

## 24 - 27 GHz GaAs Mixer MMIC

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### Preliminary Data Sheet

- Monolithic Microwave Integrated Circuit (MMIC) Single Balanced Mixer (coplanar design)
- Two IF ports allow the use of the MMIC as up- and down-converter with high LO-RF isolation
- Input/Output matched to  $50 \Omega$
- Frequency range: 24 GHz to 27 GHz
- Conversion Loss 8 dB @  $P_{LO} = 11$  dBm
- Chip size: 3.25 mm  $\times$  2.0 mm

**ESD:** Electrostatic discharge sensitive device, observe handling precautions!

### Description

This GaAs MMIC is intended for use in radio link applications. The mixer operating as resistive FET mixer provides good intermodulation characteristics with no DC power consumption and exhibits a conversion loss of 7 dB for a LO-Power of 11 dBm. The LO-RF isolation is superior to 30 dB in up- and down-conversion mode. The MMIC is fabricated with a 0.13 micron Pseudomorphic InGaAs/AlGaAs/GaAs High Electron Mobility Transistor processing technology.

Type	Marking	Ordering Code	Package
24 - 27 GHz Mixer	–	on request	Chip

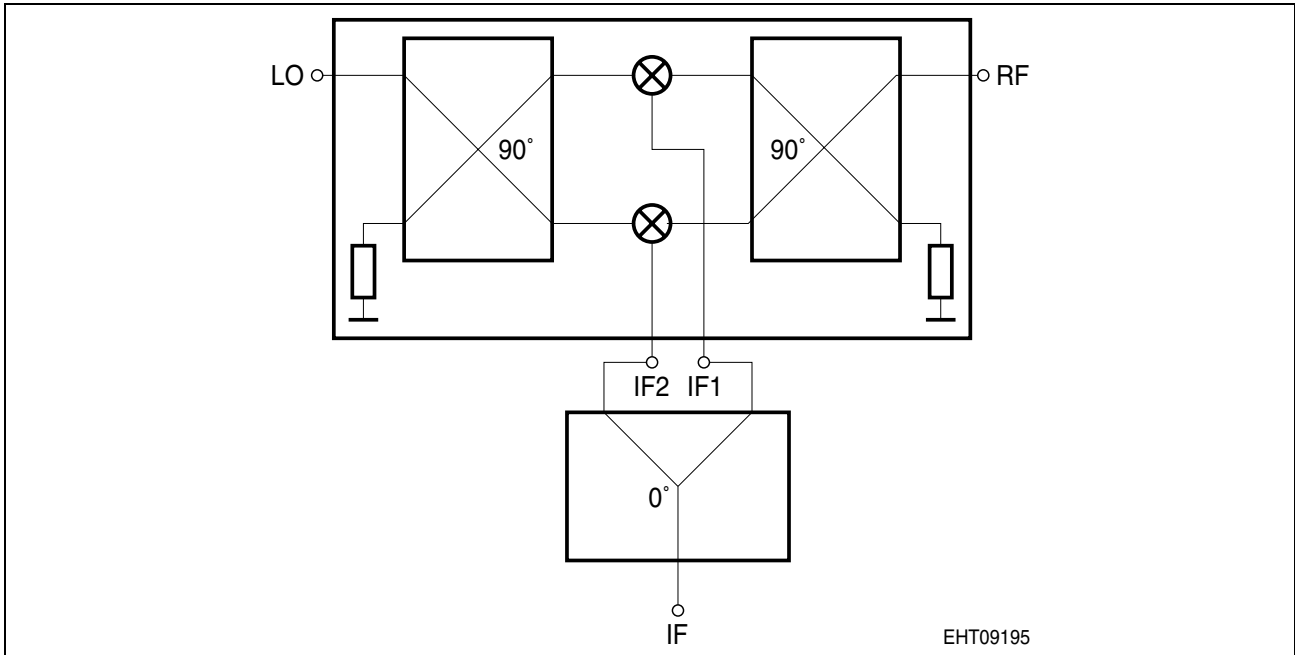
### Electrical Specifications ( $V_{G1} = V_{G2} = 0$ V)

Parameter	Limit Values			Unit	Test Conditions
	min.	typ.	max.		
Frequency Range	24	–	27	GHz	–
Conversion loss @ $P_{LO} = 11$ dBm	–	8	–	dB	–
LO input power	–	10	15	dBm	–

