



LX23224IDB
Evaluation Board
User Guide

Revision 0.2

Reference Documents

- LX23224IDB - 4 Channel EDGE-Lit LED Display Driver with DC/DC PSU Controllers, Cat. No. DS_LX23224
- AN 195 - Designing an EDGE-Lit LED BackLight System Based LX23224, Cat. No. 06-0131-80



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1 About this Guide

This document provides a description and operation procedures for Microsemi's LX23224IDB Evaluation Board.

1.1 Audience

This document is intended for qualified personnel, meaning operators and technicians who have a background in electronics and are familiar with its basic concepts.

1.2 Organization

This guide is divided into the following sections:

- Chapter 1 **About this Guide:** Describes the objectives, audience, and organization of this guide.
- Chapter 2 **Introduction:** Describes the Evaluation Board main functions and features, and the system architecture.
- Chapter 3 **Physical Description:** Provides explanation about the connectors, indicators, and test points.
- Chapter 4 **Installation:** Describes installation procedure for the System Board.
- Chapter 5 **Troubleshooting:** Provides a guide for troubleshooting

1.3 Abbreviations

- PWM: Pulse Width Modulation
- $V_{DC/DC}$: DC/DC output voltage
- V_{in} : Input Voltage

2 Introduction

Microsemi's Evaluation Kit (see Figure 1) provides designers with a platform to evaluate the performance and implementation of LX23224IDB EDGE-Lit LED Display Driver.

All necessary steps and connection instructions required to install and operate this board are provided within this document.

Backlight Demo System enables Back Light LCD designers to evaluate Microsemi's driver EDGE-Lit solution with maximum flexibility and ease in configuration.

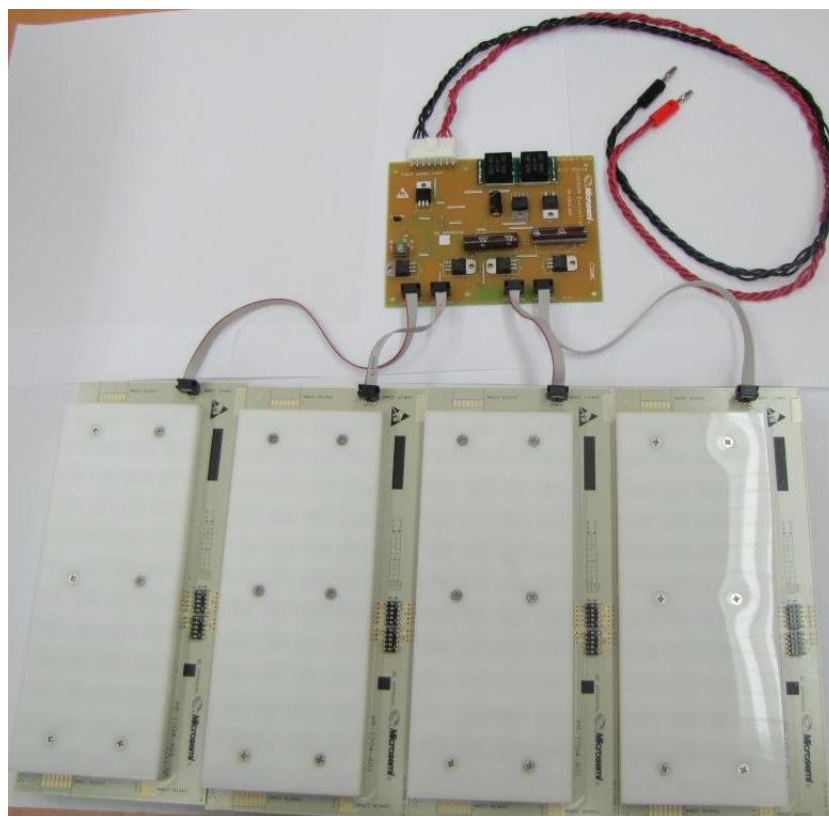


Figure 1: LX23224IDB Evaluation Board – General View

2.1 EVB Features

- LX23224IDB supports four LED strings
- Digital dimming input
- Minimum duty cycle 4%@2KHz
- Per string voltage monitoring for failure events detection
- Controls LED string voltage for power losses reduction
- LED driver inherent thermal protection
- System input voltage and output voltage monitoring
- 125 mA/string
- 120V output voltage
- 140KHz DC/DC switching frequency
- RoHS compliant

