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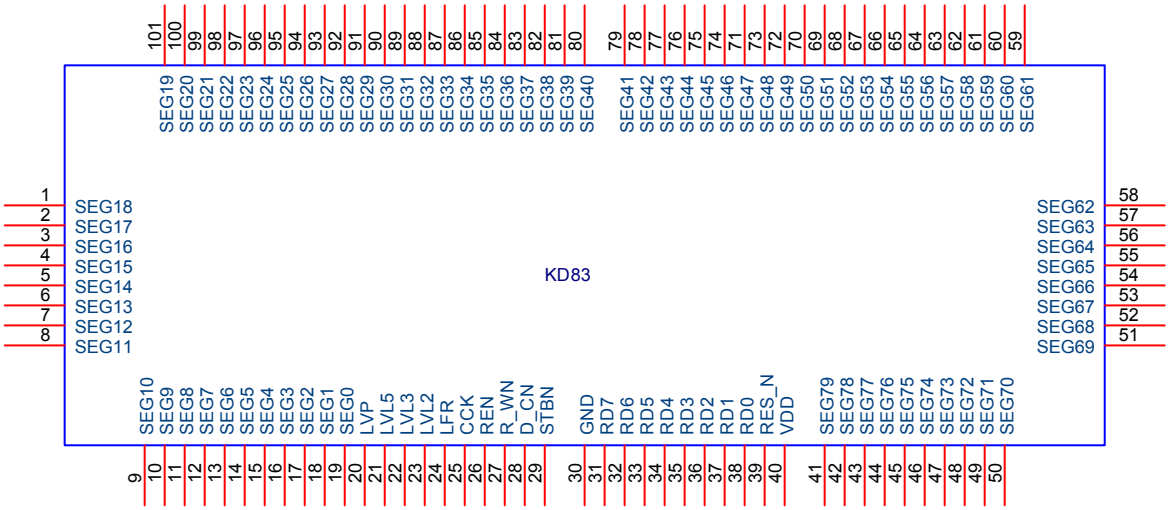
1. General Description

KD83 is a gray-scale LCD Segment Extender which, when used with KB's MCU with LCD Segment Extender interface, can expand the capacity of LCD driver. It is a 16 gray-scale, 4 gray-scale, and black and white LCD Segment Driver. This chip interfaces with KB's MCU with provisions of Segment Extender Interface LFR and CCK. KB's MCUs control KD83 through a command interface. The MCU can read/write display patterns to graphic mode display RAM by first setting up the target address, selecting the driver configuration, and then enabling the driver. KD83 can support five different LCD configurations: 16, 32, 48, 64 and 80 COM selectable by command register. The KD83 uses some of the memory as display RAM, while the memory not used for display can be access as general-purpose memory.

2. Features

- ✓ Graphic mode Gray-scale LCD Display 80 segment Extender.
- ✓ Command mode interface.
- ✓ Support 16 gray scale, 4 gray scale and Black/White LCD display.
- ✓ 5 LCD Configurations: 16, 32, 48, 64, or 80 COM LCD.
- ✓ Operating Range: 2.4V ~ 3.6V
- ✓ Dual Port display RAM: 5K Bytes
- ✓ Spare RAM for general purpose.

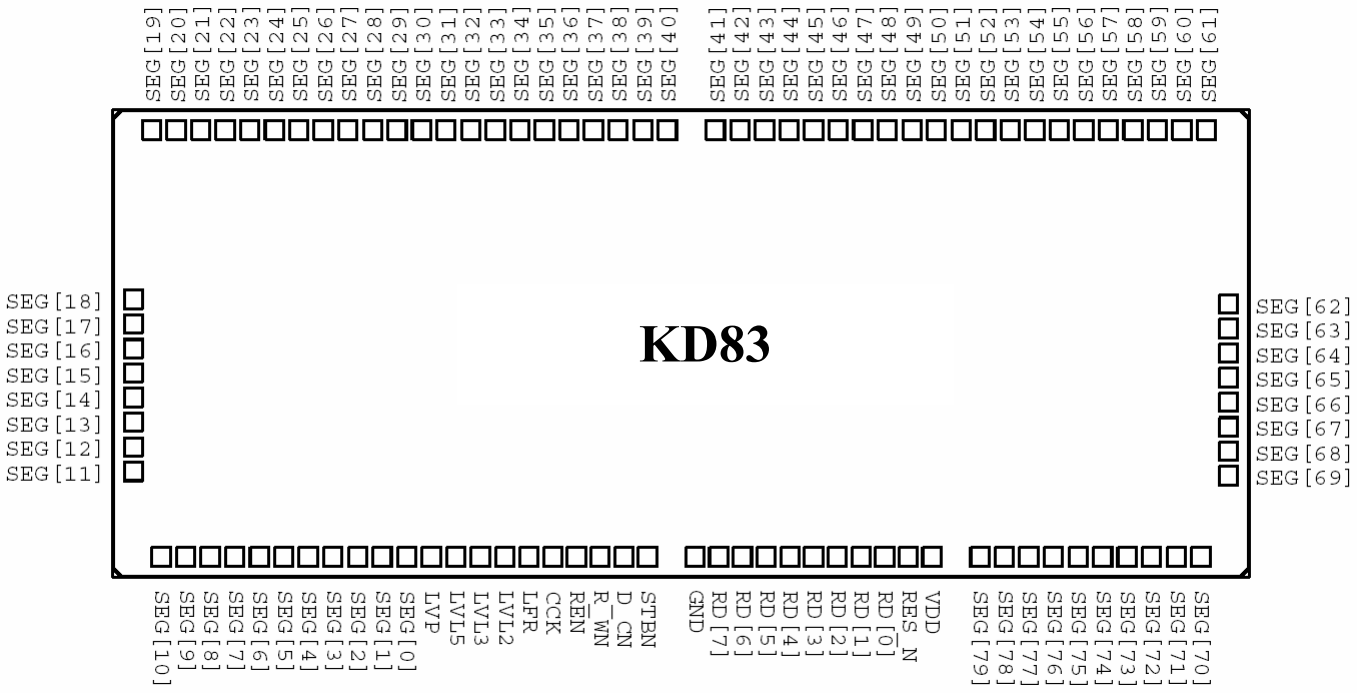
3. Pin Description



Pin Name	Pin #	I/O	Description
SEG[79..0]	41~101, 1~19	O	LCD Segment Outputs.
LVP	20	I	Charge Pump Output. These input pins must wire with master IC respectively. That means LVP with LVP, LVL5 with LVL5, …, LDL with LDL. Please refer to application circuit.
LVL5	21	I	LCD Bias Voltage 5
LVL3	22	I	LCD Bias Voltage 3
LVL2	23	I	LCD Bias Voltage 2
LFR	24	I	LCD frame.

CCK	25	I	LCD data load
REN	26	I	Low active Enable control for data or command register read/write.
R_WN	27	I	Read(1)/write(0) mode selection.
D_CN	28	I	Data(1)/Command(0) mode selection.
STBN	29	I	Active Low R/W strobe for data or command.
GND	30	P	Power Ground Input.
RD[7:0]	31~38	B	8-bit bi-directional Command/Data bus with CMOS input structure.
RES_N	39	I	Active low Reset input.
VDD	40	P	Positive power supply input. 0.1 µF by-pass capacitor should be added between VDD and GND and placed close to the chip is necessary.

