

LX1990 EVALUATION BOARD USER'S GUIDE

LX1990 Dual Programmable LED Current Sink



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OVERVIEW

The LX1990 is a dual output current sink optimized for driving light emitting diodes. 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 two strings of three LED's each. Two green and one blue connected in series to each output. Each LED has a parallel connected jumper (JB2-JB7) that allow the LED to be bypassed to remove it from the circuit so various combinations of LED's can be easily configured for each series string. A small rheostat (R1) in series with R2 (4.32K which sets the maximum current at 30mA) varies the R_{SET} resistance such that the output LED current will vary from about 5mA to 30mA. Two other jumpers are included, JB1 which enables the LX1990, and JB8 to which allows an externally supplied PWM signal to toggle the R_{SET} resistance to allow duty cycle dimming.

Evaluation Board Features

- Easily configured with 1 to 3 LED's on each output
- Included rheostat allows output current to be set from 5 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. These inputs are described in table 1 below.

The LX1990 integrated circuit itself requires a input supply voltage (VDD) in the range of 2.7 to 5.5V. When using all three LED's in series a supply voltage of greater than 5.5V is required on the VLOAD input, since the combined forward voltage of the three LED's at the rated current of 20mA is about 8.4V. However if you were to bypass as an example the two blue LED's by moving up the shorting blocks on JB4 and JB7 then a single 5V supply could be connected at both VDD and VLOAD to drive the remaining four LED's or conversely the two blue LED's since both require a forward voltage of about 4V. If you are willing to drive the blue LED's at only 5mA then voltages as low as 3.3V will directly drive both the chip and the LED's.

The other two inputs PWM and ENABLE allow external control over dimming and shutdown. The evaluation board comes with a built in 100K pull-up resistor R3 that is connected between the ENABLE input and VDD. R3 will enable the outputs unless JB1 is set to OFF. When JB1 is in the EXT/ON position enable is also connected to the external ENABLE input TP5. 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 100K pull-up resistor low (less than 0.8V).

| Input | Allowable Range | Description |
|--------|-----------------|-------------------------------------------------------------------------------------------------------------------|
| VDD | 2.7 to 5.5V | LX1990 power supply. Quiescent current draw is between 1.4 and 4mA depending on voltage and temperature |
| VLOAD | 2 to 10V | LED voltage supply. Required voltage depends on forward voltage requirements of LED's and 100-400mV chip overhead |
| ENABLE | 0 to VDD | Input for external enable control, board ships with 100K pull-up to VDD |
| PWM | 0 to VDD | Input to allow duty cycle dimming of output 150hz to 20Khz logic signal, active high |
| GND | 0V | Common ground reference |

Table 1 – Evaluation Board Connections

The PWM input TP9 engaged by JP8 allows an external PWM signal to control the output current by duty cycle dimming. This is accomplished by switching the I_{SET} current on and off. The practical limit to this switching frequency is about 20Khz, at frequencies greater than this internal delays will add errors to the expected output duty cycle. Q1, R2 and R4 provide an open collector drive for the I_{SET} resistor so a standard pulse generator can be used for evaluation purposes. For greater detail see the LX1990 datasheet.

Test Points TP7 and TP8 allow you to monitor the voltage drop across the LX1990 for the I_{OUTA} and I_{OUTB} outputs to ground. This voltage can range from as low as 100mV to 10V 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 |
|--------|---------------------------------------------------------------------------------------|
| JB1 | OFF position grounds Enable input; EXT/ON connects enable to TP5 with 100K pull-up |
| JB2 | IN position bypasses (shorts) LED1; OUT leaves LED1 connected to output LED string |
| JB3 | IN position bypasses (shorts) LED2; OUT leaves LED2 connected to output LED string |
| JB4 | IN position bypasses (shorts) LED3; OUT leaves LED3 connected to output LED string |
| JB5 | IN position bypasses (shorts) LED4; OUT leaves LED4 connected to output LED string |
| JB6 | IN position bypasses (shorts) LED5; OUT leaves LED5 connected to output LED string |
| JB7 | IN position bypasses (shorts) LED6; OUT leaves LED6 connected to output LED string |
| JB8 | ON position connects PWM (TP9) to RSET resistors; OFF leaves RSET connected to ground |

Table 2 – Jumper Explanation

| Test Point | Description |
|------------|---------------------------------------------------------------------------------------------|
| TP1 | VLOAD Input, power supply to LED's |
| TP2,4,6,10 | Common Ground Reference |
| TP3 | VDD Input to LX1990 |
| TP5 | ENABLE input can be connected to external enable signal; high or floating is on, low is off |
| TP7 | I_{OUTA} (LX1990 pin 6) |
| TP8 | I_{OUTB} (LX1990 pin 4) |
| TP9 | PWM Input can be connected to external pulse generator for duty cycle dimming |

Table 3 – Test Point Descriptions

LX1990 EVALUATION BOARD COMPONENT LIST

MISCELLANEOUS COMPONENTS

| Part Description | Manufacturer & Part # | Reference Designators | Qty |
|-----------------------|-------------------------------------------------------|------------------------|----------|
| IC, Controller | MICROSEMI LX1990ILM | U1 | 1 |
| Transistor, NPN | ON SEMI MMBT2222LT1 or equivalent | Q1 | 1 |
| LEDs, GREEN Bright | Chicago Miniature Lamp CMD333UGC or equivalent | LED1, LED2, LED4, LED5 | 4 |
| LEDs, BLUE Bright | Chicago Miniature Lamp CMD383UBC or equivalent | LED3, LED6 | 2 |

CAPACITORS

| Part Description | Manufacturer & Part # | Reference Designators | Qty |
|---------------------------------|-----------------------|-----------------------|-----|
| Capacitor, X7R, 100nF, 50V, 10% | Any | C1, C2 | 2 |

RESISTORS

| Part Description | Manufacturer & Part # | Reference Designators | Qty |
|------------------------------|-----------------------|-----------------------|-----|
| Resistor, Pot Thumbwheel 20K | Any | R1 | 1 |
| Resistor, 4.32K, 1%, 1/16W | Any | R2 | 1 |
| Resistor, 10K, 1%, 1/16W | Any | R5 | 1 |
| Resistor, 100K, 1%, 1/16W | Any | R3, R4 | 2 |

LX1990 EVALUATION BOARD SILKSCREEN

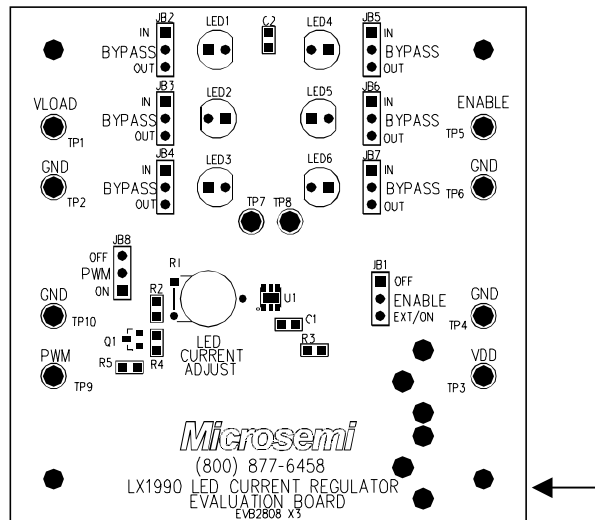


Figure 1

