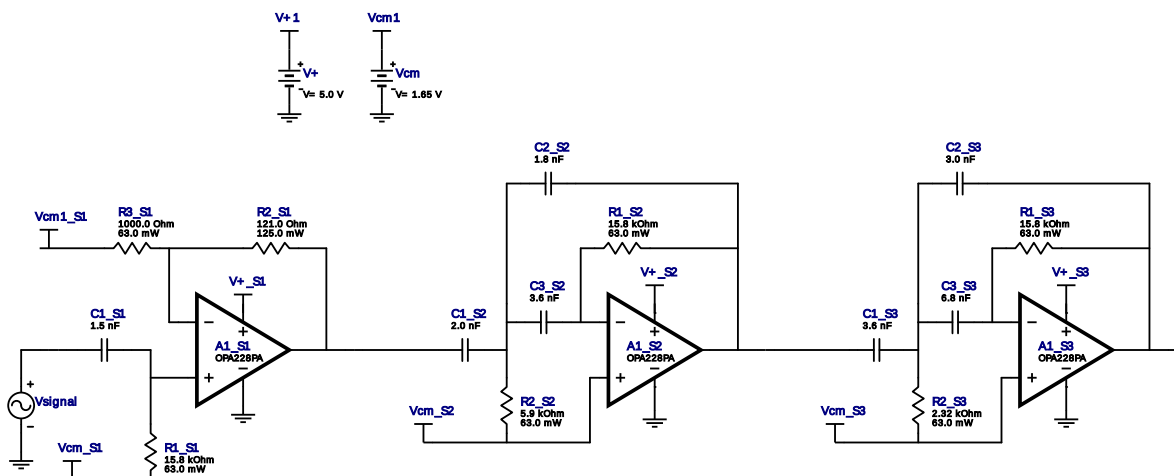


WEBENCH® Design Report

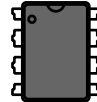
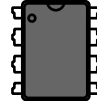
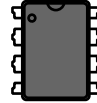
Design : 1194016/2199 OPA228PA
Highpass, Multiple Feedback, Bessel



My Comments

No comments

Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	A1_S1	Texas Instruments, Inc.	OPA228PA	GbwTyp= 33.0MHz VccMin= 5.0 V VccMax= 36.0 V	1	\$1.40	 P0008A 116 mm ²
2.	A1_S2	Texas Instruments, Inc.	OPA228PA	GbwTyp= 33.0MHz VccMin= 5.0 V VccMax= 36.0 V	1	\$1.40	 P0008A 116 mm ²
3.	A1_S3	Texas Instruments, Inc.	OPA228PA	GbwTyp= 33.0MHz VccMin= 5.0 V VccMax= 36.0 V	1	\$1.40	 P0008A 116 mm ²
4.	C1_S1	MuRata	GRM1885C1H152JA01D Series= C0G/NP0	Cap= 1.5 nF VDC= 50.0 V Tolerance= 5.0 %	1	\$0.01	 0603 5 mm ²
5.	C1_S2	MuRata	GRM1885C1H202JA01D Series= C0G/NP0	Cap= 2.0 nF VDC= 50.0 V Tolerance= 5.0 %	1	\$0.01	 0603 5 mm ²
6.	C1_S3	MuRata	GRM1885C1H362JA01D Series= C0G/NP0	Cap= 3.6 nF VDC= 50.0 V Tolerance= 5.0 %	1	\$0.03	 0603 5 mm ²
7.	C2_S2	MuRata	GRM1885C1H182JA01J Series= C0G/NP0	Cap= 1.8 nF VDC= 50.0 V Tolerance= 5.0 %	1	\$0.01	 0603 5 mm ²
8.	C2_S3	MuRata	GRM1885C1H302JA01D Series= C0G/NP0	Cap= 3.0 nF VDC= 50.0 V Tolerance= 5.0 %	1	\$0.03	 0603 5 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	C3_S2	MuRata	GRM1885C1H362JA01D Series= C0G/NP0	Cap= 3.6 nF VDC= 50.0 V Tolerance= 5.0 %	1	\$0.03	0603 5 mm ²
10.	C3_S3	AVX	06035A681JAT2A Series= C0G/NP0	Cap= 6.8 nF VDC= 50.0 V Tolerance= 5.0 %	1	\$0.04	0603 5 mm ²
11.	R1_S1	Vishay-Dale	CRCW040215K8FKED Series= CRCW..e3	Res= 15.8 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
12.	R1_S2	Vishay-Dale	CRCW040215K8FKED Series= CRCW..e3	Res= 15.8 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
13.	R1_S3	Vishay-Dale	CRCW040215K8FKED Series= CRCW..e3	Res= 15.8 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
14.	R2_S1	Vishay-Dale	CRCW0805121RFKEA Series= CRCW..e3	Res= 121.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	0805 7 mm ²
15.	R2_S2	Vishay-Dale	CRCW04025K90FKED Series= CRCW..e3	Res= 5.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
16.	R2_S3	Vishay-Dale	CRCW04022K32FKED Series= CRCW..e3	Res= 2.32 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
17.	R3_S1	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²

Design Inputs

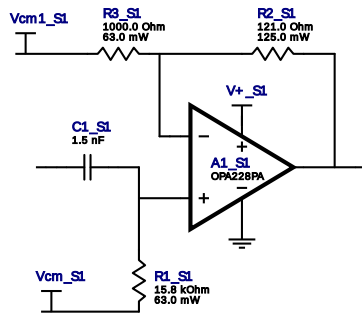
#	Name	Value	Description
1.	FilterType	Highpass	
2.	FilterResponse	Bessel	
3.	FilterOrder	5.0	
4.	FilterTopology	Multiple_Feedback	
5.	NumberOfStages	3.0	
6.	PassbandFrequency	10.0 k	
7.	StopbandAttenuation	-45.0	
8.	StopbandFrequency	2.0 k	
9.	Gain	1.413	
10.	SingleSupply	3.3	Power supply(s) to active chips
11.	ResistorTolerance	E96	Resistor series - 1% Passive resistor tolerance
12.	CapacitorTolerance	E24	Capacitor series - 5% Passive capacitance tolerance
13.	SeedCapacitance	1.0 n	Seed Capacitance to start design of filter

Design Assistance

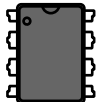
1. **OPA228PA** Product Folder : <http://www.ti.com//product/OPA228> : contains the data sheet and other resources.

