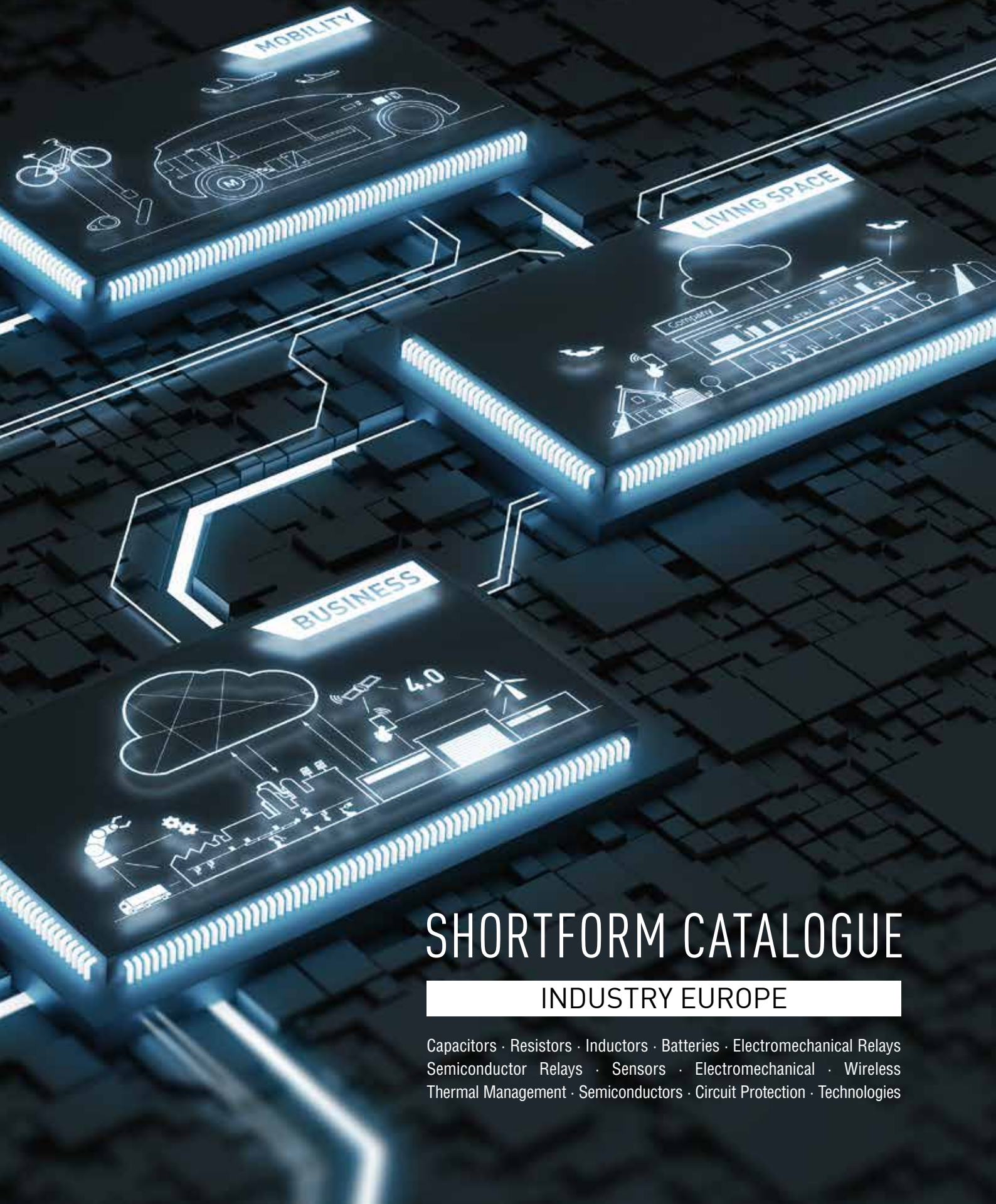


Panasonic



SHORTFORM CATALOGUE

INDUSTRY EUROPE

Capacitors · Resistors · Inductors · Batteries · Electromechanical Relays
Semiconductor Relays · Sensors · Electromechanical · Wireless
Thermal Management · Semiconductors · Circuit Protection · Technologies

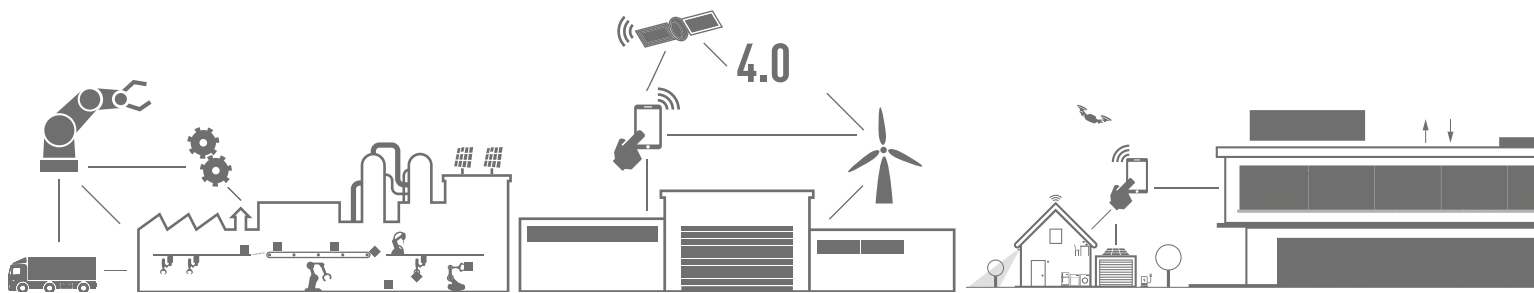


Panasonic Industry Europe

The repositioning of Panasonic Industry Europe in October 2017 unified formerly separate business divisions to provide high quality capabilities combined with efficient technical solutions from a broad portfolio of products and services.

The objective as an integrated company is to promote a strong B2B business in Europe and bring engineering solution competence closer to the customers. On top, European customers can expect exceptional sales, marketing and service performance. This mission is supported by over 1,000 employees throughout Europe.

As a partner for the industry sector, Panasonic researches, develops, manufactures and supplies key electronic components, devices, modules up to complete solutions across a wide range of industries. Looking back on hundred year of engineering knowhow in electronics, Panasonic is the right supplier when it comes to engineering expertise combined with innovative solution competence.



Accelerating Your Design and Shaping the Future

The way businesses buy from and sell to each other is changing. As an industrial partner, you have to answer to both demands: off-the-shelf products and more complex, customized solutions along with different levels of value-added services. We at Panasonic Industry develop and deploy intellectual resources rather than just relying on the management of physical assets. From electronic components, devices and modules, complete solutions and production facilities to advanced services and training, Panasonic Industry offers you everything from a single source. With our local test centers and pre- and after-sales services, we support you directly as your European partner ensuring maximum performance of your design and systems.

Since Panasonic Industry Europe repositioned itself in October 2017, all business divisions have been working even closer together to provide our customers in all areas with the newest devices and comprehensive solutions. This gives rise to a depth that is unique on the market and seamless holistic expertise along the entire value chain of industrial applications.

We stand on the brink of a technological revolution that fundamentally alters the way we live, work, communicate and travel. A fusion of technologies characterizes that trend commonly described as the Fourth Industrial Revolution, that is blurring the lines between the physical, digital and biological sphere. Physical products and services, moreover, can now be enhanced with digital capabilities that increase their value. New technologies make assets more durable and resilient, while data and analytics are transforming how they are maintained. The breadth and depth in these changes herald the transformations of entire systems especially in the sector of Mobility, Living Space and Business. Panasonic provides solutions that can meet these new circumstances head-on and get you ready for the challenges of tomorrow.

Find an overview of various industrial products, systems, and solutions in the areas of **Living Space**, **Mobility** and **Business** in our shortform catalogue.

■ Panasonic	3	■ Semiconductor Relays	52
Panasonic Industry Europe.....	3	PhotoMOS Relays	53
Editorial.....	4	Solid State Relays	55
Table of Contents	5		
Living Space	6	■ Sensors	56
Mobility	8	Grid-EYE 2nd Generation	57
Business.....	10	PaPIRs Pyroelectric Infrared Sensors (Motion Sensors)	58
Applications Matrix	12		
		■ Electromechanical	60
■ Capacitors	14	Light Touch Switches	61
Conductive Polymer Hybrid	15	Detector Switches	64
Aluminium Electrolytic Capacitors	16	Sliding Switches / Snap-Action Switches	66
Polymer Capacitors.....	19	Narrow Pitch Connectors / FPC Connectors	68
Gold Capacitors.....	23		
Film Capacitors	24	■ Wireless	70
		Bluetooth® modules	71
■ Resistors	26	Wi-Fi Modules	72
High Power SMD Resistors	27	802.15.4 + Bluetooth Combo	72
■ Inductors	32	■ Thermal Management	74
Power Inductors	33	GraphiteTIM.....	73
■ Batteries	36	■ Semiconductors	76
Lithium Batteries	37	GaN Power Transistors / Laser Diodes.....	78
NI-MH Batteries	39	NFC Tags / MOSFETs	79
LI-ION Pin Type.....	40		
VRLA Batteries / ALKALINE Batteries	41	■ Circuit Protection	80
		Multilayer NTC Thermistor.....	81
■ Electromechanical Relays	42	Multilayer Varistors	82
Signal Relays.....	43		
Power Relays.....	44	■ Technologies	84
Automotive Relays.....	48	MIPTec	85
Relays with Forcibly Guided Contact.....	50		
Microwave Relays	51		

Living Space

Looking into the Smart Home, Panasonic contributes to the fields of energy creation, storage and distribution. Starting from solar and wind energy, we deliver passive components, semiconductors and thermal solutions from the source of creation to the energy storage within the house. Modern Smart Homes use our devices in areas such as home appliances, storage solutions, personal health care and kitchen appliances. Whilst in Power Tools, Electronic Toys and gadgets you can utilize our sensors, input devices and power supplies. Wireless connectivity solutions from Panasonic enables communication between various applications, giving life to the Internet of Things.

Renewable Energy

- > Wind, Solar

Mobility

- > eBike
- > Charging Station

Appliance

- > Home Appliance
- > Personal, Healthcare and Toys
- > Power Tools

Lighting

- > Lighting
- > Internet of Things
- > Industry 4.0
- > Smart Home

HOME APPLIANCES



Industry



Charging Station



Smart Home



Power Tools

BUILDING AUTOMATION

PERSONAL APPLIANCES



Garden Tools, eBike



Robot Cleaner



Dryer



Vacuum Cleaner



Wind & Solar Energy



Toys



Refrigerator, Oven, Coffee Machine



Beauty Products & Men's Care



Lighting

Mobility

Panasonic offers a wide range of components and devices for various applications in the Automotive Market. Starting from passive components, like capacitors, resistors and inductors, Panasonic delivers to all in-car electrical applications such as airbags, brake systems, lighting systems and control panels. Our sensors are mainly used for monitoring and detecting, whilst semi-conductors focus on power electronics and battery management solutions. Thermal Management Solutions resolve heat issues experienced in displays or headlight applications. Panasonic's input devices are being used for radio, navigation, steering wheels and where a human-machine-interface is required.

Electrification

- > Power Electronics
- > Battery Management

Chassis & Safety Systems

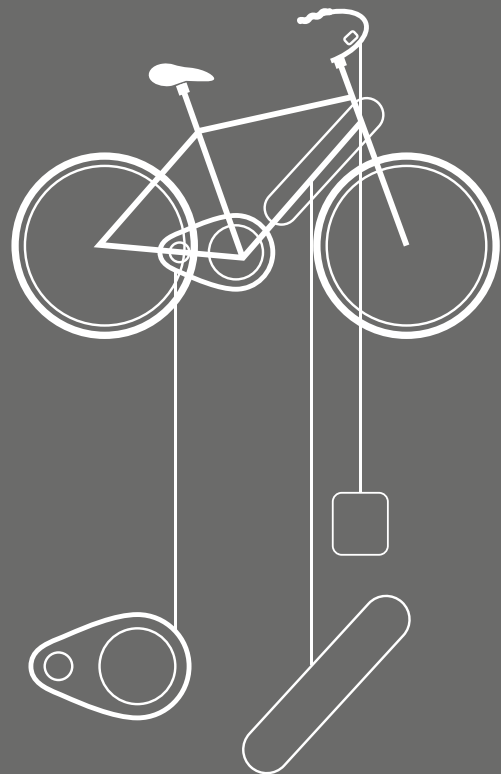
- > Active & Passive Safety
- > ADAS (Advanced Driver Assistance Systems)
- > Headlight

Interior & HMI

- > Instrumentation & HMI
- > Infotainment & Connectivity
- > Body & Security

100

in power



1.2 - 12V



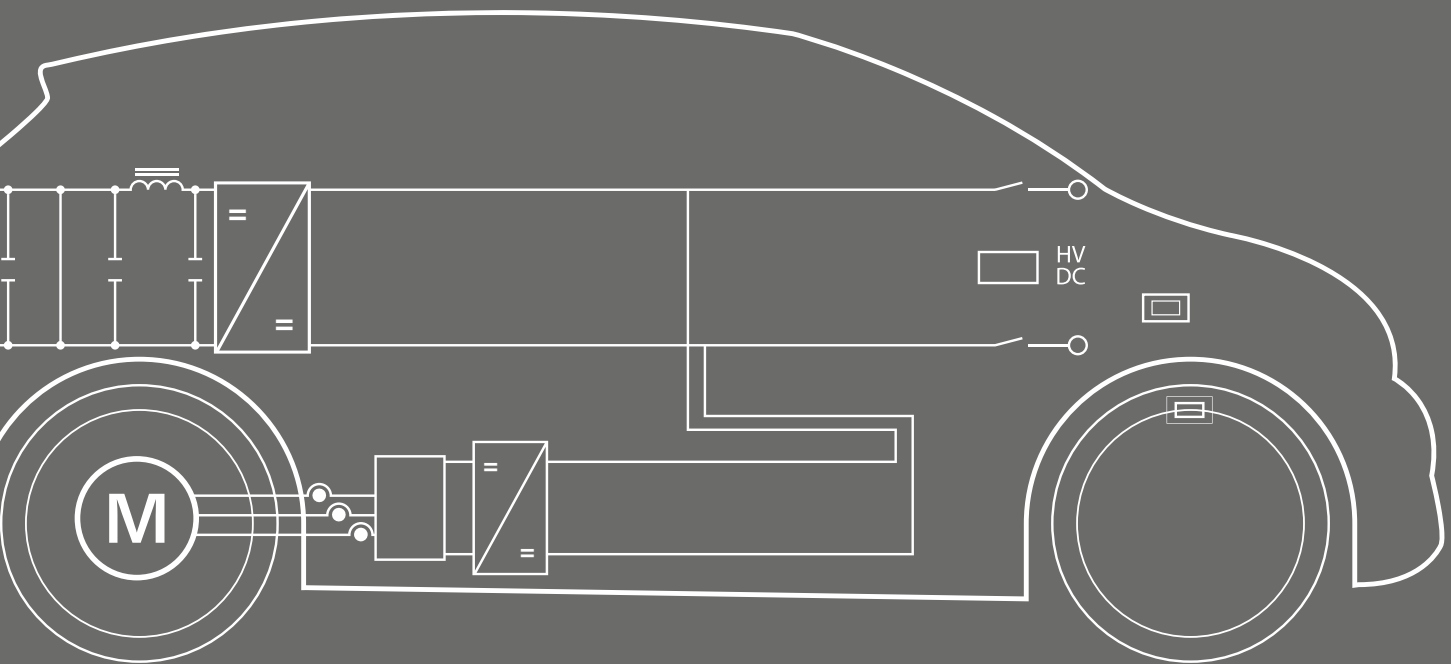
Power Electronics & Battery Management



ADAS

0% increase
r density

80% of electrified
vehicles are relying on
Panasonic products



Airbag, Instrumentation & HMI



Headlight RKE, Access Control & Alarm Brake Systems & TPMS Seat Comfort HUD & Driver Monitoring



Infotainment & Connectivity Antenna Modules Black Box Energy Management

Business

Since the line between telecommunications equipment and IT has started to blur we are dealing with an increasing importance of telecommunications infrastructure for data transfer especially within the field of industrial automation as well as professional equipment. Telecommunication providers can leverage the power of our interconnected devices to monitor, glean the insights needed to ensure uninterrupted service and build with our components and power supplies new infrastructures that are better able to meet demand. The factory of the future will be built upon cyber-physical systems – the integration of computation, networking and physical processes. MedTech organizations and new market entrants are capitalizing on recent and emerging technological advancements and providing novel health care solutions using mobile health applications, sensor technology, data analytics, and artificial intelligence. Our devices and components answer the shifting demands that come with these new networks such as little power, reliability, connectivity and robustness.

Infrastructure

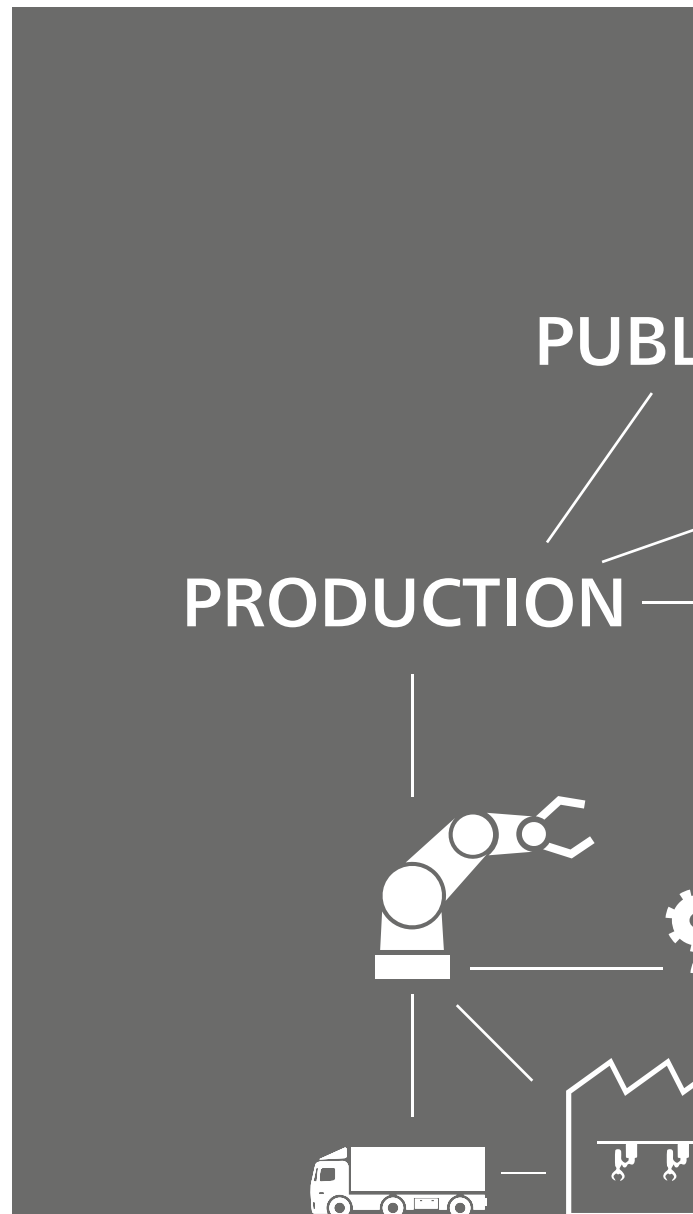
- > Smart City
- > Green Energy

Professional Equipment

- > MedTech – Equipment & Devices
- > Professional Industrial Equipment

Industrial Automation

- > Industry 4.0
- > Factory Automation



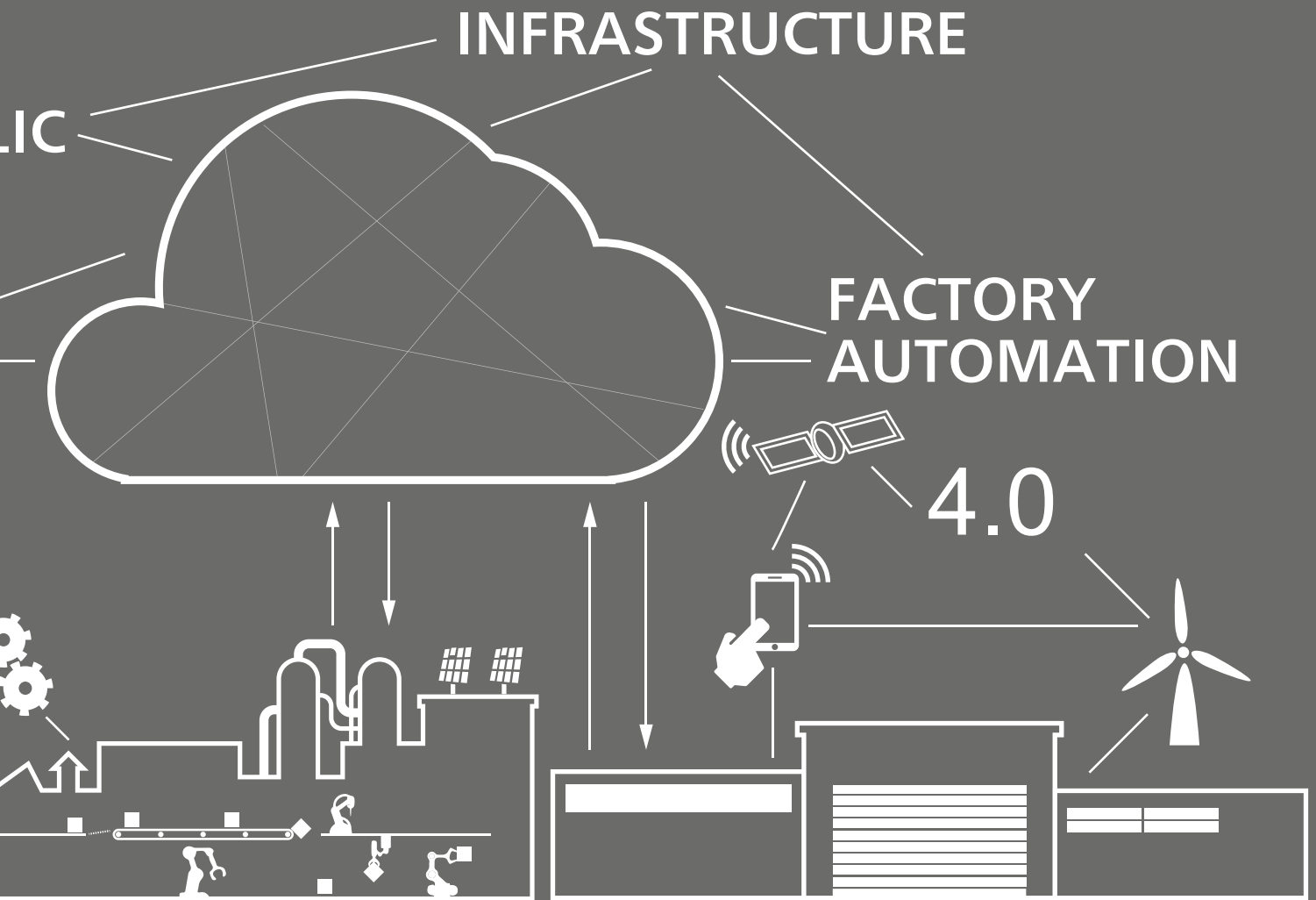
Professional AV and Broadcasting Equipment



Mobility Infrastructure



Energy Infrastructure



Public Automation



I & T Devices



Professional Industrial Equipment



MedTech - Equipment and Devices



Machine Building Robots



Water, Recycling, Environment



Information and Telecommunication Equipment



Machine Building Electronic



Lighting Infrastructure

Market		Segment													
Market	Segment	EDLCs	Film Capacitors	Hybrid Capacitors	Lytic Capacitors	Polymer Capacitors	Circuit Protections	Coils	Resistors	Detector Switches	Encoders	Light Touch Switches	Wireless Modules	Potentiometers	
		Living Space	Personal Appliances	Entertainment	-	+	+	+	+	+	-	+	+	+	+
Health & Wearables	-			+	+	+	+	+	-	+	+	+	+	+	
Home Appliances	White Goods		+	+	+	+	+	+	-	+	+	+	+	+	+
	Brown Goods		-	-	+	+	+	+	-	+	+	+	+	-	+
	Garden & Power Tools		+	+	+	+	+	+	-	+	+	-	+	+	-
Building Automation	Home & Building - Energy Management		+	+	+	+	+	+	-	+	+	+	+	+	+
	Home & Building - Security		-	-	+	+	+	+	-	+	+	+	+	+	+
	Home & Building - Lighting		-	+	+	+	+	+	-	+	+	+	+	+	+
	Home & Building - Comfort Automation		-	+	+	+	+	+	-	+	+	+	+	+	+
Mobility	Automotive		Car - E-cars	-	+	+	+	-	+	+	+	+	+	-	+
		Car - Car Comfort	-	-	+	+	-	+	+	+	+	+	+	+	
		Car - Power Train, Chassis	-	-	+	+	-	+	+	+	-	-	-	-	
		Car - Lighting	-	-	+	+	-	+	+	+	+	+	-	+	
		Car - Infotainment & HMI	+	-	+	+	+	+	+	+	+	+	+	+	
		ADAS	-	-	+	+	+	+	+	+	+	-	+	-	
	E-Vehicles	E-Bike-, E-Motorcycle, E-Scooter	-	-	+	+	-	+	+	+	+	+	+	+	
		E-Bus, E-Truck, E-Utility Vehicles	-	+	+	+	-	+	+	+	+	+	+	+	
		E-Boat and E-Plane	-	-	+	+	-	+	+	+	+	+	+	+	
		Transportation	Railway	-	+	+	+	-	+	+	+	+	+	+	+
			Aviation	-	-	+	+	-	+	+	+	+	+	+	+
			Maritime	-	+	+	+	-	+	+	+	+	+	+	+
	Motorbikes & Others		-	-	+	+	-	+	+	+	+	-	+	+	
Bus, Truck, Utility Vehicles	-		+	+	+	-	+	+	+	+	+	+	+		
Material Handling	-		+	+	+	+	+	+	+	+	+	+	+		
Business	Infrastructure	Mobility Infrastructure	-	-	+	+	+	+	+	+	+	+	+	+	
		Energy Infrastructure	+	-	+	+	+	+	+	+	+	+	+	+	
		Water, Recycling, Environment	-	-	+	+	+	+	+	+	+	+	+	+	
		Information & Telecommunication Equipment	+	+	+	+	+	+	+	+	+	+	+	+	
		I & T Devices	-	-	+	+	+	+	+	+	+	+	+	+	
		Public Automation	+	-	+	+	+	+	+	+	+	+	+	+	
		Lighting Infrastructure	-	-	+	+	+	+	+	+	+	+	+	+	
	Industrial Automation	Machine Building Electronic	-	-	+	+	+	+	-	+	+	+	+	+	
		Machine Building Robots	+	-	+	+	+	+	-	+	+	+	+	+	
	Professional Equipment	MedTech - Equipment & Devices	-	+	+	+	+	+	-	+	+	+	+	+	
Professional AV & Broadcasting Equipment		+	+	+	+	+	+	-	+	+	+	+	+		
Professional Industrial Equipment		-	+	+	+	+	+	-	+	+	+	+	+		

CAPACITORS FOR DEMANDING APPLICATIONS

- > Very low ESR types
- > Up to 10,000h endurance
- > Temperatures up to +150°C
- > AEC-Q200 qualified
- > Alternatives to MLCC and tantalum
- > High vibration terminal for smaller case sizes

Conductive Polymer Hybrid Capacitor

Using best of two worlds combining the low leakage of Aluminium Electrolytic and low ESR of the Polymer technology

Aluminium Electrolytic Capacitor

Capacitors with a liquid electrolyte using an Al oxide film as dielectric – available in Surface Mount and Leaded Radial Technology

Polymer Capacitor (SP-Cap, POSCAP, OS-CON)

