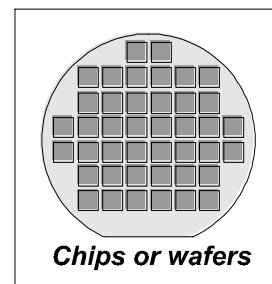


An6870 (An6870A) LCD CONTROLLER

Description of standard and extended functions

The An6870 is a dot matrix LCD controller designed for display of alphanumeric data. It is functionally compatible with the Samsung KS0070B and has a larger CGROM capacity and extended service functions.



The An6870 drives 16 COM and 80 SEG outputs to display one 8x5 or 11x5 dot character line, or two 8x5 dot character lines. With its own segment outputs the controller can display up to 16 characters in each line (i.e. 32 characters in a two-line mode). Extension drivers increase the number of displayed characters to 80 (up to 40 characters in a line for the two-line mode).

The displayed character codes are written into the 80-byte Display Data RAM (DDRAM). Character patterns are stored in the 20,480-bit Character Generator ROM (CG ROM) or 64x8-bit Character Generator RAM (CGRAM). The CGROM capacity allows coding of two pages of 8x5 dot characters or one 11x5 dot character page (up to 248 characters on each page). Mixed format coding is also allowed (see below). In the CGRAM the user can write eight 8x5 dot characters or four 11x5 dot characters.

The An6870A version is designed to display large size characters of a 15x10 dot format. In this case it is possible to display 8 characters using the controller's own segment drivers or up to 40 characters in a line with the extension drivers. Simultaneously with characters, 320 icons can be displayed, 8 icons per each displayed character. The CGROM can contain up to 126 large characters, and 2 large characters can be written into the CGRAM.

Data exchange with an external control device is performed by an easy-to-use system interface compatible with many MPU types, and a wide instruction set. Instructions and data can be transferred via a 4- or 8-bit data bus. The An6870 features an enhanced 4-bit interface that allows synchronization of the internal state of the controller with the interface timing diagram. The instruction set includes mode and address setting instructions, DDRAM & CGRAM data write or read, various service instructions such as Cursor On/Off & movement, cursor & character blinking, display clear, right/left display shift, return home, etc.

The An6870 has a standard interface for extension drivers which is compatible with An6865, An6863 and similar type drivers. COM and SEG waveforms can be "A" or "B" type as selected by the user. The type is selected in the Order Form (see below) and programmed by a metal mask.

A reset instruction automatically initializes the controller after power on.

The An6870 has a chip/mode identifier (ID) that allows the external MPU to detect the IC type, ROM code and service function status as well as the current operation mode, and to adjust the program flow according to received data.

The controller is fabricated with the baseline 1.2 um single-metal CMOS technology. Mask programming of the CGROM as well as the Initialization state and Extended mode selection are implemented with a metal mask.

Therefore, the An6870 features three basic operation modes*):

- 1) The Standard mode that is functionally equivalent to the KS0070B operation mode. This mode is enabled when the XMODE pad is either not connected or set to the logic "1" state.
- 2) The Extended mode allowing to use extended functions. The mode is enabled when the XMODE pad is connected to GND or set to the logical "0" state. The extended functions include the use of two CGROM pages for 8x5 dot characters, the Screen Inverse control capability, the cursor blinking mode (similar to the PC text mode cursor).
- 3) The Large Character mode is implemented in the An6870A version. It is programmed with a jumper in the metal layer. This mode allows to display characters of a larger size and with better quality (for this purpose a

special CGROM mask option is required) as well as the icons line. In this mode data can be output to the graphic LCD panel of the 16x80 and greater format because the character size makes it possible to leave spaces between adjacent characters.

***) Note:** Standard and Extended functions as well as CGROM character coding and the Initialization by Reset mode can be selected by the Customer when filling in the Order Form. Some functions can be made accessible in the Standard mode, others in the Extended mode. Certain functions can be accessible in both modes or disabled (see Order Form).

An6870 FEATURES (Standard mode)

- Maximum characters displayed with own SEG outputs: - 1 line display format: 16,
- 2 line display format: 2x16.
- Maximum characters displayed with extension drivers: - 80 for 1 line display format,
- 2x40 for 2 line display format.
- 80 byte (characters) Display Data RAM.
- 64 byte Character Generator RAM: - 8 characters of 8x5 dots format, or
- 4 characters of 11x5 dots format.
- 20480 bit Character Generator ROM: 240 (up to 248) characters 8 x 5 or 11x5 dots format.
- 8-bit or enhanced 4-bit data bus interface.
- Power supply voltage: 2.7V÷5.5V.
- Supply voltage for LCD drivers: 3.0V÷11.0V.
- Nominal clock oscillator frequency at $R_f=91K\Omega$, $V_{DD}=5V$: 270kHz.
- Maximum instruction execution time (except "Display Clear"): 8.5 clock periods, 31.5us (at $f_{osc}=270$ kHz).
- Maximum execution time for "Display Clear": 405 clock periods, 1500us (at $f_{osc}=270$ kHz).
- Maximum interface frequency at $V_{DD}=5V$: 2 MHz.
- TTL compatible MPU interface.
- CMOS compatible driver interface.
- Key service functions: hardware cursor, cursor or character blinking, right/left display shift, display clear and return home, reading of chip version and current mode parameters.

