**High Power**

**2 Way-90° Power Splitter**

50Ω 2 Way-90° Up to 50W* 8000 to 12000 MHz

**The Big Deal**

- High power handling up to 50W
- Wide bandwidth
- Good Amplitude Unbalance, ±0.35 dB
- Good Phase Unbalance, ±6 deg

**Product Overview**

Mini-Circuits’ new 2-way 90° power splitter, QCH-123+ capable of handling up to 50W with amplitude unbalance of ±0.35 dB typ and phase unbalance of ±6 deg. typ. Operating over a frequency range of 8000 to 12000 MHz, the good phase and amplitude unbalance make this component a versatile building block for use in a variety of systems and sub-system designs from balanced amplifiers and antenna feeds to military applications and more. The splitter is fabricated using laminated PCB process (0.2 x 0.25 x 0.069") and includes wrap-around terminations for good solderability and easy visual inspection.

**Key Features**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wide bandwidth</td>
<td>The QCH-123+ wide band width (8000 - 12000 MHz) makes it suitable for a wide range of applications.</td>
</tr>
<tr>
<td>High power handling:</td>
<td>Usable in many systems with high-power requirements such as antenna feeds, power amplifiers, and others that require balanced high power outputs.</td>
</tr>
<tr>
<td>50W @ +85°C</td>
<td></td>
</tr>
<tr>
<td>25W @ +105°C</td>
<td></td>
</tr>
<tr>
<td>Good Phase and Amplitude Unbalance:</td>
<td>QCH-123+ produces nearly equal signals with 90° phase shift - ideal for I/Q systems, balanced amplifiers, antenna feeds, phase shifters, and many more applications.</td>
</tr>
<tr>
<td>• ±0.35 dB Amplitude Unbalance</td>
<td></td>
</tr>
<tr>
<td>• ±6° Phase Unbalance</td>
<td></td>
</tr>
</tbody>
</table>

*See power derating on page 2
**QCH-123+**

**High Power Power Splitter/Combiner**

50Ω 2 Way-90° Up to 50W* 8000 to 12000 MHz

**Maximum Ratings**
- Operating Temperature, case**: -55°C to 105°C
- Storage Temperature -55°C to 105°C
- Power Input**: 50W @ +85°C, case

**Features**
- high power, up to 50W
- wide bandwidth
- good amplitude unbalance, ±0.35 dB Typ
- good phase unbalance, ±6 deg Typ

**Applications**
- Balanced amplifiers
- I&Q Modulators
- Defense and military

**Electrical Specifications @ +25°C**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Condition (MHz)</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
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<tbody>
<tr>
<td>Frequency Range</td>
<td>8000 - 12000</td>
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<td></td>
<td></td>
<td>MHz</td>
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<tr>
<td>Insertion Loss (Avg. of Coupled outputs less 3 dB)</td>
<td>8000 - 12000</td>
<td>—</td>
<td>0.25</td>
<td>0.40</td>
<td>dB</td>
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<tr>
<td>Isolation</td>
<td>8000 - 12000</td>
<td>18</td>
<td>23</td>
<td>—</td>
<td>dB</td>
</tr>
<tr>
<td>Phase Unbalance</td>
<td>8000 - 12000</td>
<td>—</td>
<td>±6</td>
<td>—</td>
<td>deg</td>
</tr>
<tr>
<td>Amplitude Unbalance</td>
<td>8000 - 12000</td>
<td>—</td>
<td>±0.35</td>
<td>±0.50</td>
<td>dB</td>
</tr>
<tr>
<td>VSWR</td>
<td>8000 - 12000</td>
<td>1.15</td>
<td>1.35</td>
<td>.1</td>
<td></td>
</tr>
<tr>
<td>Input RF Power</td>
<td>@+85°C, case</td>
<td>—</td>
<td>50</td>
<td>—</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td>@+95°C, case</td>
<td>—</td>
<td>35</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td></td>
<td>@+105°C, case</td>
<td>—</td>
<td>25</td>
<td>—</td>
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<tr>
<td>Thermal Resistance</td>
<td>8000 - 12000</td>
<td>1.1</td>
<td>—</td>
<td>—</td>
<td>°C/W</td>
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**Outine Dimensions (inch)**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
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<tbody>
<tr>
<td>.25</td>
<td>.20</td>
<td>.069</td>
<td>.050</td>
<td>.050</td>
<td>.010</td>
<td>.025</td>
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<tr>
<td>6.35</td>
<td>5.08</td>
<td>1.75</td>
<td>1.27</td>
<td>1.27</td>
<td>.025</td>
<td>.63</td>
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<tr>
<td>H</td>
<td>J</td>
<td>K</td>
<td>L</td>
<td>M</td>
<td>N</td>
<td>P</td>
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<tr>
<td>.087</td>
<td>.260</td>
<td>.055</td>
<td>.025</td>
<td>.020</td>
<td>.100</td>
<td>.210</td>
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<tr>
<td>2.21</td>
<td>6.35</td>
<td>1.40</td>
<td>.83</td>
<td>.51</td>
<td>2.54</td>
<td>5.33</td>
</tr>
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</table>

