# TRXVU Option Sheet

## How to use this Option Sheet:

1. Please fill-in this Option Sheet carefully. In case you have questions, we advise contacting ISISPACE prior to sending the Option Sheet at: sales@isispace.nl. Note that you are responsible to make sure the inputs you make are correct, since ISISPACE will produce the product accordingly, and shall not be responsible to verify your inputs or liable to provide refunds, make alterations or send a new product in case your input does not reflect your needs correctly.

2. Fill in the form digitally. You will need to have Adobe Acrobat reader installed (free download available at http://get.adobe.com/reader/)

3. Press the check button at the end to verify if your Option Sheet is complete.

4. Once you are ready, press the Enable Read Only button to prevent accidental changes, save the changes and send the digitally filled-in Option Sheet by email to your Sales Representative.

## Customer Contact Information

| | |
|---|---|
| Contact Name: | |
| Organization / Company / Institution | |
| Country: | |

## Additional Information (Optional)

| | |
|---|---|
| Intended use (EM/FM/QM) | |
| Mission name | |

## For ISISPACE Use – Leave Blank –

| | |
|---|---|
| Order Confirmation: | |
| Allocated WO: | |
| Sales responsible: | |
| Project/Ref.: | |
| Serial Number(s) | |

## RF Configuration

### Receiver

The amateur-satellite service segment of the VHF band is between 145.8MHz and 146MHz. By default, the receiver operates at 145.9MHz after power-up and may be tuned within the amateur-satellite service segment using the commands defined in the Interface Control Document. In this section an alternative frequency may be specified.

To select an alternative frequency, please select "Custom Receiver Centre Frequency" and enter your desired value below:

Receiver Center Frequency 145.9MHz  (Default)

Custom Receiver Center Frequency stated below

**Please note that all frequency assignments for satellites need to be notified to the International Telecommunications Union (ITU) via your national radiocommunications administration.** In addition, national licensing may apply. ISISPACE advises to contact your radiocommunication administration on these matters. Additionally, frequencies within the amateur-satellite service segment require frequency coordination with the International Amateur Radio Union (IARU).

**Frequencies outside the range 140 MHz – 150 MHz may be possible but must be approved by ISISPACE before order confirmation and may have an additional cost and / or lead time.**

### Transmitter

The amateur-satellite service segment of the UHF band is between 435 and 438MHz. By default, the transmitter operates at 436.5MHz after power-up and may be tuned within the amateur-satellite service segment using the commands defined in the Interface Control Document. In this section an alternative frequency may be specified.

To select an alternative frequency, please select "Custom Transmitter Centre Frequency" and enter your desired value below:

Transmitter Center Frequency 436.5MHz  (Default)

Custom Transmitter Center Frequency stated below

**Please note that all frequency assignments for satellites need to be notified to the International Telecommunications Union (ITU) via your national radiocommunications administration.** In addition, national licensing may apply. ISISPACE advises to contact your radiocommunication administration on these matters. Additionally, frequencies within the amateur-satellite service segment require frequency coordination with the International Amateur Radio Union (IARU).

**Frequencies outside the range 400 MHz – 440 MHz may be possible but must be approved by ISISPACE before order confirmation and may have an additional cost and / or lead time.**

*Modulation Scheme*

BPSK (Default)                GMSK

## Transmitter Callsign

Article 19 of the ITU Radio Regulations states that "All transmissions shall be capable of being identified either by identification signals or by other means". The "From" callsign is typically used for the spacecraft identification, the "To" callsign is typically used for the Ground Station identification.

Unless otherwise specified the "From" callsign and "To" callsign are set to "NOCALL-0" and "NOCALL-1" respectively. In this case you must set the callsigns of your spacecraft before the first transmission, using the commands described in the Interface Control Document. Alternatively in this section you can specify "From" and "To" callsigns, which will be programmed into the transmitter for use immediately after power on. If you specify callsigns here, they cannot be changed without additional cost and/or lead time. However, the callsign can always be set before the first transmission using the commands described in the Interface Control Document.

The legislation relating to callsigns may vary according to the country and frequency ranges in which operations are performed, so check with your national radiocommunications administration before deciding on a callsign.

