PRELIMINARY

1/4 DUTY LCD DRIVER

GENERAL DESCRIPTION

PACKAGE OUTLINE

The NJU6439 is a 1/4 duty LCD driver for segment type LCD panel.

The LCD driver consists of 4-common and 40-segment drives up to 160 segments.

The rectangle outline is useful the COG applications.

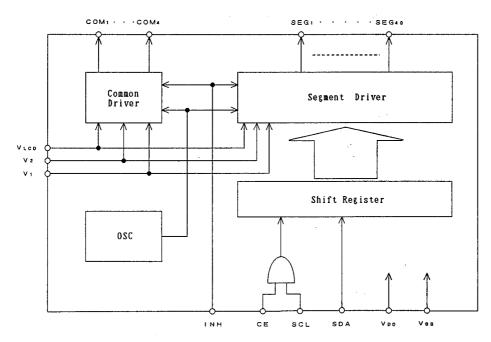


NJU6439C

FEATURES

- 40 Segment Drivers
- Duty and Bias Ratio : 1/4Duty, 1/3Bias (up to 160 segments)
- Serial Data Transmission (Shift Clock 2MHz max.)
- Oscillation Circuit On-chip
- Display Off Function (INH Terminal)
- Operating Voltage --- 2.4~3.6V
- LCD Driving Voltage ---- 6.0V Max.
- Package Outline ---- Chip / Bumped Chip
- C-MOS Technology

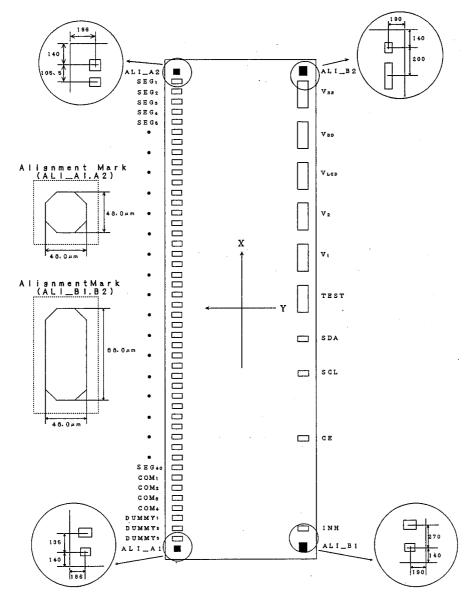
BLOCK DIAGRAM



5



PAD LOCATION



Chip size	: 5.12mm x 1.56mm	
Chip center	: X=0μm, Y=0μm	4th Mark is the Alignment Mark.
Chip thickness	$: 400 \pm 30 \mu \mathrm{m} $	
Pad size		The Alignment Mark is useful the
	$V_1, V_2, V_{LCD}, V_{DD}, V_{SS}$ Terminal is 250 μ m x 100 μ m	COG Asembly.
Bump height	: 25μ mTYP.	
Bump material	: Au	

COORDINATES

Chip Size 5. 12x1. 56mm(Chip Center X=0 μ m, Y=0 μ m)NoPAD NAMEX=(μ m)Y=(μ m)

