AVNET® ABACUS

Avnet Abacus
Internet of Things
solutions guide

IoT solutions linecard

SENSORS

	Magnetic sensors: hall effect and current sensors	Pressure: force, load and shock sensors	Motion and position: inclinometers, accelerometers, gyros and inertial sensors	Optical: light image, IR, photo and pyroelectric sensors	Atmospheric: air quality, humidity and gas sensors	Liquid level and flow sensors	Proximity and touch sensors	Temperature sensors	NTC/PTC thermistors
Alps Alpine	•	•	•		•				
Amphenol Advanced Sensors		•		•				•	•
AVX									•
Bourns		•	•		•				•
Grayhill			•						
IST					•	•		•	
KEMET	•	•		•				•	
Murata	•	•	•	•	•	•	•		•
Omron		•	•	•	•	•	•		
Panasonic Industry	•	•	•			•	•		•
Panasonic Electric Works		•	•	•		•			
SMi		•							
TDK (Inc. Epcos, Invensense)	•	•	•		•	•			•
TE Connectivity	•	•	•	•	•	•	•	•	•
Vishay			•						•

WIRELESS MODULES

	NFC	ANT	Bluetooth	Zigbee	Thread	Wi-Fi	LoRa	SigFox	Optical communication
Alps Alpine			•						
Fujitsu			•						
Murata	•		•			•	•	•	
Panasonic Industry	•		•	•		•			
Taiyo Yuden	•	•	•	•	•	•			•

ANTENNAS

	Chip antenna	GSM/LTE antenna	WLAN/Wi-Fi antenna	NFC antenna	ISM/Zigbee/Bluetooth antenna	GPS & data antenna	Small cell antenna	DAS antenna
Abracon	•	•	•	•	•	•		
Amphenol		•	•	•	•	•	•	•
AVX/Ethertronics	•	•	•		•	•		
Molex	•	•	•		•	•		
Murata				•				
Pulse		•	•	•	•	•	•	•
Taiyo Yuden	•		•			•		
TDK	•			•	•			
TE Connectivity			•	•	•			
Vishay	•		•		•	•		
Yageo		•	•	•	•	•		

BATTERIES

	Zinc carbon	Alkaline manganese	Silver oxide	Zinc air	Lithium manganese dioxide	Lithium iron disulfide	Lithium thionyl chloride	Lithium poly-carbon monofluoride	Sealed lead acid	Nickel metal hydride	Lithium-ion	Lithium-ion polymer	Lithium vanadium pentoxide
	Primary								Rechargeable				
Dubillier			•		•				•	•	•		
Enersys									•				
GP Batteries	•	•	•	•	•					•	•		
Murata		•	•		•								
Panasonic Industry	•	•		•	•				•	•	•		•
RRC											•	•	
Tadiran							•				•		
VARTA	•	•	•	•		•				•	•	•	
Wamtechnik										•	•		

WIRELESS CHARGING

	Tx coil units (WPC)	Rx coil units	Tx modules	Tx or Rx coils
Abracon	•	•		•
Molex	•	•		
TDK	•	•	•	
Vishay	•	•		

Content

LET'S TALK

Speak to your local sales representative, or get in touch with our IoT specialists in your local language at www.avnet-abacus.eu/ask-an-expert

Visit avnet-abacus.eu/iot to:

View our linecard

Download technical brochures, white papers and datasheets

Read our guide to European IoT legislation and safety requirements

INTERNET OF THINGS SOLUTIONS GUIDE

The diversity of new IoT connected devices and systems is truly vast, yet there are common building blocks and requirements. These include sensors, wireless communications, antennas, energy storage devices and increasingly smaller connectors and passive components to enable small, remote, low power, interconnected, intelligent things.

This solutions guide showcases the world's leading suppliers of these technologies, and their newest solutions to address the challenges for design engineers in developing IoT applications.

AVNET ABACUS

Avnet Abacus is a pan-European distributor of connector, electromechanical, passive, power and battery products. Our industry-leading supplier linecard and widespread local presence means that our customers benefit from the product choice, financial strength, logistics and fulfilment benefits of a global distributor, with the personal service of a local provider.

Avnet Abacus' expertise spans a wide range of industrial applications and a significant engagement with contract manufacturers. We service many end user markets including building and home automation, communications, defence and aerospace, healthcare and medical, industrial and automation, Internet of Things, lighting, power, renewable energy, smart metering and transportation.

DESIGN SUPPORT

Our in-depth knowledge of the electronics market enables us to offer the highest levels of product, service and technical expertise in the industry; and we can deliver this, in your local language, through our Europe-wide team of technical specialists. This team is committed to working with you to offer the most innovative IoT solutions for your design. To discuss your project in more detail, contact us at avnet-abacus.eu/ask-an-expert

Sensors

Advances in sensing technologies are increasing the functionality of devices in many industries including consumer, wearable devices, medical, industrial and automotive. The functionality can be delivered at various levels of integration in terms of the number of diverse sensor types included in either a single package or sensor module. It is a complicated process to determine the right types of sensor for your application and to select the optional technical characteristics such as precision, range and speed.

An in-depth knowledge of, and close working relationships with the market's leading sensor manufacturers enables Avnet Abacus to provide the product knowledge and technical expertise to assist designers in selecting the optimal sensing solution for their design, leading to reduced design cycles and shorter time to market.

ALPS ALPINE MEMS PRESSURE SENSOR HSPPA SERIES

HSPPAD143A is the 3.1mm x 3.1mm footprint and 2.6mm height digital interface pressure sensor designed as waterproof for barometer system and water depth measurement system.

