

Shaping the future of

# Healthcare & medical

*Latest technologies for all healthcare and medical applications*





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## Electronics in healthcare

*Electronics are permeating more and more into the healthcare sector, and electronics technology advances continue to enhance the functionality of healthcare equipment.*

Murata is at the cutting edge of these electronics advancements and is a key provider of technologies which will help to shape the future of healthcare around the world. Apart from our standard products, which are present in almost any electronic equipment you use, Murata has developed new, innovative products specifically for healthcare applications. In this brochure we outline just a few of these innovations.



**BCG (Ballistocardiography) Module**  
Size 8.37cm x 4.07cm x 1.76cm

*Please note that Murata does not support the usage of Murata's standard products for safety-critical applications that require especially high reliability.*

*Please don't hesitate to contact us if you have any questions or concerns.*

# MEMS HR sensor node

## Non-contact heart rate and other cardiac measurement parameters

Electronic BCG (Ballistocardiography) module with accelerometer signal processing and algorithm in the on-board micro controller



### Features

- A continuous contactless patient monitoring concept when in the bed
- Heart rate (HR), heart rate variability (HRV), respiration rate (RR) and bed occupancy detection can be utilized to analyze for example stress and relaxation index and sleep quality
- Opens new possibilities in patient monitoring and elderly care in hospitals, assisted living and at home.

### Benefits

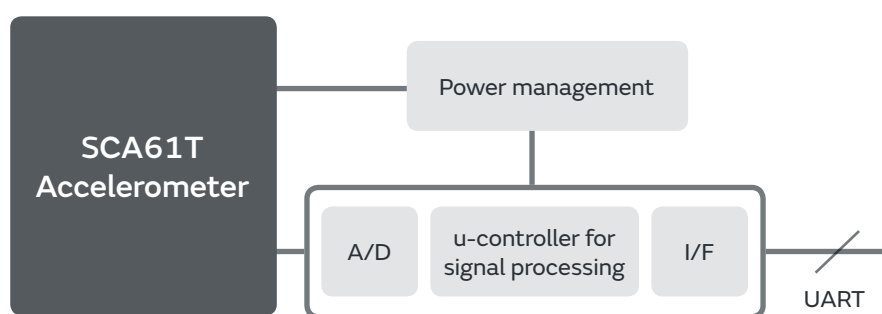
- Safety
- Efficiency
- Responsiveness

Learn about MEMS sensors

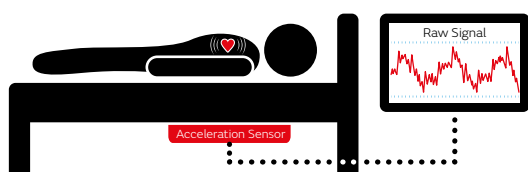
<http://www.murata.com/en-eu/products/sensor>



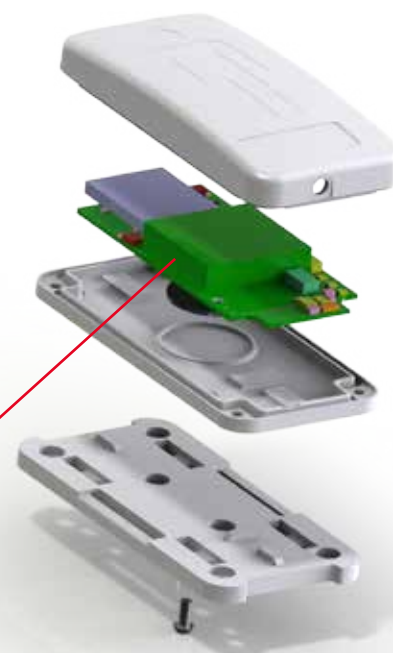
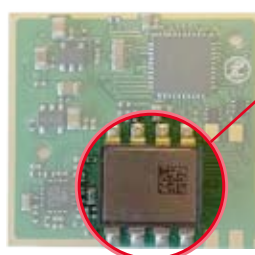
### Block diagram



Heart rate, respiration rate & bed occupancy



MEMS BCG module



# MEMS sensors

## High accuracy, low-power consumption

*Murata is a leading supplier of acceleration, inclination and angular motion sensor solutions for healthcare applications.*

Medical sensors increase the intelligence of life supporting devices, and they can be used in new types of patient monitoring applications that allow patients to lead more independent lives. Detecting signals triggered by symptoms helps optimize medication and prevent serious attacks of illness.

Murata's unique MEMS design, which combines single crystal silicon and glass, ensures exceptional reliability, unprecedented accuracy and excellent stability over time. The power requirements of these medical sensors

are extremely low, which gives them a significant advantage in small battery-operated devices.

