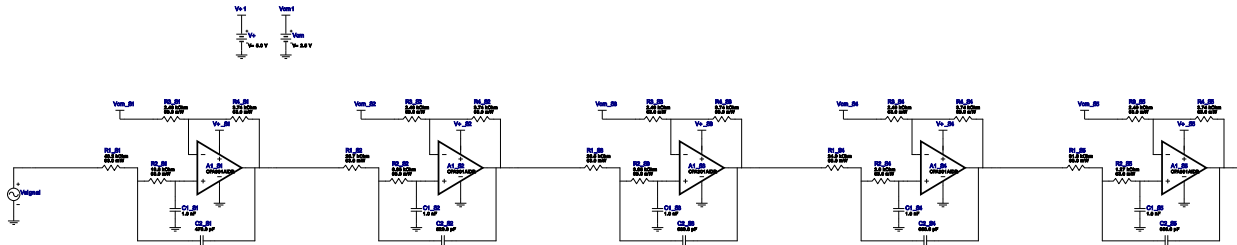


WEBENCH[®] Design Report

 Design : 4166583/19 OPA301AIDR
 Lowpass, Sallen Key, Chebyshev 0.2 dB


Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	A1_S1	Texas Instruments	OPA301AIDR	GbwTyp= 150.0 MHz VccMin= 2.7 V VccMax= 5.5 V	1	\$0.75	SOIC 0 mm ²
2.	A1_S2	Texas Instruments	OPA301AIDR	GbwTyp= 150.0 MHz VccMin= 2.7 V VccMax= 5.5 V	1	\$0.75	SOIC 0 mm ²
3.	A1_S3	Texas Instruments	OPA301AIDR	GbwTyp= 150.0 MHz VccMin= 2.7 V VccMax= 5.5 V	1	\$0.75	SOIC 0 mm ²
4.	A1_S4	Texas Instruments	OPA301AIDR	GbwTyp= 150.0 MHz VccMin= 2.7 V VccMax= 5.5 V	1	\$0.75	SOIC 0 mm ²
5.	A1_S5	Texas Instruments	OPA301AIDR	GbwTyp= 150.0 MHz VccMin= 2.7 V VccMax= 5.5 V	1	\$0.75	SOIC 0 mm ²
6.	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
7.	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
8.	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
9.	C1_S4	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.	C1_S5	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
11.	C2_S1	MuRata	GRM1555C1E471JA01D Series= C0G/NP0	Cap= 470.0 pF VDC= 25.0 V Tolerance= 5.0 %	1	\$0.01	0402 3 mm ²
12.	C2_S2	MuRata	GRM1555C1E621JA01D Series= C0G/NP0	Cap= 620.0 pF VDC= 25.0 V Tolerance= 5.0 %	1	\$0.01	0402 3 mm ²
13.	C2_S3	Samsung Electro-Mechanics	CL10C681JA8NNNC Series= C0G/NP0	Cap= 680.0 pF VDC= 25.0 V Tolerance= 5.0 %	1	\$0.01	0603 5 mm ²
14.	C2_S4	Samsung Electro-Mechanics	CL10C681JA8NNNC Series= C0G/NP0	Cap= 680.0 pF VDC= 25.0 V Tolerance= 5.0 %	1	\$0.01	0603 5 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
15.	C2_S5	Samsung Electro-Mechanics	CL10C681JA8NNNC Series= C0G/NP0	Cap= 680.0 pF VDC= 25.0 V Tolerance= 5.0 %	1	\$0.01	0603 5 mm ²
16.	R1_S1	Vishay-Dale	CRCW040240K2FKED Series= CRCW..e3	Res= 40.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
17.	R1_S2	Vishay-Dale	CRCW040226K7FKED Series= CRCW..e3	Res= 26.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
18.	R1_S3	Vishay-Dale	CRCW040220K5FKED Series= CRCW..e3	Res= 20.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
19.	R1_S4	Vishay-Dale	CRCW040224K9FKED Series= CRCW..e3	Res= 24.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
20.	R1_S5	Vishay-Dale	CRCW040231K6FKED Series= CRCW..e3	Res= 31.6 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
21.	R2_S1	Vishay-Dale	CRCW040219K6FKED Series= CRCW..e3	Res= 19.6 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
22.	R2_S2	Vishay-Dale	CRCW04026K65FKED Series= CRCW..e3	Res= 6.65 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
23.	R2_S3	Vishay-Dale	CRCW04023K65FKED Series= CRCW..e3	Res= 3.65 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
24.	R2_S4	Vishay-Dale	CRCW04022K00FKED Series= CRCW..e3	Res= 2.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
25.	R2_S5	Vishay-Dale	CRCW04021K27FKED Series= CRCW..e3	Res= 1.27 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
26.	R3_S1	Vishay-Dale	CRCW04022K49FKED Series= CRCW..e3	Res= 2.49 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
27.	R3_S2	Vishay-Dale	CRCW04022K49FKED Series= CRCW..e3	Res= 2.49 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
28.	R3_S3	Vishay-Dale	CRCW04022K49FKED Series= CRCW..e3	Res= 2.49 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
29.	R3_S4	Vishay-Dale	CRCW04022K49FKED Series= CRCW..e3	Res= 2.49 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
30.	R3_S5	Vishay-Dale	CRCW04022K49FKED Series= CRCW..e3	Res= 2.49 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
31.	R4_S1	Vishay-Dale	CRCW04023K74FKED Series= CRCW..e3	Res= 3.74 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
32.	R4_S2	Vishay-Dale	CRCW04023K74FKED Series= CRCW..e3	Res= 3.74 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
33.	R4_S3	Vishay-Dale	CRCW04023K74FKED Series= CRCW..e3	Res= 3.74 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
34.	R4_S4	Vishay-Dale	CRCW04023K74FKED Series= CRCW..e3	Res= 3.74 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
35.	R4_S5	Vishay-Dale	CRCW04023K74FKED Series= CRCW..e3	Res= 3.74 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²