1 INH -2150.0 -590.0 32 SEG22 214.5 2 CE -1240.0 -590.0 33 SEG23 114.5 3 SCL -494.0 -590.0 34 SEG24 14.5 4 SDA -178.0 -590.0 35 SEG25 -85.5 5 TEST 206.0 -590.0 36 SEG27 -285.5 6 V1 660.0 -590.0 38 SEG27 -285.5 7 V2 1040.0 -590.0 39 SEG28 -485.5 8 VLcb 1430.0 -590.0 40 SEG30 -585.5 10 Vss 2220.0 -590.0 41 SEG31 -685.5 11 SEG2 2214.5 594.0 43 SEG32 -785.5 12 SEG2 2214.5 594.0 44 SEG34 -985.5 13 SEG4 2014.5 594.0 45 SEG	No	PAD NAME	X=(μm)	Y=(μm)	No	PAD NAME	X=(µm)	Y=(μm)
L L L L	1	I NH	-2150.0	- 590.0	32	SEG 2 2	214.5	594.0
3 502 178.0 - 590.0 35 SEGzs - 85.5 5 TEST 206.0 - 590.0 36 SEGzs - 185.5 6 V1 660.0 - 590.0 37 SEGzs - 285.5 7 Vz 1040.0 - 590.0 38 SEGzs - 385.5 8 VLcD 1430.0 - 590.0 39 SEGzs - 485.5 9 Vod 1820.0 - 590.0 40 SEGso - 585.5 10 Vss 2220.0 - 590.0 41 SEGso - 685.5 11 SEG1 2314.5 594.0 42 SEGso - 785.5 12 SEG2 2214.5 594.0 43 SEGso - 985.5 13 SEG2 2014.5 594.0 45 SEGso - 1085.5 15 SEGs 1914.5 594.0 46 SEGso - 1285.5 16 SEGs 1614.5 594.0 <td< td=""><td>2</td><td>CE</td><td>-1240.0</td><td>- 590.0</td><td>33</td><td>SEG 2 3</td><td>114.5</td><td>594.0</td></td<>	2	CE	-1240.0	- 590.0	33	SEG 2 3	114.5	594.0
5TEST 206.0 -590.0 36 SEG_{28} -185.5 6V1 660.0 -590.0 37 SEG_{27} -285.5 7V2 1040.0 -590.0 38 SEG_{28} -385.5 8VLCD 1430.0 -590.0 39 SEG_{28} -485.5 9Vod 1820.0 -590.0 40 SEG_{30} -585.5 10Vss 2220.0 -590.0 41 SEG_{30} -585.5 11 SEG_1 2314.5 594.0 42 SEG_{32} -785.5 12 SEG_2 2214.5 594.0 43 SEG_{34} -985.5 13 SEG_3 2114.5 594.0 44 SEG_{34} -985.5 14 SEG_4 2014.5 594.0 45 SEG_{38} -1085.5 15 SEG_8 1914.5 594.0 46 SEG_{38} -1185.5 16 SEG_8 1814.5 594.0 47 SEG_{39} -1485.5 17 SEG_7 1714.5 594.0 48 SEG_{39} -1485.5 19 SEG_8 1614.5 594.0 49 SEG_{39} -1485.5 20 SEG_{10} 1414.5 594.0 50 $SEG_{4.0}$ -1585.5 21 SEG_{11} 1314.5 594.0 51 COM_1 -1685.5 22 SEG_{12} 1214.5 594.0 53 COM_4 -1985.5 23 SEG_{13} $1114.$	3	SCL	- 494.0	- 590.0	34	SEG24	14.5	594.0
6V1660.0 -590.0 37SEG27 -285.5 7V21040.0 -590.0 38SEG28 -385.5 8VLCD1430.0 -590.0 39SEG29 -485.5 9Vod1820.0 -590.0 40SEG30 -585.5 10Vss2220.0 -590.0 41SEG31 -685.5 11SEG12314.5594.042SEG32 -785.5 12SEG22214.5594.043SEG33 -885.5 13SEG32114.5594.044SEG34 -985.5 14SEG42014.5594.045SEG35 -1185.5 15SEG51914.5594.046SEG35 -1185.5 16SEG31814.5594.047SEG37 -1285.5 17SEG71714.5594.048SEG39 -1485.5 18SEG31614.5594.049SEG39 -1485.5 20SEG101414.5594.050SEG40 -1585.5 21SEG111314.5594.053COM4 -1985.5 23SEG131114.5594.054COM4 -1985.5 24SEG141014.5594.055DUMMY1 $\$ 2085.52625SEG18814.5594.057DUMMY1 $\$ 2285.52626SEG18814.5594.057DUMMY1 $\$ 2285.526SEG18814.5 </td <td>4</td> <td>SDA</td> <td>- 178.0</td> <td>- 590.0</td> <td>35</td> <td>SEG25</td> <td>- 85.5</td> <td>594.0</td>	4	SDA	- 178.0	- 590.0	35	SEG25	- 85.5	594.0
