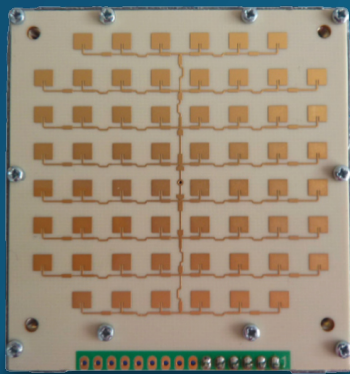


User Manual IVS-234

Version 6.11



The IVS-234 is a CW K-Band Transceiver with an integrated PLL-circuit for high frequency stability.

The PLL-circuit enables the customer to program its own transmit frequencies directly via TUV-PIN.

This product is compliant to the restriction of hazardous substances (RoHS - European Union directive 2011/65/EU)



FEATURES

- K-Band Transceiver
- CW (continuous wave) mode
- Stereo (dual channel) operation for direction-of-motion identification
- Integrated PLL circuit for high frequency stability
- Programmable transmitter frequency
- Balanced mixer with reduced common mode noise for both channels (DOP and QDOP)



PRODUCT FAMILY

PLL stabilized K-Band VCO Transceiver

APPLICATION

True Speed over Ground measurement

CERTIFICATES

InnoSenT GmbH has established and applies a quality system for: development, production and sales of radar sensors for industrial and automotive sensors.

See more information on our quality standards:
<https://www.innosent.de/certifications/>

ADDITIONAL INFORMATION

Customer specific product for DEUTA-WERKE GmbH
DEUTA-WERKE GmbH has to be informed about all technical changes.

CONFIDENTIAL & PROPRIETARY

The information contained in this document shall remain the sole and exclusive property of InnoSenT GmbH and shall not be disclosed by the recipient to third parties without prior consent of InnoSenT in writing.

ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS	COMMENT
Oscillator						
Transmit frequency range		24.008		24.243	GHz	can be adjusted by user ¹
Frequency spacing			1.6		MHz	
Variation				1.2125	MHz	due to crystal tolerance ±50 ppm
Temperature drift (frequency)	Δf		10	30	kHz/K	
Output power (EIRP)	P _{out}		20		dBm	
Plausibility check						
Frequency correct		24.008	EEPROM	24.243	GHz	use read value from EEPROM
Frequency not correct		24.243 < Read EEPROM or < 24.008			GHz	set frequency 24.1664 GHz
Receiver (compare with amplifier circuit on page 4)						
IF-amplifier	bandwidth		10 – 1M		Hz	
	gain		46		dB	
I/Q balance	amplitude			6	dB	
	phase	70		110	°	reject criteria
Offset						
Reject criteria offset	v_offset _{I(DOP)}	-500		500	mV	@ InnoSenT test setup ²
	v_offset _{Q(QDOP)}	-500		500	mV	@ InnoSenT test setup ²
Signal level						
Reject criteria signal level	S _{I(DOP)}	207.5	295	382.6	mV	@ InnoSenT test setup ²
	S _{Q(QDOP)}	207.5	295	382.6	mV	@ InnoSenT test setup ²
Noise level						
Reject criteria noise level	R _{I(DOP)}	0.4		1.5	mV _{RMS}	@ InnoSenT test setup ²
	R _{Q(QDOP)}	0.4		1.5	mV _{RMS}	@ InnoSenT test setup ²

