

LX1991 EVALUATION BOARD USER'S GUIDE

LX1991 Six Output Programmable LED Current Sink

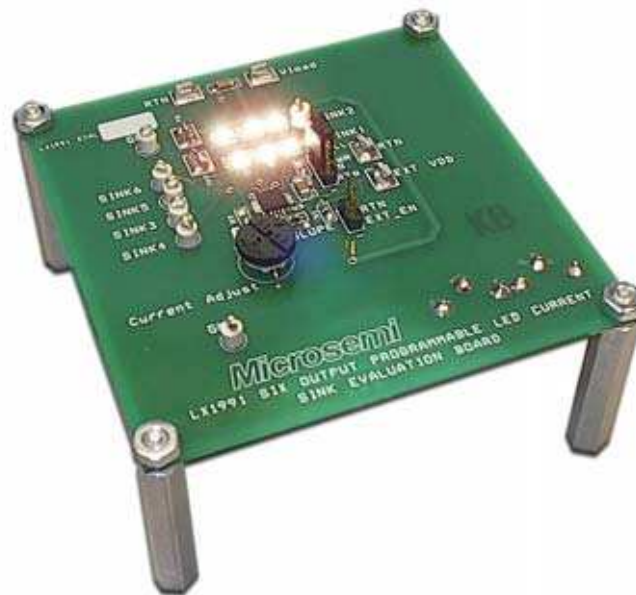


TABLE OF CONTENTS

Overview3
 Features
 Operation

TABLES
 Evaluation Board Connections 3
 Jumper Explanation..... 4
 Test Point Descriptions..... 4

FIGURES
 LX1991 Evaluation Board Component List..... 5
 LX1991 Evaluation Board Silk Screen..... 5
 LX1991 Evaluation Board Schematic 6

OVERVIEW

The LX1991 six channel current sink driver is ideal for controlling brightness of high quality dimmable LED's. The evaluation board demonstrates how this low cost bipolar IC enables precise current regulation in LED display lighting applications, yet requires far fewer parts than discrete solutions.

The evaluation board ships with six (Microsemi UBLED470A) white surface mount LED's whose cathodes are connected to each sink output of the LX1991. The anodes of the LED's are connected together to a test point called VLOAD which the user can connect to an external voltage source (typically 5V, maximum is 40V) LED6 requires an external jumper between TP7 and TP8 to allow current to flow. This demonstrates that one or more channels can be left open without effecting the other channels. In addition these test points allow the easy addition of a application specific load or a current probe loop. Use of a current probe will allow easy viewing of the current rise and fall times.

A small rheostat (Current Adjust) in series with R8 (1.02K which sets the maximum current at 30mA) varies the R_{SET} resistance such that the output LED currents will vary from about 1.5mA to 30mA. Two other jumpers are included, EXT_EN which enables/disables the LX1991, and PWM_IN which allows an externally supplied PWM signal to toggle the DIG_DIM input to allow duty cycle dimming.

Evaluation Board Features

- One channel is left open for application specific loads to be added or current probe loop
- Included rheostat allows output current to be set from 1 to 30mA
- Jumpers allow external PWM signal to burst dim the LED's and an external enable control

EVALUATION BOARD OPERATION

The evaluation board has four possible inputs of which at least two must be used to operate the circuit. In the simplest configuration connect 5V to both EXT VDD and VLOAD and the common (ground return) to RTN. With power connected to these two pins and the a jumper (factory installed) between PWM_IN and PULL-UP the evaluation board should be operational. The LX1991 integrated circuit itself requires a input supply voltage (EXT VDD) in the range of 4.5 to 5.5V. When using the included white LED's a supply voltage of at least 4V is required on the VLOAD input depending on the current setting (current adjust). All inputs are described in table 1 below.

The other two inputs PWM_IN and ENABLE allow external control over dimming and shutdown. The evaluation board comes with a built in 10K pull-up resistor R1 that is connected between the ENABLE input and EXT VDD. R1 will enable the device unless a jumper is placed between EXT_EN and RTN (GND).

| Input | Allowable Range | Description |
|---------|--------------------|--|
| EXT VDD | 4.5 to 5.5V | LX1991 power supply. Quiescent current draw is between 4 and 13mA depending on voltage and temperature and the programmed output sink currents |
| VLOAD | 3 to 40V (5V typ.) | LED voltage supply. Required voltage depends on forward voltage requirements of LED's and 700-1000mV chip overhead. This current will vary between 9 and 180mA depending on the programmed output sink current and if all six LED are connected. |
| EXT_EN | 0 to VDD | Input for external enable control, board ships with 10K pull-up to EXT VDD |
| PWM_IN | 0 to VDD | Input to allow duty cycle dimming of output 150hz to 100Khz logic signal, active high |
| RTN/GND | 0V | Common ground reference |

