US082-FS2012EVZ

The US082-FS2012EVZ board enables quick prototyping for a custom system design with the FS2012 mass air flow sensor module. The board provides a standard Pmod™ Type 6A (Extended I^2C) connection for the on-board sensor to plug into any MCU evaluation kit with a matching connector.

The US082-FS2012EVZ features Pmod connectors on both sides of the board allowing additional Type 6/6A boards to be connected in a daisy-chained solution with multiple sensors on the same MCU Pmod connector. Because of the standard connector and software support, the US082-FS2012EVZ is the best choice to rapidly create an IoT system with the Renesas Quick-Connect IoT.

Features

- FS2012 sensor sample mounted:
  - Thermo-transfer (calorimetric) principle uses MEMS thermocouples to measure flow, which provide excellent signal-to-noise ratio
  - Resistant to surface contamination
  - No cavity to cause clogging
  - Resistant to vibration and pressure shock
- High-temperature flow housing
- Standardized Type 6A Pmod connector supports I^2C Extended interface
- Dual connectors allow pass-through signals for daisy-chained solutions

Board Contents

- US082-FS2012EVZ Board



Figure 1. US082-FS2012EVZ Pmod Board

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1. Functional Description

The US082-FS2012EVZ functions as a sensor building block to create a custom system solution. Use the board individually or with a combination of other sensors by using the Pmod Type 6A interface. (See the Renesas Quick-Connect IoT web page for a list of available sensor Pmod boards.)

2. Setup

2.1 Required or Recommended User Equipment

The following additional lab equipment (sold separately) is required for using the board:

- Any MCU board that supports Type 6A Pmod.
- US082-INTERPEVZ interposer board if using one of the Renesas MCU kits shown in Table 1.

Table 1. Renesas MCU Evaluation Kits[1] capable of supporting Type 6A PMODs when used with the US082-INTERPEVZ

RA	RX	Synergy
EK-RA4W1	RX111-Starter-Kit	PK-S5D9
EK-RA2A1	RX231-Starter-Kit	DK-S3A7
EK-RA4M1	RX23W-Starter-Kit	DK-S128
EK-RA6M1	RX23T-Starter-Kit	TB-S1JA
EK-RA6M2	RX24T-Starter-Kit	TB-S3A6
EK-RA6M3	RX24U-Starter-Kit	DK-S7G2
EK-RA6M3G		

1. This table is not a comprehensive list of supported MCU Kits. See the evaluation kit hardware manual to confirm Pmod pinout.

2.2 Kit Hardware Connections

Follow these procedures to set up the kit as shown on Figure 2.

1. Ensure the MCU evaluation kit has a Pmod connector set to Type 6A (see the kit hardware manual if unsure).
   a. If no Type 6A Pmod is available, ensure the MCU evaluation kit can use the US082-INTERPEVZ interposer board and insert the board into the MCU connector before adding any sensor boards.
2. Plug in the US082-FS2012EVZ to the Type 6A connector, being careful to align Pin 1 on the sensor board and MCU kit.
3. Connect the J4 and J5 jumpers to place 4.7k pull-up resistors on the I^2C bus lines.
   a. Only one set of pull-up resistors should be used on the I^2C bus lines. If multiple sensor boards are used, only one board should have the jumpers present.
   b. MCU kits typically do not have pull-up resistors present on the bus lines but make sure to check for them.
4. The sensor is now ready to be used in the system. Follow the MCU kit instructions for connecting and powering up the evaluation kit.