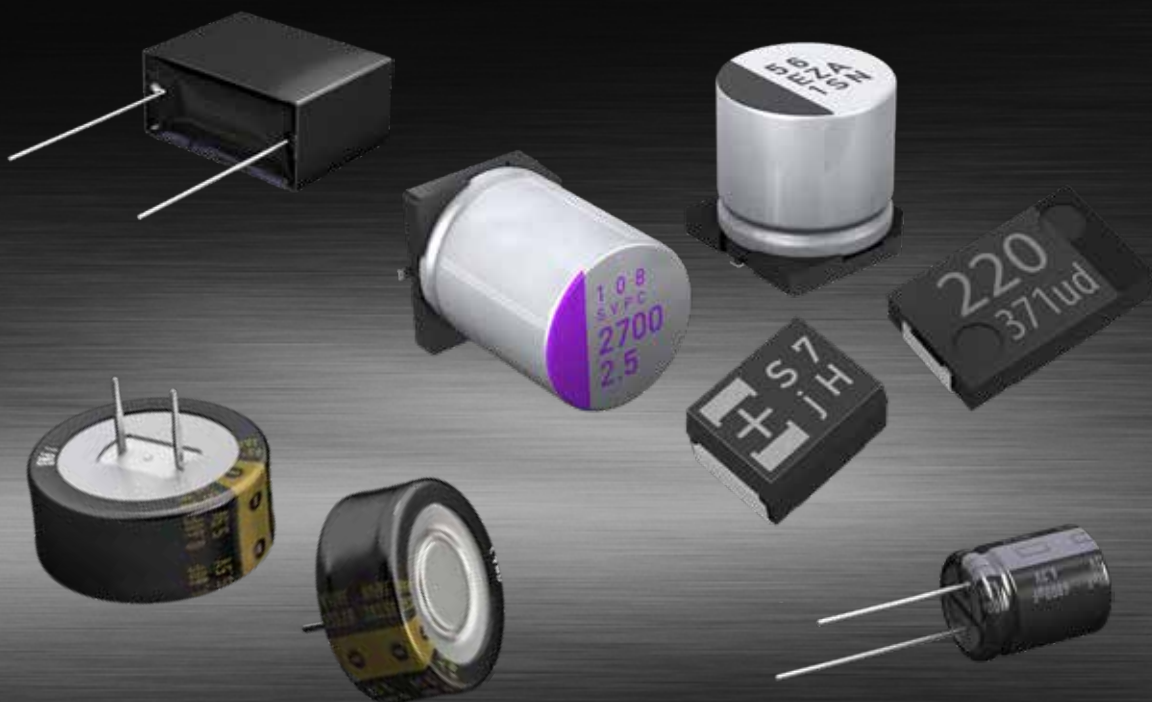
Using solid polymer electrolyte instead of liquid electrolyte achieving low ESR values and excellent performance over a wide frequency range

Electric Double Layer Capacitor (Gold Cap)

Unlike batteries, Gold Caps do not rely on a chemical reaction to produce electric current. Rather they are storage cells that utilize the absorption/release reaction of ions

Film Capacitor

Electrical capacitors using a thin insulating plastic film as dielectric



Conductive Polymer Hybrid Aluminum Electrolytic Capacitors



Product Range:

LARGE CAP. LOW ESR

ZS

125°C 4,000h
Cap.: Up to 560µF
ESR: Down to 11mΩ

ZK

125°C 4,000h
Cap.: Up to 470µF
ESR: Down to 20mΩ

ZA

105°C 10,000h
Cap.: Up to 330µF
ESR: Down to 20mΩ

ZC

125°C 4,000h
Cap.: Up to 330µF
ESR: Down to 20mΩ

ZE

135°C 4,000h
 145°C 2000h
Cap.: Up to 330µF
ESR: Down to 20mΩ

ZF (THT)

150°C 1,000h
Cap.: Up to 270µF
ESR: Down to 20mΩ

HYBRID

- > High reliability
- > Highest stability in temperature and frequency
- > Super low ESR
- > AEC-Q200 qualified

HIGH TEMPERATURE, LONG LIFETIME

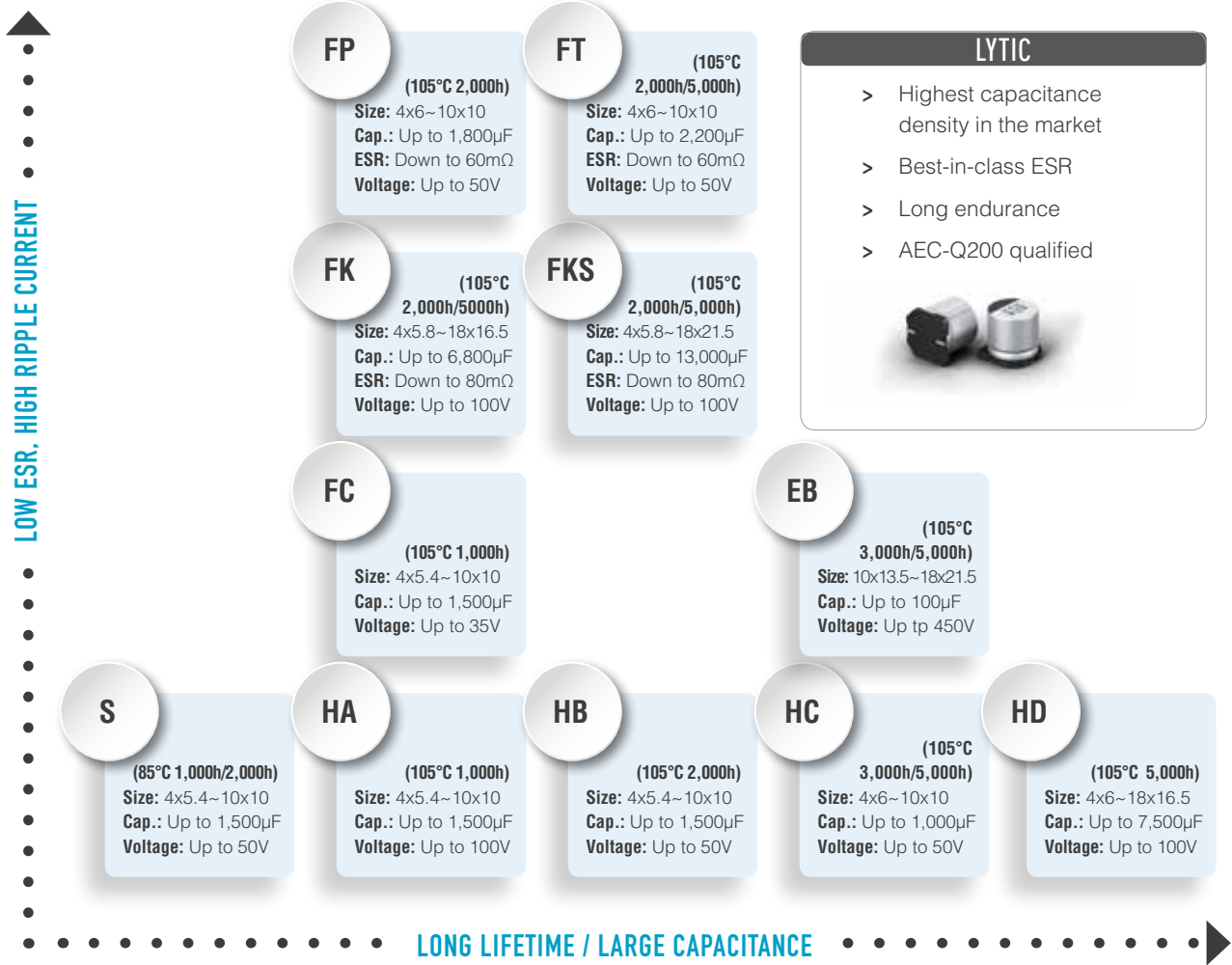
	ZA	ZC	ZK	ZE	ZF	ZS
Body Shape	Surface Mount Type	Surface Mount Type	Surface Mount Type	Surface Mount Type	Radial Lead Type	Surface Mount Type
Case Size	5x5.8~10x10.2	5x5.8~10x10.2	5x5.8~10x10.2	8x10.2~10x10.2	8x9.5~10x9.5	10x12.5*~10x16.5
Endurance Spec	105°C 10,000 h	125°C 4,000 h	125°C 4,000 h	145°C 2,000 h 135°C 4,000 h	150°C 1000 h	125°C 4,000 h
Voltage Range	25 - 80 V.DC	25 - 80 V.DC	25 - 35 V.DC	25 - 63 V.DC	25 - 63 V.DC	25 - 63 V.DC
Capacitance Range	10 - 330 µF	10 - 330 µF	33 - 470 µF	33 - 330 µF	33 - 270 µF	100 - 560 µF
ESR	20 - 120 mΩ	20 - 120 mΩ	20 - 100 mΩ	20 - 40 mΩ	20 - 40 mΩ	11 - 19 mΩ
Ripple Current	0.75 - 2.5 A (at 105°C)	0.5 - 2 A (at 125°C)	0.66 - 2.8 A (at 125°C)	0.6 - 0.9 A (at 145°C) 1.1 - 2.0 A (at 135°C)	0.65 - 1.0 A (at 150°C)	3 - 4 A (at 125°C)
Leakage Current	0.01 CV					
Damp Heat	85°C 85 %RH 2,000 h					

* Please contact us about details

CAPACITORS
RESISTORS
INDUCTORS
BATTERIES
ELECTROMECHANICAL RELAYS
SEMICONDUCTOR RELAYS
SENSORS
ELECTROMECHANICAL
WIRELESS
THERMAL MANAGEMENT
SEMICONDUCTORS
CIRCUIT PROTECTION
TECHNOLOGIES

SMD Aluminum Electrolytic Capacitors (105°C)

Product Range:



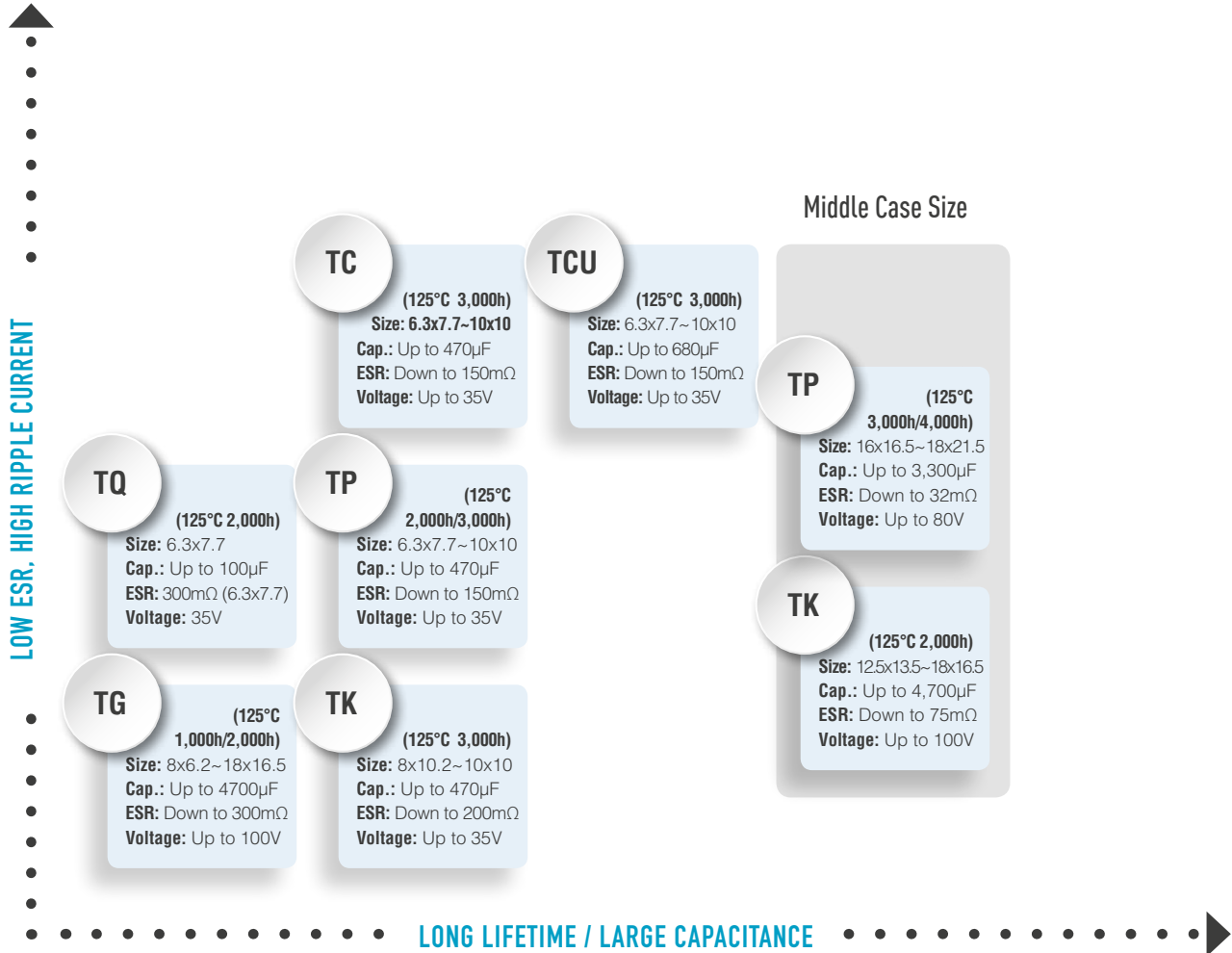
LYTIC

- > Highest capacitance density in the market
- > Best-in-class ESR
- > Long endurance
- > AEC-Q200 qualified



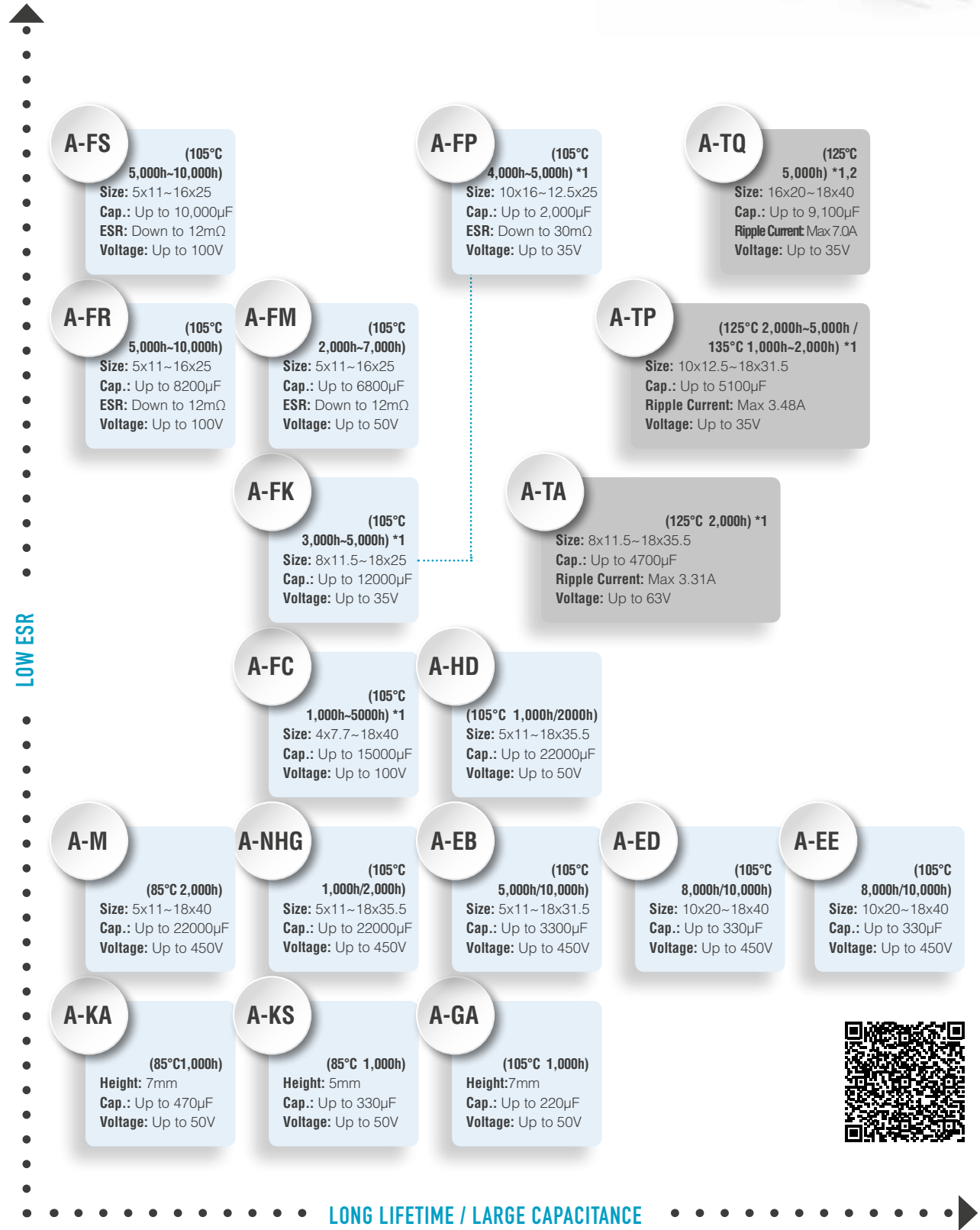

SMD Aluminum Electrolytic Capacitors (125°C)

Product Range:



THT Aluminum Electrolytic Capacitors

Product Range:



A-FS (105°C
5,000h~10,000h)
Size: 5x11~16x25
Cap.: Up to 10,000µF
ESR: Down to 12mΩ
Voltage: Up to 100V

A-FP (105°C
4,000h~5,000h) *1
Size: 10x16~12.5x25
Cap.: Up to 2,000µF
ESR: Down to 30mΩ
Voltage: Up to 35V

A-TQ (125°C
5,000h) *1,2
Size: 16x20~18x40
Cap.: Up to 9,100µF
Ripple Current: Max 7.0A
Voltage: Up to 35V

A-FR (105°C
5,000h~10,000h)
Size: 5x11~16x25
Cap.: Up to 8200µF
ESR: Down to 12mΩ
Voltage: Up to 100V

A-FM (105°C
2,000h~7,000h)
Size: 5x11~16x25
Cap.: Up to 6800µF
ESR: Down to 12mΩ
Voltage: Up to 50V

A-TP (125°C 2,000h~5,000h /
135°C 1,000h~2,000h) *1
Size: 10x12.5~18x31.5
Cap.: Up to 5100µF
Ripple Current: Max 3.48A
Voltage: Up to 35V

A-FK (105°C
3,000h~5,000h) *1
Size: 8x11.5~18x25
Cap.: Up to 12000µF
Voltage: Up to 35V

A-TA (125°C 2,000h) *1
Size: 8x11.5~18x35.5
Cap.: Up to 4700µF
Ripple Current: Max 3.31A
Voltage: Up to 63V

A-FC (105°C
1,000h~5000h) *1
Size: 4x7.7~18x40
Cap.: Up to 15000µF
Voltage: Up to 100V

A-HD (105°C 1,000h/2000h)
Size: 5x11~18x35.5
Cap.: Up to 22000µF
Voltage: Up to 50V

A-M (85°C 2,000h)
Size: 5x11~18x40
Cap.: Up to 22000µF
Voltage: Up to 450V

A-NHG (105°C
1,000h/2,000h)
Size: 5x11~18x35.5
Cap.: Up to 22000µF
Voltage: Up to 450V

A-EB (105°C
5,000h/10,000h)
Size: 5x11~18x31.5
Cap.: Up to 3300µF
Voltage: Up to 450V

A-ED (105°C
8,000h/10,000h)
Size: 10x20~18x40
Cap.: Up to 330µF
Voltage: Up to 450V

A-EE (105°C
8,000h/10,000h)
Size: 10x20~18x40
Cap.: Up to 330µF
Voltage: Up to 450V

A-KA (85°C 1,000h)
Height: 7mm
Cap.: Up to 470µF
Voltage: Up to 50V

A-KS (85°C 1,000h)
Height: 5mm
Cap.: Up to 330µF
Voltage: Up to 50V

A-GA (105°C 1,000h)
Height: 7mm
Cap.: Up to 220µF
Voltage: Up to 50V



*1: AEC-Q200 compliant
*2: Please contact us about more detail

SMD Conductive Polymer Aluminum Solid Capacitors (OS-CON)



Product Range:

OSCON

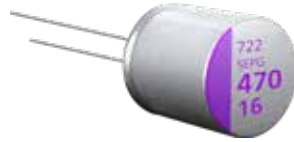
- > Low ESR @ high frequencies
- > Stable in temperature and voltage
- > Large voltage range
- > High ripple current
- > High reliability

High Reliability	General Use		High Voltage
<p>SVPD (125°C 2,000h)</p> <p>Size: 6.3x5.9~10x12.6 Cap.: Up to 82μF ESR: Down to 28mΩ Voltage: 10~35V</p>	<p>SVP (105°C 2,000h)</p> <p>Size: 4.0x5.5~10x12.6 Cap.: Up to 1500μF ESR: Down to 12mΩ Voltage: 2.5~20V</p>	<p>SVQP (125°C 1,000h)</p> <p>Size: 6.3x5.9~8.0x6.9 Cap.: Up to 220μF ESR: Down to 35mΩ Voltage: 4~20V</p>	<p>SVPF (105°C 5,000h)</p> <p>Size: 5.0x5.9~10x12.6 Cap.: Up to 1000μF ESR: Down to 12mΩ Voltage: 16~50V</p>
	<p>SVPS (105°C 5,000h)</p> <p>Size: 4.0x5.5~10x7.9 Cap.: Up to 680μF ESR: Down to 20mΩ Voltage: 4~25V</p>		<p>SVF (125°C 1,000h)</p> <p>Size: 5.0x5.9~10x12.6 Cap.: Up to 1000μF ESR: Down to 12mΩ Voltage: 16~50V</p>
Low Profile	Low ESR		High Voltage (Small Size)
<p>SVPB (105°C 1,000h)</p> <p>Size: 6.3x4.9~6.3x5.4 Cap.: Up to 120μF ESR: Down to 35mΩ Voltage: 2.5~20V</p>	<p>SVPA (105°C 2,000h)</p> <p>Size: 5.0x5.9~10x7.9 Cap.: Up to 820μF ESR: Down to 19mΩ Voltage: 2.5~20V</p>	<p>SVPC (105°C 2,000h)</p> <p>Size: 5.0x5.9~10x12.6 Cap.: Up to 2,700μF ESR: Down to 9mΩ Voltage: 2.5~16V</p>	<p>SVPK (125°C 1,000h)</p> <p>Size: 5.0x5.9~10x12.6 Cap.: Up to 470μF ESR: Down to 14mΩ Voltage: 25~50V</p>
	<p>Super Low ESR</p>		<p>High Voltage (~100V)</p>
	<p>SVPE (105°C 2,000h)</p> <p>Size: 5.0x5.9~10x12.6 Cap.: Up to 1,200μF ESR: Down to 8mΩ Voltage: 2~16V</p>	<p>SVPG (105°C 5,000h)</p> <p>Size: 5.0x4.4~6.3x9.9 Cap.: Up to 270μF ESR: Down to 8mΩ Voltage: 16~25V</p>	<p>SXV (125°C 1,000h)</p> <p>Size: 8.0x6.9~10x12.6 Cap.: Up to 68μF ESR: Down to 25mΩ Voltage: 63~100V</p>



THT Conductive Polymer Aluminum Solid Capacitors (OS-CON)

Product Range:



General Use

SEP

(105°C 3,000h)
 Size: 6.3x6.0~10x13.0
 Cap.: Up to 1500µF
 ESR: Down to 12mΩ
 Voltage: 2.5~20V

High Voltage

SEPF

(105°C 5,000h)
 Size: 6.3x5.5~10x13.0
 Cap.: Up to 1000µF
 ESR: Down to 12mΩ
 Voltage: 16~35V

SEF

(125°C 1,000h)
 Size: 6.3x6.0~10x13.0
 Cap.: Up to 1000µF
 ESR: Down to 12mΩ
 Voltage: 16~35V

SEQP

(125°C 1,000h / 105°C 5000h)
 Size: 6.3x6.0~10x13.0
 Cap.: Up to 1200µF
 ESR: Down to 12mΩ
 Voltage: 4~32V

Super Low ESR

SEPC

(105°C 5,000h)
 Size: 5.0x9.0~10x13.0
 Cap.: Up to 2700µF
 ESR: Down to 5mΩ
 Voltage: 2.5~16V

SEPG

(105°C 5,000h)
 Size: 6.3x8.9~8.0x8.9
 Cap.: Up to 470µF
 ESR: Down to 8mΩ
 Voltage: 16V

High Voltage (~50V)

SEK

(125°C 1,000h)
 Size: 6.3x6.0~10x13.0
 Cap.: Up to 470µF
 ESR: Down to 14mΩ
 Voltage: 25~50V

SXE

(125°C 1,000h)
 Size: 8.0x7.0~10x13.0
 Cap.: Up to 68µF
 ESR: Down to 25mΩ
 Voltage: 63~100V

High Voltage (~100V)

CAPACITORS

RESISTORS

INDUCTORS

BATTERIES

ELECTROMECHANICAL RELAYS

SEMICONDUCTOR RELAYS

SENSORS

ELECTROMECHANICAL

WIRELESS

THERMAL MANAGEMENT

SEMICONDUCTORS

CIRCUIT PROTECTION

TECHNOLOGIES

Conductive Polymer Aluminum Electrolytic Capacitors (SP-Cap)

Product Range:



SP-Cap

- > Low ESR and low ESL @ high frequencies
- > Stable in temperature and voltage
- > Compact size
- > High reliability
- > High ripple current capability

2-Terminals

3-Terminals

Standard Products	Low ESR Products
<p>CY, SY (85°C 2,000h) Height: 3.0mm Cap.: Up to 470µF ESR: Down to 9mΩ Voltage: 4~6.3</p> <p>CX (105°C 2,000h) Height: 1.9mm Cap.: Up to 560µF ESR: Down to 12mΩ Voltage: 2~35V</p> <p>CS (105°C 2,000h) Height: 1.1mm Cap.: Up to 120µF ESR: Down to 15mΩ Voltage: 4~35V</p> <p>CT (105°C 2,000h) Height: 1.4mm Cap.: Up to 180µF ESR: Down to 15mΩ Voltage: 4~35V</p> <p>HX (125°C 1,000h) Height: 1.9mm Cap.: Up to 560µF ESR: Down to 4.5mΩ Voltage: 2~2.5V</p>	<p>GX (105°C 2,000h) Height: 1.9mm Cap.: Up to 560µF ESR: 3mΩ Voltage: 2~2.5</p> <p>SX (105°C 2,000h) Height: 1.9mm Cap.: Up to 560µF ESR: Down to 4.5mΩ Voltage: 2~6.3V</p> <p>SS (105°C 2,000h) Height: 1.1mm Cap.: Up to 220µF ESR: 6mΩ Voltage: 2~2.5V</p> <p>SR (105°C 2,000h) Height: 1.0mm Cap.: Up to 220µF ESR: Down to 4.5mΩ Voltage: 2~6.3V</p>

Low ESR Products

GX-L (105°C 2,000h)
Height: 1.9mm
Cap.: Up to 560µF
ESR: 3mΩ
Voltage: 2~2.5V

LX (105°C 2,000h)
Height: 1.9mm
Cap.: Up to 560µF
ESR: Down to 4.5mΩ
Voltage: 2~2.5V

LT (105°C 2,000h)
Height: 1.4mm
Cap.: Up to 330µF
ESR: Down to 6mΩ
Voltage: 2~2.5V

LS (105°C 2,000h)
Height: 1.1mm
Cap.: Up to 220µF
ESR: 6mΩ
Voltage: 2~2.5V

LR (105°C 2,000h)
Height: 1.1mm
Cap.: Up to 220µF
ESR: Down to 4.5mΩ
Voltage: 2~6.3V

Conductive Polymer Tantalum Solid Capacitors (POSCAP)

Product Range:

Low Profile	General Use	High Reliability
<p>TPC</p> <p>(105°C 2,000h)</p> <p>Size: B1, D2</p> <p>Cap.: Up to 330µF</p> <p>ESR: Down to 40mΩ</p> <p>Voltage: 6.3~12.5V</p>	<p>TPB</p> <p>(105°C 2,000h)</p> <p>Size: B2, D3L, D4</p> <p>Cap.: Up to 470µF</p> <p>ESR: Down to 35mΩ</p> <p>Voltage: 4~10V</p>	<p>TA</p> <p>(105°C 2,000h)</p> <p>Size: B2, D2E, D3L</p> <p>Cap.: Up to 680µF</p> <p>ESR: Down to 9mΩ</p> <p>Voltage: 2.5~10V</p>
<p>TPG</p> <p>(85°C 2,000h)</p> <p>Size: B1G, B15G</p> <p>Cap.: Up to 220µF</p> <p>ESR: Down to 30mΩ</p> <p>Voltage: 2.5~12.5V</p>	<p>TH</p> <p>(125°C 2,000h)</p> <p>Size: D2E, D2, D3L, D4</p> <p>Cap.: Up to 470µF</p> <p>ESR: Down to 15mΩ</p> <p>Voltage: 2.5~10V</p>	<p>TV</p> <p>(125°C 1,000h)</p> <p>Size: D2E, D3L</p> <p>Cap.: Up to 150µF</p> <p>ESR: Down to 25mΩ</p> <p>Voltage: 6.3~10V</p>

