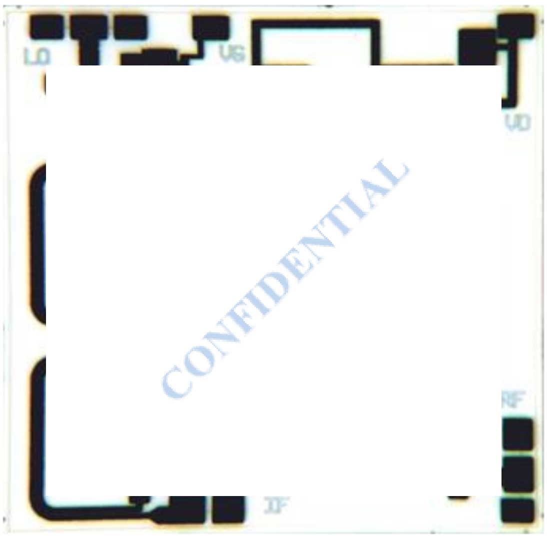
MECMIXQK

Q-K GaAs pHEMT Down Conversion Mixer

MICROWAVE ELECTRONICS FOR COMMUNICATIONS



Main Features

- 0.25µm pHEMT Technology
- Sub-Harmonic double-balanced unbiased diodes Mixer
- RF Input Frequency Range: 47.2 - 50.2 GHz
- IF Output Frequency Range: 17.3 - 20.2 GHz
- Conversion Loss: 12dB (Typ)
- LO Input Power: 10dBm (Typ)
- LO Frequency: 15 GHz
- P1dB_IN: >3dBm
- LO leakage: -23dBm (Max)
  2LO leakage: -55dBm (Maz)
- Chip Size: 2.4 x 2.4 x 0.1 mm

Product Description

MECMIXQK is a GaAs pHEMT based Sub-harmonic Mixer designed by MEC for Q-K down conversion applications and fabricated on 0.25µm process.

The MECMIXQK achieved 12dB of conversion loss in the RF frequency range from 47.2 GHz to 50.2 GHz with a LO leakage of -25 dBm and 2LO leakage of -55dBm. The higher in band spurious are about 50 dBc at an RF Input Power of -10 dBm (70 dBc at RF Input Power of -30 dBm)

The MECMIXQK is fully matched to 50 Ω with DC decoupling capacitors on both Input and Output ports. Bond Pad are gold plated for compatibility with thermo-compression bonding process.

Applications

- Radar
- Telecom

Main Characteristics

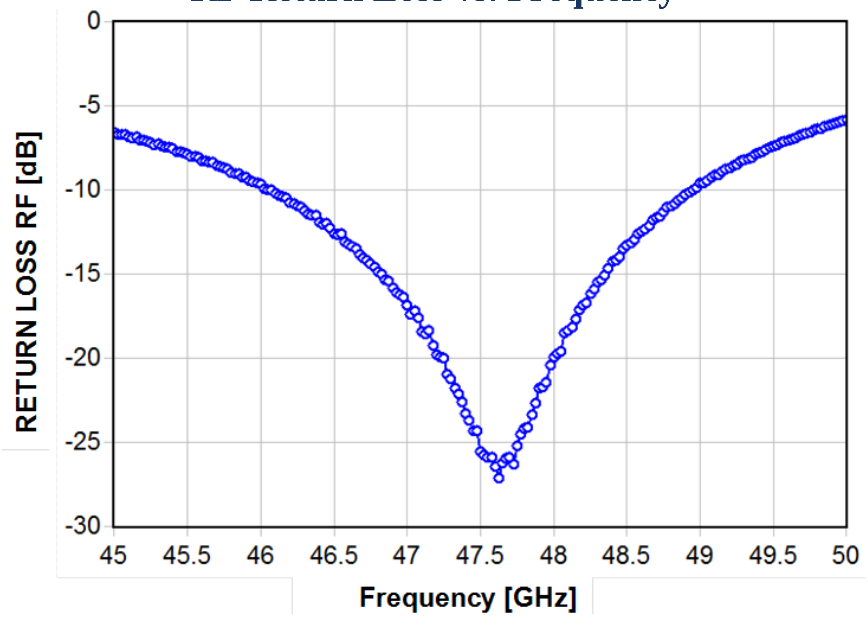
Test Conditions: T_{base_plate} = 25°C , Vd = 2.8 V, Idq = 90 mA, LOPower = 10dBm.

