UM1059
User manual

The STPMC1 and STPMS2 evaluation kit

Introduction

The STEVAL-IPE014V1 is an evaluation board designed for the STPMS2L-PUR chip. It works along with the STEVAL-IPE010V2 evaluation board, for a ready-to-use energy meter application.

The STEVAL-IPE010V2 evaluation board is for the STPMC1 device, while the STEVAL-IPE014V1 package contains the daughterboard with the STPMS2L-PUR companion chip.

These evaluation boards can be used in two ways:

- For evaluation purposes. Connecting the reference design to an AC power source and changing all setting parameters through the GUI interface and the parallel hardware programmer/reader
- For user application evaluation and development

Figure 1: STEVAL-IPE010V2 evaluation board

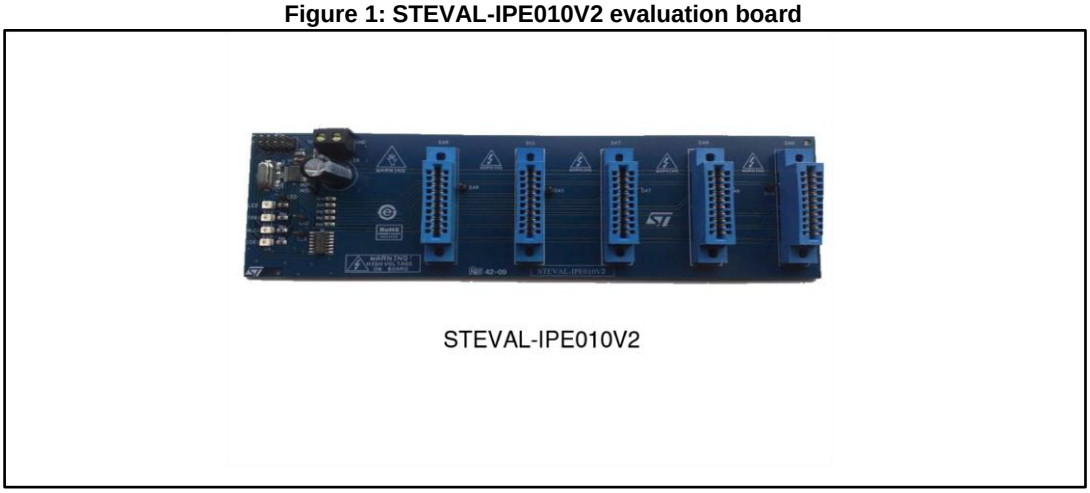
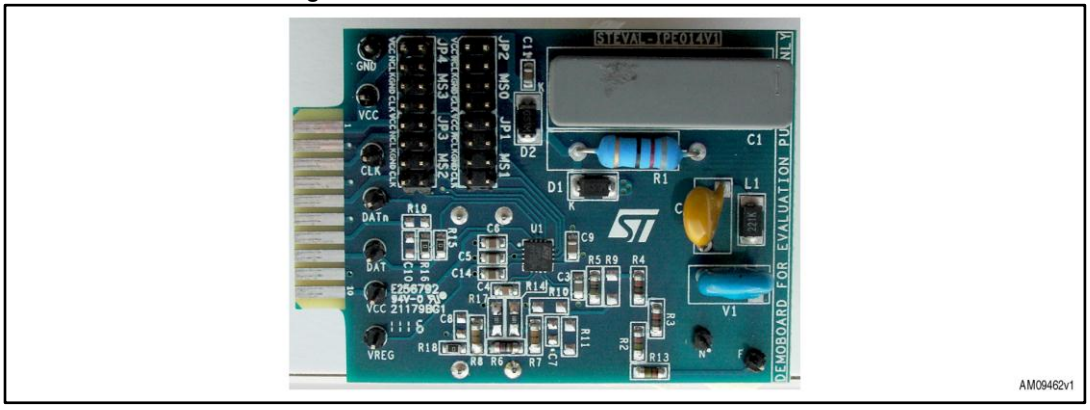


Figure 2: STEVAL-IPE014V1 evaluation board



Contents

1 Overview 3
1.1 Safety rules 3
1.2 Operating conditions 3
1.3 Features 3
1.4 Recommended readings 4
1.5 Getting technical support 4
2 STEVAL-IPE014V1 components 5
2.1 Package content 5
2.2 STEVAL-IPE014V1 5
2.2.1 Jumper settings 5
3 Getting started 7
3.1 Board connection 7
3.2 System configuration 7
4 Revision history 8

1 Overview

1.1 Safety rules

This set of boards can be connected to mains voltage (220 V/110 V). In the case of improper use, wrong installation or malfunction, there is a danger of serious personal injury and damage to property. All operations such as: transport, installation, and commissioning, as well as maintenance, should be carried out by skilled technical personnel only (national accident prevention rules must be observed).

