

# SENSORS

## ULTRASONIC SENSORS

### MA40 SERIES



#### MA40 SERIES OPEN TYPE FEATURES

- Small size: 10 and 16
- Combined types
- High SPL types
- Low voltage/current types

#### APPLICATIONS

- Burglar alarms
- Object detection devices
- Distance measurement devices

#### MA40E SERIES WATERPROOF TYPE FEATURES 40kHz Sensors

- Waterproof
- Many types leaded/not
- Short ringing time
- Directive models

#### APPLICATIONS

- Rear backing sonar
- Corner sonar

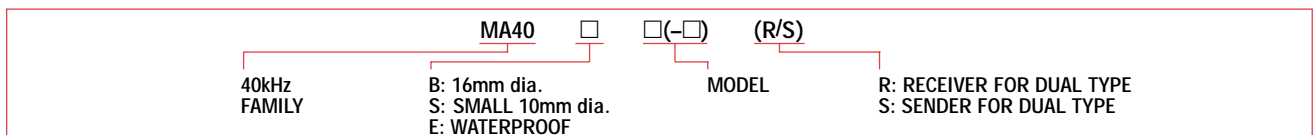
#### DIMENSIONS: mm

OPEN	MA40S4R/S	MA40B8R/S	MA40S5	MA40B7
WATERPROOF	MA40E6-7	MA40E9-1	MA40E7R/S	MA40E8-2

#### SPECIFICATIONS

Part Number	MA40E7R/S	MA40S4R/S	MA40B8R/S	MA40B7	MA40E6-7	MA40S5	MA40E8-2	MA40E9-1
Construction	Waterproof type	Open structure type			Waterproof type	Open structure type	Waterproof type	
Using Method	Receiver and Transmitter (Dual use) type			Combined use type				
Nominal Frequency (kHz)	40							
Overall Sensitivity (dB)	—	—	—	-45 <sup>+4</sup> <sub>-5</sub>	—	-50 ± 4	—	—
Sensitivity (dB)	-74 min.	-63 ± 3	-63 ± 3	—	-82 min.	—	-85 min.	-85 min.
Sound Pressure (dB)	106 min.	120 ± 3	120 ± 3	—	108 min.	—	106 min.	103 min.
Directivity (deg)	100	80	50	44	75	70	75	100 x 50
Capacitance (pF)	2200 ± 20%	2550 ± 20%	2000 ± 20%	2000 ± 20%	2200 ± 20%	2550 ± 20%	2800 ± 20%	4000 ± 20%
Operating Temp. Range(°C)	-30 ~ +85		-40 ~ +85		-30 ~ +85		-40 ~ +85	
Detectable Range (m)	0.2 ~ 3	0.2 ~ 4	0.2 ~ 6	0.2 ~ 4	0.2 ~ 2	0.2 ~ 2.5	0.2 ~ 1.5	0.2 ~ 1.5
Resolution (mm)	9							
Dimension (mm)	18φ x 12h	9.9φ x 7.1h	16φ x 12h	16φ x 12h	18φ x 12h	9.9φ x 7.1h	14φ x 8h	18φ x 10h
Weight (g)	4.5	0.7	2.0	2.0	4.5	0.7	2.4	4.8
Allowable Input Voltage (Vp-p) (Rectangular wave)	85 (40kHz) Pulse width 0.4ms Interval 100ms	20 (40kHz) Continuous signal	40 (40kHz) Continuous signal	100 (40kHz) Pulse width 0.4ms Interval 100ms	140 (40kHz sine wave) Pulse width 0.4ms Interval 100ms	60 (40kHz) Pulse width 0.4ms Interval 100ms	160 (40kHz) Pulse width 0.8ms Interval 60ms	160 (40kHz) Pulse width 0.8ms Interval 60ms
Packaging Quantity (Pcs.)	90	540	150	150	90	540	80	80

#### PART NUMBERING SYSTEM



For more detailed information regarding this product line in North America, consult us. To receive additional information on Murata Products call 1-800-831-9172.

