Option 3 Mod Design Calculations

$V_P := 0.2$ Voltage at OpAmp Non Inverting Input

$I_{MODMAX} := 60\ 10^{-3}$ Maximum Modulation Current

$I_{MODMIN} := 20\ 10^{-3}$ Minimum Modulation Current

$R_{VARMAX} := 1000$ DS1859 Resistance for Maximum Modulation Current

$R_{VARMIN} := 50000$ DS1859 Resistance for Maximum Modulation Current

Calculate MODSET Currents

$$I_{MSMAX} := \frac{I_{MODMAX}}{270} \qquad I_{MSMAX} = 2.222 \cdot 10^{-4}$$

$$I_{MSMIN} := \frac{I_{MODMIN}}{270} \qquad I_{MSMIN} = 7.407 \cdot 10^{-5}$$

Calculate R1 and R2 Divider Values

$R_1 := 49.9\ 10^3$ Pick R1 Value

$V_{BG} := 1.2$ Bandgap Voltage

$$R_2 := \left(\frac{V_P \cdot R_1}{V_{BG} - V_P} \right) \qquad R_2 = 9.98 \cdot 10^3$$

$$I_{DIV} := \frac{V_{BG}}{(R_1 + R_2)} \qquad I_{DIV} = 2.004 \cdot 10^{-5}$$

Calculate R3 and R4 Values

$$R_3 := V_P \cdot \frac{\left(-I_{MSMIN} \cdot R_{VARMAX} + R_{VARMIN} \cdot I_{MSMAX} - R_{VARMIN} \cdot I_{DIV} + I_{DIV} \cdot R_{VARMAX}\right)}{\left(-I_{MSMIN} \cdot V_{BG} + I_{MSMIN} \cdot V_P + V_{BG} \cdot I_{MSMAX} - V_P \cdot I_{MSMAX}\right)}$$

$$R_3 = 1.357 \cdot 10^4$$

$$R_4 := \frac{\left(V_{BG} - V_P\right) \cdot \left(R_{VARMIN} - R_{VARMAX}\right)}{-I_{MSMIN} \cdot R_{VARMAX} + R_{VARMIN} \cdot I_{MSMAX} - R_{VARMIN} \cdot I_{DIV} + I_{DIV} \cdot R_{VARMAX}}$$

$$R_4 = 4.873 \cdot 10^3$$

Option 3 APC Design Calculations

$V_P := 0.2$ Voltage at OpAmp Non Inverting Input

$I_{APCMAX} := 706\ 10^{-6}$ Maximum APC Photodiode Current

$I_{APCMIN} := 285\ 10^{-6}$ Minimum APC Photodiode Current

$R_{VARMAX} := 1000$ DS1859 Resistance for Maximum APC Current

$R_{VARMIN} := 50000$ DS1859 Resistance for Maximum APC Current

Calculate APCSET Currents

$$I_{ASMAX} := \frac{I_{APCMAX}}{0.5} \qquad I_{ASMAX} = 0.001$$

$$I_{ASMIN} := \frac{I_{APCMIN}}{0.5} \qquad I_{ASMIN} = 5.7 \cdot 10^{-4}$$

Calculate R5 and R6 Divider Values

$R_5 := 49.9\ 10^3$ Pick R5 Value

$V_{BG} := 1.2$ Bandgap Voltage

$$R_6 := \left(\frac{V_P \cdot R_5}{V_{BG} - V_P} \right) \qquad R_6 = 9.98 \cdot 10^3$$

$$I_{DIV} := \frac{V_{BG}}{(R_5 + R_6)} \qquad I_{DIV} = 2.004 \cdot 10^{-5}$$

Calculate R7 and R8 Values

$$R_7 := V_P \cdot \frac{\left(-I_{ASMIN} \cdot R_{VARMAX} + R_{VARMIN} \cdot I_{ASMAX} - R_{VARMIN} \cdot I_{DIV} + I_{DIV} \cdot R_{VARMAX}\right)}{\left(-I_{ASMIN} \cdot V_{BG} + I_{ASMIN} \cdot V_P + V_{BG} \cdot I_{ASMAX} - V_P \cdot I_{ASMAX}\right)}$$

$$R_7 = 1.64 \cdot 10^4$$

$$R_8 := \frac{\left(V_{BG} - V_P\right) \cdot \left(R_{VARMIN} - R_{VARMAX}\right)}{-I_{ASMIN} \cdot R_{VARMAX} + R_{VARMIN} \cdot I_{ASMAX} - R_{VARMIN} \cdot I_{DIV} + I_{DIV} \cdot R_{VARMAX}}$$

$$R_8 = 709.651$$