As the leading supplier of activity sensors for pacemakers Murata also offers a wide range of pressure sensors, accelerometers, inclinometers and gyroscopes for various demanding medical and healthcare applications. Device developers and manufacturers of many existing and emerging healthcare applications have been able to reach their power and size



Learn more online

<http://www.murata.com/en-eu/products/sensor>



## Sensor Elements (Dies)

### Vertical Accelerometer Elements

#### SCG12S and SCG14S

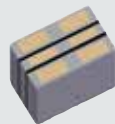
- Size 3mm x 2.12mm x 1.95 or 1.25mm
- Various measuring ranges possible (1 - 12g)
- Proven capacitive 3D-MEMS Technology



### Horizontal Accelerometer Elements

#### SCG10X and SCG10Z

- Size SCG10X: 2.55mm x 2.95mm x 1.91mm
- Size SCG10Z: 1.50mm x 1.70mm x 1.83mm
- Various measuring ranges possible (1 - 12g)
- Proven capacitive 3D-MEMS Technology



### Pressure Sensor Elements

#### SCB10H

- Size 1.4mm x 1.4mm x 0.85mm
- High pressure shock survival (> 200 bar)
- Various pressure ranges possible (1.2 - 25 bar)
- Proven capacitive 3D-MEMS technology
- Operates at near vacuum applications



## Sensor Modules

### Accelerometer

#### Digital 1-, 2- or 3-axis Accelerometers

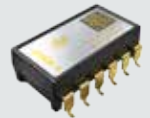
- Excellent accuracy
- Excellent stability over temperature
- Ranges:  $\pm 2g$ ,  $\pm 6g$



### Inclinometer

#### Analog 1- or 2-axis Inclinometers

- Excellent accuracy
- Excellent stability over temperature
- Ranges:  $\pm 15^\circ$ ,  $\pm 30^\circ$ ,  $\pm 90^\circ$



### Gyroscope









#### 1-axis Angular Rate Sensors

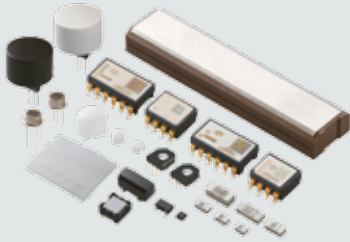
- Excellent accuracy
- Excellent stability and noise performance
- Ranges:  $\pm 100^\circ/s$ ,  $\pm 300^\circ/s$



# Sensors

## Sensor product lineup

-  Pyroelectric Infrared Sensors
-  Ultrasonic Sensors
-  Magnetic Pattern Recognition Sensors
-  Magnetic Switches (AMR Sensors)
-  Shock Sensors
-  Angular Rate Sensors
-  Rotary Position Sensors
-  MEMS Sensors



**Low profile, flexible with excellent responsiveness**



*Easily routed in complex designs the flexible film temperate sensor is ideal for sensing housing temperatures of compact devices as wearable healthcare products, smartphone and tablets..*

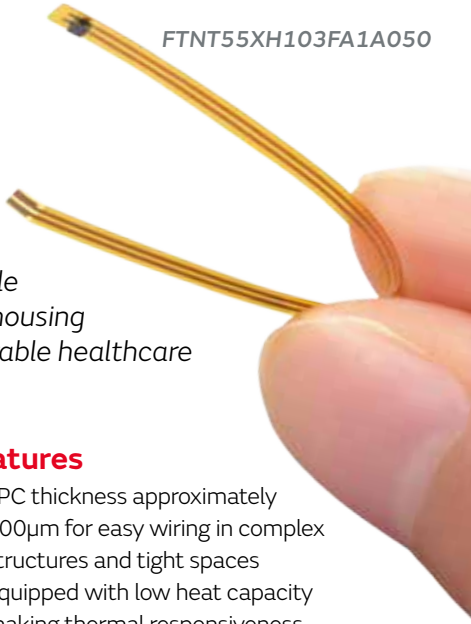
This range of surface-mounted NTC temperature sensors are packaged on a flexible printed circuit (FPC) film and measuring at 50.00 x 3.17 x 0.55 mm in size. The FTNT55XH103FA1A050 can measure temperatures in the range of -40 to + 125 degrees C and has an accuracy, at 25 degrees C of +/- 0.4 degrees C. Resistance at 25 degrees C is 10 k ohm +/- 1%.

The film temperature sensor has been granted 4 patents including 1 basic patent and 3 peripheral patents.

### Features

- FPC thickness approximately 100µm for easy wiring in complex structures and tight spaces
- Equipped with low heat capacity making thermal responsiveness excellent

FTNT55XH103FA1A050



Learn more online





<http://www.murata.com/en-eu/products/sensor>

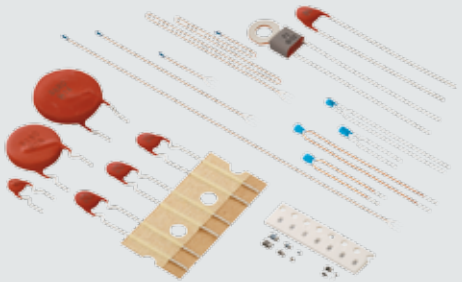


# Thermistors

*The tightest temperature tolerance chips and lead types covering inrush current suppression, temperature compensation, overcurrent and overheat sensing.*

## Product lineup

-  **PTC & NTC Thermistor**  
For overcurrent protection & temperature sensor / temperature compensation
-  **Chip NTC Thermistor**  
For temperature sensor / temperature compensation
-  **Chip PTC Thermistor Line-up**  
For overheat sensing / overcurrent protection
-  **PTC Thermistor lead type**



Learn more online

<http://www.murata.com/en-eu/products/thermistor>



## Connectivity modules

### Low-power reliable connectivity for healthcare devices

Healthcare devices are increasingly connected to each other and the Web. Use a Murata module for proven RF excellence.

