

**LC7942YC****Dot-matrix LCD Driver**

## Overview

The LC7942YC is a common driver IC for driving large, dot-matrix LCD displays. It features a built-in 64-bit bidirectional shift register and a 4-level LCD driver. It can also be connected in cascade to increase the number of bits.

The LC7942YC is designed to be used with LC7940YC or LC7941YC segment drivers to drive large LCD panels.

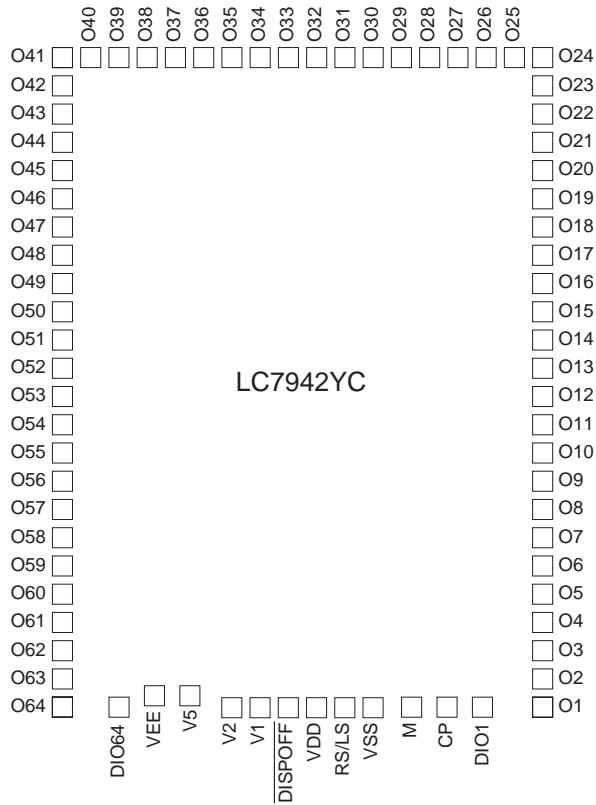
## Features

- 64 built-in LCD display drive circuits
- 1/64 to 1/128 display duty cycle
- Input/outputs for cascade connection
- Bias supply voltages can be supplied externally
- Operating supply voltage and ambient temperature
  - 2.7 to 5.5V logic supply ( $V_{DD}$ ) at  $T_a = -20$  to  $+85$  °C
  - 8 to 20 V LCD supply ( $V_{DD} - V_{EE}$ ) at  $T_a = -20$  to  $+85$  °C
- CMOS process

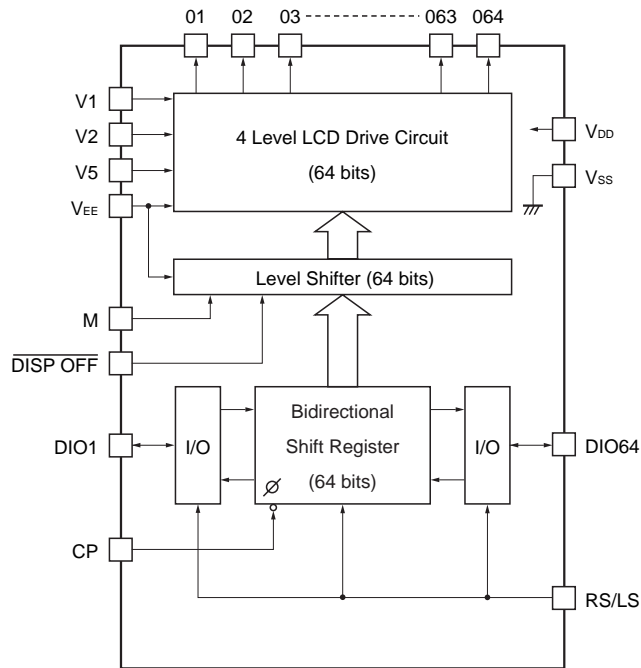
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# LC7942YC

