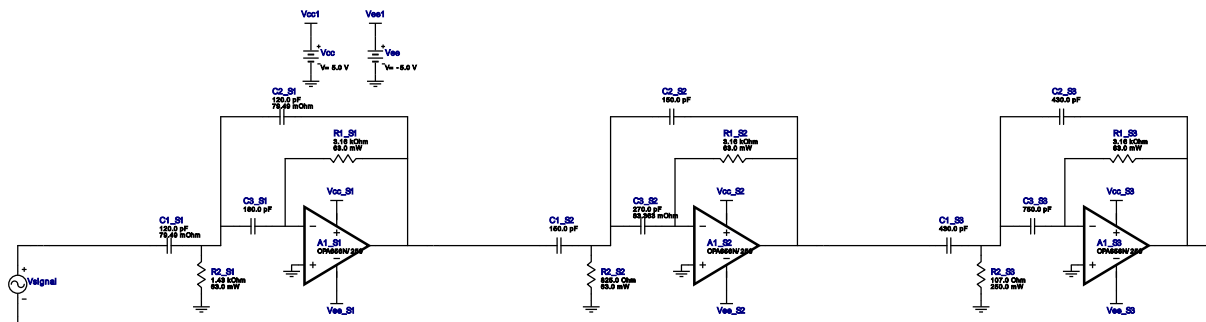


## WEBENCH® Design Report

Design : 4445574/5 OPA656N/250  
Highpass, Multiple Feedback, Butterworth










### My Comments

No comments

### Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	A1_S1	Texas Instruments	OPA656N/250	GbwTyp= 500.0MHz VccMin= 7.0 V VccMax= 13.0 V	1	\$5.75	 SOT-23 14 mm²
2.	A1_S2	Texas Instruments	OPA656N/250	GbwTyp= 500.0MHz VccMin= 7.0 V VccMax= 13.0 V	1	\$5.75	 SOT-23 14 mm²
3.	A1_S3	Texas Instruments	OPA656N/250	GbwTyp= 500.0MHz VccMin= 7.0 V VccMax= 13.0 V	1	\$5.75	 SOT-23 14 mm²
4.	C1_S1	TDK	C1608C0G1H121J Series= C0G/NP0	Cap= 120.0 pF ESR= 79.49 mOhm VDC= 50.0 V Tolerance= 5.0 %	1	\$0.01	 1608 5 mm²
5.	C1_S2	Johanson Technology	250R07N151JV4T Series= C0G/NP0	Cap= 150.0 pF VDC= 25.0 V Tolerance= 5.0 %	1	\$0.01	 0402 3 mm²
6.	C1_S3	MuRata	GRM1555C1E431JA01D Series= C0G/NP0	Cap= 430.0 pF VDC= 25.0 V Tolerance= 5.0 %	1	\$0.01	 0402 3 mm²
7.	C2_S1	TDK	C1608C0G1H121J Series= C0G/NP0	Cap= 120.0 pF ESR= 79.49 mOhm VDC= 50.0 V Tolerance= 5.0 %	1	\$0.01	 1608 5 mm²
8.	C2_S2	Johanson Technology	250R07N151JV4T Series= C0G/NP0	Cap= 150.0 pF VDC= 25.0 V Tolerance= 5.0 %	1	\$0.01	 0402 3 mm²
9.	C2_S3	MuRata	GRM1555C1E431JA01D Series= C0G/NP0	Cap= 430.0 pF VDC= 25.0 V Tolerance= 5.0 %	1	\$0.01	 0402 3 mm²
10.	C3_S1	Samsung Electro-Mechanics	CL05C181JA5NNNC Series= C0G/NP0	Cap= 180.0 pF VDC= 25.0 V Tolerance= 5.0 %	1	\$0.01	 0402 3 mm²
11.	C3_S2	TDK	C1608C0G1H271J Series= C0G/NP0	Cap= 270.0 pF ESR= 83.36 mOhm VDC= 50.0 V Tolerance= 5.0 %	1	\$0.01	 1608 5 mm²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
12.	C3_S3	MuRata	GRM1555C1E751JA01D Series= C0G/NP0	Cap= 750.0 pF VDC= 25.0 V Tolerance= 5.0 %	1	\$0.02	 0402 3 mm <sup>2</sup>
13.	R1_S1	Vishay-Dale	CRCW04023K16FKED Series= CRCW..e3	Res= 3.16 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>
14.	R1_S2	Vishay-Dale	CRCW04023K16FKED Series= CRCW..e3	Res= 3.16 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>
15.	R1_S3	Vishay-Dale	CRCW04023K16FKED Series= CRCW..e3	Res= 3.16 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>
16.	R2_S1	Vishay-Dale	CRCW04021K43FKED Series= CRCW..e3	Res= 1.43 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>
17.	R2_S2	Vishay-Dale	CRCW0402825RFKED Series= CRCW..e3	Res= 825.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>
18.	R2_S3	Panasonic	ERJ-8ENF1070V Series= ERJ-8E	Res= 107.0 Ohm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	 1206 11 mm <sup>2</sup>

