

## Ultrasonic Amplifier

Ultrasonic amplifier is a lab equipment that amplifies voltage signal at high frequencies. Unlike audio frequencies which are between 20Hz and 20kHz, ultrasonic-frequencies are greater than 20kHz and into the hundreds kilo-Hertz and even MHz. Common ultrasonic amplifier applications are piezo transducer and sensor. Ultrasound sensors and transducers are generally capacitive. At high frequencies, these transducers impedance are low. They requires high-current amplifier to drive these transducers at these supersonic frequencies.

In addition to high current, piezo ultrasonic transducers require high voltage. Their required voltage is usually greater than 10V and up to 100V or higher. Most signal sources such as those function generator are less than 5V, but ultrasonic devices need higher voltage. Therefore a high-voltage **ultrasonic power amplifier** is needed. For example, a piezoelectric speaker needs an 50Vpp sine-wave, but a signal generator output is 5V maximum. Using the TS250 to amplify the signal source and it outputs high voltage and high current ultrasonic waveform that drives the piezo speaker. In summary the TS250 is an ideal ultrasonic amplifier driver.

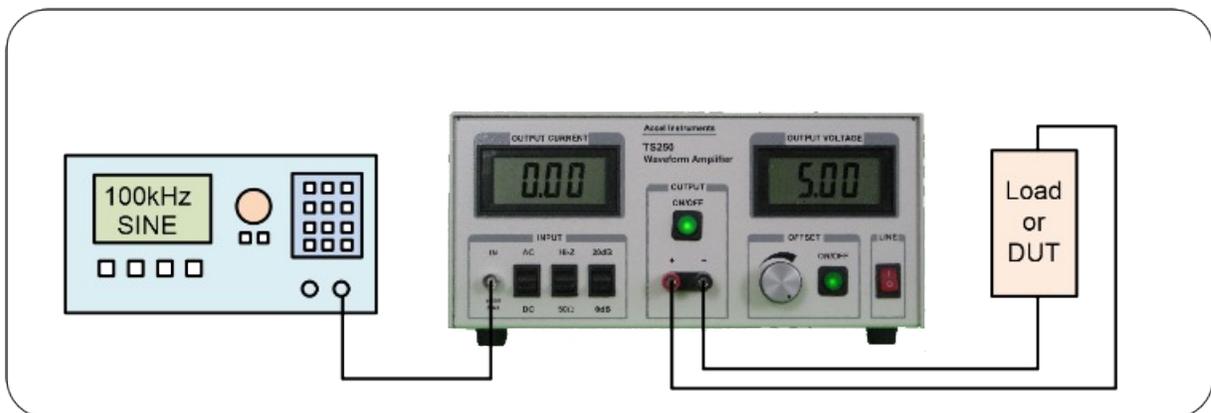


Figure 1. High-frequency signal from a waveform generator is amplified to drive a load.

## Ultrasonic Amplifier Applications

- Ultrasonic Amplifier
- Piezo Ultrasonic Transducer Amplifier
- Ultrasound Cleaning Applications
- Ultrasound Transmitter
- Ultrasound Scientific Experiments
- Wide Band Amplifier
- High-Frequency Power Amplifier

## Ultrasonic Amplifier Voltage Waveform Examples

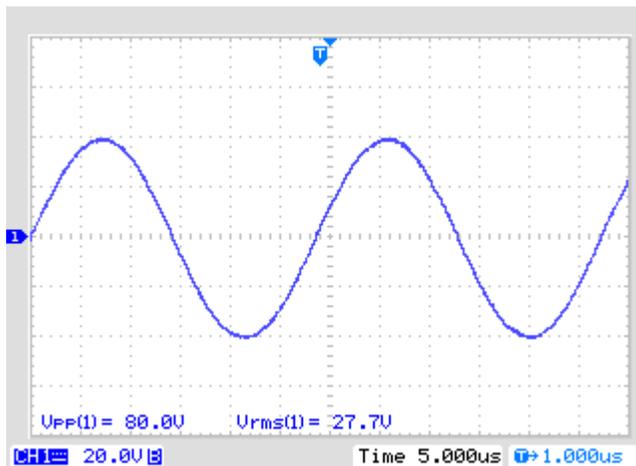


Figure 2. TS250-3 generates 80Vpp 35kHz ultrasound sinewave into 15 ohm load which is +/-2.7A current