☐ Unspecified callsigns "NOCALL-0" and "NOCALL-1" (Default)

☐ Program callsigns stated below

From Callsign (up to 6 characters and a number from 0 to 15, ex. Q1CALL-1):

   -

To Callsign (up to 6 characters and a number from 0 to 15, ex. Q1CALL-1):

   -

### *FM Transponder Mode (for Amateur-Satellite frequencies only)*

The transponder mode works as a secondary mode implemented into the main functionality of the TRXVU transceiver. It is intended for use in the amateur-satellite service allocations of 145.8-146 MHz (uplink) and 435-438 MHz (downlink). The user will be able to choose between "nominal" (i.e. data reception and transmission) and "transponder" as the operating mode of the radio. The transponder mode uses the uplink receiver section of the radio to receive an FM modulated signal which is then retransmitted with FM modulation using the transmitter section. The transponder is implemented in the digital domain in the baseband controller of the TRXVU. Such a single channel FM transponder can be used by radio amateurs to communicate with each other via the satellite. The transponder offers a "squelch" functionality whereby it only activates after the received signal strength reaches a certain user-programmable threshold.

☐ Disabled (default)

☐ Enabled

## Electrical Configuration

### CSKB Pin-out

Even though only one I2C bus is used, there are two alternative sets of pins on the CSKB that could be used to connect to the board.

| $I^2C$ Clock (SCL) | $I^2C$ Data (SDA) |
|---|---|
| ☐ H1-43 (Default). | ☐ H1-41 (Default). |
| ☐ H1-21 (Alternative). | ☐ H1-23 (Alternative). |

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**IBAN:** NL57 RABO 0118 9535 24
**BIC:** RABONL2U
**Reg. nr.:** 27293068
**VAT:** NL817198611B01

## Mounting hole grounding

The board is mechanically mounted in a CubeSat structure by means of four mounting holes. By default, these holes are connected to the subsystem electrical ground (combined power data and RF ground) by means of broadband RF capacitors.

If required, alternative grounding schemes can be accommodated but additional costs and / or lead time applies. Please contact your sales representative for further information.

Broadband RF Grounding (Default)

Alternative (non-standard)

Please leave a note in the text area below detailing your request. ISISPACE will review the information provided and contact you as soon as possible.

## RX Data Ready

The receiver section has RX Data Ready output on CSKB pin H1-46. If the customer requires that this pin is isolated, there is a non-standard option to not connect this pin.

The default state is LOW, this pin becomes HIGH if the RX buffer contains at least one frame.

For non-standard options additional costs and / or lead time applies. Please contact your sales representative for further information.

RX_DATA_READY (H1-46) pin connected (default)

H1-46 not connected (Alternative)

## General Purpose Input/Output pins

The receiver section has one digital GPIO reserved for customer-specific functionalities. This GPIO does not connect to the transmit section.

If this GPIO is connected, then the functionality shall be defined by the customer, agreed upon by ISISPACE, and additional costs and / or lead time apply. Please contact your sales representative for further information

GPIO pins not connected (Default)

RX_GPIO (H2-52) pin connected (non-standard)

Please leave a note in the text area below detailing your request. ISISPACE will review the information provided and contact you as soon as possible.

## Power input

By default, H2-45 and H2-46 (VBAT permanent) is connected as input power. A different input power source can be selected. Additional cost applies.
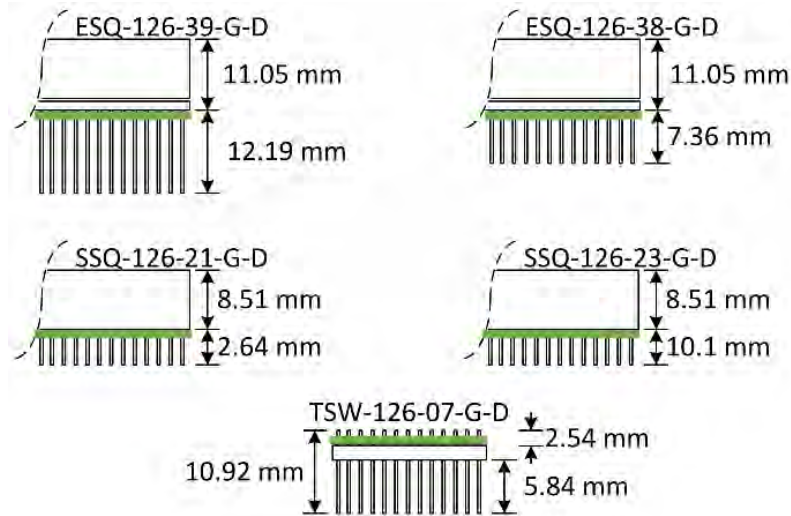
H2-45 H2-46 VD0 (VBAT) CH0 (Default)