Design Inputs

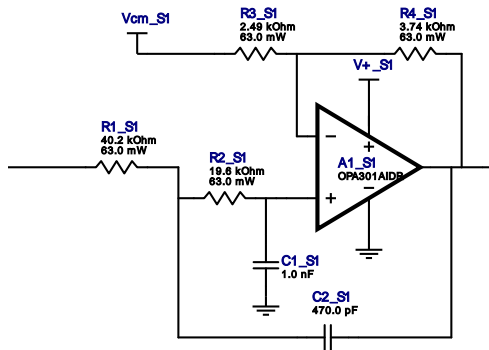
#	Name	Value	Description
1.	SingleSupply	5.0	SingleSupply
2.	FilterType	Lowpass	
3.	FilterResponse	Chebyshev	
4.	FilterOrder	10.0	
5.	FilterTopology	Sallen_Key	
6.	NumberOfStages	5.0	
7.	PassbandFrequency	30.0 k	
8.	StopbandAttenuation	-45.0	
9.	StopbandFrequency	40.0 k	
10.	Gain	100.0	
11.	ResistorTolerance	E96	Resistor series - 1% Passive resistor tolerance
12.	CapacitorTolerance	E24	Capacitor series - 5% Passive capacitance tolerance
13.	SeedCapacitance	1.0 n	Seed Capacitance to start design of filter

Design Assistance

1. **OPA301AIDR** Product Folder : <http://www.ti.com/product/OPA301> : contains the data sheet and other resources.

