

LC75842E, LC75842M

General-Purpose 1/2 Duty LCD Display Driver



Overview

The LC75842E and LC75842M are 1/2 duty general-purpose LCD display drivers for applications such as microprocessor-controlled electronic tuning. They can drive up to 54 segments directly.

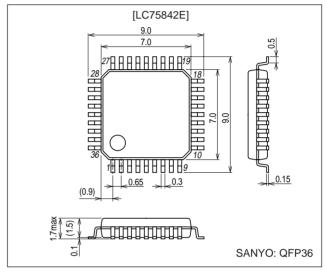
Features

- 1/2 duty, 1/2 bias drive of up to 54 segments
- Serial data input supports CCB* format communication with the system controller.
- Backup function which is based on a power saving mode and all segments off functions that are controlled by serial data.
- High generality, since display data is displayed directly without decoder intervention.
- The display can be forced to the off state with the INH pin.
- · RC oscillator circuit
 - CCB is a trademark of SANYO ELECTRIC CO., LTD.
 - CCB is SANYO's original bus format and all the bus addresses are controlled by SANYO.

Package Dimensions

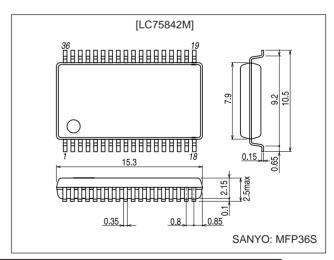
unit: mm

3162C-QFP36



unit: mm

3204-MFP36S



- Any and all SANYO products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your SANYO representative nearest you before using any SANYO products described or contained herein in such applications.
- SANYO assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all SANYO products described or contained herein.

Specifications Absolute Maximum Ratings at Ta = 25°C, V_{SS} = 0 V

Parameter	Symbol	Conditions Ratings		Unit
Maximum supply voltage	V _{DD} max	V _{DD}	-0.3 to +6.5	V
Innut valtage	V _{IN} 1	CE, CL, DI, TNH	-0.3 to +6.5	V
Input voltage	V _{IN} 2	OSC	-0.3 to V _{DD} + 0.3	V
Output voltage	V _{OUT}	OSC, S1 to S27, COM1, COM2	-0.3 to V _{DD} + 0.3	V
Output ourroad	I _{OUT} 1	S1 to S27	100	μA
Output current	I _{OUT} 2	COM1, COM2	1	mA
Allowable power dissipation	Pd max	Ta = 85°C	100	mW
Operating temperature	Topr		-40 to +85	°C
Storage temperature	Tstg		-55 to +125	°C

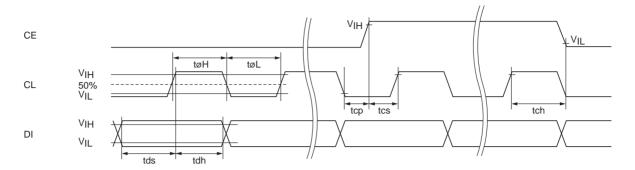
Allowable Operating Ranges at $Ta = -40 \ to \ +85^{\circ}C, \ V_{SS} = 0 \ V$

Parameter	Cymphol	Symbol Conditions		Lloit		
Parameter	Symbol		min	typ	max	Unit
Supply voltage	V _{DD}	V _{DD}	4.0	5.0	6.0	V
Input high level voltage	V _{IH}	CE, CL, DI, INH	0.8 V _{DD}		6.0	V
Input low level voltage	V _{IL}	CE, CL, DI, INH	0		0.2 V _{DD}	V
Recommended external resistance	Rosc	osc		68		kΩ
Recommended external capacitance	Cosc	osc		680		pF
Guaranteed oscillator range	fosc	osc	25	50	100	kHz
Low level clock pulse width	t _{øL}	CL: Figure 1	160			ns
High level clock pulse width	t _{øH}	CL: Figure 1	160			ns
Data setup time	t _{ds}	CL, DI: Figure 1	160			ns
Data hold time	t _{dh}	CL, DI: Figure 1	160			ns
CE wait time	t _{cp}	CE, CL: Figure 1	160			ns
CE setup time	t _{cs}	CE, CL: Figure 1	160			ns
CE hold time	t _{ch}	CE, CL: Figure 1	160			ns
INH switching time	t _c	INH, CE: Figure 3	10			μs

