**Product Description**

The BSW6420 is an absorptive SPDT 50Ω matched RF switch supporting bandwidths up to 6GHz. Its high linearity performance across the temperature range makes it ideally suited for use in 3G/4G/5G wireless infrastructure and 802.11 a/n/ac/ax applications where high power and excellent performance is required.

The BSW6420 is designed with robust ESD protection circuits at all pins and packaged in an industry standard, fully RoHS2-compliant, 16-lead, 3mm x 3mm TQFN package.

The BSW6420 does not require blocking capacitors. If DC is presented at the RF port, add a blocking capacitor.

A functional block diagram is shown in Figure 1.

**Block Diagram**

![Figure 1 Functional Block Diagram](image)

**Applications**

- Wireless 3G/4G/5G Infrastructure
- WLAN 802.11 a/n/ac/ax

**Device Features**

- Output frequency range: 50 MHz to 6.0 GHz
- Supply Voltage: 2.7V to 3.6V
- ESD, HBM:
  - 2.5kV @ RF pins
  - 2.0kV @ All pins except RF pins
- Constant impedance during switching transition: Return loss 10dB
- Operating temperature range: -40°C - +105°C
- Low Insertion Loss:
  - 0.79dB @ 2.35GHz
  - 0.81dB @ 3.5GHz
  - 0.84dB @ 4.9GHz
- High Isolation:
  - RFC to RFx:
    - 66dB @ 2.35GHz
    - 56dB @ 3.5GHz
    - 48dB @ 4.9GHz
  - RFx to RFx:
    - 52dB @ 2.35GHz
    - 47dB @ 3.5GHz
    - 42dB @ 4.9GHz
- High Input 1dB Compression:
  - 40.5dBm @ 2.35GHz
  - 41dBm @ 3.5GHz
  - 41dBm @ 4.9GHz
- High IIP3:
  - 63.5dBm @ 2.35GHz
  - 66dBm @ 3.5GHz
  - 66.5dBm @ 4.9GHz
- Switching Time: 550ns
- 16-lead TQFN package: 3.0mm x 3.0mm x 0.75mm
- Lead-free/RoHS2-compliant TQFN SMT Package
## Electrical Specifications

Typical conditions are at VDD = 3.3V, T<sub>A</sub> = 25°C, LS/CTRL Low = 0V, LS/CTRL High = 3.3V, Z<sub>L</sub> = 50Ω, Excluding SMA Connector and PCB loss<sup>(1)</sup>, unless otherwise noted.

### Table 1 Electrical Specifications - 50Ω

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Condition</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Frequency</td>
<td>RFC - RFx</td>
<td>1GHz</td>
<td>2GHz</td>
<td>3GHz</td>
<td>4GHz</td>
</tr>
<tr>
<td>Insertion Loss</td>
<td>RFC - RFx</td>
<td>1GHz</td>
<td>2GHz</td>
<td>3GHz</td>
<td>4GHz</td>
</tr>
<tr>
<td>Isolation</td>
<td>RFC - RFx</td>
<td>1GHz</td>
<td>2GHz</td>
<td>3GHz</td>
<td>4GHz</td>
</tr>
<tr>
<td>Isolation</td>
<td>RFx - RFx</td>
<td>1GHz</td>
<td>2GHz</td>
<td>3GHz</td>
<td>4GHz</td>
</tr>
<tr>
<td>Return Loss (Active Port)</td>
<td>RFC, RF1, RF2</td>
<td>50MHz – 6GHz</td>
<td>15</td>
<td>dB</td>
<td></td>
</tr>
<tr>
<td>Return Loss (Terminated Port)</td>
<td>RFC, RF1, RF2</td>
<td>50MHz – 6GHz</td>
<td>15</td>
<td>dB</td>
<td></td>
</tr>
<tr>
<td>Return Loss during switching transition</td>
<td>RFC, RF1, RF2</td>
<td>50MHz – 6GHz</td>
<td>10</td>
<td>dB</td>
<td></td>
</tr>
<tr>
<td>Input P1dB</td>
<td>RFC - RFx</td>
<td>2.35GHz</td>
<td>3.5GHz</td>
<td>4.9GHz</td>
<td>40.5</td>
</tr>
<tr>
<td>Input IP3&lt;sup&gt;(2)&lt;/sup&gt;</td>
<td>RFC - RFx</td>
<td>2.35GHz</td>
<td>3.5GHz</td>
<td>4.9GHz</td>
<td>63.5</td>
</tr>
<tr>
<td>Input IP2&lt;sup&gt;(2)&lt;/sup&gt;</td>
<td>RFC - RFx</td>
<td>2.35GHz</td>
<td>3.5GHz</td>
<td>4.9GHz</td>
<td>108</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt; Harmonic&lt;sup&gt;(3)&lt;/sup&gt;</td>
<td>RFC - RFx</td>
<td>2.35GHz</td>
<td>3.5GHz</td>
<td>4.9GHz</td>
<td>97</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt; Harmonic&lt;sup&gt;(3)&lt;/sup&gt;</td>
<td>RFC - RFx</td>
<td>2.35GHz</td>
<td>3.5GHz</td>
<td>4.9GHz</td>
<td>100</td>
</tr>
<tr>
<td>Switching Time</td>
<td>RFC - RFx</td>
<td>50% control to 90% RF</td>
<td>50% control to 10% RF</td>
<td>540</td>
<td>530</td>
</tr>
<tr>
<td>Settling Time</td>
<td>RFC - RFx</td>
<td>50% control to 90% RF</td>
<td>50% control to 10% RF</td>
<td>560</td>
<td>550</td>
</tr>
</tbody>
</table>