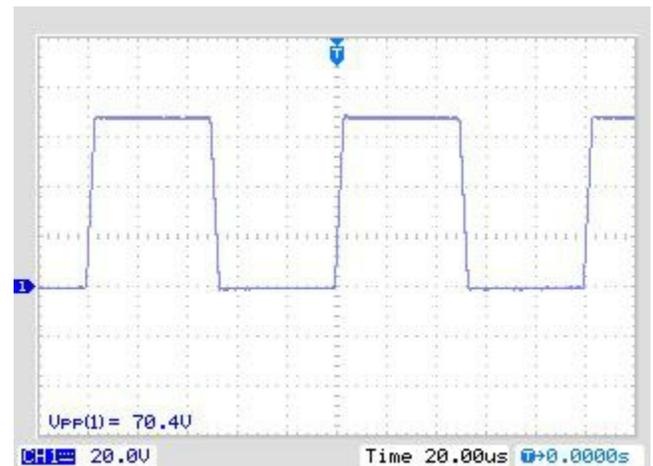


Figure 3. TS200-3B drives 70Vpp square-wave into a 220pF load.

Figure 2 and Figure 3 show examples of high-frequency waveform from the TS250 and TS200 ultrasonic amplifier. They can produce up to 80Vpp high-voltage waveform for driving ultrasound components.

## Selecting An Ultrasonic Power Amplifier

The TS200 and TS250 are high-current amplifier and high-voltage ultrasonic amplifiers. Unlike other ultrasonic piezo amplifiers available today, the TS200 and TS250 are able to output very high current at supersonic frequencies. Table 1 below shows the amplifier output current and voltage range.

The TS250-0 can drive 6A peak current into a piezoelectric device as a load. If the high-frequency device requires higher current, two or more TS250 can be connected in parallel as shown in Figure 4. Contact factory for details on higher output current.

Model	Voltage Range	DC Current	Max Peak Current
TS200-0A/B	-10V to + 10V	0 – 4.0A	0 – 5.0A
TS200-1B	-20V to + 20V	0 – 2.8A	0 – 3.8A
TS200-2B	-20V to + 45V	0 – 1.4A	0 – 2.0A
TS200-3B	-10V to + 70V	0 – 1.4A	0 – 2.0A
TS200-4A/B	0V to + 15V	0 – 3.5A	0 – 4.5A
TS200-5B	-40V to + 40V	0 – 1.4A	0 – 2.0A
TS250-0	-10V to + 10V	0 – 5.0A	0 – 6.0A
TS250-1	-20V to + 20V	0 – 3.1A	0 – 4.4A
TS250-2	-30V to + 30V	0 – 2.1A	0 – 3.0A
TS250-3	-40V to + 40V	0 – 1.7A	0 – 2.5A
TS250-4	-6V to + 15V	0 – 4.0A	0 – 5.0A
TS250-5	-6V to + 30V	0 – 2.1A	0 – 3.0A
TS250-6	-6V to + 45V	0 – 1.7A	0 – 2.5A
TS250-7	-6V to + 65V	0 – 2.1A	0 – 2.5A

## Increase Ultrasonic Driver Output Current

While the TS250 and the TS200 are designed to output high current in the range of 1.4A to 6A (See selection guide for output current and voltage). Higher current are often required for some experiments and testing applications. To obtain higher current, two or more TS200/TS250 ultrasonic power amplifiers may be connected in parallel as shown in Figure 4. Their total current is proportional to how many units connected in parallel. When connect ultrasonic transducer amplifiers in parallel, a small resistor in series is needed to isolated the driver amps from one other. It is recommended to use  $0.3\Omega$  to  $1.0\Omega$  series resistance. Use larger resistance for higher output voltage. Due to high current, the isolation resistors must be able handle the power dissipation.

