Subject: Piezo info
Posted by RMW on Sun, 26 Dec 2004 02:50:49 GMT
View Forum Message <> Reply to Message

Forgive me if this has been discussed previously. I noticed in the diagrams for the Studio Series system that there are no resistors or capacitors connected to the piezo horn tweeter. Has anyone here experimented with Mr. Risch's recommendations?(cut and paste, most of the below information credited to JON RISCH)Q. The Parts Express catalog suggests putting a 20-Ohm resister inline with any Piezo tweeter to make it a more stable load for an amp.Will this not also attenuate the tweeter? If so, and if I need further attenuation, can I simply add more resistance? Is there a rule of thumb for how much attenuation I will get with further resistance, or a way to compute this number?A. The recommended resistor is to help protect the amplifier from oscillating due to the raw capacitance that is a piezo driver. Adding resistance in series with a piezo will actually roll off the highs a bit, adding more will roll off the highs noticably. To attenuate a piezo, add a series cap, which creates a voltage divider with the capacitance that is the piezo drive element. Most piezo elements run in the 0.1 to 0.26 uF range, so a cap of the same value as the piezo element will attenuate it 6 dB.Piezo's can be crossed over, and to great advantage. I have often thought that some of the bad rap piezo drivers have is due to the "you can use them without a crossover" fallacy. Yes, you _can_ use them without a crossover, but just because you can get away with it, does not mean it is optimal.Since most piezo's are used in inexpensive systems, the cost of adding in "unecessary" components is often never even considered.How to cross over a piezo:Add a resistor in parallel, and the driver can be made to look like a current driven device to any outside components, such as a crossover cap. However, to keep costs and power dissipation down, 8 ohms is way too small of a value. The impedance of most piezo's is still quite high at 20KHz, so use a 22 ohm resistor, this makes any series crossover cap smaller and less expensive, and the resistor dissipates less energy. Use of an 8 ohm parallel resistor will also tend to lose you a little bit of output level.For most piezos, use of a 22 ohm resistor, and a 4-4.7 uF cap will allow the response to be identical to what it was in stock form, but rolls off the lows at 6 dB/oct below 1 kHz or so. This actually increases the power handling of the piezo, as it is voltage limited. Exceed the voltage used to pole (polarize the piezo element during manufacture) the unit, and it will loose sensitivity, and eventually burn out. Most pro grade piezos will handle 35 volt transients, and 28 volts continuous, which are 150 watts and 100 watts into 8 ohms respectively.Add in a capacitor and 22 ohm resistor, and the power handling could effectively be quadrupled, as the LF voltages are not imposed upon the unit, just the HF voltages.Piezo's crossed over in this manner don't sound as harsh and spity, and tend to be quite a bit more reliable. Many of the piezo units have a mild peak just before they roll off in the LF, so making the series cap a little smaller can actualy flatten response, and provide even more protection and smoother sound. For the smaller piezo units that cut off at 4-5 kHz, a series cap of 1.5 uF will do the trick, larger units that go down to 3 kHz can use a 2.2 uF, and the large compression driver units meant to be mounted on a horn need about 5 uF, as they do not peak, and any higher would lose the sloping output even more.Attenuation, HF roll-off AND the crossing over can all be done at the same time. To attenuate, place a cap in between the piezo and the 22 ohm resistor that is shunting across the unit, then if HF roll-off is desired, use a series resistor in this location too. Then the series crossover cap should be in front of the 22 ohm shunt.Looking from the amp, first the series crossover cap, say 4 uF, then the 22 ohm shunt from hot to ground, then a series cap of about 0.15 uF for 6 dB attenuation, and then a series resistor of about 30-50 ohms to tame the very top end, then the piezo itself.Thanks for any replies, and best of the Season to all, especially Wayne,

who sent me a reply on Christmas morning!

Subject: Re: Piezo info
Posted by Wayne Parham on Sun, 26 Dec 2004 03:39:49 GMT
View Forum Message <> Reply to Message

I've used many other circuits for the KSN1038 besides direct-connect but in this case, it's just perfect.I've used high-order and low-order crossovers. I've used series attenuators. I've used series attenuators with and without an attenuator. I've used them with shunt resistance to make them appear resistive and with series resistors to reduce the possibility of ultrasonic oscillation in amps that are so inclined. Some of my speaker designs required crossover components for

Speakers forum and the piezoelectric tweeter datasheet, so you can find other ways to implement the tweeter in those sources of information.Here's the straight scoop. There is no harm using any of these implementations for specific purpose. But there is also no harm removing all of the components and connecting directly. It should not be seen as a lesser implementation any more than seeing the use of a ten dollar tweeter is seen as a lesser implementation. It is a fine part for its cost, one of the best in the under-$20 class, if you asked me. Response of the KSN1038 is good and it is a very durable part.The thing is that the KSN1038 has a small peak aroud 5kHz. Not bad, and not as much of a peak as the response at 20kHz droops. So I don't consider it to be a deal breaker. But if you need crossover at 3.5kHz, you will have to live with this small peak. If you crossover above 5kHz, then you won't have it. But you will still have slightly falling response as frequency goes up, much like any other compression tweeter.When used with an Alpha 8 or an Alpha 10, the KSN1038 is best wired direct-connect. Any increase of the crossover point above the tweeter's natural slope will make a hole in response. Any series capacitance will reduce the tweeters sensitivity, and it is already below that of the Alpha midwoofer. Any series resistance will make the top octave response droop, and the tweeter already has falling response so that will tend to make it worse.In my opinion, there are good reasons to consider using this tweeter with no aditional passive components. It is just as valid a connection method as using it with crossover and/or impedance control components. It depends what you are trying to do. When a KSN1038 is used with an Alpha 8 or Alpha 10 to form a two-way loudspeaker, direct connection of the tweeter is the best implementation that I've found.
