

UM10726

User manual for the PCA8538 evaluation board OM13501A

Rev. 2 — 18 July 2013

User manual

Document information

Info	Content
Keywords	LCD driver, segment driver, COG, Chip-On-Glass, PCA8538, Vertical Alignment (VA)
Abstract	This evaluation board can be used to demonstrate and evaluate the PCA8538 segment driver. This is a chip-on-glass LCD driver which can drive up to 918 segments in MUX 1:9. The board contains only the display module, some decoupling capacitors and some jumpers. The jumpers can be used for interface selection (I ² C or SPI). A pin strip has been provided as well, which makes it easy to connect the board to any microcontroller and power supply, and start developing an application.



Revision history

Rev	Date	Description
2	20130718	2 nd revision Type number of board corrected, from OM13502 to OM13501A
1	20130702	First version

Contact information

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1. Introduction

This user manual describes the PCA8538 evaluation board. The board contains a COG display module, some decoupling capacitors for the power supply and some jumpers to configure the display driver.

The PCA8538 is a peripheral device which interfaces to almost any Liquid Crystal Display (LCD) with low multiplex rates. It generates the drive signals for any static or multiplexed LCD containing up to nine backplanes, 102 segments and up to 918 display elements. The PCA8538 features an internal charge pump with internal capacitors for on-chip generation of the LCD driving voltage. To ensure an optimal and stable contrast over the full temperature range, the PCA8538 offers a programmable temperature compensation of the LCD supply voltage. The PCA8538 can be easily controlled by a microcontroller through either the two-line I²C-bus or a four-line bidirectional SPI-bus. It is AEC Q100 grade 2 compliant for automotive applications.

Please refer to the PCA8538 datasheet as well while working with this board.

This board was developed in order to provide a low cost tool for engineers, wishing to demonstrate and evaluate this LCD driver, and to get hands-on experience with writing code for it. Code written using this board can serve as an example for the final application. This enables rapid prototyping. The board can be connected to any existing application with either I²C-bus or SPI-bus interface. This application then needs to provide also the power supply, with the supply voltage ranging from 2.5 V to 5.5 V.

Features:

- Provides tool for evaluating the PCA8538 LCD driver
- Features a vertical alignment (VA) COG display module with integrated backlight
- Jumpers for interface selection (I²C or SPI)
- Jumper for selection of internal or external oscillator
- Connector pins for easy connection to external microcontroller or application

2. Board description and layout

[Fig.1](#) shows a picture of the board.



Fig 1. PCA8538 evaluation board

For best optical performance, remove the protective foil from the display.

The jumpers are visible on the left, the pins for connecting the module are at the bottom of the board.

3. Board schematic and layout

The schematic of the board is given in [Fig 2](#). The board contains the display module (on the left) with integrated backlight module, indicated on the right as “LED Backlight”. In addition it contains decoupling capacitors for V_{DD} (C1) and for V_{LCD} (C2). The network R1/C3 pulls down the RESET pin when the module is powered up, thus generating a reset (active LOW). Pin 1 can also be connected to a GPIO of a microcontroller, allowing the microcontroller to generate a reset.

V_{LCD} can either be generated by the internal charge pump or it can be supplied with a second supply voltage (pin 13 of connector P1). In that case the internal charge pump must be disabled. Jumper JP6 should be removed when using an external V_{LCD} supply voltage.

