

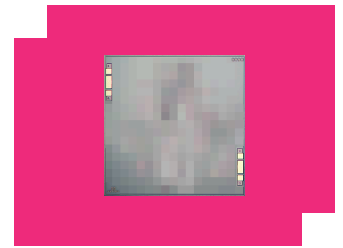
MFQH-00001CH

Passive GaAs MMIC 18.5 - 21.3 GHz Reflectionless Bandpass Filter

DEVICE OVERVIEW

General Description

The MFQH-00001CH passive MMIC reflectionless bandpass filter is an ideal solution for small form factor, high rejection filtering. Reflectionless filters feature excellent return loss for rejected signals as well as in the passband and are suited for applications that demand high signal fidelity. Passive GaAs MMIC technology allows production of smaller filter constructions that replace larger form factor circuit board constructions. Tight fabrication tolerances allow for less unit to unit variation than traditional filter technologies. The MFQH-00001CH is available as a wire bondable chip. Low unit to unit variation allows for accurate simulations using the provided S2P file taken from measured production units.



[Download s-parameters here](#)

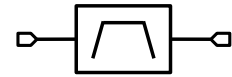
Features

- Reflectionless Response
- Excellent Return Loss
- High Stop Band Suppression
- Wide Stop Band with Fast Roll-Off

Applications

- K Band Applications
- Reflectionless Filter Applications

Functional Block Diagram



Part Ordering Options

Part Number	Description	Package	Green Status	Product Lifecycle	Export Classification
MFQH-00001CH	Passive GaAs MMIC 18.5 - 21.3 GHz Reflectionless Bandpass Filter	CH	RoHS REACH	Released	EAR99

MFQH-00001CH

Passive GaAs MMIC 18.5 - 21.3 GHz
Reflectionless Bandpass Filter

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Revision History

Revision Code	Revision Date	Comment
-	2023-08-30	Datasheet Initial Release
A	2024-01-05	Updated Production Test Criteria

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Reflectionless Bandpass Filter

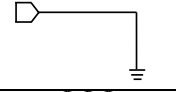
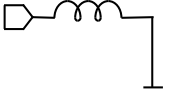
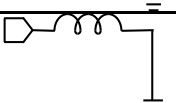
Port Configuration and Functions

Port Diagram

A top-down view of the MFQH-00001CH package outline drawing is shown below. The MMIC bandpass filters are symmetrical allowing Port 1 or Port 2 to be used as the input.



Port Functions

Port	Function	Description	DC Equivalent Circuit
Pad	Ground	CH package ground path is provided through the substrate and ground bond pads.	
Port 1	Input/Output	Port 1 is DC short to ground for the CH package.	
Port 2	Input/Output	Port 2 is DC short to ground for the CH package.	

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
DC Current, at any Port	24	mA
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	-	3.10 x 3.10 mm

Electrical Specifications

The electrical specifications apply at TA=+25°C in a 50Ω system. Min and Max limits are guaranteed at TA=+25°C. All bare die are 100% visually inspected and RF performance is guaranteed by sample testing.

Parameter	Test Conditions	Minimum Frequency (GHz)	Maximum Frequency (GHz)	Min	Typ	Max	Unit
1 dBc Passband ¹	Configuration A, 25°C	18.52	21.27	-	-	-	GHz
30 dBc Rejection Point ²	Configuration A, 25°C	17.11	22.41	-	-	-	GHz
3 dBc Passband ³	Configuration A, 25°C	18.25	21.6	-	-	-	GHz
Center Freq ⁴	Configuration A, 25°C	-	-	-	19.85	-	GHz
Group Delay ⁵	Configuration A, 25°C	-	-	-	453	-	ps
Impedance ⁶	Configuration A, 25°C	-	-	-	50	-	Ω
Insertion Loss @ f _c ⁷	Configuration A, 25°C	-	-	-	3.4	-	dB
Passband Return Loss ⁸	Configuration A, 25°C	-	-	-	39	-	dB
Center Frequency, f ₀	-	-	-	-	19.9	-	GHz
Group Delay	-	18.5	21.3	-	469	-	ps
Impedance	-	-	-	-	50	-	Ω
Insertion Loss @ F ₀	-	19.9	19.9	-	3.7	-	dB
Passband Return Loss	-	18.5	21.3	-	25	-	dB
Stopband Return Loss	-	23.6	48	-	12	-	dB
Stopband Return Loss	-	4	15.8	-	11	-	dB
Stopband Suppression	-	23.6	48	-	58	-	dB
Stopband Suppression	-	0	15.8	-	65	-	dB