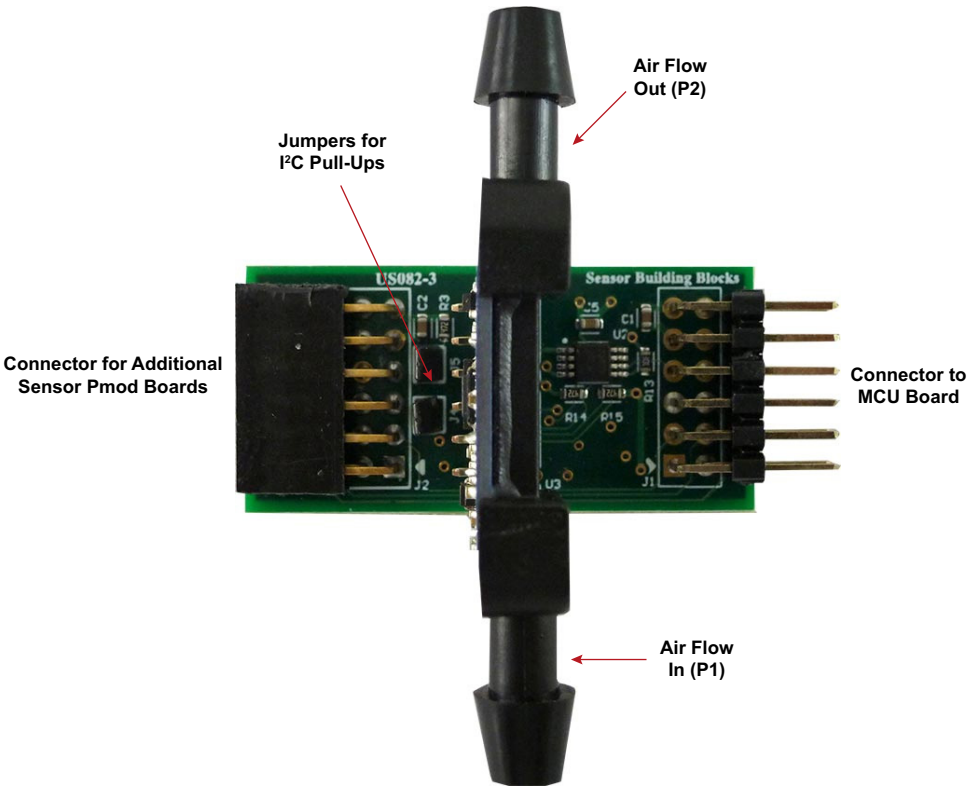

Figure 2. Evaluation Kit Connections

3. Board Design

3.1 Schematic Drawings

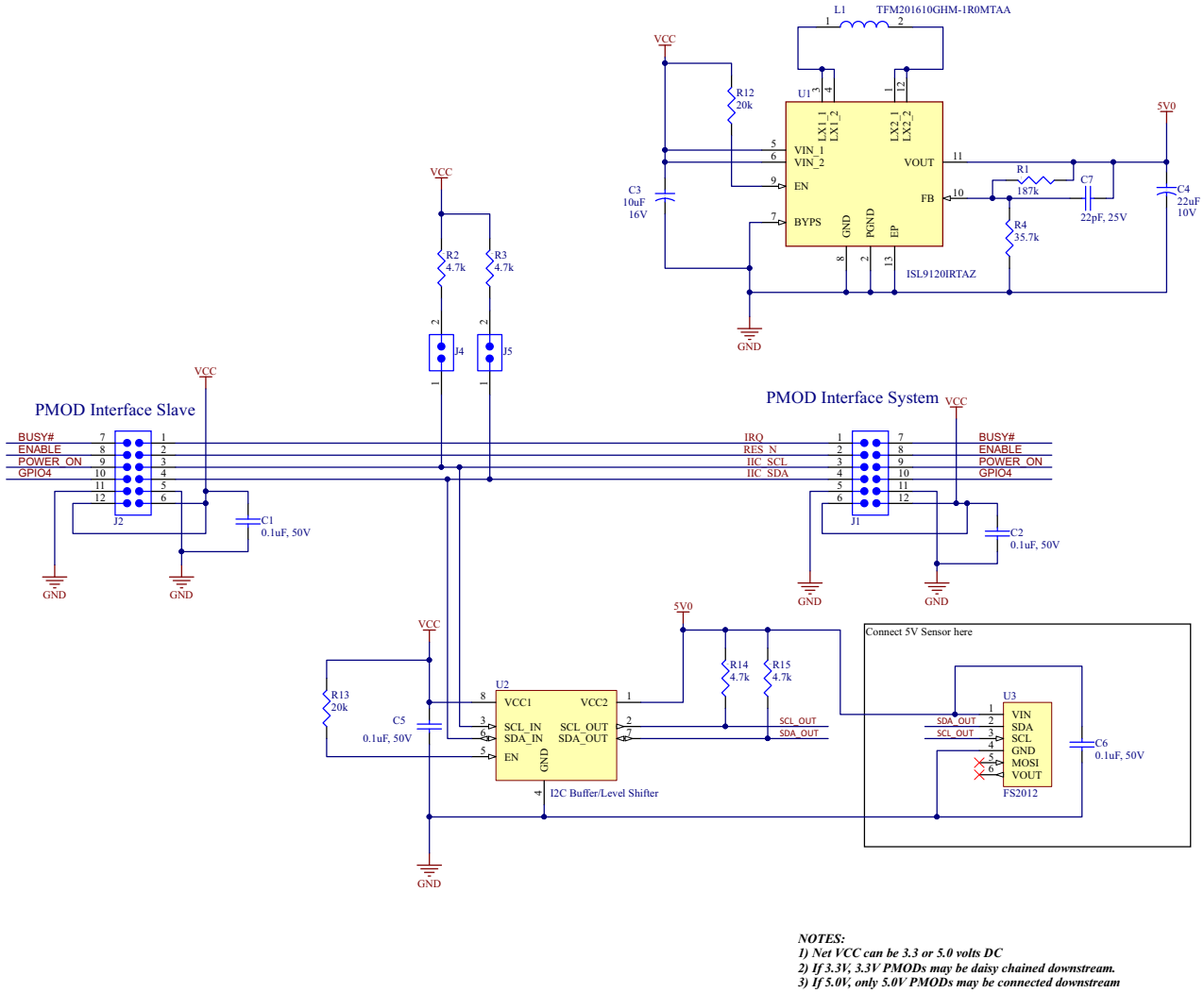

Figure 3. US082-FS2012EVZ Schematic

3.2 Bill of Materials

QTY	Reference	Description	Value	PCB Footprint	Part Number
4	C1, C2, C5, C6	Capacitor, 0.1µF, 50V, 0603	0.1µF	0603	C0603C104J5RACTU
1	C3	10µF, X5R, MLCC Ceramic Capacitor	10µF	0805	CL21A106KOQNNNG
1	C4	22µF, X5R, 10V MLCC Ceramic Capacitor	22µF	0603	0603ZD226MAT2A
1	C7	22pF, 25V, COG-NPO	22pF	0603	C0603C220K3GACTU
1	J1	Male Header 0.1" pitch PMOD 2x6 Right Angle	Pmod™	PMOD-MALE-TOP	M20-9950645
1	J2	Female Header 0.1" pitch PMOD 2x6 Right Angle		CON-000050-01	SSW-106-02-F-D-RA
2	J4, J5	CONN HEADER VERT 2POS 1.27 MM		HDR-1X2-FTS	FTS-102-01-L-S
1	L1	1µH, 3A SMT Inductor	1µH	INDC2016X100N	TFM201610GHM-1R0MTAA
1	R1	187K Resistor, 0603	187k	0603	RT0603BRE0735K7L
3	R2, R3, R14, R15	Resistor, 4.7k, 0603	4.7k	0603	RC0603JR-074K7L
1	R4	35.7K Resistor, 0603	35.7k	0603	RT0603BRE0735K7L
2	R12, R13	20k Resistor 0603	20k	0603	RC0603FR-0720KL
1	U1	Buck-Boost DC/DC, Adjustable Output		QFN50P300X300X75-13N-D	ISL9120IRTAZ
1	U2	I2C Level Shifter		TSOP65P490X110-8N	ISL33003IUZ
1	U3	Flow Sensor Module		FS2012-6pin	FS2012-1100-NG
2	J4, J5	1.27" 1x2 Jumper with Grip, Gold			NPB02SVFN-RC