Murata RF modules make it easy for you to build connectivity into most devices ...even those where space is limited and power consumption needs to stay low. With **BLE (Bluetooth® Low Energy)** devices as small as 4.8 x 5.8 x 1.0mm, wireless communication has never been easier to design in. Contact **Murata** today to find out how our RF modules could enhance the functionality of your products.



#### Small Size

Murata RF modules are small enough to suit even the most space-constrained applications with sizes from 4.8 x 5.8 x 1.0mm.

Footprint 

Height 

#### Features

- Support BLE (Bluetooth® Low Energy), Bluetooth®, WiFi®, and other wireless standards
- Combo-modules available (Bluetooth®/WiFi®, etc.)
- Easy to design in
- Antenna matching supported

#### Applications

- E-health / home monitoring
- Connectivity of healthcare appliances like blood pressure meter, glucose meter, etc.

Learn more online

<http://wireless.murata.com/eng/products/wireless-connectivity-platforms.html>



### Wi-Fi™ 802.11b/g/n Murata WICED module portfolio

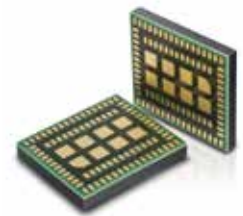


Product	Murata P/N	Chipset	Processor	WLAN	Op. Temp	Size (mm)	Host Interface	Antenna	Cert.	Grade
Type ZX	LBWA17DX6-705	Broadcom® BCM43362		802.11b/g/n	-40°C to +85°C	7.0 x 6.0 x 1.2	SDIO(Wi-Fi™)	External	No	
Type YM	LBWA1ZZYM6-663	Broadcom® BCM43362		802.11b/g/n		20.0 x 10.0 x 2.0	SDIO(Wi-Fi™)	Internal	Yes	
Type YD	LBWA1ZVYDZ-679 (WICED SW)	Broadcom® BCM43362	STM32 ARM® Cortex®-M3	802.11b/g/n	-40°C to +85°C	10.0 x 7.9 x 1.25	UART/SPI	External	Yes	Consumer
	LBWA1ZVYDZ-682 (Ayla SW)									
	LBWA1ZVYDZ-739 (Murata SW)									
Type ZD	LBWA1ZVZDZ-681	Broadcom® BCM43362	STM32 ARM® Cortex®-M4	802.11b/g/n	-40°C to +85°C	10.0 x 7.9 x 1.25	UART/SPI	External	TBD	Consumer
Type ZX	LBWA17DX6-705	Broadcom® BCM43362	N/A	802.11b/g/n	-40°C to +85°C	7.0 x 6.0 x 1.2	SDIO	External	No	Consumer
Type YD-Certified	LBWB1ZZYDZ-713 (WICED SW)	Broadcom® BCM43362	STM32 ARM® Cortex®-M3	802.11b/g/n	-40°C to +85°C	33.0 x 18.0 x 2.5	UART/SPI(MCU)	External	Yes	Consumer
	LBWB1ZZYDZ-683 (Ayla SW)									
	LBWB1ZZYDZ-740 (Murata SW)									



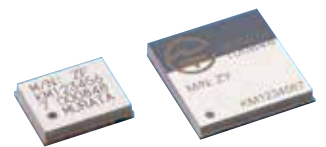
## Wi-Fi™ - Broadcom® chip set 2.4GHz IEEE 802.11b/g/n radio technology

Product	Murata P/N	Chipset	Processor	WLAN	Op. Temp	Size (mm)	Host Interface	Antenna	Cert.	Grade
<b>SN8000</b>	88-00153-00	Broadcom® BCM43362	N/A	802.11b/g/n	-40°C to +85°C	24.0 x 11.4 x 1.9	SDIO/SPI	On Board or U.FL Connector	Yes	Industrial
	88-00153-02									
<b>SN820X</b>	88-00151-00	Broadcom® BCM43362	STM32 ARM® Cortex®-M3	802.11b/g/n	-40°C to +85°C	30.5 x 19.4 x 2.8	UART/SPI	On Board or U.FL Connector	Yes	Industrial
	88-00151-02									
	88-00158-00									
	88-00158-02									



