UM10988

PCA9532 demonstration board OM13528

Rev. 1 — 2 May 2016 **User manual**

Document information

Info	Content
Keywords	Fm I^2C-bus, PCA9532, RGB and White LEDs, 16-channel Dimmer & Blinker with two 8-bit PWMs
Abstract	The OM13528 is an add-on to 9-pin connector of NXP's I^2C demo board 2005-1. This daughter board makes it easy to test and design with the PCA9532, a 16-channel Fast-mode (Fm), the LED output driver is open-drain with a 25 mA current sink capability at 5 V. These boards, along with the Win-I2CUSB GUI (PC based), provide an easy to use evaluation platform.

Revision history

Rev	Date	Description
1	20160502	Initial revision.

Contact information

For more information, please visit: http://www.nxp.com

For sales office addresses, please send an email to: salesaddresses@nxp.com

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1. Introduction

The PCA9532 evaluation board features LEDs for color mixing, blinking and dimming demonstrations. A graphical interface allows the user to easily explore the different functions of the driver. The board can be connected in series with other I^2C demo-boards to create an evaluation system.

The IC communicates to the host via the industry standard I^2C-bus/SMBus port. The evaluation software runs under Microsoft Windows PC platform.

2. Features

- A complete evaluation platform for the PCA9532 16-channel Fm I^2C-bus 25 mA voltage switch LED driver
- Easy to use GUI based software demonstrates the capabilities of the PCA9532
- On-board RGB and White LEDs for visual experience
- Convenient test points for easy scope measurements and signal access
- USB interface to the host PC
- No external power supply required

3. Getting started

3.1 Assumptions

Familiarity with I^2C-bus is helpful but not required.

3.2 Static handling requirements

CAUTION



This device is sensitive to Electro Static Discharge (ESD). Therefore care should be taken during transport and handling. You must use a ground strap or touch the PC case or other grounded source before unpacking or handling the hardware.

3.3 Minimum system requirements

- PC Pentium 60 processor (or equivalent), 8 MB RAM, 10 MB of hard drive space
- One USB port (either 2.0 or 1.1 compatible)
- Windows 98SE, ME, 2000, XP, Vista, or 7
- WIN-I2CUSB board (from www.demoboard.com)

3.4 Power requirements

The NXP demonstration board OM13528 hardware obtains power from the PC USB port. Care should be taken not to exceed the USB port current capabilities.

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4. Installation

4.1 WIN-I2CUSB software

The Win-I2CUSB software from The Boardshop runs on Windows 98SE, ME, 2000, XP, Vista or 7 and is compatible with any PC hardware having a minimum of a Pentium processor and an USB port. The soft-ware allows the user to select one of the I^2C-bus devices on the board from a menu and also provides a Universal mode (I2C Expert mode) to allow users to create their own I^2C-bus commands with the same I^2C-bus devices.

4.2 OM13528 connection to WIN-I2CUSB hardware adapter board

The Win-I2CUSB board should be disconnected from your PC before connecting the OM13528 board on to it. The OM13528 board has a 14-pin male connector (CON2) that connects to the 14-pin male connector (J1) on the Win-I2CUSB board as shown in the Fig 1.

Connect the OM13528 board to the Win-I2CUSB board before connecting the USB cable. Once the board is connected, connect the USB cable and start the WIN-I2CUSB software. You are now ready to evaluate the PCA9532.