**Measured Data (on chip measurements)**

$V_{GS1} = V_{GS2} = 0$  V, unless otherwise specified

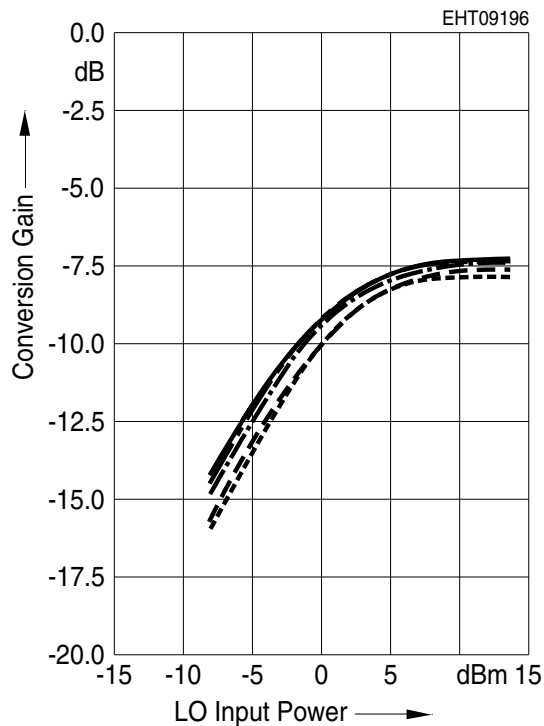
**Down-Converter Mode;  $I_{F1}$  and  $I_{F2}$  via  $0^\circ$  Combiner**



**Figure 1**

**Conversion Gain vs. LO Power**

$f_{LO} = 25.7$  GHz,  $f_{RF} = 25.5$  GHz,  $f_{IF} = 0.2$  GHz,  $P_{IN(RF)} = -5$  dBm



