Filter Design Report

Design : Bandpass Filter - 8th order Bessel
Design ID: 13
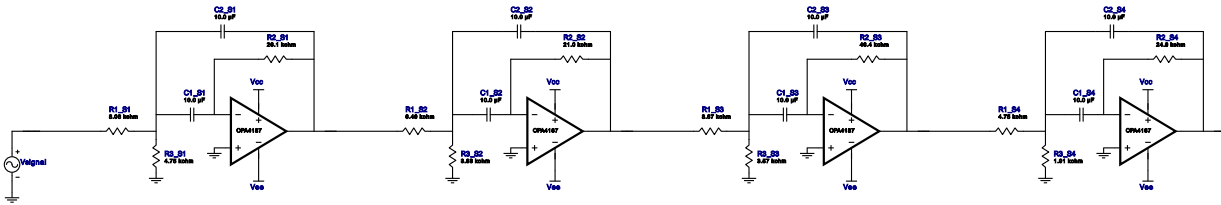
Electrical BOM

| #	Name	Manufacturer	Part Number	Properties	Qty
1.	A1_S1	Texas Instruments Inc.	OPA4187	GbwTyp= 0.55MHz VccMax= 36V VccMin= 4.5V	1
2.	A1_S2	Texas Instruments Inc.	OPA4187	GbwTyp= 0.55MHz VccMax= 36V VccMin= 4.5V	1
3.	A1_S3	Texas Instruments Inc.	OPA4187	GbwTyp= 0.55MHz VccMax= 36V VccMin= 4.5V	1
4.	A1_S4	Texas Instruments Inc.	OPA4187	GbwTyp= 0.55MHz VccMax= 36V VccMin= 4.5V	1
5.	C1_S1	Generic	Ideal	Cap= 10.0 uF Tolerance= 2.0 %	1
6.	C1_S2	Generic	Ideal	Cap= 10.0 uF Tolerance= 2.0 %	1
7.	C1_S3	Generic	Ideal	Cap= 10.0 uF Tolerance= 2.0 %	1
8.	C1_S4	Generic	Ideal	Cap= 10.0 uF Tolerance= 2.0 %	1
9.	C2_S1	Generic	Ideal	Cap= 10.0 uF Tolerance= 2.0 %	1
10.	C2_S2	Generic	Ideal	Cap= 10.0 uF Tolerance= 2.0 %	1
11.	C2_S3	Generic	Ideal	Cap= 10.0 uF Tolerance= 2.0 %	1
12.	C2_S4	Generic	Ideal	Cap= 10.0 uF Tolerance= 2.0 %	1
13.	R1_S1	Generic	Ideal	Res= 8060.0ohm Tolerance= 1%	1
14.	R1_S2	Generic	Ideal	Res= 6490.0ohm Tolerance= 1%	1
15.	R1_S3	Generic	Ideal	Res= 8870.0ohm Tolerance= 1%	1
16.	R1_S4	Generic	Ideal	Res= 4750.0ohm Tolerance= 1%	1
17.	R2_S1	Generic	Ideal	Res= 26100.0ohm Tolerance= 1%	1

#	Name	Manufacturer	Part Number	Properties	Qty
18.	R2_S2	Generic	Ideal	Res= 21000.0ohm Tolerance= 1%	1
19.	R2_S3	Generic	Ideal	Res= 46400.0ohm Tolerance= 1%	1
20.	R2_S4	Generic	Ideal	Res= 24900.0ohm Tolerance= 1%	1
21.	R3_S1	Generic	Ideal	Res= 4750.0ohm Tolerance= 1%	1
22.	R3_S2	Generic	Ideal	Res= 3830.0ohm Tolerance= 1%	1
23.	R3_S3	Generic	Ideal	Res= 3570.0ohm Tolerance= 1%	1
24.	R3_S4	Generic	Ideal	Res= 1910.0ohm Tolerance= 1%	1

