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LC79430KNE

CMOS LSI

Dot-Matrix LCD Drivers

Overview

The LC79430KNE is a large-scale dot matrix LCD common driver LSI. The LC79430KNE contains an 80-bit bidirectional shift register and is equipped with a 4-level LCD driver. The input/output pins for cascade connection can be used to further increase the IC's number of bits. The LC79430KNE can be used in conjunction with segment driver LC79401KNE (QIP100E) to drive a wide-screen LCD panel.

Features

- On-chip LCD drive circuit (80 bits)
- Display duty selection ranging from 1/64 to 1/256
- On-chip input/output pins support a further increases in bit number
- Supports externally supplied bias voltage
- On-chip 80-bit bidirectional shift register (supports 40-bit × 2 division)
- Supports single mode (80-bit shift register) and dual mode (40-bit × 2 shift register) applications
 - (1) O1 → O80 } Single mode
 - (2) O80 → O1 }
 - (3) O1 → O40 and O41 → O80 } Dual mode
 - (4) O80 → O41 and O40 → O1 }

All four of the shift direction selection listed above all supported
- Operating power supply voltage/operating temperature include
 - V_{DD} (Logic section) : 2.7 to 5.5V/-20 to +85°C
 - V_{DD}-V_{EE} (LCD section) : 12 to 32V/-20 to +85°C
- CMOS process
- 100-pin flat plastic package (QIP100E)

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Specifications

Absolute Maximum Ratings at $T_a = 25 \pm 2^\circ\text{C}$, $V_{SS} = 0\text{V}$

Parameter	Symbol	Conditions	Ratings	unit
Maximum supply voltage (Logic)	V_{DD} max		-0.3 to +7.0	V
Maximum supply voltage (LCD)	$V_{DD}-V_{EE}$ max	*1	0 to 35	V
Maximum input voltage	V_I max		-0.3 to $V_{DD}+0.3$	V
Storage temperature	Tstg		-40 to +125	$^\circ\text{C}$

Note *1 The following relations between elements should be maintained: $V_{DD} \geq V_1 > V_2 > V_5 > V_{EE}$, $V_{DD}-V_2 \leq 7\text{V}$, $V_5-V_{EE} \leq 7\text{V}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

Allowable Operating Ranges at $T_a = -20$ to $+85^\circ\text{C}$, $V_{SS} = 0\text{V}$

Parameter	Symbol	Conditions	min	typ	max	unit
Supply voltage (Logic)	V_{DD}		2.7		5.5	V
Supply voltage (LCD)	$V_{DD}-V_{EE}$	*2, 3	12		32	V
Input high level voltage	V_{IH}	DIO1, DIO80, CP, M, DMIN, MODE, RS/LS, DISPOFF	$0.8V_{DD}$			V
Input low level voltage	V_{IL}	DIO1, DIO80, CP, M, DMIN, MODE, RS/LS, DISPOFF			$0.2V_{DD}$	V
CP Shift clock	f_{CP}	CP			1	MHz
CP pulse width	t_{WC}	CP	63			ns
Setup time	t_{SETUP}	DIO1 \rightarrow CP, DIO80 \rightarrow CP, DMIN \rightarrow CP	100			ns
Hold time	t_{HOLD}	DIO1 \rightarrow CP, DIO80 \rightarrow CP, DMIN \rightarrow CP	100			ns
CP rise time	t_R	CP			50	ns
CP fall time	t_F	CP			50	ns

Note *2 The following relations between elements should be maintained: $V_{DD} \geq V_1 > V_2 > V_5 > V_{EE}$, $V_{DD}-V_2 \leq 7\text{V}$, $V_5-V_{EE} \leq 7\text{V}$

*3 When the power supply is turned on, power to the LCD driver is turned on after or simultaneously with the turning on of the logic section's power supply. When the power supply is turned off, the logic power supply is turned off after or at the same time the LCD driver power supply is turned off.