7 V_2 1040.0- 590.038SEG2s- 385.58 V_{LCD} 1430.0- 590.039SEG2s- 485.59 V_{DD} 1820.0- 590.040SEG30- 585.510 V_{SS} 2220.0- 590.041SEG31- 685.511SEG12314.5594.042SEG32- 785.512SEG22214.5594.043SEG33- 885.513SEG32114.5594.044SEG34- 985.514SEG42014.5594.045SEG35-1085.515SEG51914.5594.046SEG35-1185.516SEG51814.5594.047SEG37-1285.517SEG71714.5594.048SEG39-1485.518SEG91514.5594.049SEG39-1485.520SEG101414.5594.050SEG40-1585.521SEG111314.5594.051COM1-1685.522SEG121214.5594.053COM2-1785.523SEG131114.5594.055DUMMY1 \divideontimes -2085.524SEG141014.5594.055DUMMY1 \divideontimes -2085.525SEG15914.5594.057DUMMY1 \divideontimes -2085.526SEG15814.5594.057DUMMY1 \divideontimes -2085.525SEG15814.5	5	TEST	206.0	- 590.0	36	SEG 2 6	- 185.5	594.0
8 VLCD 1430.0 - 590.0 39 SEG20 - 485.5 9 Vod 1820.0 - 590.0 40 SEG30 - 585.5 10 Vss 2220.0 - 590.0 41 SEG30 - 585.5 11 SEG1 2314.5 594.0 42 SEG32 - 785.5 12 SEG2 2214.5 594.0 43 SEG33 - 885.5 13 SEG3 2114.5 594.0 44 SEG34 - 985.5 14 SEG4 2014.5 594.0 45 SEG38 -1185.5 15 SEG5 1914.5 594.0 46 SEG38 -1185.5 16 SEG6 1814.5 594.0 47 SEG37 -1285.5 17 SEG7 1714.5 594.0 48 SEG39 -1485.5 18 SEG3 1514.5 594.0 50 SEG40 -1585.5 20 SEG10 1414.5 594.0	6	V1	660.0	- 590.0	37	SEG 27	- 285.5	594.0
9 Voo 1820.0 - 590.0 40 SEGso - 585.5 10 Vss 2220.0 - 590.0 41 SEGs1 - 685.5 11 SEG1 2314.5 594.0 42 SEGs2 - 785.5 12 SEG2 2214.5 594.0 43 SEGs2 - 785.5 13 SEGs 2114.5 594.0 44 SEGs2 - 985.5 14 SEGs 2114.5 594.0 45 SEGss - 985.5 14 SEGs 1914.5 594.0 45 SEGss - 1085.5 15 SEGs 1914.5 594.0 46 SEGss - 1185.5 16 SEGs 1814.5 594.0 47 SEGs7 -1285.5 17 SEGs 1614.5 594.0 48 SEGs9 -1185.5 18 SEGs 1614.5 594.0 50 SEGs.9 -1485.5 20 SEG10 1414.5 594.0	7	V2	1040.0	- 590.0	38	SEG 28	- 385.5	594.0
10 Vss 2220.0 - 590.0 41 SEGa1 - 685.5 11 SEG1 2314.5 594.0 42 SEGa2 - 785.5 12 SEG2 2214.5 594.0 43 SEGa3 - 885.5 13 SEGs 2114.5 594.0 44 SEG34 - 985.5 14 SEG4 2014.5 594.0 45 SEG35 -1085.5 15 SEGs 1914.5 594.0 46 SEG35 -1085.5 16 SEG5 1914.5 594.0 47 SEG37 -1285.5 17 SEG7 1714.5 594.0 48 SEG39 -1185.5 18 SEG6 1614.5 594.0 49 SEG39 -1485.5 20 SEG10 1414.5 594.0 50 SEG40 -1585.5 21 SEG11 1314.5 594.0 52 COM1 -1685.5 22 SEG12 1214.5 594.0	8	VLCD	1430.0	- 590.0	39	SEG 2 9	- 485.5	594.0
11 SEG: 2314.5 594.0 42 SEG32 - 785.5 12 SEG2 2214.5 594.0 43 SEG33 - 885.5 13 SEG3 2114.5 594.0 44 SEG34 - 985.5 14 SEG4 2014.5 594.0 45 SEG35 -1085.5 15 SEG5 1914.5 594.0 46 SEG35 -1185.5 16 SEG5 1914.5 594.0 47 SEG37 -1285.5 16 SEG5 1814.5 594.0 48 SEG35 -1185.5 17 SEG7 1714.5 594.0 48 SEG35 -1385.5 18 SEG6 1614.5 594.0 50 SEG4.0 -1585.5 20 SEG10 1414.5 594.0 50 SEG4.0 -1785.5 21 SEG12 1214.5 594.0 53 COM1 -1685.5 23 SEG13 1114.5 594.0	9	Voo	1820.0	- 590.0	40	SEG₃₀	- 585.5	594.0