Filter Stage :1

Cutoff Frequency 8.223 kHz
 Min GBW Req'd 1.272 MHz
 Stage Gain 2.512 V/V
 Stage Q 616.0 m
 Stage Topology Sallen_Key

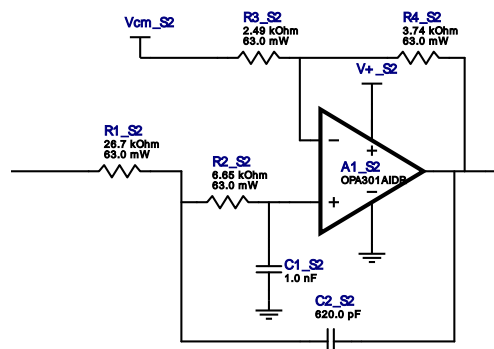


Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	A1_S1	Texas Instruments	OPA301AIDR	GbwTyp= 150.0 MHz VccMin= 2.7 V VccMax= 5.5 V	1	\$0.75	SOIC 0 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	MuRata	GRM1555C1E471JA01D Series= C0G/NP0	Cap= 470.0 pF VDC= 25.0 V Tolerance= 5.0 %	1	\$0.01	0402 3 mm ²
4.	R1_S1	Vishay-Dale	CRCW040240K2FKED Series= CRCW..e3	Res= 40.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
5.	R2_S1	Vishay-Dale	CRCW040219K6FKED Series= CRCW..e3	Res= 19.6 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
6.	R3_S1	Vishay-Dale	CRCW04022K49FKED Series= CRCW..e3	Res= 2.49 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
7.	R4_S1	Vishay-Dale	CRCW04023K74FKED Series= CRCW..e3	Res= 3.74 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²

Filter Stage :2

Cutoff Frequency 15.202 kHz
 Min GBW Req'd 4.823 MHz
 Stage Gain 2.512 V/V
 Stage Q 1.263
 Stage Topology Sallen_Key

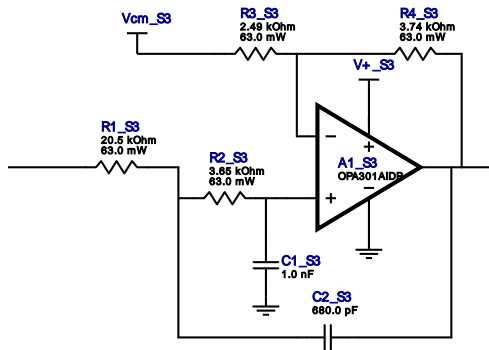


Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	A1_S2	Texas Instruments	OPA301AIDR	GbwTyp= 150.0 MHz VccMin= 2.7 V VccMax= 5.5 V	1	\$0.75	SOIC 0 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	MuRata	GRM1555C1E621JA01D Series= C0G/NP0	Cap= 620.0 pF VDC= 25.0 V Tolerance= 5.0 %	1	\$0.01	0402 3 mm ²
4.	R1_S2	Vishay-Dale	CRCW040226K7FKED Series= CRCW..e3	Res= 26.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
5.	R2_S2	Vishay-Dale	CRCW04026K65FKED Series= CRCW..e3	Res= 6.65 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
6.	R3_S2	Vishay-Dale	CRCW04022K49FKED Series= CRCW..e3	Res= 2.49 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
7.	R4_S2	Vishay-Dale	CRCW04023K74FKED Series= CRCW..e3	Res= 3.74 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²

Filter Stage :3

Cutoff Frequency 22.262 kHz
 Min GBW Req'd 13.035 MHz
 Stage Gain 2.512 V/V
 Stage Q 2.331
 Stage Topology Sallen_Key