For CGROM coding in the Standard mode both 8x5 and 11x5 dot formats can be used simultaneously in any proportion. For example, the Character Patterns Table (F00) contains 208 characters of 8x5 format and 32 characters of 11x5 format. To make it compatible with the Extended mode a single range of 8x5 character codes multiple of 16 (i.e. only full columns are valid) is desirable.

An6870 FEATURES (Extended mode)

- Maximum characters displayed with own SEG outputs: - 1 line display format: 16,
- 2 line display format: 2x16.
- Maximum characters displayed with extension drivers: - 80 for 1 line display format,
- 2x40 for 2 line display format.
- 80 byte (characters) Display Data RAM.
- 64 byte Character Generator RAM: - 8 characters of 8x5 dots format, or
- 4 characters of 11x5 dots format.
- 20480 bit Character Generator ROM: - Up to 2 x 248 characters of 8 x 5 dots format (on 2 pages), or
- Up to 1 x 248 characters of 11x 5 dots format.
- 8-bit or enhanced 4-bit data bus interface.
- Power supply voltage: 2.7V÷5.5V.

- Supply voltage for LCD drivers: 3.0V÷11.0V.
- Nominal clock oscillator frequency at $R_f=91K\Omega$, $V_{DD}=5V$: 270kHz.
- Maximum instruction execution time (except "Display Clear"): 8.5 clock periods, 31.5us (at $f_{osc}=270$ kHz).
- Maximum execution time for "Display Clear": 405 clock periods, 1500us (at $f_{osc}=270$ kHz).
- Maximum interface frequency at $V_{DD}=5V$: 2 MHz.
- TTL compatible MPU interface.
- CMOS compatible driver interface.
- Key service functions: select CGROM page, hardware cursor, cursor or character blinking, inverse function, right/left display shift, display clear and return home, reading of chip version and current mode parameters.

For CGROM coding in the Extended mode both 8x5 and 11x5 dot formats can be used simultaneously providing a single range of 8x5 character codes multiple of 16 (i.e. only full columns are valid) is set. Characters 8x5 are displayed from the selected page, whereas characters 11x5 – only from the first page. Thus, characters 11x5 are displayed equally whether the first or the second page is selected.

An6870A FEATURES (Large Characters Mode)

- Size of displayed characters: 15 COM x 10 SEG.
- 8 characters displayed with own segments.
- Up to 40 characters displayed with extension drivers.
- Up to 320 icons can be displayed (8 icons per one character).
- 80 bytes Display Data RAM: - 40 bytes for Characters line,
 - 40 bytes for Icons.
- 64 byte Character Generator RAM for 2 characters.
- 20480 bit Character Generator ROM for 126 characters.
- 8-bit or enhanced 4-bit data bus interface.
- Power supply voltage: 2.7V÷5.5V.
- Supply voltage for LCD drivers: 3.0V÷11.0V.
- Nominal clock oscillator frequency at $R_f=62K\Omega$, $V_{DD}=5V$: 400kHz.
- Maximum instruction execution time (except "Display Clear"): - 8.5 clock periods, 21.25us (at $f_{osc}=400$ kHz).
- Maximum execution time for "Display Clear": - 205 clock periods, 512.5us (at $f_{osc}=400$ kHz).
- Maximum interface frequency at $V_{DD}=5V$: 2 MHz.
- TTL compatible MPU interface.
- CMOS compatible driver interface.
- Key service functions: select CGROM page, hardware cursor, cursor or character blinking, inverse function, right/left display shift, display clear and return home, reading of chip version and current mode parameters.

In the Large Character Display mode (version An6870A) special character pattern is required in the CGROM. As the character size has become 4 times larger the CGROM is capable of storing up to 126 characters. Besides, the user can write 2 characters in the CGRAM. In this mode the controller must have higher clock oscillation frequency because display refresh cycle has become 2 times longer comparing to the Standard mode.

**An6870 Order Form for Standard and Extended Modes**

Function	Standard Mode XMODE=1	Extended Mode XMODE=0	Comments
1. Standard CGROM mask option			This parameter is specified only when one of the standard CGROM mask options is selected. When the customer's own code is ordered respective form is to be attached hereto, then this parameter is omitted (dash instead).
2. Two CGROM pages selection	☐ – yes ☐ – no	☐ – yes ☐ – no	Selection of two CGROM pages is enabled either in extended mode or in two modes simultaneously.
3. Starting address of 2 nd CGROM page.			Starting and final addresses of 2 nd CGROM page are set when selection of two CGROM pages (i.2) is enabled at least in one of the modes. The addresses of table columns are specified either in hex, or decimal or binary form (suffixes h , d , or b respectively). Example: 0E <u>h</u> , 14 <u>d</u> , 1110 <u>b</u>
4. Final address of 2 nd CGROM page			
5. Display Inverse enable	☐ – yes ☐ – no ☐ - Fixed inverse mode	☐ – yes ☐ – no	Enabling of program control for display inversion or setting of fixed inversion mode. Enabled either in extended mode or in two modes simultaneously.
6. CGROM characters for 08h-0Fh codes	☐ – yes ☐ – no		Selection of CGROM characters to 08h-0Fh addresses. Allows increase of CGROM characters up to 248. Can be set only for two modes simultaneously.
7. Cursor blink enable	☐ – yes ☐ – no	☐ – yes ☐ – no	Setting of blinking cursor with Cursor On and Blink On simultaneously. Enabled either in extended mode or in two modes simultaneously.
8. COM & SEG waveform type	☐ – A-type ☐ – B-type		Setting of display control at COM & SEG outputs: change of voltage polarity in each COM cycle (type A) or in the whole display refresh cycle (type B). Can be set only for two modes simultaneously.
9. Basic modes selection:			Selection of initial state of basic mode parameters or their fixing in a definite state (without program control). The parameter can be fixed when the alternative state for this configuration is not required. For example, if 11x5 dots format is coded in CGROM, only this font size and number of COM lines can be fixed as no other size is available. These parameters can be set for both modes simultaneously.
- Interface data length	☐ – 4 bits (Power On Reset) ☐ – 8 bits (Power On Reset) ☐ – 4 bits (Fixed) ☐ – 8 bits (Fixed)		
- Number of display lines	☐ – 1 COM line (Power On Reset) ☐ – 2 COM lines (Power On Reset) ☐ – 1 COM line (Fixed) ☐ – 2 COM lines (Fixed)		
- Font size	☐ – 8x5 (Power On Reset) ☐ – 11x5 (Power On Reset) ☐ – 8x5 (Fixed) ☐ – 11x5 (Fixed)		

