FEB167-002 User Guide

FAN2106

TinyBuck™ Integrated Synchronous Buck Evaluation Board

Featured Fairchild Product: FAN2106

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This guide supports the evaluation kit for the FAN2106 TinyBuck™ Integrated Synchronous Buck. This guide should be used in conjunction with the FAN2106 datasheet, located at Fairchild's website (www.fairchildsemi.com).

1. Overview

This board provides 1.8V_{OUT} and 0-6A from 8-20V_{IN} at a 500KHz switching rate using low-cost ceramic output capacitors.

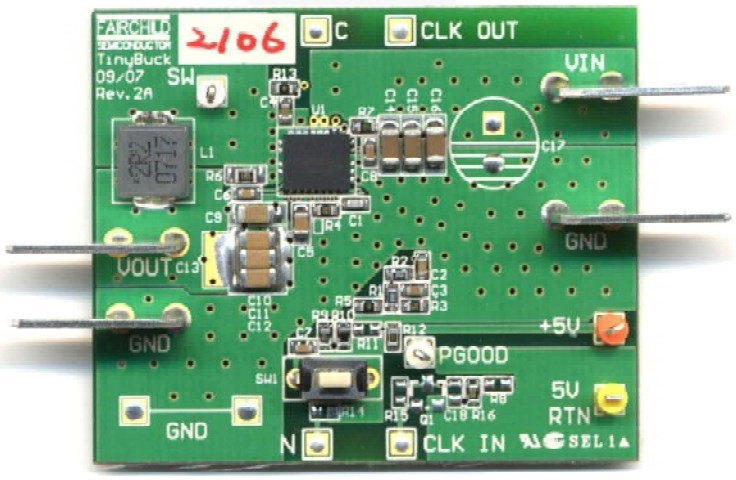

Figure 1. Evaluation Board and Required Connections

2. Board Configuration

- Output Voltage: 1.8V
- Output Current: 0-6A
- Input Voltage: 8-20V
- Frequency: 500KHz

3. Power-Up Sequence

1. Establish connections to test equipment as shown in the schematic in Figure 2. 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

Facility to make 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 FAN2106 when switching ceases and only standby current flows at V_{IN} and V_{CC}.

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 <6A is required, allowing the designer to select passive external components with lower current ratings.

With R9 open, the FAN2106 enforces a maximum default current limit in excess of 6A.

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. 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.

4.7. 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.