## Pad Layout (Top view)



## Block Diagram



## LC7942YC

<b>LC7942YC Pad Location</b>							
chip size : 3.200 mm x 3.970 mm							
Pin_No.	Name	X	Y	Pin_No.	Name	X	Y
41	O1	-1425.9	1808	11	O51	1425.9	-213
42	O2	-1425.9	1635	12	O52	1425.9	-70
43	O3	-1425.9	1465	13	O53	1425.9	70
44	O4	-1425.9	1298	14	O54	1425.9	213
45	O5	-1425.9	1134	15	O55	1425.9	359
46	O6	-1425.9	973	16	O56	1425.9	508
47	O7	-1425.9	815	17	O57	1425.9	660
48	O8	-1425.9	660	18	O58	1425.9	815
49	O9	-1425.9	508	19	O59	1425.9	973
50	O10	-1425.9	359	20	O60	1425.9	1134
51	O11	-1425.9	213	21	O61	1425.9	1298
52	O12	-1425.9	70	22	O62	1425.9	1465
53	O13	-1425.9	-70	23	O63	1425.9	1635
54	O14	-1425.9	-213	24	O64	1425.9	1808
55	O15	-1425.9	-359	25	DIO64	1096	1768
56	O16	-1425.9	-508	26	---	---	---
57	O17	-1425.9	-660	27	V <sub>EE</sub>	880	1728
58	O18	-1425.9	-815	28	V <sub>5</sub>	689	1728
59	O19	-1425.9	-973	29	V <sub>2</sub>	498	1768
60	O20	-1425.9	-1134	30	V <sub>1</sub>	318	1768
61	O21	-1425.9	-1298	31	DISPOFF	143	1768
62	O22	-1425.9	-1465	32	V <sub>DD</sub>	-37	1753
63	O23	-1425.9	-1635	33	RS/LS	-213	1753
64	O24	-1425.9	-1808	34	V <sub>SS</sub>	-393	1753
65	O25	-1236	-1808	35	---	---	---
66	O26	-1053	-1808	36	M	-598	1768
67	O27	-875	-1808	37	---	---	---
68	O28	-704	-1808	38	CP	-835	1768
69	O29	-538	-1808	39	---	---	---
70	O30	-378	-1808	40	DIO1	-1056	1768
71	O31	-223	-1808				
72	O32	-73	-1808				
73	O33	73	-1808				
74	O34	223	-1808				
75	O35	378	-1808				
76	O36	538	-1808				
77	O37	704	-1808				
78	O38	875	-1808				
79	O39	1053	-1808				
80	O40	1236	-1808				
1	O41	1425.9	-1808				
2	O42	1425.9	-1635				
3	O43	1425.9	-1465				
4	O44	1425.9	-1298				
5	O45	1425.9	-1134				
6	O46	1425.9	-973				
7	O47	1425.9	-815				
8	O48	1425.9	-660				
9	O49	1425.9	-508				
10	O50	1425.9	-359				

