Simulyzer-RT
PSI5-ECU-1 Card

Hardware version	1.1
Documentation version:	1.4
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	(1.4) 27.06.2023 Order number updated
Order no.:	20.4002

Safety instructions

To avoid damages to persons and devices the following safety instructions have to be noticed!

- Only qualified personnel are allowed to handle this device!
- Before any handling within the device the current supply has to be switched off!
- During operation the device have to be positioned, that enough air condition is supplied and no small parts can get into the ventilation slots.
- In case of any trouble the system has to be switched de-energized!
- The declared environmental conditions and max. voltage ranges have to be observed!
- To warranty the device remove all dust and dirt in periodically intervals.
- Make sure that the ventilation slots are unobstructed!

Intended use:

The Simulyzer-RT PSI5-ECU-1 card is engineered for analysis of sensors of a Simulyzer RT system.
The functionality of the PSI5-ECU-1 card is to simulate an ECU.

- The device is only permitted to use for the intended use.
  Any other use results the deletion of the guarantee!

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1. Technical data

	Symbol	Typ	Min	Max	Note
Supply voltage	U_{Supp}	12 V	11.4 V	12.6 V	
Current consumption without periphery	I_{Supp}	900 mA	-	-	Without sensors
8 x PSI5 ECU interfaces, alternatively passive					
PCI Express	Protocol according to PCIe 2.1, max. speed: 2.5GBit/s				
4 x Aux digital inputs	3,3V and 5V tolerant				
4 x Aux digital outputs	5V				
Dimension	Euroformat 4 U				
Operating temperature:	32° F … 104°F				
Rel. Humidity	Max. 85% not condensed				
Weight	200 g				
Standard specifications	EN 61326-1, EN 61000-6-2, EN 61000-6-3				

PSI5 characteristics and FPGA		
PSI5 voltage	Quiescent potential from 4.0V to 20V 14 bit resolution	All 8 Interfaces independent All 8 PSI5 ECU connectors are short-circuit proofed against external voltages from 0V to 22V
PSI5 current	Permanent current 75 mA per PSI5 interface, peak current 160 mA during 10 ms Measurement range per interface 0 to 120 mA – 14 bit resolution	(Shunt of PSI5 circuit measurement: 0.3 Ohm)
PSI5 baudrate	83.3 kBit/s, 125 kBit/s, 189 kBit/s, 250 kBit/s as well as values between	
PSI5-Spec. conformity	V1.3 and V2.1.	
500MByte DDR3 RAM for NIOS µC, instantiable 32-Bit NIOS µC in FPGA		
ALTERA FPGA Cyclone V to realize protocols		

2. Measurement accuracy

2.1. Time base

Test conditions: Environmental temperature 68° to 79°F						
Num	**Evaluation**	**Symbol**	**Typ**	**Max**	**Unit**	**Note**
1	Accuracy time base	$\Delta f/f$	±30	±50	ppm	-
2	Aging time base	$\Delta f/f_A$	±5		ppm/year	-
3	Temperature drift of the time base	$\Delta f/f_T$	±0.3	±0.7	ppm/K	-

2.2. Supply voltage of the card

Test conditions: Environmental temperature 68° to 79°F						
Num	**Evaluation**	**Symbol**	**Typ**	**Max**	**Unit**	**Note**
4	Permitted voltage range	U_{Supp}	12	±0,6	V	-
5	Current consumption	I_{Supp}	t.d.b	t.d.b		Without sensor supply

2.3. Measurement of the supply voltage (sync impulse detection)

Test conditions: Environmental temperature 68° to 79°F						
Num	**Evaluation**	**Symbol**	**Typ**	**Max**	**Unit**	**Note**
6	Accuracy of the measured PSI5 voltage	U_{mea}	±0.3	±0.4	% of scfin 20 V	
7	Aging of the measured PSI5 voltage	$U_{A\text{-}mea}$		±0.1	%/year	
8	Resolution of the measured PSI5 voltage		14		Bit	0…16383
			1,220703		mV/LSB	