11 DEAR D	10	Vss	2220.0	- 590.0	41	SEG 3 1	- 685.5	594.0
13 SEGs 2114.5 594.0 44 SEGs4 - 985.5 14 SEGs 2014.5 594.0 45 SEGs5 -1085.5 15 SEGs 1914.5 594.0 46 SEGs5 -1185.5 16 SEGs 1814.5 594.0 47 SEGs7 -1285.5 17 SEG7 1714.5 594.0 48 SEGs8 -1185.5 18 SEGs 1614.5 594.0 48 SEGs9 -1285.5 19 SEGs 1514.5 594.0 49 SEGs9 -1485.5 20 SEG10 1414.5 594.0 51 COM1 -1685.5 21 SEG11 1314.5 594.0 52 COM2 -1785.5 22 SEG12 1214.5 594.0 53 COM4 -1985.5 23 SEG13 1114.5 594.0 55 DUMMY1 & -2085.5 2 24 SEG13 914.5 594.0	11	SEG1	2314.5	594.0	42	SEG 3 2	- 785.5	594.0
10 SEGa 2014.5 594.0 45 SEGas -1085.5 15 SEGs 1914.5 594.0 46 SEGas -1185.5 16 SEGs 1814.5 594.0 47 SEGas -1185.5 17 SEGr 1714.5 594.0 48 SEGas -1285.5 17 SEGr 1714.5 594.0 48 SEGas -1185.5 18 SEGas 1614.5 594.0 49 SEGas -1185.5 19 SEGas 1514.5 594.0 49 SEGas -1185.5 20 SEGi 0 1414.5 594.0 50 SEGa 0 -1585.5 21 SEGi 1 1314.5 594.0 52 COM1 -1685.5 23 SEGi 2 1214.5 594.0 53 COM2 -1785.5 24 SEGi 8 1114.5 594.0 55 DUMMY1 ※ -2085.5 25 SEGi 8 814.5 594.0 <td>12</td> <td>SEG2</td> <td>2214.5</td> <td>594.0</td> <td>43</td> <td>SEG₃₃</td> <td>- 885.5</td> <td>594.0</td>	12	SEG2	2214.5	594.0	43	SEG₃₃	- 885.5	594.0
11 DEG 1914.5 594.0 46 SEGs 1185.5 16 SEGs 1814.5 594.0 47 SEGs7 -1285.5 17 SEG7 1714.5 594.0 48 SEGs8 -1185.5 18 SEGs 1614.5 594.0 48 SEGs8 -1485.5 19 SEGs 1514.5 594.0 49 SEGs9 -1485.5 20 SEG10 1414.5 594.0 50 SEG40 -1585.5 21 SEG11 1314.5 594.0 52 COM1 -1685.5 22 SEG12 1214.5 594.0 53 COM2 -1785.5 22 SEG12 1214.5 594.0 53 COM3 -1885.5 23 SEG12 1214.5 594.0 54 COM4 -1985.5 24 SEG14 1014.5 594.0 55 DUMMY1 X -2085.5 25 SEG15 914.5 594.0	13	SEG₃	2114.5	594.0	44	SEG₃₄	- 985.5	594.0
16 SEGs 1814.5 594.0 47 SEGs7 -1285.5 17 SEG7 1714.5 594.0 48 SEG38 -1385.5 18 SEG8 1614.5 594.0 49 SEG38 -1485.5 19 SEG9 1514.5 594.0 49 SEG38 -1585.5 20 SEG10 1414.5 594.0 50 SEG40 -1585.5 21 SEG11 1314.5 594.0 52 COM2 -1785.5 22 SEG12 1214.5 594.0 53 COM3 -1885.5 23 SEG13 1114.5 594.0 54 COM4 -1985.5 24 SEG13 1114.5 594.0 55 DUMMY1 ※ -2085.5 25 SEG13 914.5 594.0 56 DUMMY2 ※ -2185.5 26 SEG13 814.5 594.0 57 DUMMY3 ※ -2285.5 27 SEG13 614.5 594.0	14	SEG₄	2014.5	594.0	45	SEGas	-1085.5	594.0
10 SEG7 1714.5 594.0 48 SEG38 -1385.5 18 SEG8 1614.5 594.0 49 SEG38 -1485.5 19 SEG9 1514.5 594.0 49 SEG38 -1485.5 20 SEG10 1414.5 594.0 50 SEG40 -1585.5 20 SEG11 1314.5 594.0 51 COM1 -1685.5 21 SEG11 1314.5 594.0 52 COM2 -1785.5 22 SEG12 1214.5 594.0 53 COM3 -1885.5 23 SEG12 1214.5 594.0 54 COM4 -1985.5 24 SEG14 1014.5 594.0 55 DUMMY1 ※ -2085.5 25 SEG15 914.5 594.0 56 DUMMY2 ※ -2185.5 26 SEG16 814.5 594.0 57 DUMMY3 ※ -2285.5 27 SEG17 714.5 594.0	15	SEG₅	1914.5	594.0	46	SEG36	-1185.5	594.0
