### Piezoelectric Ceramic Sensors (PIEZO TITE®)

#### Ultrasonic Sensors

**Open Structure Type**

- **Features**
  1. Compact and light weight.
  2. High sensitivity and sound pressure.
  3. Less power consumption.

- **Applications**
  Burglar alarms, Range finders, Automatic doors, Remote control.

### Specifications

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Construction</th>
<th>Using Method</th>
<th>Nominal Freq. (kHz)</th>
<th>Overall Sensitivity (mVp-p)</th>
<th>Sensitivity (dB)</th>
<th>S.P.L. (dB)</th>
<th>Direc. (°)</th>
<th>Cap. (pF)</th>
<th>Operating Temp. Range (°C)</th>
<th>Detectable Range (m)</th>
<th>Resolution (mm)</th>
<th>Max. Input Voltage (Vp-p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA40B8R</td>
<td>Open struct.</td>
<td>Receiver</td>
<td>40</td>
<td>-63 typ. (0dB=10V/pa)</td>
<td>-</td>
<td>50</td>
<td>4000</td>
<td>50</td>
<td>-30 to 85</td>
<td>0.2 to 6</td>
<td>9</td>
<td>-</td>
</tr>
<tr>
<td>MA40B8S</td>
<td>Open struct.</td>
<td>Transmitter</td>
<td>40</td>
<td>-120 typ. (0dB=0.02mPa)</td>
<td>50</td>
<td>2000</td>
<td>-30 to 85</td>
<td>0.2 to 6</td>
<td>Continuous signal</td>
<td></td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>MA40S4R</td>
<td>Open struct.</td>
<td>Receiver</td>
<td>40</td>
<td>-63 typ. (0dB=10V/pa)</td>
<td>-</td>
<td>80</td>
<td>2550</td>
<td>80</td>
<td>-40 to 85</td>
<td>0.2 to 4</td>
<td>9</td>
<td>-</td>
</tr>
<tr>
<td>MA40S4S</td>
<td>Open struct.</td>
<td>Transmitter</td>
<td>40</td>
<td>-120 typ. (0dB=0.02mPa)</td>
<td>80</td>
<td>2550</td>
<td>-40 to 85</td>
<td>0.2 to 4</td>
<td>Continuous signal</td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>MA40S5</td>
<td>Open struct.</td>
<td>Dual Use</td>
<td>40</td>
<td>60 typ.</td>
<td>2550</td>
<td>30 to 85</td>
<td>0.5 to 2</td>
<td>9</td>
<td>Pulse width 0.4ms Interval 100ms</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Distance: 30 cm, Overall sensitivity 0dB=10V-p, Sensitivity 0dB=1Vrms/µbar, Sound pressure level 0dB=2×10⁻⁶µbar, 1µbar=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 are typical values. They can be changed by application circuit and fixing method of the sensor.
Note: Please read rating and CAUTION (for storage and operating, rating, soldering and mounting, handling) in this PDF catalog to prevent smoking and/or burning, etc.

This catalog has only typical specifications. Therefore, you are requested to approve our product specification or to transact the approval sheet for product specification before ordering.

Directivity in Sensitivity

**MA40B8R**

Directivity in S. P. L.

**MA40B8S**

Directivity in Overall Sensitivity

**MA40S5**
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**S. P. L. - Freq. Characteristics**

**MA40B8R**

**MA40S4R**

**Sensitivity - Freq. Characteristics**

**MA40B8S**

**MA40S4S**
### Water Proof Type Symmetric Directivity

**Features**
1. Compact and light weight.
2. High sensitivity and sound pressure.
3. Less power consumption.

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

### Specifications

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Construction</th>
<th>Using Method</th>
<th>Nominal Freq. (kHz)</th>
<th>Overall Sensitivity</th>
<th>Sensitivity (dB)</th>
<th>S.P.L. (dB)</th>
<th>Direcibility (°)</th>
<th>Capac. (pF)</th>
<th>Operating Temp. Range (°C)</th>
<th>Detectable Range (m)</th>
<th>Resolution (mm)</th>
<th>Max. Input Voltage (Vp-p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA40E7R</td>
<td>Water proof</td>
<td>Receiver</td>
<td>40</td>
<td>-</td>
<td>-74 min.</td>
<td>-100</td>
<td>2200</td>
<td>30 to 85</td>
<td>0.2 to 3</td>
<td>0.2 to 3</td>
<td>9</td>
<td>0.2 to 3</td>
</tr>
<tr>
<td>MA40E7S</td>
<td>Water proof</td>
<td>Transmitter</td>
<td>40</td>
<td>-</td>
<td>106 min.</td>
<td>100</td>
<td>2200</td>
<td>30 to 85</td>
<td>0.2 to 3</td>
<td>0.2 to 3</td>
<td>9</td>
<td>0.2 to 3</td>
</tr>
<tr>
<td>MA40E7S-1</td>
<td>Water proof</td>
<td>Dual Use</td>
<td>40</td>
<td>-</td>
<td>72 min.</td>
<td>106 min.</td>
<td>2200</td>
<td>30 to 85</td>
<td>0.2 to 3</td>
<td>0.2 to 3</td>
<td>9</td>
<td>0.2 to 3</td>
</tr>
<tr>
<td>MA40EB-2</td>
<td>Water proof</td>
<td>Dual Use</td>
<td>40</td>
<td>-</td>
<td>-85 min.</td>
<td>104 min.</td>
<td>2800</td>
<td>30 to 85</td>
<td>0.2 to 1.5</td>
<td>0.2 to 1.5</td>
<td>9</td>
<td>0.2 to 1.5</td>
</tr>
<tr>
<td>MA40MC10-1B</td>
<td>Water proof</td>
<td>Dual Use</td>
<td>40</td>
<td>-</td>
<td>-86 min.</td>
<td>104 min.</td>
<td>2400</td>
<td>30 to 95</td>
<td>0.2 to 1.5</td>
<td>0.2 to 1.5</td>
<td>9</td>
<td>0.2 to 1.5</td>
</tr>
</tbody>
</table>

