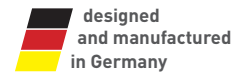


Data Sheet SMR-314/324/334

Version 1.2 - 06.03.2017

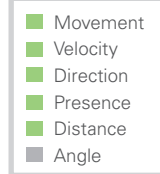


PRODUCT FAMILY

SMT mountable K-Band VCO Sensor

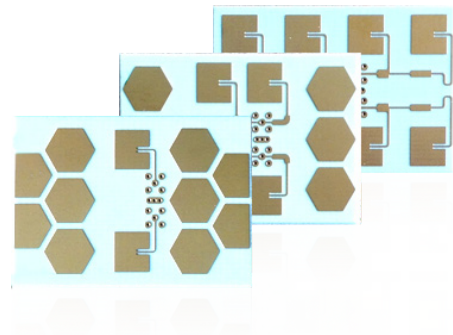
APPLICATIONS

- Industrial Applications
- Security Applications



FEATURES:

- » VCO Transceiver working in the 24GHz - ISM - Band
- » Detection of direction and velocity as well as distance of moving and stationary objects
- » Integrated Prescaler for easy frequency control
- » Integrated Low Noise Amplifier
- » Mounting by standard SMT-Process (delivery on Tape & Reel)
- » Extended temperature range from -40°C up to +85°C
- » Very small outline dimensions
- » Available with different antenna patterns by same interface



DESCRIPTION

K-Band based VCO Sensor. The ultra small device will be delivered directly on tape for mounting within a standard SMT. Due to the VCO capability the sensor is also suitable for application whereby frequency modulation is necessary (e.g. distance measurement).

ETSI / FCC

All SMR modules are compliant to ETSI 300 440. The US Version is compliant to FCC 15.245.

ADDITIONAL INFORMATION

InnoSenT Standard Product. Changes will not be notified as long as there is no influence on form, fit and within this datasheet specified function of the product.

CERTIFICATES

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



RoHS-INFO

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

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PARAMETERS

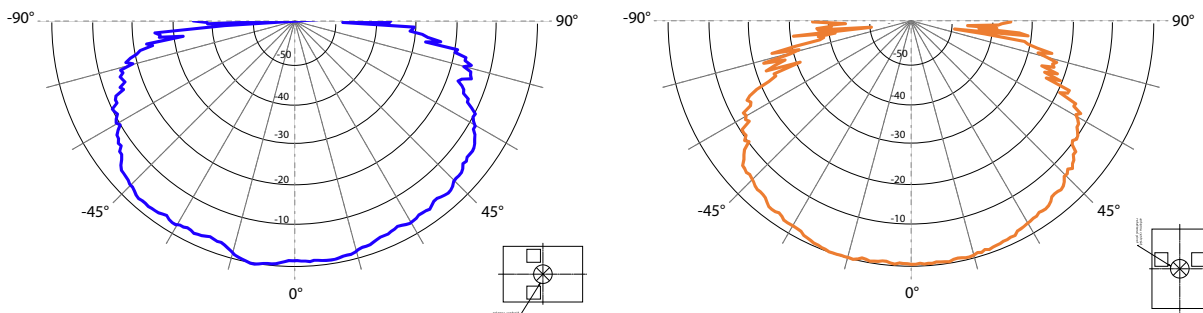
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNITS
Radar						
VCO frequency range		f_{VCO}	24.050		24.250	GHz
Tuning voltage	to cover VCO frequency range	V_{tune}	0.7		2.5	V
VCO tuning sensitivity	within VCO frequency range	K_{VCO}		720	2000	MHz/V
Max. Antenna Gain					7	dBi
IF output DC-Offset		$IF_{1/2_DC-offset}$	1.4	1.8	2.2	V
IF-Bandwidth (-3dB)		B	0		1M	Hz
signal level (RCS = 0.5m ² @ 5m)	SMR - 314	$IF_{1/2 - SMR-314}$	60		250	μVrms
	SMR - 324	$IF_{1/2 - SMR-324}$	40		235	μVrms
	SMR - 334	$IF_{1/2 - SMR-334}$	120		360	μVrms
noise level	100Hz...1kHz	$N_{1/2}$			20	μVrms
quadrat. phase imbalance		ϵ_p	-25		25	°
overall gain (conversion gain + antenna gain)	SMR - 314	$G_{OA - SMR-314}$		24		dB
	SMR - 324	$G_{OA - SMR-324}$		24		
	SMR - 334	$G_{OA - SMR-334}$		29		
Power supply						
supply voltage		V_{CC}	3.2	3.3	3.4	V
supply current		I_{CC}		47	57	mA
Frequency Divider						
Prescaler division ratio	$V_{CC_PTAT} = 3.3\text{ V}$	D_{DIV}	8192			
Prescaler output voltage	Peak to peak voltage Terminated with 50Ω $D_{DIV}=8192$	V_{DIV}	60	120	260	mV
Prescaler supply voltage		V_{CC_DIV}	3.2	3.3	3.4	V
Prescaler supply current		I_{CC_DIV}		19		mA
Environment						
operating temperature		T_{OP}	-40		+85	°C
storage temperature		T_{STG}	-40		+85	°C
Mechanical Outlines						
outline dimensions	compare to schematic on page 5	height length width	3.1 21.4 15.0			mm

