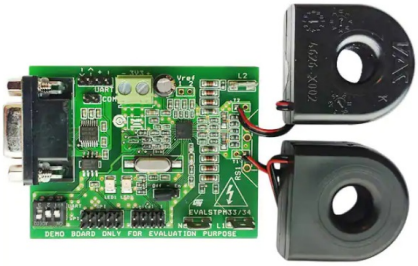
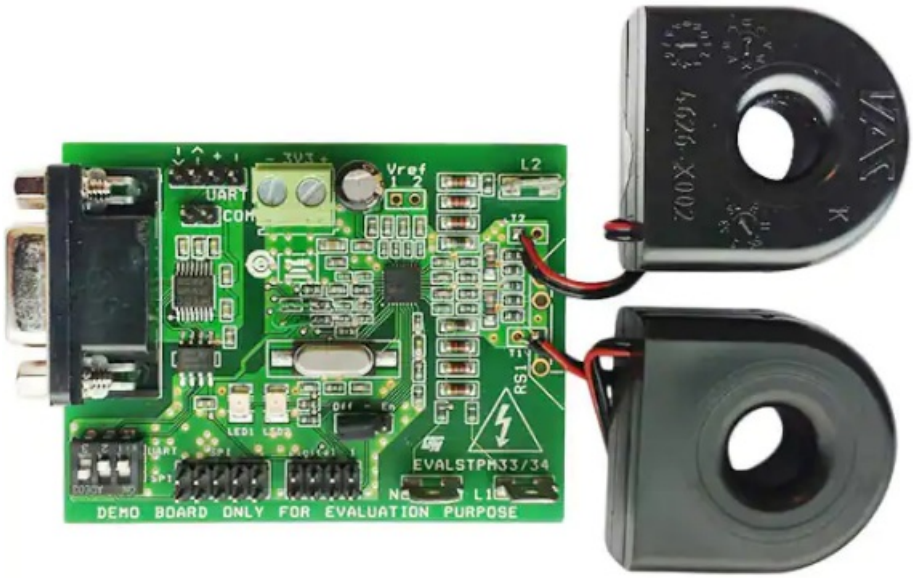


EVALSTPM34 Evaluation Board User Manual

Contents

EVALSTPM34 Evaluation Board



Introduction

This user manual describes the EVALSTPM34, EVALSTPM33, EVALSTPM32 evaluation board.
The STPM3x is an ASSP family of mixed signals designed for high accuracy measurement of power and energy in power line systems using the Rogowski coil, current transformer or shunt current sensors. According to p/n, the device has up to two voltages and two current channels, for energy measurement in dual-phase and single-phase (with or without neutral current monitoring) electricity metering systems.

The STPM3x devices provide instantaneous voltage and current waveforms and calculate voltage and current RMS values, active, reactive and apparent powers and energies for each channel. Moreover, they embed a full set of calibration and compensation parameters which allow the meter to fit tight accuracy standards (EN 50470-x, IEC 62053-2x, ANSI12.2x for AC watt meters). All calculated data, as well as configuration parameters, are stored in internal 32-bit registers accessible through SPI or UART peripheral. Three boards are available for evaluation purpose:

- EVALSTPM34 board with 2 CT
- EVALSTPM33 board with CT and shunt
- EVALSTPM32 board with shunt

The main features of these boards are:

- 0.2% accuracy single-phase meter reference design
- USB port for connection to the isolated hardware programmer STEVAL-IPE023V1 and PC GUI
- On-board USB isolated connection for UART data exchange to PC GUI (virtual COM port). RS-232 port for UART data exchange (board version 1 only)
- SPI/UART switch for device peripheral selection
- 2x programmable LEDs on-board
- Digital expansion to external system-on-chip or MCU
- Power supply 3.3 V: external or through the STEVAL-IPE023V1 isolated USB board
- IEC61000 standard compliant