# Higher Sensitivity and Sound Pressure Excellent Characteristics against Temperature and Humidity

This sensor radiates ultrasonic waves and detects echo, having many applications in measuring and detecting objects.

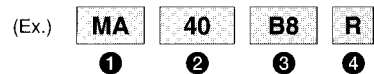
Based on its piezoelectric ceramics technology, Murata has various types of ultrasonic sensors of compact and higher performances.

### FEATURES

1. Compact and light weight
2. High sensitivity and sound pressure
3. Less power consumption
4. High reliability

### PART NUMBERING

(\* Please specify the part number when ordering)



- ① Ultrasonic Sensor
- ② Nominal Frequency
- ③ Design Number
- ④ R : Receiver, S : Sounder

### CLASSIFICATION

#### 1. Open Structure Type

Using combined vibration mode of bimorph transducer and radial corn, this type realizes high sensitivity and high sound pressure level.

Applications : Automatic doors , Burglar alarms , Remote control, Range finders.

#### 2. Water Proof Type

This type has excellent resistance to harsh environmental conditions and can be used outdoors because of its tightly sealing structure.

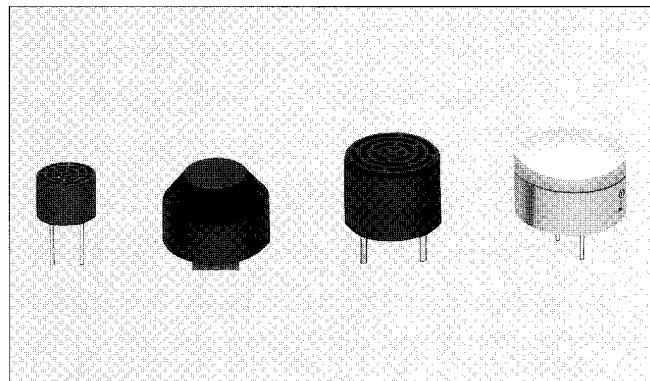
Applications : Back sonar of automobiles, Parking meters, Water level meters.

#### 3. High Frequency Type

Using longitudinal vibration and matching with the air by acoustic matching layer, this type realized high sensitivity.

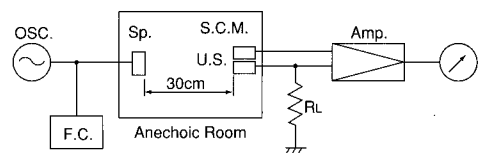
Because of short wavelength, this type has sharp directivity and can be used high precise measurement.

Applications : Approach switch for FA, distance meter, water or liquid level meters.



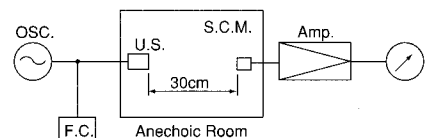
### TEST CIRCUIT

#### Receiver



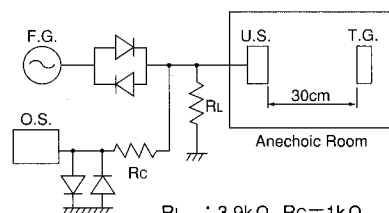
- RL : 3.9kΩ
  - U.S. : Ultrasonic Sensor
  - S.C.M. : Standard Capacitor Microphone (Brüel & Kjær4135)
  - Amp. : Amplifier (Brüel & Kjær2610)
  - OSC. : Oscillator
  - Sp. : Tweeter
  - F.C. : Frequency Counter
- 0dB=1V/μ bar

#### Transmitter



- U.S. : Ultrasonic Sensor
  - S.C.M. : Standard Capacitor Microphone (Brüel & Kjær4135)
  - Amp. : Amplifier (Brüel & Kjær2610)
  - Input Voltage : 10Vrms
  - F.C. : Frequency Counter
- 0dB=2×10<sup>-4</sup> μ bar

