

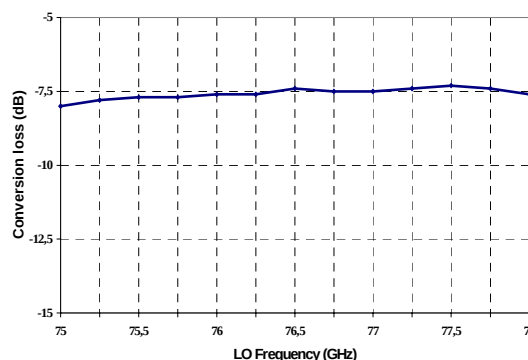
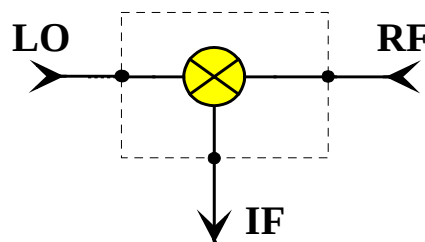
W-band Mixer

GaAs Monolithic Microwave IC

Description

The CHM2179a is a balanced Schottky diode mixer based on a six quarter wave ring structure. This circuit is manufactured with the BES-MMIC process: 1 μ m Schottky diode device, air bridges, via holes through the substrate, stepper lithography.

It is available in chip form.



Typical conversion characteristic
LO power = 5dBm ; IF=10MHz
 (measurement in test fixture)

Main Features

- W-band LO and RF frequency range
- Low conversion loss
- IF from DC to 100MHz
- High LO/RF isolation
- High LO/AM noise rejection
- Very low IF noise
- Low LO input power
- Small chip size: 1.53 x 1.17 x 0.10 mm

Main Characteristics

Tamb. = 25°C

Symbol	Parameter	Typ	Unit
F_LO,F_RF	LO,RF frequency range	76-77	GHz
F_IF	IF frequency range	DC-100	MHz
Lc	Conversion loss	7.5	dB
I_LO/RF	LO/RF isolation	20	dB
N_IF	IF noise density @ 100kHz	-158	dBm/Hz

ESD Protection : Electrostatic discharge sensitive device. Observe handling precautions !

Electrical Characteristics

T_{amb.} = 25°C, used according to section “Typical bias and IF configuration” and “Typical assembly and RF configuration”

Symbol	Parameter	Min	Typ	Max	Unit
F_LO,F_RF	LO,RF frequency range	76-77			GHz
F_IF	IF frequency range	DC-100			MHz
Lc	Conversion loss		7.5	9	dB
P_LO	LO input power	3	5	7	dBm
VSWR_LO	LO port VSWR (50Ω)		2:1		
VSWR_RF	RF port VSWR (50Ω)		2:1		
IF_load	IF load impedance		200		Ω
I_LO/RF	LO/RF isolation	17	22		dB
R_AM_LO	LO AM noise rejection		27		dB
N_IF	IF noise density @ 100kHz (1)		-158		dBm/Hz
Id	Supply current (2)		1		mA

(1) Measured on 50Ω IF load impedance.

(2) See on chapter “Typical bias and IF configuration”

Absolute Maximum Ratings (1)

