



Piezoceramics



Piezoceramic Materials

DIT Piezoceramic Materials

DIT's Piezoceramic Materials	Standard grade									Special grade					
Item	D110	D160	D210	D220	D221	D223	D310	D410	D510	D111	D211	D222	D230	D231	D240
Relative Dielectric Constant $\epsilon_{33}^T / \epsilon_0$	1450	1450	800	2250	2200	2100	720	830	1100	1300	570	2100	1900	3250	1900
Dielectric Loss Factor at low field & 1kHz $\tan \delta$	0.003	0.003	0.02	0.013	0.009	0.02	0.002	0.01	0.003	0.006	0.005	0.002	0.006	0.2	0.003
Electromechanical Coupling Coefficient k_p , Radial	0.61	0.59	0.57	0.65	0.64	0.68	0.37	0.2	0.34	0.59	0.56	0.64	0.64	0.68	0.61
Piezoelectric Constants d_{33} (10^{-12}m/V)	360	380	300	530	500	500	160	160	140	340	210	500	500	660	470
Piezoelectric Constants g_{33} (10^{-3}Vm/N)	28	29	42	27	25	28	25	22	14	29	42	27	29	23	28
Frequency Constant N_p , Radial ($\text{Hz} \cdot \text{m}$)	2160	2240	2120	2000	2000	1920	2160	-	3290	2190	2310	2010	1990	1970	2050
Mechanical Quality Factor Q_m	900	850	90	80	58	75	730	70	950	780	1100	80	63	64	240
Curie Temperature T_c (°C)	320	310	345	320	310	330	345	-	130	320	320	325	310	230	280
Density (10^3 kg/m^3)	7.6	7.6	7.2	7.6	7.6	7.4	7.4	5.4	5.7	7.6	7.6	7.4	7.5	7.3	7.2

※ This specification might be subjected to changes without a prior notice.

Piezoceramic Materials

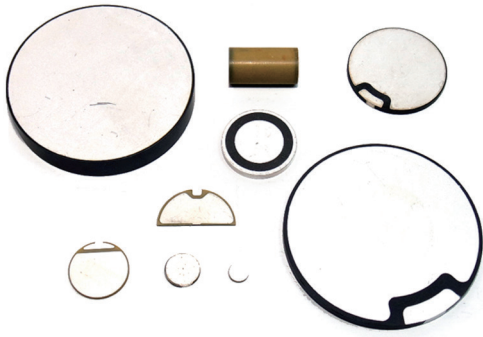
Description of the Materials

D110	Hard PZT(Lead Zirconate Titanate) ceramic for high-power ultrasonic transducer. The material retains a low dielectric loss at high fields and is resistant to depoling under high mechanical stresses and high fields. Primary application is ultrasonic cleaners and SONARs.
D111	Hard PZT ceramic equivalent to PZT-4.
D160	Low-loss PZT ceramic for multilayer application. The material has a low dielectric loss and high piezoelectric constants and is cofirable with pure Ag electrode. Especially developed for piezoelectric transformers and other multilayer devices working under resonance mode or high frequency.
D210	PZT ceramic with a high piezoelectric voltage constant. Best for voltage receiver.
D211	PZT ceramic with a high piezoelectric voltage constant. Similar to PZT-7A.
D220	All-purpose soft PZT ceramic. The material has a high piezoelectric strain constant, a high electro-mechanical coupling coefficient and a high dielectric constant. The material is well suited for hydrophones, sound detectors, flow meters and accelerometers.
D221	Low-temperature firable PZT ceramic for multilayer actuators. The material can be cofired with pure Ag and has a high piezoelectric strain constant, a high electro-mechanical coupling coefficient and a high a dielectric constant.
D222	Soft PZT ceramic equivalent to PZT-5A.
D223	Soft PZT Ceramic with a low temperature coefficient of capacitance.
D230	Soft PZT ceramic with a very low aging rate of piezoelectric constants. Well suited for hydrophones and array receivers.
D231	PZT ceramic equivalent to PZT-5H. Very high piezoelectric strain constant and dielectric constant. Well suited for low frequency actuators.
D240	For ultrasonic humidifier.
D310	PZT ceramic with a high stability of resonance frequency and a high Curie temperature. Suited for knock sensors and accelerometers with wide range of operating temperature.
D410	Modified lead metaniobate ceramic with a low mechanical Q, negligible aging of piezoelectric parameters, a low acoustic impedance and a relatively high piezoelectric strain constant for higher signal to noise ratio. Primary application is broad bandwidth sensors for pulse-echo measurement in medical or NDT application.
D510	Modified barium titanate ceramic. Primary application is fish finders and hydrophones.

