

Air Transmission



Ultrasonic Sensor



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Features

Air transmission ultrasonic sensors using piezo ceramic elements transmit or receive ultrasonic sound in air. They have wide application in measurement and communications. Nippon Ceramic can offer a wide range of standard products or can provide optimal solutions to your specific requirements.

Type

• OPEN APERTURE TYPE

High sound pressure, high sensitivity sensor with unimorph and radial cone construction. Open aperture is especially for air medium application.

Low reverberation type is also available for pulsed driving.

Standard housing size : 10, 12, 16, 18, 24[mm]

Standard frequency : 25, 32, 40, 50[KHz]

• DRIP PROOF TYPE

Water drip proof, dust proof outdoor model. All the components are enclosed in metal housing. Metal surface treatment is available for severe ambient condition.

Standard housing size : 12, 14, 15, 18[mm]

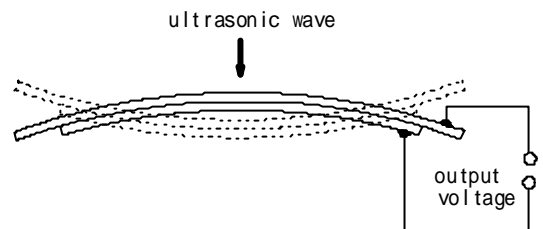
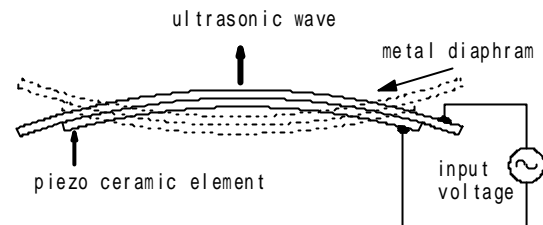
Standard frequency : 40[KHz]

Application

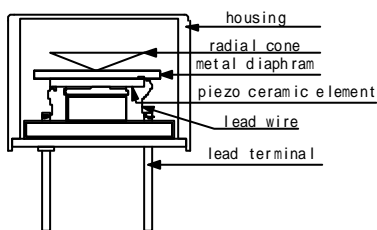
No.	Application	Method
1	Car alarm system	Doppler
2	Lighting control	"
3	Parking aid sensor	Pulse burst
4	Automatic door control	"
5	Liquid level measurement	"
6	Distance measurement	"
7	Traffic signal control	"

Principle of operation

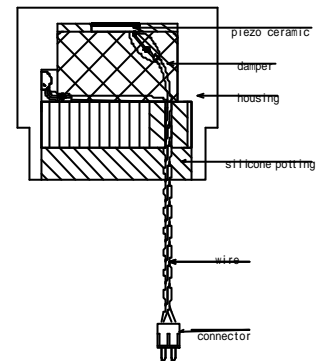
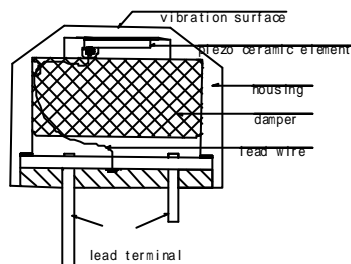
When driven from an alternating voltage source of suitable frequency, the polarized piezoelectric element mechanically distorts in proportion to the applied voltage generating a sound field. Conversely an element subjected to such a sound field will generate a voltage proportional to its intensity. The effect can be enhanced by gluing the element to a metal diaphragm, which is known as unimorph structure. When signal voltage is applied to this unimorph vibrator it creates a bending vibration. When the signal frequency meets the mechanical resonance frequency the vibrator transmits ultrasound most efficiently. This operation is used as a transmitter. When incoming ultrasound vibrates the vibrator at resonance frequency the mechanical bending vibration efficiently generates electric voltage between the vibrator electrodes. This operation is used as a receiver.



Open Aperture Type



Drip Proof Type



Model code description

(example) P T 40 - 18

1 2 3 4

- 1 : P : Drip Proof
- 2 : T : Transmitter
- R : Receiver
- C : Common
- 3 : Center frequency[KHz]
- 4 : Housing diameter[mm]

Specifications

Open Aperture Type

Item		Center Frequency (KHz)	Sound Pressure (dB)	Sensitivity (dB)	- 6dB Directivity Typical (deg)	Equivalent Circuit				Appearance
						Cb (PF)	R ()	L (mH)	Ca (PF)	
Type	Model									
Transmitter /Receiver	ST/R25-16KI	25	> 110	> - 65	80	T 2000	1000	130	130	C
						R 2400	1000	130	130	
	AT/R40-10P	40	122 ± 3	- 62.5 ± 3	100	2700	700	80	200	A
	AT/R40-12P		> 112	> - 70	85	2100	1000	80	100	B
	T/R40-16P		> 115	> - 67	55	2100	800	130	130	C
T/R40-16	> 115		> - 67	55	2100	800	130	130	D	
Common use	C40-16PU		-	1 > - 58	55	2200	1700	140	100	C
	C40-16U		-	1 > - 58	55	2200	1700	140	100	D

1 : Reflected sensitivity

2 : All products Maximum input voltage 20Vrms

Appearance

A	B
C	D

Designs and specifications are subject to change without notice.

