



MIC2174 3A Evaluation Board

Constant Frequency, Synchronous
Buck Controller Featuring Adaptive On-
Time Control

Hyper Speed Control™ Family

General Description

MIC2174, a member of the new Hyper Speed Control™ family of buck controllers introduced by Micrel, is a synchronous, adaptive on-time buck controller. This controller is targeted for cost sensitive applications requiring high performance. The MIC2174 operates over an input supply range of 3V to 40V, and is independent of the IC supply voltage.

Data sheets support documentation can be found on Micrel's web site at www.micrel.com.

Requirements

The MIC2174 evaluation board requires two power supplies: one to provide VIN (connect to HSD pin of MIC2174), and the other to provide VDD (connect to IN pin of the MIC2174) for the control circuitry. The VIN power supply should be able to deliver greater than 3.0V at over 3A. The VDD power source, which is recommended to be 5.0V typical, should be able to deliver greater than 3.0V. The typical VDD current is a few millamps. An external 20mA minimum power supply is recommended for VDD.

Precautions

The evaluation board does not have reverse polarity protection. Applying a negative voltage to the VIN or VDD terminal may damage the device. In addition, the maximum VIN operating voltage of the MIC2174 evaluation board is 40V, and the maximum VDD operation voltage is 5.5V. Exceeding 42V on VIN or exceeding 6V on VDD could damage the device.

An external VDD power supply is required and it should be turned on no earlier than VIN power supply to make sure the soft-start behavior properly.

Getting Started

1. Connect an external supply to VIN terminal. Apply desired input voltage to the VIN (J1) and ground (J4) terminals of the evaluation board, paying careful attention to polarity and supply voltage (3.0V < VIN < 40V). An ammeter may be placed between the input supply and the

VIN terminal to the evaluation board. Ensure the supply voltage is monitored at the VIN terminal. The ammeter and/or power lead resistance can reduce the voltage supplied to the input.

2. Connect an external supply to VDD terminal. Apply desired input voltage to the VDD (J6) and ground (J5) terminals of the evaluation board, paying careful attention to polarity and supply voltage (3.0V < VDD < 5.5V). The VDD power supply should be turned on no earlier than VIN power supply. The recommended voltage for VIN is 5V.

3. Connect the load to the VOUT and ground terminals. The load can be either passive (resistive) or active (as in an electronic load). An ammeter can be placed between the load and the VOUT (J2) terminal. Ensure the output voltage is monitored at the VOUT terminal. The default VOUT is set to 1.8V. This can be adjusted by changing the feedback resistors. See "Output Voltage."

4. Enable the MIC2174. The enable pin is floating by default. The output of the MIC2174 turns on when VDD exceeds the UVLO threshold. The output of the MIC2174 may be turned off by shorting the enable pin to ground or bringing the enable pin below the enable threshold. An external connection on the board provides easy access to the enable pin.

Output Voltage

The output voltages on the MIC2174 evaluation board are adjustable. The output voltage is controlled by the feedback resistors (R4 and R6) and can be calculated as follows:

$$V_{OUT} = V_{REF} \times \left(1 + \frac{R4}{R6}\right)$$

where $V_{REF} = 0.8V$.

The evaluation board is preset at a 1.8V output, but can easily be modified by removing R6 and replacing it with the value that yields the desired output voltage.