5. Schematics

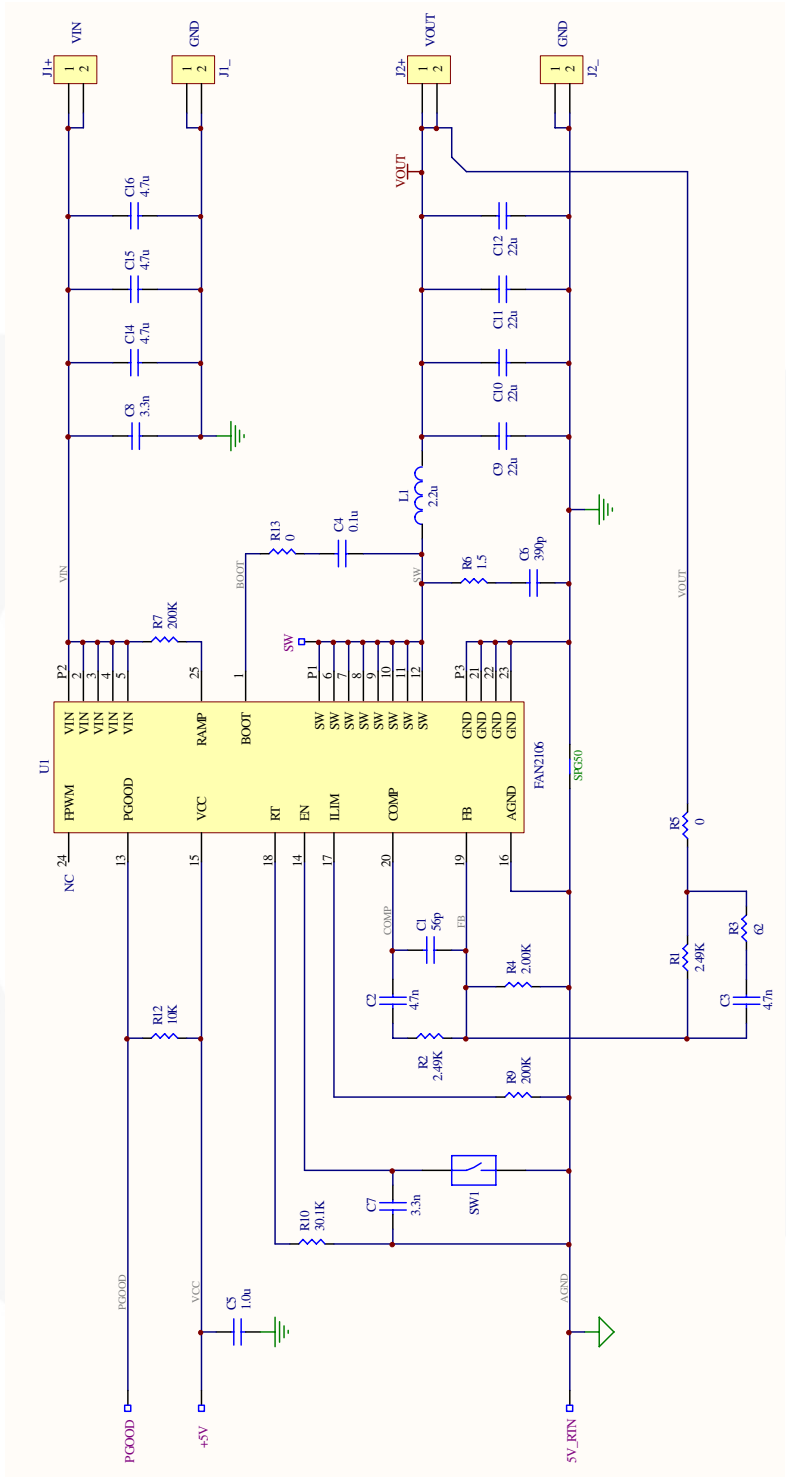

Figure 2. FAN2106 Evaluation Board Schematic

6. Bill of Materials

Reference Designator	QTY	Description	Manufacturer / Number
U1	1	IC, FAN2106, MLP5x6	Fairchild FAN2106M
L1	1	2.2µH, 8A, 10.4mΩ	Inter-Technical SC72332-2R2M
R1, 2	2	2.49K, 1%, 0603	Generic
R3	1	62Ω, 5%, 0603	Generic
R4	1	2.00K, 1%, 0603	Generic
R5, 13	3	0Ω, 5%, 0603	Generic
R6	1	1.5Ω, 5%, 0805	Generic
R7, 9	2	200kΩ, 1%, 0603	Generic
R10	1	30.1kΩ, 1%, 0603	Generic
R12	1	10kΩ, 5%, 0603	Generic
C1	1	56pf, 50V, 5%, NPO, 0603	Generic
C2, 3	2	4.7nf, 50V, 10%, X7R, 0603	Generic
C7, 8	2	3.3nf, 50V, 10%, X7R, 0603	Generic
C4	1	0.1µf, 16V, 10%, X7R, 0603	Generic
C5	1	1.0µf, 10V, 10%, X5R, 0805	Generic
C6	1	390pf, 50V, 5%, X7R, 0603	Generic
C9, 10, 11, 12	4	22µf, 6.3V, 20%, X5R, 1206	Generic
C14, 15, 16	3	4.7µf, 25V, 20%, X5R, 1206	Generic
C18 R8, R11, R14, R15, R16, R17	5	No Load 0603	
C13	1	No Load 7343	
C17	1	No Load 8x11	
C19	1	No Load 1206	
Q1	1	No Load SOT23	