Barometric and water pressure is detected by MEMS sensor element using piezo resistive bridge circuit formed on the silicon diaphragm.
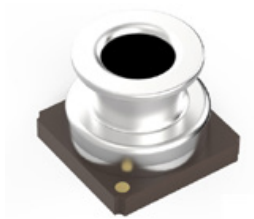
Features
- Pressure range: 300hPa to 2100hPa (9000m in altitude and 10m in depth)
- Supply voltage 1.7V to 3.6V (typical 1.8V)
- Operating temperature: -40°C to +85°C
- Package small LGA package: 3.1mm x 3.1mm x 2.6mm
- Digital interface I^2C
- Current consumption 1.8uA (low power setting)
- Noise RMS 0.026hPa (high resolution setting)
- Sampling rate 200Hz max. (continuous mode)
- Lead free, RoHS instruction, halogen free conforming

AMPHENOL ADVANCED SENSOR MICS-VZ-89TE DIGITAL VOC AND EQUIVALENT CO_2 SENSOR MODULE

The MiCS-VZ-89TE combines state-of-the-art MOS sensor technology with intelligent detection algorithms to monitor tVOCs and CO_2 equivalent variations in confined spaces, e.g. meeting rooms or vehicle cabins.

The dual signal output (I^2C, PWM) can be used to control ventilation on-demand, saving energy and reducing cost-of-ownership.
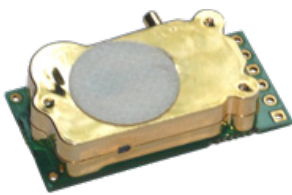
Features
- Calibration-free
- Supply voltage: 3.3VDC ±5%
- Operating power: 125mW
- Operating temperature range: 0°C to +50°C
- Operating humidity range: 0% RH to 95% RH (non-condensing)
- Monitoring range: 400ppm to 2000ppm CO_2, 0ppb to 1000ppb isobutylene equivalent tVOCs
- Response time: equivalent to conventional NDIR-CO_2 sensors, <5 seconds for tVOC
- Refresh output: 1Hz
- Package dimensions: 22.9mm x 14mm x 3.15mm

AMPHENOL ADVANCED SENSORS TELAIRE T6713 CO_2 MODULE

The T6713 series is a miniature NDIR CO_2 sensor that has the accuracy and reliability of many larger sensors. The small size allows OEM's to integrate it into smaller enclosures and equipment, and uses significantly less power than alternative devices on the market.

Features

- An affordable gas sensing solution for OEMs
- Eliminates the need for calibration in most applications with Telaire's patented ABC Logic™ software
- Lifetime calibration warranty
- A reliable sensor design based on 20 years of engineering and manufacturing expertise
- Flexible CO_2 sensor platform designed to interact with other microprocessor devices
- Compact design and versatile interface options for simple product integration

IST AG HIGH ACCURACY PLATINUM TEMPERATURE SENSORS

Innovative Sensor Technology IST AG platinum temperature sensors provide solutions for extreme temperature applications and are designed with the highest quality materials, allowing them to operate within a temperature range of -200°C to +1000°C. These sensors are available in SMD and wired configurations and in sizes ranging from 1.6mm to 10mm (L) and 0.8mm to 5.08mm (W). Standard sensors can be customised with a variety of lead wire material, length, and configurations like invert welded and bent leads or axial lead wires which are optimal for applications requiring sensors to be soldered to the bottom of the tube or with space constraints. To optimise thermal coupling, sensors are also offered with a metallised backside and with long directly welded wires to increase assembly processes and robustness.

Features

- Temperature range: -200°C to +1000°C
- Available tolerance classes (according to IEC 60751): F.03, F0.15, F0.1
- Dimensions: element length between 1.6mm and 10mm and width between 0.8mm and 5.1mm
- Connection: with various lead wires or as SMD
- Temperature coefficient: 3850ppm/K (deviant characteristics curves on request). Exception for +1000°C series with 3770ppm/K
- Additional features: excellent long-term stability, low self-heating, fast response time, good vibration stability

Sensors

KEMET PYROELECTRIC INFRARED SENSOR

KEMET's pyroelectric infrared sensors use the pyroelectric effect of ceramic by absorbing infrared rays emitted from the human body. This detects the natural infrared signature produced by humans. Also, it can detect infrared rays without using lenses.

Due to the absence of a lens, KEMET's pyro sensor is low profile, as it does not protrude, which makes it ideal for gathering visual requirements. With KEMET's proprietary piezoelectric ceramic material and element structure of the pyroelectric infrared sensor, you can also detect humans through glass or resin. This allows more freedom in the design of the outer appearance of the end product.

Features
- Reflow capable SMD configuration
- Lens not required
- Wide view angle up to ±60 degrees
- Detection possible through glass or resin
- Low power consumption, down in the µA range
- Excellent radio wave performance in high-frequency band
- Compact and low profile (5mm x 4.8mm x 1.7mm)

OMRON HVC-P2 B5T-007001 SERIES "HUMAN VISION COMPONENTS" (HVC) SYSTEM

The HVC is an image-sensing unit incorporating proprietary "OKAO® Vision" technology for recognising human face expression, gender, age, gaze and blink into a camera module. Engineers can choose from two camera heads, a long-distance detection type and a wide-angle detection type, depending on their specific application purposes.

A piece of equipment embedded with the HVC-P2 can detect and measure the attributes and conditions of a user coming into its vicinity, making it possible to provide services deemed most suitable for the user's attributes.

Features
- The HVC incorporates 10 algorithms of the OKAO vision image sensing technology software
- Recognition date is available in the form of numerical data including the number of detections, angles and age, as well as text data including facial expressions and gender
- HVC-P2 consists of a camera and a separate main board, connected via a flexible flat cable, allowing it to be installed on the edge of a flat display unit
- Output image can be chosen from three types: no image output, 160 x 120 pixels and 320 x 240 pixels
- Image format: RAW (8-bit, Y data)
- Detection resolution: 1600 × 1200 pixels
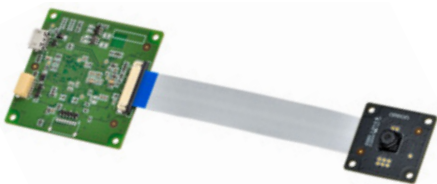
OMRON D6T-32L-01A SERIES

Omron D6T series MEMS thermal sensors are super-sensitive infrared temperature sensors that make full use of Omron's proprietary MEMS sensing technology. Unlike typical pyroelectric human presence sensors that rely on motion detection, the D6T thermal sensor is able to detect the presence of stationary humans by detecting body heat, and can therefore be used to automatically switch off unnecessary lighting, air conditioning, etc. when people are not present.

