Evaluation Board User Guide

EVAL-LT8210-1-AZ

100V V_{IN} and V_{OUT} Synchronous 4-Switch Multiphase Buck-Boost DC/DC Controller

General Description

The evaluation circuit EVAL-LT8210-1-AZ is a high voltage, high efficiency synchronous 4-switch multiphase buck-boost DC/DC converter with pass-thru mode. This circuit provides an output of 36V to 56V and can supply a maximum load current of 20A with an input voltage range of 26V to 80V. The evaluation circuit features four LT8210-1 controllers that operate in multiphase configuration, and the leaderless closed loop current sharing loop balances the current per phase.

The EVAL-LT8210-1-AZ can be operated in three modes: continuous conduction mode (CCM), discontinuous conduction mode (DCM), and pass-thru mode. Use MODE1 and MODE2 header pins to select the desired mode (see *Table 2*). The board operates at a switching frequency of 205kHz and is synchronized externally. All components on the board are selected to optimize efficiency at this frequency. Reverse input protection to –40V is also implemented on this circuit board.

The LT8210-1 data sheet gives a complete description of the part, operation, and applications information. The data sheet must be read in conjunction with this user guide.

Design files for this circuit board are available.

Features and Benefits

- Built-In Multiphase Current Sharing
  - Leader-Less Design
- Pass-Thru or Fixed Output CCM, DCM Operation
- Programmable Non-Switching Pass-Thru Window
- V_{IN} Range: 2.8V to 100V (4.5V for Start-Up)
- V_{OUT} Range: 1V to 100V
- Reverse Input Protection to -40V
- Programmable Current Limit
- No Top MOSFET Refresh Noise in Buck or Boost
- Fixed/Phase-Lockable Frequency: 80kHz to 400kHz
- Available in a 40-Lead (6mm x 6mm) QFN

***Ordering Information* appears at end of the document**.

Performance Summary **Specifications are at (T_A = 25°C)**

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage		26		80	V
Output Voltage	Pass-Thru Mode	36		56	V
	CCM, DCM		48		V
Maximum output current				20	A
Switching Frequency			205		kHz

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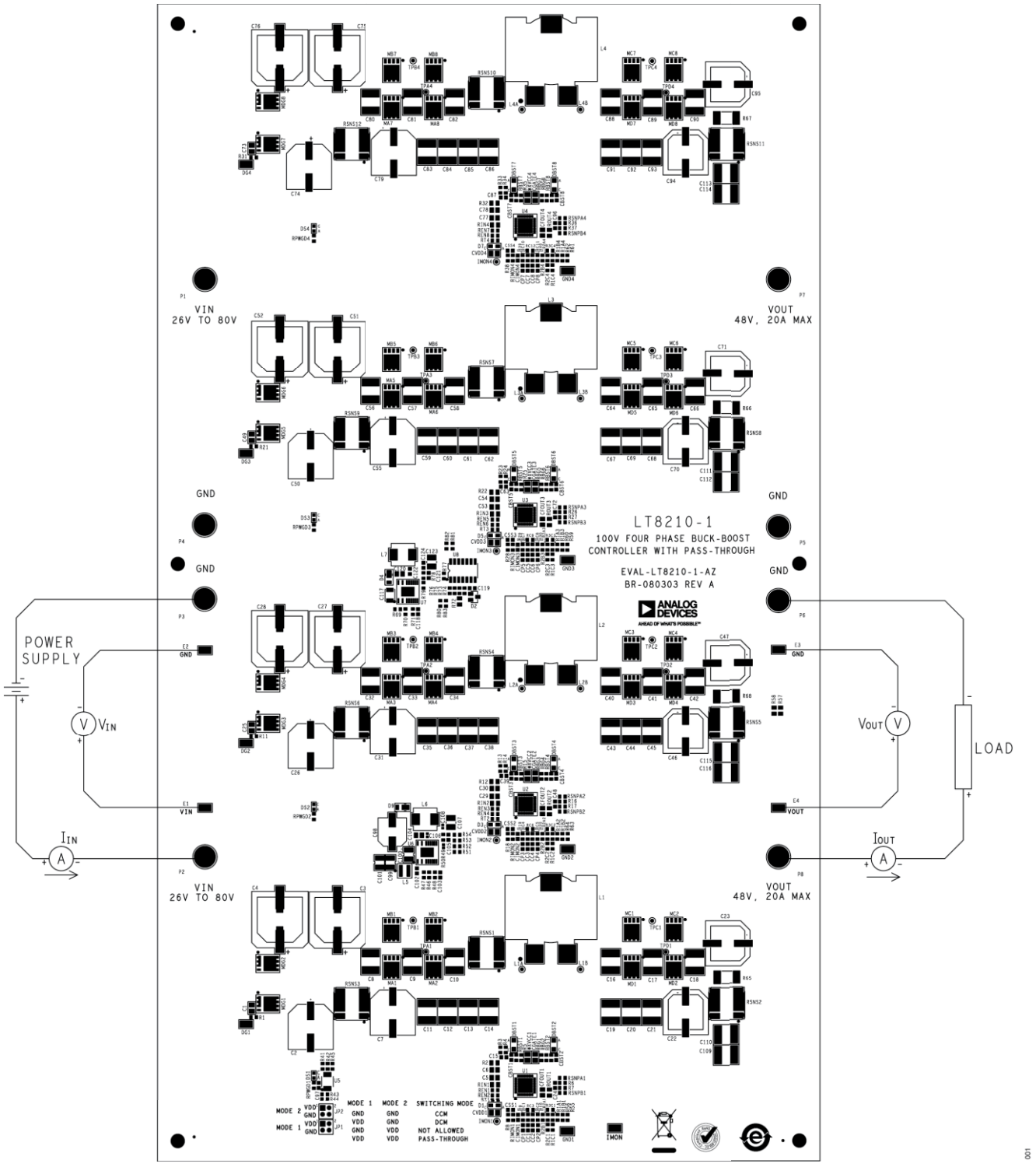


