PLC Links That You Can Trust

Discover Key Insights into Stable PLC Communication
That Will Optimize Your EV Charging Design.

Executive Summary

The transition to electric mobility is reshaping how vehicles and infrastructure communicate. At the center of this shift is **power line communication (PLC)** — the backbone of ISO 15118-based features such as **Plug & Charge** and **Vehicle-to-Grid (V2G)**.

Yet engineers designing EV and EVSE control boards face three relentless pressures:

- **Tighter layouts** with every new feature crammed into shrinking footprints.
- **Noisy environments** with high-power switching threatening fragile communication margins.
- **Rising complexity** from standards convergence (CCS, NACS, ISO 15118).

This explores these challenges — and introduces the **TDK AMT45S pulse transformer**, a miniature yet automotive-grade component designed to safeguard communication while freeing valuable board space.

The Communication Challenge in EV Charging

As EV adoption accelerates, charging systems must do more than transfer power. They must exchange critical data: authentication, billing, charging control, and in the future, bi-directional energy transactions. ISO 15118 defines this secure dialogue. At the physical layer, this dialogue rides over the **control pilot line** via HomePlug Green PHY PLC. The quality of that signal depends heavily on the **coupling transformer** that sits between modem and line.

If the PLC link fails, Plug & Charge fails.

- OEMs face delays in certification.
- EVSE operators risk stranded assets.
- End users lose trust in the system.

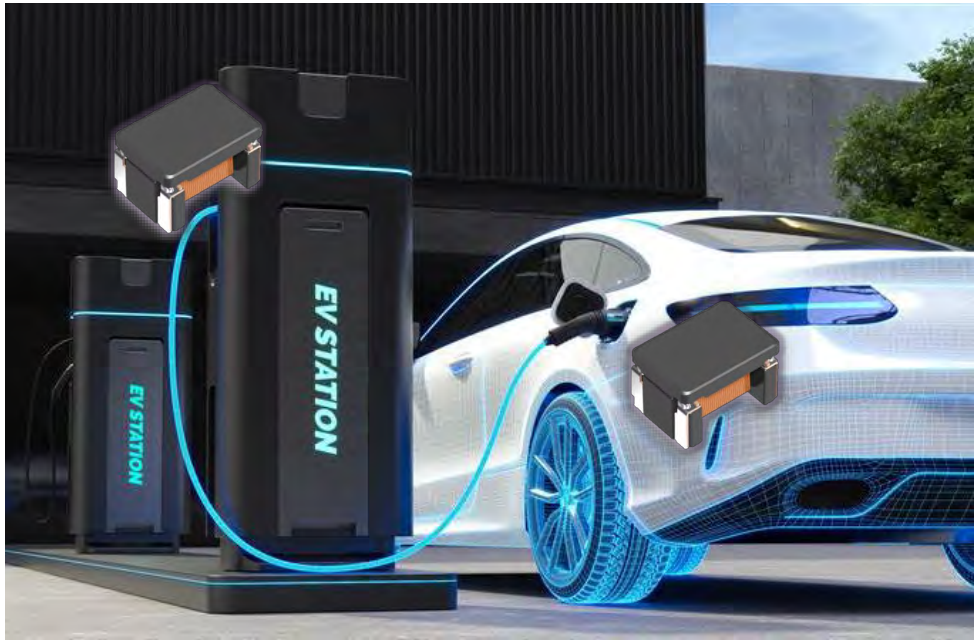
Why Engineers Struggle Today?

- **Space:** Charge-port modules are packed with relays, safety circuits, and power management. Conventional toroidal PLC transformers consume board real estate and complicate layouts.
- **Signal Integrity:** The PLC band (2–30 MHz) is prone to interference from switching power stages. Many magnetics degrade link margin, causing failed conformance tests.
- **Qualification & Manufacturability:** Hand-wound toroids vary in performance and slow down SMT assembly. Each variance introduces risk to automotive qualification timelines.