Table 1 – Evaluation Board Connections

An external voltage signal or open collector logic can be applied to this point to disable the device. This external signal must be able to drive the 10K pull-up resistor low (less than 0.8V). The PWM_IN header input allows an external PWM signal to control the output current by duty cycle dimming. This is accomplished by switching the device's DIG_DIM input with a logic signal. The practical limit to this switching frequency is about 100Khz, at frequencies greater than this internal delays will add errors to the expected output duty cycle. The evaluation board comes with a 470pF CSLOPE capacitor. This value can be increased to vary the rise and fall times of the output current waveform. For greater detail see the LX1991 datasheet.

Test Points SINK1 to SINK6 allow you to monitor the voltage drop across these pins to ground. This voltage will change to maintain the

correct forward voltage across the LED's for the programmed sink current. It can range from as low as 400mV to 40V when the outputs are off depending on the VLOAD supply voltage.

The various jumper positions are summarized in table 2 and test points in table 3. The factory installed active and passive components list can be found in table 4. Following the two tables you will find the PCB silkscreen figure 1 and the circuit schematic in figure 2. All necessary PCB traces and components are on the topside of the board. However there are PCB traces and silkscreen on the bottom side that when populated is used for a special version of the evaluation board that is used internally by Microsemi for training and demonstration purposes.

| Jumper | Function |
|--------|---|
| PWM_IN | Jumper to PULLUP connects PWM_IN through a 10K pull-up resistor to EXT VDD, Jumper to RTN connects PWM_IN to Ground. Open allows hookup to external PWM source. |
| EXT_EN | Jumper to RTN disables the LX1991 by pulling down on the 10K pull-up resistor ; EXT_EN open enable the LX1991 through the 10K pull-up to EXT VDD |

Table 2 – Jumper Explanation

| Test Point | Description |
|------------|---|
| VLOAD | VLOAD Input, power supply to LED's (3 to 40V) |
| RTN/GND | Common Ground Reference |
| EXT VDD | VDD Input to LX1991 (4.5 to 5.5V) |
| EXT_EN | ENABLE input can be connected to external enable signal; high or floating is on, low is off (LX1991 pin 16) |
| SINK1 | SINK1 (LX1991 pin 3) |
| SINK2 | SINK2 (LX1991 pin 4) |
| SINK3 | SINK3 (LX1991 pin 6) |
| SINK4 | SINK4 (LX1991 pin 7) |
| SINK5 | SINK5 (LX1991 pin 8) |
| SINK6 | SINK6 (LX1991 pin 10) |
| PWM_IN | PWM Input can be connected to external pulse generator for duty cycle dimming (LX1991 pin 1) |

Table 3 – Test Point Descriptions

LX1991 EVALUATION BOARD COMPONENT LIST

MISCELLANEOUS COMPONENTS

| Part Description | Manufacturer & Part # | Reference Designators | Qty |
|-------------------|---|-----------------------|-----|
| IC, Controller | MICROSEMI LX1991ILM | U1 | 1 |
| LEDs, BLUE Bright | Microsemi UBLED470A Optomite or equivalent | LED1 - LED6 | 6 |
| Probe Standoffs | | Various | 8 |

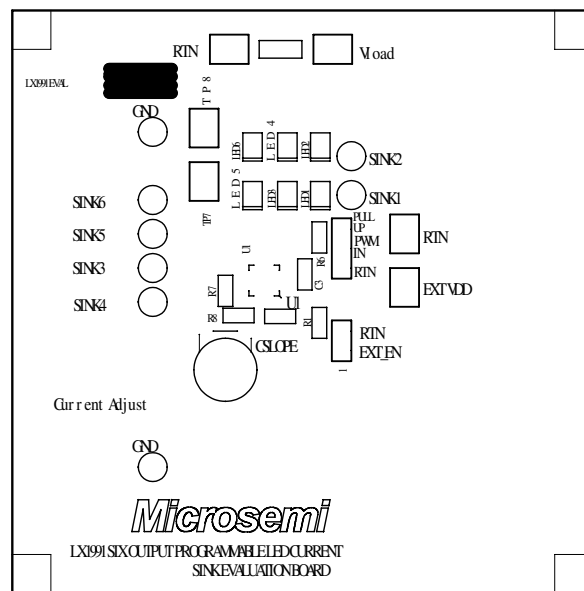
CAPACITORS

| Part Description | Manufacturer & Part # | Reference Designators | Qty |
|---------------------------------|-----------------------|-----------------------|-----|
| Capacitor, X7R, 100nF, 50V, 10% | Any | C3, C4 | 2 |
| Capacitor, CGO, 470pF, | Any | CSLOPE | 1 |

