

# 80 kHz Cylindrical Ultrasound Transducer

Omni-directional Horizontal Beam Directivity  
Broad Bandwidth  
Low Resonance Q  
Excellent Impact Resistance  
Lightweight  
Low Cost



**Piezoelectric Film (PVDF) 80 kHz Ultrasound Transducers** offer unique advantages for air ranging applications. Cylindrical 80kHz PVDF transducers exhibit omni-directional horizontal beam directivity and broad bandwidth characteristics. These characteristics lend unique solutions in many applications such as two-dimensional positioning, digitizer, object detection, and distance measurement. Depending on the applications, resonance frequency and vertical beam directivity of the transmitter can easily be customized by changing the diameter and length of the PVDF cylinder.

PVDF ultrasound transducers also have very low resonance "Q" values. Typically, PVDF transmitters have a Q value of 5. This means that the signal rise and decay times are much shorter than conventional ceramic ultrasound transducers. This characteristic is ideal for positioning applications.

## FEATURES

- PVDF Thickness: 30  $\mu\text{m}$
- Resonance Frequency: 80-90 kHz
- Resonance Q: 4-8 Transmitter; 6-9 Receiver
- Sound Pressure Output: 6 mPa/Vp 102 dB
- Sensitivity: 0.3 mV/Pa, -90 dB
- Horizontal Beam Directivity: 360°
- Vertical Beam Directivity:  $\pm 25^\circ$
- Capacitance: 200 pF
- Drive Voltage: max 400 Vp, max. 100 Vp
- Storage Temperature: -20°C to +85°C
- Operating Temperature: +5°C to +60°C

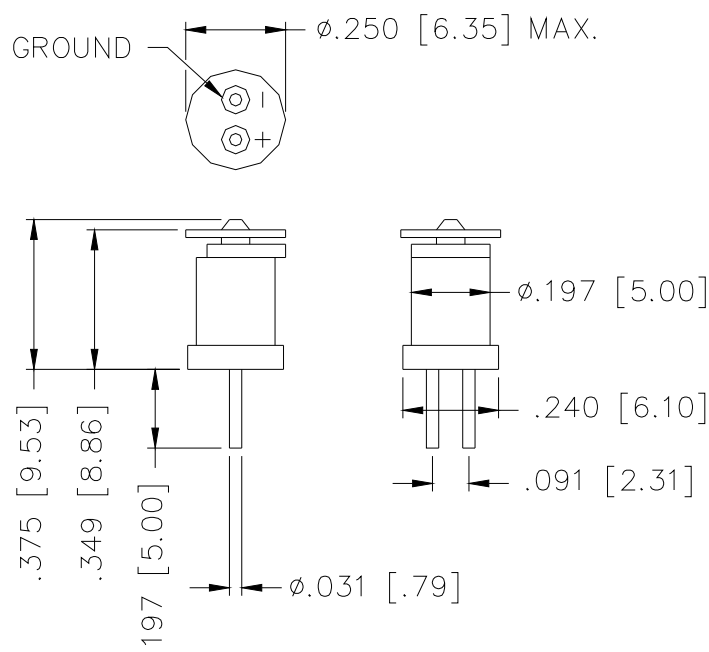
## APPLICATIONS

- Air Ranging Distance Measurement
- Object Detection
- Position Detection
- Digitizers
- Ultrasonic Mouse

## specifications

Characteristics	Transmitter Mode	Receiver Mode	Units
PVDF Thickness	30	30	μm
Resonance Frequency	80 – 90	80 – 90	kHz
Resonance Q	4 – 8	6 - 9	
Sound Pressure Output	6		mPa/V
	102		dB
Sensitivity		0.3	mPa/V
		-90	dB
Horizontal Beam Directivity	360	360	Degree
Vertical Beam Directivity	±25	±25	Degree
Capacitance	200	200	pF
Drive Voltage	max 400		Vp
	max 100		
Storage Temperature	-20 to +85	-20 to +85	°C
Operating Temperature	+5 to +60	+5 to +60	°C