Parameter	Min	Typ	Max	Unit
RF frequency	47.2		50.2	GHz
IF frequency	17.2		20.2	GHz
LO frequency		15		GHz
2LO frequency		30		GHz
LO Input Power	8		10	dBm
Conversion Loss @ PinLO = 10dBm	-13.5	-10	-8.5	dB
LO leakage @ PinLO = 10dBm		-25		dBm
2LO leakage @ PinLO = 10dBm		-55		dBm
P1dB_IN		>3		dBm
In Band Spurious @ PinRF = -30 dBm	71	105	>130	dBc
Out of Band Spurious @ PinRF = -30 dBm	73	90	>130	dBc
Supply Quiescent LO Buffer Drain Current		90		mA
Supply LO Buffer Drain Current		110		mA
LO Buffer Gate Voltage		-0.4		V
LO Buffer Drain Voltage		2.8		V

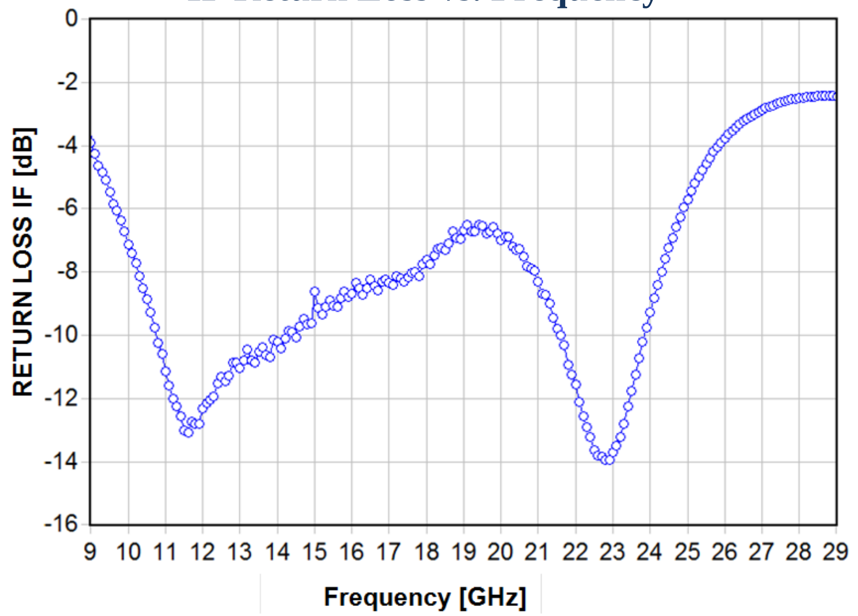
* Performances described in this document are based on preliminary on-jig characterization.
More details and new parameter will be carried out by the ongoing test campaign.

