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**DOT MATRIX LCD DRIVER****DESCRIPTION**

IZ6450/IZ6451 are dot matrix LCD (Liquid Crystal Display) drivers, designed for the display of characters and graphics.

The drivers generate LCD drive signals derived from bit mapped data stored in an internal RAM.

Design of ICs driver provides very low power dissipation at a wide range of operating voltages.

These features give the designer a flexible means of implementing small to medium size LCD displays for compact, low power systems.

IZ6450A drive 16 lines of 61 characters each.

IZ6451A operates only 80 columns LCD and works under control of IZ6450A.

Two IZ6450A can be used for control of LCD with rows number more than 16 (but not more than 32). Thus one IC operates as "Master" and the second as "Slave".

One IZ6450A operates as "Master", and one or few IZ6450A or IZ6451A is used in "Slave" mode for control of LCD with number of columns more than 61

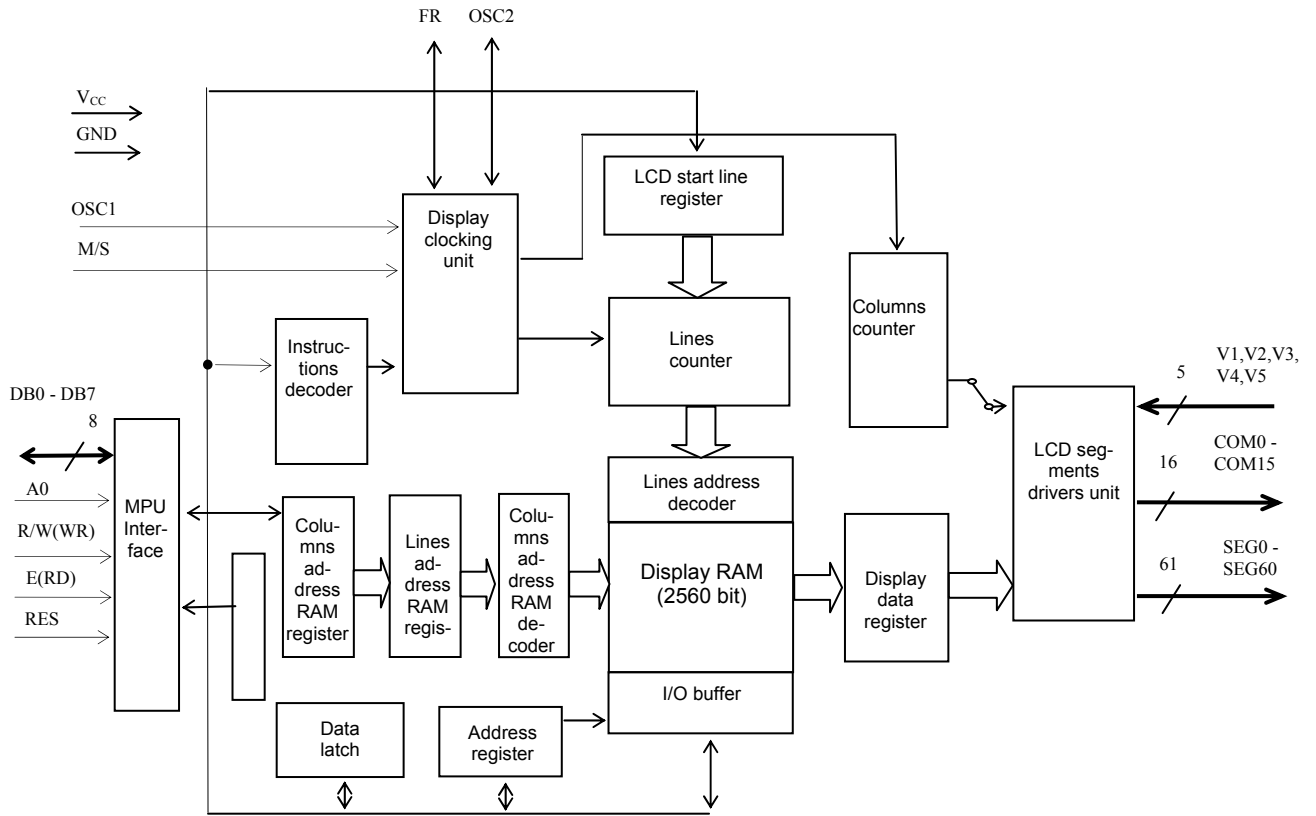
IZ6450A operates on frequency 18kHz as from the built in RC-generator (external resistor), and from external clocking.

IZ6451A operates on frequency 18kHz from external clocking.

