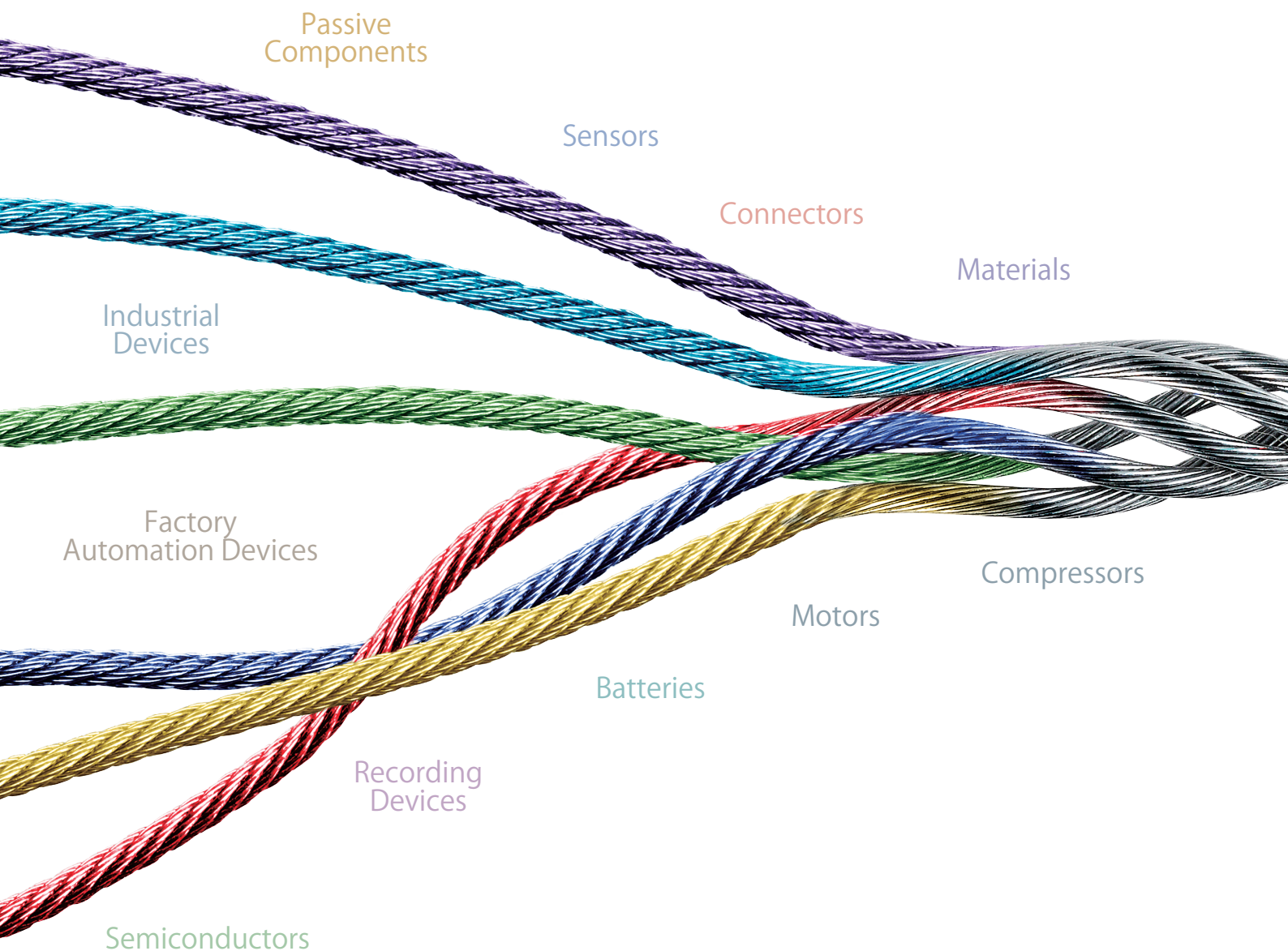


Device Product Catalog



What You Need Is Not Just Devices...



But Solutions.



Solution

Panasonic's Cross-Value Innovation

Panasonic for business. Panasonic is accelerating its BtoB activities in all fields of business.

And spearheading those activities is the Automotive & Industrial Systems Company.*

Panasonic has cultivated extensive product development know-how in worldwide markets as a comprehensive electronics manufacturer. This know-how is not only concentrated in the individual devices supplied by Panasonic, but also used and cross-linked to create the power to shape new solutions.

Innovative devices that drive the future of your business - from Panasonic.

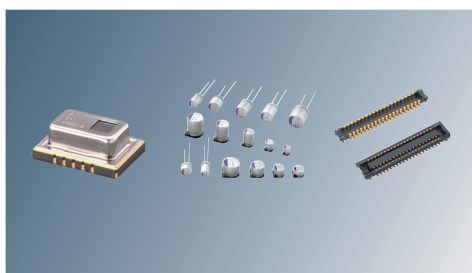
*The Automotive & Industrial Systems (AIS) Company is one of four in-house companies that comprise Panasonic Corporation.

Devices and Know-How That Only Panasonic Can Provide Based on a Wealth of Experience in All Fields of Electronics.

From sensors, semiconductors and batteries to materials, Panasonic supplies a diversity of devices. Each and every one of them is packed with the know-how that Panasonic has cultivated and refined as a comprehensive electronics manufacturer.

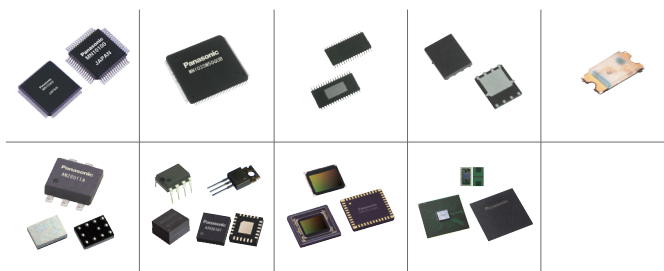
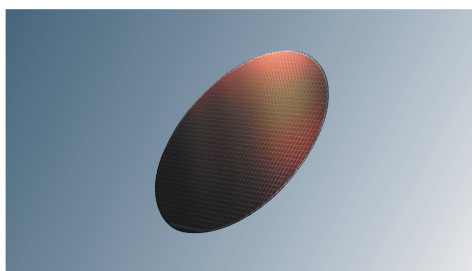
Look for clues to the solutions your company is seeking in Panasonic's vast array of devices and technologies. And let Panasonic's know-how and expertise help your company find the solutions you want.

Sensors/Passive Components/Connectors



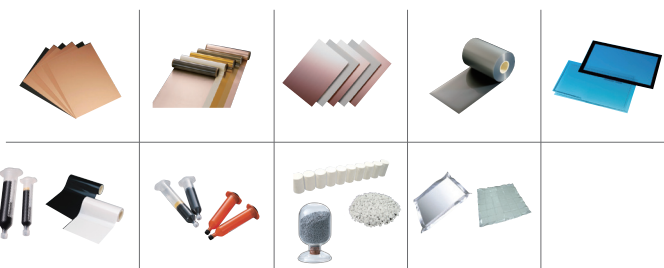
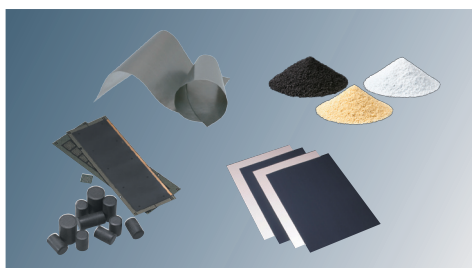
- Sensors
- Factory Automation Sensors
- Resistors
- Capacitors
- Inductors (Coils)
- Thermal Solutions, EMC Components, ESD Components, Surge Components
- Fuses, Thermistors
- Relays
- Connectors
- Switches
- Encoders, Potentiometers

Semiconductors



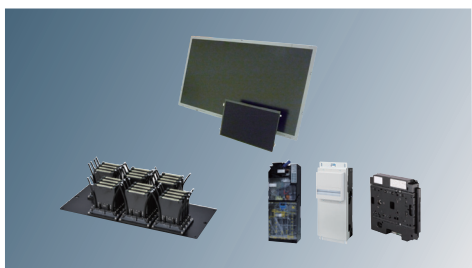
- Microcomputers
- Logic LSIs
- Analog ICs
- Discrete Devices
- Opto Electronic Devices
- Radio Frequency Devices
- Power Devices
- Image Sensors

Materials



- Circuit Board Materials
- Advanced Films (Optical Films)
- Semiconductor Encapsulation Materials
- Adhesive Materials, Sealing Materials
- Plastic Molding Compound
- Thermal Insulation Materials
- Thermal Solutions

Industrial Devices



- Optics Components
- Acoustic Components
- Communication Devices
- Display Devices
- Input/Output Units
- Monetary Devices
- Electromagnetic Wave Shield Films
- Power Generation Plate

Batteries



- Nickel Metal Hydride Batteries
- Lead-Acid Batteries
- Lithium Batteries
- Lithium Ion Batteries
- Dry Batteries

Recording Devices



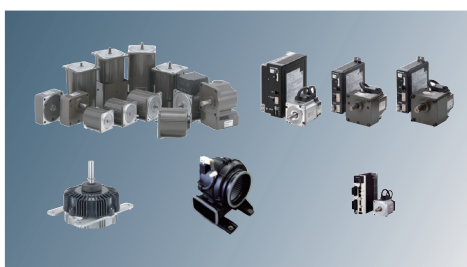
- Archival grade Blu-ray Discs
- Industrial SD Memory Card
- MicroSD Card
- eSD

Factory Automation Devices



- Programmable Controllers
- Programmable Displays (HMI)
- Machine Vision Systems
- Energy Consumption Visualization Components
- Laser Markers
- UV Curing Systems
- Wire-saving Systems
- Static Control Devices

Motors/Compressors



- Motors for Factory Automation & Industrial Application
- Motors for Equipment Home, Appliances, Automotive
- Compressors
- DC Pumps
- Cooling Fans
- Cooling Roller
- nanoe™

Infotainment

Telematics / Car navigation system /
ETC System / e-call

- Touch Panels
- Light Touch Switches
- Gyro sensors
- Acceleration Sensors
- Common Mode Noise Filters
- Multilayer NTC Thermistors
- Multilayer Varistor, Chip Type
- ESD Suppressors
- Metal (Thin Film) Chip Resistors,
High Sound Quality Type
- "PGS" Graphite Sheet
- Vehicle Audio Integrated LSI
- HDMI Communication LSIs
- Cooling Fan for Car Navigation



- 1-chip LSI for Vehicle DVD Players
- HMI (Human Machine Interface)
Display LSI
- Microphone
- Industrial SD Memory Card /
micro SD Memory Card / eSD Module /
eSD BGA
- Lithium Batteries
- Cylindrical Type Primary
Lithium Batteries
- Nickel Metal Hydride Batteries



Electronic Control Unit Device

Electronic Components for ECU

- Aluminum Electrolytic Capacitors
- Conductive Polymer Hybrid Aluminum
Electrolytic Capacitors
- Conductive Polymer Tantalum Solid
Capacitors
- Noise Suppression Metallized
Polyester Film Capacitors
- Current Sense Resistors, Metal Plate Type
- Current Sense Resistors, Thick Film Type
- Anti-Surge Chip Resistors
- Anti-Sulfurated Chip Resistors
- Metal (Thin Film) Chip Resistors
- Multilayer Varistor, Chip Type
- Multilayer NTC Thermistors
- Power Choke Coils
(Metal Composite Type)
- Power Choke Coils (Dust Core Type)
- "ZNR" Surge Absorbers (High energy SMD Type)
- "PGS" Graphite Sheets
- Low Side Switching IPD for ECU
- Zener Diodes for Automotive
- Thermal Conductive Resin
- Coin Type Primary Lithium Batteries



Safety

High Intensity Discharge /
Adaptive Front Lighting / Airbag System
Safety Driving Support / ABS Control Unit
/ Electronic Stability Control

- Weight Sensors
- Multilayer NTC Thermistors
- Small & High Power Chip Resistors
- Current Sense Resistors, Metal Plate Type
- Current Sense Resistors, Thick Film Type
- Gyro Sensors
- Fuel Level Gauges
- Acceleration Sensors
- Turquoise Switch Series
- LED driver IC
- Cooling Fan for LED Headlight
- Camera Module for Automotive
- Microphone for Automotive
- White LEDs for Automotive
- Coin Type Primary Lithium Batteries
- Nickel Metal Hydride Batteries
- ABS · ESC Motor



Power Management

Engine Control / HEV / EV
AT / CVT / Idling stop system

- DC-DC Converter for ISS / EV / HEV / 48V
- Electric Double Layer Capacitor Backup Cell
- Film Capacitors for Hybrid Electric Vehicle
- Large Capacity Current Sensor
- Water / Oil Temperature Sensors
- Intake Air Temperature Sensors
- EV Relays
- Automotive Relays
- Vehicle Microcomputer
- High Voltage IPD for Control
Power Supply of HEV / EV (MIP2NxSeries)
- VRLA Batteries for EV
- Industrial SD Memory Card /
micro SD Memory Card / eSD Module / eSD BGA
- The Battery Cooling Fan Motor
Unit for EV / HEV
- Multilayer NTC Thermistors
- Multilayer Varistor, Chip Type
- Anti-Sulfurated Chip Resistors
- Current Sense Resistors, Metal Plate Type
- Current Sense Resistors, Thick Film Type
- BMS-IC



Comfort / Accessory

Keyless entry / Power window /
Air conditioner / Power seat / TPMS

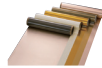
- Light Touch Switches
- Encoders / Potentiometers
- Coin Type Lithium Batteries
(for hearing aids electronic thermometers)
- Transparent Touch Panels
- Automotive Relays
- Vehicle Microcomputer
- In the car/Ambient air
Temperature Sensors
- In-vehicle Inverter Microcomputer
- Multilayer NTC Thermistors
- Multilayer Varistor, Chip Type
- Small & High Power Chip Resistors
- Current Sense Resistors, Thick Film Type
- Detector Switches
- Signal Switches
- Coin Type Primary Lithium Batteries
for High Temperature



Electronic Materials

Circuit Board Materials

- Multi-layer circuit board materials
HIPER series
Halogen-free series
MEGTRON series
PreMulti
- High thermal conductive
circuit board materials
ECOOL series
- Double/Single-sided
circuit board
materials
- Flexible circuit board
materials
FELIOS series