Distance:30cm, Overall sensitivity:0dB=1Vrms/µbar, Sensitivity:0dB=1Vrms/µbar, Sound pressure level:0dB=1x10³µbar, 1µbar=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 are typical values. They can be changed by application circuit and fixing method of the sensor.
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**Directivity in Sensitivity**

- **MA40E7R**

- **MA40E7S**

**Directivity in Overall Sensitivity**

- **MA40E7S-1**

- **MA40EB-2**

**Beam Pattern**

**S. P. L. -Freq. Characteristics**

- **MA40E7R**

**Sensitivity-Freq. Characteristics**

- **MA40E7S**
# Water Proof Type Asymmetric Directivity

## Features
1. Compact and light weight.
2. High sensitivity and sound pressure.
3. Less power consumption.
5. Compressed directivity by itself

## Applications
Vack sonar of automobiles, Parking meters, Water level meter.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Construction</th>
<th>Using Method</th>
<th>Nominal Freq. (kHz)</th>
<th>Overall Sensitivity</th>
<th>Sensitivity (dB)</th>
<th>S.P.L. (dB)</th>
<th>Directivity (°)</th>
<th>Cap. (pF)</th>
<th>Operating Temp. Range (°C)</th>
<th>Detectable Range (m)</th>
<th>Resolution (mm)</th>
<th>Max. Input Voltage (Vp-p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA40E9-1</td>
<td>Water proof</td>
<td>Dual Use</td>
<td>40</td>
<td>-</td>
<td>-85 min.</td>
<td>103 min.</td>
<td>100 to 0 dB</td>
<td>4000</td>
<td>-30 to 85</td>
<td>0.2 to 1.5</td>
<td>9</td>
<td>160 Pulse width 0.8ms Interval 60ms</td>
</tr>
<tr>
<td>MA40MF14-1B</td>
<td>Water proof</td>
<td>Dual Use</td>
<td>40</td>
<td>-</td>
<td>-87 min.</td>
<td>103 min.</td>
<td>110 to 0 dB</td>
<td>4400</td>
<td>-30 to 85</td>
<td>0.2 to 1.5</td>
<td>9</td>
<td>150 Pulse width 0.8ms Interval 60ms</td>
</tr>
</tbody>
</table>

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 are typical values. They can be changed by application circuit and fixing method of the sensor.

## Directivity in Overall Sensitivity

**MA40E9-1**

**MA40MF14-1B**
High-frequency Type

■ Features
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.

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MA80A1</td>
<td>High frequency type</td>
<td>Dual Use</td>
<td>75 +/-5</td>
<td>47 min. 0dB=18Vpp (at 50cm)</td>
<td>-</td>
<td>7</td>
<td>-10 to 60</td>
<td>0.5 to 5</td>
<td>4 Pulse width 0.6ms Interval 50ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MA200A1</td>
<td>High frequency type</td>
<td>Dual Use</td>
<td>200 +/-10</td>
<td>24 min. 0dB=18Vpp (at 20cm)</td>
<td>-</td>
<td>7</td>
<td>-30 to 60</td>
<td>0.2 to 1</td>
<td>2 Pulse width 250μs Interval 20ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MA400A1</td>
<td>High frequency type</td>
<td>Dual Use</td>
<td>400 +/-20</td>
<td>14 min. 0dB=18Vpp (at 10cm)</td>
<td>-</td>
<td>7</td>
<td>-30 to 60</td>
<td>0.06 to 0.3</td>
<td>1 Pulse width 125μs Interval 10ms</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 are typical values. They can be changed by application circuit and fixing method of the sensor.

■ Directivity in Overall Sensitivity

MA_A1 Series
**Data/Notice/Part Numbering**

### Test Circuit

#### Receiver

- **O.S.C.**: Oscillator
- **Amp**: Amplifier
- **U.S.**: Ultrasonic Sensor
- **S.C.M.**: Sound Conversion Microphone
- **F.C.**: Frequency Counter
- **R.L.**: Receiver
- **30cm**: Distance

#### Transmitter

- **O.S.C.**: Oscillator
- **Amp**: Amplifier
- **U.S.**: Ultrasonic Sensor
- **S.C.M.**: Sound Conversion Microphone
- **F.C.**: Frequency Counter
- **R.L.**: Receiver
- **30cm**: Distance

### Dual Use

- **O.S.C.**: Oscillator
- **Amp**: Amplifier
- **U.S.**: Ultrasonic Sensor
- **S.C.M.**: Sound Conversion Microphone
- **F.C.**: Frequency Counter
- **R.L.**: Receiver
- **30cm**: Distance

### Notice (Soldering and Mounting)

1. Pay attention to the mounting position as these sensors have directivity.
2. Please avoid applying DC-bias by connecting DC blocking capacitor or some other way because, otherwise, the component may be damaged.
3. Do not use in water.

### Part Numbering

The structure of the "Global Part Numbers" that have been adopted since June 2001 and the meaning of each code are described herein.

- **Product ID**
- **Series**
- **Characteristics**
- **Individual Specification Code**
- **Packaging**

* Global Part Number shows only an example which might be different from actual part number.
* Any other definitions than "Product ID" might have different digit numbers from actual Global Part Number.