11 OLGG 11110 OLGG 1110 OLGG OLGG 1110 OLGG 1110 OLGG OLGG 1110 OLGG 1110 OLGG OLGG 1110 OLGG OLGG 1110 OLGG 1110 Interval Interval< Interval< Interval< Interval< Interval Interval <thinterval< t<="" td=""><td>16</td><td>SEG₅</td><td>1814.5</td><td>594.0</td><td>47</td><td>SEG 37</td><td>-1285.5</td><td>594.0</td></thinterval<>	16	SEG₅	1814.5	594.0	47	SEG 37	-1285.5	594.0
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20 SEG10 11110 504.0 52 COM2 -1785.5 21 SEG11 1314.5 594.0 52 COM2 -1785.5 22 SEG12 1214.5 594.0 53 COM3 -1885.5 23 SEG13 1114.5 594.0 54 COM4 -1985.5 24 SEG14 1014.5 594.0 55 DUMMY1 32 -2085.5 25 SEG15 914.5 594.0 56 DUMMY2 32 -2185.5 26 SEG16 814.5 594.0 57 DUMMY3 32 -2285.5 27 SEG17 714.5 594.0 AL1_A1 -2420.0 28 SEG18 614.5 594.0 AL1_A2 2420.0	19	SEG»	1514.5	594.0	50	SEG40	-1585.5	594.0
21 SEG1 1214.5 594.0 53 COMs -1885.5 23 SEG1 2 1214.5 594.0 54 COMs -1985.5 23 SEG1 3 1114.5 594.0 54 COM4 -1985.5 24 SEG1 4 1014.5 594.0 55 DUMMY1 2000 -2085.5 25 SEG1 5 914.5 594.0 56 DUMMY2 2000 -2185.5 26 SEG1 5 814.5 594.0 57 DUMMY3 2000 -2285.5 27 SEG1 7 714.5 594.0 AL1_A1 -2420.0 28 SEG1 8 614.5 594.0 AL1_A2 2420.0	20	SEG1 0	1414.5	594.0	51	COM1	-1685.5	594.0
ZZ SEG12 12110 504.0 54 COM4 -1985.5 Z3 SEG13 1114.5 594.0 54 COM4 -1985.5 Z4 SEG14 1014.5 594.0 55 DUMMY1 ※ -2085.5 Z5 SEG15 914.5 594.0 56 DUMMY2 ※ -2185.5 Z6 SEG16 814.5 594.0 57 DUMMY3 ※ -2285.5 Z7 SEG17 714.5 594.0 AL1_A1 -2420.0 Z8 SEG18 614.5 594.0 AL1_A2 2420.0	21	SEG11	1314.5	594.0	52	COM2	-1785.5	594.0
24 SEG1 4 1014.5 594.0 55 DUMMY1 ※ -2085.5 25 SEG1 5 914.5 594.0 56 DUMMY2 ※ -2185.5 26 SEG1 6 814.5 594.0 57 DUMMY3 ※ -2285.5 27 SEG1 7 714.5 594.0 ALI_A1 -2420.0 28 SEG1 8 614.5 594.0 ALI_A2 2420.0	22	SEG1 2	1214.5	594.0	53	COM3	-1885.5	594.0
21 DEG10 10110 50100 50100 50100	23	SEG1 3	1114.5	594.0	54	COM4	-1985.5	594.0
26 SEG1 8 814.5 594.0 57 DUMMY3 ¾ -2285.5 27 SEG1 7 714.5 594.0 AL1_A1 -2420.0 28 SEG1 8 614.5 594.0 AL1_A2 2420.0	24	SEG1 4	1014.5	-594.0	55	DUMMY1 💥	-2085.5	594.0
20 SEG10 OTAL Seg10 ALI_A1 -2420.0 27 SEG10 614.5 594.0 ALI_A2 2420.0 28 SEG10 614.5 594.0 ALI_A2 2420.0	25	SEG1 5	914.5	594.0	56	DUMMY2 💥	-2185.5	594.0
28 SEG1 # 614.5 594.0 AL1_A2 2420.0	26	SEG1 6	814.5	594.0	57	DUMMY3 💥	-2285.5	594.0
	27	SEG17	714.5	594.0		ALI_A1	-2420.0	594.0
	28	SEG1 #	614.5	594.0		ALI_A2	2420.0	594.0
29 SEG19 514.5 594.0 ALI_B1 -2420.0	29	SEG1 9	514.5	594.0		ALI_B1	-2420.0	- 590.0
30 SEG20 414.5 594.0 AL1_B2 2420.0	30	SEG20	414.5	594.0	AL1_B2		2420.0	- 590.0
31 SEG21 314.5 594.0	31	SEG21	314.5	594.0				

