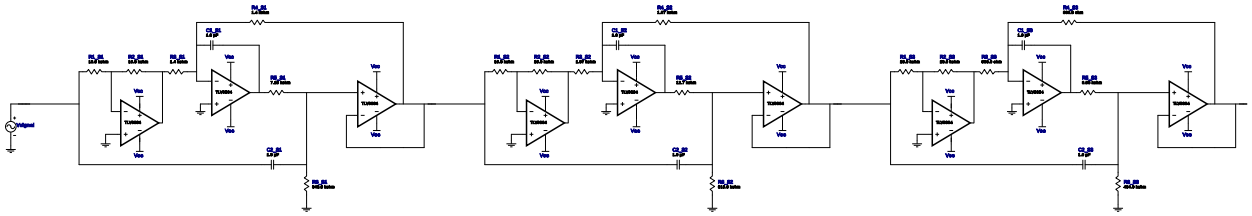
Type : Bandstop
Response : Bessel
Order : 6
Number of Stages : 3

Filter Design Report

Design : Bandstop Filter - 6th order Bessel
Design ID: 73



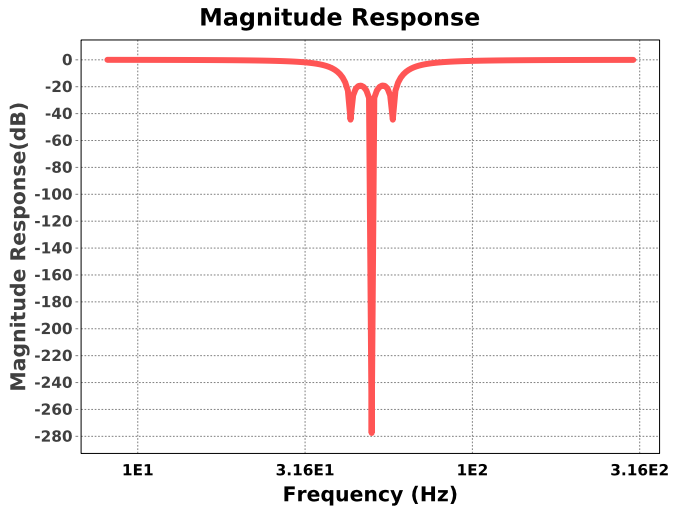
Electrical BOM

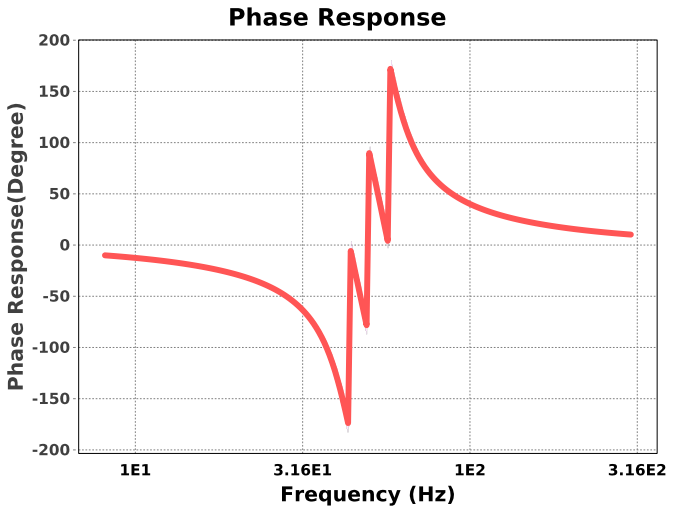
#	Name	Manufacturer	Part Number	Properties	Qty
1.	A1_S1	Texas Instruments Inc.	TLV9304	GbwTyp= 1MHz VccMax= 40V VccMin= 4.5V	1
2.	A1_S2	Texas Instruments Inc.	TLV9304	GbwTyp= 1MHz VccMax= 40V VccMin= 4.5V	1
3.	A1_S3	Texas Instruments Inc.	TLV9304	GbwTyp= 1MHz VccMax= 40V VccMin= 4.5V	1
4.	A2_S1	Texas Instruments Inc.	TLV9304	GbwTyp= 1MHz VccMax= 40V VccMin= 4.5V	1
5.	A2_S2	Texas Instruments Inc.	TLV9304	GbwTyp= 1MHz VccMax= 40V VccMin= 4.5V	1
6.	A2_S3	Texas Instruments Inc.	TLV9304	GbwTyp= 1MHz VccMax= 40V VccMin= 4.5V	1
7.	A3_S1	Texas Instruments Inc.	TLV9304	GbwTyp= 1MHz VccMax= 40V VccMin= 4.5V	1
8.	A3_S2	Texas Instruments Inc.	TLV9304	GbwTyp= 1MHz VccMax= 40V VccMin= 4.5V	1
9.	A3_S3	Texas Instruments Inc.	TLV9304	GbwTyp= 1MHz VccMax= 40V VccMin= 4.5V	1
10.	C1_S1	Generic	Ideal	Cap= 1.0 uF Tolerance= 2.0 %	1
11.	C1_S2	Generic	Ideal	Cap= 1.0 uF Tolerance= 2.0 %	1
12.	C1_S3	Generic	Ideal	Cap= 1.0 uF Tolerance= 2.0 %	1
13.	C2_S1	Generic	Ideal	Cap= 1.0 uF Tolerance= 2.0 %	1
14.	C2_S2	Generic	Ideal	Cap= 1.0 uF Tolerance= 2.0 %	1
15.	C2_S3	Generic	Ideal	Cap= 1.0 uF Tolerance= 2.0 %	1
16.	R1_S1	Generic	Ideal	Res= 10000.0ohm Tolerance= 1%	1

