

Data Sheet IVQ-980 (MC-134 REV1)

Document Version 1.0 -12.07.2016



PRODUCT FAMILY

K-Band VCO Transceiver with crystal-based reference source

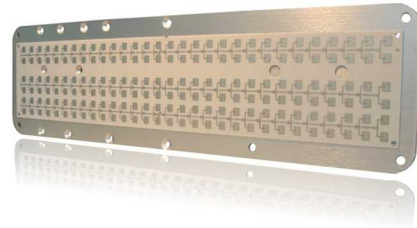
APPLICATIONS

- Speed enforcement

- Movement
- Velocity
- Direction
- Presence
- Distance
- Angle

FEATURES:

- » radar-based motion detector operating in the 24GHz - ISM - Band
- » MMIC oscillator
- » FMCW/CW/FSK operations
- » dual (stereo channel) operations
- » AGD part number MC-134 REV1



DESCRIPTION

The IVQ-980 (MC-134 REV1) is an InnoSenT K-Band VCO Transceiver with a MMIC oscillator. An integer PLL enables center frequency stabilization & transmit bandwidth calibration. With the narrow azimuth beam this Radar Front End is suitable for traffic monitoring and speed enforcement.

CERTIFICATES

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



ADDITIONAL INFORMATION

AGD to be notified of all changes.

RoHS-INFO

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

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ELECTRICAL CHARACTERISTICS

Transmitter

PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNITS
transmit frequencies ¹	depending on PLL programming programming and Vtune	f_{transmit}	<24.000		24.250>	GHz
output power ²	High Power EIRP (min. Attenuation)	P_{out}	21	24	27	dBm
	Attenuator Range	ΔP	15			dBm
power drift over temp.		ΔP_{temp}		-0.022		dB/°K
modulation input voltage	differential input	V_{tune}	0		5	V
modulation input impedance	differential input	$V_{\text{mod_in}}$		2		kΩ
detector out	lookup table available	V_{detect}	0		3.3	V
bandwidth modulation	low pass cutoff	V_{mod}		500		KHz
	high pass cutoff ³	V_{mod}		0		KHz
tuning slope		V_{tune}	250	400	725	MHz/V
tuning slope temp. drift		V_{tune}		-83.2		$\frac{\text{kHz/V}}{^\circ\text{K}}$

¹ TX-frequency is set via SPI and Vtune by customer. Customer is responsible to meet legal requirements.

² TX-power is set via SPI-DAC by customer. Customer is responsible to meet legal requirements

³ PLL-Loop generates effective high pass behavior defined by loop bandwidth

Receiver

PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNITS
mixer	type	Stereo-Mixer				
	principle	homodyne				
IF-amplifier	gain			24.8		dB
	HP 3dB cutoff frequency	f_L	50	67	80	KHz
	LP 3dB cutoff frequency	f_H	5.8	6.2	6.7	MHz
I/Q-balance		amplitude	-3		+3	dB
		phase	70	90	110	degrees
phase unambiguity range	Rx0 – Rx1			±25		degrees
self clutter ¹	Modulation Waveform: 20kHz asym. triangular Waveform large enough for 45MHz FMCW band with			<100		mVpk-pk
IF-output ²	differential outputs		0		3.3	V
differential line output impedance				2x50		Ω
Mixer+ LNA	conversion gain			5		dB
	noise figure			7.2		dB
	1dB compression			-10		dBm

¹ Self Clutter is the signal measured at the IF output (without enclosure) due to modulation when no target is present.