Figure 1. EVAL-LT8210-1 Eval Board Connections

Quick Start

Required Equipment

- Input power supply capable of at least 80V, 40A, 1500W
- Adjustable load capable of at least 60V, 20A, 1200W
- Two digital voltmeters (DVMs)
- Two ammeters

Procedure

The EVAL-LT8210-1-AZ board is fully assembled and tested. Follow the steps to make required hardware connections and start operation of the kit.

1. With power off, connect the DC power supply to V_{IN} (26V to 80V) and GND (input return).

   Note: Make sure that the input voltage V_{IN} does not exceed 80V.
2. Connect the adjustable load (<20A) between V_{OUT} and GND.
3. Connect the DVMs to the input and the output.
4. Set the operating mode to pass-thru mode by connecting the MODE1 (JP1) and MODE2 (JP2) jumpers to V_{DD}.
5. Apply a voltage within the specified input range to V_{IN} and verify V_{OUT}.
6. V_{OUT} should range from 36V ±2% to 56V ±2% (see *Figure 2*).
7. Once the proper output voltage is established, adjust the load and observe the output voltage regulation, ripple voltage, efficiency, and other parameters.

Note: When measuring the output or input voltage ripple, do not use the long ground lead on the oscilloscope probe. Measure the input or output voltage ripple by connecting the probe tip directly across the V_{IN} or V_{OUT} and GND terminals. Preferably across the input or output capacitors.

Test Results:

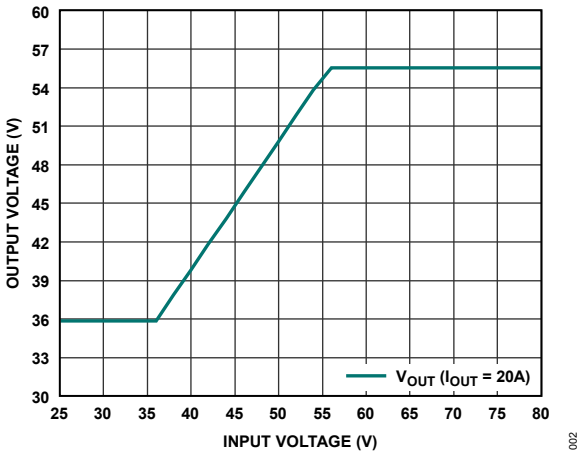


Figure 2. Output Voltage vs. Input Voltage in Pass-Thru Mode

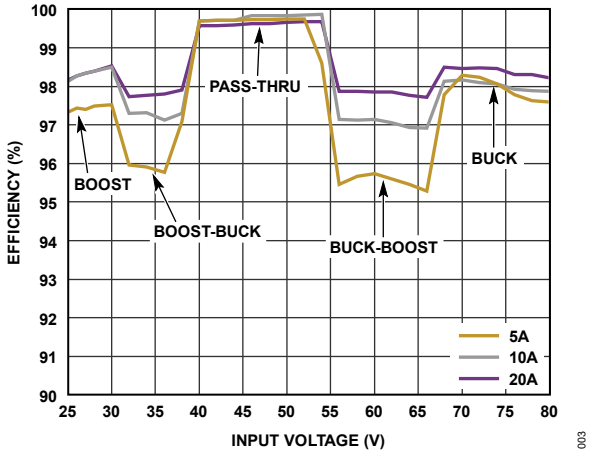


Figure 3. Efficiency vs. Input Voltage in Pass-Thru Mode

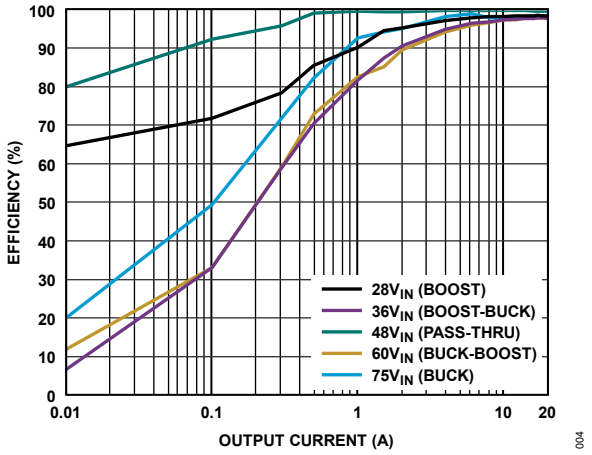


Figure 4. Efficiency vs. Output Current in Pass-Thru Mode

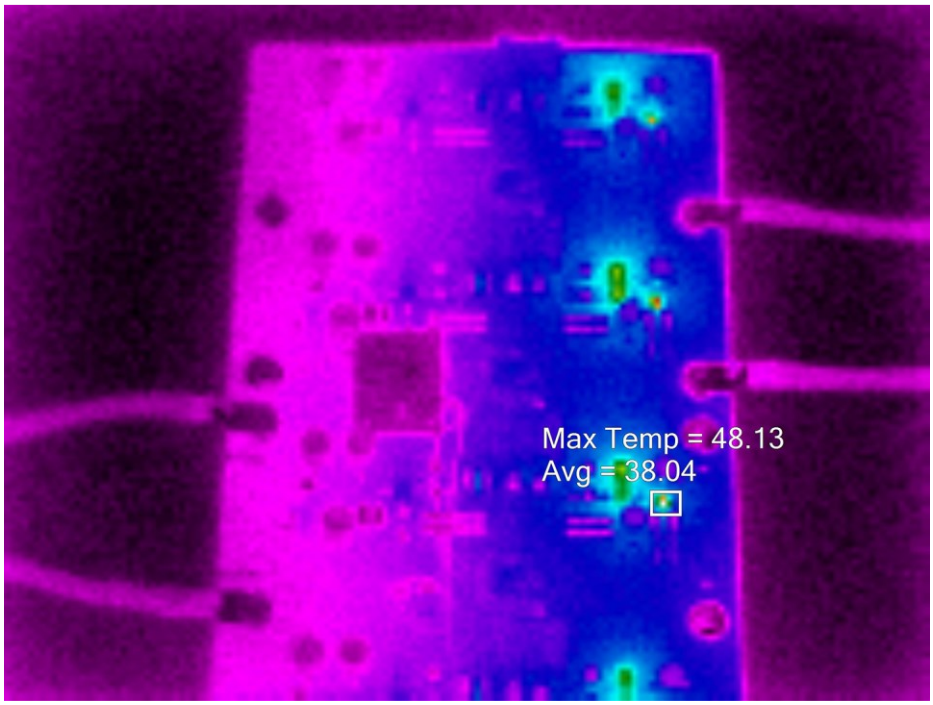


Figure 5. Thermal Performance at V_{IN} = 28V, V_{OUT} = 36V, I_{OUT} = 20A in Pass-Thru Mode

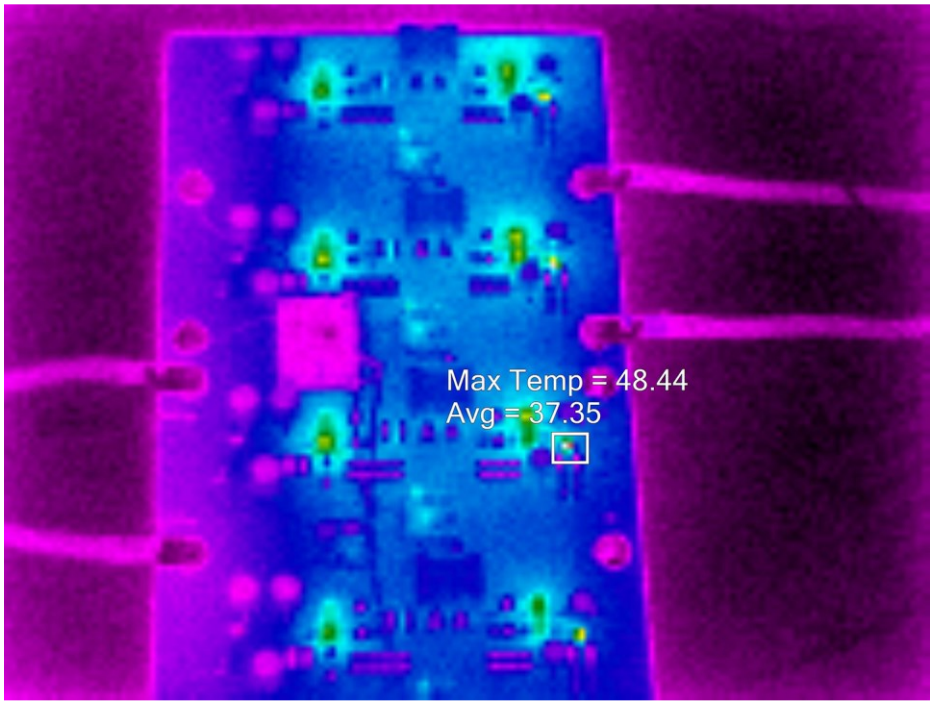


Figure 6. Thermal Performance at V_{IN} = 34V, V_{OUT} = 36V, I_{OUT} = 20A in Pass-Thru Mode