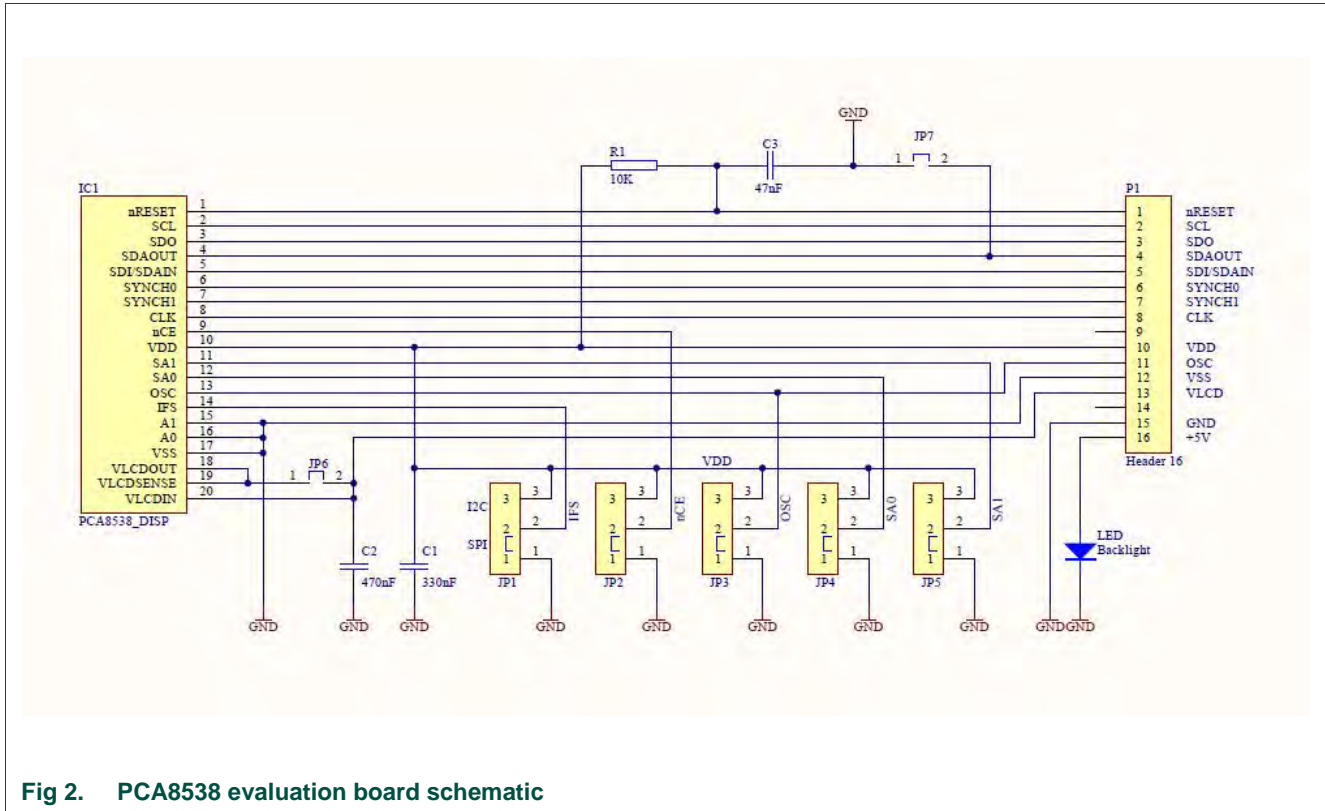


Fig 2. PCA8538 evaluation board schematic

3.1 Jumper settings

The board contains seven jumpers. Five are required for the interface selection. There is one jumper for oscillator selection and one jumper related to V_{LCD} .

Table 1. Interface selection jumpers

Jumper	SPI-bus	I ² C-bus
JP1, IFS	V_{SS} (GND)	V_{DD}
JP2, nCE	active LOW, chip enable	unused, connect to V_{DD}
JP4, SA0	V_{SS}	V_{SS} for logic 0, V_{DD} for logic 1
JP5, SA1	V_{SS}	V_{SS} for logic 0, V_{DD} for logic 1
JP7, SDAOUT	unused, connect to V_{SS} (Place)	serial data output (Remove jumper)

The other jumpers are listed in [Table 2](#).

Table 2. Jumpers for oscillator and V_{LCD} selection

Jumpers	settings
JP3, OSC	V _{SS} , internal oscillator V _{DD} , external oscillator
JP6, V _{LCD}	placed, internal V _{LCD} removed, external V _{LCD}

If pin OSC is tied to V_{SS}, CLK is the output pin of the internal oscillator. If pin OSC is tied to V_{DD}, CLK is the input pin for the external oscillator.

Fig 3 below shows the board layout.

