



# EV24830-S-00C

## 5V to 90V White LED Driver with Buck Mode and Configurable Frequency Evaluation Board

### DESCRIPTION

The EV24830-S-00C is designed to demonstrate the capabilities of the MP24830, a 90V white LED driver that is suitable for step-down applications. It supports a wide input range with excellent load and line regulation. Its configurable current limit provides customized applications with a wide power range. Current mode operation provides fast transient response and eases loop stabilization. Protections include thermal shutdown, cycle-by-cycle over-current protection (OCP), open string protection, and output short-circuit protection (SCP).

The MP24830 incorporates both DC and PWM dimming onto a single control pin. The separate input reference ground pin allows for direct enabling and/or dimming control for positive to negative power conversion. The MP24830 is available in an SOIC-14 package.

### ELECTRICAL SPECIFICATIONS

| Parameter                 | Symbol    | Value                  | Units |
|---------------------------|-----------|------------------------|-------|
| Input voltage             | $V_{IN}$  | $V_{OUT} + 2$<br>to 90 | V     |
| Enable voltage            | $V_{EN}$  | 5                      | V     |
| LED current               | $I_{LED}$ | 1                      | A     |
| Switching frequency       | $f_{SW}$  | 200                    | kHz   |
| Output voltage protection | $V_{OVP}$ | 28                     | V     |

### FEATURES

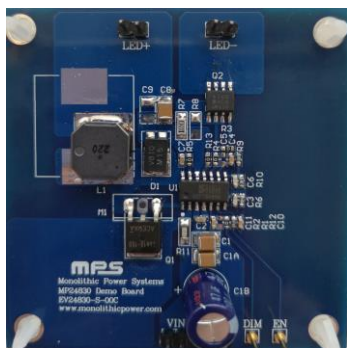
- Configurable Maximum Output Current
- Buck Mode Functionality
- Wide 5V to 90V Operating Input Range
- Adjustable Switching Frequency
- Analog and PWM Dimming
- 0.2V Reference Voltage
- 5 $\mu$ A Shutdown Mode
- No Minimum LED Required
- Stable with Low-ESR Output Ceramic Capacitors
- Cycle-by-Cycle Over-Current Protection (OCP)
- Thermal Shutdown Protection
- Open String Protection
- Output Short-Circuit Protection (SCP)
- Available in an SOIC-14 Package

### APPLICATIONS

- General LED Illuminations
- Automotive LED Lighting
- TV Backlighting Systems
- LCD Backlight Panels
- Handheld Computers

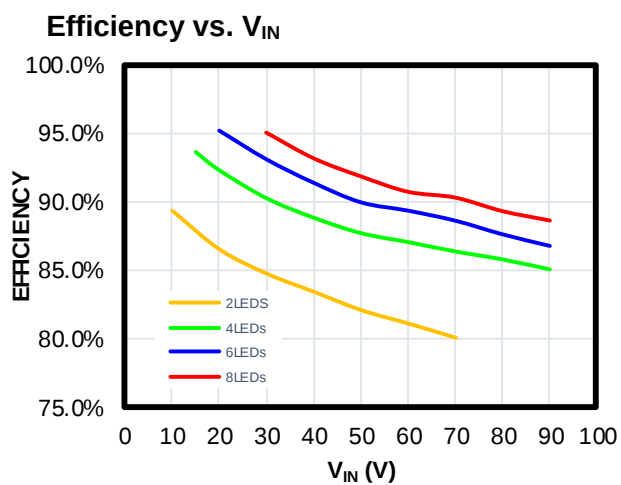
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## EV24830-S-00C EVALUATION BOARD



(LxWxH) 6.4cmx6.4cmx1.3cm

| Board Number  | MPS IC Number |
|---------------|---------------|
| EV24830-S-00C | MP24830       |



## QUICK START GUIDE

1. Connect the LED string between LED+ (anode of the LED string) and LED- (cathode of the LED string). The LED string voltage should be below 28V (7 LED string voltages equal about 25V) to avoid triggering output over-voltage protection (OVP).
2. Set the VIN power supply voltage ( $V_{OUT} + 2V \leq V_{IN} \leq 90V$ ), then connect the input between the VIN and INGND terminals on the evaluation board.
3. Set a second power supply (about 5V) to act as the EN input supply for the evaluation board.
4. Turn all the power supplies off.
5. Turn the input voltage power supply on.
6. Turn the EN power supply on. The LED strings should light up.
7. Use R6 to set the switching frequency to about 200kHz.
8. To use the dimming function on the DIM connector, use a function generator to set the PWM signal amplitude to 5V. Then set the frequency between 100Hz and 20kHz for PWM dimming. For analog dimming, adjust the power supply from 0.7V to 2V