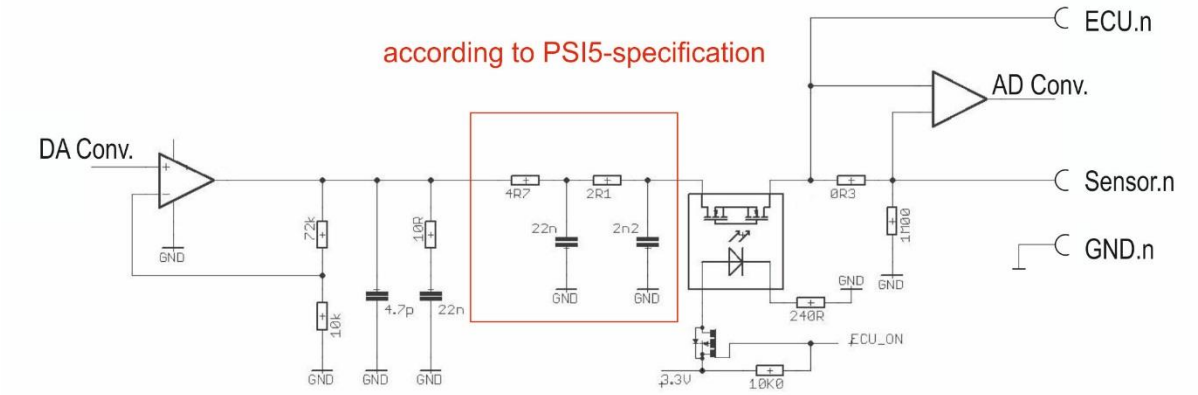
2.4. Measurement of the supply current (manchester detection)

Test conditions: Environmental temperature 68° to 79°F						
Num	**Evaluation**	**Symbol**	**Typ**	**Max**	**Unit**	**Note**
9	Accuracy of the measured PSI5 current	I_{mea}	±0.15	±0.25	% of scfin 120mA	Range 0,5mA .. 100mA
10	Aging of the measured PSI5 current	$I_{A\text{-}mea}$		±0.1	% of scfin / year	Range 0,5mA .. 100mA
11	Resolution of the measured PSI5 current		14		Bit	0.. 65535
			7,324219		µA/LSB	

2.5. Generation of the voltage/sync impulse

Test conditions: Environmental temperature 68° to 79°F						
Num	**Evaluation**	**Symbol**	**Typ**	**Max**	**Unit**	**Note**
12	Accuracy of the generated voltage	U_{mea}	±0.3	±0.4	% of scfin 20 V	Range 3V…19V
13	Aging of the generated voltage	$U_{A\text{-}mea}$		±0.1	%/year	Range 3V…19V
14	Resolution of the generated voltage		14		Bit	0..65535
			1,2207		mV/LSB	

3. Block diagram



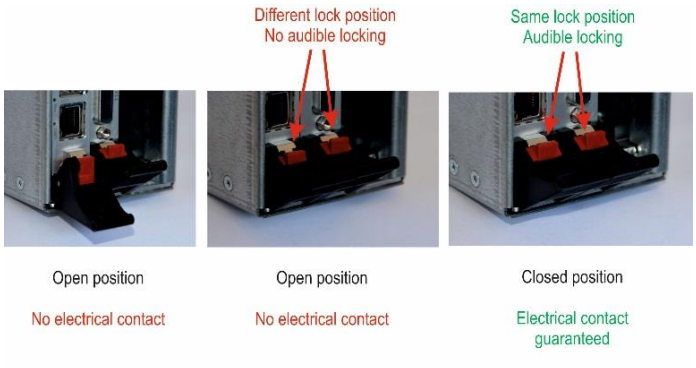
Block diagram: PSI5 part

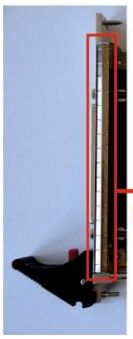
4. Connectors:

- Connector to bus: 1 PCIe Lane to RT-CPU-1
  Supply current I2C
  parallel to all cards (synchronization)
- Connector to front: 1x37 pin. SUB-D-female connector (X1)

5. Handling card/chassis

Pay attention that the ejection lever of the plug-in card is arrested correctly. Only the correct position guarantees a justly connection of the bus system and the power supply!





Note
The forcible insertion of the card with displaced HF-sealing spring will demage them. As a result of that HF energy emission will be increased!

Only with intact HF-sealing spring we guarantee that the whole system confirms to the EMC guidelines.

HF-sealing spring

6. Connection diagram X1

Pin	Name.Interface	Comment	Pin	Name.Interface	Comment
1	Sensor.1		10	Sensor.7	
20	ECU.1	not yet supported	29	ECU.7	not yet supported
2	GND.1		11	GND.7	
21	Sensor.2		30	Sensor.8	
3	ECU.2	not yet supported	12	ECU.8	not yet supported
22	GND.2		31	GND.8	
4	Sensor.3		13	GND	Common GND; same as GND.1 .. GND.8
23	ECU.3	not yet supported	32	GND	
5	GND.3		14	GND	
24	Sensor.4		33	GND	
6	ECU.4	not yet supported	15	GND	
25	GND.4		34	AUX_IN.4	
7	Sensor.5		16	AUX_OUT.4	
26	ECU.5	not yet supported	35	AUX_IN.3	
8	GND.5		17	AUX_OUT.3	
27	Sensor.6		36	AUX_IN.2	
9	ECU.6	not yet supported	18	AUX_OUT.2	
28	GND 6		37	AUX_IN.1	
			19	AUX_OUT.1