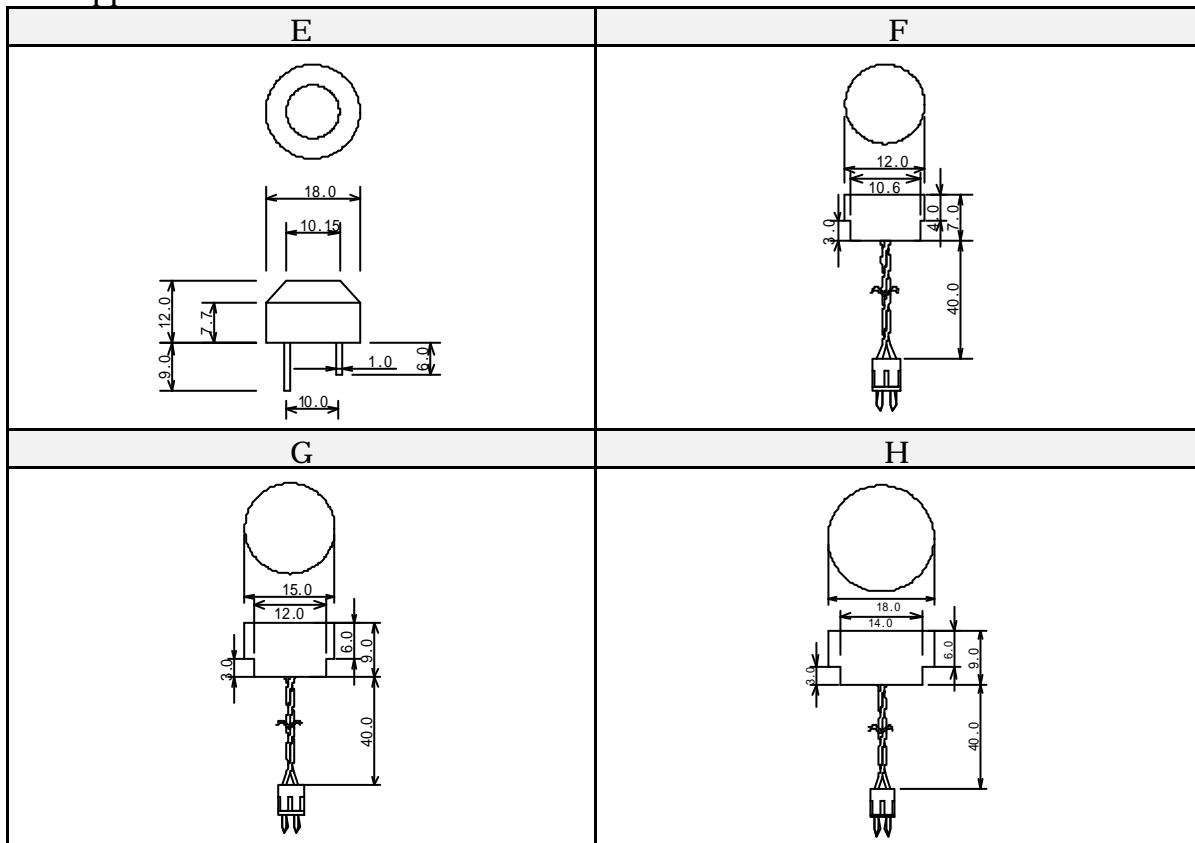
Drip Proof Type

Item		Center Frequency (KHz)	Sound Pressure (dB)	Sensitivity (dB)	- 6dB Directivity Typical (deg)	Equivalent Circuit				Appearance
						Cb (PF)	R ()	L (mH)	Ca (PF)	
Type	Model									
Conical	PT/R40-18S	40	> 106	- 78	80	2200	200	130	130	E
	PC40-18S		> 100	- 80	80	2200	400	130	130	E

Item		Center Frequency (KHz)	Dicay Time (msec)	Reflected Sensitivity (mVp-p)	- 6dB Directivity (deg)		Equivalent Circuit				Appearance
					Horizontal	Vertical	Cb (PF)	R ()	L (mH)	Ca (PF)	
Type	Model										
Flat 3	PC40S-12	40	1.5 >	> 1	100	55	1500	1200	170	100	F
	PC40S-15		1.5 >	> 1	110	50	1650	1700	110	150	G
	PC40S-18F		1.7 >	> 1	105	45	1650	1150	270	60	H

