Phase Shifter Subsystem
Model 8401

Description
The 8401 Series Butler matrix is a high performance 4x4 Butler matrix, covering several frequency bands from 0.5 to 8 GHz. It can transfer the signal reciprocally from any of 4 input ports to any of 4 output ports, with high phase accuracy, amplitude balance, low insertion loss, and high port-to-port isolation.

Features
• Compact, modular microstrip design and construction
• Good channel condition number
• Custom frequency ranges and configurations are available. Please consult the factory.

Applications
• WiFi, WiMAX, 4G/5G LTE Testing, Link Simulation
• MIMO Testing
• Multipath Simulation and Performance Evaluation
• Antenna Array Beam-forming
• Interferometer System Simulation and Testing

<table>
<thead>
<tr>
<th></th>
<th>F_{\text{min}} (GHz)</th>
<th>F_{\text{max}} (GHz)</th>
<th>Insertion Loss (dB)</th>
<th>Max. VSWR</th>
<th>Output Phase Accuracy</th>
<th>RF Input Power (dBm)</th>
<th>Isolation (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8401</td>
<td>2.4</td>
<td>6.0</td>
<td>8 typ / 10 max</td>
<td>1.6:1</td>
<td>±10° max at 4.2 GHz</td>
<td>37</td>
<td>18 typ / 15 max</td>
</tr>
<tr>
<td>8401-2</td>
<td>1.7</td>
<td>2.4</td>
<td>7 typ / 8 max</td>
<td>1.5:1</td>
<td>±10° max at 2.05 GHz</td>
<td>37</td>
<td>23 typ / 20 max</td>
</tr>
<tr>
<td>8401-3</td>
<td>1.2</td>
<td>1.4</td>
<td>6.7 typ / 7.5 max</td>
<td>1.3:1</td>
<td>±10° max at 1.3 GHz</td>
<td>30</td>
<td>30 typ / 25 max</td>
</tr>
<tr>
<td>8401-4</td>
<td>0.5</td>
<td>1.0</td>
<td>7 typ / 8 max</td>
<td>1.5:1</td>
<td>±20° max at 0.75 GHz</td>
<td>37</td>
<td>20 typ / 18 max</td>
</tr>
<tr>
<td>8401-5</td>
<td>0.7</td>
<td>1.7</td>
<td>3.2 typ / 11 max</td>
<td>1.4:1</td>
<td>±8° max at 3.25 GHz</td>
<td>37</td>
<td>25 typ / 20 max</td>
</tr>
<tr>
<td>8401-6</td>
<td>0.5</td>
<td>2.0</td>
<td>6.0 typ / 12 max</td>
<td>1.7:1</td>
<td>±10° max at 3.25 GHz</td>
<td>37</td>
<td>25 typ / 16 max</td>
</tr>
<tr>
<td>8401E</td>
<td>2.4</td>
<td>7.25</td>
<td>8.5 typ / 11 max</td>
<td>2.0:1</td>
<td>±15° max at 6.5 GHz</td>
<td>37</td>
<td>20 typ / 11 max</td>
</tr>
</tbody>
</table>

Impedance: 50 Ohms
Connectors: SMA (F) all ports
Weight: ~200 gms
Temperature Range, Operating: -20° to +70°C
Phase Shifter Subsystem
Model 8401

4 x 4 Butler Matrix

Mechanical Outline and Functional Block Diagram

Input | B1 | B3 | B2 | B4
--- | --- | --- | --- | ---
A1 | -45 | -135 | -90 | -180
A2 | -135 | -225 | 0 | -90
A3 | -90 | 0 | -225 | -135
A4 | -180 | -90 | -135 | -45

1. Relative Phase Values indicated are measured at the frequency listed in the “Output Phase Accuracy” column in the table, relative to a 0° path.
2. Phase values will vary with frequency and are dependent on the RF path.

Note: Dimensions are given in mm [inches].