**Pad Connections***

- SUM 1
- ISOLATION 2
- PORT 1 (0°) 3
- PORT 2 (+90°) 4
- GROUND 5

***Model is symmetrical and all ports are interchangeable, see port function table.

**Base material:** Printed wiring laminate.
**Termination Finish:** 2-5 μnch (0.05-0.13 microns) Gold over 120-240 μinch Gold over 120-240 μinch Gold over 120-240 μinch

**Demo Board MCL P/N: **TB-977+

**Suggested PCB Layout (PL-526)**

**Suggested Mounting Configuration**

**Port Function Configurations**

<table>
<thead>
<tr>
<th>Sum</th>
<th>Isolation</th>
<th>Port 1 (0°)</th>
<th>Port 2 (90°)</th>
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<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>2</td>
<td>1</td>
<td>4</td>
<td>3</td>
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<td>2</td>
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<tr>
<td>4</td>
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<td>1</td>
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**Outline Dimensions (inch)**

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<th>D</th>
<th>E</th>
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<td>.51</td>
<td>2.54</td>
<td>5.33</td>
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</tbody>
</table>

**Notes:**
1. Trace width is shown for Rogers RO5880 with Dielectric Thickness 0.005" ± .0015". Copper: 1 OZ. Each Side.
2. Bottom side of the PCB is continuous ground plane.
3. For other materials trace width may need to be modified.
4. Ground plane is defined as temperature on base plate.
5. Permanent damage may occur if any of these limits are exceeded.

**Applications:**
- Good phase unbalance, ±6 deg Typ
- Wide bandwidth
- High power, up to 50W

**Mini-Circuits**

P.O. Box 350166, Brooklyn, NY 11235-0003 (718) 934-4500 sales@minicircuits.com

www.minicircuits.com

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Typical Performance Data

<table>
<thead>
<tr>
<th>FREQUENCY (MHz)</th>
<th>Total Loss ² (dB)</th>
<th>Total Loss ² (dB)</th>
<th>Amplitude Unbalance</th>
<th>Isolation (dB)</th>
<th>Phase Unbalance (deg)</th>
<th>VSWR (:1)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Sum to Port 1 @ Sum=1</td>
<td>Sum to Port 2 @ Sum=1</td>
<td>Sum to Isolation @ Sum=1</td>
<td>Relative to 90°</td>
<td>Pad 1</td>
<td>Pad 2</td>
</tr>
<tr>
<td></td>
<td>@ -55°C</td>
<td>@ +25°C</td>
<td>@ +105°C</td>
<td>@ -55°C</td>
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<td>3.55</td>
<td>2.99</td>
<td>2.94</td>
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</tr>
</tbody>
</table>

1. Data at +25°C unless specified otherwise.
2. Total loss is the loss from Sum to each coupled port including the 3dB theoretical split.

Additional Notes

A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.

B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit’s applicable established test performance criteria and measurement instructions.

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