FEB207-021 User Guide

FAN2103

TinyBuck™ Integrated Synchronous Buck Evaluation Board

Featured Fairchild Product: FAN2103

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This guide supports the evaluation kit for the FAN2103 TinyBuck™ Integrated Synchronous Buck. This guide should be used in conjunction with the FAN2103 datasheet, located at Fairchild's website (www.fairchildsemi.com).

1. Overview

This board provides 1.8V_{OUT} and 0-3A from 8-20V_{IN} at a 500KHz switching rate using low-cost ceramic output capacitors.

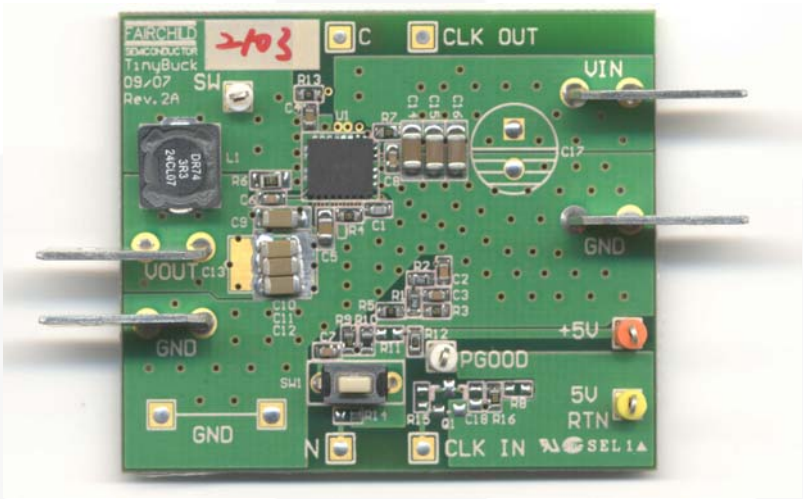

Figure 1. Evaluation Board and Required Connections

2. Board Configuration

- Output Voltage: 1.8V
- Output Current: 0-3A
- Input Voltage: 8-20V
- Frequency: 500KHz

3. Power-Up Sequence

1. Establish connections to test equipment as shown in Figure 1. Use suitable diameter wires and connectors to avoid excessive voltage drop or temperature rise.

Do not turn on power supplies until all the connections are complete.

2. Verify voltage sources have current limits adequately set to supply the load.

3. Apply V_{IN} before V_{CC} to avoid skipping the soft-start cycle.

4. Apply the desired load current.

This can be done at any time, including before power-up, but it is recommended to power-up the first time with 0A load to verify proper connections.

To power down, turn off the V_{CC} (5V) supply first.

4. Board Features

A ground strap is provided near the lower-left corner of the evaluation board to facilitate oscilloscope probe connections.

4.1. Switching Waveform

Connect an oscilloscope probe to test point marked SW to view the switching waveform. Since the MOSFETs are integrated, gate/drive waveforms cannot be viewed.

4.2. Enable / Inhibit

The momentary push-button switch S1 establishes a connection from EN to GND, inhibiting the FAN2103 when switching ceases and only standby current is consumed.

A new soft-start cycle commences upon release of S1.

4.3. Current Limit

The current limit threshold can be set lower by reducing R9. This feature is useful in applications where <3A is required, allowing the designer to select passive external components with lower current ratings.

With R9 open, the FAN2103 enforces a maximum default current limit in excess of 3A.

4.4. Auto-Restart

The board is configured for auto-restart with a delay (C7) that increases linearly with C7.

Refer to the datasheet for auto-restart or latch-off options.

4.5. Switching Frequency

Switching frequency is set by R10 (R_T). Frequency may be lowered to 200KHz or raised to >600KHz.

Large changes in frequency may warrant additional component value changes for the output filter and compensation network.

4.6. Input Voltage

The demo board is optimized to work with an 8V to 20V input voltage range. For operating between 3V to 8V, modifications to output filter, compensation network component values, and R7 need to be made.