Due to the risk of death when this prototype on mains voltage (220 V/110 V) is used, “skilled technical personnel” only, who are familiar with installation, mounting, commissioning, and operating with power electronic systems and have the qualifications to perform these functions, may use this prototype.

1.2 Operating conditions

Table 1: Operating conditions

Condition	Value	Unit
V_{NOM}	230	V_{RMS}
I_{NOM}	CT: I_{NOM} = 1	A_{RMS}
I_{MAX}	CT: I_{MAX} = 30	A_{RMS}
f_{LIN}	50/60 ± 10%	Hz
T_{OP}	-40 / +85	°C

1.3 Features

- Modularity
- Programmability
- Supports:
  - 3-phase, 4-wire RSTN, 4-system RSTN (tamper); extra module is needed
  - 3-phase, 4-wire RSTN, 3-system RST
  - 3-phase, 3-wire RST_, 3-system RST_ (tamper)
  - 3-phase, 3-wire RST_, 2-system R_T_ (Aron)
  - 2-phase, 3-wire _STN, 2-system _ST_ (America)
  - 1-phase, 2-wire __TN, 2-system _ST_ (tamper)
  - 1-phase, 2-wire __TN, 1-system __T_
- 4 LEDs showing:
  - Power
  - No load condition
  - Tamper detection
  - Reverse current direction
- Embedded capacitive power supply
- Isolation of current channel

1.4 Recommended readings

This document describes how to use and set up a basic test session with a GUI interface. Further information can be found in the following documents:

- STPMC1 datasheet
- STPMS2 datasheet
- Component datasheet
- AN4121, AN3398 and AN3254 application notes
- Schematics

1.5 Getting technical support

Technical assistance is provided free to all customers. For technical assistance, documentation, information, and product upgrades and services, please refer to your local ST distributor/office.

ST microelectronics offers its customers a free technical support service at online support in the www.st.com web site. Before contacting us, we recommend checking that you are working with the latest version of software/firmware. Upgrades are available free of charge at http://www.st.com.

2 STEVAL-IPE014V1 components

2.1 Package content

The package contains:

- Number 1 STEVAL-IPE014V1
- Promotional CD

2.2 STEVAL-IPE014V1

This board is a daughterboard. Each module serves one single phase, converting the voltage and current information, multiplexing them together, and sending the stream to the STPMC1.

Each of the boards must be connected to the voltage source of the relative phase and to the load.

Test points available are:

- GND
- VCC (stepper counter display connector)
- CLK
- DAT
- VREG
- F, N

The board should be plugged into the motherboard by the edge connector. Voltage inputs are pin F (hot wire) and N (neutral wire).

Current input (load wire) should be passed through the current transformer placed on the non-component side of the module.

2.2.1 Jumper settings

The onboard jumpers JP1, JP2, JP3, and JP4 allow the setting of the STPMS2L-PUR device according to *Table 2: "Precision mode and input amplifier gain selection"*, *Table 3: "TC of the bandgap reference"*, *Table 4: "Control of voltage channel and output signals"* and *Table 5: "Selection of hard, soft or test mode and enable of BIST"* below:

Table 2: Precision mode and input amplifier gain selection

JP1	MS0	Description
1	GND	LPR, amplifier GAIN selection g3 = 16
2	CLK	LPR, amplifier GAIN selection g0 = 2
3	NCLK	HPR, amplifier GAIN selection g0 = 2
4(1)	VCC	HPR, amplifier GAIN selection g3 = 16

Notes:

(1)Default value

Table 3: TC of the bandgap reference

JP2	MS1	Description
1	GND	TC = 60 ppm/°C
2[(1)]	CLK	Flattest TC = +30 ppm/°C
3	NCLK	TC = +160 ppm/°C
4	VCC	TC = -160 ppm/°C

