

IPS2550STKIT GETTING STARTED

20210120

RENESAS ELECTRONICS CORPORATION

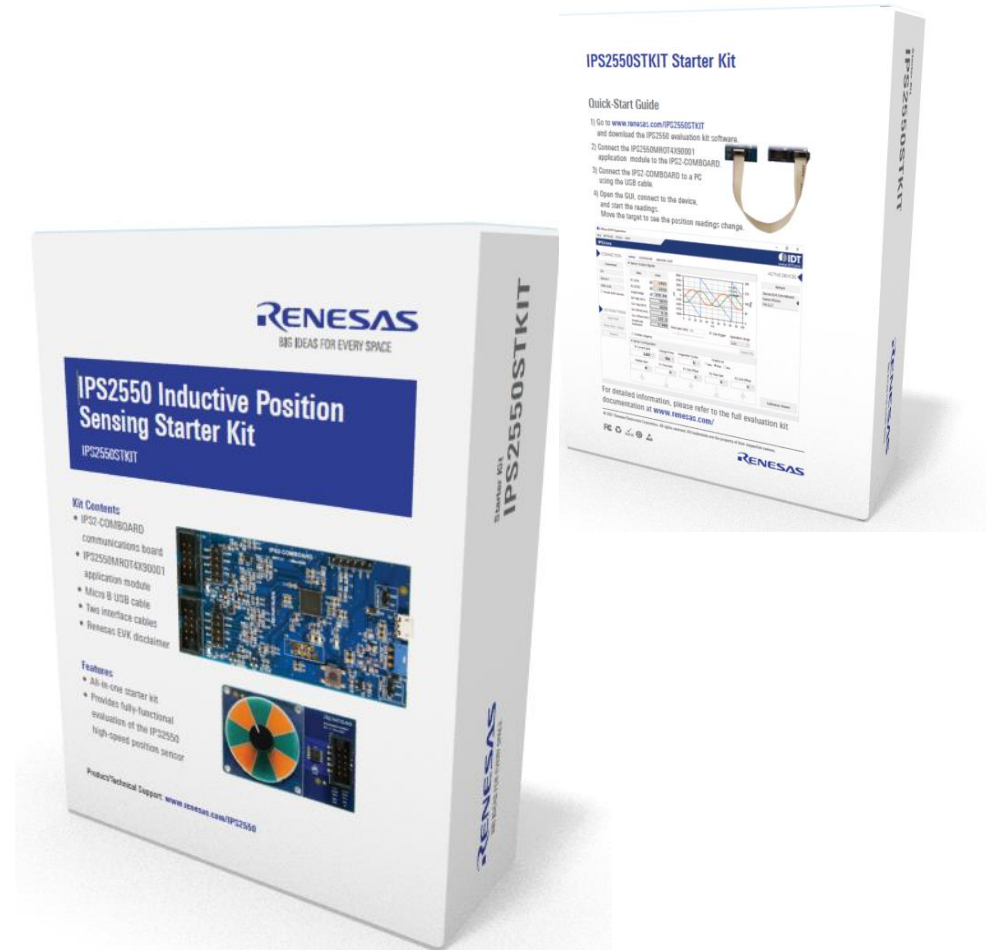
CONTENT

IPS2550STKIT Content

- IPS2-Comboard
- IPS2550MROT4x90001
- Micro B USB cable
- Two 10pin ribbon cables
- Renesas disclaimer document

IPS2550STKIT Getting Started

- IPS2550 General Overview
- Starter Kit Setup Steps
- Starter Kit Configuration
- Programming over the Analog Output Pins