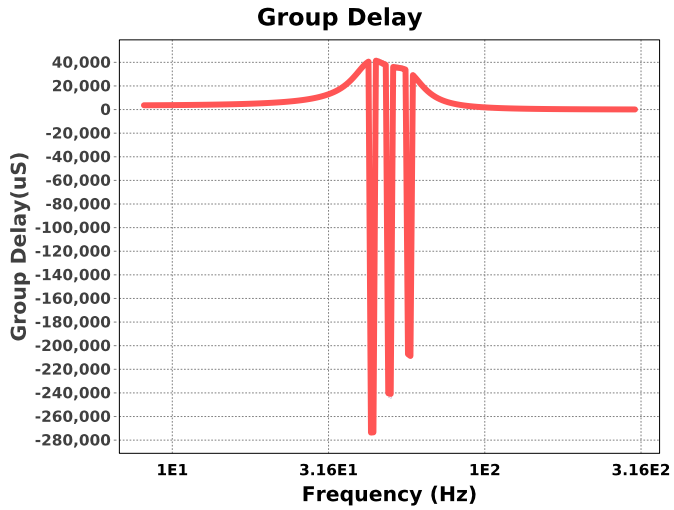
#	Name	Manufacturer	Part Number	Properties	Qty
17.	R1_S2	Generic	Ideal	Res= 10000.0ohm Tolerance= 1%	1
18.	R1_S3	Generic	Ideal	Res= 10000.0ohm Tolerance= 1%	1
19.	R2_S1	Generic	Ideal	Res= 10000.0ohm Tolerance= 1%	1
20.	R2_S2	Generic	Ideal	Res= 10000.0ohm Tolerance= 1%	1
21.	R2_S3	Generic	Ideal	Res= 10000.0ohm Tolerance= 1%	1
22.	R3_S1	Generic	Ideal	Res= 1400.0ohm Tolerance= 1%	1
23.	R3_S2	Generic	Ideal	Res= 1070.0ohm Tolerance= 1%	1
24.	R3_S3	Generic	Ideal	Res= 806.0ohm Tolerance= 1%	1
25.	R4_S1	Generic	Ideal	Res= 1400.0ohm Tolerance= 1%	1
26.	R4_S2	Generic	Ideal	Res= 1070.0ohm Tolerance= 1%	1
27.	R4_S3	Generic	Ideal	Res= 806.0ohm Tolerance= 1%	1
28.	R5_S1	Generic	Ideal	Res= 7150.0ohm Tolerance= 1%	1
29.	R5_S2	Generic	Ideal	Res= 12700.0ohm Tolerance= 1%	1
30.	R5_S3	Generic	Ideal	Res= 9530.0ohm Tolerance= 1%	1
31.	R6_S1	Generic	Ideal	Res= 348000.0ohm Tolerance= 1%	1
32.	R6_S2	Generic	Ideal	Res= 619000.0ohm Tolerance= 1%	1
33.	R6_S3	Generic	Ideal	Res= 464000.0ohm Tolerance= 1%	1

