

MX•COM, INC. MiXed Signal ICs

APPLICATION NOTE

MX009 and MX019 Amplifier Array

The MX009 and MX019 offer 8 and 4 digitally controlled gain/attenuation amplifiers respectively.

MX009	MX019	
7 Amplifiers	3 Amplifiers	+3dB to -3dB adjustment range in 0.43dB steps
1 Amplifier	1 Amplifier	+15dB to -15dB adjustment range in 2dB steps

In certain applications it may be necessary to trim over a wider dynamic range or use smaller step sizes. This can be achieved by grouping the amplifier stages together either in series or parallel.

The 2 following examples show a typical application of:

1. Series connection of 2 amplifiers to achieve trimming over a 30dB dynamic range in 0.43dB steps.
2. Parallel connection of 2 amplifiers to achieve approximately 0.21dB steps over a 6dB dynamic range.

Example 1: 0.43dB steps over a 30dB dynamic range

This is achieved by connecting the volume amplifier stage in series with 1 of the other amplifier stages as shown in the diagram below.

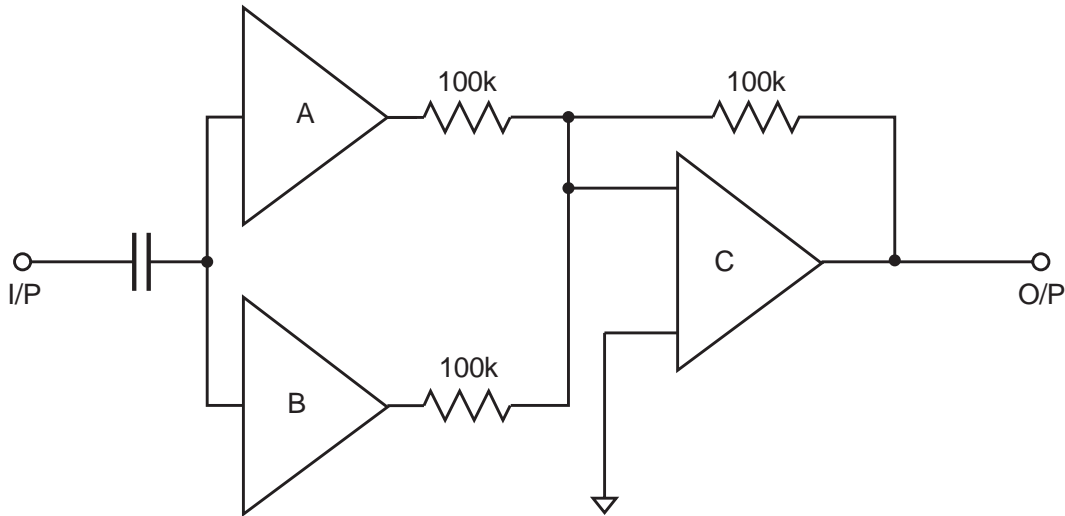


Note:

1. A - MX009 Amplifier no. 8 (MX009 Amplifier no.4) (Volume).
2. B - Any of the MX009 Amplifiers 1 through 7 (MX019 Amplifiers 1 through 3)

Example 2: 0.21dB steps over a 6dB dynamic range

A very fine step size of approximately 0.21dB can be obtained over a 6dB dynamic range by the connection of 2 amplifiers in parallel.



Note:

1. A & B - Any MX009 Amplifiers 1 through 7 (MX019 Amplifiers 1 through 3)
2. C - Standard CMOS Amplifier.

The table shows all possible combinations of gain on each of the 2 amplifiers, many of which are duplicated. The highlighted section shows 1 of the possible combinations to achieve an output dynamic of 6dB with approximately 0.21dB steps.

	3.00	2.57	2.14	1.71	1.29	0.66	0.43	0.00	-0.43	-0.86	-1.29	-1.71	-2.14	-2.57	-3.00
3.00	3.00	2.79	2.58	2.38	2.19	1.99	1.81	1.83	1.45	1.28	1.12	0.96	0.80	0.65	0.51
2.57	2.79	2.57	2.36	2.15	1.95	1.76	1.57	1.38	1.20	1.03	0.86	0.69	0.53	0.38	.022
2.14	2.58	2.36	2.14	1.93	1.72	1.52	1.33	1.14	0.95	0.77	0.60	0.43	0.26	0.10	-0.05
1.71	2.38	2.15	1.93	1.71	1.50	1.30	1.10	0.90	0.71	0.52	0.34	0.17	0.00	-0.17	-0.33
1.29	2.19	1.95	1.72	1.50	1.29	1.07	0.87	0.67	0.47	0.28	0.09	-0.09	-0.26	-0.43	-0.60
0.88	1.99	1.76	1.52	1.30	1.07	0.86	0.65	0.44	0.24	0.04	-0.15	-0.33	-0.51	-0.69	-0.86
0.43	1.81	1.57	1.33	1.10	0.87	0.65	0.43	0.22	0.01	-0.19	-0.39	-0.58	-0.76	-0.94	-1.12
0.00	1.83	1.38	1.14	0.90	0.67	0.44	0.22	0.00	-0.21	-0.42	-0.62	-0.81	-1.01	-1.19	-1.37
-0.43	1.45	1.20	0.95	0.71	0.47	0.24	0.01	-0.21	-0.43	-0.64	-0.85	-1.05	-1.24	-1.43	-1.62
-0.86	1.28	1.03	0.77	0.52	0.28	0.04	-0.19	-0.42	-0.84	-0.86	-1.07	-1.28	-1.48	-1.67	-1.86
-1.29	1.12	0.86	0.60	0.34	0.09	-0.15	-0.39	-0.62	-0.85	-1.07	-1.29	-1.50	-1.70	-1.90	-2.10
-1.71	0.96	0.69	0.43	0.17	-0.09	-0.33	-0.58	-0.81	-1.05	-1.28	-1.50	-1.71	-1.93	-2.13	-2.33
-2.14	0.80	0.53	0.26	0.00	-0.26	-0.51	-0.76	-1.01	-1.24	-1.48	-1.70	-1.93	-2.14	-2.35	-2.56
-2.57	0.65	0.38	0.10	-0.17	-0.43	-0.69	-0.94	-1.19	-1.43	-1.67	-1.90	-2.13	-2.35	-2.57	-2.78
-3.00	0.51	0.22	-0.05	-0.33	-0.60	-0.86	-1.12	-1.37	-1.62	-1.88	-2.10	-2.33	-2.56	-2.78	-3.00