0.20	0.30	0.008	0.012
K	2.92	3.68	0.115	0.145
L	14.86	15.87	0.585	0.625
M	–	15^0	–	15^0
N	0.51	1.14	0.020	0.045

NOTES:
1. LEADS WITHIN 0.13 mm (0.005) RADIUS OF TRUE POSITION AT SEATING PLANE WITH MAXIMUM MATERIAL CONDITION.
2. LEAD NO. 1 CUT FOR IDENTIFICATION, OR BUMP ON TOP.
3. DIM "L" TO INSIDE OF LEADS. (MEASURED 0.51 mm (0.020) BELOW PKG BASE)

CASE 709-01



DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	31.37	32.13	1.235	1.265
B	13.72	14.22	0.540	0.560
C	4.57	5.08	0.180	0.200
D	0.36	0.51	0.014	0.020
F	1.02	1.52	0.040	0.060
G	2.41	2.67	0.095	0.105
H	1.78	2.03	0.070	0.080
J	0.20	0.30	0.008	0.012
K	3.05	3.56	0.120	0.140
L	14.73	15.24	0.580	0.600
M	0^0	10^0	0^0	10^0
N	0.51	1.02	0.020	0.040

NOTES:
1. LEADS, TRUE POSITIONED WITHIN 0.25 mm (0.010) DIA AT SEATING PLANE AT MAXIMUM MATERIAL CONDITION. (DIM. "D")
2. DIM "L" TO CENTER OF LEADS WHEN FORMED PARALLEL.

The formats below are given for your convenience in preparing character information for MCM6570 programming. THESE FORMATS ARE NOT TO BE USED TO TRANSMIT THE INFORMATION TO MOTOROLA. Refer to the Custom Programming instructions for detailed procedures.