## EVALUATION BOARD SCHEMATIC

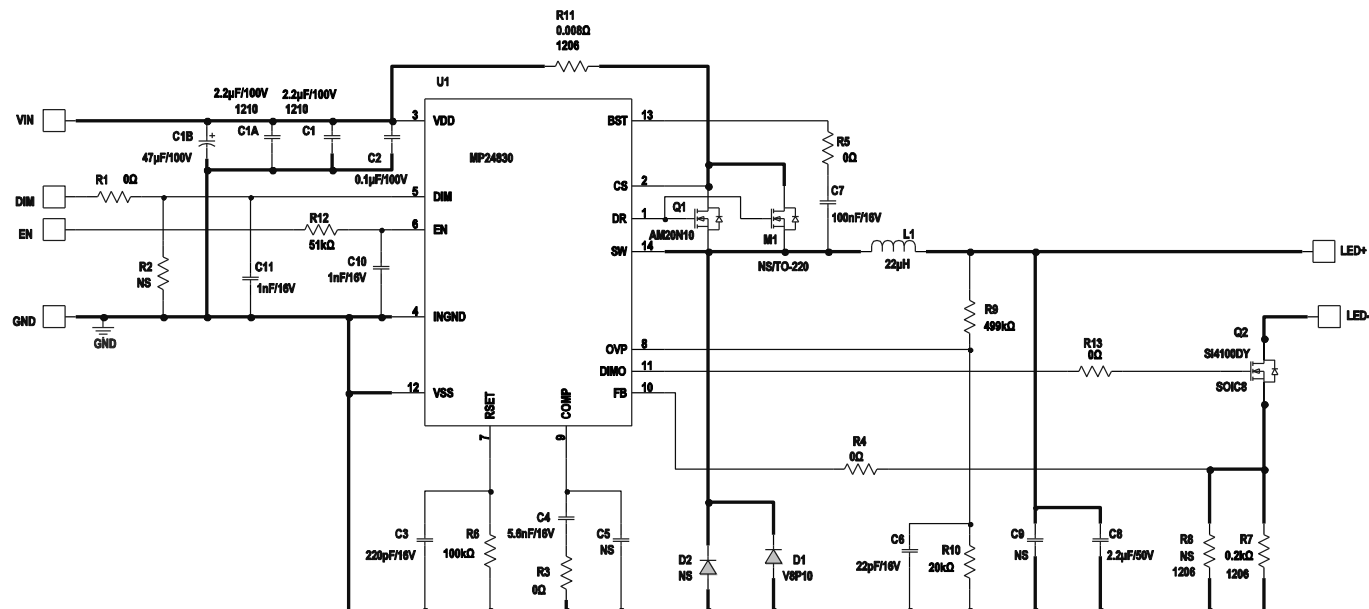


Figure 1: Evaluation Board Schematic

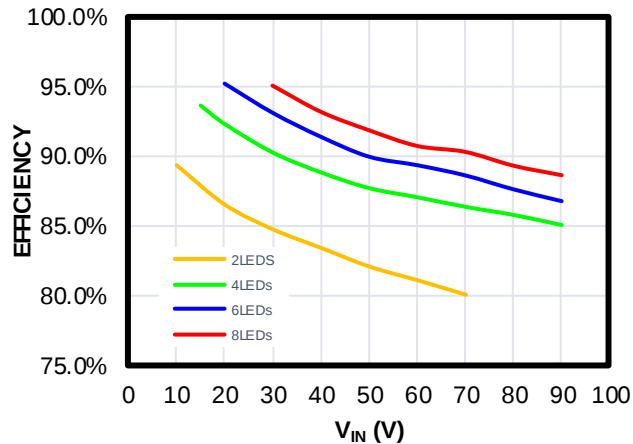
## EV24830-S-00C BILL OF MATERIALS

| Qty | Ref                 | Value            | Description                                                        | Package         | Manufacturer | Manufacturer P/N   |
|-----|---------------------|------------------|--------------------------------------------------------------------|-----------------|--------------|--------------------|
| 3   | C1, C1A, C8         | 2.2 $\mu$ F      | Ceramic capacitor, 100V, 10%, X7R                                  | 1210            | Murata       | GRM32ER72A225K     |
| 1   | C1B                 | 47 $\mu$ F       | Aluminum capacitor, 100V, 10%,                                     | 8mmx12mm x3.5mm | Panasonic    | ECA-2AM470         |
| 1   | C2                  | 0.1 $\mu$ F      | Ceramic capacitor, 100V, 10%, X7R                                  | 0603            | Murata       | GRM188R72A104KA35D |
| 1   | C3                  | 220pF            | Ceramic capacitor, 50V, 10%, X7R                                   | 0603            | Murata       | GRM188R71H221KA01D |
| 1   | C4                  | 5.6nF            | Ceramic capacitor, 50V, 10%, X7R                                   | 0603            | Murata       | GRM188R71H562KA01D |
|     | C5, C9              | NS               | NS                                                                 | NS              | NS           | NS                 |
| 1   | C6                  | 22pF             | Ceramic capacitor, 50V, 5%, C0G                                    | 0603            | Murata       | GRM1885C1H220JA01D |
| 1   | C7                  | 0.1 $\mu$ F      | Ceramic capacitor, 50V, 10%, X7R                                   | 0603            | Murata       | GRM188R71E104KA01D |
| 2   | C10, C11            | 1nF              | Ceramic capacitor, 50V, 10%, X7R                                   | 0603            | Murata       | GRM188R71H102KA01D |
| 1   | D1                  | 8A               | Schottky diode, 100V, 8A                                           | TO-277A         | Vishay       | V8P10              |
|     | D2                  | NS               | NS                                                                 | TO-277A         | NS           | NS                 |
| 1   | L1                  | 22 $\mu$ H       | Inductor, R <sub>DC</sub> = 68m $\Omega$ , I <sub>SAT</sub> = 4.2A | SMD             | Murata       | 1274AS-H-220M=P3   |
