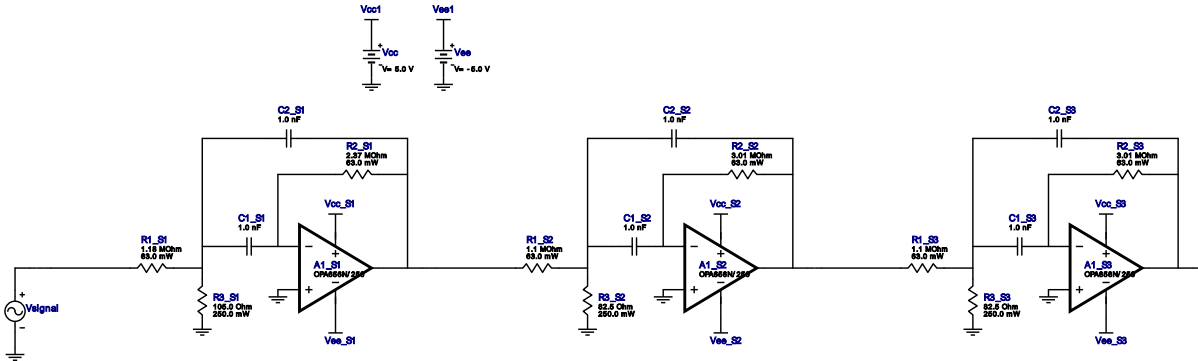


WEBENCH[®] Design Report

 Design : 3778301/3 OPA656N/250
 Bandpass, Multiple Feedback, Bessel


Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	A1_S1	Texas Instruments	OPA656N/250	GbwTyp= 500.0 MHz VccMin= 7.0 V VccMax= 13.0 V	1	\$5.75	 SOT-23 14 mm ²
2.	A1_S2	Texas Instruments	OPA656N/250	GbwTyp= 500.0 MHz VccMin= 7.0 V VccMax= 13.0 V	1	\$5.75	 SOT-23 14 mm ²
3.	A1_S3	Texas Instruments	OPA656N/250	GbwTyp= 500.0 MHz VccMin= 7.0 V VccMax= 13.0 V	1	\$5.75	 SOT-23 14 mm ²
4.	C1_S1	Samsung Electro-Mechanics	CL05C102JO5NNNC Series= C0G/NP0	Cap= 1.0 nF VDC= 16.0 V Tolerance= 5.0 %	1	\$0.01	 0402 3 mm ²
5.	C1_S2	Samsung Electro-Mechanics	CL05C102JO5NNNC Series= C0G/NP0	Cap= 1.0 nF VDC= 16.0 V Tolerance= 5.0 %	1	\$0.01	 0402 3 mm ²
6.	C1_S3	Samsung Electro-Mechanics	CL05C102JO5NNNC Series= C0G/NP0	Cap= 1.0 nF VDC= 16.0 V Tolerance= 5.0 %	1	\$0.01	 0402 3 mm ²
7.	C2_S1	Samsung Electro-Mechanics	CL05C102JO5NNNC Series= C0G/NP0	Cap= 1.0 nF VDC= 16.0 V Tolerance= 5.0 %	1	\$0.01	 0402 3 mm ²
8.	C2_S2	Samsung Electro-Mechanics	CL05C102JO5NNNC Series= C0G/NP0	Cap= 1.0 nF VDC= 16.0 V Tolerance= 5.0 %	1	\$0.01	 0402 3 mm ²
9.	C2_S3	Samsung Electro-Mechanics	CL05C102JO5NNNC Series= C0G/NP0	Cap= 1.0 nF VDC= 16.0 V Tolerance= 5.0 %	1	\$0.01	 0402 3 mm ²
10.	R1_S1	Vishay-Dale	CRCW04021M18FKED Series= CRCW..e3	Res= 1.18 MOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
11.	R1_S2	Vishay-Dale	CRCW04021M10FKED Series= CRCW..e3	Res= 1.1 MOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
12.	R1_S3	Vishay-Dale	CRCW04021M10FKED Series= CRCW..e3	Res= 1.1 MOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
13.	R2_S1	Vishay-Dale	CRCW04022M37FKED Series= CRCW..e3	Res= 2.37 MOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
14.	R2_S2	Vishay-Dale	CRCW04023M01FKED Series= CRCW..e3	Res= 3.01 MOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
15.	R2_S3	Vishay-Dale	CRCW04023M01FKED Series= CRCW..e3	Res= 3.01 MOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
16.	R3_S1	Panasonic	ERJ-8ENF1050V Series= ERJ-8E	Res= 105.0 Ohm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	1206 11 mm ²
17.	R3_S2	Panasonic	ERJ-8ENF82R5V Series= ERJ-8E	Res= 82.5 Ohm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	1206 11 mm ²
18.	R3_S3	Panasonic	ERJ-8ENF82R5V Series= ERJ-8E	Res= 82.5 Ohm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	1206 11 mm ²

