Maximum input voltage = 12V

Maximum output voltage = 4.2 V

Maximum duty cycle = 4.2 / 12 = 0.35

Switching frequency = 62.5 kHz

Maximum output current = 0.5 A

Maximum output voltage ripple = 100 mV

**Inductor selection:**

Inductor ripple current = 0.3 \* maximum output current = 0.3 \* 0.5 = 0.15 A.

Inductor value = 4.2 \* ( 12 – 4.2 ) / ( 0.15 \* 62.5 \* 10^3 \* 12 ) = 291.2 uH.

Selected inductor: 470 uH, CDRH127

**Rectifier diode selection:**

Forward diode current = 0.5 \* ( 1 – 0.35 ) = 0.325 A.

Power dissipation = 0.325A \* 0.7V = 0.2275 W.

Selected diode: 1N5819 Schottky diode.

**Output capacitor selection:**

Minimum output capacitor value = 0.15 A / ( 8 \* 62500 Hz \* 0.1V ) = 3 uF.

**Input capacitor selection:**

10 uF capacitor.

CURRENT SENSE CIRCUIT:

Maximum output current: 500 mA

ADC reference voltage: 2.56V

Current sense resistor: 0.5 ohms

Voltage drop across sense resistor at maximum output current: 0.5 \* 0.5 A = 0.25 V 🡪 2.5V

Amplification factor = 2.5V/0.25V = 10 (V/V)

2.5 V corresponds to 1024 ADC LSBs which again corresponds to 500 mA

ADC reading corresponding to maximum current is ( 1024 / 2.56 ) \* 2.5 = 1000 LSBs.

1000 LSBs corresponds to 500 mA 🡪 1 LSB corresponds to 0.5 mA.

VOLTAGE SENSE CIRCUIT:

Maximum output voltage: 4.5V

ADC reference volage: 2.56V

4.5V output voltage maps to 2.5V feedback voltage. A voltage divider of scaling factor 0.5 is chosen.

Hence, maximum output voltage of 4.5 V corresponds to a maximum feedback voltage of 2.25V.

4.5V output voltage corresponds to 2.25V which corresponds to (1024 / 2.56V) \* 2.25V = 900 LSB.

Hence, 1 LSB corresponds to 4.5/900 volts = 5 mV