H1-25 H1-26 VD0 (VBAT) CH1 (additional extra cost)

H1-29 H1-30 VD0 (VBAT) CH2 (additional extra cost)

H2-25 H2-26 VD1 CH0 (additional extra cost)

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# Connector Type and Placement

CSKB Connector



| | Note: The board location with respect to the connector is marked by the green line in the drawing above (the line represents the PCB). |
| --- | --- |

| | Connector name | h [mm] | p [mm] | Remarks |
| --- | --- | --- | --- | --- |
| | SSQ-126-23-G-D<br><br>Standard stack through.<br><br>Other CSKB components possible on top and bottom. | 8.51 | 10.1 | Default. |
| | SSQ-126-21-G-D<br><br>Stack termination bottom.<br><br>No other CSKB components possible below the ISIS-TRXVU. | 8.51 | 2.64 | Additional cost and / or lead time may apply. |
| | ESQ-126-38-G-D<br><br>Standard stack through.<br><br>Other CSKB components possible on top and bottom. | 11.05 | 7.36 | Additional cost and / or lead time may apply. |
| | ESQ-126-39-G-D<br><br>Standard stack through.<br><br>Other CSKB components possible on top and bottom. | 11.05 | 12.19 | Additional cost and / or lead time may apply. |
| | TSW-126-07-G-D<br><br>Stack termination top.<br><br>No other CSKB components possible above the ISIS-TRXVU. | 0.94 | 9.98 | Additional cost and / or lead time may apply. |

| Connector name | h [mm] | p [mm] | Remarks |
|---|---|---|---|
| CSKB-Lite<br>SSQ-106-23-G-D & SSQ-107-23-G-D<br>Standard stack through.<br>Other CSKB components possible on top and bottom. | 8.51 | 10.1 | Additional cost and / or lead time may apply. |
| CSKB-Lite<br>SSQ-106-21-G-D & SSQ-107-21-G-D<br>Stack termination bottom.<br>No other CSKB components possible below the ISIS-TRXVU. | 8.51 | 2.64 | Additional cost and / or lead time may apply. |
| CSKB-Lite<br>ESQ-106-38-G-D & ESQ-107-38-G-D<br>Standard stack through.<br>Other CSKB components possible on top and bottom. | 11.05 | 7.36 | Additional cost and / or lead time may apply. |
| CSKB-Lite<br>ESQ-106-39-G-D & ESQ-107-39-G-D<br>Standard stack through.<br>Other CSKB components possible on top and bottom. | 11.05 | 12.19 | Additional cost and / or lead time may apply. |
| CSKB-Lite<br>TSW-106-07-G-D & TSW-107-07-G-D<br>Stack termination top.<br>No other CSKB components possible above the ISIS-TRXVU. | 0.94 | 9.98 | Additional cost and / or lead time may apply. |
| Alternative<br>Write full SAMTEC code below | | | **This option must be approved by ISISPACE before order confirmation and may have an additional cost and / or lead time.** |

## Software Configuration

### I2C Watchdog

This watchdog is implemented for safety reasons. It works in the following manner: If the radio does not receive any command from the main OBC for a given duration, the board will reset itself. This safety measure can be disabled by the user if required. This feature cannot be changed without having the system reprogrammed.

I2C watchdog enabled, timeout of 60 seconds (default)

I2C watchdog enabled, user-defined value

Value in seconds, between 30s and 3600s.

Watchdog timeout:

I2C watchdog disabled

## I2C Protocol Settings

The I$^2$C addresses are defined in the code that is flashed in the microcontrollers. They cannot be changed without having the system.

The users can specify any other address if the default is not compatible with their system. The address can be any 7-bit number with the exception of reserved addresses, specified in the I2C bus specification (https://www.nxp.com/docs/en/user-guide/UM10204.pdf) and listed below.

| Slave address (binary) | Slave address (hex) |
|---|---|
| 0000 000 | 0x00 |
| 0000 001 | 0x01 |
| 0000 010 | 0x02 |
| 0000 011 | 0x03 |
| 0000 1XX | 0x04 – 0x07 |
| 1111 XXX | 0x78 – 0x7F |

*Receiver Address*

    *Default (0x60).*

    *Alternative*

Alternative Receiver Address (0x##)

*Transmitter Address*

    *Default (0x61).*

    *Alternative*

Alternative Transmitter Address (0x##)

## Additional Comments

Please use this section in case you have additional comments or remarks. If any further option has been agreed during the sales process, please add it here. Everything listed here is subject to ISISPACE approval before order confirmation.