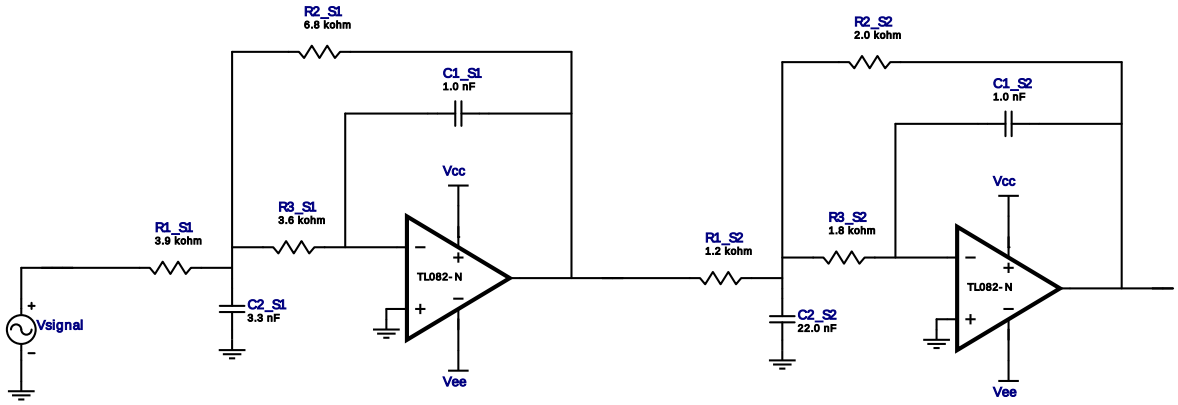
Type : Lowpass
Response : Butterworth
Order : 4
Number of Stages : 2

