

# Air Transmission Ultrasonic Sensor



Shanghai  
**Nicera**

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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 :  $\Phi 10$ ,  $\Phi 12$ ,  $\Phi 16$ [mm]

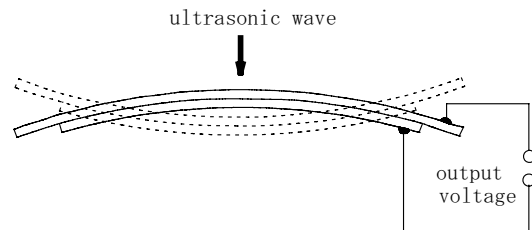
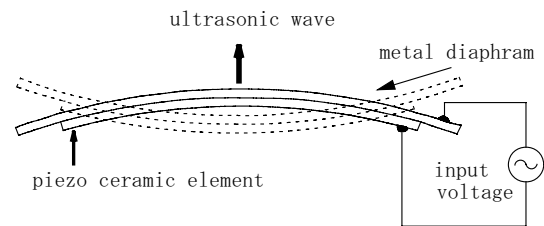
Standard frequency : 25, 32, 40[kHz]

## Application

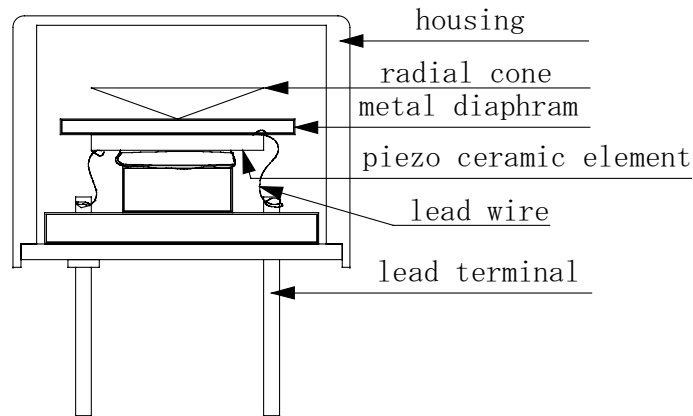
No.	Application	Method
1	Car alarm system	Doppler
2	Lighting control	„
3	Parking aid sensor	Pulse burst
4	Automatic door control	„
5	Liquid level measurement	„
6	Distance measurement	„
7	Traffic signal control	„
8	Robot	„

## 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



#### ◆ Model code description ◆

(example) (Z) (T) (40) - (16) (P)

※1 ※2 ※3 ※4 ※5

※ 1 : Z : Company Inner code

※ 2 : T : Transmitter

R : Receiver

C : Common

※ 3 : Center frequency [KHz]

※ 4 : Housing diameter [ mm ]

※ 5 : P : Plastic case

No Letter : Aluminum case

## Specifications

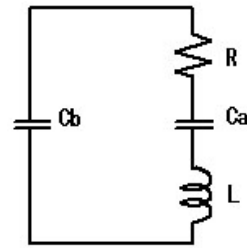
### ◆ Open Aperture Type ◆

Item		Center Frequency (kHz)	Sound Pressure (dB)	Sensitivity (dB)	-6 dB Directivity Typical (deg)	Equivalent Circuit				Appearance
Type	Model					Cb(PF)	R(Ω)	L(mH)	Ca(PF)	
Transmitter/Receiver	ST25-16	25	>110	-	85	2000	1000	250	160	C
	SR25-16		-	>-65	85	2400	1000	270	160	
	AT40-10P	40	>110	-	100	2700	700	80	200	A
	AR40-10P		-	>-67	100	2700	700	85	200	
	AT40-12P		>112	-	85	2100	1000	100	160	B
	AR40-12P		-	>-68	85	2100	1000	108	160	
	ZT40-16		>115	-	55	2100	800	120	130	C
	ZR40-16		-	>-67	55	2100	800	130	130	
	T32-16	32	>114	-	55	2100	800	120	130	D
	R32-16		-	>-67	55	2100	800	130	130	
Common use	ZC40-16	40	-	-58 ※1	55	2200	1700	160	100	C

※1 : Reflected sensitivity

※2 : All products Maximum input voltage 20Vrms  
(10Vrms is exceptionally applied to the 10mm diameter products)