4. Pad Diagram



5. Pad Coordination

No.	Pad Name	X-Coord.	Y-Coord.	No.	Pad Name	X-Coord.	Y-Coord.
1	SEG[18]	-2643	150.65	52	SEG[68]	2483.45	-560.05
2	SEG[17]	-2643	35.65	53	SEG[67]	2483.45	-445.05
3	SEG[16]	-2643	-79.35	54	SEG[66]	2483.45	-330.05
4	SEG[15]	-2643	-194.35	55	SEG[65]	2483.45	-215.05
5	SEG[14]	-2643	-309.35	56	SEG[64]	2483.45	-100.05
6	SEG[13]	-2643	-424.35	57	SEG[63]	2483.45	14.95
7	SEG[12]	-2643	-539.35	58	SEG[62]	2483.45	129.95
8	SEG[11]	-2643	-654.35	59	SEG[61]	2381.3	942.1
9	SEG[10]	-2514.7	-1053.7	60	SEG[60]	2266.3	942.1
10	SEG[9]	-2399.7	-1053.7	61	SEG[59]	2151.3	942.1
11	SEG[8]	-2284.7	-1053.7	62	SEG[58]	2036.3	942.1
12	SEG[7]	-2169.7	-1053.7	63	SEG[57]	1921.3	942.1
13	SEG[6]	-2054.7	-1053.7	64	SEG[56]	1806.3	942.1

No.	Pad Name	X-Coord.	Y-Coord.	No.	Pad Name	X-Coord.	Y-Coord.
14	SEG[5]	-1939.7	-1053.7	65	SEG[55]	1691.3	942.1
15	SEG[4]	-1824.7	-1053.7	66	SEG[54]	1576.3	942.1
16	SEG[3]	-1709.7	-1053.7	67	SEG[53]	1461.3	942.1
17	SEG[2]	-1594.7	-1053.7	68	SEG[52]	1346.3	942.1
18	SEG[1]	-1479.7	-1053.7	69	SEG[51]	1231.3	942.1
19	SEG[0]	-1364.7	-1053.7	70	SEG[50]	1116.3	942.1
20	LVP	-1249.7	-1053.7	71	SEG[49]	1001.3	942.1
21	LVL5	-1134.7	-1053.7	72	SEG[48]	886.3	942.1
22	LVL3	-1019.7	-1053.7	73	SEG[47]	771.3	942.1
23	LVL2	-904.7	-1053.7	74	SEG[46]	656.3	942.1
24	LFR	-791.7	-1053.7	75	SEG[45]	541.3	942.1
25	CCK	-680.7	-1053.7	76	SEG[44]	426.3	942.1
26	REN	-569.7	-1053.7	77	SEG[43]	311.3	942.1
27	R_WN	-458.7	-1053.7	78	SEG[42]	196.3	942.1
28	D_CN	-347.7	-1053.7	79	SEG[41]	81.3	942.1
29	STBN	-236.7	-1053.7	80	SEG[40]	-144.7	942.1
30	GND	-14.7	-1053.7	81	SEG[39]	-259.7	942.1
31	RD[7]	96.3	-1053.7	82	SEG[38]	-374.7	942.1
32	RD[6]	207.3	-1053.7	83	SEG[37]	-489.7	942.1
33	RD[5]	318.3	-1053.7	84	SEG[36]	-604.7	942.1
34	RD[4]	429.3	-1053.7	85	SEG[35]	-719.7	942.1
35	RD[3]	540.3	-1053.7	86	SEG[34]	-834.7	942.1
36	RD[2]	651.3	-1053.7	87	SEG[33]	-949.7	942.1
37	RD[1]	762.3	-1053.7	88	SEG[32]	-1064.7	942.1
38	RD[0]	873.3	-1053.7	89	SEG[31]	-1179.7	942.1
39	RES_N	984.3	-1053.7	90	SEG[30]	-1294.7	942.1
40	VDD	1095.3	-1053.7	91	SEG[29]	-1409.7	942.1
41	SEG[79]	1319.3	-1053.7	92	SEG[28]	-1524.7	942.1
42	SEG[78]	1434.3	-1053.7	93	SEG[27]	-1639.7	942.1
43	SEG[77]	1549.3	-1053.7	94	SEG[26]	-1754.7	942.1
44	SEG[76]	1664.3	-1053.7	95	SEG[25]	-1869.7	942.1
45	SEG[75]	1779.3	-1053.7	96	SEG[24]	-1984.7	942.1
46	SEG[74]	1894.3	-1053.7	97	SEG[23]	-2099.7	942.1
47	SEG[73]	2009.3	-1053.7	98	SEG[22]	-2214.7	942.1
48	SEG[72]	2124.3	-1053.7	99	SEG[21]	-2329.7	942.1
49	SEG[71]	2239.3	-1053.7	100	SEG[20]	-2444.7	942.1
50	SEG[70]	2354.3	-1053.7	101	SEG[19]	-2559.7	942.1
51	SEG[69]	2483.45	-675.05				

6. LCD Display RAM Map

The gray-scale LCD driver can be configured to be a 16 gray-scales, 4 gray-scales or black and white display by programming GRAY_MODE field of command register. For 4 gray-scale displays, 2-bit of RAM is required for each pixel and 4 bit for 16 gray-scale display, 1-bit for black and white display. For different LCD configuration, the LCD display RAM is arranged differently. The following figure shows

one byte of RAM in different LCD configurations:

0F	0E	0D	0C	0B	0A	09	08	07	06	05	04	03	02	01	00
xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Black/White	SEG7	SEG6	SEG5	SEG4	SEG3	SEG2	SEG1	SEG0
4 Gray scales	SEG3		SEG2		SEG1		SEG0	
16 Gray scales	SEG1				SEG0			

The 16 Gray Scale register GRAY0 ~ GRAYF is the mapping register between the levels selected in RAM and the real gray scale. In other words, if the content of GRAY0 is 0x03, when value of a certain pixel is 0, the displayed effect will correspond to actual gray level 3. The 16 gray scale display use all 16 registers GRAY0 ~ GRAYF to select among 32 available gray levels to correspond to level 0 ~ 15, while 4 gray scale display utilizes registers GRAY0 ~ GRAY3 to select among 32 gray levels to correspond to level 0 ~ 3. Thus user can pick the gray levels which give the best and most linear effect.

6.1. 16 Gray Scale LCD Display RAM Map

16 Gray Levels LCD Display RAM MAP						
Page		**F C**	**B 8**	**7 4**	**3 0**	**COM No.**
0	00	S31~S24	S23~S16	S15~S08	S07~S00	COM0
	10	S63~S56	S55~S48	S47~S40	S39~S32	
	20	*	*	S79~S72	S71~S64	
	30	*	*	*	*	
	40	S31~S24	S23~S16	S15~S08	S07~S00	COM1
	50	S63~S56	S55~S48	S47~S40	S39~S32	
	60	*	*	S79~S72	S71~S64	
	70	*	*	*	*	
	80	S31~S24	S23~S16	S15~S08	S07~S00	COM2
	90	S63~S56	S55~S48	S47~S40	S39~S32	
	A0	*	*	S79~S72	S71~S64	
	B0	*	*	*	*	
	C0	S31~S24	S23~S16	S15~S08	S07~S00	COM3
	D0	S63~S56	S55~S48	S47~S40	S39~S32	
	E0	*	*	S79~S72	S71~S64	
	F0	*	*	*	*	
1	00	S31~S24	S23~S16	S15~S08	S07~S00	COM4
	10	S63~S56	S55~S48	S47~S40	S39~S32	
	20	*	*	S79~S72	S71~S64	
	30	*	*	*	*	
	40	S31~S24	S23~S16	S15~S08	S07~S00	COM5
	50	S63~S56	S55~S48	S47~S40	S39~S32	
	60	*	*	S79~S72	S71~S64	
	70	*	*	*	*	

16 Gray Levels LCD Display RAM MAP						
Page		**F C**	**B 8**	**7 4**	**3 0**	**COM No.**
	80	S31~S24	S23~S16	S15~S08	S07~S00	COM6
	90	S63~S56	S55~S48	S47~S40	S39~S32	
	A0	*	*	S79~S72	S71~S64	
	B0	*	*	*	*	
	C0	S31~S24	S23~S16	S15~S08	S07~S00	COM7
	D0	S63~S56	S55~S48	S47~S40	S39~S32	
	E0	*	*	S79~S72	S71~S64	
	F0	*	*	*	*	
2	00	S31~S24	S23~S16	S15~S08	S07~S00	COM8
	10	S63~S56	S55~S48	S47~S40	S39~S32	
	20	*	*	S79~S72	S71~S64	
	30	*	*	*	*	
	40	S31~S24	S23~S16	S15~S08	S07~S00	COM9
	50	S63~S56	S55~S48	S47~S40	S39~S32	
	60	*	*	S79~S72	S71~S64	
	70	*	*	*	*	
	80	S31~S24	S23~S16	S15~S08	S07~S00	COM10
	90	S63~S56	S55~S48	S47~S40	S39~S32	
	A0	*	*	S79~S72	S71~S64	
	B0	*	*	*	*	
	C0	S31~S24	S23~S16	S15~S08	S07~S00	COM11
	D0	S63~S56	S55~S48	S47~S40	S39~S32	
	E0	*	*	S79~S72	S71~S64	
	F0	*	*	*	*	
3	00	S31~S24	S23~S16	S15~S08	S07~S00	COM12
	10	S63~S56	S55~S48	S47~S40	S39~S32	
	20	*	*	S79~S72	S71~S64	
	30	*	*	*	*	
	40	S31~S24	S23~S16	S15~S08	S07~S00	COM13
	50	S63~S56	S55~S48	S47~S40	S39~S32	
	60	*	*	S79~S72	S71~S64	
	70	*	*	*	*	
	80	S31~S24	S23~S16	S15~S08	S07~S00	COM14
	90	S63~S56	S55~S48	S47~S40	S39~S32	
	A0	*	*	S79~S72	S71~S64	
	B0	*	*	*	*	
	C0	S31~S24	S23~S16	S15~S08	S07~S00	COM15
	D0	S63~S56	S55~S48	S47~S40	S39~S32	
	E0	*	*	S79~S72	S71~S64	
	F0	*	*	*	*	
4	00	S31~S24	S23~S16	S15~S08	S07~S00	COM16
	10	S63~S56	S55~S48	S47~S40	S39~S32	
	20	*	*	S79~S72	S71~S64	
	30	*	*	*	*	
	40	S31~S24	S23~S16	S15~S08	S07~S00	COM17
	50	S63~S56	S55~S48	S47~S40	S39~S32	
	60	*	*	S79~S72	S71~S64	