Overview

Figure 1. EVALSTPM34 board

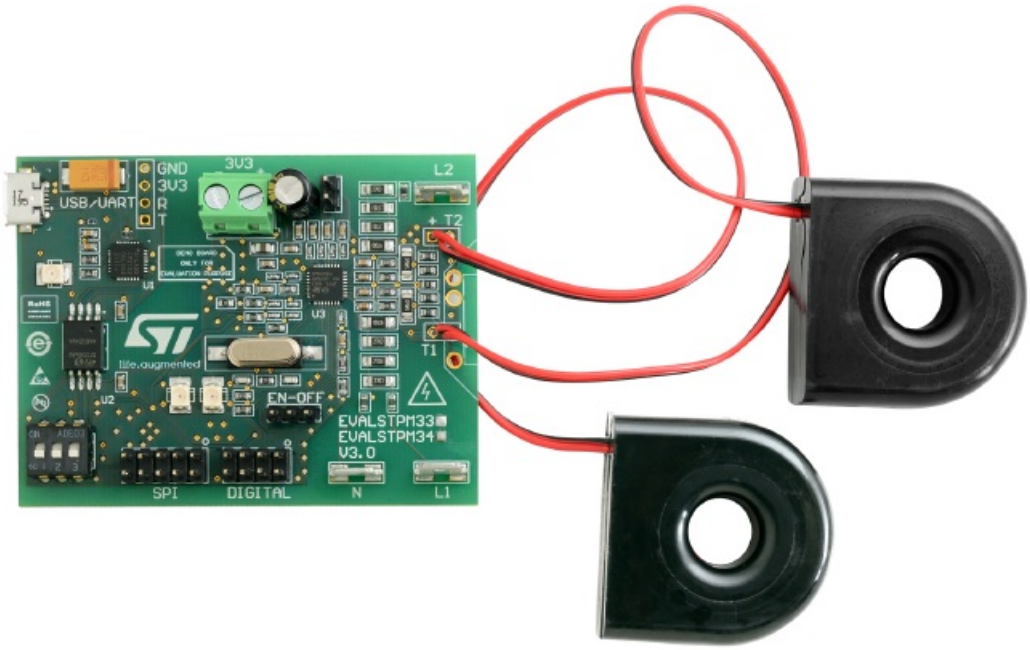


Figure 2. EVALSTPM33 board

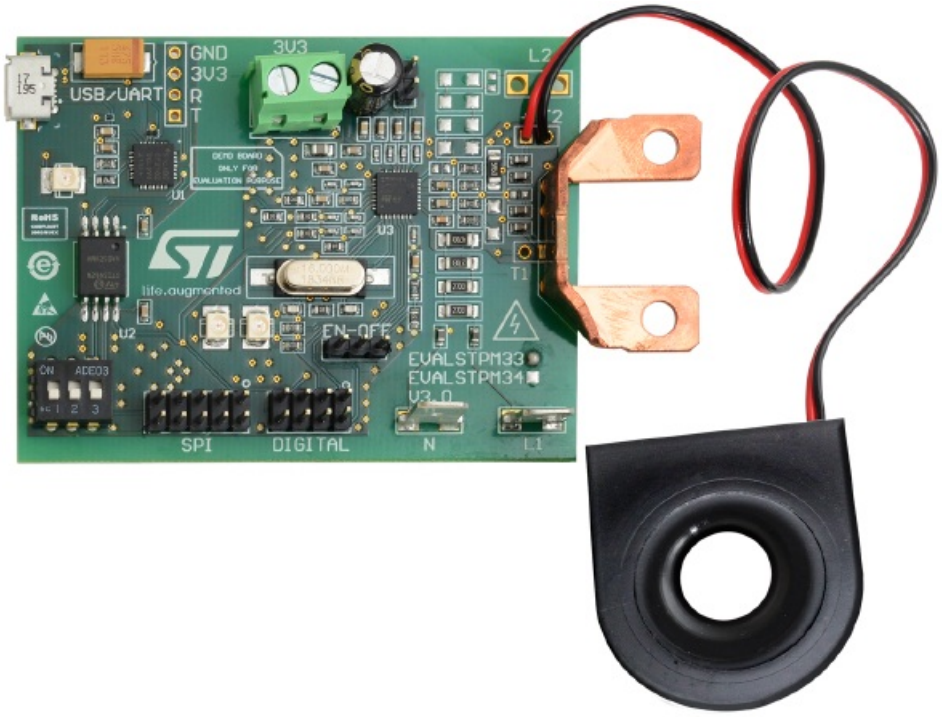
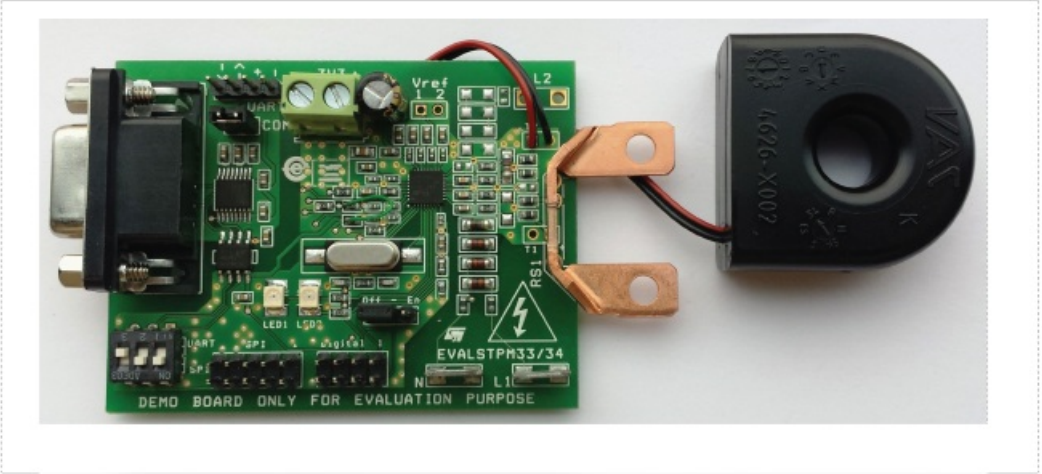


Figure 3. EVALSTPM32 board



Safety rules
These boards can be connected to the mains voltage (230 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 (national accident prevention rules must be observed) only.

Operating conditions

Table 1. Operating conditions

Parameter	Value
VN nominal voltage	230 VRMS
IN nominal current	5 ARMS
Imax. maximum current	100 ARMS
CP constant pulses	41600 imp/kWh
fline line frequency	50/60 Hz ± 10%
TOP operating temperature	-40/+85 °C

Recommended readings
This document describes how to use and set up a basic test session with a GUI interface. Additional information is available in the following documents:

- STPM3x datasheet
- AN4470
- UM1719
- EVALSTPM32 schematics
- EVALSTPM33 schematics
- EVALSTPM34 schematics

Getting technical support
All our customers receive free technical assistance through local ST distributor/office or by visiting **www.st.com**; upgrades are also available free of charge on **www.st.com/metering**. Customers should work with the latest version of software/firmware before contacting us.

EVALSTPM34, EVALSTPM33, EVALSTPM32 board

Board description
Hardware configuration

Table 2. EVALSTPM3x evaluation board setting and configuration terminals

Parameter	Value
J7	3.3 V external DC supply
J4	Device enable and reset
J5	Digital output pins
J6	SPI connector to the USB programmer/reader
J1	On-board USB connector for UART communication int erface (DB9 female connector for RS232 port on board versio n 1 only)
J2	UART test point signals
J3	RS232 enable (board version 1 only)
J11(1)	VREF jumper
SW1	DIP switches for SPI/UART peripheral selection
L1	Primary voltage
L2(2)	Secondary voltage
I1	Primary current
I2	Secondary current

1. For the EVALSTPM34 and the EVALSTPM33 board only.
2. For the EVALSTPM34 board only.

Power supply

The board does not contain a power supply. VCC = 3.3 V DC supply should be provided externally, by J7 connector. If the board is interfaced to PC by the STEVAL-IPE023V1 isolated dongle, it provides the board with supply. Since UART section is isolated, to use either the on-board USB-TO-UART or the RS-232 connectors, 3.3 V DC supply must be provided through J7 connector, anyway.