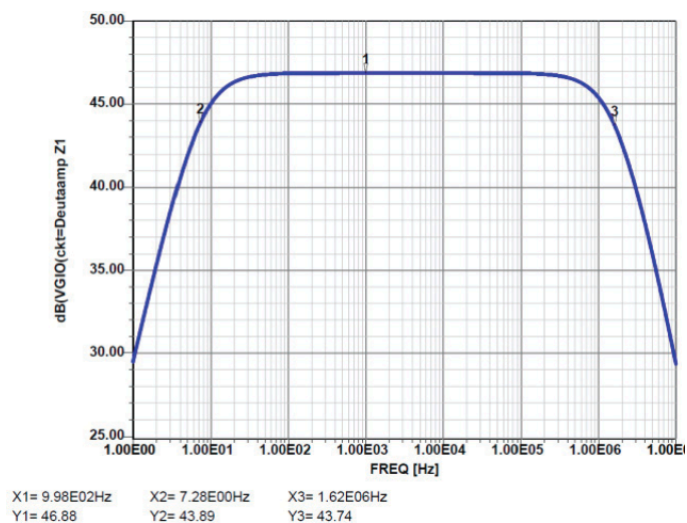
¹ The user is responsible for the compliance of the transmit frequency! Delivery condition is 24.1664 GHz.

² Measured during end of line test according to InnoSenT instruction manual AA 8-5_89

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS	COMMENT
Communication						
Interface Type			TUV			point-to-point-connection Pin #4 TUV_COM
Transmission Rate		300	1200	1200	Baud	UART (switches automatically between Rx and Tx)
Communication Protocol			8N1			8 data bits, 1 stop bit, no parity
Time				0.1	s	Receive start
			10		s	Receive stop without communication
			2		s	or Receive stop after last communication
Start			0x7E			Master Tx-word
			0x55			write to EEPROM command
Operating Temperature		10	25	40	°C	for single-wire bus communication
ISP interface	VCC	3.0	3.3	3.6	V	VCC for the external programmer must be provided by the customer
Low_input		0		0.8	V	25°C ± 10°K
High_input		1		2.6	V	25°C ± 10°K
Low-output		0		0.8	V	25°C ± 10°K
High-output		2		3.6	V	25°C ± 10°K
Current-output		462	541	633	µA	for low output level

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS	COMMENT
Power supply						
Supply voltage	V_{cc}	4.75		5.25	V	
	V_{ss}	-5.25		-4.75	V	
Supply current	I_{cc}		150	200	mA	
	I_{ss}		20	50	mA	
Recovery time			0.1		s	time between shut down and restart
Antenna pattern (compare with antenna plot on page 4)						
Full beam width @ -3dB	horizontal	11	13	15	°	
	vertical	11	13	15	°	
Side-lobe suppression	horizontal	12			dB	
	vertical	12			dB	
Antenna gain			22		dBi	
Environment						
Operating temperature	T_{OP}	-40		+80	°C	
Storage temperature	T_{STG}	-40		+85	°C	
Outline dimensions	height length width	10.5 (11.8) 70.0 65.8			mm	tolerances according to DIN1687-4
FIT-rate			419		$10^{-9}/h$	Siemens-Norm SN-29500, 55°C

