USB FlexCharger

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Why a USB Charger?

- Common need
- Multitude of power sources
- Challenging design problem
Input and Boost Stage

Goal: Provide stable higher end voltage inputs for buck stage.

- Specifications:
  - Input voltages: 1.5-15 V
  - Input currents: 100mA - 9A pulsed
  - Output voltages: 10-15 V
  - Output currents: 100mA-2A
Boost Converter

General operation:
Inductor stores and releases energy between two states

MOSFET On/Inductor Charging

MOSFET Off/Inductor Discharging
Boost Stage Power Rails

Why necessary?

Specifications:
Input 1.5-15 Volts
Output 3 - 15 Volts
Boost Stage Control Circuitry

Pulse width module controls switching

Input controlled duty cycle

Burst PWM
Buck and Output Stage

Specifications:
Input Voltage: 10-15 Volts

Output (USB Standard):
Max Output Current: 1.5 Amps
Output Voltage: 5 Volts
Buck Converter

Continuous Mode
Duty Cycle = Vout/Vin
PWM Based Buck Stage Control

Varying duty cycle of PWM adjusts charge/discharge timing of Buck stage

Control Stage

Triangle Wave Generator
Comparator
PWM Driver
Power Stage
Error Amplifier
Output Protection

Filtering ripple

Safety features:
  Current and voltage limiter
Time Line

By April 12th: Design schematic completed and order parts
April 14th: Project Presentation
By April 16th: Buck and boost modules tested and working
By April 22nd: Control circuitry tested and working
By April 24th: Input and output stages tested and working
April 27th: Project implementation status due
May 5/6: Final presentation and checkoff
Possible Extensions

Take input from wall adapter

Power specific device such as ECG
Questions?