## Wi-Fi™ 802.11a/b/g/n with Bluetooth 4.0™ for Linux™ & Android platforms

Product	Murata P/N	Chipset	WLAN	BT	Clock	Op. Temp	Size (mm)	Host Interface	Antenna	Cert.
<b>Type ZP</b>	LBEH5HMZPC	BCM4339	802.11 a/b/g/n,ac	BT®+BLE®	X'tal	-20°C to +75°C	7.8 x 7.42 x 1.0	SDIO(Wi-Fi™), UART(BT®)	External	No
<b>Type 1BW</b>	LBEH5DU1BW	Broadcom® BCM43340	802.11 a/b/g/n	BT®+BLE®	X'tal		8.0 x 7.5 x 1.33	SDIO(Wi-Fi™)	External	No
<b>Type XR</b>	LBEP5CLXRC-701	Ti WiLink™ 8 WL1801	802.11b/g/n	No	External	-40°C to +85°C	9.9 x 8.8 x 1.3	SDIO(Wi-Fi™)	External	No
<b>Type WT</b>	LBEP5CLWTC-601 (WLAN Only)	Ti WiLink™ 8 WL1831	802.11b/g/n	v4.0 (BLE®+EDR)	Internal X'tal	-40°C to +85°C	9.9 x 8.8 x 1.3	SDIO(Wi-Fi™), UART(BT®)	External	No
	LBEP5CLWTC-631 (WLAN + BT + BLE)									
<b>Type WM</b>	LBEP5CLWMC-603 (WLAN Only)	Ti WiLink™ 8 WL1833	802.11a/b/g/n	v4.0 (BLE®+EDR)	Internal X'tal	-40°C to +85°C	9.9 x 8.8 x 1.3	SDIO(Wi-Fi™), UART(BT®)	External	No
	LBEP5CLWMC-633 (WLAN + BT + BLE)									



## Bluetooth SMART® modules

Product	Freq	Murata P/N	Power Class	Version	Output Power	Op. Temp	Size (mm)	Host Interface	Antenna	Cert.
<b>Type VZ</b>	2.4GHz	LBCA2ZZVZZ-721 (Central Device)	Class 3	BLE®	-2dBm	-10°C to +60°C	20.0 x 13.0 x 2.4	UART	On Board	Yes
		LBCA2ZZVZZ-722 (Peripheral Device)								
<b>Type WS</b>	2.4GHz	LBCA2ZXWSE-723 (Central Device)	Class 3	BLE®	-2dBm	-10°C to +60°C	10.4 x 7.7 x 1.8	UART	External	Yes
		LBCA2ZXWSE-724 (Peripheral Device)								
<b>Type ZF</b>	2.4GHz	LBCA2BZZFZ	Class 3	BLE® v4.1	0dBm	-20°C to +85°C	5.4 x 4.4 x 1.0	UART	External	No
<b>Type ZY</b>	2.4GHz	LBCA2HNZYZ-711	Class 3	BLE® v4.1	0dBm	-20°C to +85°C	7.4 x 7.0 x 1.0	UART	Internal	Yes
<b>Type 1BX</b>	2.4GHz	LBMA15Q1BX	Class 1	BT®+BLE®	13dBm (Max)	-30°C to +85°C	5.0 x 4.5 x 1.0	UART	External	No

# AC-DC front-end power supplies

## Medical approved

Custom products also available for medical applications

### Selection table

Series	Convection Cooling	Forced Air 250LFM	Input Voltage (Vac)	Output Voltage (V)	Efficiency
MVAC400	250W	400W	90-264	12V/24V/50V	93%
MVAC250	170W	250W	90-264	12V/24V/50V	93%
<b>NEW</b> MVAD160	110W	160W	90-264	12V/24V/48V	93%
MVAB120	75W	120W	90-264	12V/24V/28V/48V	91%
MVAD065	65W	65W	90-264	12V/24V/48V	90%
MVAD040	40W	40W	90-264	12V/24V/48V	89%

### Features

- Universal input 90-264Vac
- Active power-factor correction
- Up to 250W natural convection cooling
- -20°C to +70°C full power operating temp.
- Class B conducted EMC
- Aux isolated 12V@1A fan output
- MVAC 250/400: 10W 5V standby power
- MVAD040/065: less than 0.3W at no load
- 2 x MOPP (Primary-Secondary)
- 1 x MOPP (Secondary-Chassis/Earth Enclosure)

### Quality/Safety

- 60601 (3rd edition) MOPP, 60950 safety approval
- 2 year warranty

### Applications

- Mains-powered medical equipment

### MVAC Series

3"x5"



250W



400W

### MVAD Series

2"x4"



40W



120W



65W

### MVAD160 Series

NEW



160W



Learn more online

<http://power.murata.com/en/products/ac-dc-power-supplies.html>



# DC-DC converters

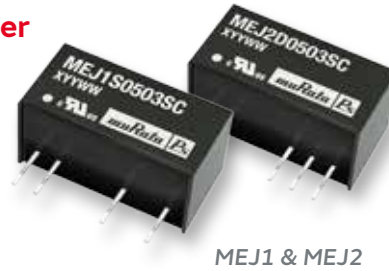
## Low power modules



Learn more online  
<http://power.murata.com/en/products/dc-dc-converters.html>

### Compact 1W & 2W DC-DC converter complies with UL60601-1

Industry standard, pin compatible 1W and 2W converters maintaining high levels of efficiency at light loads.