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2.2 System Architecture

Figure 2 depicts block diagram of LX23224IDB Evaluation Board. LX23224IDB LED Driver controls a DC/DC and four LED strings

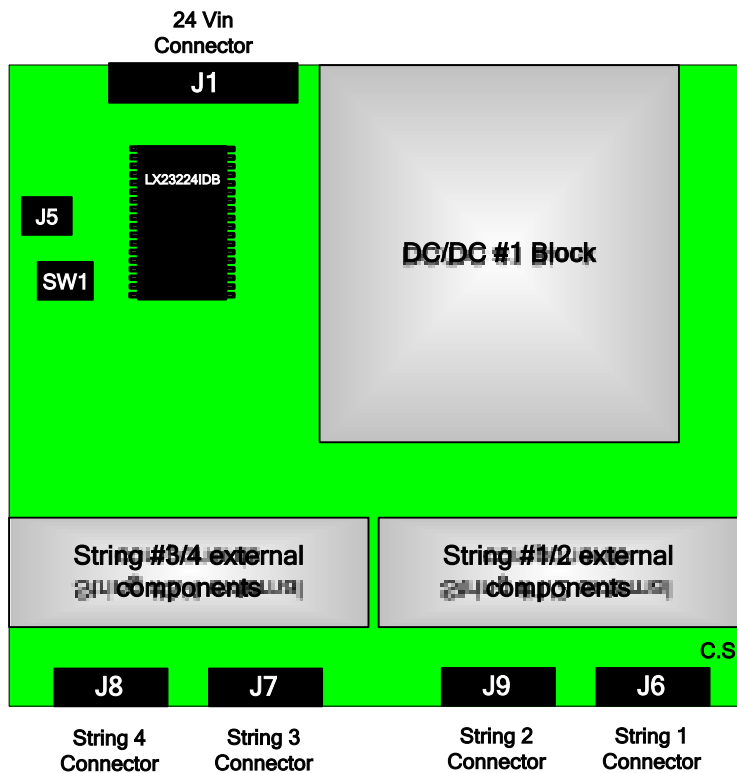


Figure 2: System Architecture – Block Diagram

2.3 Interfaces and Connections

The board has several interfaces:

- **LEDs:** A connection between LED strings and the LED driver output terminals. Connection is made through dedicated connectors (J6, J7, J8, J9).
- **User:** A user can turn system on/off by using a switch (SW1) and insert a digital PWM information via connector J5 .
- **Power Supply:** 24V input, fed by an external power supply (J1).



3 Physical Description

The following sections describe the board's connectors, test points and switches.

3.1 Connectors

Table 1 lists board's connectors.

Table 1: Evaluation Board's Connectors

Connector	Name	Description
J6, J7, J8, J9	LED strings connectors	Connect LED strings to LED driver. Each connector has 6 pins, for LED string and for $V_{DC/DC}$.
J1	Power	An 8 pin connector; for V_{in} and AGND.
J5	Host	2 pin connectors; for digital PWM input information

3.1.1 LED Strings Connectors J6, J7, J8, J9

Table 2 lists the two dedicated LED connectors that connect to Microsemi LED demo panel (PR-1004-A01).

