Passive MMIC 13.6-15.1 GHz Bandpass Filter

1 Device Overview

1.1 General Description
The MFB-1445SM is a passive MMIC bandpass filter. It is an integrated filter that passes Ku-Band frequencies (13.6-15.1 GHz). 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 MFB-1445SM is available as a 3 X 3 mm QFN package. Evaluation boards are also available.

1.2 Features
- Designed for Ku-Band Applications including Satcom
- Excellent Return Loss
- High Stop Band Suppression
- Wide Stop Band
- S2P data available

1.3 Functional Block Diagram

1.4 Part Ordering Options

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Package</th>
<th>Green Status</th>
<th>Product Lifecycle</th>
<th>Export Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>MFB-1445SM</td>
<td>3 X 3 mm QFN</td>
<td>SM</td>
<td>RoHS</td>
<td>Active</td>
<td>EAR99</td>
</tr>
<tr>
<td>EVAL-MFB-1445</td>
<td>Connectorized Evaluation Fixture</td>
<td>Eval</td>
<td>ROHS</td>
<td>Active</td>
<td>EAR99</td>
</tr>
</tbody>
</table>

1 Refer to our [website](#) for a list of definitions for terminology presented in this table.
# Table of Contents

1 Device Overview ........................................... 1  
   1.1 General Description ............................. 1  
   1.2 Features ................................................. 1  
   1.3 Functional Block Diagram ....................... 1  
   1.4 Part Ordering Options ............................ 1  
2 Port Configurations and Functions ..... 3  
   2.1 Port Diagram ............................................. 3  
   2.2 Port Functions ........................................ 3  
3 Specifications ............................................. 4  
   3.1 Absolute Maximum Ratings ................. 4  
   3.2 Package Information ......................... 4  
   3.3 Electrical Specifications ................... 4  
   3.4 Typical Performance Plots ............... 5  
      3.4.1 Insertion Loss ................................. 5  
      3.4.2 Performance over temperature ......... 5  
4 Mechanical Data ........................... 6  
   4.1 SM package Outline Drawing .............. 6  
   4.2 SM package Footprint ......................... 6  
   4.3 Evaluation Board Outline ................. 7  

---

## Revision History

<table>
<thead>
<tr>
<th>Revision Code</th>
<th>Revision Date</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>January 2021</td>
<td>Datasheet Initial Release</td>
</tr>
</tbody>
</table>
2 Port Configurations and Functions

2.1 Port Diagram
A bottom-up view of the MFB-1445SM package outline drawing is shown below. The MMIC bandpass filters are symmetrical allowing Pin 2 or Pin 11 to be used as the input.

2.2 Port Functions

<table>
<thead>
<tr>
<th>Port</th>
<th>Function</th>
<th>Description</th>
<th>Equivalent Circuit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 2</td>
<td>Input/Output</td>
<td>Pin 2 is DC open to ground for the SM package.</td>
<td><img src="image" alt="Pin 2" /></td>
</tr>
<tr>
<td>Pin 11</td>
<td>Input/Output</td>
<td>Pin 11 is DC open to ground for the SM package.</td>
<td><img src="image" alt="Pin 11" /></td>
</tr>
<tr>
<td>Pad</td>
<td>Ground</td>
<td>SM package ground path is provided through the ground paddle.</td>
<td><img src="image" alt="Pad" /></td>
</tr>
</tbody>
</table>
3 Specifications

3.1 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.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Maximum Rating</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Current at any port</td>
<td>N/A</td>
<td>mA</td>
</tr>
<tr>
<td>Power Handling, at any Port</td>
<td>+30</td>
<td>dBm</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-55 to +100</td>
<td>ºC</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-65 to +125</td>
<td>ºC</td>
</tr>
</tbody>
</table>

3.2 Package Information

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Details</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESD</td>
<td>Human Body Model (HBM), per MIL-STD-750, Method 1020</td>
<td>N/A</td>
</tr>
</tbody>
</table>

3.3 Electrical Specifications
The electrical specifications apply at $T_A=+25$ºC in a 50Ω system.\(^2\)\(^3\)

Min and Max limits are guaranteed at $T_A=+25$ºC.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Frequency (GHz)</th>
<th>Min</th>
<th>Typ.</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center Frequency, $f_c$ (GHz)</td>
<td></td>
<td>14.45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1dB Passband (GHz)</td>
<td></td>
<td>13.6-15.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insertion Loss @ $f_c$ (dB)</td>
<td>14.45</td>
<td>3.75</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>Passband Return Loss (dB)</td>
<td>13.6-15.1</td>
<td>16</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Stopband Suppression (dB)</td>
<td>11.5 12.5</td>
<td>35</td>
<td>45</td>
<td>35</td>
</tr>
<tr>
<td>Stopband Suppression (dB)</td>
<td>17.5 18.5</td>
<td>30</td>
<td>35</td>
<td>40</td>
</tr>
<tr>
<td>Group Delay (ps)</td>
<td></td>
<td>630</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impedance (Ω)</td>
<td></td>
<td>50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^2\) Filter is symmetrical. Reverse measurement is equivalent to forward measurement.

\(^3\) All measured data is taken from the eval board without de-embedding of the connectors and traces.
3.4 Typical Performance Plots

3.4.1 Insertion Loss & Group Delay

NOTE: All measured data is taken from the eval board without de-embedding of the connectors and traces.

3.4.2 Return Loss

3.4.3 Performance Over Temperature
4 Mechanical Data

4.1 SM package Outline Drawing

1. Substrate material is LCP.
2. I/O Leads and Ground paddle plating is (from base to finish):
   - Ni: 0.5um MIN
   - Pd: 0.02um MIN
   - Au: 0.05um MAX
3. All unconnected pins should be connected to PCB RF ground

4.2 SM package Footprint

The landing pattern is to be used on Rogers 4003 0.008” thick, and taper sample is below.
Grounded Coplanar wave guide with 5.25mil slot.

QFN-Package Surface-Mount Landing Pattern

Click here for a DXF of the above layout.
Click here for leaded solder reflow, Click here for lead-free solder reflow
4.3 Evaluation Board Outline

All measurement are typical

Back side label

Marki Microwave reserves the right to make changes to the product(s) or information contained herein without notice.

Marki Microwave makes no warranty, representation, or guarantee regarding the suitability of its products for any particular purpose, nor does Marki Microwave assume any liability whatsoever arising out of the use or application of any product.

© Marki Microwave, Inc.