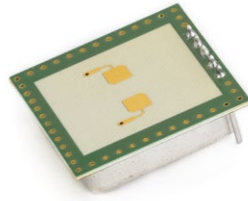


K-LC4

radar transceiver



Features

- 24 GHz K-band miniature transceiver
- Dual 1 patch circular polarized antenna
- Dual balanced mixer with 50 MHz bandwidth
- Excellent noise cancelling ability through I/Q technology
- Wide beam aperture $138^\circ/132^\circ$
- 10 dBm EIRP output power
- $25 \times 25 \text{ mm}^2$ surface, $< 6 \text{ mm}$ thickness
- Low cost design

Applications

- Direction sensitive movement detectors
- Security systems
- Simple ranging detection using FSK
- Ceiling and wall mount surveillance system
- Industrial sensors

Description

K-LC4 is a 2 patch Doppler module with a nearly symmetrical wide beam for low cost short distance applications.

Typical applications are movement sensors for security, lighting and building automation applications. This module may be an alternative or a complementary sensor for infrared PIR or AIR systems thanks to its outstanding performance/cost ratio.

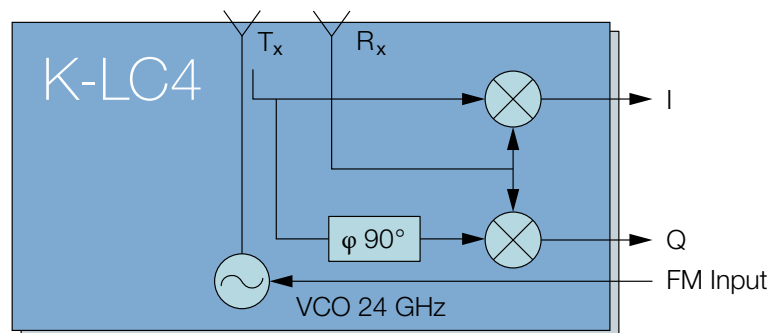
The module is extremely small and lightweight. With an IF bandwidth from DC to 50 MHz it opens many new applications.

The unique RFbeam circular polarized antenna form allows much wider acquisition fields than the traditional linear polarized patch antenna.

A powerful starterkit with signal conditioning and visualization is available from RFbeam. Find more informations on www.rfbeam.ch.

Block Diagram

Figure 1: Blockdiagram



CHARACTERISTICS

Parameter Conditions/Notes Symbol Min Typ Max Unit

Operating Conditions

Supply voltage		V_{CC}	4.75	5	5.25	V
Supply current		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	$^{\circ}C$
Storage temperature		T_{st}	-20		+105	$^{\circ}C$

Transmitter

Transmitter frequency	$T_{amb} = -20^{\circ}C \dots +85^{\circ}C$	f_{TX}	24.05	24.125	24.25	GHz
Frequency drift vs temperature	$V_{CC} = 5.0V, -20^{\circ}C \dots +85^{\circ}C$ ^{Note 2}	Δf_{TX}		-0.9		MHz/ $^{\circ}C$
Frequency tuning range		Δf_{VCO}		140		MHz
VCO sensitivity		S_{VCO}		-55		MHz/V
VCO Modulation Bandwidth	$\Delta f = 20$ MHz	B_{VCO}		3		MHz
Output power	EIRP	P_{TX}		+10		dBm
Spurious emission		P_{spur}		-30		dBm
Turn-on time	Until oscillator stable, $\Delta f_{TX} < 5$ MHz	t_{on}		1		μs

Receiver

Mixer Conversion loss	$f_{IF} = 1$ kHz, IF load = 1 k Ω	D_{mixer1}		-6		dB
	$f_{IF} = 20$ MHz, IF load = 50 Ω	D_{mixer2}		-11		dB
Antenna Gain	$F_{TX} = 24.125$ GHz ^{Note 3}	G_{Ant}		4.8		dB
Receiver sensitivity	$f_{IF} = 500$ Hz, B = 1 kHz, $R_{IF} = 1$ k Ω , S/N = 6 dB	P_{RX1}		-93		dBm
	$f_{IF} = 1$ MHz, B = 20 MHz, $R_{IF} = 50$ Ω , S/N = 6 dB	P_{RX1}		-81		dBm
Overall sensitivity	$f_{IF} = 500$ Hz, B = 1 kHz, $R_{IF} = 1$ k Ω , S/N=6 dB	D_{system}		-103		dBc

IF output

IF resistance		R_{IF}		50		Ω
IF frequency range	-3dB Bandwidth, IF load = 50 Ω	f_{IF}	0		50	MHz
IF noise power	$f_{IF} = 500$ Hz, IF load = 50 Ω	$P_{IFnoise1}$		-134		dBm/Hz
	$f_{IF} = 1$ MHz, IF load = 50 Ω	$P_{IFnoise2}$		-164		dBm/Hz
IF noise voltage	$f_{IF} = 500$ Hz, IF load = 1 k Ω	$U_{IFnoise1}$		-147		dBV/Hz
	$f_{IF} = 500$ Hz, IF load = 1 k Ω	$U_{IFnoise1}$		45		nV/ \sqrt{Hz}
IF output offset voltage	no object in range	U_{IF}	-200		200	mV
I/Q amplitude balance	$f_{IF} = 500$ Hz, $U_{IF} = 1$ mVpp	ΔU_{IF}		3		dB
I/Q phase shift	$f_{IF} = 1$ Hz–20 kHz	φ	80	90	100	$^{\circ}$
Supply rejection	Rejection supply pins to IF output	D_{supply}		26		dB

Antenna

Antenna type	Right hand circular polarized	RHCP				
Horizontal -3 dB beamwidth	E-Plane	W_{φ}		138		$^{\circ}$
Vertical -3 dB beamwidth	H-Plane	W_{φ}		132		$^{\circ}$
Horiz. sidelobe suppression		D_{φ}		-12		dB
Vertical sidelobe suppression		D_{φ}		-12		dB

Body

Outline Dimensions				25 × 25 × 6		mm ³
Weight				4.5		g
Connector	5 pin single row jumper					

ESD rating

Electrostatic discharge	Human body model class 0	V_{ESD}		250		V
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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

Note 3 Theoretical value, given by Design