ICD Sirius Development Kit

Rev. B

PAGES	KLASSIFICERING / CLASSIFICATION	KOMMENTAR/COMMENTS
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REVISION LOG

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PA1	2018-01-22	First issue	T. Kuremyr
PA2	2018-02-13	Minor adjusments	T. Kuremyr
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Rev. B	2019-06-11	Update ICD revisions in list of reference documents	T. Kuremyr

TABLE OF CONTENT

1. Introduction

This document describes electrical interfaces of the Sirius development kit.

1.1. Reference documents

RD#	Document ref	Document name
RD1	205089	ICD Sirius TCM Rev. E
RD2	205088	ICD Sirius OBC Rev. E
RD3	205197	Sirius Dev. Kit User's Manual
RD4	NIS5132/D	NIS5132 Series Datasheet

2. Product description

The ÅAC Sirius development kit is intended as an easy to use extension for the Sirius family of products. The development kit adapts the nano-D interfaces of the Sirius unit to D-sub to simplify the manufacturing of test harnesses and measurement of signals on the connectors. With two exceptions, all interfaces are replicated as D-sub connectors.

The exceptions are the SpaceWire ports on both Sirius TCM and OBC units, and the Umbilical port on the Sirius TCM. The SpaceWire ports are adapted to micro-D to be compatible with SpaceWire standard harnesses. The TCM Umbilical connector is not adapted to a D-sub on the case due to design constraints. Connection to the Umbilical connector can be done through the supplied nano-D to D-sub adapter cable.

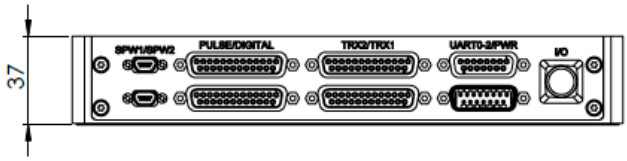
To allow easy and safe powering of the unit, the development kit is supplied with a 12 V power adapter. Powering the unit can either be done through this adapter, through a 4 mm banana jack interface, or through the 15-pin D-sub adaptation of the Sirius unit power connector. All power interfaces are reverse polarity protected to avoid damage to the Sirius unit in the event that the power supply leads are connected incorrectly.

3. Mechanical ICD

The OBC and TCM development kits have the same base enclosure but use different front panels to match the connectors of the Sirius units. When using more than one Development kit it is possible to stack units on top of the other. A low rim makes sure the Development kits do not slide of each other. Because the base enclosure is the same for both units the footprint is also the same for both units.

Figure 1 - TCM Development kit

Figure 2 - OBC Development kit



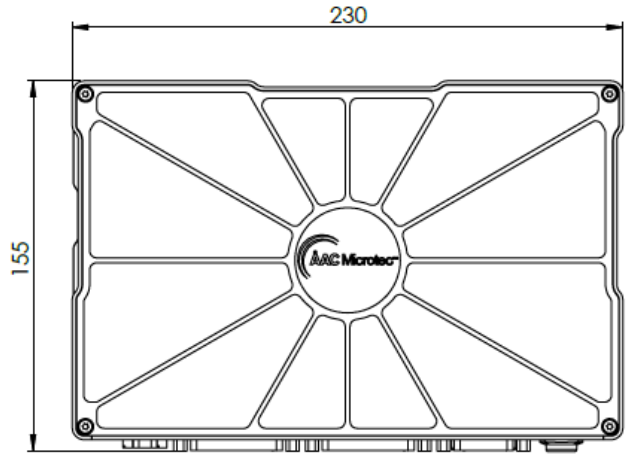


Figure 3 - Development kit Footprint (front view and top view)

4. Electrical ICD

Electrical parameters of the Sirius development kit are in most aspects identical to those specified in the Sirius TCM and OBC ICDs [RD1] and [RD2]. The power interface is unique to the development kit and is therefore described in detail in this document, for the other interfaces; refer to the ICD for the concerned Sirius unit. While the development kit has different connector sizes than the Sirius unit, connector pinouts are identical.

4.1. Power interface

To enable flexibility in powering the unit, three connectors for powering the unit are provided. First a DC-barrel jack for powering through a 12 V power adapter supplied with the kit, second a 4 mm connector interface, finally the front D-sub connector can be used for powering the unit. The power input is fitted with a diode OR circuit to prevent damaging the Sirius unit if the supplies are connected incorrectly and prevention of cross current flow if multiple power sources are connected simultaneously. A simplified view of the circuit is provided in Figure 4.

The power input is also fitted with an electronic fuse for downstream short circuit protection. The electronic fuse further acts as an overvoltage clamp, limiting the supplied voltage for the Sirius unit to 15 V. In practice, this means that the Development Kit has a maximum supply voltage of 15 V and not the 16 V specified for the Sirius unit itself.

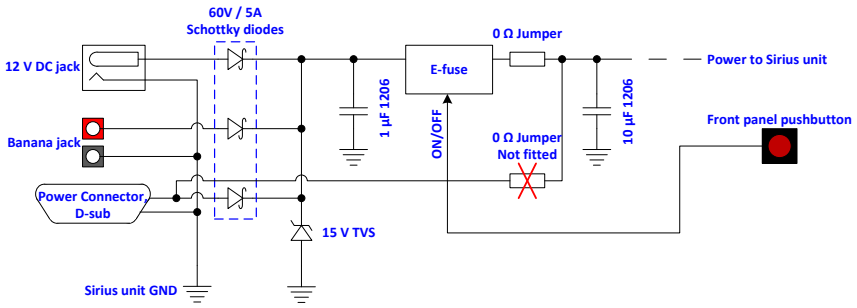


Figure 4 Development kit power interface circuit (simplified)

Table 1 Development kit input electrical parameters

NAME	DESCRIPTION	VOLTAGE		E-FUSE SC I-LIMIT	E-FUSE Trip time [ms]	
		MIN [V]	MAX [V]	MAX [A]	@9V 25°C TYP [s]	@15V 25°C TYP [ms]
VBUS	Positive supply terminal	+5	+15	0.5[2]	800	400
GND	Return supply terminal	N/A	+0.5[1]	0.5[2]	N/A	N/A

Note 1: Reverse polarity protection ensures no reverse current flow up to +40 V reverse polarity
Note 2: When powering from a laboratory power supply, the current limit must be set higher than this value.