Up-Converter Mode;  $I_{F1}$  and  $I_{F2}$  via 180° Combiner

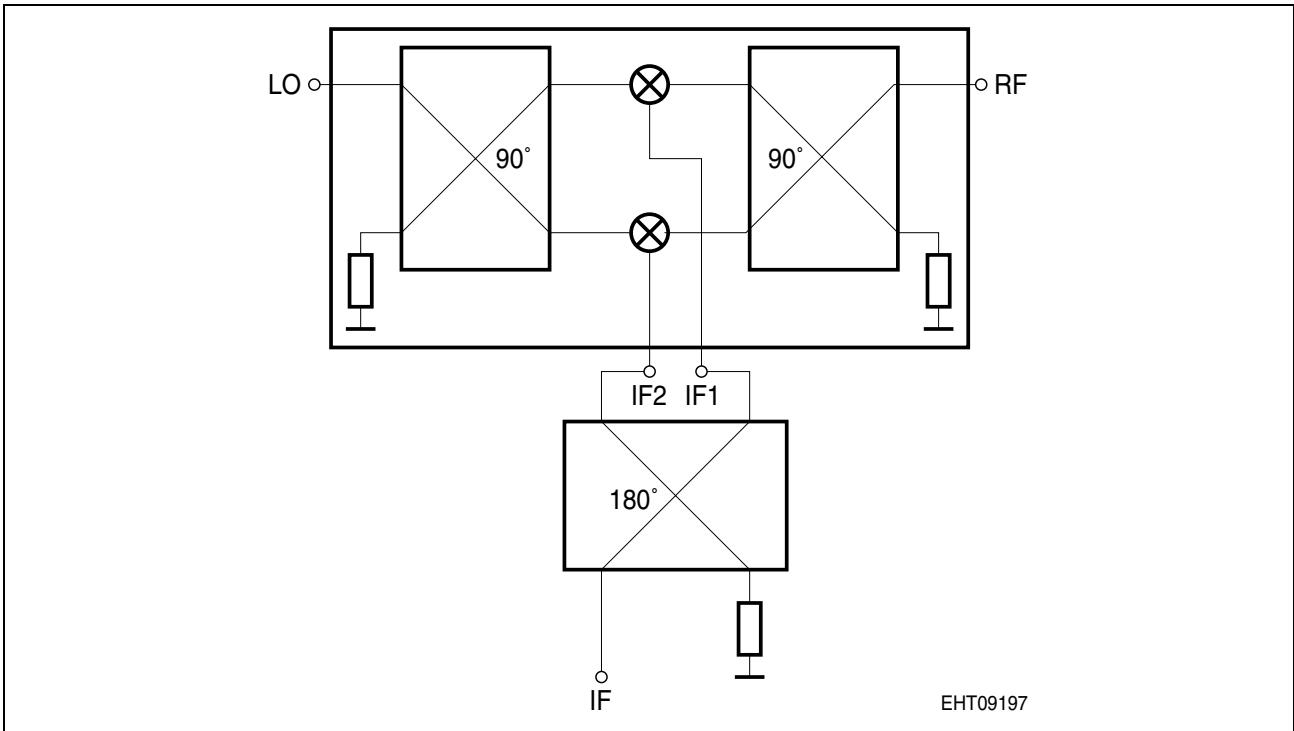
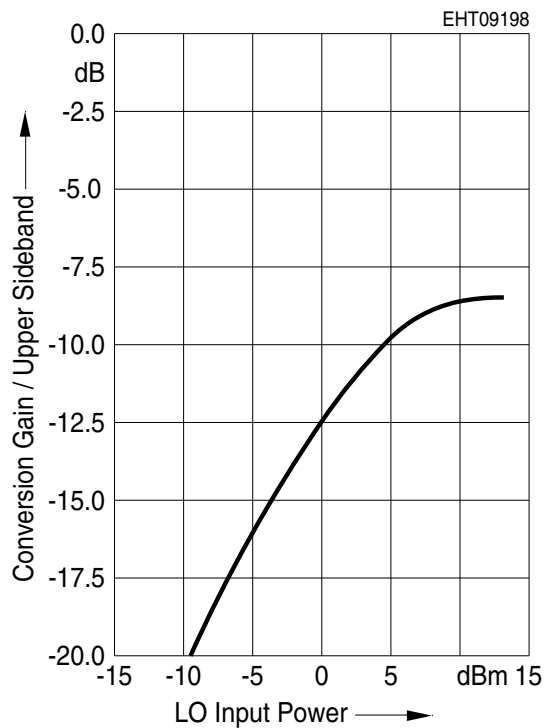


Figure 2

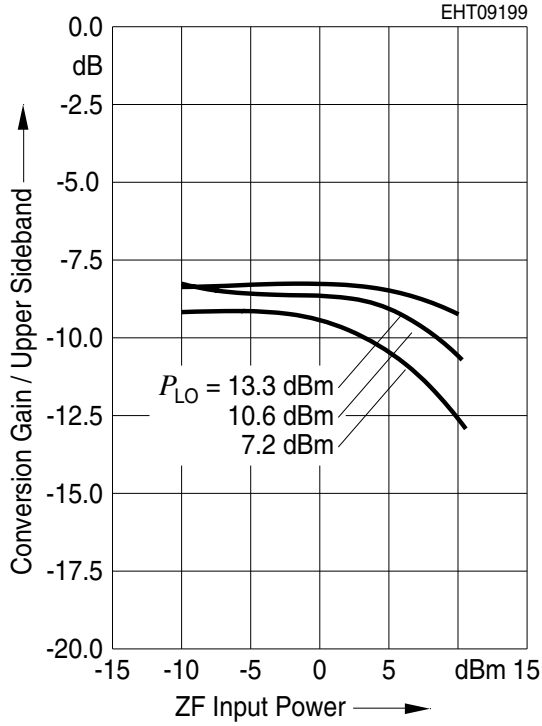
Conversion Gain vs. LO Power

$f_{LO} = 25.7$  GHz,  $f_{IF} = 200$  MHz,  $P_{IF} = -0$  dBm,  $P_{IN(ZF)} = 0$  dBm,  $f_{RF} = 25.9$  GHz



**Conversion Gain vs. RF Power**

$f_{LO} = 25.7 \text{ GHz}$ ,  $f_{IF} = 200 \text{ MHz}$ ,  $f_{RF} = 25.9 \text{ GHz}$