High Voltage	Low ESR
<p>TQC</p> <p>(105°C 2,000h)</p> <p>Size: B2, D12, D15, D2, D3L</p> <p>Cap.: Up to 150µF</p> <p>ESR: Down to 40mΩ</p> <p>Voltage: 16~35V</p>	<p>TPE</p> <p>(105°C 2,000h)</p> <p>Size: B2, D15E, D2E, D3L, D4</p> <p>Cap.: Up to 1500µF</p> <p>ESR: Down to 7mΩ</p> <p>Voltage: 2~10V</p>
	<p>TCE</p> <p>(125°C 1,000h)</p> <p>Size: D2E, D3L, D4</p> <p>Cap.: Up to 1000µF</p> <p>ESR: Down to 12mΩ</p> <p>Voltage: 2.5~10V</p>

High Voltage, Small Size	Large Capacitance, Ultra-Low ESR	Ultra-Low ESR, Low ESL
<p>TQS</p> <p>(105°C 1,000h)</p> <p>Size: B1S</p> <p>Cap.: Up to 150µF</p> <p>ESR: Down to 70mΩ</p> <p>Voltage: 16~35V</p>	<p>TPF</p> <p>(105°C 2,000h)</p> <p>Size: D2E, D3L, D4</p> <p>Cap.: Up to 1000µF</p> <p>ESR: Down to 5mΩ</p> <p>Voltage: 2~10V</p>	<p>TCF</p> <p>(125°C 1,000h)</p> <p>Size: D3L, D4</p> <p>Cap.: Up to 1000µF</p> <p>ESR: Down to 5mΩ</p> <p>Voltage: 2.5~10V</p>
		<p>TPSF</p> <p>(105°C 1,000h) 1*</p> <p>Size: B2S</p> <p>Cap.: 270µF</p> <p>ESR: Down to 6mΩ</p> <p>Voltage: 2~2.5V</p>

POSCAP

- > Miniaturization potential
- > Highest capacitance density
- > Stable in temperature and voltage
- > High ripple current



1* For automotive certified products please contact your local Panasonic sales representative



Electric Double Layer Capacitors (Gold Capacitor)

Product Range:

Large Capacitance

HW	<p>2.3(2.1) VDC</p> <p>Size: $\Phi 18$</p> <p>Cap.: 22F to 70F</p> <p>Intern. resist. : $\leq 0.1\Omega$</p> <p>-25°C ~ +70(60)°C</p>
HL	<p>2.7 VDC</p> <p>Size: $\Phi 18$</p> <p>Cap.: 50F to 100F</p> <p>Intern. resist. : $\leq 0.01\Omega$</p> <p>-40°C ~ +65°C</p>

Small Size

HZ	<p>2.5 VDC</p> <p>Size: $\Phi 8, \Phi 10$</p> <p>Cap.: 3.3F to 70F</p> <p>Intern. resist. : $\leq 0.2\Omega$</p> <p>-25°C ~ +70°C</p>
HL	<p>2.7 V.DC (2.5 VDC)</p> <p>Size: $\Phi 8, \Phi 10$</p> <p>Cap.: 2.5F to 7.5F</p> <p>Intern. resist. : $\leq 0.03\Omega$</p> <p>-40°C ~ +70°C (85°C)</p>

EDLC

- > Superior charge/discharge performance compared to batteries
- > More than 100,000 charge/discharge cycles possible




SMD Film Capacitors

Product Range:

Metallized PPS Film Capacitor

ECHU (X)

Voltage: 16, 50VDC
Cap.: 0.00010 μ F ~ 0.22 μ F
Temp.: -55°C ~ +125°C

ECHU (C)

Voltage: 100VDC
Cap.: 0.010 μ F ~ 0.22 μ F
Temp.: -55°C ~ +105°C

Metallized PEN Film Capacitor

ECWU (X)

Voltage: 100VDC
Cap.: 0.0010 μ F ~ 0.010 μ F
Temp.: -55°C ~ +105°C

ECWU (C)

Voltage: 100 ~ 630VDC
Cap.: 0.0010 μ F ~ 1.0 μ F
Temp.: -55°C ~ +125°C

ECWU (V16)

Voltage: 250VDC
Cap.: 0.001 μ F ~ 0.12 μ F
Temp.: -55°C ~ +85°C



Metallized Plastic Film Capacitor

ECPU (A)

Voltage: 16VDC
Cap.: 0.10 μ F ~ 1.0 μ F
Temp.: -40°C ~ +85°C

FILM

- > High reliability
- > Available series:
 - » Electronic equipment
 - » AC Motor
 - » Automotive and Industrial Infrastructure

- CAPACITORS
- RESISTORS
- INDUCTORS
- BATTERIES
- ELECTROMECHANICAL RELAYS
- SEMICONDUCTOR RELAYS
- SENSORS
- ELECTROMECHANICAL
- WIRELESS
- THERMAL MANAGEMENT
- SEMICONDUCTORS
- CIRCUIT PROTECTION
- TECHNOLOGIES



THT Film Capacitors

Product Range:



Metallized PET Film Capacitor

<p>ECQE (F)</p> <p>Voltage: 100 ~ 1,250VDC, 125, 250VAC Cap.: 0.0010μF ~ 10μF Temp.: -40°C ~ +105°C</p>	<p>ECQE (B)</p> <p>Voltage: 250VDC, 125VAC Cap.: 0.010μF ~ 4.7μF Temp.: -40°C ~ +105°C</p>
<p>ECQE (T)</p> <p>Voltage: 250 ~ 630VDC, 125, 250VAC Cap.: 0.0010μF ~ 10μF Temp.: -40°C ~ +105°C</p>	

Safety Standard Approved Metallized Film Capacitor

<p>ECQUA</p> <p>Voltage: 275VAC Cap.: 0.1μF ~ 4.7μF Temp.: -40°C ~ +110°C</p>	<p>ECQUL</p> <p>Voltage: 275VAC Cap.: 0.0010μF ~ 2.2μF Temp.: -40°C ~ +100°C</p>
<p>ECQUG</p> <p>Voltage: 300VAC Cap.: 0.010μF ~ 1.0μF Temp.: -40°C ~ +100°C</p>	

Metallized PP Film Capacitor

<p>ECWF (A)</p> <p>Voltage: 250 ~ 630VDC Cap.: 0.10μF ~ 6.8μF Temp.: -40°C ~ +105°C</p>	<p>ECWF (D)</p> <p>Voltage: 450VDC, 630VDC Cap.: 0.47 ~ 2.2μF; 0.1 ~ 47μF Temp.: -40 ~ +115°C (450VDC) -40°C ~ +105°C (630VDC)</p>
<p>ECWF (L)</p> <p>Voltage: 400 ~ 630VDC Cap.: 0.010μF ~ 2.4μF Temp.: -40°C ~ +105°C</p>	<p>ECWF (E)</p> <p>Voltage: 450VDC, 630VDC Cap.: 0.47μF ~ 2.2μF 0.10μF ~ 2.2μF Temp.: -40°C ~ +105°C</p>
<p>ECWH (A)</p> <p>Voltage: 800VDC, 1,600VDC Cap.: 0.010μF ~ 0.047μF Temp.: -40°C ~ +105°C</p>	<p>ECWH (V)</p> <p>Voltage: 1,000VDC, 2,000VDC Cap.: 0.47μF ~ 2.2μF 0.0010μF ~ 0.10μF Temp.: -40°C ~ +105°C</p>
<p>ECWH (C)</p> <p>Voltage: 630VDC, 1,250VDC Cap.: 0.10μF ~ 0.33μF Temp.: -40°C ~ +105°C</p>	

Metallized PP Film Capacitor (AEC-Q200)

<p>ECQUA</p> <p>Voltage: 275VAC Cap.: 0.10μF ~ 4.7μF Temp.: -40°C ~ +110°C</p>	<p>ECWFG</p> <p>Voltage: 630 VDC Cap.: 1.0μF ~ 3.0μF Temp.: -40°C ~ +110°C</p>
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FOR AUTOMOTIVE AND HIGH RELIABILITY APPLICATIONS

- > AEC-Q200 qualified
- > High power in small package
- > High performance and reliability
- > Excellent long term stability
- > Wide resistance value
- > Excellent TCR
- > Downsizing, cost saving

ERA Series – High Reliability Thin Film Resistors

- > High reliability, high heat resistance and high moisture resistance make ERA-series perfectly suited to harsh environment applications, such as automotive, medical, transportation and any measurement industry
- > Low tolerance, low TCR provide high voltage measurement accuracy

High Power (ERJB Series) & Anti-Surge Resistors (ERJP and ERJT Series) – Soft Termination

- > Electronic surge can occur anywhere in a vehicle's electronic circuitry, industrial, measurement and telecom applications
- > Panasonic ERJP series have great Anti-Surge characteristics and excellent heat dissipation characteristics due to 'Serpentine Resistor Pattern Structure' which helps to decrease electric field strength per unit length

SMD Current Sensing Shunt Resistors

- > Current Sensing Resistors are designed for current detection
- > Low resistance value (from 0,5mΩ) and high power rating (5W, 3W, 2W, 1W)
- > In order to meet the requirements of the market Panasonic offers a wide range of Current Sensing Resistors in many case sizes (0402m to 2526) and many resistor types in different technologies
- > Double sided resistor element technology (ERJxBW-series) & wide terminal technology (ERJA, ERJB-series) for high power purpose



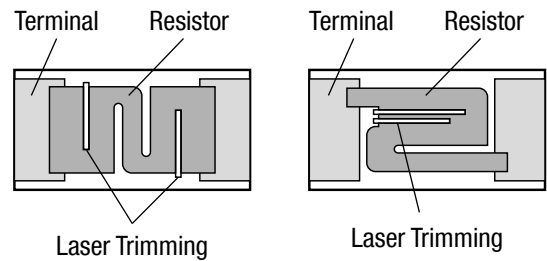
High Power SMD Resistors

Downsizing and Component-Saving Purpose

Features:

- > Downsizing & high power load
- > Components-saving
- > Cost saving
- > High pulse characteristics
- > High voltage characteristics
- > Heat dissipation

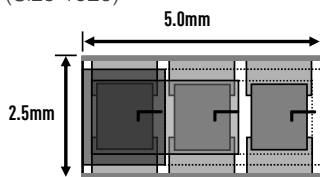
Anti-Surge Type Structure



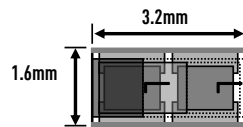
1	2	3	4	5	6	7	8	9	10	11	12	Digit	
E	R	J	P	0	6	D	1	0	0	2	V	Part Number	
Product Code			Size, Power, Rating			Resistance Tolerance		Resistance Value			Packaging Methods		
Thick Film Chip Resistors			Type	Inch	Power R.	Code	Tolerance	The first two or three digits are significant figures of resistance and the third or fourth one denotes numbers of zeros following. Three digit type ($\pm 5\%$) Four digit type ($\pm 1.0\%$, $\pm 0.5\%$) Example: 222 -> 2.2k Ω , 1002 -> 10k Ω			Code	Packaging	Type
			P03	0603	0.20W	D	$\pm 0.5\%$				V	Punched Carrier Taping 4mm pitch, 5,000 pcs.	ERJP03 ERJPA3 ERJP06 ERJP08
			PA3	0603	0.25W	F	$\pm 1.0\%$				U	Embossed Carrier Taping 4mm pitch, 5,000 pcs.	ERJP14
			P06	0805	0.50W	J	$\pm 5.0\%$						
			P08	1206	0.66W								
			P14	1210	0.50W								

Wide Terminal Type Structure

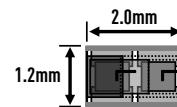
> ERJB1,D1
(Size 1020)



> ERJB2,D2
(Size 0612)



> ERJB3
(Size 0508)



1	2	3	4	5	6	7	8	9	10	11	Digit			
E	R	J	A	1	A	J	1	0	2	U	Part Number			
Product Code			Size, Power, Rating			Resistance Value Region		Resistance Tolerance		Resistance Value		Packaging Methods		
Thick Film Chip Resistors			Type	Inch	Power R.	A	$10\Omega \leq R$	F	$\pm 1.0\%$	Shown by three digits or letters. Only when it is possible, shown by four digits or letters. Ex.: 102: 1.0k Ω R01: 0.01 Ω = 10m Ω 4R7: 4.7 Ω R015: 0.015 Ω = 15m Ω		Code	Packaging	Type
			B1	1020	1W (2W; R $\leq 10\Omega$)	B	$0.22\Omega \leq R < 10\Omega$	G	$\pm 2.0\%$			V	Punched Carrier Taping 4mm pitch, 5,000 pcs.	ERJB2 ERJB3
			B2	0612	0.75W (1W; R $\leq 10\Omega$)	C	$0.01\Omega \leq R < 0.22\Omega$	J	$\pm 5.0\%$			U	Embossed Carrier Taping 4mm pitch, 5,000 pcs.	ERJB1
			B3	0508	0.33W (0.5W; R $\leq 10\Omega$)	D	$0.005\Omega \leq R < 0.01\Omega$					Embossed Carrier Taping 4mm pitch, 4,000 pcs.		ERJA1
			D1	1020	2W									
			D2	0612	1W									


Solution for Automotive Trend - High Power in Small Size for Increased Solder-Joint Reliability

Product Range:


HIGHER POWER IN SMALLER SIZE

Size \ Power	0402 (1005mm)	0603 (1608mm)	0805 / 0508 (2012/1220mm)	1206 / 0612 (3216/1632mm)	1210 (3225mm)	2010 / 1020 (5025/2550mm)	2512/1225 (6432/3264mm)
>1W						ERJB1 ≤10Ω	ERJA1
1W				ERJB2 ≤10Ω		ERJB1 >10Ω	ERJ1T
0.75W (3/4W)				ERJB2 >10Ω		ERJ12Z	
0.66W (2/3W)				ERJP08			
0.5W (1/2W)			ERJP06	ERJB3 ≤1Ω		ERJP14	
						ERJT14/14L	
						ERJ14	
0.33W (1/3W)			ERJB3 >1Ω		ERJT08	Downsizing Solution > Reducing PCB Area > Reducing Large Size Resistor (1206) by High Power Series 1W : 0612 Wide-terminal (B2) 0.66W: 1206 High Power (P08) 0.50W: 0805 High Power (P06) : 0508 Wide-Terminal (B3) 0.25W: 0603 High Power (PA3) 0.20W: 0402 High Power (PA2)	
0.25W (1/4W)		ERJPA3	ERJT06	ERJ8G			
0.2W (1/5W)	ERJPA2	ERJP03					
0.125W (1/8W)			ERJ6G				
0.1W (1/10W)	ERJ2G	ERJ3G					


High Power Type
(ERJP Series Anti-Surge)




New High Power Type
(ERJT Series Anti-Pulse)



Wide Terminal Type
(ERJB Series)



Standard Type
(ERJ*G Series)




High Precision Resistors

Product Range:

HIGHER PRECISION IN THIN FILM RESISTOR

TOL.	TCR	5ppm/K	10ppm/K	25ppm/K	50ppm/K	100ppm/K	>100ppmK
		0.05%		ERA*A Series (0.063W~0.25W)			ERJPB* Series (0.2W~0.25W)
0.1%			ERA*A Series (0.063W~0.25W)		ERJPB* Series (0.2W~0.25W)		
0.5%					ERJ*R Series (0.05W0.1W)		
1%						ERJ*EK/EN Series (0.1W~0.25W)	
5%							ERJ*G Series (0.1W~0.25W)

High Precision Typ
(Thin Film ERA*A Series)



Precision High Power Type
(Thick Film ERJPB Series)



Precision Type
(Thick Film ERJ*R Series)



Standard Type
(ERJ*G/ERJ*E Series)




HIGHER PRECISION & ANTI-ESD IN THIN FILM RESISTOR

TOL.	TCR	5ppm/K	10ppm/K	25ppm/K	50ppm/K	100ppm/K	>100ppmK
		0.05%	ERA*V Series (0.063W~0.25W)				
0.1%		ERA*V Series (0.063W~0.25W)			ERJPB* Series (0.2W~0.25W)		
0.5%					ERJ*R Series (0.05W0.1W)		
1%						ERJ*EK/EN Series (0.1W~0.25W)	
5%							ERJ*G Series (0.1W~0.25W)

High Precision
Anti-ESD TypeE
(Thin Film ERA*V Series)



Precision High Power Type
(Thick Film ERJPB Series)








Precision Type
(Thick Film ERJ*R Series)



Standard Type
(ERJ*G/ERJ*E Series)



Product		High Precision			High power					
		Thin Film Anti-ESD	Thin Film	Thick Film / High Precision	Thick Film	Wide Terminal	Metal Plate		Metal Foil	Anti-Surge / Anti-Pulse
Part number		ERA*V	ERA*A	ERJPB	ERJ*B / BW / LW	ERJA / B / D	ERJM1WS / 1WT	ERJMB / MS	ERJMFBA	ERJP / T
Spec	Size (inch)	0402 to 0805	0201 to 1206	0603 0805	0402 to 2512	0508 to 1225	2512	1020, 2512, 2526	0402	0402 to 1210
	Power Rating (W)	0.063 to 0.125	0.05 to 0.25	0.2, 0.25	0.166 to 1	0.33 to 2	1	2, 3, 5	0,33	0.2 to 0.66
	Resistance (Ω)	47 to 1M	10 to 1M	200 to 1M	5m to 9.1	5m to 1M	1m to 20m	1m to 10m	5m to 20m	1 to 10M
	Resistance Tolerance (%)	± 0.05 to ± 0.1	± 0.05 to ± 0.5	$\pm 0.1, \pm 0.5$	± 0.5 to ± 5	$\pm 1, \pm 2, \pm 5$	$\pm 1, \pm 5$	± 1	± 1	$\pm 0.5, \pm 1, \pm 5$
Usage Purpose	Current Sensing (Shunt resistor)	Low Current			•	•			•	
		High Current				•	•			
	Small Size / High Power			•		•			•	•
	Surge and Pulse Countermeasures						•			•
	Improve circuit accuracy			•	•					
	High Reliability	Solder Connection	•	•	•	•	•	•	•	•
		Anti-Surge	•				•			•
		Anti-Sulfurated								
General Circuit										
Details										

Product		Anti-sulfurated			General purpose		Resistor Network			
		Thick Film	Anti-Surge	Wide Terminal	Thick Film / Precision	Thick Film	Network	Array	Anti-sulfurated Array	
Part number		ERJS / U	ERJUP	ERJC1	ERJ		EXB (8, 15 element)	EXB (2, 4, 8 element)	EXBU (2, 4, 8 element)	
Spec	Size (inch)	0201 to 2512	0805, 1206	1020	01005 to 2512	01005 to 2512	1206 to 2512	0302 to 2009	0302 to 1506	
	Power Rating (W)	0.05 to 1	0.5, 0.66	2	0.05 to 1	0.031 to 1	0.025 to 0.063/element	0.03, 0.063, 0.1/element	0.03, 0.063/element	
	Resistance (Ω)	0.1 to 10M	1 to 10M	10m to 1	1 to 2.2M	1 to 10M	47 to 1M	1 to 1M	1 to 1M	
	Resistance Tolerance (%)	$\pm 0.5, \pm 1, \pm 2, \pm 5$	± 0.5 to ± 5	$\pm 1, \pm 5$	$\pm 0.5, \pm 1$	± 5 , Jumper	± 5	± 5	± 5	
Usage Purpose	Current Sensing (Shunt resistor)	Low Current	•	•						
		High Current		•						
	Small Size / High Power	• (ERJU6)	•	•	• (ERJ1G, XG)	• (ERJ1G, XG)	•	•	•	
	Surge and Pulse Countermeasures		•	•						
	Improve circuit accuracy									
	High Reliability	Solder Connection	•	•	•	•	•	•	•	•
		Anti-Surge		•	•					
		Anti-Sulfurated	•	•	•					•
General Circuit				•	•	•	•			
Details										

- CAPACITORS
- RESISTORS
- INDUCTORS
- BATTERIES
- ELECTROMECHANICAL RELAYS
- SEMICONDUCTOR RELAYS
- SENSORS
- ELECTROMECHANICAL
- WIRELESS
- THERMAL MANAGEMENT
- SEMICONDUCTORS
- CIRCUIT PROTECTION
- TECHNOLOGIES

WINDING AND METAL COMPOSITE TECHNOLOGIES

- > Wide range of inductive products in both SMD and THT
- > Automotive type metal composite Power Choke Coil is applicable
150°C/2,000h, 30G
- > AEC-Q200 qualified series available

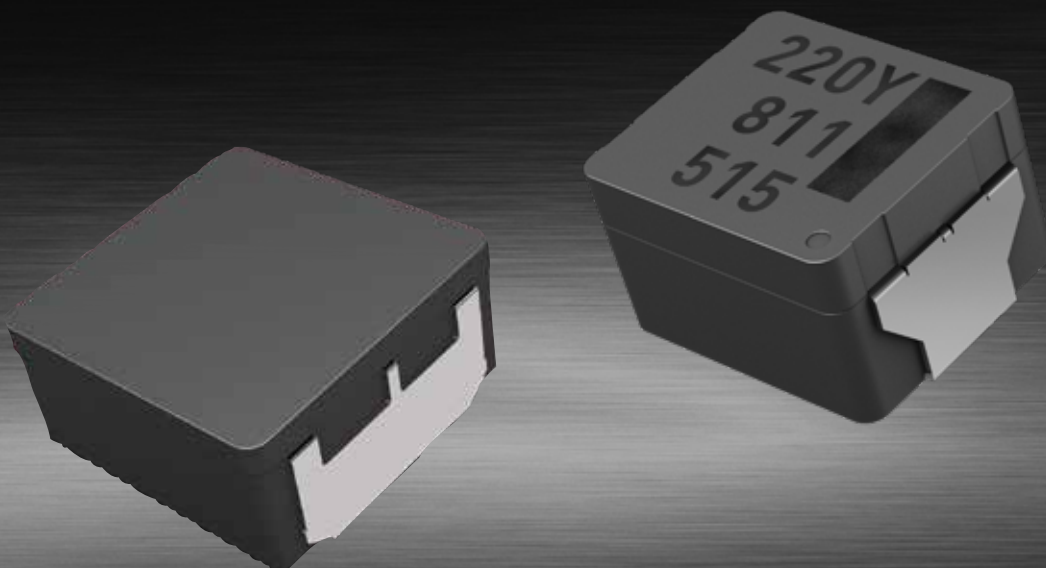
Surface Mount high **Power Inductors (ETQ-series)** in Metal Composite technology have excellent "non-hard"-saturation characteristics and reduce power loss at high switching frequencies for automotive application such as ECU DC/DC converters

Panasonic's **High Performance Power Choke Coil (Y-Type)** offers high temperature stability and low core loss in unique robust structure for Buck or Boost DCDC Converter applications

Low Profile Series (KV-Type) offers a wide range of merchantable case-sizes and circuit board land patterns for power supply filter applications

Large Current Series (JF-Type) provides the lowest DCR for filter applications in 12.6mmx13.2mm size where currents up to 53A are required

High Vibration Acceleration-resistant Power Choke Coils (YS-Type) specify vibration resistance up to 50G and guarantees the same performance like Panasonic's high performance family



Power Inductors

Metal Composite Magnetics Core Type: ETQP□M□□□YF□; -KV□; -KF□; -YG□

Features:

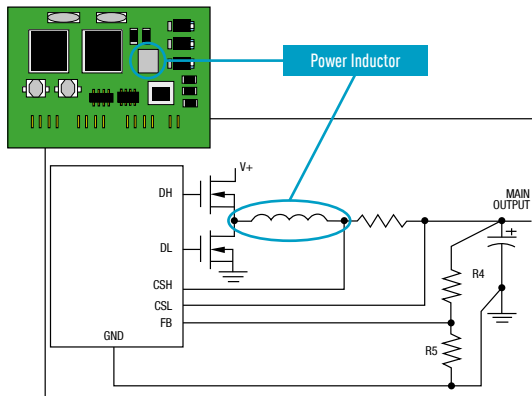
- > No-Hard magnetic saturation by high peak current
- > Robust design (up to +155°C, 2,000hrs, 30g vibration)
- > Solution for downsizing (30-50% less mounting space)
- > Lower power loss at high switching frequency and outstanding power efficiency
- > Ultra compact size and less mounting space by magnetic shield, molded structure
- > Super high reliability and high stability for the requirements of the automotive and industrial market

Monolithic Molded by Metal Composite Magnetic Material



Metal Composite Inductors Solution

for High Performance DC to DC Converter

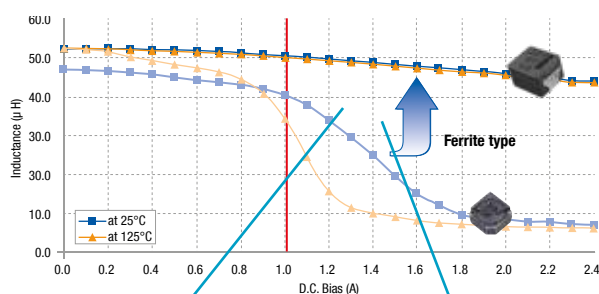


Metal Composite Magnetic Material

Specifications	Parameters
Size	5x5, 6x6, 7x7, 8x8, 10x10, 12x12mm
Inductance	0.22μH – 100μH
Bias Current	No hard saturation, temp. influence
Robustness	+155°C x 2,000hrs, +180°C short time. Up to 30G vibration proof.

Low DCR, Low Profile, Ultra low loss type available

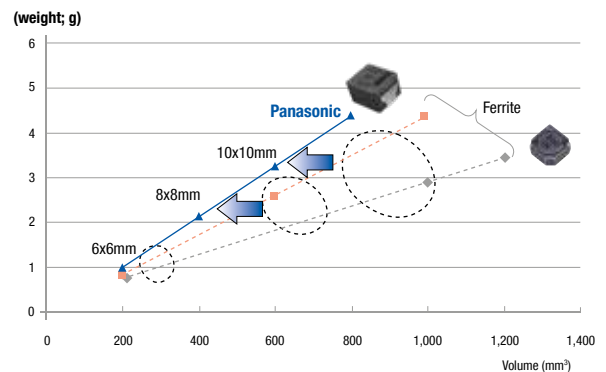
Inductance v.s. D.C. Bias Current



Stable Temp Characteristic

None Hard Saturation

Product Size and Weight Reduction



Same Performance as Ferrite Type with a Downsizing Advantage of 30-50%

Power Inductors

Large current 13.2X12.6X8.0MM Type: ETQP8M□□□IFA

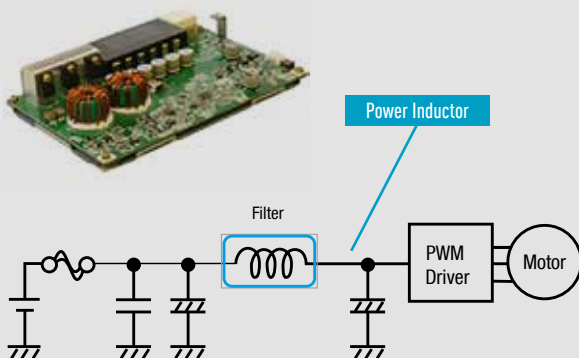
Features:

- > No-hard magnetic saturation by high peak current (up to 50A)
- > High robust design (up to +160°C*2,000hrs, 30G vibration)
- > SMD solution for downsizing (50 – 70% miniaturize)
- > Lowest DC resistance in market & excellent heat resistance for high current filter application
- > High reliable molding structure and integral terminal structure for vibration resistance up to 30G (5-2kHz)
- > Ultra compact SMD package enable by high magnetic permeability and low eddy-current loss of metal core

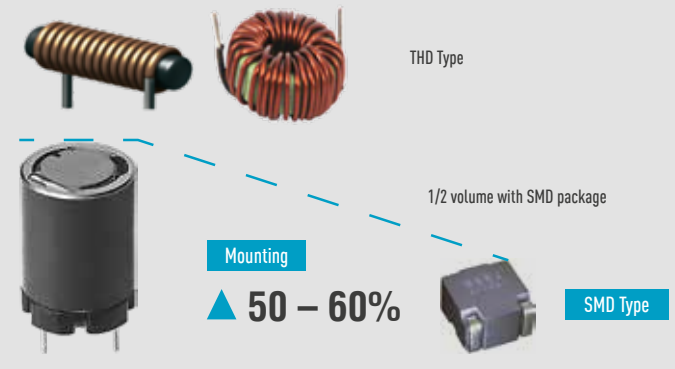
Direct Leading Wire & Metal Composite Magnetic Material



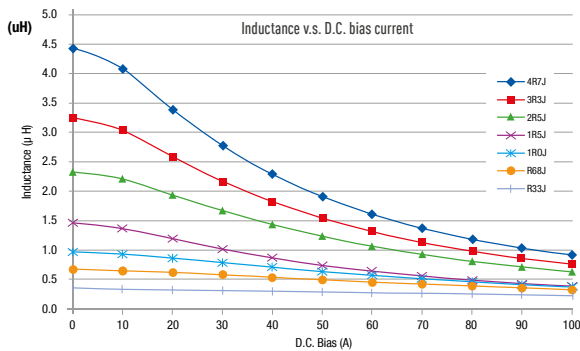
SMD Solution for High Current DC-DC, Motors



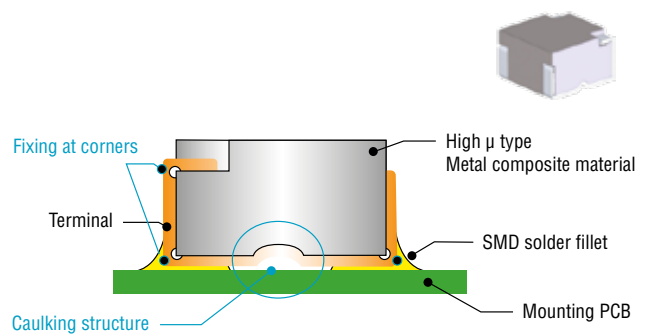
Metal Composite Magnetic material



High Power Current Stability Characteristics



12x13 Vibration Resistant Terminal Design



Product Range:

Metal Composite Power Choke Coil Product Line-Up for Automotive Applications					
Item	High performance type ETQP_M__YF_	Low profile type ETQP_M__KV_	Large current type ETQP_M__JF_	5Mhz low loss type ETQP_M__HF_	High Vibration Acceleration-resistant ETQP5M__YSC
Size [L×W×H] (mm)	5.5×5.0×3.0 - 10.9×10.0×6.0	5.5×5.0×3.0 - 10.7×10.0×4.0	12.6×13.2×8.0	5.5×5.0×3.0, 6.5×6.0×3.0	10.9×10.0×5.0
Inductance (µH)	0.33 - 100	0.68 - 47	0.33 - 4.7	2.2, 10, 22	0.68
*1) Rated Current (A)	1.4 - 33.2	1.7 - 19.6	16.8 - 44.4	5.2, 3.0, 2.1	27
DCR (mΩ)	1.1 - 348	2.6 - 206	0.7 - 4.9	19.5, 68.0, 144	1.66
*2) Operating temperature range (°C)	-40°C - +180°C	-55°C - +155°C	-40°C - +180°C	-40°C - +180v	-40°C - +180°C
	(Including self-temperature rise)	(Including self-temperature rise)	(Including self-temperature rise)	(Including self-temperature rise)	(Including self-temperature rise)
Detail					

*1) DC current which causes temperature rise of 40 K. Parts are soldered by reflow on four-layer PWB (1.6 mmFR4) and measured at room temperature.