IPS2550 HIGH-SPEED POSITION SENSOR

AECQ100 Grade-0 Automotive Qualified

Interface: sin/cos single ended or differential

Temperature range: -40° to 160° C ambient

Functional Safety: supports ASIL-C single

Voltage Supply: 3.3V \pm 10% or 5.0V \pm 10% supply

Speed: 600.000 (el) rpm

Propagation delay: 4 μ s

Overvoltage, reverse polarity, short-circuit protected

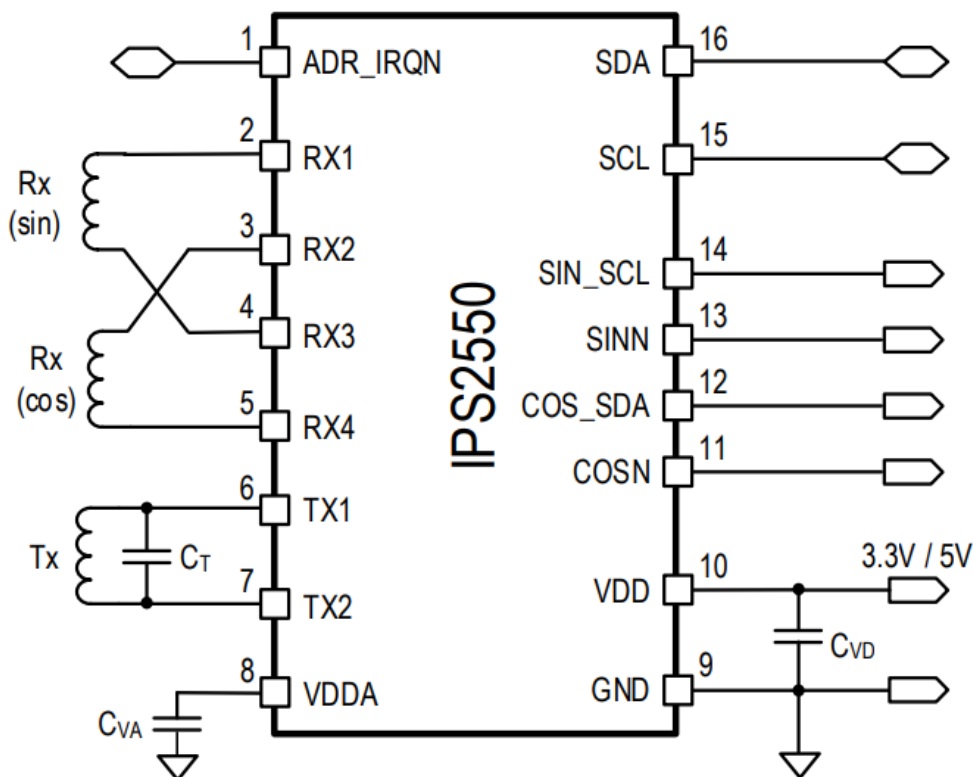
Programming interface: I²C or over output pins

Diagnostics interrupt to external MCU

AGC to compensate air-gap variations

TSSOP-16 with exposed pad

Improvement over IPS2200 in blue



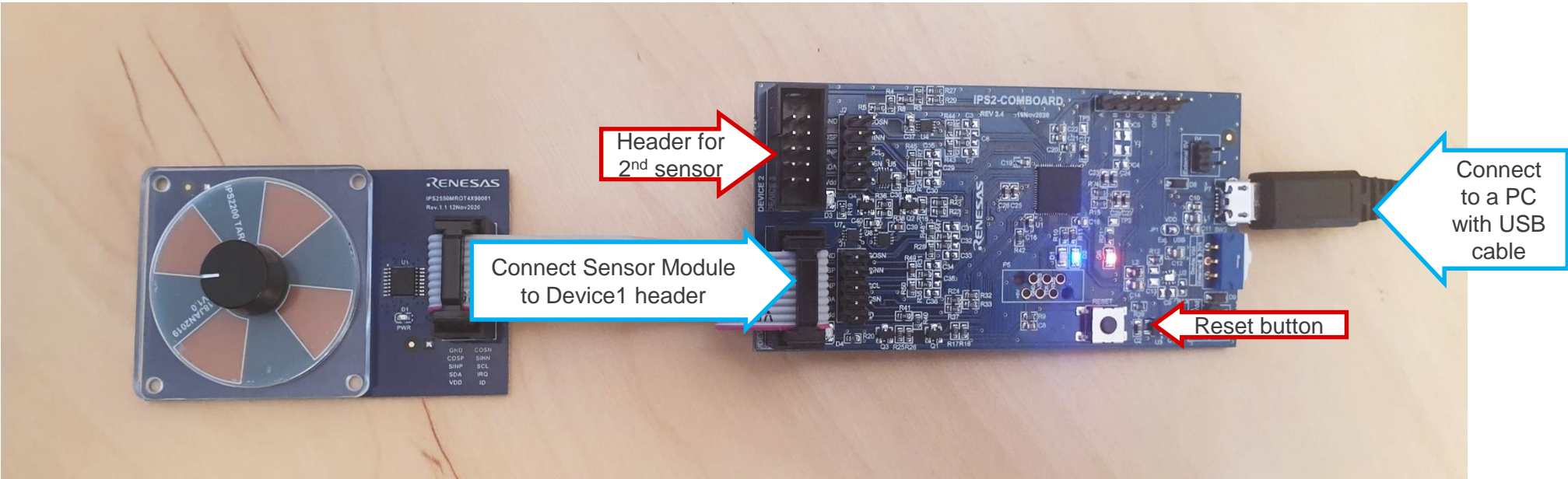
IPS2550 is pin backward compatible
to IPS2200 in straight pinout mode