16 Gray Levels LCD Display RAM MAP						
Page		**F C**	**B 8**	**7 4**	**3 0**	**COM No.**
	70	*	*	*	*	
	80	S31~S24	S23~S16	S15~S08	S07~S00	COM18
	90	S63~S56	S55~S48	S47~S40	S39~S32	
	A0	*	*	S79~S72	S71~S64	
	B0	*	*	*	*	
	C0	S31~S24	S23~S16	S15~S08	S07~S00	COM19
	D0	S63~S56	S55~S48	S47~S40	S39~S32	
	E0	*	*	S79~S72	S71~S64	
	F0	*	*	*	*	
5	00	S31~S24	S23~S16	S15~S08	S07~S00	COM20
	10	S63~S56	S55~S48	S47~S40	S39~S32	
	20	*	*	S79~S72	S71~S64	
	30	*	*	*	*	
	40	S31~S24	S23~S16	S15~S08	S07~S00	COM21
	50	S63~S56	S55~S48	S47~S40	S39~S32	
	60	*	*	S79~S72	S71~S64	
	70	*	*	*	*	
	80	S31~S24	S23~S16	S15~S08	S07~S00	COM22
	90	S63~S56	S55~S48	S47~S40	S39~S32	
	A0	*	*	S79~S72	S71~S64	
	B0	*	*	*	*	
	C0	S31~S24	S23~S16	S15~S08	S07~S00	COM23
	D0	S63~S56	S55~S48	S47~S40	S39~S32	
	E0	*	*	S79~S72	S71~S64	
	F0	*	*	*	*	
6	00	S31~S24	S23~S16	S15~S08	S07~S00	COM24
	10	S63~S56	S55~S48	S47~S40	S39~S32	
	20	*	*	S79~S72	S71~S64	
	30	*	*	*	*	
	40	S31~S24	S23~S16	S15~S08	S07~S00	COM25
	50	S63~S56	S55~S48	S47~S40	S39~S32	
	60	*	*	S79~S72	S71~S64	
	70	*	*	*	*	
	80	S31~S24	S23~S16	S15~S08	S07~S00	COM26
	90	S63~S56	S55~S48	S47~S40	S39~S32	
	A0	*	*	S79~S72	S71~S64	
	B0	*	*	*	*	
	C0	S31~S24	S23~S16	S15~S08	S07~S00	COM27
	D0	S63~S56	S55~S48	S47~S40	S39~S32	
	E0	*	*	S79~S72	S71~S64	
	F0	*	*	*	*	
7	00	S31~S24	S23~S16	S15~S08	S07~S00	COM28
	10	S63~S56	S55~S48	S47~S40	S39~S32	
	20	*	*	S79~S72	S71~S64	
	30	*	*	*	*	
	40	S31~S24	S23~S16	S15~S08	S07~S00	COM29
	50	S63~S56	S55~S48	S47~S40	S39~S32	

16 Gray Levels LCD Display RAM MAP						
Page		**F C**	**B 8**	**7 4**	**3 0**	**COM No.**
	60	*	*	S79~S72	S71~S64	
	70	*	*	*	*	
	80	S31~S24	S23~S16	S15~S08	S07~S00	
	90	S63~S56	S55~S48	S47~S40	S39~S32	COM30
	A0	*	*	S79~S72	S71~S64	
	B0	*	*	*	*	
	C0	S31~S24	S23~S16	S15~S08	S07~S00	
	D0	S63~S56	S55~S48	S47~S40	S39~S32	COM31
	E0	*	*	S79~S72	S71~S64	
	F0	*	*	*	*	
8	00	S31~S24	S23~S16	S15~S08	S07~S00	
	10	S63~S56	S55~S48	S47~S40	S39~S32	COM32
	20	*	*	S79~S72	S71~S64	
	30	*	*	*	*	
	40	S31~S24	S23~S16	S15~S08	S07~S00	
	50	S63~S56	S55~S48	S47~S40	S39~S32	COM33
	60	*	*	S79~S72	S71~S64	
	70	*	*	*	*	
	80	S31~S24	S23~S16	S15~S08	S07~S00	
	90	S63~S56	S55~S48	S47~S40	S39~S32	COM34
	A0	*	*	S79~S72	S71~S64	
	B0	*	*	*	*	
	C0	S31~S24	S23~S16	S15~S08	S07~S00	
	D0	S63~S56	S55~S48	S47~S40	S39~S32	COM35
	E0	*	*	S79~S72	S71~S64	
	F0	*	*	*	*	
9	00	S31~S24	S23~S16	S15~S08	S07~S00	
	10	S63~S56	S55~S48	S47~S40	S39~S32	COM36
	20	*	*	S79~S72	S71~S64	
	30	*	*	*	*	
	40	S31~S24	S23~S16	S15~S08	S07~S00	
	50	S63~S56	S55~S48	S47~S40	S39~S32	COM37
	60	*	*	S79~S72	S71~S64	
	70	*	*	*	*	
	80	S31~S24	S23~S16	S15~S08	S07~S00	
	90	S63~S56	S55~S48	S47~S40	S39~S32	COM38
	A0	*	*	S79~S72	S71~S64	
	B0	*	*	*	*	
	C0	S31~S24	S23~S16	S15~S08	S07~S00	
	D0	S63~S56	S55~S48	S47~S40	S39~S32	COM39
	E0	*	*	S79~S72	S71~S64	
	F0	*	*	*	*	
A	00	S31~S24	S23~S16	S15~S08	S07~S00	
	10	S63~S56	S55~S48	S47~S40	S39~S32	COM40
	20	*	*	S79~S72	S71~S64	
	30	*	*	*	*	
	40	S31~S24	S23~S16	S15~S08	S07~S00	COM41

16 Gray Levels LCD Display RAM MAP						
Page		**F C**	**B 8**	**7 4**	**3 0**	**COM No.**
	50	S63~S56	S55~S48	S47~S40	S39~S32	
	60	*	*	S79~S72	S71~S64	
	70	*	*	*	*	
	80	S31~S24	S23~S16	S15~S08	S07~S00	
	90	S63~S56	S55~S48	S47~S40	S39~S32	COM42
	A0	*	*	S79~S72	S71~S64	
	B0	*	*	*	*	
	C0	S31~S24	S23~S16	S15~S08	S07~S00	
	D0	S63~S56	S55~S48	S47~S40	S39~S32	COM43
	E0	*	*	S79~S72	S71~S64	
	F0	*	*	*	*	
B	00	S31~S24	S23~S16	S15~S08	S07~S00	
	10	S63~S56	S55~S48	S47~S40	S39~S32	COM44
	20	*	*	S79~S72	S71~S64	
	30	*	*	*	*	
	40	S31~S24	S23~S16	S15~S08	S07~S00	
	50	S63~S56	S55~S48	S47~S40	S39~S32	COM45
	60	*	*	S79~S72	S71~S64	
	70	*	*	*	*	
	80	S31~S24	S23~S16	S15~S08	S07~S00	
	90	S63~S56	S55~S48	S47~S40	S39~S32	COM46
	A0	*	*	S79~S72	S71~S64	
	B0	*	*	*	*	
	C0	S31~S24	S23~S16	S15~S08	S07~S00	
	D0	S63~S56	S55~S48	S47~S40	S39~S32	COM47
	E0	*	*	S79~S72	S71~S64	
	F0	*	*	*	*	
C	00	S31~S24	S23~S16	S15~S08	S07~S00	
	10	S63~S56	S55~S48	S47~S40	S39~S32	COM48
	20	*	*	S79~S72	S71~S64	
	30	*	*	*	*	
	40	S31~S24	S23~S16	S15~S08	S07~S00	
	50	S63~S56	S55~S48	S47~S40	S39~S32	COM49
	60	*	*	S79~S72	S71~S64	
	70	*	*	*	*	
	80	S31~S24	S23~S16	S15~S08	S07~S00	
	90	S63~S56	S55~S48	S47~S40	S39~S32	COM50
	A0	*	*	S79~S72	S71~S64	
	B0	*	*	*	*	
	C0	S31~S24	S23~S16	S15~S08	S07~S00	
	D0	S63~S56	S55~S48	S47~S40	S39~S32	COM51
	E0	*	*	S79~S72	S71~S64	
	F0	*	*	*	*	
D	00	S31~S24	S23~S16	S15~S08	S07~S00	
	10	S63~S56	S55~S48	S47~S40	S39~S32	COM52
	20	*	*	S79~S72	S71~S64	
	30	*	*	*	*	