Features

- Achieves world's highest level of SNR
- Accurate temperature measurements with little impact from outside
- Superior noise immunity with a digital output
- High-precision area temperature detection with low crosstalk field of view characteristics
- RoHS compliant

SMI SM923X SERIES

The SM923X series was developed to meet the challenging reliability requirements of the industrial, HVAC and medical applications. SMI's compact solution replaces traditional bulky and costly equipment and the SM923X series improves system efficiency with accurate and reliability performance. The total accuracy error after board mount and system level autozero is less than 1% full scale over the entire compensated temperature range. The 16-bit resolution provides the ability to resolve signals as small as 0.0038Pa. The excellent warm-up behavior and long-term stability further assures its expected performance over the life of the part.

Features

- Pressure ranges: 250Pa up to 600Pa gauge
- Accuracy after autozero: <1% FS
- 16-bit I²C digital interface
- Pressure calibrated and temperature compensated output
- Compensated temperature range: -20°C to +85°C

Sensors

TDK INVENSENSE ICM-20789 7-AXIS MEMS MOTION TRACKING DEVICE

The ICM-20789 is an integrated 6-axis inertial device that combines a 3-axis gyroscope, 3-axis accelerometer and an ultra-low noise MEMS capacitive barometric pressure sensor in a 24-pin LGA package. This unique 7-axis ultrasmall device is ideal for tracking rotational and linear motion as well as pressure differences with an accuracy of ±1Pa, an accuracy enabling altitude measurement differentials as small as 8.5cm. The pressure sensor's MEMS capacitive architecture provides the industry's lowest noise at the lowest power, high sensor throughput and temperature coefficient offset of ±0.5Pa/°C. The sensor's combination of high accuracy elevation measurements complemented by the 6-axis motion tracking in a small footprint makes it ideal for a wide range of applications like drones, virtual reality controllers and indoor/outdoor navigation (dead-reckoning, floor/ elevator/step detection).

Features

- Pressure operating range: 30kpa to 110kpa
- Current consumption: 1.3µA (LP mode), 5.2µA (LN mode), 10.4µA (ULN mode)
- Pressure sensor absolute accuracy: ±1hPa over 950hPa-1050hPA, 0°C to +65°C
- Gyroscope programmable FSR of ±250dps, ±500dps, ±1000dps, and ±2000dps
- User-programmable interrupts
- Wake-on-motion interrupt for low power operation of applications processor
- Host interface: 400kHz fast mode I^2C & 8MHz SPI
- Two digital-output temperature sensors
- Nominal VDD operation at 1.8V
- Accelerometer with programmable FSR of ±2g, ±4g, ±8g, and ±16g
- 4kB FIFO buffer enables the applications processor to read the data in bursts
- EIS FSYNC support
- 10,000g shock tolerant
- Operating temperature range: -40°C to +85°C
- Package dimensions: 4mm x 4mm x 1.365mm (24-pin LGA)

TDK INVENSENSE ICM-20948 SERIES 9-AXIS MOTION TRACKING DEVICE

The ICM-20948 is the world's lowest power 9-axis motion tracking device that is ideally suited for wearable sensors, tablets, drones and IoT applications. The device combines a 3-axis gyroscope, 3-axis accelerometer, 3-axis compass, and a Digital Motion Processor™ (DMP) in a compact 24-pin QFN package. The sensor supports an auxiliary I^2C interface to external sensors, on-chip 16-bit ADCs, programmable digital filters, an embedded temperature sensor, and programmable interrupts.

Features

- Lowest power 9-axis device at 2.5mW
- 3-axis gyroscope with programmable FSR of ±250dps, ±500dps, ±1000dps, and ±2000dps
- 3-axis accelerometer with programmable FSR of ±2g, ±4g, ±8g, and ±16g
- 3-axis compass with a wide range to ±4900µT
- Onboard Digital Motion Processor (DMP)
- Android support
- Auxiliary I^2C interface for external sensors
- On-chip 16-bit ADCs and programmable filters
- 7MHz SPI or 400kHz fast mode I^2C
- Digital-output temperature sensor
- VDD operating range of 1.71V to 3.6V
- MEMS structure hermetically sealed and bonded at wafer level
- 20,000g shock tolerant
- Operating temperature range: -40°C to +85°C
- Package dimensions: 3mm x 3mm x 1mm (24-pin QFN)

TE CONNECTIVITY HTU21D(F) DIGITAL HUMIDITY SENSORS

HTU21D(F) digital humidity sensors are dedicated humidity and temperature plug-and-play transducers where reliable and accurate measurements are required. Setting standards in terms of size and intelligence, they are embedded in a reflow solderable Dual Flat No leads (DFN) package with a small 3mm x 3mm x 0.9mm footprint. This sensor provides calibrated, linearised signals in digital, I²C format.

TE CONNECTIVITY TSYS02D DIGITAL TEMPERATURE SENSOR

The TSYS02D is a single chip temperature sensor, providing factory calibrated data corresponding to the measured temperature. The TDFN8 package provides smallest size 2.5mm x 2.5mm, but the device is also available in several modular form factors for development and evaluation purposes, for example a Digilent Pmod™ compatible module with 152.4mm x 50.8mm x 2.54mm header.

Antennas

Every device that communicates wirelessly requires at least one antenna and they are a key component in the performance of the entire RF functionality. Poorly designed and chosen antenna solutions can compromise the overall performance, power efficiency and regulatory compliance of a product.

Working closely with leading antenna manufacturers, including Abracon, AVX, Molex, Pulse and TE Connectivity, Avnet Abacus will recommend the best solutions and services available to ensure your design does not compromise performance on reliability, efficiency, range or interference.

ABRACON APAE SERIES PATCH ANTENNA

The APAE series of patch antennas provides low-cost system level solutions for GPS, RFID, SDARS, and GLONASS based architectures. Applications include RFID systems for logistic and inventory management of retail, pharmaceutical, automotive industries; industrial automation and contactless smart cards.
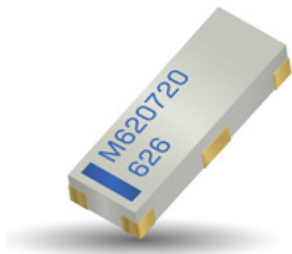
Features

- High-gain
- Pin-type
- Customisation available
- RoHS compliance

AVX/ETHERTRONIX M620720 868 AND 915MHZ CERAMIC IMD ANTENNAS

Ceramic Isolated Magnetic Dipole™ (IMD) chip antennas deliver on the key needs of device designers for higher functionality and performance in smaller and thinner designs. These innovative antennas provide compelling advantages for 868MHz and 915MHz ISM enabled handheld devices, media players and other mobile devices.

