$$\boxed{V_{rms} = \sqrt{\frac{1}{T}\int_0^T V^2(t)\,dt}}$$

ANALOG VOLTAGE SIGNAL FROM THE SENSING CIRCUIT YIELDS:

$$V_{sense}(t) = 0.00744675\ V_{AC}(t) + 1.488$$

STEPS TO CALCULATE V_{RMS}

1) REMOVE THE 1.488 OFFSET

$$V_{sense\_nooff}(t) = V_{sense}(t) - 1.488$$

2) SQUARE THE VOLTAGE

$$V_{sense\_sqd}(t) = V_{sense\_nooff}(t) * V_{sense\_noff}(t)$$

3) INTEGRATE THE SQUARED VOLTAGE

$$V_{sense\_int}(t) = \sum_{n=0}^{T} V_{sense\_sqd}(t)$$

4) CALCULATE MEAN OF SUM OF VOLT-SQUARED

$$V_{squared\_mean} = \frac{1}{t_i - t_0} \cdot \sum_{n=0}^{t} v(t_n) \cdot v(t_n) \cdot t_{step}$$

5) SCALE RESULT BACK TO REAL VALUES

$$v(t)^2 = (.00744675\, V(t))^2$$

$$V(t)^2 = \frac{v(t)^2}{(.00744675)^2} = 18033\ v(t)^2$$

6) TAKE SQUARE ROOT OF RESULT TO FIND RMS VALUE

$$V_{RMS} = \sqrt{V(t)^2}$$

STEPS FOR CODE (RMS VOLTAGE)

v_sum = 0

v_sample = v(t)

v_sample = v_sample − 1.488

v_sample = v_sample * v_sample

v_sum = v_sum + v_sample * tstep

NO — tstep == T — YES

v_sum = $\frac{1}{T}$ * v_sum

NOTE: T SHOULD REALLY BE A MULTIPLE OF THE WAVEFORM FREQUENCY.

scaled_v_sum = v_sum * 18033

v_rms_value = sqrt(scaled_v_sum)

STEPS FOR CODE (RMS CURRENT)

```
i_sum = 0
i_sample = i(t)
i_sample = isample - 1.68
i_sample = isample * isample
i_sum = i_sum + i_sample * tstep
tstep == T    NO -> (back to i_sample = i(t))
YES
i_sum = 1/T * i_sum
```

NOTE: T SHOULD REALLY BE A MULTIPLE OF THE WAVEFORM FREQUENCY.

```
scaled_i_sum = i_sum * 223
i_rms_value = sqrt(scaled_i_sum)
```

$\frac{1}{(.067)^2}$

NOTE: AVERAGE POWER, RMS VOLTAGE, RMS CALCULATION CAN BE COMBINED IN ONE CALCULATION LOOP WHICH WOULD AVOID DUPLICATING A LOT OF CALCULATIONS