

SANYO

No. 4475A

Dot-matrix LCD Driver

## Overview

The LC7942ND is a common driver LSI 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 LC7942ND is designed to be used with LC7940ND (QFP100) or LC7941ND (QFP100) segment drivers to drive large LCD panels.

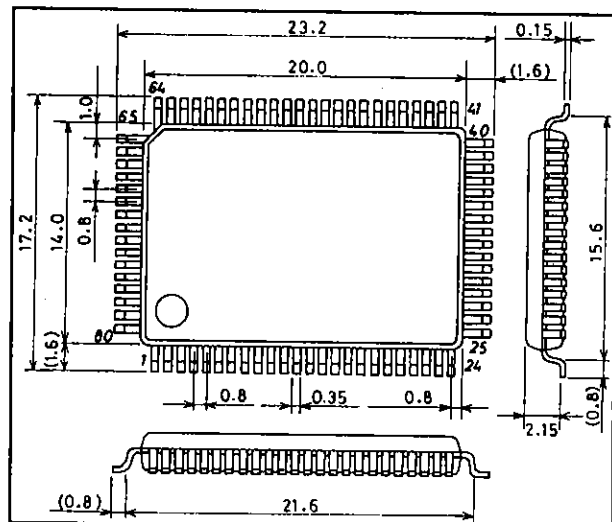
## Features

- 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
  - 5 V  $\pm$ 10% 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
- 80-pin flat plastic package

