Transphorm Releases Two Battery Charger Reference Designs Ideal for Two- and Three-Wheeled Electric Vehicles

November 30, 2023

New Design Tools Enable Faster Growth of Two-Wheeler Market Design-Ins While Helping System Engineers Harness SuperGaN FET Advantages

GOLETA, Calif.--(BUSINESS WIRE)--Nov. 30, 2023-- Transphorm, Inc. (Nasdaq: TGAN), a global leader in robust GaN power semiconductors, today announced availability of two new reference designs for electric vehicle ("EV") charging applications. The 300 W and 600 W Constant Current/Constant Voltage (CC/CV) battery chargers use the company's 70 and 150 milliohm SuperGaN® devices to deliver highly efficient AC-to-DC power conversion with high power density at competitive costs. The reference designs are intended to enable high volume production of chargers for 2- and 3-wheel EVs, of which over 14 million and over 45 million are sold annually in India and China respectively. The reference designs can also be used for a variety of applications including fast charging, LED dimmable drivers, gaming consoles, and high-performance laptops.

"GaN's adoption in the EV market is rapidly advancing. This is largely driven by the technology's high-power density with cost-effective, high-yield manufacturing process when compared to alternative options such as Silicon Carbide or Silicon," said Tushar Dhayagude, Vice President of Worldwide Sales and FAE, Transphorm. "Specifically, our SuperGaN devices have achieved significant traction in two and three wheelers as they exhibit those advantages along with system and device-level cost benefits versus select Silicon solutions. Based on consistent customer design requests, we're excited to release reference designs that can help on- or off-board charger manufacturers speed up go-to-market with GaN-based systems that can increase the performance and overall usability of next generation vehicles."

What is CC/CV?

The Constant Current/Constant Voltage (CC/CV) lithium-ion battery charging method uses constant current in the initial stage of charging and then switches to constant voltage in later stages of charging when the battery reaches the set charge level. This ensures batteries are not overcharged.

Open-Frame CC/CV AC-to-DC Battery Chargers

The 300 W and 600 W reference designs pair the SuperGaN FETs and controllers in the popular power factor correction (PFC) and resonant LLC topologies, with the LLC being specifically designed for a wide battery range (from empty to full charge). Transphorm's SuperGaN platform enables power system developers to maximize the PFC+LLC's performance potential, delivering the highest efficiency possible from these topologies at a competitive cost.

The reference designs use pure analog controllers versus digital controllers that require firmware. This configuration offers several benefits such as easier designability and simplified product development driven by:

- Reduced development resource requirements.
- Reduced development time.
- Elimination of the need for potentially complex firmware programming/maintenance.

Note: The 300 W reference design includes an additional PWM input port for requesting output current levels lower than rated output value, enabling further flexibility for all battery chemistries.

Key specifications follow:

Reference Design	TDAIO-TPH-ON-CCCV-300W-RD	TDAIO-TPH-MPS-CCCV-600W-RD
VAC	90 to 264	90 to 264
Wattage	300	600
SuperGaN FET(s)	TP65H070G4PS x 3	TP65H070G4PS x 1 TP65H150G4PS x 2
Driver(s)	NCP1654 PFC (onsemi) NCP1399 LLC (onsemi)	HR1211 (MPS)
Peak Efficiency	95% @ 264 Vac	94.4% @ 264 Vac
Switching Frequency	Up to 150 kHz	Up to 120 kHz

The reference designs leverage Transphorm's SuperGaN FETs known for delivering differentiating advantages such as:

- Industry-leading robustness with a +/- 20 V gate threshold and a 4 V noise immunity.
- Easier designability by reducing the amount of circuitry required around the device.
- Easier drivability as FETs can pair with well-known, off-the shelf drivers common to silicon devices.

Reference Design Access

The complete 300 W and 600 W CC/CV battery charger reference designs are currently available from Transphorm. Visit the following links to download technical documentation, design files, firmware, and bill of materials:

- TDAIO-TPH-ON-CCCV-300W-RD: https://www.transphormusa.com/en/reference-design/tdaio-tph-on-cccv-300w-rd/
- TDAIO-TPH-MPS-CCCV-600W-RD: https://www.transphormusa.com/en/reference-design/tdaio-tph-mps-cccv-600w-rd/

To ensure design accuracy of the above battery chargers, power system developers should also review the following design guide:

- *Constant Current/Constant Voltage (CC/CV) Application for Power Adaptor with LLC Output Stage*: https://www.transphormusa.com/en/document/design-guide-design-guide-11-constant-current-constant-voltage-application-for-llc/

For more information about the SuperGaN devices included in the design tools, visit the following links:

- TP65H070G4PS
  650 V, 72 mOhm GaN FET in a TO-220 package
  https://www.transphormusa.com/en/product/tp65h070g4ps/
- TP65H150G4PS
  650 V, 150 mOhm GaN FET in a TO-220 package
  https://www.transphormusa.com/en/product/tp65h150g4ps/

About Transphorm

Transphorm, Inc., a global leader in the GaN revolution, designs and manufactures high performance and high reliability GaN semiconductors for high voltage power conversion applications. Having one of the largest Power GaN IP portfolios of more than 1,000 owned or licensed patents, Transphorm produces the industry's first JEDEC and AEC-Q101 qualified high voltage GaN semiconductor devices. The Company's vertically integrated device business model allows for innovation at every development stage: design, fabrication, device, and application support. Transphorm's innovations move power electronics beyond the limitations of silicon to achieve over 99% efficiency, 50% more power density, and 20% lower system cost. Transphorm is headquartered in Goleta, California and has manufacturing operations in Goleta and Aizu, Japan. For more information, please visit www.transphormusa.com. Follow us on Twitter @transphormusa and WeChat @ Transphorm_GaN.

View source version on businesswire.com: https://www.businesswire.com/news/home/20231130979564/en/

Press Contact:
Heather Ailara
+1.973.567.6040
heather.ailara@transphormusa.com

Investor Contacts:
David Hanover or Jack Perkins
KCSA Strategic Communications
transphorm@kcsa.com

Source: Transphorm, Inc.