MEJ1 & MEJ2

### Features

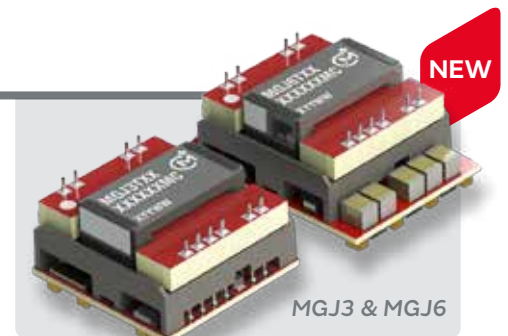
- High efficiency across the full load range
- Op. temp. range: -40° to 85°
- Encapsulated: superior thermal performance
- 72-79% typical efficiency
- 3.5 - 5% typical load regulation
- ANSI AAMI ES60601-1 recognition
- UL60950

### Selection table

Series	Isolation	Input voltage	Output voltage	Efficiency	Power rating
MEJ1	5200Vdc	3.3/5/12/15/24V	3.3/5/9/12/15V	69-78%	1W
MEJ2	5200Vdc	3.3/5/12/15V	3.3/5/9/12/15V	70-82%	2W

### Configurable output voltage, high isolation DC-DC converters

With configurable triple output voltages of +15V, +5V and +5V, the MGJ series of DC-DC converters is ideal for powering gate drives for IGBTs and Mosfets (standard, SiC) in bridge circuits. The MGJ series is characterised for high isolation and common mode dv/dt requirements. A disable/frequency synchronisation pin simplifies EMC filter design.



MGJ3 & MGJ6

### Features

- 3 outputs configurable for all gate drive applications: +15V/-5V, +15V/-10V & +20V/-5V outputs
- ANSI/AAMI ES60601-1 pending
- Reinforced insulation to UL60950 pending
- Characterised dv/dt immunity
- Characterised partial discharge immunity
- Ultra-low coupling capacitance 15pF
- Operation to 105°C

### Configurations

Function	IGBT	SiC	MOSFET
<b>15V Output</b>	+15V	+20V	+15V
<b>15V (0V reference) 5VA output</b>	0V		0V
<b>15VA (0V reference) 5VB output</b>		0V	-5V
<b>5VB (0V reference)</b>	-10V	-5V	

### Selection table

	Output 1			Output 2			Output 3		
	Rated Output Voltage (V)	Rated Output Current (mA)	Output Power (W)	Rated Output Voltage (V)	Rated Output Current (mA)	Output Power (W)	Rated Output Voltage (V)	Rated Output Current (mA)	Output Power (W)
MGJ3T05150505MC	15	120	1.8	5	120	0.6	5	120	0.6
MGJ3T12150505MC	15	120	1.8	5	120	0.6	5	120	0.6
MGJ3T24150505MC	15	120	1.8	5	120	0.6	5	120	0.6
MGJ6T05150505MC	15	240	3.6	5	240	1.2	5	240	1.2
MGJ6T12150505MC	15	240	3.6	5	240	1.2	5	240	1.2
MGJ6T24150505MC	15	240	3.6	5	240	1.2	5	240	1.2

# Inductors

Murata chip inductors feature compact size and high-performance. The unique coil and case structures give them low DC resistance and outstanding high-frequency characteristics.

Murata offers a broad variety of products for different applications.

The diverse lineup offers the customer a choice of the types of inductors and characteristics optimal for the circuit in question.

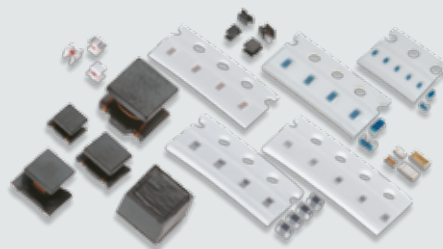
Learn more online

<http://www.murata.com/en-eu/products/inductor>



### Product line-up

- Inductors for Power Circuits (Power and Choke)
- RF Inductors



# Power inductors

Inductors are passive components and are required in all noise-sensitive electronic power circuits. Magnetic inductors are not restricted by application.

Whether you need to reduce noise or protect vital components, we can offer a wide range of products to suit your requirements, having developed over 1,200 highly advanced and optimized inductor and transformer solutions. With an emphasis on miniaturization, reliability and ease of handling, our inductors, current transformers and common mode chokes are available in a variety of styles including bobbin, radial, axial and surface mount.

### Product line-up

- Inductors/Common Mode Chokes
  - AC and DC Powerline filtering
  - Magnetically shielded inductors for EMI sensitive applications
  - Energy storage in power converters
- Transformers
  - Pulse
  - Current sense



Power inductors

Learn more online

<http://www.murata-ps.com/en/products/magnetics.html>

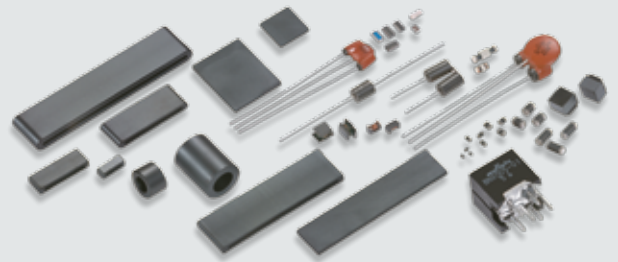


# EMI Noise suppression

Using Murata's ceramic processing technology and unique material, we offer a variety of Noise Suppression Products and EMI Suppression Filters. Murata also offers technical support and guidance based on many years of experience operating in the field of noise suppression.