Electrical Characteristics at $T_a = 25 \pm 2^\circ\text{C}$, $V_{DD} = 2.7$ to 5.5V

Parameter	Symbol	Conditions	min	typ	max	unit
Input high level current	I_{IH}	$V_{IN}=V_{DD}$, $V_{DD}=5.5\text{V}$, DIO1, DIO80, CP, M, DMIN, MODE, RS/LS, DISPOFF			1	μA
Input low level current	I_{IL}	$V_{IN}=V_{SS}$, $V_{DD}=5.5\text{V}$, DIO1, DIO80, CP, M, DMIN, MODE, RS/LS, DISPOFF	-1			μA
Output high level voltage	V_{OH}	$I_{OH}=-0.4\text{mA}$, DIO1, DIO80	$V_{DD}-0.4$			V
Output low level voltage	V_{OL}	$I_{OL}=0.4\text{mA}$, DIO1, DIO80			0.4	V
Driver on resistance	$R_{ON(1)}$	$V_{DD}-V_{EE}=30\text{V}$, $ V_{DE}-V_O =0.5\text{V}$ $V_{DD}=4.5\text{V}$, O1 to O80 *4			1.0	$\text{k}\Omega$
	$R_{ON(2)}$	$V_{DD}-V_{EE}=20\text{V}$, $ V_{DE}-V_O =0.5\text{V}$ $V_{DD}=4.5\text{V}$, O1 to O80 *4			1.0	$\text{k}\Omega$
Consumable current drain (1)	I_{SS}	$V_{DD}-V_{EE}=30\text{V}$, CP=14kHz no-load, $V_{DD}=5.5\text{V}$; V_{SS}			100	μA
Consumable current drain (2)	I_{EE}	$V_{DD}-V_{EE}=30\text{V}$, CP=14kHz no-load, $V_{DD}=5.5\text{V}$; V_{EE}			100	μA
Input capacitance	CI	f=1MHz; CP		8		pF

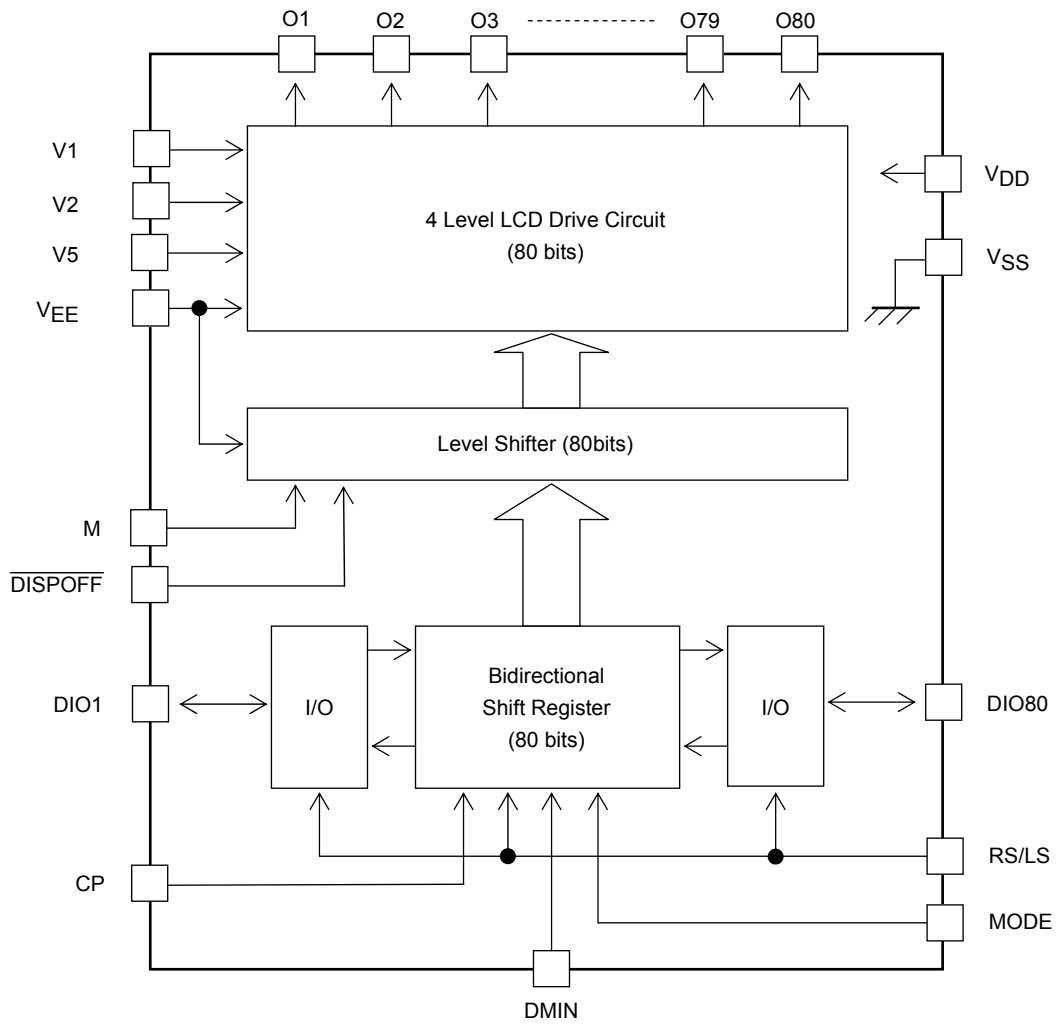
Note *4 $V_{DE} = V_1$ or V_2 or V_5 or V_{EE} , $V_1 = V_{DD}$, $V_2 = 16/17 (V_{DD}-V_{EE})$, $V_5 = 1/17 (V_{DD}-V_{EE})$