## LC7942YC

### Pin Functions

Number	Name	I/O	Function																								
32	V <sub>DD</sub>	Supply	V <sub>DD</sub> - V <sub>SS</sub> is the logic supply. V <sub>DD</sub> - V <sub>EE</sub> is the LCD supply.																								
34	V <sub>SS</sub>																										
27	V <sub>EE</sub>																										
30	V <sub>1</sub>	Supply	LCD panel drive voltage supplies. V <sub>1</sub> and V <sub>EE</sub> are selected levels. V <sub>2</sub> and V <sub>5</sub> are not-selected levels.																								
29	V <sub>2</sub>																										
28	V <sub>5</sub>																										
38	CP	I	Display data input clock (falling-edge trigger).																								
40	DIO1	I/O	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>RS/LS</th> <th>DIO1</th> <th>DIO64</th> <th>Shift direction</th> </tr> </thead> <tbody> <tr> <td>LOW (right shift)</td> <td>Input</td> <td>Output</td> <td>O1 → O64</td> </tr> <tr> <td>HIGH (left shift)</td> <td>Output</td> <td>Input</td> <td>O64 → O1</td> </tr> </tbody> </table>	RS/LS	DIO1	DIO64	Shift direction	LOW (right shift)	Input	Output	O1 → O64	HIGH (left shift)	Output	Input	O64 → O1												
RS/LS	DIO1	DIO64		Shift direction																							
LOW (right shift)	Input	Output		O1 → O64																							
HIGH (left shift)	Output	Input	O64 → O1																								
25	DIO64	I/O																									
33	RS/LS	I																									
36	M	I	LCD panel drive voltage output alternation control signal.																								
31	DISP OFF	I	O1 to O64 output control input pins.																								
41 to 80	O1 to O40	O	LCD drive outputs The output drive level is determined by the display data, M signal and DISPOFF input as show below. <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>M</th> <th>Q</th> <th>DISPOFF</th> <th>Output</th> </tr> </thead> <tbody> <tr> <td>LOW</td> <td>LOW</td> <td>HIGH</td> <td>V<sub>2</sub></td> </tr> <tr> <td>LOW</td> <td>HIGH</td> <td>HIGH</td> <td>V<sub>EE</sub></td> </tr> <tr> <td>HIGH</td> <td>LOW</td> <td>HIGH</td> <td>V<sub>5</sub></td> </tr> <tr> <td>HIGH</td> <td>HIGH</td> <td>HIGH</td> <td>V<sub>1</sub></td> </tr> <tr> <td>×</td> <td>×</td> <td>LOW</td> <td>V<sub>1</sub></td> </tr> </tbody> </table>	M	Q	DISPOFF	Output	LOW	LOW	HIGH	V <sub>2</sub>	LOW	HIGH	HIGH	V <sub>EE</sub>	HIGH	LOW	HIGH	V <sub>5</sub>	HIGH	HIGH	HIGH	V <sub>1</sub>	×	×	LOW	V <sub>1</sub>
M	Q			DISPOFF	Output																						
LOW	LOW			HIGH	V <sub>2</sub>																						
LOW	HIGH			HIGH	V <sub>EE</sub>																						
HIGH	LOW			HIGH	V <sub>5</sub>																						
HIGH	HIGH	HIGH	V <sub>1</sub>																								
×	×	LOW	V <sub>1</sub>																								
1 to 24	O41 to O64																										
			<b>Note</b> × = don't care (tied HIGH or LOW)																								
26	NC	-	No connection.																								
35	NC																										
37	NC																										
39	NC																										

### Specifications

The following electrical characteristics apply when sealed in a Sanyo standard QIC-80 package.

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

Parameter	Symbol	Ratings	Unit
Logic supply voltage	V <sub>DD</sub> max	-0.3 to +7.0	V
LCD supply voltage. See note.	V <sub>DD</sub> - V <sub>EE</sub> max	0 to 22	V
Input voltage	V <sub>1</sub> max	-0.3 to V <sub>DD</sub> + 0.3	V
Operating temperature range	T <sub>opr</sub>	-20 to +85	°C
Storage temperature range	T <sub>stg</sub>	-40 to +125	°C

**Note**

$$V_{DD} \geq V_1 > V_2 > V_5 > V_{EE}$$

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### Allowable Operating Ranges at $T_a = -20$ to $+85$ °C, $V_{SS} = 0$ V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Logic supply voltage	$V_{DD}$		2.7	—	5.5	V
LCD supply voltage	$V_{DD} - V_{EE}$	See notes 1 and 2.	8	—	20	V
DIO1, DIO64, CP, M, RS/LS and DISPOFF HIGH-level input voltage	$V_{IH}$		$0.8V_{DD}$	—	—	V
DIO1, DIO64, CP, M, RS/LS and DISPOFF LOW-level input voltage	$V_{IL}$		—	—	$0.2V_{DD}$	V
CP shift clock frequency	$f_{CP}$		—	—	1	MHz
CP pulsewidth	$t_{WC}$		125	—	—	ns
DIO1 and DIO64 to CP setup time	$t_{SETUP}$		100	—	—	ns
DIO1 and DIO64 to CP hold time	$t_{HOLD}$		100	—	—	ns
CP rise time	$t_R$		—	—	50	ns
CP fall time	$t_F$		—	—	50	ns

#### Notes

- $V_{DD} \geq V_1 > V_2 > V_5 > V_{EE}$
- At turn ON, the LCD supply should be energized after or simultaneously with the logic supply. At turn OFF, the logic supply should be cut after or simultaneously with the LCD supply.