*2) 180°C short time is available depended on the temperature mission profile

THE RIGHT BATTERY FOR YOUR APPLICATION

- > One of the world's largest battery manufacturer
- > Comprehensive product range
- > Huge experience in battery production since 1931
- > European-wide distributor network
- > World-wide network of battery manufacturing companies
- > "Quality is our Business" - our quality is proofed by numerous certifications such as ISO, VDS, UL etc.
- > Marketing Service Tools such as HTML Battery Finder, Mediapool, YouTube Channel, Whitepapers and Catalogs / Handbooks are available

Lithium Batteries:

State-of-the-Art-Lithium technology batteries

Li-Ion Pin Type Batteries:

Ideal for wearables and the modern world of IoT applications

Li-Ion Batteries:

Excellent battery safety and superior performance

Zinc-Carbon Batteries

The solution for less complex and cost-sensitive applications

Alkaline Batteries

Ideal for high-performance standard applications

Ni-MH Batteries

Designed for less complex and wide operating temperature applications

Ni-Cd Batteries

Well suited to tough conditions

VRLA Batteries

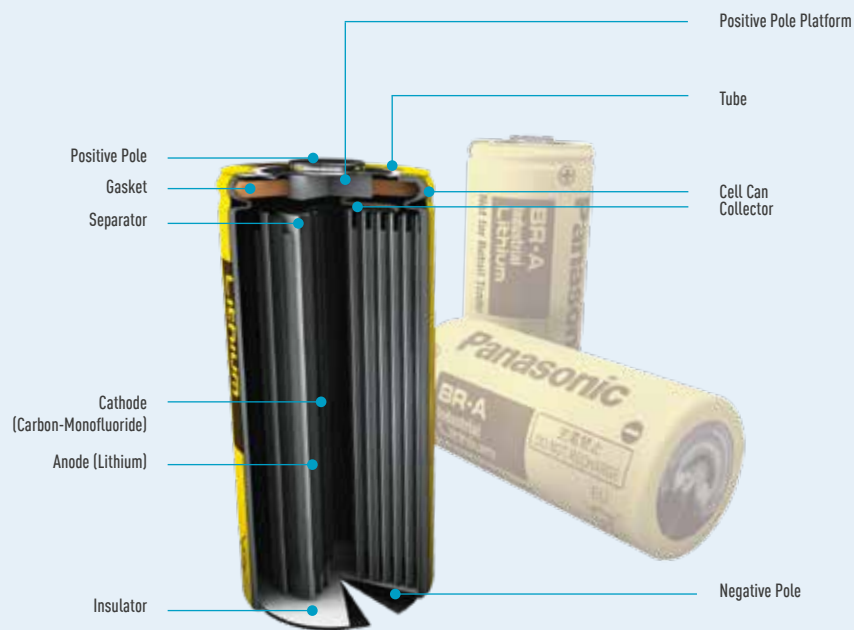
Outstanding quality for demanding applications



Lithium Batteries: State-of-the-Art Lithium Technology Batteries

These days Lithium primary battery technologies are getting more and more important. Due to their high voltage, low self-discharge and proven reliability a broad range of applications can be powered. Please study the comparison

overview at the next page and find out why Panasonic is especially emphasizing on its famous BR and CR technology which is a proof for outstanding quality for years in the market.



Features:

- > Low self-discharge
- > Decades of mass production experience
- > Superior designed battery ranges
- > Proven reliability



Lithium Primary Coin Batteries

Type		CR Series		BR Series	
		Standard Models	High Temp. Models	Standard Models	High Temp. Models
Feature	Service Life	Up to 10 + Years	Up to 10 + Years	Up to 20 + Years	Up to 20 + Years
	Temperature Range	-30 to +60°C	-40 to +105 (+125)°C	-30 to +80°C	-40 to +125°C
	Discharge Characteristics	Good at Pulse Discharge	Good at Pulse Discharge	Good for Memory Backup	Good for Memory Backup
	Suitable Applications	Remote Controller RFID Tag Sensors Beacons Key Lighting	TPMS ETC Automotive Applications	Meters Memory Back-up POS Terminal	Heatcost Allocator ETC Meters Automotive Applications

Lithium Primary Cylindrical Batteries

Type		CR Series for Consumer(or RETAIL)	CR Series for Industrial	BR Series
Feature	Service Life	Up to 2 Years	Up to 15 + Years	Up to 20 + Years
	Temperature Range	-30 to +70°C	-40 to +70 (+85)°C *1	-30 to +85 (+100)°C *2
	Discharge Characteristics	Good at High Drain and Pulse	Good at High Drain and Pulse	Good for Memory Backup
Suitable Applications		Smoke Alarm (Battery Replaceable) Flashlight Tags Security Devices	IoT Modules Smoke Detector Tracking Devices eCall Meters	Meters Memory Back-up POS Terminal

*1 Please consult Panasonic if temperature exceeds 70°C

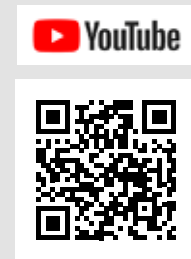
*2 Please consult Panasonic if temperature exceeds 85°C



Ni-MH Batteries: Designed for Less Complex and Wide Operating Temperature Applications

Panasonic rechargeable Ni-MH batteries are designed to meet the requirements for increasingly higher levels of energy demand and a wide operating temperature range by today's

electronic products. Two examples of Ni-MH battery groups are our High Temperature & Long Life Type and the Wide Temperature Type.*1



High Temperature & Long Life Type

The expected life of these back-up batteries is about 6 to 10 years and therefore approximately twice the lifetime compared to standard Ni-MH batteries. In addition they are capable of delivering excellent charge characteristics at high temperature (60°C).

Features:

- > High charge efficiency at elevated temperatures
- > Small size and light weight
- > Long lifetime when using intermittent charge
- > Most suitable for exchanging with Nickel-Cadmium batteries
- > Long-life and excellent charging performance at 75°C

Applications:

- > Medical Equipment
- > Emergency Lighting
- > Ticketing Machine
- > POS System
- > Solar Window Shutter
- > Shaver
- > Solar Street Lighting
- > Guidance Light

Wide Temperature Type

This Panasonic Ni-MH battery series is designed for automotive applications. The long life reliability and the high discharge capability make these batteries ideal for these demanding applications. Furthermore they are eco-friendly designed and non-flammable.

Features:

- > High discharge performance
- > Wide operating temperature range: -30°C ~ +85°C
- > Especially designed for high safeness
- > Long life reliability: 6 ~ 8 years at 40°C

Applications:

- > E-Call
- > E-Latch

*1 Please check our website in order to see the entire batteries product range

LI-ION Pin Type Batteries: Ideal for Wearables and the Modern World of IoT Applications



Miniature batteries have become a key component of today's common mobile wearable devices. For these innovative product ideas to work in practice, their Lithium-Ion cells have to be as small as possible and still deliver high energy density, good cycle stability and a long lifespan.

Part Number		CG-320A	CG-425A	CG-435A (under consideration)
Size (Without Tabs)	Diameter (Max.)	3.65mm	4.7mm	4.7mm
	Height (Max.)	20mm	25mm	35mm
Weight* (Approx.)		0.5g	1.0g	1.5g
Typical Capacity		15mAh	32mAh	52mAh
Rated Capacity		15mAh	30mAh	48mAh
Nominal Voltage		3.8V		
Maximum Charging Voltage		4.35V		
Maximum Charging Current		11.2mA (0.75C)	90.0mA (3C)	144.0mA(3C)
Operating Temperature	Charge	0°C ~ 60°C		
	Discharge	-20°C ~ 60°C		
Certifications		IEC62133, UL1642		Not yet

Applications:



Pen



Trackers



Wearables



Head phones



Aid



Clothes



Industrial IoT Applications

VRLA Batteries: Outstanding Quality for Demanding Applications



The Panasonic high quality VRLA batteries serving the majority of all VRLA battery applications. From batteries with a trickle design life of 6 – 9 years and 10 – 12 years to batteries of 15 years, the series includes solutions for every requirement. Also our cyclic battery series as well as the UP-VW high power series meet our customers' needs. Most of the battery models are obtainable with flame-retardant housing and with different terminals.

Features:

- > Superior design and low voltage spread
- > Highest quality control standards
- > State-of-the-Art AGM technology
- > Enhanced lifespan due to excellent recombination efficiency



Alkaline Batteries: Ideal For High-Performance Standard Applications

Panasonic Alkaline batteries are made from the same basic materials as Zinc-Carbon batteries, but deliver generally higher performance on all criteria. These batteries can therefore power high performance standard applications (e.g. marine devices, smoke detectors). Our Alkaline batteries are mostly made in Europe and fulfill the highest quality standards.

Features:

- > Continuously reliable energy provision
- > Long shelf-life
- > High and medium drain applications
- > Superior low temperature behavior



HIGH PERFORMANCE AND COMPREHENSIVE LINEUP

- > Switching from μA to kA
- > Switching from μV to kV
- > Small footprints
- > Long lifetime
- > Low contact resistance
- > Environmental friendly latching technology
- > Best performance, quality & reliability
- > Computer aided thermal design
- > Latest production technologies
- > Local laboratory support

Signal Relays

Signal Relays are suited for low-level current switching, often below 2A and are used in a range from dry circuit up to analog telecom signals. They can handle voltages from μV up to 200 V and currents from μA to 2A. Key applications to which signal relays significantly contribute include communications, AC control, secure data transmission, measurement, and control equipment, automotive devices, and audiovisual devices

Power Relays

As the name already indicates, Power Relays are a reliable technology for applications up to 300A nominal switching capacity. They are generally grouped into polarized and non polarized relays

Automotive Relays

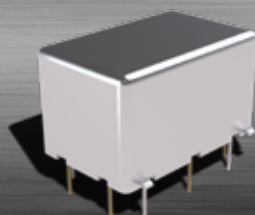
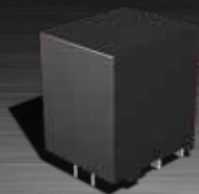
Panasonic's large automotive relay product portfolio is perfectly suited for the ever increasing need for versatility and innovation in car electronics and for almost all applications. Special high current relays for EV cars provide cut-off capabilities up to 1,500A @ 500VDC

Relays with Forcibly Guided Contact

Panasonic relays with forcibly guided contacts according to EN61810-3 are used for safety automation devices, elevators and railway technology. A special design of the actuator combines the contacts in such a way that malfunctioning, like contact welding, can be monitored. This is used to stop automatic actions and to protect humans from injury or to prevent damage to machinery

Microwave Relays

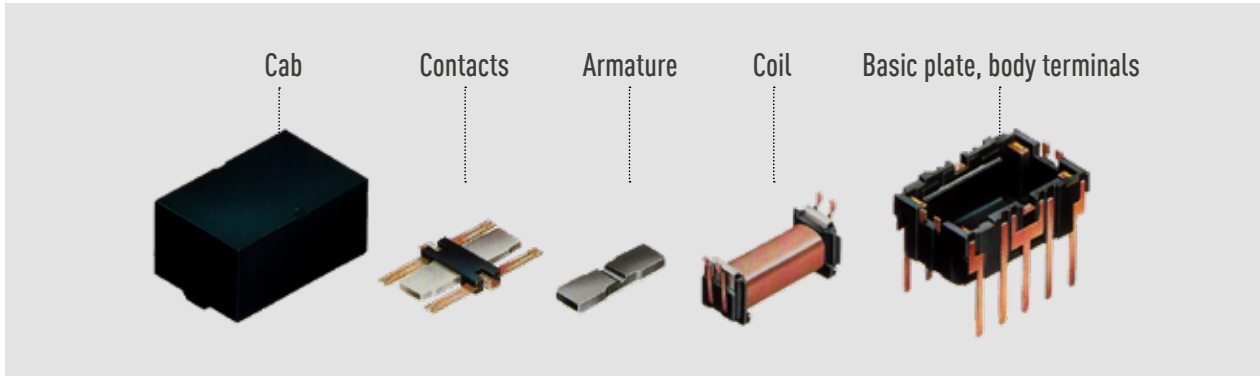
Microwave Relays are ideally suited for switching high frequencies. These devices are frequently used in area of test and measurement equipment, wireless device, and base station



Signal Relays

Signal relays are specialists for currents from 10µA to 2A in a particularly compact design. Due to their 2 changeover contacts, signal relays are suitable for a wide range of applications. Both the gold-plated silver contacts and the silver palladium contacts help to provide stable contact resistance


at low loads, while the dual-line contacts provide high switching reliability. Whether a high dielectric strength or low coil power dissipation, Panasonic offers the right signal relay for every application.




Features:

- > High sensitive types 50mW
- > Stable contact resistance types AgPd
- > High inrush current type TX-TH 7.5A
- > High insulation type TX-D 3,000Vrms
- > Twin crossbar contacts


Applications:




Home Appliances /
Office Automation




Automotive




Precision Devices



Security









Industrial Equipment



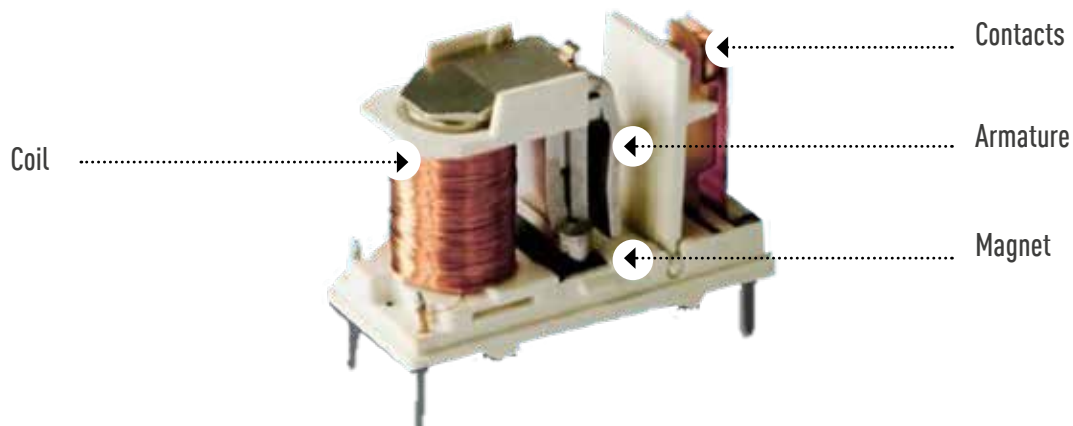
Communication
Network Equipment

Product Range:

		DS1	DS	GQ	TX	TXD	TQ	HY	GN	TX-S	TQ (THT)	TX-1
Product												
Main Feature				Compact & flat	Wide-variation	High isolation between coil and contact	(SMD) Flat type 5.6mm		Compact & slim	Ultra high sensitive	Flat type 5.6mm	
Contact arrangement	1C	+						+				
	2C		+	+	+	+	+		+	+	+	+
Rated control capacity	2A	+	+	+	+	+	+		+			
	1A							+		+	+	
	0.01A											+

Polarized Relays

High power switching applications as charging stations or solar inverters are the key markets for non polarized power relays, complemented by commodity business with global standard types like LDP or LQ type.



Features:

- > Wide product portfolio which is continuously enriched with new product developments
- > Different switching currents up to 90A
- > High shock and vibration resistance
- > Latching and non latching types available
- > Different dimensions to cover the variable market needs with heights starting from 9.7mm
- > **DE Relay:** Very constant Ton/Toff bounce timing through whole lifetime
- > **DW Relay:** Very small PCB space
- > **DJ-H Relay:** 300A inrush current
- > **DSP Relay:** Miniature high power relay with RT III (IP67)

Applications:



Heating Systems



Energy Management



Robotics



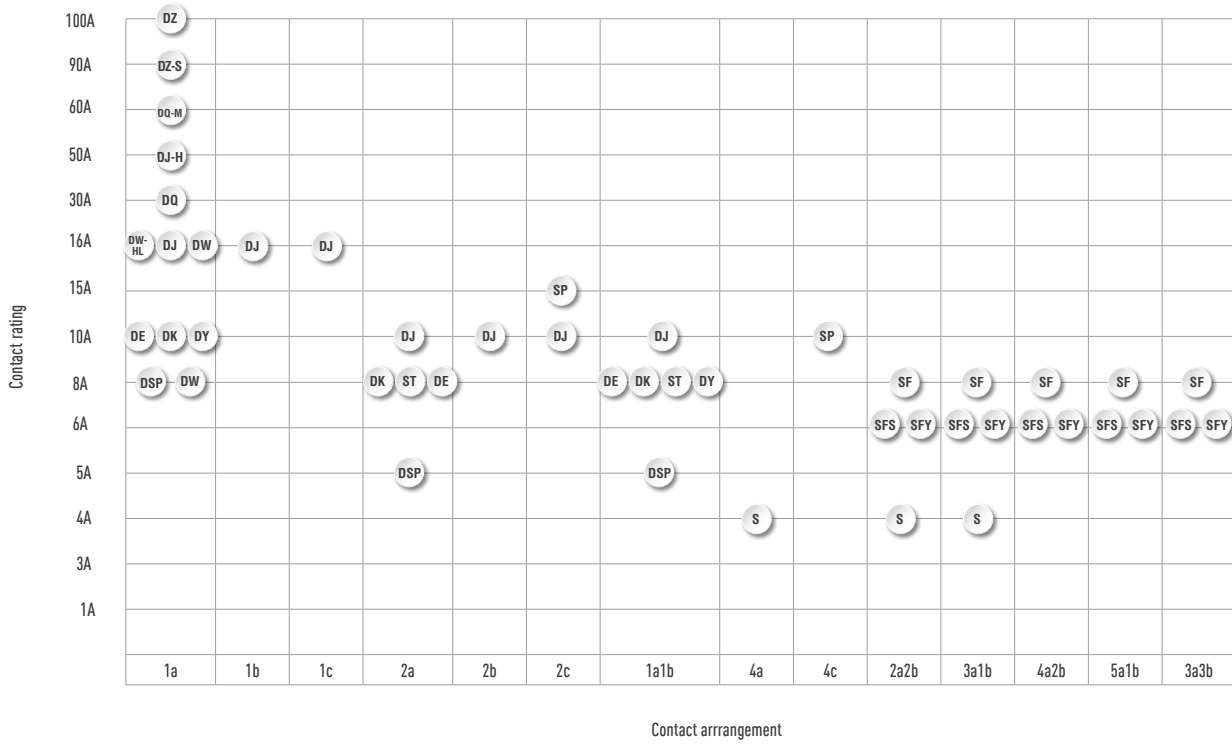
Lighting



Smart Home

Product Range:

Polarized Type Power Relays (with Latching)

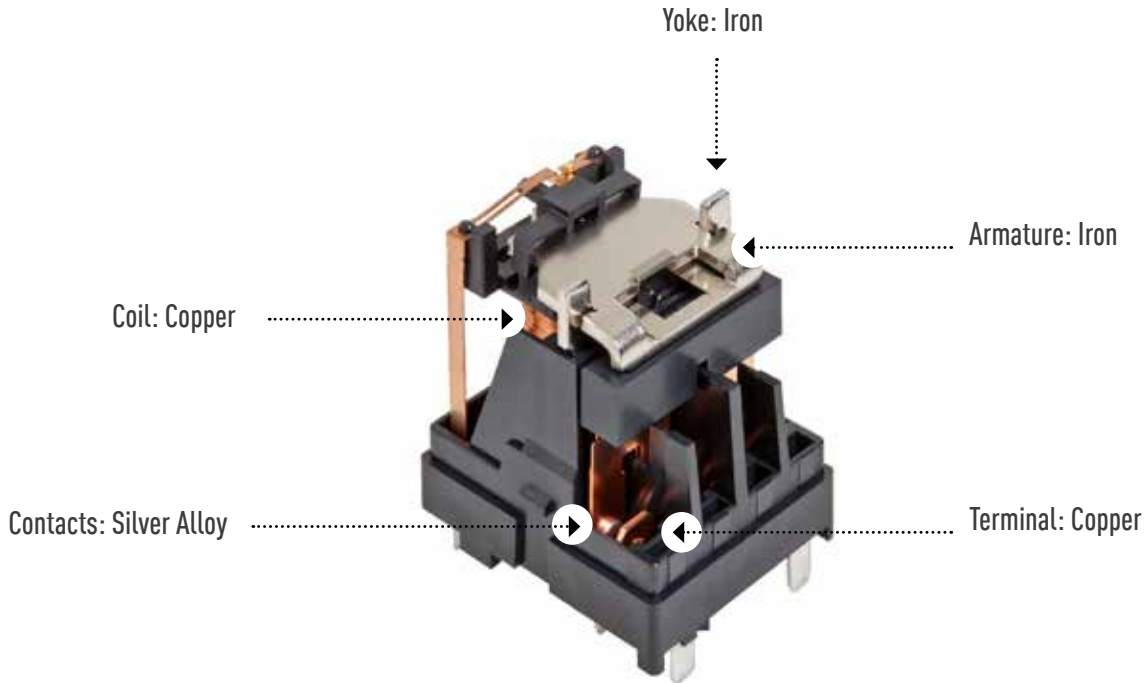


- CAPACITORS
- RESISTORS
- INDUCTORS
- BATTERIES
- ELECTROMECHANICAL RELAYS
- SEMICONDUCTOR RELAYS
- SENSORS
- ELECTROMECHANICAL
- WIRELESS
- THERMAL MANAGEMENT
- SEMICONDUCTORS
- CIRCUIT PROTECTION
- TECHNOLOGIES

Non-Polarized Relays

Non-polarized relays do not use a permanent magnet in their electromagnetic section. This means that generally the operating coils do not have polarity and that the coils has to

be continually energized in order to maintain an ON state. When compared to polarized relays they are less sensitive than non-polarized relays.



Features:

- > Up to 120A high power PCB types available
- > Switching currents between 3 – 120A
- > Reduced coil holding voltage
- > High surge withstand voltage up to 10kV
- > Small size power relays
- > **LDP:** High runner 5A relay
- > **LQ:** High runner 10A relay
- > **HE-S:** 2x 35A relay with feedback contact, suitable e.g. for charging stations or contactor replacements
- > **LFG Relay:** 33A with 1.8mm gap
- > **LG Relay:** intended for the volume market

Applications:



Robotics



White ware



TV



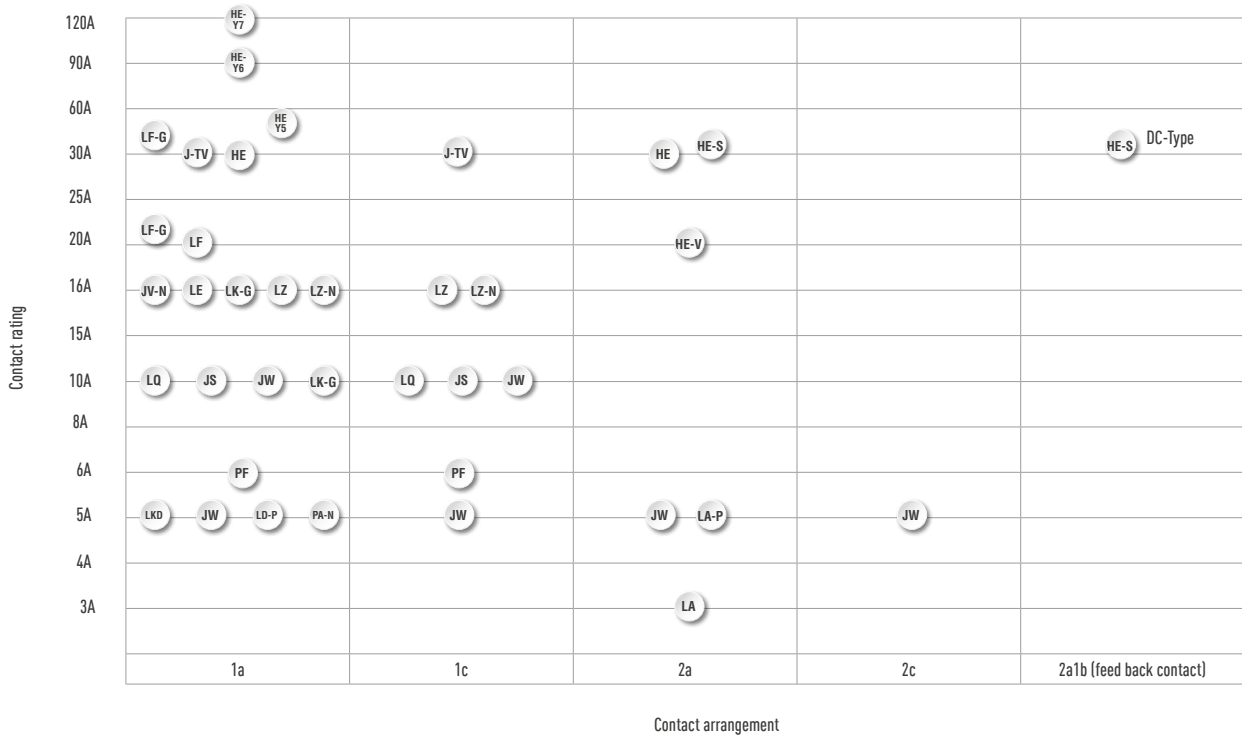
Office Equipment



Measurement Equipment

Product Range:

Non-Polarized Type Power Relays (without Latching)

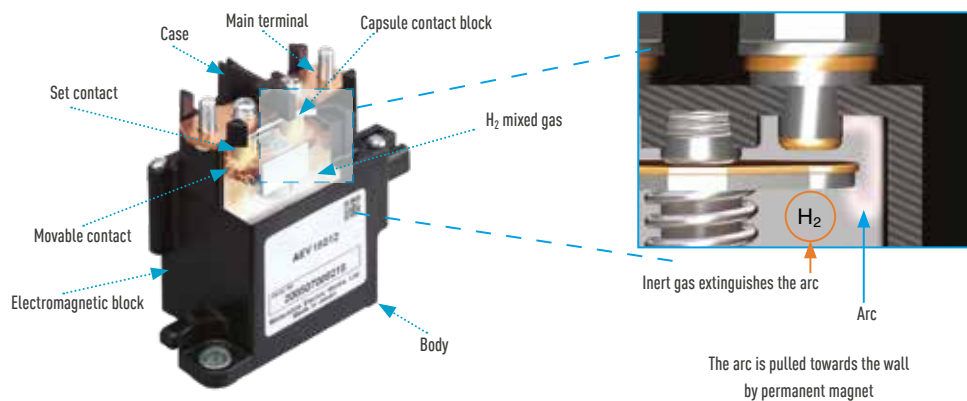


- CAPACITORS
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- ELECTROMECHANICAL RELAYS
- SEMICONDUCTOR RELAYS
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- SEMICONDUCTORS
- CIRCUIT PROTECTION
- TECHNOLOGIES

Automotive Relays (EV and PCB Relays)

Panasonic has been contributing to the ever increasing need for innovation in transportation electronics for decades, with highly reliable, long lasting devices for transportation safety, comfort, entertainment and powertrain applications. There is continued effort within the transportation

industry to balance societal and economic pressures with the environment. Panasonic continually supports these efforts with proven quality, a solid manufacturing organization and experienced engineering talent.



