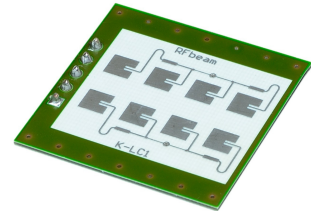


K-LC1a RADAR TRANSCEIVER

Product Information

Features

- 24 GHz K-band miniature transceiver
- 100MHz sweep FM input
- Dual 4 patch antenna
- Single balanced mixer with 50MHz bandwidth
- Beam aperture 80°/34°
- 15dBm EIRP output power
- 25x25mm² surface, <6mm thickness
- 100% electrically compatible with K-LC1
- Lowcost design



K-LC1a Actual Size

Applications

- General purpose movement detectors
- Security systems
- Object speed measurement systems
- Simple shorrange ranging detection
- Highspeed shorrange data transmission
- Industrial sensors

Description

K-LC1a is a 8 patch Doppler module with an asymmetrical beam for lowcost short distance applications. Its typical applications are movement sensors in the security and automatic door 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 IF bandwidth from DC to 50MHz it opens many new applications.

FM and FSK are possible thanks to the unique RFbeam oscillator design. This allows to use this lowcost module even in ranging applications.

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

Blockdiagram

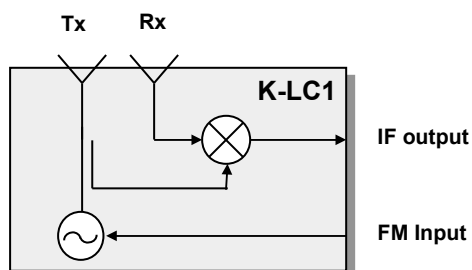


Fig. 1: Block diagram

K-LC1a 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	45	mA
VCO input voltage		U_{vco}	-0.5		2.0	V
Operating temperature		T_{op}	-20		+60	°C
Storage temperature		T_{st}	-20		+80	°C
Transmitter						
Transmitter frequency	VCO pin left open, $T_{amb} = -20^{\circ}\text{C} \dots +60^{\circ}\text{C}$	f_{TX}	24.050	24.125	24.250	GHz
Frequency drift vs temperature	$V_{cc} = 5.0\text{V}$, $-20^{\circ}\text{C} \dots +60^{\circ}\text{C}$ ^{Note 2}	Δf_{TX}		-1		MHz/°C
Frequency tuning range		Δf_{vco}		180		MHz
VCO sensitivity		S_{vco}		-80		MHz/V
VCO Modulation Bandwidth	$\Delta f = 20\text{MHz}$	B_{vco}		3		MHz
Output power	EIRP	P_{TX}	+12	+15	+17	dBm
Spurious emission	According to ETSI 300 440	P_{spur}			-30	dBm
Turn-on time	Until oscillator stable, $\Delta f_{TX} < 5\text{MHz}$	t_{on}		1		µs
Receiver						
Antenna Gain	$F_{TX} = 24.125\text{GHz}$ ^{Note 3}	G_{Ant}		8.6		dB
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 resistance		R_{IF}		50		Ω
IF frequency range	-3dB Bandwidth, IF load = 50Ω	f_{IF}	0		50	MHz
IF noise power	$f_{IF} = 500\text{Hz}$, IF load = 50Ω	$P_{IFnoise1}$		-134		dBm/Hz
IF noise voltage	$f_{IF} = 500\text{Hz}$, IF load = 1kΩ	$U_{IFnoise1}$		-147		dBV/Hz
	$f_{IF} = 500\text{Hz}$, IF load = 1kΩ	$U_{IFnoise1}$		45		nV/√Hz
IF output offset voltage	Full VCO range, no object in range	U_{IF}	10		200	mV
Supply rejection	Rejection supply pins to IF output	D_{supply}		26		dB
Antenna						
Horizontal -3dB beamwidth	E-Plane	W_{θ}		80		°
Vertical -3dB beamwidth	H-Plane	W_{θ}		34		°
Horiz. sidelobe suppression		D_{θ}		-12		dB
Vertical sidelobe suppression		D_{θ}		-12		dB
Body						
Outline Dimensions				25*25*6		mm ³
Weight				4.5		g
Connector	5pin single row jumper					

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