Sales: 408-778-9952 | General: 408-778-4200 | Fax: 408-778-4300
Sales & Customer Support: sales@markimicrowave.com
Tech Support: support@markimicrowave.com
General Support: info@markimicrowave.com

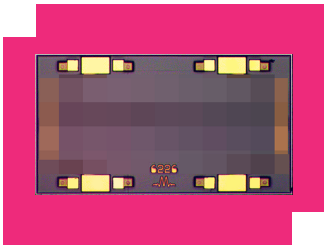
MQH-0920CH

MMIC 9-20GHz Quadrature Hybrid

DEVICE OVERVIEW

General Description

The MQH-0920 is a MMIC 9 GHz – 20 GHz quadrature (90°) hybrid. Passive GaAs MMIC technology allows production of smaller constructions that replace larger form factor circuit board constructions. Tight fabrication tolerances allow for less unit to unit variation than traditional quadrature hybrid technologies. The MQH-0920 is available as a wire bondable chip. Low unit to unit variation allows for accurate simulations using the provided S4P file taken from measured production units. Applications include single sideband upconverters, image rejection downconverters, IQ modulators, balanced amplifiers, microwave correlators, and microwave Butler matrices.



Download s-parameters here

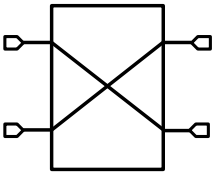
Features

- Designed for Ku-band applications
- High amplitude and phase balance
- High isolation
- Low insertion loss

Applications

N/A

Functional Block Diagram



Part Ordering Options

Part Number	Description	Package	Packing Size	Green Status	Product Lifecycle	Export Classification
MQH-0920CH	MMIC 9-20GHz Quadrature Hybrid	CH	-	RoHS	Released	EAR99

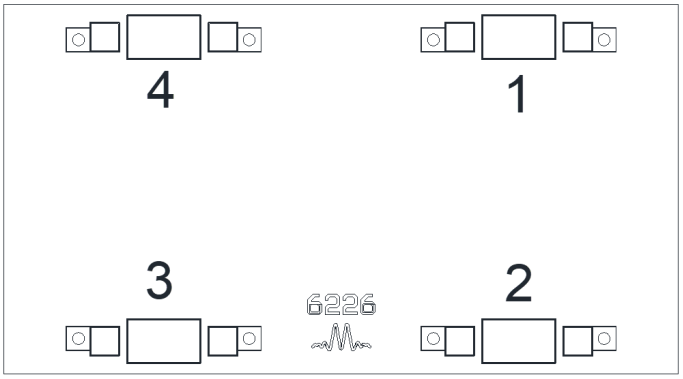
Table Of Contents

Revision History

Revision Code	Revision Date	Comment
-	2018-05-01	Datasheet Initial Release
A	2019-06-01	Corrected Port Definitions
B	2020-02-01	Modified Phase Limits

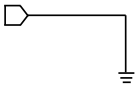
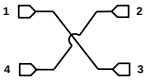
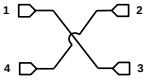
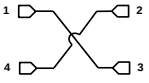
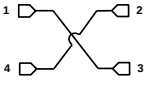
Port Configuration and Functions

Port Diagram

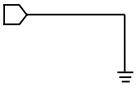
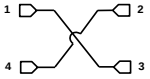
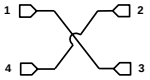
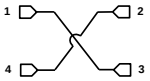
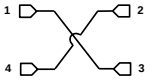


Port Functions

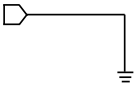
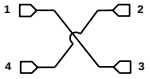
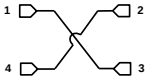
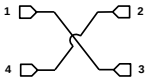
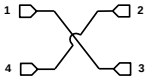
Configuration A

Port	Function	Description	Equivalent Circuit for Package
Pad	Ground	CH package ground path is provided through the substrate and ground bond pads.	
Port 1	Input	Port 1 is DC short to port 3 and open to ground.	
Port 2	90° Output	Port 2 is DC short to port 4 and open to ground.	
Port 3	0° Output	Port 3 is DC short to port 1 and open to ground.	
Port 4	Isolated	Port 4 is DC short to port 2 and open to ground.	