## Design Inputs

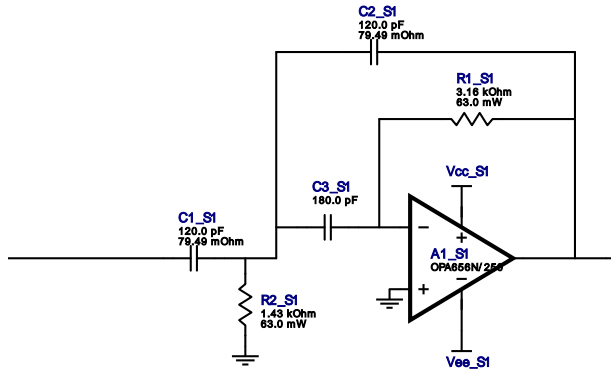
#	Name	Value	Description
1.	FilterType	Highpass	
2.	FilterResponse	Butterworth	
3.	FilterOrder	6.0	
4.	FilterTopology	Multiple_Feedback	
5.	NumberOfStages	3.0	
6.	PassbandFrequency	500.0 k	
7.	StopbandAttenuation	-45.0	
8.	StopbandFrequency	200.0 k	
9.	Gain	1.0	
10.	DualSupply	+/-5.0 V	Power supply(s) to active chips
11.	ResistorTolerance	E96	Resistor series - 1% Passive resistor tolerance
12.	CapacitorTolerance	E24	Capacitor series - 5% Passive capacitance tolerance
13.	SeedCapacitance	100.0 p	Seed Capacitance to start design of filter

## Design Assistance







1. **OPA656N/250** Product Folder : <http://www.ti.com//product/OPA656> : contains the data sheet and other resources.

## Filter Stage :1

Cutoff Frequency 500.0 kHz  
 Min GBW Req'd 26.0 MHz  
 Stage Gain 1.0 V/V  
 Stage Q 520.0 m  
 Stage Topology Multiple\_Feedback

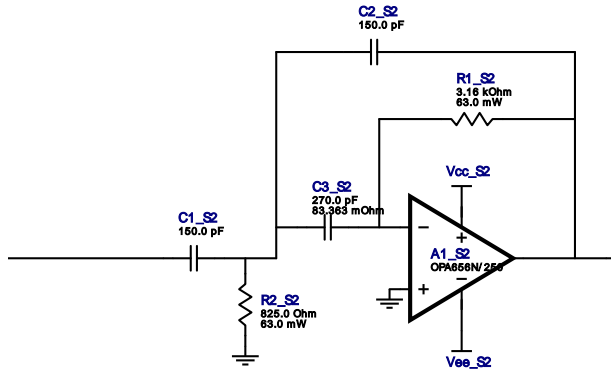


## Electrical BOM







#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	A1_S1	Texas Instruments	OPA656N/250	GbwTyp= 500.0MHz VccMin= 7.0 V VccMax= 13.0 V	1	\$5.75	 SOT-23 14 mm <sup>2</sup>
2.	C1_S1	TDK	C1608C0G1H121J Series= C0G/NP0	Cap= 120.0 pF ESR= 79.49 mOhm VDC= 50.0 V Tolerance= 5.0 %	1	\$0.01	 1608 5 mm <sup>2</sup>
3.	C2_S1	TDK	C1608C0G1H121J Series= C0G/NP0	Cap= 120.0 pF ESR= 79.49 mOhm VDC= 50.0 V Tolerance= 5.0 %	1	\$0.01	 1608 5 mm <sup>2</sup>
4.	C3_S1	Samsung Electro-Mechanics	CL05C181JA5NNNC Series= C0G/NP0	Cap= 180.0 pF VDC= 25.0 V Tolerance= 5.0 %	1	\$0.01	 0402 3 mm <sup>2</sup>
5.	R1_S1	Vishay-Dale	CRCW04023K16FKED Series= CRCW..e3	Res= 3.16 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>
6.	R2_S1	Vishay-Dale	CRCW04021K43FKED Series= CRCW..e3	Res= 1.43 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>

