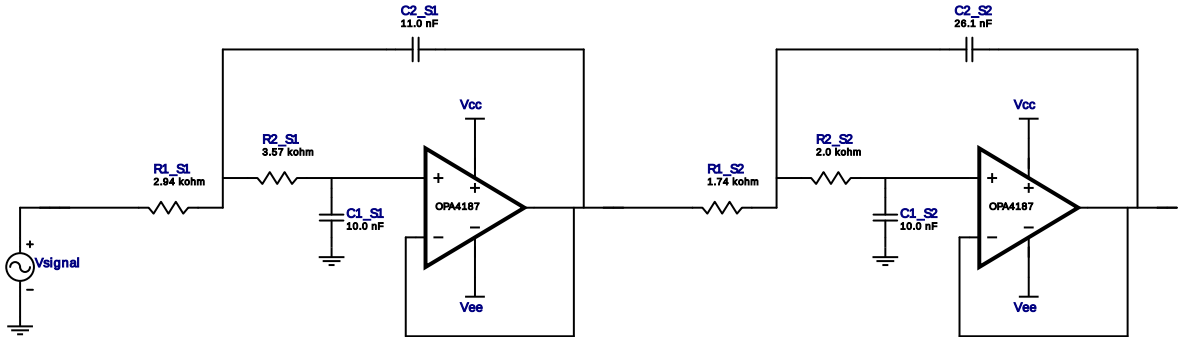
Type : Lowpass
Response : Bessel
Order : 4
Number of Stages : 2

Filter Design Report

Design : Lowpass Filter - 4th order Bessel
Design ID: 33

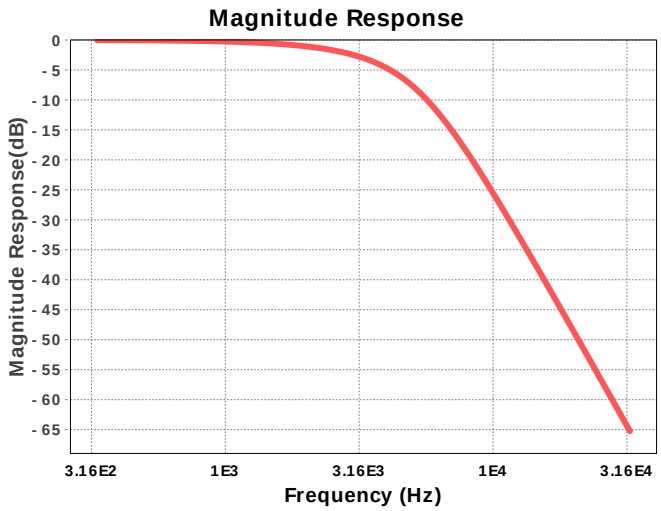


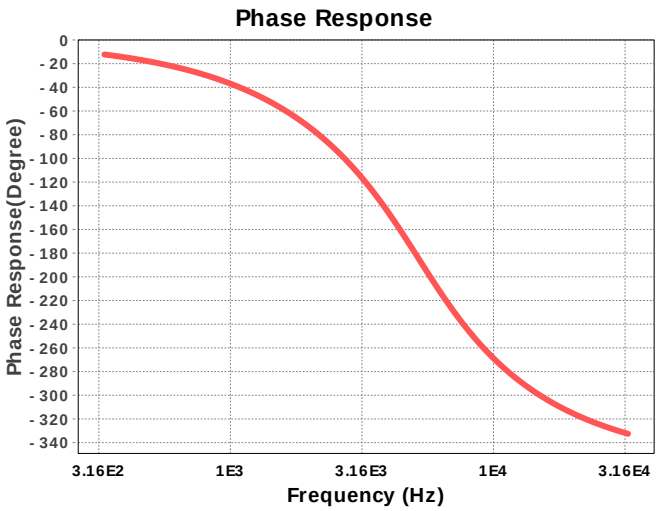
Electrical BOM

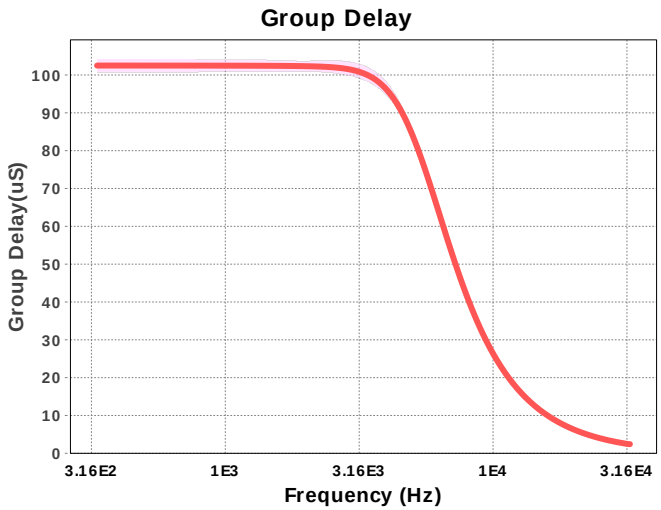
#	Name	Manufacturer	Part Number	Properties	Qty
1.	A1_S1	Texas Instruments Inc.	OPA4187	GbwTyp= 0.55MHz VccMax= 36V VccMin= 4.5V	1
2.	A1_S2	Texas Instruments Inc.	OPA4187	GbwTyp= 0.55MHz VccMax= 36V VccMin= 4.5V	1
3.	C1_S1	Generic	Ideal	Cap= 10.0 nF Tolerance= 2.0 %	1
4.	C1_S2	Generic	Ideal	Cap= 10.0 nF Tolerance= 2.0 %	1
5.	C2_S1	Generic	Ideal	Cap= 11.0 nF Tolerance= 2.0 %	1
6.	C2_S2	Generic	Ideal	Cap= 26.1 nF Tolerance= 2.0 %	1
7.	R1_S1	Generic	Ideal	Res= 2940.0ohm Tolerance= 1%	1
8.	R1_S2	Generic	Ideal	Res= 1740.0ohm Tolerance= 1%	1
9.	R2_S1	Generic	Ideal	Res= 3570.0ohm Tolerance= 1%	1
10.	R2_S2	Generic	Ideal	Res= 2000.0ohm Tolerance= 1%	1

