



Automotive Functional Safety Controller platform (AFSC)

General Description

Sioux brought its extensive knowledge on automotive controllers and functional safety together in this AFSC platform. AFSC is used as a basis to develop your customized controller with specific I/O requirements in the most cost effective way. This robust and powerful electronic control unit is used in a wide range of vehicles. AFSC is developed in compliance with ISO26262 and meets the requirements for functional safety up to ASIL-D. The heart of AFSC is the NXP Power architecture MCU family (tricore 200MHz with lockstep capabilities), designed for advanced performance and time critical systems with functional safety capabilities. AFSC is protected by a rugged yet affordable enclosure, designed to perform in extreme environmental conditions commonly found on commercial and off-road vehicles and industrial equipment.

On top of the hardware Sioux developed a functional safety software architecture supplied with clear separation of board support, service, middleware and application layer. Sioux is ready to kick-start your project with a compiler, build and test environment ensuring end-to-end traceability.

Approach

With AFSC, our in-house functional safety experts and our functional safety engineers can kick start, develop and guide your controller project until certification. With analyzing your specific demands on inputs, outputs and control software we customize AFSC to your specific needs.

‘Our partnership is based on trust, transparency and working towards a common goal. That’s really great, and it has absolutely contributed to our success.’

Manager Air Suspension Supplier



Sioux Functional Safety Expertise

Functional Safety Controller Platform

Reduce development effort with our ready to use hardware and embedded software platform, designed for automotive functional safety.

Customize I/O's to your specific requirements

Make use of our libraries of hardware I/O modules and drivers to customize inputs and outputs to your specific needs.

Functional Safety Experts

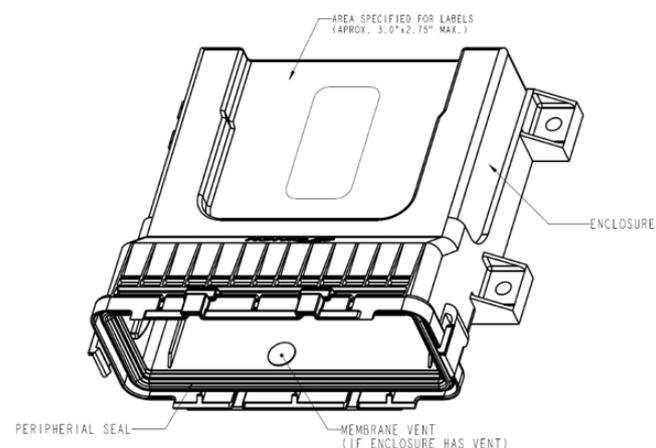
Our functional safety expert ensures that your safety case is in line with ISO26262 requirements at any development phase until certification.



Specifications

Parameter		Unit
ECU dimensions	134,62 * 143,21 * 52,2	mm
PCB dimensions	114 x 116 x 18.6	mm
Supply Voltage	12-24	VDC
Max Voltage	32	VDC
Min Voltage	9	VDC
Power consumption:		
- sleep state	<1, average	mW
- active state	<5*, average	W
Temperature Range	-40 to +85	°C

*) When no outputs are energized



Application Fields

- Commercial vehicles
- Construction
- Off Highway vehicles
- Agriculture

Software

- Drivers – embedded C
- Application Layer – C or generated C (e.g. Simulink)

Features

All I/Os and interfaces mentioned below are protected against short circuit to GND and BAT+ CPU:

- 32 bit tricore lock step processor with MPU or MMU. E.g. MPC5746R, 200MHz, 4MB Flash, 256KB SRAM
- Up to 128 Mbit external (data)flash
- Temperature, voltage sensor, clock monitor, external windowed watchdog
- Internal watchdog in MCU
- Safety power system basis chip (NXP FS6510)
- Realtime clock (with battery backup)

Communication Interface:

- 1 High Speed CAN Network - ISO 11898:2003 (up to 1Mbit, fixed speed)
- 1 CAN FD - ISO 11898:2015 (up to 5Mbit, flexible speed)
- J1939 protocol support
- RS232
- JTAG
- LIN
- SENT

Inputs:

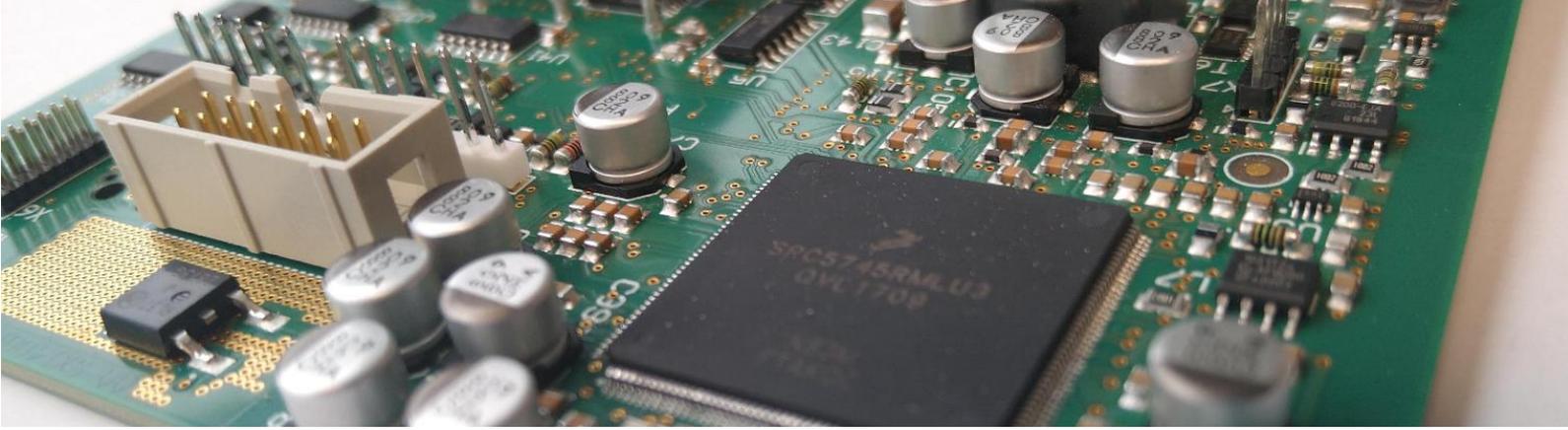
- 4 digital inputs, Conversion of voltage level into binary signal with hysteresis.
 - 1 digital input with speed pulse capabilities
- 2 temperature sensor inputs
- Wake up input (KL15)
- 4 analog inputs 0-5 VDC

Outputs:

- 4 General purpose high side switch with PWM (1.5 kHz max)
- 2 Brushed motor connection
- 1 brushless motor connection
- 1 warning light
- 5V sensor supply

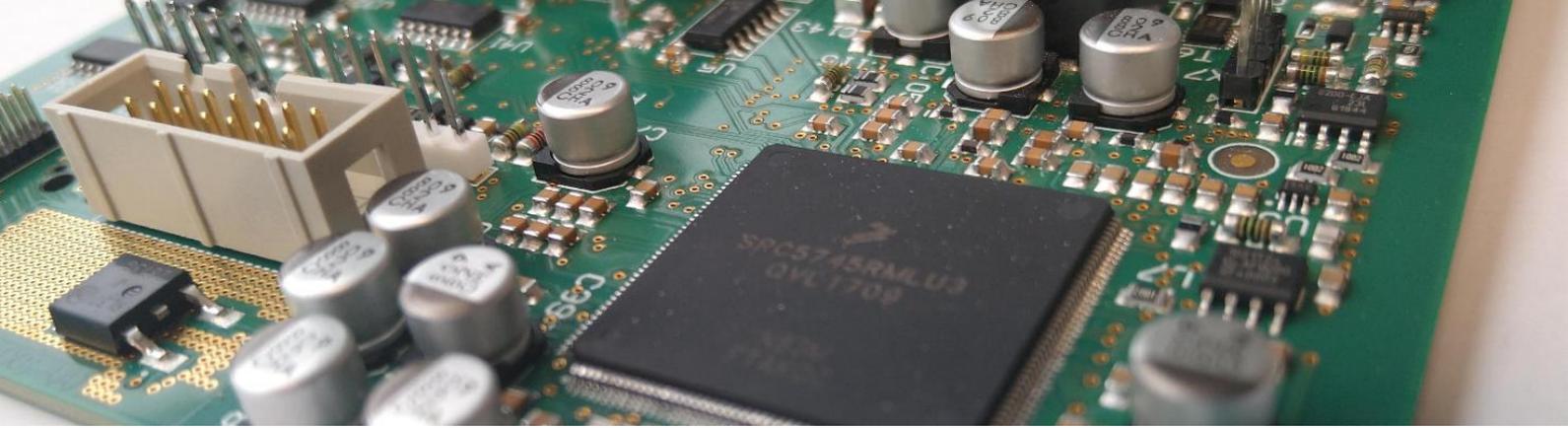
Enclosure:

- Rugged, sealed packaging
- IP67 / IP69K
- 48 pin connector



Connector 1: 30 pins:	Signal	Remarks
1	Vcc_GPO1	Power supply input for general purpose output 1 and 2, 12V/24V
2	GPO1	General purpose output 1
3	GPO2	General purpose output 2
4	GPO1_2_GND	Ground for general purpose output 1 and 2
5	Vcc_GPO3	Power supply input for general purpose output 3 and 4, 12V/24V
6	GPO3	General purpose output 3
7	GPO4	General purpose output 4
8	GPO3_4_GND	Ground for general purpose output 3 and 4
9	Vcc_motor1	Brushed motor 1 power supply input, 12V/24V
10	Out1_motor1	Output 1 for brushed motor 1
11	Out2_motor1	Output 2 for brushed motor 1
12	GND_motor1	Ground for motor 1, high current
13	Vcc_motor2	Brushed motor 2 power supply input, 12V/24V
14	Out1_motor2	Output 1 for brushed motor 2
15	Out2_motor2	Output 2 for brushed motor 2
16	GNDmotor2	Ground for motor 2, high current
17	Vcc_motor3	Brushless motor 3 power supply input, 12V/24V
18	PWR_motor3	Power supply output to motor3
19	On/Off_motor3	On/Off output to motor 3
20	Direction_motor3	Direction output to motor 3
21	PWMmotor3	PWM output to motor 3
22	Encoder_motor3	Encoder input from motor3
23	GNDmotor3	Ground for motor 3, high current
24	Temperature input 1	for 2k00 NTC
25	Temperature input 2	for 10k00 NTC
26	Warning light	LED, 2V, 20mA
27	Vsensor	+5V
28	Ignition	KL15, 12V/24V
29		
30		

Connector 2: 18 pins:		
1	Vbat	KL30, 12V/24V
2	GND	Ground for ECU
3	GND	Ground for ECU
4	CAN1 H	CAN-FD with Partial Networking
5	CAN1 L	CAN-FD with Partial Networking
6	CAN2 H	Standard CAN
7	CAN2 L	Standard CAN
8	GND	Ground for LIN/SENT bus
9	LIN	LIN bus
10	SENT	SENT bus input
11	Analog in 1	0-5V
12	Analog in 2	0-5V
13	Analog in 3	0-5V
14	Analog in 4	0-5V
15	Digital in 1	0-24V
16	Digital in 2	0-24V
17	Digital in 3	0-24V
18	Digital in 4	0-24V, suitable for speedpulse



References

	<p>Air Suspension controller</p> <p>Development of an air suspension controller which complies to ISO26262-ASIL C and is prepared for active damping functionality. Sioux developed the entire controller (hardware and software) and took responsibility for getting the controller through the entire ASIL- C certification process, under considerable time pressure. The product and the used state of the art development and production process have been certified and approved by the TÜV, which opens the doors for for our customer to any OEM in the automotive industry.</p>
	<p>Integrated Retarder Control System</p> <p>Sioux redesigned the software and developed a standard client-independent software package for the ECU using AutoSAR, ASPICE and ISO26262 (ASIL C).</p>
	<p>Door Controller</p> <p>With the Sioux functional safety platform as a basis, Sioux supported in hardware services, driver software and functional safety expertise for the development of a door control unit (ASIL-C). With these services, the customer was able to port and develop the application software by themselves, which shortened development project.</p>
	<p>Active Aerodynamics</p> <p>Sioux developed an actuator software platform typically combined with integrated control electronics driven by a LIN bus (e.g. for active air dam and grill shutter systems). Sioux created the system requirements and a modular architecture in software for this platform, in line with the low cost hardware, which was intended to be re-used. The system complies to ASIL-QM.</p>