Enable and reset

The STPM3x enable pin should be shorted to VCC by keeping J4 jumper in EN position. To reset the device, this jumper has to be in OFF position (GND).

Digital output

8-pin J5 connector provides all digital output pins of the device as listed in the below table:

Table 3. **J5 connector pinout**

Connector pin	STPM3x pin
1	INT1
2	INT2(1)
3	LED2
4	EN/RST
5	LED1
6	GND
7	CKIN/XTAL2
8	CKOUT/ZCR

1. For the EVALSTPM34 and the EVALSTPM33 board only.

SPI connection

To communicate with the device using the STEVAL-IPE023V1 isolated USB dongle, the STPM3x SPI peripheral has to be selected. All SW1 switches have to be in OFF position before the device powers up. SPI pins are available in J6 connector for 10-pin flat cable interfacing either to the STEVAL-IPE023V1 or to an external MCU.

Table 4. **J6 SPI connector pinout**

Name	Description
1	Not connected
2	MOSI
3	GND
4	MISO
5	SCS
6	SCL
7	Not connected
8	SYN
9	Not connected
10	VCC

The STEVAL-IPE023V1 provides isolation, while J6 pins are not isolated.

On-board USB (UART) connection
UART peripheral can be selected to communicate with the device. In this case, all SW1 switches should be in ON position when the device powers up. USB port is isolated from the board through STISO621 transceiver to safely connect the board to PC. UART isolated pins are also available on J2 connector for MCU connection or debug purpose. If UART connection is used, a separate 3.3 V DC must be provided to UART section.
For the board version 1 only: UART peripheral also communicates to the device. In this case, all SW1 switches

should be in ON position when the device powers up. RS232 port is isolated from the board through Si8621 transceiver to safely connect the board to PC; in this case, J3 jumper must be connected. UART isolated pins are also available on J2 connector for MCU connection; in this case J3 jumper must be disconnected. If UART connection is used, a separate 3.3 V DC must be provided to UART section.

Table 5**. J2 UART connector**

Name	Description
1	Master TXD – Device RXD (Data to STPM)
2	Master RXD – Device TXD (Data from STPM)
3	+3.3 V DC
4	GND

Metrology
Current sensing is performed by CT or shunt, while voltage is sensed by voltage dividers.
The EVALSTPM34 board has two currents and two voltage channels, while the EVALSTPM33 has two currents and one voltage channel and the EVALSTPM32 has one current and one voltage channel available. Main design parameters are listed in the below table.

Table 6. **EVALSTPM3x evaluation board parameters**

Channel	Parameter	Value
Primary current	Current sensor sensitivity kS (1)	2.4 mV/A
	Shunt sensor sensitivity(2)	0.3 mV/A
Primary voltage	R1 voltage divider upper resistor(3)	810000 Ω
	R2 voltage divider upper resistor	470 Ω
Secondary current(4)	kS current sensor sensitivity	2.4 mV/A
Secondary voltage	R1 voltage divider upper resistor	81000 Ω
	R2 voltage divider upper resistor	470 Ω
Any	CP constant pulse	41600 pulses/kWh

1. For the EVALSTPM34 board only.
2. For the EVALSTPM32 and EVALSTPM33 board only.
3. R1, R2 names do not refer to specific resistors on the schematic, but these names indicate voltage divider resistors.
4. For the EVALSTPM34 and EVALSTPM33 board.

A 22 nF capacitor in parallel with R2 implements an antialiasing filter for voltage signal. Regarding to current signal, the antialiasing filter is given by a 10 nF capacitor and 2 x 1 KOhm resistors.

LED
Two LEDs are connected to programmable LED pins of the device.

Clock
Clocking is provided to the board through 16 MHz quartz. 1 MOhm resistor and 15 pF capacitors are used to filter noise.

