



## Overview

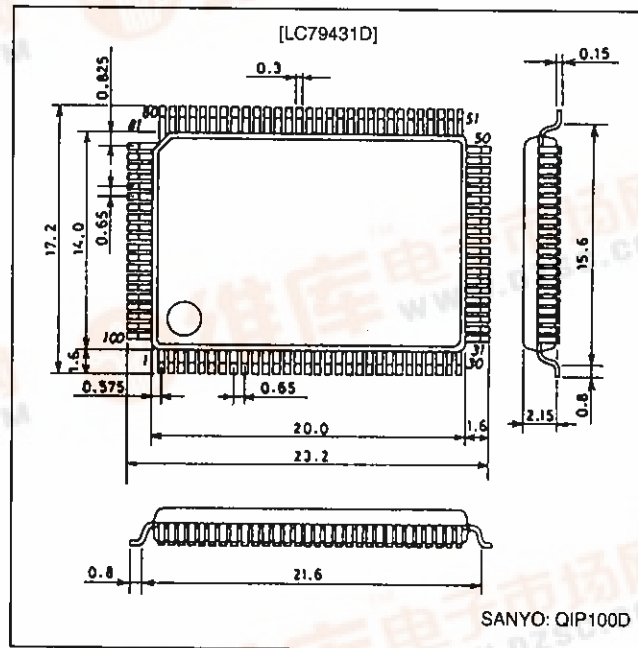
The LC79431D is a large-scale dot matrix LCD common driver LSI. The LC79431D contains an 80-bit bidirectional shift register and a 4-level LCD driver. The input/output pins for cascade connection can be used to further increase the bit count. The LC79431D can be used in conjunction with segment driver LC79400D or LC79401D (QIP100D) to drive a wide-screen LCD panel.

## Features

- On-chip LCD drive circuit (80 bits)
- Display duty of 1/64 to 1/256 selectable
- On-chip input/output pins support a further increase in bit count
- Supports externally supplied bias voltage
- Operating supply voltage/operating temperature are:  
 $V_{DD}$  (logic block) : 5 V  $\pm$ 10 % / -20 to +75 °C  
 $V_{DD}-V_{EE}$  (LCD block) : 12 V to 32 V / -20 to +75 °C
- CMOS process