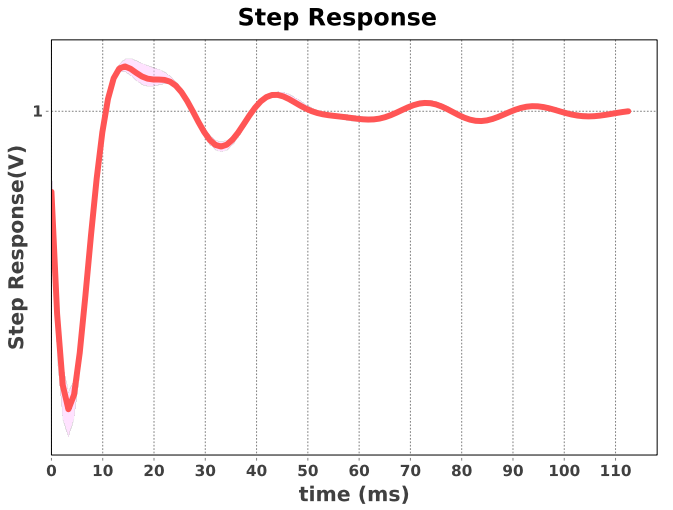
Sensitivity Analysis

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









Design Inputs

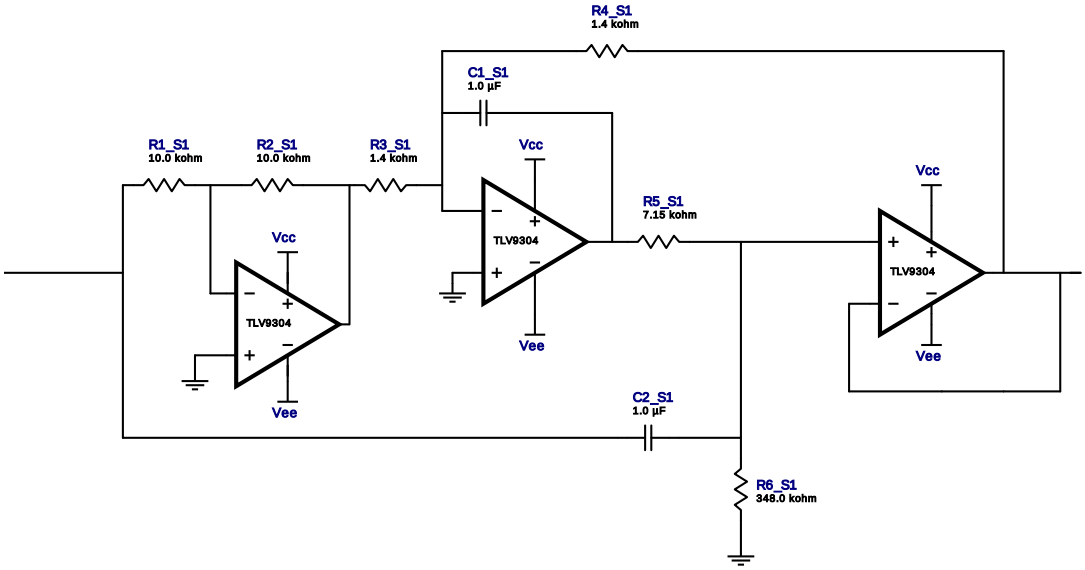
#	Name	Value	Description
1.	FilterType	bandstop	
2.	FilterResponse	Bessel	
3.	FilterOrder	6.0	
4.	FilterTopology	Bainter	
5.	NumberOfStages	3.0	
6.	CenterFrequency	50.0	
7.	StopbandAttenuation	-51.146	
8.	PassbandBandwidth	30.0	
9.	StopbandBandwidth	3.0	
10.	Gain	1.0	
11.	DualSupply	+/-5.00 V	Power supply(s) to active chips
12.	ResistorTolerance	E96	Resistor series - 1% Passive resistor tolerance
13.	CapacitorTolerance	E48	Capacitor series - 2% Passive capacitor tolerance

Design Assistance

1. **TLV9304** Product Folder : http://www.ti.com/product/TLV9304 : contains the data sheet and other resources.

