

General Description

The EV0002 Evaluation Board is a fully operational 5W CCFL driver based on the MP1022A. The MP1022A is a complete CCFL driver on a chip employing a full-bridge output to obtain the highest possible output power relative to other traditional driver topologies. Further efficiency gains are made by internal circuitry that detects and forces the MP1022A switching frequency to lock to the CCFL circuit's natural resonant frequency. The Evaluation Board is configured for burst-mode dimming. Analog dimming is possible with a few minor component changes. For additional features refer to the MP1022A Data Sheet.

Absolute Maximum Ratings

| | |
|----------------------------|-----------------------|
| Battery Voltage V_{BATT} | 14 V |
| Input Voltage V_{IN} | 5.5V |
| Logic Inputs | 0.3V to $V_{DD}+0.3V$ |
| Power Dissipation | 1.0W |

Recommended Operating Conditions

| | |
|---------------------------------|--------------|
| Battery Voltage V_{BATT} | 1.0V to 12V |
| Input Voltage V_{IN} | 4.5V to 5.5V |
| Enable Voltage V_{EN} | 0 to 5.0V |
| Brightness Voltage V_{Bright} | 0 to 2.0V |

Ordering Information

| Board Number | MPS IC Number |
|--------------|---------------------------|
| EV0002 | MP1022EMA |

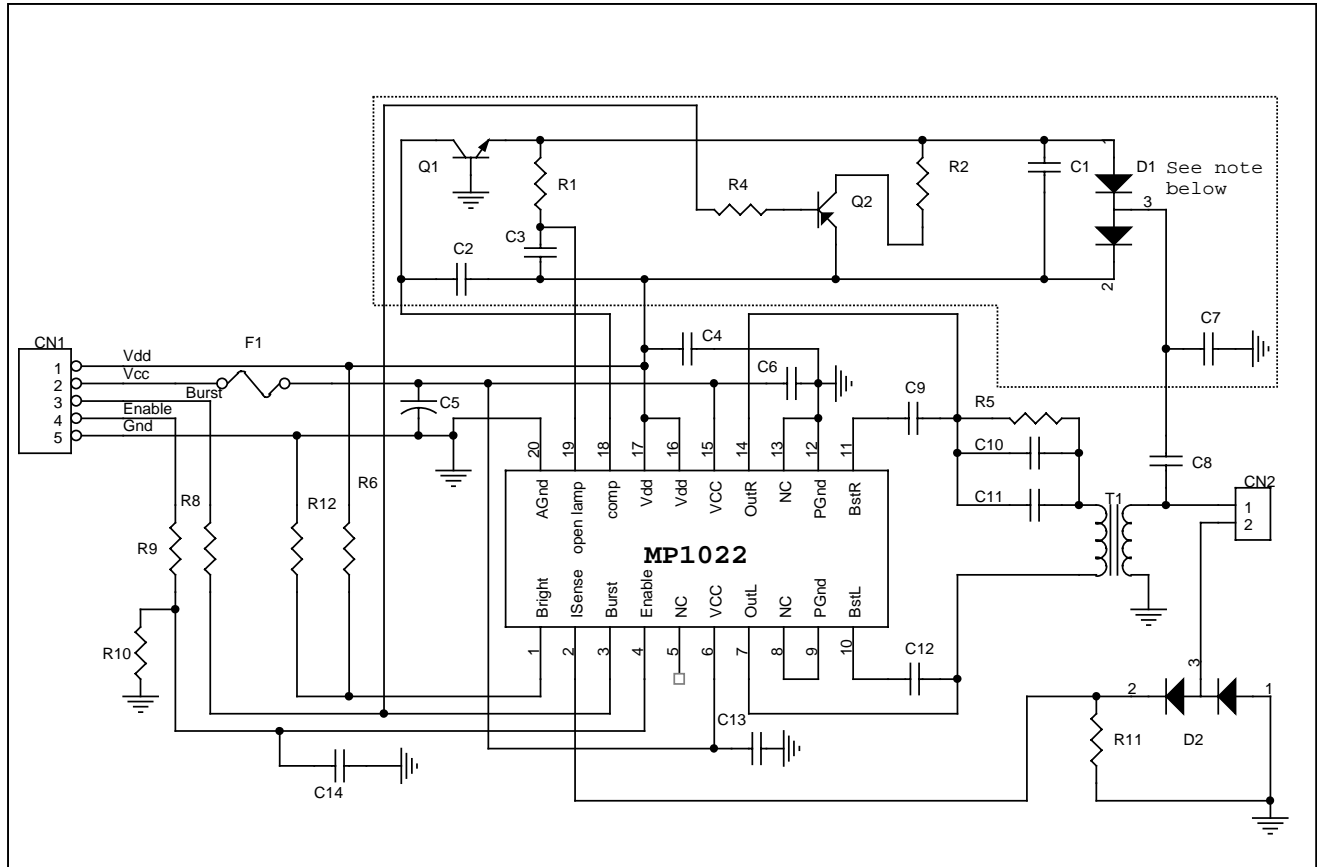
Figure 1: EV0002 Evaluation Board (Actual Size)



Figure 2: EV0002 Evaluation Board (Enlarged)



Figure 3: MP1022 Evaluation Board Schematic



Note: The above circuit includes an optional open lamp regulator/shutdown circuit.