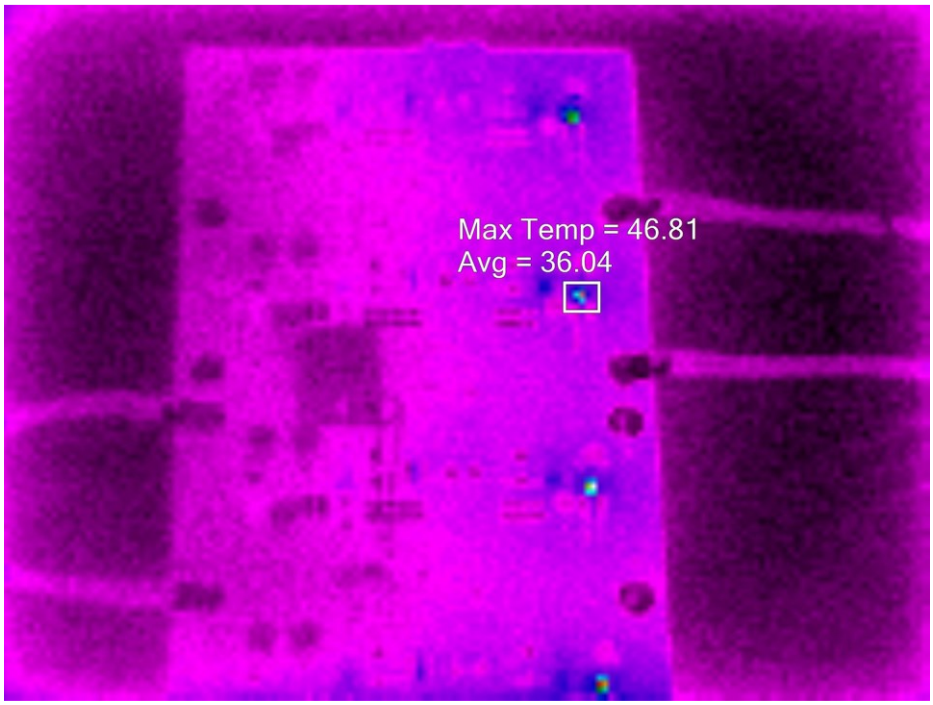


Figure 7. Thermal Performance at V_{IN} = 48V, V_{OUT} = 48V, I_{OUT} = 20A in Pass-Thru Mode

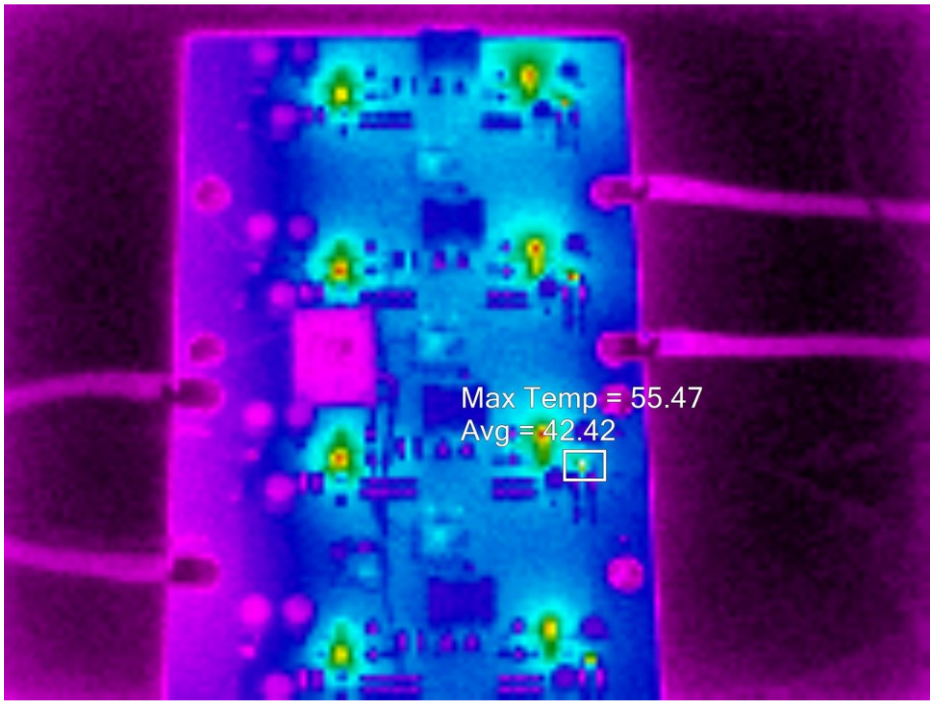


Figure 8. Thermal Performance at V_{IN} = 60V, V_{OUT} = 56V, I_{OUT} = 20A in Pass-Thru Mode

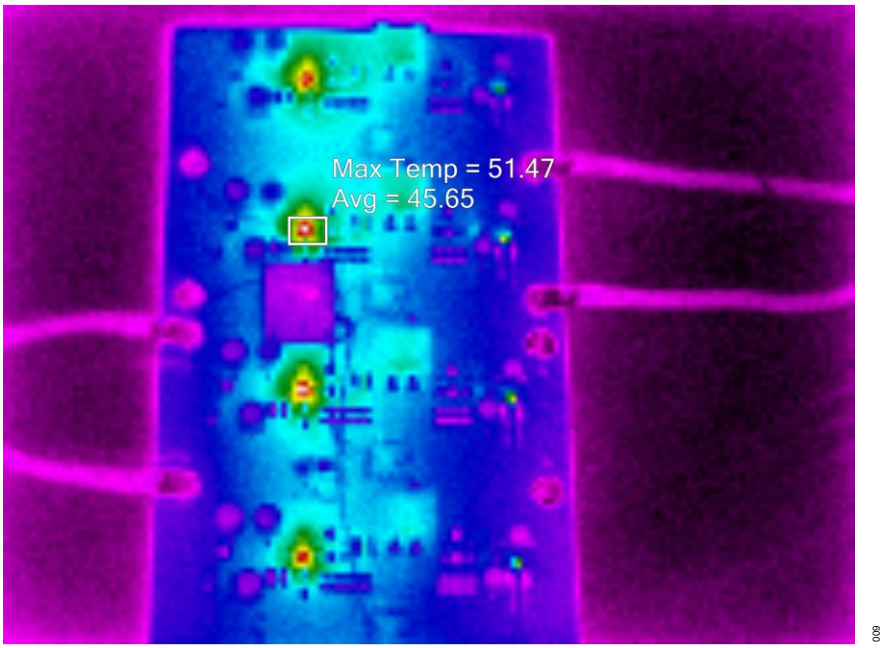


Figure 9. Thermal Performance at V_{IN} = 75V, V_{OUT} = 56V, I_{OUT} = 20A in Pass-Thru Mode