#### Combined Use Type



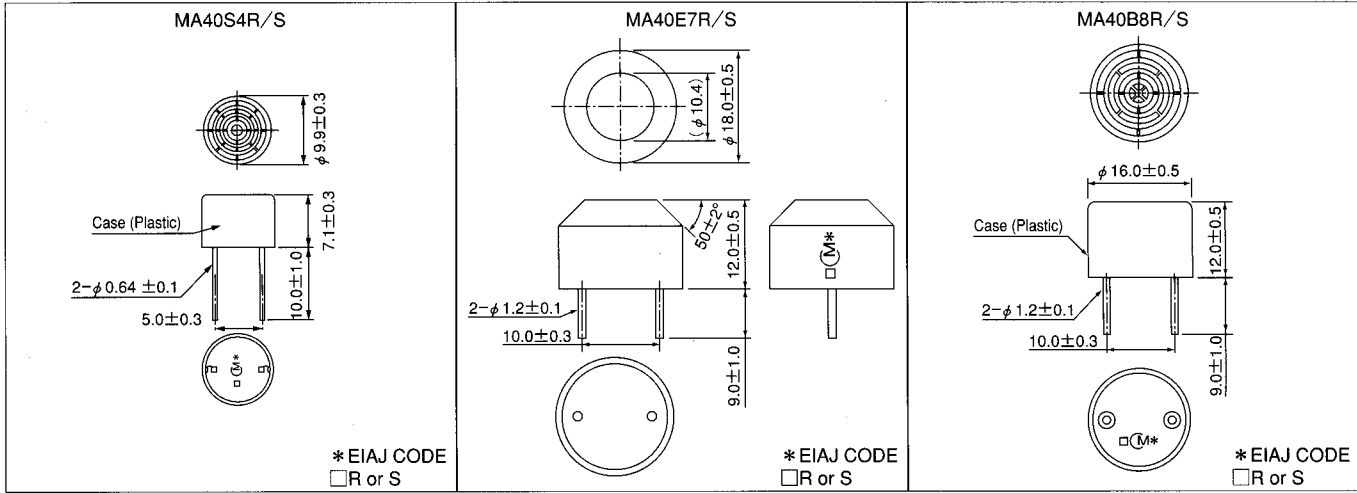
- RL : 3.9kΩ Rc=1kΩ
- U.S. : Ultrasonic Sensor
- T.G. : Target
- F.G. : Function Generator
- O.S. : Oscilloscope

## Ultrasonic Sensor MA Series

### ■ DIMENSIONS

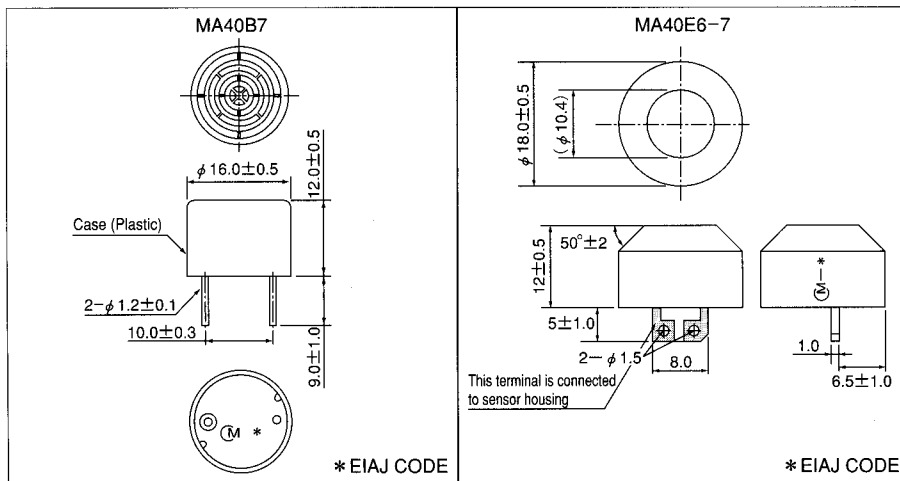
#### ● RECEIVER AND TRANSMITTER (DUAL USE) TYPE

(in mm)