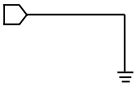
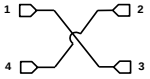
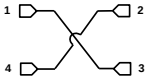
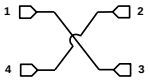
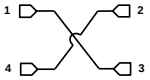
Configuration B

Port	Function	Description	Equivalent Circuit for Package
Pad	Ground	CH package ground path is provided through the substrate and ground bond pads.	
Port 1	90° Output	Port 1 is DC short to port 3 and open to ground.	
Port 2	Input	Port 2 is DC short to port 4 and open to ground.	
Port 3	Isolated	Port 3 is DC short to port 1 and open to ground.	
Port 4	0° Output	Port 4 is DC short to port 2 and open to ground.	

Configuration C

Port	Function	Description	Equivalent Circuit for Package
Pad	Ground	CH package ground path is provided through the substrate and ground bond pads.	
Port 1	0° Output	Port 1 is DC short to port 3 and open to ground.	
Port 2	Isolated	Port 2 is DC short to port 4 and open to ground.	
Port 3	Input	Port 3 is DC short to port 1 and open to ground.	
Port 4	90° Output	Port 4 is DC short to port 2 and open to ground.	

Configuration D

Port	Function	Description	Equivalent Circuit for Package
Pad	Ground	CH package ground path is provided through the substrate and ground bond pads.	
Port 1	Isolated	Port 1 is DC short to port 3 and open to ground.	
Port 2	0° Output	Port 2 is DC short to port 4 and open to ground.	
Port 3	90° Output	Port 3 is DC short to port 1 and open to ground.	
Port 4	Input	Port 4 is DC short to port 2 and open to ground.	

Specifications

Absolute Maximum Ratings

The Absolute Maximum Ratings indicate limits beyond which damage may occur to the device. If these limits are exceeded, the device may be inoperable or have a reduced lifetime.

Parameter	Maximum Rating	Unit
Maximum Operating Temperature	100	°C
Maximum Storage Temperature	125	°C
Minimum Operating Temperature	-55	°C
Minimum Storage Temperature	-65	°C

Package Information

Parameter	Details	Rating
Dimensions	-	2.28 x 1.25 mm

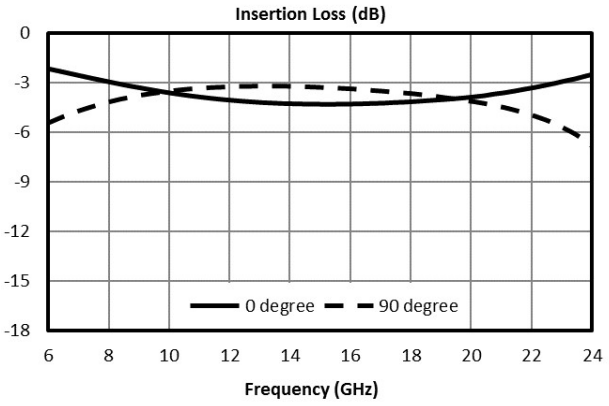
Electrical Specifications

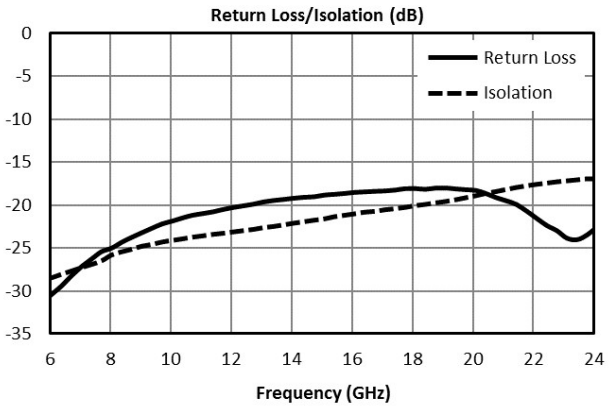
The electrical specifications apply at TA=+25°C in a 50Ω system.

Parameter	Port Configuration	Test Conditions	Minimum Frequency (GHz)	Maximum Frequency (GHz)	Min	Typ	Max	Unit
Nominal Phase Shift	A	-	9	20	-	90	-	°
Amplitude Balance	A	-	9	20	-	0.55	1.1	dB
Phase Balance	-	-	8	20	-	2	10	°
Excess Through Line Insertion Loss	A	-	9	20	-	1	2.2	dB
Isolation	A	-	9	20	17	21.5	-	dB
VSWR	A	-	9	20	-	1.25	-	-
Impedance	A	-	-	-	-	50	-	Ω
Mean Coupling	A	-	9	20	-	3	-	dB