Plastic Molding Compound

- Phenolic Molding Compound
- Thermoplastic Molding Compound




Advanced Films

- Optical Films
Fine Tiara series





Passive Components


- Micro Chip Fuse
- Anti-Sulfurated Chip Resistors
- Current Sensing Thick Film Chip Resistors
- "ZNR" Surge Absorbers
- Power Choke Coils 
- Conductive Polymer Aluminum Electrolytic Capacitors 
- Conductive Polymer Tantalum Solid Capacitors 
- Conductive Polymer Aluminum Solid Capacitors 
- Conductive Polymer Hybrid Aluminum Electrolytic Capacitors 
- Electric Double Layer Capacitors 
- Film Capacitors 

Smart Meters



for Gas

- Gas Meter Safety Devices
- Gas AMR Products 
- Ultrasonic Devices
- PhotoMOS 
- Cylindrical Type Primary Lithium Batteries 

for Electricity

- HMI Display LSIs
- "ZNR" Surge Absorbers
- PhotoMOS 
- Cylindrical Type Primary Lithium Batteries
- Primary and Rechargeable Coin Type Lithium Batteries

Power Electronics

- Power Detection Units
- Current Sense Resistors, Metal Plate Type
- IPD Series 
- MOS FET Series
- PhotoMOS
- Programmable Displays (HMI) 
- GaN Power Devices
- DC-DC Module with Built-in Inductor (PSiP)
- Motor Driver ICs
- Inverter Control Microcomputers



Sensor Network

- PIR Motion Sensor PaPIRs
- Infrared Array Sensors Grid-EYE 
- Sensing Camera LSIs
- Ambient Light and Proximity Sensors
- NFC Tag LSIs / Modules
- Metal (Thin Film) Chip Resistors
- Security Sensor



Battery System

- Direct Methanol Fuel Cells
- Lithium Ion Battery Modules (for Store Energy) 
- Lithium Ion Batteries
- VRLA Batteries for EV Application
- Electric Double Layer Capacitors (Gold Capacitor)
- EP Relays 
- PhotoMOS
- Vacuum Insulation Materials
- Fan Motors 
- Nickel Metal Hydride Batteries for Infrastructure Type 

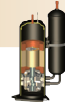


LED Lighting

- LED Illumination Module
- LEDs for Lighting 
- Cooling Devices for LED Lighting
- LED Lighting Connector
- LED Lighting Devices 

Security


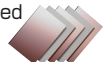

- Cylindrical Type Primary Lithium Batteries
- Nickel Metal Hydride batteries (for Emergency light, Guidance light) 
- AC Servo Motors 

Appliance


- Compressors 
- Compressors for Household Refrigerator
- DC Pumps
- HEMS Controllers / Thermostat
- Fan Motors for Appliance and Air Conditioner 
- nanoe™ 
- Human Machine Interface Display LSIs
- NFC Tag LSIs / Modules
- Nickel Metal Hydride Batteries (Toothbrush, Shaver)

Electronic Materials

Circuit Board Materials

- Multi-layer circuit board materials
HIPER series
Halogen-free series 
- High thermal conductive circuit board materials
ECOOL series
- Double/Single-sided circuit board materials 
- Flexible circuit board materials
FELIOS series 

Plastic Molding Compound

- Urea/Melamine Molding Compound
- Unsaturated Polyester Molding Compound
- Thermoplastic Molding Compound 

Advanced Films













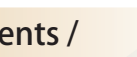

- Optical Films
Fine Tiara series 





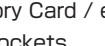

















Power Supply

- Lithium Ion Batteries 
- Primary and Rechargeable Coin Type Lithium Batteries 
- Nickel Metal Hydride Batteries for Backup 
- Nickel Metal Hydride Batteries for Infrastructure Type 
- Multilayer Type Film Chip Capacitors 
- "ZNR" Surge Absorbers 
- Power Inductors (Multilayer Type) 
- Power Inductors (Wire Wound Type) 
- Power Choke Coils 
- IPD Series 
- Micro Chip Fuse 
- Current Sensing Thick Film Chip Resistors 
- MOS FET Series 
- DC-DC Module with Built-in Inductor (PSiP) 
- Conductive Polymer Aluminum Electrolytic Capacitors 
- Conductive Polymer Tantalum Solid Capacitors 
- Conductive Polymer Aluminum Solid Capacitors 
- Conductive Polymer Hybrid Aluminum Electrolytic Capacitors 


User Experience

- NFC Tag LSIs / NFC Tag Modules 
- Gyro Sensors for Consumers 
- Giant Magneto Resistive Sensor 
- "PGS" Graphite Sheet 
- Metal (Thin Film) Chip Resistors, High Sound Quality Type 
- LCD Panels 
- Optical Imaging Unit 
- Resistive / Capacitive Transparent Touch Panels 
- Light Touch Switches 
- Detector Switches 
- Switch Modules 
- LSIs for HMI Display 
- ReRAM Built-in MCU 
- Micro Speakers 

Communication / Interface

- Receivers 
- Dual Wavelength High Power Laser Diode 
- Aspherical Lenses 
- Optical Disc Controllers 
- Image Sensors 
- Blu-ray Disc™ Series 
- Industrial SD Memory Card / eSD 
- SD Memory Card Sockets 
- CCD Output Compound Devices 
- HDMI Communication LSIs 
- Devices for Commercial 3D Camera 
- Devices for Consumer 3D DSC 
- Voltage Step-up Coils (HAC Coils) 
- "PGS" Graphite Sheet 
- ESD Suppressors 
- Common mode Noise Filters 
- Radio Frequency Devices 
- Narrow Pitch Connectors 
- FPC Connectors 
- 3D Packaging Devices 


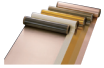
EMC Components / Thermal Solutions

- ESD Suppressors 
- Multilayer Varistor, Chip Type 
- Common mode Noise Filters 
- Coil Type EMI Filters 
- "PGS" Graphite Sheet 
- Multilayer NTC Thermistors 
- Cooling Devices 
- Heat Exchangers 
- Air Conditioning Units 
- Diodes Series




Electronic Materials


Circuit Board Materials

- Multi-layer circuit board materials MEGTRON series
HIPER series
Halogen-free series
MEGTRON GX series 
- Flexible circuit board materials FELIOS series 

Semiconductor Encapsulation Materials

- ECOM Super Fine (Halogen free Epoxy Molding Compound) 
- ECOM Fine Flow (Liquid Epoxy Encapsulant)
- ECOM Fine Sheet (Encapsulation Sheet Materials)

Advanced Films

- Optical Films Fine Tiara series 

Adhesive Materials, Sealing Materials

- Fine Glue



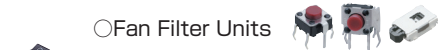
Sensors

- Inductive Proximity Sensors
- Fiber Sensors
- Laser Displacement Sensors
- IC Hall Sensors
- Pressure Sensors / Flow Sensors
- Micro Photo Sensors
- Thru-beam Type Ultrasonic Sensors
- Magneto Resistive Sensors
- Linear Position Sensors
- Steering Angle Sensors
- Security Sensor
- Infrared Array Sensors Grid-EYE
- MA Motion Sensor
- Pressure Sensor
- Gyro Sensors
- Acceleration Sensors



Industrial Devices

- Connectors
- Power-supply Switches
- Detector Switches
- Solid State Relays
- PhotoMOS
- Power Relays
- nano^{oe}™
- Energy Consumption Visualization Components
- Industrial Ink Jet Head
- Programmable Displays
- Programmable Controllers
- Machine Vision Systems
- Air Flow Monitors
- Static Control Devices
- Monetary Devices
- Aspherical Glass Lenses
- Laser Markers
- Network Cameras
- AC Servo Motors
- Compact AC Geared Motors
- Brushless Motors
- Fan Filter Units
- Light Touch Switches
- Nickel Metal Hydride Batteries
- Cylindrical Type Primary Lithium Batteries
- Primary and Rechargeable Coin Type Lithium Batteries
- Dry Batteries
- Valve Regulated Lead-Acid Batteries for Industrial Use
- Industrial SD Memory Card / micro SD Memory Card / eSD Module / eSD BGA
- Valve Regulated Lead-Acid Batteries
- VRLA Batteries for EV Application
- Nickel Metal Hydride Batteries for Infrastructure Type



Passive Components

- "ZNR" Surge Absorbers
- Conductive Polymer Aluminum Electrolytic Capacitors
- Conductive Polymer Tantalum Solid Capacitors
- Conductive Polymer Aluminum Solid Capacitors
- Conductive Polymer Hybrid Aluminum Electrolytic Capacitors
- Current Sensing Thick Film Chip Resistors
- Small & High Power Chip Resistors
- Anti-Surge Chip Resistors
- Anti-Sulfurated Chip Resistors
- Metal (Thin Film) Chip Resistors
- Common mode Noise Filters
- Coil Type EMI Filters
- Power Inductors / Wire Wound Type
- Power Choke Coils
- Multilayer NTC Thermistors
- Multilayer Varistors (Chip Type)
- Film Capacitors
- Optical Imaging Unit



Communication

- Communication RF Units
- Low Power Wireless Modules
- Wireless Modules
- Echo-Net Wireless Units
- Radio Sensor
- Connectors
- Nickel Metal Hydride Batteries
- Aspherical Glass Lenses

Thermal Solution

- Multilayer NTC Thermistors
- Vacuum Insulation Materials
- "PGS" Graphite Sheet
- Thermal Conductive Resin

Semiconductors

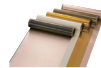
- MOSFET Series
- Diodes Series
- IPD Series
- DC-DC Module with Built-in Inductor (PSIP)
- Inverter Control Microcomputers
- NFC Tag LSIs / Modules
- Motor Driver ICs



Electronic Materials

Circuit Board Materials

- Multi-layer circuit board materials
HIPER series
Halogen-free series
PreMulti
- High thermal conductive circuit board materials
ECOOL series
- Double/Single-sided circuit board materials
- Flexible circuit board materials
FELIOS series






Advanced Films

- Optical Films
Fine Tiara series





Operating Room



- Remote Head HD Camera Modules (for Endoscope) 
- Mos Image Sensors (for Endoscope) 
- LEDs
- Hybrid ICs
- Intraoral Cameras
- *Not ready to market in Europe (Non MDD approved yet)
- High resolution LCD Panels for Medical Monitor 
- Cylindrical Type Primary Lithium Batteries (for Endoscope etc.)





In-hospital

- Nickel Metal Hydride Batteries (Pager for Calling Patients) 
- HEPA Filters
- Power Choke Coils 
- PhotoMOS 
- Connectors
- Signalrelay 
- MA motion Sensors
- "PGS" Graphite Sheet
- AC Servo Motors
- Compact AC Geared Motors

Examination Room

- SD Memory Card Sockets 
- Film Capacitors 
- Industrial SD Memory Cards (for Storing Electrocardiographic Data)
- Nickel Metal Hydride Battery (Dialysis)


AED / Emergency

- Cylindrical Type Primary Lithium Battery (for AED) 
- Coin Type Primary Lithium Battery (for Emergency call)
- Nickel Metal Hydride Battery (Back-up for AED) 

In-home Medical Equipment

- Nickel Metal Hydride Batteries (for Blood Pressure Monitor and Blood Glucose Measuring Devices)
- Coin Type Primary Lithium Batteries (for Hearing Aids and Electronic Thermometers and Blood Glucose Measuring Devices) 
- Lithium Ion Batteries (Blood Glucose Measuring Devices)
- NFC Tag LSI / NFC Tag Modules
- Switches
- Multilayer Varistors, Chip Type (for Hearing Aid)
- Aspherical Glass Lenses
- Acousto-Optic Devices 
- Connectors
- Common mode Noise Filters (for USB) 
- Current Sensing Thick Film Chip Resistors
- Metal (Thin Film) Chip Resistors
- ESD Suppressors
- Multilayer NTC Thermistors 
- Micro Chip Fuses
- Voltage Step-up Coils 
- IPD Series
- MOS FET Series
- Diode series
- DC-DC Module with Built-in Inductor (PSIP)
- Pressure Sensors 


Care & Wellness Facilities

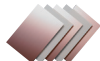
- Vacuum Insulation Panels
- Brushless Motor 




