UM0425
User manual

STLED316S Front panel LED controller/driver evaluation board

Introduction

LED displays are widely used on consumer electronics and household appliances. Both push button keys and LED displays form the front panel of these products.

Figure 1. Typical front panel application

In conventional systems, a sub MCU (Microcontroller) is used to control the front panel functions. Depending on the number of LED digit/segment and push button keys, an MCU with a high pin count might be required.

Other disadvantages of an MCU solution:

- External discrete current driver
- Current limiting resistors
- Additional cost of crystal for MCU clock

The STLED316S is a complete front panel LED controller/driver that is able to solve these disadvantages.

A common anode LED driver can drive 40 mA of current on each segment output. No current limiting resistor is required as the current is set by a single RSET resistor. It has the additional advantage of brightness control up to 8 increments. Display brightness can be adjusted by modifying the brightness register value. It also has the capability of controlling each 7-segment LED digit and discrete LED brightness individually.

The device can handle a maximum of 16 front panel keys. If any front panel key event is detected, IRQ out is asserted. IRQ is released once the key data is read.

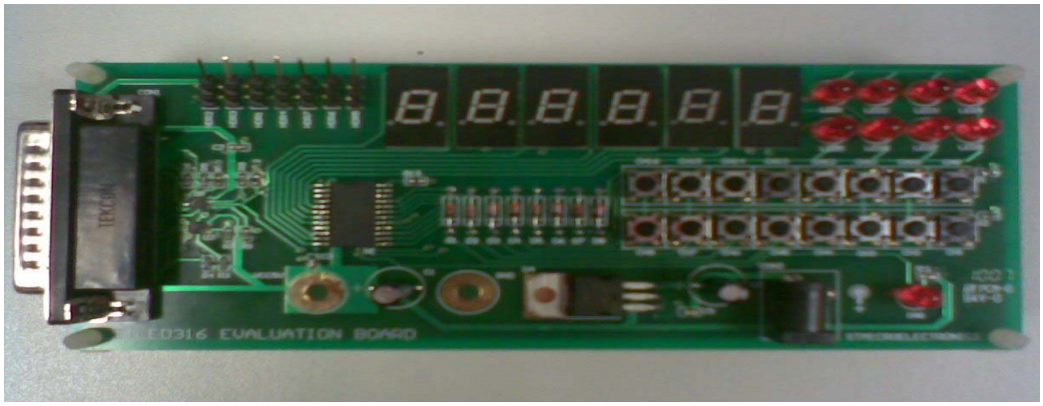
Current matching on each segment is guaranteed to be within 3%. When no digit and segment are ON, STLED consumes much less current of around 200 µA which is achieved by turning OFF internal current mirror circuitry.

Contents

1 Evaluation board

The demo board is integrated with six 7-segment LED digits, eight discrete LEDs, 16 push button keys, and other components for interfacing to a PC parallel port and power supply. One LED indicates the status of IRQ output. If IRQ is asserted, the LED is turned ON.