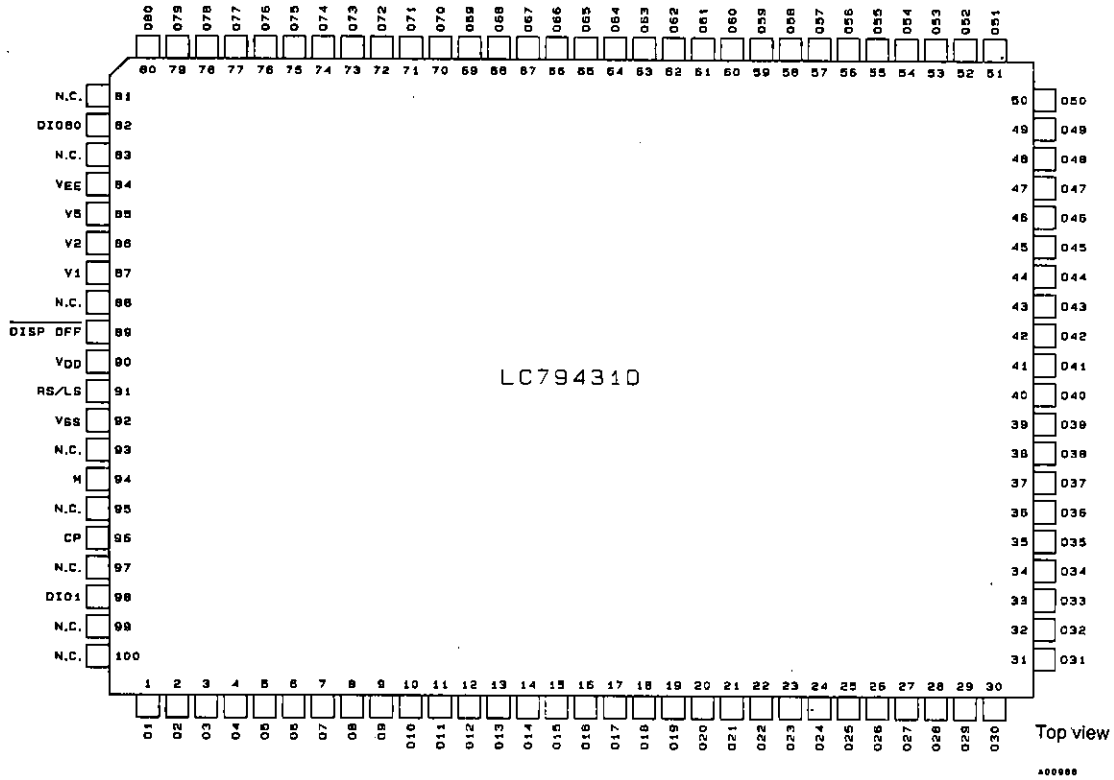
## Package Dimensions

unit : mm

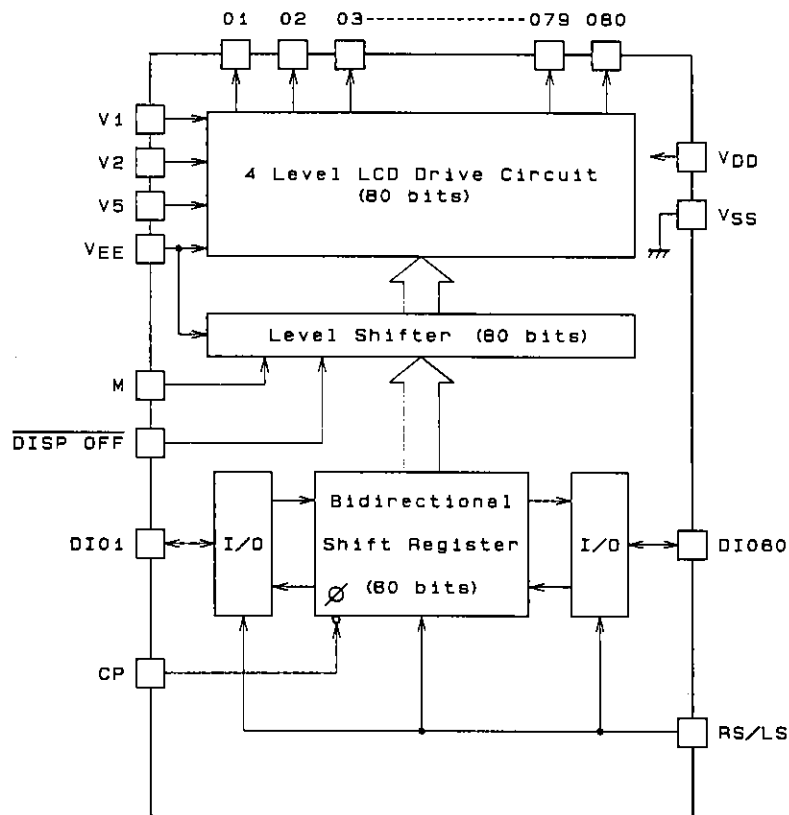
**3180-QFP100D**

# LC79431D

## Pin Assignment



## Equivalent Circuit Block Diagram



## LC79431D

### Pin Descriptions

Pin No	Pin name	Input/Output	Functions																								
90	V <sub>DD</sub>	Power supply	V <sub>DD</sub> to V <sub>SS</sub> : Power supply for logic block																								
92	V <sub>SS</sub>																										
84	V <sub>EE</sub>																										
87	V1	Power supply	V <sub>DD</sub> to V <sub>EE</sub> : Power supply for LCD drive block																								
86	V2																										
85	V5																										
96	CP	Input	Bidirectional shift register's shift clock (triggering on the trailing edge)																								
98	DIO1	Input/Output	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">RS/LS</th> <th style="width: 35%;">Data Transfer Direction</th> <th style="width: 15%;">DIO1</th> <th style="width: 35%;">DIO80</th> </tr> </thead> <tbody> <tr> <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> </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> </tr> </tbody> </table>	RS/LS	Data Transfer Direction	DIO1	DIO80	L (Shift right)	O1 → O80	IN	OUT	H (Shift left)	O80 → O1	OUT	IN												
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L (Shift right)	O1 → O80	IN		OUT																							
H (Shift left)	O80 → O1	OUT	IN																								
82	DIO80	Input/Output																									
91	RS/LS	Input																									
94	M	Input	LCD drive output alternating signal																								
89	DISP OFF	Input	O1 to O80 output controlling input pin																								
1 ⋮ 80	O1 ⋮ O80	Output	<p>LCD drive output The combination of scanning data, M signal, and <math>\overline{\text{DISP OFF}}</math> signal can be used to create output levels as shown below.</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%;">DISP OFF</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<sub>EE</sub></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 (To be set to either "H" or "L")</p>	M	Data	DISP OFF	Output	L	L	H	V2	L	H	H	V <sub>EE</sub>	H	L	H	V5	H	H	H	V1	*	*	L	V1
M	Data	DISP OFF	Output																								
L	L	H	V2																								
L	H	H	V <sub>EE</sub>																								
H	L	H	V5																								
H	H	H	V1																								
*	*	L	V1																								

