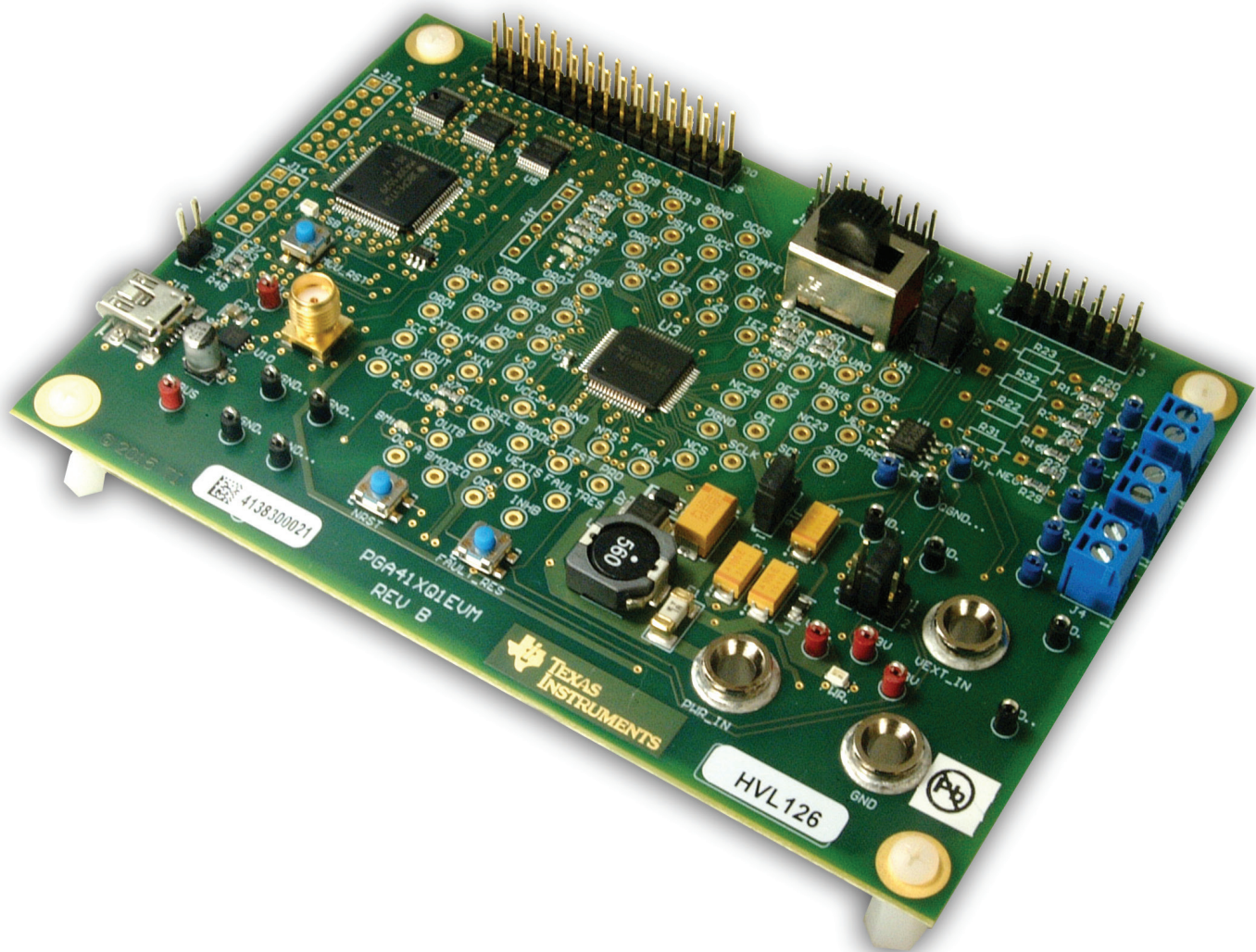


PGA411-Q1 Evaluation Module Quick Start Guide



For more information:

www.ti.com/product/PGA411-Q1

www.ti.com/tool/PGA41XQ1EVM

2016

Welcome to the PGA411-Q1 Evaluation Module (EVM) Quick Start Guide. This guide is designed to help you through the initial setup of the EVM and using the PGA411 GUI. Using this Quick Start Guide will help you to connect the PGA to a resolver sensor, power on the EVM, use the PGA411 GUI to configure the PGA411-Q1 Resolver-to-Digital Interface IC, read angle information from the resolver and see and clear faults. All contents of this guide assume that the user has a resolver sensor and the PGA411 GUI installed on a PC. The GUI can be downloaded from www.ti.com/product/PGA411-Q1.

