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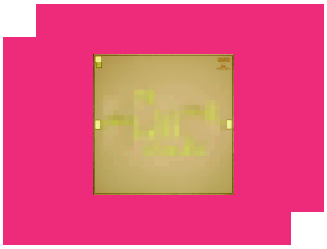
# MFBC-00018CH

## Passive GaAs MMIC 44.50 – 62.50 GHz Bandpass Filter

## DEVICE OVERVIEW

### General Description

The MFBC-00018CH family of passive MMIC 44.50 – 62.50GHz bandpass filters are an ideal solution for small form factor, mmWave, high rejection filtering. 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. Low unit-to-unit variation allows for accurate simulations using the provided S2P file taken from measured production units. The MFBC-00018CH is available as a wire bondable die.



### Features

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

### Applications

N/A

### Functional Block Diagram

### Part Ordering Options

| Part Number | Description | Package | Green Status | Product Lifecycle | Export Classification |
|---|---|---|---|---|---|
| MFBC-00018CH | Passive GaAs MMIC 44.50 – 62.50 GHz Bandpass Filter | CH | RoHS REACH | Released | EAR99 |

## Table Of Contents



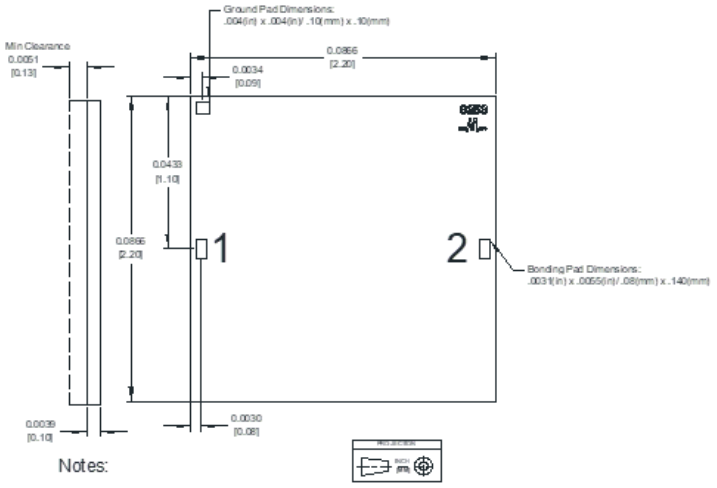
## Revision History

| Revision Code | Revision Date | Comment |
|---|---|---|
| - | 2023-03-28 | Datasheet Initial Release |
| A | 2024-01-05 | Updated Production Test Criteria |

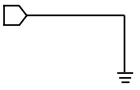
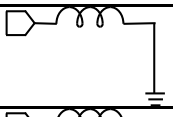
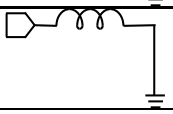
## Port Configuration and Functions

### Port Diagram

A top-down view of the MFBC-000018 CH 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 | Equivalent Circuit for Package |
|---|---|---|---|
| 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 or met simultaneously, 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 |
| Port 1 DC Current | 400 | mA |
| Port 2 DC Current | 400 | mA |

### Package Information

| Parameter | Details | Rating |
|---|---|---|
| Dimensions | - | 2.20 x 2.20 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.

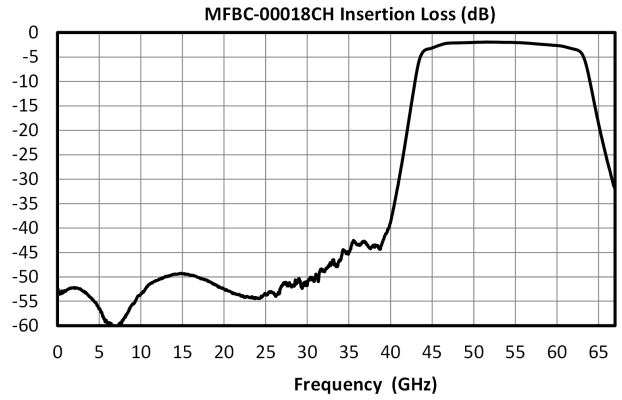
| Parameter | Test Conditions | Minimum Frequency (GHz) | Maximum Frequency (GHz) | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| 1 dBc Passband [1] | Configuration A, 25°C | 45.44 | 61.28 | - | - | - | GHz |
| 1 dBc Passband [2] | Configuration A, 25°C | 45.35 | 61.01 | - | - | - | GHz |
| 30 dBc Rejection Point [3] | Configuration A, 25°C | 40.83 | 52.6 | - | - | - | GHz |
| 3 dBc Passband [4] | Configuration A, 25°C | 43.64 | 63.19 | - | - | - | GHz |
| 3 dBc Passband [5] | Configuration A, 25°C | 43.61 | 63.25 | - | - | - | GHz |
| Center Freq [6] | Configuration A, 25°C | - | - | - | 52.60 | - | GHz |
| Center Freq [7] | Configuration A, 25°C | - | - | - | 52.77 | - | GHz |
| Group Delay [8] | Configuration A, 25°C | - | - | - | 117 | - | ps |
| Impedance [9] | Configuration A, 25°C | - | - | - | 50 | - | Ω |
| Impedance [10] | Configuration A, 25°C | - | - | - | 50 | - | Ω |
| Insertion Loss @ fc [11] | Configuration A, 25°C | - | - | - | 32.2 | - | dB |
| Insertion Loss @ fc [12] | Configuration A, 25°C | - | - | - | 1.9 | - | dB |
| Passband Return Loss [13] | Configuration A, 25°C | - | - | - | 24 | - | dB |
| Stopband Suppression | - | 0 | 40 | 30 | 52 | - | dB |

