



## MIC4834 Evaluation Board

### Low Noise Dual 220 V<sub>pp</sub> EL Driver

## General Description

The MIC4834 is a low noise dual Electroluminescent (EL) Panel driver used in backlighting applications. The MIC4834 converts a low DC voltage to a high DC voltage using a boost converter and then alternates the high DC voltage across the EL panels using an H-bridge. The MIC4834 incorporates internal wave-shaping circuitry specifically designed to reduce audible noise emitted by EL panels.

The MIC4834 features separate oscillators for the boost and H-bridge stages. The boost switching frequency may be adjusted by an external resistor. This flexibility allows the MIC4834 to optimize on brightness and efficiency. The H-bridge frequency is internally set to 225Hz to reduce the number of external components

## Requirements

The MIC4834 evaluation board requires an input power source that is able to deliver greater than 400mA at 2.3V.

## Precautions

The evaluation board does not have reverse polarity protection. Applying a negative voltage to the V<sub>IN</sub> terminal may damage the device. The MIC4834 is a high voltage, low current device and should be handled with care.

## Getting Started

1. **Connect an external supply to V<sub>IN</sub>.** Apply desired input voltage to the V<sub>IN</sub> (J1) and ground terminal (J2) of the evaluation board, paying careful attention to polarity and supply voltage ( $2.3V \leq V_{IN} \leq 5.8V$ ). An ammeter may be placed between the input supply and the V<sub>IN</sub> terminal to the evaluation board. Ensure that the supply voltage is monitored at the V<sub>IN</sub> terminal. The ammeter and/or power lead resistance can reduce the voltage supplied to the input.
2. **Connect EL panel(s).** Connect one EL panel between the ELA (J3) and COM (J5) terminals. Connect another EL panel between the ELB (J4) and COM (J5) terminals if desired. Note that polarity of the EL panel does not matter.

3. **Enable/Disable the MIC4834 Boost Regulator.** JP3 is the enable/disable jumper for the Boost Regulator portion of the MIC4834. Connecting JP3 to ground disables the boost regulator and connecting JP3 to V<sub>IN</sub> enables the boost regulator. A voltage signal may be applied to the center pin of JP3 to enable or disable the boost regulator. A low voltage signal (0V) will disable the boost regulator and a high voltage equal to V<sub>IN</sub> will enable the boost regulator. The enable voltage should rise and fall between high and low monotonically without interruptions.
4. **Enable/Disable the EL Panel Individually.** The Boost Regulator must be enabled (JP3 pulled to V<sub>IN</sub>) in order for the EL panel to illuminate. For minimum shutdown current, the Boost Regulator should be turned off. Remove the ENA (JP1) and ENB (JP2) jumpers to disable EL Panel A and Panel B, respectively.

## Ordering Information

Part Number	Description
MIC4834YML EV	220Vpp EL Driver, 10-pin 3mm x 3mm MLF <sup>®</sup> Evaluation Board
MIC4834YMM EV	220Vpp EL Driver, 10-pin MSOP Evaluation Board

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**Boost Regulator Output Voltage**

The boost regulator output voltage is set to 110V. The output peak-to-peak voltage across the EL panel is approximately 2 times the boost regulator output voltage ( $220V_{PP}$ ).

**Switching Frequency**

The switching frequency ( $f_{SW}$ ) of the converter is controlled by an external resistor (R1). The switching frequency increases as the resistor value decreases. In general, the lower the switching frequency, the greater the input current is drawn to deliver more power to the output. Lower the switching frequencies can be used to drive larger panels. However, the switching frequency should not be so low as to allow the voltage at the switch node or the CS pin to exceed the absolute maximum voltage of those pins. For resistor value selections use the following equation. The switching frequency range is 35kHz to 350kHz, with an accuracy of  $\pm 20\%$ .

$$f_{SW} \text{ (kHz)} = \frac{46}{R1 \text{ (M}\Omega\text{)}}$$

**EL Frequency**

The MIC4834 EL panel frequency ( $f_{EL}$ ) is internally fixed at 225Hz.

**Enable Function**

There are two different ways to enable and disable the MIC4834. The R1 resistor can be pulled to VDD or ground to enable or disable the boost regulator, respectively. This turns off both the EL panels by cutting power to the device completely. If R1 is not pulled all the way to VDD, then the frequency set by R1 will be different than the programmed value.