Filter Stage :1

Cutoff Frequency	50.304 Hz
Min GBW Reqd	11.058 kHz
Stage Gain	1.0 V/V
Stage Q	2.214
Stage Topology	Bainter

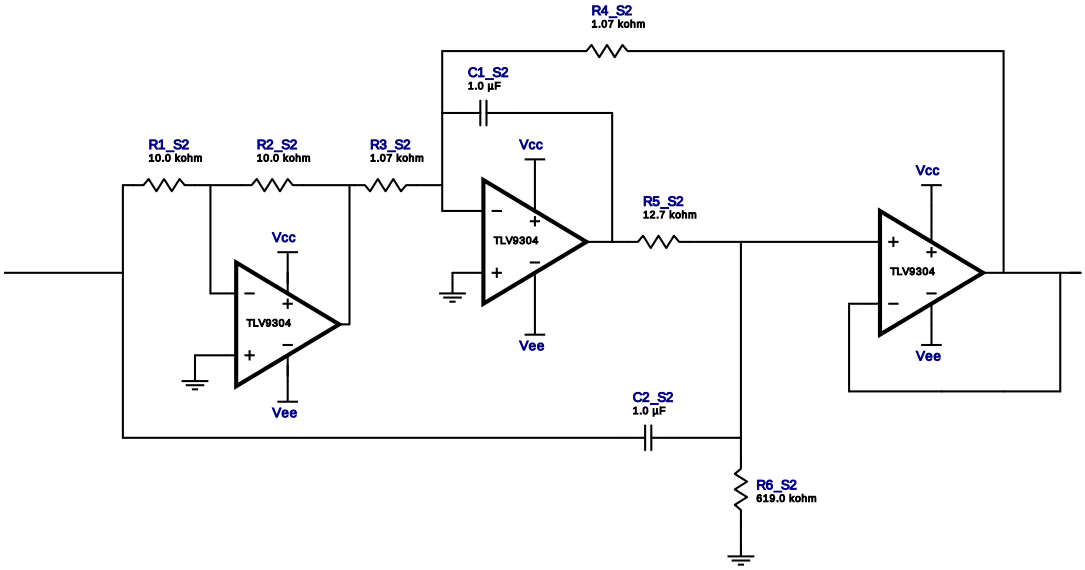


Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty
1.	A1_S1	Texas Instruments Inc.	TLV9304	GbwTyp= 1MHz VccMax= 40V VccMin= 4.5V	1
2.	A2_S1	Texas Instruments Inc.	TLV9304	GbwTyp= 1MHz VccMax= 40V VccMin= 4.5V	1
3.	A3_S1	Texas Instruments Inc.	TLV9304	GbwTyp= 1MHz VccMax= 40V VccMin= 4.5V	1
4.	C1_S1	Generic	Ideal	Cap= 1.0 uF Tolerance= 2.0 %	1
5.	C2_S1	Generic	Ideal	Cap= 1.0 uF Tolerance= 2.0 %	1
6.	R1_S1	Generic	Ideal	Res= 10000.0ohm Tolerance= 1%	1
7.	R2_S1	Generic	Ideal	Res= 10000.0ohm Tolerance= 1%	1
8.	R3_S1	Generic	Ideal	Res= 1400.0ohm Tolerance= 1%	1
9.	R4_S1	Generic	Ideal	Res= 1400.0ohm Tolerance= 1%	1
10.	R5_S1	Generic	Ideal	Res= 7150.0ohm Tolerance= 1%	1
11.	R6_S1	Generic	Ideal	Res= 348000.0ohm Tolerance= 1%	1

Filter Stage :2

Cutoff Frequency	43.174 Hz
Min GBW Reqd	14.638 kHz
Stage Gain	1.0 V/V
Stage Q	3.376
Stage Topology	Bainter