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Piezoceramics

Disks / Rods



Availability

- Diameter : 3 ~ 70 (mm)
- Thickness / Length : 0.08 ~ 35 (mm)
- Electrode : Face/end, wrapped-over, edge

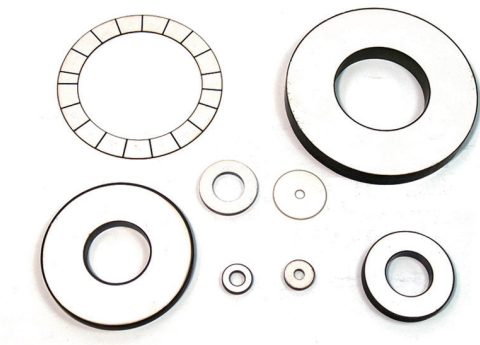
Readily available sizes (diameter, mm)

2.8, 3.0, 5.0, 7.0, 10, 15, 20, 25, 30, 40, 50, 60, 70

Applications

- Ultrasonic cleaning
- Sensors and actuators
- Ultrasonic level & flow measurement
- Vibration sensor
- Non-Destructive testing (NDT)
- Piezoelectric / Ultrasonic motors

Rings



Availability

- Outer diameter : 3 ~ 70 (mm)
- Inner diameter : 1.5 ~ 65 (mm)
- Thickness / Diameter : 0.08 ~ 35 (mm)
- Electrode : Face/end, segmented

Readily available sizes (O.D./I.D., mm)

10/5, 12/6, 15/7, 20/11, 20/13, 25/10, 30/15, 35/15, 38/15, 50/23

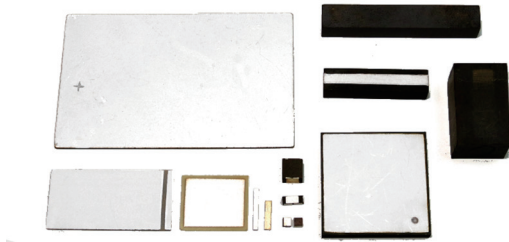
Applications

- Ultrasonic cleaners
- High power ultrasonic generators
- Ultrasonic welder
- Dental scaler / Surgical tools
- Piezoelectric / Ultrasonic motors

※ All products can be customized by requirements.

Piezoceramics

Plates / Blocks



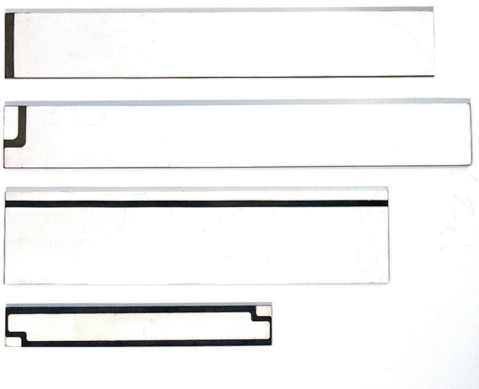
Availability

- Length, Width : 3 ~ 70 (mm)
- Thickness / Length : 0.080 ~ 35 (mm)

Application

- Actuators
- Sensors
- Haptic actuators
- Energy harvesting
- Piezoelectric speakers
- Piezoelectric / Ultrasonic motors

Megasonic Plates



Availability

- Length : ~ 180 (mm)
- Width : ~ 35 (mm)
- Frequency : 0.5 ~ 3MHz
- Electrode : Face/end, wrapped-over, edge

Readily available sizes (length/width, mm)

100/25, 145/35, 165/25, 175/34, 178/25

Applications

- Megasonic cleaners

※ All products can be customized by requirements.

Piezoceramics

Tubes



Availability

- Outer diameter : 3 ~ 70 (mm)
- Inner diameter : 1.5 ~ 60 (mm)
- Height : ~ 30 (mm)
- Electrode : End, face, segmented

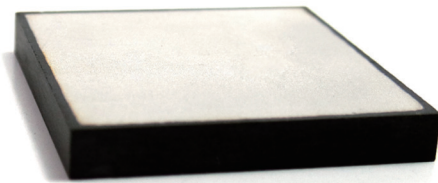
Readily available sizes (O.D./I.D., mm)

10/5, 37/32, 20/15

Applications

- Tube actuators
- AFM
- Tilt stages
- SONAR

Shear Plates



Availability

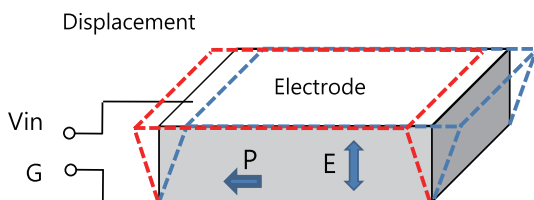
- Length, Width : 2.8 ~ 70 (mm)
- Thickness : 0.080 ~ 35 (mm)

Readily available sizes (length/width, mm)

15/15, 20/15

Applications

- Actuators
- Accelerometer
- Non-Destructive testing (NDT)
- Material testing



※ All products can be customized by requirements.

