

## DESCRIPTION

The MP24830 is a 90V, white LED driver suitable for inverting step-up/down applications. It supports a wide input range with excellent load and line regulation. Its programmable current limit provides customized applications with wide power range. Current mode operation provides fast transient response and eases loop stabilization. Fault condition protection includes thermal shutdown, cycle-by-cycle peak current limiting, open strings protection and output short circuit protection.

The MP24830 incorporates both DC and PWM dimming onto a single control pin. The separate input reference ground pin allows for direct enable and/or dimming control for a positive to negative power conversion

## ELECTRICAL SPECIFICATION

| Parameter                 | Symbol           | Value                                           | Units |
|---------------------------|------------------|-------------------------------------------------|-------|
| Input Voltage             | V <sub>IN</sub>  | 5 To<br>(V <sub>IN</sub> +V <sub>OUT</sub> )<80 | V     |
| Enable Voltage            | V <sub>EN</sub>  | 5                                               | V     |
| LED Current               | I <sub>LED</sub> | 1                                               | A     |
| Switching Frequency       | F <sub>S</sub>   | 200                                             | kHz   |
| Output Voltage Protection | V <sub>OVP</sub> | 28                                              | V     |

## FEATURES

- Programmable Maximum Output Current
- Unique Operation (Buck-Boost Mode)
- Wide 5V to 90V Operating Input Range
- Adjustable Switching Frequency
- Analog and PWM Dimming
- 0.2V Reference Voltage
- 5μA Shutdown Mode
- No Minimum LED Required
- Stable with Low ESR Output Ceramic Capacitors
- Cycle-by-Cycle Over Current Protection
- Thermal Shutdown Protection
- Open Strings Protection
- Output Short Circuit Protection
- Available in 14-Pin SOIC14

## APPLICATIONS

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

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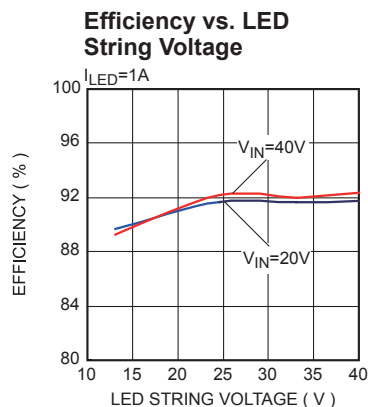
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## EV24830-S-00A EVALUATION BOARD