4.7. Output Voltage

The output voltage is determined by the ratio of R1 and R4. For minor output voltage changes, adjust R4.

Larger V_{OUT} changes may impact output filter and compensation network component value selection.

4.8. Feedback Loop Response

R5 opens the feedback loop for closed-loop response measurement. Remove R5 and connect a network analyzer or injection transformer in its place.

4.9. Connections

Be clear about order of connections, notes or cautions, etc.

Include step-by-step, numbered instructions.

5. Schematics

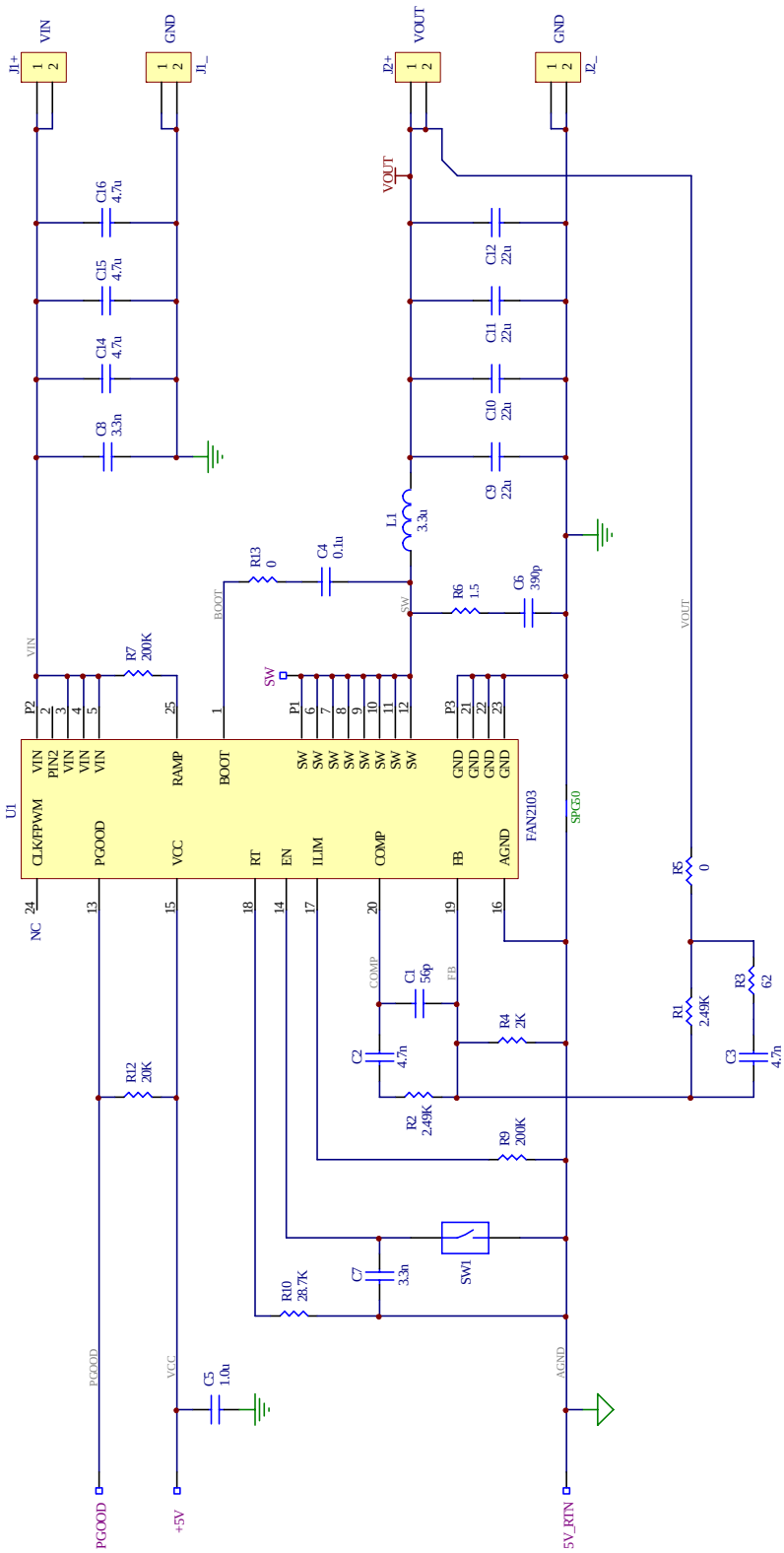

Figure 2. FAN2103 Evaluation Board Schematic

6. Bill of Materials

U1	1	IC, FAN2103, MLP5x6	Fairchild FAN2103M
L1	1	3.3µH, 5.4A, 18mΩ	Cooper DR74-3R3-R
R1, 2	2	2.49K, 1%, 0603	DigiKey P2.49K H
R3	1	62Ω, 5%, 0603	DigiKey P62 G
R4	1	2.00K, 1%, 0603	DigiKey P2.00K H
R5, 13	3	0Ω, 5%, 0603	DigiKey P0.0 G
R6	1	1.5Ω, 5%, 0805	DigiKey P1.5 A
R7, 9	2	200K, 1%, 0603	DigiKey 200K H