Electronic Materials


Circuit Board Materials

- Multi-layer circuit board materials
HIPER series
Halogen-free series
PreMulti 

- Double/Single-sided circuit board materials 

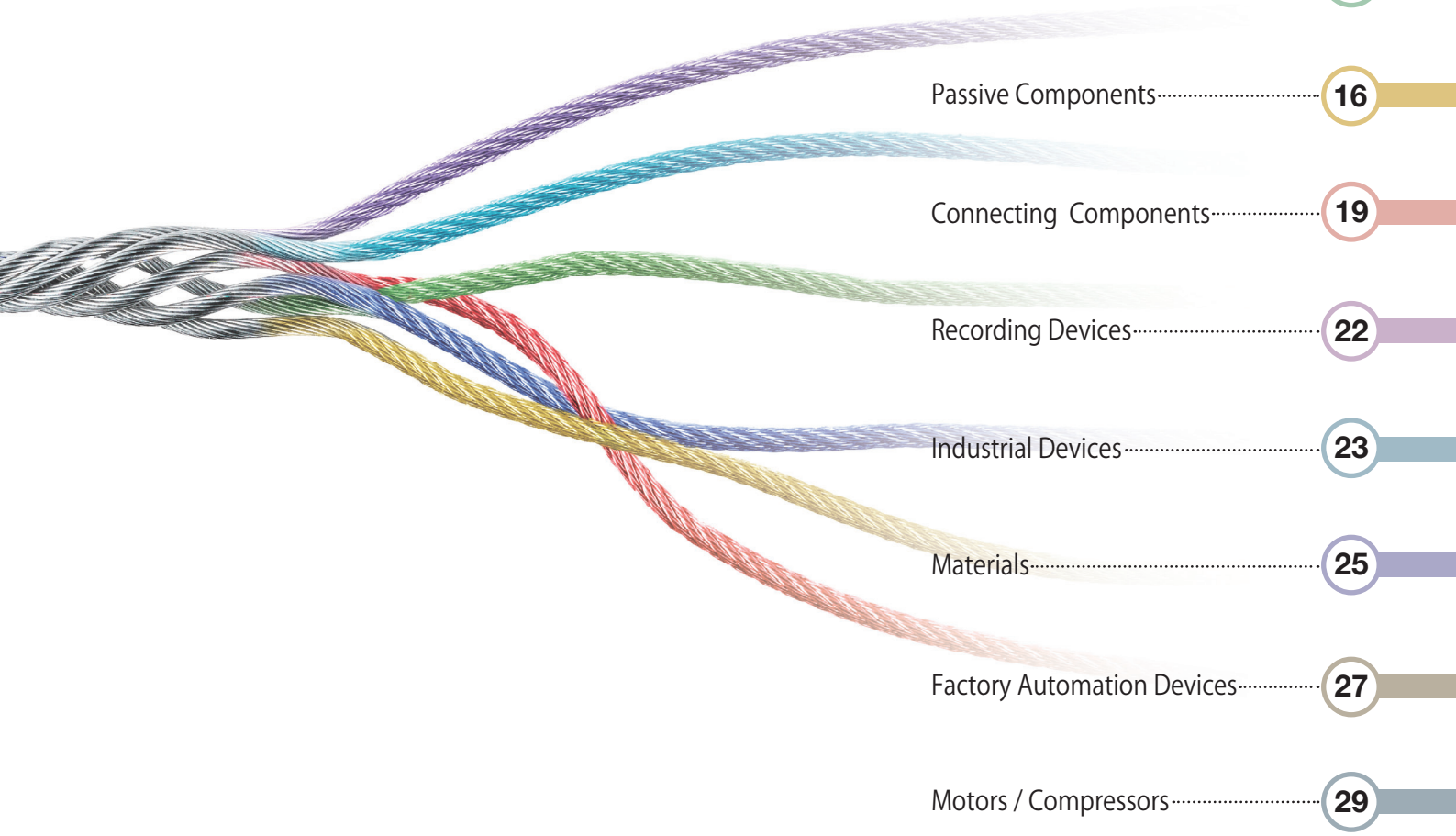
- Flexible circuit board materials
FELIOS series 

Advanced Films

- Optical Films
Fine Tiara series 

Devices Line-up

I N D E X



Sensors.....	11
Batteries.....	14
Semiconductors.....	15
Passive Components.....	16
Connecting Components.....	19
Recording Devices.....	22
Industrial Devices.....	23
Materials.....	25
Factory Automation Devices.....	27
Motors / Compressors.....	29

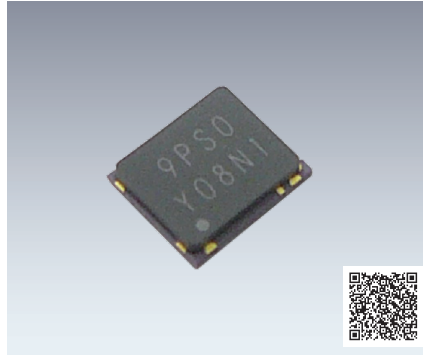
Sensors

Gyro Sensors for Automotive



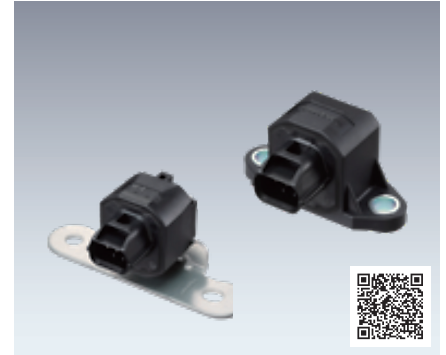
Realized downsizing & low-height by using MEMS Technology. High-precision angular rate detection suitable for electronic stability control, rollover detection and car navigation systems.

2-Axis Gyro Sensors for Consumers



High accuracy and dual axes small size sensor, based on the performance of automotive application (For image stabilizers DSCs, DVCs, Mobile phones).

Acceleration Sensors



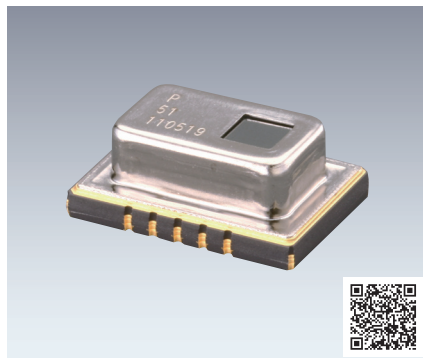
High precision and reliability MEMS acceleration sensor. Product lineup covers range of operating voltage and acceleration detection.

MA Motion Sensors



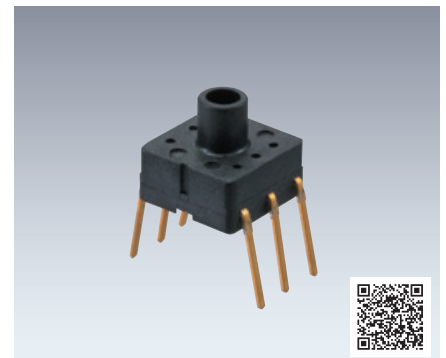
Active infrared (area reflective) human detection sensor. Certain detection unaffected by the reflectance of the object.

Infrared Array Sensors Grid-EYE



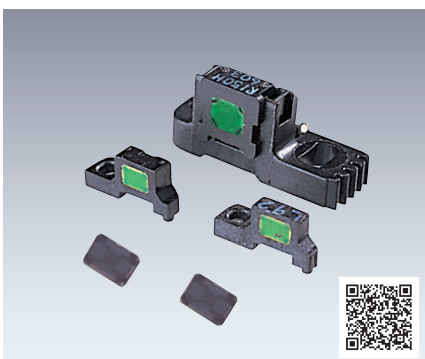
High precision infrared array sensor based on advanced MEMS technology. Temperature detection achieved on a two dimensional area with 8×8 (64) pixels.

Pressure Sensors



Compact and high precision MEMS pressure sensor. Built-in amplifier and compensating circuit.

MR Sensors

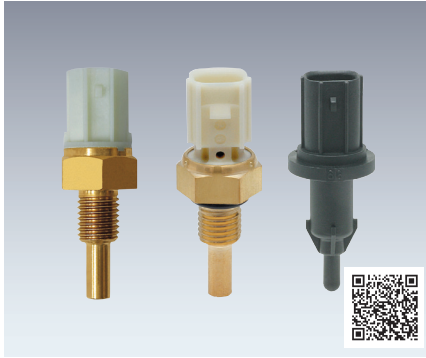


Better resolution & accurate control with high sensitivity than other magnetic sensors. Mechanical adjusting free type also is available.



Sensors

■ Thermistor Temperature Sensors



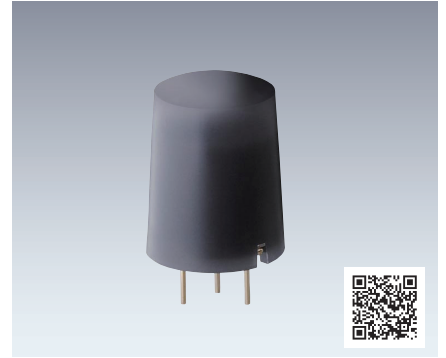
Temperature sensor realizes the heat resistance of industry highest standard (-40deg to 200deg), and waterproofing performance with original resin molding technique.

■ In the car / Ambient air Temperature Sensors



Temperature is detected by high response and it is a temperature sensor strong also against a shock.

■ PIR Motion Sensor PaPIRs



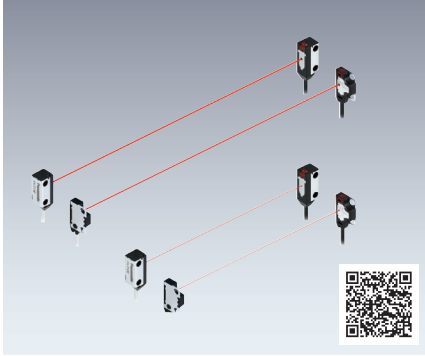
Simplified circuitry with Amplifier & Comparator ASIC integrated design. With small & smart lens. Low current consumption type available. (1 to 6μA)





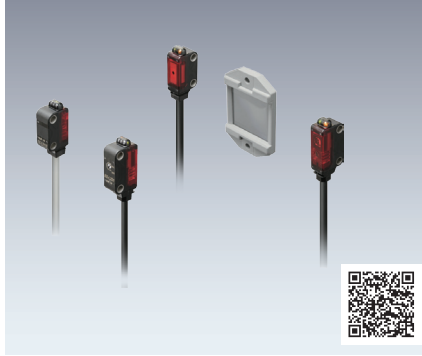
Factory Automation Sensors

Photoelectric Sensors



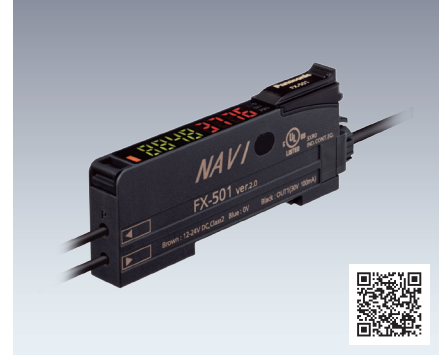
Ultra-minute Photoelectric Sensor EX-Z: W8 x H14 x D3mm, 50% smaller in volume ratio than conventional model. Enable installation in narrow space.

Laser Sensors



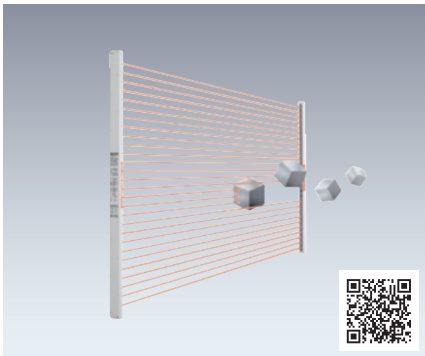
Amplifier Built-in Ultra-compact Laser Sensor EX-L200: The customized IC and the new structural design pursue a compact size.

Fiber Sensors



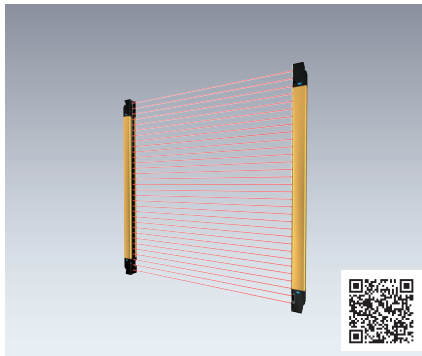
Digital Fiber Sensor FX-500 Ver.2: The sensors have long sensing range, high accuracy, and stability, which open up a whole new era of digital fiber sensors.

Area Sensors



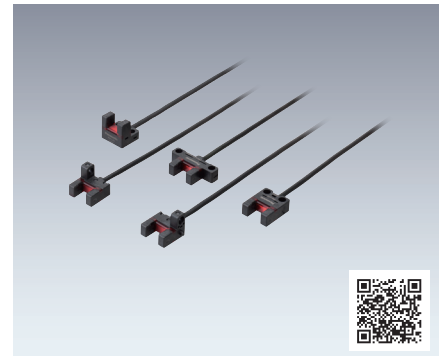
General Purpose & Slim Body Area Sensor NA2-N: The thin resin case type area sensor has a sensing height of 540 mm (28 beam channels).

Light Curtains



Compact & Robust Safety Light Curtain SF4D: High rigidity body with slim & thick frame (28 x 30mm size)

Micro Photoelectric Sensors



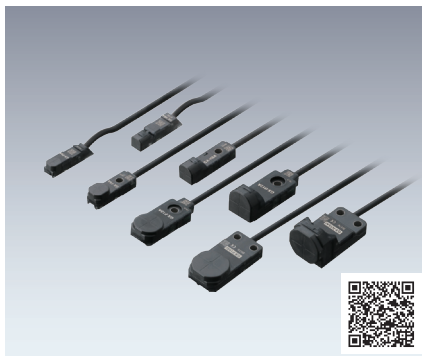
U-shaped Micro Photoelectric Sensor PM: Three protection circuits (Reverse supply polarity/Reverse output polarity/Output short-circuit) standard on all models.

Pressure Sensors



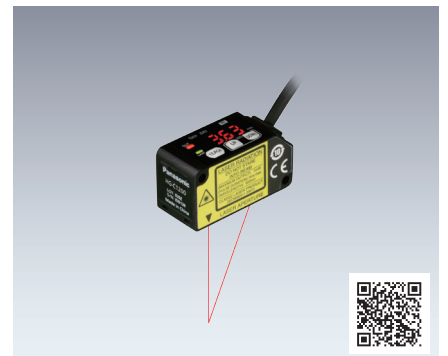
Digital Pressure Sensor DP-100: Dual 3-color display makes operation easier.

Inductive Proximity Sensors



Rectangular-shaped Inductive Sensor GX-F/H: Thorough adjustment and control of sensitivity greatly reduces individual sensor differences and variations.

Measurement Sensors

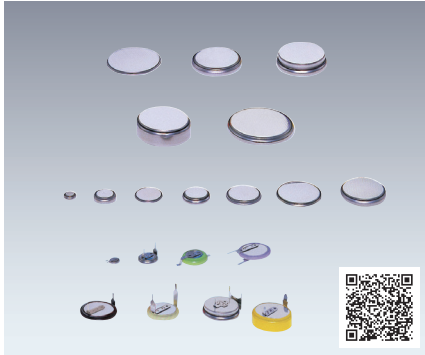


CMOS Type Micro Laser Distance Sensor HG-C: Compact size (W20 x H44 x D25mm) CMOS type laser sensor.



