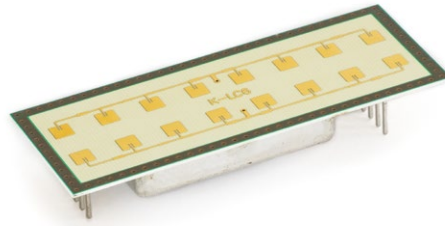


K-LC6

radar transceiver



Features

- 24 GHz short range transceiver
- Narrow–wide asymmetrical field pattern
- Beam aperture 80° / 12°
- High sensitive LNA receiver
- 300 MHz wide sweep FM input
- I/Q IF outputs
- Optional IF amplifier (K-LC6-RFB-01x)
- Compact size: 66 mm × 25 mm × 6 mm
- Available as 3.3V or 5V version

Applications

- Indoor and outdoor lighting control applications
- Traffic supervision and counting
- Object speed measurement systems
- Ranging and distance detection using FSK or FMCW
- Industrial sensors
- Home automation

Description

K-LC6 is a dual channel Doppler Radar module with an asymmetrical narrow beam for short to medium distance sensors. It is ideally suited for person and vehicle movement and presence sensors.

This module includes an RF low noise amplifier (LNA) for best signal to noise performance. Dual IF I and Q allow movement direction detection and high performance signal processing.

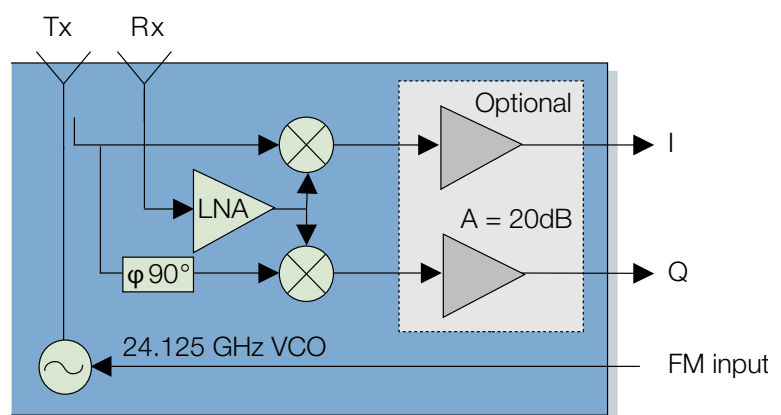
The optional internal IF amplifier is available in version K-LC6-RFB-01x.

An extremely slim construction with only 6 mm depth gives you maximum flexibility in your equipment design.

Powerful starterkits with signal conditioning and visualization are also available. (ST100/ST200)

Block Diagram

Figure 1: Blockdiagram



Optional amplifier is present in the K-LC6-RFB-01x version.

CHARACTERISTICS

Parameter	Conditions/Notes	Symbol	Min	Typ	Max	Unit
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Operating conditions K-LC6-RFB-xxC (3.3V version)

Supply voltage ^{Note 1}		V_{CC}	3.13	3.3	3.47	V
Supply current		I_{CC}		85		mA
VCO input voltage		U_{VCO}	0		3.3	V
VCO pin resistance	Internal voltage divider ^{Note 3}	R_{VCO}		20k		Ω
Operating temperature		T_{op}	-20		+85	°C
Storage temperature		T_{st}	-20		+85	°C

Operating conditions K-LC6-RFB-xxD (5V version)

Supply voltage ^{Note 1}		V_{CC}	4.8	5	5.2	V
Supply current		I_{CC}		85		mA
VCO input voltage		U_{VCO}	0		10	V
VCO pin resistance	Internal pullup to 5V	R_{VCO}		4.7k		Ω
Operating temperature		T_{op}	-20		+85	°C
Storage temperature		T_{st}	-20		+85	°C

