SKY16406-381LF: 2.2 to 2.8 GHz Two-Way, 0 Degrees Power Divider

Applications
- TD-LTE systems
- Satellite communications
- 2.4 GHz ISM band

Features
- Low insertion loss: 0.3 dB @ 2.5 GHz
- High isolation: >25 dB @ 2.5 GHz
- Return loss: 25 dB typical @ 2.5 GHz
- Miniature DFN (6-pin, 1.5 x 2.0 mm) package (MSL1 @ 260 °C per JEDEC J-STD-020)

Skyworks Green™ products are compliant with all applicable legislation and are halogen-free. For additional information, refer to Skyworks Definition of Green™, document number SQ04–0074.

Description
The SKY16406-381LF is a two-way, in-phase Wilkinson-style pHEMT power splitter/combiner. The device is optimized for performance in the 2.2 to 2.8 GHz band. The monolithic circuitry offers low insertion loss, high isolation, and exceptional phase/amplitude balance between ports.

The SKY16406-381LF is manufactured in a miniature, 1.5 x 2.0 mm, 6-pin Dual Flat No-Lead (DFN) package. A functional block diagram is shown in Figure 1. The pin configuration and package are shown in Figure 2. Signal pin assignments and functional pin descriptions are provided in Table 1.
Table 1. SKY16406-381LF Signal Descriptions

<table>
<thead>
<tr>
<th>Pin</th>
<th>Name</th>
<th>Description</th>
<th>Pin</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GND</td>
<td>Ground</td>
<td>4</td>
<td>PORT2</td>
<td>RF output, splitter mode, or RF input, combine mode. Not AC coupled.</td>
</tr>
<tr>
<td>2</td>
<td>IN/SUM</td>
<td>RF input, splitter mode, or RF output, combine mode. Not AC coupled.</td>
<td>5</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>3</td>
<td>GND</td>
<td>Ground</td>
<td>6</td>
<td>PORT1</td>
<td>RF output, splitter mode, or RF input, combine mode. Not AC coupled.</td>
</tr>
</tbody>
</table>

Electrical and Mechanical Specifications

The absolute maximum ratings of the SKY16406-381LF are provided in Table 2. Electrical specifications are provided in Tables 3.

Table 2. SKY16406-381LF Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF input power, CW RF signal</td>
<td>P_{IN}</td>
<td>2.5</td>
<td></td>
<td></td>
<td>W</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>T_{STG}</td>
<td>-65</td>
<td>+25</td>
<td>+150</td>
<td>°C</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>T_{A}</td>
<td>-55</td>
<td>+25</td>
<td>+105</td>
<td>°C</td>
</tr>
</tbody>
</table>

1 Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device.

ESD HANDLING: Although this device is designed to be as robust as possible, electrostatic discharge (ESD) can damage this device. This device must be protected at all times from ESD when handling or transporting. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD handling precautions should be used at all times.

Table 3. SKY16406-381LF Electrical Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Test Condition</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion loss</td>
<td>IL</td>
<td>PORT1 or PORT2, referenced to IN/SUM port</td>
<td>0.3</td>
<td>0.5</td>
<td></td>
<td>dB</td>
</tr>
<tr>
<td>Isolation</td>
<td>Iso</td>
<td>Referenced from PORT1 to PORT2</td>
<td>19</td>
<td>28</td>
<td></td>
<td>dB</td>
</tr>
<tr>
<td>Input return loss</td>
<td>IS_{11}</td>
<td>PORT1 and PORT2, terminated in 50 Ω</td>
<td>18</td>
<td>25</td>
<td></td>
<td>dB</td>
</tr>
<tr>
<td>Output return loss</td>
<td>IS_{22}</td>
<td>PORT1 and PORT2, terminated in 50 Ω</td>
<td>18</td>
<td>25</td>
<td></td>
<td>dB</td>
</tr>
<tr>
<td>Amplitude balance</td>
<td>Abal</td>
<td>Referenced from PORT1 to PORT2</td>
<td>±0.1</td>
<td>±0.2</td>
<td></td>
<td>dB</td>
</tr>
<tr>
<td>Phase balance</td>
<td>Pbal</td>
<td>Referenced from PORT1 to PORT2</td>
<td>±1.0</td>
<td>±3.5</td>
<td></td>
<td>deg</td>
</tr>
</tbody>
</table>

1 Performance is guaranteed only under the conditions listed in this Table.
2 Above the nominal 3 dB split for PORT1 and PORT2.
3 0.29 dB has been de-embedded from the measurement for circuit board and connector losses.
Typical Performance Characteristics
(Ta = +25 °C, Pm = 0 dBm, Characteristic Impedance [Zo] = 50 Ω, @ 2500 MHz, Unless Otherwise Noted)

Figure 3. Insertion Loss vs Frequency Over Temperature, Narrow Band (EVB Loss Removed From Measurement)

Figure 4. Input Return Loss (|S11|, IN/SUM Port) vs Frequency Over Temperature

Figure 5. Output Return Loss (|S22|, PORT1) vs Frequency Over Temperature

Figure 6. Output Return Loss (|S22|, PORT2) vs Frequency Over Temperature

Figure 7. PORT1 to PORT2 Isolation (IN/SUM Port Terminated) vs Frequency Over Temperature

Figure 8. Amplitude Tracking (PORT1 to PORT2) vs Frequency Over Temperature
Evaluation Board Description
The SKY16406-381LF Evaluation Board is used to test the performance of the SKY16406-381LF LNA. An assembly drawing for the Evaluation Board is shown in Figure 10. An Evaluation Board schematic diagram is provided in Figure 11.
**Package Dimensions**

The PCB layout footprint for the SKY16406-381LF is provided in Figure 12. Typical part markings are shown in Figure 13. Package dimensions are shown in Figure 14, and tape and reel dimensions are provided in Figure 15.

**Package and Handling Information**

Instructions on the shipping container label regarding exposure to moisture after the container seal is broken must be followed. Otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

The SKY16406-381LF is rated to Moisture Sensitivity Level 1 (MSL1) at 260 °C. It can be used for lead or lead-free soldering. For additional information, refer to the Skyworks Application Note, *Solder Reflow Information*, document number 200164. Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment. Production quantities of this product are shipped in a standard tape and reel format.
Notes:

1. All measurements are in millimeters.
2. Dimensions and tolerances according to ASME Y14.5M-2009.
3. Coplanarity applies to the terminals and all other bottom surface metallization.
4. Dimension applies to metallized terminal. If the terminal has a radius on its end, the width dimension should not be measured in that radius area.

Figure 13. Typical Part Markings (Top View)

Figure 14. SKY16406-381LF Package Dimensions
Figure 15. SKY16406-381LF Tape and Reel Dimensions
**Ordering Information**

<table>
<thead>
<tr>
<th>Product Description</th>
<th>Product Part Number</th>
<th>Evaluation Board Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKY16406-381LF: Two-Way Power Divider</td>
<td>SKY16406-381LF</td>
<td>SKY16406-381LF-EVB</td>
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