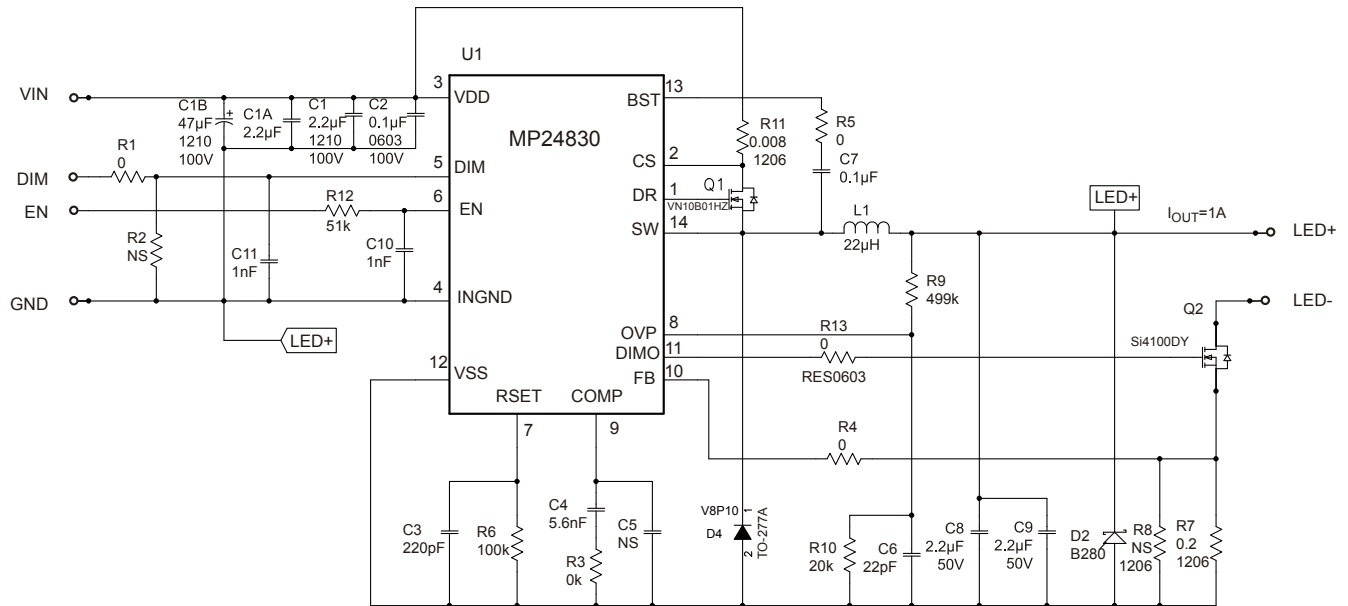
TBD

(L x W x H) 6.4cm x 6.4cm x 1.3cm

|               |         |
|---------------|---------|
| EV24830-S-00A | MP24830 |
|---------------|---------|



## EVALUATION BOARD SCHEMATIC



## EV24830-S-00A BILL OF MATERIALS

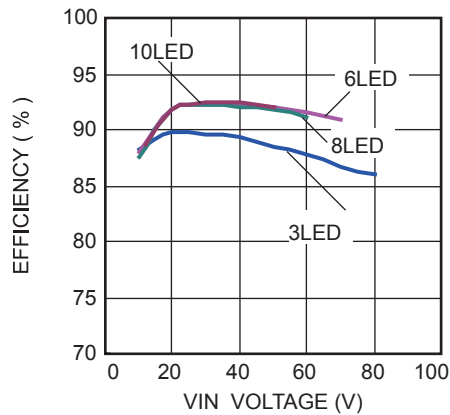
| Qty | RefDes                    | Value   | Description                     | Package      | Manufacturer     | Manufacturer P/N   |
|-----|---------------------------|---------|---------------------------------|--------------|------------------|--------------------|
| 3   | C1,C1A,<br>C8             | 2.2μF   | Ceramic Cap., 100V,<br>10%, X7R | 1210         | muRata           | GRM32ER72A225K     |
| 1   | C1B                       | 47μF    | Alu Cap., 100V, 10%,            | 8 x 12 x 3.5 | Panasonica       | ECA-2AM470         |
| 1   | C2                        | 0.1μF   | Ceramic Cap., 100V,<br>10%, X7R | 0603         | muRata           | GRM188R72A104KA35D |
| 1   | C3                        | 220pF   | Ceramic Cap., 50V, 10%,<br>X7R  | 0603         | muRata           | GRM188R71H221KA01D |
| 1   | C4                        | 5.6nF   | Ceramic Cap., 50V, 10%,<br>X7R  | 0603         | muRata           | GRM188R71H562KA01D |
|     | C5, C9                    | NS      |                                 |              |                  |                    |
| 1   | C6                        | 22pF    | Ceramic Cap., 50V, 5%,<br>C0G   | 0603         | muRata           | GRM1885C1H220JA01D |
| 1   | C7                        | 0.1μF   | Ceramic Cap., 50V, 10%,<br>X7R  | 0603         | muRata           | GRM188R71E104KA01D |
| 2   | C10, C11                  | 1nF     | Ceramic Cap., 50V, 10%,<br>X7R  | 0603         | muRata           | GRM188R71H102KA01D |
|     | D1                        | NS      |                                 | TO-220       |                  |                    |
| 1   | D2                        | 1A      | Schottky Rect., 100V, 1A        | SMA          | ST               | STPS1100A          |
| 1   | D3                        | 8A      | Schottky Rect., 100V, 8A        | SMC          | Vishay           | V8P10              |