Table 2: LED Strings Connectors Table – Pin Description

Connector	Pin No.	Signal Name	Description
J6	1	$V_{DC/DC}$	Output voltage to LED string anode
	2	$V_{DC/DC}$	Output voltage to LED string anode
	3	VD1	LED string 1 cathode return path
	4	N.C.	Not connected
	5	N.C.	Not connected
	6	N.C.	Not connected
J7	1	$V_{DC/DC}$	Output voltage to LED string anode
	2	$V_{DC/DC}$	Output voltage to LED string anode
	3	VD3	LED string 3 cathode return path
	4	N.C.	Not connected
	5	N.C.	Not connected
	6	N.C.	Not connected
J8	1	$V_{DC/DC}$	Output voltage to LED string anode
	2	$V_{DC/DC}$	Output voltage to LED string anode
	3	VD4	LED string 4 cathode return path
	4	N.C.	Not connected
	5	N.C.	Not connected
	6	N.C.	Not connected
J9	1	$V_{DC/DC}$	Output voltage to LED string anode
	2	$V_{DC/DC}$	Output voltage to LED string anode
	3	VD2	LED string 2 cathode return path
	4	N.C.	Not connected
	5	N.C.	Not connected
	6	N.C.	Not connected

- Manufacturer: CviLux
- Manufacture part number: CH81-062V100

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3.1.2 Power Connector J1

This connection supplies operating voltage for the whole LED backlight platform. Connector is connected to both high power supplies and LED driver.

Table 3: Power Connector Table – Pin Description

Pin No.	Signal Name	Description
1, 2, 3, 4	V _{in}	Application input voltage
5, 6, 7, 8	AGND	Ground connection for power return

- Manufacturer: CviLux
- Manufacture part number: CI5208P1H00

3.1.3 Host Connectors J5

Table 4: Host Connectors Table – Pin Description

Connector	Pin No.	Signal Name	Description
J5	1	DIGITAL_DIM1	Digital dimming input line (5V tolerate)
	2	AGND	Ground connection for signals return

- Manufacturer: CviLux
- Manufacture part number (J5): CH31-021V200

3.2 Test Points

Table 5 describes the on-board test points and their functions.

Table 5: On-Board Test Points

Test Point	TPs Name	Functionality
TP5,TP10,TP13	AGND	Analog ground
TP7,TP9,TP12	PGND1	Power ground 1
TP6,TP8,TP11	PGND2	Power ground 2
TP1	PS_SYNC	Power supplies synchronization signal
TP13	EN_BLU	System on/off signal

3.3 DIP Switch SW1

Evaluation board contains switch used for switching on or off the LED backlight system (Figure 3).

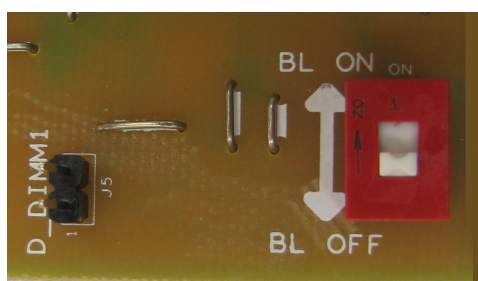


Figure 3: System On/Off Switch

4 Installation

The following chapter describes the steps required for installing and operating the Evaluation Board.

4.1 Preliminary Steps and Safety Precautions

- Connect all required peripherals prior to powering the board. (LED's, digital dimming generator)
- Do not perform a hot-swap!
- Verify board is properly configured prior to turning on power supply. (LED's per string. SW1 at BL OFF state)

WARNING!

Do not look directly at the LED panel when system is operating and LED panels are illuminating.

4.2 LED Demo Panel Configuration

The following paragraph describes the steps required for LED panel configuration.

The panel contains 48 high-power white LEDs connected in series as one string and 10 configuration switches (see Figure 4). Users can configure the LED string LED count to any LED number they need.

Single LED forward voltage is 3V@125mA, therefore for 120V output-voltage 40 LEDs are needed.