Switching Characteristics at $T_a = 25 \pm 2^\circ\text{C}$, $V_{SS} = 0\text{V}$, $V_{DD} = 2.7$ to 5.5V

Parameter	Symbol	Conditions	min	typ	max	unit
Output delay time	t_{PLH}	CL=15pF; CP \rightarrow DIO1, CP \rightarrow DIO80			250	ns
	t_{PHL}	CL=15pF; CP \rightarrow DIO1, CP \rightarrow DIO80			250	ns

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Equivalent Circuit Block Diagram



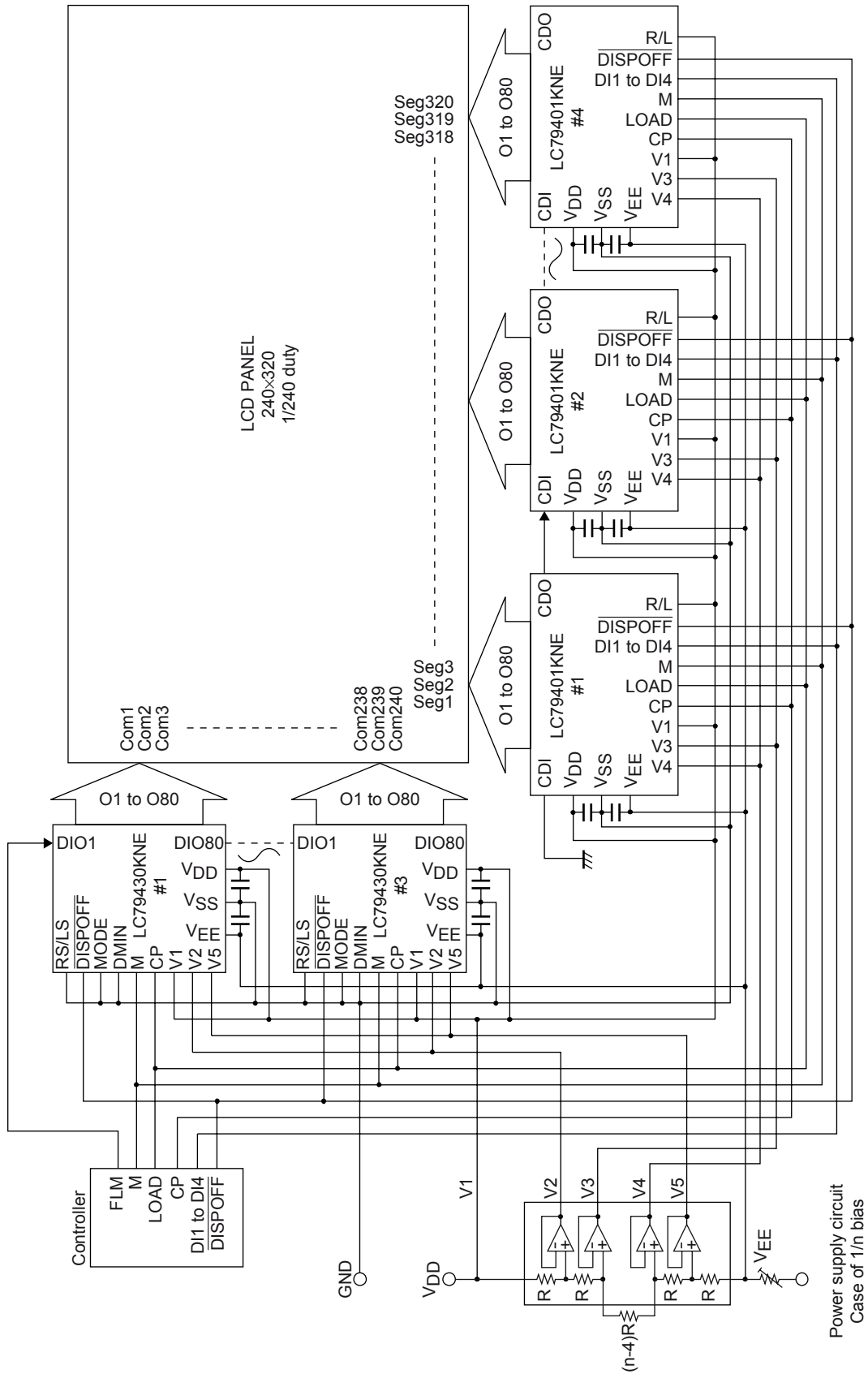
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Pin Function

