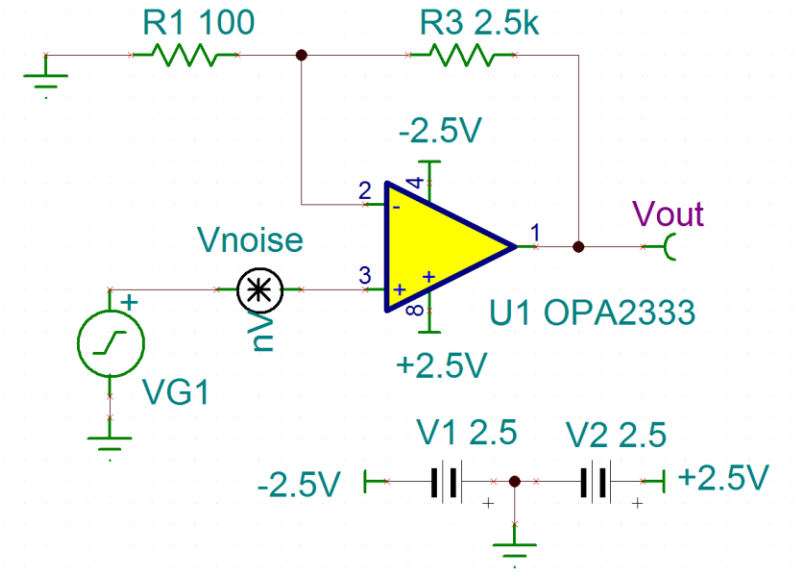
Hand Calculations:



Schematic Shown Above:

Need Noise gain and equivalent feedback resistance

$$G_n = 1 + \frac{R_3}{R_1}$$

$$G_n = 1 + \frac{(2.5k)}{(100)}$$

$$G_n = 26\ V/V$$

$$R_{eq} = R_3 || R_1$$

$$R_{eq} = (2.5k)||(100)$$

$$R_{eq} = 96.2\Omega$$

Need GBW from datasheet to calculate Noise Bandwidth

FREQUENCY RESPONSE				
GBW	Gain-bandwidth product	C_L = 100 pF	350	kHz

Frequency cutoff of noise:

$$f_c = \frac{GBW}{G_n}$$

$$f_c = \frac{(350k)}{(26)}$$

$$f_c = 13.461\ kHz$$

Modeling Noise as rectangle:

$$BW_n = k_n \cdot f_c$$

$$BW_n = (1.57) \cdot (13.461k)$$

$$BW_n = 21.1\ kHz$$

Only need broadband noise since all other noise sources are small comparatively but all calculations will be added for completeness. Note: flicker noise is negligible in this device.

Resistor Noise:

$$E_{n_r} = \sqrt{4kT_k R_{eq} BW_n}$$

$$E_{n_r} = \sqrt{4(1.38 \cdot 10^{-23})(273 + 25)(96.2)(21.1k)}$$

$$E_{n_r} = 0.182\ \mu Vrms$$

Broadband Noise:
Note: e_n = 56nV/sqrtHz is the value from the Noise Spectral Density graph which you've already done

$$E_{n_{BB}} = e_n \sqrt{BW_n}$$

$$E_{n_{BB}} = (56n)\sqrt{(21.1k)}$$

$$E_{n_{BB}} = 8.13\ \mu Vrms$$

Current Noise:
Note: i_n is from the datasheet:

i_n	Input current noise	f = 10 Hz	100	fA/√Hz

$$e_{n_i} = R_{eq} \cdot i_n$$

$$e_{n_i} = (96.2) \cdot (100f)$$

$$e_{n_i} = 9.62 \cdot 10^{-12}$$

$$E_{n_i} = e_{n_i} \sqrt{BW_n}$$

$$E_{n_i} = (9.62 \cdot 10^{-12})\sqrt{(21.1k)}$$

$$E_{n_i} = 1.40\ nVrms$$

Total Noise:

$$E_{n_{total}} = \sqrt{{E_{n_i}}^2 + {E_{n_{BB}}}^2 + {E_{n_r}}^2}$$

$$E_{n_{total}} = \sqrt{(1.40n)^2 + (8.13\mu)^2 + (0.18\ \mu)^2}$$

$$E_{n_{total}} = 8.13\ \mu Vrms$$

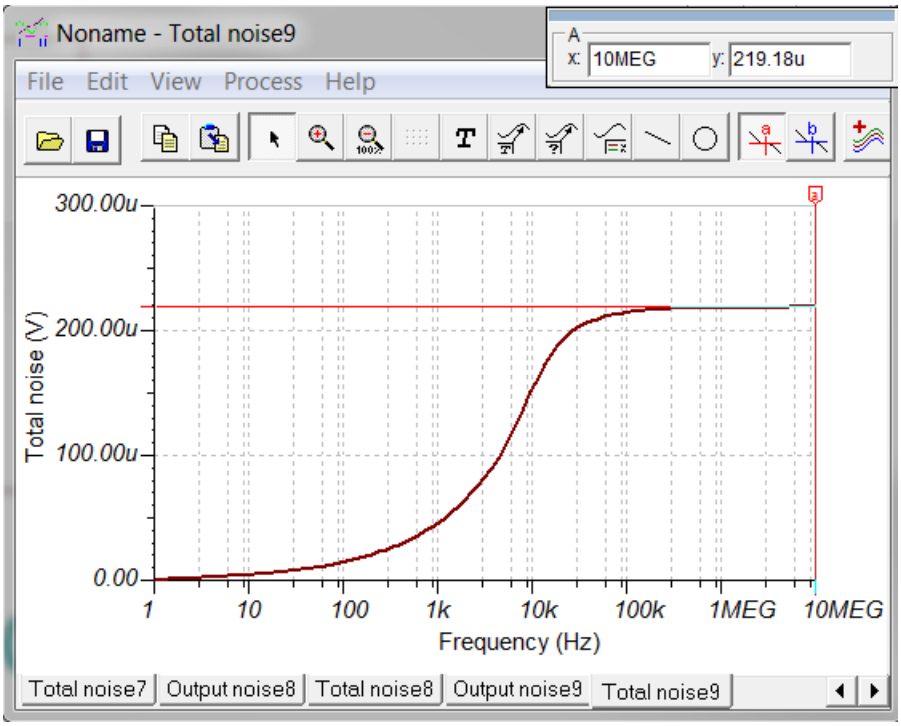
Noise how the other sources compared to Broadband didn't matter at all. Broadband could be reduced by adding filtering.

$$E_{n_{Out_{total}}} = E_{n_{total}} \cdot G_n$$

$$E_{n_{Out_{total}}} = (8.13\mu) \cdot (26)$$

$$E_{n_{Out_{total}}} = 211.76\ \mu Vrms$$

Compare with Simulation:



Simulation Total noise = 219.18μV_{RMS}
Hand Calculation Total noise = 211.76μV_{RMS}