### Electrical Characteristics at $T_a = 25 \pm 2$ C, $V_{SS} = 0$ V, $V_{DD} = 2.7$ to $5.5$ V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
DIO1, DIO64, CP, M, RS/LS and DISPOFF HIGH-level input current	$I_{IH}$	$V_{IN} = V_{DD}$	—	—	1	$\mu$ A
DIO1, DIO64, CP, M, RS/LS and DISPOFF LOW-level input current	$I_{IL}$	$V_{IN} = V_{SS}$	-1	—	—	$\mu$ A
DIO1 and DIO64 HIGH-level output voltage	$V_{OH}$	$I_{OH} = -400 \mu$ A	$V_{DD} - 0.4$	—	—	V
DIO1 and DIO64 LOW-level output voltage	$V_{OL}$	$I_{OL} = 400 \mu$ A	—	—	0.4	V
O1 to O64 driver ON resistance	$R_{ON}$	$V_{DD} - V_{EE} = 18$ V, $V_{DD} - V_{OL} = 0.25$ V, $V_{DD} = 4.5$ V	—	—	1.5	k $\Omega$
$V_{DD}$ static supply current	$I_{DD}$	$V_{DD} - V_{EE} = 18$ V, CP = $V_{DD}$	—	—	100	$\mu$ A
CP input capacitance	$C_I$	$f_{CP} = 1$ MHz	—	5	—	pF

#### Note

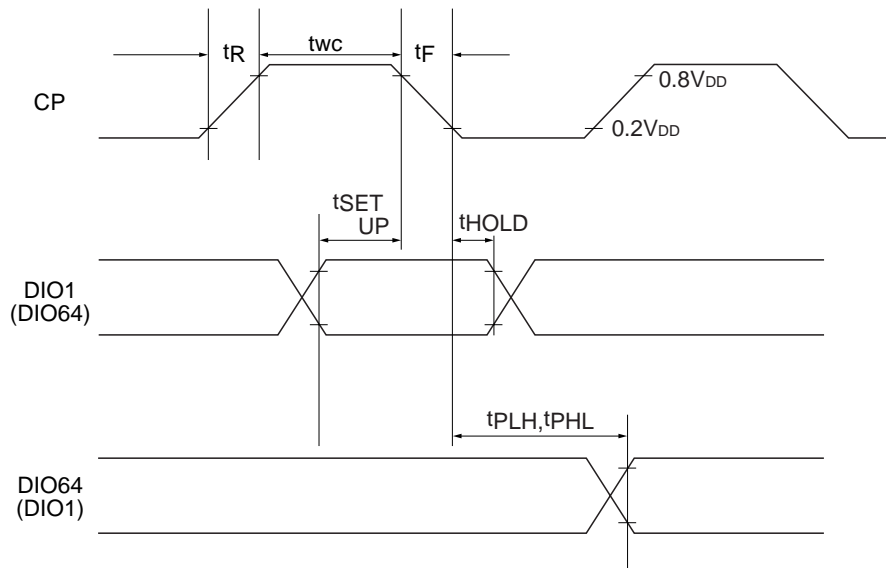
$$V_{DE} = V_1 \text{ or } V_2 \text{ or } V_5 \text{ or } V_{EE}, V_1 = V_{DD}, V_2 = 10/11 \times (V_{DD} - V_{EE}), V_5 = 1/11 \times (V_{DD} - V_{EE})$$