Primary Batteries / Rechargeable Batteries

Coin Type Lithium Batteries



- Coin Type Primary Lithium Batteries (CR /BR/BR(A) series)
- Coin Type Rechargeable Lithium Batteries (VL /ML/MS/CTL/MT series)

Cylindrical Type/Pin Type Lithium Batteries



- Cylindrical Type Primary Lithium Batteries (CR/BR series)
- Pin Type Primary Lithium Batteries (BR series)

Dry Batteries



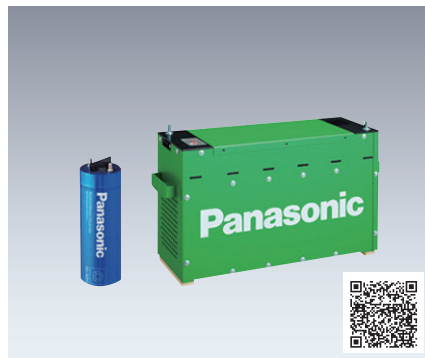
- Alkaline batteries
- Zinc carbon batteries

Nickel Metal Hydride Batteries



- Back-up (High temperature & long life, High rate discharge & high temperature)
- Button Top
- Standard
- High rate discharge & rapid charge
- Low temperature discharge

Ni-MH Batteries for Infrastructure



Infrastructure type: Lightweight and space-saving for High capacity. Ni-MH Battery & module. Used for Power Storage, Power supply for vehicle.

Pin-type Lithium-ion Battery



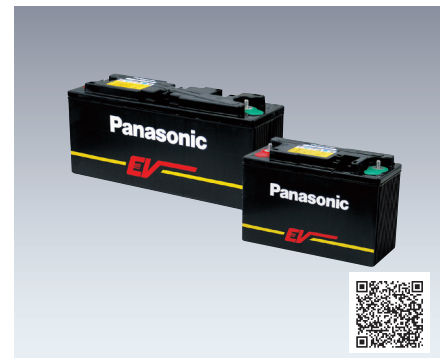
A 3.65mm diameter pin-shaped rechargeable battery which expands design options for small devices.

Valve Regulated Lead-Acid Batteries



Valve regulated lead-acid batteries for industrial use such as power supplies for communications equipment, uninterruptible power supplies (UPS) and power tools.

VRLA Battery for EV



Valve regulated lead-acid batteries for main power and energy storage applications such as electric vehicles, forklifts, streetlights, peak shaving and off-grid power systems.

Lithium Ion Batteries

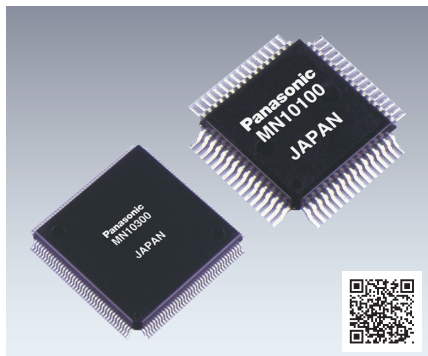


These batteries are also used in backup base stations for mobile telephones, electricity storage systems with solar power generation, and various other industrial uses.



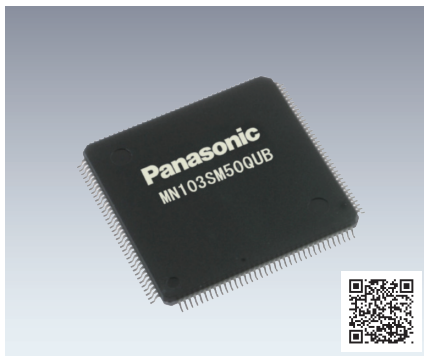
Semiconductors

Microcomputers



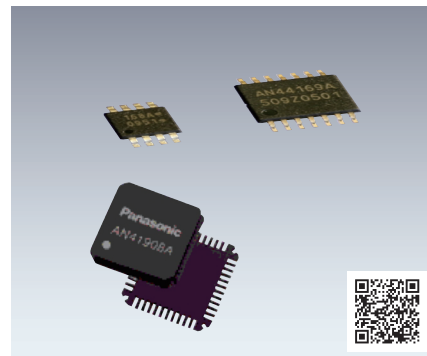
32-bit High Performance / Low Power Microcomputers (MN103S/H/L Series)
8-bit Low Power Microcomputers (MN101E/L/C Series)

Interface & Communication ICs



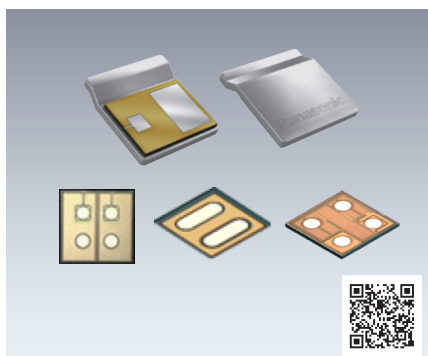
Communication ICs, AV Signal Processing ICs (HDMI V2.0 Communication ICs, NFC Tag ICs, HMI Display ICs, etc.)

Analog ICs



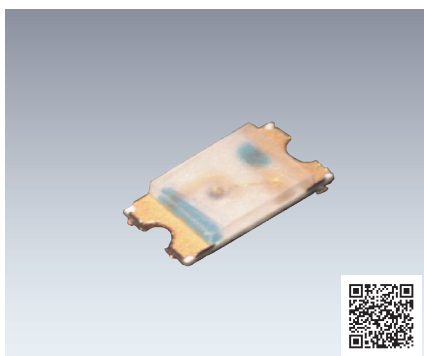
Battery Monitoring ICs, Motor Driver ICs, LED Driver ICs, Analog Master Slices, etc.

Discrete Devices



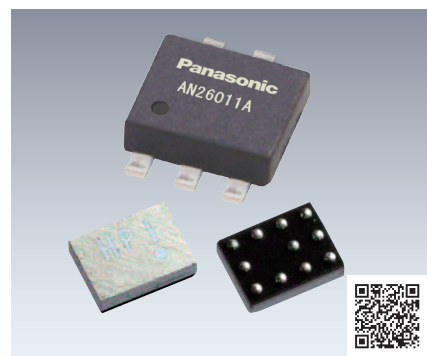
Diode & MOSFET Series with High Quality, Low Loss, Ultra Small Package using Chip Size Package (CSP) technology

Opto Electronic Devices



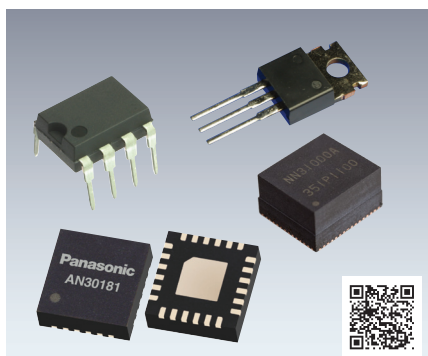
High Efficient & Color Rendering LEDs for Lighting, Automotive-use Small White LEDs with High Heat Dissipation

Radio Frequency Devices



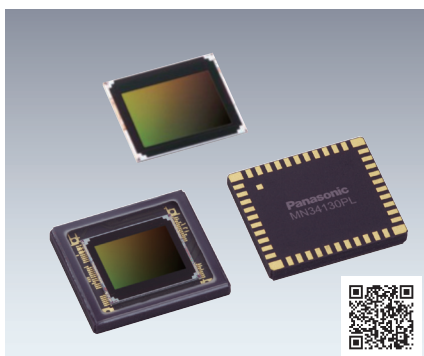
Low Power / Low NF / Low Distortion Low Noise Amplifier (LNA)

Power Devices



Fast / High Efficiency GaN Power Devices, High Efficiency DC-DC Regulators ICs with Built-in Inductor, Intelligent Power Devices (IPD)

Image Sensors



Small & Low Power Consumption Image Sensors for Security and Network

Passive Components

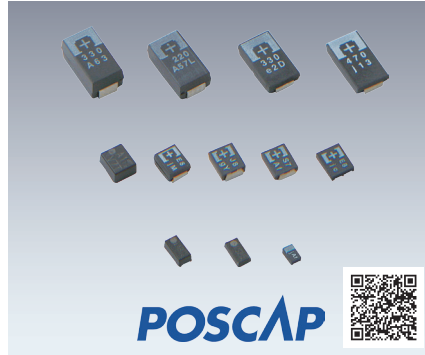
Capacitors

Conductive Polymer Aluminum Electrolytic Capacitors



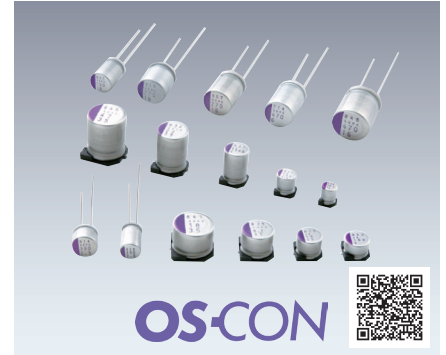
Electrolytic capacitors No.1 ultra low ESR
Low profile 1.0mm height (Dsize:7343)
Low ESL is realized by 3-terminals
High voltage (~35 V.DC)

Conductive Polymer Tantalum Solid Capacitors



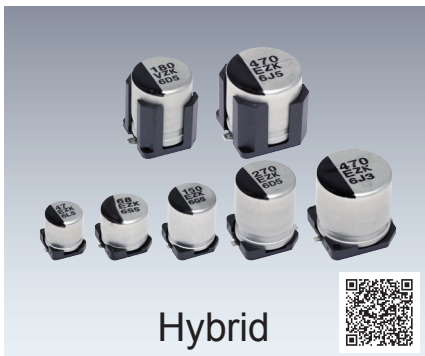
Low ESR by using conductive polymer.
Small size / Large capacitance / High
voltage / High reliability
Rush current resistance characteristics

Conductive Polymer Aluminum Solid Capacitors



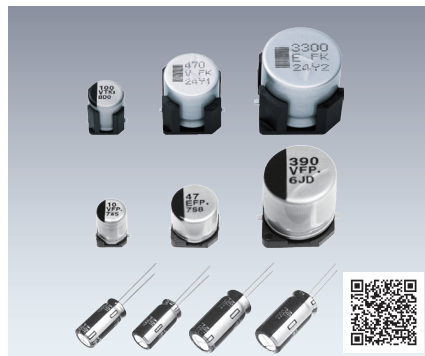
Low ESR by using conductive polymer
Long life / High reliability
High voltage 100V.DC max.

Conductive Polymer Hybrid Aluminum Electrolytic Capacitors



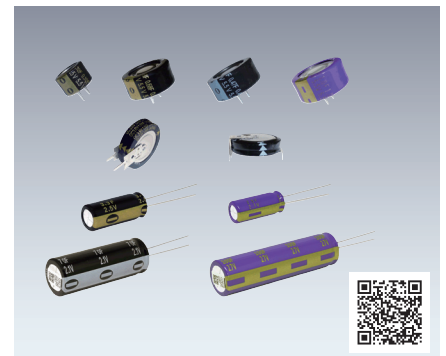
Low ESR and High ripple current
Low-temp. characteristic equivalent to a
conductive polymer aluminum electrolytic
cap., and a frequency characteristic.

Aluminum Electrolytic Capacitors



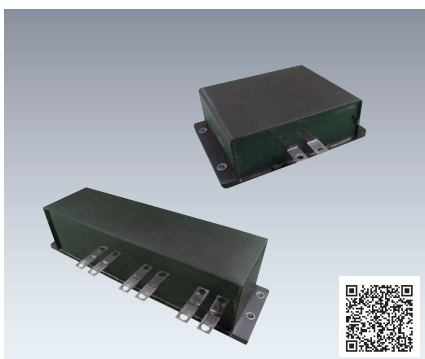
Wide products range for the high appliance
performance (Surface mount type, Radial
lead type). Vibration-proof is available up-
on request (ø8 mm and larger).

Electric Double Layer Capacitors (Gold Capacitor)



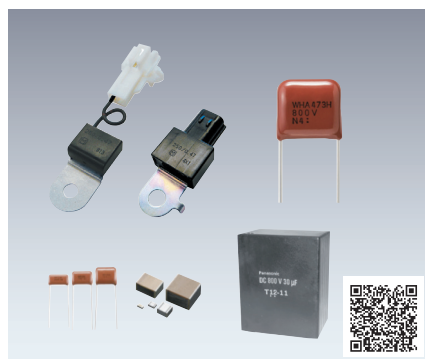
Superior charge and discharge performance com-
pared with secondary batteries. Large capacity
than aluminum electrolytic cap. Quick charge and
discharge cycle (100 thousand times or more).

HEV/EV Film Capacitors



Self protective function by finely-patterned
electrode
Capacitor modules are available. (DC-Link,
Filtering and Snubbing)

Film Capacitors (general-purpose)



Excellent temperature characteristics and
frequency characteristic
High reliability with self healing function

Film Capacitors (AC motor use)

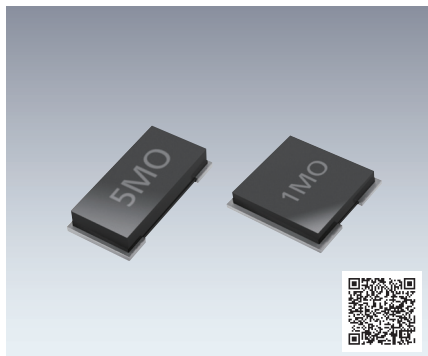


High safety (Safety function installed)
IEC60252-1, UL810 standard authorization

Passive Components

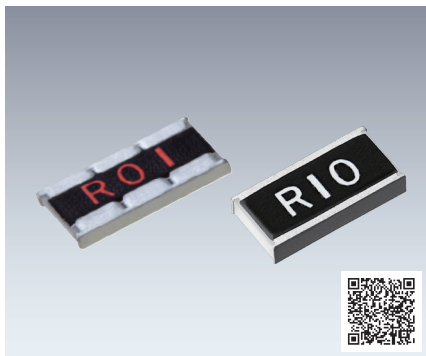
Resistors / Inductors (Coils)

Current Sense Resistors



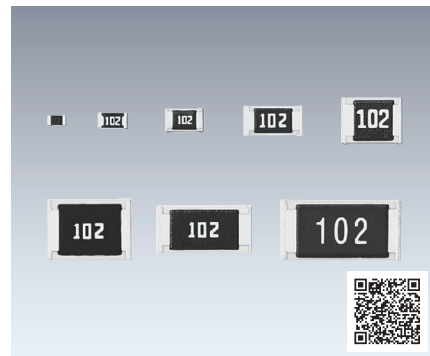
Current Sensing Resistors with low resistance value for the devices from mobile to automotive.(120A max.)