Figure 2. STLED316S Evaluation board



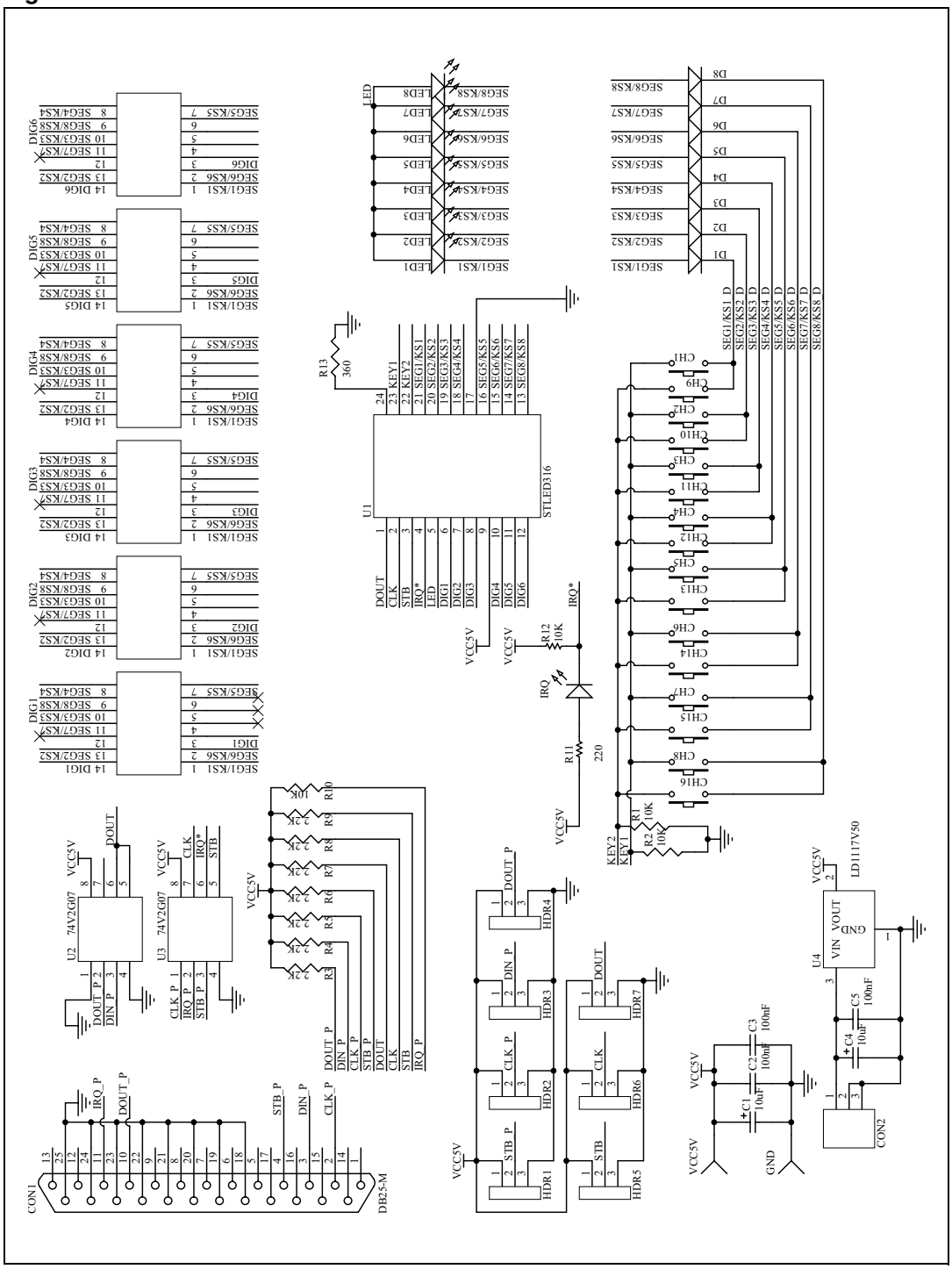
The board can be powered from a DC power supply or center positive AC to DC adaptor. If it is to be powered from a DC power supply, the power pad labeled V_{CC} 5 V should be connected to 5 V and the power pad labeled GND should be connected to power supply ground.

A center positive AC to DC adaptor with output voltage between 6 V to 15 V can also be used to power the board. The adaptor should be plugged to the DC connector labeled CON2.

CON1 provides the connection to the PC parallel port. General User Interface (GUI) communicates with the board through this parallel port. The parallel port address should be set to 0378h.

The STLED316S_GUI.exe and io.dll files are contained in a zip file. Before operating the GUI, both files should be extracted to the same folder.

