DISCONTINUED

SED1631

CMOS DOT MATRIX HIGH DUTY LCD DRIVER

- **CMOS 100-bit Common Driver**
- **High Voltage Resistant Output**
- **CMOS High Voltage Resistant Process**

■ DESCRIPTION

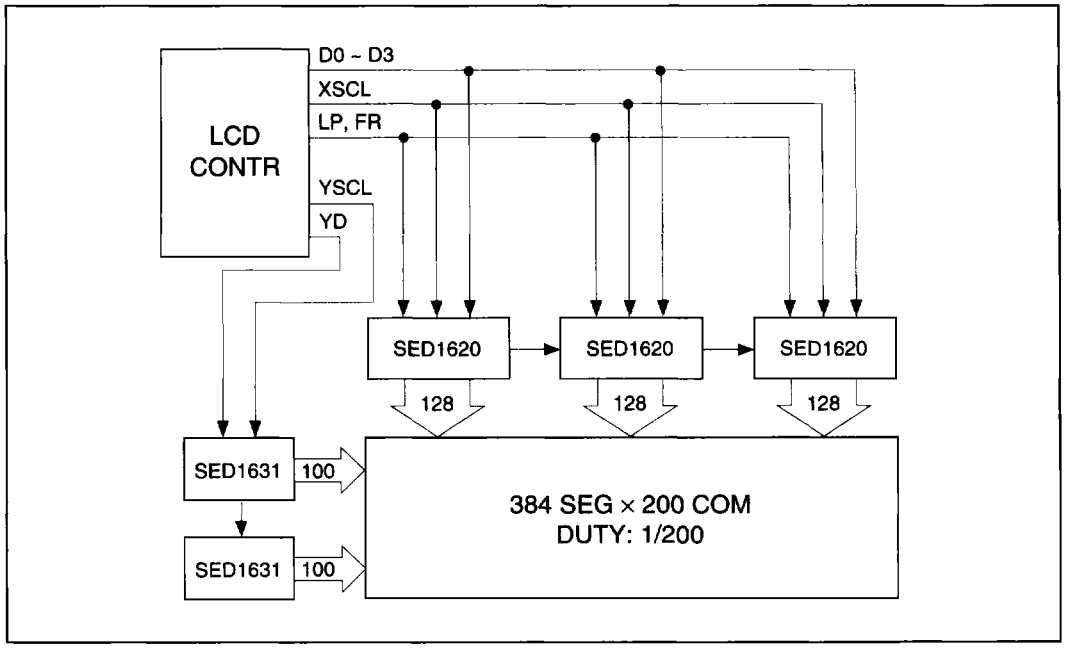
The SED1631 is a 100 output dot matrix LCD common (row) driver for driving a high-capacity LCD panel at duty cycles higher than 1/64 (up to 1/300). The LSI has a wide range of LCD driving voltages. Due to the architecture of the SED1631, the LCD driving voltage V0 is isolated from V_{DD}. This provides the ability to adjust the offset bias independently of V_{DD}. These unique features allow the SED1631 to interface with a variety of LCD panels.

The SED1631 is used in conjunction with the SED1600 (80 segment driver), the SED1601 (80 segment driver) and the SED1620 (128 segment driver) to drive a large-capacity dot matrix LCD panel.