High Power Chip Resistors/Wide Terminal Type



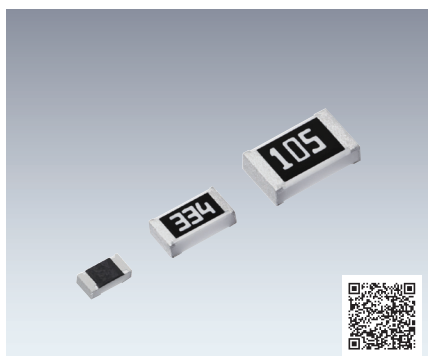
Quite high reliability for soldering strength with wide terminal structure. Space saving with high power rating spec.

Anti-Surge /Anti-Sulfurated Thick Film Chip Resistors



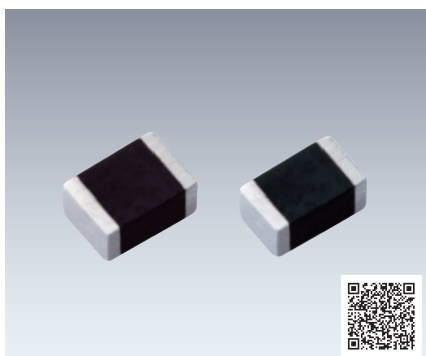
Special structure for anti-surge brings excellent ESD withstanding performance and space saving tiny size. Anti-sulfurated type has excellent against sulfuration.

Metal Film (Thin Film) Chip Resistors



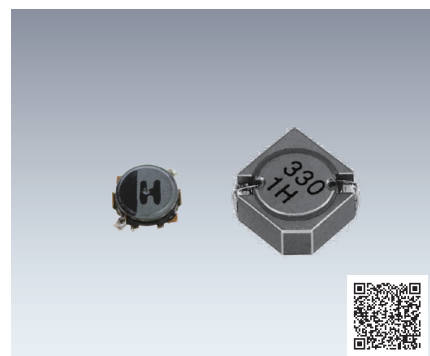
Thin film resistors are suitable for the circuit which requires high stability against the temp fluctuation because of its precise resistance value.

Power Inductors(Multilayer type)



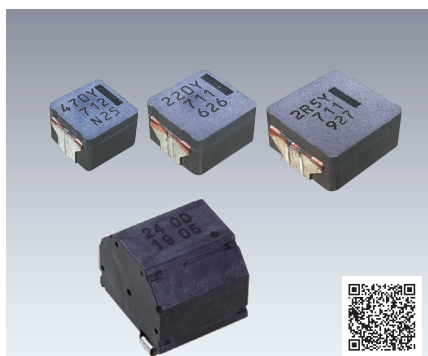
Large current in the original process. Replaced can from metal alloy. To high-performance and can operate in high frequency.

Power Inductors(Wire Wound type)



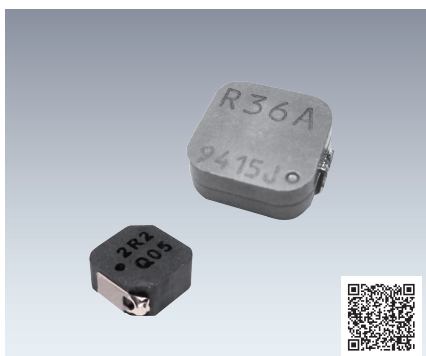
Magnetic shielded structure. Low DC resistance and large current capability. Shock resistant .(ELL**G series)

Power Choke Coils for Automotive application



Excellent inductance sustainability to DC bias current & temperature. High heat resistance. (up to 150°C) & vibration resistant. (30G)

Power Choke Coils for consumer use

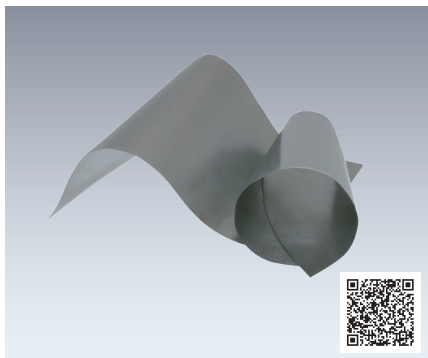


Low DCR and High Power. Low buzz noise due to its gap-less structure. Magnetic shield type by metallic magnetic material.

Passive Components / Materials

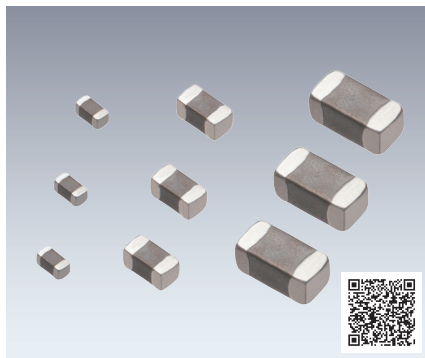
Thermal Solutions / EMC Components / ESD Components / Surge Components / Fuses

■ “PGS” Graphite Sheet



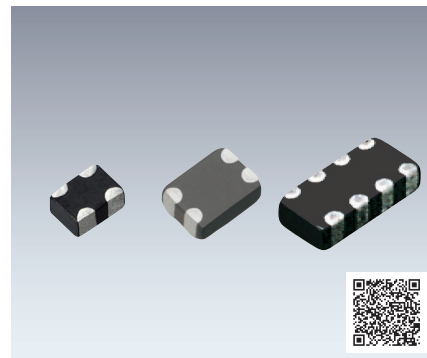
Excellent thermal conductivity: 700 to 1950W/(m·K).
Lightweight: Density 0.85 to 2.13 g/cm³.
Flexible and easy to be cut or trimmed.

■ Multilayer NTC Thermistors



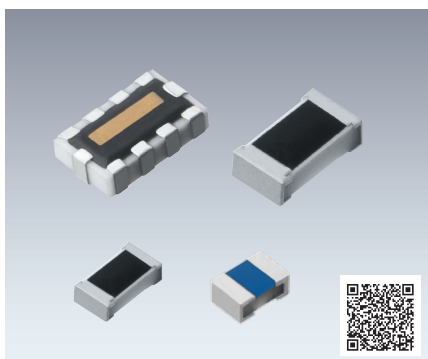
Highly reliable multi-layer / monolithic structure. Highly reliable multi-layer / monolithic structure.
Wide range of resistance / B value.

■ Common mode Noise Filters



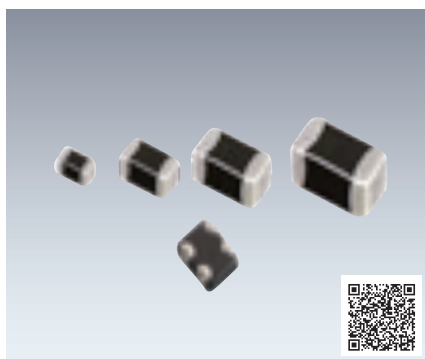
Simple multi-layer structure (sintered solid) brings excellent environmental quality and stable mounting with wide variation for high speed I/F and tiny arrays.

■ ESD Suppressors



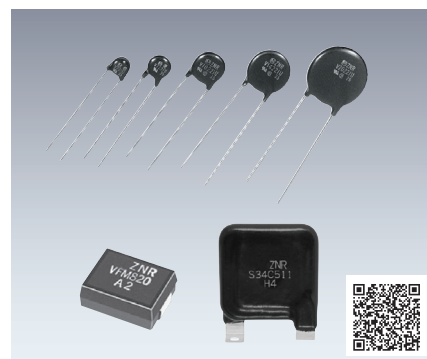
Easy to use for the super high speed data transmission line like HDMI etc because of super low capacitance of 0.5pF. Contact & Air 15KV is available.

■ Multilayer Chip Varistors



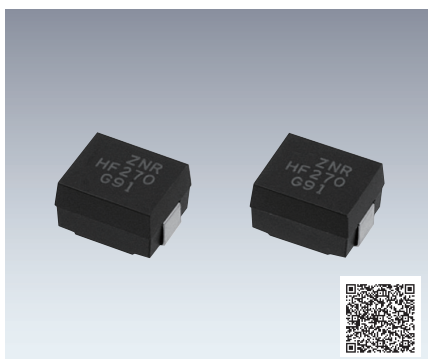
Excellent ESD suppression due to advanced material technology.
Can replace 2 Zener Diodes and 1 Capacitor. Wide lineup for lamination structure.

■ “ZNR” Transient/Surge Absorbers



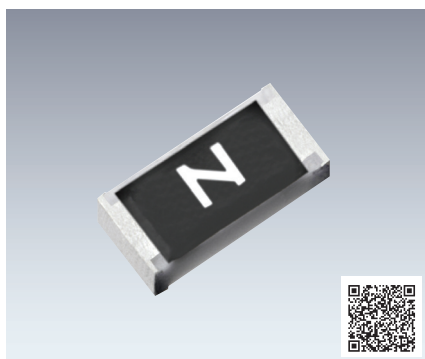
Surge protection device for electronic equipment of various fields composed primarily of zinc oxide (ZnO). From consumer electronics to power plant applications.

■ “ZNR” Transient/Surge Absorbers HF Series



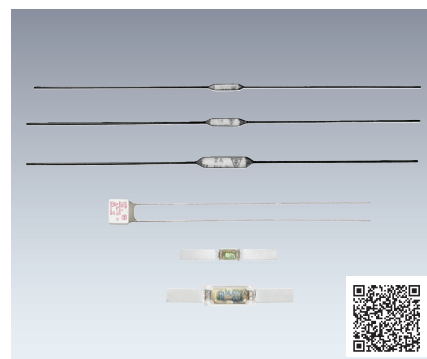
ZNR for Load Dump Surge protection. Suitable for requirement of Automotive. Can be smaller and lighter than the EUC Measured by ZD.

■ Micro Chip Fuses



Fast acting chip fuses for the secondary circuit protection. Small size variation of 0402, 0603 and 0805.

■ Thermal Cutoffs (TCO) / Thermal-Links

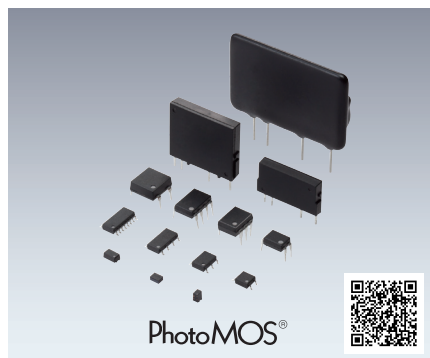


Narrow operation temperature tolerance. Larger current thermal fuse. Protection for Li-ion and Li-polymer batteries. (Thin type) Protection for transformer, motor. (Lead type)

Connecting Components

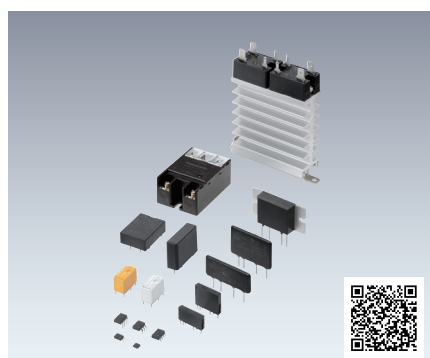
Relays

■ "PhotoMOS®"



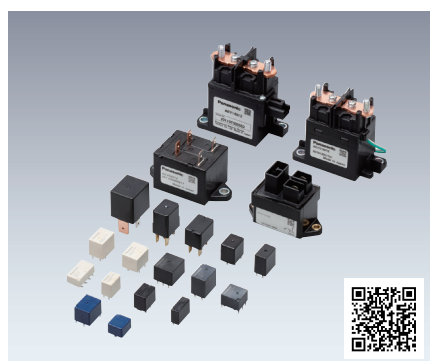
Panasonic offers a wide range of "PhotoMOS" ideal for measurement, telecommunication, security and industrial control equipment.

■ Solid State Relays



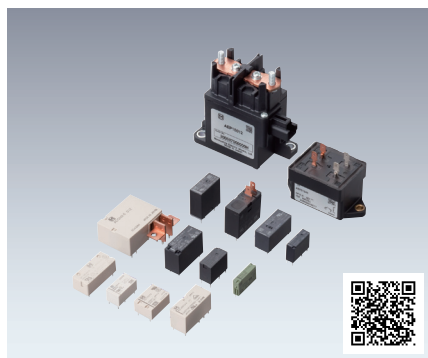
Semiconductor relay ideal for heater control etc.

■ Automotive Relays



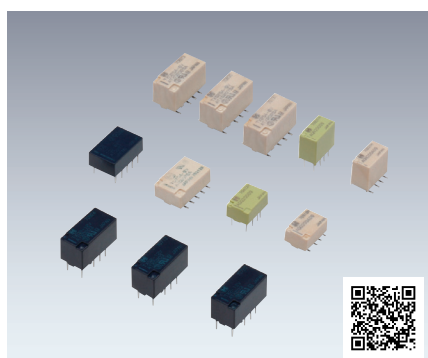
Relays for automotive electronics that includes plug-in and PCB type. High-capacity DC cutoff Relays for EV also available.

■ Power Relays



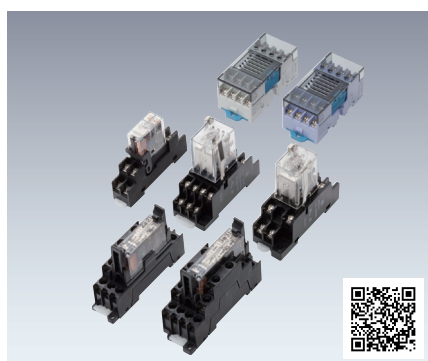
Mechanical relay with greater than 2A nominal switching capacity that is ideal for power supply applications.

■ Signal Relays



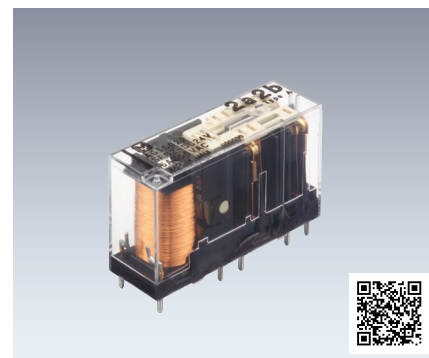
Mechanical relay ideal for signal control, etc., with less than 2A nominal switching capacity

■ Control Panel Relays



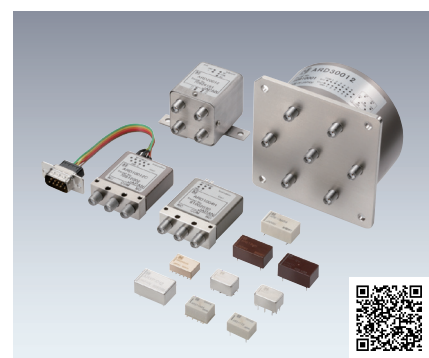
Relays for general purpose switching. A wide range of switching capacity, ranging up to 16A AC, and a wide variety of contact arrangement, 1c/2c/3c/4c.