² Fully differential AC-coupled amplifier, IF-output voltage offset set by Vocm inputs

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ELECTRICAL CHARACTERISTICS

PLL

PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNITS
PLL type	ADF4159	fractional-n				
PLL-Loop BW	@ 2.5mA CP current / setting = 8			250		kHz

Crystal oscillator

PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNITS
crystal oscillator	frequency	$f_{\text{crystal oscillator}}$		49.152		MHz
	temp. drift	Δf_{temp}			50	ppm

Antenna

PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNITS
antenna pattern (-3dB)	azimuth	horizontal	4	5	6	degrees
	elevation	vertical	38	46	53	degrees
side lobe suppression	azimuth	horizontal	15			dB
	elevation	vertical	13			dB

Power supply

PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNITS
supply voltage		V_{cc}	6.0	6.1	6.5	V
supply current ¹		I_{cc}		7	10	mA
supply voltage		V_{cc}	5.3	5.4	5.5	V
supply current ¹		I_{cc}		274	299	mA
supply voltage		V_{cc}	3.5	3.6	3.7	V
supply current ¹		I_{cc}		200	210	mA
permissible ripple	voltage@Fswitch<1MHz ²				10	mV

¹ estimation based on component data sheet values² higher voltage ripple may degrades S/N and / or may generate ghost targets**Environment**

PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNITS
operating temperature		T_{OP}	-30		+60	°C
storage temperature		T_{storage}	-30		+70	°C

Mechanical Outlines

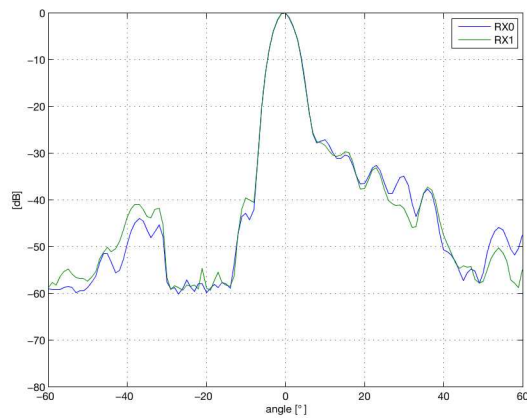
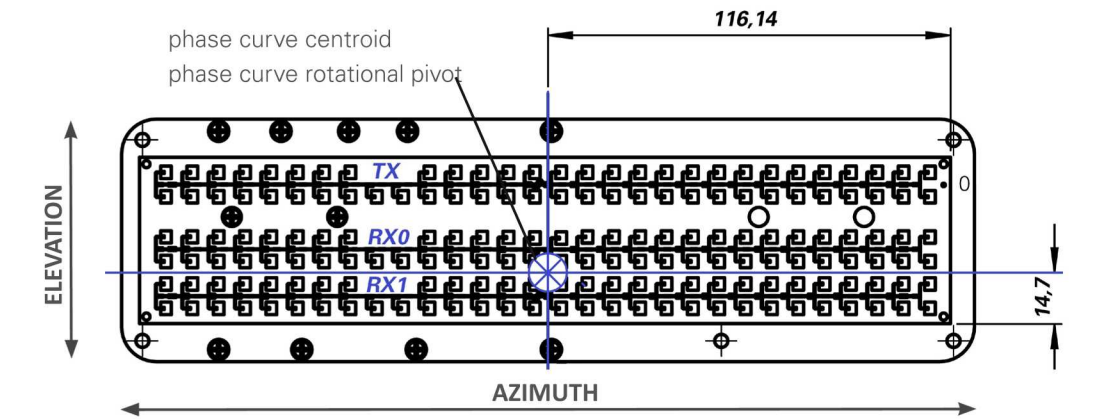
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNITS
outline dimensions	compare to schematic on page 7	height length width		10 246 70		mm

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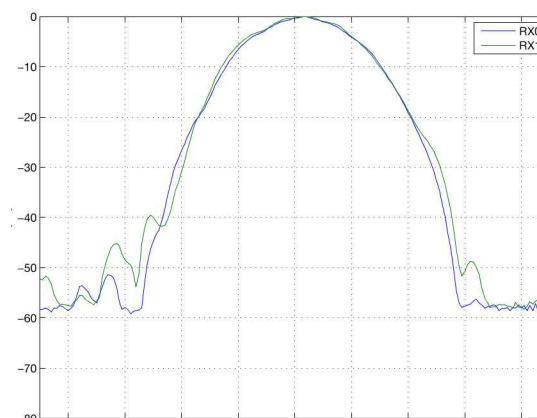
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SYSTEM PATTERN