R10	1	30.1K, 1%, 0603	DigiKey P30.1K H
R12	1	10K, 5%, 0603	DigiKey P10K G
C1	1	56pf, 50V, 5%, NPO, 0603	DigiKey PCC560ACV
C2, 3	2	4.7nf, 50V, 10%, X7R, 0603	DigiKey PCC1780
C7, 8	2	3.3nf, 50V, 10%, X7R, 0603	DigiKey PCC1778
C4	1	0.1µf, 16V, 10%, X7R, 0603	DigiKey PCC1762
C5	1	1.0µf, 10V, 10%, X5R, 0805	DigiKey PCC1807
C6	1	390pf, 50V, 10%, X7R, 0603	DigiKey PCC391BV
C9, 10, 11, 12	4	22µf, 6.3V, 20%, X5R, 1206	DigiKey PCC2242
C14, 15, 16	3	4.7µf, 25V, 20%, X5R, 1206	DigiKey PCC2241
J1+, J1-, J2+, J2-	4	Connector, QDM, 0.25", Right Angle	DigiKey 4966K
SW1	1	Switch, 1 pole, momentary push	DigiKey EG2513
+5V	1	Test Point, Red	DigiKey 5000K
5V_RTN	1	Test Point, Black	DigiKey 5001K
SW, PGOOD	2	Test Point, White	DigiKey 5002K
PCB	1	PCB, TINYBUCK_2A	
C18 R8,R11, R14, R15, R16, R17	5	No Load 0603	
C13	1	No Load 7343	
C19	1	4.7µf, 25V, 20%, X5R, 1206	
C17	1	No Load 8x11	
Q1	1	No Load SOT23	
C, N, CLKIN, CLKOUT	4	No Load Test Point	