### Specifications

#### Absolute Maximum Ratings at Ta = 25±2°C, V<sub>SS</sub> = 0V

Parameter	Symbol	Ratings	Unit
Maximum supply voltage (logic)	V <sub>DD</sub> max	-0.3 to +7.0	V
Maximum supply voltage (LCD)	V <sub>DD</sub> -V <sub>EE</sub> max *	0 to 35	V
Maximum input voltage	V <sub>IN</sub> max	-0.3 to V <sub>DD</sub> +0.3	V
Storage temperature range	T <sub>stg</sub>	-40 to +125	°C

Note: \* The voltages V1, V2, and V5 must obey the relationships: V<sub>DD</sub> ≥ V1 > V2 > V5 > V<sub>EE</sub>; V<sub>DD</sub> - V2 ≤ 7V, V5 - V<sub>EE</sub> ≤ 7V.

## LC79431D

### Allowable Operating Ranges at $T_a = -20$ to $+75^\circ\text{C}$ , $V_{SS} = 0\text{V}$

Parameter	Symbol	Conditions	min	typ	max	Unit
Supply voltage (logic)	$V_{DD}$		4.5		5.5	V
Supply voltage (LCD)	$V_{DD}-V_{EE}$	*1, *2	12		32	V
Input high level voltage	$V_{IH}$	DIO1, DIO80, CP, M, RS/LS, DISP OFF	$0.8V_{DD}$			V
Input low level voltage	$V_{IL}$	DIO1, DIO80, CP, M, RS/LS, DISP OFF			$0.2V_{DD}$	V
CP (shift clock)	$t_{CP}$	CP			1	MHz
CP (pulse width)	$t_{WC}$	CP	63			ns
Setup time	$t_{SETUP}$	DIO1 $\rightarrow$ CP, DIO80 $\rightarrow$ CP,	100			ns
Hold time	$t_{HOLD}$	DIO1 $\rightarrow$ CP, DIO80 $\rightarrow$ CP,	100			ns
CP rise/fall time	$t_R$	CP			50	ns
	$t_F$	CP			50	ns

Note: 1. The voltages V1, V2, and V5 must obey the relationships:  $V_{DD} \geq V1 > V2 > V5 > V_{EE}$ ,  $V_{DD} - V2 \leq 7\text{V}$ ,  $V5 - V_{EE} \leq 7\text{V}$ .

2. When applying power, apply power to the LCD drive block after applying power to the logic block or apply power to both the blocks simultaneously. When turning off power, turn off power to the logic block after turning off power to the LCD drive block or turn off power to both the blocks simultaneously.