Electrical Characteristics in the Allowable Operating Ranges

Parameter	Symbol	Conditions		Ratings			
Parameter	Symbol Conditions		min	typ	max	Unit	
Hysteresis voltage	V _H	CE, CL, DI, INH: V _{DD} = 5.0 V		0.4		V	
Input high level current	I _{IH}	CE, CL, DI, INH: V _I = 6.0 V			5.0	μA	
Input low level current	I _{IL}	CE, CL, DI, INH: V _I = 0 V	-5.0			μA	
Output high level voltage	V _{OH} 1	S1 to S27: $I_O = -10 \mu A$	V _{DD} – 1.0			V	
Output high level voltage	V _{OH} 2	COM1, COM2: I _O = -100 μA	V _{DD} – 0.6			V	
Outrout love lovel veltere	V _{OL} 1	S1 to S27: I _O = 10 μA			1.0	V	
Output low level voltage	V _{OL} 2	COM1, COM2: I _O = 100 μA			0.6	V	
Outrout middle level veltere	V _{MID} 1	COM1, COM2: V _{DD} = 6.0 V, I _O = ±100 μA	2.4	3.0	3.6	V	
Output middle level voltage	V _{MID} 2	COM1, COM2: V _{DD} = 4.0 V, I _O = ±100 μA	1.4	2.0	2.6	V	
Oscillator frequency	fosc	OSC: R _{OSC} = 68 kΩ, C _{OSC} = 680 pF	40	50	60	kHz	
Current drain	I _{DD} 1	Power saving mode			5	μΑ	
Current diam	I _{DD} 2	V _{DD} = 6.0 V, output open, f _{OSC} = 50 kHz		1.2	2.0	mA	

1. When CL is stopped at the low level



2. When CL is stopped at the high level

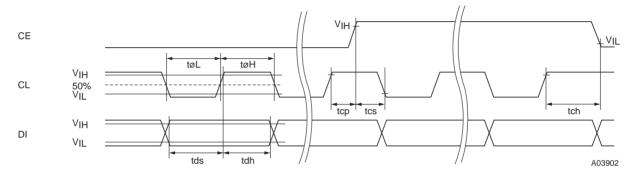
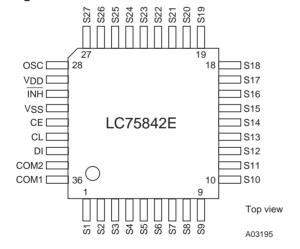
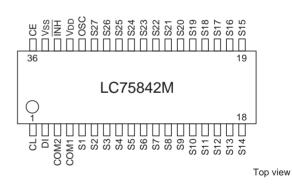