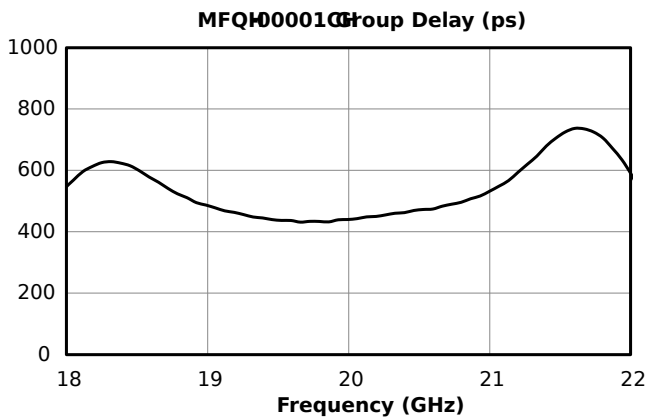
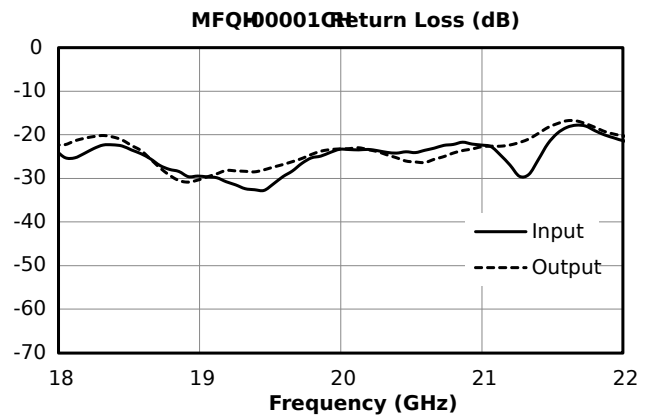
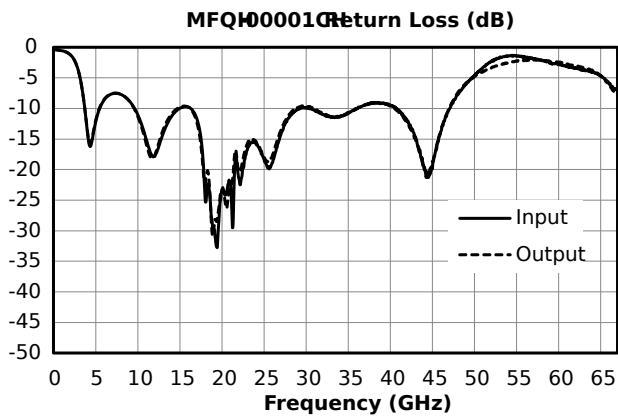
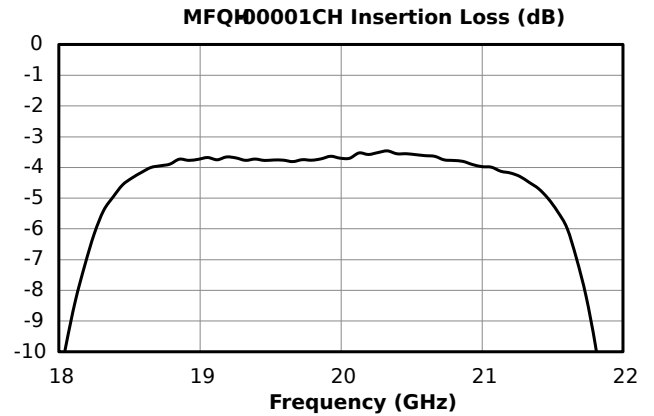
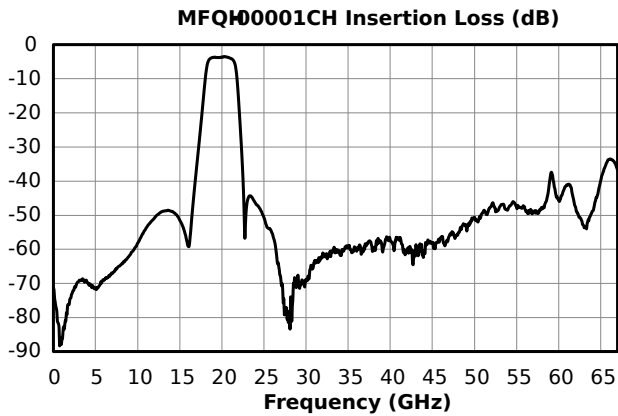
[1][2][3][4][5][6][7][8] Bare die probed

All specifications include wire bond effects.