Table 1: EV0002 Evaluation Board Bill of Materials

| Item | Qty | Description | Vendor / Part # | Designation |
|----------------------------|-----|--|---|-----------------------|
| Resistors | | | | |
| 1 | 2 | 1M Ω , \pm 5%, SMD, 0805 | | R1, R2 |
| 2 | 2 | Zero ohm jumper, SMD, 0805 | | R3 |
| 3 | 0 | Unused | | R4, R6, R8 |
| 4 | 1 | 1K Ω , \pm 5%, SMD, 0805 | | R5 |
| 5 | 1 | 100K Ω , \pm 5%, SMD, 0805 | | R12 |
| 6 | 1 | 10K Ω , \pm 5%, SMD, 0805 | | R9 |
| 7 | 1 | 100 Ω , \pm 5%, SMD, 0805 | | R11 |
| Capacitors | | | | |
| 8 | 1 | 0.1 μ F, 25V, ceramic, SMD, 1206 size | | C1 |
| 9 | 2 | 1nF, 50V, ceramic, SMD, 1206 | | C2, C14 |
| 10 | 5 | 1 μ F, 50V, ceramic, SMD, 1206 | | C3, C6, C10, C11, C13 |
| 11 | 1 | 10 μ F, 10V, electrolytic, SMD, D size | | C5 |
| 12 | 1 | 8.2nF, 50V, ceramic, SMD, 1206 | | C7 |
| 13 | 1 | 15pF, 3KV | | C8 |
| 14 | 2 | 10nF, | | C9, C12 |
| 15 | 0 | Optional component | | C15 |
| Semiconductors | | | | |
| 17 | 1 | Transistor, bipolar, 2N3904, SMD | | Q1 |
| 18 | 0 | Optional component | | Q2 |
| Integrated Circuits | | | | |
| 19 | 1 | MP1022, 20-pin TSSOP | Monolithic Power Systems | MPS |
| Magnetics | | | | |
| 20 | 1 | Optional component | | L1 |
| 21 | 1 | Transformer | Darfon Electronics Corp., T0.1601A.101 | T1 |
| Hardware | | | | |
| 22 | 1 | 0.10 inch straight header, 0.025 square | 3M (929834-02-36) | Ref (5 pin) |
| 23 | 1 | Lamp connector | | |
| 24 | 1 | Fuse, 1A | | F1 |
| 25 | 1 | PCB, single-sided, MP1022EVAL, Rev A | | N/A |

Evaluation Board Testing

The following equipment is required to test and demonstrate the MP1022 Evaluation Board:

CAUTION: Do not apply power to the Evaluation Board until all connections are complete.

- Power supply: 5V, 5mA (+ pin 1, - pin 5)
- Battery: 1-15V, 3A maximum (+ pin 2, - pin 5)
- Dimming Signal (Burst): 0-5V, 120-500Hz, 10uA maximum (+ pin 3, - pin 5)
- Enable logic: 0-5V, 10uA maximum (+ pin 5, - pin 5)

Comments/Precautions

1. When designing a printed circuit board, pay strict attention to single point (star) grounding. Keep all high current and output traces well away from the high impedance signals).

If in doubt, use the Evaluation Board as a reference especially when separating analog and power grounds!

2. Bypass VCC to GND as close to the MP1022 as possible. The use and placement of the bulk capacitor and the lower-valued high frequency bypass capacitor is necessary for proper operation of the amplifier.

Table 2: Performance Summary

The following data was collected using a lamp with length 100mm, diameter, 3.0mm and a nominal operating voltage of 300VRMS.

| V _{IN} | V _{DIM} | I _{LAMP} (mA DC) | I _{IN} (A DC) | I _{PRIMARY} (A RMS) | Frequency (kHz) | Duty Cycle (%) |
|-----------------|------------------|------------------------------|---------------------------|---------------------------------|--------------------|-------------------|
| 3.2V | 0V | 0.47 | 0.063 | 0.359 | 126.8 | 22.7 |
| 3.2V | 0.5V | 0.89 | 0.141 | 0.503 | 120.3 | 32.3 |
| 3.2V | 1.0V | 1.64 | 0.263 | 0.530 | 120.6 | 48.3 |
| 3.2V | 1.5V | 2.23 | 0.315 | 0.507 | 116.3 | 55.9 |
| 3.2V | 2.0V | 2.75 | 0.360 | 0.483 | 109.4 | 69.9 |
| | | | | | | |
| 5.0V | 0V | 0.53 | 0.048 | 0.387 | 127.5 | 17.9 |
| 5.0V | 0.5V | 0.95 | 0.112 | 0.533 | 124.4 | 22.4 |
| 5.0V | 1.0V | 1.63 | 0.171 | 0.552 | 125.0 | 32.9 |
| 5.0V | 1.5V | 2.21 | 0.206 | 0.550 | 124.0 | 37.2 |
| 5.0V | 2.0V | 2.77 | 0.239 | 0.540 | 121.0 | 43.5 |
| | | | | | | |
| 7.0V | 0V | 0.89 | 0.071 | 0.530 | 125.6 | 17.6 |
| 7.0V | 0.5V | 0.95 | 0.080 | 0.545 | 126.3 | 17.7 |
| 7.0V | 1.0V | 1.62 | 0.123 | 0.572 | 127.5 | 25.5 |
| 7.0V | 1.5V | 2.21 | 0.150 | 0.568 | 126.9 | 30.5 |
| 7.0V | 2.0V | 2.77 | 0.178 | 0.526 | 125.2 | 33.0 |