Sensitivity Analysis

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

Magnitude Response

Phase Response

Group Delay

Step Response

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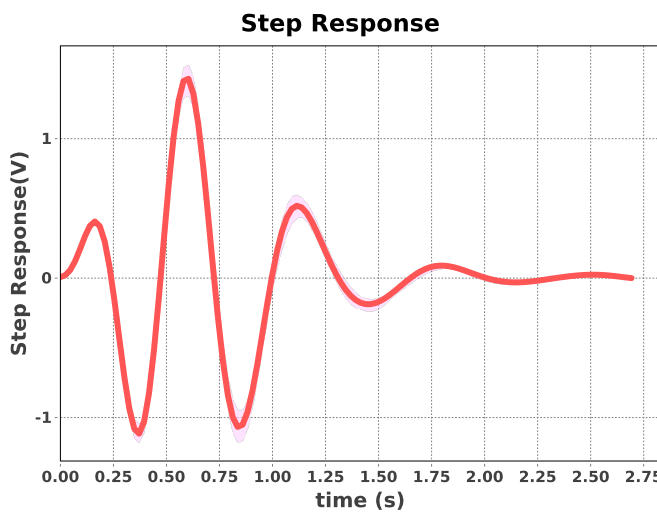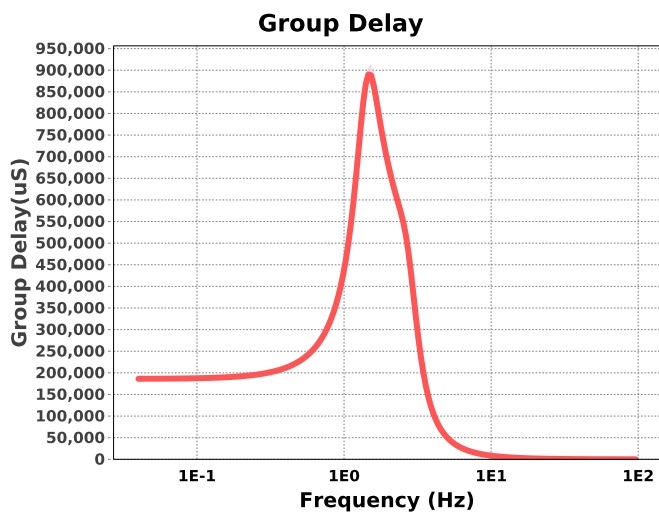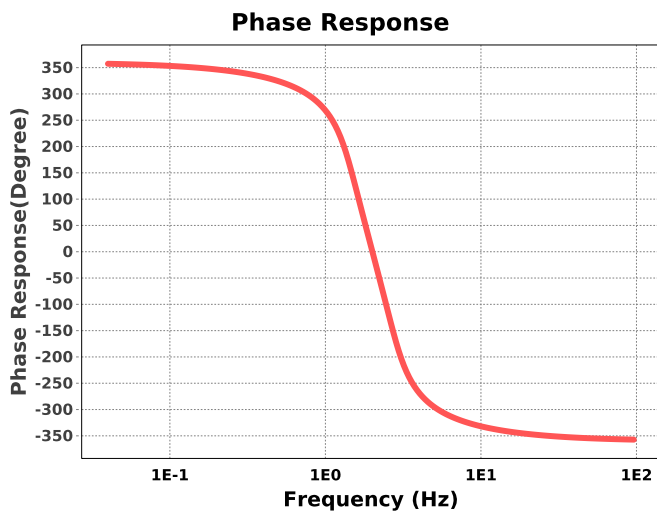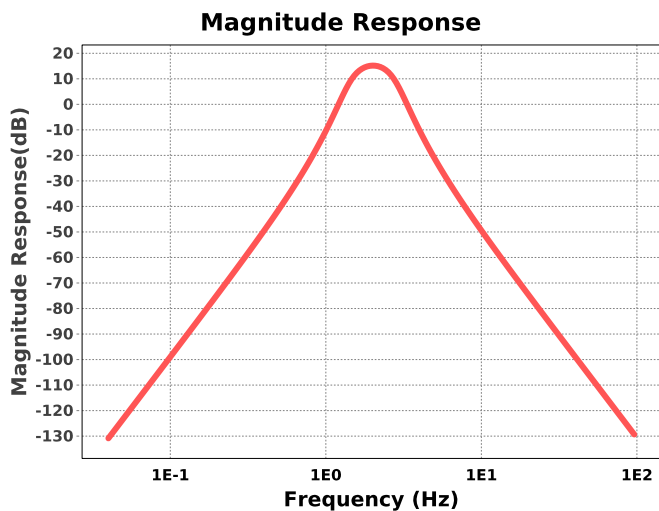
Design Inputs