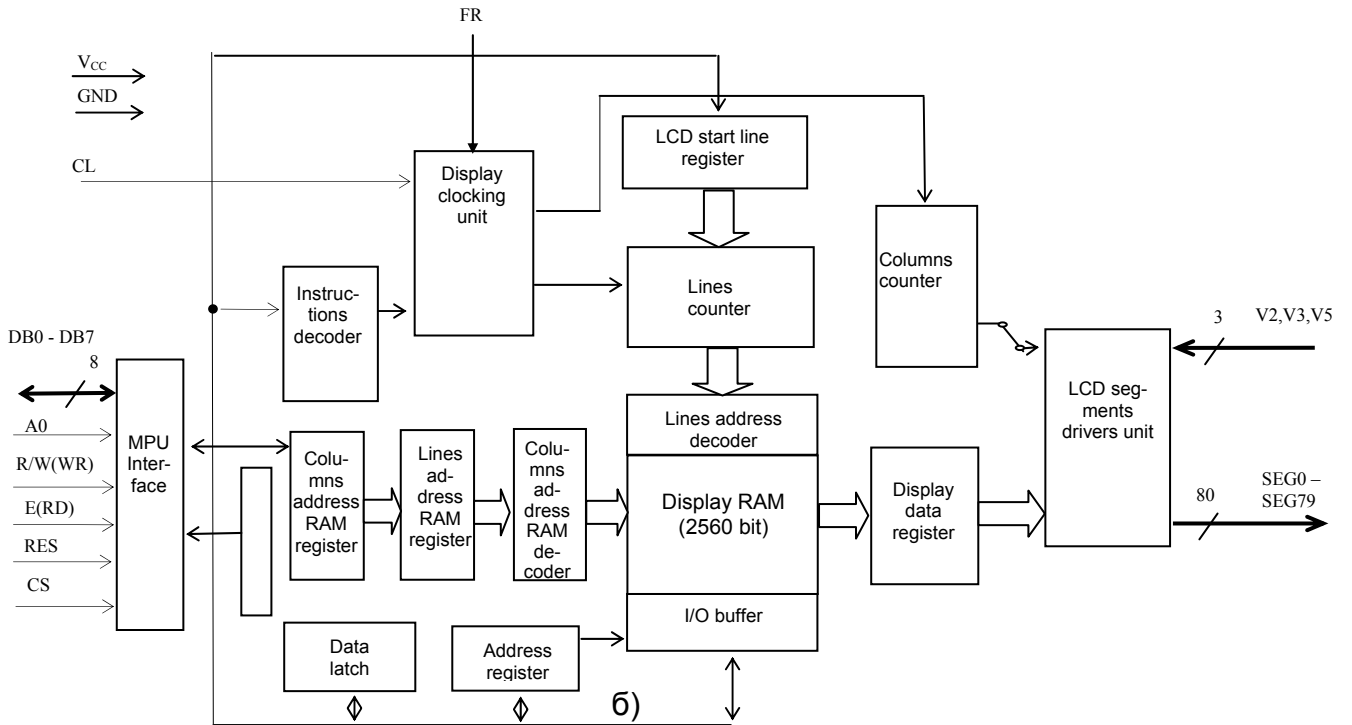
The most similar on parameters functional equivalents are NJU6450A, NJU6451A (New Japan Radio Co).

Microcircuits support the data exchange protocol with MPU family 80XXX (Intel), and MPU family 68XXX (Motorola) to receive the information to display on LCD from MPU.

Microcircuits are used in calculators, pagers, notebooks, translators and other products, demanding simultaneous displaying of graphic and any fonts text information on LCD.



**Fig.1 Block diagram of IZ6450A**



**Fig.2 Block diagram of IZ6451A**

**Table 1 Absolute maximum ratings and recommended modes**

Parameter,unit	Symbol	Recommended modes		Absolute maximum ratings	
		Min	Max.	Min	Max.
Logic (low voltage) part supply voltage, V	$U_{CC}$	4.5*	5.5*	-0.3	7.0
		2.4**	5.5**		
High voltage part supply voltage, V	V5	$U_{CC}-10$	$U_{CC}-3.5$	$U_{CC}-11$	$U_{CC}+0.3$
Switching levels, V	U1,U2, U3,U4 ***	U5	$U_{CC}$	$U_{CC}-11$	$U_{CC}+0.3$
High level input voltage, V - A0, DB0-DB7, E(RD), R/W(WR), CS, OSC1 pins at $V_{CC}= 2.4 \dots 4.5$ V  at $V_{CC}= 4.5 \dots 5.5$ V	$U_{IH1}$			-	$U_{CC}+0.3$
		$0.8U_{CC}$	$U_{CC}$		
		$U_{CC}-2.5$	$U_{CC}$		
- pins FR, RES, CL, OSC2, M/S	$U_{IH2}$	$0.8U_{CC}$	$U_{CC}$		
Low level input voltage, V - A0, DB0-DB7, E(RD), R/W(WR), CS, OSC1 pins at $V_{CC}= 2.4 \dots 4.5$ V at $V_{CC}=4.5 \dots 5.5$ V	$U_{IL1}$			-0.3	-
		0	$0.2U_{CC}$		
		0	0.8		
- FR, RES, CL, OSC2, M/S pins	$U_{IL2}$	0	$0.2U_{CC}$		
Data exchange cycle duration(via bus), ns at $V_{CC}=4.5$ V	$t_{CY}$	1000	-	-	-
<p>* This supply voltage range guarantees norms of electric parameters and operation of IC</p> <p>** This supply voltage range guarantees operation of IC only.</p> <p>*** <math>V5 \leq V4 \leq V3 \leq V2 \leq V1 \leq V_{CC}</math></p>					