Typical Measured Performances

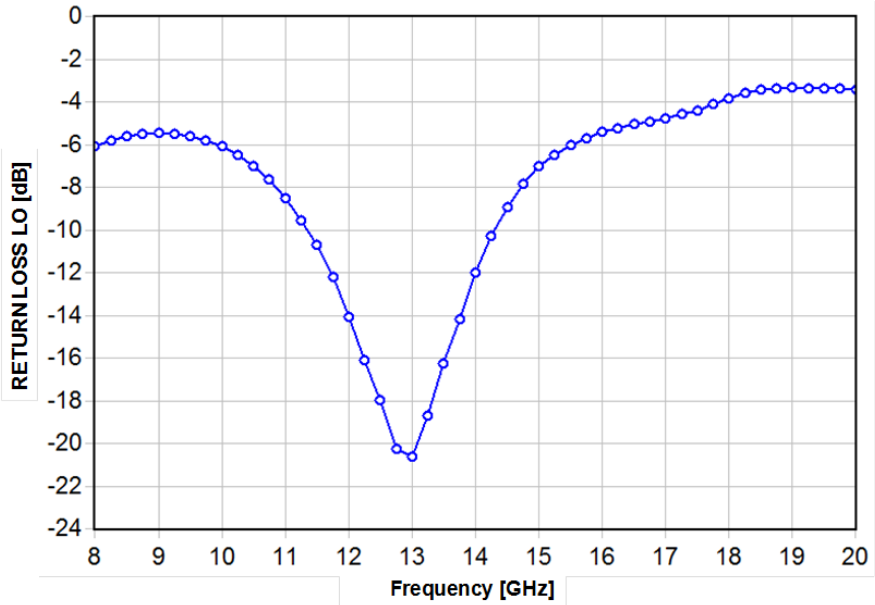
RF Return Loss vs. Frequency



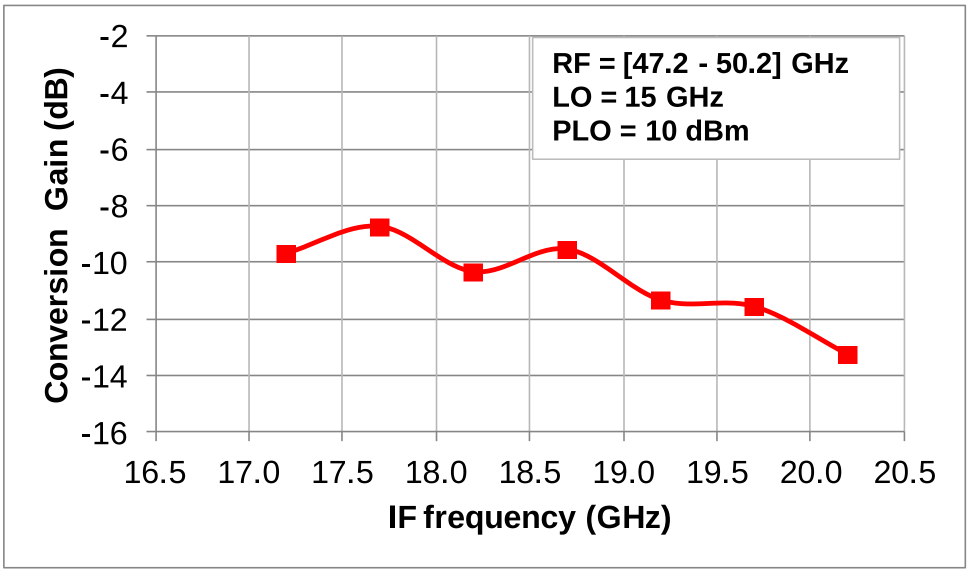
IF Return Loss vs. Frequency



LO Return Loss vs. Frequency



Conversion Gain Vs. Frequency @ PLO=10dBm (RF frequency [47.2 – 50.2] GHz)



[15-25]GHz Spurious Measurements in dBc @ P_RFin = -10 dBm

- RF Frequency = 47.2 GHz

LO\RF	1	2	3	4	5	6
1		-9,7				
2						
3						
4						
5		51				
6						
7						
8			62			
9						
10						
11			82	89		
12						
13						
14				>110*		
15						
16						
17					>110*	
18						
19						
20						>110*

In Band Spurious
Out of Band Spurious
Conv. Loss

- RF Frequency = 47.9 GHz

LO\RF	1	2	3	4	5	6
1		-10,34				
2						
3						
4						
5		53				
6						
7						
8		78	66			
9						
10						
11			>110*			
12						
13						
14				>110*		
15					>110*	
16						
17						
18						>110*
19						
20						

In Band Spurious
Out of Band Spurious
Conv. Loss

- RF Frequency = 48.6 GHz

LO\RF	1	2	3	4	5	6
1		-9,55				
2						
3						
4						
5		78				
6						
7						
8		67				
9						
10						
11			>110*			
12				>110*		
13						
14						
15					>110*	
16						
17						
18						>110*
19						
20						

In Band Spurious
Out of Band Spurious
Conv. Loss

- RF Frequency = 48.7 GHz

LO\RF	1	2	3	4	5	6
1		-9,86				
2						
3						
4						
5		78				
6						
7						
8		67				
9						
10						
11			>110*			
12				>110*		
13						
14						
15					>110*	
16						
17						
18						>110*
19						
20						

In Band Spurious
Out of Band Spurious
Conv. Loss

- RF Frequency = 49.4 GHz

LO\RF	1	2	3	4	5	6
1		-11,57				
2						
3						
4						
5		71				
6						
7						
8		71				
9						
10						
11			>110*			
12				>110*		
13						
14						
15					>110*	
16						
17						
18					>110*	
19						
20						