| 1   | L1                        | 22μH    | Inductor, Rdc 15mΩ, Isat<br>11A | SMD          | Würth Elektronik | 74435572200        |
| 5   | R1, R3,<br>R4, R5,<br>R13 | 0       | Film Res., 5%                   | 0603         | Yageo            | RC0603JR-070RL     |
|     | R2                        | NS      |                                 | 0603         |                  |                    |
| 1   | R6                        | 100kΩ   | Film Res., 1%                   | 0603         | Yageo            | 9C06031A1003FKHFT  |
| 1   | R7                        | 200mΩ   | Film Res.1/2W, 1%               | 1206         | Cyntec           | RLT1632-4-R200-FNH |
|     | R8                        | NS      |                                 | 1206         |                  |                    |
| 1   | R9                        | 499kΩ   | Film Res., 1%                   | 0603         | Yageo            | 9C06031A4993FKHFT  |
| 1   | R10                       | 20k     | Film Res., 1%                   | 0603         | Yageo            | 9C06031A2002FKHFT  |
| 1   | R11                       | 8mΩ     | Film Res., 1/2W, 1%             | 1206         | Cyntec           | RL1632H-R008-FNH   |
| 1   | R12                       | 51k     | Film Res., 5%                   | 0603         | Yageo            | 9C06031A5102FKHFT  |
| 1   | Q1                        | N-MOS   | 100V Mosfet FDD86102            | D-Pak        | Fairchild        | FDD86102           |
| 1   | Q2                        | N-MOS   | 100V Mosfet Si4100DY            | SO-8         | Vishay           | Si4100DY           |
|     | Q3                        | NS      |                                 | TO-220       |                  |                    |
| 1   | U1                        | MP24830 | Power Led Driver                | SO14DS       | MPS              | MP24830HS(R2)      |
| 1   | EN,DIM,G<br>ND            |         | 3 Pin Header, 2.54mm            | 2.54mm       | Sullins          | PCC03SAAN          |
| 4   | LED+,LED-<br>,VIN,GND     |         | 2.3 pillar                      | W200D100     | HZ               | China              |
| 2   | JP1, JP2                  |         | Jumper                          |              | HZ               | China              |