Table 1. Jumper Connection Guide

JUMPER	DEFAULT CONNECTION	FEATURE
JP1	VDD	Mode Select*
JP2	VDD	Mode Select*

*See Table 2

Detailed Description of Hardware

The EVAL-LT8210-1 is a four-phase, high efficiency, buck-boost converter with Pass-Thru mode. Four LT8210-1 (U1, U2, U3, and U4) and U5 (LTC6902) provide a leaderless four-phase converter with 90° phase separation. U6 (LT8631) provides a DC voltage through jumper resistors (R51, R52, R53, and R54) to the $EXTV_{CC}$ pins of each LT8210-1. U8 (LTC2052) provides a coordinated shutdown of the LT8210-1 chips. U7 (LT8631) provides a DC voltage for U8 operation. Two mode pins (JP1 and JP2) provide an easy method to select operating modes. The LT8210-1 can operate in continuous conduction mode (CCM), discontinuous conduction mode (DCM), and pass-thru mode (PTM). Refer to the data sheet for more details on operating modes and many other features of the LT8210-1.

Table 2. JP1 and JP2 Operating Modes

JP1	JP2	SWITCHING MODE
GND	GND	CCM
VDD	GND	DCM
GND	VDD	Not Allowed
VDD	VDD	PTM*

Denotes default.

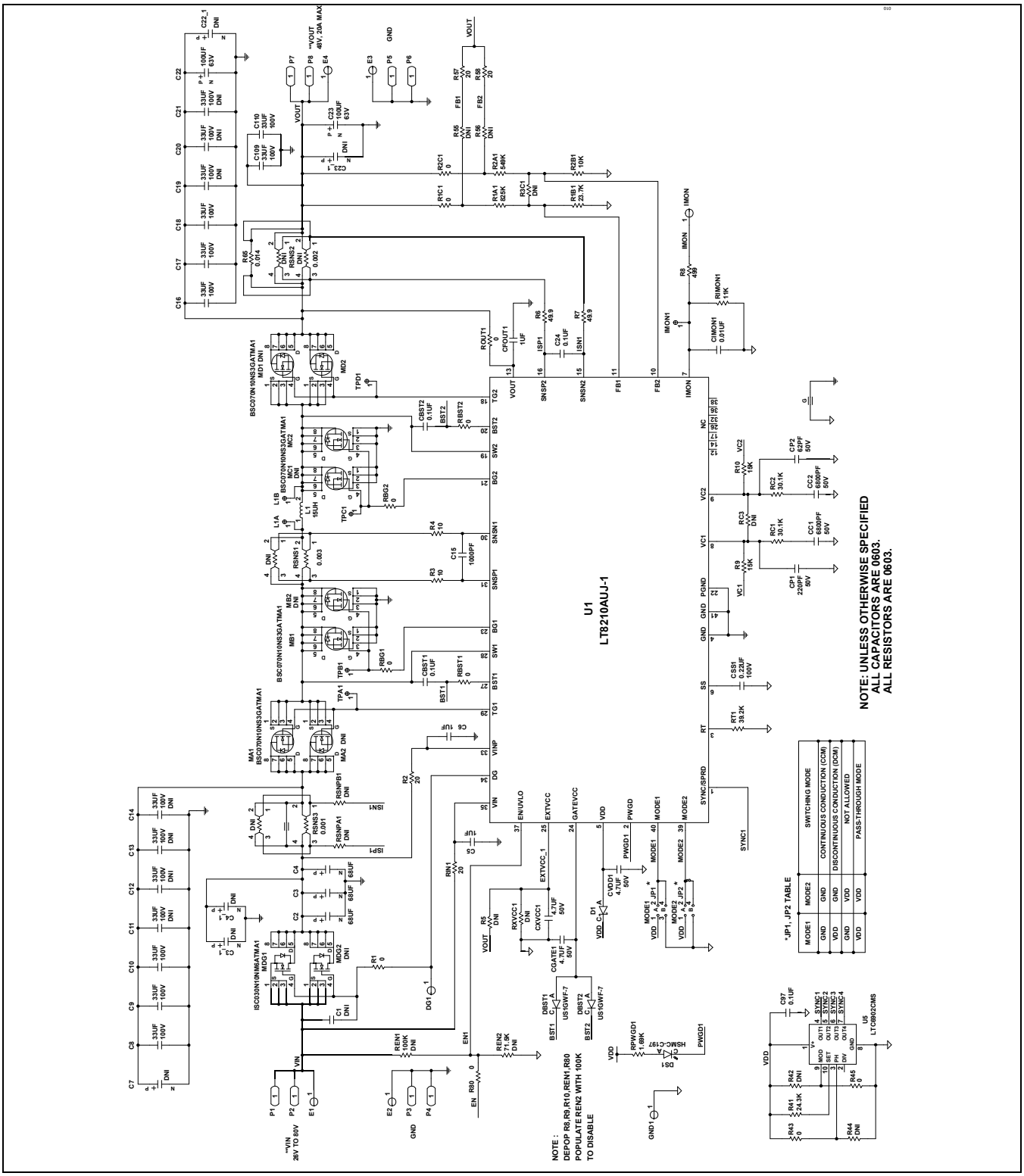
Power Supply

This EV kit can be powered using a variable DC power supply. Supply a 26V to 80V input for evaluation. Do not exceed 80V_{IN}.