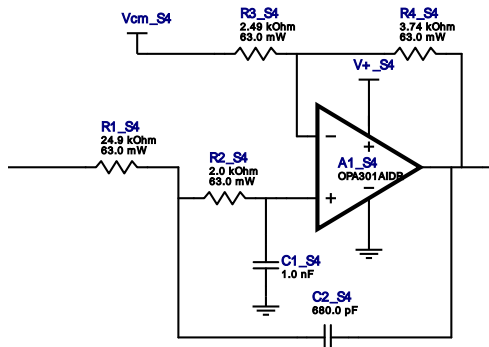


Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	A1_S3	Texas Instruments	OPA301AIDR	GbwTyp= 150.0 MHz VccMin= 2.7 V VccMax= 5.5 V	1	\$0.75	SOIC 0 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	CL10C681JA8NNNC Series= C0G/NP0	Cap= 680.0 pF VDC= 25.0 V Tolerance= 5.0 %	1	\$0.01	0603 5 mm ²
4.	R1_S3	Vishay-Dale	CRCW040220K5FKED Series= CRCW..e3	Res= 20.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
5.	R2_S3	Vishay-Dale	CRCW04023K65FKED Series= CRCW..e3	Res= 3.65 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
6.	R3_S3	Vishay-Dale	CRCW04022K49FKED Series= CRCW..e3	Res= 2.49 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
7.	R4_S3	Vishay-Dale	CRCW04023K74FKED Series= CRCW..e3	Res= 3.74 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²

Filter Stage :4

Cutoff Frequency 27.57 kHz
 Min GBW Req'd 31.144 MHz
 Stage Gain 2.512 V/V
 Stage Q 4.497
 Stage Topology Sallen_Key

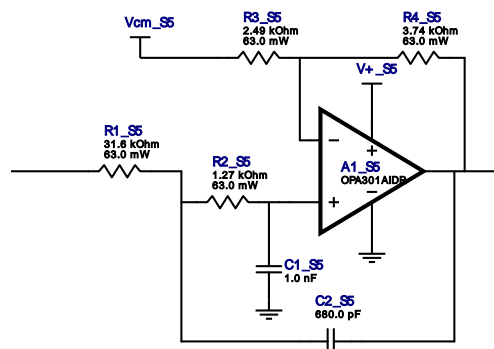


Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	A1_S4	Texas Instruments	OPA301AIDR	GbwTyp= 150.0 MHz VccMin= 2.7 V VccMax= 5.5 V	1	\$0.75	SOIC 0 mm ²
2.	C1_S4	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_S4	Samsung Electro-Mechanics	CL10C681JA8NNNC Series= C0G/NP0	Cap= 680.0 pF VDC= 25.0 V Tolerance= 5.0 %	1	\$0.01	0603 5 mm ²
4.	R1_S4	Vishay-Dale	CRCW040224K9FKED Series= CRCW..e3	Res= 24.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
5.	R2_S4	Vishay-Dale	CRCW04022K00FKED Series= CRCW..e3	Res= 2.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
6.	R3_S4	Vishay-Dale	CRCW04022K49FKED Series= CRCW..e3	Res= 2.49 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
7.	R4_S4	Vishay-Dale	CRCW04023K74FKED Series= CRCW..e3	Res= 3.74 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²

Filter Stage :5

Cutoff Frequency 30.39 kHz
 Min GBW Req'd 109.816 MHz
 Stage Gain 2.512 V/V
 Stage Q 14.385
 Stage Topology Sallen_Key



Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	A1_S5	Texas Instruments	OPA301AIDR	GbwTyp= 150.0 MHz VccMin= 2.7 V VccMax= 5.5 V	1	\$0.75	SOIC 0 mm ²
2.	C1_S5	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_S5	Samsung Electro-Mechanics	CL10C681JA8NNNC Series= C0G/NP0	Cap= 680.0 pF VDC= 25.0 V Tolerance= 5.0 %	1	\$0.01	0603 5 mm ²
4.	R1_S5	Vishay-Dale	CRCW040231K6FKED Series= CRCW..e3	Res= 31.6 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
5.	R2_S5	Vishay-Dale	CRCW04021K27FKED Series= CRCW..e3	Res= 1.27 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
6.	R3_S5	Vishay-Dale	CRCW04022K49FKED Series= CRCW..e3	Res= 2.49 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
7.	R4_S5	Vishay-Dale	CRCW04023K74FKED Series= CRCW..e3	Res= 3.74 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²

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