Features

- Frequency range: 868MHz to 870MHz or 902MHz to 928MHz
- Peak gain: 0.75dBi
- Average efficiency: 60%
- VSWR match: 2.5:1 max.
- Feed point impedance: 50ohms unbalanced
- Polarisation: linear
- Power handling: 0.5W CW
- Package dimensions: 6mm x 2mm x 1.08mm

MOLEX TRIPLE-BAND WI-FI CERAMIC ANTENNAS (SERIES 201932)

Molex triple-band (900MHz, 2.45GHz) Wi-Fi antennas offer greater power efficiency and longer-range connectivity to Wi-Fi certified products. The triple-band ceramic antenna enables multi-vendor operability and easy setup for IoT and M2M applications.

Features

- Antenna radiator awnchor antenna housing onto the SMT pad of the PCB

PULSE W3312B0100 EMBEDDED ANTENNA

The W3312B0100 is an ISM 868MHz to 915MHz PCB antenna with a coaxial feed, which is ideal for LoRa and or Sigfox applications.
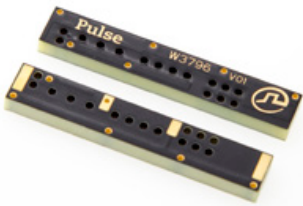

Features

- Frequency range: 863MHz to 928MHz
- Size: 75mm x 15mm
- Flexible PCB thickness 0.1mm with adhesive tape
- Mounting with 3M467 adhesive tape on back side
- 100mm x 1.13mm OD coax cable with U.FL connector

Antennas

PULSE W3796 LTE SMD ANTENNAS

The W3796 compact, sleek LTE antenna is part of the surface mount antenna, Domino series of embedded antennas. LTE, also referred to as 4G, is designed to increase traffic capacity and reduce overall power consumption. This sleek multi-band embedded antenna is the ideal option for many LTE applications, offering high efficiency where space is limited. As an added feature, the W3796 also covers the GNSS/GPS band.

Features
- Frequency range: 698MHz to 960MHz or 1427.9MHz to 1660.5MHz or 1695MHz to 2200MHz or 2300MHz to 2700Mhz
- Operating temperature: -40°C to +85°C
- 3G/4G LTE antenna
- Fully SMT compatible
- RoHS compliant
- 40mm x 7mm x 3mm
- Tape and reel packing
- Part numbers: W3796/W3796NL

TE CONNECTIVITY STAMPED METAL ANTENNAS

TE Connectivity's low profile, high performance stamped metal antenna solutions offer customers a low cost and highly repeatable manufacturing solution with a number of standard "off-the-shelf" or customised antennas designs.

Features
- Lowest cost
- Integrated contacts
- High volume capable production die
- Additional assembly stations may be added for volume upswings

Batteries and energy storage devices

Internet of Things devices including remote sensors and wireless nodes and gateways require energy storage devices to provide primary, pulse or backup power. Design considerations include electrical requirements, environmental temperatures and the available space, and solutions can come in the form of batteries, supercapacitors or hybrid devices.

Avnet Abacus provides battery solutions for the IoT from leading manufacturers including Enersys, GP Batteries, Panasonic Industry, Tadiran and VARTA. Supercapacitors and hybrid capacitors are offered from AVX, Eaton, KEMET, Murata, Panasonic Industry, TDK and Vishay.

EATON PHV SERIES SUPERCAPACITORS

Eaton PHV series supercapacitors are unique, ultra-high capacitance devices utilising Electrochemical Double Layer Capacitor (EDLC) construction combined with high performance materials. This combination of advanced technologies allows Eaton to offer a wide variety of capacitor solutions tailored to specific applications that range from a few micro-amps for several days to several amps for milliseconds.

Features
- Large capacitance for high energy density
- Ultra-low ESR for high power density
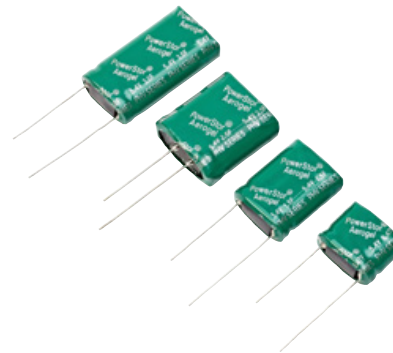
PANASONIC INDUSTRY 3V LITHIUM LIMNO2 CELLS

Panasonic Industry offers a wide range of 3V lithium coin (rechargeable and non-rechargeable) and cylindrical 3V batteries. The CR and BR series cylindrical cells are perfect for applications such as meters or smoke detectors which demand either long-term power supply reliability or the need to handle a wide temperature range. Service life in excess of 10 years can be achieved. Coin cells can be either primary or rechargeable and are available in standard, high and very high temperature versions. Applications include Remote Keyless Entry (RKE), digital thermometers, glucose meters, door lock systems, price tags, and tyre pressure monitoring systems.

Features
- High open circuit and load voltage (above 3V per cell)
- High energy density (400Wh/kg and 600Wh/l)
- High capacity and high rate cell construction
- Operation over a wide temperature range
- Flat discharge profile under low to medium rate applications
- Low self-discharge (less than 1% per year at RT)
- Superior shelf life and operational life (up to 10 years and more)
- UL recognised

Batteries and
energy storage devices

TADRIAN 3.6V LITHIUM THIONYL CHLORIDE BATTERIES

The Tadiran lithium thionyl chloride inorganic electrolyte battery is a power source that is suited to the requirements of microelectronics. For example, CMOS memories as well as utility meters require a lightweight power source to provide a safe and reliable performance over a wide range of environmental conditions, for long periods of time. The Tadiran lithium battery is a component that can be permanently connected to a circuit and, in many cases, will last the entire lifetime of the equipment.

