

**Panasonic**  
INDUSTRY

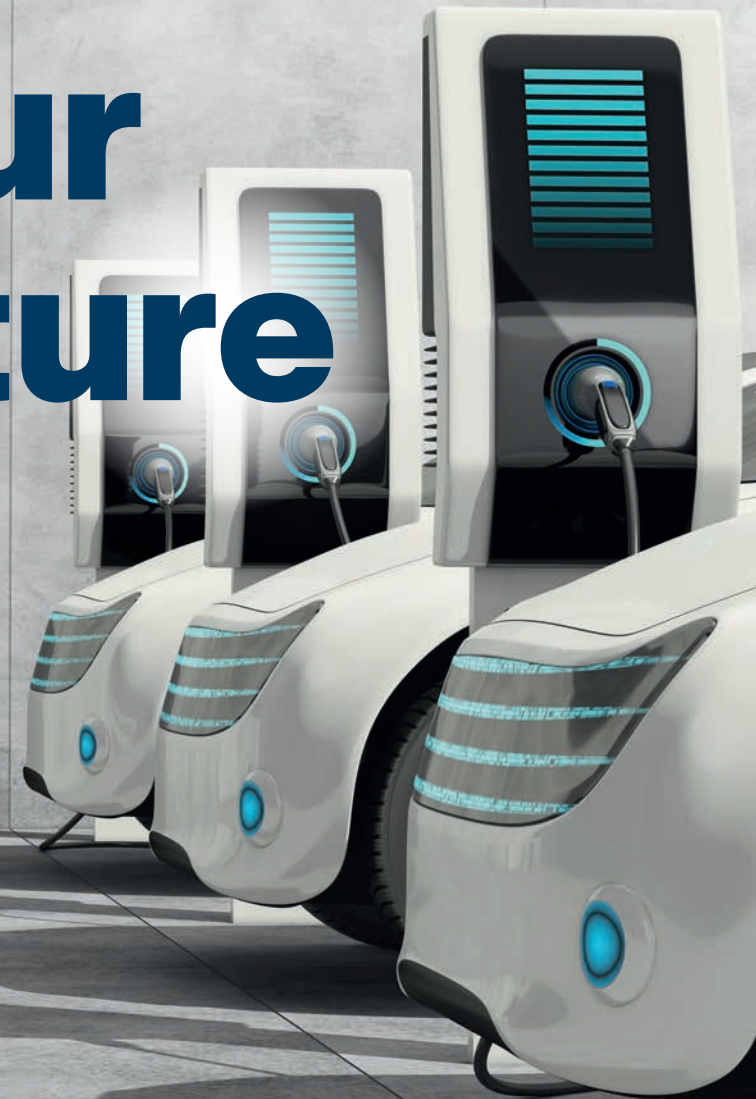
## EV Charging Solutions

Wireless modules  
Passive & Emecch Components  
Thermal Management



**Your Committed Enabler**

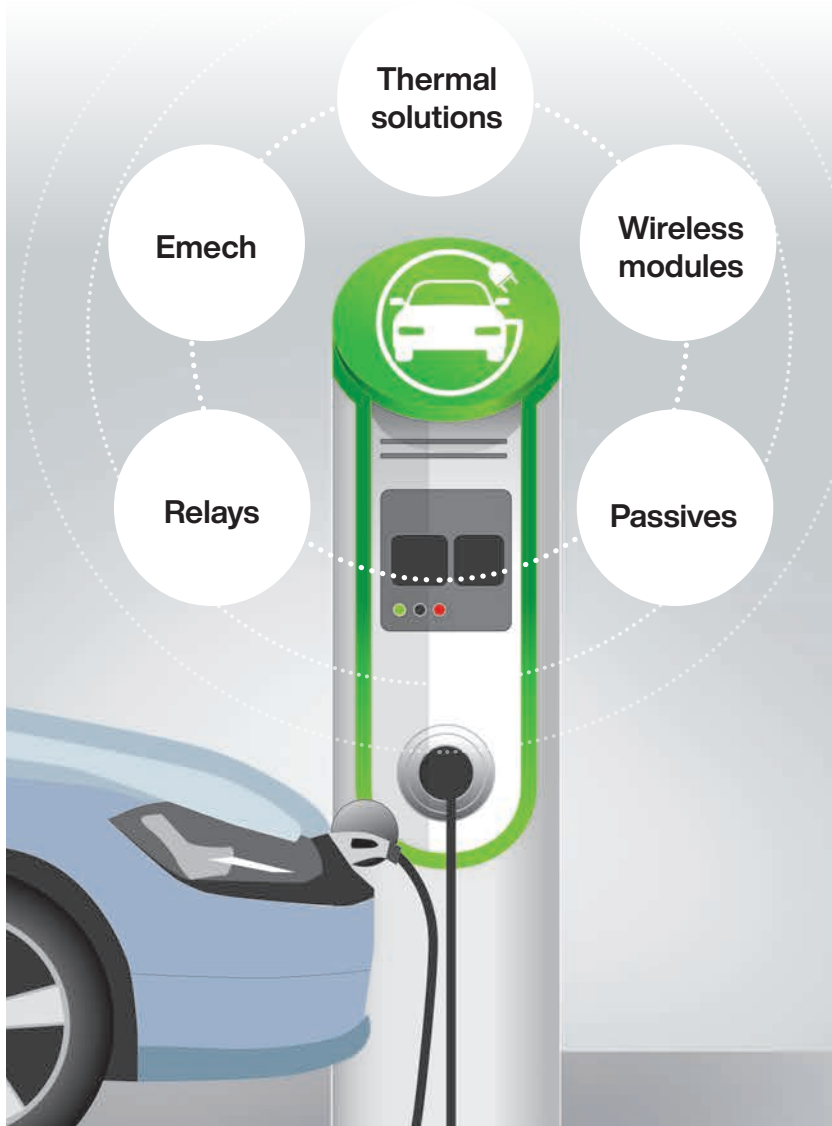
# IN Your Future



# PANASONIC EV CHARGING SOLUTIONS

## EV Charging Types and Requirements


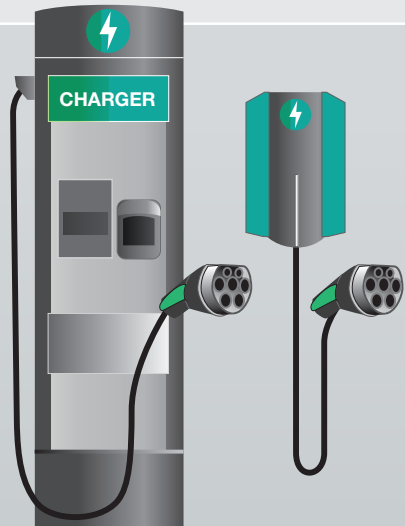

Our mission: **“**  
**”** Zero failure



### Safe, fast & reliable charging – the key driver for successful e-mobility

E-mobility is a core DNA of Panasonic. For decades we develop and supply solutions for all kind of xEVs. To succeed in the mass market, the new technology must be reliable. Customers will not accept failures, neither during driving nor during charging.

**This zero failure mindset motivates us to engineer best in class components & devices for safe, fast & reliable charging technology.**

<b>Mode 2</b> AC charging cable	<b>Mode 3</b> AC wallbox or charging station – AC to EV	<b>Mode 4</b> DC wallbox or charging station – DC to EV
Input: 120V AC 1-phase Output: 240V~480V AC ~3kW	Input: 208~240V AC 1-phase Output: 240V~480V AC ~20kW	Input: 380~600V AC 3-phase Output: 150~1000V - Up to 400kW
		

# WIRELESS MODULES

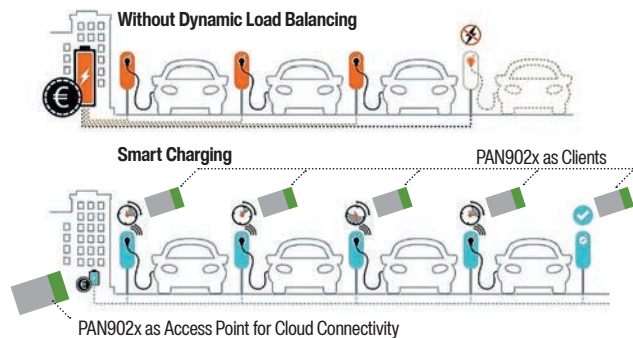
## Combination of Wi-Fi and Bluetooth®

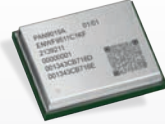


The PAN902x Series perfectly connects the charging station with mobile devices or a cloud.

For commissioning and displaying usage data by a smartphone or a similar handset, wireless modules serve as access points or clients. With its combination of Wi-Fi and Bluetooth® function, the PAN902x Series provides the highest flexibility for connectivity, depending on which data rates or ranges are required for an EV charger application.