Piezoceramics

CeraTrans[®]



CeraTrans[®], Piezoelectric transformers from DIT

Availability

- Economic monolayer CeraTrans[®]
- Multilayer CeraTrans[®] for low voltage application
- Step-up & Step-down CeraTrans[®]
- Power : max. 40W

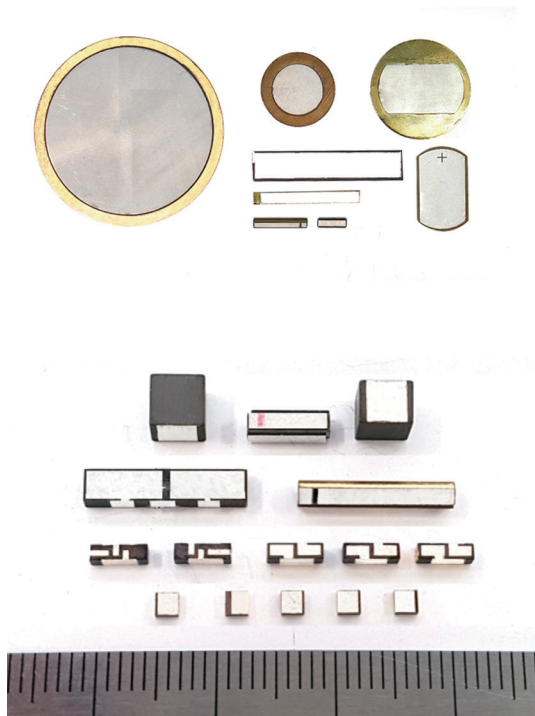
Features

- Low cost with Ag –cofired electrodes

Applications

- High-voltage power supplies
- Ionizers
- Plasma generators
- Inverters
- Low profile adaptors

Benders / Chips / MLA



Availability

Benders :

- Type : Unimorph, bimorph, ceramic multilayered monolithic
- Shape : Rectangular, circular or customized shapes

Chips :

- Type : Single layered, multilayered
- Size : Any size

MLA :

- Size : min. 1x1(mm)
- Height : max 10 (mm)

Features

- Multilayer : min. layer thickness, 30 microns
- Hard pzt and soft pzt materials available

Applications

- Actuators
- Energy harvesting
- Piezoelectric motors
- Piezoelectric fan
- Piezoelectric / Ultrasonic motors
- Piezoelectric AF / Zoom mechanism

※ All products can be customized by requirements.

Piezoceramics

Spherical Shells for HIFU



Availability

- Frequency : 0.5 ~ 15MHz
- Diameter : 8 ~ 100mm
- Radius of curvature : ~ 100mm

Features

- Wide selection of sizes / frequencies
- Short delivery / development time

Applications

- Skin lifting
- Body contouring

Piezoelectric Tube / Disk for SONAR and Fish Finders



Availability

- Diameter : ~ 100mm
- Height : ~ 30mm
- Electrode : Face/end, split

Features

- High durability
- Excellent coupling factor

Applications

- SONAR
- Fish finders
- Hydrophones

※ All products can be customized by requirements.

Piezoceramics, Applied Products

HIFU Transducers



Availability

- Frequency : 0.5 ~ 15MHz
- Diameter : ~ 100mm
- Radius of curvature : ~ 100mm

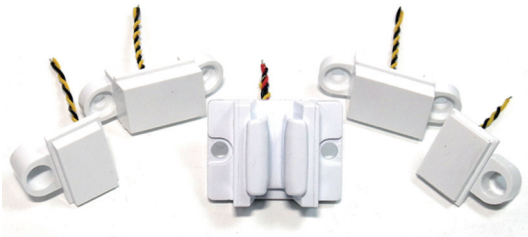
Features

- Wide selection of sizes / frequencies
- Assembled transducers with plastic case and lead wires/connector
- Short delivery / development time

Applications

- Skin lifting
- Body contouring

Ultrasonic Bubble Detectors



Detection of air bubbles in tubes

Features

- Small and light
- High sensitivity (Nominal frequency : 2MHz)
- High durability

Applications

- Infusion pump
- Apheresis / Auto-transfusion
- Hemodialysis

※ All products can be customized by requirements.