For individual panel control, the ENA and ENB pins can be used to enable ELA and ELB, respectively. Pulling ENA or ENB high (above 1.2V) or low (below 0.4V) will turn ELA and ELB panels on or off.

### Evaluation Board Schematic (MLF<sup>®</sup>)

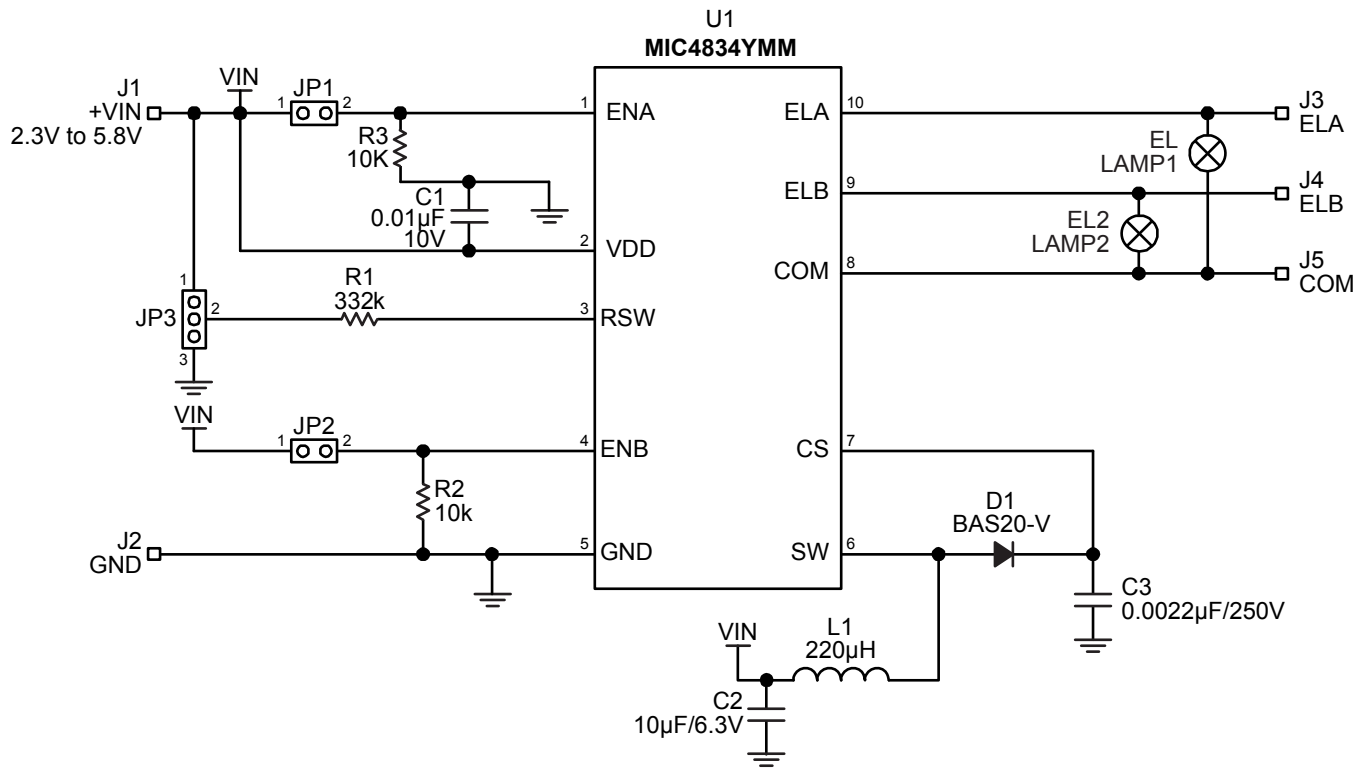


Figure 1: Typical Li-Ion Powered MIC4834 Circuit

Note: Table 1 applies to circuit shown in Figure 1.