Features
- Nominal voltage: 3.6V
- Temperature range: −55°C to +85°C
- Energy density: up to ~650Wh/kg and ~1280Wh/dm3
- Superior shelf life and reliability
- Hermetically sealed case

TAIYO YUDEN LITHIUM-ION CAPACITORS

Lithium-ion capacitors feature an extremely large capacitance (about twice as large as conventional EDLCs), while pre-doping of anodes allows these capacitors to achieve a higher output voltage up to around 3.8V. Pre-doping also helps to stabilise electrode potential, meaning that li-ion capacitors have very little self-discharge.

Features
- Nominal capacitance: 200F
- Max. usable voltage1: 3.8V (at −30°C to +70°C)
- Min. usable voltage1: 2.2V (at −30°C to +70°C)
- Max. usable voltage2: 3.5V (at −30°C to +85°C)
- Min. usable voltage2: 2.5V (at −30°C to +85°C)
- Initial DCR: 50mΩ max.
- Initial capacitance: 200F ±15%
- Operating temp. range1: −30°C to +70°C
- Operating temp. range2: −30°C to +85°C
- RoHS2 compliance (10 subst.): yes
- Reach compliance (181 subst.): yes
- Halogen free: yes
- Soldering: manual

VARTA COINPOWER RECHARGEABLE LI-ION BUTTON CELLS

CoinPower lithium rechargeable cells from VARTA Microbattery are small in size but deliver energy density in a big way. These unique cells offer a powerful, reliable battery solution for the latest headphones, miniaturised medical devices, sensors, instruments and other advanced electronic devices.
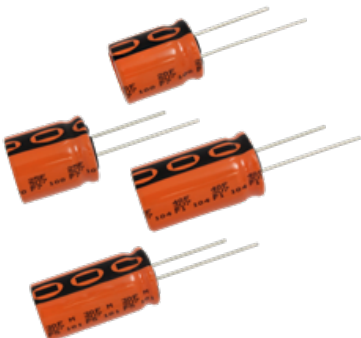
Features

- 3.7V
- Capacity from 60mAh to 120mAh
- Coin cell shape
- Light weight
- Robust can design
- Low internal resistance
- Discharge currents up to 5C rating
- No memory effect
- Extended life cycle
- Excellent charge and discharge characteristics
- 0% lead, 0% mercury and 0% cadmium
- Approved to UN38.3 for air transport
- UL recognised

VISHAY ENYCAP HYBRID ENERGY STORAGE CAPACITORS

The 196HVC ENYCAP series offers designers exceptional flexibility and enhanced charge and discharge performance for energy harvesting and power line backup applications. Delivering the best energy/volume rating in the industry, the devices are especially suited for applications such as embedded computers, utility meters, point-of-sales terminals, servers, data storage systems, professional remote controls, real-time clocks, emergency lighting, access systems and surveillance cameras, gaming and vending machines, and network equipment. For applications requiring a constantly high charge state from the ENYCAP capacitors —such as solar energy systems and emergency signaling in medical devices — a reliable charging solution must also be applied.

Features

- Polarised energy storage capacitor with high capacity and energy density
- Voltage flexibility: 1.4V (single cell)/2.8V/4.2V/5.6V/7.0V/8.4V (multiple cells)
- Available in Stacked Through-Hole (STH, radial), Surface-Mount Flat (SMF) and Lay Flat Configurations (LFC) with wire and connectors
- Useful life: up to 2000h at +85°C
- No cell balancing necessary
- Soft and low transient-voltage-controlled charging characteristic
- Non-hazardous electrolyte
- Maintenance-free, no service necessary

Miniature, precision and low-power timing solutions

Maximising battery life and minimising size are key design considerations for remote Internet of Things applications. Remote applications can remain in sleep mode for long periods of time, requiring innovative solutions to extend battery life while maintaining a real–time clock to accurately time stamp events.

Another key area of potential power savings can be achieved by careful selection of timing devices with reduced ESR. Where available space is being minimised, manufacturers of passive devices such as crystal units employ advanced manufacturing techniques to achieve extremely small package sizes with no loss in reliability.

ABRACON AB08X5 REAL–TIME CLOCK FAMILY

The Abracon AB08X5 real-time clock family provides a groundbreaking combination of ultra-low power coupled with a highly sophisticated feature set. With power require-ments significantly lower than any other industry RTC (as low as 14nA), these are the first semiconductors based on the innovative SPOT™ (Subthreshold Power Optimised Technology) CMOS platform. The AB08X5 includes on-chip oscillators to provide minimum power consumption, full RTC functions including battery backup and programmable counters and alarms for timer and watchdog functions, and either an I^2C or SPI serial interface for communication with a host controller.
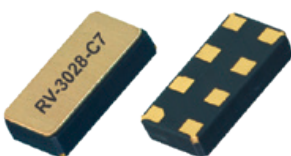
Features
- Ultra–low supply current
- Baseline timekeeping features:
  > 32.768kHz crystal oscillator with integrated load capacitor/resistor
  > Counters for hundredths, seconds, minutes, hours, date, month, year, century, and weekday
  > Alarm capability on all counters
- Advanced timekeeping features:
  > Integrated power optimised RC oscillator
  > Advanced crystal calibration to ±2ppm
  > Advanced RC calibration to ±16ppm
- Power management features:
  > Automatic switchover to VBAT
  > External interrupt monitor
  > Programmable low battery detection threshold
  > Programmable analogue voltage comparator

MICRO CRYSTAL RV-3028-C7 ULTRA LOW POWER REAL-TIME CLOCK MODULE

The RV-3028-C7 is an SMT real-time clock module that incorporates an integrated CMOS circuit together with an XTAL. It operates under vacuum in a hermetically sealed ceramic package with a metal lid. The extremely low power consumption, I^2C interface, small size and factory calibration makes it ideal for a wide variety of IoT, metering, industrial, automotive, healthcare and wearables applications.