Customer _____ / _____ /

An6870A Order Form for Large Character Mode

Function	XMODE=1	XMODE=0	Comments
1. Standard CGROM mask option			This parameter is specified only when a standard CGROM mask option is selected. If the customer orders his own code a respective form is attached hereto and this parameter is omitted (dash instead).
2. Display Inverse enable	☐ – yes ☐ – no ☐ - Fixed Inverse mode	☐ – yes ☐ – no	Setting program controlled or fixed Inverse mode. Enabled either in extended mode or in two modes simultaneously.
3. COM and SEG waveform type	☐ – A-type ☐ – B-type		Providing screen control at COM and SEG outputs: voltage polarity is changed in every COM cycle (A-type) or in the whole screen refresh cycle (B-type). Can be set only for two modes simultaneously.
4. Basic mode selection	☐ – 4 bits (Power On Reset) ☐ – 8 bits (Power On Reset) ☐ – 4 bits (fixed) ☐ – 8 bits (fixed) ☐ – 1 COM line (Power On Reset) ☐ – 2 COM lines (Power On Reset) ☐ – 16-th COM line (Power On Reset) ☐ – 15-th COM line (Power On Reset)		Selection of the initial state of basic mode parameters or their fixation in a certain state (without program control function). A fixed interface data length is used if the alternative state is not required for a given configuration. This parameter can be set simultaneously for both modes. The cursor can occupy one or two COM lines. This parameter can be set simultaneously for both modes. The cursor starting position can be the 16-th or 15-th COM line. In case of the two-line cursor it can be located in lines 16&15 or 15&14, respectively. This parameter can be set for both modes simultaneously.

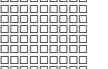
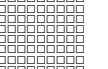
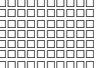
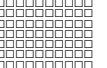
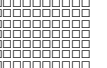
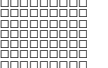
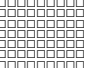
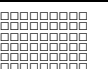
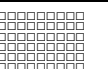
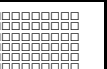
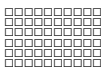
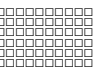
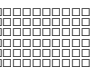
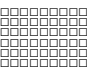
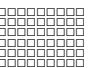
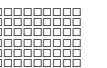
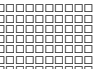
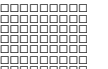
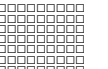
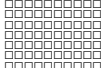
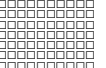
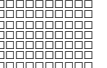
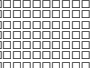
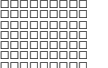
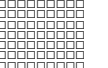
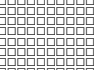
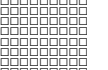
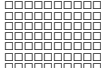
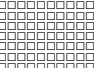
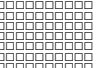
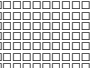
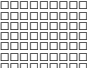
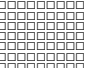
Customer _____ / /

CGROM Pattern Form for standard and extended modes (1st or 2nd page)