## Product line-up

-  **EMI Suppression Filters**
-  **Microwave Absorber**
-  **AC Line Filter**
-  **ESD Protection Devices**
-  **Ferrite Core**



EMI suppression filters

Learn more online









<http://www.murata.com/en-eu/products/emc>



# Capacitors

Murata offers the No. 1 most abundant lineup in the industry, responding to all possible needs, and proposing ideal solutions. Continuing to evolve as the world's No.1 manufacturer of monolithic ceramic capacitor

## Product line-up

-  **Monolithic ceramic capacitors**
-  **High voltage capacitors**
-  **PAC (Polymer aluminum electrolytic capacitors)**
-  **Film capacitors**
-  **EDLC (Electrical double layer capacitors)**
-  **Safety capacitors**
-  **Trimmer capacitors**
-  **Single layer microchip capacitor**



EDLC, GRM, ZRB, TZC3

Learn more online

<http://www.murata.com/en-eu/products/capacitor>



# Timing Devices

Learn more online






<http://www.murata.com/en-eu/products/timingdevice>

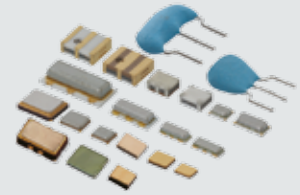


Ceramic resonators (CERALOCK®) are made of high stability piezoelectric ceramics that function as a mechanical resonator.

With the advance of the IC technology, various equipment may be controlled by a single LSI integrated circuit, such as the one-chip micro-processor.

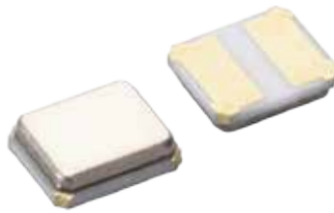
### Product line-up

-  Ceramic resonators
-  Ceramic filters
-  Crystal units
-  Crystal oscillators
-  Piezoelectric sound components



Timing devices

## Crystal units



Since 2009, Murata's crystal unit has offered a compelling balance of value and accuracy, in an innovative 2016 package. Such features are ideal for size and cost conscience consumer and communication applications.

### Features

#### Small size

- 2016\* size for 24MHz to 48MHz
- 2520\* size for 16MHz to 24MHz

\*2016 = 2.0mm x 1.6mm package size

\*2520 = 2.5mm x 2.0mm package size

#### Frequency Tolerance

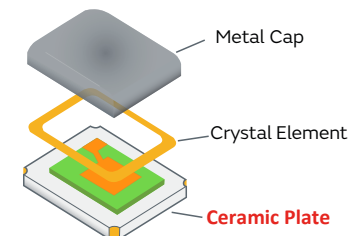
- Available +/-20ppm\* for Consumer
- Available +/-100ppm\* for Automotive

#### Economical & robust design

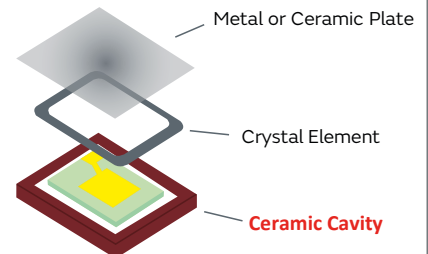
- Simple structure using Murata's proven package technology
- Particle screening process for enhanced reliability

RoHS Compliant & Pb Free

### Murata Crystal Unit



### Conventional Crystal Unit



RoHS Compliant & Pb Free

Learn more online

<http://www.murata.com/en-eu/products/timingdevice/crystalu>



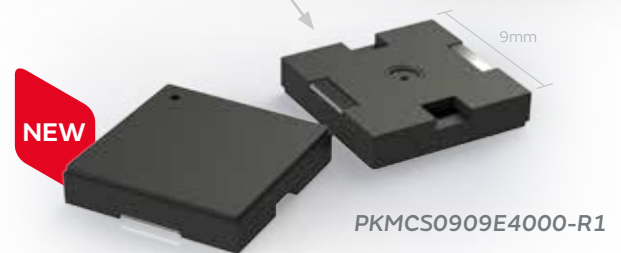
# Sound components

Piezoelectric sound components utilize natural oscillation of piezoelectric ceramics. They are widely used in the applications from healthcare to consumer products.



## Ultra compact light and low power SMD piezoelectric sounder suits portable healthcare devices

The smallest and lightest surface mount piezoelectric sounder available. Occupying significantly less surface area, and with a combined weight and area reduction of 44% compared to other similar products.



Specifications	
Sound pressure level	65dB min
Measure condition of sound pressure level	$\pm 1.5$ Vo-p, 4.0kHz, square wave, 10cm
Maximum input voltage	$\pm 12.5$ Vo-p max
Operating temperature range	-40 to +85°C
Storage temperature range	-40 to +85°C
Drive type	External-drive

## Features

- Small, thin and lightweight
- 9.0mm x 9.0mm x 1.9mm
- 44% less than current one
- Low power consumption
- The piezo based brings in noiseless because of magnet less