Voltage reference
The STPM34 and STPM33 devices embed two internal independent voltage references. J11 jumper shorts VREF, or it can be used to connect the external precision voltage reference. The external reference should be connected between the desired VREF and GND, if a single reference has to be used for both channels, VREF1 and VREF2 should be shorted by J11.

Connection to the line
The board can be connected to line voltage and current in several ways, as shown in below pictures.
Please note that, in boards using shunt, the shunt is at the same potential of voltage neutral Faston and therefore it is at the same potential of the board GND. When isolated power sources are used or phantom loads, this is not important. In case of connection to the mains, this must be taken into account since, according to the wire connected to the shunt, the board GND may be either at the 0 or 230 V potential.

Figure 4. **Board connection to phantom load, dual-phase system (STPM34)**

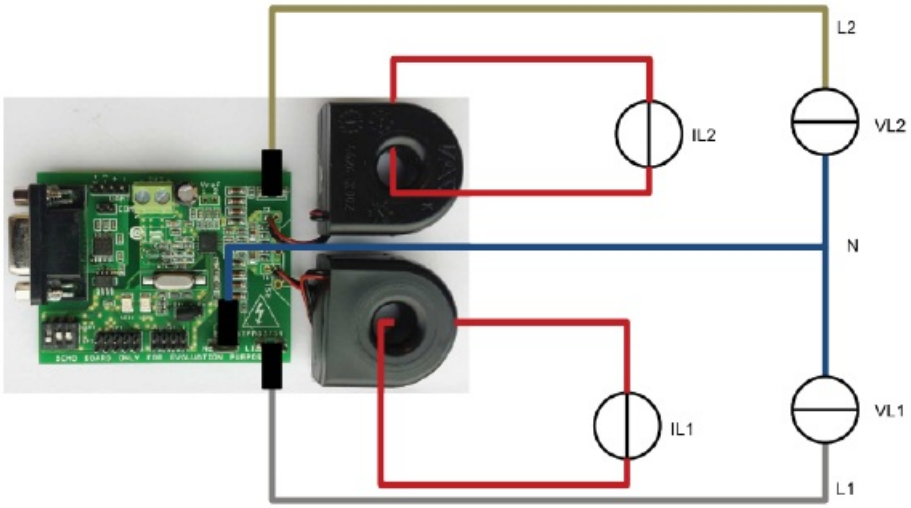


Figure 5. **Board connection to phantom load, single-phase system with neutral monitoring (STPM34 and STPM33)**

