# Requirements Document - DC-DC Buck-Boost Converter

## 1. Introduction

### 1.1 Objective

This document defines the technical and functional requirements for the development of a DC-DC Buck-Boost converter, detailing the electrical, mechanical, and environmental specifications of the system.

### 1.2 Scope

The converter will be designed for embedded applications, powering loads of sensitive electronic devices. The system must be efficient, compact, and reliable.

## 2. General Requirements

### 2.1 Electrical Specifications

- \*\*Input Voltage (Vin):\*\* 17V to 30V  
- \*\*Output Voltage (Vout):\*\* 20V to 45V adjustable  
- \*\*Output Current (Iout):\*\* Up to 5A  
- \*\*Efficiency:\*\* >= 90% under nominal conditions  
- \*\*Switching Frequency:\*\* 100kHz to 500kHz (to be defined in the future)  
- \*\*Output Voltage Ripple:\*\* <= 50mVpp (to be defined in the future)  
- \*\*Protections:\*\* Overcurrent, overvoltage, short-circuit, and overtemperature (to be defined in the future)

### 2.2 Mechanical Requirements

- Maximum dimensions: 50mm x 50mm x 20mm  
- Weight: <= 50g  
- Connection interface: Standard terminals or connectors

### 2.3 Environmental Conditions

- \*\*Operating Temperature:\*\* -40°C to 85°C  
- \*\*Relative Humidity:\*\* 10% to 90% (non-condensing)  
- \*\*Vibration Resistance:\*\* According to MIL-STD-810G standard

## 3. Functional Requirements

- Ability to operate in Buck, Boost, or Buck-Boost mode automatically  
- PWM control with dynamic adjustment  
- Voltage and current monitoring via digital interface (I2C, SPI, or UART)  
- Closed-loop feedback for precise regulation

## 4. Reliability and Testing Requirements

- Maximum load and voltage variation tests  
- Transient response test  
- Thermal analysis for heat dissipation verification  
- Electromagnetic immunity testing (EMI/EMC)

## 5. Documentation and Certification

- Electrical schematic and PCB layout  
- Compliance analysis with IEC 60950-1 and CISPR 22 standards  
- User and integration manual

## 6. Final Considerations

The design of the DC-DC Buck-Boost converter must follow the guidelines presented in this document to ensure an efficient and reliable product suitable for its intended applications.