Features
- Power consumption: 40nA at 3V
- Voltage range: 1.2V to 5.5V
- Time accuracy: factory calibrated to ±1ppm at +25°C
- Non-volatile configuration settings with user programmable offset value
- Backup switch and trickle charge
- Provides year, month, date, weekday, hours, minutes and seconds
- 32-bit UNIX time counter
- Timer, alarm and external event functions
- Clock output: 32.768kHz, 8192Hz, 1024Hz, 64Hz, 32Hz, 1Hz
- 43 bytes non-volatile user memory, 2 bytes user RAM
- I^2C-bus interface: 400kHz
- Automotive qualification according to AEC-Q200 available
- Operating temperature range: −40°C to +85°C
- Package dimensions: 3.2mm x 1.5mm x 0.8mm (SON–8)

MURATA XRCGB SERIES CRYSTAL UNITS

Crystal units are made of high stability piezoelectric quartz crystal that functions as a mechanical resonator. With the advance of IC technology, various pieces of equipment may be controlled by a single LSI integrated circuit, such as the one-chip microprocessor. Crystal units can generate clock signals which are essential for ICs and LSIs to operate, achieving high stability, adjustment-free performance and miniaturisation. At present, crystal units are found in a broad range of applications such as communication satellites, mobile communication devices, automotive electronics, TVs, personal computing and home information appliances such as DVD equipment.

Features
- Small size: 2.5mm x 2mm for 16MHz to 20MHz/2mm x 1.6mm for 24MHz to 48MHz
- Economical and robust design
- Simple structure using Murata's proven package technology particle screening process for enhanced reliability

Connector solutions for the industrial IoT/Industry 4.0

The industrial Internet of Things is driving connectivity advances in information capture, power delivery and adaptive, intelligent networking. The intelligent machines of the smart factory require advanced cable and connector solutions to provide power, data and signal links to make data available in real time to other machines and analytics systems.

Avnet Abacus offers connectivity solutions for connected factories from industry leaders including Amphenol, Hirose, Molex, Samtec and TE Connectivity.

HIROSE IX SERIES RUGGED, COMPACT HIGH-SPEED I/O CONNECTORS

The IX series of connectors is for space-constrained industrial applications that need to support high-speed signal transmission up to 3Gbps.

The IX range consists of 8 contact plugs and receptacles to provide a LAN interface connection. The plugs are available in straight or right angle versions with upright or downward cable direction, allowing flexible connectivity solutions in combination with the right angle receptacle.

Features

- High-speed transmission: 3Gbps x 4 pairs
- Contacts: 8
- Current rating: 0.5A (all pins), 1A (any 2 pins), 2A (pin no.1 and no.8 only)
- Voltage rating: 30V
- Mating cycles: 5000
- RoHS compliant
- 70% size reduction compared with multi-purpose RJ45 jack
- One-touch lock design with audible click and push button release
- Robust design resistant to wrenching forces and protects contacts
- Shield highly resistant to EMI/ESD
- THR (Through Hole Reflow) mounting possible

MOLEX USB TYPE-C SHIELDED I/O CABLE ASSEMBLY

Molex USB type C, gen. 3.1 shielded I/O cable assemblies offer robust, reliable connectivity in IoT, wearable device and other high-speed data I/O applications. The mid-plate connector tongue ensures high reliability and prevents damage, and can withstand high mating cycles.
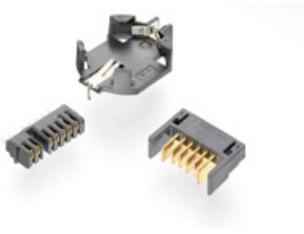
Features

- Cable length: 1m
- Circuits (loaded): 22
- Color - resin: black
- Gender: male-male
- Lock to mating part: yes
- Net weight: 42.500/g
- Packaging type: bag
- Single ended: no
- Wire/cable type: PVC
- Current - maximum per contact: 3A
- Shielded: yes
- Voltage - maximum: 30VDC

TE CONNECTIVITY BATTERY INTERCONNECTS FOR MOBILE DEVICES

TE Connectivity mobile battery connectors include low profile battery connectors, leaf battery connectors and Floating Battery Interconnection Systems (FBIS II). These mobile battery connectors are used in mobile phones with removable batteries - high design flexibility allows them to be scaled up or down regardless of positions, working height, or contact pitch. This connector series improves cost effectiveness for customers by reducing the number of components needed and the size of the tooling platform.

Features

- Centerline of 2.5mm to 6.5mm
- Various positions including 2, 3, 4, and 6
- Working height: 0.4mm to 6.7mm
- Wide current rating: 1.5A to 5A

TE CONNECTIVITY INDUSTRIAL RJ45 CONNECTORS WITH INTEGRATED MAGNETICS

Industrial RJ45 jacks with integrated magnetics offer a highly integrated connectivity solution - from the cable to the physical layer - for industrial Ethernet. Integrating the magnetics into the jack allows for much improved EMI noise shielding, enabling more reliable connections. TE's standardised portfolio with 1x1 straight and R/A, 1x2, 2x1 form factors addresses industrial applications requiring RJ45 connectivity, including PLCs, switches, routers, wireless access points and all Ethernet enabled equipment. Specific industrial requirements such as high reliability through improved corrosion resistance, extended temperature range and long product lifetime are all featured, including support of the latest reflow soldering production processes.

Features

- Extended temperature range: –40°C to +85°C
- Minimum product life requirement of 10 years
- +260°C reflow pin in paste soldering
- Plating thickness: 0,76μm [30μinch] gold over 1,27μm [50μinch] nickel
- Improved EMI integrity and signal integrity performance
- Both current and voltage mode PHY-chips supported
- 10/100 base-T Ethernet, 1Gbps
- Dielectric withstanding voltage: 2250VDC
- Minimum 750 mating cycles

Wireless modules

As wireless connectivity is becoming the norm in all electronic devices, and even electrical appliances, the range of wireless modules available on the market is expanding. There are many benefits to using a wireless module versus a discrete design such as faster time to market, simpler certification approvals and a reduced cost of ownership. Solutions are available for widely used protocols including Bluetooth, Wi-Fi, Thread, Zigbee, LoRa and Sigfox.

Avnet Abacus offers wireless module solutions from leading manufacturers including Abracon, Alps Alpine, Fujitsu, Murata, Taiyo Yuden and TDK.