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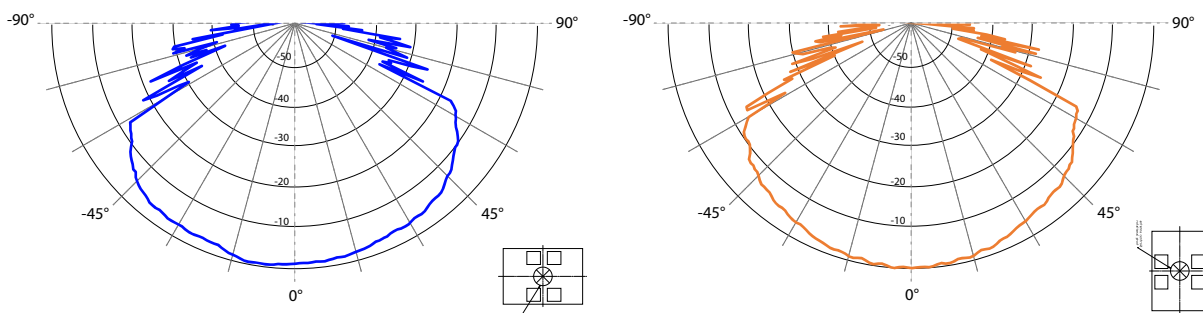
ANTENNA PATTERN

System Pattern SMR-314:



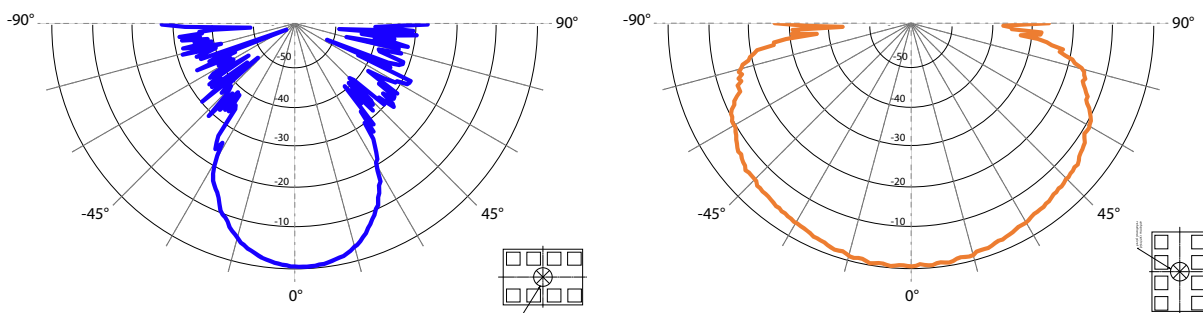
system pattern (-10dB)	azimuth	system_az		121		°
	elevation	system_el		111		°

System Pattern SMR-324:



system pattern (-10dB)	azimuth	system_az		100		°
	elevation	system_el		104		°

System Pattern SMR-334:

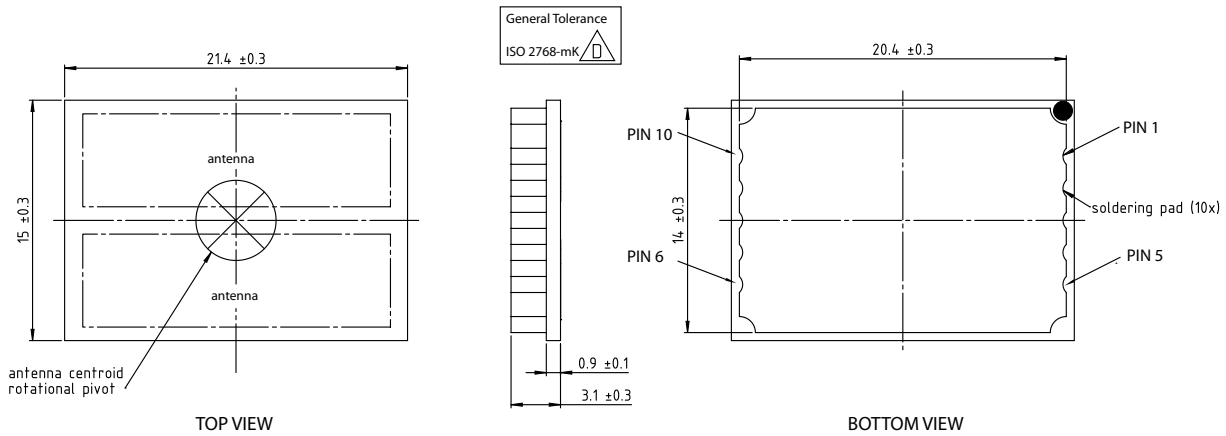


system pattern (-10dB)	azimuth	system_az		43		°
	elevation	system_el		116		°

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OUTLINE DIMENSIONS



INTERFACE

The sensor provides solder pads for SMT mounting.