■ Safety Relays



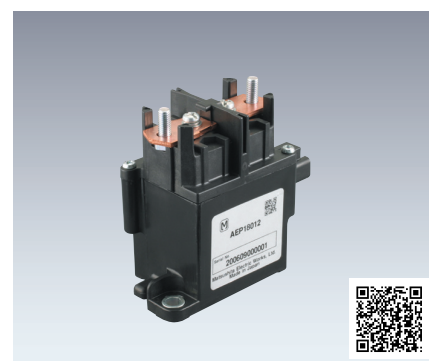
Safety relay ideal for safety circuit construction, with forcibly guided contact structure.

■ Microwave Devices



Lineup spans from relays to coaxial switches. High-frequency devices that support high bandwidth frequencies.

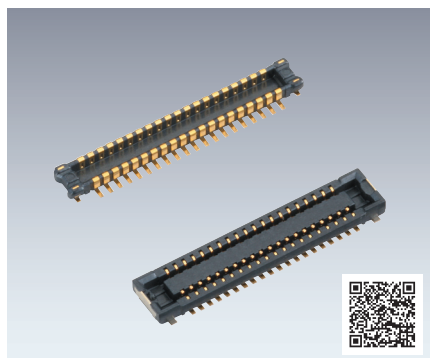
■ High-capacity DC Cutoff Relays



DC high voltage switching possible. Up to 300 A current capacity type available. EP Relay : High Capacity of Max.1,000V DC Cut-off Possible.

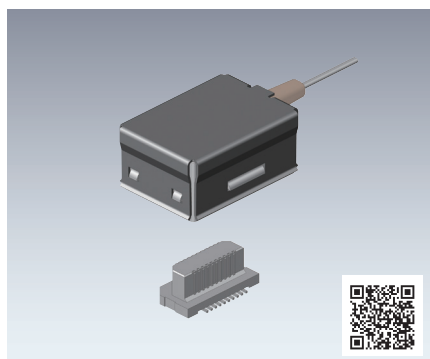
Connectors

Narrow Pitch Connectors for Board to FPC



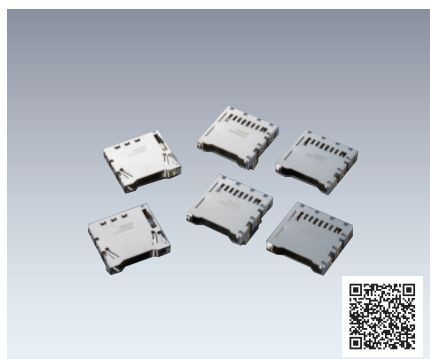
0.35 to 0.4mm terminal pitch, 1.7 to 3.6 width, and 0.6 to 1.5mm mated height. Strong resistance to advanced environments with "TOUGH CONTACT" construction.

Active Optical Connector



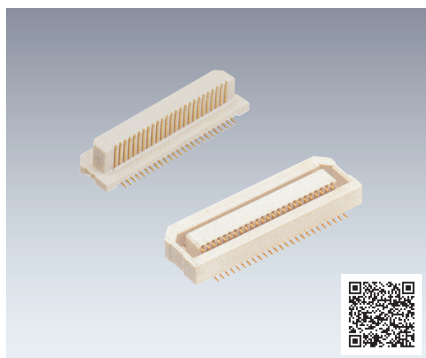
8Gbps high speed optical. Improve EMC characteristics by optical transmission.

SD Memory Card Sockets (*)



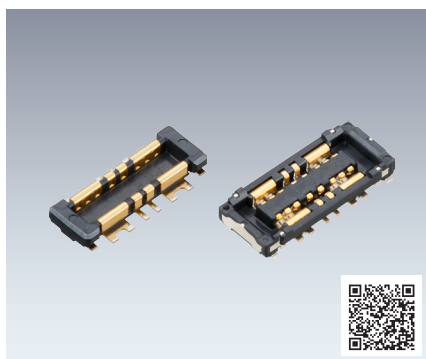
AXA series
With a double-sided metallic shell structure, the connector offers outstanding "robustness", "EMI-resistance" and "terminal flatness".

Narrow Pitch Connectors for Board to Board



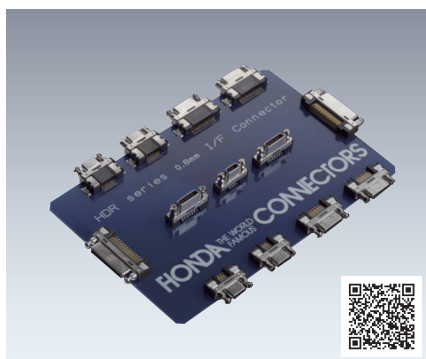
0.35 to 0.8mm terminal pitch, 3.6 to 5.8 width, and 1.5 to 14mm mated height. Strong resistance to advanced environments with "TOUGH CONTACT" construction.

High Current Connectors



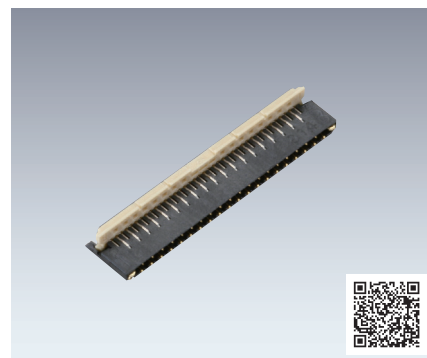
Small and low profile connectors up to 10A available.

0.8mm Pitch Connector (*)



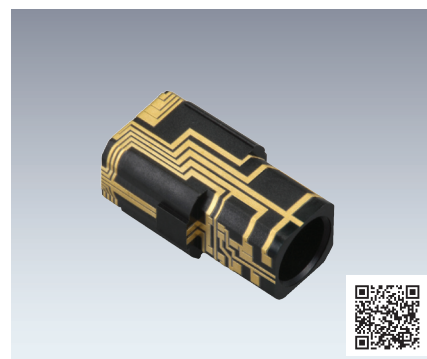
HDR series
A compact, robust and EMI-compliant 0.8mm pitch interface connector.

FPC/FFC Connectors



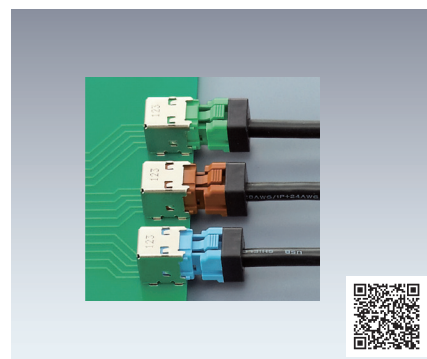
0.2 to 0.5mm contact pitch. Easy-to-handle back lock design. Slim and low profile design.

MIPTEC 3D Packaging Technology



Molded components with an electrical circuit directly formed on 3D surface.

Connector with small lock (*)



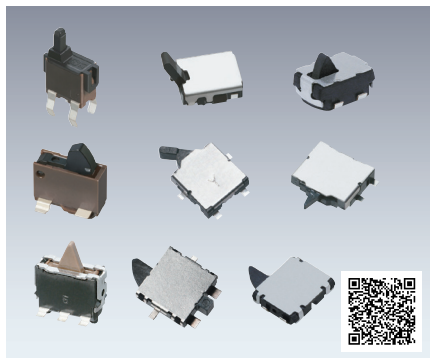
TAK series
USB2.0 compatible. A fully-shielded type featuring a mold lock mechanism.

* Products of Honda Tsushin Kogyo Co. Ltd.

Connecting Components

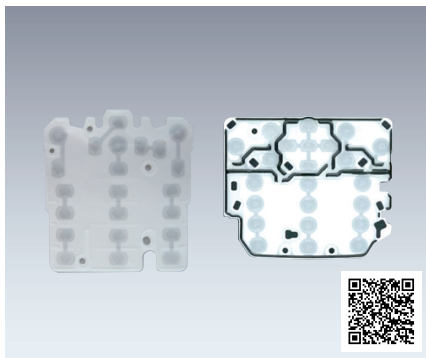
Switches / Potentiometers / Encoders

Detector Switches



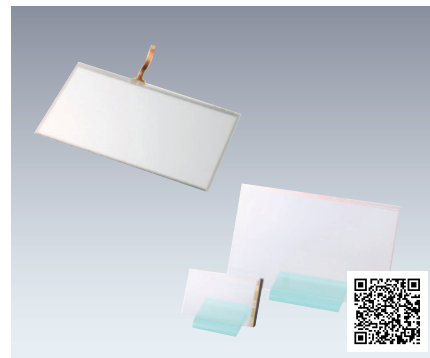
Realize high reliability by original contact technology.

Switch Module



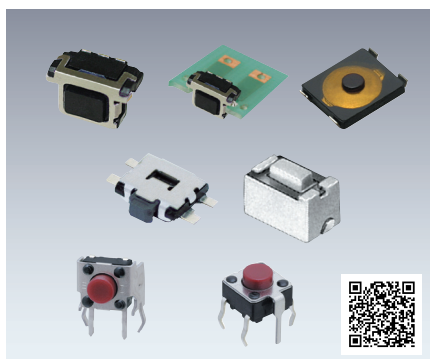
Thin and lightweight design achieved by adopting a metal diaphragm.

Touch Panel



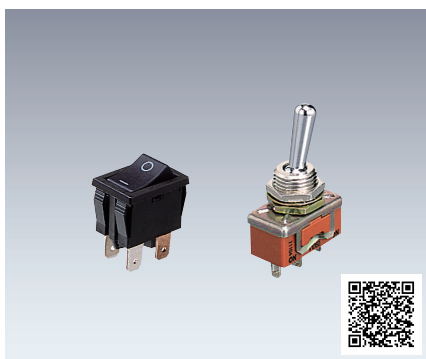
Touch panel for realizing high-visibility and high-endurance properties.

Light Touch Switches



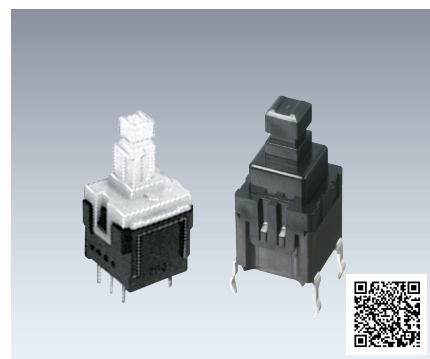
Selectable from a wide variety of types optimized for each application. Reliable switch performance with good tactile feedback.

Operation Switches



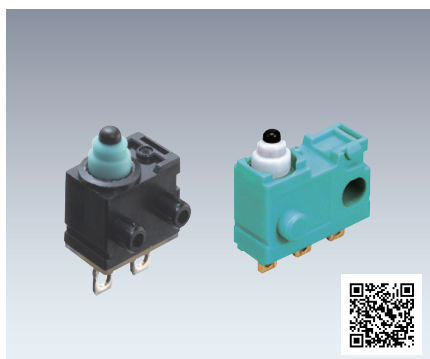
Operation switches that achieve comfortable operation. Wide lineup of sizes and shapes are available.

Signal Switches



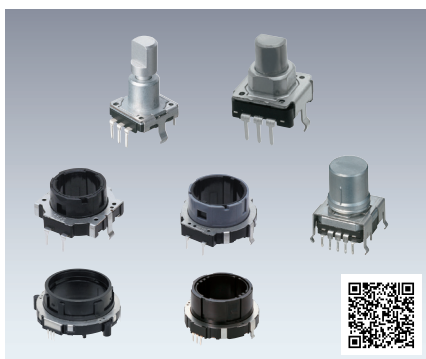
Realize optimized operation feeling for each application.

Snap Action Switches



Wide lineup of sizes and shapes are available. Sealed type (Turquoise switch series) also available that is highly resistant to harsh environments.

Encoders / Potentiometers



Applicable to various operations. High reliability achieved by original contact technology.



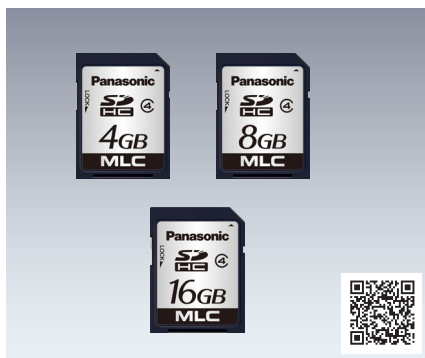
Industrial SD Memory Card / MicroSD Card / eSD

SD High Grade <SLC type>



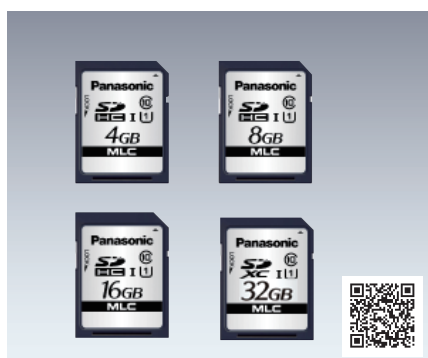
High grade SLC type suitable for long-term repeated use. With Power Failure Recovery. UHS-I compliant (Over 4 GB). Made in Japan.

SD Basic <MLC type>



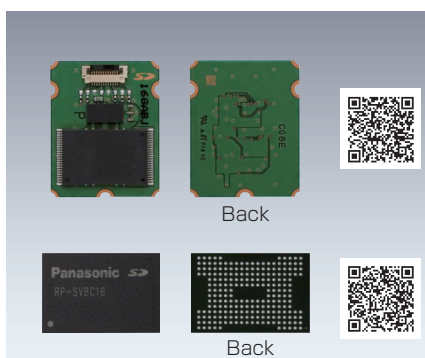
Basic series of a high-durability and good cost performance required for industrial SD. cards. MLC flash memory. Made in Japan.

SD UHS-I <MLC Type>



Ultra high-speed (UHS-I compliant) and high-capacity (up to 256GB) series. Suitable for large data recording.