EVALUATION KIT SETUP: STEP 1 - CONNECT BOARD

Step 1: Connect IPS2550MROT4X90001 to the IPS-COMBOARD

IPS2550 Sensor Module
IPS2550MROT4X90001

IPS-COMBOARD
(Same for IPS2200 and IPS 2550)



EVALUATION KIT SETUP: STEP 2 – INSTALL GUI AND CONNECT

Step 2: Download and Install the IPS2550 EVKIT Application. Open the application and click on “Connect”

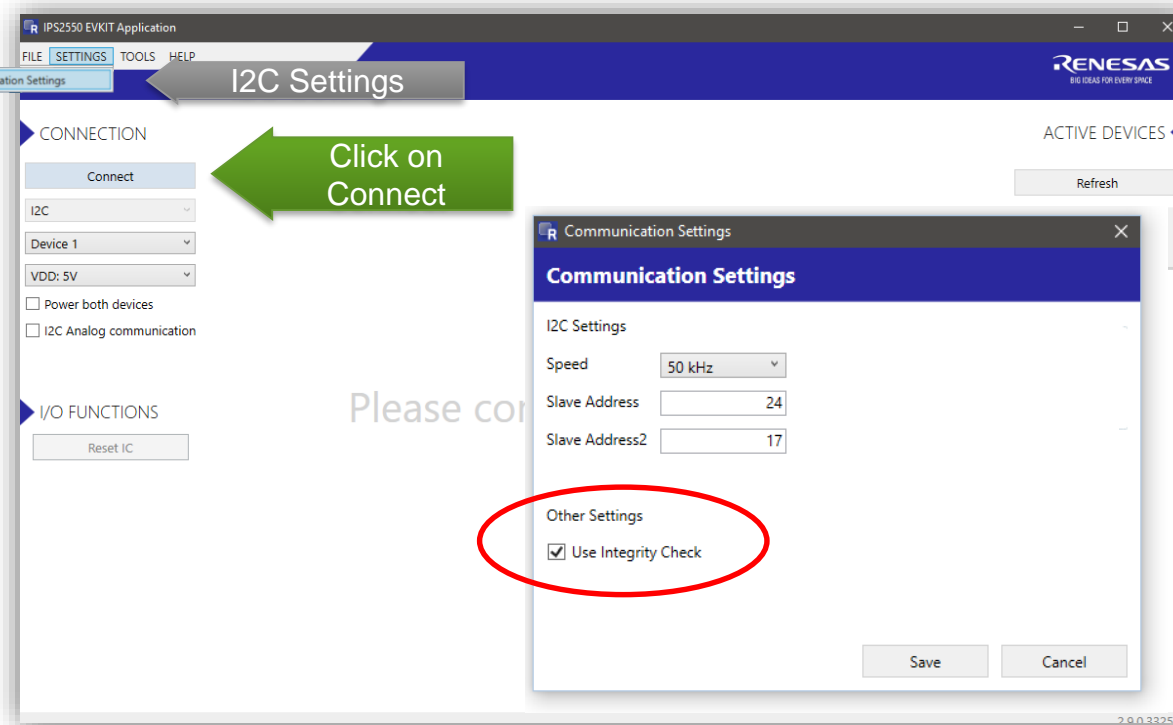
(Request Download Link if not available)

Select connection settings:

- (1) Select Device 1 (as connected)
- (2) Select VDD: 5V (IPS2550MROT4X90001 default)

Optional:

- (3) Change I2C address if needed in “Settings → Communication Settings”
- (4) Enable Integrity Check for default config



Default I2C Addresses:

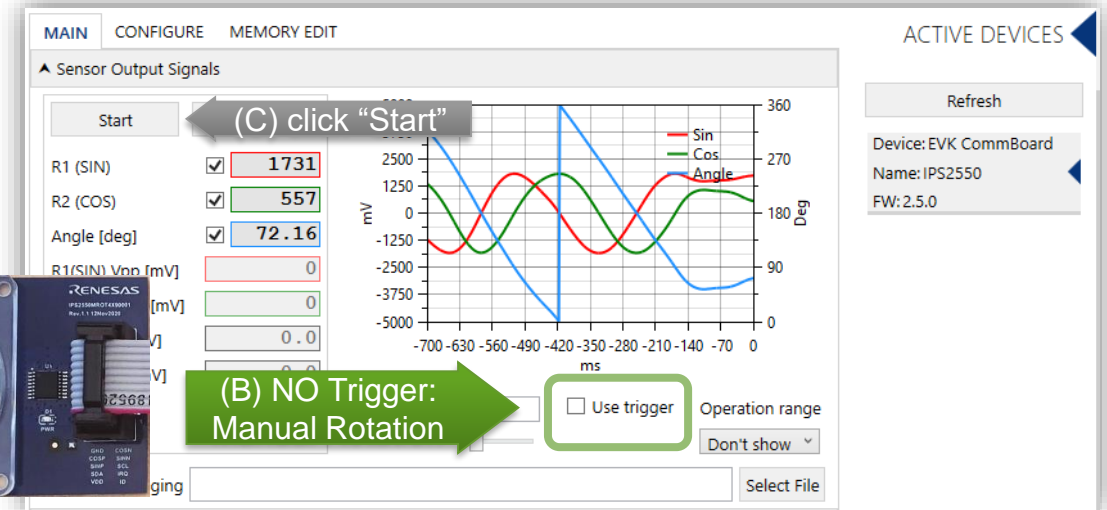
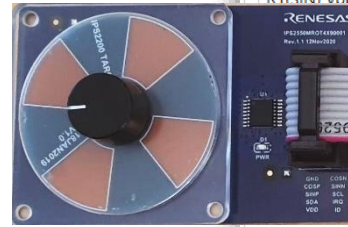
- 24 dec (18h) → default + AdrPin High (IPS2550MROT4X90001)
- 17 dec (11h) → default + AdrPin Low
- 16 dec (10h) → old default

EVALUATION KIT SETUP: STEP 3 – READ OUTPUT SIGNALS

Step 3: Read Output Signals

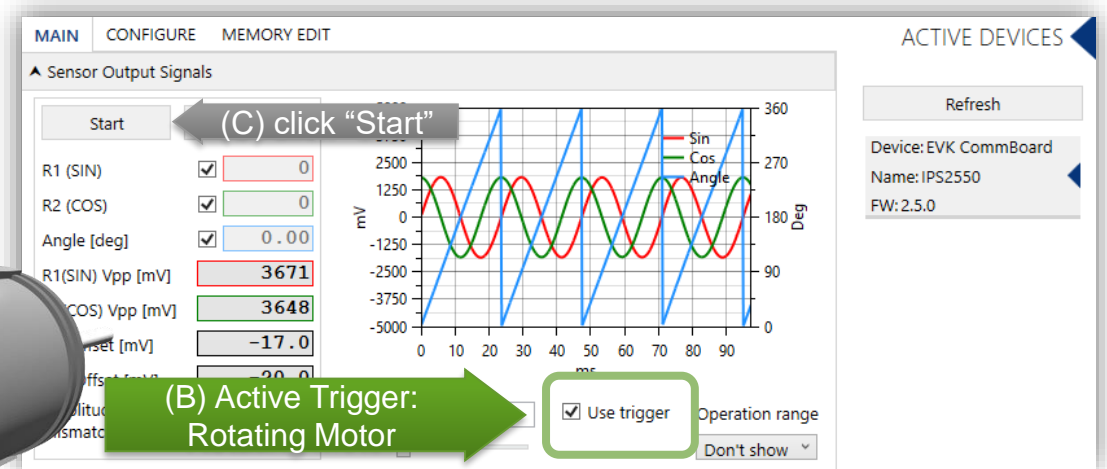
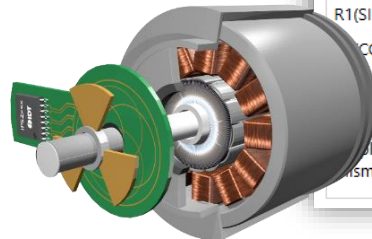
- (A) Place a target over the Sensor Module
- (B) Decide for automatic trigger
- (C) Click Start to display output signals