7. Assembly Diagram

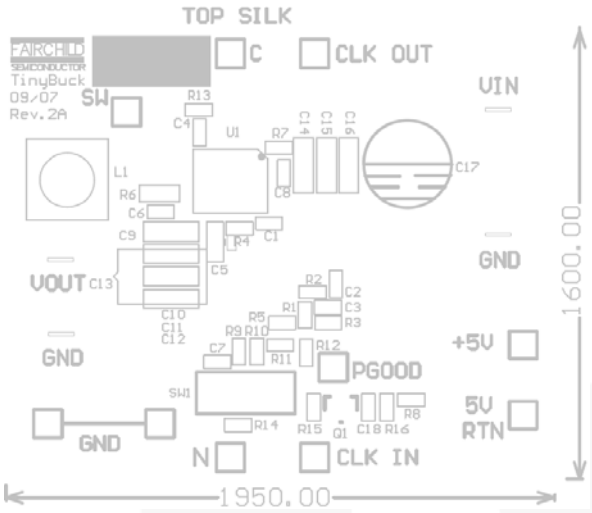

Figure 3. Assembly Diagram

8. PCB Layout

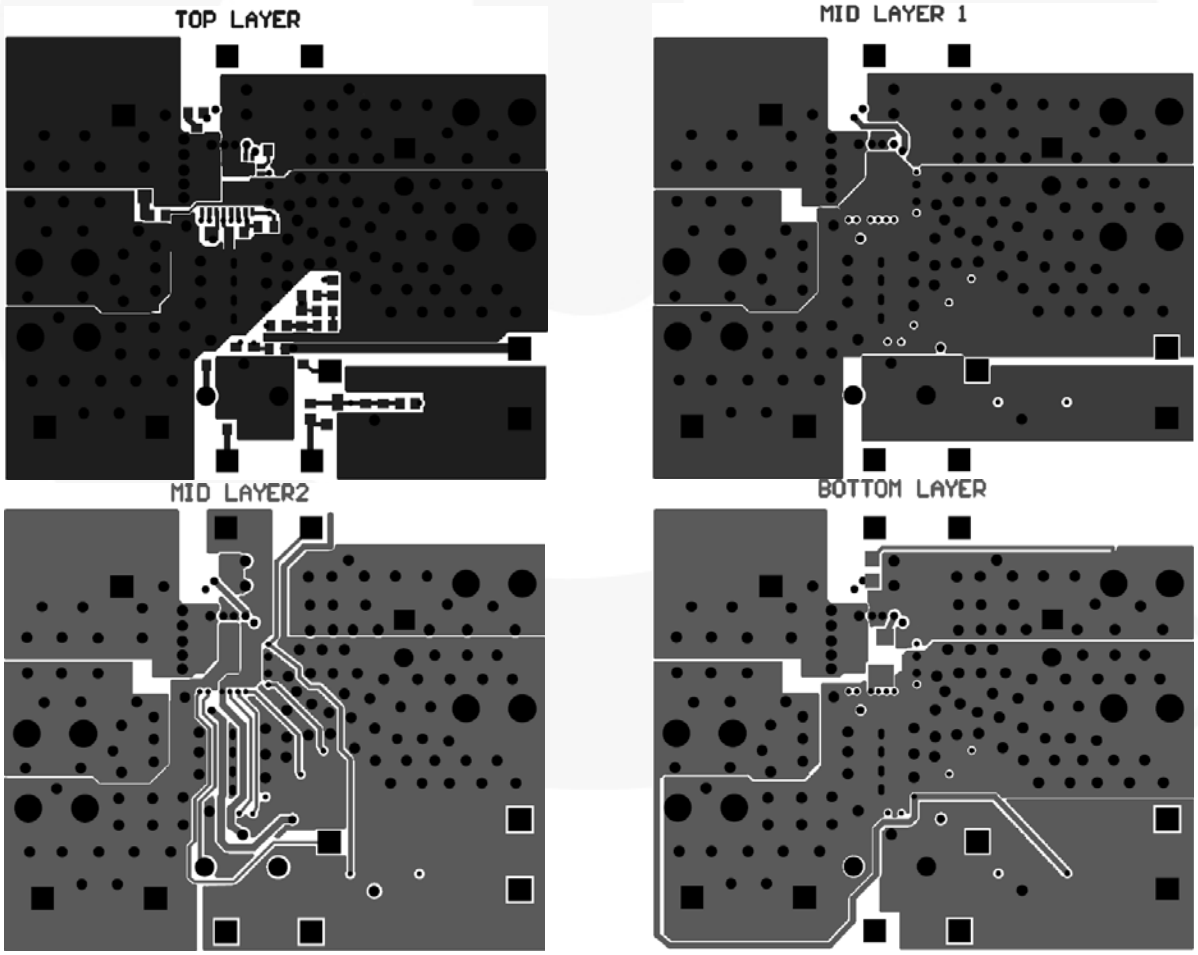

Figure 4. PCB Layout

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