1 kW SMPS digitally controlled multiphase interleaved converter using STNRG388A

Features

- Digital controller: STNRG388A
- 3-phase interleaved DC/DC architecture
- Full load power: 1000 W (scalable up to 3 kW)
- Efficiency: more than 94% from 10% to full load
- Peak efficiency: 96.5% at full load
- Stand-by consumption: 425 mW
- Input voltage range: 350 - 420 V dc
- CC/CV output regulation
- Output voltage regulation: 133 V
- Output current regulation: 7.5 A
- Maximum output current for each phase: 2.5 A
- Modular power and control board

Description

The EVLSTRNG-1KW evaluation board is intended for evaluating the STNRG388A digital controller in offline power conversion applications such as EV battery chargers, UPS and industrial power supplies.

The architecture is based on a multiphase interleaved DC/DC converter using the half bridge SAB ("Single Active Bridge") topology supporting more than 1000 W of power.

The interleaved topology balances the power through 3 parallel stages. Also, the solution delivers high efficiency during the whole load range by enabling one, two or three stages depending on the load.

The STNRG388A power conversion dedicated peripherals (SMEDs) offer the flexibility to drive the interleaved power stages while guaranteeing the correct phase realignment during the activation and deactivation of each stage.

Thanks to the digital core of the STNRG388A, it is also possible to monitor, control and debug the EVLSTRNG-1KW board via a convenient HyperTerminal control.
Schematic diagrams

Figure 1. Power board schematic diagram - power section and feedback
Figure 2. Power board schematic diagram - auxiliary supply and protections
Figure 3. Power board schematic diagram - connector to control board

Figure 4. Power board schematic diagram - gate driver subcircuit
Figure 5. Control board schematic diagram
Revision history

Table 1. Document revision history

<table>
<thead>
<tr>
<th>Date</th>
<th>Revision</th>
<th>Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>14-May-2015</td>
<td>1</td>
<td>Initial release.</td>
</tr>
</tbody>
</table>
IMPORTANT NOTICE – PLEASE READ CAREFULLY

STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST’s terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers’ products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2015 STMicroelectronics – All rights reserved