Design Inputs

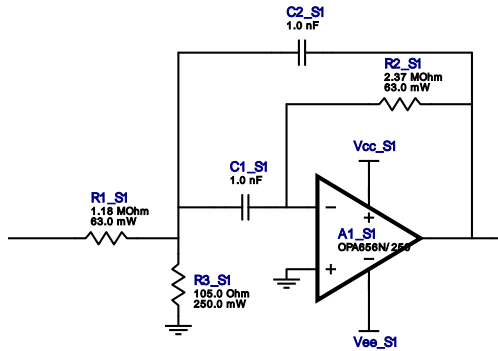
#	Name	Value	Description
1.	FilterType	Bandpass	
2.	FilterResponse	Bessel	
3.	FilterOrder	6.0	
4.	FilterTopology	Multiple_Feedback	
5.	NumberOfStages	3.0	
6.	CenterFrequency	10.0 k	
7.	StopbandAttenuation	-45.0	
8.	PassbandBandwidth	100.0	
9.	StopbandBandwidth	1,000.0	
10.	Gain	1.0	
11.	DualSupply	+/-5.0 V	Power supply(s) to active chips
12.	ResistorTolerance	E96	Resistor series - 1% Passive resistor tolerance
13.	CapacitorTolerance	E24	Capacitor series - 5% Passive capacitance tolerance
14.	SeedCapacitance	1.0 n	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 10.0 kHz
 Min GBW Req'd 75.358 MHz
 Stage Gain 1.0 V/V
 Stage Q 75.358
 Stage Topology Multiple_Feedback

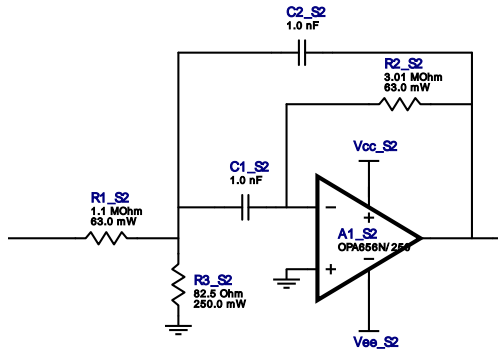


Electrical BOM







#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	A1_S1	Texas Instruments	OPA656N/250	GbwTyp= 500.0 MHz VccMin= 7.0 V VccMax= 13.0 V	1	\$5.75	 SOT-23 14 mm ²
2.	C1_S1	Samsung Electro-Mechanics	CL05C102JO5NNNC Series= C0G/NP0	Cap= 1.0 nF VDC= 16.0 V Tolerance= 5.0 %	1	\$0.01	 0402 3 mm ²
3.	C2_S1	Samsung Electro-Mechanics	CL05C102JO5NNNC Series= C0G/NP0	Cap= 1.0 nF VDC= 16.0 V Tolerance= 5.0 %	1	\$0.01	 0402 3 mm ²
4.	R1_S1	Vishay-Dale	CRCW04021M18FKED Series= CRCW..e3	Res= 1.18 MOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
5.	R2_S1	Vishay-Dale	CRCW04022M37FKED Series= CRCW..e3	Res= 2.37 MOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
6.	R3_S1	Panasonic	ERJ-8ENF1050V Series= ERJ-8E	Res= 105.0 Ohm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	 1206 11 mm ²