$$R6 = \frac{R4 \times V_{REF}}{V_{OUT} - V_{REF}}$$

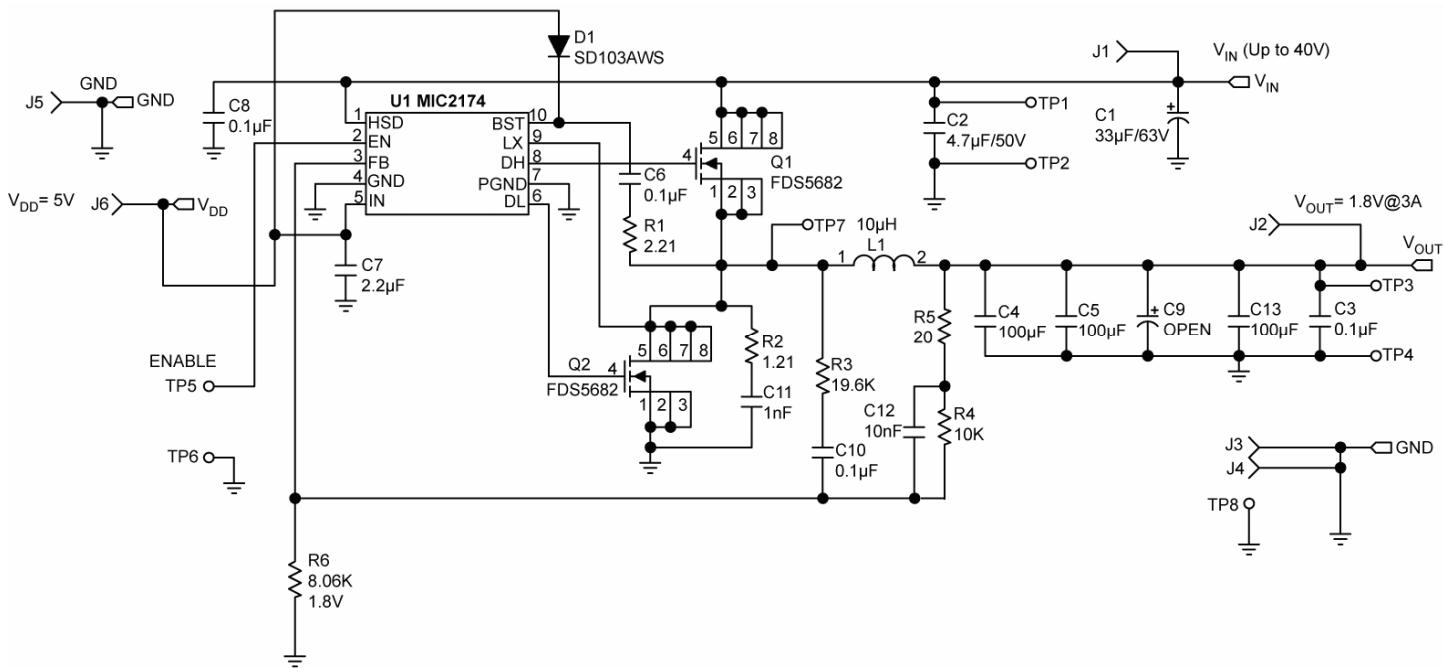
For $V_{REF} = 0.8V$, this reduces to:

$$R6 = \frac{R4 \times 0.8V}{V_{OUT} - 0.8V}$$

Ensure the output voltage set does not exceed 5V, since the output capacitor has a 6.3V voltage rating. When the output voltage greater than 5V is desired, the output capacitor should be replaced with higher voltage rating.

Ordering Information

| Part Number | Description | Package |
|-----------------------|------------------|-------------|
| MIC2174-1YMM | IC | 10-pin MSOP |
| MIC2174-1YMM 3A EV | Evaluation Board | 10-pin MSOP |