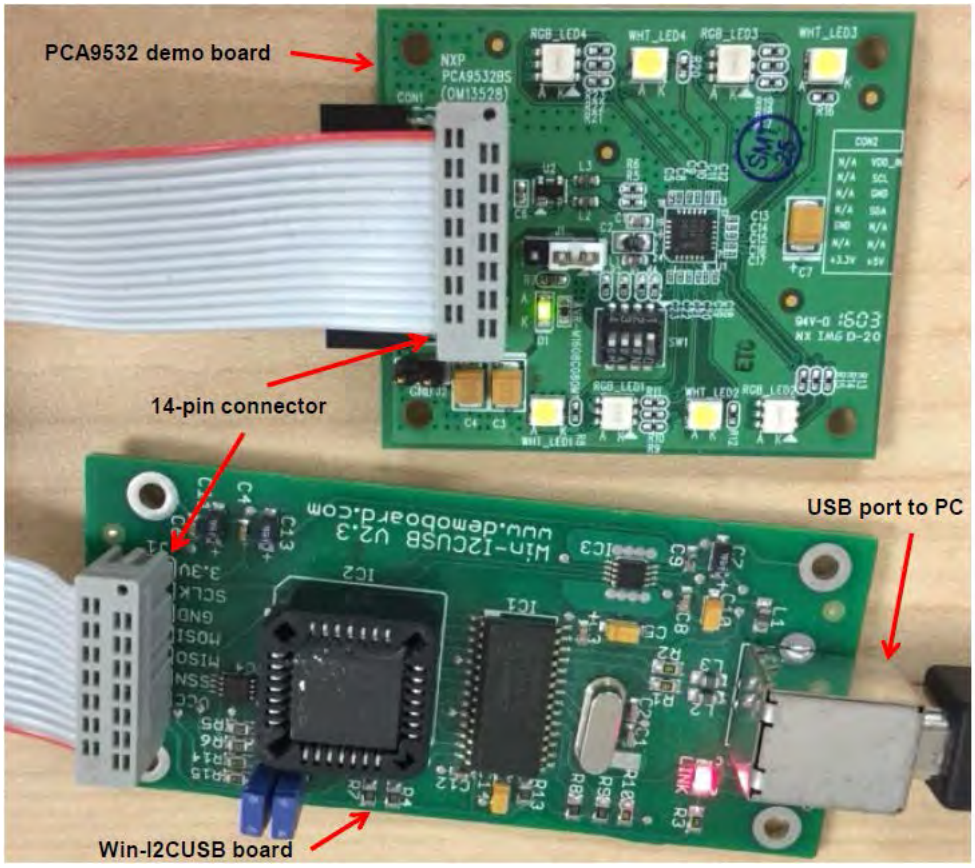


Fig 1. PCA9532 demo board (OM13528) connecting to the WIN-I2CUSB board

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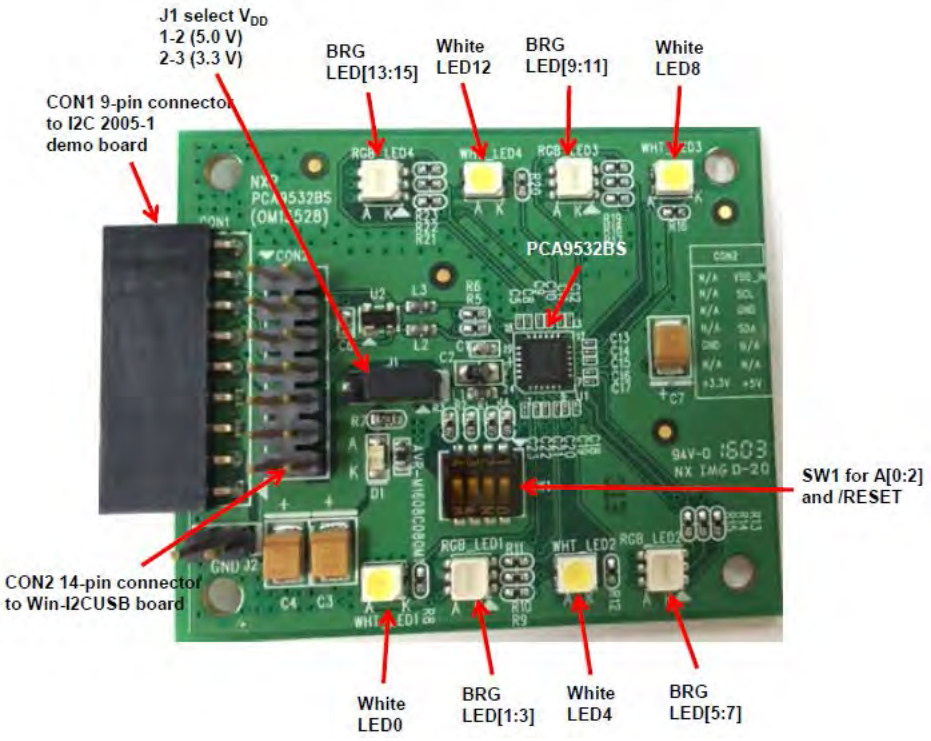


Fig 2. PCA9532 demo board (OM13528)

5. Hardware description

Fig 2 shows the following items on the hardware:

- CON1 (9-pin female) is for connection to JP1 on I^2C demo board 2005-1.
- J1 selects V_{DD} power for PCA9532, connected 1-2 for V_{DD} = 5.0 V and connected 2-3 for V_{DD} = 3.3 V.
- SW1 4-position dip switch to select I^2C-bus address A[0:2] = SW1[4:2] for this device (default address is 0xC0, all three switches are ON). SW1[1] is used to control /RESET input (default is OFF position to disable RESET input).
- CON2 (14-pin) is for connection to J1 on WIN-I2CUSB board.
- Four LED outputs (LED0/4/8/12) drive four White LEDs and the other 12 LED outputs (LED[1:3];LED[5:7];LED[9:11];LED[13:15]) drive four BRG LEDs.
- J2 is GND pin for probing use.

