

IPS2550STKIT GETTING STARTED

20210729

RENESAS ELECTRONICS CORPORATION

CONTENT

IPS2550STKIT Content

IPS2-Comboard, Micro B USB cable

IPS2550MROT4x90001, Two 10pin ribbon cables

Renesas disclaimer document

Getting Started Index

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IPS2550 OVERVIEW: 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 ±10% or 5.0V ±10% supply

Speed: 600.000 (el) rpm

Propagation delay: 4µs

Overvoltage, reverse polarity, short-circuit protected

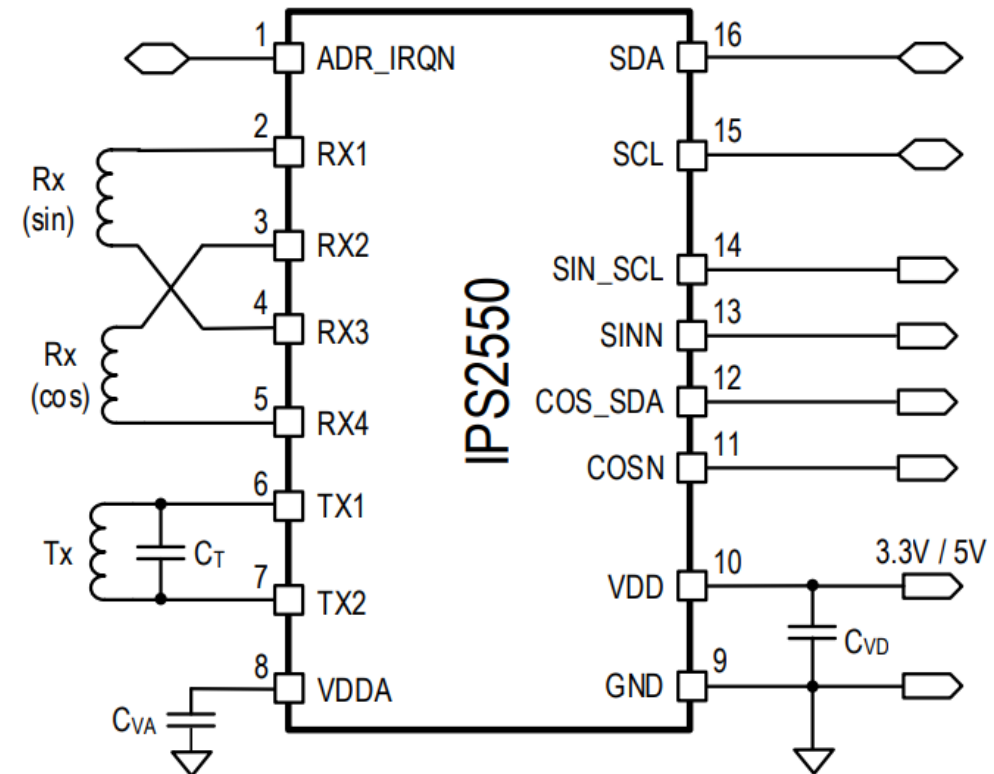
Programming interface: I²C or [over output pins](#)

Diagnostics interrupt to external MCU

[AGC to compensate air-gap variations](#)

TSSOP-16 [with exposed pad](#)

Improvement over IPS2200 in [blue](#)