| 5   | R1, R3, R4, R5, R13 | 0                | Film resistor, 5%                                                  | 0603            | Yageo        | RC0603JR-070RL     |
|     | R2                  | NS               | Film resistor, 5%                                                  | 0603            | Yageo        |                    |
| 1   | R6                  | 100k $\Omega$    | Film resistor, 1%                                                  | 0603            | Yageo        | 9C06031A1003FKHFT  |
| 1   | R7                  | 200m $\Omega$    | Film resistor, 0.5W, 1%                                            | 1206            | Cyntec       | RLT1632-4-R200-FNH |
|     | R8                  | NS               | NS                                                                 | 1206            | NS           | NS                 |
| 1   | R9                  | 499k $\Omega$    | Film resistor, 1%                                                  | 0603            | Yageo        | 9C06031A4993FKHFT  |
| 1   | R10                 | 20k $\Omega$     | Film resistor, 1%                                                  | 0603            | Yageo        | 9C06031A2002FKHFT  |
| 1   | R11                 | 8m $\Omega$      | Film resistor, 0.5W, 1%                                            | 1206            | Cyntec       | RL1632H-R008-FNH   |
| 1   | R12                 | 51k $\Omega$     | Film resistor, 5%                                                  | 0603            | Yageo        | 9C06031A5102FKHFT  |
| 1   | Q1                  | N-channel MOSFET | 100V MOSFET                                                        | TO-252          | Analog Power | AM20N10-160D       |
| 1   | Q2                  | N-channel MOSFET | 100V MOSFET                                                        | SO-8            | Vishay       | Si4100DY           |
|     | M1                  | NS               | MOSFET                                                             | TO-220          | NS           | NS                 |
| 1   | U1                  | MP24830          | Power LED driver                                                   | SOIC-14         | MPS          | MP24830HS-LF-Z     |

## EVB TEST RESULTS

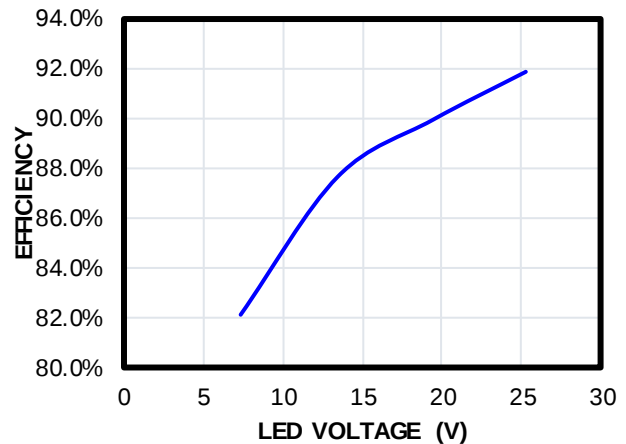
Performance waveforms are tested on the evaluation board.  $V_{IN} = 10V$  to  $90V$ ,  $I_{OUT} = 1A$ ,  $L = 22\mu H$ ,  $T_A = 25^\circ C$ , unless otherwise noted.