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6. Schematic

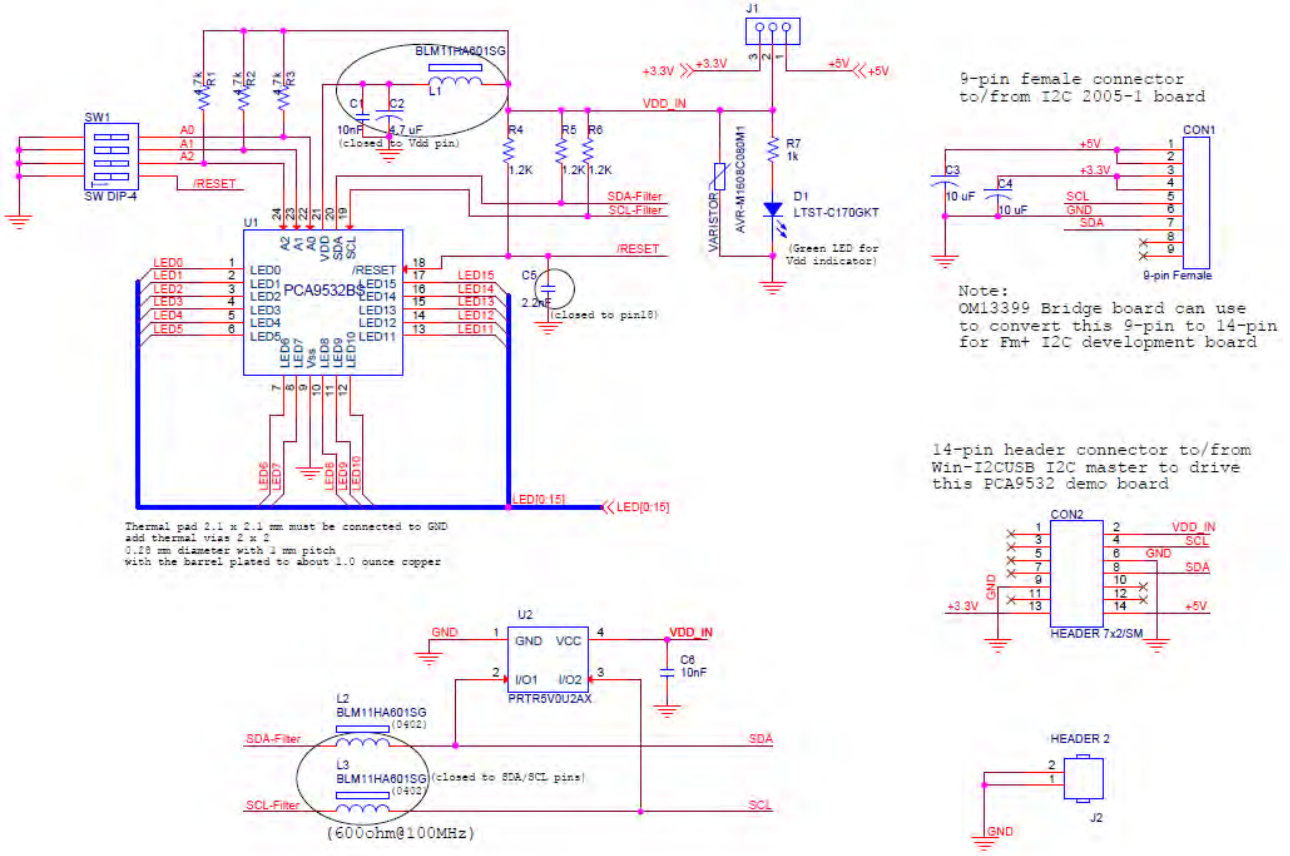


Fig 3. PCA9532 demo board schematic (1 of 2)