3.3 Board Layout

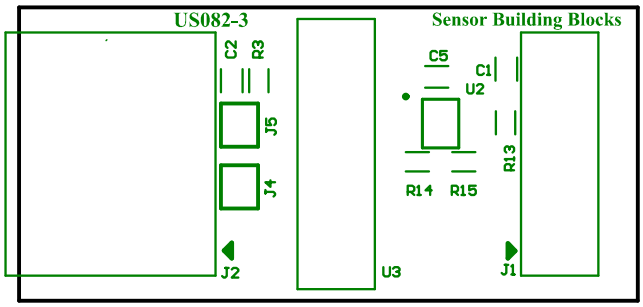

Figure 4. Silkscreen Top Layer

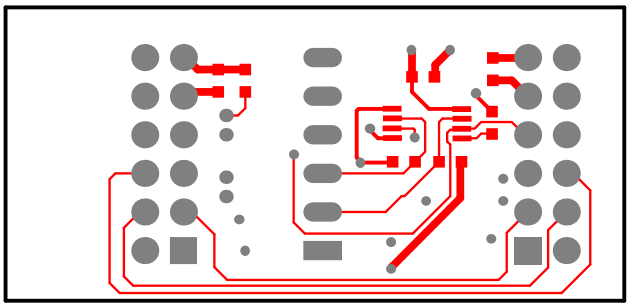

Figure 5. Top Layer

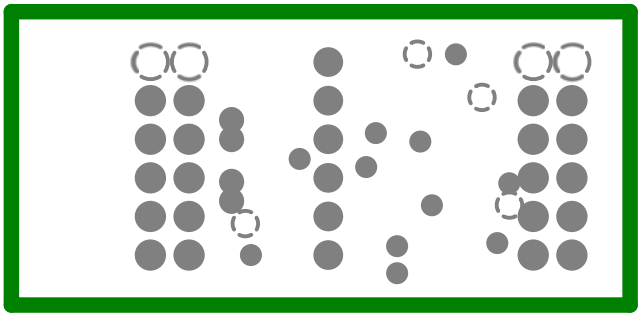

Figure 6. Layer 1

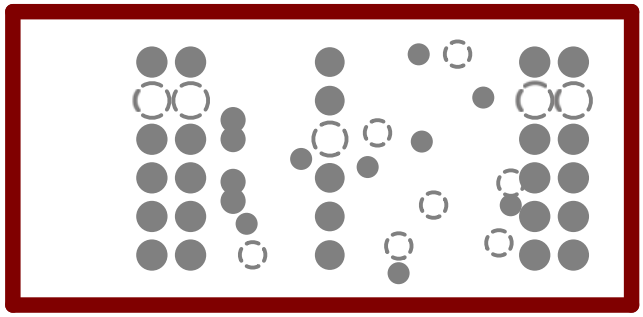

Figure 7. Layer 2

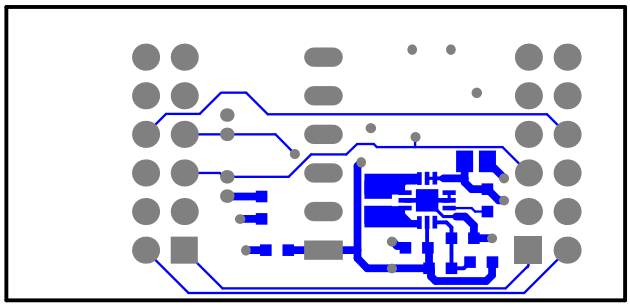

Figure 8. Bottom Layer

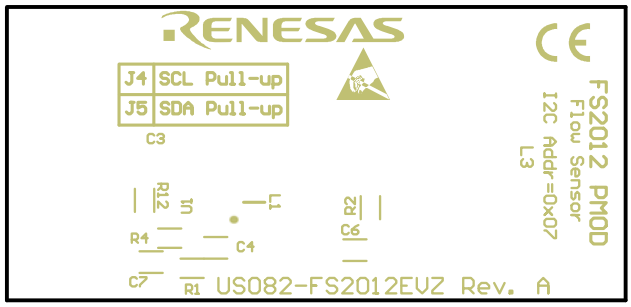

Figure 9. Silkscreen Bottom Layer

4. Ordering Information

Part Number	Description
US082-FS2012EVZ	FS2012 Pmod Board
US082-INTERPEVZ	Pmod interposer board to convert Type 2A and 3A to Type 6A on older Renesas MCU kits.

5. Revision History

Revision	Date	Description
1.0	Jun 30, 2021	Initial release

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