Total Panel Area (in <sup>2</sup> )	0.4	1	2	3	4	5	6
Capacitance (nF)	2	5	10	15	20	25	30
R1 (kΩ)	357	392	487	562	750	931	1100
f <sub>sw</sub> (kHz)	128	116	94	82	62	50	42

Table 1. Recommended R1 Values for Various Total Panel Sizes

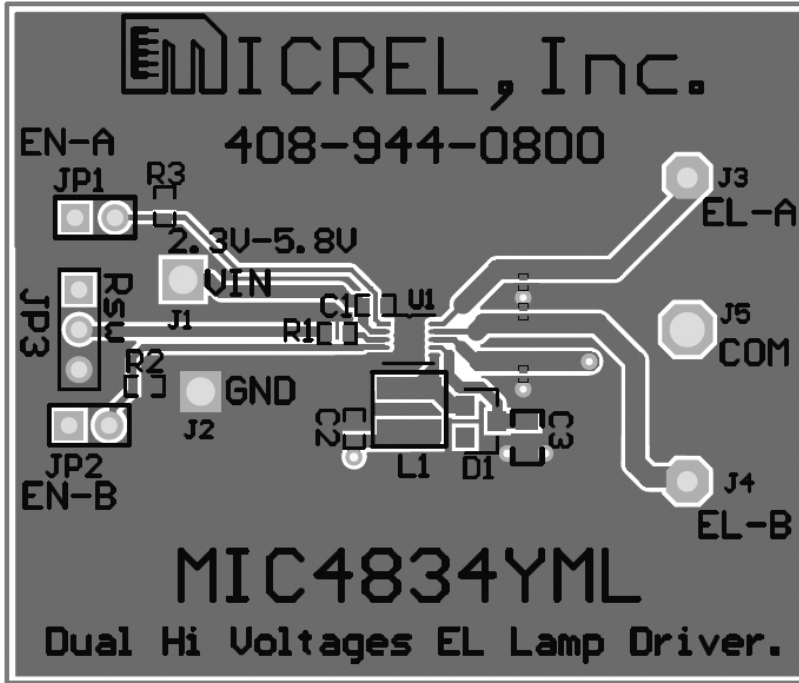
### Bill of Materials

Item	Part Number	Manufacturer	Description	Qty
C1	C1608X7R1A103K	TDK <sup>(1)</sup>	0.01µF Ceramic Capacitor, 10V, X7R, Size 0603	1
C2	C1608X5R0J106K	TDK <sup>(1)</sup>	10 µF Ceramic Capacitor, 6.3V, X5R, Size 0603	1
C3	C2012C0G2E2222J	TDK <sup>(1)</sup>	0.0022µF Ceramic Capacitor, 250V, C0G, Size 0805	1
L1	VLS4012T-221M	TDK <sup>(1)</sup>	220µH, 210mA I <sub>SAT</sub> . (4mmx4mmx1.2mm)	1
D1	BAS20-V-GS18	Vishay <sup>(2)</sup>	200V/200mA Hi-Voltage Switching Diode	1
R1	CRCW06033323FKEYE3	Vishay <sup>(2)</sup>	332kΩ, 1%, 1/16W, Size 0603	1
R2, R3	CRCW06031002FKEYE3	Vishay <sup>(2)</sup>	10kΩ, 1%, 1/16W, Size 0603	2
U1	MIC4834YML	Micrel <sup>(3)</sup>	Low Noise 10-pin 3mm x 3mm Dual 220Vpp EL Driver	1

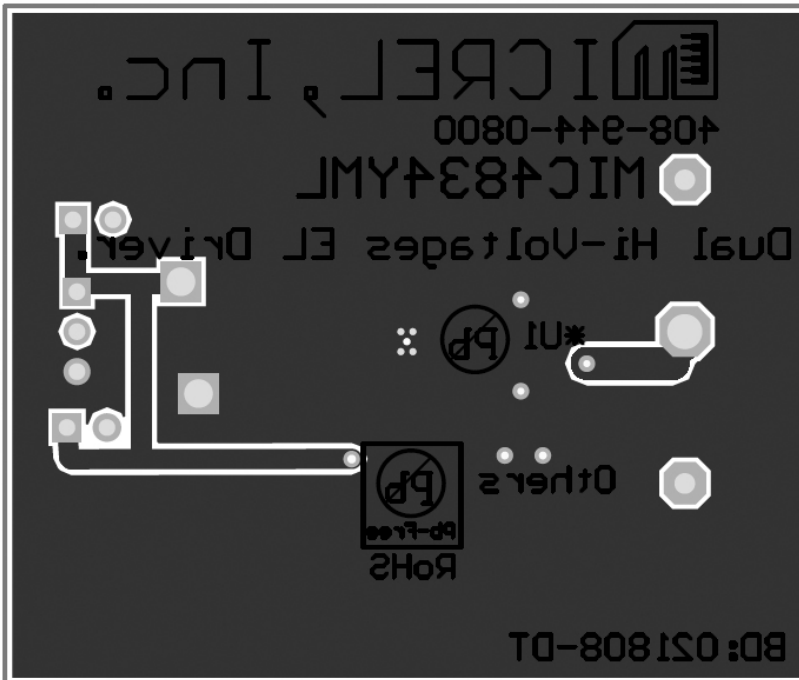
Notes:

1. TDK: [www.tdk.com](http://www.tdk.com)
2. Vishay: [www.vishay.com](http://www.vishay.com)
3. **Micrel, Inc.:** [www.micrel.com](http://www.micrel.com)

### Printed Circuit Board Layout (MLF<sup>®</sup>)



Top Layer



Bottom Layer

### Evaluation Board Schematic (MSOP)

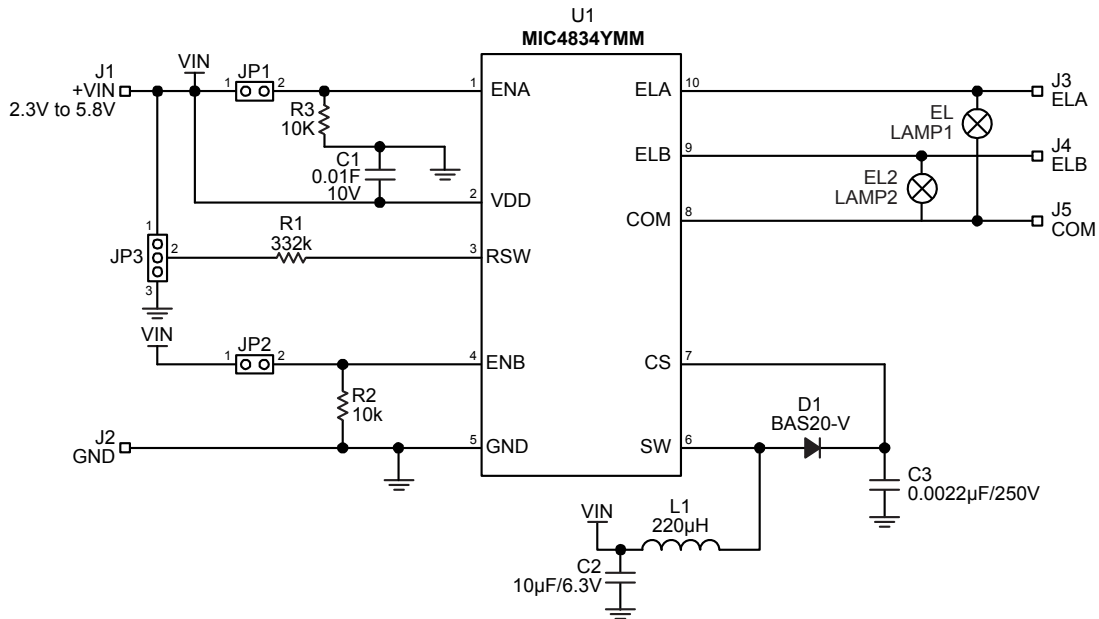


Figure 2: Typical Li-Ion Powered MIC4834 Circuit

Note: Table 1 applies to circuit shown in Figure 2.