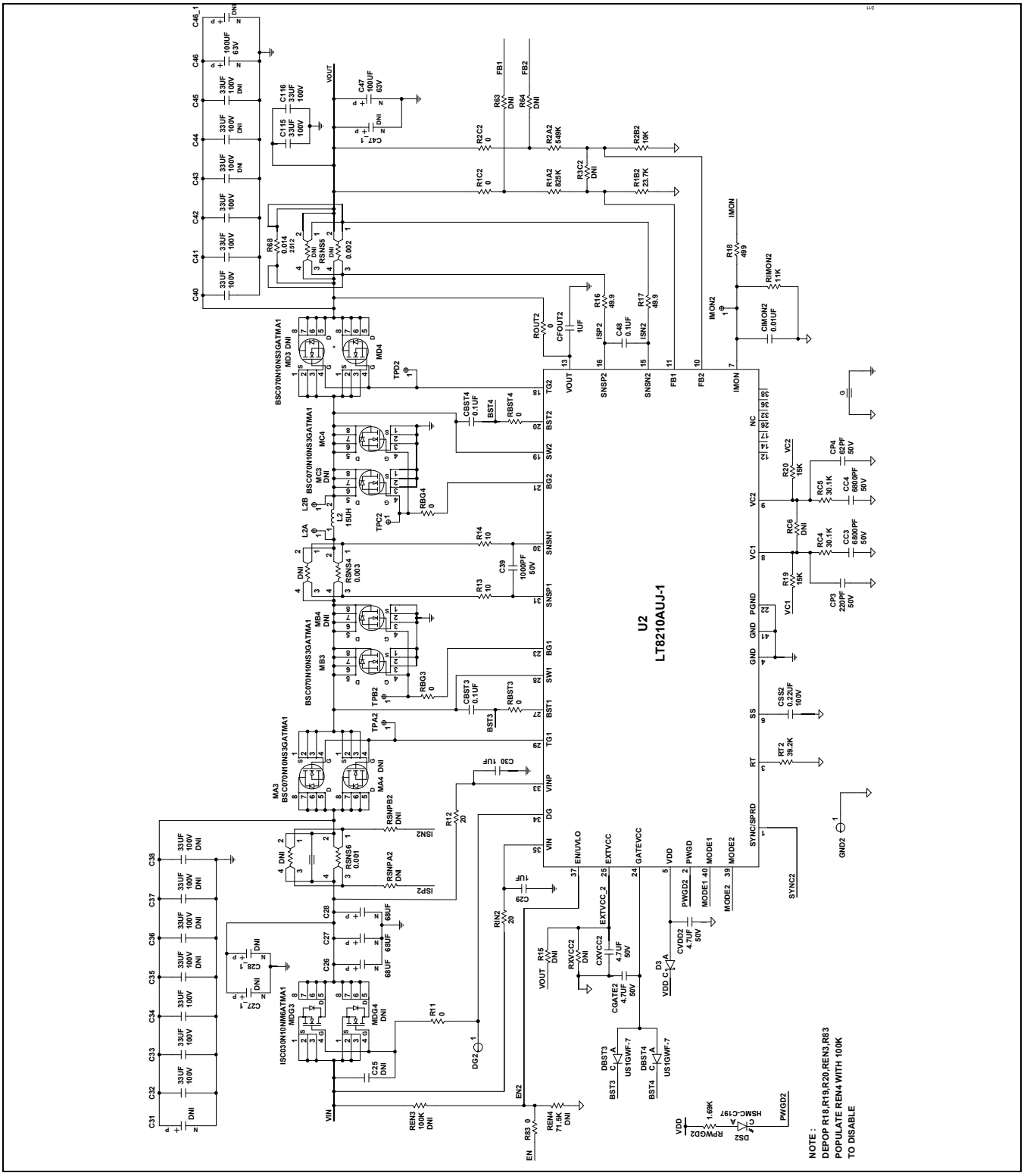
Ordering Information

PART	TYPE
EVAL-LT8210-1-AZ	EV Kit

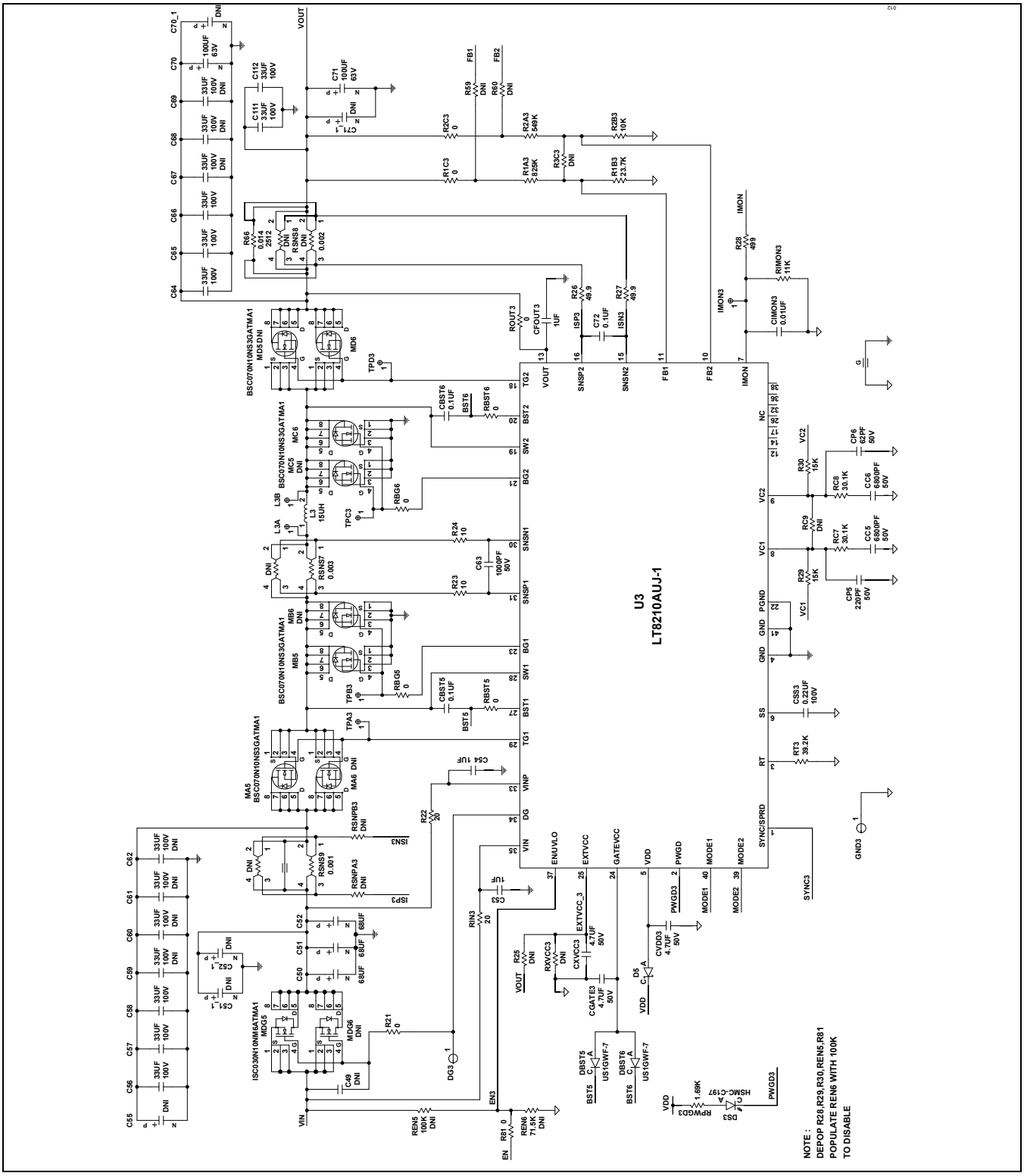