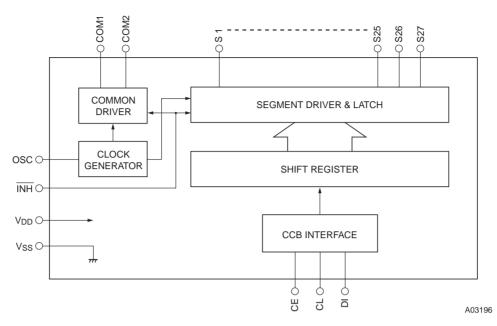
Figure 1

Pin Assignments





Block Diagram

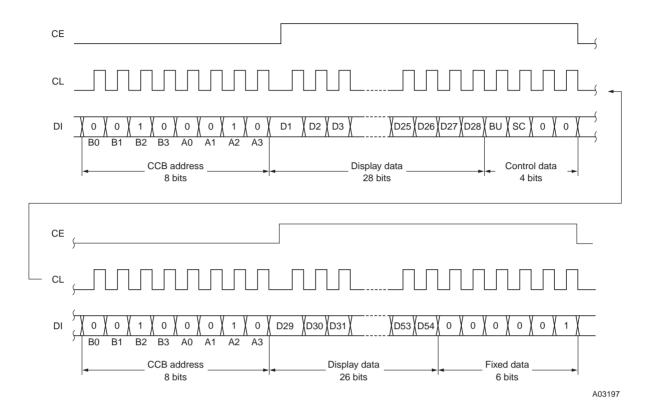


Pin Functions

Pin	Pin		Function		I/O	Handling when
	LC75842E	LC75842M				unused
S1 to S27	1 to 27	5 to 31	Segment outputs for displaying the display data transferred by serial data input.	-	0	Open
COM1	36	4	Common driver outputs. The frame frequency fo is fosc/512 Hz.		0	Open
COM2	35	3				opon
OSC	28	32	Oscillator connection. An oscillator circuit is formed by connecting an external resistor and capacitor at this pin.		I/O	V _{DD}
CE	32	36	Serial data transfer inputs. Must be connected to the control microprocessor. CE: Chip enable	Н		
CL	33	1	CL: Synchronization clock		'	GND
DI	34	2	DI: Transfer data	_		
ĪNH	30	34	Display off control input $\overline{\text{INH}} = \text{low (V}_{SS}) \text{Display off (S1 to S27, COM1 and COM2 = low)}$ $\overline{\text{INH}} = \text{high (V}_{DD}) \text{Display on}$ However, serial data transfer is possible when the display is forced off by this pin.	L	I	GND
V _{DD}	29	33	Power supply. Provide a power supply voltage of between 4.0 and 6.0 V.	_	_	_
V _{SS}	31	35	Power supply. Connect this pin to ground.	_	_	_

Serial Data Transfer Format

1. When CL is stopped at the low level



2. When CL is stopped at the high level

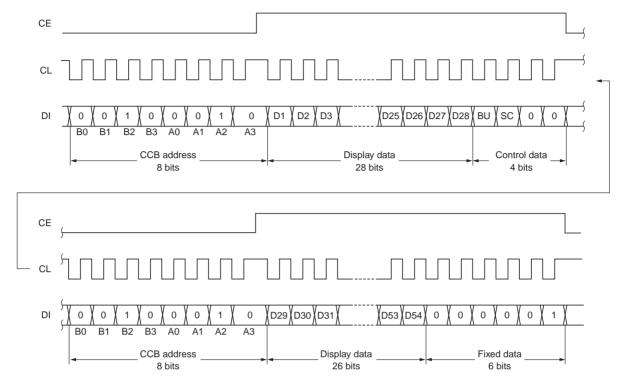


Figure 2

- CCB address.....44_H
- D1 to D54......Display data

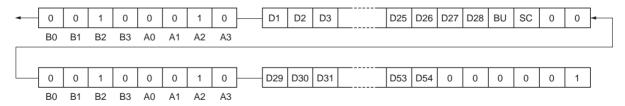
Dn (n = 1 to 54) = 1: Segment on

Dn (n = 1 to 54) = 0: Segment off

- BUControl data for specifying normal mode or power saving mode
- SC.....Control data for specifying all segments on or off

Serial Data Transfer Example

When 29 or more segments are used all 80 bits of the serial data must be sent.



When fewer than 29 segments are used only the first 40 bits of the serial data can be sent. However, all 80 bits must be sent after power is first applied.



Note: The following type of transfer cannot be used when fewer than 29 segments are used.



Control Data Functions

1. BU: Control data for specifying normal mode or power saving mode

This control data bit is used to control the normal mode/power saving mode state of the LC75842E and LC75842M.

BU	Mode	
0	Normal mode	
1	Power saving mode (The OSC pin oscillator is stopped and the common and segment output pins go to the V _{SS} level.)	

2. SC: Control data for specifying all segments on or off This control data bit is used to turn all segments on or off.

SC	Display state	
0	On	
1	Off	

Note that when SC is 1 the display is turned off by outputting the segment off waveforms from the segment pins.

Correspondence between Display Data and Segment Output Pins

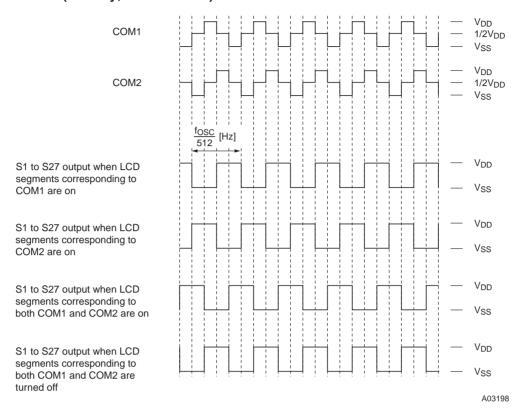
Segment output pin	COM1	COM2
S1	D1	D2
S2	D3	D4
S3	D5	D6
S4	D7	D8
S5	D9	D10
S6	D11	D12
S7	D13	D14
S8	D15	D16
S9	D17	D18
S10	D19	D20
S11	D21	D22
S12	D23	D24
S13	D25	D26
S14	D27	D28