#	Name	Value	Description
1.	FilterType	bandpass	
2.	FilterResponse	Bessel	
3.	FilterOrder	8.0	
4.	FilterTopology	Multiple Feedback	
5.	NumberOfStages	4.0	
6.	CenterFrequency	2.0	
7.	StopbandAttenuation	-65.946	
8.	PassbandBandwidth	1.0	
9.	StopbandBandwidth	10.0	
10.	Gain	5.623	
11.	DualSupply	+/-5.00 V	Power supply(s) to active chips
12.	ResistorTolerance	E96	Resistor series - 1% Passive resistor tolerance
13.	CapacitorTolerance	E48	Capacitor series - 2% Passive capacitor tolerance

Design Assistance

1. **OPA4187** Product Folder : http://www.ti.com/product/OPA4187 : contains the data sheet and other resources.

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Filter Stage :1

Cutoff Frequency	1.802 Hz
Min GBW Reqd	429.507 Hz
Stage Gain	1.619 V/V
Stage Q	1.478
Stage Topology	Multiple Feedback
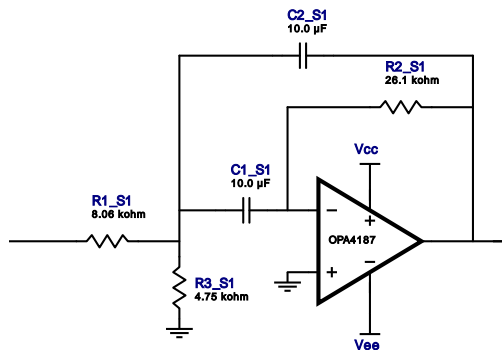
Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty
1.	A1_S1	Texas Instruments Inc.	OPA4187	GbwTyp= 0.55MHz VccMax= 36V VccMin= 4.5V	1
2.	C1_S1	Generic	Ideal	Cap= 10.0 uF Tolerance= 2.0 %	1
3.	C2_S1	Generic	Ideal	Cap= 10.0 uF Tolerance= 2.0 %	1
4.	R1_S1	Generic	Ideal	Res= 8060.0ohm Tolerance= 1%	1
5.	R2_S1	Generic	Ideal	Res= 26100.0ohm Tolerance= 1%	1
6.	R3_S1	Generic	Ideal	Res= 4750.0ohm Tolerance= 1%	1