16 Gray Levels LCD Display RAM MAP						
Page		**F C**	**B 8**	**7 4**	**3 0**	**COM No.**
	40	S31~S24	S23~S16	S15~S08	S07~S00	COM53
	50	S63~S56	S55~S48	S47~S40	S39~S32	
	60	*	*	S79~S72	S71~S64	
	70	*	*	*	*	
	80	S31~S24	S23~S16	S15~S08	S07~S00	COM54
	90	S63~S56	S55~S48	S47~S40	S39~S32	
	A0	*	*	S79~S72	S71~S64	
	B0	*	*	*	*	
	C0	S31~S24	S23~S16	S15~S08	S07~S00	COM55
	D0	S63~S56	S55~S48	S47~S40	S39~S32	
	E0	*	*	S79~S72	S71~S64	
	F0	*	*	*	*	
E	00	S31~S24	S23~S16	S15~S08	S07~S00	COM56
	10	S63~S56	S55~S48	S47~S40	S39~S32	
	20	*	*	S79~S72	S71~S64	
	30	*	*	*	*	
	40	S31~S24	S23~S16	S15~S08	S07~S00	COM57
	50	S63~S56	S55~S48	S47~S40	S39~S32	
	60	*	*	S79~S72	S71~S64	
	70	*	*	*	*	
	80	S31~S24	S23~S16	S15~S08	S07~S00	COM58
	90	S63~S56	S55~S48	S47~S40	S39~S32	
	A0	*	*	S79~S72	S71~S64	
	B0	*	*	*	*	
	C0	S31~S24	S23~S16	S15~S08	S07~S00	COM59
	D0	S63~S56	S55~S48	S47~S40	S39~S32	
	E0	*	*	S79~S72	S71~S64	
	F0	*	*	*	*	
F	00	S31~S24	S23~S16	S15~S08	S07~S00	COM60
	10	S63~S56	S55~S48	S47~S40	S39~S32	
	20	*	*	S79~S72	S71~S64	
	30	*	*	*	*	
	40	S31~S24	S23~S16	S15~S08	S07~S00	COM61
	50	S63~S56	S55~S48	S47~S40	S39~S32	
	60	*	*	S79~S72	S71~S64	
	70	*	*	*	*	
	80	S31~S24	S23~S16	S15~S08	S07~S00	COM62
	90	S63~S56	S55~S48	S47~S40	S39~S32	
	A0	*	*	S79~S72	S71~S64	
	B0	*	*	*	*	
	C0	S31~S24	S23~S16	S15~S08	S07~S00	COM63
	D0	S63~S56	S55~S48	S47~S40	S39~S32	
	E0	*	*	S79~S72	S71~S64	
	F0	*	*	*	*	
10	00	S31~S24	S23~S16	S15~S08	S07~S00	COM64
	10	S63~S56	S55~S48	S47~S40	S39~S32	
	20	*	*	S79~S72	S71~S64	

16 Gray Levels LCD Display RAM MAP						
Page		**F C**	**B 8**	**7 4**	**3 0**	**COM No.**
	30	*	*	*	*	
	40	S31~S24	S23~S16	S15~S08	S07~S00	COM65
	50	S63~S56	S55~S48	S47~S40	S39~S32	
	60	*	*	S79~S72	S71~S64	
	70	*	*	*	*	
	80	S31~S24	S23~S16	S15~S08	S07~S00	COM66
	90	S63~S56	S55~S48	S47~S40	S39~S32	
	A0	*	*	S79~S72	S71~S64	
	B0	*	*	*	*	
	C0	S31~S24	S23~S16	S15~S08	S07~S00	COM67
	D0	S63~S56	S55~S48	S47~S40	S39~S32	
	E0	*	*	S79~S72	S71~S64	
	F0	*	*	*	*	
11	00	S31~S24	S23~S16	S15~S08	S07~S00	COM68
	10	S63~S56	S55~S48	S47~S40	S39~S32	
	20	*	*	S79~S72	S71~S64	
	30	*	*	*	*	
	40	S31~S24	S23~S16	S15~S08	S07~S00	COM69
	50	S63~S56	S55~S48	S47~S40	S39~S32	
	60	*	*	S79~S72	S71~S64	
	70	*	*	*	*	
	80	S31~S24	S23~S16	S15~S08	S07~S00	COM70
	90	S63~S56	S55~S48	S47~S40	S39~S32	
	A0	*	*	S79~S72	S71~S64	
	B0	*	*	*	*	
	C0	S31~S24	S23~S16	S15~S08	S07~S00	COM71
	D0	S63~S56	S55~S48	S47~S40	S39~S32	
	E0	*	*	S79~S72	S71~S64	
	F0	*	*	*	*	
12	00	S31~S24	S23~S16	S15~S08	S07~S00	COM72
	10	S63~S56	S55~S48	S47~S40	S39~S32	
	20	*	*	S79~S72	S71~S64	
	30	*	*	*	*	
	40	S31~S24	S23~S16	S15~S08	S07~S00	COM73
	50	S63~S56	S55~S48	S47~S40	S39~S32	
	60	*	*	S79~S72	S71~S64	
	70	*	*	*	*	
	80	S31~S24	S23~S16	S15~S08	S07~S00	COM74
	90	S63~S56	S55~S48	S47~S40	S39~S32	
	A0	*	*	S79~S72	S71~S64	
	B0	*	*	*	*	
	C0	S31~S24	S23~S16	S15~S08	S07~S00	COM75
	D0	S63~S56	S55~S48	S47~S40	S39~S32	
	E0	*	*	S79~S72	S71~S64	
	F0	*	*	*	*	
13	00	S31~S24	S23~S16	S15~S08	S07~S00	COM76
	10	S63~S56	S55~S48	S47~S40	S39~S32	

16 Gray Levels LCD Display RAM MAP						
Page		**F C**	**B 8**	**7 4**	**3 0**	**COM No.**
	20	*	*	S79~S72	S71~S64	
	30	*	*	*	*	
	40	S31~S24	S23~S16	S15~S08	S07~S00	
	50	S63~S56	S55~S48	S47~S40	S39~S32	COM77
	60	*	*	S79~S72	S71~S64	
	70	*	*	*	*	
	80	S31~S24	S23~S16	S15~S08	S07~S00	
	90	S63~S56	S55~S48	S47~S40	S39~S32	COM78
	A0	*	*	S79~S72	S71~S64	
	B0	*	*	*	*	
	C0	S31~S24	S23~S16	S15~S08	S07~S00	
	D0	S63~S56	S55~S48	S47~S40	S39~S32	COM79
	E0	*	*	S79~S72	S71~S64	
	F0	*	*	*	*	

6.2. 4 Gray Scale LCD Display RAM Map

4 Gray Levels LCD Display RAM MAP						
Page		**F C**	**B 8**	**7 4**	**3 0**	**COM No.**
0	00	S63~S48	S47~S32	S32~S16	S15~S00	COM0
	10	*	*	*	S79~S64	
	20	S63~S48	S47~S32	S32~S16	S15~S00	COM1
	30	*	*	*	S79~S64	
	40	S63~S48	S47~S32	S32~S16	S15~S00	COM2
	50	*	*	*	S79~S64	
	60	S63~S48	S47~S32	S32~S16	S15~S00	COM3
	70	*	*	*	S79~S64	
	80	S63~S48	S47~S32	S32~S16	S15~S00	COM4
	90	*	*	*	S79~S64	
	A0	S63~S48	S47~S32	S32~S16	S15~S00	COM5
	B0	*	*	*	S79~S64	
	C0	S63~S48	S47~S32	S32~S16	S15~S00	COM6
	D0	*	*	*	S79~S64	
	E0	S63~S48	S47~S32	S32~S16	S15~S00	COM7
	F0	*	*	*	S79~S64	
1	00	S63~S48	S47~S32	S32~S16	S15~S00	COM8
	10	*	*	*	S79~S64	
	20	S63~S48	S47~S32	S32~S16	S15~S00	COM9
	30	*	*	*	S79~S64	
	40	S63~S48	S47~S32	S32~S16	S15~S00	COM10
	50	*	*	*	S79~S64	
	60	S63~S48	S47~S32	S32~S16	S15~S00	COM11
	70	*	*	*	S79~S64	

