

**LC7942YD****Dot-matrix LCD Driver****Overview**

The LC7942YD 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.

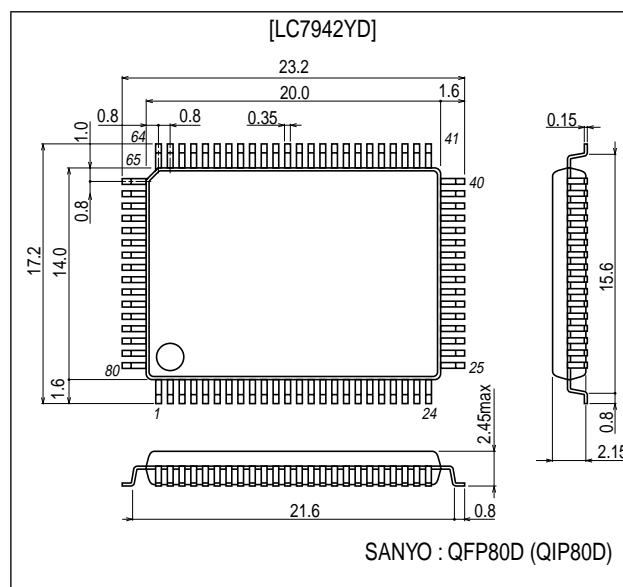
The LC7942YD is designed to be used with LC7940YD (QFP100) or LC7941YD (QFP100) segment drivers to drive large LCD panels.

**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
  - 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
- 80-pin flat plastic package