EVAL-LT8210-1-AZ Schematic



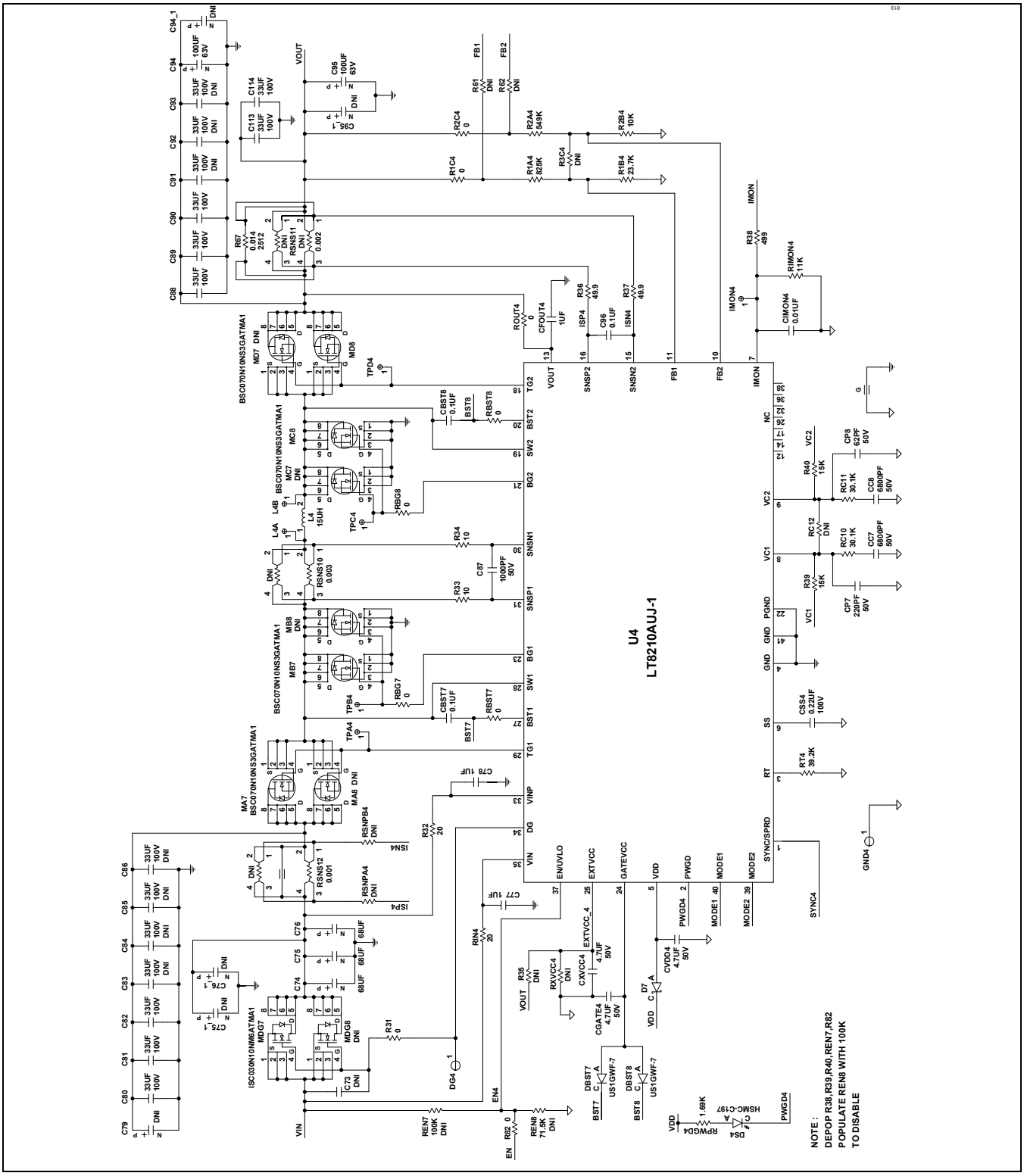
EVAL-LT8210-1-AZ Schematic (continued)