4 Gray Levels LCD Display RAM MAP						
Page		**F C**	**B 8**	**7 4**	**3 0**	**COM No.**
	80	S63~S48	S47~S32	S32~S16	S15~S00	COM12
	90	*	*	*	S79~S64	
	A0	S63~S48	S47~S32	S32~S16	S15~S00	COM13
	B0	*	*	*	S79~S64	
	C0	S63~S48	S47~S32	S32~S16	S15~S00	COM14
	D0	*	*	*	S79~S64	
	E0	S63~S48	S47~S32	S32~S16	S15~S00	COM15
	F0	*	*	*	S79~S64	
2	00	S63~S48	S47~S32	S32~S16	S15~S00	COM16
	10	*	*	*	S79~S64	
	20	S63~S48	S47~S32	S32~S16	S15~S00	COM17
	30	*	*	*	S79~S64	
	40	S63~S48	S47~S32	S32~S16	S15~S00	COM18
	50	*	*	*	S79~S64	
	60	S63~S48	S47~S32	S32~S16	S15~S00	COM19
	70	*	*	*	S79~S64	
	80	S63~S48	S47~S32	S32~S16	S15~S00	COM20
	90	*	*	*	S79~S64	
	A0	S63~S48	S47~S32	S32~S16	S15~S00	COM21
	B0	*	*	*	S79~S64	
	C0	S63~S48	S47~S32	S32~S16	S15~S00	COM22
	D0	*	*	*	S79~S64	
	E0	S63~S48	S47~S32	S32~S16	S15~S00	COM23
	F0	*	*	*	S79~S64	
3	00	S63~S48	S47~S32	S32~S16	S15~S00	COM24
	10	*	*	*	S79~S64	
	20	S63~S48	S47~S32	S32~S16	S15~S00	COM25
	30	*	*	*	S79~S64	
	40	S63~S48	S47~S32	S32~S16	S15~S00	COM26
	50	*	*	*	S79~S64	
	60	S63~S48	S47~S32	S32~S16	S15~S00	COM27
	70	*	*	*	S79~S64	
	80	S63~S48	S47~S32	S32~S16	S15~S00	COM28
	90	*	*	*	S79~S64	
	A0	S63~S48	S47~S32	S32~S16	S15~S00	COM29
	B0	*	*	*	S79~S64	
	C0	S63~S48	S47~S32	S32~S16	S15~S00	COM30
	D0	*	*	*	S79~S64	
	E0	S63~S48	S47~S32	S32~S16	S15~S00	COM31
	F0	*	*	*	S79~S64	
4	00	S63~S48	S47~S32	S32~S16	S15~S00	COM32
	10	*	*	*	S79~S64	
	20	S63~S48	S47~S32	S32~S16	S15~S00	COM33
	30	*	*	*	S79~S64	
	40	S63~S48	S47~S32	S32~S16	S15~S00	COM34
	50	*	*	*	S79~S64	
	60	S63~S48	S47~S32	S32~S16	S15~S00	COM35

4 Gray Levels LCD Display RAM MAP						
Page		**F C**	**B 8**	**7 4**	**3 0**	**COM No.**
	70	*	*	*	S79~S64	
	80	S63~S48	S47~S32	S32~S16	S15~S00	COM36
	90	*	*	*	S79~S64	
	A0	S63~S48	S47~S32	S32~S16	S15~S00	COM37
	B0	*	*	*	S79~S64	
	C0	S63~S48	S47~S32	S32~S16	S15~S00	COM38
	D0	*	*	*	S79~S64	
	E0	S63~S48	S47~S32	S32~S16	S15~S00	COM39
	F0	*	*	*	S79~S64	
5	00	S63~S48	S47~S32	S32~S16	S15~S00	COM40
	10	*	*	*	S79~S64	
	20	S63~S48	S47~S32	S32~S16	S15~S00	COM41
	30	*	*	*	S79~S64	
	40	S63~S48	S47~S32	S32~S16	S15~S00	COM42
	50	*	*	*	S79~S64	
	60	S63~S48	S47~S32	S32~S16	S15~S00	COM43
	70	*	*	*	S79~S64	
	80	S63~S48	S47~S32	S32~S16	S15~S00	COM44
	90	*	*	*	S79~S64	
	A0	S63~S48	S47~S32	S32~S16	S15~S00	COM45
	B0	*	*	*	S79~S64	
	C0	S63~S48	S47~S32	S32~S16	S15~S00	COM46
	D0	*	*	*	S79~S64	
	E0	S63~S48	S47~S32	S32~S16	S15~S00	COM47
	F0	*	*	*	S79~S64	
6	00	S63~S48	S47~S32	S32~S16	S15~S00	COM48
	10	*	*	*	S79~S64	
	20	S63~S48	S47~S32	S32~S16	S15~S00	COM49
	30	*	*	*	S79~S64	
	40	S63~S48	S47~S32	S32~S16	S15~S00	COM50
	50	*	*	*	S79~S64	
	60	S63~S48	S47~S32	S32~S16	S15~S00	COM51
	70	*	*	*	S79~S64	
	80	S63~S48	S47~S32	S32~S16	S15~S00	COM52
	90	*	*	*	S79~S64	
	A0	S63~S48	S47~S32	S32~S16	S15~S00	COM53
	B0	*	*	*	S79~S64	
	C0	S63~S48	S47~S32	S32~S16	S15~S00	COM54
	D0	*	*	*	S79~S64	
	E0	S63~S48	S47~S32	S32~S16	S15~S00	COM55
	F0	*	*	*	S79~S64	
7	00	S63~S48	S47~S32	S32~S16	S15~S00	COM56
	10	*	*	*	S79~S64	
	20	S63~S48	S47~S32	S32~S16	S15~S00	COM57
	30	*	*	*	S79~S64	
	40	S63~S48	S47~S32	S32~S16	S15~S00	COM58
	50	*	*	*	S79~S64	

4 Gray Levels LCD Display RAM MAP						
Page		**F C**	**B 8**	**7 4**	**3 0**	**COM No.**
	60	S63~S48	S47~S32	S32~S16	S15~S00	COM59
	70	*	*	*	S79~S64	
	80	S63~S48	S47~S32	S32~S16	S15~S00	COM60
	90	*	*	*	S79~S64	
	A0	S63~S48	S47~S32	S32~S16	S15~S00	COM61
	B0	*	*	*	S79~S64	
	C0	S63~S48	S47~S32	S32~S16	S15~S00	COM62
	D0	*	*	*	S79~S64	
	E0	S63~S48	S47~S32	S32~S16	S15~S00	COM63
	F0	*	*	*	S79~S64	
8	00	S63~S48	S47~S32	S32~S16	S15~S00	COM64
	10	*	*	*	S79~S64	
	20	S63~S48	S47~S32	S32~S16	S15~S00	COM65
	30	*	*	*	S79~S64	
	40	S63~S48	S47~S32	S32~S16	S15~S00	COM66
	50	*	*	*	S79~S64	
	60	S63~S48	S47~S32	S32~S16	S15~S00	COM67
	70	*	*	*	S79~S64	
	80	S63~S48	S47~S32	S32~S16	S15~S00	COM68
	90	*	*	*	S79~S64	
	A0	S63~S48	S47~S32	S32~S16	S15~S00	COM69
	B0	*	*	*	S79~S64	
	C0	S63~S48	S47~S32	S32~S16	S15~S00	COM70
	D0	*	*	*	S79~S64	
	E0	S63~S48	S47~S32	S32~S16	S15~S00	COM71
	F0	*	*	*	S79~S64	
9	00	S63~S48	S47~S32	S32~S16	S15~S00	COM72
	10	*	*	*	S79~S64	
	20	S63~S48	S47~S32	S32~S16	S15~S00	COM73
	30	*	*	*	S79~S64	
	40	S63~S48	S47~S32	S32~S16	S15~S00	COM74
	50	*	*	*	S79~S64	
	60	S63~S48	S47~S32	S32~S16	S15~S00	COM75
	70	*	*	*	S79~S64	
	80	S63~S48	S47~S32	S32~S16	S15~S00	COM76
	90	*	*	*	S79~S64	
	A0	S63~S48	S47~S32	S32~S16	S15~S00	COM77
	B0	*	*	*	S79~S64	
	C0	S63~S48	S47~S32	S32~S16	S15~S00	COM78
	D0	*	*	*	S79~S64	
	E0	S63~S48	S47~S32	S32~S16	S15~S00	COM79
	F0	*	*	*	S79~S64	