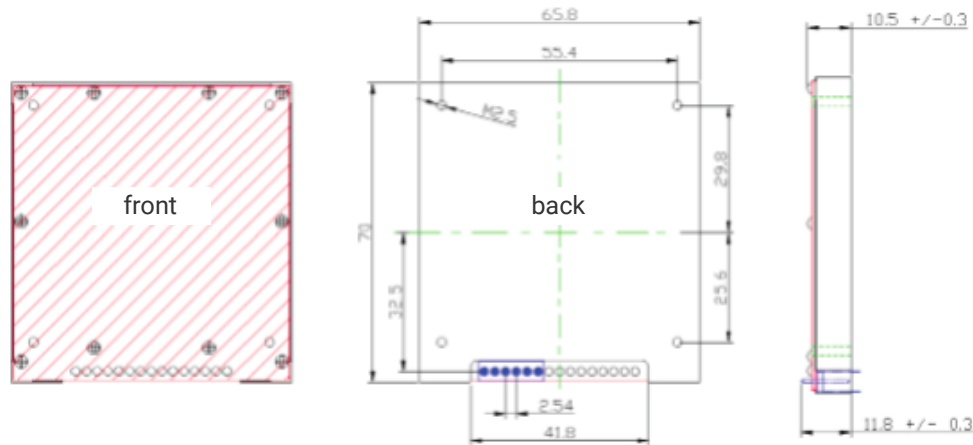
BANDWIDTH AND GAIN SIMULATION



GAIN	BANDWIDTH
46dB	10Hz - 1MHz

MECHANICAL OUTLINES/LABEL

All dimensions in mm / all tolerances according DIN1687-4



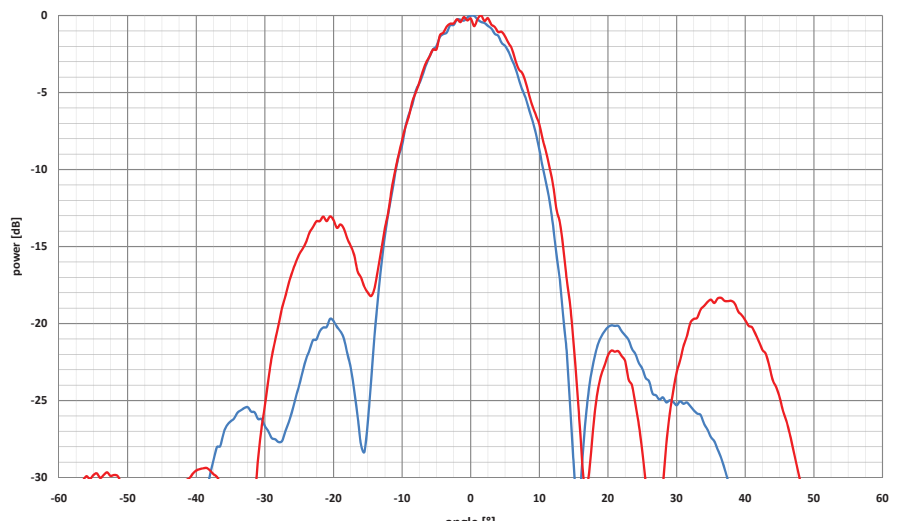
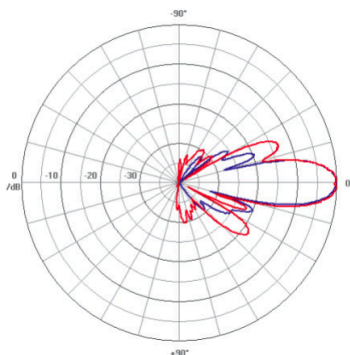
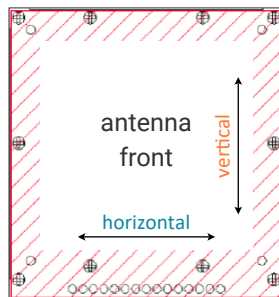
Example label:

Model: IVS-234
99999999
S/N: 00131809

FCC ID: UXS-IVS-234-2G
IC: 6902A-IVS2342G
So845



Tx - ANTENNA PATTERN



PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS
Full beam width @ -3dB	horizontal	11	13	15	°
	vertical	11	13	15	°
Side-lobe suppression	horizontal	12			dB
	vertical	12			dB

INTERFACE

The sensor provides a 6-PIN Berg connector and 2.54mm grid pads for programming

PIN #	DESCRIPTION	IN / OUT	COMMENT
1	V_{CC}	input	positive supply voltage for VCO Controller, IF-amplifier
2	V_{SS}	input	negative supply voltage for IF-amplifier
3	GND	input	analog ground
4	TUV_COM ¹	input	timed programming
		output	current mirror
5	DOP	output	I (DOP / -S2-S1)
6	QDOP	output	Q (QDOP / S2-S1)
7	NC		not connected
8	DNC	input	SCK (do not connect)
9	DNC	output	MISO (do not connect)
10	DNC	input	MOSI (do not connect)
11	DNC	input	RES (do not connect)
12	NC		not connected
13	NC		not connected
14	NC		not connected
15	GND	input	analog ground

¹ TUV "low" signals "Transceiver Unit Valid": PLL-frequency is locked

APPROVAL

This Data Sheet contains the technical specifications of the described product. Changes of the specification must be in written form. All previous versions of this Data Sheet are no longer valid.