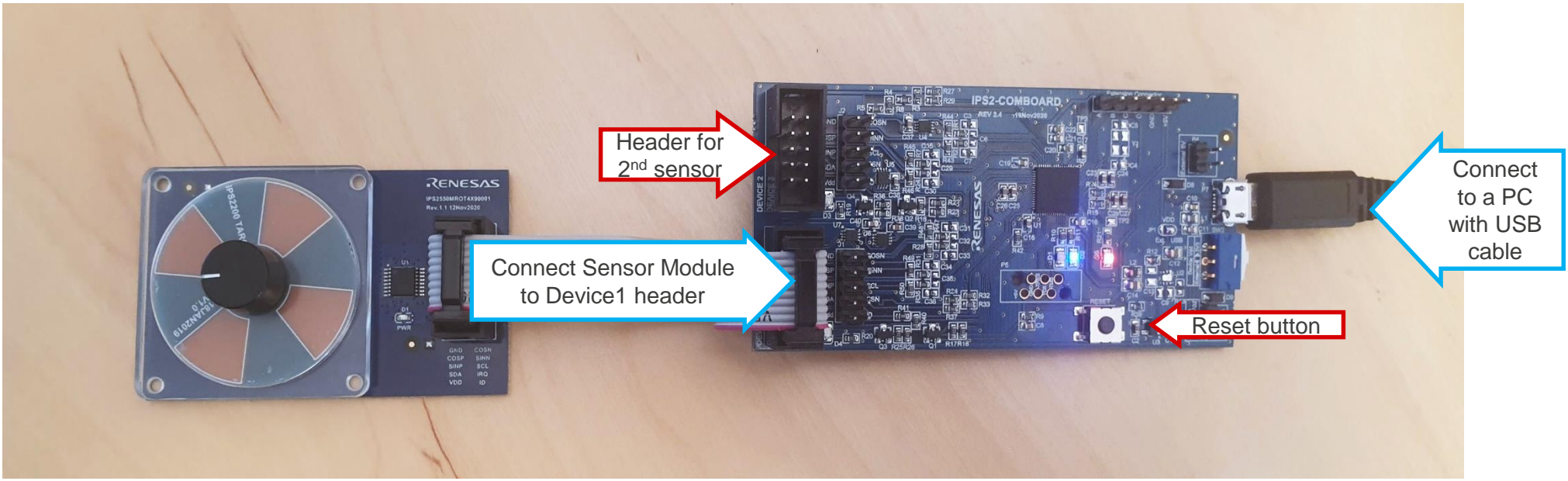
IPS2550 is pin backward compatible
to IPS2200 in straight pinout mode

EVALUATION KIT SETUP: STEP 1 - CONNECT BOARD

Connect the IPS2550MROT4X90001 sensor module 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

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

(Download Link: <https://www.renesas.com/document/swr/ips2550stkit-evaluation-software-gui>)

Select connection settings:

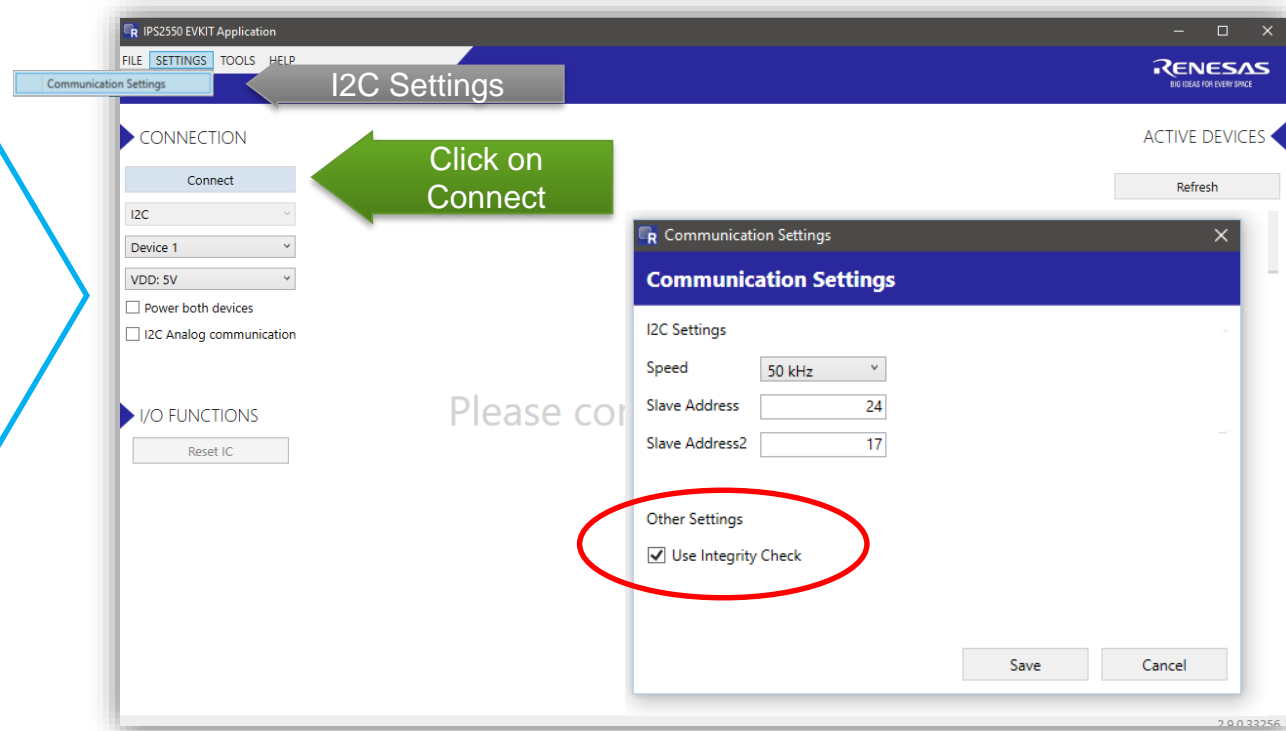
- (1) Select Device 1 (as connected)
- (2) Select VDD: 5V (IPS2550MROT4X90001 default)