**Table 2 . Electric parameters Tamb=25 °C**

Parameter, unit	Symbol	Measurement mode	Norm		Note
			Min	Max	
High level output voltage, V	$U_{OH1}$	$I_{OH}=-3.0\text{ mA}$ $U_{CC}=4.5\text{V}$	2.4	–	D0-D7 pins
	$U_{OH2}$	$I_{OH}=-2.0\text{ mA}$ $U_{CC}=4.5\text{V}$	2.4	–	FR pin
	$U_{OH3}$	$I_{OH}=0.12\text{mA}$ $U_{CC}=4.5\text{V}$	$0.8 \cdot U_{CC}$	–	OSC2 pin
Low level output voltage, V	$U_{OL1}$	$I_{OL}= 3.0\text{ mA}$ $U_{CC}=4.5\text{V}$ .	–	0.4	D0-D7 pins
	$U_{OL2}$	$I_{OL}= 2.0\text{ mA}$ $U_{CC}=4.5\text{V}$ .	–	0.4	FR pin
	$U_{OL3}$	$I_{OL}=0.12\text{mA}$ $U_{CC}=4.5\text{V}$ .	–	$0.2 \cdot U_{CC}$	OSC2 pin
High level input current, $\mu\text{A}$	$I_{H1}$	$U_{IN}= U_{CC}$ . $U_{CC}=5.5\text{V}$ .	–	3.0	D0-D7,FR pins
	$I_{H2}$	$U_{IN}= U_{CC}$ . $U_{CC}=5.5\text{V}$ .	–	1.0	A0, E, R/W, CL, RES, M/S pins
Low level input current, $\mu\text{A}$	$I_{L1}$	$U_{IN}=0\text{V}$ . $U_{CC}=5.5\text{V}$ .	–	$ -3.0 $	D0-D7, FR pins
	$I_{L2}$	$U_{IN}=0\text{V}$ . $U_{CC}=5.5\text{V}$ .	–	$ -1.0 $	A0, E, R/W,CL,RES,M/S pins
Output voltage drop, V	$U_d$	$I_o=+-0.1\text{mA}$ $U_{LCD}=5.0\text{V}$ $U_{CC}=5.0\text{ V}$	$U_i - 1$	$U_i + 1$	(1)
Static consumption current, $\mu\text{A}$	$I_{CC1}$	$U_{CC}=5.5\text{ V}$ .	–	1.0	
Dynamic consumption current, $\mu\text{A}$	$I_{CC2}$	$F_{cyc}=200\text{ kHz}$ $U_{CC}=5.5\text{ V}$ .	–	500	
Dynamic consumption current, $\mu\text{A}$	$I_{CC3}$	$F_{osc}=18\text{ kHz}$ $U_{CC}=5.5\text{ V}$ .	–	15	
Clock frequency, kHz.	$F_{ec}$	$R=1.0\text{ MOhm}$ , $U_{CC}=5.0\text{ V}$ .	11	21	

Note:

(1) Correspond to driver resistance not more 10 kOhm.