The technical specifications of this Data Sheet are approved:

FCC approval

This device complies with Part 15 of the FCC Rules and with RSS-210 of Industry Canada.

Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

Warning: Changes or modifications made to this equipment not expressly approved by InnoSenT GmbH may void the FCC authorization to operate this equipment. Manufacturers of mobile or fixed devices incorporating IVS-234 modules are authorized to use the FCC Grants and IC Certificates of the IVS-234 modules for their own final products according to the conditions referenced in these documents. In this case, the FCC label of the module shall be visible from the outside, or the host device shall bear a second label stating contains "FCC ID: UXS-IVS-234-2G" and contains "IC: 6902A-IVS2342G".

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Transmit frequency can be programmed by the customer. The following frequency ranges apply according to the certification for FCC and IC: 24.075 GHz - 24.175 GHz

La fréquence d'émission peut être programmée par le client. Les plages de fréquences suivantes s'appliquent conformément à la certification FCC et IC : 24,075 GHz – 24,175 GHz

This equipment complies with FCC and IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps. Ce transmetteur ne doit pas être placé au même endroit ou utilisé simultanément avec un autre transmetteur ou antenne.

OEM INTEGRATION INSTRUCTIONS — FCC AND ISED

The IVS-234 is intended for integration by qualified OEM manufacturers or system integrators. Use of the module's FCC/I-SED authorizations is subject to the issued grant and certificate, their applicable conditions and the instructions below. The module authorization does not constitute approval of the complete host product.

Operating conditions and installation

The transmitter has been evaluated against FCC 47 CFR § 15.245, ISED RSS-210 Annex F, and the applicable RSS-Gen requirements. Host controls, programming and software updates shall prevent unauthorized operating settings.

The module shall be operated within the supply voltage and operating temperature limits specified in this manual.

Antenna and enclosure

Use only the original integrated patch antenna with a typical gain of **22 dBi**. The antenna, RF circuitry and shielding shall remain unchanged. External antennas, RF amplifiers and host PCB antenna traces are not part of the authorized configuration. The host enclosure, mounting arrangement and any radome shall preserve compliance with the applicable emission and RF exposure requirements.

RF exposure

The FCC and ISED RSS-102 evaluations demonstrate compliance for the evaluated configuration at **20 cm**. Maintain a minimum distance of **20 cm between the radiating antenna and all persons** during operation.

Under these integration conditions, the transmitter shall not be co-located or operated in conjunction with another antenna or transmitter. Shorter separation distances or simultaneous transmission require reassessment and any necessary authorization changes.

Host evaluation

Evaluate the completed host with the module operating in its normal **CW mode** and with the host electronics and accessories active in representative operating configurations.

Power supply arrangements shall meet the module's electrical requirements and maintain compliance.

The host manufacturer is responsible for continued transmitter compliance and any additional host requirements, including **FCC Part 15, Subpart B**, and applicable Canadian ICES requirements. FCC KDB 996369 D04 provides guidance for host evaluation.

Labelling and user information

If the module identifiers are not visible from outside the assembled product, provide a permanent, legible host label stating:

Contains FCC ID: UXS-IVS-234-2G

Contains IC: 6902A-IVS2342G

The host user manual shall include the applicable FCC/ISED notices, modification warning and installation restrictions, including the 20 cm separation distance and restriction on co-location and simultaneous transmission. Required Canadian user notices shall be provided in English and French.

For deviations from these instructions or changes affecting the authorized configuration, contact **InnoSent GmbH** at **info@innosent.de** before relying on the existing authorization. Additional testing or authorization may be required.



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