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XXXX 0000	(0)															
XXXX 0001	(1)															
XXXX 0010	(2)															
XXXX 0011	(3)															
XXXX 0100	(4)															
XXXX 0101	(5)															
XXXX 0110	(6)															
XXXX 0111	(7)															
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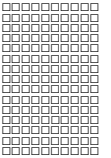
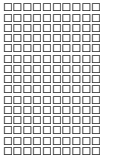
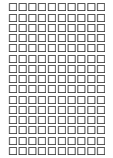
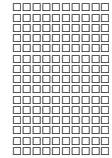
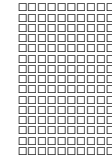
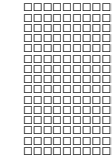
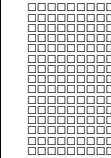
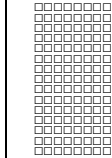
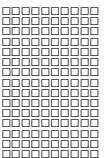
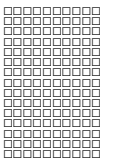
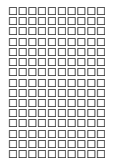
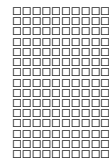
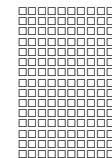
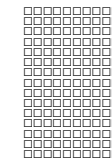
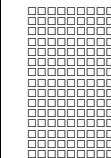
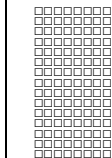
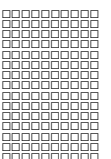
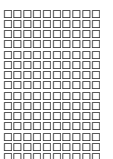
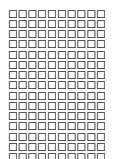
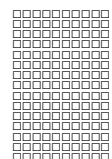
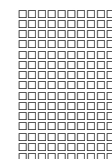
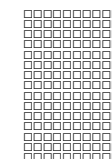
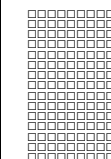
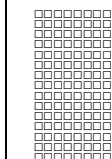
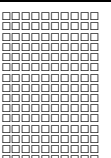
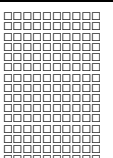
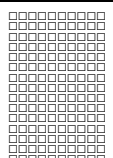
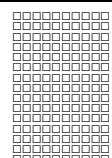
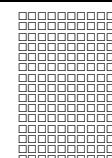
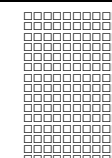
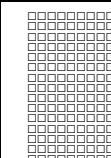
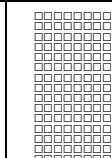
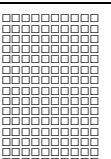
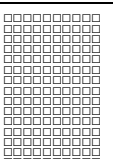
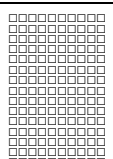
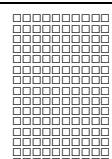
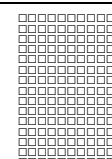
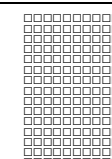
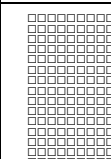
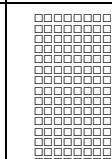
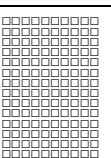
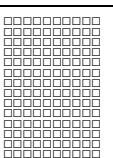
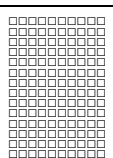
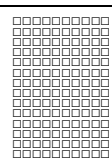
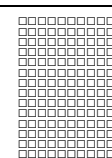
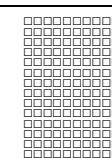
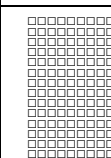
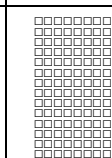
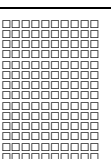
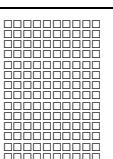
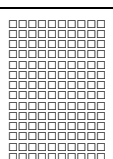
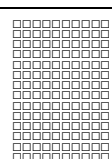
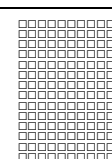
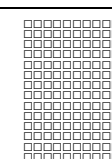
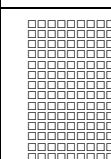
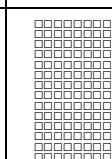
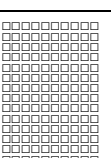
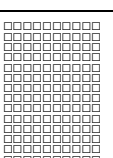
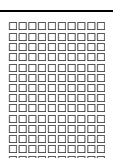
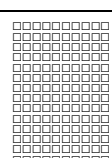
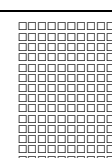
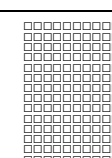
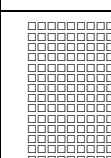
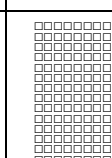
Customer _____ / /

CGROM Pattern Form for Large Characters mode (1/2 page)

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XXXX 0000								
XXXX 0001								
XXXX 0010								
XXXX 0011								
XXXX 0100								
XXXX 0101								
XXXX 0110								
XXXX 0111								

Customer _____ / /

CGROM Pattern Form for Large Characters mode (2/2 page)

	0000	0001	0010	0011	0100	0101	0110	0111
XXXX 1000								
XXXX 1001								
XXXX 1010								
XXXX 1011								
XXXX 1100								
XXXX 1101								
XXXX 1110								
XXXX 1111								

Customer _____ / /



CGROM Pattern (S00, 1 page)