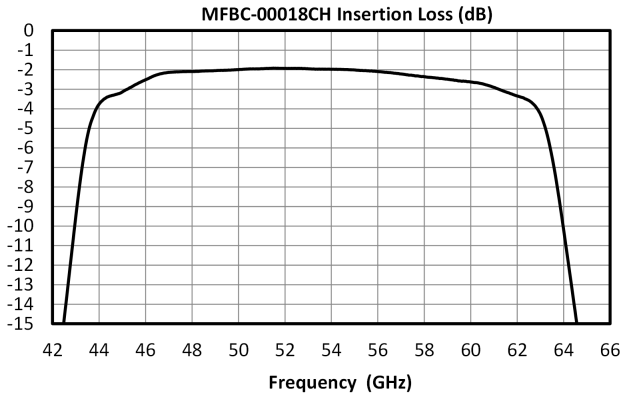
[1][5][7][10][11] Included bondwires
[2][3][4][6][8][9][12][13] Bare die probed

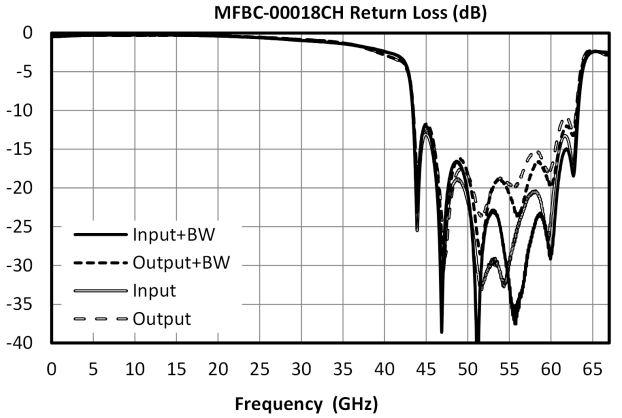
# MFBC-00018CH

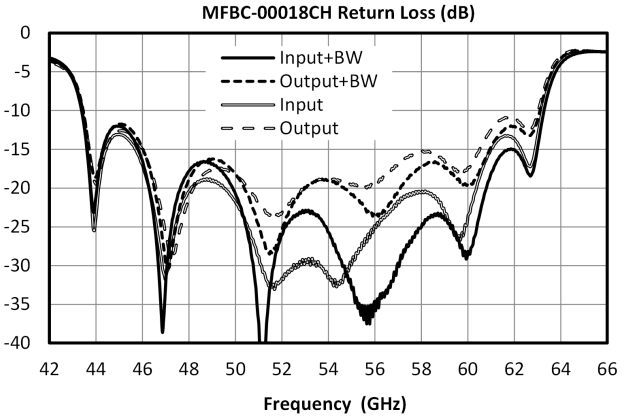
## Passive GaAs MMIC 44.50 – 62.50 GHz Bandpass Filter

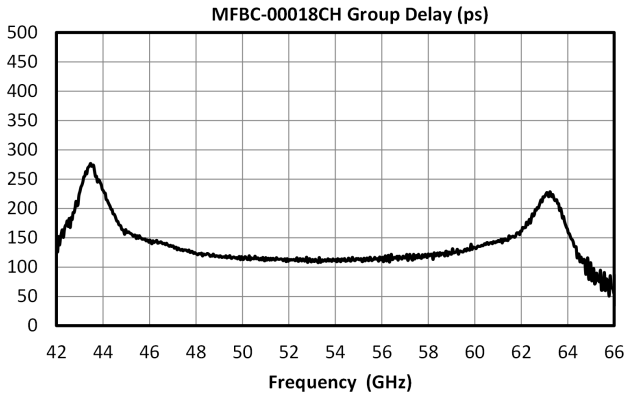
## Typical Performance Plots



## Application Information

To show performance improvement with bond wires (BW), inductance was added to these measurements in simulation per table below.