<sup>(1)</sup> Excluding SMA Connector and PCB loss.
<sup>(2)</sup> Tone Power is 18dBm and Tone spacing is 20KHz.
<sup>(3)</sup> Tone Power is 18dBm.
BSW6420
High Isolation Absorptive SPDT RF switch
50MHz-6GHz

Table 2 Pin Descriptions

<table>
<thead>
<tr>
<th>No.</th>
<th>Pin Name</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>RF1</td>
<td>RF Port</td>
</tr>
<tr>
<td>7</td>
<td>RFC</td>
<td>RF Common Port</td>
</tr>
<tr>
<td>11</td>
<td>RF2</td>
<td>RF2 Port</td>
</tr>
<tr>
<td>14</td>
<td>CTRL</td>
<td>Digital Control Logic Input</td>
</tr>
<tr>
<td>15</td>
<td>LS</td>
<td>Logic Select (Definition for the CTRL pin, See Table3)</td>
</tr>
<tr>
<td>16</td>
<td>VDD</td>
<td>Supply Voltage</td>
</tr>
</tbody>
</table>

Table 3 Control Truth Table

<table>
<thead>
<tr>
<th>LS</th>
<th>CTRL</th>
<th>RFC-RF1</th>
<th>RFC-RF2</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>OFF</td>
<td>ON</td>
</tr>
</tbody>
</table>

Table 4 Operating Ranges

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>VDD</td>
<td>2.7</td>
<td>3.3</td>
<td>3.6</td>
<td>V</td>
</tr>
<tr>
<td>Supply Current</td>
<td>IDD</td>
<td>-</td>
<td>-180</td>
<td>-</td>
<td>μA</td>
</tr>
<tr>
<td>Digital Input Control (LS/CTRL)</td>
<td>High</td>
<td>1.0</td>
<td></td>
<td>3.3</td>
<td>V</td>
</tr>
<tr>
<td>Low</td>
<td>0</td>
<td>-</td>
<td>0.7</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>To</td>
<td>-40</td>
<td>+25</td>
<td>+105</td>
<td>°C</td>
</tr>
<tr>
<td>RF Input Power, CW (Active Port)</td>
<td>$P_{\text{Max,Active}}$</td>
<td>-</td>
<td>-</td>
<td>36</td>
<td>dBm</td>
</tr>
<tr>
<td>2.35GHz, 3.5GHz, 4.9GHz (any port)</td>
<td>$P_{\text{Max,Term}}$</td>
<td>-</td>
<td>-</td>
<td>26</td>
<td>dBm</td>
</tr>
</tbody>
</table>

Table 5 Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>VDD</td>
<td>-0.3</td>
<td>3.6</td>
<td>V</td>
</tr>
<tr>
<td>Digital Input Voltage</td>
<td>LS/CTRL</td>
<td>-0.3</td>
<td>3.6</td>
<td>V</td>
</tr>
<tr>
<td>Maximum Input Power, CW (+25°C)</td>
<td>-</td>
<td>-</td>
<td>Input P1dB</td>
<td>dBm</td>
</tr>
<tr>
<td>Storage Temperature range</td>
<td>-</td>
<td>-65</td>
<td>+150</td>
<td>°C</td>
</tr>
<tr>
<td>ESD HBM</td>
<td>RF pins</td>
<td>-</td>
<td>2500</td>
<td>V</td>
</tr>
<tr>
<td>All pins</td>
<td>-</td>
<td>-</td>
<td>2000</td>
<td>V</td>
</tr>
<tr>
<td>CDM All pins</td>
<td>-</td>
<td>-</td>
<td>1000</td>
<td>V</td>
</tr>
</tbody>
</table>

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Ver. 1.00
Typical Performances - 50Ω

Typical conditions are at VDD = 3.3V, TA = 25°C, LS/CTRL Low = 0V, LS/CTRL High = 3.3V, ZL = 50Ω, Excluding SMA Connector and PCB loss, unless otherwise noted.