**Table 3 Instruction set**

Instruction	Instruction code											Function
	RD	WR	AO	D7	D6	D5	D4	D3	D2	D1	D0	
Display ON/OFF	1	0	0	1	0	1	0	1	1	1	1/0	Switches ON/OFF input og RAMdata for LCD columns control
Display start line	1	0	0	1	1	0	Start address of RAM line (0~31)					Sets RAM address of line corresponding to data indicated at the display's top line (COM0)
Page address set	1	0	0	1	0	1	1	1	0	Page address (0~3)		Sets the page of the Display RAM
Column address set	1	0	0	0	Address of column RAM (0~79)							Sets the column of the Display RAM
Status read	0	1	0	BUSY	ADC	ON/OFF	RESET	0	0	0	0	Reads LCD status: . Bit of status word: BUSY 1: "Working" state, 0: "Ready" state; ADC 1:RAM columns reading from right to left (direct); 0: RAM columns reading from left to right (reverse) ON/OFF 1: "Display" ON; 0: "Display" OFF RESET 1: driver reset processed
Write display data	1	0	1	Data being written							Data writing down to RAM	RAM column address is incremented
Read display data	0	1	1	Data being read							Data reading out of RAM	
ADC	1	0	0	1	0	1	0	0	0	0	0/1	1: reading RAM column right to left (direct); 0: RAM columns reading from left to right (reverse)
Static	1	0	0	1	0	1	0	0	1	0	0/1	1: Static parameter control mode; 0: Operating (normal) mode
Duty select	1	0	0	1	0	1	0	1	0	0	0/1	Duty factor select mode: 1: 1/32 duty, 0: 1/16 duty
Read modify write	1	0	0	1	1	1	0	0	0	0	0	RAM column address is incremented only when display data is written
End	1	0	0	1	1	1	0	1	1	1	0	Stop " Read Modify Write" mode
Reset	1	0	0	1	1	1	0	0	0	1	0	Reset LCD driver to initial set

**Table 4 IZ6450A contact pad description**

Contact pad number	Symbol	Description
01	COM5	LCD line control output
02	COM6	LCD line control output
03	COM7	LCD line control output
04	COM8	LCD line control output
05	COM9	LCD line control output
06	COM10	LCD line control output
07	COM11	LCD line control output
08	COM12	LCD line control output
09	COM13	LCD line control output
10	COM14	LCD line control output
11	COM15	LCD line control output
12	SEG60	LCD column control output
13	SEG59	LCD column control output
14	SEG58	LCD column control output
15	SEG57	LCD column control output
16	SEG56	LCD column control output
17	SEG55	LCD column control output
18	SEG54	LCD column control output
19	SEG53	LCD column control output
20	SEG52	LCD column control output
21	SEG51	LCD column control output
22	SEG50	LCD column control output
23	SEG49	LCD column control output
24	SEG48	LCD column control output
25	SEG47	LCD column control output
26	SEG46	LCD column control output
27	SEG45	LCD column control output
28	SEG44	LCD column control output
29	SEG43	LCD column control output
30	SEG42	LCD column control output
31	SEG41	LCD column control output
32	SEG40	LCD column control output
33	SEG39	LCD column control output
34	SEG38	LCD column control output
35	SEG37	LCD column control output

**Table 4 continued**

Contact pad number	Symbol	Description
36	SEG36	LCD column control output
37	SEG35	LCD column control output
38	SEG34	LCD column control output
39	SEG33	LCD column control output
40	SEG32	LCD column control output
41	SEG31	LCD column control output
42	SEG30	LCD column control output
43	SEG29	LCD column control output
44	SEG28	LCD column control output
45	SEG27	LCD column control output
46	SEG26	LCD column control output
47	SEG25	LCD column control output
48	SEG24	LCD column control output
49	SEG23	LCD column control output
50	SEG22	LCD column control output
51	SEG21	LCD column control output
52	SEG20	LCD column control output
53	SEG19	LCD column control output
54	SEG18	LCD column control output
55	SEG17	LCD column control output
56	SEG16	LCD column control output
57	SEG15	LCD column control output
58	SEG14	LCD column control output
59	SEG13	LCD column control output
60	SEG12	LCD column control output
61	SEG11	LCD column control output
62	SEG10	LCD column control output
63	SEG9	LCD column control output
64	SEG8	LCD column control output
65	SEG7	LCD column control output
66	SEG6	LCD column control output
67	SEG5	LCD column control output
68	SEG4	LCD column control output
69	SEG3	LCD column control output
70	SEG2	LCD column control output

**Table 4 continued**

Contact pad number	Symbol	Description
71	SEG1	LCD column control output
72	SEG0	LCD column control output
73	A0	Data/instructions display select input
74	OSC1	“Master” mode clock input
75	OSC2	“Slave” mode clock input / “Master” mode clock output
76	E(RD)	Read/Write Enable input if a 68-port MPU is connected (Read signal input if an 80-port MPU is connected)
77	R/W(WR)	Data Read/Write signal input if a 68-port MPU is connected (Write signal input if an 80-port MPU is connected)
78	GND	Common pin (Ground)
79	DB0	Data I/O
80	DB1	Data I/O
81	DB2	Data I/O
82	DB3	Data I/O
83	DB4	Data I/O
84	DB5	Data I/O
85	DB6	Data I/O
86	DB7	Data I/O
87	V <sub>CC</sub>	Supply voltage pin
88	RES	Reset & interface select input
89	FR	LCD frame signal input
90	V5	LCD driving power supply pin.
91	V3	LCD driving power supply pin.
92	V2	LCD driving power supply pin.
93	M/S	«Master/Slave» select input
94	V4	LCD driving power supply pin.
95	V1	LCD driving power supply pin.
96	COM0	LCD line control output
97	COM1	LCD line control output
98	COM2	LCD line control output
99	COM3	LCD line control output
100	COM4	LCD line control output