Why AMT45S? – Use Case & Benefit

The **TDK AMT45S** is purpose-built to overcome these challenges:

- **Compact footprint:** frees valuable PCB space and enhances design flexibility
- **Cost efficiency:** highly efficient automated production enables significant cost advantages at scale
- **Stable quality:** automated winding ensures consistent insertion loss and reduced variability compared to manual toroidal winding
- **High reliability:** stable communication performance over long operating hours, minimizing field maintenance
- **Proven ecosystem:** adopted in leading IC reference designs, reducing design risk and accelerating time-to-market

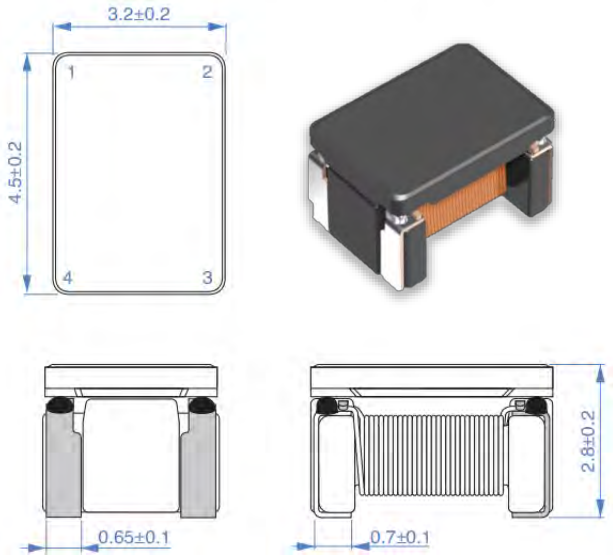


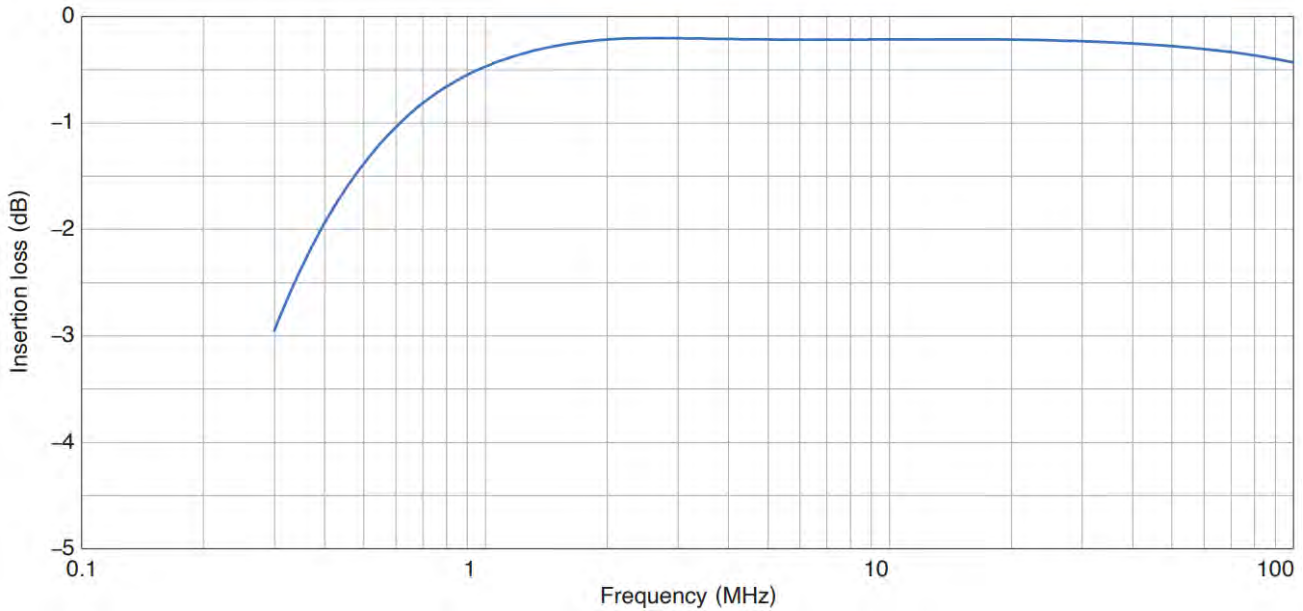
PLC: Power Line Communication
CCS: Combined Charging System
NACS: North American Charging Standard

With AMT45S, both on-board chargers (OBC) and charging stations can achieve improved system performance and lower total cost of ownership, ensuring compliance with global EV charging standards.