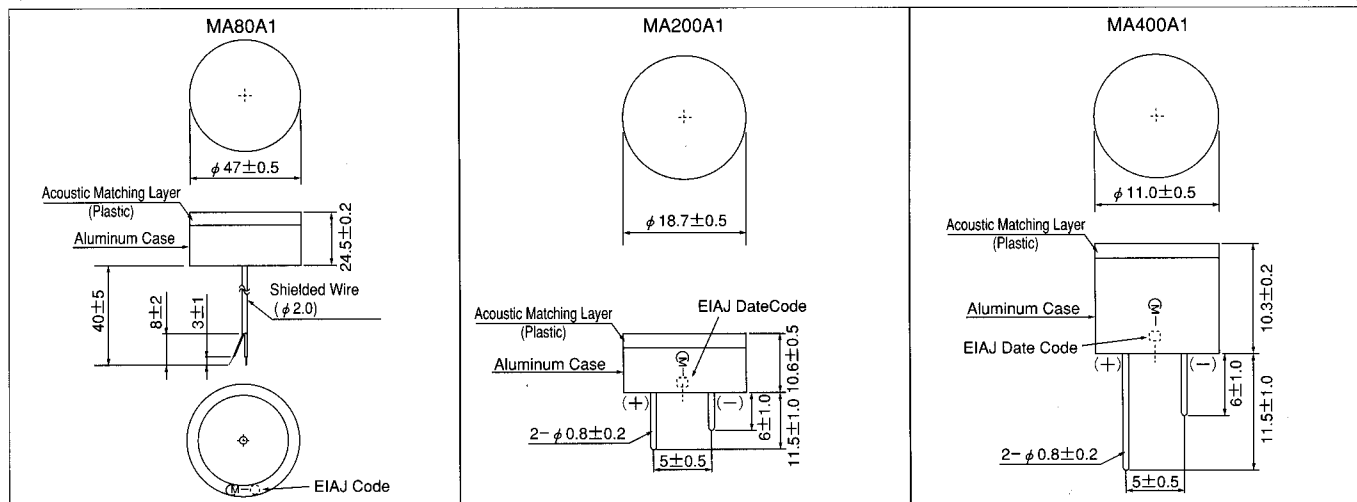
#### ● COMBINED USE TYPE

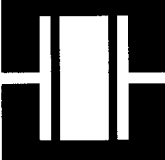
(in mm)



#### ● COMBINED USE AND HIGH FREQUENCY TYPE

(in mm)