The PGA411-Q1 EVM contains the following:

Hardware

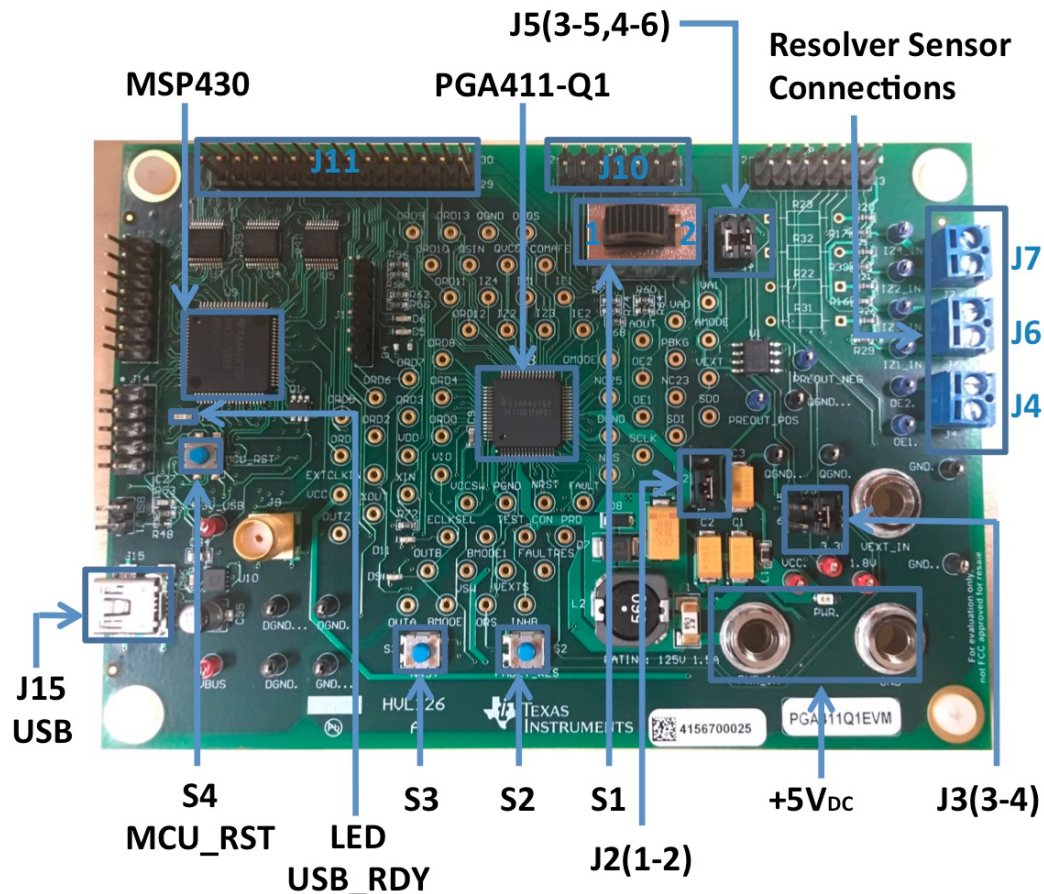
- PGA411-Q1
- MSP430® Texas Instruments microcontroller
- Voltage regulator LDO TLV716/P
- Voltage Regulator LDO TPS735
- Circuitry for interfacing general resolver sensors
- Multiple test points for main analog and digital Signals
- UART, JTAG and USB connectors.

Printed Documents

- PGA411-Q1 Quick Start Guide (this document)

Miscellaneous

- 1 Micro USB 2.0 cable, 3 ft
- Default jumper configurations as shown in figure below.

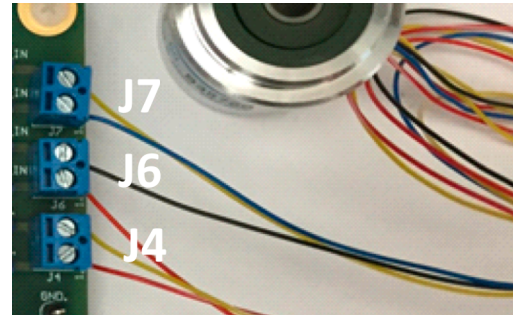


1

Connect the resolver sensors cables to **J4** (Exciter), **J6** (Cosine) and **J7** (Sine). Please refer to the resolver data sheet on cabling nomenclature.

Provide the 5 Volts supply using banana connectors to the PGA411-Q1 EVM. The one in the left is +5V and the one in the right is ground (GND).