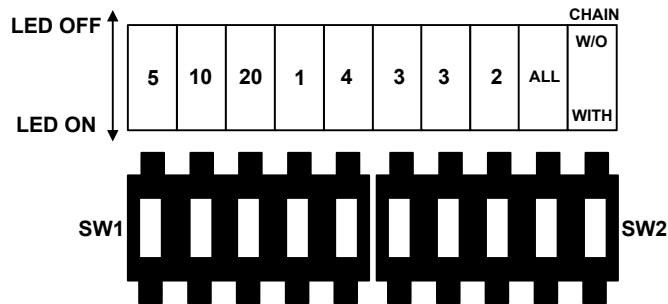


Figure 4: LED Number Configuration Switches and PCB Silk

- W/O WITH switch – LED string chaining switch. For applications with output-voltage lower than 150V this switch should be moved to W/O.
- 5, 10, 20, 1, 4, 3, 3, 2 switches – LED number configuration switches.

For example:

V _{LED}	Total LED	SW "5"	SW "10"	SW "20"	SW "1"	SW "4"	SW "3"	SW "3"	SW "2"
63V	21	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF
63V	21	ON	ON	OFF	OFF	ON	OFF	OFF	ON
120V	40	ON	ON	ON	ON	ON	OFF	OFF	OFF

- ALL switch – LED string short circuit switch. To short circuit entire string, move switch to LED OFF. To release the short, move switch to LED ON.

4.2.1 Fault simulation using the LED Demo Panel

During normal system operation users can perform various fault conditions using the LED Demo panel switches.

- Open string – By moving "W/O WITH" switch to WITH
- Short entire string – By moving "ALL" switch to LED OFF
- LED short – Users should choose LED number to be shorted and move suitable switch to LED OFF.

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4.3 Hardware Setup

1. Set power supply to 24V output. (Don't turn ON the power supply yet)
 - Verify its minimum current capability; power supply must provide 4A.
2. Connect the power cable to J1 connector (Figure 55).
3. Plug power cable connectors to the power supply.
 - Red connector is plugged in the positive output terminal.
 - Black connector is plugged in the negative output terminal.

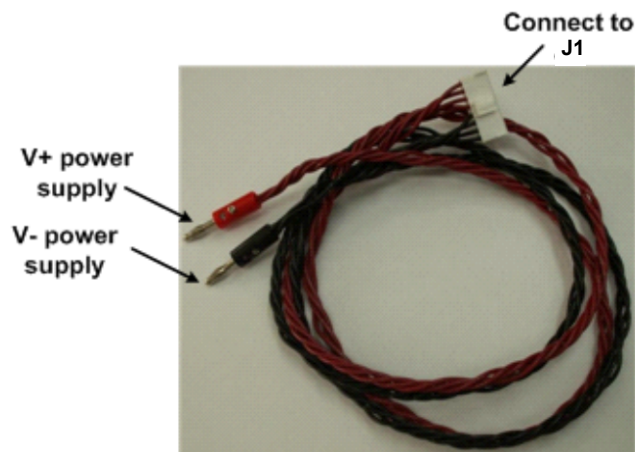


Figure 5: Power Cable

4. Connect LED loads to LED Strings Connectors J6, J7, J8, and J9. (LED string forward voltage should be set in the range of 110V to 120V)
6. Turn on the 24V power supply.
7. Connect signal generator to connector J5.
8. Switch SW1 to BL_ON position.
9. Evaluate the system.



5 Troubleshooting

Table 6 provides a troubleshooting guide. Scenarios defined in the table are simple and do not take into account human error or multiple failures. Corrective action is to be done in a sequential manner.

Table 6: LED System Board Troubleshooting Guide

Symptom	Corrective Action
System Board does not power up; no voltage on V _{12V} (C23) and V _{DD} (C44) pins	<ol style="list-style-type: none"> 1. Verify power is applied to the 24V cable. 2. Verify correct polarity is supplied to Board. 3. Check power cable at J1 is well connected.
LED strings do not illuminate.	<ol style="list-style-type: none"> 1. Ensure a proper connection between EVB and LED panel. 2. Verify SW1 switch is set to BL_ON. 3. Verify dimming information is provided. (measured on J5 pin 1) 4. Verify fuse F1 is conducting. 5. Verify Fault pin (22) is high (5V). If it's low try to check LED strings connection.



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