Filter Design Report

Design : Lowpass Filter - 4th order Butterworth
Design ID: 1

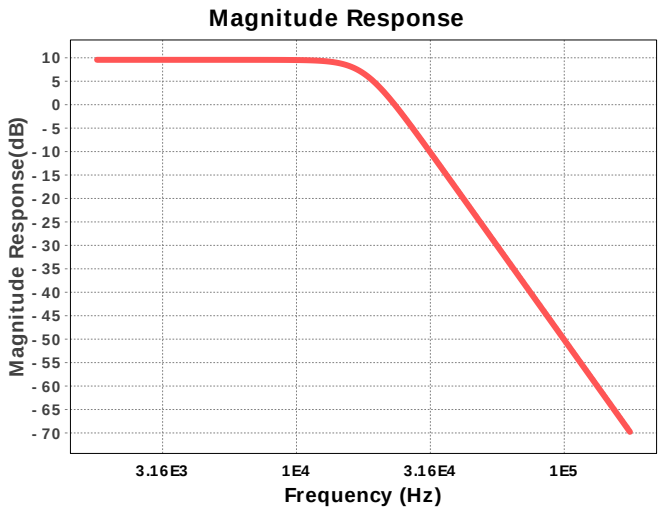


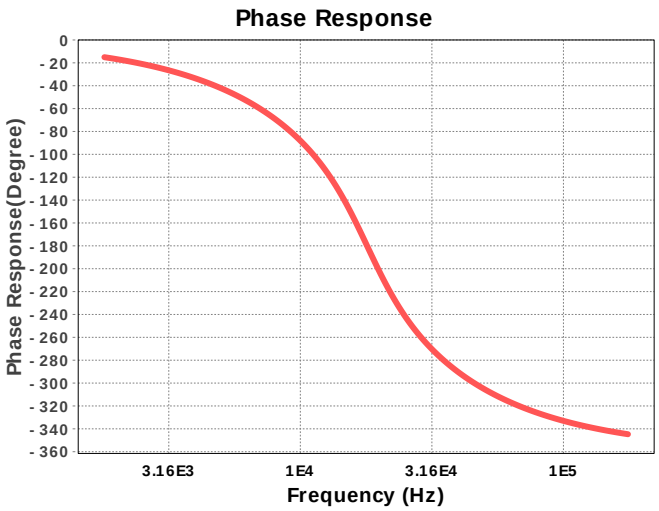
Electrical BOM

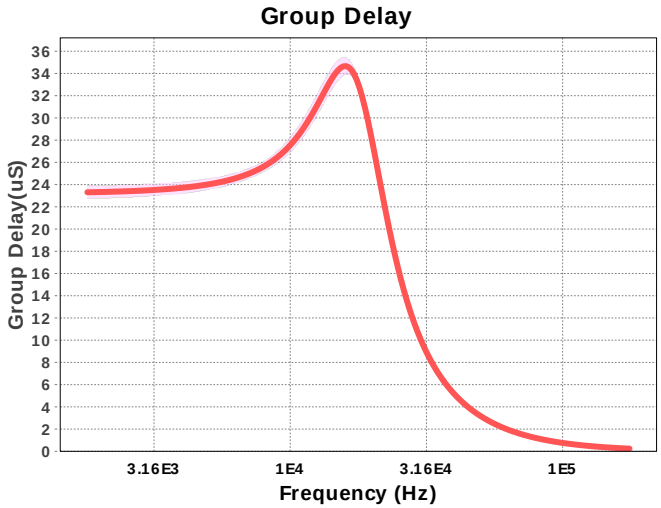
#	Name	Manufacturer	Part Number	Properties	Qty
1.	A1_S1	Texas Instruments Inc.	TL082-N	GbwTyp= 4MHz VccMax= 30V VccMin= 10V	1
2.	A1_S2	Texas Instruments Inc.	TL082-N	GbwTyp= 4MHz VccMax= 30V VccMin= 10V	1
3.	C1_S1	Generic	Ideal	Cap= 1.0 nF Tolerance= 2.0 %	1
4.	C1_S2	Generic	Ideal	Cap= 1.0 nF Tolerance= 2.0 %	1
5.	C2_S1	Generic	Ideal	Cap= 3.3 nF Tolerance= 2.0 %	1
6.	C2_S2	Generic	Ideal	Cap= 22.0 nF Tolerance= 2.0 %	1
7.	R1_S1	Generic	Ideal	Res= 3900.0ohm Tolerance= 1%	1
8.	R1_S2	Generic	Ideal	Res= 1200.0ohm Tolerance= 1%	1
9.	R2_S1	Generic	Ideal	Res= 6800.0ohm Tolerance= 1%	1
10.	R2_S2	Generic	Ideal	Res= 2000.0ohm Tolerance= 1%	1
11.	R3_S1	Generic	Ideal	Res= 3600.0ohm Tolerance= 1%	1
12.	R3_S2	Generic	Ideal	Res= 1800.0ohm Tolerance= 1%	1