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

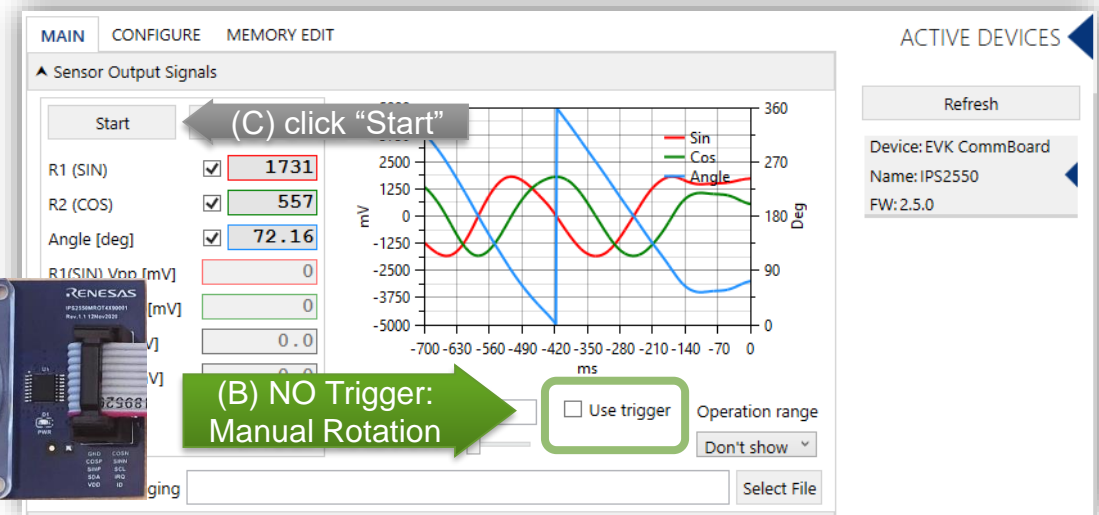
A) Place Target over the Sensor Module

B) Decide for Automatic Trigger

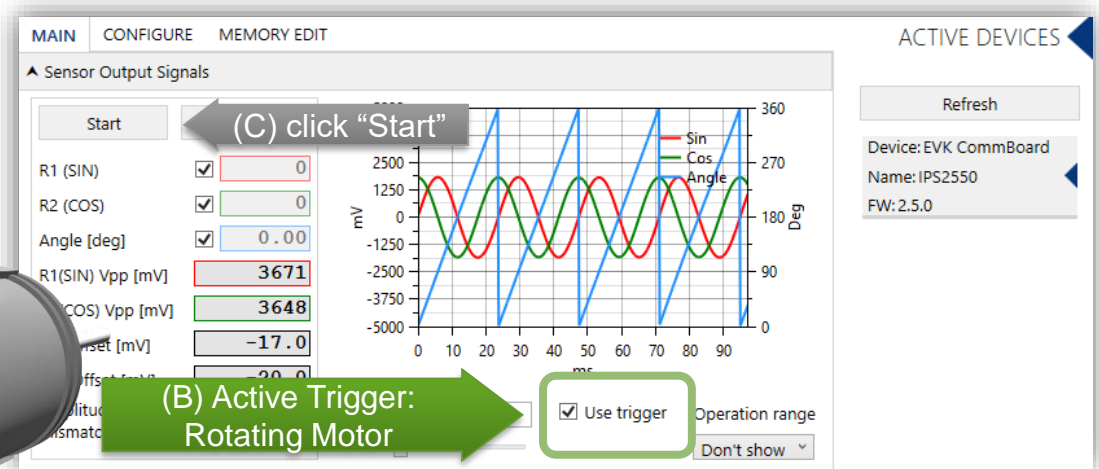
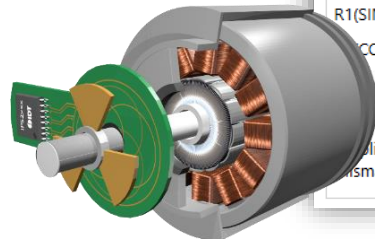
Manual Rotation: NO Trigger	Motor Rotation: USE Trigger
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C) Click „Start“ to display data