The PAN9028, a dual band Wi-Fi 5 radio module with additional Bluetooth and its integrated antenna is specifically designed for highly integrated and cost effective applications, whereas the Wi-Fi 6 & Bluetooth combo module PAN9019 is targeted for more sophisticated use cases where higher data rates (802.11ax) are needed. With the PAN9019A, you can connect your Chargers to a mesh network via Thread and Zigbee thanks to the additional 802.15.4 radio. The PAN902x can act as a client to connect the charging station to a network, in order to upload data to a cloud.

### Load Balancing



	PAN9019 / PAN9019A	PAN9028	PAN9026
			
Chipset	IW611 / IW612	88W8987	88W8977
RF Category	WiFi 6 & Bluetooth 5.2 (BR, EDR, LE) (& 802.15.4)	WiFi 5 & Bluetooth 5.2 (BR, EDR, LE)	WiFi 4 & Bluetooth 5.0 (BR, EDR, LE)
Antenna	Bottom Pad	Chip / Bottom Pad	Chip
Size (mm)	15.3 x 12.0 x 2.5	24.0 x 12.0 x 2.8	17.5 x 10.0 x 2.6
Temperature Range (°C)	-40 to +85	-30 to +85	-30 to +85

Private Wallbox	Professional DC Charging Station
<b>Usage data</b>	
Uploading usage data to a cloud	Uploading commercial data to a cloud
<b>Monitoring</b>	
Tracking of vehicle's state of charge or storage capacity	Tracking of vehicle's state of charge or storage capacity, occupancy and expected availability of the various charging stations
<b>Maintenance</b>	
No technical staff needed locally for maintenance	On site technician can access maintenance data remotely, thus saving material costs
<b>Smart charging</b>	
No smart charging needed	Load Balancing by taking storage capacity, occupancy and vehicles' state of charges into account thus saving you from costs of expensive grid upgrades.