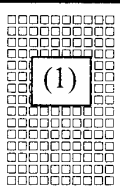
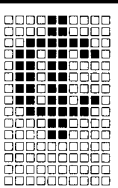
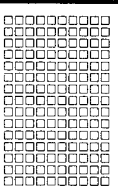
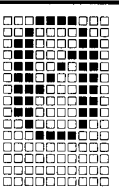
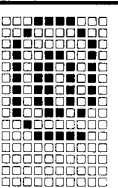
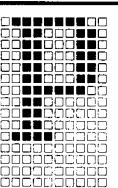
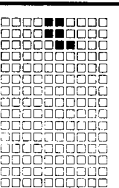
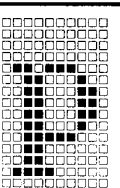
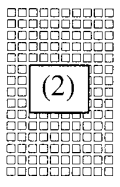
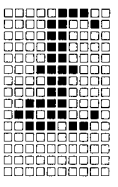
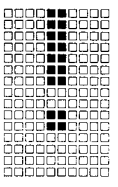
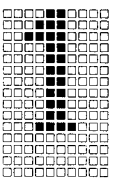
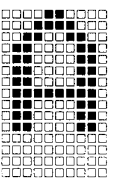
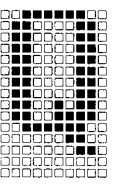
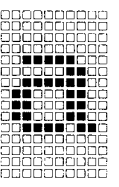
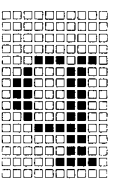
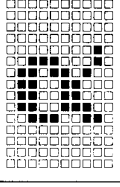
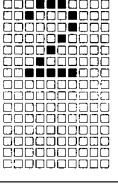
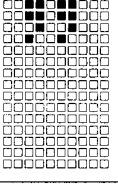
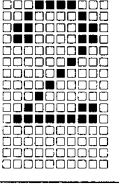
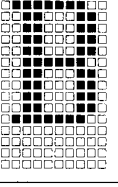
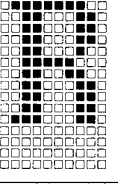
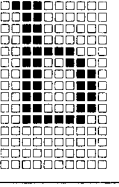
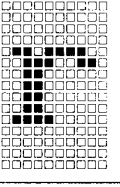
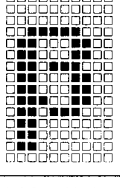
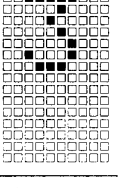
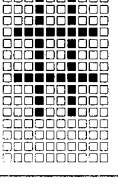
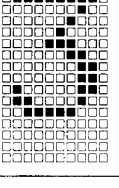
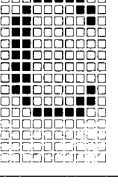
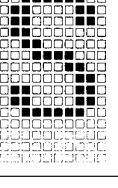
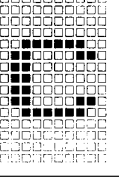
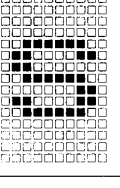
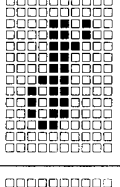
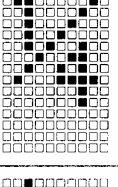
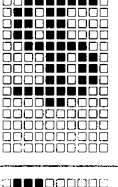
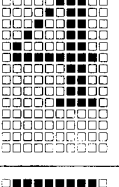
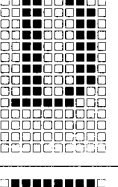
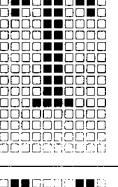
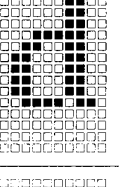
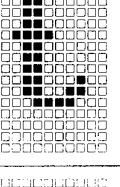
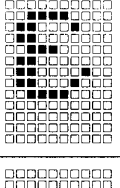
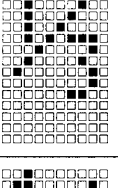
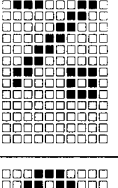
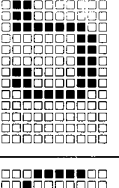
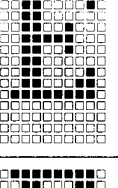
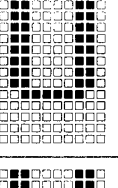
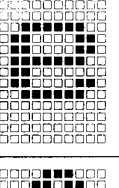
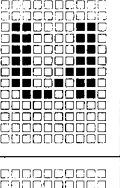
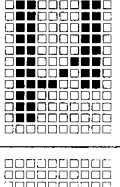
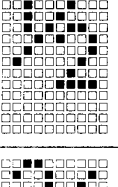
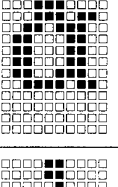
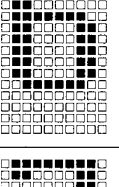
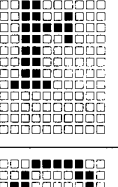
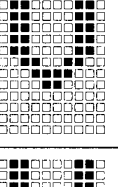
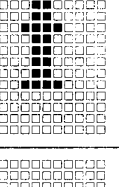
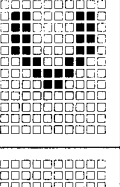
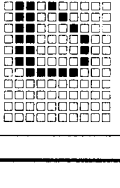
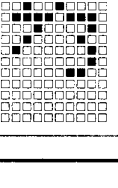
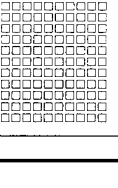
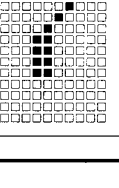
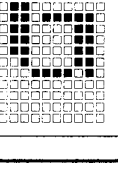
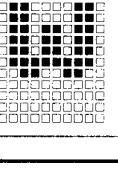
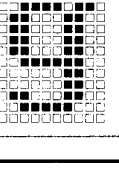
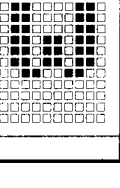
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xxxx 0001	(1)		!	1	Q	a	a				a	7	*	Q	a	q
xxxx 0010	(2)		"	2	B	R	b	r			"	4	W	X	R	B
xxxx 0011	(3)		#	3	C	S	c	s			,	Q	T	E	c	w
xxxx 0100	(4)		\$	4	D	T	d	t			.	T	k	t	P	d
xxxx 0101	(5)		%	5	E	U	e	u			*	*	*	1	c	U
xxxx 0110	(6)		&	6	F	V	f	v			7	Q	2	3	p	z
xxxx 0111	(7)		'	7	G	W	g	w			7	*	X	7	g	m
xxxx 1000	(0)		(	8	H	X	h	x			4	Q	*	U	r	X
xxxx 1001	(1)		)	9	I	Y	i	y			5	7	J	U	7	y
xxxx 1010	(2)		*	:	J	Z	j	z			=	Q	N	V	j	*
xxxx 1011	(3)		+	;	K	L	k	l			*	*	C	Q	*	*
xxxx 1100	(4)		,	<	L	*	l	l			p	Q	Q	Q	*	m
xxxx 1101	(5)		-	=	M	7	m	7			a	X	a	2	t	÷
xxxx 1110	(6)		.	>	N	^	n	^			a	B	h	^	n	
xxxx 1111	(7)		/	?	O	_	o	*			u	U	7	h	o	