**Package Dimensions**

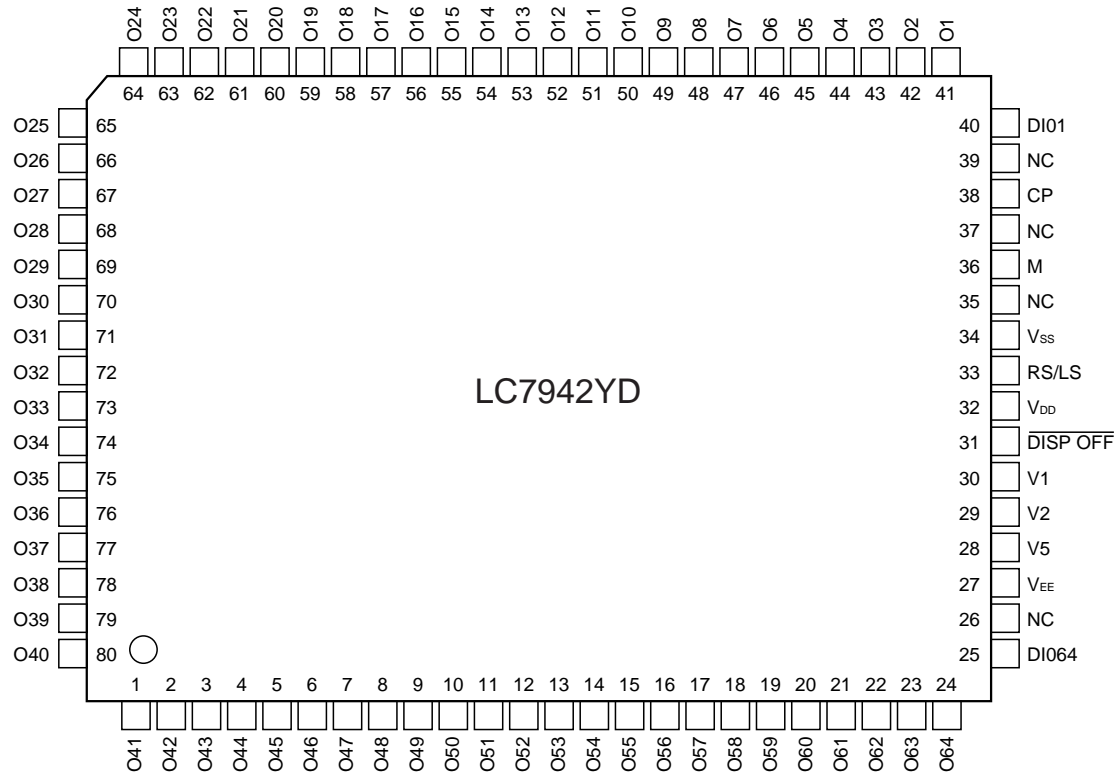
unit: mm

**3177-QFP80D**

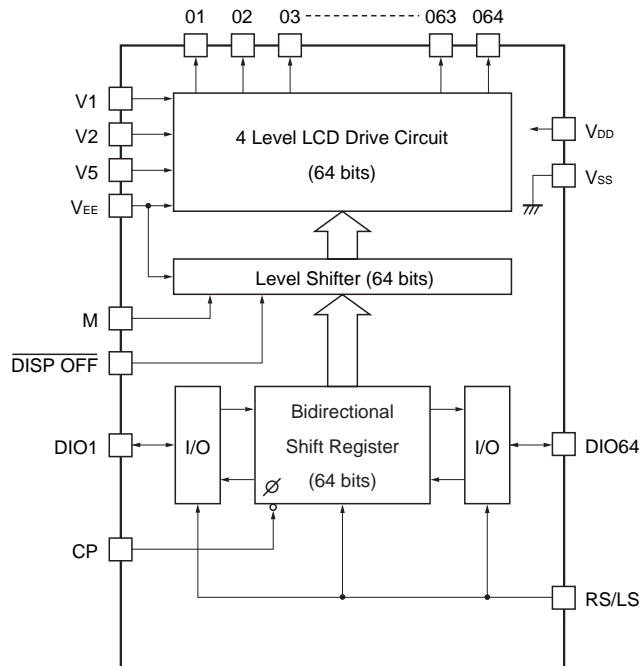
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## LC7942YD

### Pad Layout (Top view)



### Block Diagram



## 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><tr><th>RS/LS</th><th>DIO1</th><th>DIO64</th><th>Shift direction</th></tr><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></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 $\overline{\text{DISPOFF}}$ input as show below.																								
1 to 24	O41 to O64		<table><tr><th>M</th><th>Q</th><th>DISPOFF</th><th>Output</th></tr><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></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>																								
<b>Note</b> × = don't care (tied HIGH or LOW)																											
26	NC	–	No connection.																								
35	NC																										
37	NC																										
39	NC																										

## Specifications

### 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>I</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<sub>DD</sub> ≥ V<sub>1</sub> > V<sub>2</sub> > V<sub>5</sub> > V<sub>EE</sub>

**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

**Note**

1.  $V_{DD} \geq V_1 > V_2 > V_5 > V_{EE}$
2. 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