**Table 5 IZ6451A contact pad description**

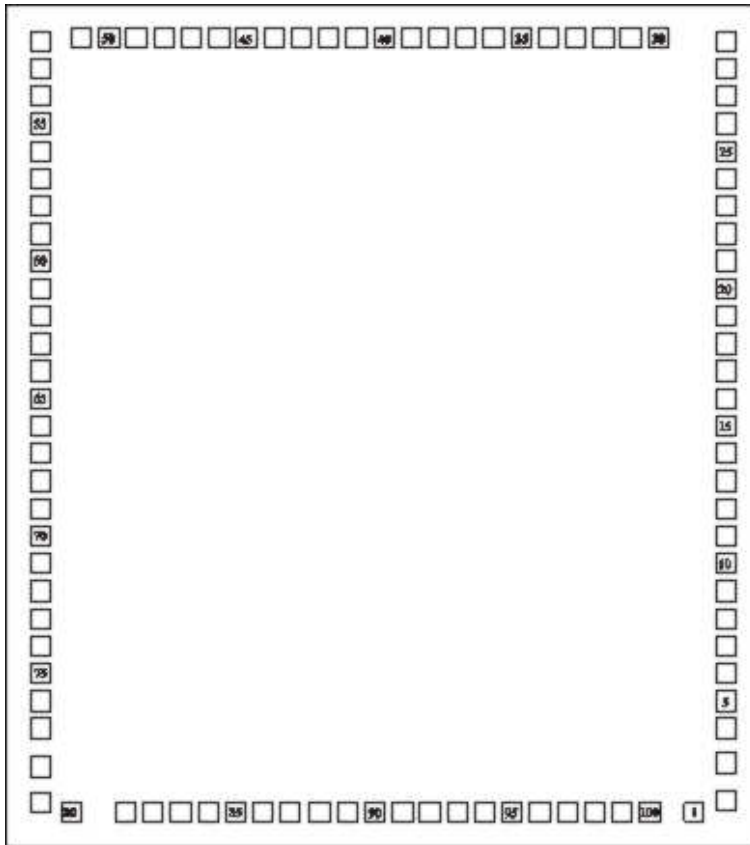
Contact pad number	Symbol	Description
01	SEG71	LCD column control output
02	SEG70	LCD column control output
03	SEG69	LCD column control output
04	SEG68	LCD column control output
05	SEG67	LCD column control output
06	SEG66	LCD column control output
07	SEG65	LCD column control output
08	SEG64	LCD column control output
09	SEG63	LCD column control output
10	SEG62	LCD column control output
11	SEG61	LCD column control output
12	SEG60	LCD column control output
13	SEG59	LCD column control output
14	SEG58	LCD column control output
15	SEG57	LCD column control output
16	SEG56	LCD column control output
17	SEG55	LCD column control output
18	SEG54	LCD column control output
19	SEG53	LCD column control output
20	SEG52	LCD column control output
21	SEG51	LCD column control output
22	SEG50	LCD column control output
23	SEG49	LCD column control output
24	SEG48	LCD column control output
25	SEG47	LCD column control output
26	SEG46	LCD column control output
27	SEG45	LCD column control output
28	SEG44	LCD column control output
29	SEG43	LCD column control output
30	SEG42	LCD column control output
31	SEG41	LCD column control output
32	SEG40	LCD column control output
33	SEG39	LCD column control output
34	SEG38	LCD column control output
35	SEG37	LCD column control output

**Table 5 continued**

Contact pad number	Symbol	Description
36	SEG36	LCD column control output
37	SEG35	LCD column control output
38	SEG34	LCD column control output
39	SEG33	LCD column control output
40	SEG32	LCD column control output
41	SEG31	LCD column control output
42	SEG30	LCD column control output
43	SEG29	LCD column control output
44	SEG28	LCD column control output
45	SEG27	LCD column control output
46	SEG26	LCD column control output
47	SEG25	LCD column control output
48	SEG24	LCD column control output
49	SEG23	LCD column control output
50	SEG22	LCD column control output
51	SEG21	LCD column control output
52	SEG20	LCD column control output
53	SEG19	LCD column control output
54	SEG18	LCD column control output
55	SEG17	LCD column control output
56	SEG16	LCD column control output
57	SEG15	LCD column control output
58	SEG14	LCD column control output
59	SEG13	LCD column control output
60	SEG12	LCD column control output
61	SEG11	LCD column control output
62	SEG10	LCD column control output
63	SEG9	LCD column control output
64	SEG8	LCD column control output
65	SEG7	LCD column control output
66	SEG6	LCD column control output
67	SEG5	LCD column control output
68	SEG4	LCD column control output
69	SEG3	LCD column control output
70	SEG2	LCD column control output