Transmitter

Transmitter frequency	VCO pin open, $T_a = -20^\circ\text{C} \dots +85^\circ\text{C}$ ^{Note 4}	f_{TX}	24.05	125	24.25	GHz
Frequency drift vs temp.	$-20^\circ\text{C} \dots +85^\circ\text{C}$ ^{Note 3}	Δf_{TX}		-0.13		MHz/K
Frequency tuning range		Δf_{VCO}		300		MHz
VCO Modulation Bandwidth	$\Delta f = 20\text{MHz}$	B_{VCO}		3		MHz
Output power	EIRP	P_{TX}		16		dBm
Spurious emission	According to ETSI 300 440	P_{spur}			-30	dBm
Turn-on time	Until IF signal is valid	T_{ON}		6		μs

Receiver

Antenna gain	$f_{TX} = 24.125\text{GHz}$ ^{Note 2}	G_{Ant}		12.5		dBi
Receiver gain	$f_{RX} = 24.125\text{GHz}$	G_{LNA}		10		dB
Receiver sensitivity	$f_{IF} = 500\text{Hz}$, $B = 1\text{kHz}$, $S/N = 6\text{dB}$, $R_{Load} = 1\text{k}\Omega$	P_{RX}		-108		dBm
Overall sensitivity	$f_{IF} = 500\text{Hz}$, $B = 1\text{kHz}$, $S/N = 6\text{dB}$, $R_{Load} = 1\text{k}\Omega$	D_{system}		-126		dBc

IF output K-LC6-RFB-00x

IF output impedance		R_{IF}		100		Ω
I/Q amplitude balance	$f_{IF} = 500\text{Hz}$	ΔU_{IF}		3		dB
I/Q phase shift	$f_{IF} = 500\text{Hz}$	φ	80	90	100	°
IF frequency range	-3dB Bandwidth	f_{IF}	0		10	MHz
IF noise voltage	$f_{IF} = 500\text{Hz}$	$U_{IFnoise}$		45		nV/ $\sqrt{\text{Hz}}$
	$f_{IF} = 500\text{Hz}$	$U_{IFnoise}$		-147		dBV/Hz
IF output offset voltage		U_{os}		0.2		V
Supply rejection	Rejection supply pins to outputs, 500Hz	D_{supply}		-50		dB

IF output K-LC6-RFB-01x

IF output impedance		R_{IF}		100		Ω
IF Amplifier gain		G_{IF}		20		dB
I/Q amplitude balance	$f_{IF} = 500\text{Hz}$	ΔU_{IF}		3		dB
I/Q phase shift	$f_{IF} = 500\text{Hz}$	φ	80	90	100	°
IF frequency range	-3 dB Bandwidth	f_{IF}	10		15k	Hz
IF noise voltage	$f_{IF} = 500\text{Hz}$	$U_{IFnoise}$		450		nV/ $\sqrt{\text{Hz}}$
	$f_{IF} = 500\text{Hz}$	$U_{IFnoise}$		-127		dBV/Hz
IF output offset voltage		U_{os}	2.25	2.5	2.75	V
Supply rejection	Rejection supply pins to outputs, 500Hz	D_{supply}		-50		dB

Antenna

Parameter	Conditions/Notes	Symbol	Min	Typ	Max	Unit
Horizontal -3dB beamwidth	E-Plane	W_{φ}		12		°
Vertical -3dB beamwidth	H-Plane	W_{θ}		80		°
Horiz. sidelobe suppression		D_{φ}		-20		dB
Vert. sidelobe suppression		D_{θ}		-18		dB

Body

Outline Dimensions	connector left unconnected			66×5×6		mm ³
Weight				6		g
Connector				5 (+ 3)		Pins

ESD Ratings

Electrostatic Discharge	Human Body Model Class 1A	VESD			500	V
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Note 1 Use a low noise voltage source.

Note 2 Theoretical value, given by design.

Note 3 The VCO Input has an internal voltage divider. If the VCO Pin is left open the voltage is typically 1.65V.

Note 4 Transmit frequency stays within 24.050 to 24.250 GHz over the specified temperature.