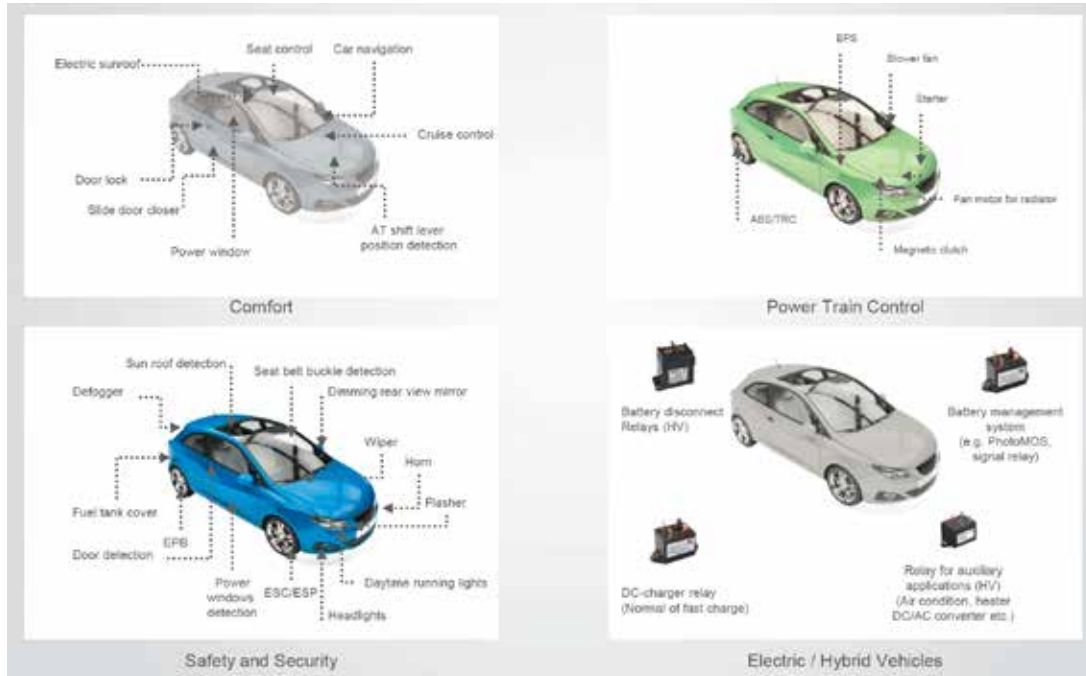
Features (EV Relays):

- > Contact arrangement 1 Form A
- > Current capability 10A-300A
- > Switching voltage: 450 VDC
- > Ambient temperature -40 -85°C
- > Max. cut off capability: 800-2500A 300VDC
- > Nominal operation power 1.24-6W
- > Offer a perfect switching performance thanks to its hermetically sealed ceramic chamber filled with hydrogen gas
- > High breaking capacity
- > Compact size
- > Robust construction
- > High contact reliability
- > Optimally matched components (main and precharge relay)
- > Proven and tested in hybrid and electric vehicles for more than 20 years

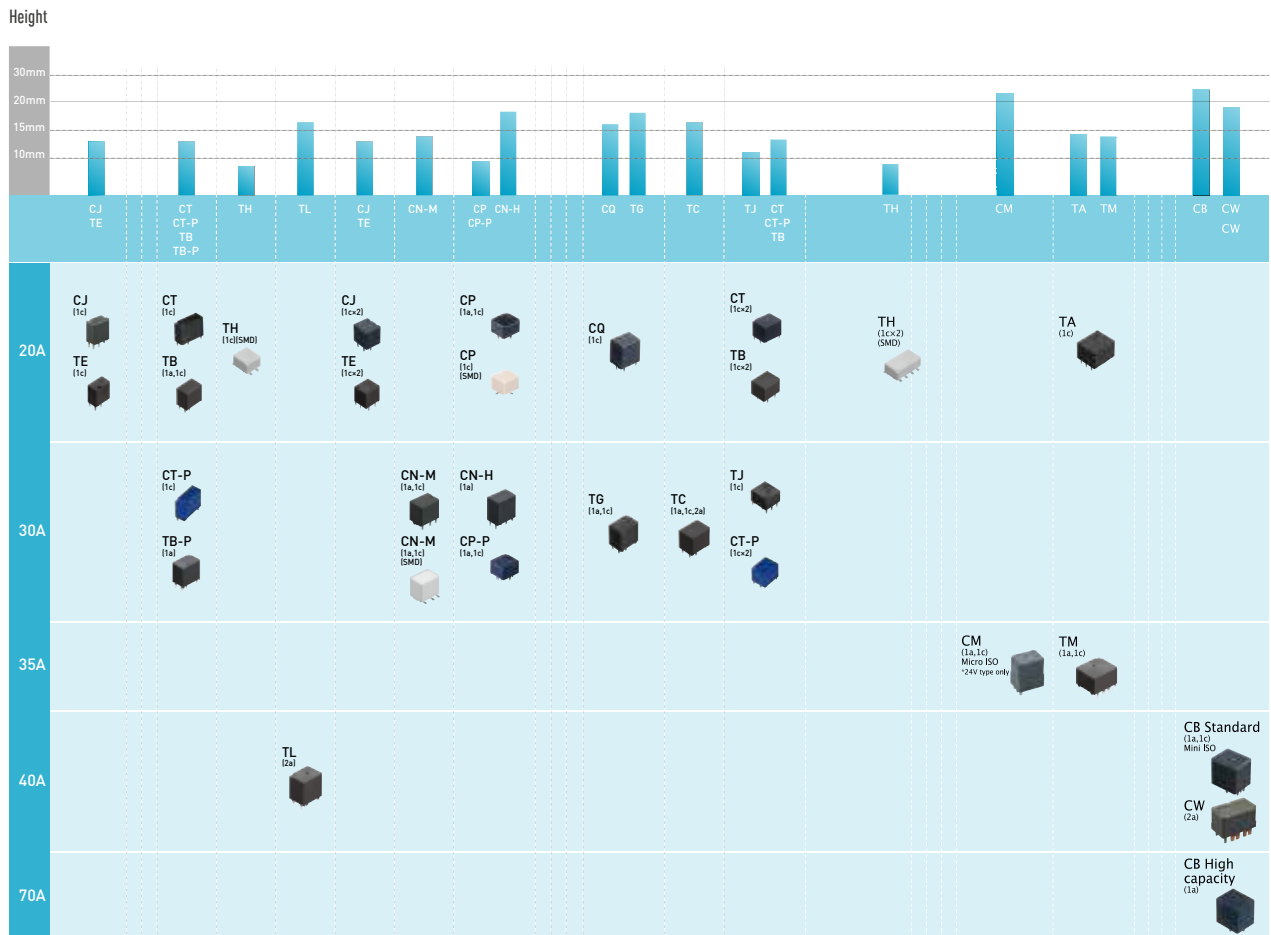
Features (PCB Relays):

- > Small size, low profile and compact for space saving
- > 1 Form A, Form B, Form C contacts
- > Monostable and latching types available
- > THT, SMD, Plug-in available
- > High capacity
- > Contributing to the ever increasing need for versatility and innovation in car electronics, our line-up of automotive components excels on quality cost and space savings
- > ISO/TS16949, 14001, 9001 certified

Applications:



Product Range:

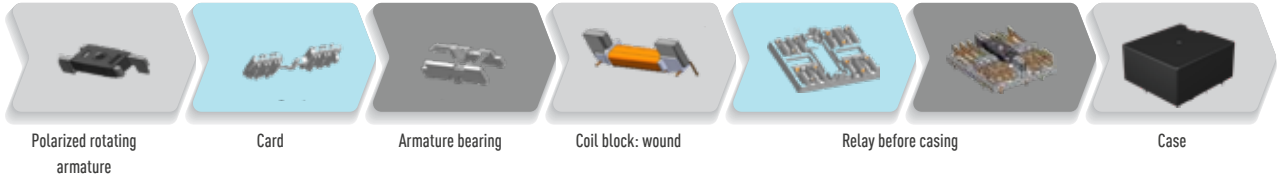


CAPACITORS
RESISTORS
INDUCTORS
BATTERIES
ELECTROMECHANICAL RELAYS
SEMICONDUCTOR RELAYS
SENSORS
ELECTROMECHANICAL
WIRELESS
THERMAL MANAGEMENT
SEMICONDUCTORS
CIRCUIT PROTECTION
TECHNOLOGIES

Relays with Forcibly Guided Contact

Panasonic relays with forcibly guided contacts according to EN50205 are used for safety automation devices, elevators and railway technology. A special design of the actuator combines the contacts in such a way that malfunctioning,

like contact welding, can be monitored. This is used to stop automatic actions and to protect humans from injury or to prevent damage to machinery.

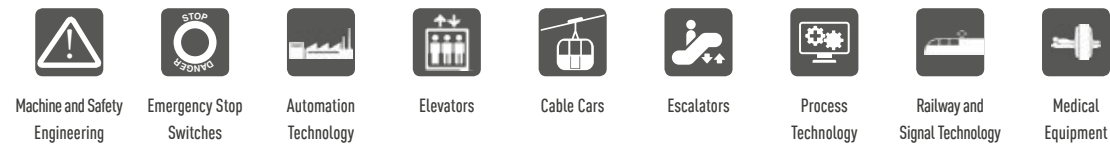


Features:

- > 4-pole versions with 2a2b or 3a1b
- > 6-pole versions with 4a2b, 5a1b or 3a3b
- > 8-pole version with 4a4b
- > Forcibly guided contacts according to IEC 61810-3, type A (SFY/SFS/SF2D/SF3), type B (SFN/SF4D)
- > Max. switching current up to 8A
- > Max. switching voltage up to 500V DC/250V AC
- > Min. load 10V/10mA (for low level loads gold clad contacts are available)
- > Low coil power dissipation thanks to polarized drive system
- > Height is only 14.5mm (SFY, SFN)
- > Very high shock and vibration resistance
- > Degree of protection: RTIII (SFS 6pole RTII)
- > Approvals: TÜV, cULus
- > Suitable for railway applications according to EN 50155
- > Suitable for applications requiring IEC/EN 60335-1 (SF2D/SF3/SF4D)
- > DIN rail sockets available (SFS)

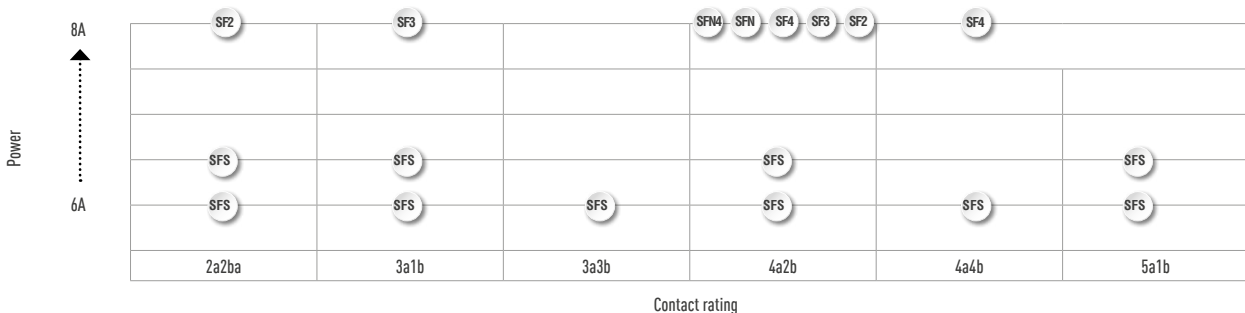


Applications:



Product Range:

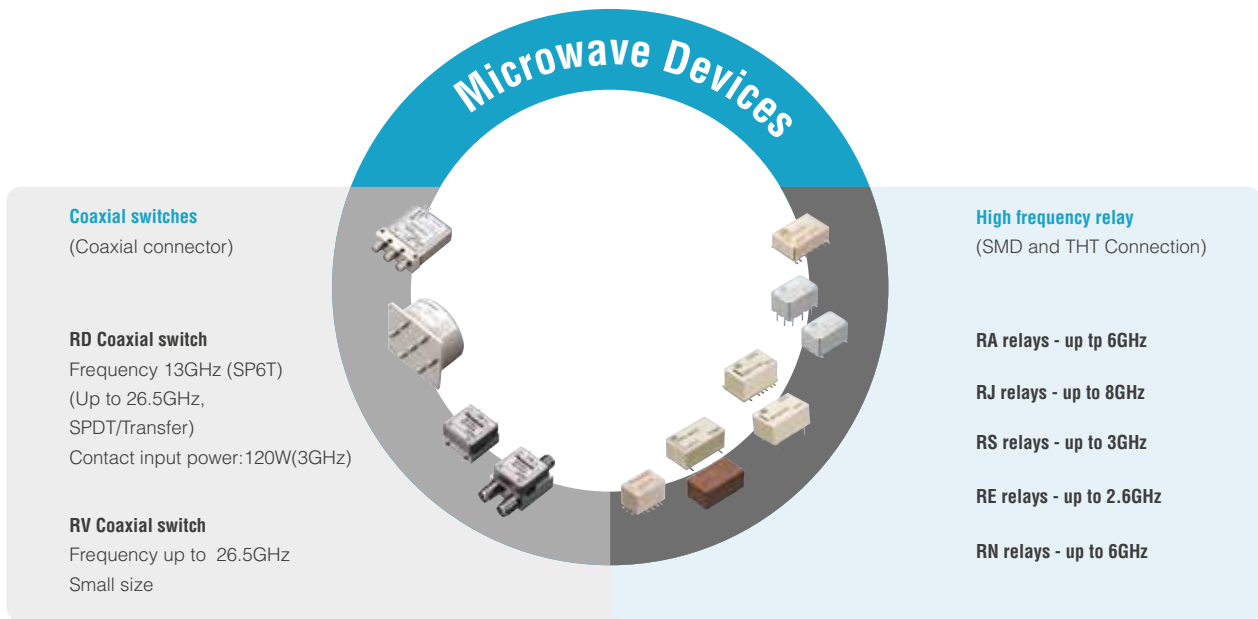
Relays with forcibly guided contact applications



Microwave Relays

Microwave devices can be classified into relays and coaxial switches which switches high frequency signals. These devices are frequently used in area of test and measurement equipment, wireless device, and base station use. Panasonic has wide range of relay and coaxial switch product

lineups to various frequency bands. Specialized relays designed for RF signals typically required at signals above 100-200MHz. Features include low Insertion Loss, high Isolation, and low VSWR for impedance matching.



Features:

- > ARD coaxial switch with 26,5 coming in SPDT, Transfer SP6T type
- > ARA, ARJ, ARS, ARV, ARD as latching type available
- > ARS and ARE optional with an impedance of 50 ohm or 75 ohm
- > ARA, ARJ, ARN, ARV, ARD coming with an impedance of 50 ohm
- > ARS and ARN as standard and reversed type available
- > ARA, ARJ, ARS, ARE coming a sealed construction
- > Excellent high frequency characteristics over lifetime
- > ARD and ARV with coaxial design: ARJ, ARS, ARE as SMD and THT; ARA and ARN as SMD
- > ARN can handle 150W carrying power at 2GHz

Applications:



BROAD RANGE OF SEMICONDUCTOR RELAYS BY THE MARKET

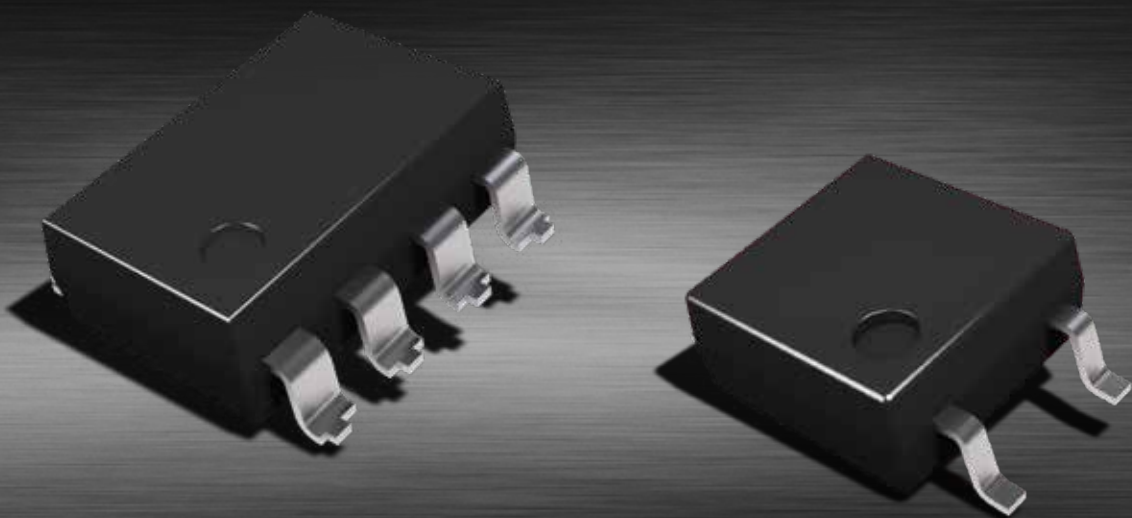
- > Linear output characteristics
- > No threshold voltage
- > Low operate current (sensitive type $\leq 0.31\text{mA}$)
- > Low output capacitance (RF type $\leq 1\text{pF}$)
- > Absolute minimum leakage current (pA)
- > Extremely long lifetime
- > Stable ON-resistance over the entire lifetime
- > Extremely compact design (TSON, VSSOP, SON, SSOP)
- > No contact bounce
- > Highly resistant to shock and vibration
- > Flexible mounting orientation
- > Noiseless switching
- > No arcing
- > High I/O isolation voltage
- > Low power consumption

PhotoMOS Relays

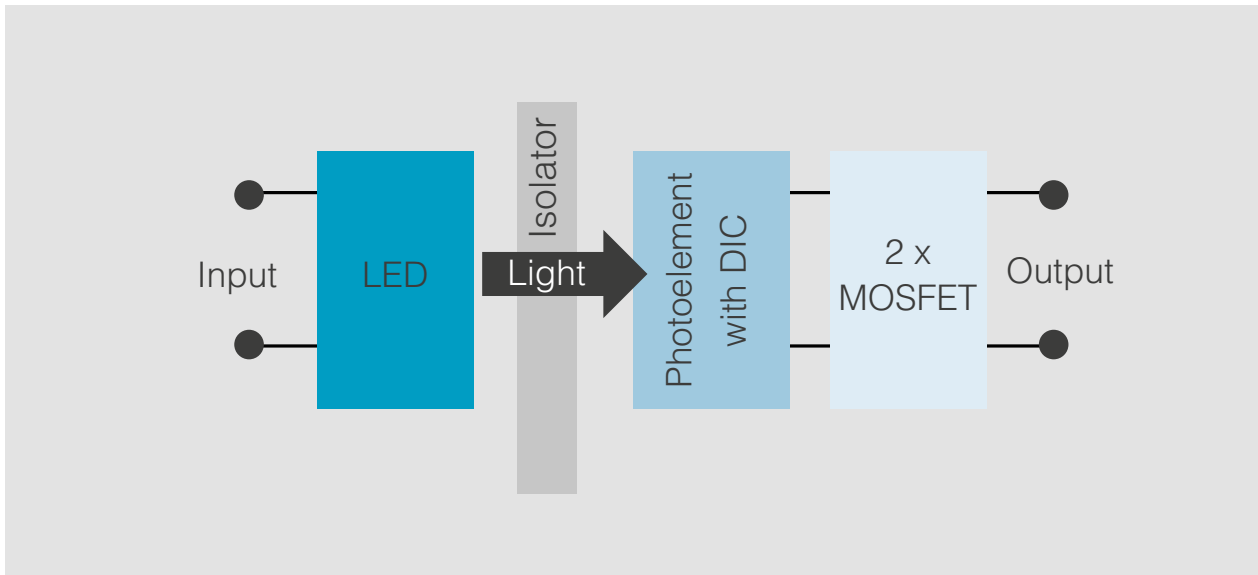
A PhotoMOS is a semiconductor relay with an LED as an input, a solar cell array and two MOSFET in the output circle and combine both advantages of EMR and semiconductor technology. As soon as the light-emitting diode is triggered, its emitted light passes through an isolator permeable to light and is detected by a solar cell. The voltage generated in the solar cell is sufficient to activate the MOSFET. By varying these three individual elements, it is possible to generate a wide range of switching behavior with linear output characteristics which are ideally suited for AC & DC switching. Moreover, they are extremely reliable, unaffected by vibrations, and their ON-resistance remains stable throughout their entire lifetime

Solid State Relay:

SSRs are relays that use semiconductor switching elements. They use optical semiconductors called photocouplers to isolate input and output signals. The photocouplers change electric signals into optical signals and relay the signals through space, thus fully isolating the input and output sections while relaying the signals at high speed. Also, SSRs consist of electronic components with no mechanical contacts. Compared to conventional relays, semiconductor-based switching elements offer two essential advantages: superb reliability and a nearly unlimited lifespan. The greatest feature of SSRs is that SSRs do not use switching contacts that will physically wear out their high speed switching as well as no operation sound



PhotoMOS Relays

**Features:**

- > Very compact housing
- > Very low on-resistance (HE-Type: $R_{on} = \text{type. } 8\text{m}\Omega$)
- > Fast turn-on time (RF-Type: $T_{on} = 0.2\text{ms}$)
- > Very low leakage current (RF-Type: $\text{Leak} = 10\text{pA}$)
- > Insensible to shock & vibration (1000G)
- > No arcing
- > No abrasion → endless lifetime
- > No threshold voltage
- > Switching of lowest analog signals is possible
- > Linear output characteristic
- > Low control voltage / non inductive input
- > High I/O-Isolation (up to 5 kV)

CAPACITORS

RESISTORS

INDUCTORS

BATTERIES

ELECTROMECHANICAL RELAYS

SEMICONDUCTOR RELAYS

SENSORS

ELECTROMECHANICAL

WIRELESS

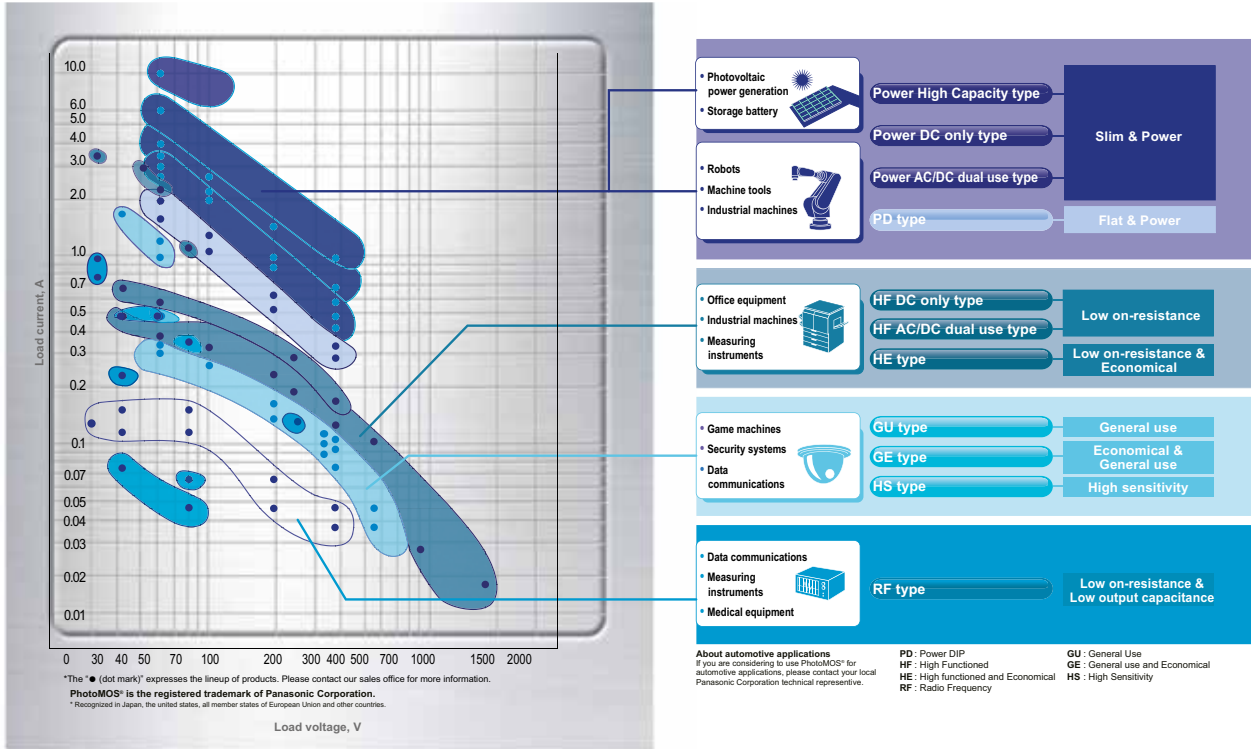
THERMAL MANAGEMENT

SEMICONDUCTORS

CIRCUIT PROTECTION

TECHNOLOGIES

Product Range:

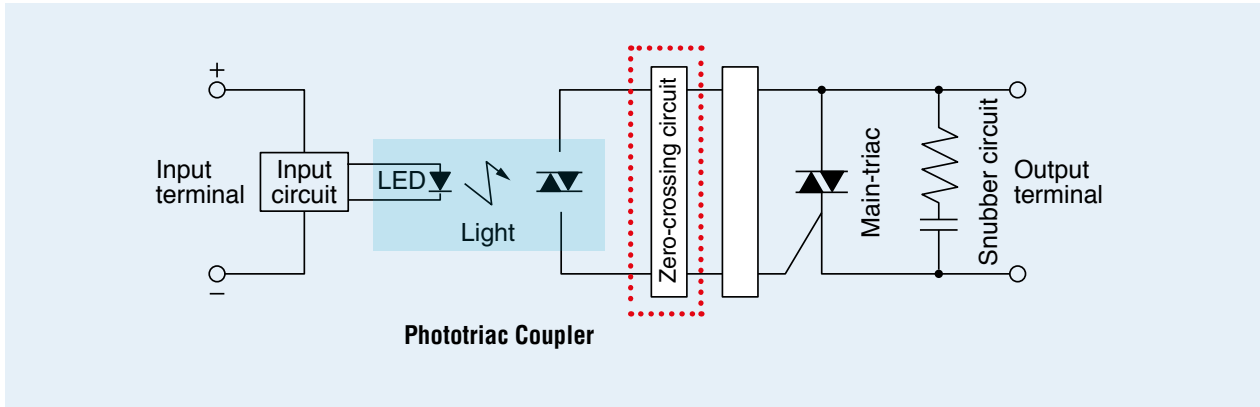


Applications:

- Energy Management
- Automotive Electronics
- Measurement Equipment
- Telecommunication Equipment
- Industrial Automation
- Medical Equipment
- Home and Building Security Equipment



Solid State Relays



Features:

- > Endless lifetime
- > Low Control current
- > Heat Sink connection
- > Handles both 110V and 230V applications
- > Wide input range (4-32V DC)
- > Optional operation status LED
- > Built-in varistor protection
- > Zero-Cross and Random switching
- > Load current up to 40A
- > High I/O Isolation (up to 5kV)
- > Integrated protection circuit
- > Reinforced Isolation types available

Applications:



White Ware



Professional Kitchen



Industrial Automation



Robotics



Smart Home



Energy Management



WIDE RANGE OF MEMS AND OPTICAL SENSOR TECHNOLOGIES

- > High precision
- > High reliability
- > Compact size
- > Energy saving
- > Environmental-friendly

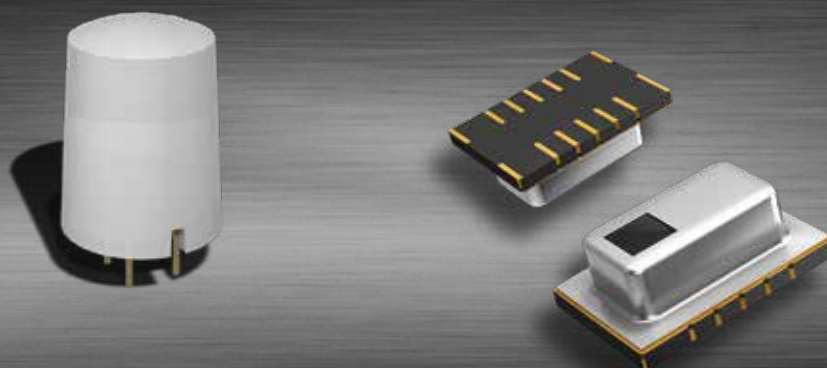
Grid-EYE Thermal Array Sensor

- > IR multipixel sensor for absolute temperature measurements
- > Robust thermopile technology
- > Wide operational and sensing temperature range
- > Different FOV options available
- > People counting and tracking algorithms available free of charge

PaPIRs – Panasonic Pyroelectric Infrared Sensors (Motion sensors)

- > 11 different optics
- > 9 different sensors
- > 3 different colors
- > More than 180 part numbers
- > Digital and Analog Sensors
- > 1, 2, 6 and 170 μ A current consumption

Panasonic pyroelectric infrared sensors (PaPIRs) guarantee a fast and reliable time-to-market. The sensitivity is significantly improved (approx. 2 times) compared with conventional PIR sensors. The modular portfolio offers highest design flexibility because all sensors share the same pin concept. As a result, designers can implement various applications without extensive redesigning



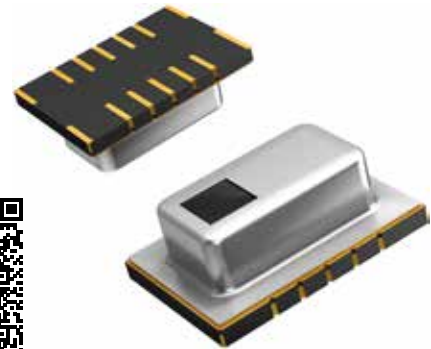
Evaluation Kit available!