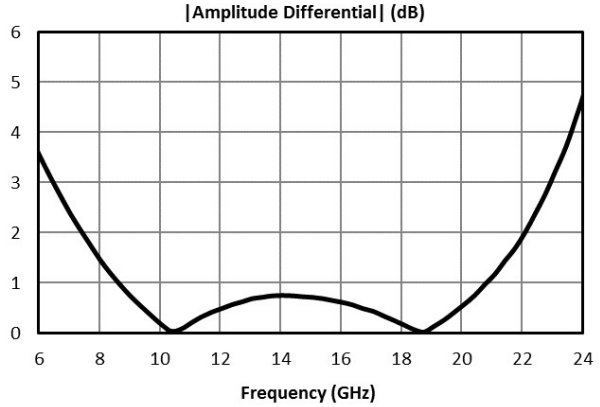
Typical Performance Plots

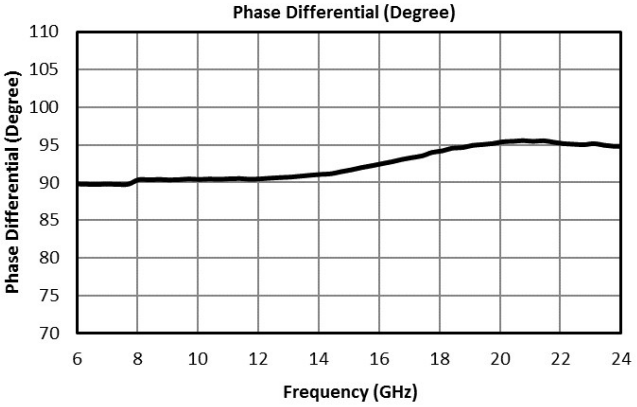
Insertion Loss, Return Loss, and Isolation





Amplitude and Phase Balance





Die Mounting Recommendations

Mounting and Bonding Recommendations

Marki MMICs should be attached directly to a ground plane with conductive epoxy. The ground plane electrical impedance should be as low as practically possible. This will prevent resonances and permit the best possible electrical performance. Datasheet performance is only guaranteed in an environment with a low electrical impedance ground.

Mounting - To epoxy the chip, apply a minimum amount of conductive epoxy to the mounting surface so that a thin epoxy fillet is observed around the perimeter of the chip. Cure epoxy according to manufacturer instructions.

Wire Bonding - Ball or wedge bond with 0.025 mm (1 mil) diameter pure gold wire. Thermosonic wirebonding with a nominal stage temperature of 150 °C and a ball bonding force of 40 to 50 grams or wedge bonding force of 18 to 22 grams is recommended. Use the minimum level of ultrasonic energy to achieve reliable wirebonds. Wirebonds should be started on the chip and terminated on the package or substrate. All bonds should be as short as possible <0.31 mm (12 mils).

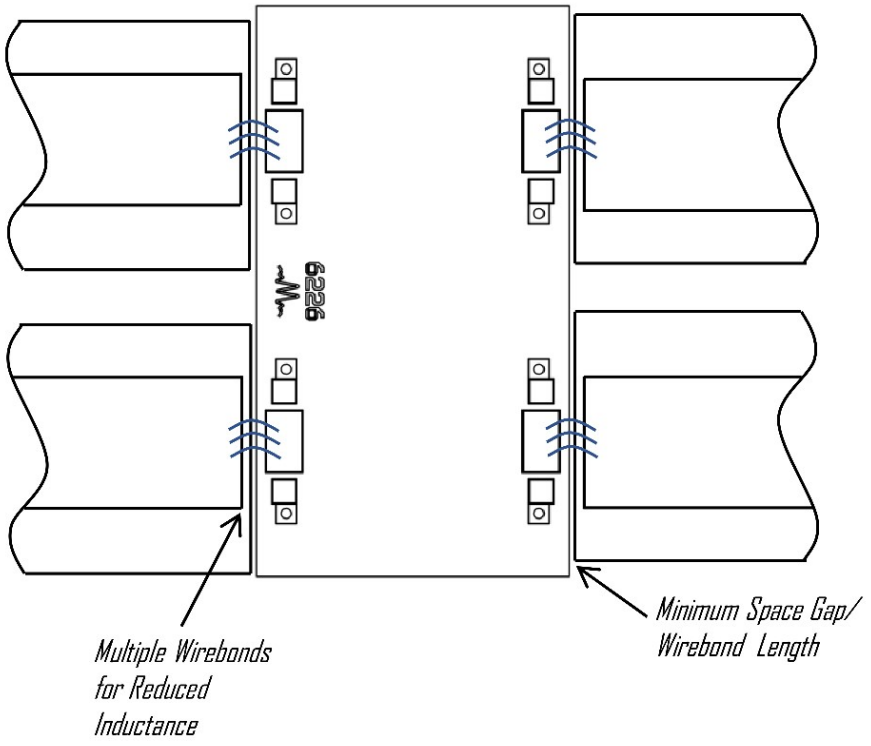
Circuit Considerations – 50 Ω transmission lines should be used for all high frequency connections in and out of the chip. Wirebonds should be kept as short as possible, with multiple wirebonds recommended for higher frequency connections to reduce parasitic inductance. In circumstances where the chip more than .001” thinner than the substrate, a heat spreading spacer tab is optional to further reduce bondwire length and parasitic inductance.