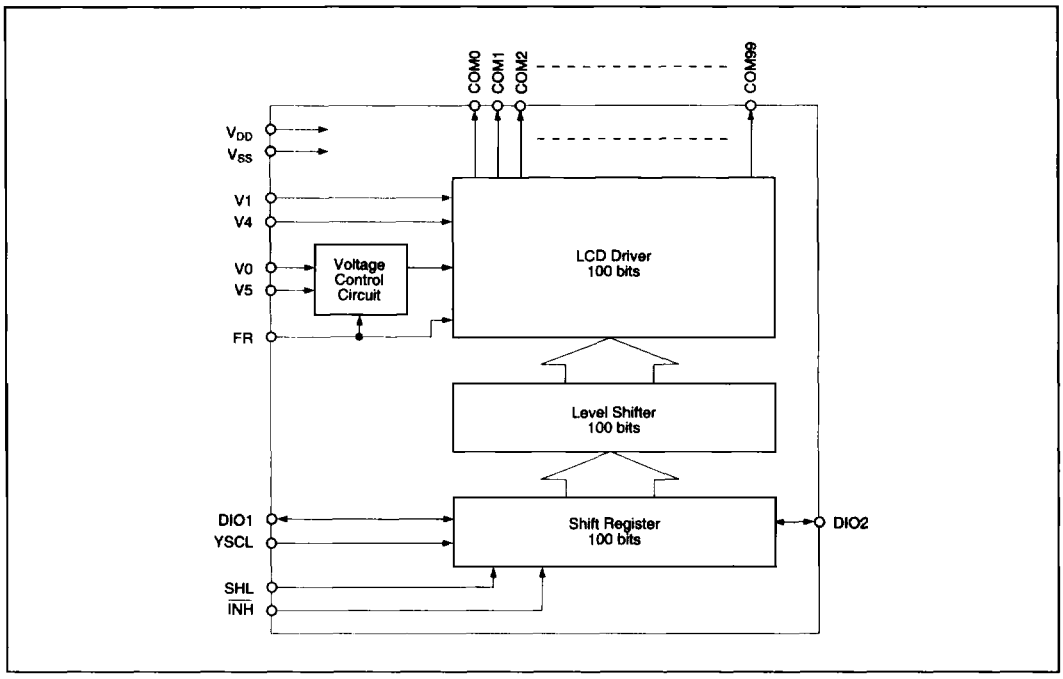
■ FEATURES

- Low-power CMOS technology
- 100-bit common (row) driver
- Duty cycle ..... 1/64 to 1/300
- Display blanking available
- Shift clock frequency ..... 2MHz max
- Ability to adjust offset bias of the LCD source from V_{DD}
- Selectable output shift direction
- Wide range of LCD voltage .... 12V to 28V
- Supply voltage ..... 5.0V ± 10%
- Package ..... DIE: .. Al pad (D_{0A})
  Au bump (D_{0B})

■ SYSTEM BLOCK DIAGRAM



■ BLOCK DIAGRAM



■ PIN DESCRIPTION

Pin Name	I/O	Function
COM0 to COM99	100 to 112 1 to 96	LCD drive common outputs.
$\overline{INH}$	98	Active low blanking control input.
YSCL	100	Data is shifted into the driver on the falling edge of this signal.
DI01,DI02	108, 97	Serial data input/output pins. Configured by SHL.
SHL	101	Shift direction and input/output select input. SHL: L → COM 0 → 99, DIO 1 = input, DIO 2 = output SHL: H → COM 99 → 0, DIO 1 = output, DIO 2 = input
FR	99	LCD AC drive signal input.
VDD, VSS	102, 103	Logic power inputs.
V0, V1, V4, V5	104, 105, 106, 107	LCD drive power inputs.

■ ELECTRICAL CHARACTERISTICS

● Absolute Maximum Ratings

(V_{DD} = 0 V)

Parameter	Symbol	Ratings	Unit
Supply voltage (1)	V_{SS}	−7.0 to 0.3	V
Supply voltage (2)	V5	−30.0 to 0.3	V
Supply voltage (3)	V0, V1, V4	V5 −0.3 to 0.3	V
Input voltage	V_I	Vss −0.3 to 0.3	V
Output voltage	V_O	Vss −0.3 to 0.3	V
Output current (1)	I_O	20	mA
Output current (2)	I_{OCOM}	20	mA
Power dissipation	P_D	300	mW
Operating temperature	T_{opr}	−20 to 75	°C
Storage temperature	T_{stg}	−65 to 150	°C

Notes: 1. All voltages are given relative to V_{DD} = 0 V

2. V0,V1 and V4 must satisfy the condition $V_{DD} \geq V0 \geq V1 \geq V4 \geq V5$
3. Exceeding the absolute maximum ratings can cause permanent damage to the device. Functional operation under these conditions is not implied.
4. Moisture resistance of flat package can be reduced by the soldering process. Care should be taken to avoid thermally stressing the package during board assembly.