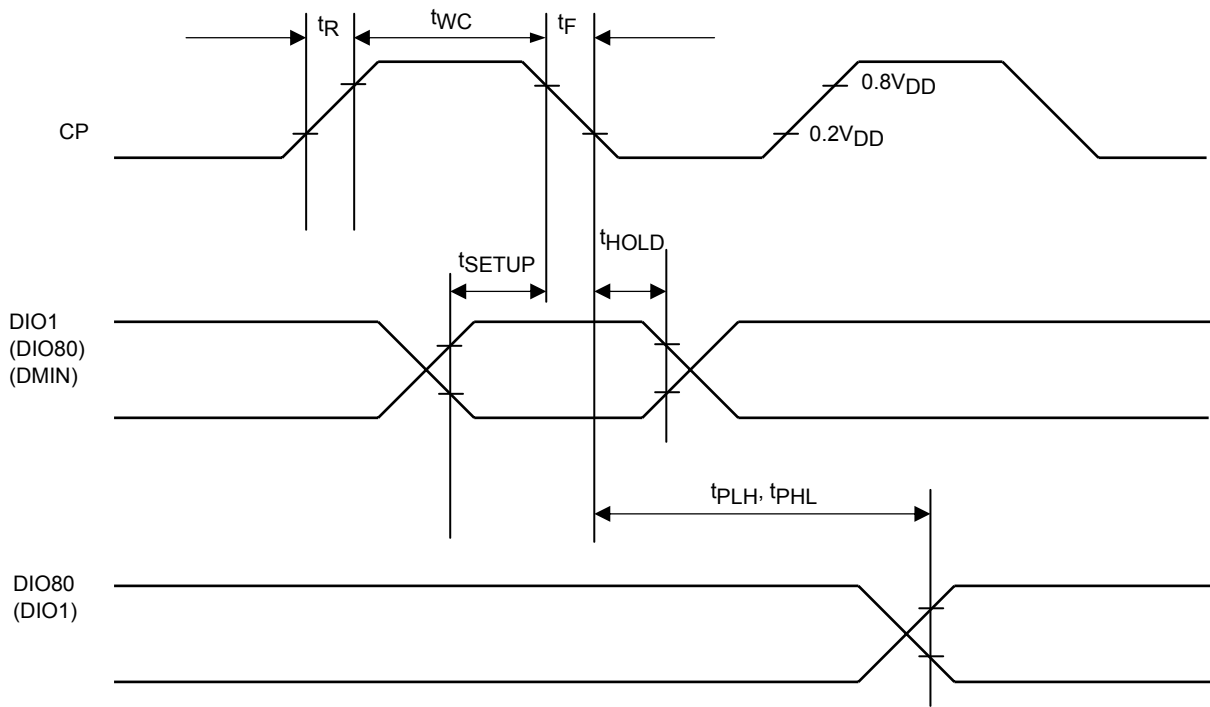
Pin No	Symbol	I/O	Function																														
90	V _{DD}	Supply	V _{DD} -V _{SS} : Logic power supply V _{DD} -V _{EE} : LCD drive circuit power supply																														
92	V _{SS}																																
84	V _{EE}																																
87	V1	Supply	LCD drive level power supply V1, V _{EE} : Selected level V2, V5 : Unselected level																														
86	V2																																
85	V5																																
96	CP	I	Bidirectional shift register shift clock (falling edge trigger)																														
98	DIO1	I/O	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">MODE</th> <th style="width: 15%;">RS/LS</th> <th style="width: 20%;">Data Transfer Direction</th> <th style="width: 10%;">DIO1</th> <th style="width: 10%;">DIO80</th> <th style="width: 10%;">DMIN</th> </tr> </thead> <tbody> <tr> <td rowspan="2" style="text-align: center;">L (Single)</td> <td>L (Shift right)</td> <td style="text-align: center;">O1 → O80</td> <td style="text-align: center;">IN</td> <td style="text-align: center;">OUT</td> <td style="text-align: center;">*</td> </tr> <tr> <td>H (Shift left)</td> <td style="text-align: center;">O80 → O1</td> <td style="text-align: center;">OUT</td> <td style="text-align: center;">IN</td> <td style="text-align: center;">*</td> </tr> <tr> <td rowspan="4" style="text-align: center;">H (Dual)</td> <td rowspan="2" style="text-align: center;">L (Shift right)</td> <td style="text-align: center;">O1 → O40</td> <td rowspan="2" style="text-align: center;">IN</td> <td rowspan="2" style="text-align: center;">OUT</td> <td rowspan="2" style="text-align: center;">IN</td> </tr> <tr> <td style="text-align: center;">O41 → O80</td> </tr> <tr> <td rowspan="2" style="text-align: center;">H (Shift left)</td> <td style="text-align: center;">O80 → O41</td> <td rowspan="2" style="text-align: center;">OUT</td> <td rowspan="2" style="text-align: center;">IN</td> <td rowspan="2" style="text-align: center;">IN</td> </tr> <tr> <td style="text-align: center;">O40 → O1</td> </tr> </tbody> </table> <p>* Don't care (May be set to either "H" or "L")</p>	MODE	RS/LS	Data Transfer Direction	DIO1	DIO80	DMIN	L (Single)	L (Shift right)	O1 → O80	IN	OUT	*	H (Shift left)	O80 → O1	OUT	IN	*	H (Dual)	L (Shift right)	O1 → O40	IN	OUT	IN	O41 → O80	H (Shift left)	O80 → O41	OUT	IN	IN	O40 → O1
MODE	RS/LS	Data Transfer Direction		DIO1	DIO80	DMIN																											