## Applications

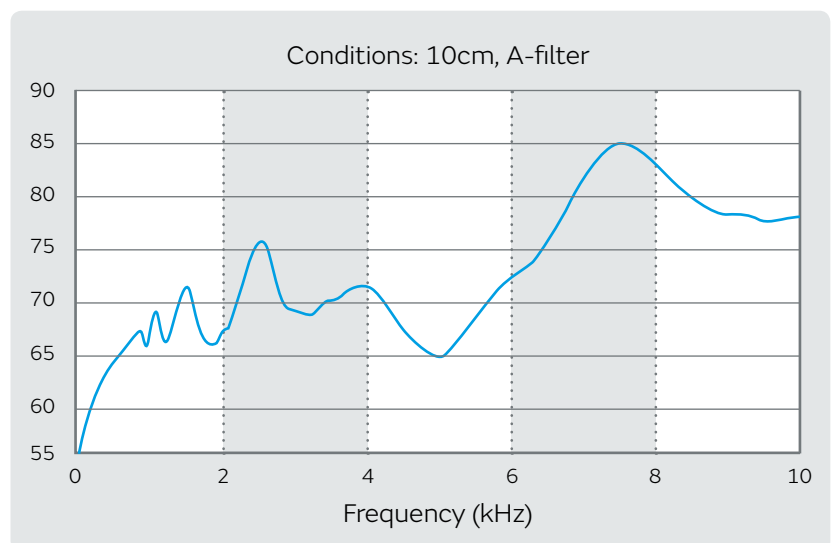
- Blood glucose meter
- Thermometer

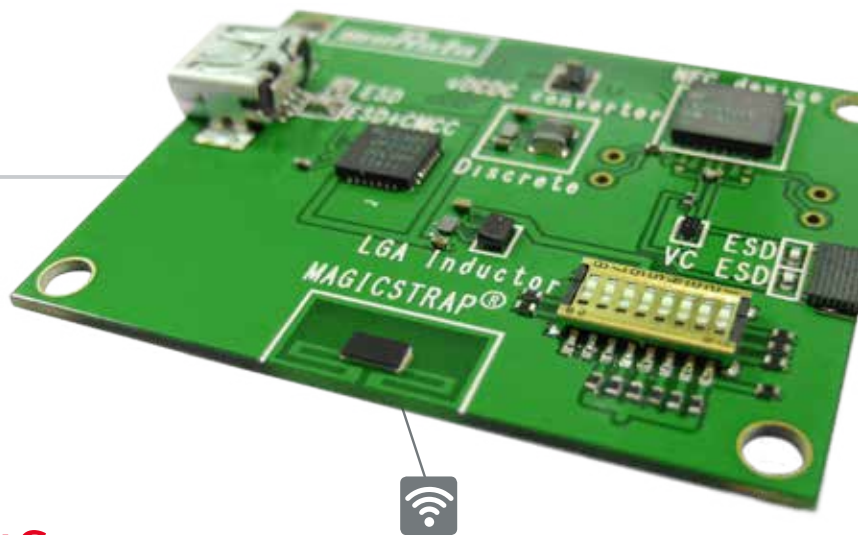
Learn more online

<http://www.murata.com/en-eu/products/sound>



Frequency Characteristics of Sound Pressure Level





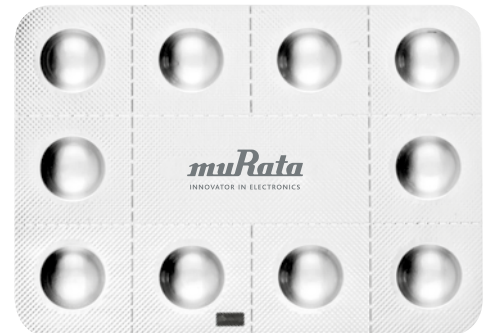
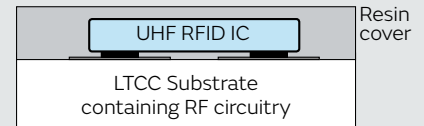
# Track, trace, & verify with ultra-miniature UHF RFID tags

Whether your focus is on anti-counterfeiting, inventory management, or process control, MAGICSTRAP® offers you an integrated solution with a tag size which can meet the challenges of almost any application.

At only 2.0 x 1.2 (LXMS21) and 3.2 x 1.6 (LXMS31), the **MAGICSTRAP®** UHF IC module is one of the smallest in the world. It can be mounted onto, or embedded into, a wide variety of materials even in non-electronic products, and can be surface-mounted directly onto your PCB for use in medical electronics.

In association with partner companies offering hardware & software solutions, we are able to provide a fully integrated system that gives you massive read/write functionality all built around an unbelievably small module.