<Equivalent Circuit>



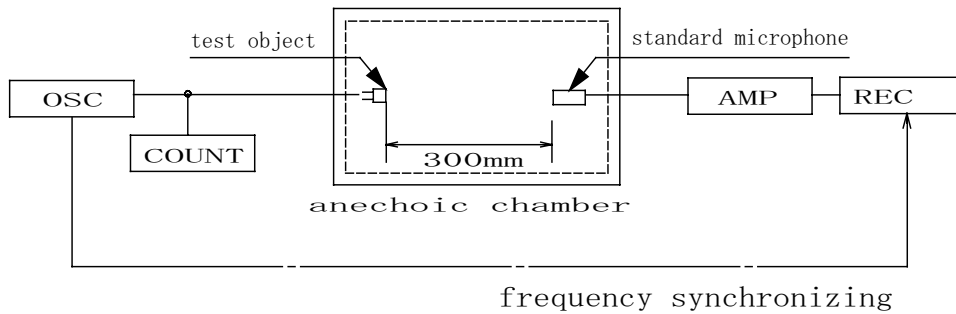
### ◆ Appearance I ◆

A	B
C	D

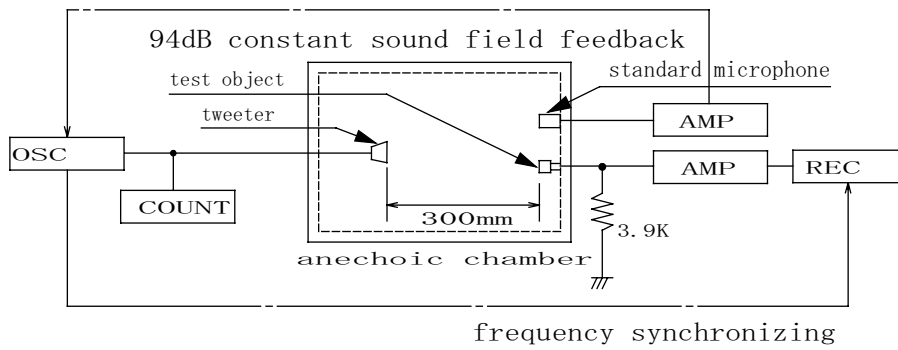
※ Designs and specifications are subject to change without notice.

Test circuit

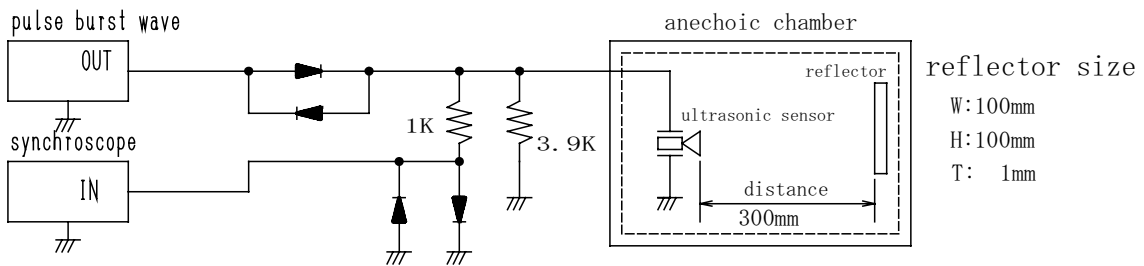
Frequency characteristic  
Transmitter(SPL) :0dB=0.0002  $\mu$  bar



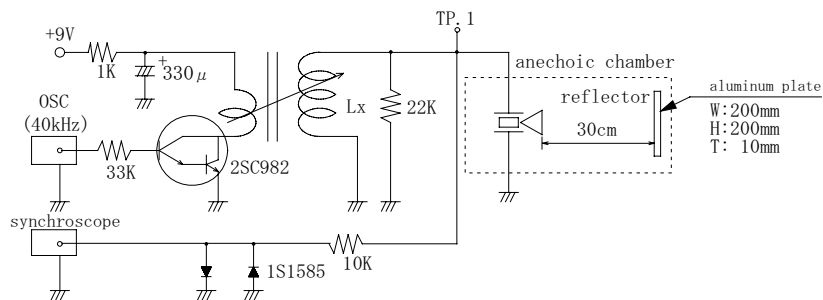
Frequency characteristic  
Receiver(sensitivity) :0dB=1V/  $\mu$  bar