● DC Electrical Characteristics

(Unless otherwise stated, V_{DD} = V0 = 0V, V_{SS} = –5.0V ± 10%, T_a = –20 to 75°C)

Parameter	Symbol	Condition	Pin	Min	Typ	Max	Unit
Operating voltage (1)	V_{SS}		V_{SS}	–5.5	–5.0	–4.5	V
Recommended operating voltage	V5		V5	–28.0	—	–12.0	V
Minimum operating voltage				—	—	–8.0	V
Operating voltage (2)	V0	Recommended value	V0	–2.5	—	0	V
Operating voltage (3)	V1	Recommended value	V1	2/9·V5	—	V_{DD}	V
Operating voltage (4)	V4	Recommended value	V4	V5	—	7/9·V5	V
High level input voltage	V_{IH}		DIO1, DIO2, YSCL, FR, SHL, INH	—	—	—	V
Low level input voltage	V_{IL}			—	—	0.8V_{SS}	V
High level output voltage	V_{OH}	I_{OH} = –0.3 mA	DIO1, DIO2	–0.4	—	—	V
Low level output voltage	V_{OL}	I_{OL} = 0.3 mA		—	—	V_{SS}+0.4	V
Input leakage current	V_{LI}	$V_{SS} \le V_I \le 0V$	YSCL, SHL, INH, FR	—	—	2.0	µA
	$V_{LI/O}$	$V_{SS} \le V_I \le 0V$	DIO1, DIO2	—	—	5.0	µA
Stand-by current	I_{DDS}	V5 = –12.0 to –28.0 V, V_{IH} = V_{DD}, V_{IL} = V_{SS}	V_{DD}	—	—	25	µA
Output resistance	R_{COM}	|ΔV_{ON}| = 0.5V, V5=–20.0V	V1, V4 Output level	—	0.40	0.80	kΩ
		V5=–14.0V			0.50	1.00	
		V5=–0.8V	COM0 to COM99		(0.60)	(1.20)	
		V5=–20.0V	V0, V5 Output level	—	0.60	1.20	
		V5=–14.0V			0.70	1.40	
		V5=–8.0V	COM0 to COM99		(0.90)	(1.20)	
Current dissipation (1)	I_{SS1}	V_{SS} = –5.0 V, V_{IH} = V_{DD}, V = V_{SS}, f_{YSCL} = 12 kHz, Frame frequency = 60 Hz; Input data inverted bit by bit, No-load	V_{SS}	—	7	15.0	µA
Current dissipation (2)	I_{SS2}	V_{SS} = –5.0 V, V1 = –2.0 V, V4 = –18.0 V, V5 = –20.0 V, All other conditions are same as I_{SS1}	V5	—	7	15.0	µA
Input capacitance	C_I	T_a = 25°C	YSCL, SHL, INH, FR	—	—	8.0	pF
	$C_{I/O}$		DIO1, DIO2	—	—	15.0	pF

● AC Electrical Characteristics

○ Input Timing

(V_{SS} = –5.0 V ± 10%, T_a = –20 to 75°C)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
YSCL period	t_{CCL}		500	—	—	ns
YSCL High-level pulse width	t_{WCLH}		70	—	—	ns
YSCL Low-level pulse width	t_{WCLL}		330	—	—	ns
Data setup time	t_{DS}		100	—	—	ns
Data hold time	t_{DH}		10	—	—	ns
Allowable FR delay time	t_{DFR}		–500	—	500	ns
Input signal rise time	t_r		—	—	50	ns
Input signal fall time	t_f		—	—	50	ns

