Passive GaAs MMIC 20 GHz Equalizer Family

MEQX-20ASM

1 Device Overview

1.1 General Description
The MEQX-20ASM family of passive MMIC equalizer QFN are an ideal solution for compensating for low pass filtering effects in RF/microwave and high speed digital systems. They provide positive slope from DC to 20GHz with DC attenuation options between 3 and 11dB. The unique design offers superior return loss to competitors. GaAs MMIC technology provides consistent unit-to-unit performance in a small, low cost form factor.

1.2 Features
- DC attenuation options from 3 to 11dB
- Typical Insertion Loss 1.2 dB at 20GHz
- VSWR < 1.5:1 Over Entire Band
- S2P data: MEQX-XASM.zip

1.3 Applications
- RF Transceivers
- High-Speed Data
- Telecom
- Cable Loss Compensation
- Amplifier Compensation

1.4 Functional Block Diagram

1.5 Part Ordering Options

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Loss at DC (dB)</th>
<th>Description</th>
<th>Package</th>
<th>Green Status</th>
<th>Product Lifecycle</th>
<th>Export Classification</th>
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<tbody>
<tr>
<td>MEQ3-20ASM</td>
<td>3</td>
<td>3x3 mm QFN</td>
<td>SM</td>
<td>RoHS</td>
<td>Active</td>
<td>EAR99</td>
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<tr>
<td>EVAL-MEQ3-20A</td>
<td>3</td>
<td>Connectorized Eval Module</td>
<td>Module</td>
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</table>

1 Refer to our website for a list of definitions for terminology presented in this table.
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Revision History

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<thead>
<tr>
<th>Revision Code</th>
<th>Revision Date</th>
<th>Comment</th>
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<tr>
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<td>June 27, 2018</td>
<td>Datasheet Initial Release</td>
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<tr>
<td>A</td>
<td>August 2018</td>
<td>Added §4.2, EVAL Outline</td>
</tr>
<tr>
<td>B</td>
<td>November 2018</td>
<td>Updated §4.2, EVAL Outline</td>
</tr>
<tr>
<td>C</td>
<td>March 2019</td>
<td>Added ESD Rating</td>
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<tr>
<td>D</td>
<td>May 2019</td>
<td>Corrected Table in 4.1, Added Package Dimension Tolerance Spec</td>
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<tr>
<td>E</td>
<td>August 2019</td>
<td>Added §4.2, SM Footprint</td>
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</table>
2 Port Configurations and Functions

2.1 Port Diagram
A top-down view of the MEQX-20ASM package outline drawing is shown below. The MEQ equalizers are symmetrical allowing Port 1 or Port 2 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 1</td>
<td>Input/Output</td>
<td>Port 1 is DC connected to ground through a resistor. DC block is required if voltage present.</td>
<td>P1</td>
</tr>
<tr>
<td>Pin 9</td>
<td>Input/Output</td>
<td>Port 2 is DC connected to ground through a resistor. DC block is required if voltage present.</td>
<td>P2</td>
</tr>
<tr>
<td>GND</td>
<td>Ground</td>
<td>SM package ground path is provided through the ground paddle.</td>
<td>Pad</td>
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</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>Port 1 DC Current</td>
<td>40</td>
<td>mA</td>
</tr>
<tr>
<td>Port 2 DC Current</td>
<td>40</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>°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-65 to +125</td>
<td>°C</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>1A</td>
</tr>
</tbody>
</table>

3.3 Electrical Specifications
The electrical specifications apply at $T_A=+25{^\circ}C$ in a 50Ω system. Typical data shown is for the equalizer in a SM package with a sine wave input applied to port 1. Min and Max limits are guaranteed at $T_A=+25{^\circ}C$. All bare die are 100% DC tested and visually inspected.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Typical Insertion Loss</th>
<th>Typical Return Loss</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DC</td>
<td>20 GHz</td>
<td>DC-14 GHz</td>
</tr>
<tr>
<td>MEQ3-20ASM</td>
<td>3</td>
<td>1</td>
<td>19</td>
</tr>
<tr>
<td>MEQ5-20ASM</td>
<td>5</td>
<td>1.1</td>
<td>22</td>
</tr>
<tr>
<td>MEQ6-20ASM</td>
<td>6</td>
<td>1</td>
<td>23</td>
</tr>
<tr>
<td>MEQ7-20ASM</td>
<td>7.5</td>
<td>1.1</td>
<td>26</td>
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<tr>
<td>MEQ10-20ASM</td>
<td>10</td>
<td>0.9</td>
<td>20</td>
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<tr>
<td>MEQ11-20ASM</td>
<td>11</td>
<td>1.2</td>
<td>27</td>
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</tbody>
</table>

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2 Equalizer is symmetrical. Reverse measurement is equivalent to forward measurement. All measurements taken in eval board without de-embedding.
3.4 Typical Performance Plots

3.4.1 Insertion Loss

![Insertion Loss Graph]

- MEQ3-20ASM
- MEQ6-20ASM
- MEQ10-20ASM
- MEQ5-20ASM
- MEQ7-20ASM
- MEQ11-20ASM

Frequency (GHz)

Insertion Loss (dB)
3.4.2 Return Loss & Group Delay

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3 Group delay measured in eval board without de-embedding.
4 Mechanical Data
4.1 SM Package Outline Drawing

Unless otherwise specified, dimensions are in inches. Tolerances are:

- .XX ± .02
- .XXX ± .005

1. Substrate material is ceramic.
2. I/O Leads and Ground Paddle plating is (from base to finish):
   - Ni: 8.89μm MAX 1.27μm MIN
   - Pd: 0.17μm MAX 0.07μm MIN
   - Au: 0.254μm MAX 0.03μm MIN
3. All unconnected pads should be connected to PCB RF ground.

4.2 SM Package Footprint

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Circuit Number</th>
</tr>
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<tbody>
<tr>
<td>MEQ3-20ASM</td>
<td>6339</td>
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<tr>
<td>MEQ6-20ASM</td>
<td>6340</td>
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<tr>
<td>MEQ10-20ASM</td>
<td>6341</td>
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<td>MEQ5-20ASM</td>
<td>6342</td>
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<tr>
<td>MEQ7-20ASM</td>
<td>6343</td>
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<tr>
<td>MEQ11-20ASM</td>
<td>6345</td>
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</tbody>
</table>

SM-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 Eval Package Outline Drawing

<table>
<thead>
<tr>
<th>XX</th>
<th>Part Number</th>
</tr>
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<tbody>
<tr>
<td>39</td>
<td>Eval-MEQ3-20A</td>
</tr>
<tr>
<td>40</td>
<td>Eval-MEQ6-20A</td>
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<td>41</td>
<td>Eval-MEQ10-20A</td>
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<td>42</td>
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<td>43</td>
<td>Eval-MEQ7-20A</td>
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<td>45</td>
<td>Eval-MEQ11-20A</td>
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</table>

<table>
<thead>
<tr>
<th>Port</th>
<th>Connector Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>SMA Female</td>
</tr>
<tr>
<td>O</td>
<td>SMA Male</td>
</tr>
</tbody>
</table>

Note: Eval-Package Connectors are not removeable.

Unless otherwise specified, dimensions are in inches. Tolerances are:

- XX ± .02
- XXX ± .005

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