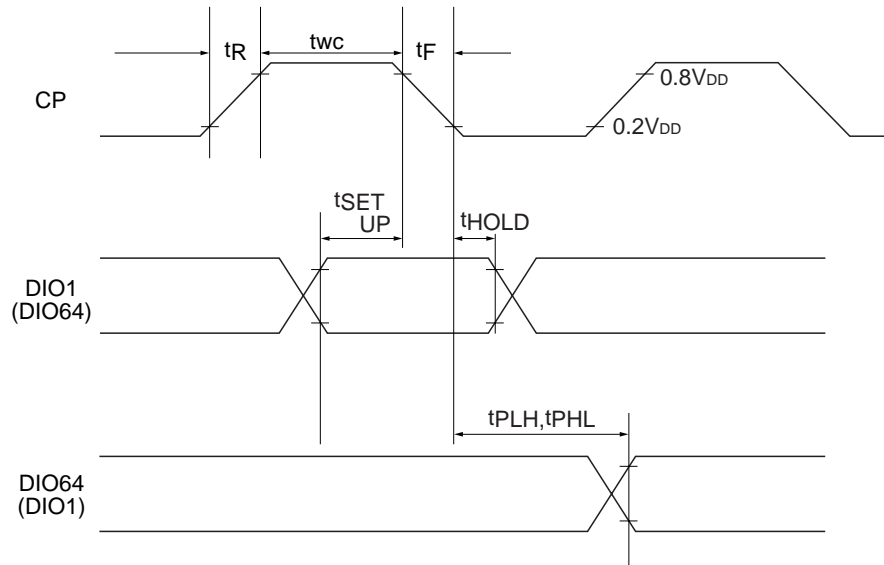
**Note**

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

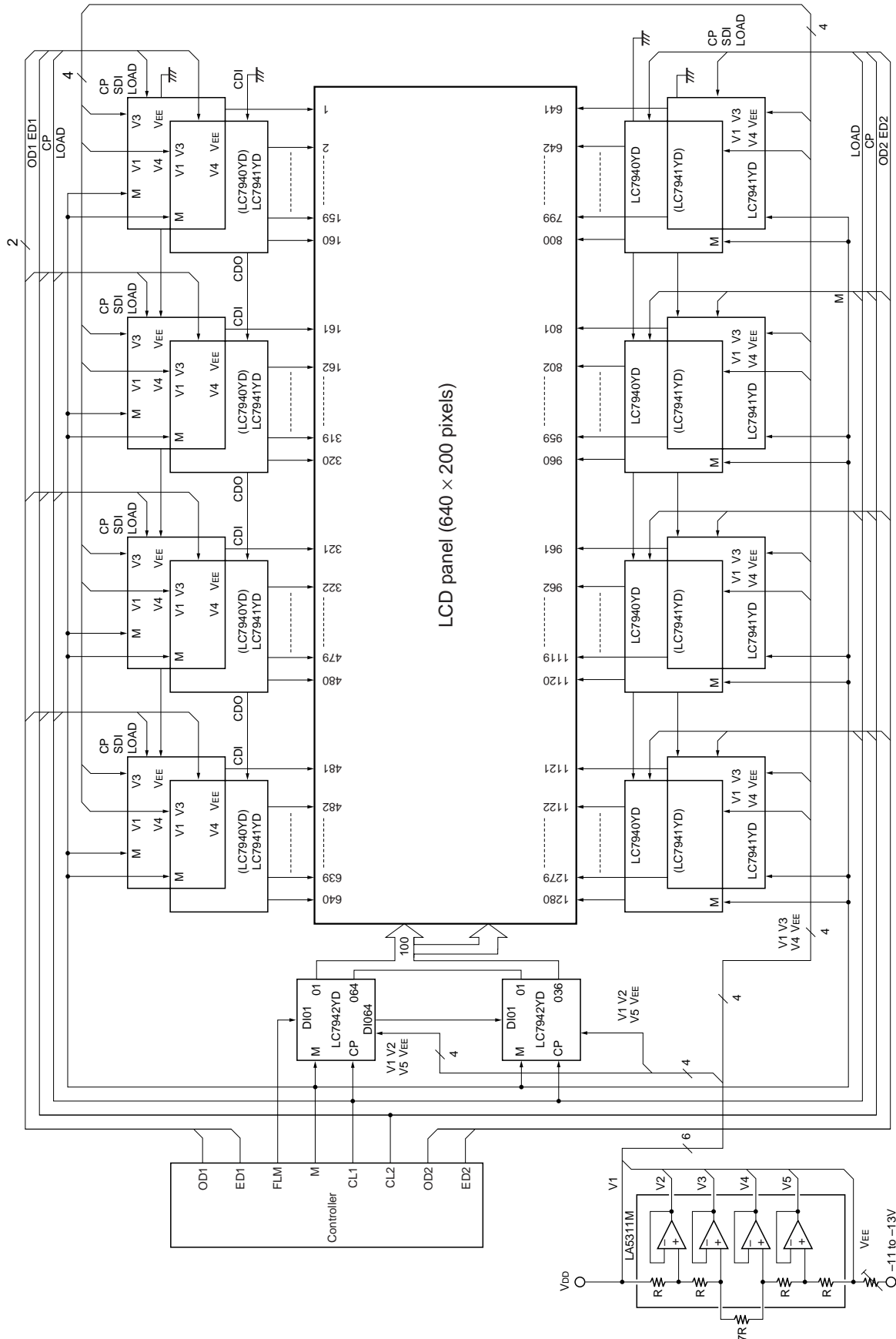
**Switching Characteristics** at  $T_a = 25 \pm 2^\circ\text{C}$ ,  $V_{SS} = 0\text{ V}$ ,  $V_{DD} = 2.7\text{ to }5.5\text{ V}$

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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