Efficiency vs.  $V_{IN}$

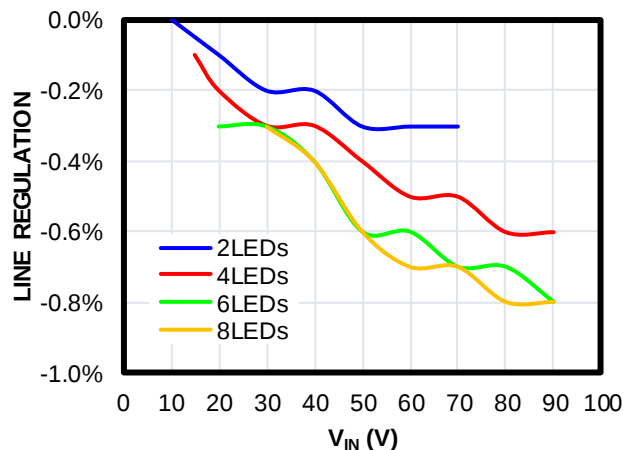


Efficiency vs. LED Voltage

$V_{IN} = 50V$

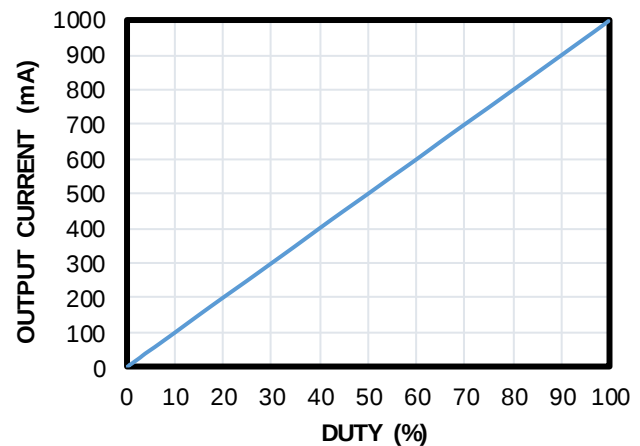


Line Regulation



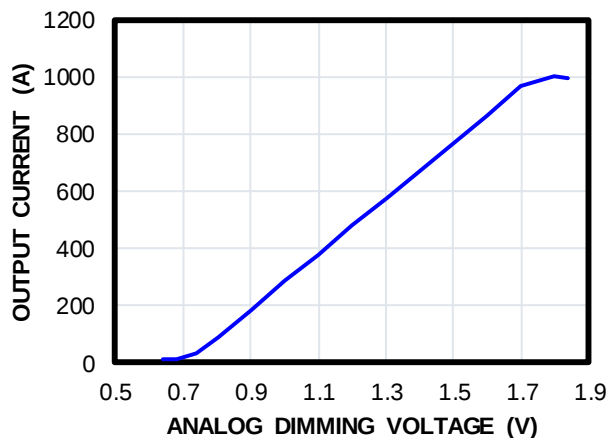
PWM Dimming Curve

$V_{IN} = 25V$ , 3 LEDs,  $f_{PWM} = 200Hz$



Analog Dimming Curve

$V_{IN} = 25V$ , 3 LEDs

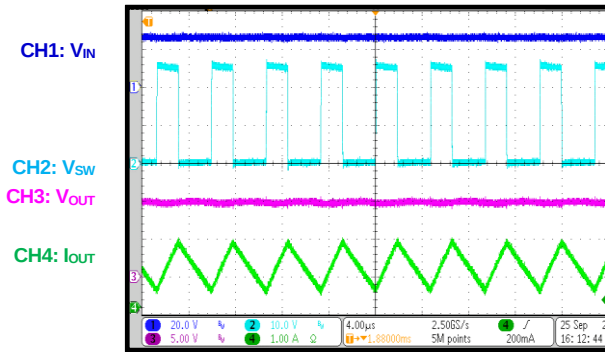


## EVB TEST RESULTS

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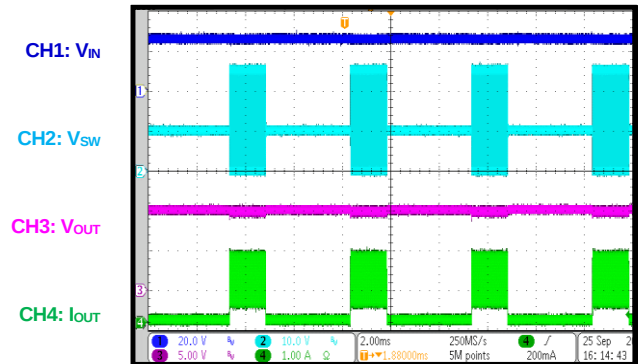
### Steady State