Bill of Materials

| Item | Part Number | Manufacturer | Description | Qty |
|-----------------|--------------------|---------------------------|---|-----|
| C1 | B41112A8336M | EPCOS ⁽¹⁾ | 33µF Aluminum Capacitor, SMD, 63V | 1 |
| C2 | 12105C475KAZ2A | AVX ⁽²⁾ | 4.7µF Ceramic Capacitor, X7R, Size 1210, 50V | 1 |
| | GRM32ER71H475KA88L | Murata ⁽³⁾ | | |
| C4, C5, C13 | 12106D107MAT2A | AVX | 100µF Ceramic Capacitor, X5R, Size 1210, 6.3V | 3 |
| | GRM32ER60J107ME20L | Murata | | |
| C3, C6, C8, C10 | 06035C104KAT2A | AVX | 0.1µF Ceramic Capacitor, X7R, Size 0603, 50V | 4 |
| | GRM188R71H104KA93D | Murata | | |
| | C1608X7R1H104K | TDK ⁽⁴⁾ | | |
| C7 | 0805ZC225MAT2A | AVX | 2.2µF Ceramic Capacitor, X7R, Size 0805, 10V | 1 |
| | GRM21BR71A225KA01L | Murata | | |
| | C2012X7R1A225K | TDK | | |
| C11 | 06035C102KAT2A | AVX | 1nF Ceramic Capacitor, X7R, Size 0603, 50V | 1 |
| | GRM188R71H102KA01D | Murata | | |
| | C1608X7R1H102K | TDK | | |
| C12 | 06035C103KAZ2A | AVX | 10nF Ceramic Capacitor, X7R, Size 0603, 50V | 1 |
| | GRM188R71H103K | Murata | | |
| | C1608X7R1H103K | TDK | | |
| D1 | SD103AWS-7 | Diodes Inc ⁽⁵⁾ | Small Signal Schottky Diode | 1 |
| | SD103AWS | Vishay ⁽⁶⁾ | | |
| L1 | CDRH104RNP-100 | Sumida ⁽⁷⁾ | 10µH Inductor, 3.8A Saturation Current | 1 |

| | | | | |
|-----------|-------------------|-----------------------------|--|---|
| Q1,Q2 | FDS5682 | Fairchild ⁽⁸⁾ | 60V 7.5A N-Channel MOSFET 26.5mΩ Rds(on) @ 4.5V | 1 |
| R1 | CRCW06032R21FKEA | Vishay Dale | 2.21Ω Resistor, Size 0603, 1% | 1 |
| R2 | CRCW06031R21FKEA | Vishay Dale | 1.21Ω Resistor, Size 0603, 1% | 1 |
| R3 | CRCW060319K6FKEA | Vishay Dale | 19.6kΩ Resistor, Size 0603, 1% | 1 |
| R4 | CRCW060310K0FKEA | Vishay Dale | 10kΩ Resistor, Size 0603, 1% | 1 |
| R5 | CRCW060320R0FKEA | Vishay Dale | 20Ω Resistor, Size 0603, 1% | 1 |
| R6 | CRCW06038K06FKEA | Vishay Dale | 8.06kΩ Resistor, Size 0603, 1% | 1 |
| U1 | MIC2174YMM | Micrel. Inc. ⁽⁹⁾ | 300kHz Buck Controller | 1 |

Notes:

1. EPCOS: www.epcos.com
2. AVX: www.avx.com
3. Murata: www.murata.com
4. TDK: www.tdk.com
5. Diodes Inc: www.diodes.com
6. Vishay: www.vishay.com
7. Sumida: www.sumida.com
8. Fairchild: www.fairchildsemi.com
9. **Micrel, Inc.:** www.micrel.com

