Electrical Project Specification

Project Name:	**Buck Starter (BUCKED UP)**
Document Rev:	**01**
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Document Revisions

Revision	Date	Change(s)
01	2022/17/01	Initial Release (template)
02	2025/25/10	Inserted specifications based on IC BD9G341AEFJ-LB.
03	2025/12	Added 8 more components (resistors, capacitors, 1x2-pin header)

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0.0 Conventions, Terms, & Reference Documents

0.1 Conventions
"Must" is used to indicate a mandatory requirement.

"Should" is used to indicate an additional nice to have.

"May" is used to indicate an option.

0.2 Terms & Definitions
Buck Converter: DC/DC switching power converter that steps voltage down from Vin to Vout.

BUCKED UP: Codename for the 12V to 5V, 2A minimum output buck converter board.

BD9G341AEFJ-LB: Buck converter IC manufactured by Rohm semiconductor.

HTSOP-J8: Thermally enhanced small outline package, used for the main IC.

0.3 Reference Documents

Table 1: Reference documents

RD#	Document	Link
RD1	BD9G341AEFJ-LB, 12-76V input range, 3A output buck converter	Datasheet
RD2	PM4343.153NLT, 15uH power inductor	Mouser link
RD3	YQ3VWM10BTR, Schottky diode	Mouser link
RD4	AM32LR71H106KL, 10uF input capacitor	Mouser link
RD5	EMK325ABJ107MM-T, 100uF output capacitor	Mouser link
RD6	1568-08432-ND, 2-pin header (x2)	Digikey
RD7	RMCF0603FT3K00, 3kOhm feedback resistor	Digikey
RD8	P750HCT-ND, 750Ohm feedback resistor	Digikey
RD9	311-47.0KHRCT-ND, 47kOhm timing resistor	Digikey
RD10	311-10.0KHRCT-ND, 10kOhm loop stability resistor	Digikey
RD11	311-3775-1-ND, 6800pF loop stability capacitor	Digikey
RD12	1276-1012-1-ND, 0.1uF capacitor (x2)	Digikey

1.0 Description

BUCKED UP is a starter project board designed to create a 5V power rail from the rover's nominal 12V bus. It uses the BD9G341AEFJ-LB (RD1), a buck converter IC, to step down the voltage. The main requirement of the board is to support a continuous output current of at least 2A.

1.1 Dependencies

BUCKED UP is a starter project and therefore does not depend on any other systems.

2.0 Requirements & Constraints

Table 2: Requirements & constraints

Requirement ID	Description	Status
REQ-01	The starter project must take a nominal 12V input and convert it to 5V	MET
REQ-02	The 5V output must support at least 2A of continuous current.	MET
CON-01	The design must use a 2-layer PCB.	MET
CON-02	The component selection must be rated for the 12V to 76V input range of the buck converter IC.	MET
SHO-01	The switching frequency should be set to 200kHz, using 47kOhm for total resistance as per the recommendation of the datasheet.	MET

3.0 Performance Specifications

Table 3: Performance specifications

Specification ID	Parameter	Min.	Nom.	Max.	Unit
BUCKED UP-SPEC-01	Input Voltage	12	12	76	V
BUCKED UP-SPEC-02	Output Voltage	4.95	5	5.05	V
BUCKED UP-SPEC-03	Output Current	0	2	3	A

BUCKED UP - SPEC-04	Operating Junction Temp.	-40	N/A	150	Celsius
BUCKED UP - SPEC-05	Switching Frequency	50	200	750	kHz

4.0 PCB Layout

FOR THE STARTER PROJECT: This has been pre-filled here for two layers.

Use the table below to identify important parameters of the PCB. Add parameters that would be notable to document for your design. Examples include high-voltage clearances or impedance control.

Table 4: PCB parameters

Parameter	Value	Unit
Number of Layers	2	layers
PCB Thickness	1	oz
Vendor	JLCPCB	-

Table 5: PCB layer stack-up

Layer #	Copper Weight (oz)	Type
1		Signal/Power
2		GND

5.0 Mechanical Interfaces

Mechanical interfaces will not be considered for this starter project.

6.0 Detailed Description (Theory of Operation)

BUCKED UP uses a buck converter, which is a DC-DC switching power supply that steps down voltage. The IC uses a switch (transistor) to rapidly turn the input voltage on and off, which creates a square wave. The square wave is passively filtered using an inductor and capacitor into a smooth DC voltage. A feedback loop adjusts the cycle of the switch to regulate the output voltage to 5V.