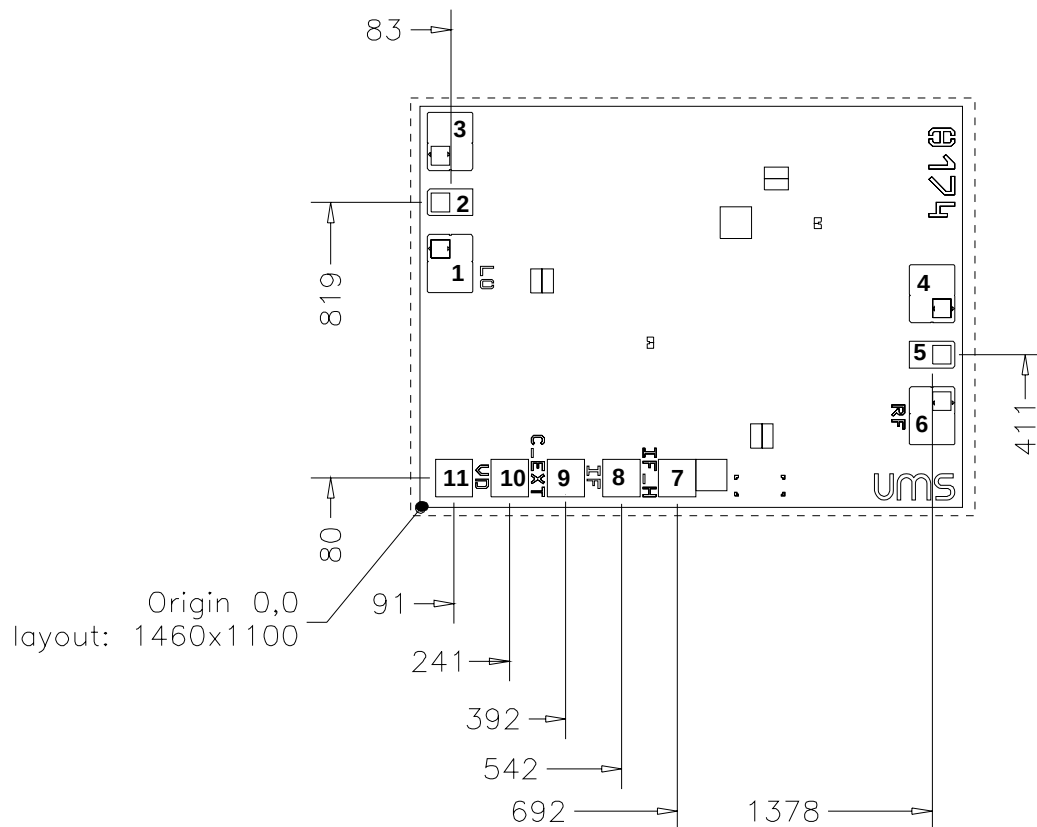
T_{amb} = +25°C

Symbol	Parameter	Values	Unit
Id	Supply current	3	mA
P_LO	Maximum peak input power overdrive at LO port (2)	10	dBm
P_RF	Maximum peak input power overdrive at RF port (2)	10	dBm
Top	Operating temperature range	-40 to +100	°C
Tstg	Storage temperature range	-55 to +125	°C

(1) Operation of this device above any one of these parameters may cause permanent damage.

(2) Duration < 1s

Chip Mechanical Data and Pin References

Unit = μm

External chip size = 1530 x 1170

Chip thickness = 100 +/- 10

HF Pads (2,5) = 68 x 118

DC/IF Pads = 100 x 100

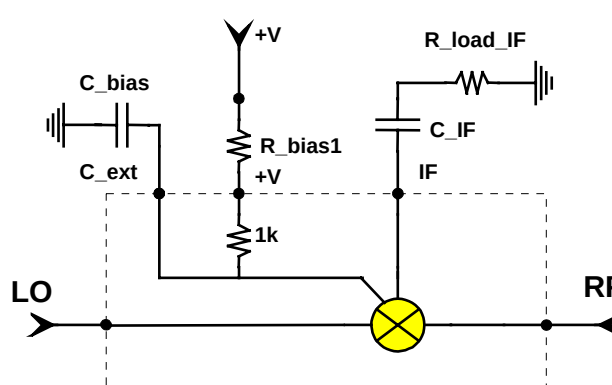
Pin number	Pin name	Description
1,3,4,6		Ground : should not be bonded. If required, please ask for more information.
2	LO	LO input
5	RF	RF input
7	GND	Ground (optional)
8		Not Connected
9	IF	IF output
10	C_ext	Bias decoupling
11	+V	Positive supply voltage

Typical Bias and IF Configuration

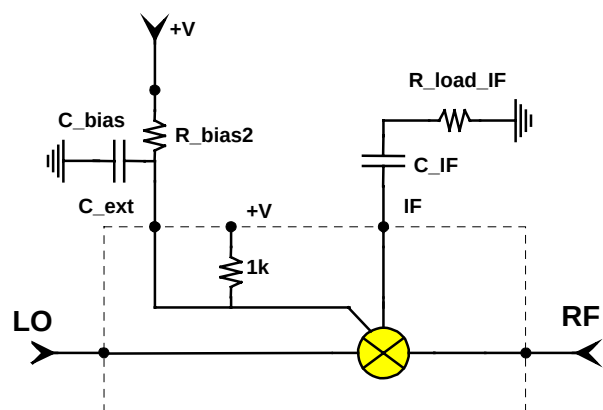
Several external configurations are possible for bias and IF. The objective is to give flexibility for the integration.

As this component is mainly dedicated to low IF use, there are several possibilities for interfacing with low noise IF amplifier. The optimum IF load for conversion loss is 200Ω, however depending on the IF amplifier noise characteristic this load can be modified in order to optimise the noise figure. A series capacitor, between IF output and the load is recommended.