Figure 3. Evaluation board schematic

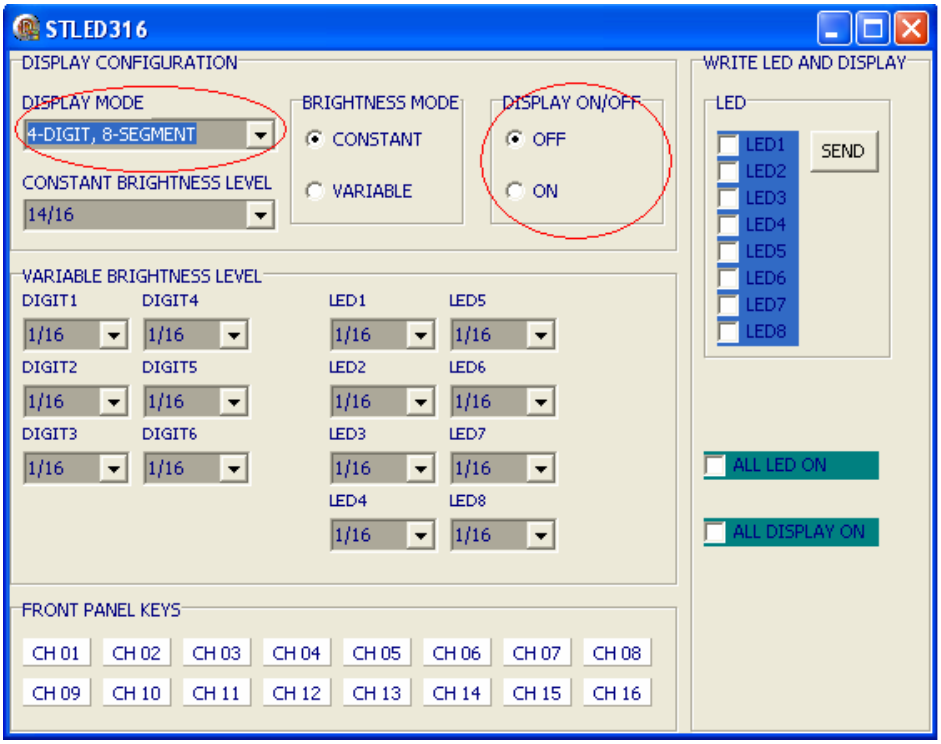


2 General User Interface

Connect the evaluation board to the computer by a parallel port cable.

Run STLED316S_GUI.exe and then power up the demo board.

Figure 4. Default GUI setting



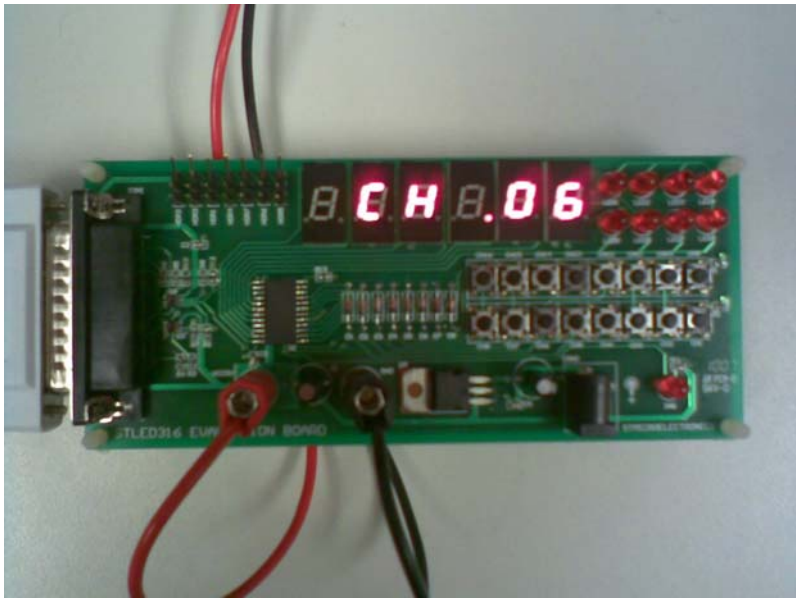
The setting of GUI when it is first run is the default setting of STLED316S upon power-up. The number of 7-segment LED on evaluation board is six. The DISPLAY MODE (red circle in *Figure 4*) should be modified from the default value of 4-digit, 8-segment to 6-digit, 8-segment. By default also, DISPLAY is OFF. Modify DISPLAY ON/OFF (red circle in *Figure 4*) setting to ON.