Segment output pin	COM1	COM2
S15	D29	D30
S16	D31	D32
S17	D33	D34
S18	D35	D36
S19	D37	D38
S20	D39	D40
S21	D41	D42
S22	D43	D44
S23	D45	D46
S24	D47	D48
S25	D49	D50
S26	D51	D52
S27	D53	D54

For example, the table below lists the output states for the S11 segment output pin.

Displa	ay data	Segment output pin (S11) state	
D21	D22	Segment output pin (STT) state	
0	0	Both segments for COM1 and COM2 are off.	
0	1	Segment for COM2 is on.	
1	0	Segment for COM1 is on.	
1	1	Both segments for COM1 and COM2 are on.	

Output Waveforms (1/2 duty, 1/2 bias drive)



INH and Display Control

Since the IC internal data (D1 to D54 and control $\underline{\text{data}}$) is undefined when power is first applied, the display is turned off (S1 to S27, COM1 and COM2 = low) by setting $\overline{\text{INH}}$ pin low at the same time as power is applied. Then, meaningless display at the power on can be prevented by transferring all 80 bits of serial data from the controller while the display is turned off and $\overline{\text{INH}}$ pin high after the transfer completes. (See Figure 3.)

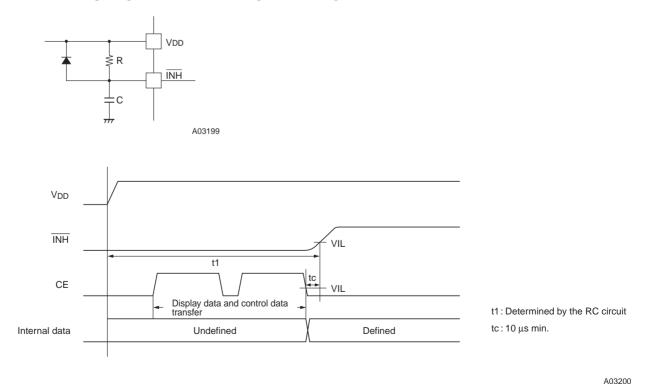


Figure 3

Notes on Transferring Display Data from the Controller

Since the LC75842E and LC75842M take the display data (D1 to D54) in two separate transfer operations as shown in Figure 2, we recommend that all the display data be transferred within 30 [ms] to maintain the quality of the displayed image.

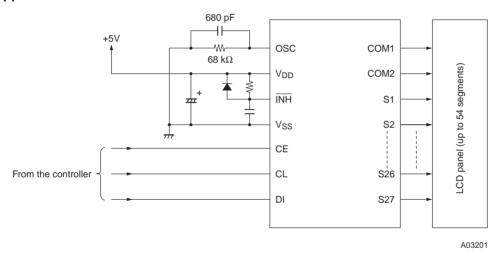
Sample Display

Example in which 40 segments are used (up to 54 segments can be used)

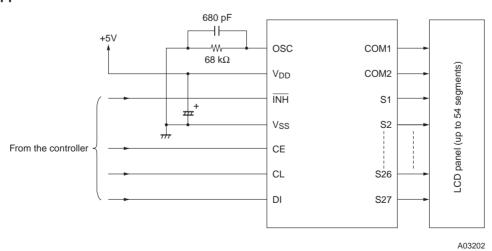


Note: The numbers in circles indicate the number of segments.

Sample Application Circuit 1



Sample Application Circuit 2



- Specifications of any and all SANYO products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.
- SANYO Electric Co., Ltd. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all SANYO products (including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written permission of SANYO Electric Co., Ltd.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the SANYO product that you intend to use.
- Information (including circuit diagrams and circuit parameters) herein is for example only; it is not guaranteed for volume production. SANYO believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.

This catalog provides information as of September, 2001. Specifications and information herein are subject to change without notice.