MURATA CMWX1ZZABZ-078 LORAWAN WIRELESS MODULE

The CMWX1ZZABZ-078 LoRa wireless module from Murata is a stand-alone, compact and low power solution that supports the LoRaWAN™ wireless protocol. One of the world's smallest solutions for adding LoRa connectivity to applications, the module is designed to be a fully standalone solution incorporating an SX1276 RF transceiver from Semtech and a STM32L Cortex M0+ microcontroller from ST Microelectronics, with 192Kbytes available flash memory. All frequency bands specified for LoRa applications globally are supported with this module, removing the requirement for separate solutions for different regions.
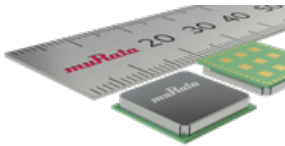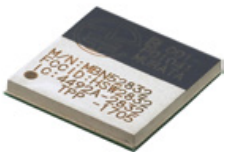
Features
- Radio chip: Semtech SX1276
- Microcontroller: STMicro STM32L (Cortex M0+)
- Flash: 192Kbytes
- Package size: 12.5mm x 11.6mm x 1.7mm
- Antenna configurations: external
- Host interfaces: UART/SPI/I^{2}C
- Other interfaces: GPIO/ADC
- LGA package (57 pads)
- RF Tx power: +14dBm (+20dBm with PA boost)
- VDD: 2.2V to 3.6V
- Operating temperature range: -40°C to +85°C
- RoHS compliant
- Metal shield can

MURATA MBN52832 BLUETOOTH 5.0 LOW ENERGY MODULE WITH NORDIC NRF52832

The MBN52832 is a Bluetooth 5.0 low energy module. It enables ultra-low power connectivity for data communication. The product integrates a Nordic Bluetooth low energy IC, RF front end, and crystal. This is an ideal solution for Internet of Things (IoT) applications.

Features
- Bluetooth: v5.0 LE
- Technology: BLE, ANT and NFC tag
- Chipset: Nordic nRF52832
- Processor: ARM Cortex -M4
- Antenna: on-board
- Host interface BT: UART/SPI
- Other interfaces: 20GPIO, 5ADC, UART, SPI (master and slave), I^{2}C, PWM and Debug SWD
- Data rate Bluetooth: 1Mbps
- Transmit power BT: +4dBM (LDO mode)
- Receiver sensitivity BT: -93dBm (LDO mode)
- Power consumption: Tx 7mA at 3.5dBm/Rx 6mA (DC-DC mode), 0.36uA (system OFF)
- Supply voltage (VDC): 1.7V to 3.6V
- System clock: internal X'tal
- Operating temperature range: -40°C to +85°C (consumer grade)
- Package size: 7.4mm x 7mm x 0.9mm (LGA)
- Mounting type: SMT
- FCC/IC certified: yes

MURATA LPWA MODULE

Murata developed two products, the type 1SS, which are the world's smallest class LPWA (Low-Power Wide Area) modules. LPWA network is a wireless communication technology specialised for interconnecting devices together, focusing on power efficiency and long range. LPWA is most suitable for applications such as IoT, M2M, and many other that require to operate at lower cost and lower power consumption.

Features

- Size: 10.6mm x 13.2mm x 1.8mm
- Current consumption: 3.5µA or less
- Supported standards: NB-IoT
- Modem chip: MT2625 by mediatek (Taiwan)
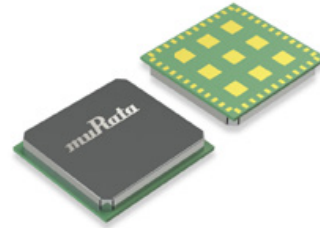
PANASONIC INDUSTRY PAN1740A

The PAN1740A is an optimised version of the PAN1740, offering a reduced boot time and supporting up to eight connections. It has a fully integrated radio transceiver and baseband processor for Bluetooth® 5.0 Low Energy (LE). It can be used as a stand-alone application processor or as a data pump in hosted systems. The device is optimised for Remote Control Units (RCU) requiring support for voice commands and motion/gesture recognition.

Features

- Pre-programmed Bluetooth/MAC address
- Includes 16MHz and 32MHz, 768kHz crystal calibrated up to 1ppm
- Single mode Bluetooth 5.0 system-on-chip
- Programmable ARM® Cortex® - M0 CPU
- Autonomous Bluetooth LE stand-alone operation
- Bluetooth 5.0 (LE) embedded GATT profile (LE single mode)
- Dimensions: 9 mm x 9.5 mm x 1.8 mm (SMD package with antenna)
- Less than a few µA in low power modes
- Integrated shielding to resist EMI
- No external components needed

PANASONIC INDUSTRY PAN1780

The PAN1780 is a Bluetooth 5 Low Energy (LE) module based on the Nordic nRF52840 single chip controller. The Bluetooth 5 features additionally a higher symbol rate of 2Mbps using the high-speed LE 2M PHY or a significantly longer range using the LE coded PHY at 500kb/s or 125kb/s. In addition the ultra-low current consumption of the PAN1780 makes the module an ideal choice for battery powered devices.

Features
- Surface mount type dimensions: 15.6 mm x 8.7 mm x 2mm
- Same form factor as PAN1026A and PAN1762 but smaller pitch and more pins
- Nordic nRF52840 featuring ARM® Cortex® - M4F with 64MHz
- Bluetooth 5 LE including LE 2M and LE coded PHY
- Embedded 1MB flash memory and 256kB internal RAM
- Includes ARM TrustZone® CryptoCell® 310 and supports secure boot including Root of Trust (RoT)
- Up to 48 General Purpose I/Os (GPIO), which are shared by up to 4SPI, 2I²C, 2UART, 4PWM, 8ADC, 1NFC-A, 32kHz IN/OUT, nRESET
- USB 2.0 full-speed device interface
- Built in temperature sensor

PANASONIC INDUSTRY PAN9026 DUAL-BAND WI-FI MODULE WITH BLUETOOTH®

The PAN9026 dual-band 2.4GHz to 5GHz 802.11a/b/g/n Wi-Fi radio module with integrated Bluetooth BDR/EDR/LE functionality has been specifically designed for highly integrated and cost-effective applications. The simultaneous and independent operation of the two standards enables high data rates (802.11n) and low-power operation (Bluetooth low energy). Integrated power management, a fast dual-core CPU, 802.11i security standard support, as well as high-speed data interfaces deliver the performance for the speed, reliability, and quality requirements of next generation products.

