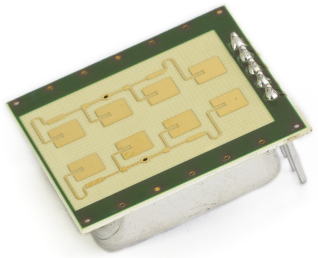
K-LC1a RADAR TRANSCEIVER

Product Information

Features



- 24 GHz K-band miniature transceiver
- Dual 4 patch antenna
- Beam aperture 80°/34°
- 15dBm EIRP output power
- 25x25mm^2 surface, 6mm thickness
- Lowcost design
- With or without FM input depending on variant
- 3.3V or 5V variant

Applications

- General purpose movement detectors
- Security systems
- Object speed measurement systems
- Simple shortrange ranging detection
- Highspeed shortrange 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 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.
A powerful starterkit with signal conditioning and visualization is available from RFbeam. Find more informations at www.rfbeam.ch.

Blockdiagram

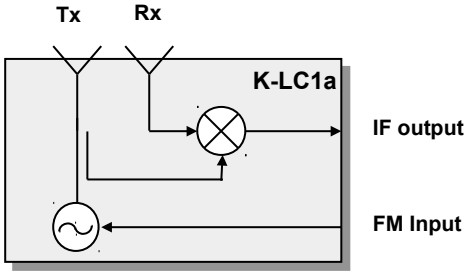


Fig. 1: Block diagram (FM input not present on K-LC1a_V2 & K-LC1a_V5)

Characteristics

Parameter	Conditions / Notes	Symbol	Min	Typ	Max	Unit
Operating conditions						
Supply voltage	For K-LC1a & K-LC1a_V2 variant	V_{cc}	4.75	5.0	5.25	V
	For K-LC1a_V4 & K-LV1a_V5 variant	V_{cc}	3.0	3.3	3.6	V
Supply current	VCO Pin open	I_{cc}		35	65	mA
VCO input voltage	For K-LC1a variant	U_{vco}	-0.5		2.0	V
	For K-LC1a_V4 variant	U_{vco}	-0.5		1.0	V
Operating temperature		T_{op}	-20		+85	°C
Storage temperature		T_{st}	-20		+105	°C
Transmitter						
Transmitter frequency	VCO pin left open, T_{amb}=-20°C .. +85°C	f_{TX}	24.050	24.125	24.250	GHz
Frequency drift vs temperature	V_{cc}=5.0V, -20°C .. +85°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	Δf=20MHz	B_{VCO}		3		MHz
Output power	EIRP	P_{TX}		+15		dBm
Spurious emission		P_{spur}		-30		dBm
Turn-on time	Until oscillator stable, Δf_{TX} < 5MHz	t_{on}		1	6	µs
Receiver						
Antenna Gain	F_{TX}=24.125GHz Note 3	G_{Ant}		8.6		dB
Receiver sensitivity	f_{IF} =500Hz,B=1kHz,R_{IF} =1kΩ,S/N=6dB	P_{RX1}		-96		dBm
	f_{IF} =1MHz,B=20MHz,R_{IF} =50Ω,S/N=6dB	P_{RX1}		-84		dBm
Overall sensitivity	f_{IF} =500Hz,B=1kHz,R_{IF} =1kΩ,S/N=6dB	D_{system}		-111		dBc
IF output						
IF resistance		R_{IF}		50		Ω
IF frequency range	-3dB Bandwidth, IF load = 50Ω	f_{IF}	0	10	50	MHz
IF noise power	f_{IF} =500Hz, IF load = 50Ω	$P_{IFnoise1}$		-134		dBm/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_{φ}		80		°
Vertical -3dB beamwidth	H-Plane	W_{θ}		34		°
Horiz. sidelobe suppression		D_{φ}		-12		dB
Vertical sidelobe suppression		D_{θ}		-12		dB
Body						
Outline Dimensions				25*25*6		mm^3
Weight				4.5		g
Connector	Depending on variant, 2.54mm spacing			3 or 5		pins
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