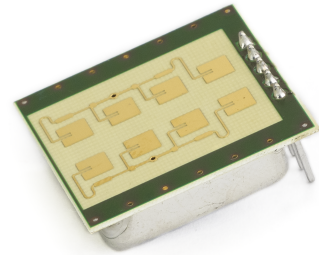


K-LC2 RADAR TRANSCEIVER

Product Information

Features

- 24 GHz K-band miniature I/Q transceiver
- 140MHz sweep FM input
- 2 x 4 patch antenna
- Excellent noise cancelling ability though I/Q technology
- Beam aperture 80°/34°
- 15dBm EIRP output power
- 25x25mm² surface, <6.5mm thickness
- Lowcost design



Applications

- Direction sensitive movement detectors
- Security systems
- Object speed measurement systems
- Simple ranging detection using FSK
- Industrial sensors

Description

K-LC2 is a 2 x 4 patch Doppler module with an asymmetrical beam for lowcost short distance applications. Its typical applications are movement sensors in the security and presence detection domain.

In building automation this module may be an alternative for infrared PIR or AIR systems thanks to its outstanding performance/cost ratio.

The module is extremely small and lightweight. With its wide IF bandwidth it opens many new applications. FSK is possible thanks to the unique RFbeam oscillator design. This allows to use this lowcost module even in ranging applications.

Powerful starterkits (ST100 and ST200) with signal conditioning and visualization on the PC's are available.

Blockdiagram

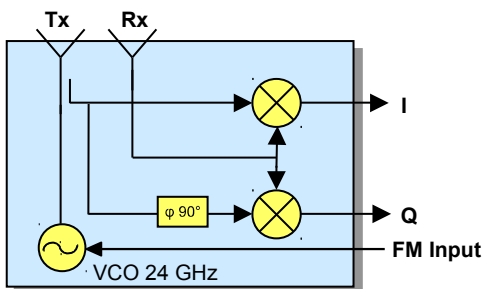


Fig. 1: Block diagram

K-LC2 RADAR TRANSCEIVER

Product Information

Characteristics

Parameter	Conditions / Notes	Symbol	Min	Typ	Max	Unit
Operating conditions						
Supply voltage		V_{cc}	4.75	5.0	5.25	V
Supply current	VCO Pin open	I_{cc}		35	65	mA
VCO input voltage		U_{vco}	-0.5		2.0	V
VCO pin resistance	Driving voltage source ^{Note 1}	R_{vco}		570		Ω
Operating temperature		T_{op}	-20		+85	°C
Storage temperature		T_{st}	-20		+105	°C
Transmitter						
Transmitter frequency	VCO pin left open, $T_{amb} = -20^{\circ}\text{C} \dots +85^{\circ}\text{C}$	f_{TX}	24.050	24.125	24.250	GHz
Frequency drift vs temperature	$V_{cc}=5.0\text{V}$, $-20^{\circ}\text{C} \dots +85^{\circ}\text{C}$ ^{Note 2}	Δf_{TX}		-0.9		MHz/°C
Frequency tuning range		Δf_{vco}		140		MHz
VCO sensitivity		S_{vco}		-55		MHz/V
VCO Modulation Bandwidth	$\Delta f=20\text{MHz}$	B_{vco}		3		MHz
Output power	EIRP	P_{TX}		+15		dBm
Output power deviation	Full VCO tuning range	ΔP_{TX}			+/- 1	dBm
Spurious emission		P_{spur}		-30		dBm
Turn-on time	Until oscillator stable, $\Delta f_{TX} < 5\text{MHz}$	t_{on}		1	6	μs
Receiver						
Mixer Conversion loss	$f_{IF} = 1\text{kHz}$, IF load = $1\text{k}\Omega$	D_{mixer1}		-6		dB
	$f_{IF} = 20\text{MHz}$, IF load = 50Ω	D_{mixer2}		-11		dB
Antenna Gain	$F_{TX}=24.125\text{GHz}$ ^{Note 3}	G_{Ant}		8.6		dBi
Receiver sensitivity	$f_{IF} = 500\text{Hz}$, $B=1\text{kHz}$, $R_{IF} = 1\text{k}\Omega$, $S/N=6\text{dB}$	P_{RX1}		-96		dBm
	$f_{IF} = 1\text{MHz}$, $B=20\text{MHz}$, $R_{IF} = 50\Omega$, $S/N=6\text{dB}$	P_{RX1}		-84		dBm
Overall sensitivity	$f_{IF} = 500\text{Hz}$, $B=1\text{kHz}$, $R_{IF} = 1\text{k}\Omega$, $S/N=6\text{dB}$	D_{system}		-111		dBc
IF output						
IF output resistance		R_{IF}		50		Ω
IF frequency range	-3dB Bandwidth, IF load = 50Ω	f_{IF}	0	10	50	MHz
IF noise power	$f_{IF} = 500\text{Hz}$, IF load = 50Ω	$P_{IFnoise1}$		-134		dBm/Hz
	$f_{IF} = 1\text{MHz}$, IF load = 50Ω	$P_{IFnoise2}$		-164		dBm/Hz
IF noise voltage	$f_{IF} = 500\text{Hz}$, IF load = $1\text{k}\Omega$	$U_{IFnoise1}$		-147		dBV/Hz
	$f_{IF} = 500\text{Hz}$, IF load = $1\text{k}\Omega$	$U_{IFnoise1}$		45		nV/ $\sqrt{\text{Hz}}$
IF output offset voltage	Full VCO range, no object in range	U_{IF}	-200		200	mV
I/Q amplitude balance	$f_{IF} = 500\text{Hz}$, $U_{IF} = 1\text{mVpp}$	ΔU_{IF}		3		dB
I/Q phase shift	$f_{IF} = 1\text{Hz} - 20\text{kHz}$	φ	80	90	100	°
Supply rejection	Rejection supply pins to IF output	D_{supply}		25		dB
ESD Rating						
Electrostatic Discharge	Human body model class 0	V_{ESD}			250	V

Note 1 The VCO input has an internal voltage source with approx. 0.9VDC. For driving this pin it is necessary to source and sink current

Note 2 Transmit frequency stays within 24.050 to 24.250GHz over the specified temperature range when the VCO pin is left open

Note 3 Theoretical value, given by Design