AMZ Message Board Archives

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You'll find a wealth of information in this collection of old forum postings, including some interesting history of the Shaka III, Mini-Booster and Mini-Tubes. It's well worth browsing these old messages for the questions (and answers), tips and ideas that have been previously discussed.

AMZ Op-Amp Noise Calculator

Enter the values into the form below and hit submit to calculate the total opamp noise.

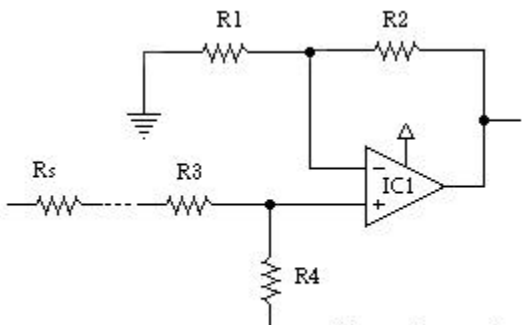
nV/root Hz Equivalent Input Noise Voltage
pA/root Hz Equivalent Input Noise Current
ohms, Non-inverting resistance
ohms, Inverting resistance
Submit Reset

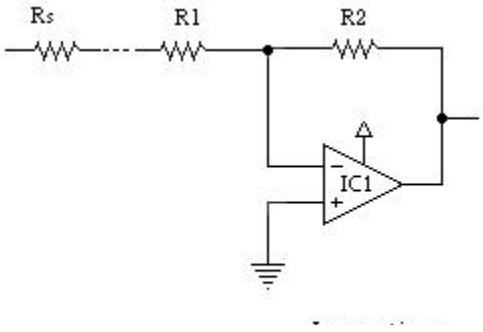
The Equivalent Input Noise and Current values are found on almost every op-amp datasheet. Be sure to check that the specifications are in the proper units of measure. For instance, the Input Current is sometimes listed in fA instead of pA (1000 fA = 1 pA).

The source impedance Rs is the impedance (or reactance) of the device that is driving the op-amp input. It may be a guitar pickup, microphone, tube output or another op-amp. With the non-inverting op-amp, the Source impedance will be added to any input resistance R3 and used as the non-inverting resistance (R4 is not used). The R1 value will be the inverting input resistance value and R2 not used.

With an inverting opamp, the value of the source impedance is added to the value of the input resistor R1. Usually there is no resistor on the non-inverting input as shown in the drawing, but if there is one, then the value should be entered. Once again, ignore R2.

This is the simplified version of the calculations and parallel resistances and capacitor reactances have been eliminated for simplicity so the results may be compared to those in the table below. The calculations are based on 75°F (about 24°C) but the temperature does not make much difference unless it is extremely different from the nominal.





I have calculated the total input noise of a large selection of op-amps to serve as a general selection table for different circuits when driven by some common signal sources. One thing that is immediately noticeable is that chips that work well for microphone amplifiers do not give the same low noise performance when driven by a guitar pickup or piezo transducer. All of the measurements are for 1k Hz. which is commonly used in specifications.

A 150 ohm interface is common for microphone amplifiers, a 5k pickup would be a single coil and a 12k pickup would be a typical humbucker. Piezo pickups are basically capacitive but we can calculate the reactance of one at 1k Hz and use that as the basis for the noise table.

The numbers in the table are not meant to be 100% exact however they will be correct relative to each other for purposes of selecting an op-amp for use in a design. Lower noise numbers are quieter; high slew rates will indicate a wider bandwidth. Noise specs at 1k Hz were used.

Two commonly used chips stand out as being poor performers, the LM324 and the TL062, while the common TL072 gives good results across the board.

Noise figures for comparative purposes only:

Total Calculated Noise, nV					
	150ohm Mic	5k Pickup	12k Pickup	Piezo Pickup	Slew Rate V/µS
SSM2017	2.98	13.6	27.9	1064.1	17
TL072	18.1	20.6	23.2	95.1	13
MC33178	7.8	12.5	16.5	122.8	2
MC33272	18.1	20.7	23.9	281.5	10
LF353	25.1	26.9	28.9	96.6	13
OP275	6.4	13.9	24.0	800.5	22
RC4560	7.3	12.3	16.9	231.7	1.6
LM833	5.0	11.2	16.4	281.0	7
OP227	3.3	10.4	15.6	231.6	2.8
LT1028	2.4	11.2	18.9	538.1	15
LT1007	3.3	10.4	15.6	231.6	2.5
TLC2272	9.3	13.4	17.1	93.7	3.6
RC4559	10.2	14.3	18.7	281.1	2
NE5532	5.5	11.7	17.6	382.6	9
AD711	18.1	20.6	23.2	95.1	16
AD797	2.4	14.3	28.2	1064.1	20
INA103	2.5	14.3	28.2	1064.1	15
OPA2111	8.3	12.7	16.6	93.7	2

OPA2227	3.7	10.6	15.7	231.6	2.3
OPA2604	11.2	14.8	18.3	94.0	25
OPA27	3.9	10.6	15.7	231.6	1.9
OPA270	3.9	10.6	15.7	231.6	3
LM318	23.1	25.2	27.9	281.9	70
LT1028	2.4	11.2	18.9	538.1	30
LT1115	2.4	11.7	20.6	642.8	20
SSM2275	8.3	13.5	19.9	486.1	12
LM324	23.1	25.2	27.9	281.9	0.25
TL052	18.1	20.6	23.2	95.1	18
TL062	42.1	43.5	46.1	539.8	3.5

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