## Filter Stage :2

Cutoff Frequency 500.0 kHz  
 Min GBW Req'd 35.5 MHz  
 Stage Gain 1.0 V/V  
 Stage Q 710.0 m  
 Stage Topology Multiple\_Feedback

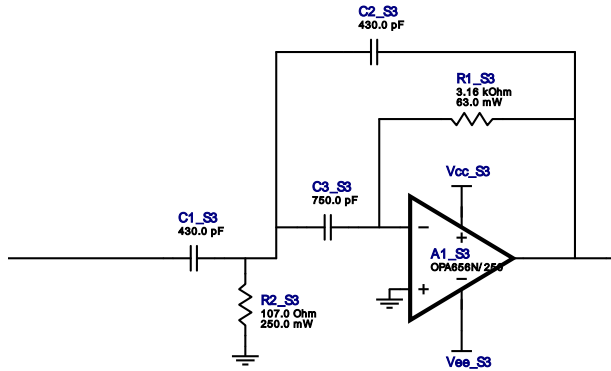


### Electrical BOM






#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	A1_S2	Texas Instruments	OPA656N/250	GbwTyp= 500.0MHz VccMin= 7.0 V VccMax= 13.0 V	1	\$5.75	 SOT-23 14 mm <sup>2</sup>
2.	C1_S2	Johanson Technology	250R07N151JV4T Series= C0G/NP0	Cap= 150.0 pF VDC= 25.0 V Tolerance= 5.0 %	1	\$0.01	 0402 3 mm <sup>2</sup>
3.	C2_S2	Johanson Technology	250R07N151JV4T Series= C0G/NP0	Cap= 150.0 pF VDC= 25.0 V Tolerance= 5.0 %	1	\$0.01	 0402 3 mm <sup>2</sup>
4.	C3_S2	TDK	C1608C0G1H271J Series= C0G/NP0	Cap= 270.0 pF ESR= 83.363 mOhm VDC= 50.0 V Tolerance= 5.0 %	1	\$0.01	 1608 5 mm <sup>2</sup>
5.	R1_S2	Vishay-Dale	CRCW04023K16FKED Series= CRCW..e3	Res= 3.16 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>
6.	R2_S2	Vishay-Dale	CRCW0402825RFKED Series= CRCW..e3	Res= 825.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>


## Filter Stage :3

Cutoff Frequency 500.0 kHz  
 Min GBW Req'd 96.5 MHz  
 Stage Gain 1.0 V/V  
 Stage Q 1.93  
 Stage Topology Multiple\_Feedback



### Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	A1_S3	Texas Instruments	OPA656N/250	GbwTyp= 500.0MHz VccMin= 7.0 V VccMax= 13.0 V	1	\$5.75	 SOT-23 14 mm <sup>2</sup>
2.	C1_S3	MuRata	GRM1555C1E431JA01D Series= C0G/NP0	Cap= 430.0 pF VDC= 25.0 V Tolerance= 5.0 %	1	\$0.01	 0402 3 mm <sup>2</sup>
3.	C2_S3	MuRata	GRM1555C1E431JA01D Series= C0G/NP0	Cap= 430.0 pF VDC= 25.0 V Tolerance= 5.0 %	1	\$0.01	 0402 3 mm <sup>2</sup>
4.	C3_S3	MuRata	GRM1555C1E751JA01D Series= C0G/NP0	Cap= 750.0 pF VDC= 25.0 V Tolerance= 5.0 %	1	\$0.02	 0402 3 mm <sup>2</sup>
5.	R1_S3	Vishay-Dale	CRCW04023K16FKED Series= CRCW..e3	Res= 3.16 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
6.	R2_S3	Panasonic	ERJ-8ENF1070V Series= ERJ-8E	Res= 107.0 Ohm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	 1206 11 mm <sup>2</sup>

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