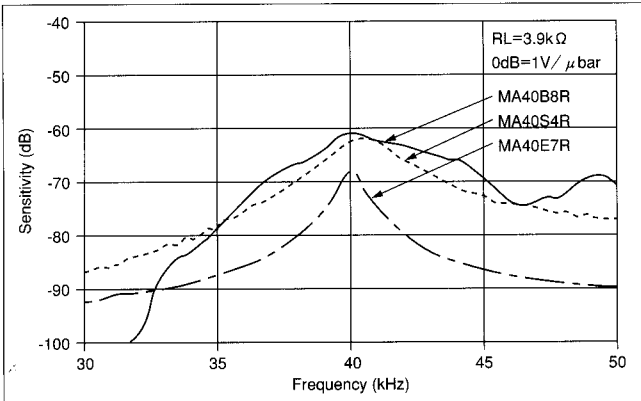


# PIEZOTITE®

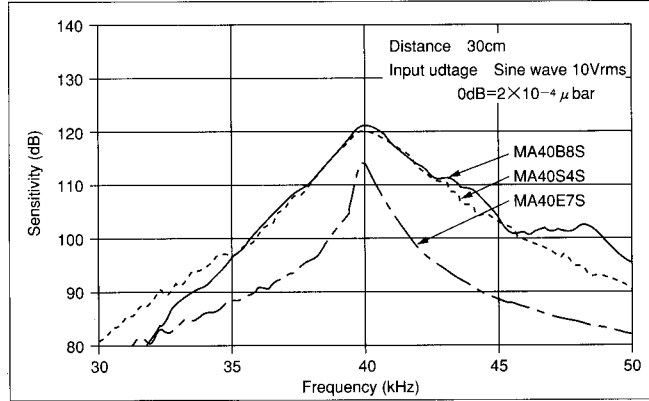
# muRata

## Ultrasonic Sensor MA Series

### SENSITIVITY VS. FREQUENCY CHARACTERISTICS



### S.P.L VS. FREQUENCY CHARACTERISTICS

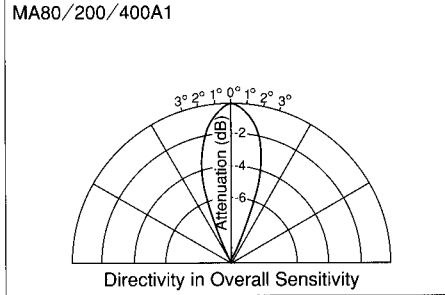
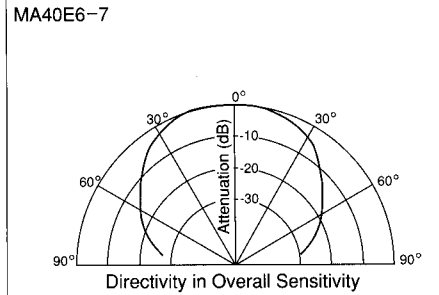
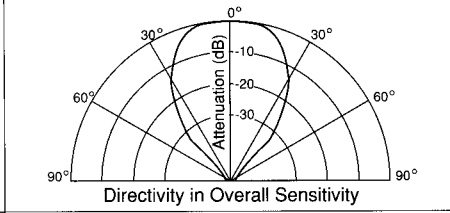
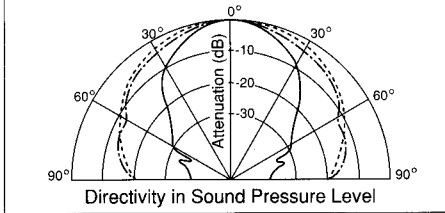
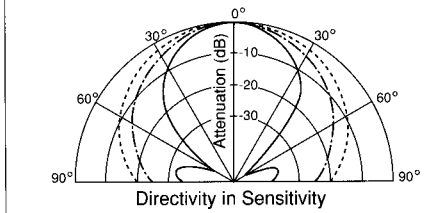


### DIRECTIVITY

MA40E7R --- Frequency 40kHz  
MA40B8R --- Distance 30cm  
MA40S4R ---

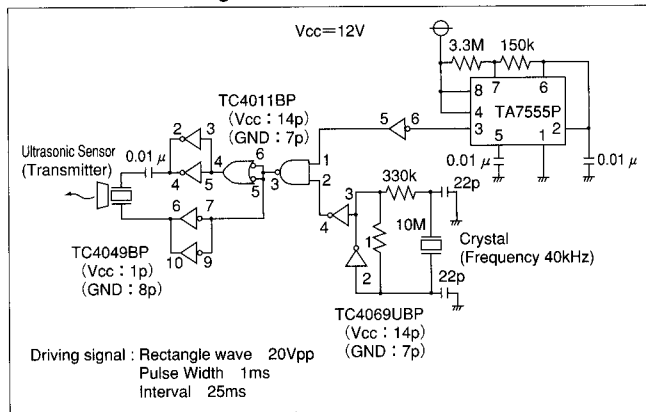
MA40E7S --- Frequency 40kHz  
MA40B8S --- Input udtage Sine wave 10Vrms  
MA40S4S --- Distance 30cm

MA40B7 Frequency 40kHz  
Input udtage Rectangle Wave 10Vp-p  
Pulse width 0.4ms  
Distance 30cm