Filter Stage :1

Cutoff Frequency 6.636 kHz
 Min GBW Req'd 372.263 kHz
 Stage Gain 1.122 V/V
 Stage Q 500.0 m
 Stage Topology Real_Pole

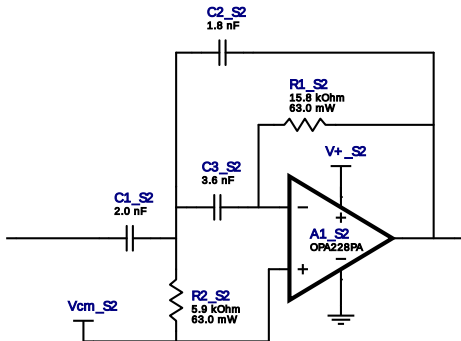


Electrical BOM

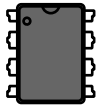
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	A1_S1	Texas Instruments, Inc.	OPA228PA	GbwTyp= 33.0MHz VccMin= 5.0 V VccMax= 36.0 V	1	\$1.40	 P0008A 116 mm ²
2.	C1_S1	MuRata	GRM1885C1H152JA01D Series= C0G/NP0	Cap= 1.5 nF VDC= 50.0 V Tolerance= 5.0 %	1	\$0.01	 0603 5 mm ²
3.	R1_S1	Vishay-Dale	CRCW040215K8FKED Series= CRCW..e3	Res= 15.8 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
4.	R2_S1	Vishay-Dale	CRCW0805121RFKEA Series= CRCW..e3	Res= 121.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
5.	R3_S1	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²

Filter Stage :2

Cutoff Frequency 6.406 kHz
 Min GBW Req'd 402.511 kHz
 Stage Gain 1.122 V/V
 Stage Q 560.0 m
 Stage Topology Multiple_Feedback

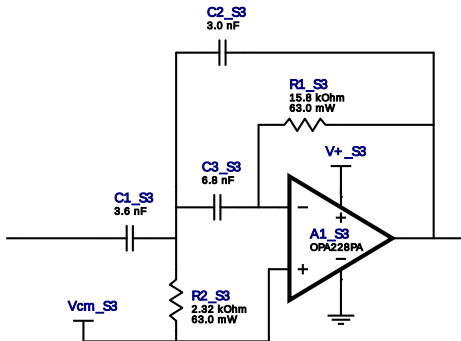


Electrical BOM

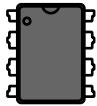
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	A1_S2	Texas Instruments, Inc.	OPA228PA	GbwTyp= 33.0MHz VccMin= 5.0 V VccMax= 36.0 V	1	\$1.40	 P0008A 116 mm ²
2.	C1_S2	MuRata	GRM1885C1H202JA01D Series= C0G/NP0	Cap= 2.0 nF VDC= 50.0 V Tolerance= 5.0 %	1	\$0.01	 0603 5 mm ²
3.	C2_S2	MuRata	GRM1885C1H182JA01J Series= C0G/NP0	Cap= 1.8 nF VDC= 50.0 V Tolerance= 5.0 %	1	\$0.01	 0603 5 mm ²
4.	C3_S2	MuRata	GRM1885C1H362JA01D Series= C0G/NP0	Cap= 3.6 nF VDC= 50.0 V Tolerance= 5.0 %	1	\$0.03	 0603 5 mm ²
5.	R1_S2	Vishay-Dale	CRCW040215K8FKED Series= CRCW..e3	Res= 15.8 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
6.	R2_S2	Vishay-Dale	CRCW04025K90FKED Series= CRCW..e3	Res= 5.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²

Filter Stage :3

Cutoff Frequency 5.679 kHz
 Min GBW Req'd 586.167 kHz
 Stage Gain 1.122 V/V
 Stage Q 920.0 m
 Stage Topology Multiple_Feedback



Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	A1_S3	Texas Instruments, Inc.	OPA228PA	GbwTyp= 33.0MHz VccMin= 5.0 V VccMax= 36.0 V	1	\$1.40	 P0008A 116 mm ²
2.	C1_S3	MuRata	GRM1885C1H362JA01D Series= C0G/NP0	Cap= 3.6 nF VDC= 50.0 V Tolerance= 5.0 %	1	\$0.03	 0603 5 mm ²
3.	C2_S3	MuRata	GRM1885C1H302JA01D Series= C0G/NP0	Cap= 3.0 nF VDC= 50.0 V Tolerance= 5.0 %	1	\$0.03	 0603 5 mm ²
4.	C3_S3	AVX	06035A681JAT2A Series= C0G/NP0	Cap= 6.8 nF VDC= 50.0 V Tolerance= 5.0 %	1	\$0.04	 0603 5 mm ²
5.	R1_S3	Vishay-Dale	CRCW040215K8FKED Series= CRCW..e3	Res= 15.8 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
6.	R2_S3	Vishay-Dale	CRCW04022K32FKED Series= CRCW..e3	Res= 2.32 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²

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