Features
- Dual band 2.4GHz to 5GHz 802.11a/b/g/n Wi-Fi/BT combo module
- Supports 802.11i security standards through AES, CCMP, and more security mechanisms
- 802.11e quality of service is supported for multimedia applications
- IEEE 802.11n-compliant, 1x1 spatial stream with data rates up to MCS7 150Mbps
- Bluetooth 4.2 (includes LE) as well as future Bluetooth 5.0 features
- Dual simultaneous and independent WLAN and Bluetooth operation
- Indoor location and navigation with IEEE 802.11mc
- Power management with sleep clock
- Coexistence interface for arbitration of co-located WLAN, Bluetooth, or mobile wireless system (e.g. LTE)
- Generic interfaces include SDIO 3.0 and highspeed UART for host processor connection
- Linux/Android driver
- Marvell® 88W8977 WLAN 2.4/5GHz and Bluetooth single-chip solution inside
- Wide temperature range: –30°C to +85°C
- Surface Mount Type (SMT) 17.5mm x 10mm x 2.6mm

TAIYO YUDEN BLUETOOTH 5.0 LOW ENERGY MODULES

Bluetooth is rapidly spreading as technology and is being embedded in devices and used in ways that were previously unimaginable. This has diversified requirements for Bluetooth modules, creating demand for smaller sizes, embedded software, and a built-in antenna. Taiyo Yuden to meet diversified needs, has developed the Bluetooth v5.0 full and IEEE 802.15.4 radio (e.g. Thread, Zigbee) module EYSKBNZWB. The module long range capability or high throughput combined with the Bluetooth concurrent operation with Thread or Zigbee make it the ideal solution for a variety of applications like for example lighting and building automation.

Features

- Chip used: Nordic nRF52840, ARM Cortex M4F
- Memory: flash 1MB, RAM 256KB
- RF output: +8dBm
- Crystal: internal 32kHz (for main clock and sleep clock)
- LC for DC-DC: internal
- Interfaces: USB, SPI, UART, I2C, I2S, PDM, and ADC
- Antenna: embedded
- Certifications: FCC,ISED,MIC certified, ETSI EN 300 328 v2.1.1 conducted test report available
- Touch-to-pair supported by NFC
- USB 2.0 (full speed) supported
- Operating temperature range: -40°C to +85°C
- Dimensions: 10mm x 15.4mm x 2mm

TAIYO YUDEN EYSLSNZWW MODULE

Taiyo Yuden EYSLSNZWW Bluetooth® Low Energy (BLE) 5.0 module is a 2Mbps module with single-mode. The EYSLSNZWW module is based on the Nordic nRF52810 chip with an integrated system clock, ARM Cortex M4 32-bit processor, 192kB flash, and 24kB RAM. This BLE module operates at 2402MHz to 2480MHz frequency with 4dBm output power. The EYSLSNZWW module comes with an integrated high-performance PCB antenna. This BLE module employs SPI, UART, I2C, PDM, and 12-bit ADC interface. Typical applications include smart wristbands, remote control ring, heart rate monitor, pressure monitor, blood glucose meter, thermometer, and mobile accessories.

Features

- Single-mode Bluetooth low energy
- Bluetooth 5.0 low energy 2Mbps mode
- Nordic nRF52810 chip with:
  - > Integrated system clock
  - > ARM cortex M4 32-bit processor
  - > 192kB flash and 24kB RAM
- Integrated high-performance PCB antenna
- -40°C to +85°C operating temperature range
- 3.25mm x 8.55mm x 1mm max. outline

Interfaces:

- Serial Peripheral Interface (SPI)
- Universal Asynchronous Receiver-Transmitter (UART)
- Inter-integrated circuit (I2C)
- Pulse-Density Modulation (PDM)
- 12-bit Analog-to-Digital Converter (ADC)
- RoHS compliant
- Complete lead-free

Wireless charging

MOLEX POWERLIFE WIRELESS CHARGING COILS

This high efficiency coil is made of flex and shield, and designed for high performance mobile phones, handheld mobile terminals or any other device/accessory requiring up to 5W power out. Standard PCB construction enables integration with other electronics, high durability, and high yield manufacturing and consistent performance.
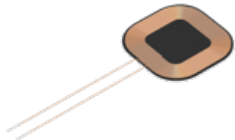
Features
- Powered with NuCurrent technology
- Direct current resistance: 190mΩ at 200kHz, 70mΩ at 6.78MHz
- Equivalent series resistance: 500mΩ at 6.78MHz, 545mΩ at 200kHz
- Frequency: high, low
- Function: receive
- Inductance: 1.30µH at 6.78MHz, 10.60µH at 200kHz
- Coil material: FR4

TDK WT-WR WIRELESS CHARGING COILS

Taking advantage of their expertise in magnetic materials technology and process technology, TDK supplies coil units for wireless charging which utilise a proprietary thin and flexible magnetic metal sheet. In addition to leading the industry in ultra-thin and lightweight properties, it is also highly resistant to shock and therefore provides excellent reliability.

Features
- Transmitting and receiving coils for wireless power transfer
- Pre-cracked ferrite is available for durable construction
- Variety of thicknesses available from 0.5mm
- Flexible sheet type is available
- Meets WPC QI standard
- Custom design is available based on each design's requirements

VISHAY IWTX WIRELESS CHARGING TRANSMITTER COILS

Featuring a durable construction and high permeability shielding, Vishay's IWTX series of wireless charging transmitter coils are optimised for size to save space in Qi wireless charging pads compared to alternative solutions, while providing high efficiency. The IWTX's high-saturation powdered iron is not affected by permanent locating magnets.

Features
- Wireless charging transmitter coil
- High permeability shielding for wireless charging
- High saturation powdered iron not affected by permanent locating magnets
- Durable construction
- AEC-Q200 qualified

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