Rotation by hand:
No trigger & configure time span



(B) NO Trigger:
Manual Rotation


**Motor rotating
(preferred):**
automatic trigger & select periods

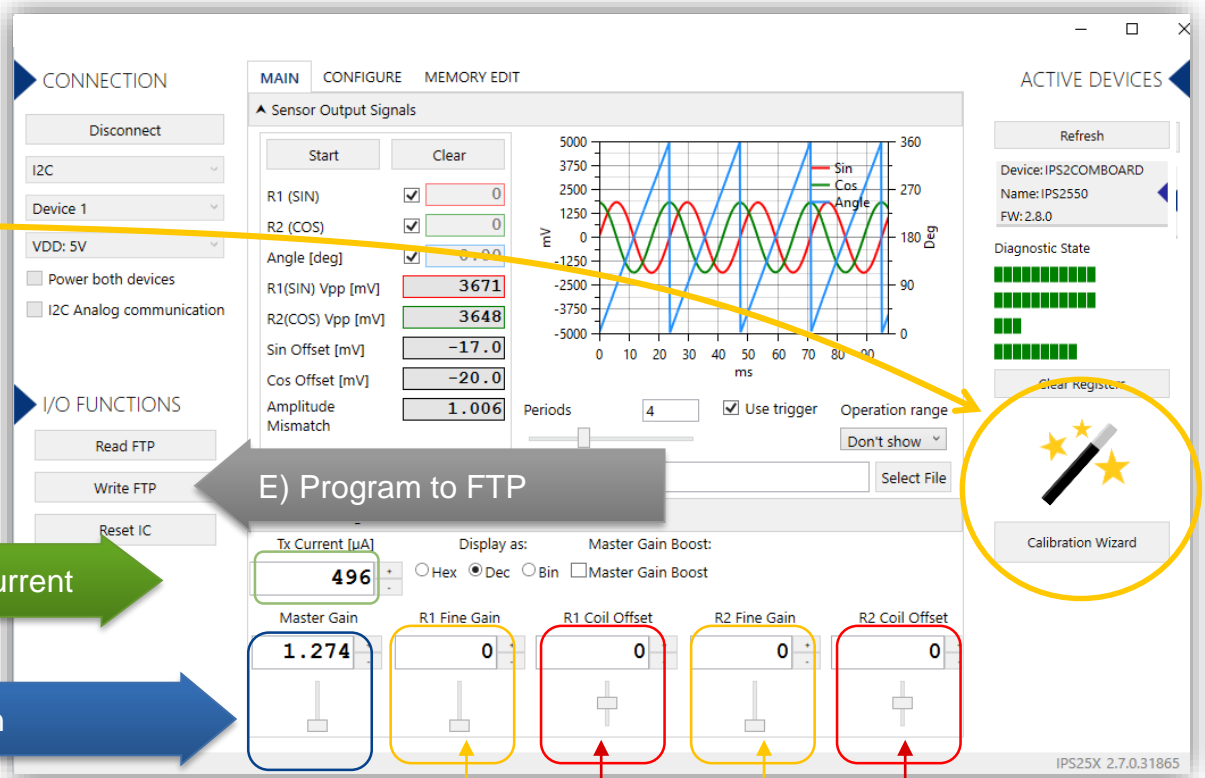


(B) Active Trigger:
Rotating Motor

EVALUATION KIT SETUP: STEP 4 – SENSOR CONFIGURATION

Step 4: Sensor Configuration Options:

- Use the Calibration Wizard 
(ONLY WITH ROTATING MOTOR)
- Alternatively configure Steps A...E manually (refer to the IPS2550 Programming Manual)



The screenshot shows the 'MAIN' tab of the 'Sensor Configuration' software. The interface includes a 'CONNECTION' panel on the left with 'Disconnect', 'I2C', 'Device 1', and 'VDD: 5V' options. The 'I/O FUNCTIONS' panel has 'Read FTP', 'Write FTP', and 'Reset IC' buttons. The 'Sensor Output Signals' section contains a table of parameters and a graph. The 'ACTIVE DEVICES' panel on the right shows 'Device: IPS2COMBOARD', 'Name: IPS2550', 'FW: 2.8.0', and a 'Diagnostic State' bar. A 'Calibration Wizard' button with a pencil and stars icon is circled in yellow. Annotations A-E point to specific fields: A) TX Bias Current (496), B) Gain (1.274), C) Offset (R1 SIN, R2 COS, Sin Offset, Cos Offset), and D) Amplitude (Amplitude Mismatch). A grey box labeled 'E) Program to FTP' is also present.