3 Front panel keys

There are 16 front panel keys on the board. If any key press is detected, STLED316S asserts interrupt. For this evaluation board, the interrupt is sent to GUI. Once the GUI detects an interrupt, it reads front panel key data on the STLED316S key register. Having decoded the data, GUI then writes to the 7-segment display the key that has been pressed.

For example if the push button labeled CH6 is pressed, CH.06 will be displayed on 7-segment display as shown below:

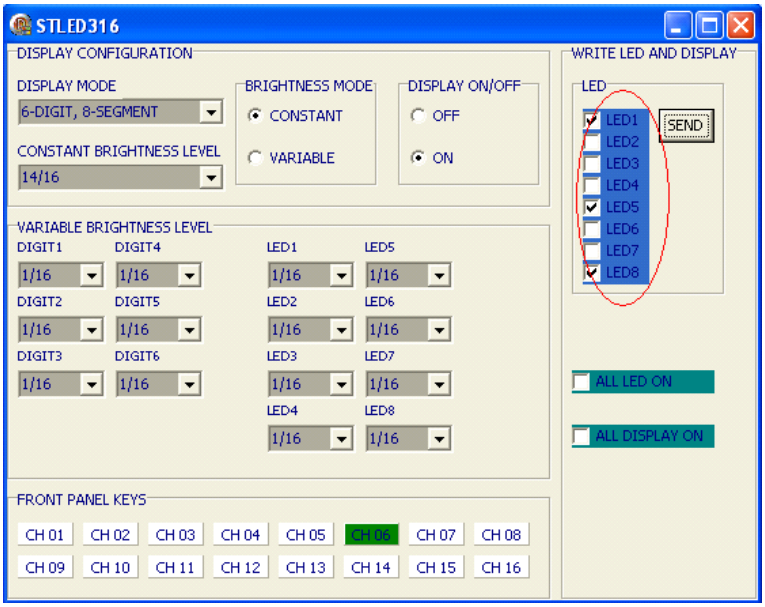
Figure 5. CH.06 corresponding to CH6 push button press



4 7-Segment display and discrete LED

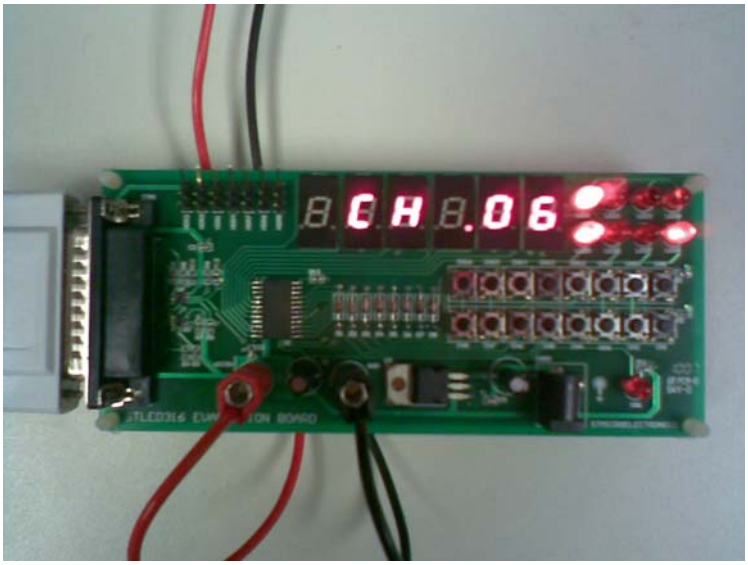
The STLED316S is able to drive up to 56 LED segments (48 segments for 7-segment display and 8 segments for discrete LED).

Figure 6. Discrete LED control



On the top right of the GUI (red circle in *Figure 6*) is the control for turning ON and OFF each individual discrete LED on the board. Click on the LED to be turned ON and press the send button. The corresponding LED on board turns ON.