Figure 4: EV0002 Top Silk Screen

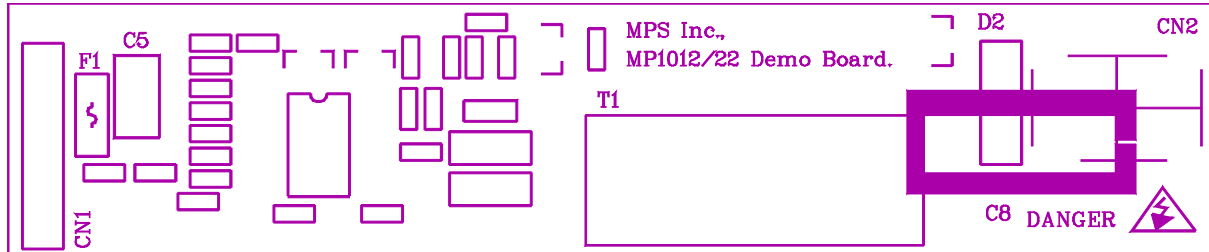


Figure 5: EV0002 Top Copper

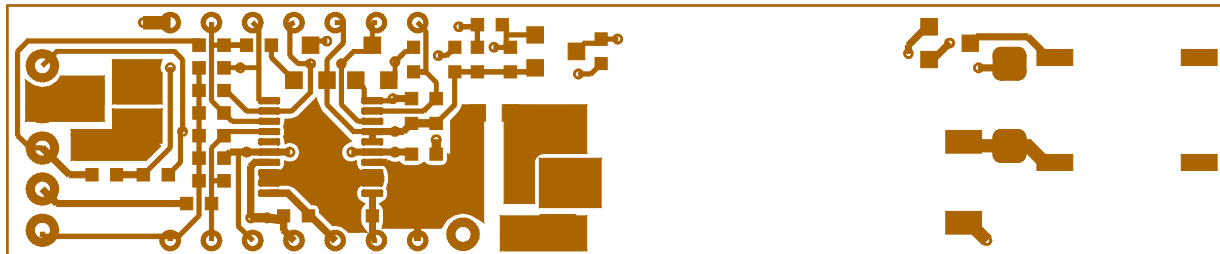


Figure 6: EV0002 Bottom Silk

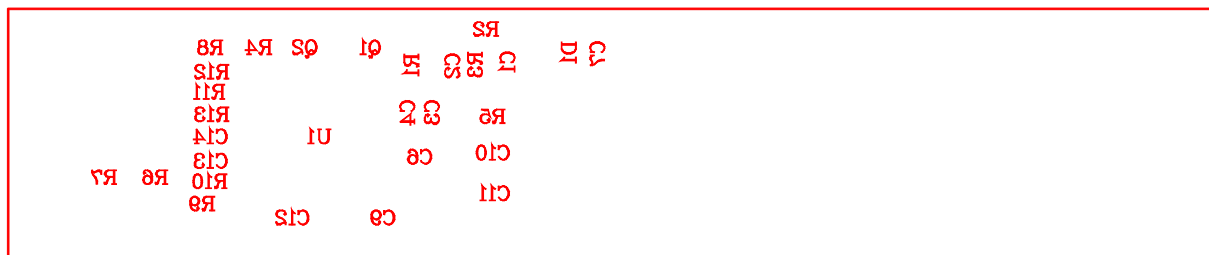
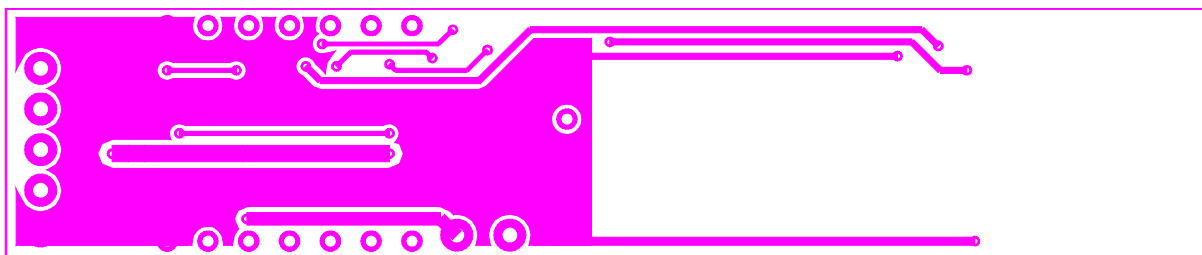


Figure 7: EV0002 Bottom Copper



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