System Specifications

$FSR := 1.5V$

$T_{ambient} := 25C \quad T_{max} := 125C$

$\Delta T := T_{max} - T_{ambient} = 100 \times 10^{0}\,C$

$V_{s\_buf} := 3.0V$

$V_{s\_spec} := 3.3V$

Conversions

$$dB(x) := \frac{1}{10^{\frac{x}{20}}}\frac{V}{V} \quad ppm := \frac{1}{1000000}$$

Resistor Divider Errors

Resistor Specifications

$\alpha_{res\_tol} := 0.1\%$

$\delta_{res\_drift} := 5\frac{ppm}{C}$

Accuracy

$E_{res\_tol} := \alpha_{res\_tol} = 1 \times 10^{3}\cdot ppm$

$E_{res\_drift} := \Delta T \cdot \delta_{res\_drift} = 500 \times 10^{0}\cdot ppm$

Buffer Amplifier Errors

Buffer Specifications

$V_{os\_max} := 0.25mV$

$V_{os\_PSRR} := dB(93) = 22.387 \times 10^{0}\cdot\frac{\mu V}{V}$

$V_{os\_drift} := 0.5\cdot\frac{\mu V}{C}$

Accuracy

$$E_{buf\_Vos} := \frac{V_{os\_max}}{FSR} = 166.667 \times 10^{0}\cdot ppm$$

$$E_{buf\_PSRR} := \frac{\left(V_{s\_spec} - V_{s\_buf}\right)\cdot V_{os\_PSRR}}{FSR} = 4.477 \times 10^{0}\cdot ppm$$

Drift

$$E_{buf\_drift\_Vos} := \frac{V_{os\_drift}}{FSR}\cdot\Delta T = 33.333 \times 10^{0}\cdot ppm$$

Reference Errors

Reference Specifications

$\alpha_{REF\_output} := 0.1\%$

$\delta_{REF\_drift\_output} := 3\frac{ppm}{C}$

Accuracy

$E_{REF\_output} := \alpha_{REF\_output} = 1 \times 10^{3} \cdot ppm$

Drift

$E_{REF\_drift} := 165C \cdot \delta_{REF\_drift\_output} = 495 \times 10^{0} \cdot ppm$

Alternate System Error

Vref Accuracy

$E_{accuracy\_vref} := E_{REF\_output} = 1 \times 10^{3} \cdot ppm$

Vref Drift

$E_{drift\_vref} := E_{REF\_drift} = 495 \times 10^{0} \cdot ppm$

Vref Total

$E_{total\_vref\_RSS} := \sqrt{E_{accuracy\_vref}^{2} + E_{drift\_vref}^{2}} = 1.116 \times 10^{3} \cdot ppm$

$E_{total\_vref} := E_{accuracy\_vref} + E_{drift\_vref} = 1.495 \times 10^{3} \cdot ppm$

Vbias Accuracy

$$E_{accuracy\_vbias\_RSS} := \sqrt{E_{res\_tol}^{2} + E_{buf\_Vos}^{2} + E_{buf\_PSRR}^{2} + E_{REF\_output}^{2}} = 1.424 \times 10^{3} \cdot ppm$$

$$E_{accuracy\_vbias\_total} := E_{res\_tol} + E_{buf\_Vos} + E_{buf\_PSRR} + E_{REF\_output} = 2.171 \times 10^{3} \cdot ppm$$

Vbias Drift

$$E_{drift\_vbias\_RSS} := \sqrt{E_{res\_drift}^{2} + E_{buf\_drift\_Vos}^{2} + E_{REF\_drift}^{2}} = 704.369 \times 10^{0} \cdot ppm$$

$$E_{drift\_vbias\_total} := E_{res\_drift} + E_{buf\_drift\_Vos} + E_{REF\_drift} = 1.028 \times 10^{3} \cdot ppm$$

Vbias Total

$$E_{total\_vbias\_RSS} := \sqrt{E_{total\_vref\_RSS}^{2} \cdots + E_{accuracy\_vbias\_RSS}^{2} + E_{drift\_vbias\_RSS}^{2}} = 1.941 \times 10^{3} \cdot ppm$$

$$E_{total\_vbias} := E_{accuracy\_vbias\_total} + E_{drift\_vbias\_total} = 3.199 \times 10^{3} \cdot ppm$$

Matching

$$\alpha_{matching} := \sqrt{\alpha_{res\_tol}^{2} + \left(\frac{V_{os\_max}}{FSR}\right)^{2}} = 1.014 \times 10^{-3}$$

$$\alpha_{matching} = 1.014 \times 10^{3} \cdot ppm$$

Tracking

$$\delta_{tracking\_total} := \delta_{res\_drift} + \frac{V_{os\_drift}}{FSR} = 5.333 \times 10^{0} \frac{1}{C} \cdot ppm$$

$$\delta_{tracking\_RSS} := \sqrt{\delta_{res\_drift}^{2} + \left(\frac{V_{os\_drift}}{FSR}\right)^{2}} = 5.011 \times 10^{0} \frac{1}{C} \cdot ppm$$