Figure 7. Discrete LED ON



To observe the effect of brightness variation, it is better to turn ON all discrete LED and 7-segment displays. Click both ALL LED ON and ALL DISPLAY ON (red circle in *Figure 8*). All segments are then turned ON.

Figure 8. Turning ON all segments

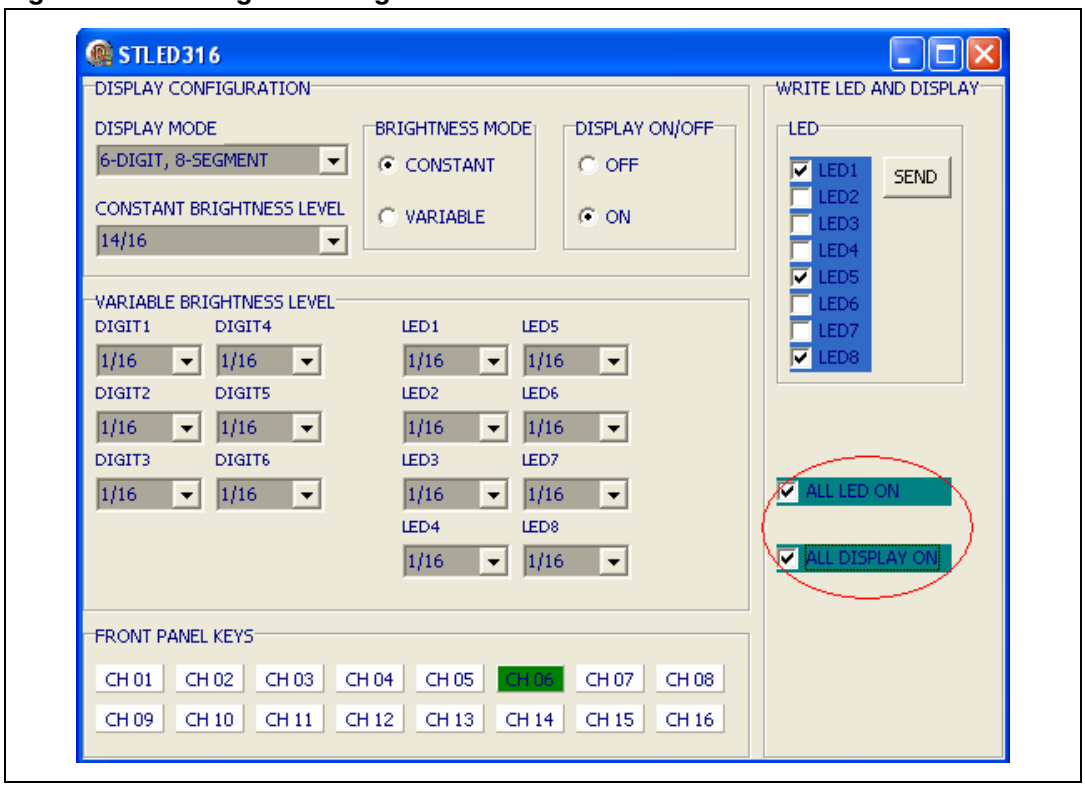
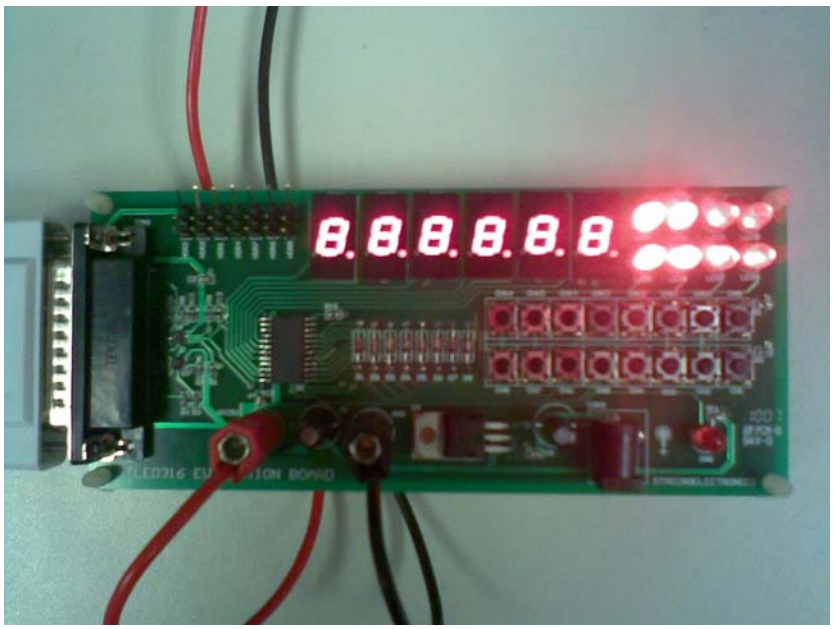
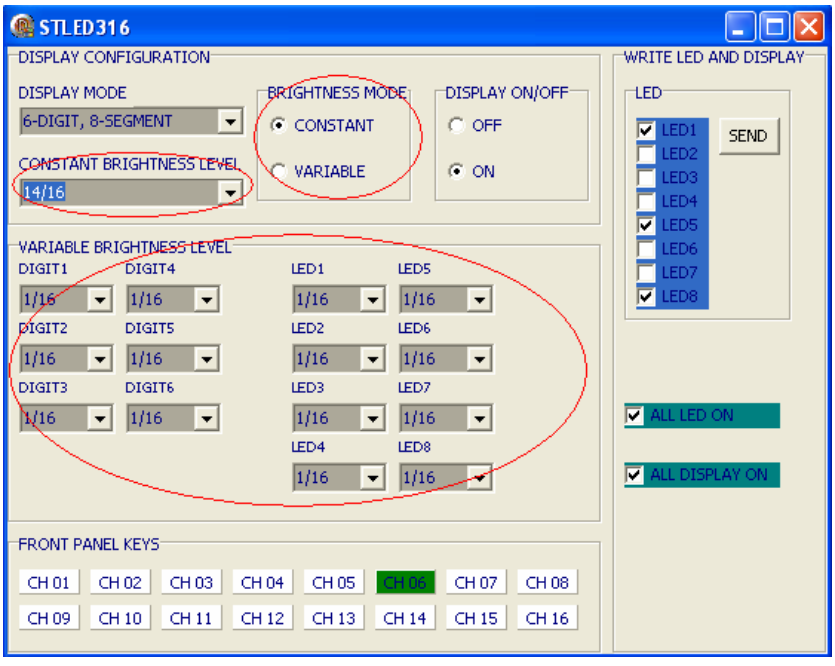