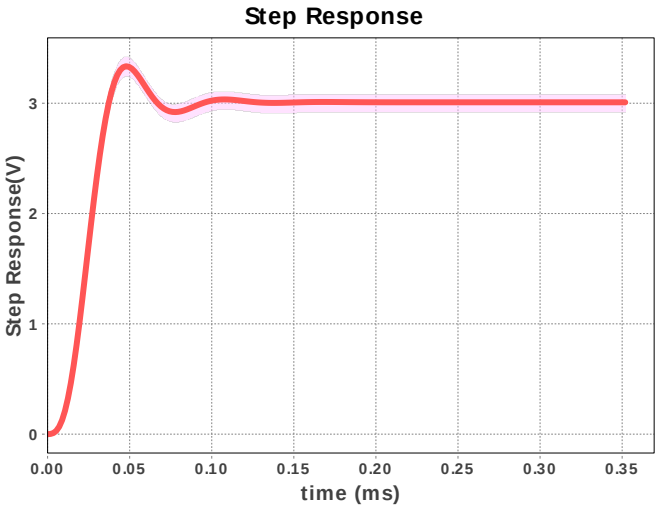
Sensitivity Analysis

#	Name	Series	Tolerance
1.	Cap	E48	2%
2.	Res	E96	1%









Design Inputs

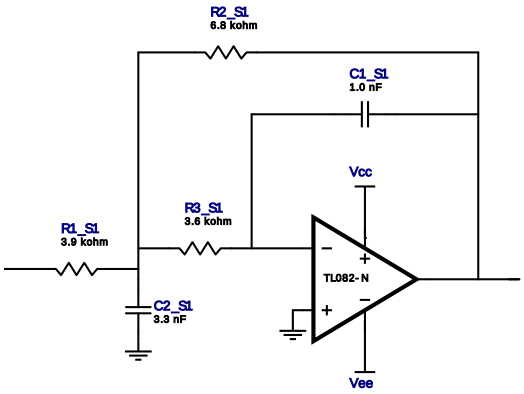
#	Name	Value	Description
1.	FilterType	lowpass	
2.	FilterResponse	Butterworth	
3.	FilterOrder	4.0	
4.	FilterTopology	Multiple Feedback	
5.	NumberOfStages	2.0	
6.	PassbandFrequency	18.0 k	
7.	StopbandAttenuation	-79.999	
8.	StopbandFrequency	180.0 k	
9.	Gain	3.0	
10.	DualSupply	+/-5.00 V	Power supply(s) to active chips
11.	ResistorTolerance	E96	Resistor series - 1% Passive resistor tolerance
12.	CapacitorTolerance	E48	Capacitor series - 2% Passive capacitor tolerance

Design Assistance

1. **TL082-N** Product Folder : http://www.ti.com/product/TL082-N : contains the data sheet and other resources.

Filter Stage :1

Cutoff Frequency	17.708 kHz
Min GBW Reqd	1.687 MHz
Stage Gain	1.744 V/V
Stage Q	538.948 m
Stage Topology	Multiple Feedback



Electrical BOM

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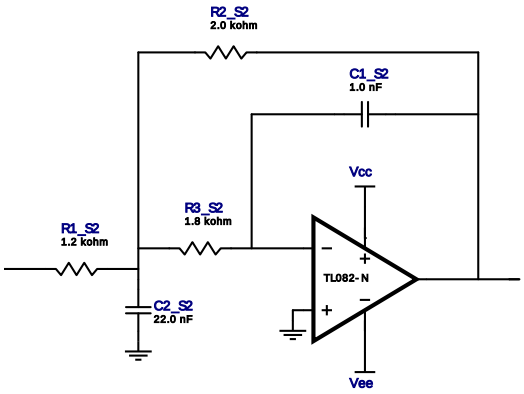
4.	R1_S1	Generic	Ideal	Res= 3900.0ohm Tolerance= 1%	1
5.	R2_S1	Generic	Ideal	Res= 6800.0ohm Tolerance= 1%	1
6.	R3_S1	Generic	Ideal	Res= 3600.0ohm Tolerance= 1%	1

Filter Stage :2

Cutoff Frequency	17.884 kHz
Min GBW Reqd	4.073 MHz
Stage Gain	1.667 V/V
Stage Q	1.309
Stage Topology	Multiple Feedback



Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty
1.	A1_S2	Texas Instruments Inc.	TL082-N	GbwTyp= 4MHz VccMax= 30V VccMin= 10V	1
2.	C1_S2	Generic	Ideal	Cap= 1.0 nF Tolerance= 2.0 %	1
3.	C2_S2	Generic	Ideal	Cap= 22.0 nF Tolerance= 2.0 %	1
4.	R1_S2	Generic	Ideal	Res= 1200.0ohm Tolerance= 1%	1
5.	R2_S2	Generic	Ideal	Res= 2000.0ohm Tolerance= 1%	1
6.	R3_S2	Generic	Ideal	Res= 1800.0ohm Tolerance= 1%	1