6.3. Black and White LCD Display RAM Map

2 Gray Levels (Black/White) LCD Display RAM MAP						
Page		**F A**	**9 8**	**7 4**	**3 0**	**COM No.**
0	00	*	S79~S64	S63~S32	S31~S00	COM0
	10	*	S79~S64	S63~S32	S31~S00	COM1
	20	*	S79~S64	S63~S32	S31~S00	COM2
	30	*	S79~S64	S63~S32	S31~S00	COM3
	40	*	S79~S64	S63~S32	S31~S00	COM4
	50	*	S79~S64	S63~S32	S31~S00	COM5
	60	*	S79~S64	S63~S32	S31~S00	COM6
	70	*	S79~S64	S63~S32	S31~S00	COM7
	80	*	S79~S64	S63~S32	S31~S00	COM8
	90	*	S79~S64	S63~S32	S31~S00	COM9
	A0	*	S79~S64	S63~S32	S31~S00	COM10
	B0	*	S79~S64	S63~S32	S31~S00	COM11
	C0	*	S79~S64	S63~S32	S31~S00	COM12
	D0	*	S79~S64	S63~S32	S31~S00	COM13
	E0	*	S79~S64	S63~S32	S31~S00	COM14
	F0	*	S79~S64	S63~S32	S31~S00	COM15
1	00	*	S79~S64	S63~S32	S31~S00	COM16
	10	*	S79~S64	S63~S32	S31~S00	COM17
	20	*	S79~S64	S63~S32	S31~S00	COM18
	30	*	S79~S64	S63~S32	S31~S00	COM19
	40	*	S79~S64	S63~S32	S31~S00	COM20
	50	*	S79~S64	S63~S32	S31~S00	COM21
	60	*	S79~S64	S63~S32	S31~S00	COM22
	70	*	S79~S64	S63~S32	S31~S00	COM23
	80	*	S79~S64	S63~S32	S31~S00	COM24
	90	*	S79~S64	S63~S32	S31~S00	COM25
	A0	*	S79~S64	S63~S32	S31~S00	COM26
	B0	*	S79~S64	S63~S32	S31~S00	COM27
	C0	*	S79~S64	S63~S32	S31~S00	COM28
	D0	*	S79~S64	S63~S32	S31~S00	COM29
	E0	*	S79~S64	S63~S32	S31~S00	COM30
	F0	*	S79~S64	S63~S32	S31~S00	COM31
2	00	*	S79~S64	S63~S32	S31~S00	COM32
	10	*	S79~S64	S63~S32	S31~S00	COM33
	20	*	S79~S64	S63~S32	S31~S00	COM34
	30	*	S79~S64	S63~S32	S31~S00	COM35
	40	*	S79~S64	S63~S32	S31~S00	COM36
	50	*	S79~S64	S63~S32	S31~S00	COM37
	60	*	S79~S64	S63~S32	S31~S00	COM38
	70	*	S79~S64	S63~S32	S31~S00	COM39
	80	*	S79~S64	S63~S32	S31~S00	COM40
	90	*	S79~S64	S63~S32	S31~S00	COM41
	A0	*	S79~S64	S63~S32	S31~S00	COM42

2 Gray Levels (Black/White) LCD Display RAM MAP						
Page		**F A**	**9 8**	**7 4**	**3 0**	**COM No.**
	B0	*	S79~S64	S63~S32	S31~S00	COM43
	C0	*	S79~S64	S63~S32	S31~S00	COM44
	D0	*	S79~S64	S63~S32	S31~S00	COM45
	E0	*	S79~S64	S63~S32	S31~S00	COM46
	F0	*	S79~S64	S63~S32	S31~S00	COM47
3	00	*	S79~S64	S63~S32	S31~S00	COM48
	10	*	S79~S64	S63~S32	S31~S00	COM49
	20	*	S79~S64	S63~S32	S31~S00	COM50
	30	*	S79~S64	S63~S32	S31~S00	COM51
	40	*	S79~S64	S63~S32	S31~S00	COM52
	50	*	S79~S64	S63~S32	S31~S00	COM53
	60	*	S79~S64	S63~S32	S31~S00	COM54
	70	*	S79~S64	S63~S32	S31~S00	COM55
	80	*	S79~S64	S63~S32	S31~S00	COM56
	90	*	S79~S64	S63~S32	S31~S00	COM57
	A0	*	S79~S64	S63~S32	S31~S00	COM58
	B0	*	S79~S64	S63~S32	S31~S00	COM59
	C0	*	S79~S64	S63~S32	S31~S00	COM60
	D0	*	S79~S64	S63~S32	S31~S00	COM61
	E0	*	S79~S64	S63~S32	S31~S00	COM62
	F0	*	S79~S64	S63~S32	S31~S00	COM63
4	00	*	S79~S64	S63~S32	S31~S00	COM64
	10	*	S79~S64	S63~S32	S31~S00	COM65
	20	*	S79~S64	S63~S32	S31~S00	COM66
	30	*	S79~S64	S63~S32	S31~S00	COM67
	40	*	S79~S64	S63~S32	S31~S00	COM68
	50	*	S79~S64	S63~S32	S31~S00	COM69
	60	*	S79~S64	S63~S32	S31~S00	COM70
	70	*	S79~S64	S63~S32	S31~S00	COM71
	80	*	S79~S64	S63~S32	S31~S00	COM72
	90	*	S79~S64	S63~S32	S31~S00	COM73
	A0	*	S79~S64	S63~S32	S31~S00	COM74
	B0	*	S79~S64	S63~S32	S31~S00	COM75
	C0	*	S79~S64	S63~S32	S31~S00	COM76
	D0	*	S79~S64	S63~S32	S31~S00	COM77
	E0	*	S79~S64	S63~S32	S31~S00	COM78
	F0	*	S79~S64	S63~S32	S31~S00	COM79

7. Command Interface

KB's MCU with Segment Extender Interface controls KD83 by an 8-bit parallel data/command bus. The D_CN and R_WN pins select current activity to be a Command read/write or Data Read/Write. The STBN signal is the active low strobe signal to read/write to the command registers or read/write RAM content. There are 19 command registers which can be read/write in cyclic order. The command sequence

are reset by any read/write to data or power-on reset or REN=1 or RES_N=0. The COM counter are reset to 00H by LEP=0 or LFR signal transient.

cmd seq	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	Reset
1	A7	A6	A5	A4	A3	A2	A1	A0	0000 0000
2	LEP	WR_INC	RD_INC	A12	A11	A10	A9	A8	0010 0000
3	KS	COMS2	COMS1	COMS0	GRAY_MODE		-	-	1011 11--
4				GRAY0					---0 0000
5				GRAY1					---0 0010
6				GRAY2					---0 0100
7				GRAY3					---0 0110
8				GRAY4					---0 1000
9				GRAY5					---0 1010
10				GRAY6					---0 1100
11				GRAY7					---0 1110
12				GRAY8					---1 0000
13				GRAY9					---1 0010
14				GRAYA					---1 0100
15				GRAYB					---1 0110
16				GRAYC					---1 1000
17				GRAYD					---1 1010
18				GRAYE					---1 1100
19				GRAYF					---1 1110

The address of display RAM can be configured to increment with each Read or Write access by setting the WR_INC and RD_INC bit of CMD2 register.