Filter Stage :2

Cutoff Frequency	9.95 kHz
Min GBW Req'd	94.682 MHz
Stage Gain	1.0 V/V
Stage Q	95.158
Stage Topology	Multiple_Feedback

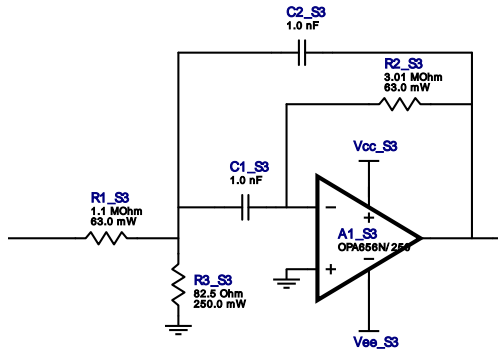


Electrical BOM






#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	A1_S2	Texas Instruments	OPA656N/250	GbwTyp= 500.0 MHz VccMin= 7.0 V VccMax= 13.0 V	1	\$5.75	 SOT-23 14 mm ²
2.	C1_S2	Samsung Electro-Mechanics	CL05C102JO5NNNC Series= C0G/NP0	Cap= 1.0 nF VDC= 16.0 V Tolerance= 5.0 %	1	\$0.01	 0402 3 mm ²
3.	C2_S2	Samsung Electro-Mechanics	CL05C102JO5NNNC Series= C0G/NP0	Cap= 1.0 nF VDC= 16.0 V Tolerance= 5.0 %	1	\$0.01	 0402 3 mm ²
4.	R1_S2	Vishay-Dale	CRCW04021M10FKED Series= CRCW...e3	Res= 1.1 MOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
5.	R2_S2	Vishay-Dale	CRCW04023M01FKED Series= CRCW...e3	Res= 3.01 MOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
6.	R3_S2	Panasonic	ERJ-8ENF82R5V Series= ERJ-8E	Res= 82.5 Ohm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	 1206 11 mm ²


Filter Stage :3

Cutoff Frequency 10.05 kHz
 Min GBW Req'd 95.636 MHz
 Stage Gain 1.0 V/V
 Stage Q 95.158
 Stage Topology Multiple_Feedback



Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	A1_S3	Texas Instruments	OPA656N/250	GbwTyp= 500.0 MHz VccMin= 7.0 V VccMax= 13.0 V	1	\$5.75	 SOT-23 14 mm ²
2.	C1_S3	Samsung Electro-Mechanics	CL05C102JO5NNNC Series= C0G/NP0	Cap= 1.0 nF VDC= 16.0 V Tolerance= 5.0 %	1	\$0.01	 0402 3 mm ²
3.	C2_S3	Samsung Electro-Mechanics	CL05C102JO5NNNC Series= C0G/NP0	Cap= 1.0 nF VDC= 16.0 V Tolerance= 5.0 %	1	\$0.01	 0402 3 mm ²
4.	R1_S3	Vishay-Dale	CRCW04021M10FKED Series= CRCW..e3	Res= 1.1 MOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
5.	R2_S3	Vishay-Dale	CRCW04023M01FKED Series= CRCW..e3	Res= 3.01 MOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
6.	R3_S3	Panasonic	ERJ-8ENF82R5V Series= ERJ-8E	Res= 82.5 Ohm Power= 250.0 mW Tolerance= 1.0%	1	\$0.01	 1206 11 mm ²

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