Rotation by hand:
No trigger & configure time span




Motor rotating (preferred):
automatic trigger & select periods



EVALUATION KIT SETUP: STEP 4 – SENSOR CONFIGURATION

Step 4: Sensor Configuration Options:

1. Use the Calibration Wizard 
(WITH ROTATING MOTOR ONLY)

2. Alternatively configure steps A...E manually (refer to the IPS2550 Programming Manual)

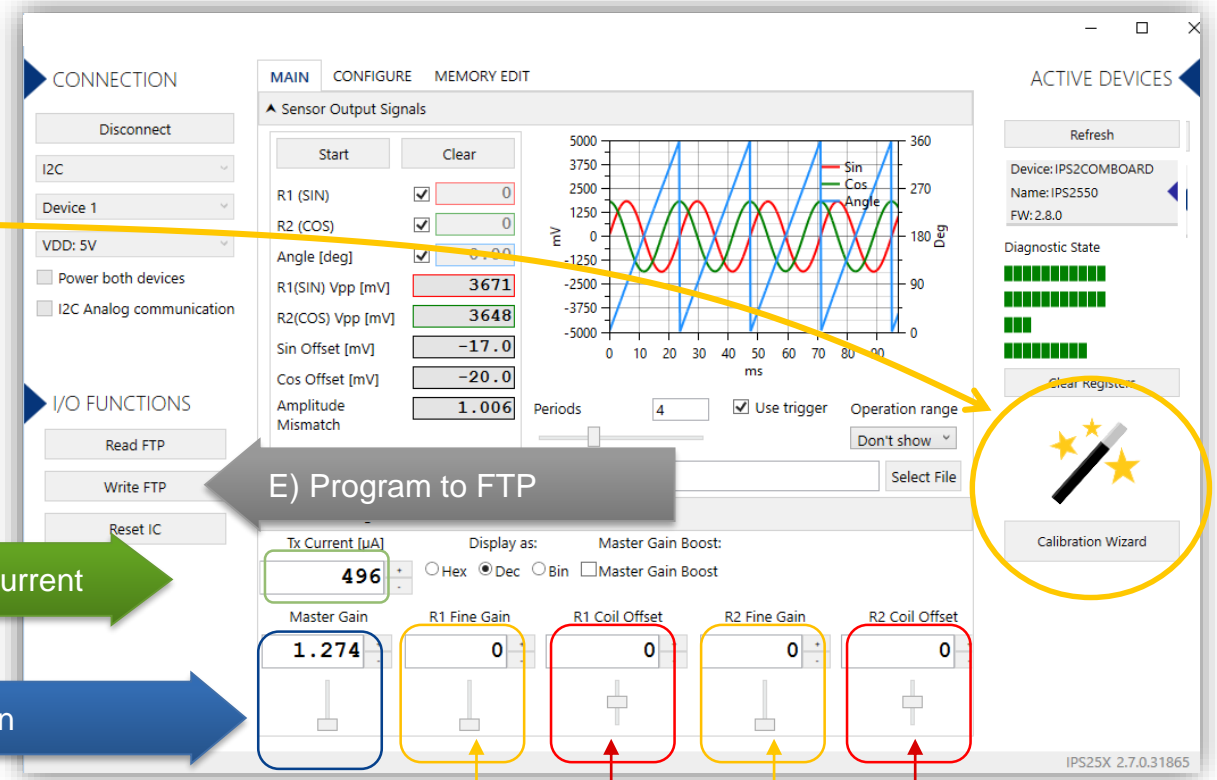
A) TX Bias Current

B) Gain

C) Offset

D) Amplitude

E) Program to FTP



ACTIVE DEVICES

Device: IPS2COMBOARD
Name: IPS2550
FW: 2.8.0

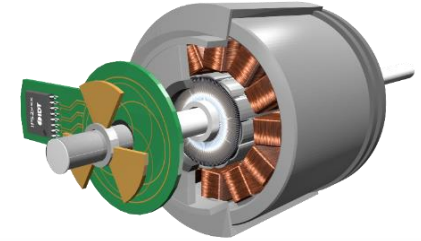
Diagnostic State

Calibration Wizard

IPS25X 2.7.0.31865

SENSOR CONFIGURATION USING THE CALIBRATION WIZARD

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



IPS2550 Calibration Wizard

TX Current Setup

1. TX Current Setup

2. Gain Stage Calibration

3. Offset Compensation

4. Mismatch Compensation

L [μ H] 1.6 Coil Inductance
R_L [Ohm] 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} [μ A] 0
TX Current [μ A] 0

Calculate TX Current

Write Calibration to NVM Proceed with Gain Stage Calibration Close

B) Gain

IPS2550 Calibration Wizard

Gain Stage Calibration

1. TX Current Setup

2. Gain Stage Calibration

3. Offset Compensation

4. Mismatch Compensation

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

C) Offset

IPS2550 Calibration Wizard

Offset Compensation

1. TX Current Setup

2. Gain Stage Calibration

3. Offset Compensation

4. Mismatch 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

D) Amplitude

IPS2550 Calibration Wizard

Mismatch Compensation

1. TX Current Setup

2. Gain Stage Calibration

3. Offset Compensation

4. 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 Proceed with Mismatch Compensation Close

E) Program to FTP

MANUAL SENSOR CONFIGURATION

Configure the Sensor by performing steps A ...E

(WITH ROTATING MOTOR ONLY)