## EVB TEST RESULTS

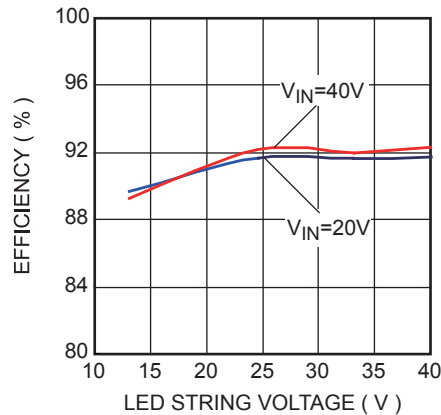
Performance waveforms are tested on the evaluation board.

$V_{EN}=5V$ ,  $V_{IN}=12V$ ,  $I_{OUT}=1A$ ,  $L=22\mu H$ ,  $T_A=25^\circ C$ , Unless otherwise noted.

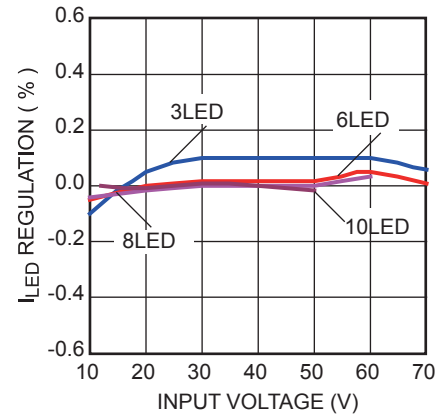
**Efficiency vs. Input Voltage**



**Efficiency vs. LED String Voltage**

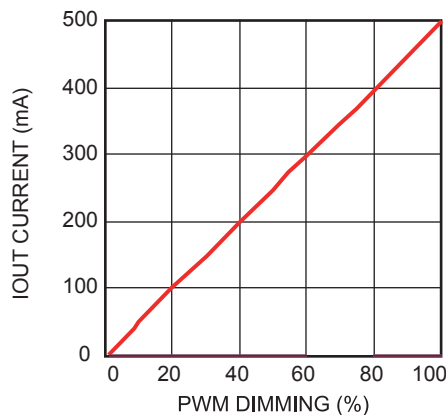


**ILED Line Regulation vs. VIN**



**ILED vs. PWM Dimming**

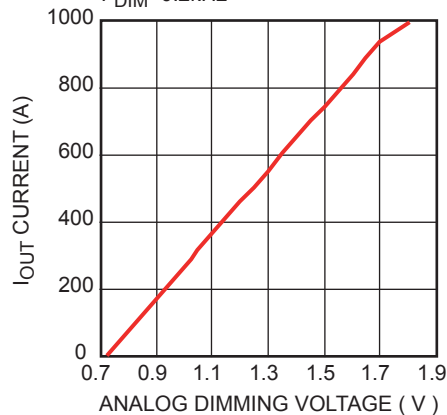
$V_{IN}=25V$ , 3LED,  $F_{DIM}=0.2kHz$



**ILED vs. Analog Dimming**

$V_{IN}=20V$ , 3LED,  $I_{OUT}=1A$ ,

$F_{DIM}=0.2kHz$



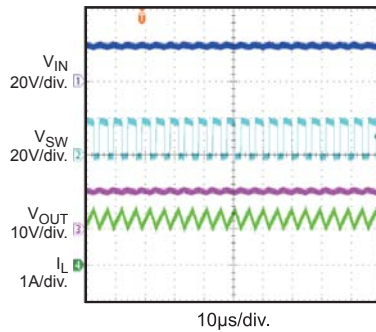
## EVB TEST RESULTS (continued)

Performance waveforms are tested on the evaluation board.

$V_{EN}=5V$ ,  $V_{IN}=12V$ ,  $I_{OUT}=1A$ ,  $L=22\mu H$ ,  $T_A=25^\circ C$ , Unless otherwise noted.