Count and track people without privacy problems!

Grid-EYE Thermal Array Sensor

Features:

- > World's first MEMS SMD 8x8 pixel thermal sensor
- > Measures absolute temperatures and thermal gradients by infrared radiation sensing
- > Powerful software package available free of charge for people tracking and counting applications
- > Features a convenient packaging and industry-standard interfaces for a fast time-to-market development

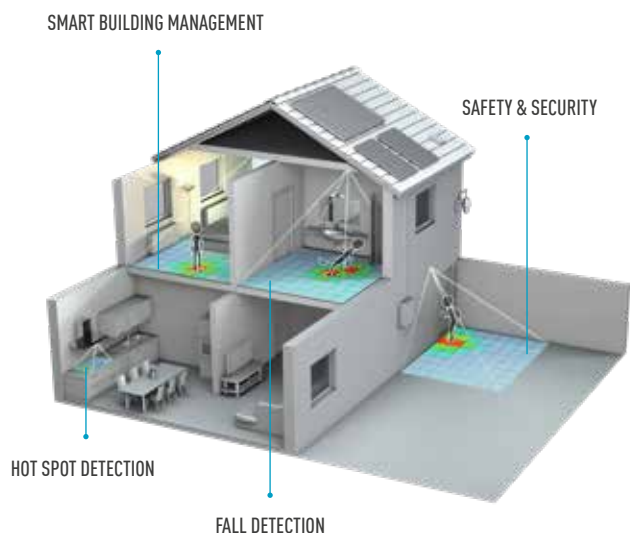


Specification	
Dimensions (LxHxW)	11.6 x 4.3 x 8.0 mm
Operating Voltage	3.3V or 5V
Current Consumption	Typ. 4.5mA (normal), 0.8mA (standby), 0.2mA (sleep)
Measurement Range / Distance	0 to 80°C or -20 to 100°C / up to 7m
Field of View	60° (horizontal and vertical), 36° and 90° options available
Interface / Frame Rate	I ² C fast mode / 10 frames/s or 1 frame/s (averaged)
Absolute Accuracy / NETD	Typ. ±2.5°C or ±3.0°C / 0.16°C @ 10 frames/s or 0.05°C @ 1 frame/s

Applications:

- > People detection, counting and tracking, gesture control
- > Fall detection and home comfort functions (HVAC & shutter control)
- > Kitchen stove guards
- > Hot spot detection
- > RF and microwave cooking
- > Smart office: hot desking, workspace occupation monitoring

And many more applications!



Product Range:

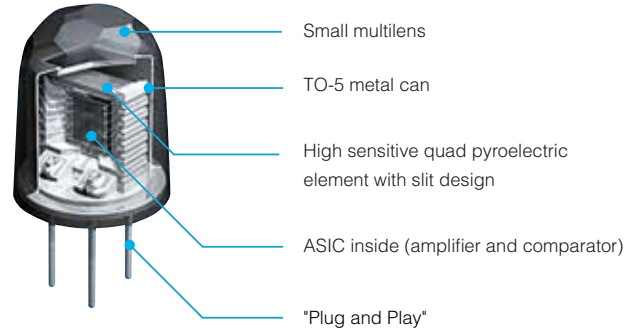
Order information			
Part No.	Operating Voltage	Measurement Range	Absolute Temperature Accuracy
AMG8833	3.3V	0 to 80°C	Typ. ±2.5°C
AMG8834	3.3V	-20 to 100°C	Typ. ±3.0°C
AMG8853	5V	0 to 80°C	Typ. ±2.5°C
AMG8854	5V	-20 to 100°C	Typ. ±3.0°C

CAPACITORS
RESISTORS
INDUCTORS
BATTERIES
ELECTROMECHANICAL RELAYS
SEMICONDUCTOR RELAYS
SENSORS
ELECTROMECHANICAL
WIRELESS
THERMAL MANAGEMENT
SEMICONDUCTORS
CIRCUIT PROTECTION
TECHNOLOGIES

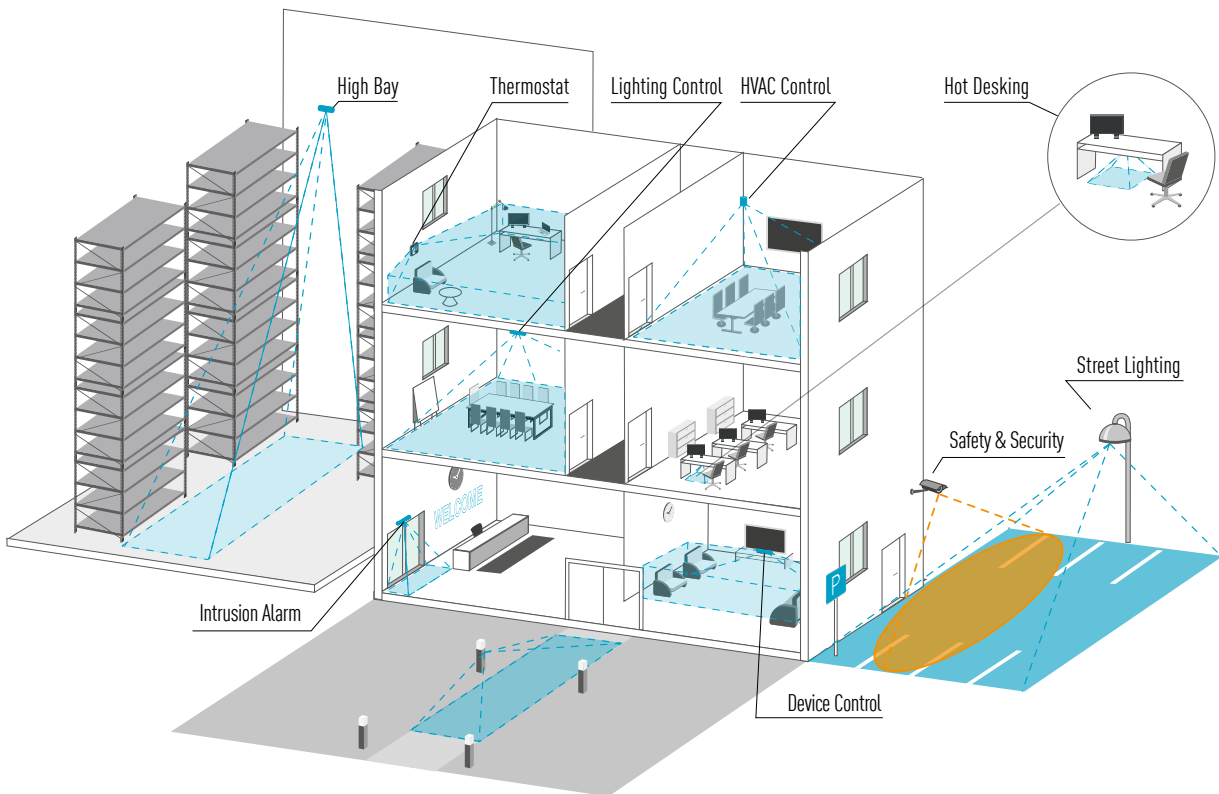
PaPIRs – Panasonic Pyroelectric Infrared Sensors (Motion Sensors)

Features:

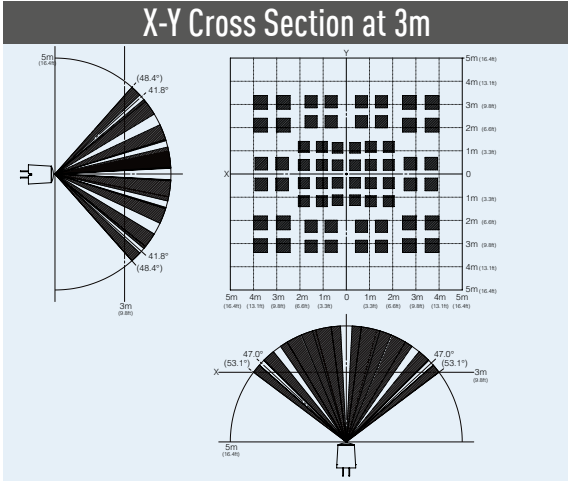
- > Plug and play
- > Small lenses
- > Outstanding sensitivity
- > With integrated amplifier and comparator
- > Supreme reliability
- > Uniform 3-pin concept
- > Up to 17m detection distance



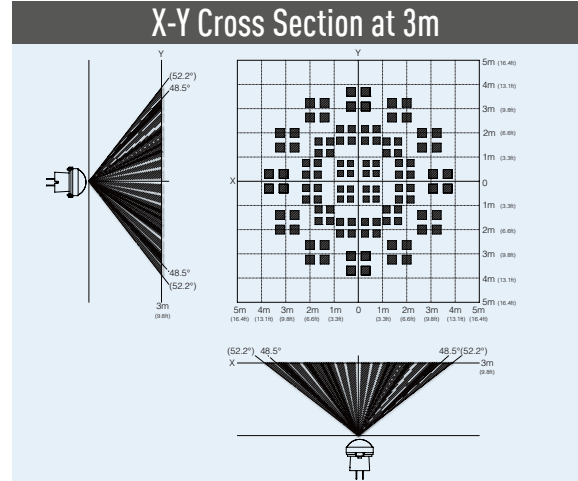
Applications:



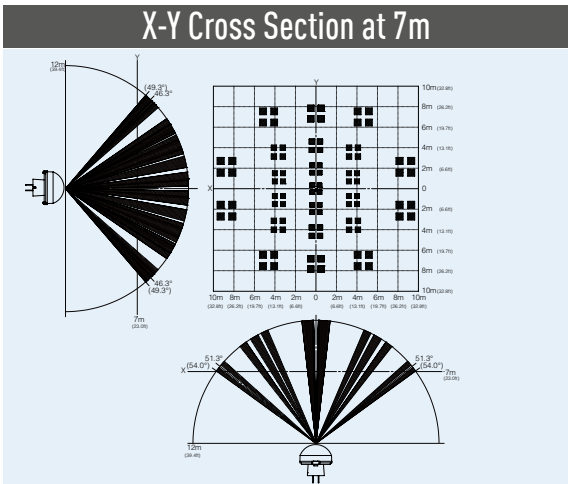
Product Range:



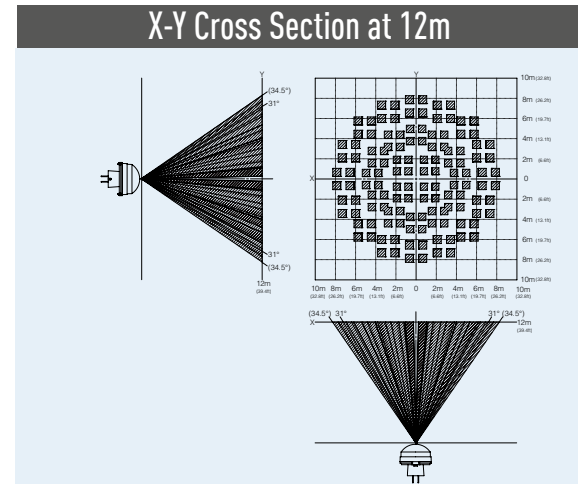
EKM – Standard Detection Type



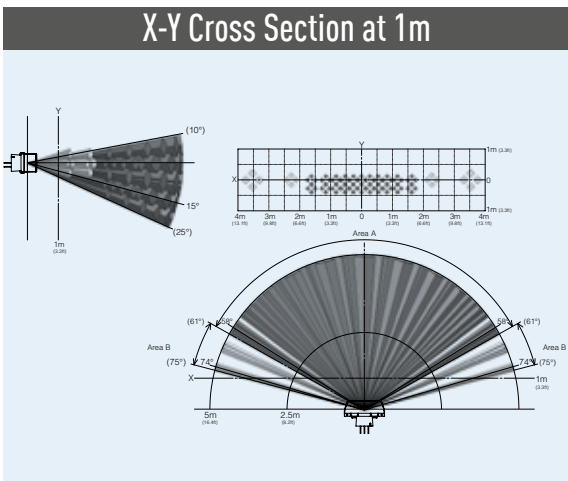
EKM – Slight Motion Detection Type



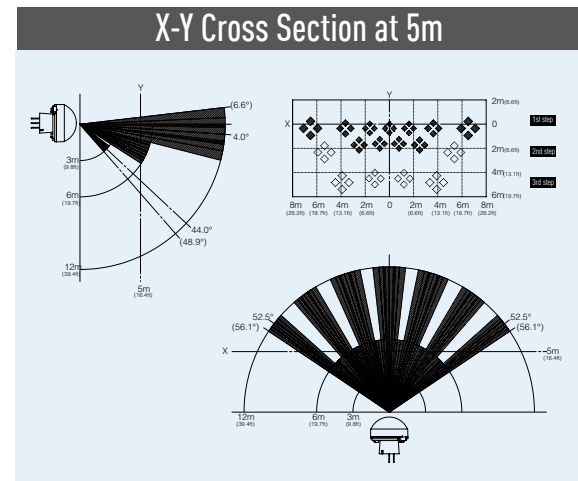
EKM – Long Distance Detection Type



EKM – High Density Long Distance Detection Type



EKM – Horizontally Wide Detection Type



EKM – Wall Installation Detection Type (corner)

SWITCHES AND CONNECTORS – INFINITE POSSIBILITIES FOR HMI DEVICES

- > Wide range of size and operating forces
- > Very low contact resistance
- > High contact reliability
- > Temperature range from -40 up to +85°C
- > Excellent tactile behaviour
- > Long life types up to 2 Mio. cycles
- > Variety of IP67 switches
- > Excellent shock and vibration resistance
- > Ultra slim touch contact technology

Light Touch Switches provide a unique, sharp tactile feel, have low contact resistance, minimal bounce noise, high contact reliability and are available in a wide selection of operating forces

Detector Switches are used to detect mechanical movement, such as the closing of a flip-phone or detecting end positions of rotaries. Detector Switches can also be used as an Encoder function enabling lower cost solutions

Sliding Switches/Snap-Action Switches are characterized by a large switching capacity range, long lifetime and exceptional reliability in all common sizes with various IP degrees of protection

Narrow Pitch Connectors' line-up includes both Board-to-Board and Board-to-FPC options. Panasonic's industry leading "tough contact" design provides customers with the reliability that is required when developing the latest computer or wearable device.

FPC Connectors' offering includes various High Current Board-to-Board Connectors suitable for applications that require a connection to a power source/battery. These High Current Connectors have low mated height profiles, high reliability, and are manufactured with Panasonic's Touch Contact technology

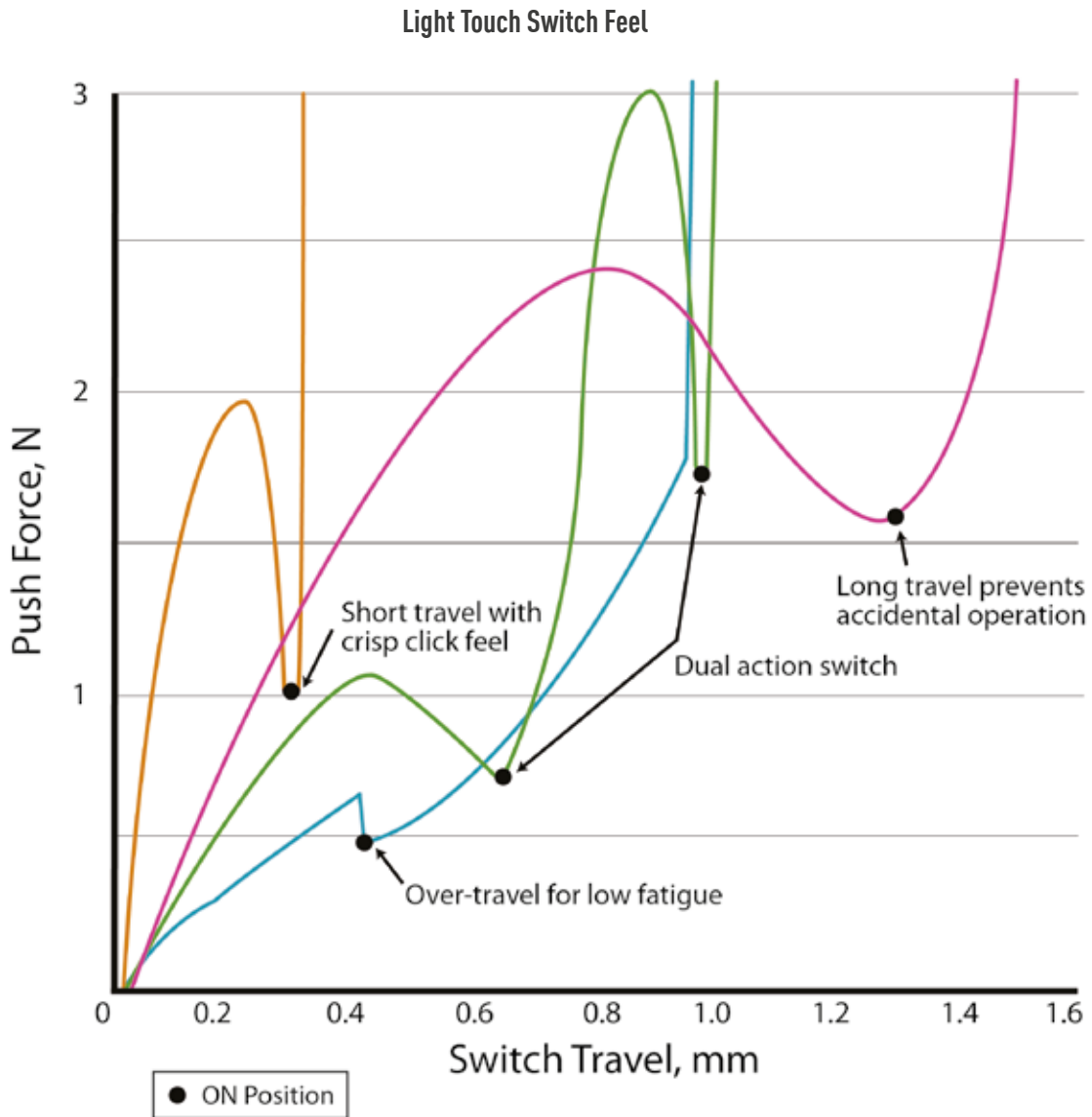


Light Touch Switches

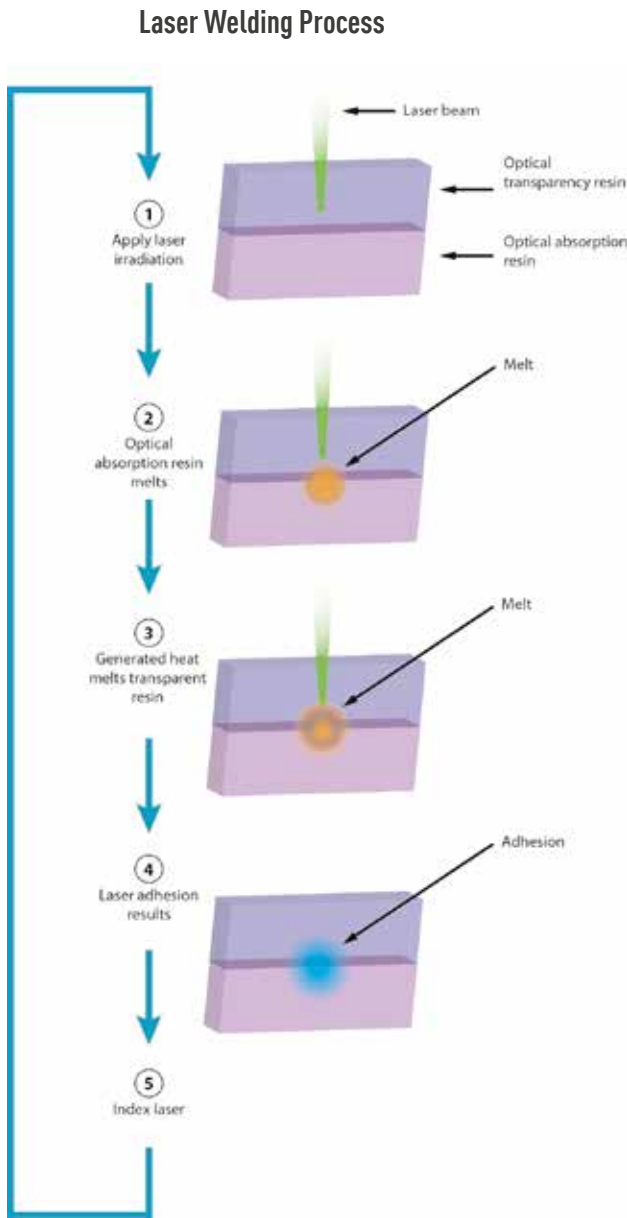
The Right Force/Travel Ratio

Features:

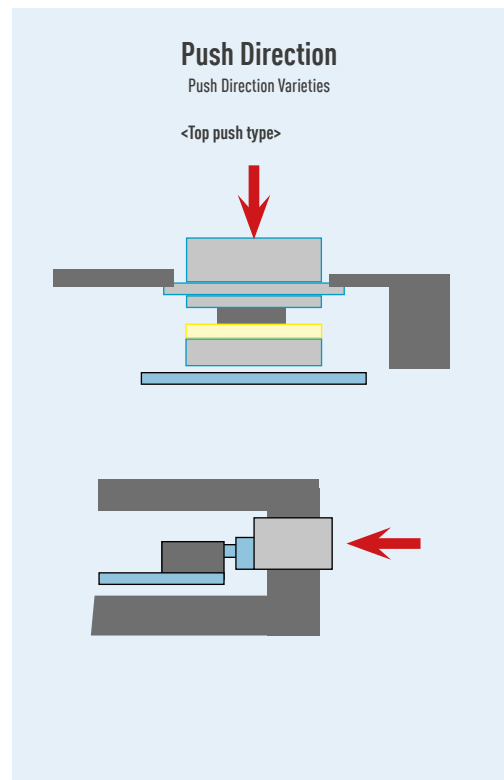
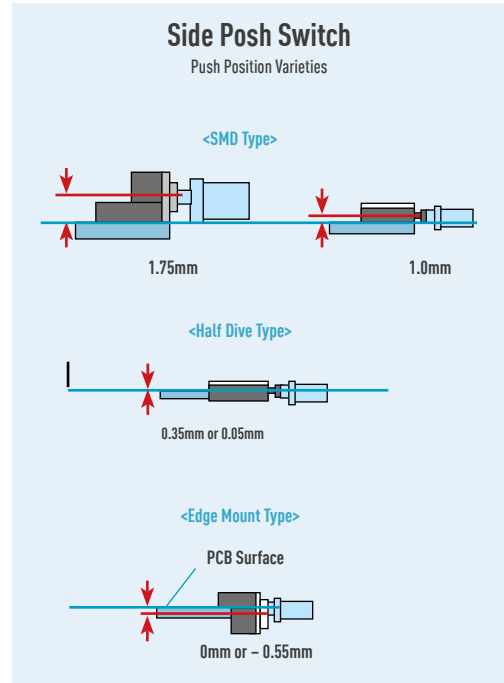
- > Wide range of size and operating force
- > Very low contact resistance due to silver contacts
- > High contact reliability
- > Temperature range from -40 up to +85°C
- > Highly flexible actuation angle
- > Long life types available, up to 1M cycles



Construction for IP67 Switches:



Sealing by laser welding contributes to a higher sealing that avoids water/oil invasion through the film attached area. Panasonic uses a patented laser welding process in which the switch is sealed with a thin nylon film. This safeguards the feel of the switch and protects it from developing any signs of wear.