## LC7942YC

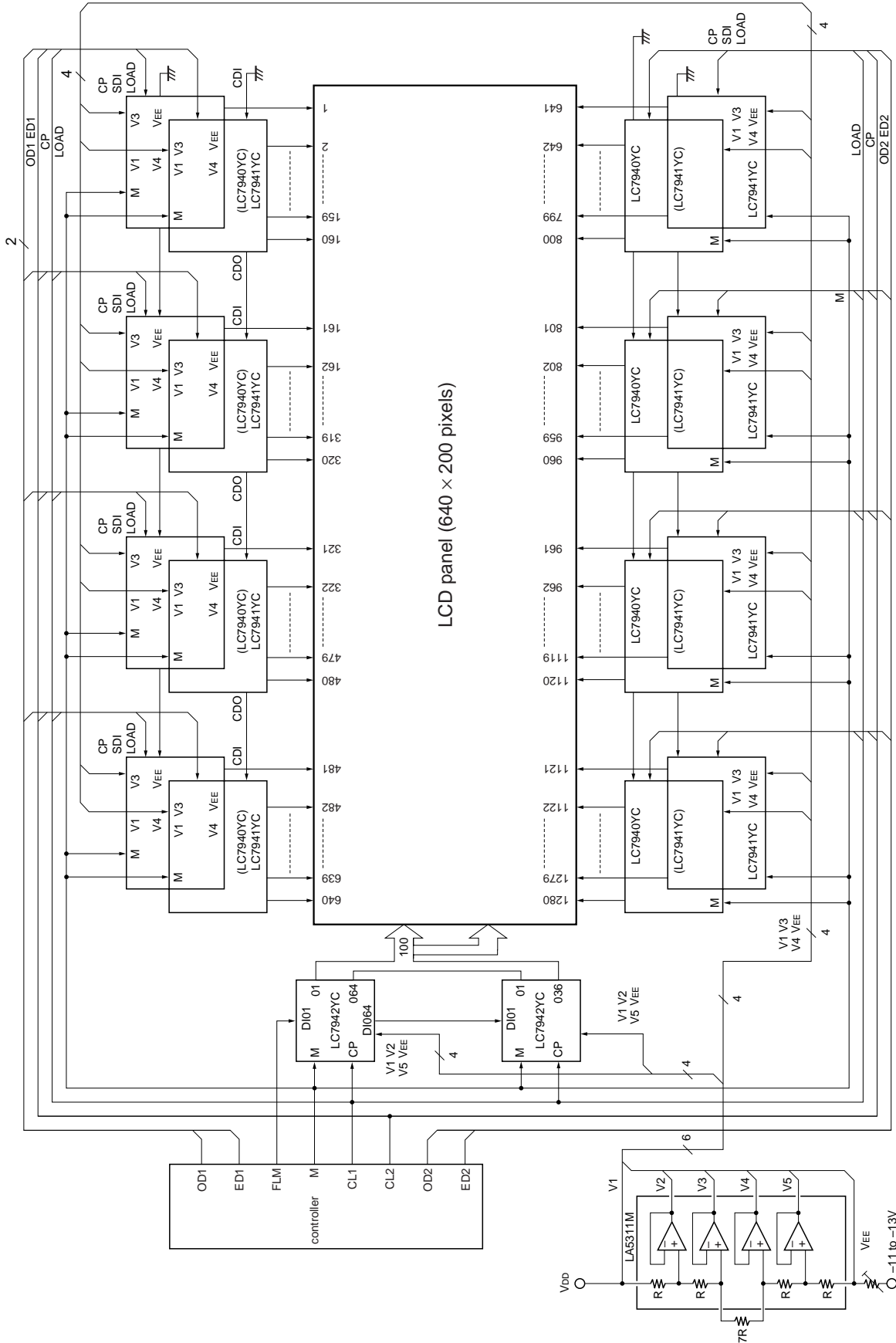
**Switching Characteristics** at  $T_a = 25 \pm 2 \text{ }^\circ\text{C}$ ,  $V_{SS} = 0 \text{ V}$ ,  $V_{DD} = 2.7 \text{ to } 5.5 \text{ V}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output delay time	$t_{PLH}$	$C_L = 30 \text{ pF}$	—	—	250	ns
	$t_{PHL}$		—	—	250	

### Switching Characteristics Waveform



LCD Panel



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