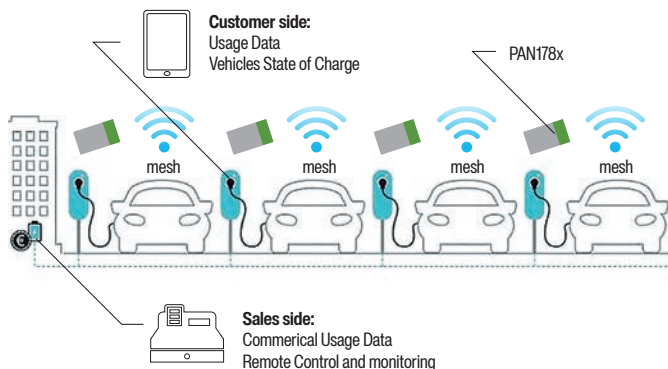
# WIRELESS MODULES

## Bluetooth® LE Solution

Just integrate PAN178x series “” access charging station data.

PAN178x are Bluetooth® 5.3 Low Energy modules with additional 802.15.4 radio based on Nordic Semiconductor chipsets, particularly suitable for low-power transmission of smaller data rates. The wireless modules differ only in memory size and number of GPIOs to meet various application requirements.

In commercial DC charging stations, the PAN178x modules can be integrated into a meshed network, which gives the operator an overview of the individual charging stations in terms of occupation and thus also allow dynamic load balancing. The PAN1780 in particular offers full flexibility to choose the appropriate mesh protocol, such as Thread, Zigbee or Bluetooth Mesh.

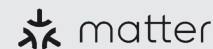


PAN178x



- » IP Core: Cortex M4(F) with 64 MHz
- » Temperature Range: -40 to 85
- » Size: 15.6x8.7x2mm
- » Up to 48 General Purpose I/Os (depending on module version)

### Supported mesh protocols:



PAN1781	PAN1782	PAN1780
256 kB Flash 32 kB RAM 64 MHz	512 kB Flash 128 kB RAM 64 MHz	1 MB Flash 256 kB RAM 64 MHz

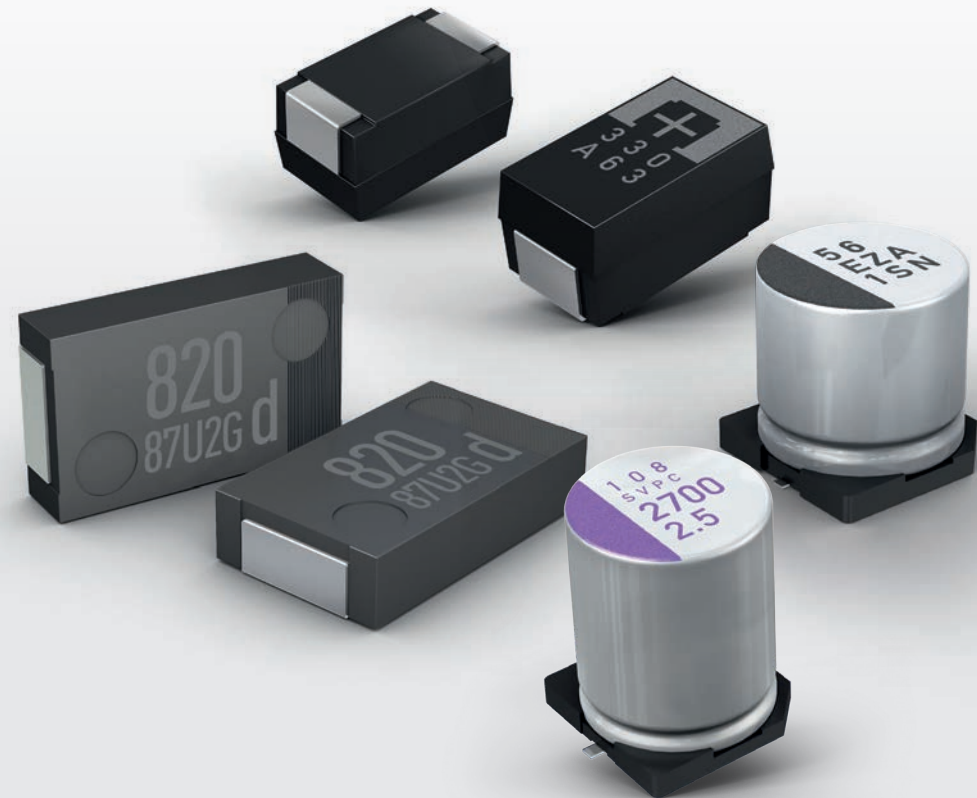
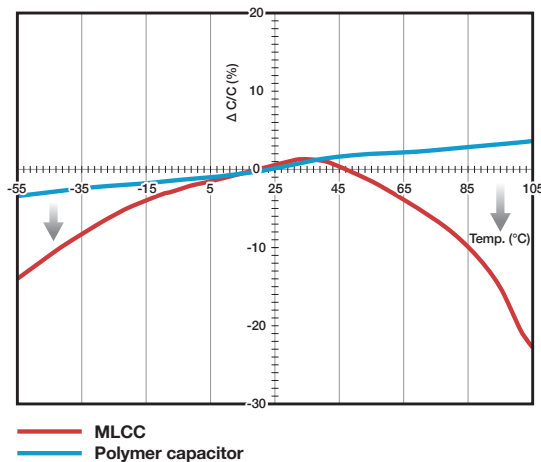
# POLYMER CAPACITORS

Perfect for AC/DC and DC/DC Converters

Tough against temperature fluctuations, perfect for outdoor installations.