Due to high sensitivity to electrical discharges a integrated resistance is used and two ports are available for biasing. One is for the connection of a decoupling capacitor (C_ext) and the other one is for the supply voltage connection through an external series resistance (+V port). However, in order to keep the compatibility with the CHM2179, only the "C_ext" port can be used.



Recommended external bias and IF configuration



Other possible configuration
(compatible with the previous version)

The recommended values for external components are:

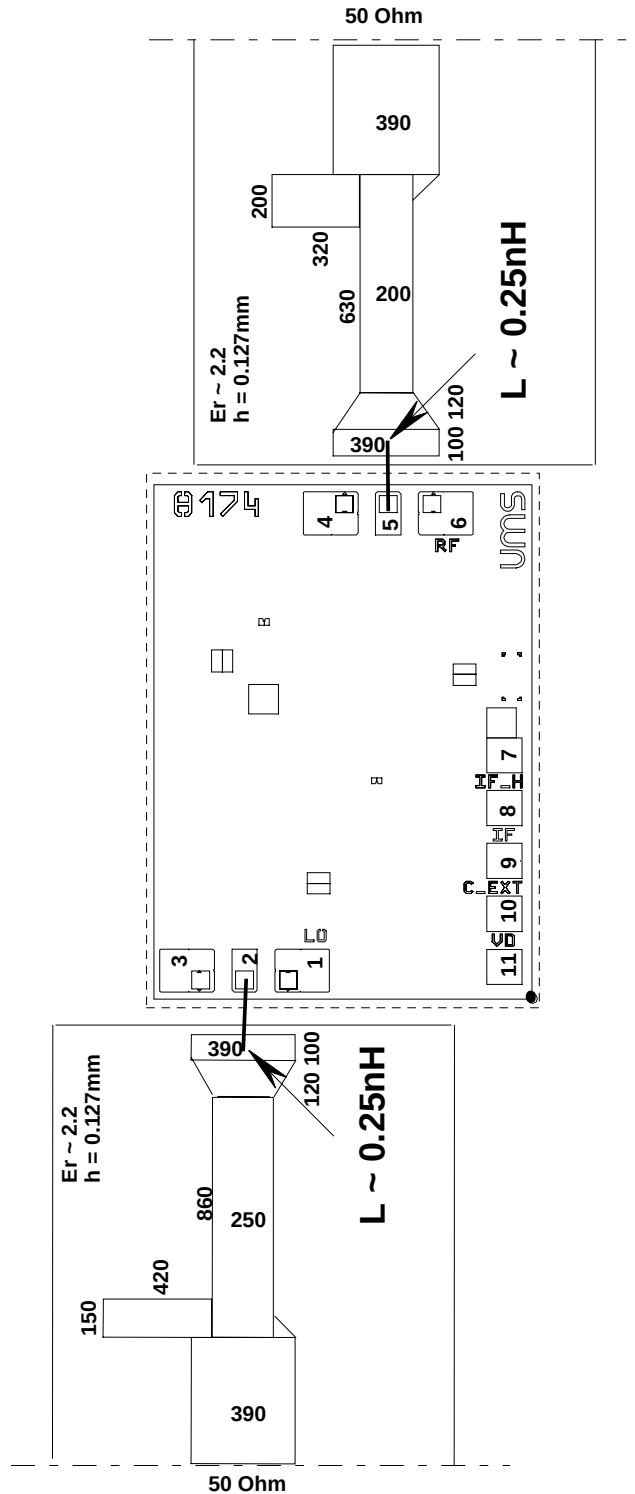
C_bias	$R_{bias} \cdot C \gg 1/F_{IF}$
R_bias1	2.9kΩ for 1mA current consumption (V = 4.5V, typical LO power)
R_bias2	$R_{bias2} = R_{bias1} + 1k\Omega$
R_load_IF	From 50 to 200Ω

Notes::

1. $R_{bias} = R_{bias1} + 1k\Omega$ when "+V" port is used, otherwise $R_{bias} = R_{bias2}$
2. R_{bias} can be adjusted if necessary; This allows to optimise the performances when some parameters are different from recommended ones (Supply voltage, LO power ...). However maximum ratings for the current have to be taken into account.
3. A series capacitor at IF outputs is recommended for DC decoupling.

Typical Assembly and RF Configuration

In order to use acceptable wire bonding length, compatible with automatic pick and place and wire bonding equipment, an external matching network is proposed on low dielectric constant substrate.



Example of integration using low dielectric constant substrate : $Er=2.2$,
height=0.127mm (dimensions are in μm)

Ordering Information

Chip form : CHM2179a-99F/00

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