### Construction



### Features

- RF circuitry incorporated in LTCC substrate
- Read range:
  - Up to 2cm using the component alone\*
  - Up to 7m with external antenna
- Can be mounted on many surfaces
- Can be embedded into many materials
- Small SMD: 2.0 x 1.2 (LXMS21) and 3.2 x 1.6 (LXMS31)
- Complies with EPCglobal C1G2, ISO 18000-6C

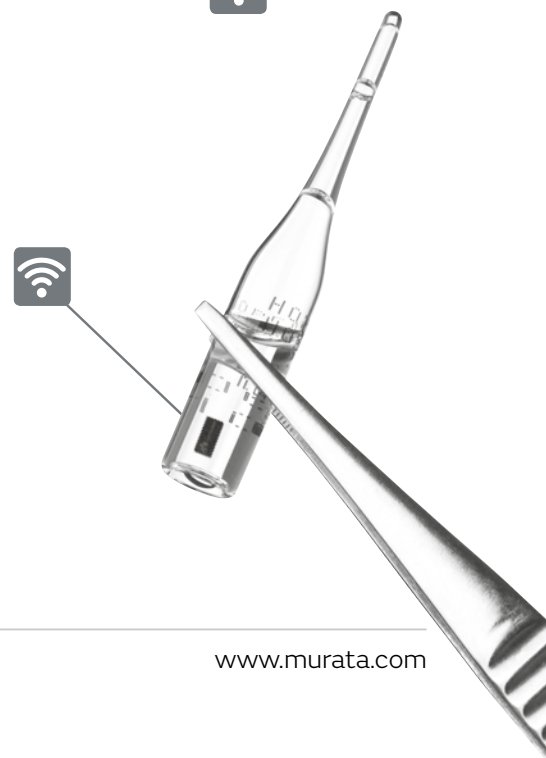
\*Loop type antenna for reader/writer is required

### Applications

- Anti-counterfeit
- Process control/traceability of medical electronics
- Tracking/tracing PCBs
- Inventory management in healthcare institutions
- Probe tracking

### Small Size

2.0 x 1.2 (LXMS21) or  
3.2 x 1.6 (LXMS31),  
surface-mounted device



Learn more online

<http://www.murata.com/en-eu/products/rfid>



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Get your login credentials at:  
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## Get the latest product information

You can find out about the latest ceramic capacitor product lines, updated regularly as well as some unreleased product information, exclusively available on 'my Murata'. Plus much more...



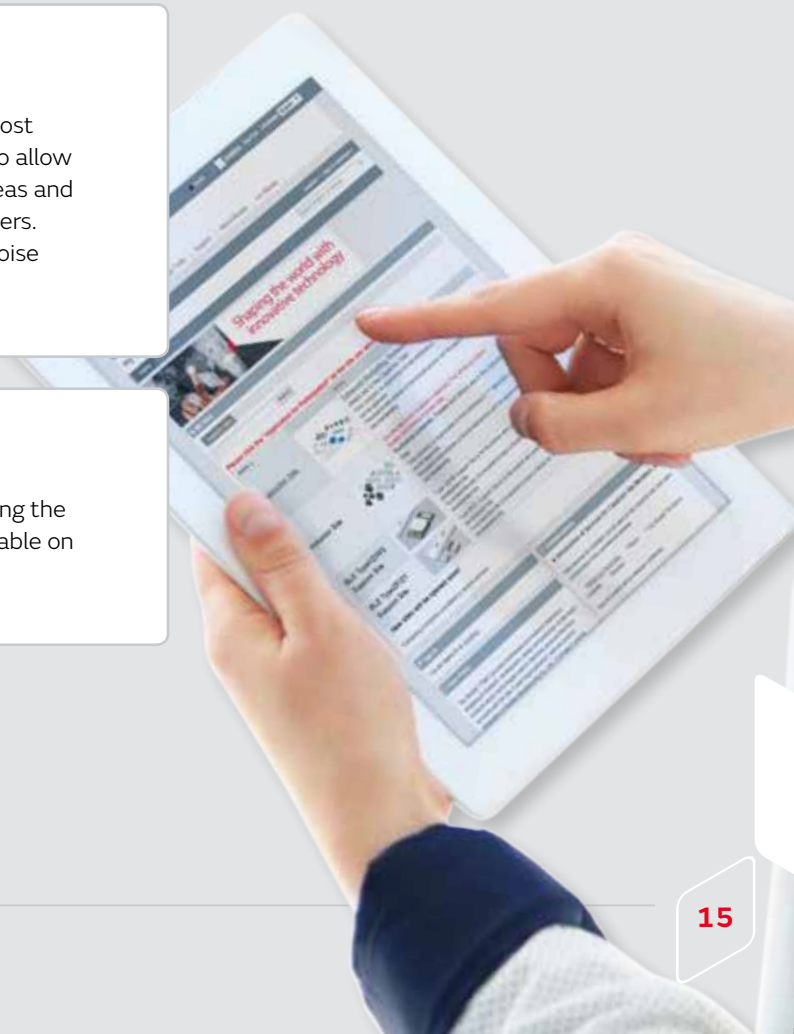
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## Enhanced design tool

Simulate the characteristics of Murata products using the enhanced version of our 'SimSurfing' software available on the 'my Murata' portal.



# Global Locations

For details please visit [www.murata.com](http://www.murata.com)



## ⚠️ Note

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- ② Aerospace equipment
- ③ Undersea equipment
- ④ Power plant equipment
- ⑤ Medical equipment
- ⑥ Transportation equipment (vehicles, trains, ships, etc.)
- ⑦ Traffic signal equipment
- ⑧ Disaster prevention / crime prevention equipment
- ⑨ Data-processing equipment
- ⑩ Application of similar complexity and/or reliability requirements to the applications listed above

3 Product specifications in this catalog are as of March 2014. They are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering. If there are any questions, please contact our sales representatives or product engineers.

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