Parameter	Value
R1 (SIN)	<input checked="" type="checkbox"/> 0
R2 (COS)	<input checked="" type="checkbox"/> 0
Angle [deg]	<input checked="" type="checkbox"/> 0.00
R1(SIN) Vpp [mV]	3671
R2(COS) Vpp [mV]	3648
Sin Offset [mV]	-17.0
Cos Offset [mV]	-20.0
Amplitude Mismatch	1.006

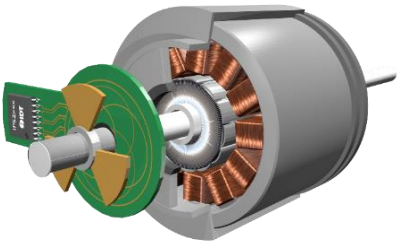
Graph: Sin (red), Cos (green), Angle (blue) vs Time (ms). Y-axis: mV (-5000 to 5000). X-axis: ms (0 to 90).

Parameters: Tx Current [uA] = 496, Master Gain = 1.274, R1 Fine Gain = 0, R1 Coil Offset = 0, R2 Fine Gain = 0, R2 Coil Offset = 0.

Buttons: Start, Clear, Read FTP, Write FTP, Reset IC, Calibration Wizard, E) Program to FTP.

SENSOR CONFIGURATION USING THE CALIBRATION WIZARD

Configure the Sensor by performing steps A ...E
(WITH ROTATING MOTOR ONLY)



1. TX Current Setup

2. Gain Stage Calibration

3. Offset Compensation

4. Mismatch Compensation

TX Current Setup

L [μH]
1.6
Coil Inductance

R_L [Ω]
2

C_{TX} [pF]
550

Fexc [MHz]
3
Excitation Frequency

VDD [V]
5
Specified in Main Window

System Type
Single
Specified in Main Window

Formula
I_{bias} = VDD / (35 * L * Q * Fexc)

I_{bias} [μA]
0

TX Current [μA]
0

Calculate TX Current

Write Calibration to NVM

Proceed with Gain Stage Calibration

Close

1. TX Current Setup

2. Gain Stage Calibration

3. Offset Compensation

4. Mismatch Compensation

Gain Stage Calibration

Optimal signal range
3900

Sin Vpkpk
0

Cos Vpkpk
0

Master Gain
0

Number of Periods
4

Points per Period
400

Start Calibration

Write Calibration to NVM

Proceed with Offset Compensation

Close

1. TX Current Setup

2. Gain Stage Calibration

3. Offset Compensation

4. Mismatch Compensation

Offset Compensation

Sin Offset [mV]
0
R1 Offset Reg Value
0

Cos Offset [mV]
0
R2 Offset Reg Value
0

Number of Periods
4

Points per Period
400

Status

Start Calibration

Write Calibration to NVM

Proceed with Mismatch Compensation

Close

1. TX Current Setup

2. Gain Stage Calibration

3. Offset Compensation

4. Mismatch Compensation

Mismatch Compensation

Sin Vpkpk
0
R1 Fine Gain
0

Cos Vpkpk
0
R2 Fine Gain
0

Mismatch
0

Number of Periods
4

Points per Period
400

Start Calibration

Write Calibration to NVM

Program to FTP

IPS2550 CONFIG: CHANGE CONFIGURATION IN CONFIGURE TAB

All configuration of the IPS2550 can be changed here.

It consists of 3 register blocks:

- FTP
 - Few Times Programmable Register
 - (1000 write cycles max.)
- SRB
 - Shadow Register Bank
 - Volatile
- SFR
 - Special Function Register
 - Contains Status and Interrupt handling

(For details refer to the IPS2550 Programming Manual)

The screenshot displays the configuration tool interface for the IPS2550. A green arrow labeled "Configure Tab" points to the "CONFIGURE" tab, which is highlighted in the top navigation bar. The interface is divided into several sections:

- CONNECTION:** Includes a "Disconnect" button, a dropdown for "I2C", a dropdown for "Device 1", a dropdown for "VDD: 5V", and checkboxes for "Power both devices" and "I2C Analog communication".
- I/O FUNCTIONS:** Includes buttons for "Read FTP", "Write FTP", "Read SRB", "Write SRB", "Read SFR", "Write SFR", and "Reset IC".
- MAIN CONFIGURE TAB:** Features a "CONFIGURE" tab (highlighted), a "MEMORY EDIT" tab, and a "Show memory type" dropdown set to "FTP". Below this is a table of registers with their values.
- ACTIVE DEVICES:** Includes a "Refresh" button and a section showing "Device: EVK CommBoard", "Name: IPS2550", and "FW: 2.5.0".