## Application Circuit

| Filter Name | Number of Bondwires | Bondwire Length (um) | Bondwire Diameter (mil) | Bondwire Inductance (pH) |
|---|---|---|---|---|
| MFBC-00008CH | 2 | 400 | 1 | 128 |
| MFBC-00009CH | 2 | 400 | 1 | 132 |
| MFBC-00017CH | 2 | 275 | 1 | 74 |
| MFBC-00018CH | 3 | 275 | 1 | 30 |

## Die Mounting Recommendations

## Mounting and Bonding Recommendations

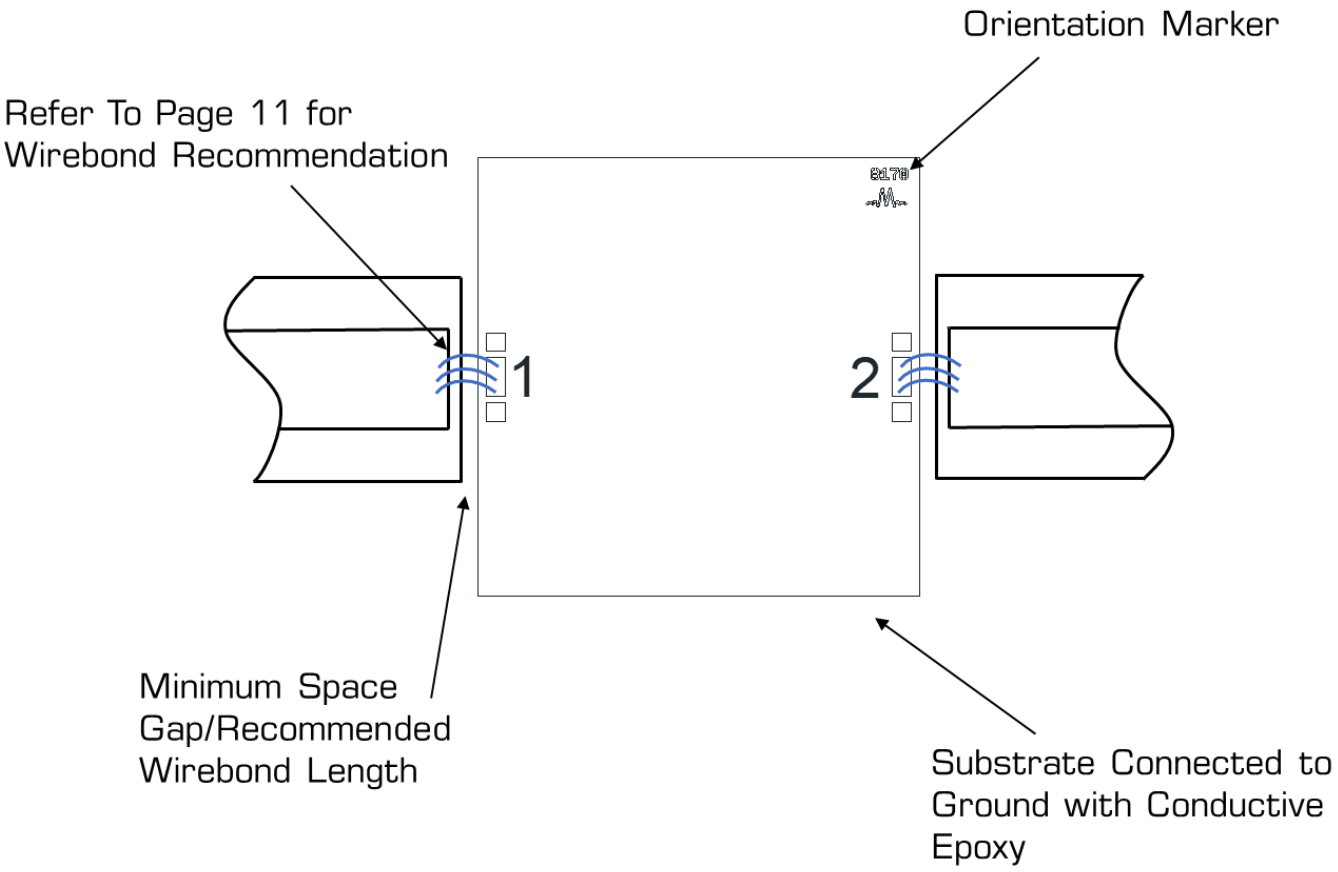
Marki MMICs should be attached directly to a ground plane with conductive epoxy. The ground plane electrical impedance should be as low as practically possible. This will prevent