These advanced capacitors use conductive polymers to form the electrolyte, or the conductive polymers can be used in conjunction with a liquid electrolyte in a design known as a hybrid capacitor. Either way, these polymer-based capacitors fulfill the high endurance and temperature requirements of EV charging stations. In addition, due to polymerization and having high conductivity, such applications benefit from a very low ESR which is needed for power stabilization.

Temperature Range



- » Ultra-low ESR for power stabilization (down to 3m $\Omega$ )
- » Long endurance at high temperature, 20,000h @105°
- » High reliability for outdoor usage
- » AEC-Q200 compliant
- » High temperature resistance up to 150°C

# FILM CAPACITORS

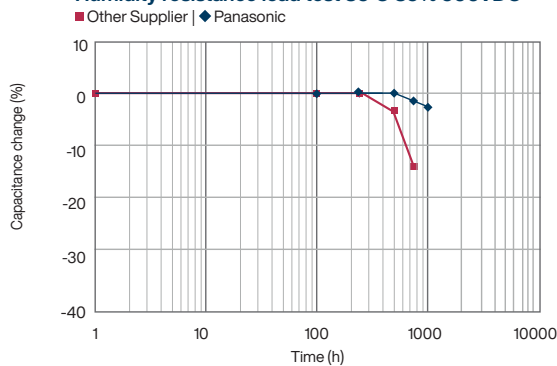
Automotive Film caps up to 125 degree C integrated with fuse function for higher safety

Zero risk for safety and high resistance against moisture.

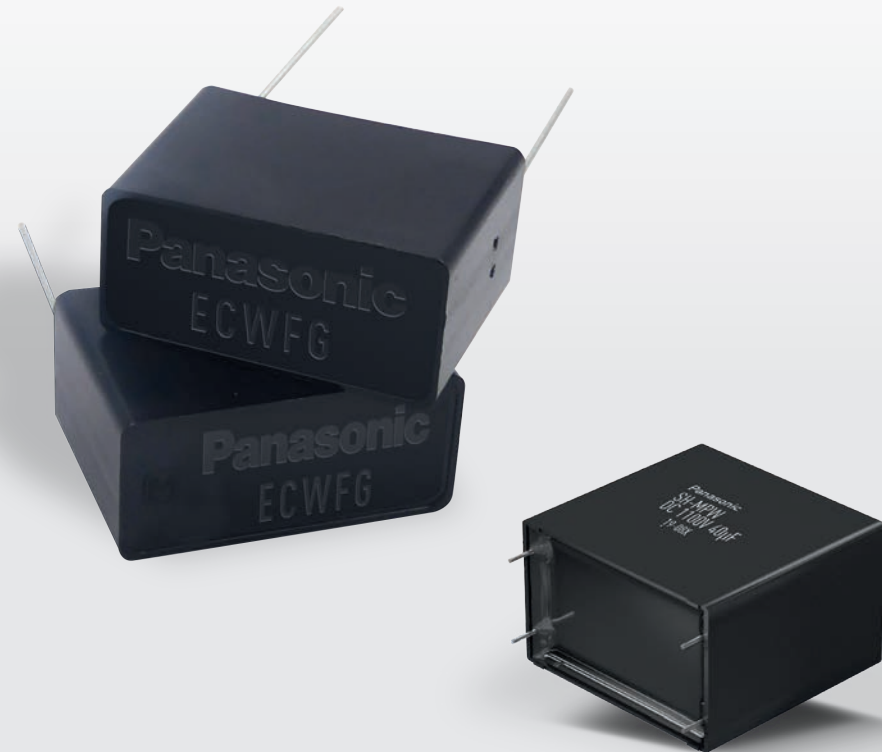
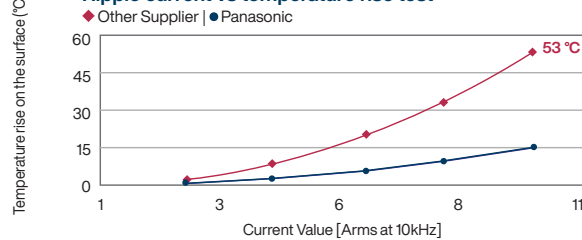
The outstanding feature of the film capacitor is the high ripple current (up to 30A) along with high humidity resistance. This is achieved by using special vacuum controlled sealing technology which prohibits the moisture to settle down on the film thereby making panasonic film caps more reliable.

In addition to this Panasonic's Film Capacitors also have the original in-house patterned metalization process which serves as a fuse function for extra added safety.