PIN #	DESCRIPTION	IN/OUT	COMMENT
1	V_{CC_DIV}	input	supply voltage divider
2	div_out	output	divider output
3	IF1	output	signal I(nphase)
4	IF2	output	signal Q(adrature)
5	enable*	input	TX output power enable (active high)
6	GND	input	analog ground
7	V_{CC}	input	supply voltage
8	V_{CC_PTAT}	input	divider ratio setting (3.3V = 8192)
9	V_{tune}	input	tuning voltage (0.7...2.5V)
10	GND	input	analog ground

*the enable has no influence on current consumption but reduces the TX output power by about 30dB.

enable pin off: 0 - 0.8V

enable pin on: 2 - 3.3V

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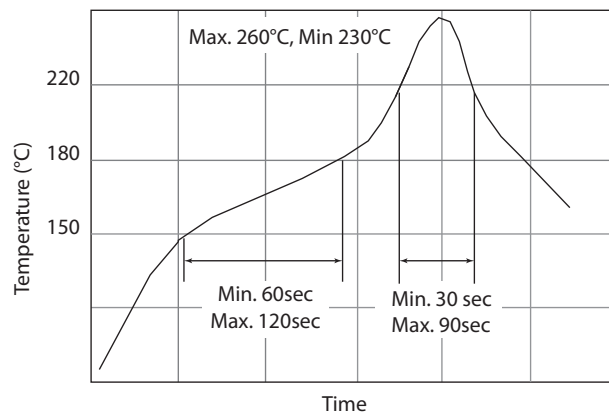
SMT GUIDELINES

The SMR device is 100% Pb-free. Therefore, Pb-free solder paste with a Pb-free reflow profile is recommended. Do not use solder paste with active or acid-based flux. To avoid submerging the device in the solder paste, the placement height (Z) of the device on the pick-and-place equipment should be controlled carefully. Optimally, the Z height should be set at one-half the printed solder paste height. Maintaining board flatness (coplanarity) is important in keeping the Z height under control.

If possible use a pick-and-place machine with a visions-alignment system for proper centering on the PCB.

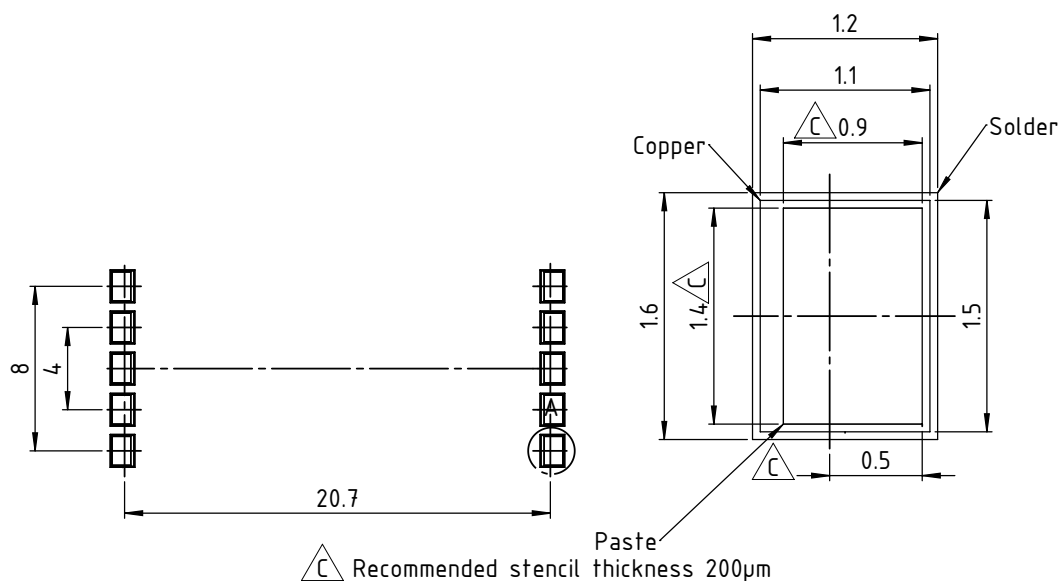
For the soldering process we recommend the following:

- For optimum results the reflow oven should have nitrogen purge (we recommend 1000ppm)
- To avoid damage during assembly solder reflow attachment, follow the guidelines in IPC/JEDEC J-STD-020D.1. The device is qualified at 260 °C reflow. The following figure shows a typical temperature profile for Pb-free (Sn-Ag-Cu or Sn-Ag) solder and the corresponding critical reflow parameters.



PACKAGE FOOTPRINT

Recommended Footprint and Stencil Layout



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ORDER INFORMATION

 www.InnoSenT.de	antenna		
	3dB: 121° x 111° (1 x 1 Patch)	3dB: 100° x 104° (1 x 2 Patch)	3dB: 43° x 116° (1 x 4 Patch)
SMR-314			
SMR-324			
SMR-334			

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.

VERSION	DATE	COMMENT
1.0	13.04.2016	initial release
1.1	26.07.2016	Datamatrix code in outline dimensions removed
1.2	06.03.2017	changing Recommended Footprint; addition information in interface

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