● AC Electrical Characteristics

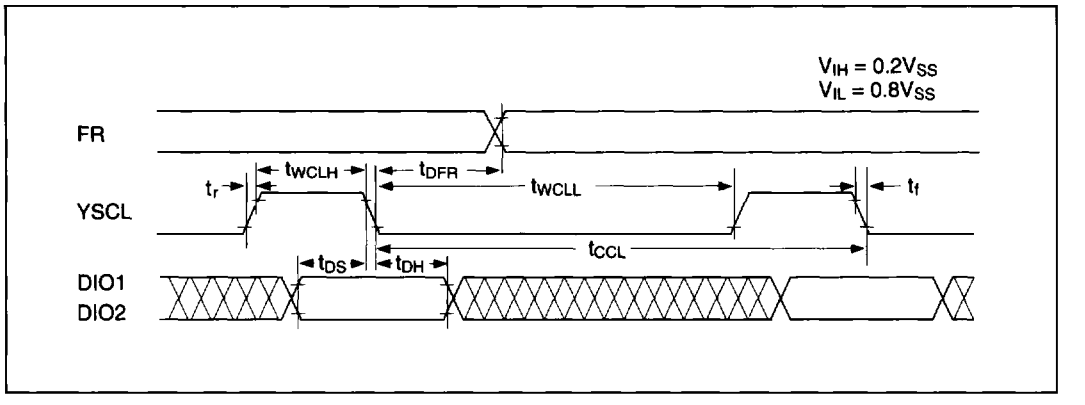
○ Output Timing

(V_{SS} = –5.0 V ±10%, T_a = –20 to 75°C)

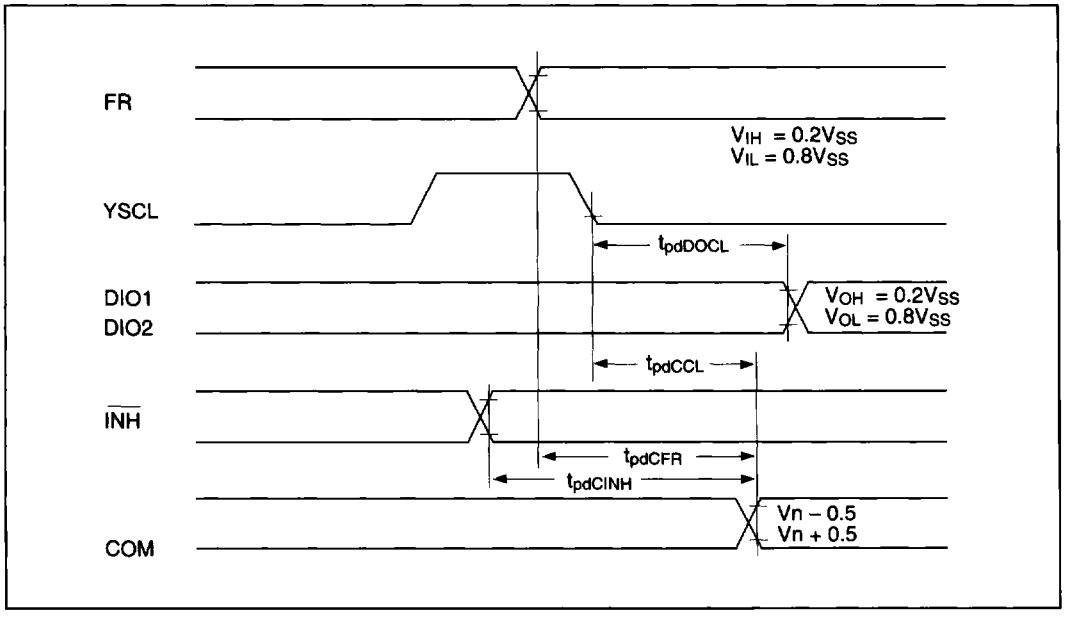
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
(YSCL-fall to DIO) Delay time	t_{pdDOCL}	C_L = 15 pF	30	—	300	ns
(YSCL-fall to COM output) Delay time	t_{pdCCL}	V5 = –12.0 to –28.0 V C_L = 100 pF	—	—	3.0	µs
($\overline{INH}$ to COM output) Delay time	t_{pdCINH}		—	—	3.0	µs
(FR to COM output) Delay time	t_{pdCFR}		—	—	3.0	µs