Humidity resistance load test 85°C 85% 500VDC



Ripple current vs temperature rise test



- » DC Film Capacitors: ECWFG/EZPV
- » Rated Voltage: Up to 1100VDC
- » Temperature: Up to 125°C
- » Capacitance: Up to 110uF
- » Self healing + fuse function for higher safety standards
- » High moisture resistance 85%, 85°C, 1000h
- » Flame retardant plastic casing

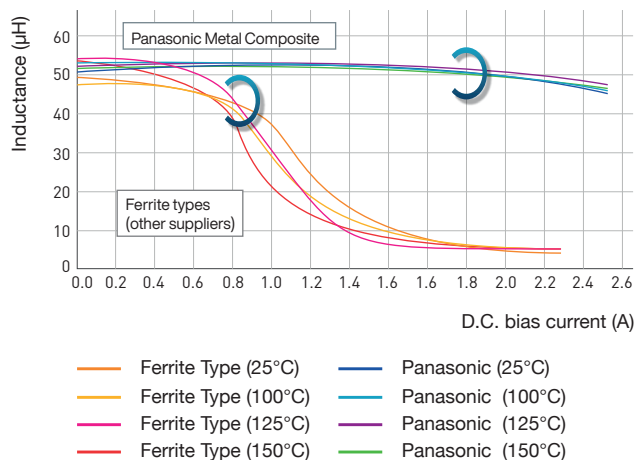
# POWER INDUCTORS

## Metal Composite Magnetic Core Technology for Outstanding Reliability

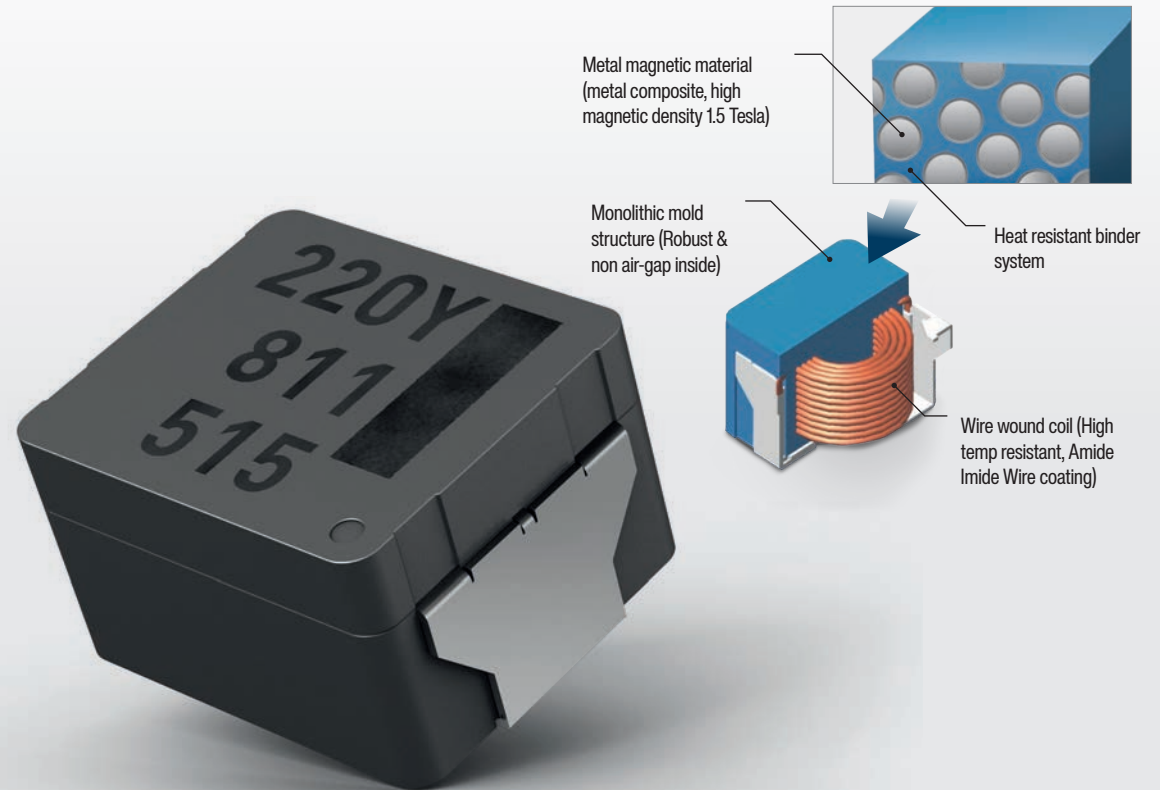
Space saving high quality design with zero failures.

ETQP power inductors series give best-in class reliability for the automotive industry market. The monolithic core and innovative terminal structure guarantee high resistance against thermal stress and vibrations. Unique is the magnetic core material which provides none hard saturation characteristics against D.C. bias current for high peak current capability, and also can reduce D.C. Resistance and A.C. Resistance for low power loss.

This in turn supports higher power efficiency in DC-DC converters and input filter circuits, as well as a possible space reduction of up to 50% against ferrite inductors.