AMT45S - Electrical Characteristics

SHAPE & DIMENSIONS





CHARACTERISTICS SPECIFICATION TABLE

Inductance (µH)min.	DC resistance (Ω)max.	Withstand Voltage [AC] 60sec. (Vrms)	Insulation resistance [DC] 1kV (MΩ)min.	Rated Voltage Between Primary and Secondary [DC] (V)max.	Input Signal Voltage [AC] (Vp-p)max.	Secondary Load Current [AC] (mArms)max.	Part No.
15.0	1.0	500	10	50	10	10	AMT45S-150-2P-TL000

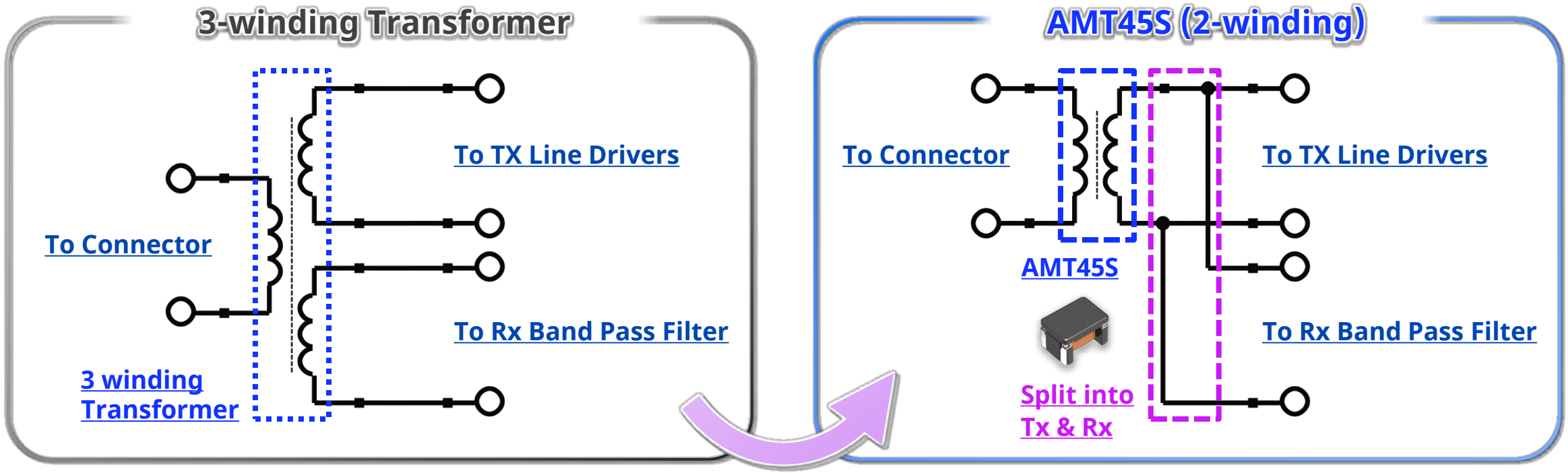
Adoption Status of AMT45S in Market

AMT45S is already validated with multiple PLC chipsets, including Qualcomm’s QCA series and Lumissil’s IS32CG family. With ongoing adoption in reference designs and projects, engineers can rely on proven interoperability and a clear path to faster market introduction.

IC Vendor	IC Part #	IC Reference	AMT45S Adoption in Ongoing Project
Qualcomm	QCA7000 QCA7005 QCA7006AQ	-	✓
Lumissil	IS32CG5317	✓	✓

How to Replace 3-Winding Transformer with AMT45S

Traditional PLC circuits often use bulky 3-winding transformers, which increase component size and cost. AMT45S simplifies the design with a compact 2-winding configuration, reducing footprint while maintaining the necessary isolation and performance. The secondary output can be easily split into Tx and Rx paths, making the replacement straightforward for engineers.



The output on the secondary side only needs to be split into Tx and Rx.

Related Information

- TDK Product Center:
  https://product.tdk.com/en/index.html

- Pulse Transformers for PLC | Product Information:
  https://product.tdk.com/en/products/transformer/transformer/plc/index.html

- Pulse Transformers for PLC | Product Detail Page:
  https://product.tdk.com/en/search/transformer/transformer/plc/info?part_no=AMT45S-150-2P-TL000

- Pulse Transformers for PLC | Datasheet:
  https://product.tdk.com/system/files/dam/doc/product/transformer/transformer/plc/catalog/trans_amt45s_en.pdf

- Tech Library Article | AMT45S: Compact, Reliable Pulse Transformer for xEV Charging
  https://product.tdk.com/en/techlibrary/applicationnote/trans-amt45s.html

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