Applications:



Medical Devices Market



Wearable Market



Automotive Market








General Industry









- CAPACITORS
- RESISTORS
- INDUCTORS
- BATTERIES
- ELECTROMECHANICAL RELAYS
- SEMICONDUCTOR RELAYS
- SENSORS
- ELECTROMECHANICAL**
- WIRELESS
- THERMAL MANAGEMENT
- SEMICONDUCTORS
- CIRCUIT PROTECTION
- TECHNOLOGIES

Product Range:

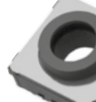


Light Touch Switches (SMD – Short Stroke) Top Push

					
Series	EVPBB	EVPBL	EVPBW	EVPAY	EVPAF
External Dimensions L x W x H (mm)	2.6 x 1.6 x 0.53	2.8 x 1.9 x 0.53 2.8 x 1.9 x 0.57	3.0 x 2.0 x 0.6	3.4 x 2.9 x 1.7	3.0 x 2.6 x 0.65
Travel (mm)	0.11	0.15	0.13, 0.15	0.15	0.15
Operating Force (N)	0.7, 1.0, 1.6, 2.4	1.6, 2.25, 3.1	1.2, 1.6, 2.4, 3.1	1.6, 2.4	1.3, 1.6, 2.4, 3.4
Operating Life (Cycles)	500k	300k	300k	500k	100k

								
Series	EVPBA	EVPAX	EVQ6P6 EVQ7P6 EVQ9P6 EVQP6	EVPAL	EVPAA	EVQP2 EVQP9	EVQ3PL EVQ5PL EVQPL	EVQP0 EVQQ2
External Dimensions L x W x H (mm)	3.0 x 2.6 x 0.58	3.0 x 2.6 x 0.7	4.1 x 4.1 x 0.35 4.1 x 4.1 x 0.43 4.1 x 4.1 x 0.58	2.9 x 2.6 x 1.4	3.5 x 2.9 x 1.7	4.7 x 3.5 x 2.1 4.7 x 3.5 x 2.5	4.9 x 4.9 x 0.8 4.9 x 4.9 x 1.5	6.5 x 6.0 x 2.0 6.5 x 6.0 x 2.5 6.5 x 6.0 x 3.1
Travel (mm)	0.13	0.07, 0.16	0.25	0.13	0.15	0.25	0.25	0.25, 0.30
Operating Force (N)	1.8	0.7, 2.0 Double Action	1.0, 1.6, 2.4	2.5, 3.5, 4.0, 5.0	1.0, 1.6, 2.4, 3.5, 5.0, 7.0	1.0, 1.6, 2.4, 3.5, 5.0	1.0, 1.6, 2.6	0.5, 0.6, 1.0, 1.3, 1.6, 2.6, 3.5
Operating Life (Cycles)	100k	100k	1M, 500k, 200k	200k	1M, 200k	1M, 500k, 200k	500k, 200k	2M, 1M, 200k, 100k

Light Touch Switches (SMD – Mid / Long Stroke) Top Push

					
Series	EVQ3P2 EVQP9	EVPBD	EVPAS	EVQQ1	EVPAD
External Dimensions L x W x H (mm)	4.7 x 3.5 x 2.1 4.7 x 3.5 x 2.5	6.0 x 6.0 x 4.0	6.0 x 6.1 x 5.0	8.5 x 8.5 x 6.5	9.8 x 9.8 x 4.7
Travel (mm)	0.70	0.75	1.0, 1.3	1.0	1.0
Operating Force (N)	2.5, 3.5, 5.0	3.5	1.6, 2.0, 2.2, 2.5, 3.0, 3.5	4.0, 5.0	4.0
Operating Life (Cycles)	1M, 500k, 200k	100k	100k, 30k	100k	100k

CAPACITORS
RESISTORS
INDUCTORS
BATTERIES
ELECTROMECHANICAL RELAYS
SEMICONDUCTOR RELAYS
SENSORS
ELECTROMECHANICAL
WIRELESS
THERMAL MANAGEMENT
SEMICONDUCTORS
CIRCUIT PROTECTION
TECHNOLOGIES

Detector Switches

Downsizing and Design-Flexibility

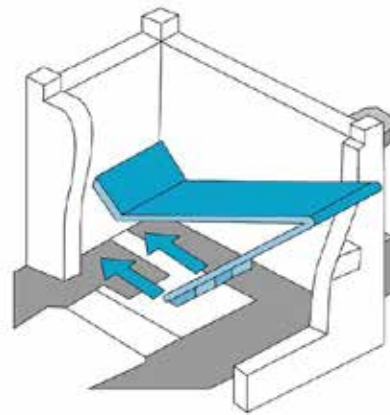
Features:

- > Thin profile and compact size
- > Very low contact resistance due to silver contacts
- > High contact reliability
- > Temperature range from -40 up to +85°C
- > Highly flexible actuation angle
- > Long life types available, up to 1M cycles

Construction:

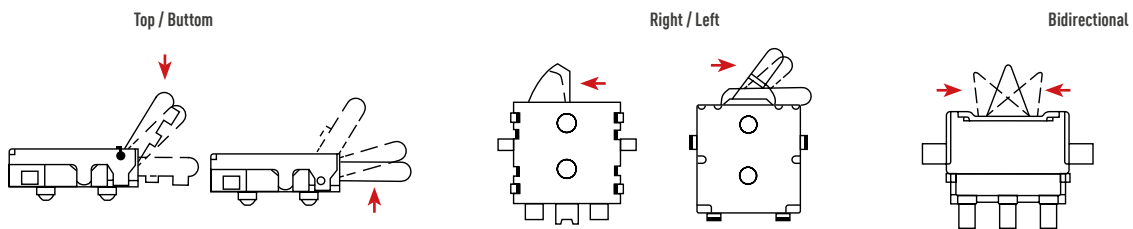
Ensure high contact reliability with original structure of plate spring wiping contacts

- > Consistency in quality with simple structure
- > Long life
- > Self cleaning contact mechanism

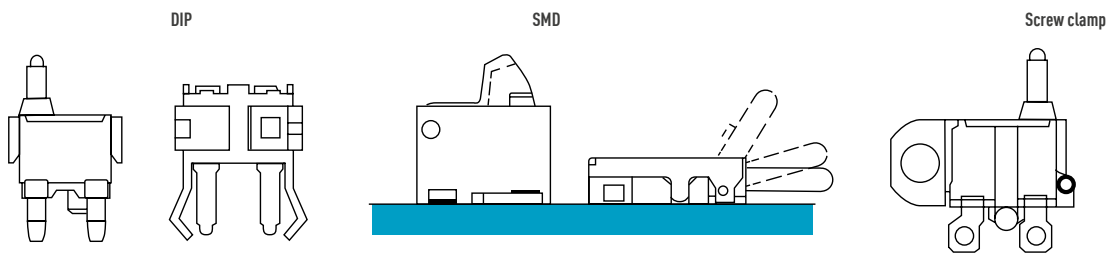


Product Range:

Contribute to customer's design flexibility - Operating direction



Mounting Type



Applications:



Medical Devices Market



Wearable Market



Automotive Market



General Industry

Product Range:

Detector Switches (SMD & THT) Top Push

Series	EVPAT	EVPAK	EVPAV	EVPAE	EVQP4	EVPAN	EVQ9P7 EVQP3 EVQP7	EVQPU
External Dimensions L x W x H (mm)	3.4 x 1.7 x 1.105	3.9 x 1.9 x 1.6	2.8 x 2.3 x 1.95	4.5 x 2.2 x 2.9	6.2 x 2.55 x 3.5	3.5 x 2.9 x 1.2	3.5 x 2.9 x 1.35	4.7 x 3.5 x 1.65
Travel (mm)	0.11	0.12	0.13	0.15	0.25, 0.70	0.2	0.2	0.3
Operating Force (N)	1.6	1.6	1.6	1.6, 3.0, 3.5	1.0, 1.6, 2.4, 2.5, 3.5, 5.0	1.6, 2.2	1.6, 2.2	1.6, 2.2
Operating Life (Cycles)	500k	200k	300k	200k	200k, 500k, 1M	100k	100k	100k

Detector Switches (SMD and THT) Top Push

SERIES	ESE13	ESE16	ESE18	ESE22	ESE24
External Dimensions L x W x H (mm)	4.2 x 3.6 x 1.2	2.2 x 3.35 x 1.5	4.0 x 4.4 x 1.2	5.7 x 1.9 x 4.1	7.5 x 3.0 x 5.6
Travel (mm)	2.15, 3.05	01.05	1.4, 2.15	2.2	6.1
Operating Force (N)	0.3	0.25	0.3	0.3	0.35
Operating Life (Cycles)	50k	50k	50k	50k	50k



Switches

Our portfolio includes switches in all common sizes and with various IP degrees of protection, and are guaranteed to cover all standard requirements. Our switches are characterized by a large switching capacity range, long lifetime and exceptional reliability. A wide selection of supplemental actuators coupled with various terminal styles, e.g. solder, quick connect, PC board terminal and cable connections, maximize flexibility and ease application design.

In addition, we concentrate on the development and implementation of customer-specific solutions: Does the cable have to be a little bit longer? Or is a pluggable solution necessary? With our engineering know-how we guarantee flexible, on-time delivery and provide immediate, on-site technical support.



Features Sliding Switches:

- > Silent operation
- > High contact reliability
- > Long stroke
- > Contact force is independent from stroke

Features Snap-Action Switches:

- > 1FormA, 1FormB and 1FormC available
- > Broad variety of terminal setups, sizes, levers
- > Different protection grade (IP40 and IP67)
- > Various harnassing options are available

Applications:

Automotive Electronics

- > Seat detection
- > Electronic Steering Column Lock (ESCL)
- > Door contact switch
- > Electronic Parking Brake (EPB)

Health Care / Wellness

- > Bathtub entrance
- > Lady shaver
- > Massage device

Industrial Technology

- > Final position switch
- > Position recognition
- > Air compressor
- > Circuit breaker

Smart Home

- > Air conditioning
- > Heating control
- > Jalousie control

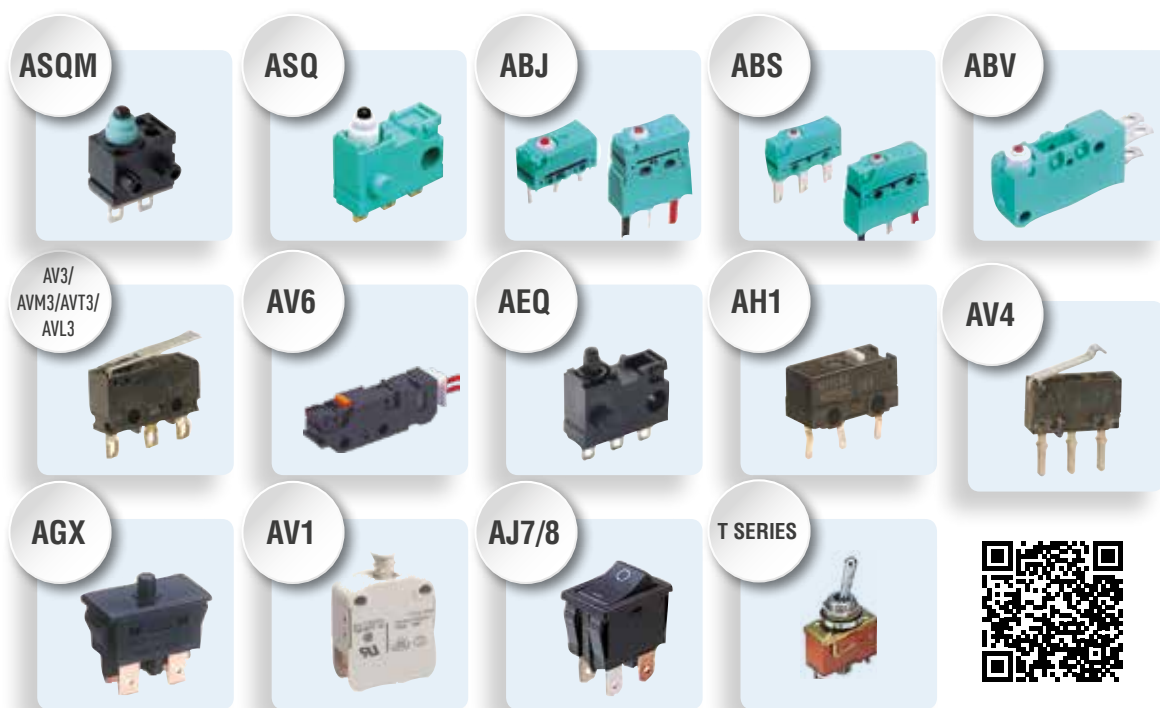
Medical Equipment

- > Electrically adjustable hospital bed
- > OP table
- > Eye diagnostic

Home and Building Security

- > Manual call point
- > Break-in detection system
- > Lock monitoring

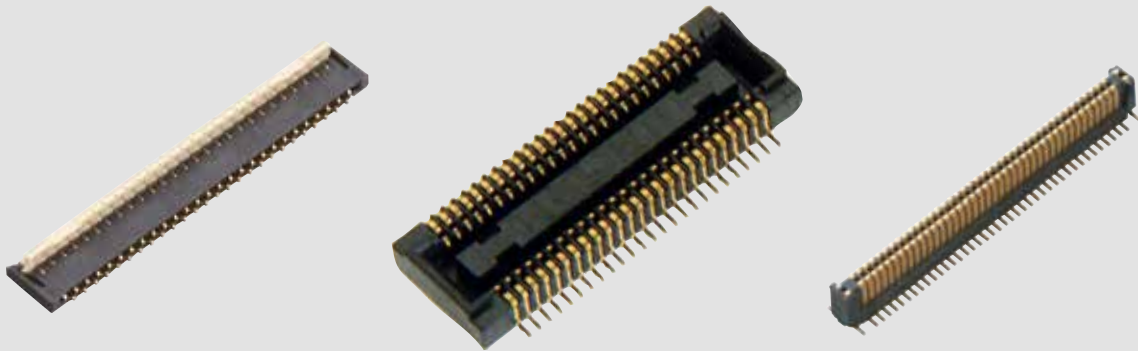
Product Range:



Connectors

Panasonic offers Narrow Pitch Board-to-Board, FPC and other specialty Connectors. The industry leading Tough Contact construction offers customers the opportunity to design-in highly reliable Connectors, even in applications with extreme environmental conditions. Engineered for durability

and long lifetime, Panasonic Tough Contact Connectors increase: tolerance to twisting and dropping resistance as well as protection against dust and foreign particles and finally resistance to corrosive gases.



Features Narrow Pitch Connectors:

- > Broad variety of mating heights from 0.6mm to 14mm
- > Solder barrier (Ni-barrier)
- > Tough contact advanced
- > Strong resistance to adverse environments and high contact reliability
- > Connectors for inspection available
- > Some products with patterns wiring available

Features FPC Connectors:

- > Low profile
- > Wiring patterns can be placed underneath the connector
- > Mechanical design freedom is achieved with double top and bottom contacts
- > Back lock types with improved lever operability
- > BW Types are offered with a higher FPC holding force
- > High durability assured with proprietary soldering terminals
- > Ni barrier with high resistance to solder creepage

Applications:



Digital Cameras



Automotive

Home and
Building Security
Equipment

Notebook

Mobile
PhonesWireless
Modules

Robotics

Office
Equipment

Product Range:



Narrow-Pitch (2 pieces)


Board-to-Board/FPC

<p>P35S</p>  <p>0.35mm pitch</p>	<p>A35P</p>  <p>0.35mm pitch</p>	<p>S35</p>  <p>0.35mm pitch</p>	<p>A35UH</p>  <p>0.35mm pitch</p>	<p>A35US</p>  <p>0.35mm pitch</p>
<p>A35S</p>  <p>0.35mm pitch</p>	<p>S35H</p>  <p>0.35mm pitch</p>	<p>A4S</p>  <p>0.4mm pitch</p>	<p>F4S</p>  <p>0.4mm pitch</p>	<p>P4SP</p>  <p>0.4mm pitch</p>
<p>P4S</p>  <p>0.4mm pitch</p>	<p>P4</p>  <p>0.4mm pitch</p>	<p>P5K/ KS</p>  <p>0.5mm pitch</p>	<p>P5KF</p>  <p>0.5mm pitch</p>	<p>Shielded Connector</p>  <p>0.5mm pitch</p>

Battery Connector






Active Optical

<p>B01 / 5A type</p>  <p>0.4mm pitch</p>	<p>B02 / 10A type</p>  <p>0.4mm pitch</p>
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<p>Vertical inserion type</p>  <p>0.5mm pitch</p>

FPC Connector (1 piece)

Board-to-Board/FPC

<p>Y2B</p>  <p>0.2mm pitch</p>	<p>Y3BL</p>  <p>0.3mm pitch</p>	<p>Y3B/ Y3BW</p>  <p>0.3mm pitch</p>	<p>Y4BH</p>  <p>0.4mm pitch</p>	<p>Y5B/ Y5BW</p>  <p>0.5mm pitch</p>
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MODULES FOR A WIRELESS WORLD

One major trend in the wireless connected world is the Internet of Everything (IoE) – connect the unconnected.

Application in the IoE are divided towards what shall be connected.

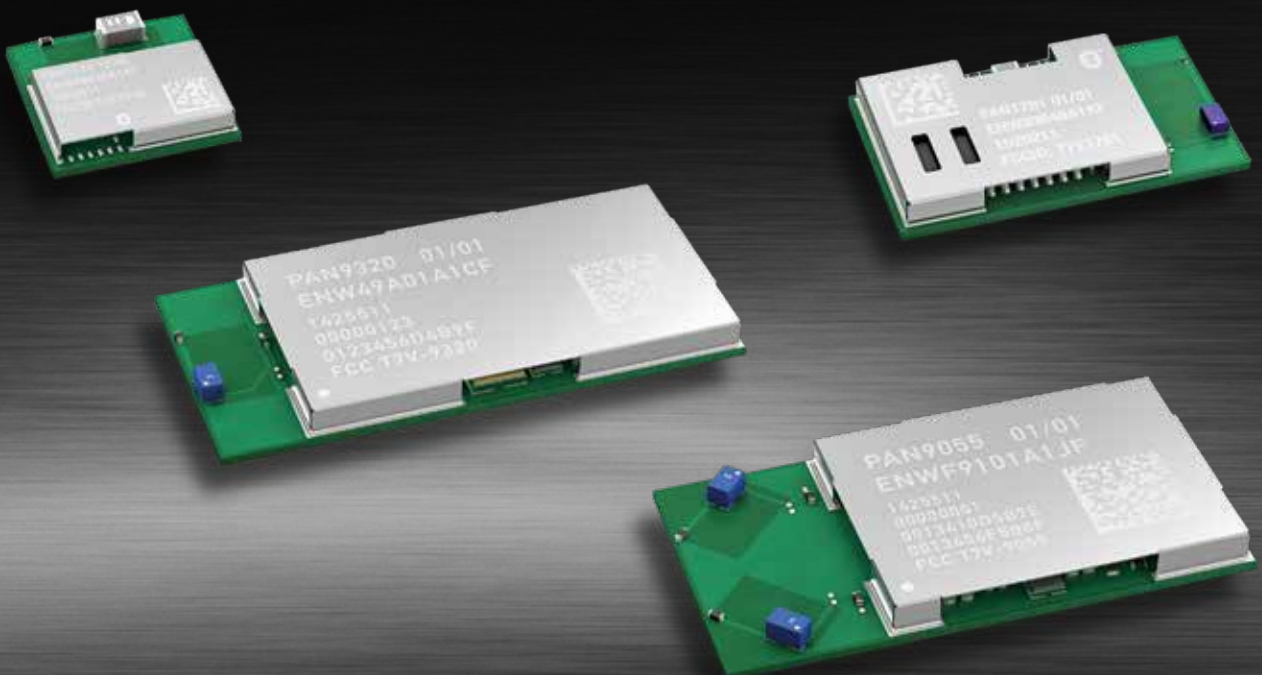
- > Person to machine
- > Machine to machine
- > Person to person

In a connected world all these will interact together.

Panasonic is manufacturing modules in the field of **Wireless Personal Area Network** (WPAN: *Bluetooth*[®], ISM and Mesh Networking), **Wireless Body Area Network** (WBAN) and expanding its portfolio to **Wireless Local Area Network** (WLAN: Wi-Fi). The modules are engineered in Germany and produced in Europe under the premise of TS16949

Products are FCC/IC/CE compliant and have *Bluetooth*[®] QDID if applicable. Different software/profile options are available

With short project deadlines, a module design enables you to be the first in the market, quickly. Panasonic evaluation kits provide an easy to use and low-cost platform for evaluating and prototyping your design





Bluetooth

Industry Leading Power Consumption

5.0

PAN1762 (ENW89853A1KF)



Long Range High Throughput

- > **Bluetooth Low Energy v5.0**
- > Tx: 11mA; Rx: 5.1mA typ.
- > Cortex®-M0
- > 128KB Flash, 128KB RAM
- > 15.6 x 8.7 x 1.9 [mm]

4.2

PAN1760A (ENW89847A3KF)



Low Power

- > Bluetooth Low Energy v4.2
- > **3.3mA** Tx/Rx peak
- > Cortex®-M0
- > 256KB Flash, 83 KB RAM
- > 15.6 x 8.7 x 1.9 [mm]

PAN1740 (ENW89846A1KF)



Small Size

- > Bluetooth Low Energy v4.2
- > 4.9mA Tx/Rx peak
- > Cortex®-M0
- > 32KB OTP, 42KB SRAM
- > **9.0 x 9.5 x 1.8 [mm]**

Dual Mode

PAN1026A (ENW89837A5KF)



Cable Replacement

- > Bluetooth Dual Mode BLE v4.2 class 2
- > **Embedded SPP + GATT**
- > 15.6 x 8.7 x 1.9 [mm]

PAN1326B/C (ENW89823AxKF)



Small Size

- > Bluetooth Dual Mode BLE v4.1/4.2 class 1.5
- > **HCI**
- > **UART, PCM, GPIO**
- > **9.0 x 9.5 x 1.8 [mm]**

Applications:



Cable replacement



Sensors and Beacons



General Industry



Smart Home



Automotive Markets



Medical

WiFi

Ready to use IoT solution



PAN9420 (ENW49C0xA6KF)



Place & Play

- > **WiFi 802.11 b/g/n 2.4GHz**
- > **Fully Embedded**
- > Websocket, MQTT Client
- > Integrated webserver
- > 29.0 x 13.5 x 2.66 [mm]

PAN9026 (ENWF920xA1EF)



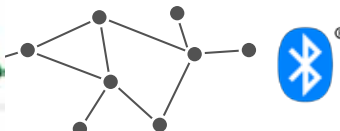
Allrounder

- > **WiFi 802.11 a/b/g/n 2.4 & 5 GHz + Bluetooth Dual Mode BLE v4.2 class 1**
- > **Linux Driver**
- > simultaneous and independent WLAN and Bluetooth operation
- > 17.5 x 10.0 x 2.6 [mm]

802.15.4 + Bluetooth Combo

No border router necessary

PAN4620 (ENWC9B01A1EF)



Combines Best of Two Worlds

- > **802.15.4 + Bluetooth Low Energy v4.2**
- > Cortex®-M0
- > 512KB Flash, 128KB SRAM
- > Single and concurrent operation of Thread® and BLE
- > 15.6 x 8.7 x 1.9 [mm]

Applications:



Cable replacement



Sensors and Beacons



General Industry



Smart Home



Automotive Markets



Medical

CAPACITORS
RESISTORS
INDUCTORS
BATTERIES
ELECTROMECHANICAL RELAYS
SEMICONDUCTOR RELAYS
SENSORS
ELECTROMECHANICAL
WIRELESS
THERMAL MANAGEMENT
SEMICONDUCTORS
CIRCUIT PROTECTION
TECHNOLOGIES

Certifications



BT SIG



Europe



USA



South Korea



Japan



Canada



*Not all certifications are available for all part numbers. Please consult Panasonic Sales Team for further information.

Product Range:

RF Technology	Name	P/N	Footprint	Module / Evaluation Kit
Bluetooth 5.0	PAN1762	ENW89853A1KF	#1 15.6 x 8.7 x 1.9 [mm]	Module
	PAN1762-USB Dongle Kit	ENW89853AWKF		Evaluation Kit
Bluetooth 4.2	PAN1760A	ENW89847A3KF	#1 15.6 x 8.7 x 1.9 [mm]	Module
	PAN1760A-USB Dongle Kit	ENW89847AWKF		Evaluation Kit
Bluetooth 4.2	PAN1740	ENW89846A1KF	#2 9.0 x 9.5 x 1.8 [mm]	Module
	PAN1740-USB Dongle Kit	ENW89846AYKF		Evaluation Kit
Dual Mode Bluetooth	PAN1026A	ENW89837A5KF	#1 15.6 x 8.7 x 1.9 [mm]	Module
	PAN1026A-USB Dongle Kit	ENW89837AUKF		Evaluation Kit
Dual Mode Bluetooth	PAN1316C	ENW89823C4KF	#3 9.0 x 9.5 x 1.8 [mm]	Module
	PAN1326B	ENW89823A3KF		Module
	PAN1326C	ENW89823A4KF		Module
	PAN1326C-EMK	ENW89819AYKF		Module
WiFi 802.11 b/g/n	PAN9420-FP-EU	ENW49C02A6KF	#4 29.0 x 13.5 x 2.66 [mm]	Module
	PAN9420-FP-US	ENW49C01A6KF		Module
	PAN9420-US-KIT	ENW49C01AYKF		Evaluation Kit
WiFi 802.11 a/b/g/n 2.4 + 5 GHz + Bluetooth Classic + Bluetooth Low Energy	PAN9026-EU	ENWF9202A1EF	#5 17.5 x 10.0 x 2.6 [mm]	Module
	PAN9026-US	ENWF9201A1EF		Module
	PAN9026-CA	ENWF9203A1EF		Module
	PAN9026-SDIO Dongle Kit	ENWF9201AYEF		Evaluation Kit
	PAN9026-IMX	ENWF9201AXEF		Evaluation Kit
802.15.4 + Bluetooth Low Energy v4.2	PAN4620	ENWC9B01A1EF	#1 15.6 x 8.7 x 1.9 [mm]	Evaluation Kit
	PAN4620-Daughter Board	ENWC9B01AQEF		Module

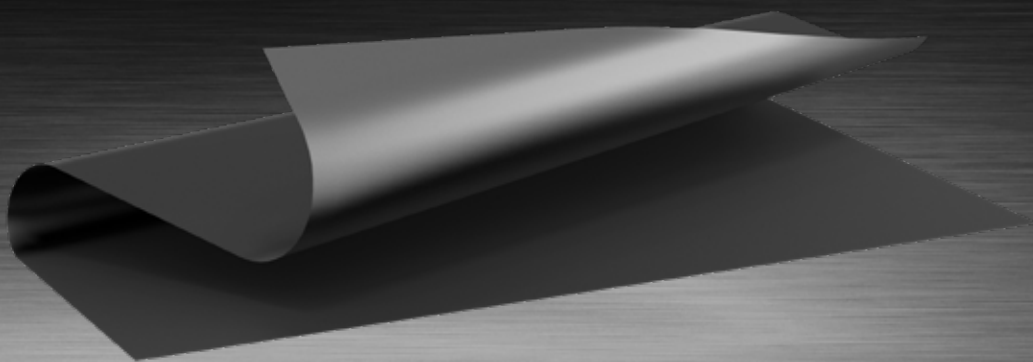
*1 Please check our website in order to see the entire batteries product range

CAPACITORS
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SEMICONDUCTOR RELAYS
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CIRCUIT PROTECTION
TECHNOLOGIES

THE FUTURE OF THERMAL MANAGEMENT

- > Flexible and easy to cut or trim
- > Withstands repeated bending
- > RoHS directive compliant

GraphiteTIM is a graphite sheet that is dedicated for use as a thermal interface material (**TIM**). High compressibility property helps to reduce contact thermal resistance due to better fitting to uneven surface compared with regular PGS (Pyrolytic Graphite Sheet). The properties are greater than that of existing TIMs



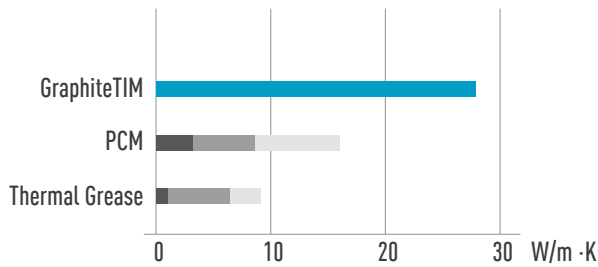
GraphiteTIM Thermal Interface Material

GraphiteTIM is a thermal interface material (TIM) designed with high compressibility characteristics to reduce contact thermal resistance between rough surfaces in extremely thin spaces. Customized cut to IGBT module footprints, GraphiteTIM contributes to long life and increased performance

of power modules by providing high thermal stability and reliability in thermal-sensitive areas. GraphiteTIM is easy to install with a one to two step process that requires a much lower labor and installation costs than thermal grease does.