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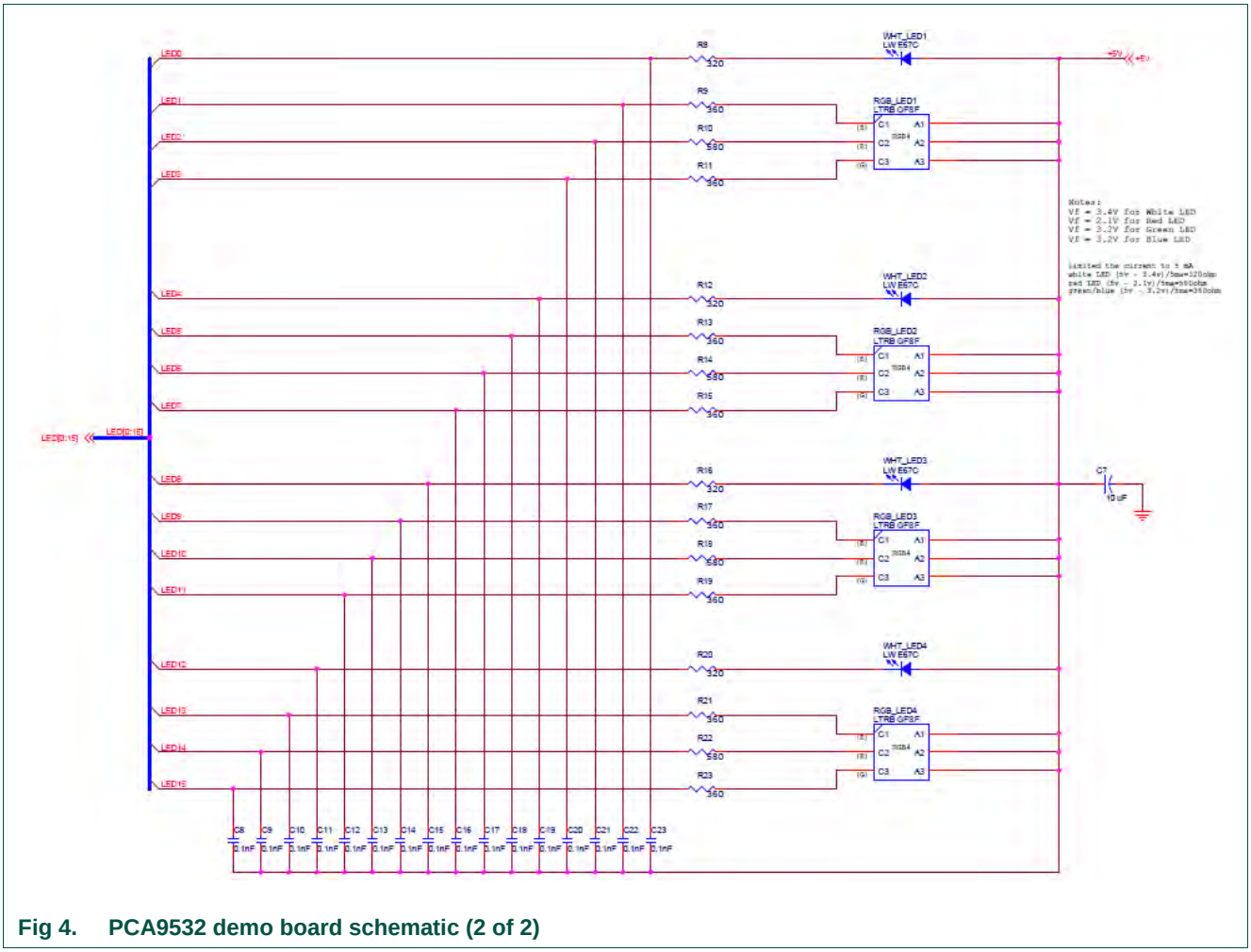


Fig 4. PCA9532 demo board schematic (2 of 2)

7. OM13528 demonstration board main components

Table 1. OM13528 demo board main components

Device	Description	Address/LED Output	Location
PCA9532BS	16-channel 8-bit PWM FM I^2C-bus 25 mA voltage switch LED driver	0xC0 default device address	U1
LW-E67C	White LED	LED0, LED4, LED8, LED12	WHT_LED[1:4]
LTRB_GFSF	RGB LED	LED1, LED2, LED3	RGB_LED1
LTRB_GFSF	RGB LED	LED5, LED6, LED7	RGB_LED2
LTRB_GFSF	RGB LED	LED9, LED10, LED11	RGB_LED3
LTRB_GFSF	RGB LED	LED13, LED14, LED15	RGB_LED4
LTST-C170GKT	PCA9532 power supply either 3.3 V or 5 V indicator	Green LED	D1

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8. PCA9532 evaluation steps

The PCA9532 functions are controlled by WIN-I2CUSB GUI. Refer to the PCA9532 data sheet for additional information on the registers and functionality.