₩DUMMY PAD

TERMINAL DESCRIPTION

NO.	SYMBOL	FUNCTION				
1	INH	Display-Off Control Terminal : When display goes to off, the display data in the shift- register is retained. "H" : Display-Off "L" : Display-On				
2	CE	Chip Enable Signal Input Terminal : "H" : LCD display data "L" : Disable				
3	SCL	Serial Data Transmission Clock Input Terminal : LCD display data are input synchronized SCL clock signal rise edge.				
4	SDA	Serial Data Input Terminal Data input timing : SCL clock rise edge				
6	V ₁	LCD Driver Voltage Adjust Terminal				
7	V2	LCD Driver Voltage Adjust Terminal				
8	VLGD	Power Supply for LCD Driving				
9	VDD	Power Supply (+3V)				
10	Vss	Power Supply (OV)				
11~50	SEG1 ~ SEG40	LCD Segment Output Terminals				
51~54		LCD Common Output Terminals				

FUNCTIONAL DESCRIPTION

(1) Operation of each block

(1-1)Oscillation Circuit :

This circuits supply the basical clock signal to other circuits like as common driver and segment driver.

(1-2)Shift-Register

When the CE terminal is "H" (Enable mode), the display data is transferred to the shift-register synchronized by the shift clock on the SCL terminal.

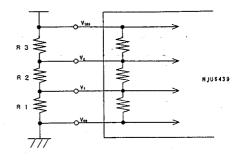
(1-3)Common Divider Circuit

This circuit divides the oscillating signal to generate the common timing.

(1-4) Segment Divider Circuit

This circuit divides the oscillating signal to generate the segment timing.

 (1-5) The LCD Driver Voltage Adjust circuit The incorprate Bleeder Resistance sets 1/3 bias, and LCD Driver ability can be increased by connecting external resistance.



(2) Display Data input timing, correspond to segment and common terminal

When the CE terminal is "H" (Enable mode), the display data is transferred to the shift-register synchronized by the shift clock on the SCL terminal. When the power is turned on, whole data in the shift-resister are "L".

Whole 160bits data transfer to the shift register. When the input data in less than 160bits, parts which bit data is inputed corresponded to display, and segment which correspond to the rest part in "off".

In care of over then 160bits, front 160bits from fall edge of "CE"signal is valid.

Input data correspond to Segment Status
The "H" input data correspond to segment "ON" and "L" correspond to "OFF".

Data (D1D160)	Segment Status
"H"	ON
"L"	OFF

• Display Data Correspond to Segment Status

CE ____<u>^</u>__ SCL Diss Dis4 Diss Dise Dis7 Dise Dis9 Die0 D4 D5 D6 D7 D8 SDA D2 Da Dı



Input data correspond to Segment Status

The "H" input data correspond to segment "ON" and "L" correspond to "OFF".

Data (D1D160)	Segment Status
	ON
"L"	0FF

· Display Data Correspond to Segment and Common Terminals

Segment	Data	COM ₁	COM2	COM₃	COM ₄
SEG₁	D1 D2 D3 D4	0	0	ο	0
SEG₂	D₅ D6 D7 D8	0	0	ο	0
:		:	:	:	:
SEG₃∍	D 153 D 154 D 155 D 156	0	0	ο	0
SEG₄₀	D 157 D 158 D 159 D 160	0	0	0	0

ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL.	RATING	UNIT
Operating Voltage (1)	Voo	-0.3 ~ +7.0	۷
Operating Voltage (2)	VLCD	-0.3 ~ +7.0	۷
Operating Voltage (3)	V1, V2	-0.3 ~ +7.0	٧
Input Voltage	VIN	-0.3 ~ V _{DD}	٧
Operating Temperature	Topr	-20 ~ +75	°C
Storage Temperature	Tstg	-55 ~ +125	°C

- Note 1) If the LSI are used on condition above the absolute maximum ratings, the LSI may be destroyed. Using the LSI within electrical characteristics is strongly recommended for normal operation. Use beyond the electric characteristics conditions will cause malfunction and poor reliability.
- Note 2) All voltage values are specified as $V_{ss} = 0 V$
- Note 3) The relation: $V_{LCD} \ge V_2 \ge V_1 \ge V_{SS}$ must be maintained.
- Note 4) Decoupling capacitor should be connected between V_DD and V_SS due to the stabilized operation.



