APPLICATION BRIEF

XENSIV™ current sensor TLE4971

Contributing to grid stability in India with PFC

The streets in India are among the busiest in the world, packed full of motorcycles, tuk-tuks, and cars. Four-lane roads often accommodate seven lanes of traffic, pushing up noise and exhaust emissions. This is starting to change, however, as the trend towards electrically powered motorcycles becomes more pronounced. In fact, e-scooters and electric motorcycles have been experiencing exponential growth for several years now – similar to the growth trajectory for electric cars in other parts of the world. This electrification trend presents India with new challenges as it moves to put the enabling charging standards and infrastructure in place. Read on to see how Infineon is helping to meet these challenges and contributing to grid stability in India.

Key challenges

- Low self heating
- Long lifetime
- High isolation capabilities
- Accurate sensing
- High bandwidth

Pressure on the grid

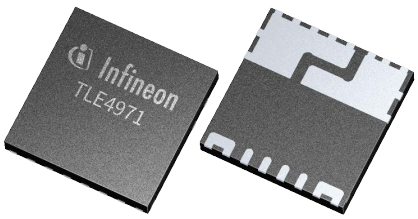
The regulatory authorities in India have approved a charging solution based on the global xEV (electric vehicle) charging standard. The Bharat AC-001 EV charger is a single-phase, AC station with a current carrying capacity of 15 A. It is based on a globally standardized 230 V plug according to IEC 60309. In Europe this is commonly referred to as a camping plug.
By comparison, the Bharat DC-001 EV charger was defined for faster DC charging. It is divided into a level-1 DC charger rated from 40 to 100 V, and a level-2 DC charger rated at up to 1000 V. Although most standards approve plugs commonly used worldwide, the Bharat DC-001 EV charger specification recommends the GB/T plug.

Key features

- Integrated current rail with 220 µΩ insertion resistance for ultra-low power losses
- Smallest form factor, 8 x 8 mm
- Highly accurate, scalable DC and AC current sensing
- 210 kHz bandwidth, making it ideal for chargers supporting PFC
- Very low sensitivity error rate over temperature
- Galvanic functional isolation up to 1150 V peak V_{IORM}

However, neither of the standards mentioned above are typically applied to electric motorbikes and rickshaws in India. Instead, vendors prefer OEM-specific, non-standardized connectors. There are many reasons for this. First and foremost, there is simply no room for a standards-compliant on-board charger (OBC) as electric motorcycles don't typically have enough space to accommodate a bulky connector on the bike. In addition, a standards-compliant OBC would add weight and cost to the design.

For this reason, drivers typically leave their portable 48 V charger at home (home-based charging) or in the office (office-based charging). Or they may use a charging station at their destination as long as they have a compact connector on the motorcycle (unlike the bulky connectors that comply with the Bharat AC-001 or DC-001 standards).







www.infineon.com/current-sensors

Continued widespread use of smaller, cost-efficient 48 V chargers in the 800 W to 3.3 kW mobile power class is putting pressure on Indian power grids, however. A new regulation is urgently required to protect and stabilize power supplies in India.

Given that mobile chargers overall draw quite a lot of power from the network, it is essential that the regulations for mobile charging stations are the same as those for fixed installations. They work by drawing sinusoidal current from the public network. Grid overload can be triggered by peak periods in sinusoidal current drain caused by cheap charging scheme topologies or by current shifts in relation to the voltage. These shifts must be regulated to maintain grid stability. Accurate sensors are required to detect peaks, current shifts and regulating these. In other words, OBC and DC charger designs must have an active frontend (AFE) supporting power factor correction (PFC).

As a key player in power electronics, Infineon provide all products needed for the DC-DC stage and for PFC in motorcycle chargers.

Typically, these chargers are designed in two stages:
- The first stage is the rectification of the alternating current.
- The second stage is a DC-DC converter, which adjusts the rectified stage to the charging voltage required for the traction battery.

Presenting the XENSIV™ current sensor TLE4971
The latest Infineon XENSIV™ current sensor TLE4971 is the perfect fit for mobile chargers in India and beyond. It is already successfully deployed in various charging solutions, contributing to grid stability by detecting and regulating current shifts in relation to voltage.

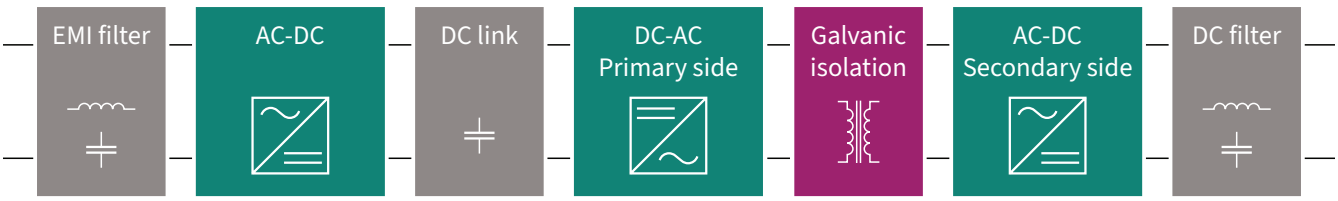
A 3300 W charger will draw a continuous current of 15 A from the grid, which means the sensor must be capable of measuring peaks of up to ±25 A. With a current measuring range extending up to ±25 A, our XENSIV™ TLE4971 sensor is ideal for PFC, exploiting the advantages of an insertion resistance of 220 µΩ. This active Hall-based current sensor thus offers excellent thermal resistance, outperforming that of competitor models. At the same time, it offers sufficient isolation to be used directly in the supply line!

In addition, the extremely energy-efficient design means it can also be used at the output of the DC-DC stage, where it can measure the full 3300 W over the wider current measuring range of 75 A or 120 A (optional).

Take a look at Infineon's steadily growing portfolio of current sensors. The UL-certified TLE4971-A025N5-U-E0001 with its ±25 A bidirectional measurement range might be the best fit for mobile charging stations in India.
www.infineon.com/current-sensors

Discover our useful, easy-to-understand support materials including application notes or get started with one of our plug-and-measure evaluation boards.
www.infineon.com/sensors2go

AC-DC boost PFC topologies for higher power ratings



www.infineon.com

Published by
Infineon Technologies AG
Am Campeon 1-15, 85579 Neubiberg
Germany

© 2023 Infineon Technologies AG
All rights reserved.

Public

Date: 05 / 2023

Please note!
This Document is for information purposes only and any information given herein shall in no event be regarded as a warranty, guarantee or description of any functionality, conditions and/or quality of our products or any suitability for a particular purpose. With regard to the technical specifications of our products, we kindly ask you to refer to the relevant product data sheets provided by us. Our customers and their technical departments are required to evaluate the suitability of our products for the intended application.

We reserve the right to change this document and/or the information given herein at any time.

Additional information
For further information on technologies, our products, the application of our products, delivery terms and conditions and/or prices, please contact your nearest Infineon Technologies office (www.infineon.com).

Warnings
Due to technical requirements, our products may contain dangerous substances. For information on the types in question, please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by us in a written document signed by authorized representatives of Infineon Technologies, our products may not be used in any life-endangering applications, including but not limited to medical, nuclear, military, life-critical or any other applications where a failure of the product or any consequences of the use thereof can result in personal injury.