7. Assembly Diagram

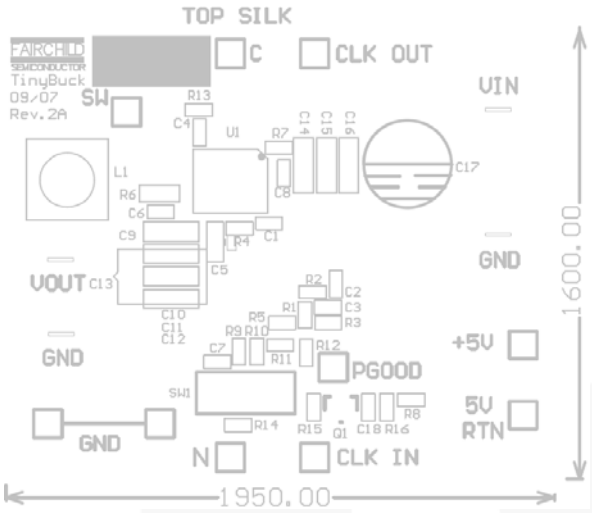

Figure 3. Assembly Diagram

8. PCB Layout

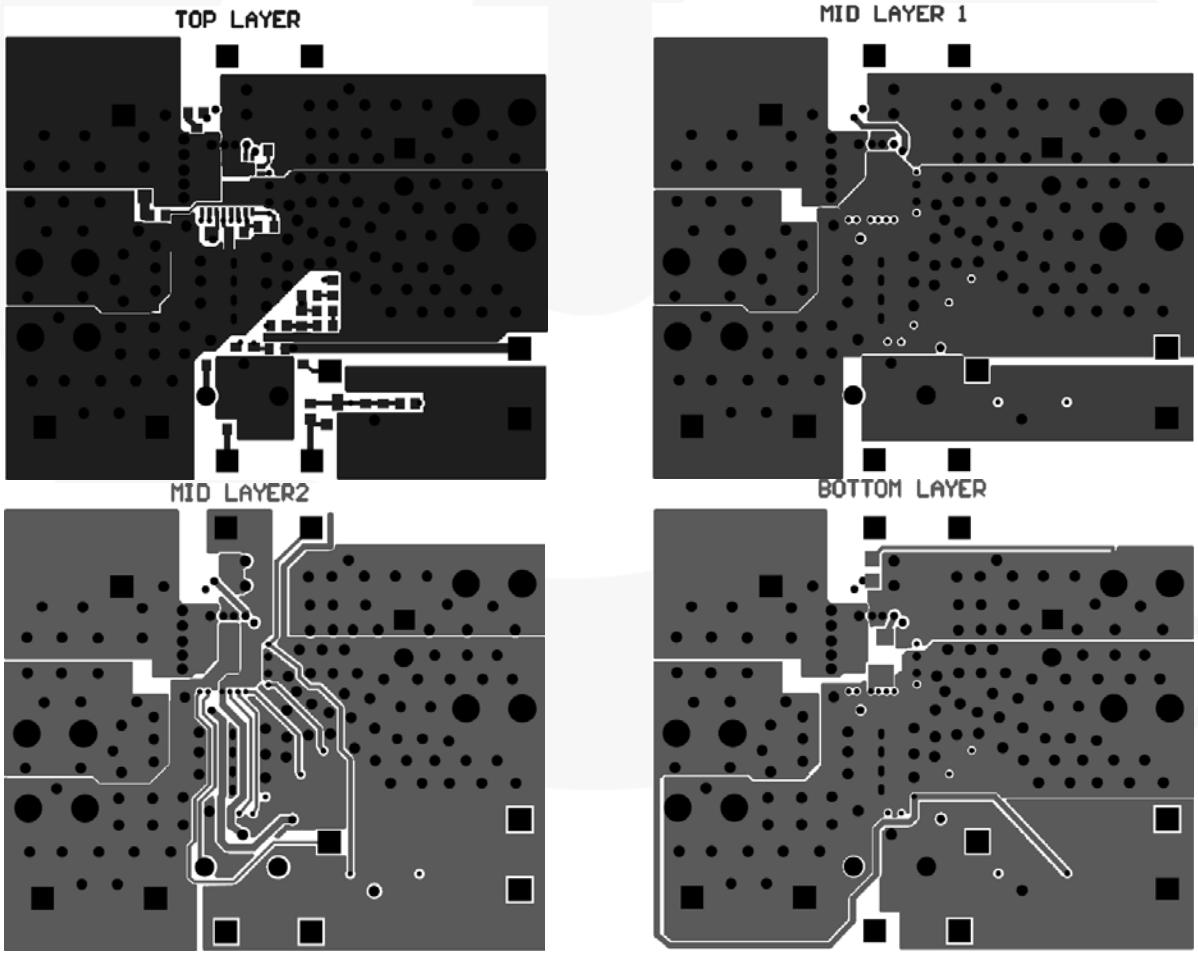

Figure 4. PCB Layout

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F-PFS™
FRFET®
Global Power Resource℠
Green FPS™
Green FPS™ e-Series™
GTO™
IntelliMAX™
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