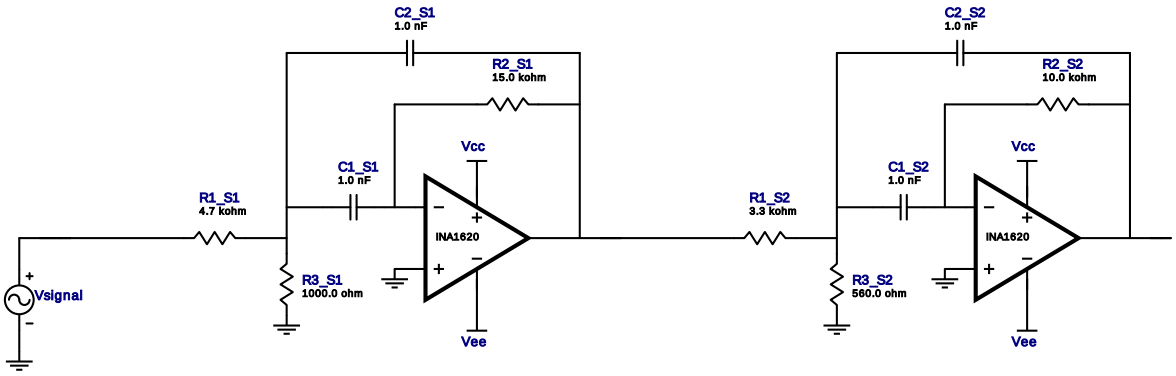
Type : Bandpass
Response : Butterworth
Order : 4
Number of Stages : 2

Filter Design Report

Design : Bandpass Filter - 4th order Butterworth
Design ID: 8

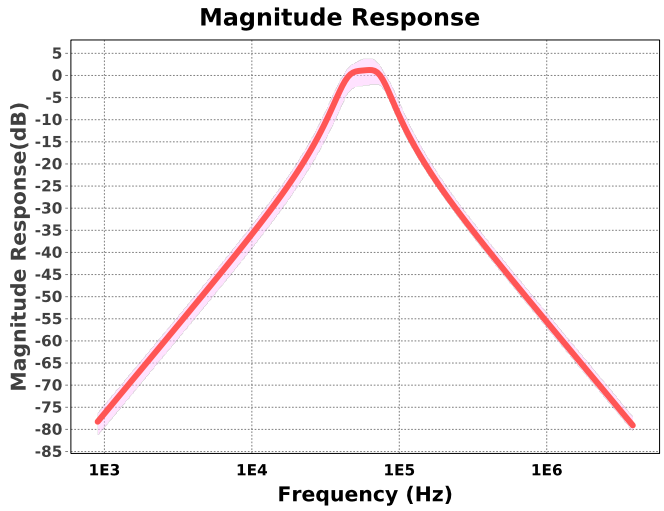


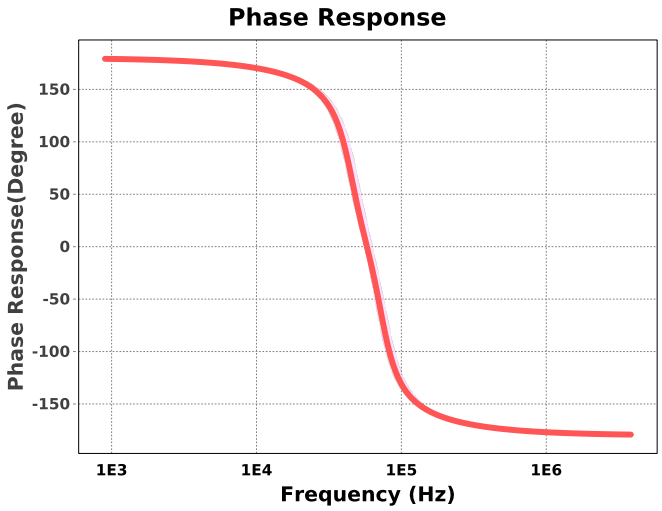
Electrical BOM

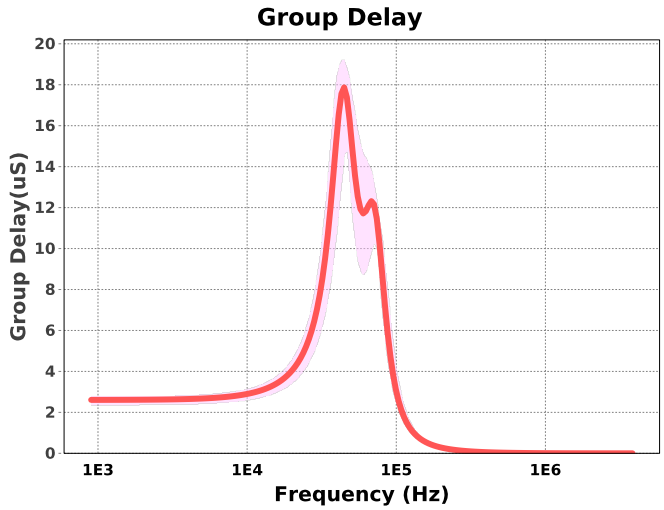
#	Name	Manufacturer	Part Number	Properties	Qty
1.	A1_S1	Texas Instruments Inc.	INA1620	GbwTyp= 32MHz VccMax= 36V VccMin= 4V	1
2.	A1_S2	Texas Instruments Inc.	INA1620	GbwTyp= 32MHz VccMax= 36V VccMin= 4V	1
3.	C1_S1	Generic	Ideal	Cap= 1.0 nF Tolerance= 2.0 %	1
4.	C1_S2	Generic	Ideal	Cap= 1.0 nF Tolerance= 2.0 %	1
5.	C2_S1	Generic	Ideal	Cap= 1.0 nF Tolerance= 2.0 %	1
6.	C2_S2	Generic	Ideal	Cap= 1.0 nF Tolerance= 2.0 %	1
7.	R1_S1	Generic	Ideal	Res= 4700.0ohm Tolerance= 10%	1
8.	R1_S2	Generic	Ideal	Res= 3300.0ohm Tolerance= 10%	1
9.	R2_S1	Generic	Ideal	Res= 15000.0ohm Tolerance= 10%	1
10.	R2_S2	Generic	Ideal	Res= 10000.0ohm Tolerance= 10%	1
11.	R3_S1	Generic	Ideal	Res= 1000.0ohm Tolerance= 10%	1
12.	R3_S2	Generic	Ideal	Res= 560.0ohm Tolerance= 10%	1

