EV Charging Solutions

Wireless modules
Passive & Emech Components
Thermal Management

IN Your Future

Your Committed Enabler
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.
**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.

<table>
<thead>
<tr>
<th>Chipset</th>
<th>PAN9019 / PAN9019A</th>
<th>PAN9028</th>
<th>PAN9026</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF Category</td>
<td>WiFi 6 &amp; Bluetooth 5.2 (BR, EDR, LE) &amp; 802.15.4</td>
<td>WiFi 5 &amp; Bluetooth 5.2 (BR, EDR, LE)</td>
<td>WiFi 4 &amp; Bluetooth 5.0 (BR, EDR, LE)</td>
</tr>
<tr>
<td>Antenna</td>
<td>Bottom Pad</td>
<td>Chip / Bottom Pad</td>
<td>Chip</td>
</tr>
<tr>
<td>Size (mm)</td>
<td>15.3 x 12.0 x 2.5</td>
<td>24.0 x 12.0 x 2.8</td>
<td>17.5 x 10.0 x 2.6</td>
</tr>
<tr>
<td>Temperature Range (°C)</td>
<td>-40 to +85</td>
<td>-30 to +85</td>
<td>-30 to +85</td>
</tr>
</tbody>
</table>

**Load Balancing**

- **Without Dynamic Load Balancing:**
  - Smart Charging
  - PAN902x as Clients

- **PAN902x as Access Point for Cloud Connectivity:**
  - Smart Charging
  - PAN902x as Clients

**Usage**

<table>
<thead>
<tr>
<th>Private Wallbox</th>
<th>Professional DC Charging Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usage data</td>
<td></td>
</tr>
<tr>
<td>Uploading usage data to a cloud</td>
<td>Uploading commercial data to a cloud</td>
</tr>
</tbody>
</table>

**Monitoring**

<table>
<thead>
<tr>
<th>Tracking of vehicle's state of charge or storage capacity</th>
<th>Tracking of vehicle's state of charge or storage capacity, occupancy and expected availability of the various charging stations</th>
</tr>
</thead>
</table>

**Maintenance**

<table>
<thead>
<tr>
<th>No technical staff needed locally for maintenance</th>
<th>On site technician can access maintenance data remotely, thus saving material costs</th>
</tr>
</thead>
</table>

**Smart Charging**

| 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 in a meshed network and easily 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.

Supported mesh protocols:

- Thread
- Zigbee
- Matter

<table>
<thead>
<tr>
<th>PAN1781</th>
<th>PAN1782</th>
<th>PAN1780</th>
</tr>
</thead>
<tbody>
<tr>
<td>256 kB Flash</td>
<td>512 kB Flash</td>
<td>1 MB Flash</td>
</tr>
<tr>
<td>32 kB RAM</td>
<td>128 kB RAM</td>
<td>256 kB RAM</td>
</tr>
<tr>
<td>64 MHz</td>
<td>64 MHz</td>
<td>64 MHz</td>
</tr>
</tbody>
</table>

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)
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.

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

With soft resin (Panasonic)

- 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.

<table>
<thead>
<tr>
<th>Series</th>
<th>HE-S</th>
<th>HE-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switching current</td>
<td>35A AC</td>
<td>40A AC</td>
</tr>
<tr>
<td>Contact configuration</td>
<td>2a, 2a1b</td>
<td>4a, 4a1b</td>
</tr>
<tr>
<td>Dimensions</td>
<td>30x36x40mm</td>
<td>35x58x47mm</td>
</tr>
<tr>
<td>Holding power*</td>
<td>170mW</td>
<td>490mW</td>
</tr>
<tr>
<td>Contact gap</td>
<td>3.2mm</td>
<td>3.6mm</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Feature</th>
<th>PhotoMOS</th>
<th>Signal Relay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal transfer</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>I/O Galvanic Isolation</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Output Separation</td>
<td>0</td>
<td>++</td>
</tr>
<tr>
<td>AC/ DC Switching</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Control Power</td>
<td>++</td>
<td>0</td>
</tr>
<tr>
<td>Load Voltage</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Load Current</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Stable On Resistance</td>
<td>++</td>
<td>0</td>
</tr>
<tr>
<td>Overload withstand</td>
<td>0</td>
<td>+</td>
</tr>
<tr>
<td>Switching noise</td>
<td>++</td>
<td>0</td>
</tr>
<tr>
<td>Size</td>
<td>++</td>
<td>0</td>
</tr>
</tbody>
</table>
Just apply and benefit the long-term reliability effect.

Graphite TIM, 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 low thermal resistance. Compared to grease, Graphite TIM 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 K • cm²/W*
- High Compressibility (ASTM D5470 at 0.6MPa) 40%*
- High reliability (stable juntion temperature)
- Operating temperature -55 to +400 °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 FP0H, 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 FP0H 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.
We are dedicated to the highest standards of global sustainability as Your Committed Enabler. Find out more on our website.