$V_{IN} = 25V$ , 3 LEDs,  $I_{OUT} = 1A$



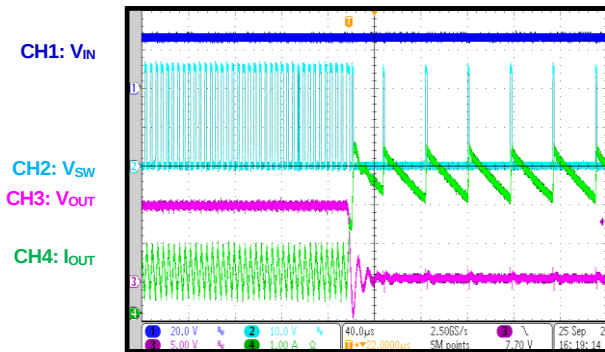
### PWM Dimming

$V_{IN} = 25V$ , 3LEDs,  $I_{OUT} = 1A$ ,  $f_{PWM} = 200Hz$



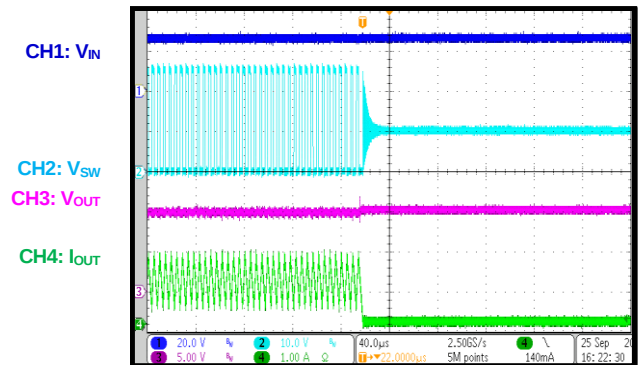
### LED-to-GND Short

$V_{IN} = 25V$ , 3 LEDs,  $I_{OUT} = 1A$



### LED Short Output

$V_{IN} = 25V$ , 3 LEDs,  $I_{OUT} = 1A$



## PCB LAYOUT

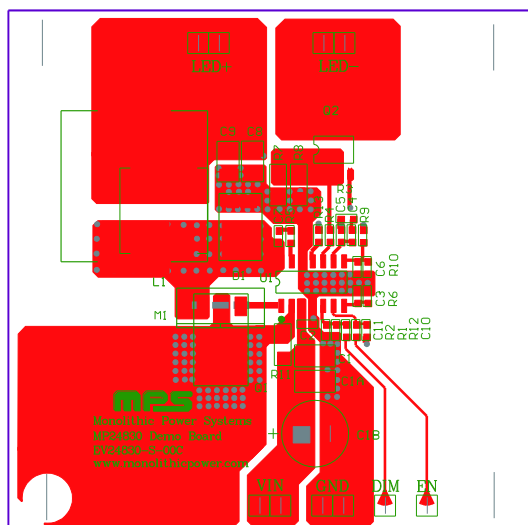


Figure 2: Top Layer

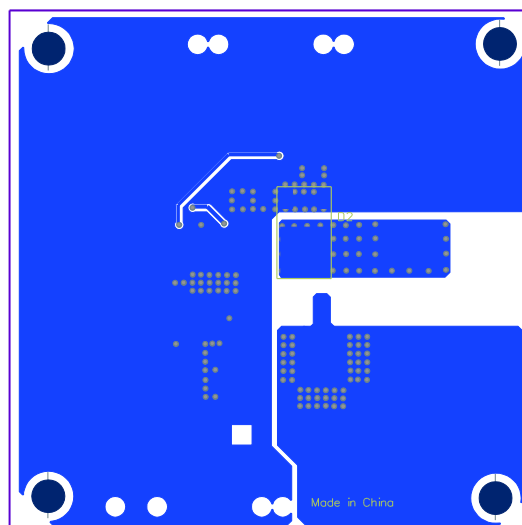


Figure 3: Bottom Layer



## Revision History

| Revision # | Revision Date | Description     | Pages Updated |
|------------|---------------|-----------------|---------------|
| 1.0        | 12/1/2020     | Initial Release | -             |

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