A12~A0: display RAM address

RD_INC: address auto increment when read

WR_INC: address auto increment when write

WR_INC	RD_INC	A [12..0]
0	0	Automatically increment by one with each data read/write access
0	1	Automatically increment by one with each data write access
1	0	Automatically increment by one with each data read access
1	1	No automatically increment by one

LEP: LCD enable, 0: Disable 1: Enable

COMS[2..0]: LCD Configuration

COMS[2]	COMS[1]	COMS[0]	LCD configuration
1	0	0	16 COM (COM15 ~COM0)
0	0	0	32 COM (COM31 ~COM0)
0	0	1	48 COM (COM47 ~COM0)
0	1	0	64 COM (COM63 ~COM0)
0	1	1	80 COM (COM79 ~COM0)

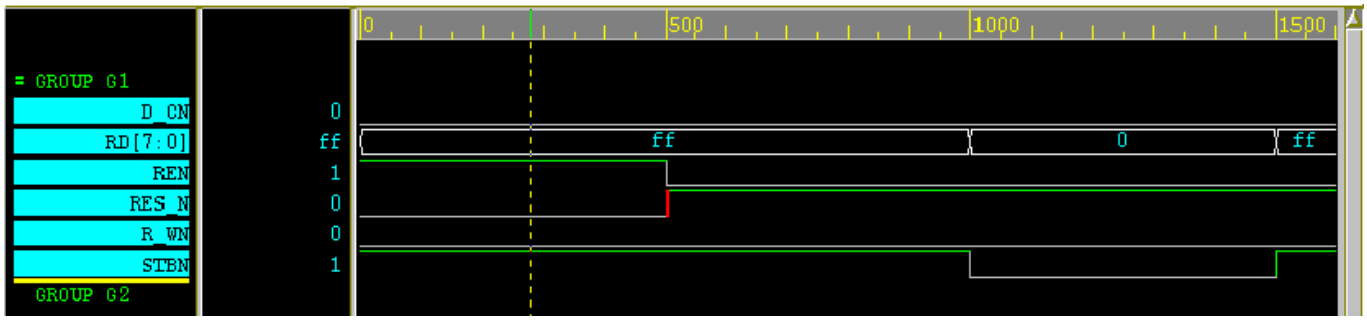
GRAY_MODE:

GRAY_MODE		Gray Scales
0	0	16
0	1	4
1	0	Black and White

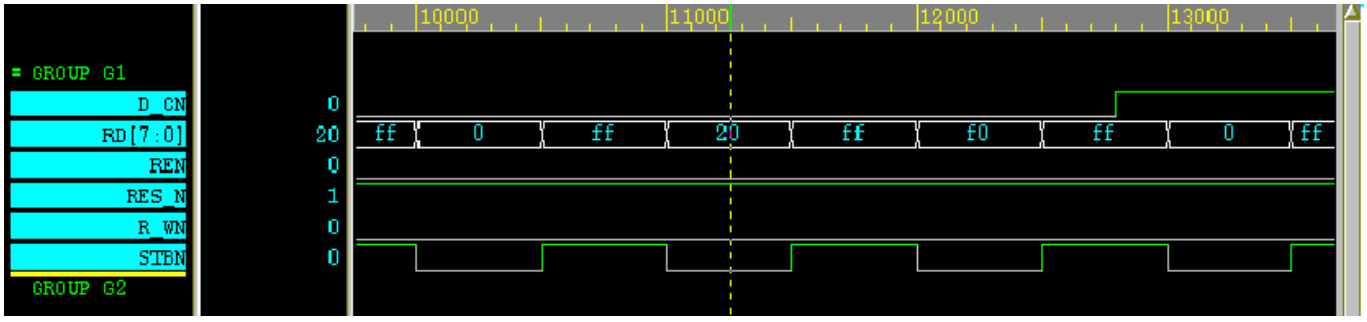
KS: Key Board Scan 0: Disable 1: Enable

8. Timing Diagram

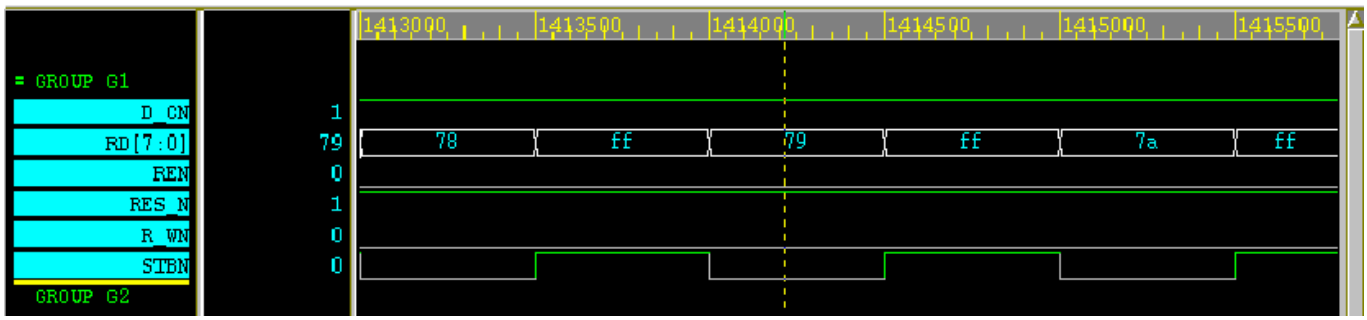
1. reset



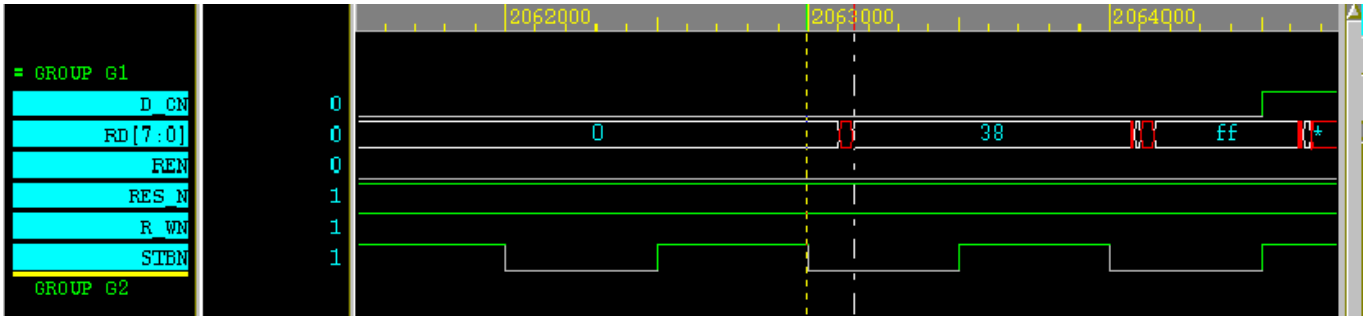
2. command_write



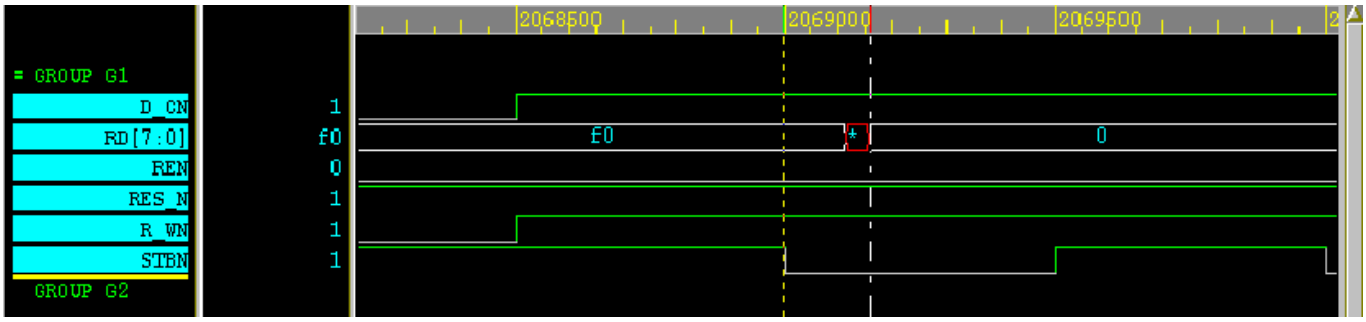
3. data write



4. command read



5. data read



9. Absolute Maximum Rating

Item	Sym.	Rating	Condition
Supply Voltage	V_{DD}	-0.5V ~ 4V	
Input Voltage	V_{IN}	-0.5V ~ V_{dd}+0.5V	
Output Voltage	V_o	-0.5V ~ V_{dd}+0.5V	
Operating Temperature	T_{OP}	0^0C ~ 70^0C	
Storage Temperature	T_{ST}	-50^0C ~ 100^0C	