Figure 4 Insertion Loss vs VDD (RFC - RF1)

Figure 5 Insertion Loss vs VDD (RFC - RF2)

Figure 6 Insertion Loss vs Temp (RFC - RF1)

Figure 7 Insertion Loss vs Temp (RFC - RF2)

Figure 8 Return Loss vs VDD (RFC, RFx) @ On State

Figure 9 Return Loss @RFC : RF1 ON vs RF2 ON
Typical Performances - 50Ω

Typical conditions are at VDD = 3.3V, TA = 25°C, LS/CTRL Low = 0V, LS/CTRL High = 3.3V, ZL = 50Ω. Excluding SMA Connector and PCB loss, unless otherwise noted.

Figure 10 Return Loss vs Temp (RFC)

Figure 11 Return Loss vs Temp (RF1, RF2)

Figure 12 Terminated Port Return Loss

Figure 13 Terminated Port Return Loss vs Temp (RF1)

Figure 14 Isolation vs VDD (RFC to RFx)

Figure 15 Isolation vs Temp (RFC to RFx)

* Extrapolated data is the actual performance of part excluding the resonance of the Evaluation board.
Typical Performances - 50Ω

Typical conditions are at VDD = 3.3V, TA = 25°C, LS/CTRL Low = 0V, LS/CTRL High = 3.3V, ZL = 50Ω. Excluding SMA Connector and PCB loss, unless otherwise noted.

Figure 16 Isolation vs VDD (RFx to RFx)

Figure 17 Isolation vs Temp (RFx to RFx)
Evaluation Board

Figure 18 Evaluation Board Layout

Figure 19 Evaluation Board PCB Layer Information
BSW6420
50MHz-6GHz

High Isolation Absorptive SPDT RF switch

Table 6 Bill of Material - Evaluation Board 50Ω

<table>
<thead>
<tr>
<th>No.</th>
<th>Ref Des</th>
<th>Part Qty</th>
<th>Part Number</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C3</td>
<td>1</td>
<td>CAP 1005 100pF J 50V</td>
<td>C3 should be placed near the BSW6420</td>
</tr>
<tr>
<td>2</td>
<td>C6</td>
<td>1</td>
<td>CAP 1608 1uF J 50V</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>R1</td>
<td>1</td>
<td>RES 1608 J 1Kohm</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>C1, C2</td>
<td>2</td>
<td>CAP 1608 DNI</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>R2</td>
<td>1</td>
<td>RES 1608 DNI</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>C4, C5</td>
<td>2</td>
<td>CAP 1005 DNI</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>J1</td>
<td>1</td>
<td>6 Pin Header</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>RFC, RF1, RF2</td>
<td>3</td>
<td>SMA_END_LAUNCH</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>U1</td>
<td>1</td>
<td>BSW6420</td>
<td></td>
</tr>
</tbody>
</table>
Package Outline Drawing

[ Top View ]

[ Bottom View ]

[ Side View ]

Figure 21 Package Outline Drawing

Figure 22 Recommended Land Pattern
High Isolation Absorptive SPDT RF switch

BSW6420

50MHz-6GHz

Tape & Reel

Packaging information:
- Tape Width (mm): 12
- Reel Size (inches): 7
- Device Cavity Pitch (mm): 8
- Device Per Reel: 1000EA

Package Marking
- BS6420: BSW6420
- YY: Year
- WW: Work Week
- XX: Wafer Lot Number

Figure 23 Tape & Reel

Figure 24 Package Marking
High Isolation Absorptive SPDT RF switch

BSW6420
50MHz-6GHz

Lead plating finish

100% Tin Matte finish

(All BeRex products undergoes a 1 hour, 150 degree C, Anneal bake to eliminate thin whisker growth concerns.)

MSL / ESD Rating

<table>
<thead>
<tr>
<th>ESD Rating</th>
<th>Value</th>
<th>Test</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class2</td>
<td>Passes &lt; 2000V</td>
<td>Human Body Model (HBM)</td>
<td>JEDEC Standard JESD22-A114B</td>
</tr>
<tr>
<td>Class3</td>
<td>Passes &lt; 1000V</td>
<td>Charged Device Model (CDM)</td>
<td>JEDEC Standard JESD22-C101F</td>
</tr>
</tbody>
</table>

Caution: ESD Sensitive
Appropriate precautions in handling, packaging and testing devices must be observed.
Proper ESD procedures should be followed when handling the device.

MSL Rating

<table>
<thead>
<tr>
<th>MSL Rating</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSL1 at +265°C convection reflow</td>
<td>JEDEC Standard J-STD-020</td>
</tr>
</tbody>
</table>

NATO CAGE code:

2 N 9 6 F