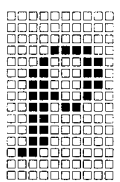
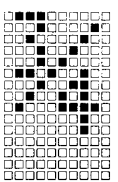
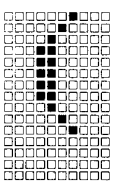
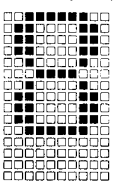
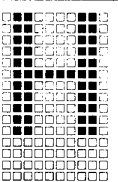
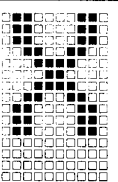
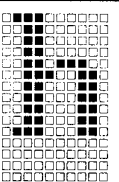
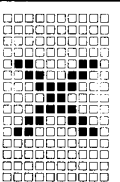
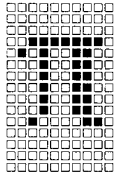
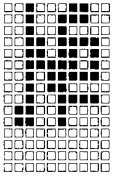
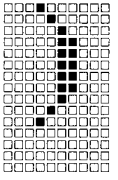
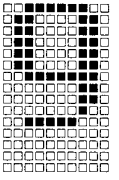
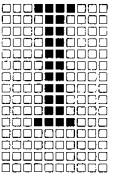
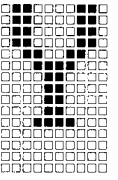
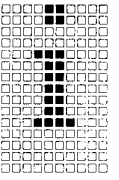
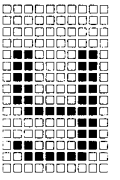
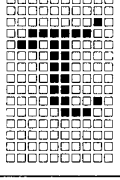
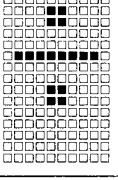
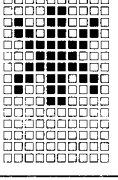
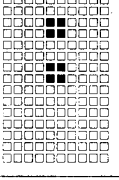
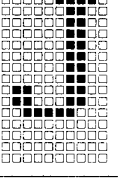
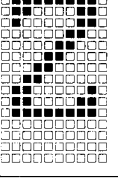
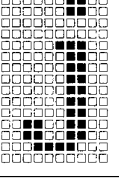
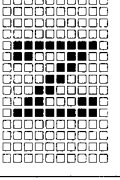
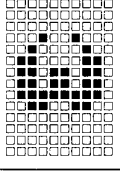
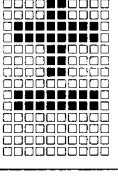
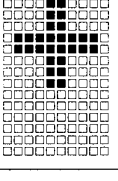
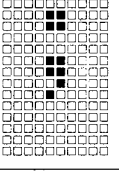
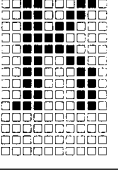
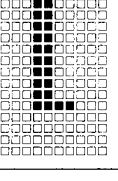
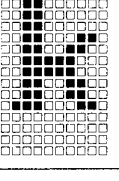
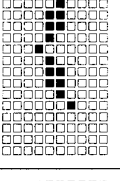
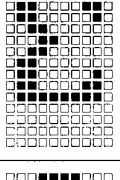
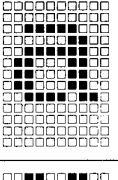
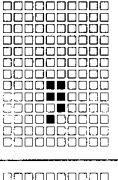
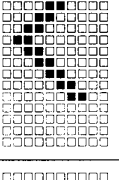
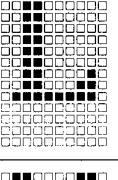
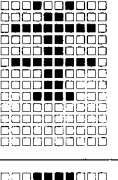
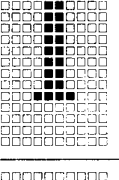
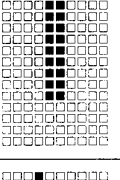
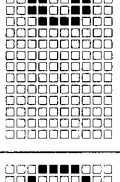
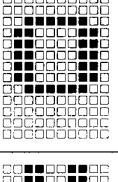
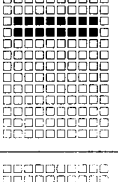
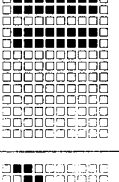
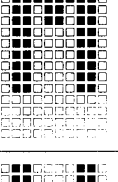
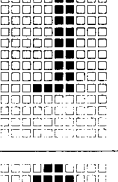
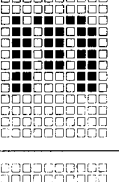
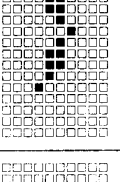
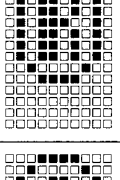
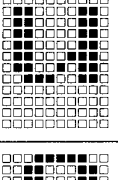
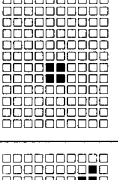
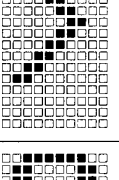
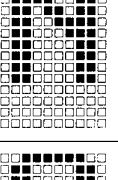
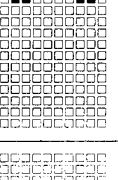
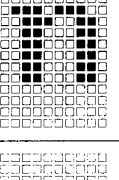
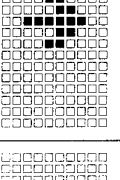
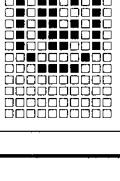
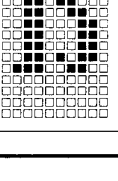
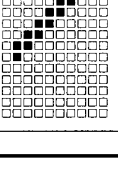
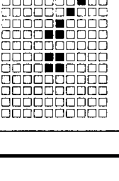
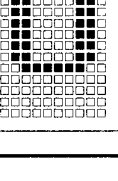
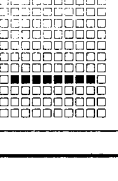
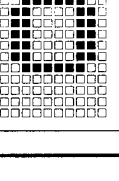
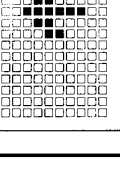
CGROM Pattern (S00, 2 page)