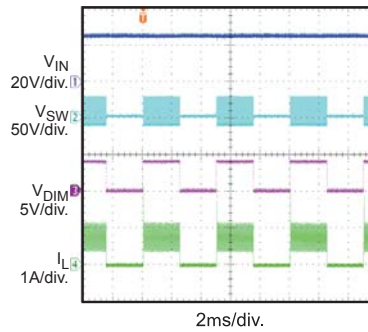
### Steady State

$V_{IN}=8V$ , 3LED,  $I_{OUT}=1A$



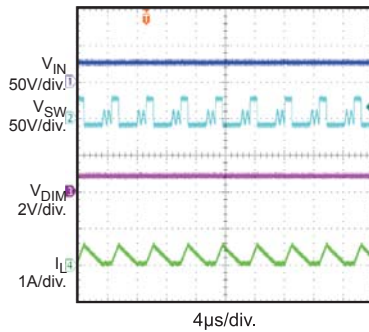
### PWM Dimming

$V_{IN}=25V$ , 3LED,  $F_{DIM}=200Hz/50\%$



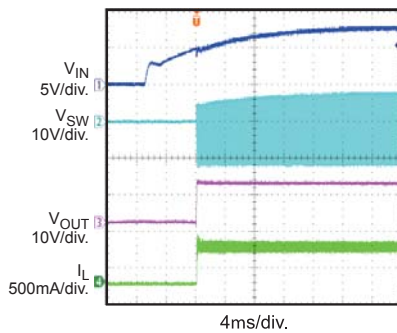
### Analog Dimming

$V_{IN}=25V$ , 3LED,  $V_{DIM}=0.9V$



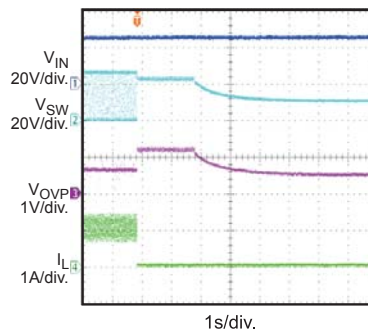
### Power Ramp Up

$V_{IN}=8V$ , 3LED



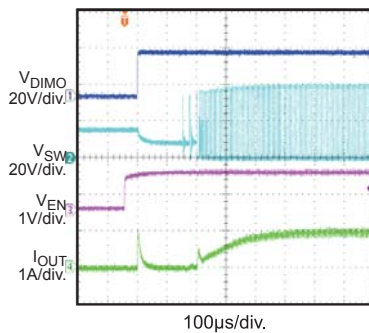
### Open LED Protection

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



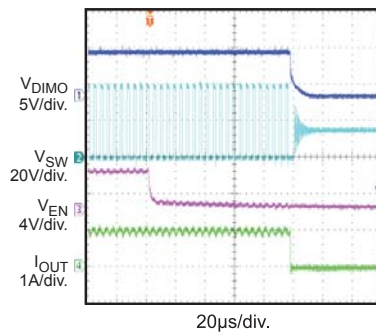
### Enable Power Up

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



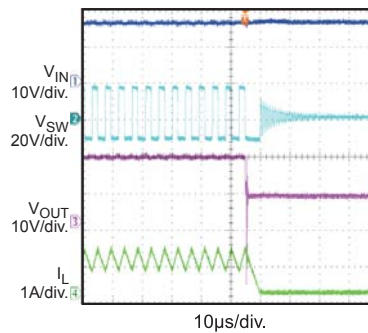
### Enable Power Down

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



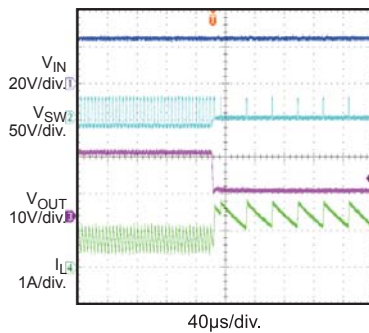
### Short LED Protection

$V_{IN}=16V$ , 3LED



### Short LED To VSS

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



## PRINTED CIRCUIT BOARD LAYOUT

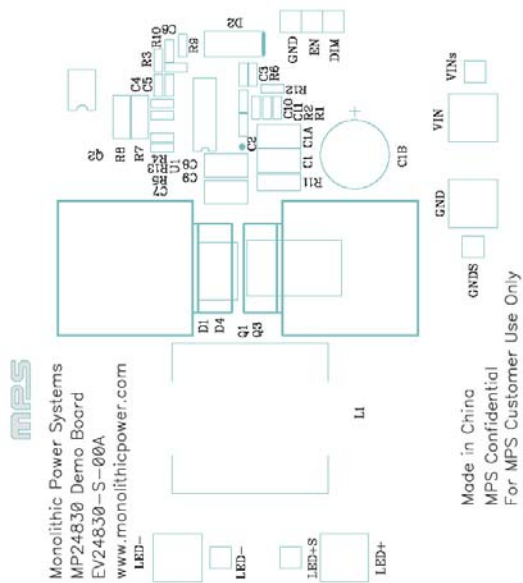


Figure 1—Top Silk Layer

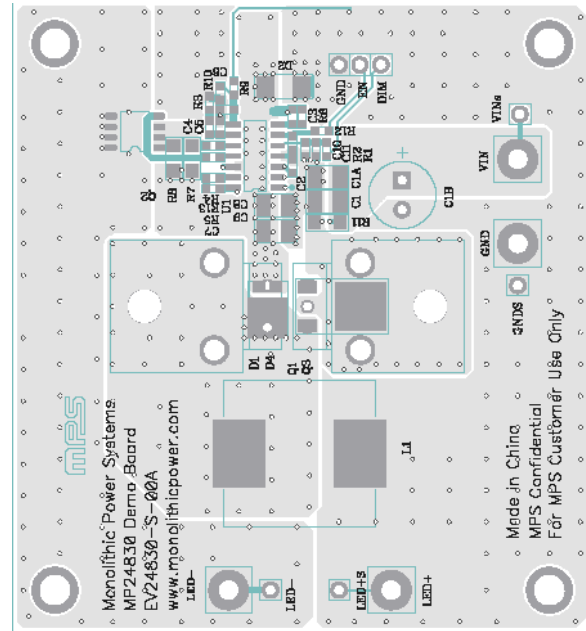


Figure 2—Top Layer