Total Panel Area (in <sup>2</sup> )	0.4	1	2	3	4	5	6
Capacitance (nF)	2	5	10	15	20	25	30
R1 (kΩ)	357	392	487	562	750	931	1100
f <sub>sw</sub> (kHz)	128	116	94	82	62	50	42

Table 1. Recommended R<sub>sw</sub> Values for Total Panel Sizes

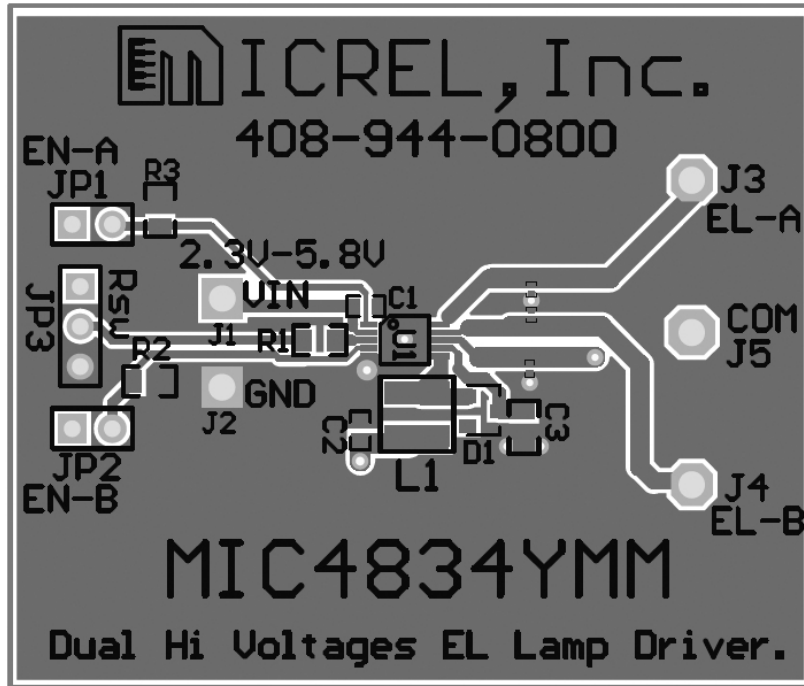
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L1	VLS4012T-221M	TDK <sup>(1)</sup>	220µH, 210mA I <sub>SAT</sub> . (4mmx4mmx1.2mm)	1
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R1	CRCW06033323FKKEYE3	Vishay <sup>(2)</sup>	332kΩ, 1%, 1/16W, Size 0603	1
R2, R3	CRCW06031002FKKEYE3	Vishay <sup>(2)</sup>	10kΩ, 1%, 1/16W, Size 0603	2
U1	MIC4834YMM	Micrel <sup>(3)</sup>	Low Noise 10-pin MSOP Dual 220Vpp EL Driver	1

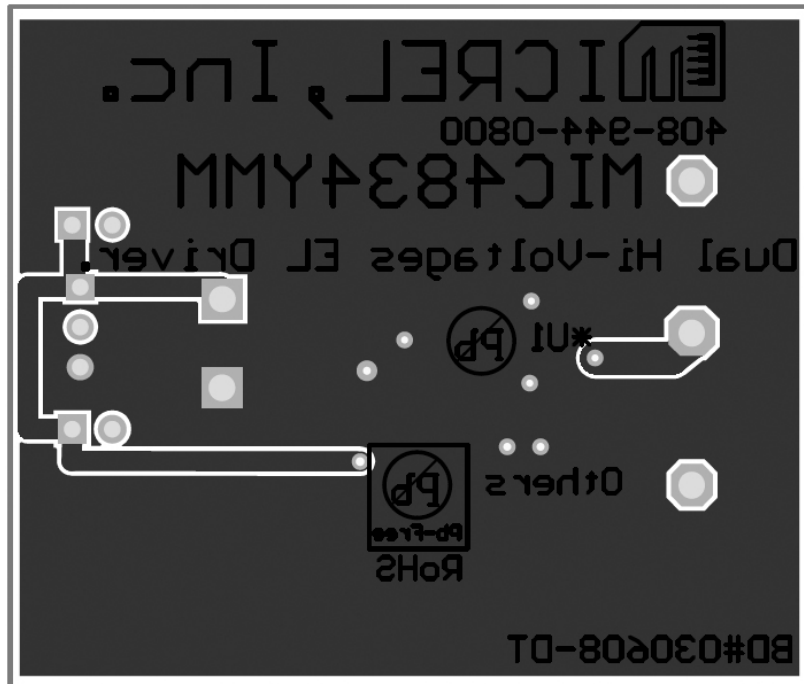
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3. Micrel, Inc.: [www.micrel.com](http://www.micrel.com)

### Printed Circuit Board Layout (MSOP)



Top Layer



Bottom Layer

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