● Timing Chart

○ Input Timing

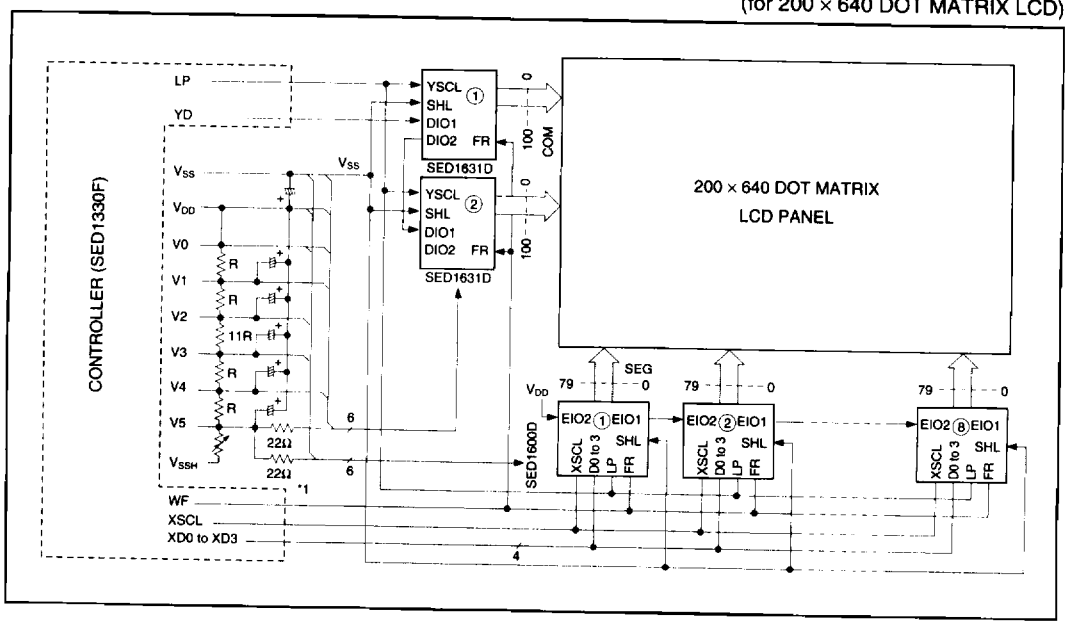


○ Output Timing



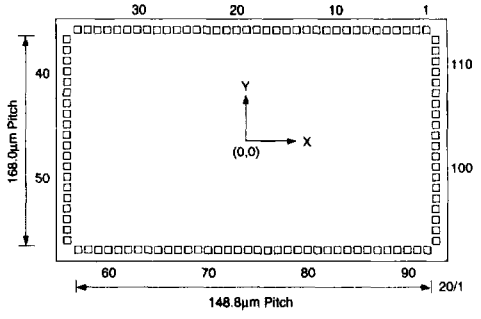
■ EXAMPLE OF APPLICATION

(for 200 × 640 DOT MATRIX LCD)



Note: * Be sure to connect a current limiter resistor. Also, connect decoupling capacitors (0.01 μF) near pins Vss and V5 of each LSI for noise protection.