Notes:
(1)Default value

Table 4: Control of voltage channel and output signals

JP3	MS2	Description
1[(1)]	GND	Voltage channel ON, DATn = ~(DAT =(CLK) ? bsV: bsC
2	CLK	Voltage channel OFF, DATn = bsCn, DAT = bsC
3	NCLK	Voltage channel OFF, DATn = bsCn, DAT = bsC
4	VCC	Voltage channel ON, DATn = bsC, DAT = bsV

Notes:
(1)Default value

Table 5: Selection of hard, soft or test mode and enable of BIST

JP4	MS3	Description
1[(1)]	GND	Hard mode, BIST mode OFF
2	CLK	Soft mode
3	NCLK	Reserved
4	VCC	Hard mode, BIST mode ON

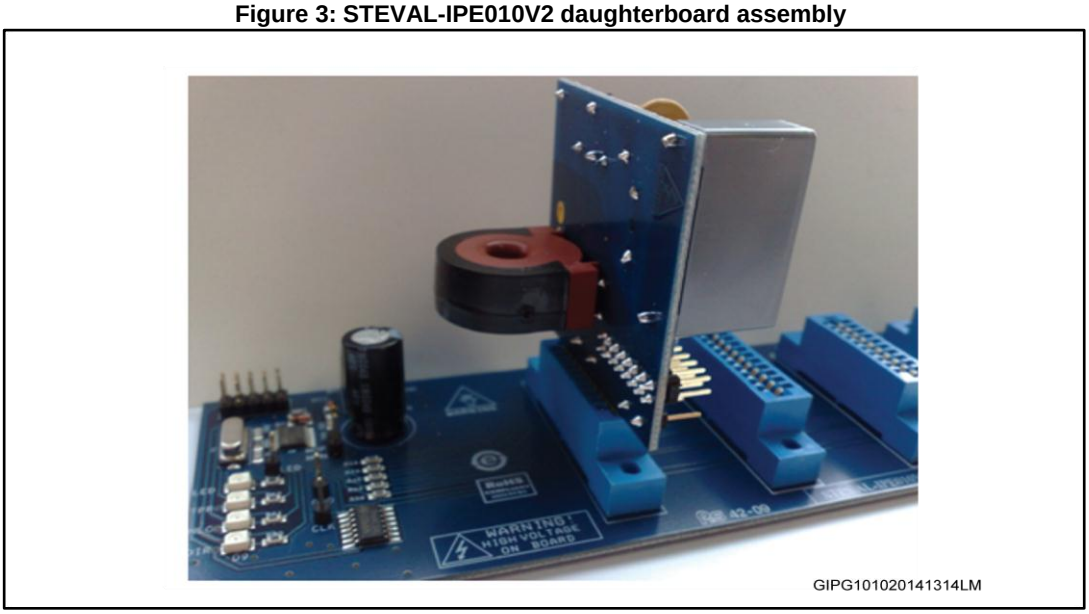
Notes:
(1)Default value

3 Getting started

3.1 Board connection

Plug in one or more STEVAL-IPE014V1, using the connectors DAR, DAS, DAT, and DAN (optional for 4-wire with tamper system), as shown in *Figure 3: "STEVAL-IPE010V2 daughterboard assembly"*:

Figure 3: STEVAL-IPE010V2 daughterboard assembly



3.2 System configuration

Once one or more STEVAL-IPE014V1 boards are plugged into the STEVAL-IPE010V2 board and powered on, the system must be programmed and configured through the STPMC1 GUI.

The basic STPMC1 configuration bits to be set are the following:

TCS = 1: current transformer sensor selected

PM = 1: the STPMS2 device selected for precision mode

HSA = 1: high speed clock output for the STPMS2 device

Please, note that these boards are not neither programmed and nor calibrated.

To calibrate the system, first set the calibrator value to the middle of the range, setting CVX7 = 1 and CIX7 = 1 (where X stands for R, S, T, or N according to the phase the STPMS2 board is plugged into).

To complete the calibration, use the STPMC1 GUI and follow the procedure described in AN3398.

4 Revision history

Table 6: Document revision history

Date	Revision	Changes
25-Aug-2011	1	Initial release.
15-Oct-2014	2	Deleted "Bill of material" and "Schematic" section. Updated *Section 3: "Getting started"*. Minor text changes.

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.

© 2014 STMicroelectronics – All rights reserved