## Package Dimensions

Unit: mm

### 3177-QFP80D

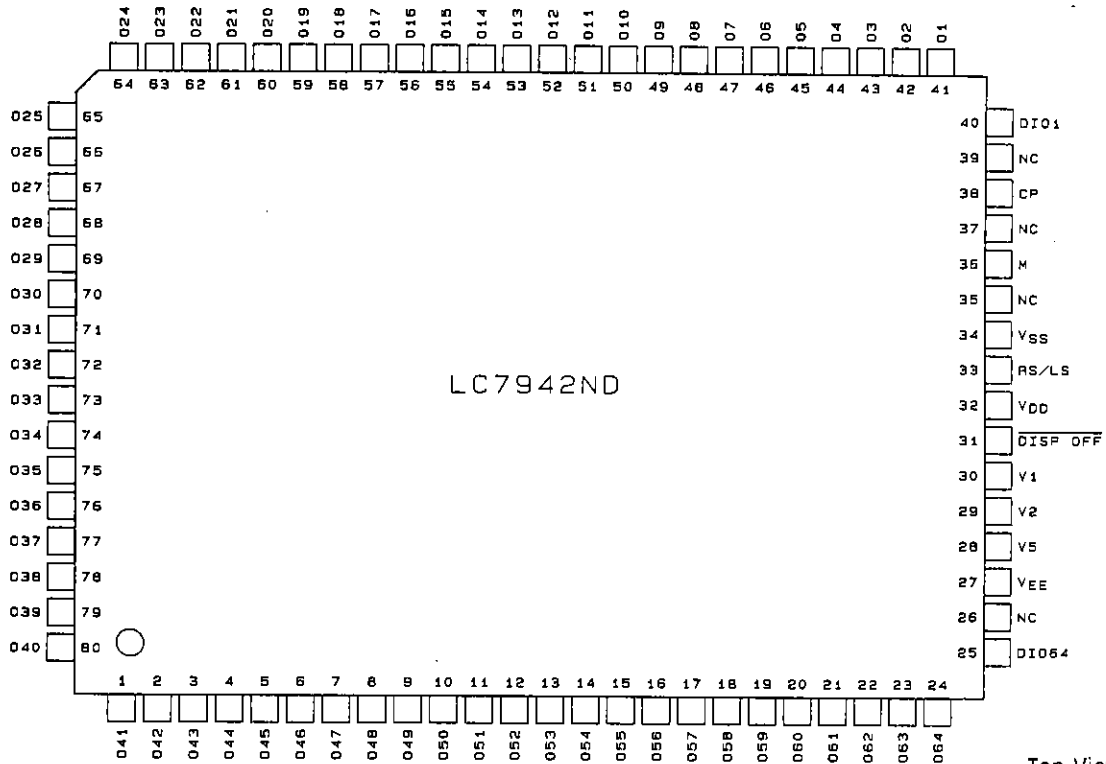


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# LC7942ND

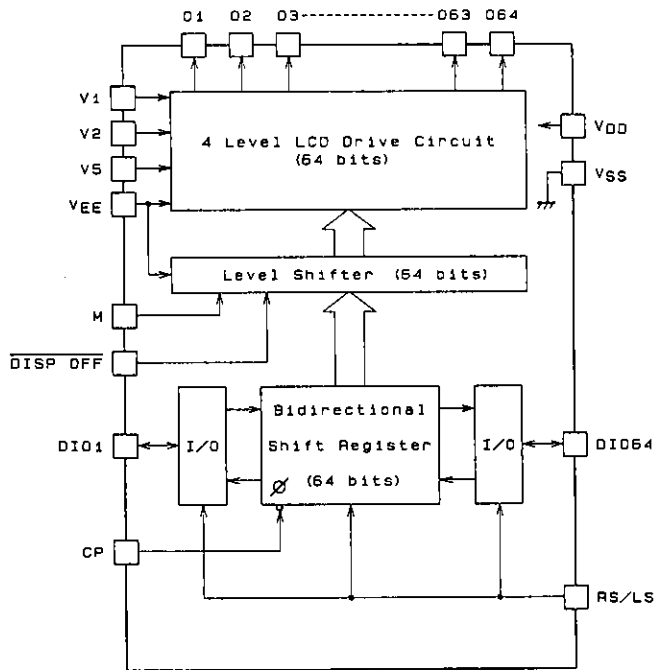
## Pin Assignment



Top View

A01646

## Block Diagram



A01645

# LC7942ND

## Pin Functions

Number	Name	I/O	Function																								
32	VDD	Supply	VDD – VSS is the logic supply. VDD – VEE is the LCD supply.																								
34	VSS																										
27	VEE																										
30	V1	Supply	LCD panel drive voltage supplies. V1 and VEE are selected levels. V2 and V5 are not-selected levels.																								
29	V2																										
28	V5																										
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 DISP OFF input as shown below. <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th>M</th> <th>Q</th> <th>DISP OFF</th> <th>Output</th> </tr> </thead> <tbody> <tr> <td>LOW</td> <td>LOW</td> <td>HIGH</td> <td>V2</td> </tr> <tr> <td>LOW</td> <td>HIGH</td> <td>HIGH</td> <td>VEE</td> </tr> <tr> <td>HIGH</td> <td>LOW</td> <td>HIGH</td> <td>V5</td> </tr> <tr> <td>HIGH</td> <td>HIGH</td> <td>HIGH</td> <td>V1</td> </tr> <tr> <td>×</td> <td>×</td> <td>LOW</td> <td>V1</td> </tr> </tbody> </table>	M	Q	DISP OFF	Output	LOW	LOW	HIGH	V2	LOW	HIGH	HIGH	VEE	HIGH	LOW	HIGH	V5	HIGH	HIGH	HIGH	V1	×	×	LOW	V1
M	Q			DISP OFF	Output																						
LOW	LOW			HIGH	V2																						
LOW	HIGH			HIGH	VEE																						
HIGH	LOW			HIGH	V5																						
HIGH	HIGH			HIGH	V1																						
×	×	LOW	V1																								
1 to 24	O41 to O64																										
26	NC	-	No connection.																								
35	NC																										
37	NC																										
39	NC																										

## Specifications

### Absolute Maximum Ratings

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

Parameter	Symbol	Ratings	Unit
Logic supply voltage	$V_{DD} \text{ max}$	-0.3 to +7.0	V
LCD supply voltage. See note.	$V_{DD} - V_{EE} \text{ max}$	0 to 22	V
Input voltage	$V_I \text{ max}$	-0.3 to $V_{DD} + 0.3$	V
Operating temperature range	$T_{opr}$	-20 to +85	$^\circ\text{C}$
Storage temperature range	$T_{stg}$	-40 to +125	$^\circ\text{C}$

#### Note

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

## LC7942ND

### Allowable Operating Ranges

$T_a = -20$  to  $+85$  °C,  $V_{SS} = 0$  V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Logic supply voltage	$V_{DD}$		4.5	-	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	$V_{IH}$		$0.9V_{DD}$	-	-	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

- $V_{DD} \geq V_1 > V_2 > V_3 > V_{EE}$
- 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

$T_a = 25 \pm 2$  °C,  $V_{SS} = 0$  V,  $V_{DD} = 5$  V  $\pm 10\%$

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_{DE} - V_{OL}  = 0.25$ V, $V_{DD} = 4.5$ V	-	-	1.5	$k\Omega$
VDD 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

$V_{DE} = V_1$  or  $V_2$  or  $V_3$  or  $V_{EE}$ ,  $V_1 = V_{DD}$ ,  $V_2 = 10/11 \times (V_{DD} - V_{EE})$ ,  $V_3 = 1/11 \times (V_{DD} - V_{EE})$