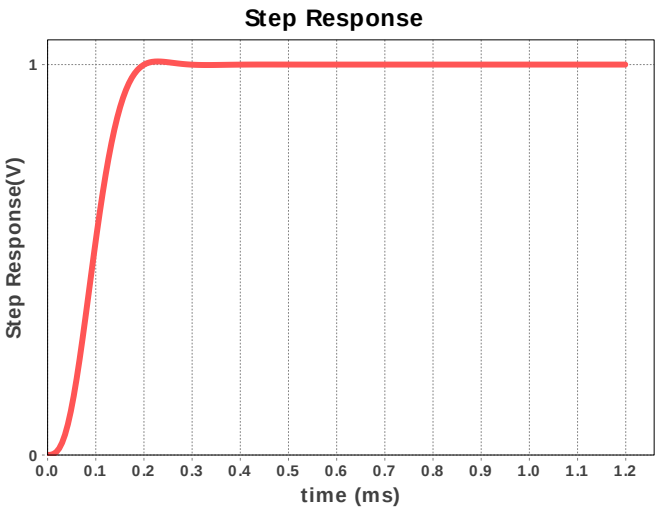
Sensitivity Analysis

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









Design Inputs

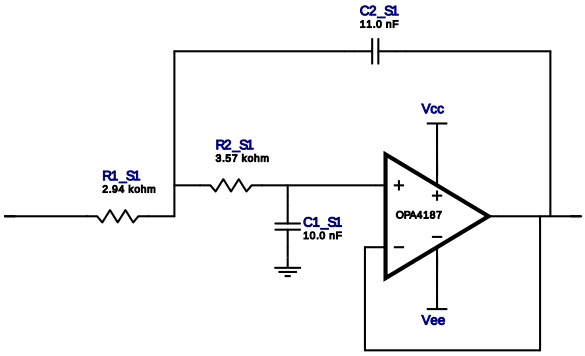
#	Name	Value	Description
1.	FilterType	lowpass	
2.	FilterResponse	Bessel	
3.	FilterOrder	4.0	
4.	FilterTopology	Sallen-Key	
5.	NumberOfStages	2.0	
6.	PassbandFrequency	3.32 k	
7.	StopbandAttenuation	-65.946	
8.	StopbandFrequency	33.2 k	
9.	Gain	1.0	
10.	DualSupply	+/-5.00 V	Power supply(s) to active chips
11.	ResistorTolerance	E96	Resistor series - 1% Passive resistor tolerance
12.	CapacitorTolerance	E48	Capacitor series - 2% Passive capacitor tolerance

Design Assistance

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

Filter Stage :1

Cutoff Frequency	4.684 kHz
Min GBW Reqd	245.928 kHz
Stage Gain	1.0 V/V
Stage Q	521.943 m
Stage Topology	Sallen-Key



Electrical BOM

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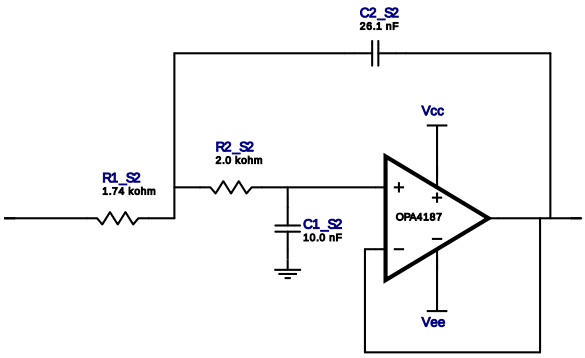
3.	C2_S1	Generic	Ideal	Cap= 11.0 nF Tolerance= 2.0 %	1
4.	R1_S1	Generic	Ideal	Res= 2940.0ohm Tolerance= 1%	1
5.	R2_S1	Generic	Ideal	Res= 3570.0ohm Tolerance= 1%	1

Filter Stage :2

Cutoff Frequency	5.281 kHz
Min GBW Reqd	425.556 kHz
Stage Gain	1.0 V/V
Stage Q	805.82 m
Stage Topology	Sallen-Key



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 nF Tolerance= 2.0 %	1
3.	C2_S2	Generic	Ideal	Cap= 26.1 nF Tolerance= 2.0 %	1
4.	R1_S2	Generic	Ideal	Res= 1740.0ohm Tolerance= 1%	1
5.	R2_S2	Generic	Ideal	Res= 2000.0ohm Tolerance= 1%	1