### Electrical Characteristics at $T_a = 25 \pm 2^\circ\text{C}$ , $V_{SS} = 0\text{V}$ , $V_{DD} = 5\text{V} \pm 10\%$

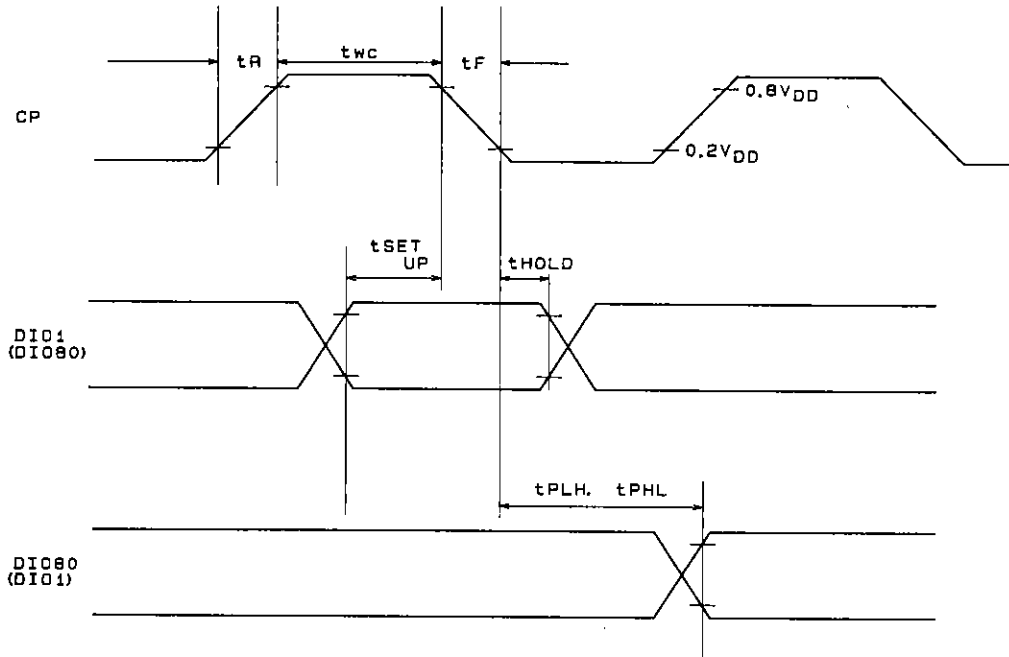
Parameter	Symbol	Conditions	min	typ	max	Unit
Input high level current	$I_{IH}$	$V_{IN} = V_{DD}$ , $V_{DD} = 5.5\text{V}$ ; DIO1, DIO80, CP, M, RS/LS, DISP OFF			1	$\mu\text{A}$
Input low level current	$I_{IL}$	$V_{IN} = V_{SS}$ , $V_{DD} = 5.5\text{V}$ ; DIO1, DIO80, CP, M, RS/LS, DISP OFF	-1			$\mu\text{A}$
Output high level voltage	$V_{OH}$	$I_{OH} = -0.4\text{mA}$ , $V_{DD} = 4.5\text{V}$ ; DIO1, DIO80	$V_{DD}-0.4$			V
Output low level voltage	$V_{OL}$	$I_{OL} = 0.4\text{mA}$ , $V_{DD} = 4.5\text{V}$ ; DIO1, DIO80			0.4	V
Drive-on resistor	$R_{ON}(1)$	$V_{DD}-V_{EE} = 30\text{V}$ , $ V_{DE}-V_o  = 0.5\text{V}$ , $V_{DD} = 4.5\text{V}$ *; O1 to O80			1.0	$\text{k}\Omega$
	$R_{ON}(2)$	$V_V-V_{EE} = 20\text{V}$ , $ V_{DE}-V_o  = 0.5\text{V}$ , $V_{DD} = 4.5\text{V}$ *; O1 to O80			1.0	$\text{k}\Omega$
Current drain (1)	$I_{SS}$	$V_{DD}-V_{EE} = 30\text{V}$ , CP = 14 kHz, no load, $V_{DD} = 5.5\text{V}$ ; $V_{SS}$			100	$\mu\text{A}$
Current drain (2)	$I_{EE}$	$V_{DD}-V_{EE} = 30\text{V}$ , CP = 14 kHz, no load, $V_{DD} = 5.5\text{V}$ ; $V_{EE}$			100	$\mu\text{A}$
Input capacitance	$C_I$	$f = 1\text{MHz}$ ; CP		5		pF

Note: \*  $V_{DE} = V1$  or  $V2$  or  $V5$  or  $V_{EE}$   $V1 = V_{DD}$ ,  $V2 = 16/17 (V_{DD}-V_{EE})$ ,  $V5 = 1/17 (V_{DD}-V_{EE})$

### Switching Characteristics at $T_a = 25 \pm 2^\circ\text{C}$ , $V_{SS} = 0\text{V}$ , $V_{DD} = 5\text{V} \pm 10\%$

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

## Switching Characteristics Diagram



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