Figure 9. All segments ON



By default the brightness mode is constant. Default constant brightness LEVEL is 14/16. Constant brightness mode means that the brightness level applies uniformly for all the 56 segments (7-segment and discrete LED).

Figure 10. Brightness mode and level



Modify constant brightness level (red circle in *Figure 10*) to another setting all the 56 segments change brightness accordingly.

The brightness mode setting (red circle in *Figure 10*) can be changed to variable. Variable brightness mode means that each 7-segment digit and discrete LED brightness can be controlled individually and independently of each other. The default variable brightness level for all the digit and discrete LEDs is 1/16.

Modify the variable brightness level (red circle in *Figure 10*) for each individual 7-segment digit and discrete LED, and the 7-segment display and discrete LED brightness change accordingly.

Segments for 7-segment display can also be used for discrete LED and vice versa. Segments for 7-segment display and discrete LED operate in the same way. The only difference is that in variable brightness mode, the brightness of segments for 7-segment displays are controlled in groups of eight, which is per digit, whereas discrete LED segment brightness is controlled individually.

5 Summary

The STLED316S is the right solution for front panel LED controller/drivers. With its adjustable brightness level, 3% current matching, integrated front panel key detection, and low stand-by current, it enhances performance and at the same time simplifies front panel design.

6 Revision history

Table 1. Revision history

Date	Revision	Changes
05-Jun-2007	1	First issue

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