The register table in the main configure tab shows the following values:

Register Name	Value	Register Name	Value
i2c_slave_sub_addr	2	afe_r1_offset_cal	0
afe_r2_offset_cal	0	exc_current_cal_base	62
exc_freq_wdg	0	exc_freq_ll	0
exc_freq_ul	0	irq_wdg	0
agc_pause_err_dis	0	rc_osc_cal	55
cmode_trim_val	8	sinp_offs_trim	1
cmode_trim_sign	0	sinn_offs_trim	7
prob_dly_trim_lsb	0	cosp_offs_trim	3
over_temp_trim	4	prob_dly_trim_msb	0
cosn_offs_trim	2	customer_id	0
product_id	0	fab_code	0
wafer_id	0	I2_lot_id	0
I1_lot_id	0	I3_lot_id	0
I2_msb_lot_id	0	I4_I5_lot_id	0
die_v_nsec	0	die_v_nsec	0

Register values in red are different than actual values in chip memory. You need to write them to chip memory in order to take effect.

IPS25X 2.7.0.31865

IPS2550 CONFIG: MEMORY EDIT

Default Setup:

5V Mode

I2C Interface with address pin

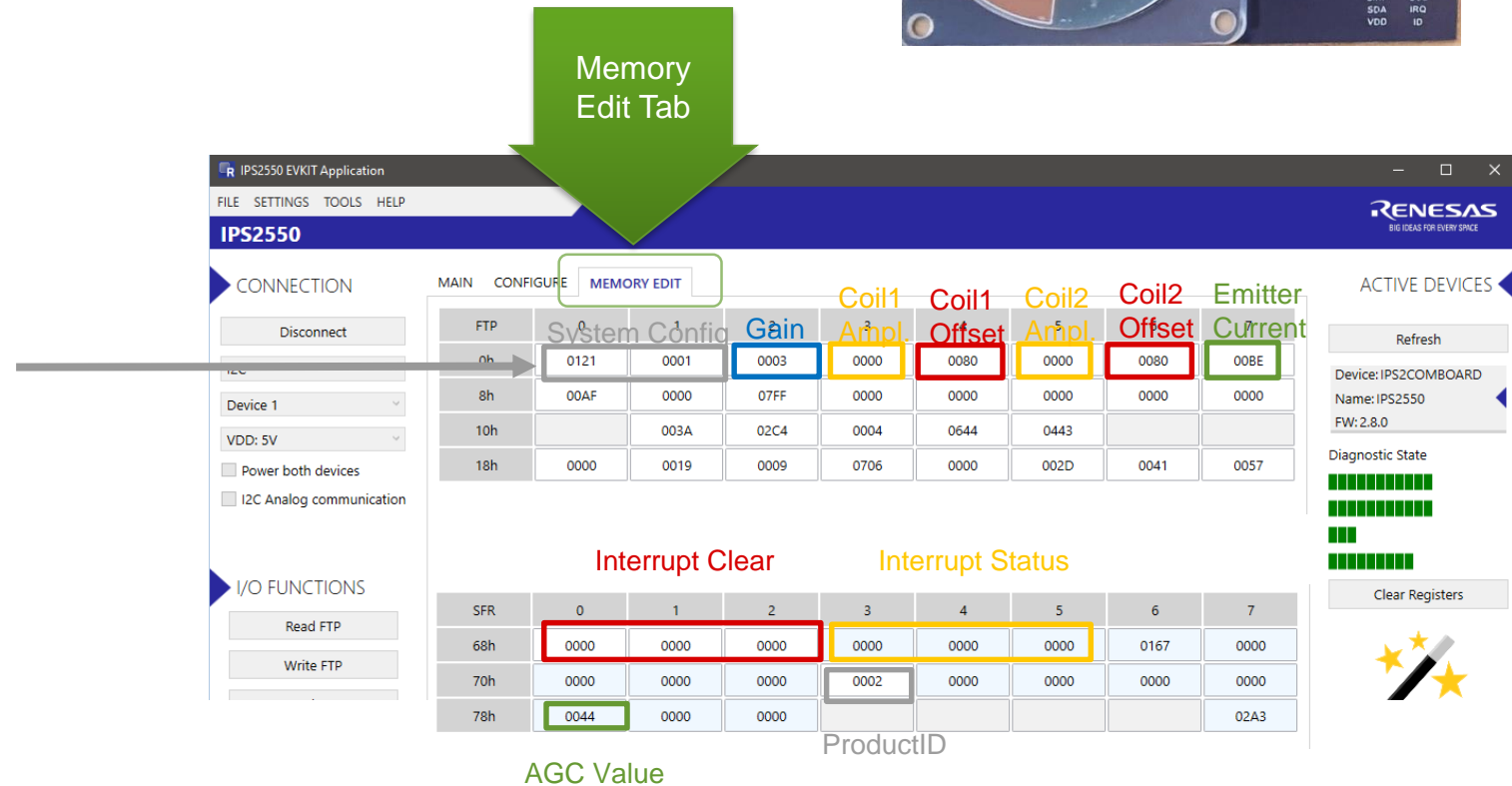
Differential Sin/Cos Output

AGC "ON"