ELECTRICAL CHARACTERISTICS

- DC Characteristics

(1a=25°C, V₀₀=3. 0V, V₅s=UV, V∟₀₀=6. 0V								
PARAM	ETER	SYMBOL.	CONDITIONS	MIN	TYP	MAX	UNIT	NOTE
Operating	Recommend	VDD	Vod Terminal	2.4	3.0	3.6	. V	
Voltage (1)	Available	VDD	V _{DD} Terminal	2.4	3.0	5.5	V	
Operating V	oltage (2)	VLCD	VLCD Terminal	2.0		6.0	V	
Operating V	oltage (3)	V2	V₂ Terminal	V 1	2/3VLCD	VLCD	۷	
Operating V	oltage (4)	V 1	V, Terminal	0.7	1/3V_CD	V 2	۷	
"H" Input V	oltage	V _{,CH}	CE, SCL, SDA, INH Terminals	0. 7V DD		Vod	V	
"L" Input V	oltage	Vil	CE, SCL, SDA, INH Terminals	Vss		0. 3V DD	۷	
"H" Input C	urrent	Ітн	CE, SCL, SDA, INH Terminals $V_{IN} = V_{DD}$			5	μA	
"L" Input C	urrent	I 1L	CE, SCL, SDA, INH Terminals $V_{\rm IN}{=}V_{\rm SS}$			5	μA	
"H" Output	Voltage(1)	V он (1)	SEG ₁ ~SEG ₄₀ Term., $I_0 = -1 \mu A$	V.cd-0.6			۷	5
"L" Output	Voltage(1)	Vol (1)	SEG ₁ ~SEG ₄ o Term., $I_0 = 1 \mu A$			V _{DD} +0.6	V	5
Middle Leve Voltag	l e 1/3 (1)	V ms1/3	SEG ₁ ~SEG ₄₀ Term., $I_0=\pm 1 \mu A$	1/3V⊾∝¤ −0.6	1/3V.cd	1/3V⊾cd +0.6	٧	5
Middle Leve Voltag	l e 2/3 (1)	V MS2/3	SEG ₁ ~SEG ₄₀ Term., $I_0=\pm 1 \mu A$	2/3V⊾c⊅ −0.6	2/3V100	2/3V _{LCD} +0.6	V	5
"H" Output	Voltage(2)	VOH (2)	$COM_1 \sim COM_4$ Term., $I_0 = -30 \mu$ A	V_cD-0.6			۷	6
"L" Output	Voltage(2)	Vol (2)	$COM_1 \sim COM_4$ Term., $I_0 = 30 \mu A$			Vss+0.6	۷	6
Middle Leve Voltag	 e 1/3 (2)	V мс1/3	$COM_1 \sim COM_4$ Term., $I_0 = \pm 1 \mu A$	1/3V⊾₀₀ -0.6	1/3VLCD	1/3V⊾c⊅ +0.6	V	6
Middle Leve Voltag	 e 2/3 (2)	V мс2/3	$COM_1 \sim COM_4$ Term., $I_0 = \pm 1 \mu A$	2/3V⊾⊙⊅ −0.6	2/3VLCD	2/3VLCD +0.6	۷	6
"L" Output	Voltage(3)	Vol (3)	SDA I o= 30mA			Vss+0.4	۷	6
Operating C	urrent (1)	lod	Vob Terminal Vob=3.0V Vucb OPEN		15	25	μA	7
Operating C	urrent (2)	LCD	VLCD Terminal VDD=3.0V VLCD=6.0V		18	28	μA	8
Hysteresis	Voltage	V _H	SCL Termimal, V₀₀=3. OV	0. 3			۷	
Terminal Ca	pacitor	Сн	SCL, SDA Terminal Except measurement terminal are open.			10	pF	

 $(Ta=25^{\circ}C, V_{DD}=3.0V, V_{SS}=0V, V_{LDD}=6.0V)$

Note 5) Segment terminals except measurement terminal are open.