Printed Circuit Board Layouts

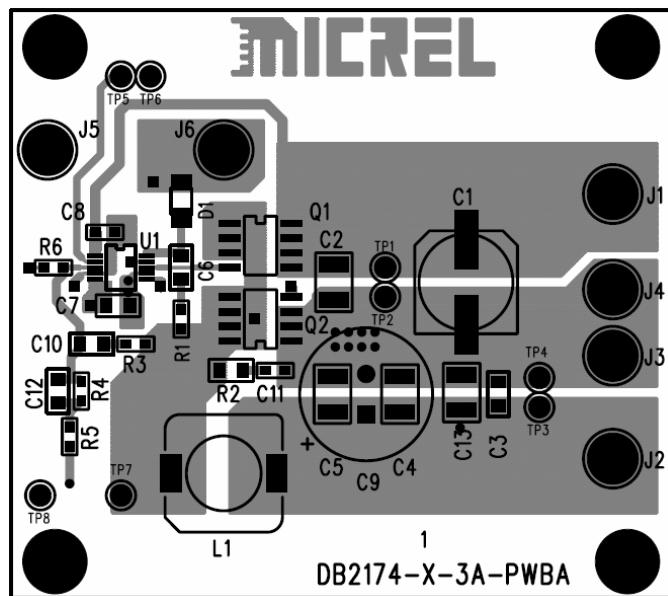


Figure 1a. Top Layer

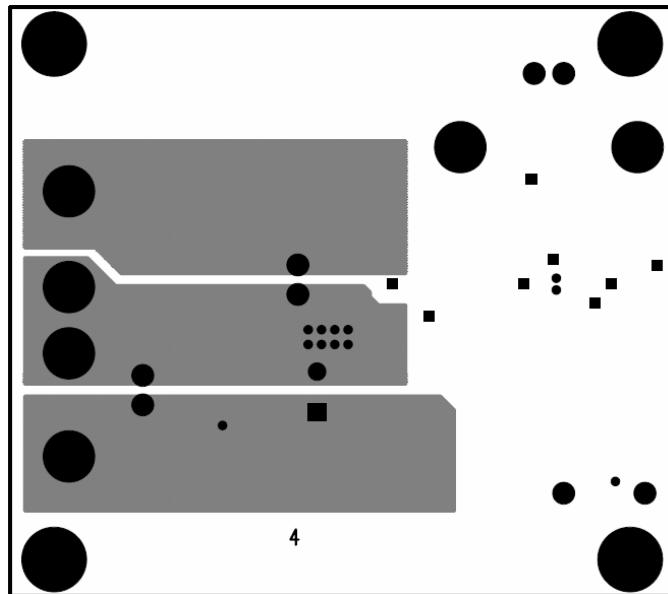


Figure 1b. Bottom Layer

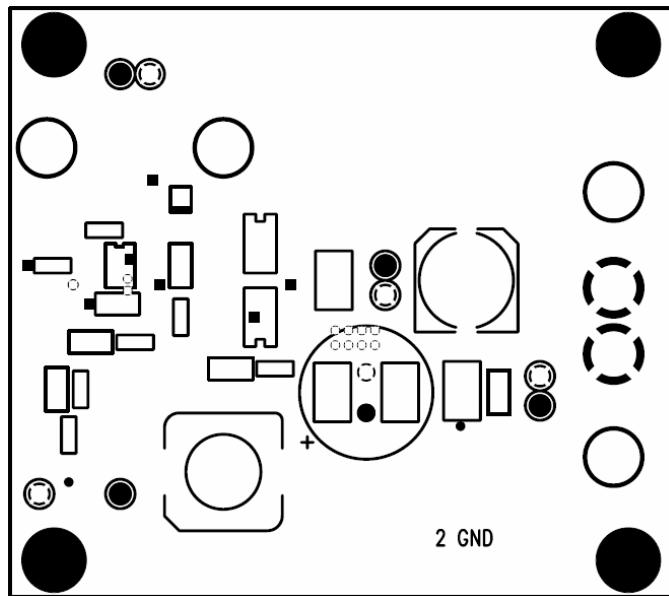


Figure 1c. Mid Layer 1 (GND Plane)

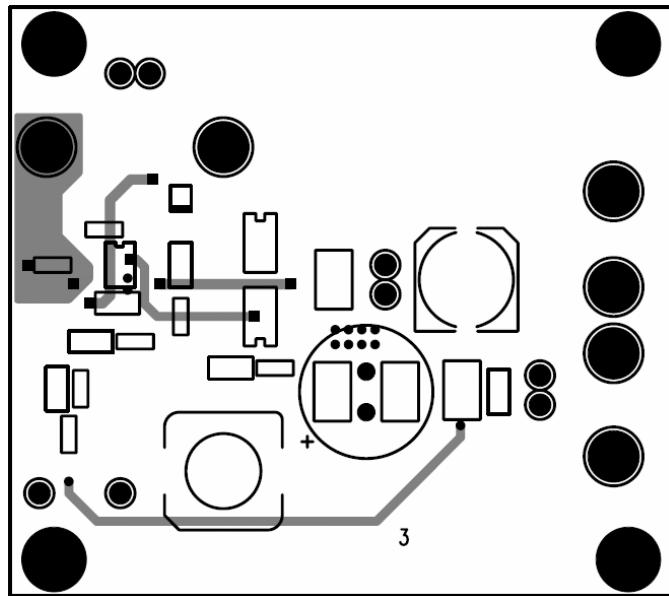


Figure 1d. Mid Layer 2

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