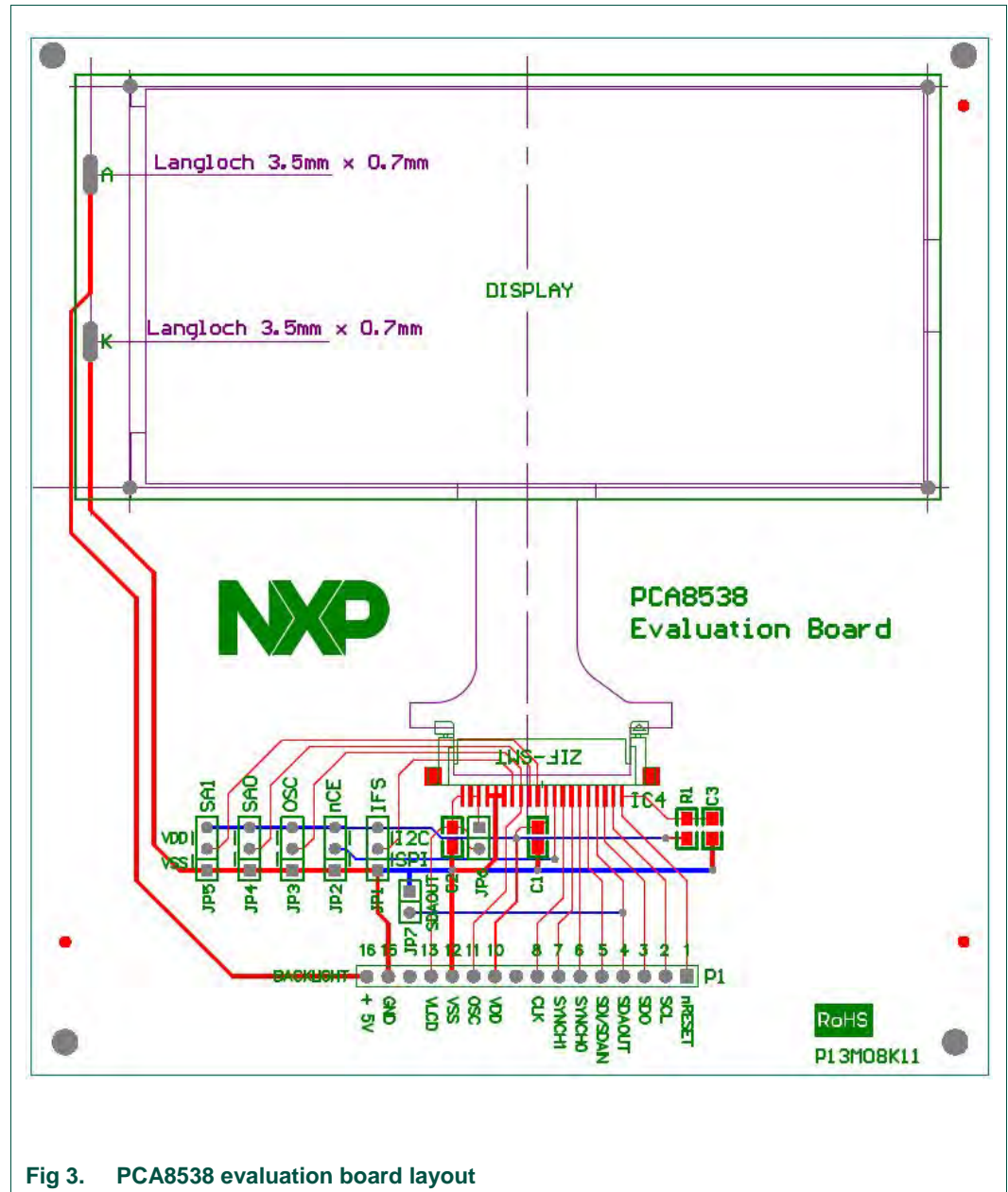


Fig 3. PCA8538 evaluation board layout

4. Software code example

Section 8 of the PCA8538 data sheet contains all the commands and their description. In order to write software for this driver, it will be necessary to read the datasheet.

Below, an example for the configuration of this module is listed. Exact details of how to write the functions are left to the programmer. This example shows the data to be sent to the PCA8538 to configure it for use with the module on this board.

```
I2CWrite = PCA8538_ADDR;
I2CWrite = 0b10000000; // control byte
I2CWrite = 0x3A;      // Initialize
I2CWrite = 0b10000000; // control byte
I2CWrite = 0xD8;      // OTP refresh
I2CWrite = 0b10000000; // control byte
I2CWrite = 0x18;      // Device Select 0
I2CWrite = 0b10000000; // control byte
I2CWrite = 0xD4;      // CLKOUT disabled
I2CWrite = 0b10000000; // control byte
I2CWrite = 0xC9;      // Charge pump enabled, Vlcd = 3*Vdd2
I2CWrite = 0b10000000; // control byte
I2CWrite = 0x45;      // set VLCD, MSB
I2CWrite = 0b10000000; // control byte
I2CWrite = 0x73;      // set VLCD, LSB. VLCD = 6.4 V
I2CWrite = 0b10000000; // control byte
I2CWrite = 0x00;      // Temp. comp. and measurement disabled
I2CWrite = 0b10000000; // control byte
I2CWrite = 0xD0;      // Set 1/4 bias
I2CWrite = 0b10000000; // control byte
I2CWrite = 0xB3;      // Driving scheme C, 3-line inversion
I2CWrite = 0b10000000; // control byte
I2CWrite = 0x39;      // Display enable
I2CWrite = 0b10000000; // control byte
I2CWrite = 0x80;      // Set Data pointer x-MSB = 0
I2CWrite = 0b10000000; // control byte
I2CWrite = 0x90;      // Set Data pointer x-LSB = 0
I2CWrite = 0b10000000; // control byte
I2CWrite = 0xA0;      // Set Data pointer y = 0
I2CWrite = 0b00100000; // Write to DDRAM
```

5. References

The document listed below provides further useful information. It is available at NXP's website www.nxp.com.

- [1] **PCA8538**: Automotive 102 x 9 Chip-On-Glass LCD Segment driver, Product data sheet

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