Preparation:

Disable the AGC: AGC code is configured as static gain

A) TX current

Keep the default or set-up with programming manual

B) Gain

Adjust the master gain for desired output amplitudes only if AGC is not enabled after configuration

C) Offset compensation

Adjust Coil Offset Compensation until the Offset is as close as possible to „0“

D) Amplitude Mismatch compensation

Adjust Fine Gain Compensation until the Amplitude Mismatch is as close as possible to „1“

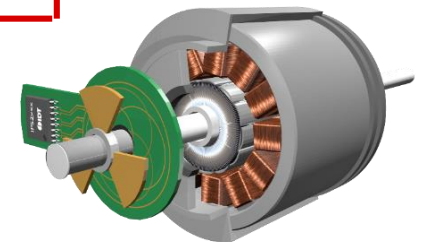
E) Enable AGC again if needed & Click on „Write FTP“

A) TX Bias Current

B) Gain

C) Offset

D) Amplitude



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)

Configure Tab

CONNECTION

Disconnect

I2C

Device 1

VDD: 5V

Power both devices

I2C Analog communication

I/O FUNCTIONS

Read FTP

Write FTP

Read SRB

Write SRB

Read SFR

Write SFR

Reset IC

MAIN **CONFIGURE** MEMORY EDIT

ALL REGISTERS

Shown memory type: FTP

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_plause_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_pos	0	die_v_pos	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.

ACTIVE DEVICES

Refresh

Device: EVK CommBoard

Name: IPS2550

FW: 2.5.0

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



IPS2550 EVKIT Application

FILE SETTINGS TOOLS HELP

IPS2550

CONNECTION MAIN CONFIGURE MEMORY EDIT

Disconnect

Device 1

VDD: 5V

Power both devices

I2C Analog communication

I/O FUNCTIONS

Read FTP

Write FTP

FTP	System Config	Gain	Coil1 Ampl.	Coil1 Offset	Coil2 Ampl.	Coil2 Offset	Emitter Current	
0h	0121	0001	0003	0000	0080	0000	0080	00BE
8h	00AF	0000	07FF	0000	0000	0000	0000	
10h		003A	02C4	0004	0644	0443		
18h	0000	0019	0009	0706	0000	002D	0041	0057

Interrupt Clear

SFR	0	1	2	3	4	5	6	7
68h	0000	0000	0000	0000	0000	0000	0167	0000
70h	0000	0000	0000	0002	0000	0000	0000	0000
78h	0044	0000	0000					02A3