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xxxx 0001	(1)															
xxxx 0010	(2)															
xxxx 0011	(3)															
xxxx 0100	(4)															
xxxx 0101	(5)															
xxxx 0110	(6)															
xxxx 0111	(7)															
xxxx 1000	(0)															
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CGROM Pattern (L00)

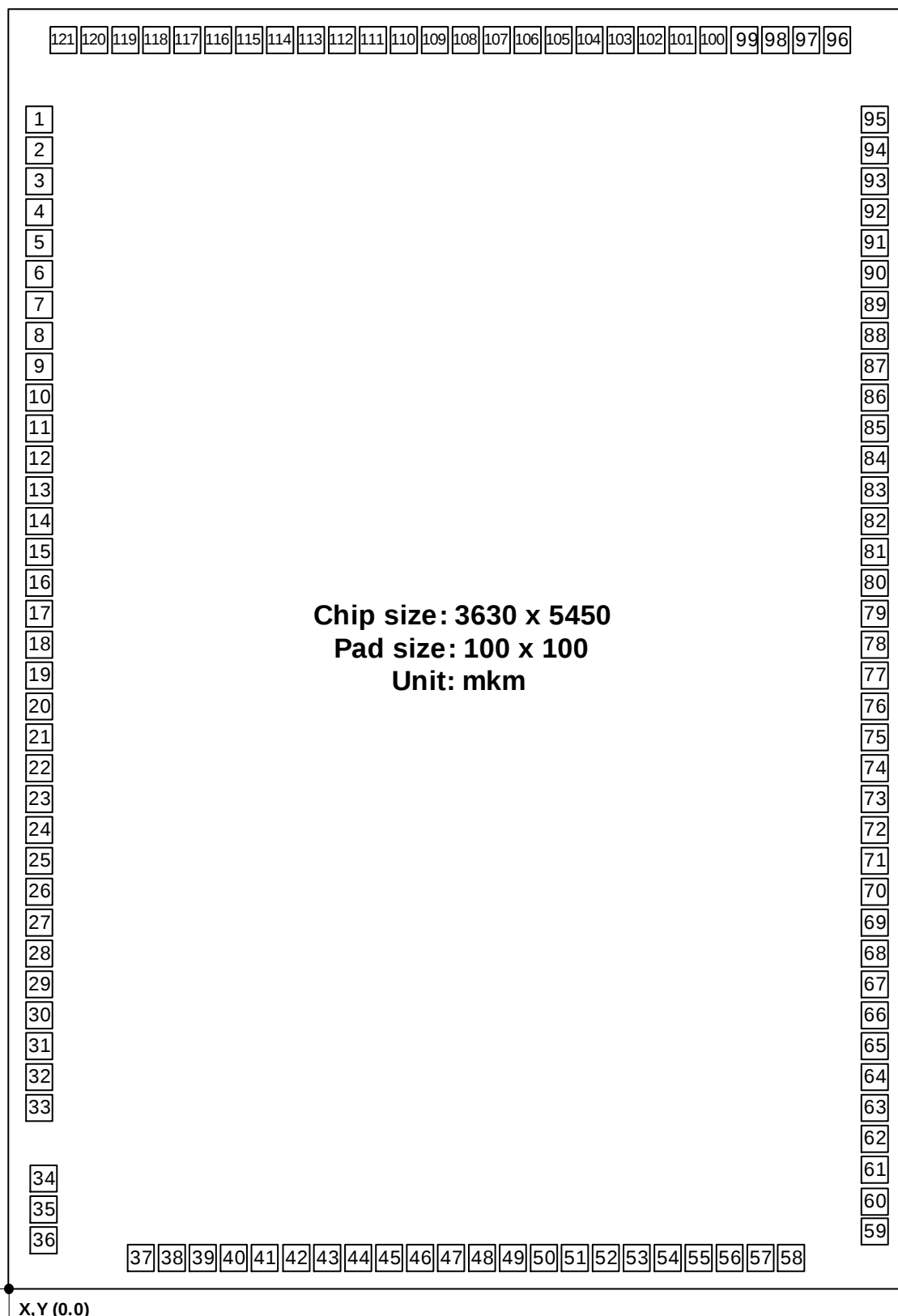
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xxxx 0001								
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xxxx 0101								
xxxx 0110								
xxxx 0111								