3:Patent pending

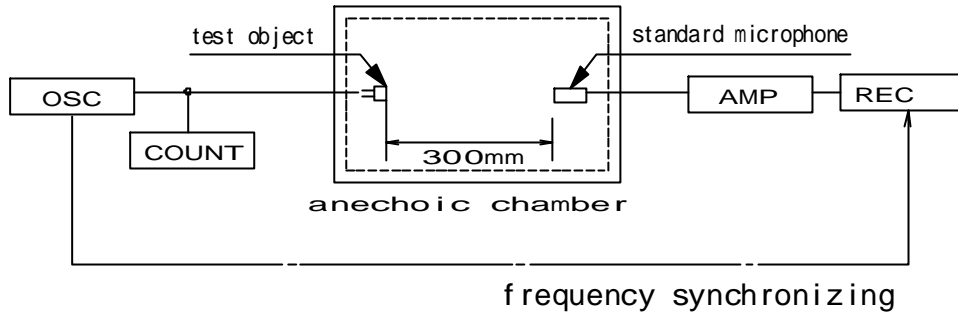
Appearance



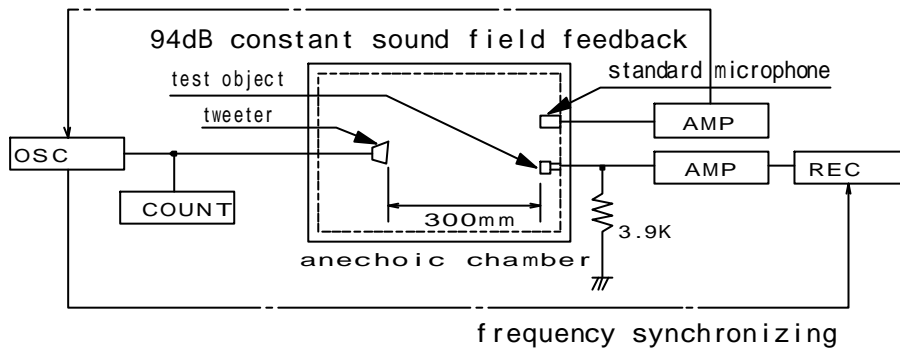
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Test circuit

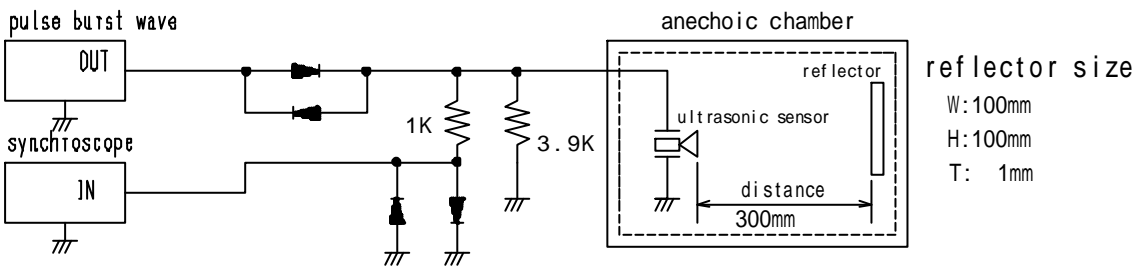
**Frequency characteristic
Transmitter(SPL) :0dB=0.0002 μ bar**



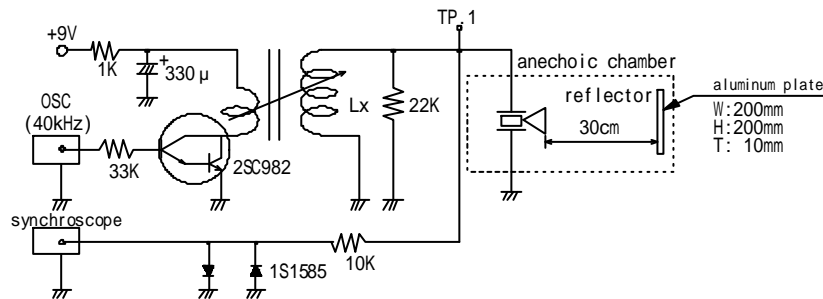
**Frequency characteristic
Receiver(sensitivity) :0dB=1V/ μ bar**



**Reflected sensitivity (model : C40-16PU, C40-16U)
(Standard level 0dB = Appended voltage 20Vpp)**



Reflected sensitivity (Flat type)



Reference circuit

1. Crystal-oscillating circuit	2. C&R-oscillating circuit
<p>FREQ = 40KHz</p>	<p>FREQ = 40KHz</p>
3. Receiver circuit	4. Voltage multiplier circuit
<p>FREQ = 40KHz</p>	<p>FREQ = 40KHz</p>
5. Pulse transmitter circuit	
<p>FREQ = 40KHz</p>	
6. Transmitter/ receiver circuit	Precaution to be taken in use
<p>FREQ = 40KHz</p>	<ol style="list-style-type: none"> 1. Locate sensor paying attention to the direction of radiation. 2. Do not apply DC voltage to avoid insulation resistance deterioration. 3. Sensor is designed for air transmission, not water. 4. Hold the sensor housing with soft material like sponger rubber to avoid noise upon impact.