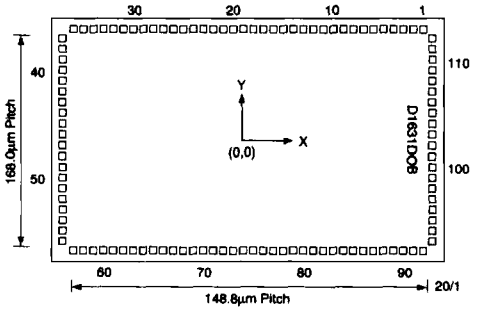
■ PAD LAYOUT (SED1631D0A)



Chip size	6.03mm × 4.01mm
Chip thickness	0.400mm ±0.025mm
Pad Size	108mm × 110mm (X) (Y)

Pad No.	Pad Name	X (µm)	Y (µm)	Pad No.	Pad Name	X (µm)	Y (µm)	Pad No.	Pad Name	X (µm)	Y (µm)
1	COM5	2604	1839	39	COM43	-2847	1260	77	COM81	372	-1839
2	COM6	2455	1839	40	COM44	-2847	1092	78	COM82	521	-1839
3	COM7	2306	1839	41	COM45	-2847	924	79	COM83	670	-1839
4	COM8	2158	1839	42	COM46	-2847	756	80	COM84	818	-1839
5	COM9	2009	1839	43	COM47	-2847	588	81	COM85	967	-1839
6	COM10	1860	1839	44	COM48	-2847	420	82	COM86	1116	-1839
7	COM11	1711	1839	45	COM49	-2847	252	83	COM87	1265	-1839
8	COM12	1562	1839	46	COM50	-2847	84	84	COM88	1414	-1839
9	COM13	1414	1839	47	COM51	-2847	-84	85	COM89	1562	-1839
10	COM14	1265	1839	48	COM52	-2847	-252	86	COM90	1711	-1839
11	COM15	1116	1839	49	COM53	-2847	-420	87	COM91	1860	-1839
12	COM16	967	1839	50	COM54	-2847	-588	88	COM92	2009	-1839
13	COM17	818	1839	51	COM55	-2847	-756	89	COM93	2158	-1839
14	COM18	670	1839	52	COM56	-2847	-924	90	COM94	2306	-1839
15	COM19	521	1839	53	COM57	-2847	-1092	91	COM95	2455	-1839
16	COM20	372	1839	54	COM58	-2847	-1260	92	COM96	2604	-1839
17	COM21	223	1839	55	COM59	-2847	-1428	93	COM97	2847	-1596
18	COM22	74	1839	56	COM60	-2847	-1596	94	COM98	2847	-1428
19	COM23	-74	1839	57	COM61	-2604	-1834	95	COM99	2847	-1260
20	COM24	-223	1839	58	COM62	-2455	-1834	96	DIO2	2847	-1092
21	COM25	-372	1839	59	COM63	-2306	-1834	97	INH	2847	-924
22	COM26	-521	1839	60	COM64	-2158	-1834	98	FR	2847	-756
23	COM27	-670	1839	61	COM65	-2009	-1839	99	YSCL	2847	-508
24	COM28	-818	1839	62	COM66	-1860	-1839	100	SHL	2847	-420
25	COM29	-967	1839	63	COM67	-1711	-1839	101	VDD	2847	-252
26	COM30	-1116	1839	64	COM68	-1562	-1839	102	VSS	2847	-84
27	COM31	-1265	1839	65	COM69	-1414	-1839	103	V0	2847	84
28	COM32	-1414	1839	66	COM70	-1265	-1839	104	V1	2847	252
29	COM33	-1562	1839	67	COM71	-1116	-1839	105	V4	2847	420
30	COM34	-1711	1839	68	COM72	-967	-1839	106	V5	2847	588
31	COM35	-1860	1839	69	COM73	-818	-1839	107	DIO1	2847	756
32	COM36	-2009	1839	70	COM74	-670	-1839	108	COM0	2847	924
33	COM37	-2158	1839	71	COM75	-521	-1839	109	COM1	2847	1092
34	COM38	-2306	1839	72	COM76	-372	-1839	110	COM2	2847	1260
35	COM39	-2455	1839	73	COM77	-223	-1839	111	COM3	2847	1428
36	COM40	-2604	1839	74	COM78	-74	-1839	112	COM4	2847	1596
37	COM41	-2847	1596	75	COM79	74	-1839				
38	COM42	-2847	1428	76	COM80	223	-1839				