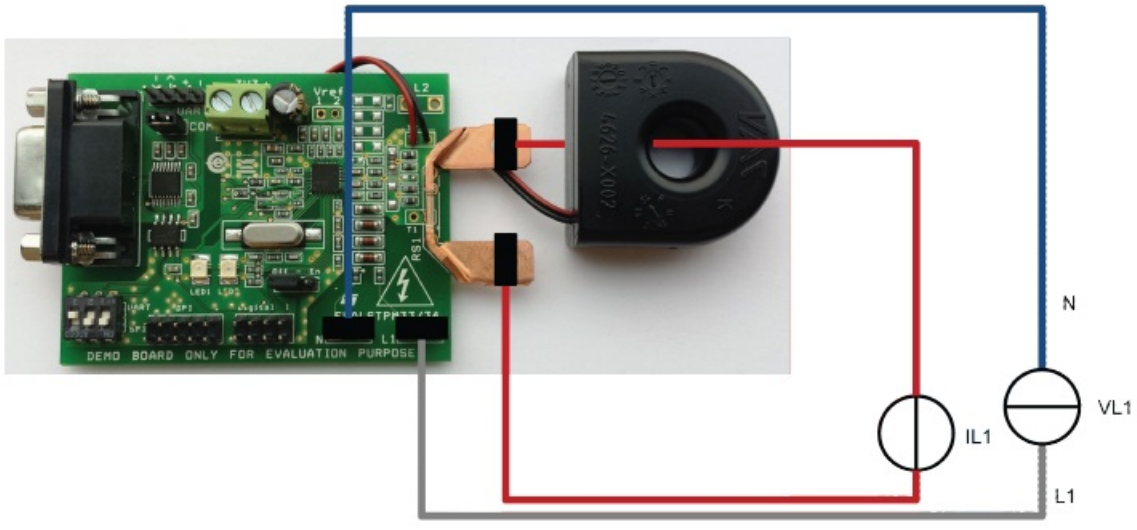


Figure 6. **Board connection to phantom load, single-phase system (STPM3x)**

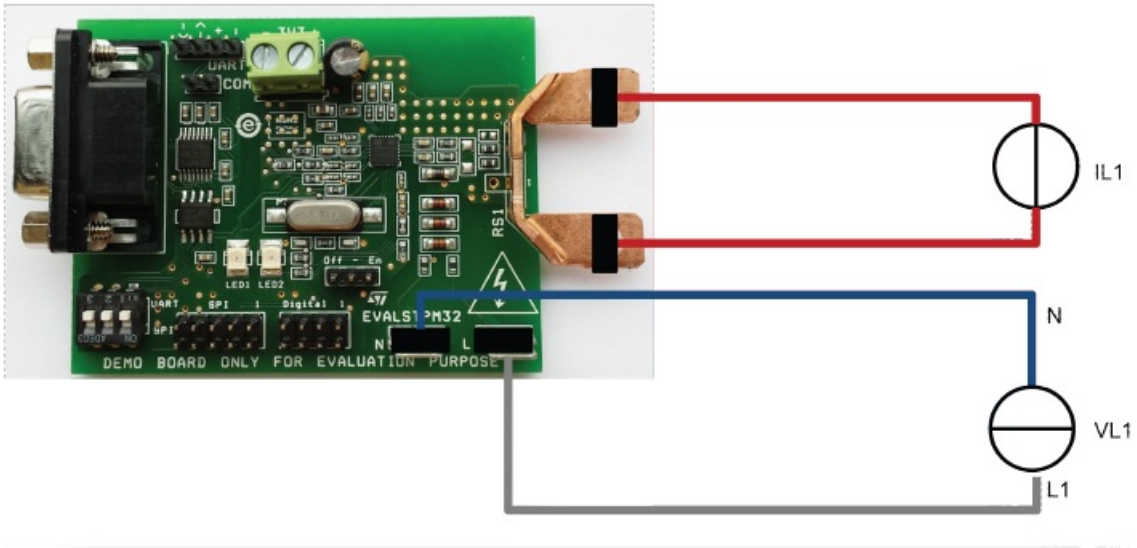


Figure 7. **Board connection to isolated AC source (STPM34 and STPM33)**