CGROM Pattern (L00, continue)

	1000	1001	1010	1011	1100	1101	1110	1111
xxxx 1000								
xxxx 1001								
xxxx 1010								
xxxx 1011								
xxxx 1100								
xxxx 1101								
xxxx 1110								
xxxx 1111								



PAD DIAGRAM



**PAD LOCATION**

Pad number	Pad name	X	Y	Pad number	Pad name	X	Y
1	SEG33	162.30	4772.30	62	COM4	3467.50	628.90
2	SEG32	162.30	4647.30	63	COM5	3467.50	753.90
3	SEG31	162.30	4522.30	64	COM6	3467.50	878.90
4	SEG30	162.30	4397.30	65	COM7	3467.50	1003.90
5	SEG29	162.30	4272.30	66	COM8	3467.50	1128.90
6	SEG28	162.30	4147.30	67	COM9	3467.50	1253.90
7	SEG27	162.30	4022.30	68	COM10	3467.50	1378.90
8	SEG26	162.30	3897.30	69	COM11	3467.50	1503.90
9	SEG25	162.30	3772.30	70	COM12	3467.50	1628.90
10	SEG24	162.30	3647.30	71	COM13	3467.50	1753.90
11	SEG23	162.30	3522.30	72	COM14	3467.50	1878.90
12	SEG22	162.30	3397.30	73	COM15	3467.50	2003.90
13	SEG21	162.30	3272.30	74	COM16	3467.50	2128.90
14	SEG20	162.30	3147.30	75	SEG80	3467.50	2268.70
15	SEG19	162.30	3022.30	76	SEG79	3467.50	2393.70
16	SEG18	162.30	2897.30	77	SEG78	3467.50	2518.70
17	SEG17	162.30	2772.30	78	SEG77	3467.50	2643.70
18	SEG16	162.30	2647.30	79	SEG76	3467.50	2768.70
19	SEG15	162.30	2522.30	80	SEG75	3467.50	2893.70
20	SEG14	162.30	2397.30	81	SEG74	3467.50	3018.70
21	SEG13	162.30	2272.30	82	SEG73	3467.50	3143.70
22	SEG12	162.30	2147.30	83	SEG72	3467.50	3268.70
23	SEG11	162.30	2022.30	84	SEG71	3467.50	3393.70
24	SEG10	162.30	1897.30	85	SEG70	3467.50	3518.70
25	SEG9	162.30	1772.30	86	SEG69	3467.50	3643.70
26	SEG8	162.30	1647.30	87	SEG68	3467.50	3768.70
27	SEG7	162.30	1522.30	88	SEG67	3467.50	3893.70
28	SEG6	162.30	1397.30	89	SEG66	3467.50	4018.70
29	SEG5	162.30	1272.30	90	SEG65	3467.50	4143.70
30	SEG4	162.30	1147.30	91	SEG64	3467.50	4268.70
31	SEG3	162.30	1022.30	92	SEG63	3467.50	4393.70
32	SEG2	162.30	897.30	93	SEG62	3467.50	4518.70
33	SEG1	162.30	772.30	94	SEG61	3467.50	4643.70
34	GND	179.90	469.10	95	SEG60	3467.50	4768.70
35	OSC2	179.90	344.10	96	SEG59	3377.40	5288.60
36	OSC1	179.90	219.10	97	SEG58	3252.40	5288.60
37	V1	439.50	197.50	98	SEG57	3127.40	5288.60
38	V2	564.50	197.50	99	SEG56	3002.40	5288.60
39	V3	689.50	197.50	100	SEG55	2877.40	5288.60
40	V4	814.50	197.50	101	SEG54	2752.40	5288.60
41	V5	939.50	197.50	102	SEG53	2627.40	5288.60
42	CLK1	1064.50	197.50	103	SEG52	2502.40	5288.60
43	CLK2	1189.50	197.50	104	SEG51	2377.40	5288.60
44	M	1314.50	197.50	105	SEG50	2252.40	5288.60
45	D	1439.50	197.50	106	SEG49	2127.40	5288.60
46	RS	1564.50	197.50	107	SEG48	2002.40	5288.60
47	RW	1689.50	197.50	107	SEG47	1877.40	5288.60
48	E	1814.50	197.50	109	SEG46	1752.40	5288.60
49	V _{DD}	1939.50	197.50	110	SEG45	1627.40	5288.60



Pad number	Pad name	X	Y	Pad number	Pad name	X	Y
50	DB0	2064.50	197.50	111	SEG44	1502.40	5288.60
51	DB1	2189.50	197.50	112	SEG43	1377.40	5288.60
52	DB2	2314.50	197.50	113	SEG42	1252.40	5288.60
53	DB3	2439.50	197.50	114	SEG41	1127.40	5288.60
54	DB4	2564.50	197.50	115	SEG40	1002.40	5288.60
55	DB5	2689.50	197.50	116	SEG39	877.40	5288.60
56	DB6	2814.50	197.50	117	SEG38	752.40	5288.60
57	DB7	2939.50	197.50	118	SEG37	627.40	5288.60
58	XMODE	3064.50	197.50	119	SEG36	502.40	5288.60
59	COM1	3467.50	253.90	120	SEG35	377.40	5288.60
60	COM2	3467.50	378.90	121	SEG34	252.40	5288.60
61	COM3	3467.50	503.90				