In Band Spurious
Out of Band Spurious
Conv. Loss

- RF Frequency = 50.0 GHz

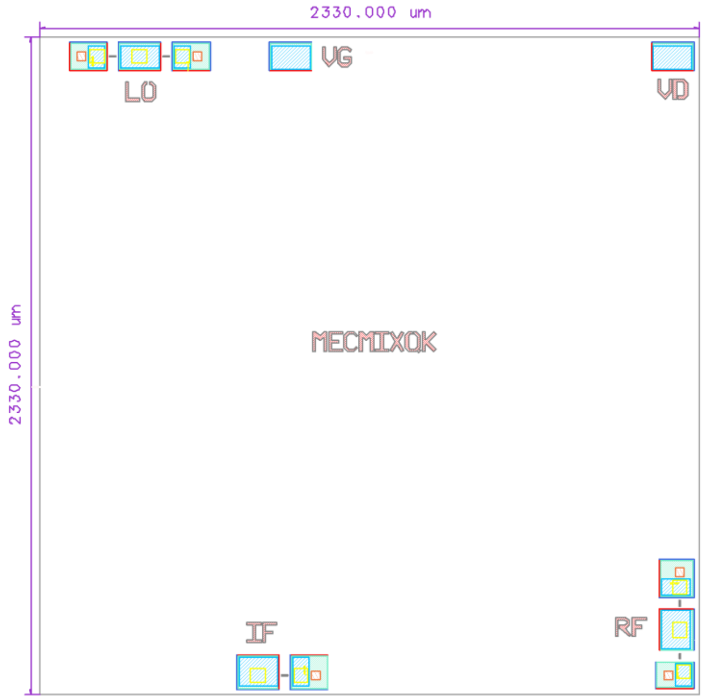
LO\RF	1	2	3	4	5	6
1		-13,26				
2						
3						
4						
5	62					
6						
7						
8		85				
9			>110*			
10						
11						
12				>110*		
13						
14						
15				>110*		
16						
17						
18					>110*	
19						>110*
20						

In Band Spurious
Out of Band Spurious
Conv. Loss

*: These spurious power levels was below the minimum level readably by the spectrum analyzer and corresponds to a dBc values greater than 110.

Note: At nominal operating condition the Mixer works with a RF Input Power of about -30 dBm; in this case the spurious generated by the combination (2*RF - N*LO) have to be considered at 20 dBc more than the values in the Table.

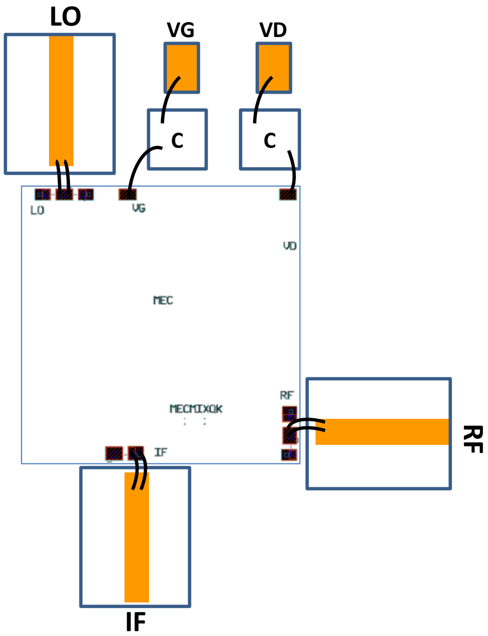
Bond Pad Configuration



- A tolerance of ± 35µm has to be considered for chip dimensions
- Chip Thickness is 100 µm ± 10 µm
- RF Pad [IN] = 122µm x 148µm
- LO Pad [IN] = 150µm x 100µm
- IF Pad [OUT] = 150µm x 122µm
- DC Pads [VG, VD] = 150µm x 100µm

Bond Pad #	Symbol	Description
RF	RFin	Input RF Port
LO	LOin	Input LO Port
IF	IFout	Output IF Port
VG	Vg	Buffer Gate Negative Supply Voltage
VD	Vd	Buffer Drain Positive Supply Voltage

Assembly Recommendations



Bond Pad #	Connection	External Components
RF, LO and IF	2x 0.25µm Bonding Wires or 1x 100µm Ribbon **L_bond = 0.2nH**	
VG	L_bond ≤ 1 nH	C = 100pF
VD	**1** Bonding Wires L_bond ≤ 1nH	C = 100pF

- Eutectic or Epoxy Die bond.
- The backside of the die is the Source (ground) contact.
- Thermosonic ball or wedge bonding are the preferred connection methods.
- Gold wire must be used for connections.

Bias Procedure

Bias-Up

1. Vg set to -1.2 V.
2. Vd set to +2.8 V.
3. Adjust Vg until quiescent Id is 90 mA (Vg = -0.4 V Typical).
4. Apply LO signal. (PinLO = 10 dBm Typical).
5. Apply RF signal.

Bias-Down

1. Turn off RF signal.
2. Turn off LO signal.
3. Reduce Vg to -1.2 V (Id0 ≈ 0 mA).
4. Set Vd to 0 V.
5. Set Vg to 0 V.

Contact Information

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