RESISTORS

| Part Description | Manufacturer & Part # | Reference Designators | Qty |
|------------------------------|-----------------------|-----------------------|-----|
| Resistor, Pot Thumbwheel 20K | Any | Current Adjust | 1 |
| Resistor, 1.02K, 1%, 1/16W | Any | R8 | 1 |
| Resistor, 10K, 1%, 1/16W | Any | R1,R6 | 2 |
| Not Used | n/a | R7 | 0 |

LX1991 EVALUATION BOARD SILKSCREEN



Silkscreen Top RR

Figure 1

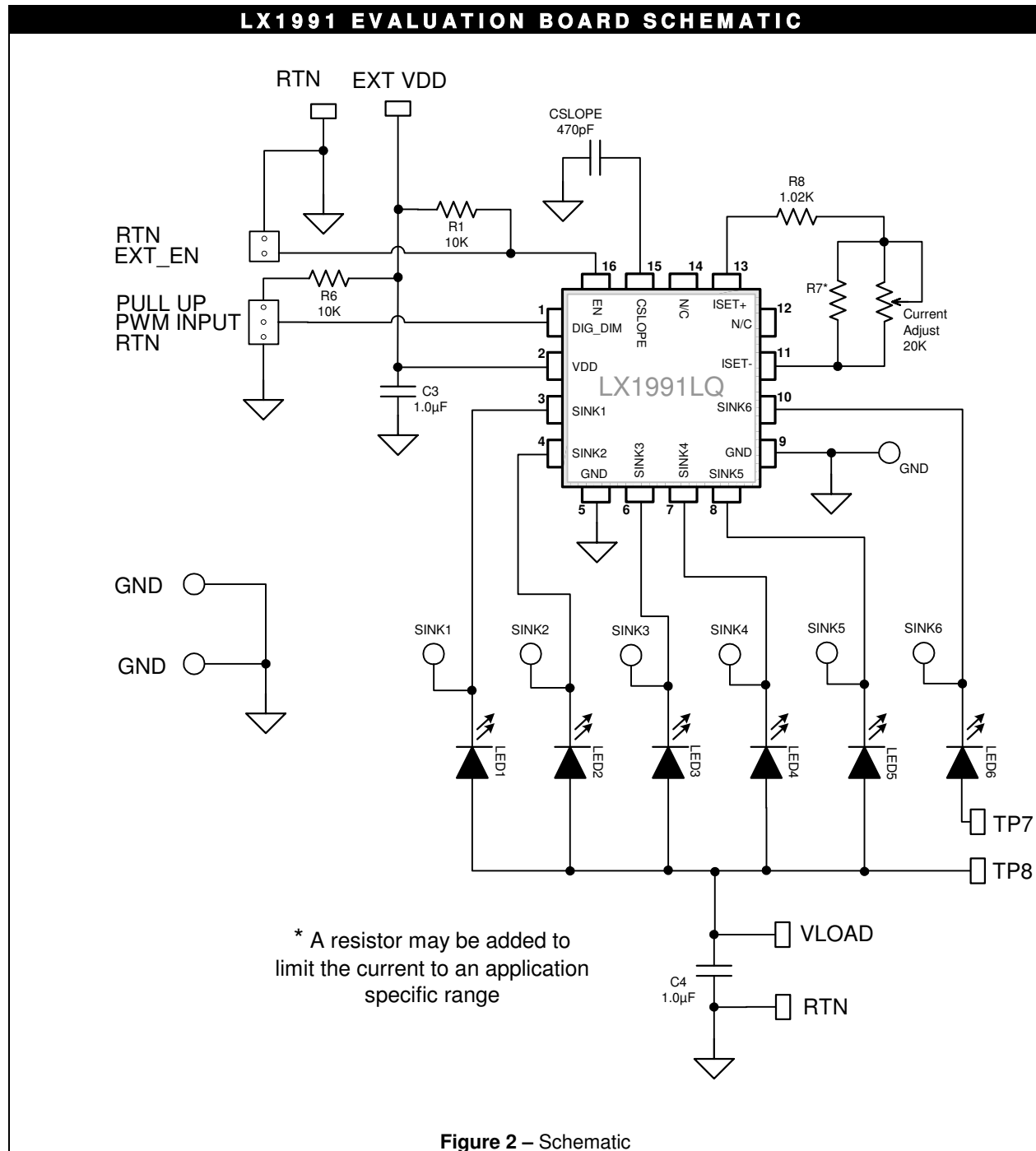


Figure 2 – Schematic