Inductance is stable during lifetime, regardless temperature and current values



- » Variety of inductance range from 0.33µH to 100µH
- » Package size from 5x5mm to 12x12mm
- » Up to 85A saturation, 53A rated / 0.33µH
- » Operation temp. -55°C to +155°C, up to +180°C in short time
- » Up to 50% space saving vs ferrite
- » Vibration resistance from 10G to 30G
- » AEC-Q200 compliant
- » Operations voltage up to 70 V

# CHIP RESISTORS

## Enhancing Solder Joint Reliability by Soft Termination

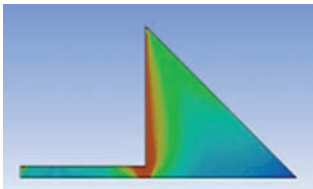
Our mission: Zero “  
” solder joint cracks

Panasonic offers a wide range of resistors, designed and tested to be used in a variety of applications. All of Panasonic resistors use soft termination technology. This means that by using a soft resin, the solder joint experiences less stress in temperature cycles and therefore, ensures minimum risk of solder joint cracks.

### EV Charging – recommended series

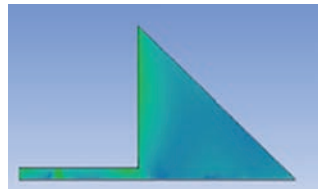
- » High temperature thick film chip resistors (ERJH series)
- » Anti-surge thick film chip resistors (ERJP series)
- » High power wide terminal thick film chip resistors (ERJB and ERJD series)

#### Without soft resin



Risk of solder crack because of high stress

#### With soft resin (Panasonic)



Less risk of crack because of soft termination → high solder-joint reliability



- » Soft termination technology for highest solder-joint reliability
- » Resistance values from 1 mΩ to 10 MΩ
- » High power series available up to 2W
- » High temperature up to 175°C, 100% rated power up to 105°C
- » Anti-pulse and anti-sulfur types available
- » AEC-Q200, RoHS, and REACH compliant



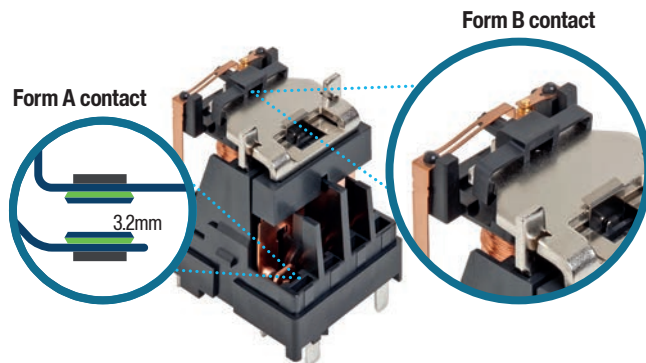
# RELAYS AS A MAIN SWITCHING ELEMENT

Handle up to 22kW of Charging Power Directly on the PCB

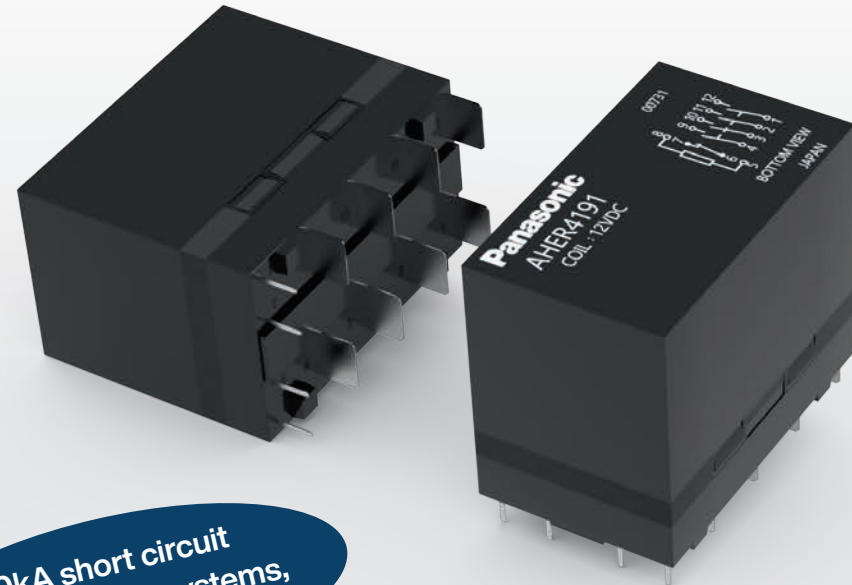
Get ready for maximum charging power and use HE-R relay for 3 phase systems for direct PCB mounting.

AC switching elements are a crucial part of safety and protection function in charging stations and cables. Key parts of the HE line-up are the 35A HE-S or 80A HE-R relay with two contacts and 40A HE-R relay with four contacts. All types are available with a mirror contact according to IEC 60947-1 and VDE / UL approvals. They can be used in the latest generation of wallboxes which fulfill either IEC 61851-1 or the recent IEC 62955 norm.

Feedback contact construction: HE-S relay



With a gap between normally open contacts of 3.2mm, the HE-S exceeds mandatory regulations.