The included electronic fuse changes the behavior of the Sirius unit input power interface both through current and voltage limiting as well as an extra soft-start function. If a user desires to perform and interface test with a representative spacecraft power distribution circuit it is therefore required to bypass the electronic fuse. For bypassing the electronic fuse, the circuit is fitted with a 0 Ω jumper selection allowing a switch to unprotected direct input from the D-sub power connector. Note that bypassing the electronic fuse protection circuit is a semi-permanent modification and will require greater caution when supplying

power to the Sirius unit. Removing the electronic fuse protection will also disable the ON/OFF functionality, and powering through other interfaces than the front D-sub.

4.1.1. E-Fuse sizing

The fitted electronic fuse NIS5132MN1TXG is a non-retriggering electronic fuse with a built in output voltage clamp. The E-fuse relies on an on chip over temperature sensor for triggering disconnection of the load. Due to this, the trip time will be input voltage dependent (see Figure 2 from the chip datasheet [RD4]).

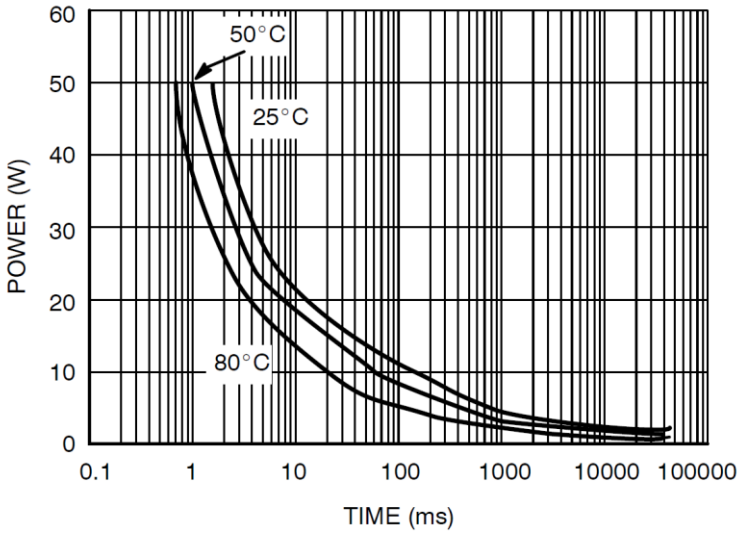


Figure 2. Power Dissipation vs. Thermal Trip Time

As the development kit is intended to function from 9 to 15 V input supply, the current limit must be selected to allow for a quick tripping of the E-fuse over this range of input voltages. A current limiting resistance of 47 Ω is used in the design, this gives a 1.25 A current limit in short circuit conditions and a 2.5 A limit in overload conditions (high current draw to non-zero voltage).

The 1.25 A current limit in short circuit gives 5.6 W dissipation at 5 V input and 18.1 W at 15 V input. This gives trip times in the range of 700 ms to 20 ms.

4.2. Front panel connectors

Front panel connectors on the Sirius Development Kit are identical to those of the Sirius unit although sized up to D-sub or micro-D. For pinouts and I/O characteristics, the user should therefore refer to the development kit user manual [RD3] or the ICD of the concerned unit: [RD1] for TCM or [RD2] for OBC. The adapted connector types are listed in Table 2.

Table 2 Connector type mapping Sirius unit to Development Kit

Connector Name	Sirius TCM connector type	Dev. kit connector type	Sirius OBC connector type	Dev. kit connector type
SpW1	9-pin nano-D female	9-pin µ-D female	9-pin nano-D female	9-pin µ-D female
SpW2	9-pin nano-D female	9-pin µ-D female	9-pin nano-D female	9-pin µ-D female
PULSEOUT	25-pin nano-D female	25-pin D-sub female	-	-
DIGITAL	25-pin nano-D female	25-pin D-sub female	25-pin nano-D female	25-pin D-sub female
ANALOG	-	-	25-pin nano-D female	25-pin D-sub female
XBAND	25-pin nano-D female	25-pin D-sub female	-	-
SBAND	25-pin nano-D female	25-pin D-sub female	-	-
UART 0 – 2	15-pin nano-D female	15-pin D-sub female	15-pin nano-D female	15-pin D-sub female
UART 3 – 5	-	-	15-pin nano-D female	15-pin D-sub female
POWER	15-pin nano-D male	15-pin D-sub male	15-pin nano-D male	15-pin D-sub male

4.3. Side panel connectors

The side panel hatch provides access to the Debug and JTAG connectors on the Sirius unit. For the TCM, the umbilical connector is also accessible through this hatch. There is no adaptation of these connectors as compared to the specification in [RD1] and [RD2].

4.4. Back panel connectors

In addition to the connectors adapted from the Sirius unit, the development kit has connectors on the back panel for connection of power to the unit. The connectors provided are a DC-barrel jack for connecting the supplied wall-wart power supply and a pair of 4 mm connectors for powering the unit through a benchtop power supply. The specifications for the DC-barrel jack are provided in Figure 5.

Input voltage: 12 V center positive
Ø Outer : 5.5 mm
Ø Pin : 2.0 mm
Insertion depth : 9.0 mm

Figure 5 DC-barrel jack specifications