■ PAD LAYOUT (SED1631D0B)



Chip size	6.03mm × 4.01mm
Chip thickness	0.525mm ±0.025mm
Bump size	117µm × 105µm ±20µm
Bump height	20mm + 10/5µm

Pad		X	Y	Pad		X	Y	Pad		X	Y
No.	Name	(µm)	(µm)	No.	Name	(µm)	(µm)	No.	Name	(µm)	(µm)
1	COM5	2604	1834	39	COM43	-2842	1260	77	COM81	372	-1834
2	COM6	2455	1834	40	COM44	-2842	1092	78	COM82	521	-1834
3	COM7	2306	1834	41	COM45	-2842	924	79	COM83	670	-1834
4	COM8	2158	1834	42	COM46	-2842	756	80	COM84	818	-1834
5	COM9	2009	1834	43	COM47	-2842	588	81	COM85	967	-1834
6	COM10	1860	1834	44	COM48	-2842	420	82	COM86	1116	-1834
7	COM11	1711	1834	45	COM49	-2842	252	83	COM87	1265	-1834
8	COM12	1562	1834	46	COM50	-2842	84	84	COM88	1414	-1834
9	COM13	1414	1834	47	COM51	-2842	-84	85	COM89	1562	-1834
10	COM14	1265	1834	48	COM52	-2842	-252	86	COM90	1711	-1834
11	COM15	1116	1834	49	COM53	-2842	-420	87	COM91	1860	-1834
12	COM16	967	1834	50	COM54	-2842	-588	88	COM92	2009	-1834
13	COM17	818	1834	51	COM55	-2842	-756	89	COM93	2158	-1834
14	COM18	670	1834	52	COM56	-2842	-924	90	COM94	2306	-1834
15	COM19	521	1834	53	COM57	-2842	-1092	91	COM95	2455	-1834
16	COM20	372	1834	54	COM58	-2842	-1260	92	COM96	2604	-1834
17	COM21	223	1834	55	COM59	-2842	-1428	93	COM97	2842	-1596
18	COM22	74	1834	56	COM60	-2842	-1596	94	COM98	2842	-1428
19	COM23	-74	1834	57	COM61	-2604	-1834	95	COM99	2842	-1260
20	COM24	-223	1834	58	COM62	-2455	-1834	96	DIO2	2842	-1092
21	COM25	-372	1834	59	COM63	-2306	-1834	97	INH	2842	-924
22	COM26	-521	1834	60	COM64	-2158	-1834	98	FR	2842	-756
23	COM27	-670	1834	61	COM65	-2009	-1834	99	YSCL	2842	-588
24	COM28	-818	1834	62	COM66	-1860	-1834	100	SHL	2842	-420
25	COM29	-967	1834	63	COM67	-1711	-1834	101	VDD	2842	-252
26	COM30	-1116	1834	64	COM68	-1562	-1834	102	VSS	2842	-84
27	COM31	-1265	1834	65	COM69	-1414	-1834	103	V0	2842	84
28	COM32	-1414	1834	66	COM70	-1265	-1834	104	V1	2842	252
29	COM33	-1562	1834	67	COM71	-1116	-1834	105	V4	2842	420
30	COM34	-1711	1834	68	COM72	-967	-1834	106	V5	2842	588
31	COM35	-1860	1834	69	COM73	-818	-1834	107	DIO1	2842	756
32	COM36	-2009	1834	70	COM74	-670	-1834	108	COM0	2842	924
33	COM37	-2158	1834	71	COM75	-521	-1834	109	COM1	2842	1092
34	COM38	-2306	1834	72	COM76	-372	-1834	110	COM2	2842	1260
35	COM39	-2455	1834	73	COM77	-223	-1834	111	COM3	2842	1428
36	COM40	-2604	1834	74	COM78	-74	-1834	112	COM4	2842	1596
37	COM41	-2842	1596	75	COM79	74	-1834				
38	COM42	-2842	1428	76	COM80	223	-1834				