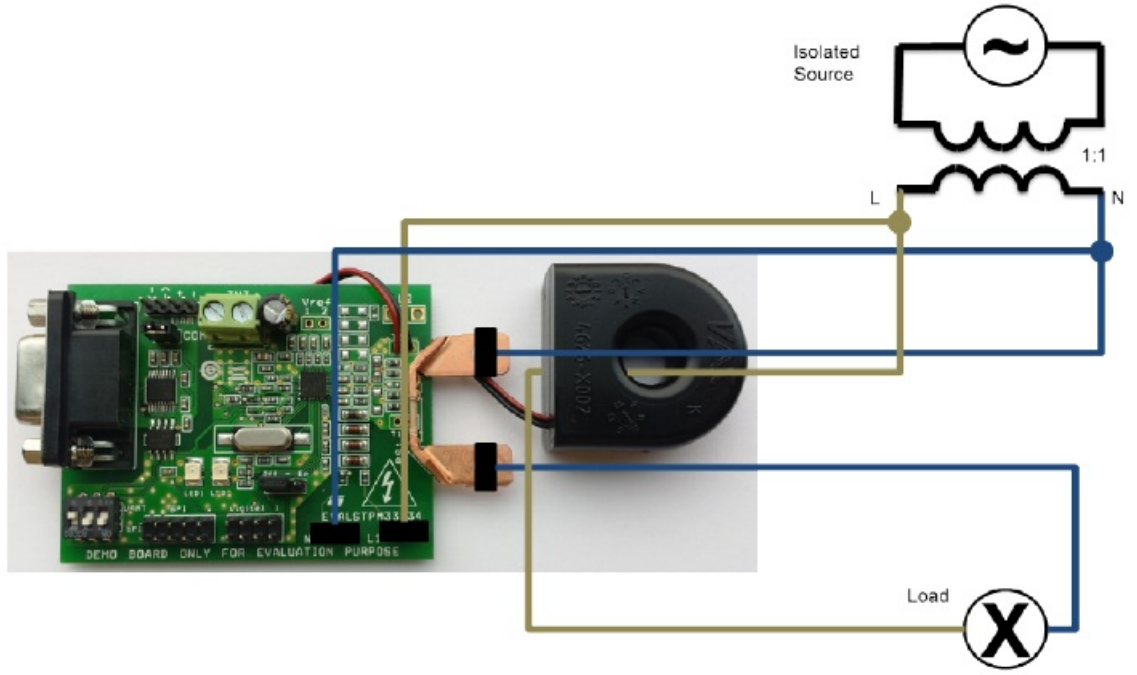
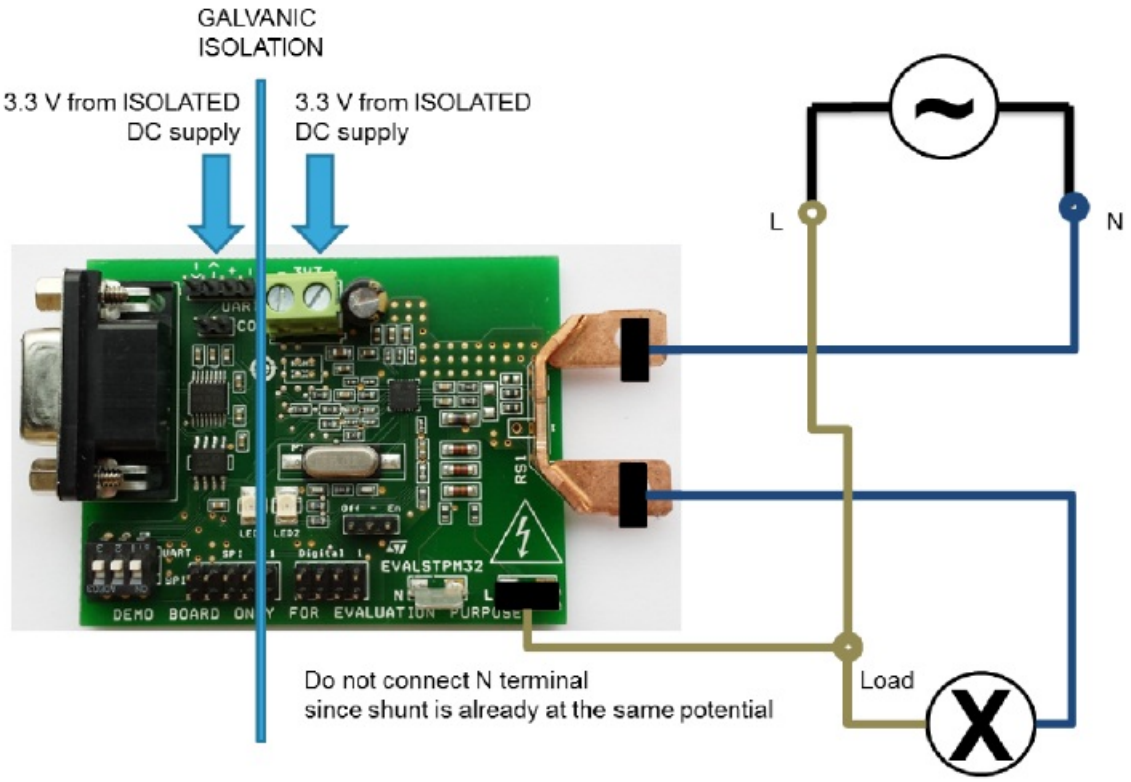


Figure 8. **Board connection to mains**



Board setup
Regarding to the STPM3x evaluation software setup and use, please refer to user manual UM1719.