Features:

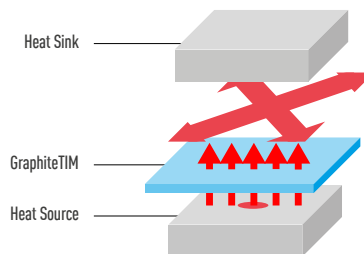
- > High compressibility property helps to reduce contact thermal resistance due to better fitting to uneven surface
- > Excellent TIM material with high workability, reliability and thermo stability compared to thermal grease and PCM



Item	Condition	Data
Thickness		200µm
Density		0.43K·cm ² /W
Compressibility	600kPa	40%
Thermal Conductivity	X-Y	400W/m·K
	Z	28W/m·K
Thermal Resistance	600kPa	0.2K·cm ² /W
Operating Temperature		-55 to +400°C
Flame Classification	UL 94	V-0

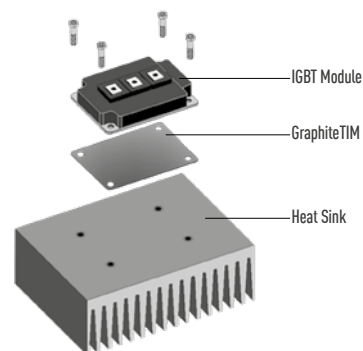
Applications:

- > Decreasing the thermal resistance and diffusing heat on the horizontal and vertical axes



Practicability

- > Specifically designed as TIM for IGBT Modules
- > Easy to install



Product Range:

- > Ready-to-use GraphiteTIM is available for major IGBT module manufacturers such like Fuji Electric, Hitachi, Infineon, Littelfuse, Mitsubishi Electric and Semikron
- > Custom sizes available upon request
- > Further products under development



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TECHNOLOGIES

ORIGINAL SOLUTIONS FOR POWER, SENSING AND COMMUNICATION

- > The quick and easy way to improve and differentiate your green electronic designs
- > Original design solutions
- > Advanced materials, beyond silicon
- > Reduce power waste
- > Integration and miniaturization

Power

- > Fast switching, low on-resistance, normally off GaN power transistors
- > Lithium battery monitoring solutions for industry and automotive

NFC

- > Easily add cloud connectivity to your products with Panasonic NFC modules and interface ICs. Worldwide standards supported

Discretes

- > Thin-wafer trench MOSFETs in innovative chip-scale packages exhibit superior efficiency and heat extraction characteristics while reducing the PCB footprint. For load switching, battery protection and battery cell-balancing

Laser Diodes

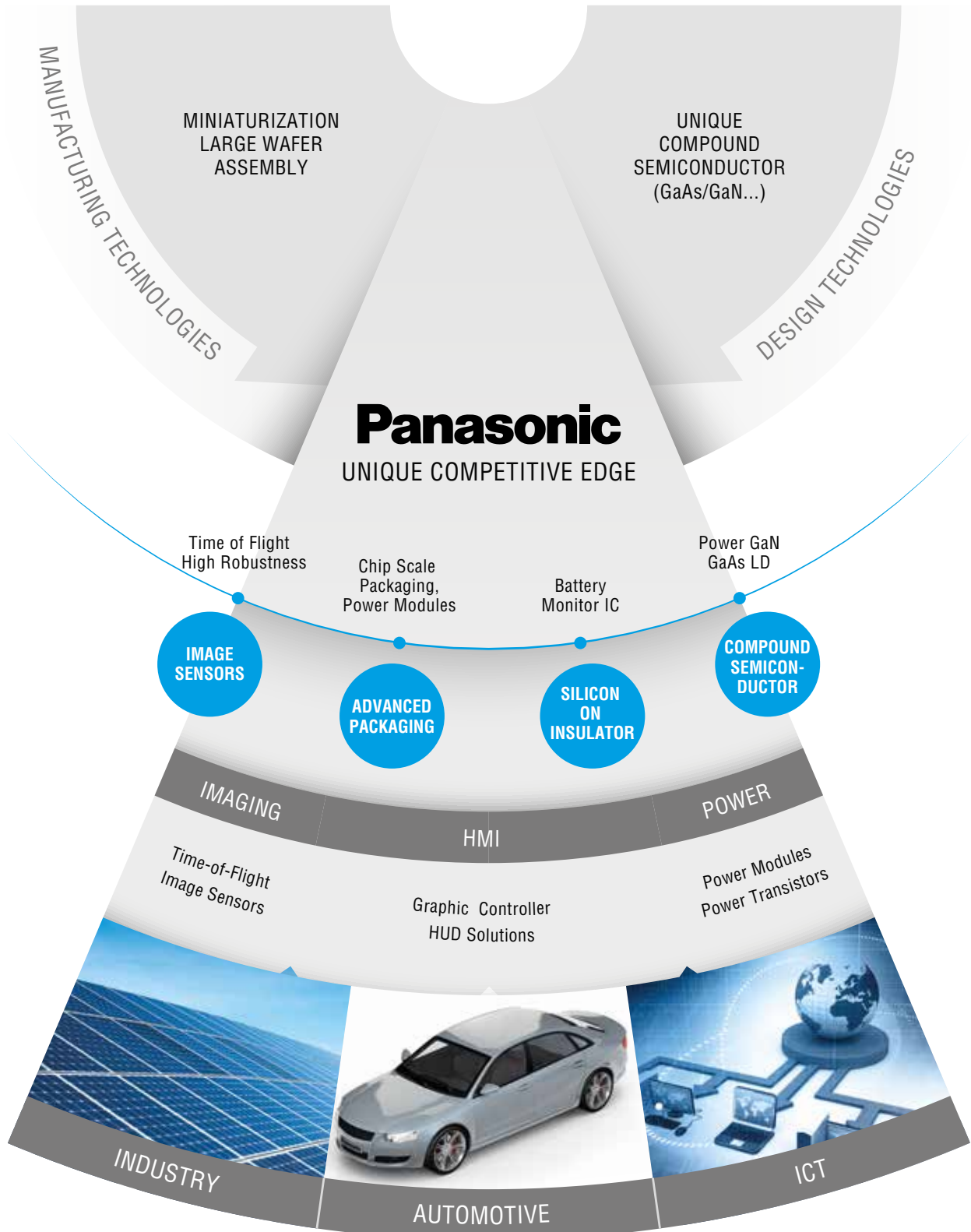
- > High reliable red, infrared and dual wavelength laser diode

Time of Flight Sensor

- > Facial Recognition, Gesture Control, Logistics, Robotics
- > For further details please contact your local Panasonic Sales representative



Competitive Edge and Focus Markets



- CAPACITORS
- RESISTORS
- INDUCTORS
- BATTERIES
- ELECTROMECHANICAL RELAYS
- SEMICONDUCTOR RELAYS
- SENSORS
- ELECTROMECHANICAL
- WIRELESS
- THERMAL MANAGEMENT
- SEMICONDUCTORS
- CIRCUIT PROTECTION
- TECHNOLOGIES

CAPACITORS

RESISTORS

INDUCTORS

BATTERIES

ELECTROMECHANICAL RELAYS

SEMICONDUCTOR RELAYS

SENSORS

ELECTROMECHANICAL

WIRELESS

THERMAL MANAGEMENT

SEMICONDUCTORS

CIRCUIT PROTECTION

TECHNOLOGIES



GaN Power Transistors

GaN Power Transistors

Series / Type	VDSS [V]	IDmax,cont [A]	Typ. Rdson [mΩ]	Package [mm]	Part Number
X-GaN	600V (750V pulse)	26	56	DFN 8x8	PGA26E07BA
X-GaN	600V (750V pulse)	13	140	DFN 8x8	PGA26E19BA

X-GaN Gate Driver IC

Series / Type	VDSS [V]	Gate current [mA]	Negative Vg [V]	Prop. Delay [ns]	Safety	Package [mm]	Part Number
High Speed Gate River	4.75~24	2.5~25	-5.5~-3 (opt.)	30	ULVO, TSD,	QFN4x4	AN34092B

X-GaN Evaluation Boards

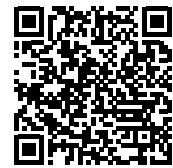
Series / Type	Purpose	Transistor(s)	Driver IC	Isolator	Pout,cont	Part Number
SMD to Trough Hole Adapter	Easy Evaluation	PGA26E07BA (x1)	AN34092B	n/a	n/a	PGA26E07BA-DB001
SMD to Trough Hole Adapter	Easy Evaluation	PGA26E19BA (x1)	AN34092B	n/a	n/a	PGA26E19BA-DB001
Chopper Board	Switching Measurement	PGA26E07BA (x1)	AN34092B	n/a	n/a	PGA26E07BA-SWEVB006
Chopper Board	Switching Measurement	PGA26E19BA (x1)	AN34092B	n/a	n/a	PGA26E19BA-SWEVB006
Half Bridge Board	Continuous P(out)	PGA26E07BA (x2)	AN34092B	Si8275DSG	400W	PGA26E07BA-SWEVB008
Half Bridge Board	Continuous P(out)	PGA26E19BA (x2)	AN34092B	Si8275DSG	800W	PGA26E19BA-SWEVB008



Laser Diodes

Series	Wavelength [nm]	CW Output Power [mW]	Pulse Output Power [mW]	Built-in Photo Diode	Package	Part Number
Red Laser Diodes	661	100	300	No	Ø5.6 CAN Package	LNCQ28PS01WW
	661	100	300	Yes	Ø5.6 CAN Package	LNCQ28MS01WW
Infrared Laser Diodes	783	200	380	No	Ø5.6 CAN Package	LNC728PS01WW
	783	200	380	Yes	Ø5.6 CAN Package	LNC728MS01WW
Dual Wavelength Laser Diodes	661 / 783	100 / 200	300 / 380	No	Ø5.6 CAN Package	LNCT28PS01WW
	661 / 783	100 / 200	300 / 380	No	1.65x3.75x5.15mm	LNCT28PF01WW
	661 / 785	100 / 200	280 / 380	No	1.2x3.75x3.55mm	LNCT22PK01WW

NFC Tags



Series	FeRAM	NFC Forum	Safely	Digital I/Fs	Package [mm]	Part Number
NFC Tag ICs	4 kbit	Type 3	N/A	UART/Sync Serial	SSOP16 (5x6.4x1.3)	MN63Y1210AF
	4 kbit	Type 3/4B	AES128	N/A (only IRQ)	SON8 (2x2x0.5)	MN63Y1212-E1
	4 kbit	Type 3/4B	AES128	I2C (100 kbps)	SON8 (2x2x0.5)	MN63Y1213-E1
	8 kbit	Type 3/4A/4B	Password	I2C (400 kbps)	SON8 (2x2x0.5)	MN63Y1221-E1
NFC Tag Modules	4 kbit	Type 3/4B	AES128	N/A (only IRQ)	25x11.5x0.85	MN63Y3212N1
	4 kbit	Type 3/4B	AES128	N/A	Ø30x3	MN63Y3212N4
	4 kbit	Type 3/4B	AES128	N/A	30x15x2.4	MN63Y3212N5
	4 kbit	Type 3/4B	AES128	I2C (100 kbps)	30x9x1.4	MN63Y3213N1
	8 kbit	Type 3/4A/4B	Password	I2C (400 kbps)	40x30x1.35	MN63Y3214N1



MOSFETs

Series	VDS/VSS [V]	VGS[V]	ID/IS [A]	Rdson [mΩ] @ 4.5V Typ / Max	Package [mm]	Part Number
MOSFETs for Load Switch	12	8	3.4	22 / 30	CSP [0.8x0.8x0.1]	FK4B01100L
	12	8	2.3	47 / 64	CSP [0.6x0.6x0.1]	FK4B01110L
	12	8	3.9	14 / 24	CSP [1x1x0.1]	FK4B01120L
	-12	8	-2.2	57 / 74	CSP [0.8x0.8x0.1]	FJ4B01100L
	-12	8	-1.4	118 / 153	CSP [0.6x0.6x0.1]	FJ4B01110L
	-12	8	-2.6	34 / 51	CSP [1x1x0.1]	FJ4B01120L
	-12	8	-4.0	19 / 23	CSP [1.2x1.2x0.1]	FJ4B01240L
MOSFETs for Lithium-ion Battery Protection	12	8	1.5	70 / 95	CSP [0.6x0.6x0.1]	FC4B21300L
	12	8	2.5	36 / 48	CSP [0.8x0.8x0.1]	FC4B21320L
	12	8	8	4.5 / 5.7	CSP [2.67x1.67x0.1]	FC6B21100L
	12	8	13.5	2.1 / 2.75	CSP [2.98x1.49x0.11]	FCAB21490L
	12	8	12	2.1 / 2.75	CSP [3.05x1.77x0.11]	FCAB21350L
	12	8	11	2.3 / 3.1	CSP [3.54x1.57x0.1]	FCAB21500L
	12	8	16	1.45 / 2	CSP [3.54x1.77x0.11]	FCAB21520L
	12	8	12	2 / 2.65	CSP [3.54x1.77x0.11]	FCAB21260L
	12	10.5	8	4 / 5.1	CSP [2.14x1.67x0.11]	FC6B21150L
	12	12	2.9	27 / 37	CSP [1.11x1.11x0.1]	FC4B21080L
	20	8	5	9.4 / 11.9	CSP [1.74x1.74x0.11]	FC4B22180L
	20	8	8	4.7 / 6.2	CSP [2.65x1.67x0.11]	FC6B22160L
	20	12	4	17 / 22	CSP [1.29x1.29x0.1]	FC4B22270L
	20	12	6.2	7.9 / 10.3	CSP [2.02x1.33x0.11]	FC6B22500L
	20	12	8.5	5 / 6.5	CSP [2.34x1.56x0.11]	FCAB22510L
	20	12	10	3.1 / 4.2	CSP [3.05x1.77x0.11]	FCAB22370L
	24	12	3.5	17.5 / 22	CSP [1.67x1.67x0.1]	FC4B22070L
24	12	6	8.2 / 11.2	CSP [2.56x1.67x0.1]	FC6B22100L	
24	12	13	8.2 / 11.2	CSP [2.56x1.67x0.1]	FC6B22220L	
24	12	6	8.5 / 11.5	CSP [2.56x1.67x0.1]	FC6B22090L	
MOSFETs for Automotive Battery Cell Balancing	30	+5, -0.5	1.5	200 / 280	WSMini [2.1x2x0.7]	FK6K0335ZL
	30	+5, -0.5	1.5	200 / 280	WSMini [2.1x2x0.7]	FC6K3339ZL
	-30	-5, +0.5	-1.4	280 / 350	WSMini [2.1x2x0.7]	FJ6K0338ZL
	-30	-5, +0.5	-1.4	280 / 350	WSMini [2.1x2x0.7]	FA6K3342ZL

CAPACITORS
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CIRCUIT PROTECTION
TECHNOLOGIES

OUR PROTECTION FOR AUTOMOTIVE APPLICATION

Temperature Voltage Protection

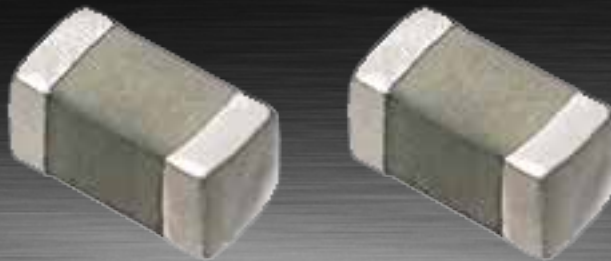
- > AEC-Q200 Qualified> Compact size
- > Wide operating temperature range
- > High stability and reliability

Multilayer NTC Thermistors

- > Supporting Automotive grade that have High Heat Resistance (150 °C), High Accuracy and High Reliability
- > Contribute to miniaturize and lighten design of ECU

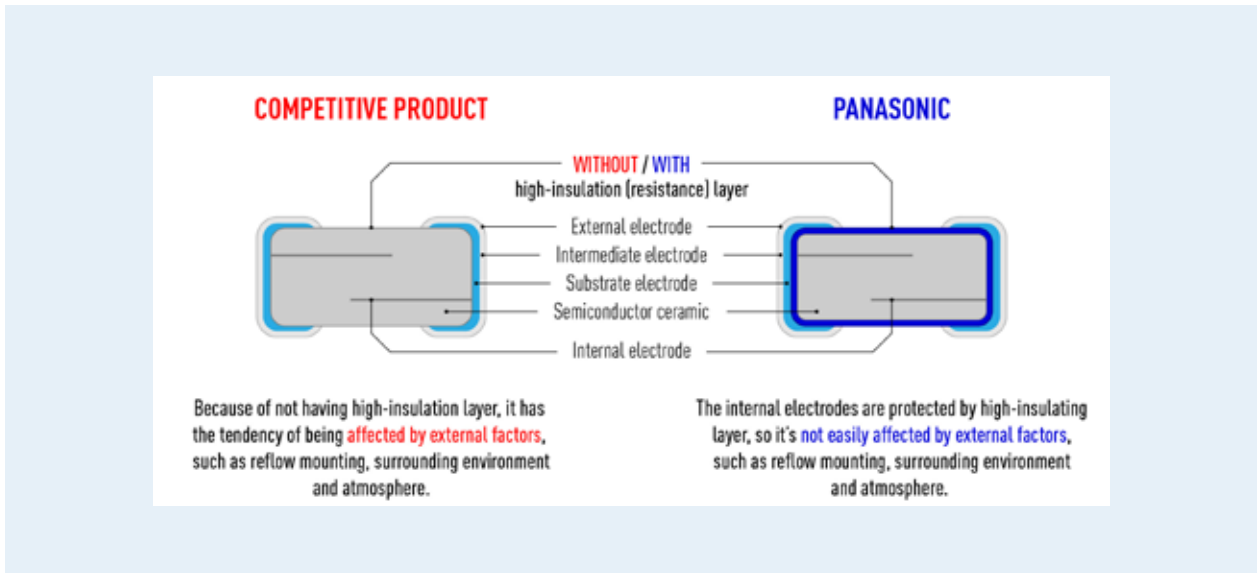
Multilayer Varistors

- > Excellent ESD suppression effect due to original advanced material technology
- > High durability performance against ESD voltage and Surge current
- > Replaceable from 2pcs Zener Diodes to 1 pcs Varistor due to having no polarity (bipolar)



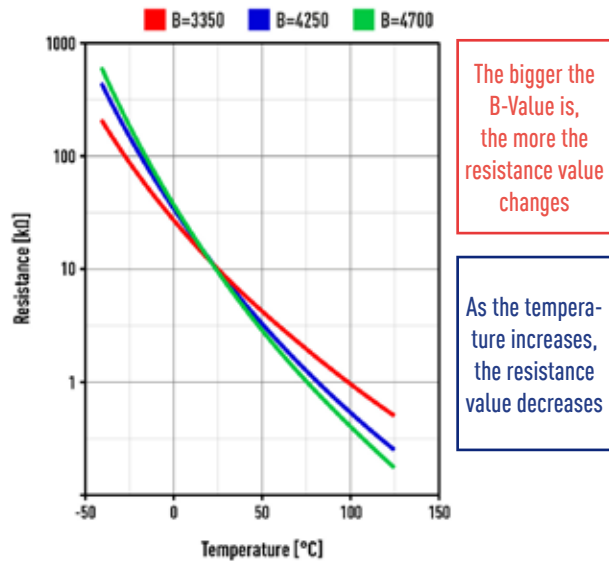
Multilayer NTC Thermistor

Highly Reliable Multilayer with Wide Lineup



Features:

- > Surface Mount Device (0402, 0603)
- > Enable high accuracy temperture sensing at wide temperarure range
- > Highly reliable multilayer and monolithic struture
- > Wide operating temperature range (-40 to 150°C)
- > Multilayer structure enabled designing various resistance value



Product Range:

Size	Reistance Value	Part Number	Resistance Tolerance	B Value (25/50)	B Value (25/85)
0402 (10059)	10kΩ	ERTJ0EG103□M	±1,2,3,5%	3380K±1%	3435K±1%
	47kΩ	ERTJ0EP473□M	±1,2,3,5%	4050K±1%	(4100K)
	100kΩ	ERTJ0ER104□M	±1,2,3,5%	4250K±1%	(4300K)
	100kΩ	ERTJ0ET104□M	±1,2,3,5%	4485K±1%	(4550K)
	100kΩ	ERTJ0EV104□M	±1,2,3,5%	4700K±1%	(4750K)
	470kΩ	ERTJ0EV474□M	±1,2,3,5%	4700K±1%	(4750K)
0603 (1608)	10kΩ	ERTJ1VG103□M	±1,2,3,5%	3380±1%	3435K±1%
	47kΩ	ERTJ1VP473□M	±1,2,3,5%	4100K±1%	(4150K)
	100kΩ	ERTJ1VR10□M4	±1,2,3,5%	4200K±1	(4250K)
	100kΩ	ERTJ1VV104□M	±1,2,3,5%	4700K±1	(4/50K)
	220kΩ	ERTJ1VT224□M	±1,2,3,5%	4485K±1	(4550K)

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SEMICONDUCTOR RELAYS

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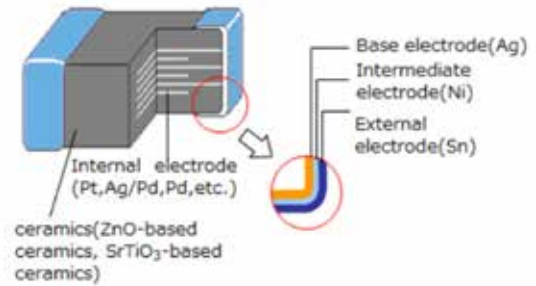
Multilayer Varistor

Voltage Nonlinear Resistor/Voltage-dependent Resistor

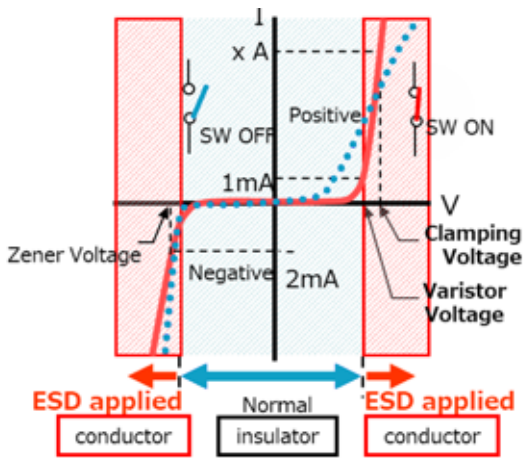
Features:

- > Surface Mount Device (0402, 0603)
- > Excellent ESD suppression effect due to original advanced material technology
- > Having large electrostatic resistance meeting IEC61000-4-2, ISO10605
- > Replaceable from 2pcs Zener Diodes to 1 pcs Varistor due to having no polarity (bipolar)
- > Wide range of products is available in 0402 and 0603 case size, meet the various needs from application

Construction



Applications:



Before	After
Zener Diode	Multilayer Varistors
2.5x1.25mm	1.6x0.8mm
	P/N: EZJZ1V180JM
	<ul style="list-style-type: none"> > Mounting area: Reduced 71% > Number of parts: Reduced 50% > Part weight: Reduced about 50%

Product Range:

Size	Part No.	Maximum at lowable voltage DC (V)	Nominal Varistor Voltage at 1mA (V)	Capacitance (pF)		Maximum Peak Current at 8/20µs, 2 times (A)	Maximum ESD	
				at 1M Hz	at 1k Hz		IEC61000-4-2 150p F / 330Ω	ISO 10605 330p F / 2kΩ
0402 /EIA	EZJP0V180HM	11	18	150 max. (120 typ.)	140 typ.	10	Contact discharge 8k V	Contact diicharge 25k V
	EZJP0V220HM	13	22	150 max. (100 typ.)	116 typ.	10		
	EZJP0V270GM	18	27	100 max. (85 typ.)	100 typ.	10		
	EZJP0V270EM	18	27	47 max. (33 typ.)	37 typ.	4		
	EZJP0V270RM	18	27	20 max. (15 typ.)	16.5 typ.	2		
	EZJP0V270BM	18	27	10 max. (8 typ.)	10 typ.	-		
	EZJP0V330GM	25	33	100 max. (85 typ.)	100 typ.	10		
	EZJP0V420WM	30	42	56max. (40 typ.)	45 typ.	6		
0603 /EIA	EZJP0V650DM	40	65	27 max. (22 typ.)	33 typ.	2		
	EZJP1V180JM	11	18	220 max. (180 typ.)	210 typ.	20		
	EZJP1V220JM	13	22	220 max. (160 typ.)	185 typ.	10		
	EZJP1V270GM	18	27	100 max. (85 typ.)	100 typ.	10		
	EZJP1V270EM	18	27	47 max. (33 typ.)	37 typ.	5		
	EZJP1V270RM	18	27	20 max. (15 typ.)	16.5 typ.	2		
	EZJP1V330GM	25	33	100 max. (85 typ.)	100 typ.	10		
	EZJP1V420FM	30	42	68 max. (55 typ.)	63 typ.	8		
	EZJP1V650DM	40	65	27 max. (22 typ.)	33 typ.	2		
	EZJZ1V180JM	11	18	220 max. (180 typ.)	210 typ.	20		
	EZJZ1V220JM	13	22	220 max. (160 typ.)	185 typ.	20		
	EZJZ1V270GM	16	27	100 max. (85 typ.)	100 typ.	20		
	EZJZ1V330GM	26	33	100 max. (85 typ.)	100 typ.	20		
	EZJZ1V420FM	30	42	68 max. (55 typ.)	63 typ.	15		
EZJZ1V650DM	40	65	27 max. (22 typ.)	33 typ.	5			

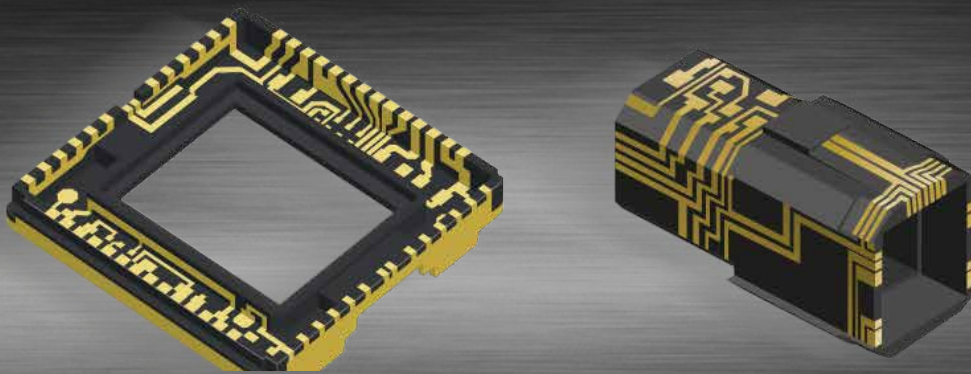


GETTING SMALLER, THINNER, AND MORE FUNCTIONALLY ADVANCED

- > Function integration (Mechanical component and Electrical circuit)
- > Miniaturization of components / devices
- > Reduction of in the number of required components on FPC, PCB, etc.
- > Reduction in the number of required man-hours for assembly

MID (Molded Interconnect Device)

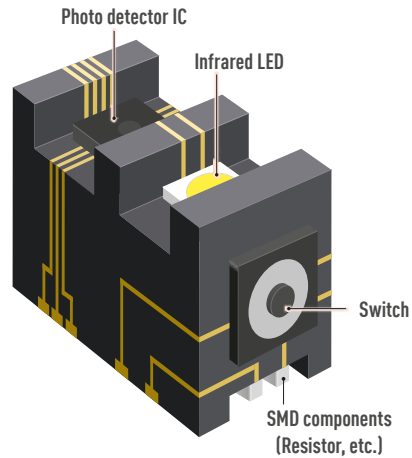
Three-dimensional injection molded circuit components use MID (Molded Interconnect Device) Technology. Further advancements use proprietary surface activation technology and laser patterning. The result is a 3D circuit device with a fine circuit pattern for mounting bare chips. Custom shapes and patterns are produced on a order request basis



MIPTEC

Enabling forms beyond the reach of conventional methods, Panasonic's MID technology MIPTEC paves the way to new devices

Through the advancement of MID technology using our proprietary surface activation technology and laser patterning, among others, we have achieved 3D packaging devices that make fine patterning and bare chip mounting a possibility. In various fields, contributes towards further miniaturization of parts, feature advancement, and improved efficiency.



Product Range:



Applications:

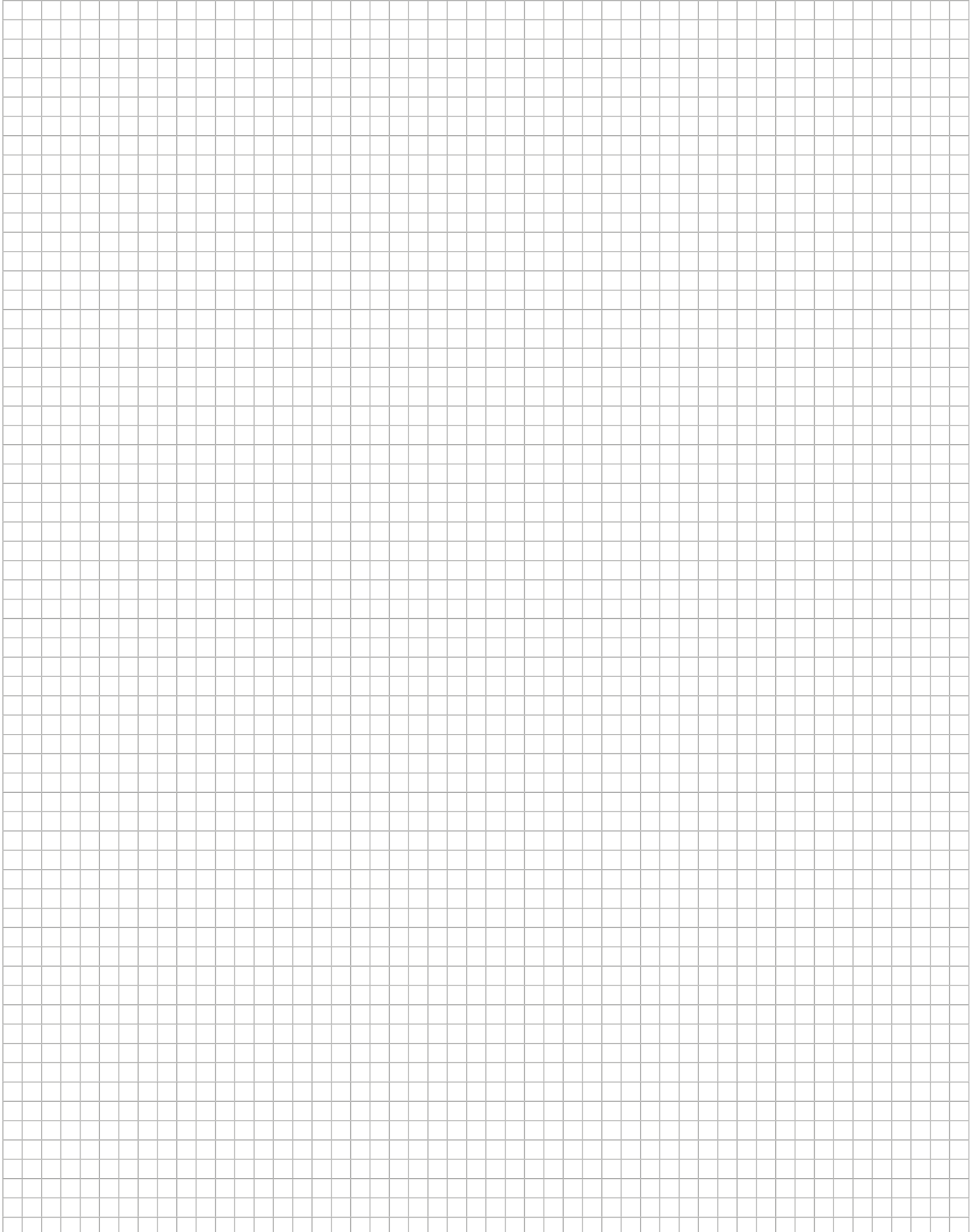


Industrial Equipment Medical Mobile Smart Appliance Measurement



CAPACITORS
RESISTORS
INDUCTORS
BATTERIES
ELECTROMECHANICAL RELAYS
SEMICONDUCTOR RELAYS
SENSORS
ELECTROMECHANICAL
WIRELESS
THERMAL MANAGEMENT
SEMICONDUCTORS
CIRCUIT PROTECTION
TECHNOLOGIES

Notes



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