Piezoceramics, Applied Products

Immersion Transducer



Broad band longitudinal wave transducers

Availability

- Frequency : 0.5 ~ 2 MHz
- Outer diameter : 20 ~ 50 mm

Features

- $\lambda/4$ layer acoustically matched to water
- Wide bandwidth for high resolution pulse-echo measurement
- Large diameter to increase scanning index

Applications

- NDT(Nondestructive testing) probe
- Ultrasound bone densitometer
- High speed flaw detection in bar, plate, etc
- Material analysis and velocity measurements
- On-line thickness gauging

Heart Beat Monitor



Doppler sensors for fetal monitoring

Availability

- Dual elements (Two half-spheres or ring / disk types)
- Multiple array : 7~9 elements
- Nominal frequency : 1MHz

Features

- High S/N ratio
- High durability

Applications

- Fetal monitor

※ All products can be customized by requirements.

Piezoceramics, Applied Products

Ultrasonic Air Transducers



Ultrasonic transducers matched acoustically to air

Features

- 40kHz, 48kHz, 120kHz, 200kHz, 300kHz, 400kHz
- Air coupled transducer
- High sound pressures & sensitivity
- Small & lightweight
- Low power consumption
- Temperature, humidity, dirt, etc. environment resistance

Applications

- Distance measurement
- Flow sensor of gas
- Proximity switch in the FA facilities
- Level sensors
- Automotive parking assistance (PAS / SPAS)

Ultrasonic Double Sheet Detector



Features

- Frequency : 300kHz
- Short ringing time
- Quick response
- Wide bandwidth

Applications

- Double sheet detection for papers or film
- Detection of double sheets or tapes in bank notes

※ All products can be customized by requirements.

Piezoceramics, Applied Products

Level Sensor, Hermetically Sealed



Features

- Hermetically sealed, immersion transducer
- High accuracy regardless of the liquid type and temperature
- Immune to vapors
- High durability

Applications

- Level measurement for all kinds of liquids
- Fuel level sensor

Ultrasonic Transducer for Gas / Liquid Flowmeter



Availability

- Frequency : 850kHz, 1MHz
- Size : $\Phi 15$, $\Phi 20$

Features

- Stainless steel housing
- Low sensitivity changes with temperature
- Quick and easy replacement
- Silicone rubber packaging

Applications

- Ultrasonic gas flowmeter
- Ultrasonic liquid flowmeter
- Ultrasonic heat meter

※ All products can be customized by requirements.

Piezoceramics, Applied Products

Ultrasonic Transducer for Massager / Bone Healing



Availability

- Frequency : 0.2 ~ 4MHz
- Outer diameter : 15 ~ 50mm

Features

- Stainless steel housing
- High electromechanical conversion efficiency
- Low dielectric loss

Applications

- Skin massager
- Bone fracture healing

Ultrasonic Transducer for Scrubber



Availability

- Frequency : 25kHz, 30kHz

Features

- Stainless steel blade
- High electromechanical conversion efficiency
- Low dielectric loss

Applications

- Facial cleansing
- Medical treatment
- Skin scrubber for face
- Device for ultrasonic beautification instrument

※ All products can be customized by requirements.

Piezoceramics, Applied Products

Ultrasonic Transducer for Humidifier / Atomizers



Availability

- Nominal frequency : 1.65MHz

Features

- Stainless steel face
- Long life
- Quick and easy replacement
- Silicone rubber packaging

Applications

- Ultrasonic humidifier
- Industrial humidifier
- Medical nebulizer
- Ultrasonic atomizer
- Mist generator
- Aroma diffuser

Ultrasonic Sensors / Mapping Sensors



Availability

- Frequency : 120, 170, 250, 380 (kHz)

Features

- Various operating range
- Color and transparency independent
- Temperature compensation
- Metal housing and short body
- IP 67 protection

Applications

- Level detection (water, oil etc)
- Object detection for counting (NPN or PNP output)
- Distance measurement (voltage or current output)

※ All products can be customized by requirements.

Piezoceramics, Applied Products

Cluster Ionizer / Negative Ionizer



Ionizer utilizing piezoelectric transformers, CeraTrans[®]

Availability

- Output voltage : 1kV ~ 5kV

Features

- Low profile, compact size
- High reliability with piezoelectric transformers

Applications

- Cluster ionizers
- Negative ionizers

Electrostatic Charge Eliminators / Electrostatic Dust Precipitators / Potential Sensors



Designed with piezoelectric transformers, CeraTrans[®]

Availability

- Bars, Blowers, Nozzle & Gun

Features

- Low profile, compact size
- High reliability with piezoelectric transformers

Applications

- ESD control for clean rooms, display / film industries, assembly line, etc
- Air purifiers

※ All products can be customized by requirements.



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