10. Recommended Operating Conditions

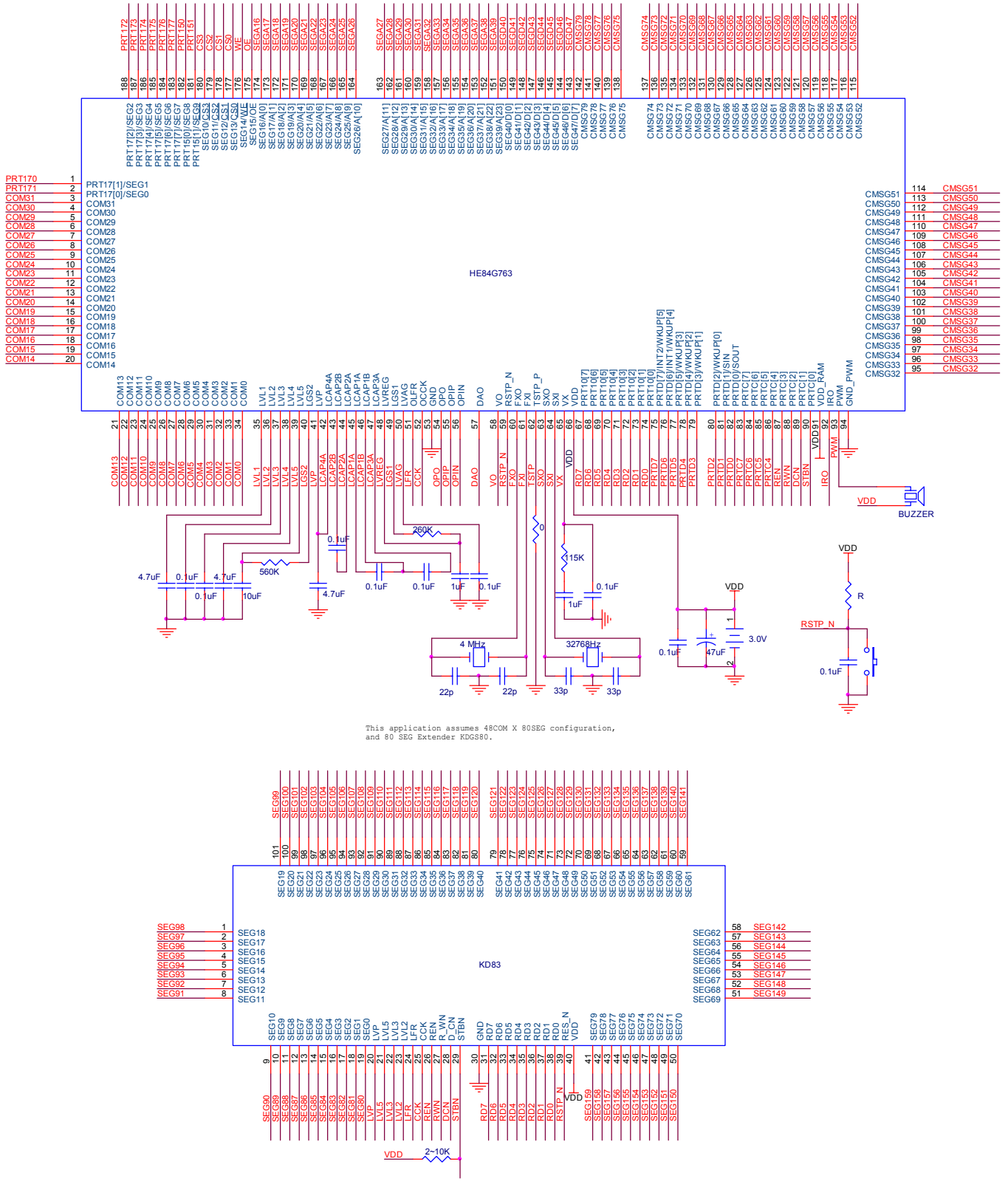
Item	Sym.	Rating	Condition
Supply Voltage	V_{DD}	2.4V ~ 3.6V	
LCD Operating Voltage	V_{LVP}	<12V	
Input Voltage	V_{IH}	0.9 V_{DD} ~ V_{DD}	
	V_{IL}	0.0V ~ 0.1V_{dd}	
Operating Temperature	T_{op}	0^0C ~ 70^0C	
Storage Temperature	T_{ST}	-50^0C ~ 100^0C	

11. AC/DC Characteristics

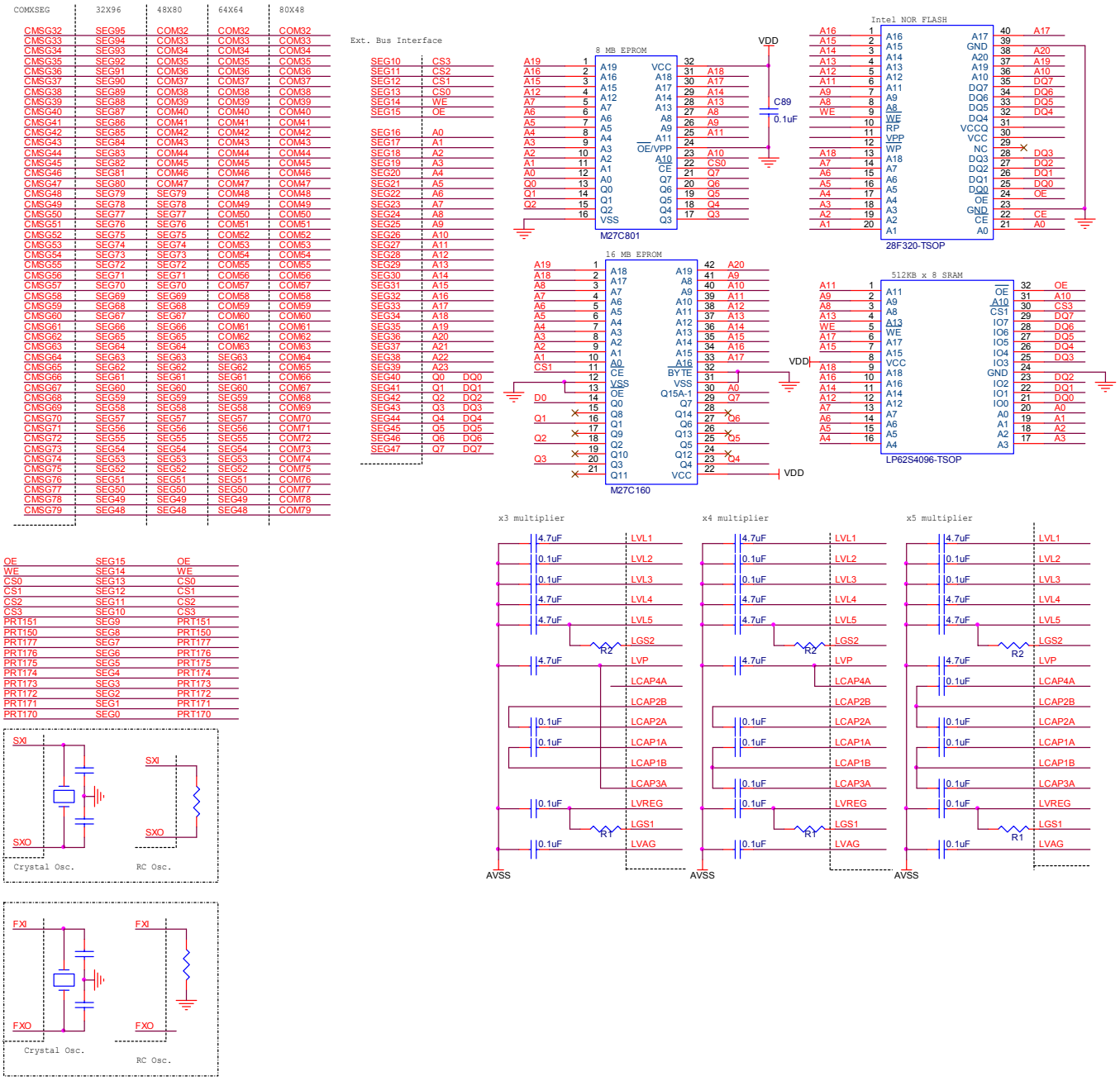
Parameters	Symbol	Min.	Typ.	Max.	Unit	Condition
Supply Current	I_{DD}		200	220	μA	
Standby mode current	I_{Sstdby}			1	μA	

Parameters	Symbol	Min.	Typ.	Max.	Unit	Condition
Input high voltage	V_{IH}	0.8			V_{DD}	Input pins
Input low voltage	V_{IL}			0.2	V_{DD}	Input pins
Input leakage current	I_{IL}		20		μA	V_{IL} = GND, VDD
Input Hysteresis Width	V_{HYS}		1/3		V_{DD}	Input pins Threshold=2/3V_{DD}(input from low to high) Threshold=1/3V_{DD}(input from high to low)
Output source current	I_{OH}	-2.0			mA	RD[7..0], V_{OL}=2.0V
Output sink current	I_{OL}			2.0	mA	RD[7..0], V_{OL}=0.4V

12. Application Circuit



Note: Options for LCD, Osc. and external memory



13. Updated History

Version	Date	Update Record
V1.0	10/30/03	New release version