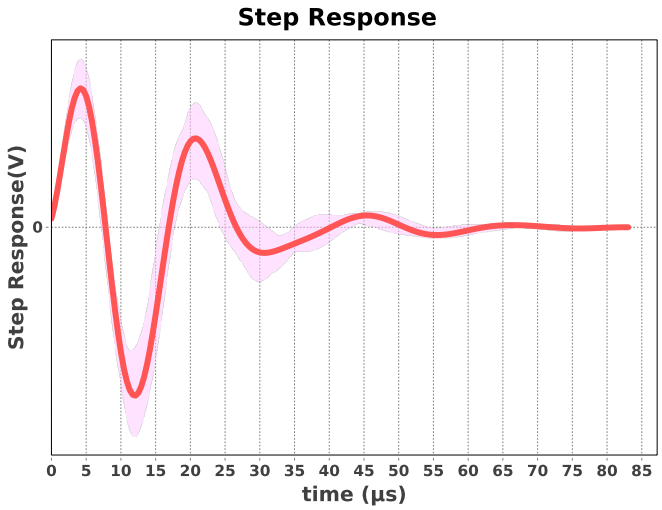
Sensitivity Analysis

#	Name	Series	Tolerance
1.	Cap	E48	2%
2.	Res	E12	10%









Design Inputs

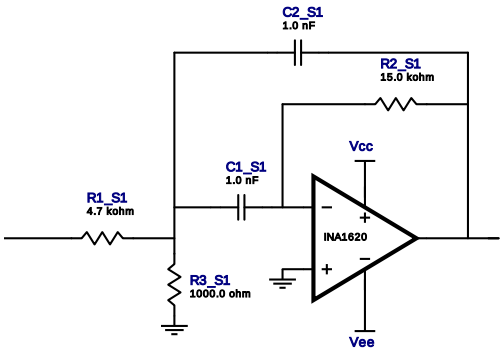
#	Name	Value	Description
1.	FilterType	bandpass	
2.	FilterResponse	Butterworth	
3.	FilterOrder	4.0	
4.	FilterTopology	Multiple Feedback	
5.	NumberOfStages	2.0	
6.	CenterFrequency	60.0 k	
7.	StopbandAttenuation	-40.001	
8.	PassbandBandwidth	40.0 k	
9.	StopbandBandwidth	400.0 k	
10.	Gain	1.0	
11.	SingleSupply	15.0	Power supply(s) to active chips
12.	ResistorTolerance	E12	Resistor series - 10% Passive resistor tolerance
13.	CapacitorTolerance	E48	Capacitor series - 2% Passive capacitor tolerance

Design Assistance

1. **INA1620** Product Folder : http://www.ti.com/product/INA1620 : contains the data sheet and other resources.

Filter Stage :1

Cutoff Frequency	45.255 kHz
Min GBW Reqd	14.992 MHz
Stage Gain	1.596 V/V
Stage Q	2.133
Stage Topology	Multiple Feedback



Electrical BOM

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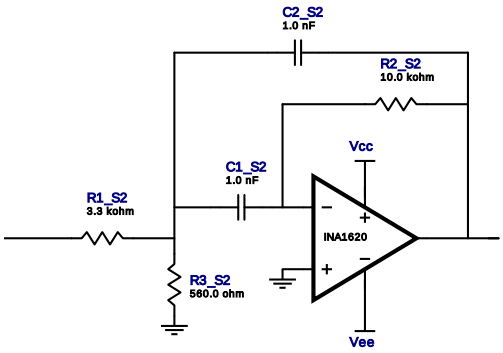
4.	R1_S1	Generic	Ideal	Res= 4700.0ohm Tolerance= 10%	1
5.	R2_S1	Generic	Ideal	Res= 15000.0ohm Tolerance= 10%	1
6.	R3_S1	Generic	Ideal	Res= 1000.0ohm Tolerance= 10%	1

Filter Stage :2

Cutoff Frequency	72.738 kHz
Min GBW Reqd	24.22 MHz
Stage Gain	1.515 V/V
Stage Q	2.285
Stage Topology	Multiple Feedback



Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty
1.	A1_S2	Texas Instruments Inc.	INA1620	GbwTyp= 32MHz VccMax= 36V VccMin= 4V	1
2.	C1_S2	Generic	Ideal	Cap= 1.0 nF Tolerance= 2.0 %	1
3.	C2_S2	Generic	Ideal	Cap= 1.0 nF Tolerance= 2.0 %	1
4.	R1_S2	Generic	Ideal	Res= 3300.0ohm Tolerance= 10%	1
5.	R2_S2	Generic	Ideal	Res= 10000.0ohm Tolerance= 10%	1
6.	R3_S2	Generic	Ideal	Res= 560.0ohm Tolerance= 10%	1