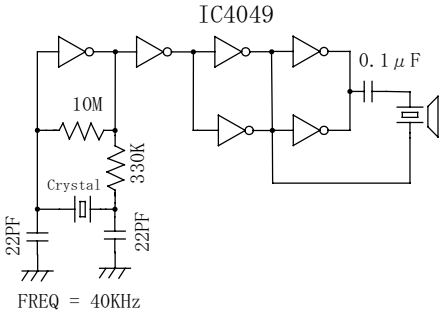
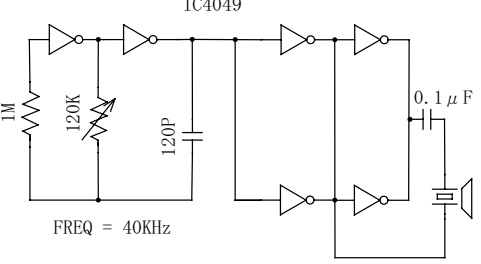
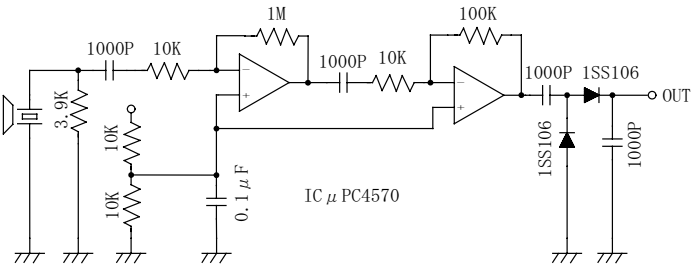
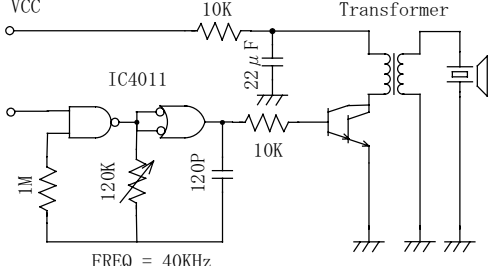
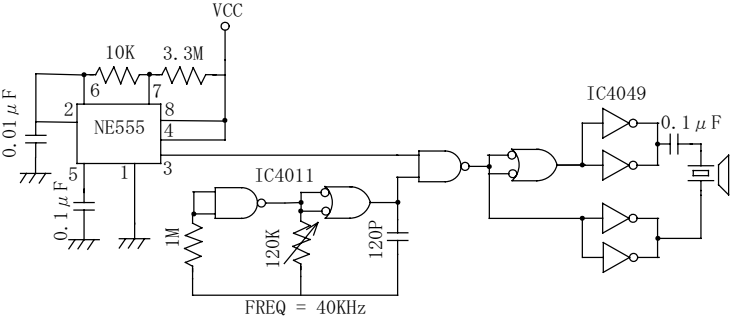
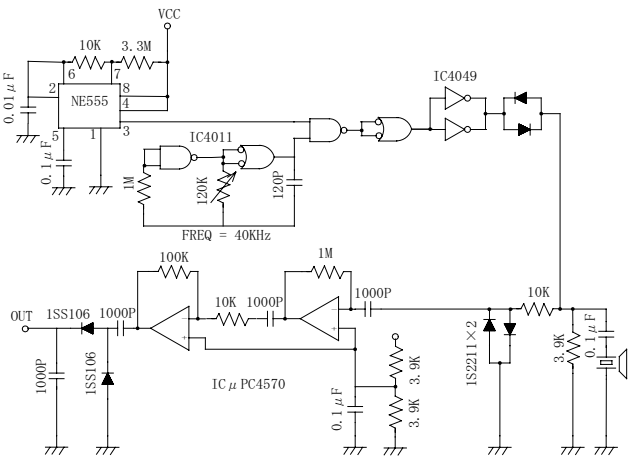
Reflected sensitivity ( model : ZC40-16 )  
(Standard level 0dB = Appended voltage 20Vpp)



Reflected sensitivity ( Flat type)



## Reference circuit

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