Note 6) Common terminals except measurement terminal are open.

Note 7) CE, SCL, SDA terminals are conected $V_{ss.}$ /INH teiminal is conected $V_{oo.}$ /TEST terminal is open.

Note 8) CE, SCL, SDA, INH terminals are measurement terminal are conected V_{SS}./TEST terminal is open.

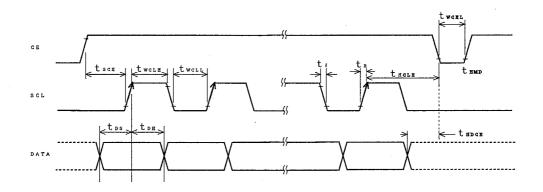


• AC Characteristics

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PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
"L" Clock Pulse Width	tweel	SCL	0. 25	_	-	μs
"H" Clock Pulse Width	twolh	SCL	0. 25	-	-	μs
SCL Rise Time	tŖ	SCL	-		50	ns
SCL Fall Time	t∺	SCL		-	50	ns
SDA Data Set-up Time	tos	SDA, SCL	0. 25	_	-	μs
SDA Data Hold Time	t _{DH}	SCL	0. 25	-		μs
CE Set-up Time	tsce	CE, SDA	1. 25	-		μs
CE Hold Time(1)	tHDCE	se, sda	1.00	-	-	μs
CE Hold Time(2)	t HOLE	SCL, CE	1. 25		-	μs
"L" CE Pulse Width	twcel	CE	4.00	—	-	μs
Frame Frequency	f。	$COM_{1} \sim COM_{4}, SEG_{1} \sim SEG_{40}$	45	70	-	

 $(Ta=25^{\circ}C, V_{DD}=3. OV, V_{SS}=0V, V_{LCD}=6. OV)$

• Input Timing Characteristics



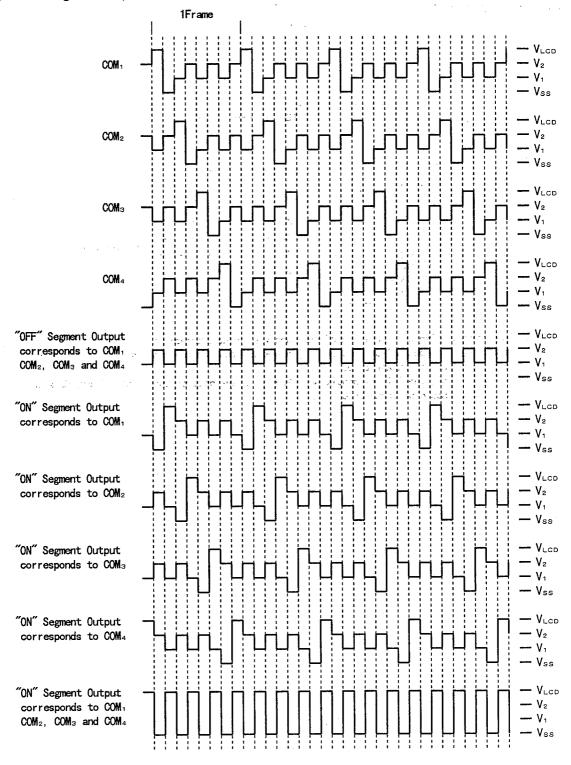
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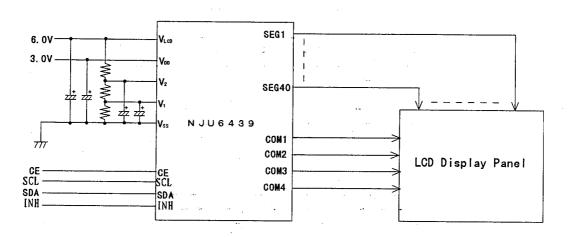
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■ LCD Driving Waveform(1/4DUTY - 1/3BIAS)





APPLICATION CIRCUIT



(Note) The internal display data is undefined when V_{DD} is just turned on. To avoid the meaningless display, please keep the INH terminal at "H" until proper display data has been transferred.

In order to set the initial condition, 160-bit blank data or the first 160-bit data to be displayed should be transferred.

-New Japan Radio Co., Ltd.

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MEMO

[CAUTION] The specifications on this databook are only given for information , without any guarantee as regards either mistakes or omissions. The application circuits in this databook are described only to show representative usages of the product and not intended for the guarantee or permission of any right including the industrial rights.