Connect the hardware as described in Section 4. The PCA9532 demo board address is set to 0xC0 on switch (SW1) as A[0:2] = SW1[4:2] = 000 (0 -> ON, 1 -> OFF). When you have correctly installed the software and the demonstration board hardware is connected and recognized by the computer, start the Win-I2CUSB software. As shown in the Fig 5, when the demonstration board hardware is correctly connected to the USB port and the computer recognizes it, the message “Hardware Detected” is dis-played on the bottom of the window.

Switched 3.3 V or 5.0 V power supplies is controlled through the “Options” menu or by double clicking on the 3.3 V or 5.0 V symbols on the bottom of the window. Power supplies are disabled by default and you must enable them before using the I^2C-bus devices on the board. I^2C-bus frequency is controlled through the “Options” menu or by double clicking on the frequency symbol on the bottom of the window.

8.1 Dimming and blinking control for LEDs

The LED brightness is controlled by setting the blink rate (PCS0/1 to control period of the PWM output) high enough (> 100 Hz) that the blinking cannot be seen and then using the duty cycle (PWM0/1) to vary the amount of time the LED is on and thus the average current through the LED.

The initial setup sequence programs the two PWM period PCS0/PCS1 and PWM duty cycle PWM0/PWM1registers. From then on, only one command from the bus master is required to turn individual LEDs ON, OFF, BLINK at PWM0 or BLINK at PWM1. Based on the programmed frequency and duty cycle, BLINK PWM0 and BLINK PWM1 will cause the LEDs to appear at a different brightness or blink.

1. From the ‘Device’ drop-down menus select ‘LED Blinkers and Dimmers’, and from the subsequent drop-down menu select ‘PCA9532 16-bit LED Driver with 8-bit PWM’ as shown in Fig 5.
2. The device address is set to “0xC0” hex as default value, also check the ‘Auto Write On’ box (next lower) as shown in Fig 6.
3. The device configuration screen for dimming and blinking effect will be displayed by clicking the following options:
   - ‘PWM 0” box is used to set “Period” from 0.59 Hz to 152 Hz and “Duty Cycle” from 0% to 99.61% (256 steps)
   - ‘PWM 1” box is used to set “Period” from 0.59 Hz to 152 Hz and “Duty Cycle” from 0% to 99.61% (256-steps)
4. Click the ‘LED[0:15]’ configuration screen for each LED in “LED Mode Select” box to set LED output in one of these four modes: “OFF” (default), “ON”, “Blinks at PWM0 rate” or “Blinks at PWM1 rate”

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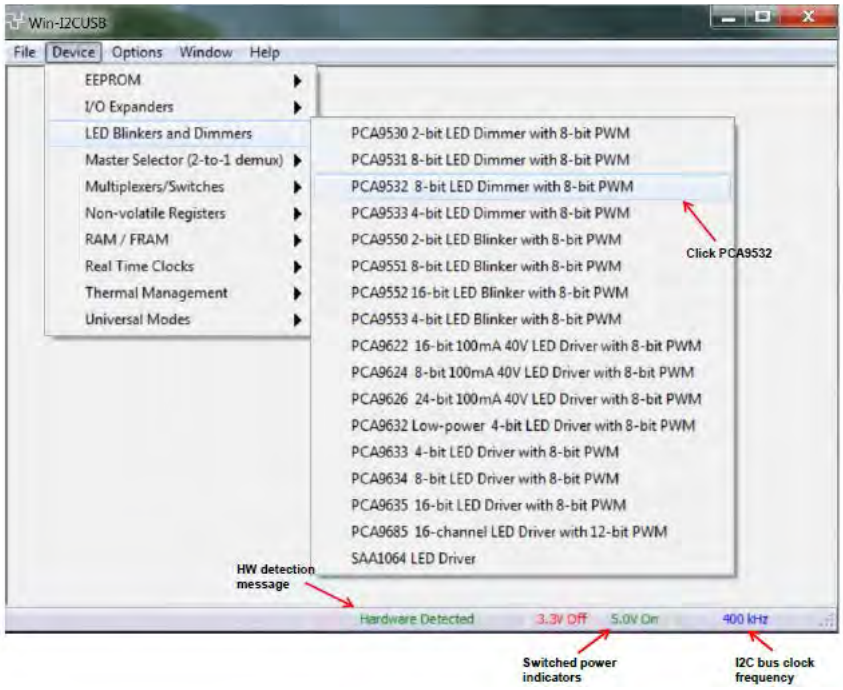