Flexible Connection Type/Semi-Conductor Mounting Type(MLC)



Suitable for an embedded-use. Available in 4/8/16GB. (16GB : flexible connection type only). Made in Japan.

microSD High Grade <SLC type>



High grade microSD SLC type suitable for long-term repeated use. With Power Failure Recovery. UHS-I compliant. Made in Japan.

microSD <MLC type>



Highly reliable microSD. Suitable for an embedded-use. Power Failure Recovery while using MLC flash memory. Made in Japan.

Optical Disc Drives

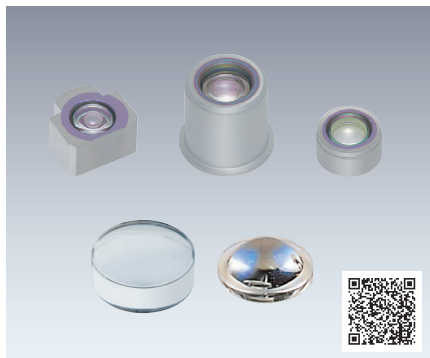
Archival grade Blu-ray Discs



A single-sided 50GB and 25GB write once in 1-6 speed discs. Highly reliable discs featuring a 50-year archival life. "Tough Coating" protects the disc from scratches and affective materials. Made in Japan.

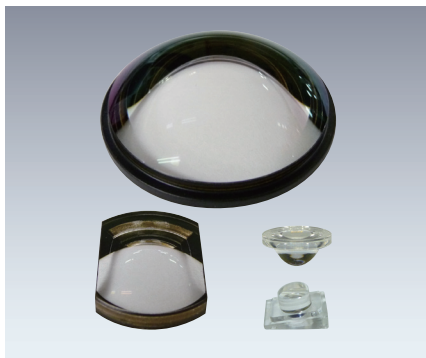
Optics Components / Acoustic Components / Communication Devices / Energy Creation & Storage

Aspherical Glass Lenses



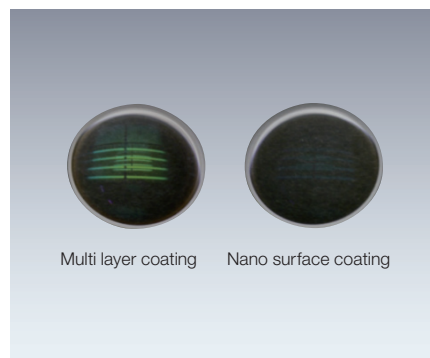
High reliability, lightweight, compact, high-performance (NA) and with barrel aspherical glass lenses are achieved using high precision "one shot" molding technology.

Aspherical Lenses



Wide variety of Glass & Plastic Lens for Various Application.
High Accurate / Large-Aperture / Thin / Aspheric Lens for Various Application

Thin Film Coating



Functional coating, such as Nano-surface coating which reduces a visible light reflection to 0.1%, hard, AR, hydrophilic, water repelling coating are available.

Acousto-optic Devices



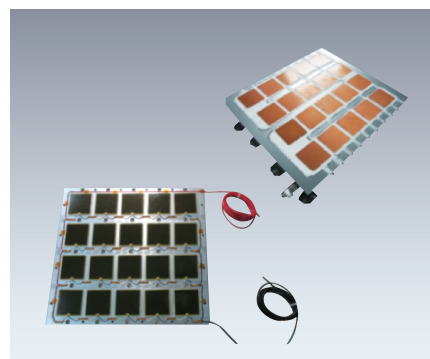
The acousto-optic device can modulate and deflect laser. The high-performance is achieved using in-house making high quality single crystal.

Optical Imaging Units



Transfer rate: 4Mbps.
Compact size achieved by custom IC, Built-in ATC Circuit.
JIS F07 Connector adopted.

Power Generation Plates

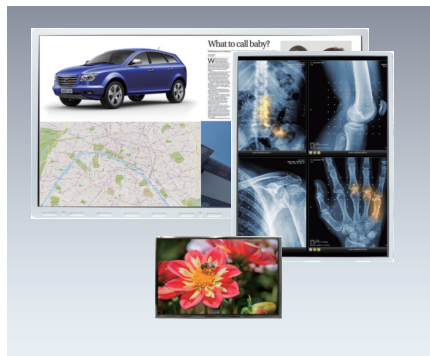


The plate is capable to generate 200W/h max power by 140 degree difference in temperature caused by exhausted heat \leq 200 degrees C, unutilized currently.



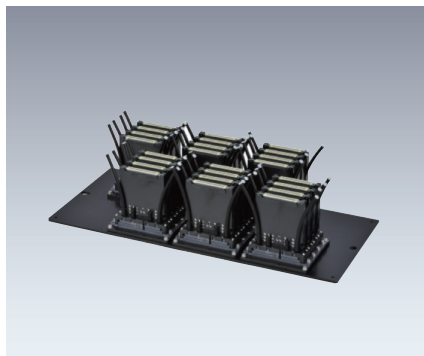
Display Devices / Input & Output Units / Power Supplies / Hybrid ICs

LCD Panel Modules



- IPS, Evolved Image Quality, Saved Energy
- Best for Various Applications in B2B
- Customizable to Your Needs

Industrial Ink Jet Head



Line Head for Commercial Digital Printer.
High Quality(1440×1440dpi Resolution).
High Speed:105m/min.(@1440×1440dpi).
High Accurate & Stable Jetting.

Industrial Ink Jet Head Module



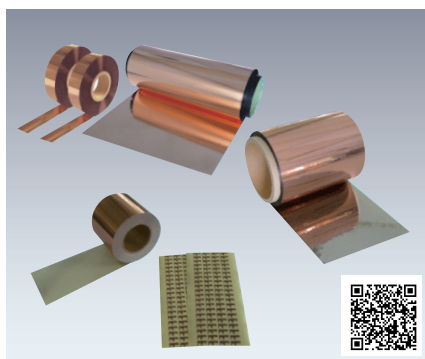
Head Module for Wide Format Printers.
Excellent linearity of the ink Jetting, it corresponds to the wide print gap.
Compatible with a wide variety of ink.

Monetary Devices



Original identification technology enabling efficient detection of counterfeit coins and bills

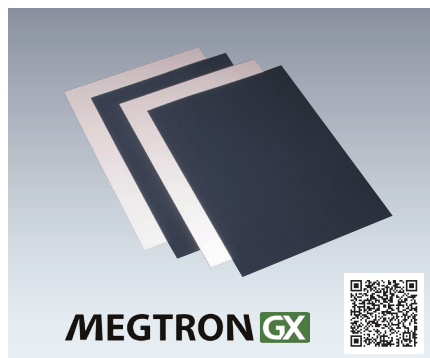
Electromagnetic Wave Shield Films



Copper shield layer formed on the surface of thin PET film by vacuum evaporation. Not only excellent electromagnetic wave shield but also flexible and light weight shield film.

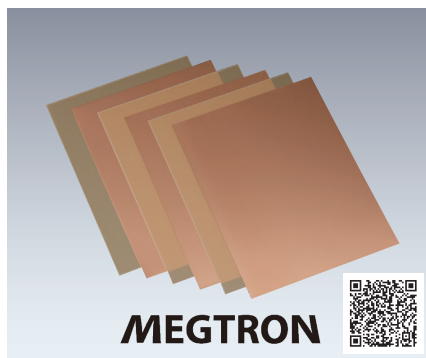
Circuit Board Materials / Advanced Films

MEGTRON GX series (Multi-layered)



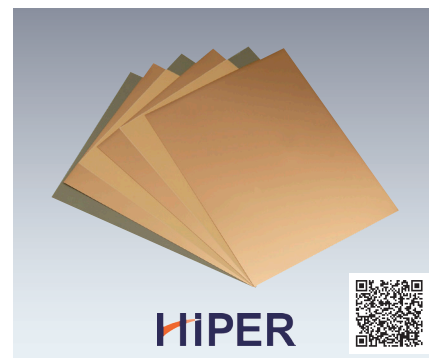
- For IC-packages
- Low warpage of IC-substrate
- Thinner and smaller of IC-packages

MEGTRON series (Multi-layered)



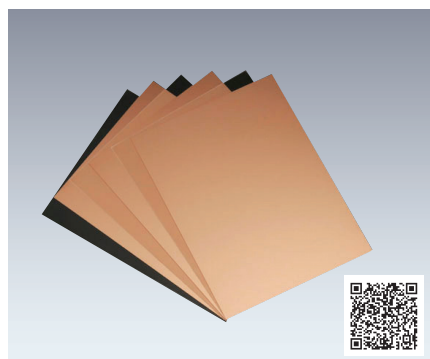
- For ICT-infrastructure equipment
- Low transmission loss and high thermal resistance
- Faster and low loss for big data

HIPER series (Multi-layered)



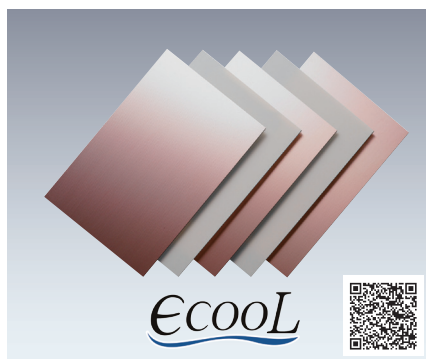
- For Automotive
- High heat resistance and high reliability
- Available in harsh usage environment such as engine ECU

Halogen-free series (Multi-layered)



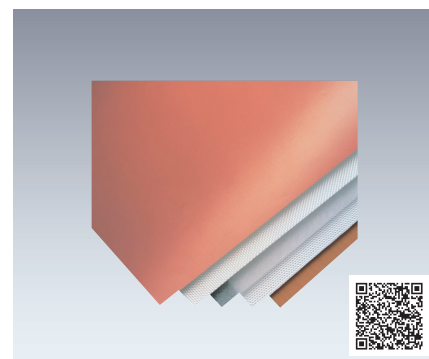
- For ICT terminal devices
- Low Dk and high reliability
- No hazardous gas when burned it

ECOOOL series (Double-sided)



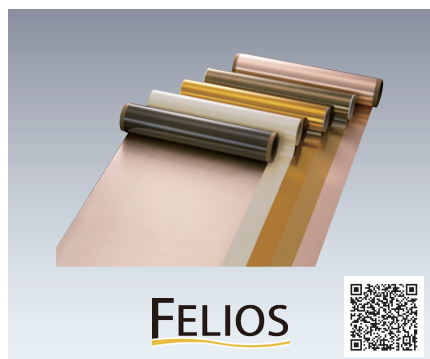
- For LED lightings
- High thermal conductive
- Apply to a wide range of heat dissipation application

Double/Single-sided circuit board materials



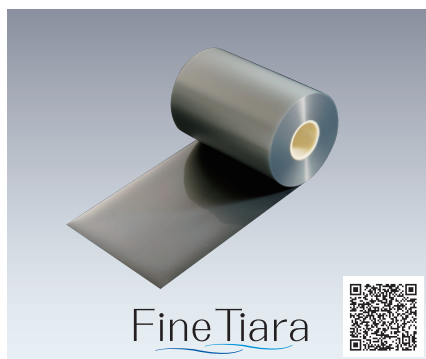
- For digital home appliance CEM-3, paper phenolic circuit board materials
- Excellent tracking resistance
- Good processability

FELIOS series (Flexible materials)



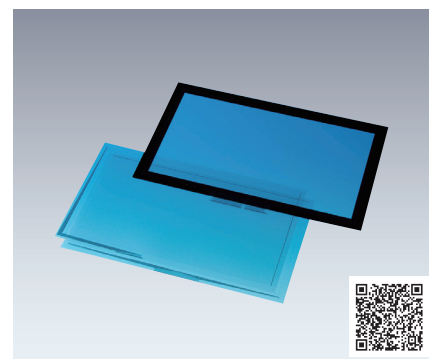
- For ICT terminal devices/ automotive
- Thinner and lighter of devices
- Apply to narrow space and bending part

Optical films



"Fine Tiara series" for mobile products. Excel in anti-reflection and anti-fingerprint of touch panel.

Fine Wiring Electrode Films

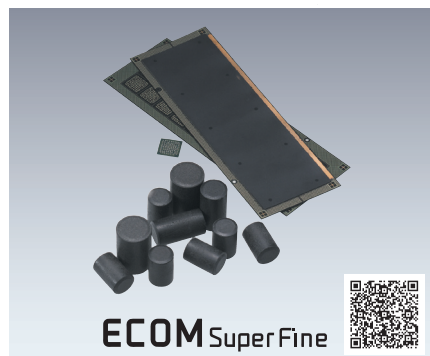


Superfine Micro Circuitry Film for Touch Panel System.



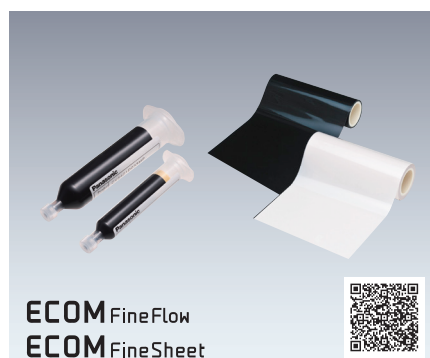
Semiconductor Encapsulation Materials / Adhesive , Sealing Materials

Halogen-free Epoxy Encapsulation Materials



- Fine pitch applicable grade
- Narrow gap filling applicable low-warpage type
- High thermal conductivity type

Liquid Epoxy Encapsulant, Encapsulation Sheet Materials



- Liquid epoxy encapsulant Ultra-low warpage type
- Fine-pitch bumps applicable Underfill(CUF)
- Encapsulation sheet materials

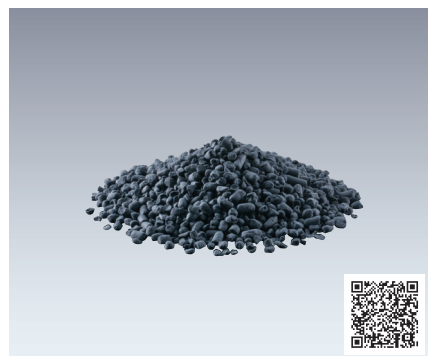
Adhesive Materials, Sealing Materials



- One humoral epoxy adhesive materials
- UV curing type(Rapid · Time-lagged)

Plastic Molding Compound / Thermal Insulation Materials

Phenolic Molding Compounds



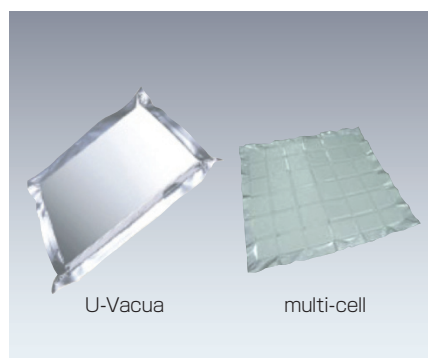
- Glass reinforcement & Heat resistance
- High dimensional stability type
- High insulation type

Unsaturated Polyester Molding Compounds



- For reflector of LED package "FULL BRIGHT UP"
- High thermal conductivity (for motor)
- Low linear expansion(CTE) (for motor)

Vacuum Insulation Panel



Insulation material with high reliability, accommodating wide variation of shape with U-Vacua and multi-cell type, and achieving top performance as industry leader.