**Table 5 continued**

Contact pad number	Symbol	Description
71	SEG1	LCD column control output
72	SEG0	LCD column control output
73	A0	Data/instructions display select input
74	CS	Chip select input
75	CL	Clock input
76	E(RD)	Read/Write Enable input if a 68-port MPU is connected (Read signal input if an 80-port MPU is connected)
77	R/W(WR)	Data Read/Write signal input if a 68-port MPU is connected (Write signal input if an 80-port MPU is connected)
78	GND	Common pin
79	DB0	Data I/O
80	DB1	Data I/O
81	DB2	Data I/O
82	DB3	Data I/O
83	DB4	Data I/O
84	DB5	Data I/O
85	DB6	Data I/O
86	DB7	Data I/O
87	V <sub>CC</sub>	Supply voltage pin
88	RES	Reset & interface select input
89	FR	LCD frame signal input
90	V5	LCD driving power supply pin.
91	V3	LCD driving power supply pin.
92	V2	LCD driving power supply pin.
93	SEG79	LCD column control output
94	SEG78	LCD column control output
95	SEG77	LCD column control output
96	SEG76	LCD column control output
97	SEG75	LCD column control output
98	SEG74	LCD column control output
99	SEG73	LCD column control output
100	SEG72	LCD column control output



Contact pad sizes: 0.09x 0.09 mm.  
Chip size: 3.4 x 3.8 mm  
Chip thickness: 0.46 ± 0.02 mm

Fig 3 – Contact pad layout

**Table 6 Contact pad coordinates**

Pad #	Symbol	Coordinates		Pad #	Symbol	Coordinates		Pad #	Symbol	Coordinates	
		X (μm)	Y (μm)			X (μm)	Y (μm)			X (μm)	Y (μm)
1	SEG71	3200	110	35	SEG37	2281	3600	69	SEG3	110	1483
2	SEG70	3200	163	36	SEG36	2157	3600	70	SEG2	110	1359
3	SEG69	3200	334	37	SEG35	2033	3600	71	SEG1	110	1235
4	SEG68	3200	491	38	SEG34	1909	3600	72	SEG0	110	1111
5	SEG67	3200	615	39	SEG33	1785	3600	73	A0	110	987
6	SEG66	3200	739	40	SEG32	1661	3600	74	CS	110	863
7	SEG65	3200	863	41	SEG31	1537	3600	75	CL	110	739
8	SEG64	3200	987	42	SEG30	1413	3600	76	E RD	110	615
9	SEG63	3200	1111	43	SEG29	1289	3600	77	R/W (WR)	110	491
10	SEG62	3200	1235	44	SEG28	1165	3600	78	GND	110	318
11	SEG61	3200	1359	45	SEG27	1041	3600	79	DB0	110	156
12	SEG60	3200	1483	46	SEG26	917	3600	80	DB1	110	110
13	SEG59	3200	1607	47	SEG25	793	3600	81	DB2	495	122
14	SEG58	3200	1731	48	SEG24	669	3600	82	DB3	619	122
15	SEG57	3200	1855	49	SEG23	545	3600	83	DB4	743	122
16	SEG56	3200	1979	50	SEG22	421	3600	84	DB5	867	122
17	SEG55	3200	2103	51	SEG21	297	3600	85	DB6	991	122
18	SEG54	3200	2227	52	SEG20	110	3591	86	DB7	1115	122
19	SEG53	3200	2351	53	SEG19	110	3467	87	V <sub>CC</sub>	1239	122
20	SEG52	3200	2475	54	SEG18	110	3343	88	RES	1373	122
21	SEG51	3200	2599	55	SEG17	110	3219	89	FR	1497	122
22	SEG50	3200	2723	56	SEG16	110	3095	90	V5	1621	122
23	SEG49	3200	2847	57	SEG15	110	2971	91	V3	1745	122
24	SEG48	3200	2971	58	SEG14	110	2847	92	V2	1869	122
25	SEG47	3200	3095	59	SEG13	110	2723	93	SEG79	1993	122
26	SEG46	3200	3219	60	SEG12	110	2599	94	SEG78	2117	122
27	SEG45	3200	3343	61	SEG11	110	2475	95	SEG77	2241	122
28	SEG44	3200	3467	62	SEG10	110	2351	96	SEG76	2365	122
29	SEG43	3200	3591	63	SEG9	110	2227	97	SEG75	2489	122
30	SEG42	2901	3600	64	SEG8	110	2103	98	SEG74	2613	122
31	SEG41	2777	3600	65	SEG7	110	1979	99	SEG73	2737	122
32	SEG40	2653	3600	66	SEG6	110	1855	100	SEG72	2861	122
33	SEG39	2529	3600	67	SEG5	110	1731				
34	SEG38	2405	3600	68	SEG4	110	1607				