Antenna Orientation:

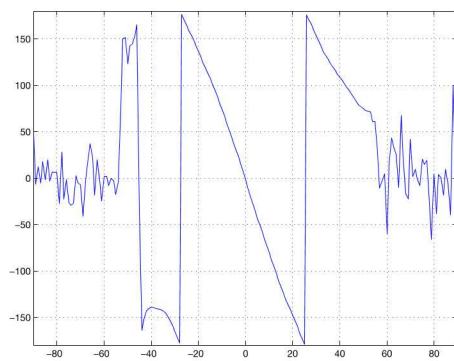


IVQ-980 system-pattern (AZIMUTH)



IVQ-980 system-pattern (ELEVATION)

PHASE CHARACTERISTICS



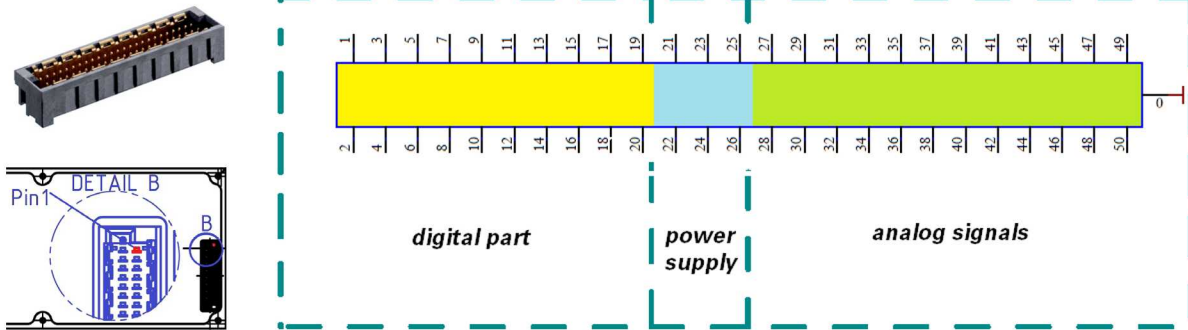
IVQ-980 R0-R1 phase characteristics (ELEVATION)

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INTERFACE

The sensor provides a ERNI MICROSPEED M10 Blind Mate 50 PIN SMD Male 2-Row



digital part:

PIN #	DESCRIPTION	INPUT / OUTPUT	COMMENT
1	GND		ground (Noise might be improved if only one ground pin is used)
2	REF_CLK_P	OUTPUT	±360 mV LVDS
3	GND		ground (Noise might be improved if only one ground pin is used)
4	REF_CLK_N	OUTPUT	±360 mV LVDS
5	MUX_PLL_N	OUTPUT	±360 mV LVDS
6	GND		ground (Noise might be improved if only one ground pin is used)
7	MUX_PLL_P	OUTPUT	±360 mV LVDS
8	SPI1.PLL_CS	INPUT	1.8V Logic ¹
9	SPI1.CLK	INPUT	1.8V Logic ¹
10	SPI1.MOSI	INPUT	1.8V Logic ¹
11	GND		ground (Noise might be improved if only one ground pin is used)
12	TX_DATA	INPUT	1.8V Logic ¹
13	SPI2.CLK	INPUT	3.3V Logic ²
14	GND		ground (Noise might be improved if only one ground pin is used)
15	SPI2.MOSI	INPUT	3.3V Logic ²
16	SPI2.ATT_CS	INPUT	3.3V Logic ²
17	VCO_EN	INPUT	>1.3V enable, <1.0V disable
18	N.C.		not connect
19	GND		ground (Noise might be improved if only one ground pin is used)
20	GND		ground (Noise might be improved if only one ground pin is used)

¹ 1.8V Logic: high level: min. 1.4V, low level max. 0.3V

² 3.3V Logic: high level: min. 2.2V, low level max. 0.8V

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power supply:

PIN #	DESCRIPTION	INPUT / OUTPUT	COMMENT
21	VCC ³	INPUT	3.6V supply voltage
22	VCC ³	INPUT	3.6V supply voltage
23	VCC ³	INPUT	5.4V supply voltage
24	VCC ³	INPUT	5.4V supply voltage
25	VCC ³	INPUT	6.1V supply voltage
26	GND		ground (Noise might be improved if only one ground pin is used)

³ Supply: see page4 Power supply for detail

analog signals:

PIN #	DESCRIPTION	INPUT / OUTPUT	COMMENT
27	GND		ground (Noise might be improved if only one ground pin is used)
28	TEMP	OUTPUT	see MCP9700T-E/LT data sheet for detail
29	V_mod_P	INPUT	diff. modulation input ⁴
30	DET	OUTPUT	output RF-power detector
31	V_mod_N	INPUT	diff. modulation input ⁴
32	GND		ground (Noise might be improved if only one ground pin is used)
33	GND		ground (Noise might be improved if only one ground pin is used)
34	Vtune_out_N	OUTPUT	diff. PLL vtune readback ⁴
35	IF:I0_N	OUTPUT	diff. IF I0
36	Vtune_out_P	OUTPUT	diff. PLL vtune readback ⁴
37	IF:I0_P	OUTPUT	diff. IF I0
38	GND		ground (Noise might be improved if only one ground pin is used)
39	VOCM_0	INPUT	VOCM for IF 0 ⁵
40	IF:Q0_N	OUTPUT	diff. IF Q0
41	GND		ground (Noise might be improved if only one ground pin is used)
42	IF:Q0_P	OUTPUT	diff. IF Q0
43	IF:Q1_N	OUTPUT	diff. IF Q1
44	GND		ground (Noise might be improved if only one ground pin is used)
45	IF:Q1_P	OUTPUT	diff. IF Q1
46	VOCM_1	INPUT	VOCM for IF 1 ⁵
47	GND		ground (Noise might be improved if only one ground pin is used)
48	IF:I1_N	OUTPUT	diff. IF I1
49	GND		ground (Noise might be improved if only one ground pin is used)
50	IF:I1_P	OUTPUT	diff. IF I1