Once power is ON connect the USB to the EVM and to your PC, press **S4 MCU_RST** to reset the microcontroller MSP430. LED USB_RDY should be green



2

Launch the PGA411 GUI. Few seconds after the GUI welcome screen appears you should see a block diagram; this diagram is a high level representation of the PGA411-Q1 Resolver to Digital Interface and contains interactive features. All boxes in red are controls that can be configured. If the connection is successful you should see a **CONNECTED** value in the “Connections Status” field and a Revision number in the PGA411-Q1 Device field, both on the upper section of the GUI.

If connections failed press **S4 MCU_RST** on the EVM to re-set the MSP430 and the click on the “Reset”  button in the upper left corner of the GUI to re start it.

The screenshot shows the PGA411 EVM GUI with the following details:

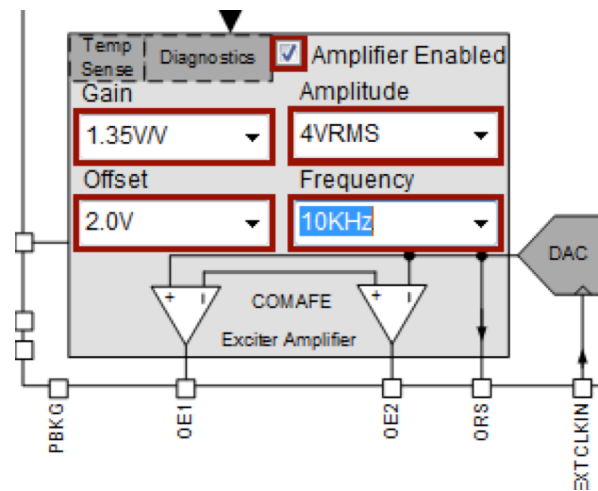
- Top Bar:** Device State: NORMAL, Read Angle button.
- Left Panel:**
 - PGA411x-Q1 EVM
 - Pin Configuration
 - Device Settings
 - General
 - Exciter Amplifier
 - Analog Front End
 - Tracking Loop
 - Diagnostic Masks
 - Memory Map
 - Data Monitor
 - Quick Actions
 - Mask Exciter Faults
 - Mask Fault Pins
 - Force ORS Enabled
 - Device Unlock button
- Main Area:**
 - USB Controller: USB2ANY I/F Found
 - USB Firmware: 2.6.5.53
 - Angle: 89.6484375
 - Connection Status: Connected
 - PGA411x-Q1 Device: Revision: v10.1
- Block Diagram:** A detailed schematic of the PGA411-Q1 device showing internal components like the Digital core, Clock Monitor, Registers, State Machine, SPI I/F, Digital I/O, Exciter Signal Generator, Analog Front End, DAC, and various pins (VDD, VSS, VDDC, VSSC, VDDTS, VSSTS, POND, VEXT, GOND, DOND, J4, J6, J7, etc.).
- Right Panel:**
 - UTILITIES: Fault Status
 - DEV_STAT1: FLOOP_CLAMP, EXTUV, FOCOSOPH, FRCRC, EXTUV, FOSINOPH, FOCERC, FLOOPE, SPI_STAT, FTECRC, FOCOSOPH, FGOPEN, EXTILIM, FOSINOPH, FOSHORT
 - DEV_STAT3: OMIZ4L, OMIZ2H, FIZL3, FIZH1, OMIZ2L, OMIZ3H, FIZL1, OMIZ3L, OMIZ1H, FIZH4, OMIZ1L, FIZL4, FIZH2, OMIZ4H, FIZL2, FIZH3
 - DEV_STAT4: FEXTMONH, FTSD2, FVDDOV, FEXTMONL, FEXTMODE, IOFAULT, SPI_ERR, ABISTF, SFALT, FBSTOV, LBISTF, FVDDOC, FVCCOV
 - DEV_STAT7: FAFECAL
 - Auto Update: Update button, Enable checkbox
- Status Bar:** Fault Reported: FAULTRES, refer to section "Seeing a Fault Triggered at Startup?" in user's guide
- Footer:** TEXAS INSTRUMENTS

3

Now set the PGA411-Q1 parameters depending on the exciter used.

- Exciter Frequency (10 KHz to 20 KHz)
- Exciter Amplitude (4Vrms or 7Vrms)
- Exciter Amp Gain (1.15V/V to 1.9V/V)
- Common Mode - Offset (0.5V to 2V)

All these values, once changed, can be seen instantaneously using a scope probe on the test points next to exciter connection, **J4**.