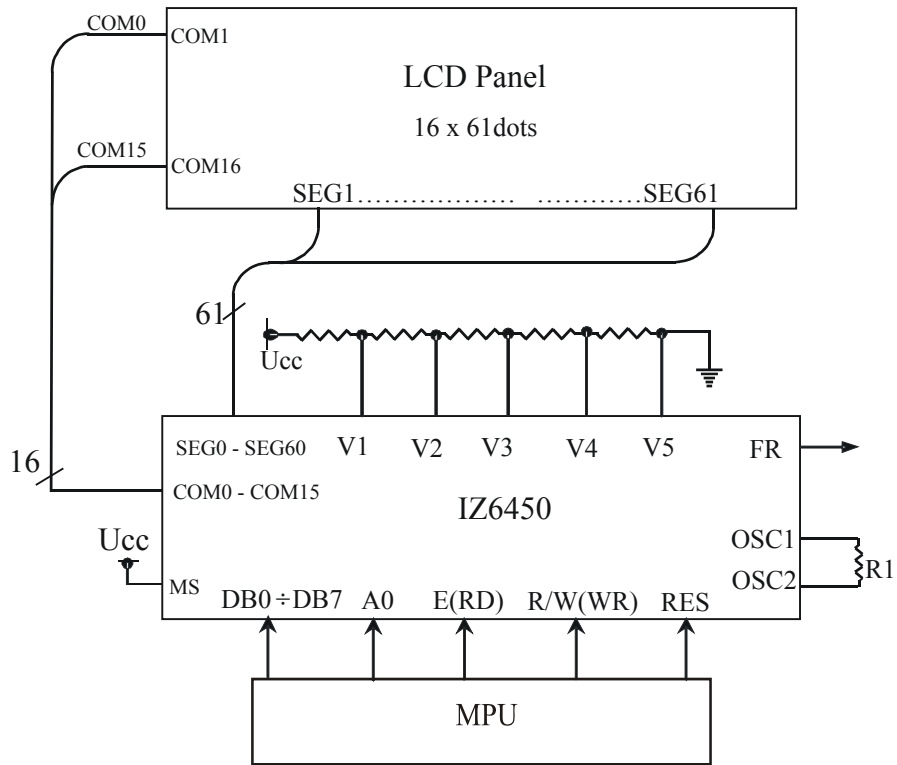
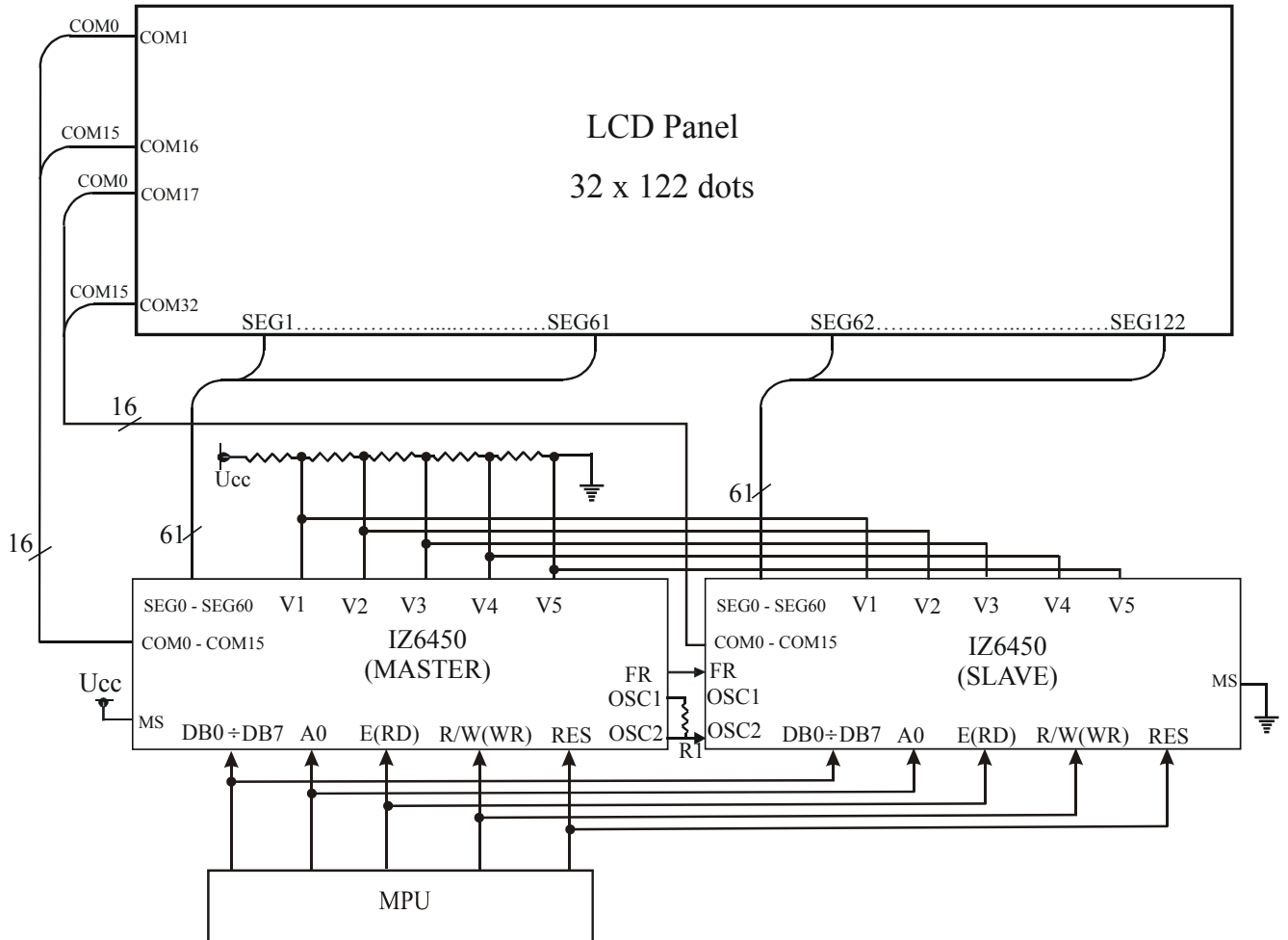
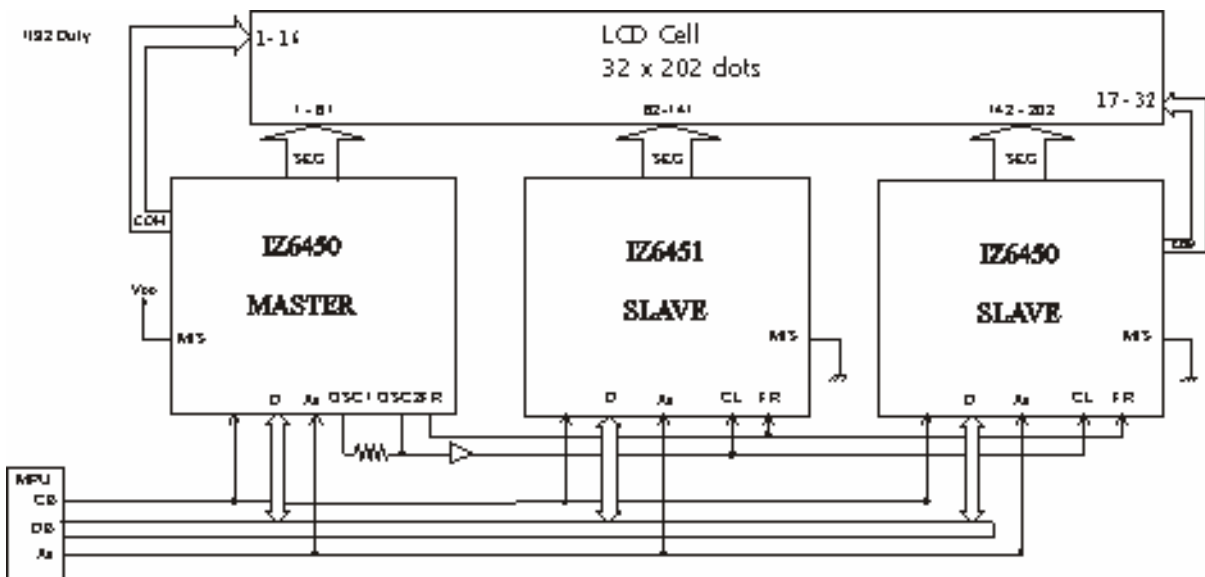


Fig 4 - IZ6450A application diagram for 16 x 61 dots LCD panel control (multiplexing ratio 1/16).



**Fig. 5 - IZ6450A application diagram for 32x122 dots LCD panel control (multiplexing ratio 1/32).**



**Fig. 6 - IZ6450A, IZ6451A application diagram for 32x202 dots LCD panel control (multiplexing ratio 1/32).**