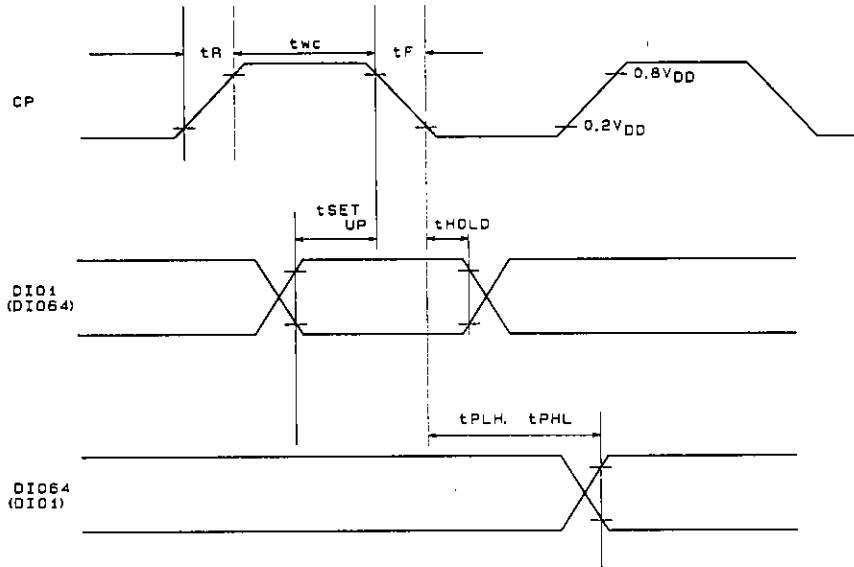
# LC7942ND

## Switching Characteristics

$T_A = 25 \pm 2 \text{ }^\circ\text{C}$ ,  $V_{SS} = 0 \text{ V}$ ,  $V_{DD} = 5 \text{ V} \pm 10\%$

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

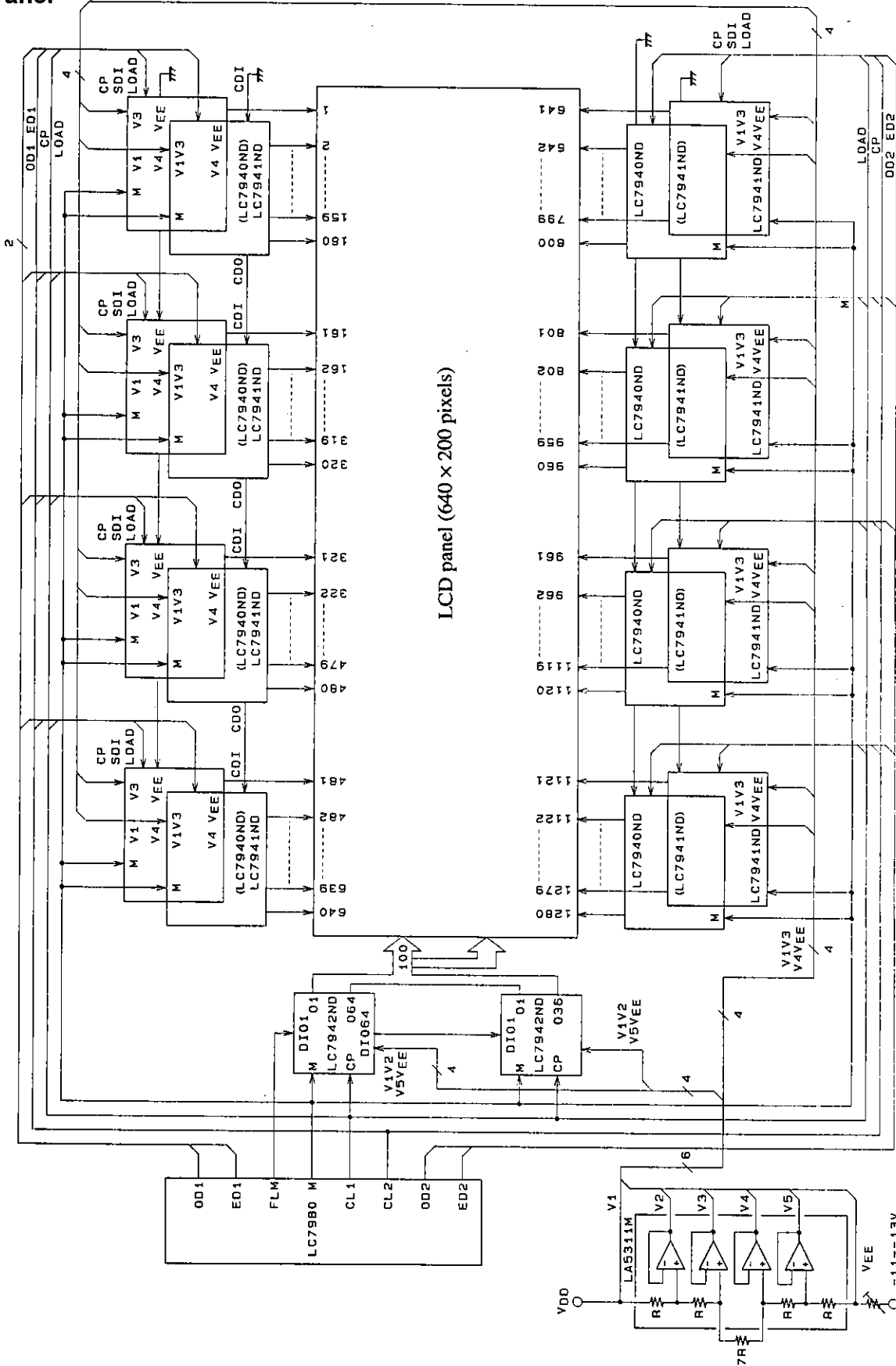
## Switching Characteristics Waveform



A01648

LC7942ND

LCD Panel



AD1647