The STEVAL-IPE023V1 is not included in the package, therefore it should be ordered separately. Please read the user manual, before using it.

Connection to PC GUI through the STEVAL-IPE023V1
To evaluate the board using the STEVAL-IPE023V1 and the STPM3x evaluation software:

1. Put J4 enable jumper in EN position
2. Put SW1 switches in OFF position, to “SPI” serigraphy
3. Connect J7 connector to 3.3 V DC isolated power supply, or put J4 jumper in the STEVAL-IPE023V1 board in 1-2 position (supply voltage set to 3.3 V)
4. Connect the EVALSTPM3x board to either AC line or power source or phantom load as shown in Section 2.2 Connection to the line, without powering it on
5. Connect the USB cable both to the STEVAL-IPE023V1 board and to PC
6. Connect the flat SPI cable from USB board to the EVALSTPM3x board
7. Power on AC source and DC source
8. Open GUI
9. When green LED on the STEVAL-IPE023V1 starts blinking, click “options”, then “interface”, select “STEVAL-IPE023” and select the proper “serial port”, baud rate is 19200
10. Now you can read, write, sample or calibrate the device

Connection to PC GUI through the on-board USB-to-UART port
To evaluate the board using a PC USB port and the STPM3x evaluation software:

1. Put J4 enable jumper in EN position
2. Put SW1 switches in ON position, to “UART” serigraphy

3. Connect J7 connector to 3.3 V DC power supply
4. Connect the EVALSTPM3x board to either AC line or power source or phantom load as shown in Section 2.2 Connection to the line, without powering it on
5. Connect the USB cable both to the board and to PC
6. Power on AC source and DC source
7. Open GUI
8. Click “options”, then “interface”, select “USB” and select the proper “serial port”, baud rate is 9600
9. Now you can read, write, sample or calibrate the device

Connection to PC GUI through the RS232 port (board version 1 only):
To evaluate the board using a PC RS232 port and the STPM3x evaluation software:

1. Put J4 enable jumper in EN position
2. Put SW1 switches in ON position, to “UART” serigraphy
3. Connect J7 connector and J2 connectors to 3.3 V DC separated and isolated power supply
4. Enable RS232 port by inserting J3 jumper
5. Connect the EVALSTPM3x board to either AC line or power source or phantom load as shown in Section 2.1: “Board description”, without powering it on
6. Connect the serial cable both to the board and to PC
7. Power on AC source and DC source
8. Open GUI
9. Click “options”, then “interface”, select “UART” and select the proper “serial port”, baud rate is 960
10. Now you can read, write, sample or calibrate the device

The device basic configuration
During the startup, all internal device parameters are in the default value. For the EVALSTPM34 board, primary channel gain GAIN[1:0] has to be changed to value 0 (current gain = x2), a correct energy measurement is, in this manner, assured. All other parameters can be changed according to the needs (board calibration, phase-shift compensation, desired output on the programmable pin,…). For further information on the device configuration, please refer to the STPM3x datasheet.

Revision history

Table 7. **Document revision history**

Date	Revision	Changes
16-Apr-2014	1	Initial release.
30-Sep-2015	2	Updated recommended readings, power supply, board setup and the dev ice basic configuration section. Removed the schematic section. Changed figure titled “Board connection to phantom load, single-phase s ystem (STPM3x)” and figure titled “Board connection to isolated AC sour ce (STPM34 and STPM33)”. Added figure titled “Board connection to mains”.
31-Mar-2022	3	Updated to comply with ver. 1 and 3 of the evaluation boards

IMPORTANT NOTICE – READ CAREFULLY

Documents / Resources

	ST EVALSTPM34 Evaluation Board [pdf] User Manual EVALSTPM34, EVALSTPM33, EVALSTPM32, Evaluation Board

References

- STMicroelectronics: Our technology starts with you
- Energy Generation and Distribution - Smart Grid - STMicroelectronics
- STMicroelectronics Trademark List - STMicroelectronics