Filter Stage :2

Cutoff Frequency	2.238 Hz
Min GBW Reqd	532.985 Hz
Stage Gain	1.618 V/V
Stage Q	1.476
Stage Topology	Multiple Feedback
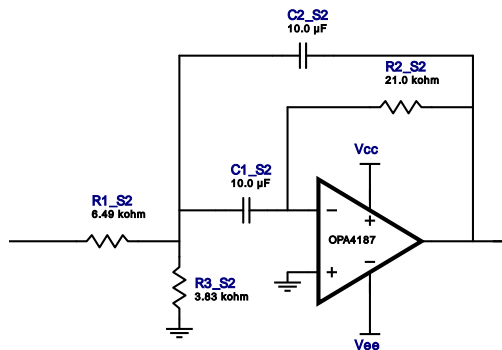
Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty
1.	A1_S2	Texas Instruments Inc.	OPA4187	GbwTyp= 0.55MHz VccMax= 36V VccMin= 4.5V	1
2.	C1_S2	Generic	Ideal	Cap= 10.0 uF Tolerance= 2.0 %	1
3.	C2_S2	Generic	Ideal	Cap= 10.0 uF Tolerance= 2.0 %	1
4.	R1_S2	Generic	Ideal	Res= 6490.0ohm Tolerance= 1%	1
5.	R2_S2	Generic	Ideal	Res= 21000.0ohm Tolerance= 1%	1
6.	R3_S2	Generic	Ideal	Res= 3830.0ohm Tolerance= 1%	1

Filter Stage :3

Cutoff Frequency	1.464 Hz
Min GBW Reqd	808.232 Hz
Stage Gain	2.616 V/V
Stage Q	2.135
Stage Topology	Multiple Feedback
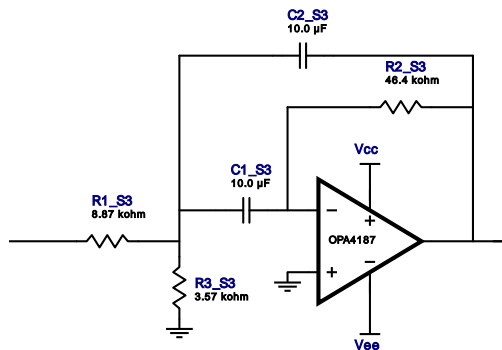
Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty
1.	A1_S3	Texas Instruments Inc.	OPA4187	GbwTyp= 0.55MHz VccMax= 36V VccMin= 4.5V	1
2.	C1_S3	Generic	Ideal	Cap= 10.0 uF Tolerance= 2.0 %	1
3.	C2_S3	Generic	Ideal	Cap= 10.0 uF Tolerance= 2.0 %	1
4.	R1_S3	Generic	Ideal	Res= 8870.0ohm Tolerance= 1%	1
5.	R2_S3	Generic	Ideal	Res= 46400.0ohm Tolerance= 1%	1
6.	R3_S3	Generic	Ideal	Res= 3570.0ohm Tolerance= 1%	1

Filter Stage :4

Cutoff Frequency	2.733 Hz
Min GBW Reqd	1.519 kHz
Stage Gain	2.621 V/V
Stage Q	2.138
Stage Topology	Multiple Feedback
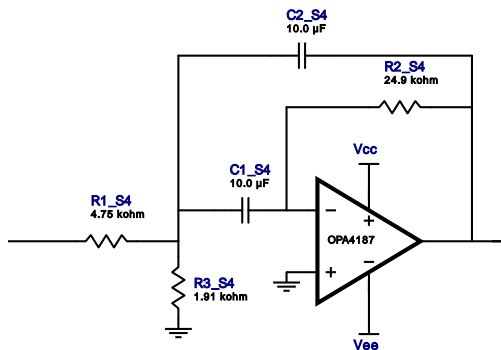
Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty
1.	A1_S4	Texas Instruments Inc.	OPA4187	GbwTyp= 0.55MHz VccMax= 36V VccMin= 4.5V	1
2.	C1_S4	Generic	Ideal	Cap= 10.0 uF Tolerance= 2.0 %	1
3.	C2_S4	Generic	Ideal	Cap= 10.0 uF Tolerance= 2.0 %	1
4.	R1_S4	Generic	Ideal	Res= 4750.0ohm Tolerance= 1%	1
5.	R2_S4	Generic	Ideal	Res= 24900.0ohm Tolerance= 1%	1
6.	R3_S4	Generic	Ideal	Res= 1910.0ohm Tolerance= 1%	1