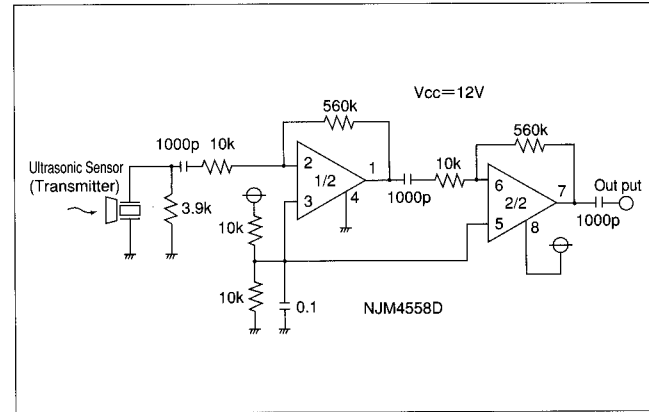


### APPLICATION CIRCUIT

#### 1. Pulse-transmitting Circuit



#### 2. Receiving Circuit



## Ultrasonic Sensor MA Series

### RATING

Part Number	MA40E7R/S	MA40S4R/S	MA40B8R/S	MA40B7	MA40E6-7
Item					
Construction	Water proof type	Open structure type			Water proof type
Using Method	Receiver and Transmitter (Dual use) type			Combined use type	
Nominal Frequency (kHz)	40				
Overall Sensitivity (dB)	—	—	—	$-45 \pm 4$	—
Sensitivity (dB)	-74 min.	$-63 \pm 3$	$-63 \pm 3$	—	-82 min.
Sound Pressure (dB)	106 min.	$120 \pm 3$	$120 \pm 3$	—	108 min.
Directivity (deg)	100	80	50	44	75
Capacitance (pF)	$2200 \pm 20\%$	$2550 \pm 20\%$	$2000 \pm 20\%$	$2000 \pm 20\%$	$2200 \pm 20\%$
Operating Temperature Range (°C)	-30 to +85				
Detectable Range (m)	0.2 - 3	0.2 - 4	0.2 - 6	0.2 - 4	0.2 - 2
Resolution (mm)	9				
Dimension (mm)	18 φ × 12h	9.9 φ × 7.1h	16 φ × 12h	16 φ × 12h	18 φ × 12h
Weight (g)	4.5	0.7	2.0	2.0	4.5
Allowable Input Voltage (Vp-p) (Rectangular wave)	85 (40kHz) Pulse width 0.4ms Interval 100ms	20 (40kHz) Continuous signal	20 (40kHz) Continuous signal	100 (40kHz) Pulse width 0.4ms Interval 100ms	140 (40kHz Sine wave) Pulse width 0.4ms Interval 100ms
Packing Unit (pcs.)	90	540	150	150	90

\* Distance : 30cm. Overall sensitivity : 0dB=10Vpp, Sensitivity : 0dB=1V/μbar. Sound pressure level : 0dB=2×10<sup>-4</sup> μbar 1 μbar=0.1Pa  
 \* The sensor can be used in the operating temperature range. Please refer to the individual specification for the temperature drift of Sensitivity/Sound pressure level or environmental characteristics in that temperature range.  
 \* Directivity, Detectable Range and Resolution is typical value. It can be changed by application circuit and fixing method of the sensor.

Part Number	MA80A1	MA200A1	MA400A1
Item			
Construction	High frequency type		
Using Method	Receiver and Transmitter (Dual use) type		
Center Frequency (kHz)	75±5	200±10	400±20
Overall Sensitivity (dB)	-47 min. 0dB=18 Vp-p (at 50cm)	-54 min. 0dB=18 Vp-p (at 20cm)	-74dB min. 0dB=18 Vp-p (at 10cm)
Directivity (deg)	7		
Operating Temperature Range (°C)	-10 to +60	-30 to +60	
Detectable Range (m)	0.5 - 5	0.2 - 1	0.06 - 0.3
Resolution (mm)	4	2	1
Dimension (mm)	47 φ × 24.5h	19 φ × 11h	11 φ × 10.5h
Weight (g)	93	6	2
Allowable Input Voltage (Vp-p) (Rectangular wave)	120 (75kHz) Pulse width 600 μs Interval 50ms	120 (200kHz) Pulse width 250 μs Interval 20ms	120 (400kHz) Pulse width 125 μs Interval 10ms
Packing Unit (pcs.)	5	90	224

\* The sensor can be used in the operating temperature range. Please refer to the individual specification for the temperature drift of Sensitivity/Sound pressure level or environmental characteristics in that temperature range.  
 \* Directivity, Detectable Range and Resolution is typical value. It can be changed by application circuit and fixing method of the sensor.