Handling Precautions

General Handling: Chips should be handled with care using tweezers or a vacuum collet. Users should take precautions to protect chips from direct human contact that can deposit contaminants, like perspiration and skin oils on any of the chip's surfaces.

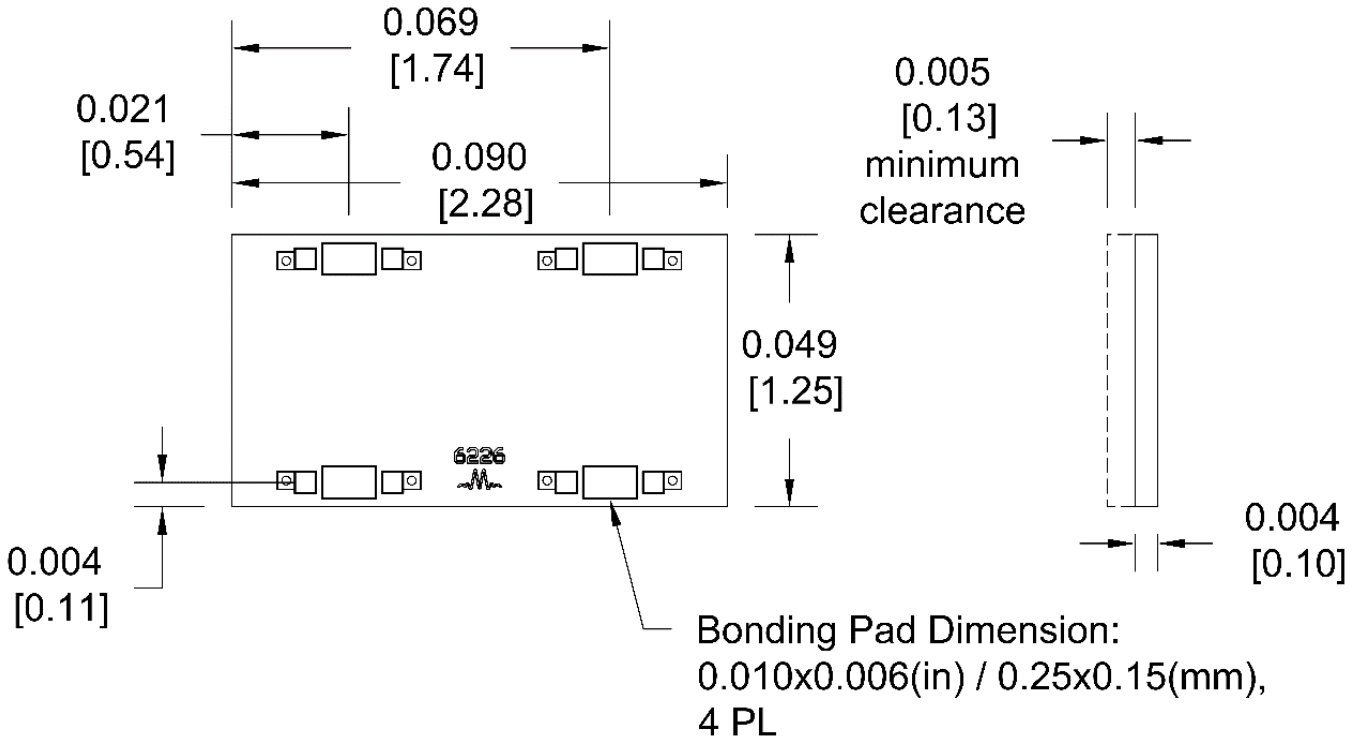
Cleaning and Storage: Do not attempt to clean the chip with a liquid cleaning system or expose the bare chips to liquid. Once the ESD sensitive bags the chips are stored in are opened, chips should be stored in a dry nitrogen atmosphere.

Bonding Diagram



Mechanical Data

Outline Drawing



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