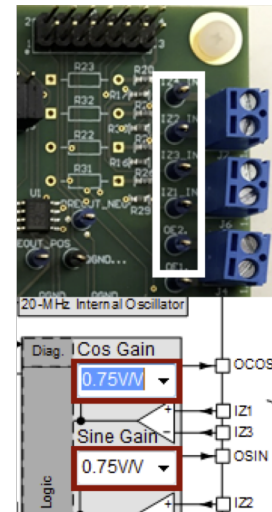


4

The optimum AFE settings depend on the signal levels from the resolver outputs (sine and cosine). Observe these signals on the test points next to the **J6** and **J7** connectors when configuring the AFE.

- AFE Amplifier Gain from 0.75 to 3.5V/V.

Both gains must match to achieve better accuracy on the angle estimation.

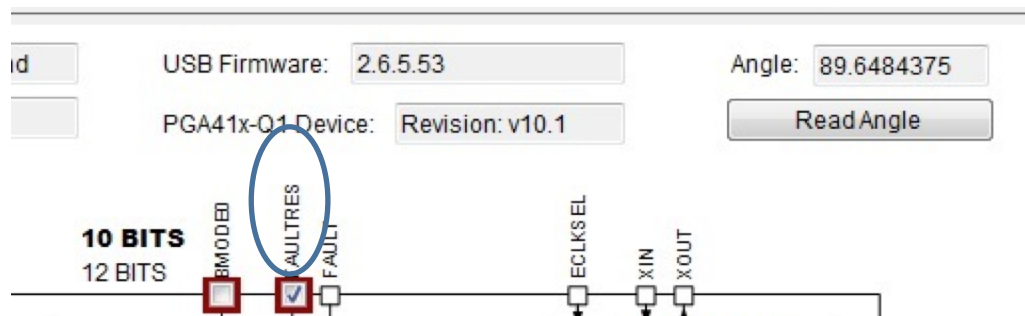


5

To ignore faults, ensure that the **FAULTRES** pin is set to low. To set this pin low, uncheck the box. Toggling the **FAULTRES** pin with a fault condition still present will cause the PGA411-Q1 into normal operation, which may cause damage to the PGA411-Q1. This is most likely to occur with high current short circuits on the exciter amplifier. Ignoring the faults is only recommended for initial evaluation.

After pressing the “**Read Angle**” button the angle (in degrees) from the resolver is displayed. Rotate the resolver and read again. An updated angle is displayed.

Higher precision is achieved by changing the resolution from 10 bits to 12 bits by checking the **BMODE0** box. The new angle reading should have more digits of precision.



6

If you check the box on **FAULTRES** (making it high) faults will be enabled. In order to “force” a fault and to see how the internal diagnostics in PGA411-Q1 work, change the values for detection thresholds on the AFE amplifiers to lower dynamic range as follows:

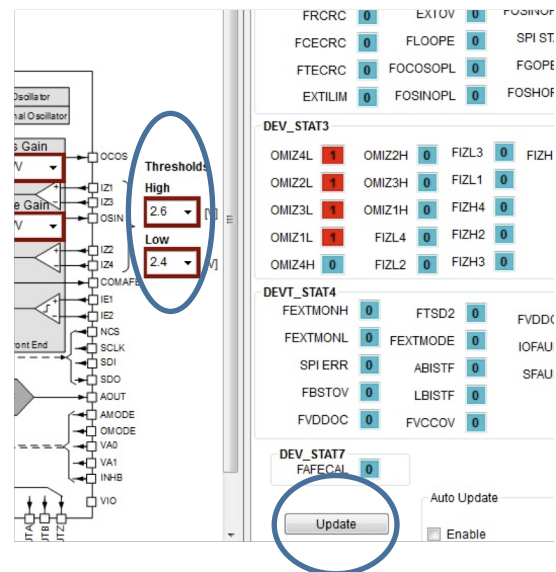
- Threshold High to 2.5V (min value)
- Threshold Low to 2.4 V (max value)

This will trigger the Faults for “Low Reference Integrity” on the AFE inputs. OMIZ1L to OMIZ4L are red. This can be seen clicking on the “**UPDATE**” control.

If the thresholds values are reprogrammed to more relaxed conditions, such as:

- Threshold High to 3.5V
- Threshold Low to 1.5 V

An update on faults will show that the previous faults are not present now.



ADDITIONAL RESOURCES

For more information on PGA411-Q1, including:

- User Guides
- Application Notes
- GUI Updates
- TI Designs

Please visit www.ti.com/product/PGA411-Q1

For troubleshooting tips download <http://www.ti.com/lit/pdf/slaa687>

For support questions, go to TI's E2E™ online community, e2e.ti.com.

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