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		O40 → O1																															
82	DIO80	I/O																															
91	RS/LS	I																															
95	MODE	I																															
97	DMIN	I																															
94	M	I	LCD drive output alternation signal																														
89	$\overline{\text{DISPOFF}}$	I	O1 to O80 output controlling input pins.																														
1 ⋮ 80	O1 ⋮ O80	O	<p>LCD drive outputs</p> <p>The output levels are determined by the combination of the output the data, The M signal, and the $\overline{\text{DISPOFF}}$ pin as shown in the table.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">M</th> <th style="width: 15%;">Data</th> <th style="width: 15%;">$\overline{\text{DISPOFF}}$</th> <th style="width: 55%;">Output</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">L</td> <td style="text-align: center;">L</td> <td style="text-align: center;">H</td> <td style="text-align: center;">V2</td> </tr> <tr> <td style="text-align: center;">L</td> <td style="text-align: center;">H</td> <td style="text-align: center;">H</td> <td style="text-align: center;">V_{EE}</td> </tr> <tr> <td style="text-align: center;">H</td> <td style="text-align: center;">L</td> <td style="text-align: center;">H</td> <td style="text-align: center;">V5</td> </tr> <tr> <td style="text-align: center;">H</td> <td style="text-align: center;">H</td> <td style="text-align: center;">H</td> <td style="text-align: center;">V1</td> </tr> <tr> <td style="text-align: center;">*</td> <td style="text-align: center;">*</td> <td style="text-align: center;">L</td> <td style="text-align: center;">V1</td> </tr> </tbody> </table> <p>* Don't care (May be set to either "H" or "L")</p>	M	Data	$\overline{\text{DISPOFF}}$	Output	L	L	H	V2	L	H	H	V _{EE}	H	L	H	V5	H	H	H	V1	*	*	L	V1						
M	Data	$\overline{\text{DISPOFF}}$	Output																														
L	L	H	V2																														
L	H	H	V _{EE}																														
H	L	H	V5																														
H	H	H	V1																														
*	*	L	V1																														
81	NC	-	Must be left open.																														
83																																	
88																																	
93																																	
99																																	
100																																	

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Application Example (LC79401KNE/LC79430KNE)



Switching Characteristics Diagram



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