10kA short circuit current for 32A systems, VDE approved

Series	HE-S	HE-R	
Switching current	35A AC	40A AC	80A AC
Contact configuration	2a, 2a1b	4a, 4a1b	2a, 2a1b
Dimensions	30x36x40mm	35x58x47mm	37x60x47mm
Holding power*	170mW	490mW	
Contact gap	3.2mm	3.6mm	

# RELAYS FOR CONTROL SIDE

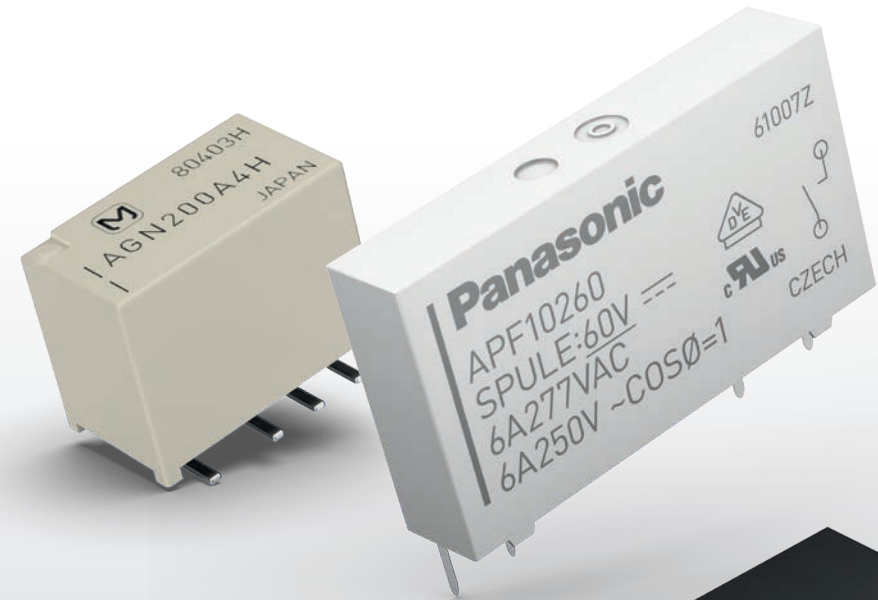
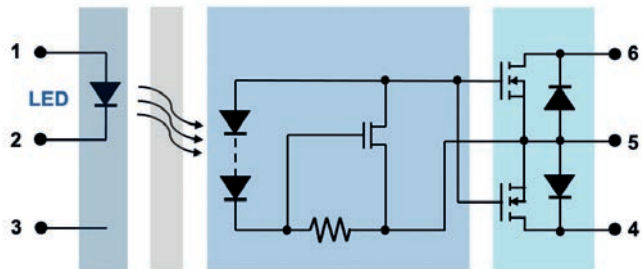
## Galvanic Isolated Relays for Signaling and Locking

Realize an isolation of “  
1,500V in a small  
” SOP6 housing.

Beside the power line, charging stations include a lot of systems for communication, system control, safety functions and HMI. Wherever switching must be electrically separated from the control circuit, electromechanical or optocoupled semiconductor PhotoMOS® relays are used. AQY series, for example, is used in charging station battery storage systems to isolate internal from external signals.

Contact us directly to find the perfect fit for your need quickly – and save hours of internet investigation.

PhotoMOS® relays realize galvanic isolation by an LED that emits light through an isolator to a solar cell. The solar cell drives the MOSFET output.



Feature	PhotoMOS	Signal Relay
Signal transfer	++	++
I/O Galvanic Isolation	++	+
Output Separation	0	++
AC/ DC Switching	+	+
Control Power	++	0
Load Voltage	++	+
Load Current	+	+
Stable On Resistance	++	0
Overload withstand	0	+
Switching noise	++	0
Size	++	0