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Typical Performance Plots



All measurements include wire bond effects.

Die Mounting Recommendations

Mounting and Bonding Recommendations

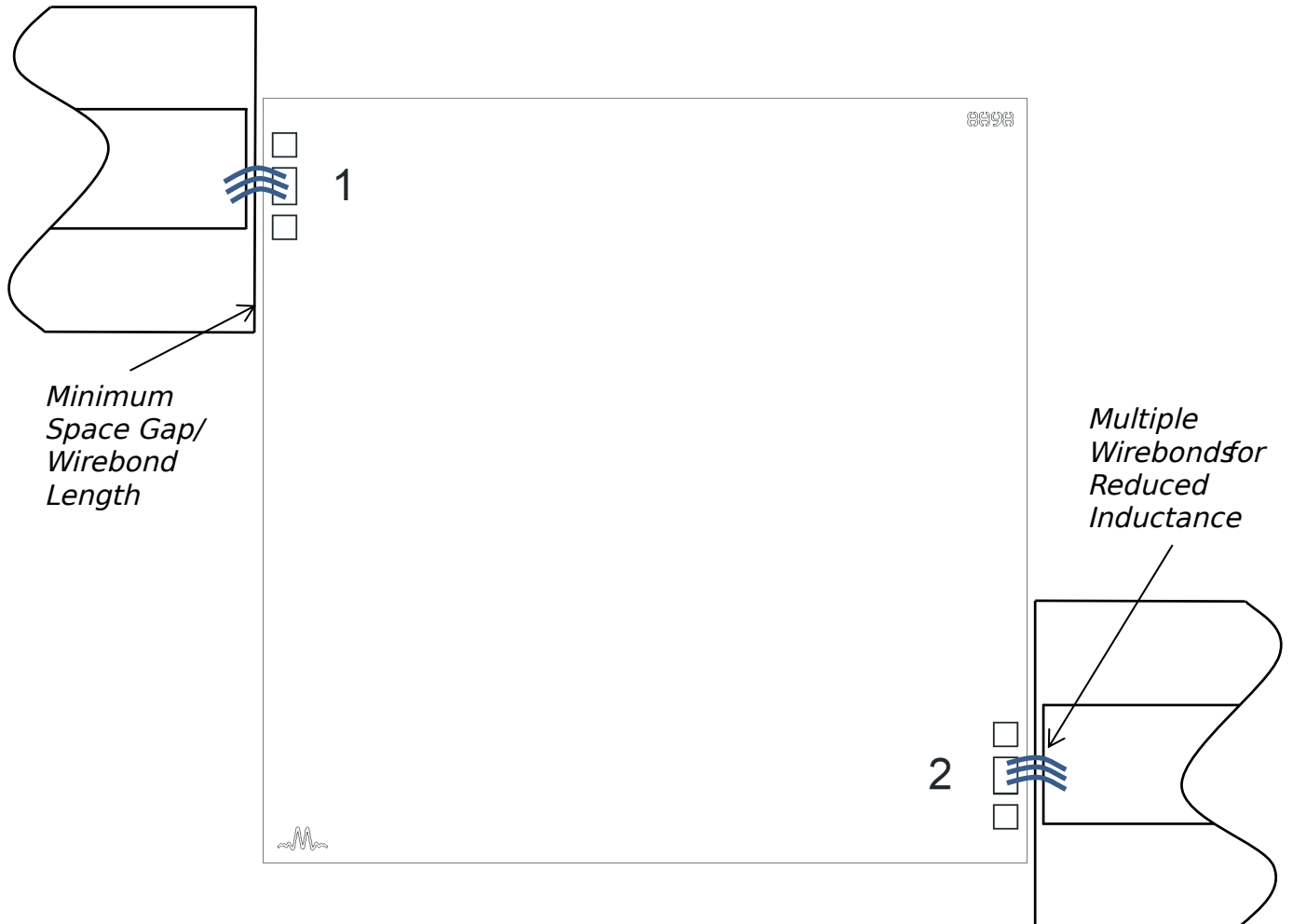
Marki MMICs should be attached directly to a ground plane with conductive epoxy. The ground plane electrical impedance should be as low as practically possible. This will prevent resonances and permit the best possible electrical performance. Datasheet performance is only guaranteed in an environment 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. Bond wire inductance will improve return loss. Bondwire inductance in the range of 30pH to 200pH will improve performance.

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.

Bonding Diagram



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.

Static Sensitivity

GaAs MMIC devices are sensitive to ESD and should be handled, assembled, tested, and transported only in static protected environments.

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.

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