resonances and permit the best possible electrical performance. Datasheet performance is only guaranteed in an environment 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. Refer to table on page 11 for wirebond recommendation. In circumstances where the chip is 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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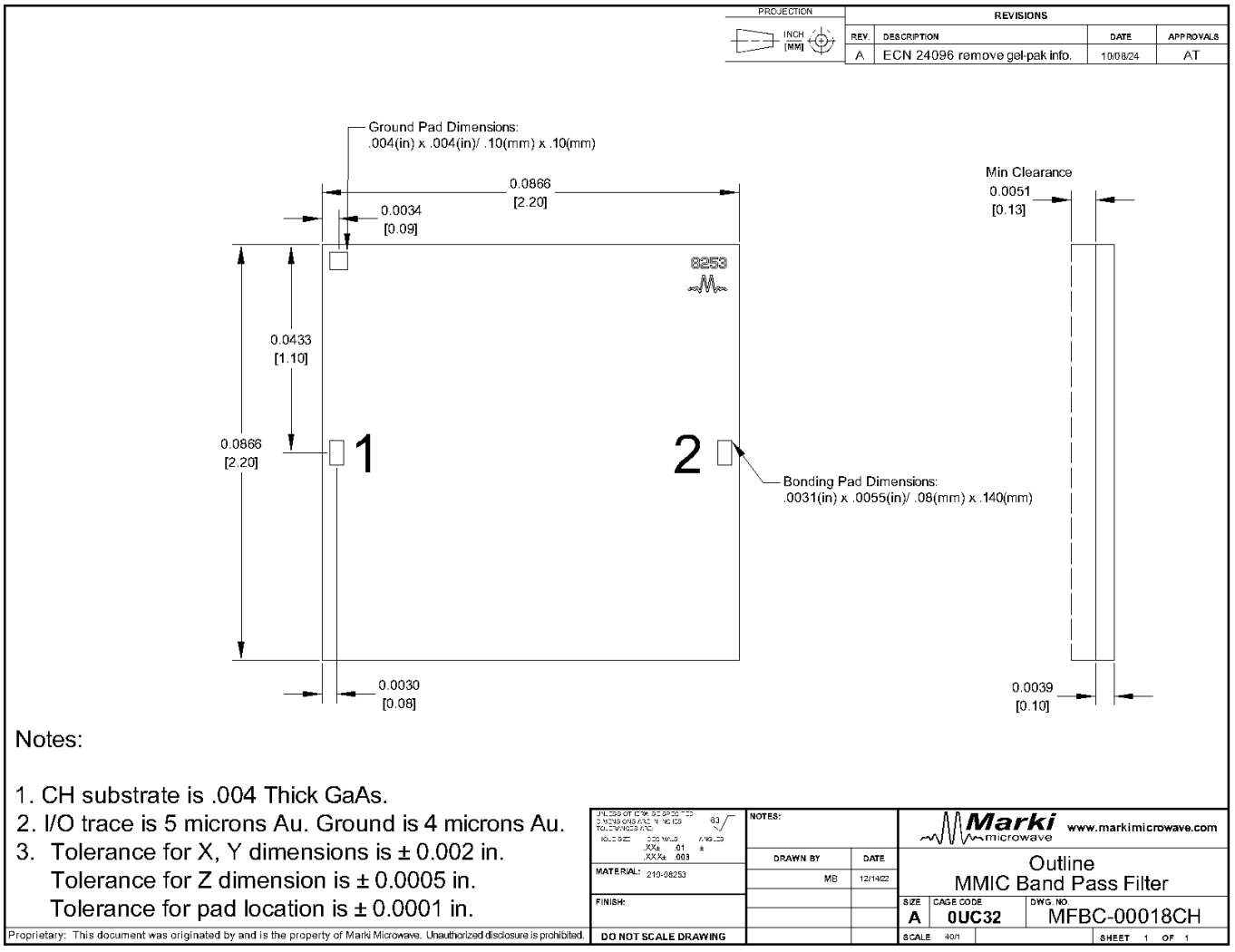
## Passive GaAs MMIC 44.50 – 62.50 GHz Bandpass Filter

## Mechanical Data

## Outline Drawing

Download : Outline 2D Drawing



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