⁴ see page2 block diagram for detail

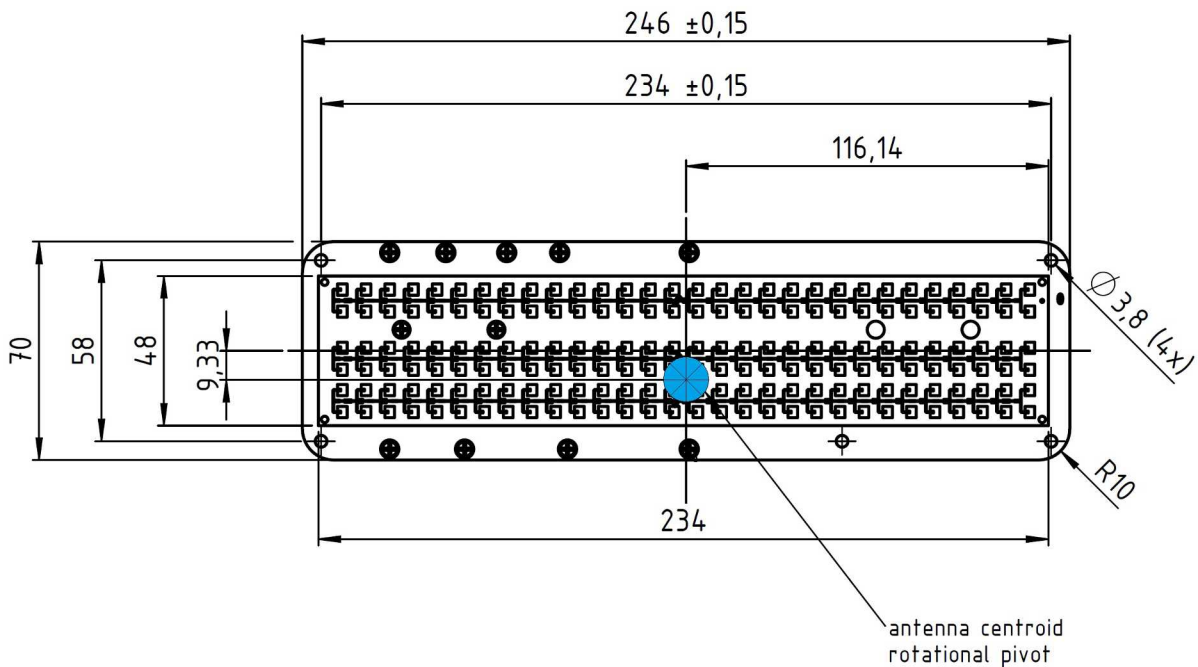
⁵ see LTC6406 data sheet for detail

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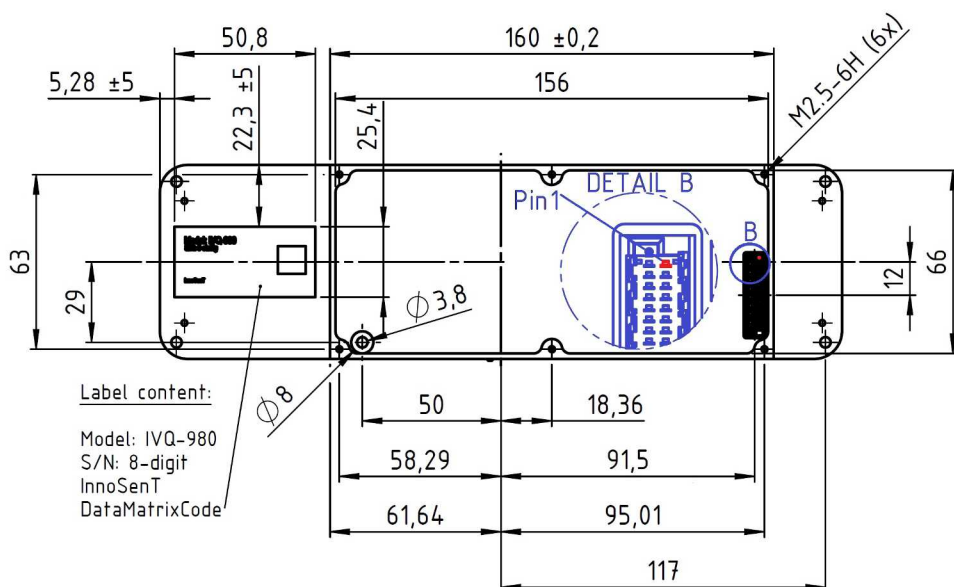
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MECHANICAL OUTLINES

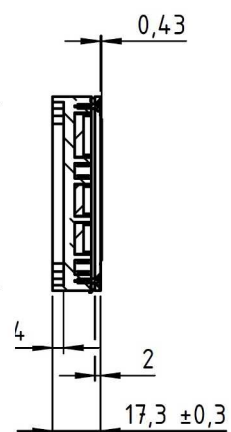
top view



bottom view



side view



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APPROVAL

This Data Sheet contains the technical specifications of the described product. All previous versions of this Data Sheet are no longer valid.

The sensor uses Hydrocarbon based material which may change its dielectric properties when used in an oxidative environment. This may vary based on temperature. Therefore InnoSenT recommends evaluating this influence within the specific environment.

ESD-INFORMATION



This InnoSenT sensor is sensitive to damage from ESD. Normal precautions as usually applied to CMOS devices are sufficient when handling the device. Touching the signal output pins has to be avoided at any time before soldering or plugging the device into a motherboard.

VERSION	DATE	COMMENT
1.0	12.07.2016	Initial release

CUSTOMER APPROVAL

This data sheet contains the technical specifications of the described product. Changes of the specifications must be in written form. All previous versions of this data sheets are no longer valid.

The technical specifications of this data sheet are approved:

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