AGC Value

ProductID

ACTIVE DEVICES

Refresh

Device: IPS2COMBOARD

Name: IPS2550

FW: 2.8.0

Diagnostics State

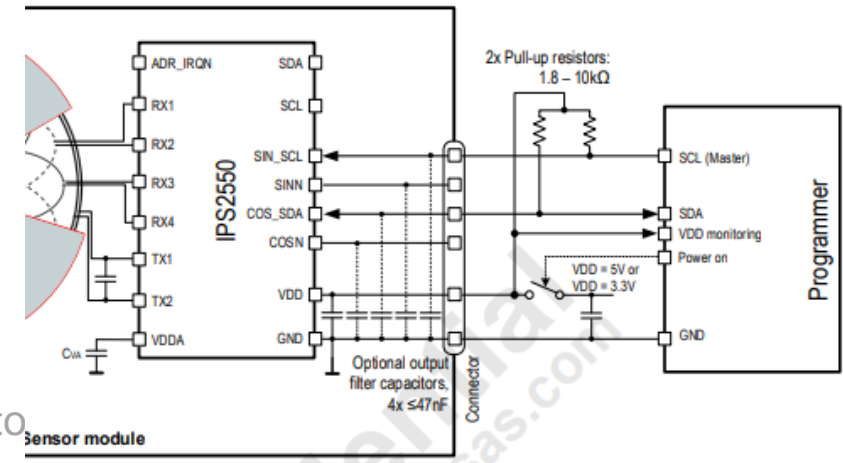
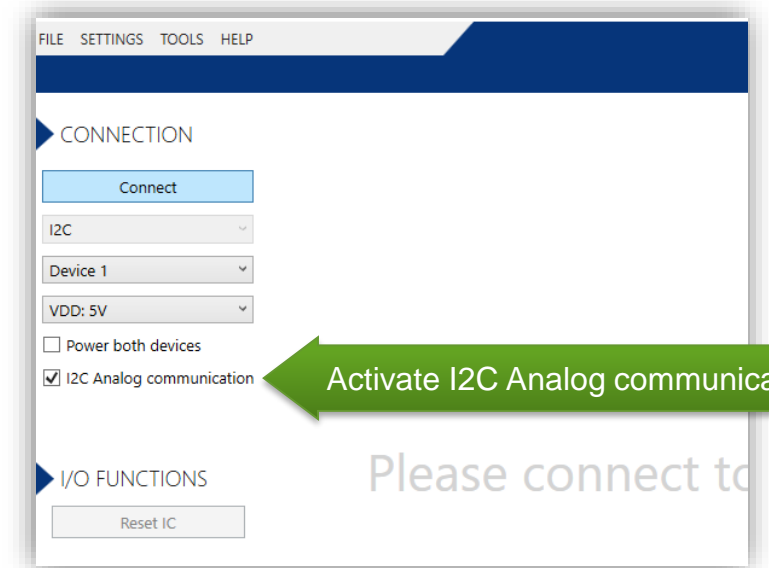
Clear Registers

(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 an 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 and FW:3.2 or newer, external 2K4 pull-ups must be added on SIN_SCL and COS_SDA pins. (Jumper wires not needed)
 - Up to Rev.2.3 and with FW:2.11 or older, analog output pins on the IPS-comboard must be connected to I2C pins of the IPS-comboard using jumper wires. As well the pull-ups on the IPS-comboard must be reduced to 2K4. (eg. add additional 4K7 resistors in parallel)



IPS2550 SUPPORT DOCUMENTS

IPS2550 Landing Page:

<https://www.renesas.com/ips2550>

IPS2550 Datasheet (secure link):

<https://www.renesas.com/us/en/document/dst/ips2550-datasheet>

IPS2550 Sensor and Coil Design Instruction Video (9min):

<https://www.renesas.com/us/en/video/how-design-inductive-position-sensor>

IPS2550 Customer Reference Board Catalog:

<https://www.renesas.com/us/en/document/oth/ips2-customer-reference-board-catalog-crb>

IPS2550 EMC Recommendations (secure link):

<https://www.renesas.com/document/apn/ips2550-emc-recommendations>

IPS2550 Programming Guide:

<https://www.renesas.com/document/man/ips2550-programming-guide>

[Renesas.com](https://www.renesas.com)