Output Spectrum in Up-Converter Mode at RF Port

Input	Output at RF-port
LO: 25.7 GHz, 10.6 dBm	$P_{LO} = -30$ dBm
IF: 200 MHz, 4.7 dBm	$P_{RF} = -11$ dBm

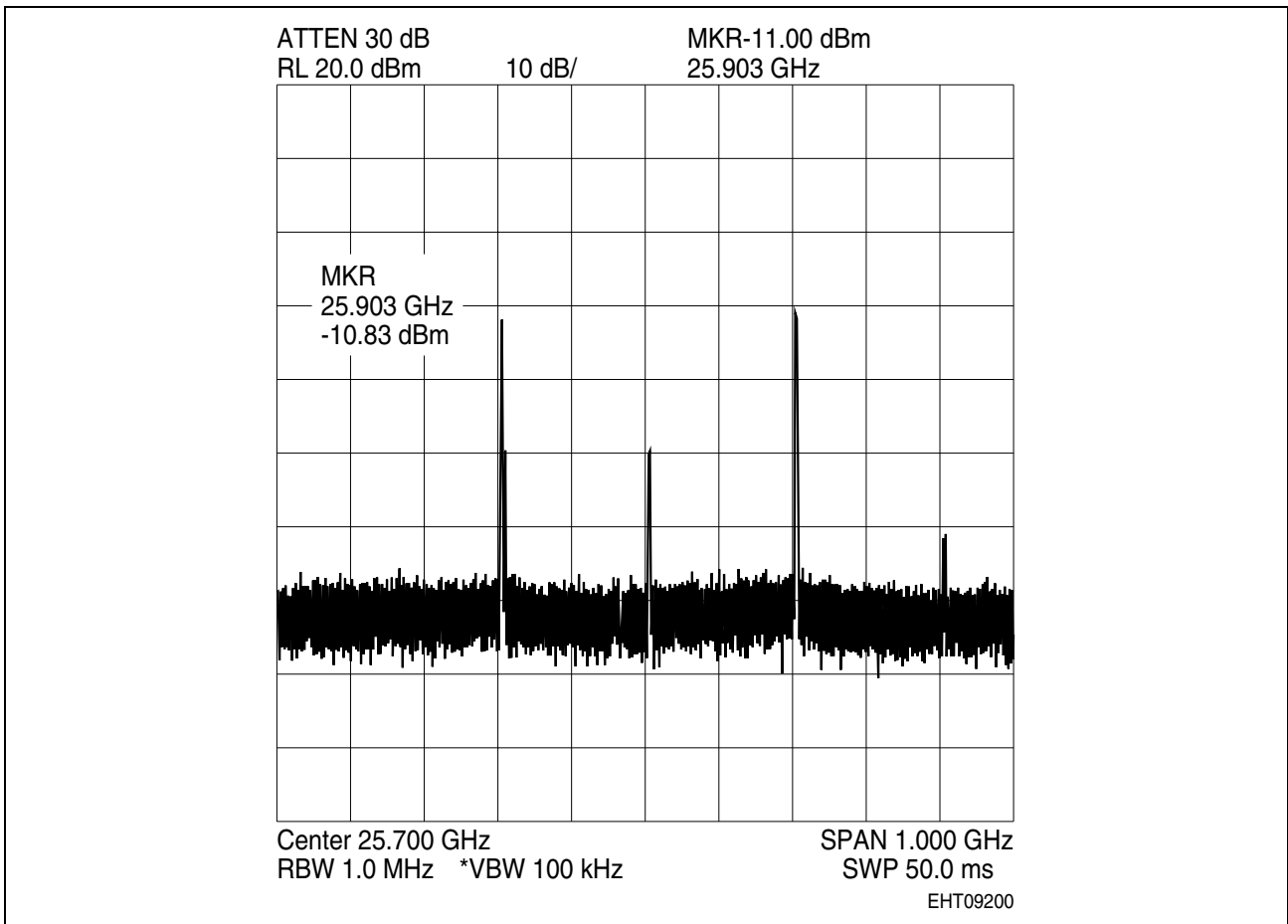


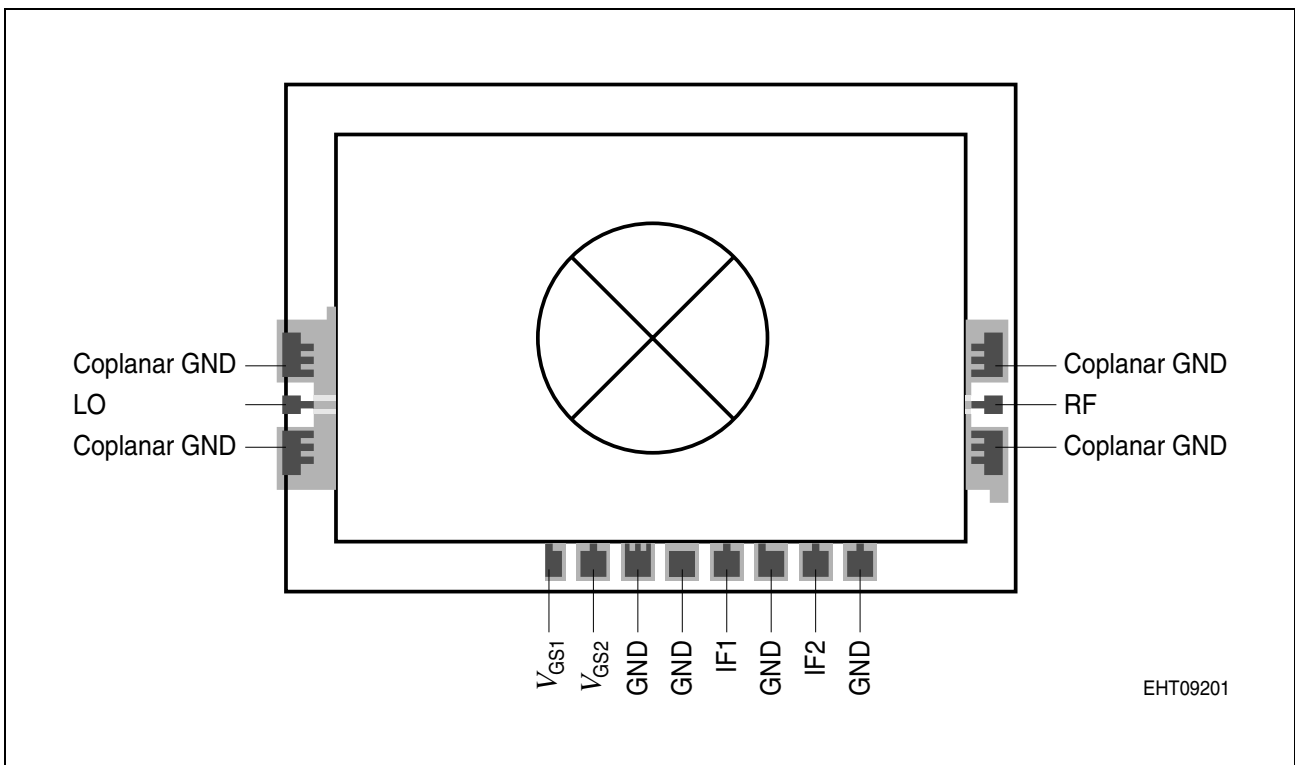
Figure 3

Technology Data

Parameter	Value
Chip thickness	95 $\mu$ m
Chip size	3.25 mm $\times$ 2.0 mm
DC/RF Bond pads	100 $\mu$ m $\times$ 100 $\mu$ m/70 $\mu$ m $\times$ 70 $\mu$ m
Bond pad material	Au (plated gold)
Chip passivation	SiN (silicon nitride)

**Recommendation of Bonding Conditions**

Parameter	Thermocompression Nailhead, without Ultrasonic	Wedge Bonding	Bond Pull Test Mil 883, > 2 g
Table Temp.	250 °C	250 °C	1 : 2.5 g
Tool Temp.	180 °C	150 °C	2 : 3.1 g
Scrub	100 Hz	–	3 : 3.2 g
Bond Force	50 g	25 g	4 : 3.0 g
Wire Diameter	25 μm	17 μm	5 : 2.8 g



**Figure 4 Bond Plan**

$V_{GS1}$  and  $V_{GS2}$  can directly be bonded to ground. Blocking capacitors in the range of 100 pF should be used if a gate voltage ( $V_{GS1}$ ,  $V_{GS2}$ ) is applied to the mixer diodes.