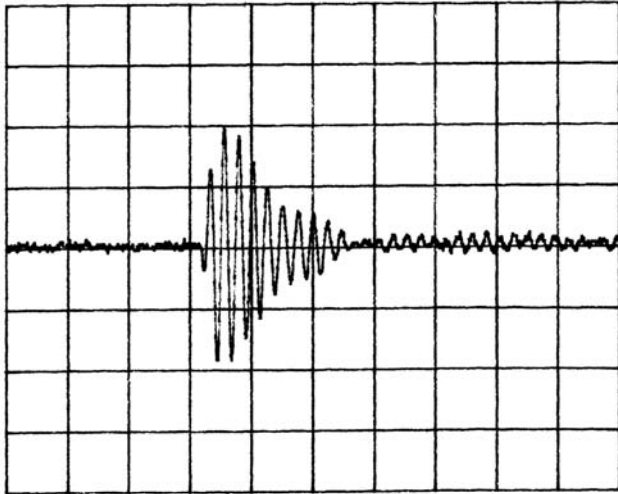
## mechanical dimensions



### (a) Transmitter Drive Circuit Example

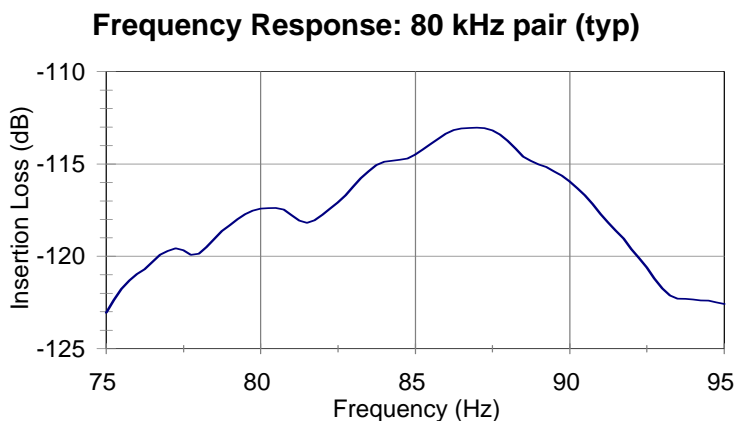


## Typical Time Response of PVDF Transmitter and Receiver System



The plot at left shows the time-domain response obtained when one device is driven as a transmitter, and another is used as receiver at a distance of 30 cm. The drive signal comprised a single cycle at 400 V pk-pk. Receiver gain was +26 dB.

(Scale: time (X) 50 us/div, amplitude (Y) 2mV/div)



The plot at left shows an estimate of the frequency response curve for two identical units, one driven as transmitter, the other acting as a receiver. The spectrum of the received signal was divided by that of the drive signal and gain stage, giving the overall insertion loss as a function of frequency (measured at 30 cm distance, in air).

Note that the Q factor (center frequency divided by  $-6$  dB bandwidth) for the complete system is very low: around 5.4 in the plot shown above. The minimum value of insertion loss was  $-113$  dB at 87 kHz. This means that a 1Vrms drive signal at this frequency would create a 2.2  $\mu$ Vrms response. Thus, higher voltage drive signals are preferred (see section entitled "Design Notes" below), and relatively high gain may be required in the receiver electronics.

## design notes

- Transmitter sound pressure output is linearly proportional to the drive voltage.
- Maximum drive voltage for PVDF transmitter is 400 V<sub>peak</sub> for a single pulse and 100 V<sub>peak</sub> for continuous pulses.
- Operating frequency may be selected in the range 80KHz to 90KHz (low Q transducer).
- Shielding is necessary for the ultrasound receiver and preamplifier circuit to minimize electromagnetic pick-up. Make sure the outer electrode of PVDF receiver is grounded.
- Input capacitance of preamplifier should be less than PVDF receiver capacitance (200pF typical) to minimize loading effects.
- To maximize S/N ratio, a narrow band-pass filter is recommended. On the other hand, if the filter has too narrow a pass-band, signal strength may be decreased. An example of pass band is 70KHz - 100K.
- Selection of input resistance is important to maximize the S/N (10M ohm is used in the above preamplifier circuit example).
- Low noise amplifiers are recommended.

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## ordering information

Description	Part #
80KHz Transducer w/o cage	1005919-1

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