Urea/Melamine Molding Compounds



- Faster cure type
- High Tracking resist and Arc resist type
- Super tough grade Melamine Molding Compound MEWLUS

Thermoplastic Molding Compounds



- GF grade/flame retardant PBT
- High reflecting/light diffusing PP "FULL BRIGHT PP"
- High weld strength LCP

Factory Automation Devices

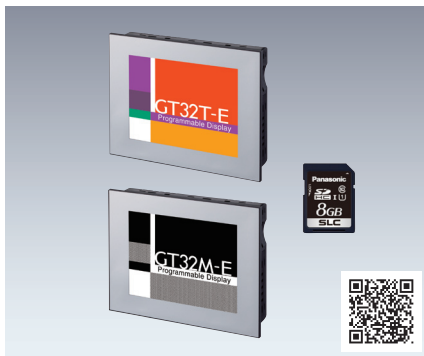
Factory Automation Devices

■ Programmable Controllers



Programmable Controller FP7 can control not only machinery but also information. Users can check the accumulated data in the FP7 with a browser.

■ Programmable Displays(HMI)



Programmable Display (HMI) GT32-E: Superior visibility even in sunlight. Impressive water resistance makes usage possible in areas prone to water contact.

■ Static Control Devices



Pulse AC Method Area Ionizer ER-X: High-speed, wide area charge removal.

■ Energy Consumption Visualization Components Control Unit



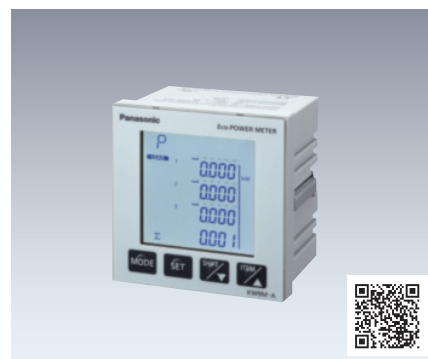
Control unit ELC1

■ Energy Consumption Visualization Components Air Flow Monitor



Air Flow Monitor EWA2: Visualize air consumption to eliminate Waste. Air flow meter is essential for air leak detection and energy saving.

■ Energy Consumption Visualization Components Eco-Power Meter



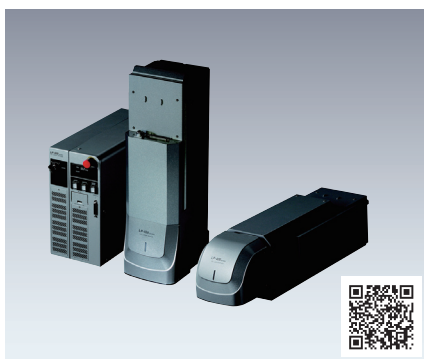
Eco-Power Meter KW: From Introduction to Measurement and Data Management, "Visualization" of Energy Use is Easy!

■ UV Curing Systems



LED Spot Type UV Curing Systems
Acure UJ30/35:
Easy Operation & High irradiation performance.

■ Laser Markers (CO₂)



CO2 Laser Marker LP-400:
A high-speed galvanoscanner and the advanced technology makes it possible to mark on products that are moving rapidly.

■ Laser Markers (FAYb)

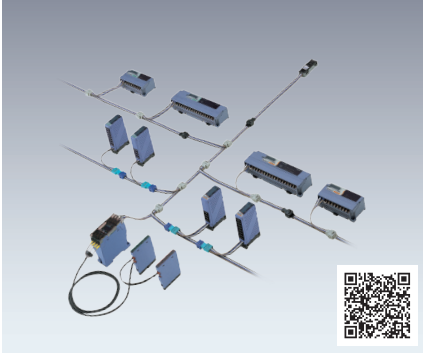


FAYb Laser Marker LP-M Series:
Productivity and safety in one New 3D fiber laser marker LP-M series.



FA Components

Wire-saving Systems



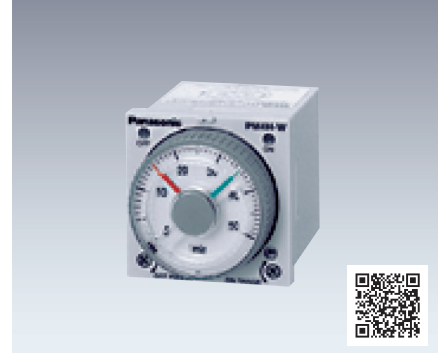
Flexible Wire-saving System S-LINK V:
Ideal wire-saving system that meets the
strict demands of the FA worksite.

Solenoids



Solenoids ideal for general industry equip-
ment and incorporation into consumer
products.

Timers



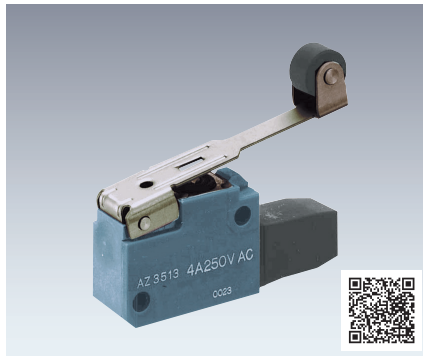
The wide variety of product types includes
affordable digital timers and multifunctional
compact analog timers.

Fan Motors



We have small, large, and thin sizes for
both DC and AC types, which are available
at affordable prices.

Limits Switches



Space-saving compact horizontal/vertical
limit switches. Long-life and highly reliable.
Compliant with overseas standards.

Temperature Controllers



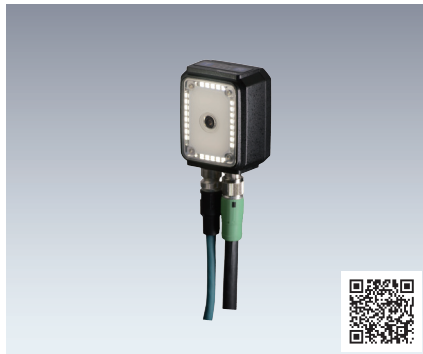
Easy-to-operate high-precision, affordable
temperature controllers. All models have
multiple input capabilities and support any
type of sensor. The short body.

Machine Vision Systems



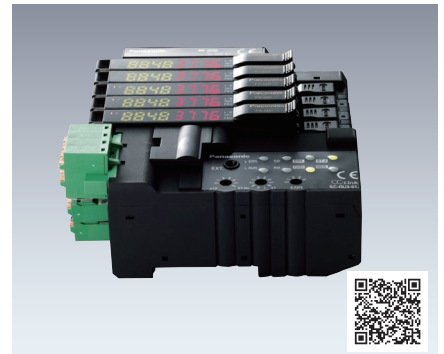
Machine Vision Systems
IMAGECHECKER PV200 :
Improved inspection reliability while reduc-
ing engineering time.

2D Code Readers



Stable reading of 2D codes marked on
parts of diverse shapes and with various
surface conditions. DPM-compatible 2D
Code Reader LP-ABR10.

Communication Unit for Open Network



Communication Unit for Open Network
SC-GU3 : The SC-GU3 Series is easy to
install and enables flexible remote opera-
tion over a network.

Motors / Compressors

Motors for Factory Automation

■ AC Servo Motors



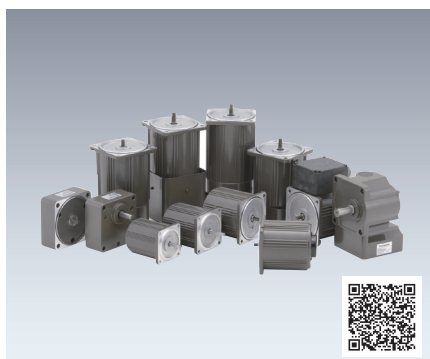
MINAS-A6series, rated output: 50W to 5kW. 3.2kHz frequency response. two-degree-of-freedom control system and fit-gain tuning featuring simple setup.

■ Brushless Motors



MINAS-BL GV•GP•KV series, rated output: 50W to 130W(GV:speed control•GP:position control), 50W to 750W(KV:speed control). Compact and high-efficiency.

■ Compact AC Geared Motors



Shin-G series, rated output: 1W to 90W. Varieties of models, Long life-10000 hours for Ball bearing type, Low noise geared motor.

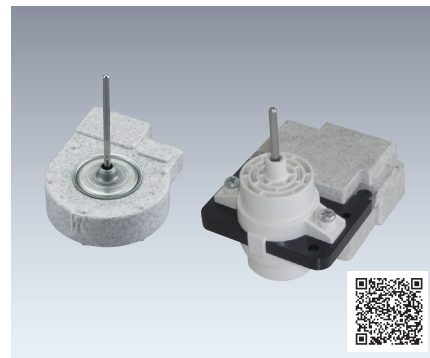
Motors for Equipment Home, Appliances, Automotive

■ DC Brushless Fan Motors for Packaged Air-conditioner



Using for Large-Size Air-Conditioner (Building & Unitary) Fan Driving.
Output : 60W~750W

■ Refrigerator Fan Motors



Full range of AC/DC and DC Input
Using for Refrigerator Evaporator & Condenser Fan Driving

■ Motors for Automotive

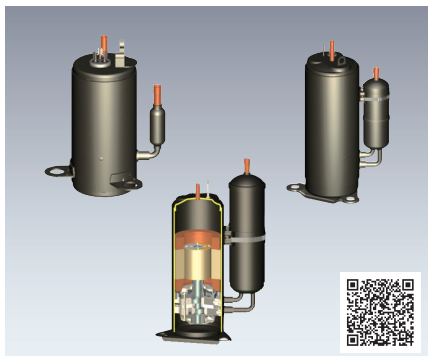


Compact and Light Weight DC Motor for Automotive Industry.
<Application>
ABS/ESC, Cooling fan for various applications



Compressors / Pumps / Cooling Fans / Cooling Roller / nanoe™

■ DC Inverter Compressors for Air-Conditioner



DC-Inverter rotary compressor model:
2 Piston model suitable for energy saving.

■ Scroll / CO2 compressors



Scroll / CO2 compressor:
Implementation high efficiency and low noise. Broad line-up from small to large for each applications.

■ DC Pump



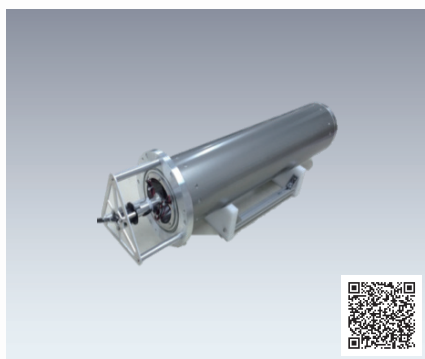
We can develop not only pump but also the moter on our own.
High-Efficiency. Control of Performance.
Low Noise. Low Vibration. Downsizing

■ Cooling fan with Unique Hydro Dynamic Bearing



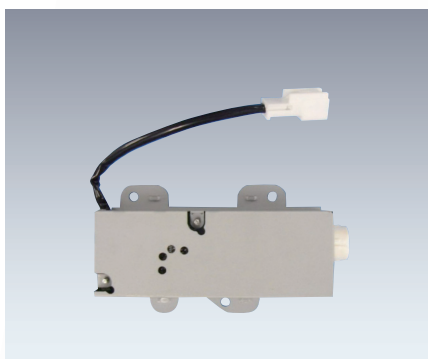
Unique Hydro Dynamic Bearing realize reliability by non-contact rotation.
Longevity, Low noise Low vibration.
High delivery records in the car use.

■ Cooling Roller



Thermoelectric Cooling Roller does not use water, the excellent cooling capability and quick thermal response are achieved, making cooling system itself compact.

■ nanoe™ device



A nanoe™ is a nano-sized ion particle coated with water particles, and has the benefits of hygienic environment and beauty. nanoe™ is generated by the nanoe™ device .

Visit the Panasonic Website or Showroom for More Detailed Product Information.

The Panasonic website introduces the latest information on electronic devices by parts type and by application. You can also download product catalogs by category as well as technical documents from the website. At the Panasonic Showroom, you can experience first-hand the core technologies incorporated in Panasonic's devices as well as a host of mainstay products through videos and demonstrations. Please drop in when you're in the area. (For a tour of the showroom, please contact a sales representative.)

Product information websites

<http://industrial.panasonic.com/jp> (Japanese)

<http://industrial.panasonic.com> (English)

<http://industrial.panasonic.com/ea> (Chinese)



Panasonic Devices Showroom (Kadoma City, Osaka)
*Multilingual support in Japanese, English and Chinese

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- The products described on this material were designed and manufactured for standard applications such as general electronics devices, office equipment, data and communications equipment, measuring instruments, household appliances and audio-video equipment. For special applications in which quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or cause threat of personal injury (such as for aircraft and aerospace equipment, traffic and transport equipment, combustion equipment, medical equipment, accident prevention and anti-theft devices, and safety equipment), please use only after your company has sufficiently tested our products' suitability for that application.
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- The products and product specifications described on this material are subject to change for improvement without prior notice. Therefore, be sure to request and confirm in advance the most current specifications, which explain the specifications in detail, before the final stage of your design, purchasing or use for any application.
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Safety Precautions

When using our products, no matter what sort of equipment they might be used for, be sure to confirm the applications and environmental conditions with our specifications in advance.

For further details please contact:

**Industrial Marketing & Sales Division
Automotive & Industrial Systems Company
Panasonic Corporation**

1006 Kadoma, Kadoma city,
Osaka 571-8506, Japan

* Information in this catalog is accurate as of April 2017.