# GRAPHITE THERMAL INTERFACE MATERIAL

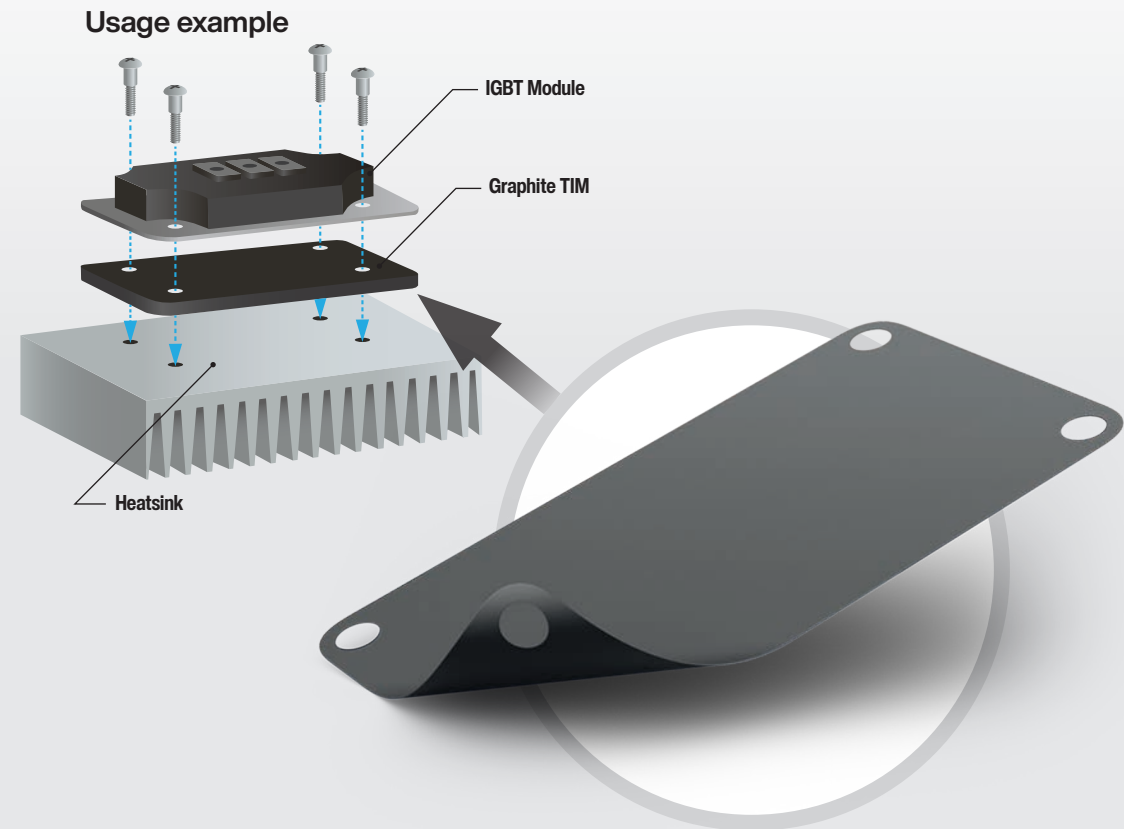
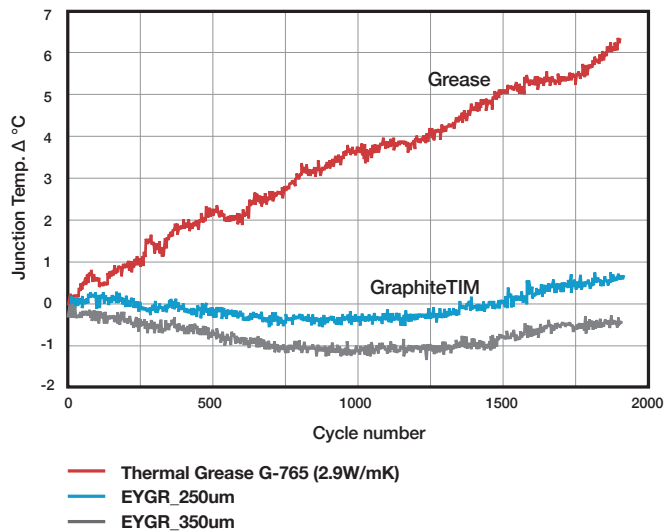
Extends Product Lifetime with High Reliability Properties

Just apply and benefit the **“**  
**”** long term reliability effect.

GraphiteTIM, a Panasonic exclusive material using highly crystallized graphite, transfers heat generated from a power device to a heat sink with excellent thermal conductivity. In addition, the high compressibility effectively fills the voids between the heating and the cooling device to achieve even lower thermal resistance. Compared to grease, GraphiteTIM has a stable heat dissipation for a long period of time due to no deterioration and pump out effect.

## High reliability (power cycle test)

Junction temperature remain stable for a long period of time.



- » Low thermal resistance (ASTM D5470 at 0.6MPa)  $0.2 \text{ K} \cdot \text{cm}^2/\text{W}^*$
- » High Compressibility (ASTM D5470 at 0.6MPa) 40%\*
- » High reliability (stable junction temperature)
- » Operating temperature  $-55$  to  $+400 \text{ }^\circ\text{C}$
- » Easy handling and easy to install

\* Measuring device TIM Tester ANALYSIS TECH, ASTM D5470 compliant)

# CONVENIENT OPERATION AND CONNECTIVITY

For end users and manufacturers

Human Machine Interface, “  
PLC, and Industrial Communicator  
as perfect match to connect your  
” charging infrastructure

Panasonic Industry offers a wide portfolio of industrial automation devices.

For the particular use in an EV charging infrastructure the Human Machine Interface (HMI) HMx700, the PLC FPOH, and the Industrial Communicator FP-I4C can be of great advantage. The HMx700 is a high-end but nevertheless robust touch panel which allows an easy operation of the charging station.

With its small footprint, the PLC FPOH fits perfectly in narrow places. Even though of its compactness this programmable logic controller convinces with its connectivity and performance. The collection and secure transfer of data is crucial for all applications. For this case, the Industrial Communicator is the perfect choice: Literally endless connectivity with multiple communication languages.



## FPOH

- » Fast processing with 10ns per step
- » Very compact footprint
- » Excellent connectivity with two Ethernet ports and internal switch

②



①

## HMx700

- » Capacitive glass touch panel
- » UV and scratch resistant
- » Operation temperature -20 to +60°C

③



## FP-I4C

- » Collecting and transferring data
- » Connect directly to SQL data bases or other systems
- » Sophisticated secure protocols: HTTPS, VPN, SSH, FTPS, SSL/TLS

# Panasonic

## INDUSTRY



We are dedicated to the highest standards of global sustainability as **Your Committed Enabler**. Find out more on our [website](#).

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