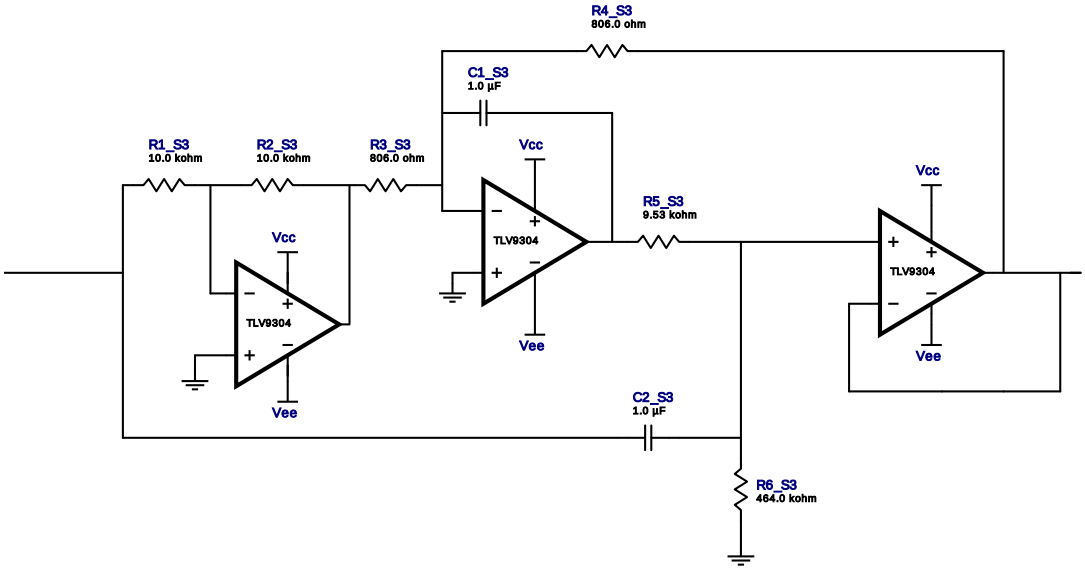


Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty
1.	A1_S2	Texas Instruments Inc.	TLV9304	GbwTyp= 1MHz VccMax= 40V VccMin= 4.5V	1
2.	A2_S2	Texas Instruments Inc.	TLV9304	GbwTyp= 1MHz VccMax= 40V VccMin= 4.5V	1
3.	A3_S2	Texas Instruments Inc.	TLV9304	GbwTyp= 1MHz VccMax= 40V VccMin= 4.5V	1
4.	C1_S2	Generic	Ideal	Cap= 1.0 uF Tolerance= 2.0 %	1
5.	C2_S2	Generic	Ideal	Cap= 1.0 uF Tolerance= 2.0 %	1
6.	R1_S2	Generic	Ideal	Res= 10000.0ohm Tolerance= 1%	1
7.	R2_S2	Generic	Ideal	Res= 10000.0ohm Tolerance= 1%	1
8.	R3_S2	Generic	Ideal	Res= 1070.0ohm Tolerance= 1%	1
9.	R4_S2	Generic	Ideal	Res= 1070.0ohm Tolerance= 1%	1
10.	R5_S2	Generic	Ideal	Res= 12700.0ohm Tolerance= 1%	1
11.	R6_S2	Generic	Ideal	Res= 619000.0ohm Tolerance= 1%	1

Filter Stage :3

Cutoff Frequency	57.426 Hz
Min GBW Reqd	19.511 kHz
Stage Gain	1.0 V/V
Stage Q	3.369
Stage Topology	Bainter



Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty
1.	A1_S3	Texas Instruments Inc.	TLV9304	GbwTyp= 1MHz VccMax= 40V VccMin= 4.5V	1
2.	A2_S3	Texas Instruments Inc.	TLV9304	GbwTyp= 1MHz VccMax= 40V VccMin= 4.5V	1
3.	A3_S3	Texas Instruments Inc.	TLV9304	GbwTyp= 1MHz VccMax= 40V VccMin= 4.5V	1
4.	C1_S3	Generic	Ideal	Cap= 1.0 uF Tolerance= 2.0 %	1
5.	C2_S3	Generic	Ideal	Cap= 1.0 uF Tolerance= 2.0 %	1
6.	R1_S3	Generic	Ideal	Res= 10000.0ohm Tolerance= 1%	1
7.	R2_S3	Generic	Ideal	Res= 10000.0ohm Tolerance= 1%	1
8.	R3_S3	Generic	Ideal	Res= 806.0ohm Tolerance= 1%	1
9.	R4_S3	Generic	Ideal	Res= 806.0ohm Tolerance= 1%	1
10.	R5_S3	Generic	Ideal	Res= 9530.0ohm Tolerance= 1%	1

#	Name	Manufacturer	Part Number	Properties	Qty
11.	R6_S3	Generic	Ideal	Res= 464000.0ohm Tolerance= 1%	1