Fig 5. Drop-down menu selections

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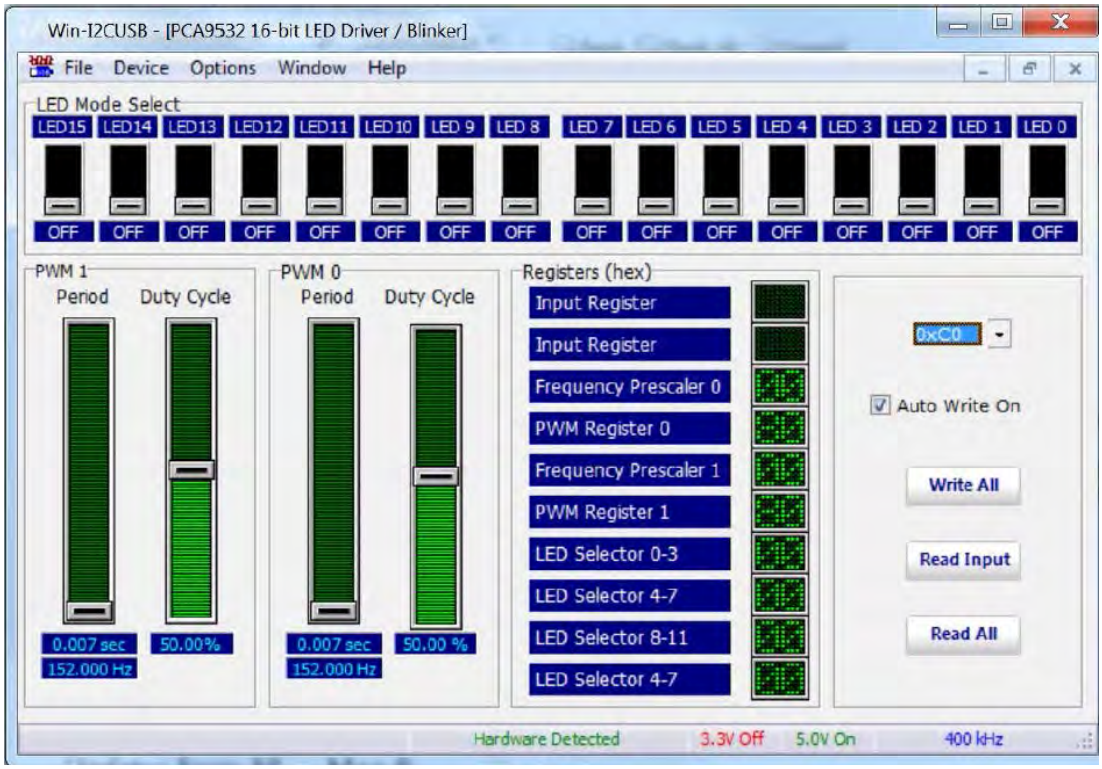


Fig 6. PCA9532 GUI configuration screen

9. Support

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10. Abbreviations

Table 2. Abbreviations

Acronym	Description
ESD	Electro Static Discharge
GUI	Graphical User Interface
I^2C-bus	Inter-integrated Circuit bus
IC	Integrated Circuit
LED	Light Emitting Diode
PC	Personal Computer
PWM	Pulse Width Modulation
RAM	Random Access Memory
RGB	Red/Green/Blue
RGBA	Red/Green/Blue/Amber
SMBus	System Management Bus
USB	Universal Serial Bus

11. References

[1] PCA9532, 16-channel Fm I^2C-bus 25 mA voltage switch LED driver Product data sheet; NXP Semiconductors; http://www.nxp.com/pip/PCA9532

[2] UM10206, I2C Demonstration Board 2005-1 Quick Start Guide NXP Semiconductors; http://www.nxp.com/documents/user_manual/UM10206.pdf

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