Examples:

- System Config1 0x00 =
 - 0121h -> AGC ON (default)
 - 0321h-> AGC OFF
- System Config2 0x01 =
 - 0001h-> IPS2550 Pinout (default)
 - 0021h-> IPS2200 Pin Compatible

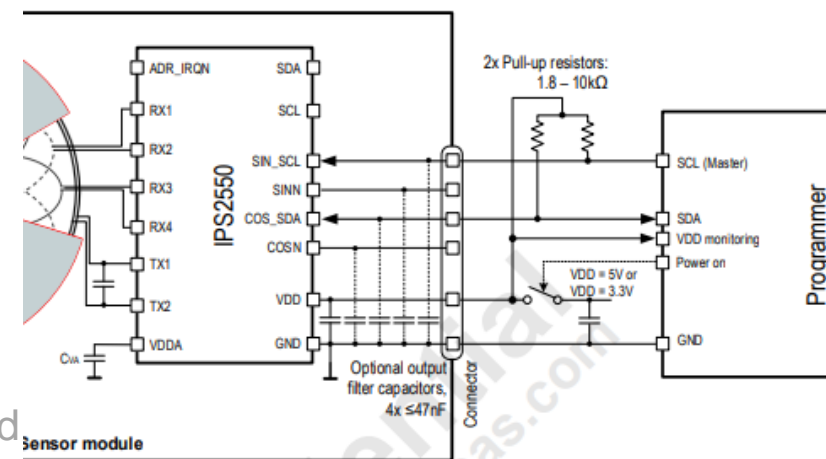
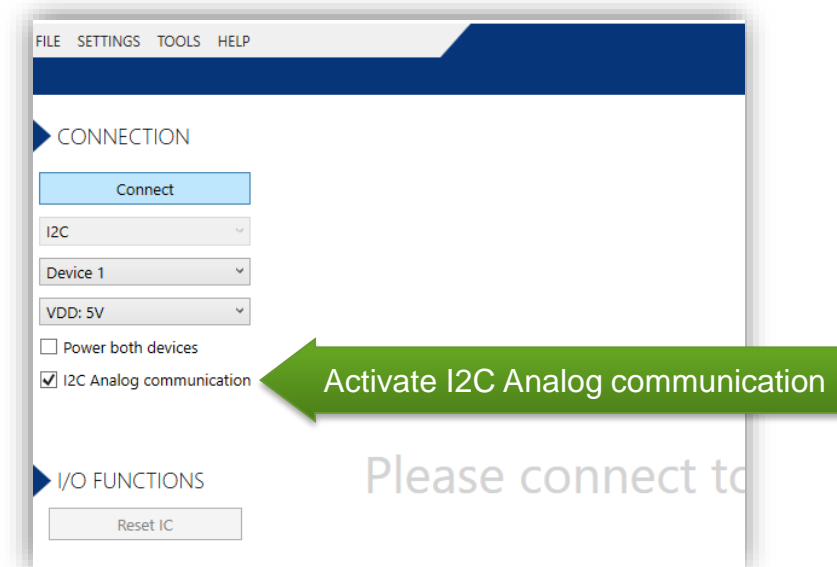


(For details refer to the IPS2550 Programming Manual)

PROGRAMMING OVER ANALOG OUTPUT PINS

It is possible to program the IC over the analog output pins. Select “**I2C Analog communication**”.

- When I2C over analog lines is selected 4KHz clock is used automatically
- If a customer programming board is used pull-ups should be 2.4K or lower.
- Filtering capacitors should be max 47nF
- If a IPS-comboard is used:
 - From Rev.2.4, the smaller pull-ups are activated automatically. Connect supply and output pins only.
 - Up to Rev.2.3 (with internal 4K7 ohm pull-ups), additional pull-ups (4K7 ohm) on the SINP and COSP pins of the sensor module are needed. Alternatively these pull-ups on the IPS-comboard can be replaced with smaller ones.
 - Up to Rev.2.3, analog output pins on the IPS-comboard must be connected to I2C pins of the IPS-comboard using jumper wires



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