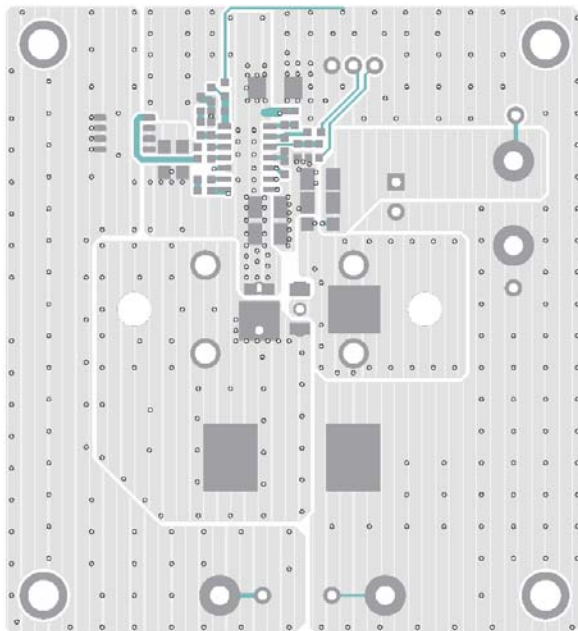


Figure 3—Top Layer

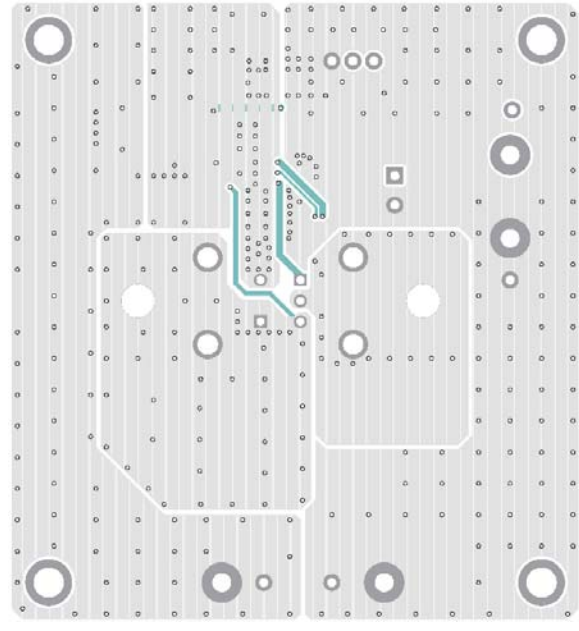


Figure 4—Bottom Layer

## QUICK START GUIDE

1. Connect the LED string between “LED+” (anode of LED string) and “LED-”(cathode of LED string). The LED string voltage should be Less than 28V (7 LED string voltage is about 25V), since the output voltage protection is about 28V.
2. Set a VIN power supply voltage (range from 5V to  $V_{IN}+V_{OUT} < 80V$ ) and connect the input between the “VIN” and “INGND” terminals as shown in the EVB board.
3. Set a second power supply 5V as the EN input supply to the EVB.
4. Turn-off all power supplies.
5. Turn-on the input voltage power supply.
6. Turn on the 5V EN power supply. All the LED strings should be lighted.
7. The switching frequency was set by R6, which is about 200kHz.
8. To demo the dimming function on DIM connector: using a function generator set the PWM signal amplitude to 5V and the frequency within 100Hz to 20kHz range for PWM dimming. For analog dimming, adjust the power supply from 0.7V to 2V.

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