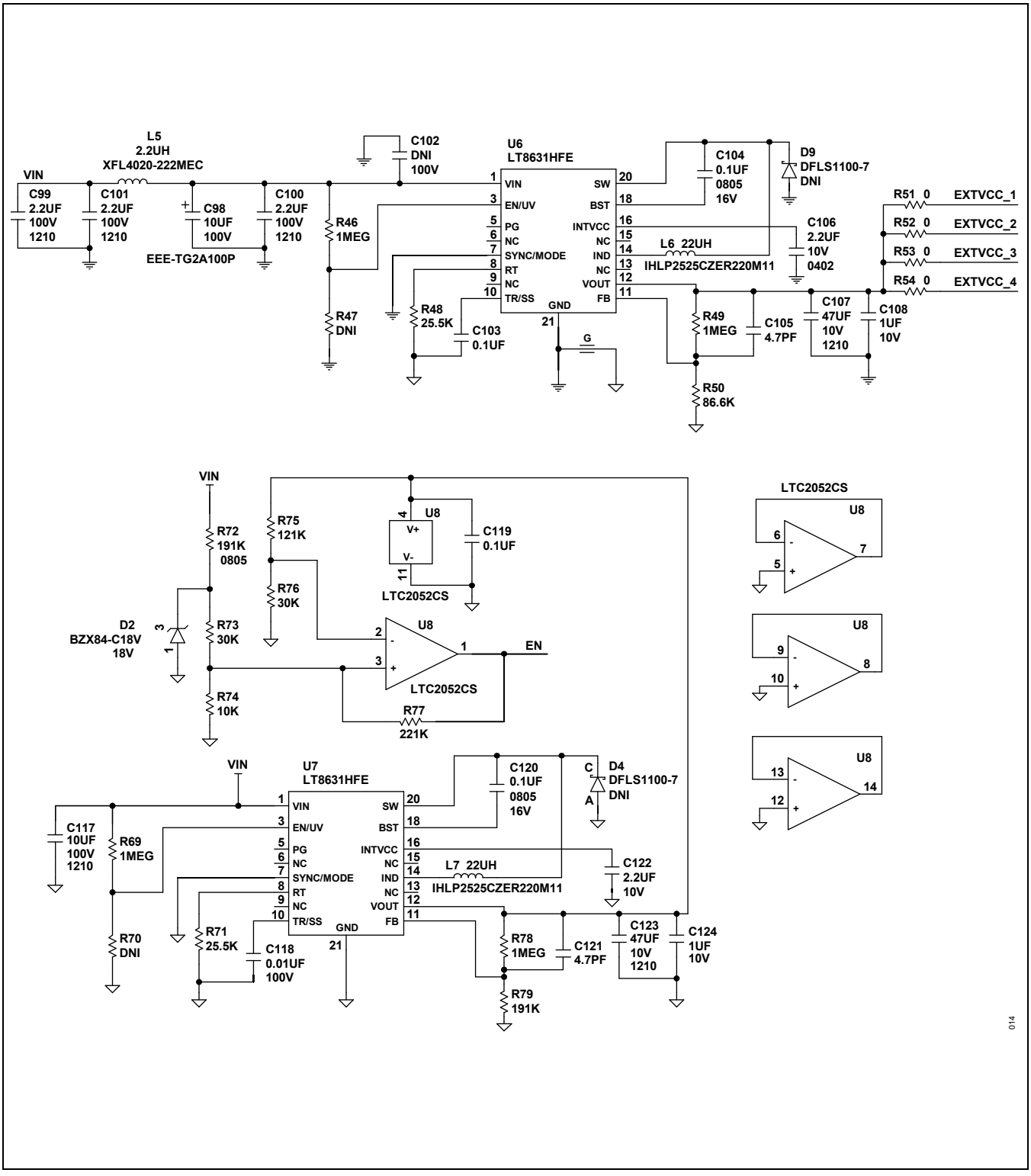
EVAL-LT8210-1-AZ Schematic (continued)



EVAL-LT8210-1-AZ Schematic (continued)



EVAL-LT8210-1-AZ Schematic (continued)



Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	12/24	Initial release	—

Notes