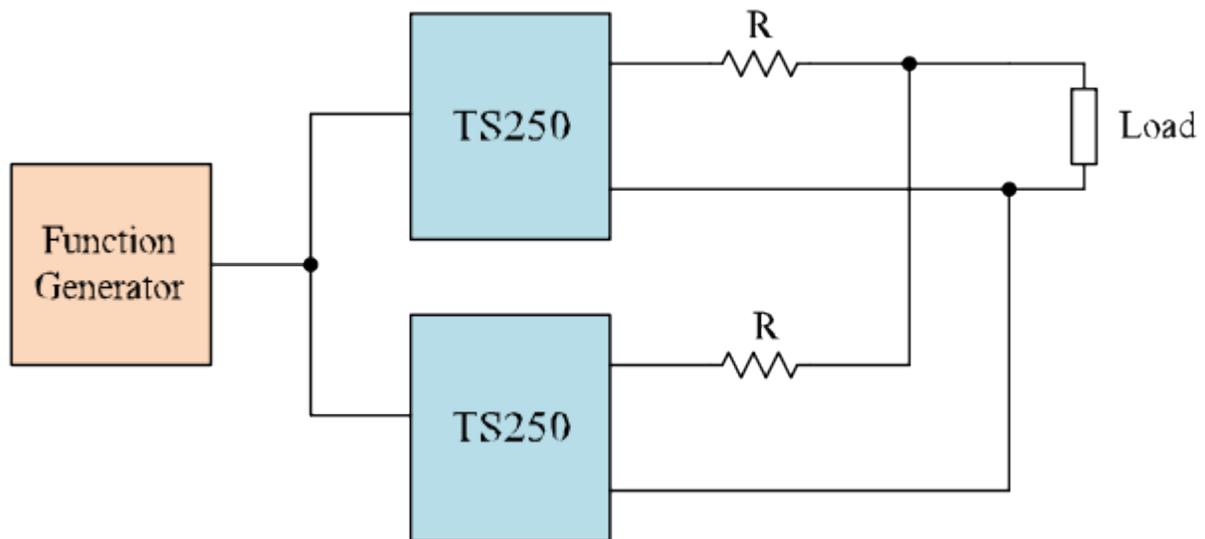


Figure 4. Parallel two TS250 ultrasonic transducer amplifiers doubles the output current.

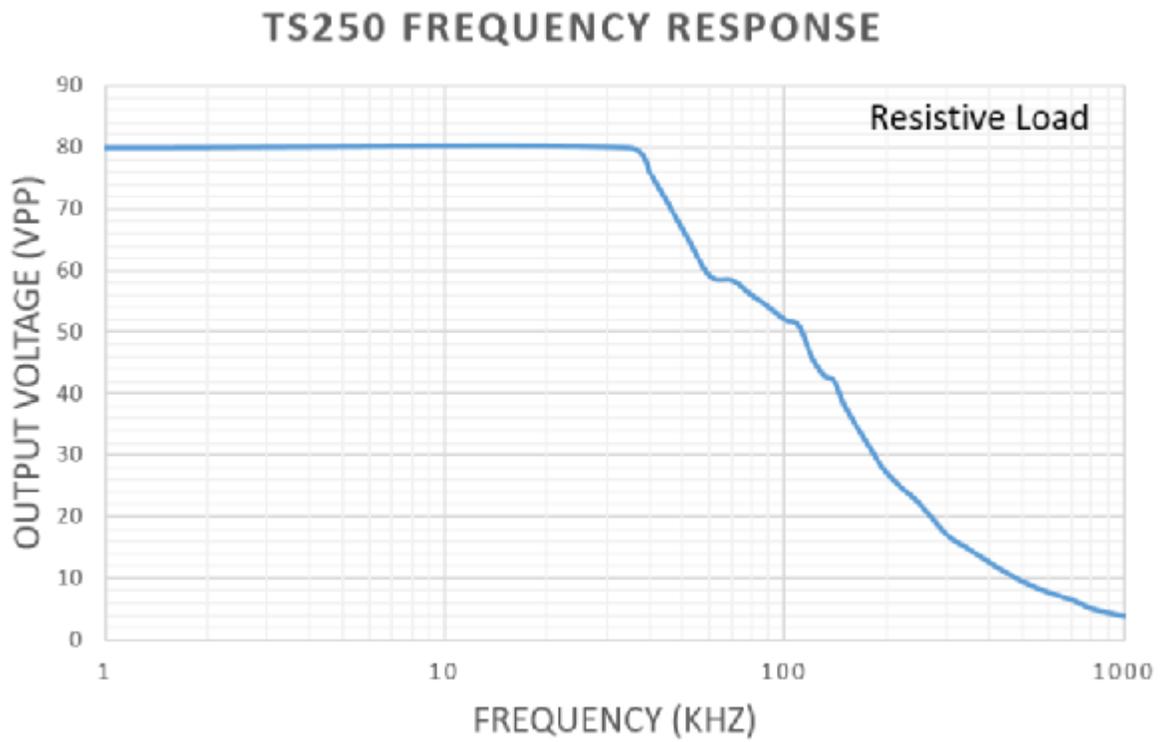


Figure 5. TS250 ultrasonic driver amplifier frequency response.