Does anyone else feel crowded??
Why Go Higher … ?

Data Throughput
Resolution
Spectrum congestion
Wired to Wireless Economies of Scale

Spectral Efficiency
Higher Operating Frequencies
Technology Advancements

• High frequency component and solution design requires more than just the next new semiconductor node

• Sometimes it’s simply a matter of applying 2 existing technologies to deliver a high performance solution

• Often times new products come from thinking about the problem from a different perspective or using a tool in a new way

• Products and Technology innovations that have helped our customers solve high frequency system challenges
Low Current Wideband Amplifier

DC to 20 GHz

Key Features

- Super wideband: DC to 20 GHz
- Low current: 20mA
- Good input & output return loss: > 10dB
- Repeatable performance (HBT Process)

Markets

- Instrumentation
- CATV
- Telecommunications
  - 5G
Medium Power, Wideband Amp

13 to 26.5 GHz

Key Features

- Wideband performance
- Excellent gain flatness, over temperature - ±1 dB
- Output Power: up to 27 dBm
- Unconditional stability
- Small, thermally efficient package - 5x5mm
Wideband Gainblock Amplifier

0.05 to 40 GHz

Key Features

• Gain: 11 dB typ.
• P1dB: 10 dBm typ.
• IP3: 21 dBm typ.
• Noise figure: 4.0 dB
• 2.92 mm F/F connectors

Markets

• Test and Measurement
• Telecommunications
  • 5G
• Aerospace and Defense

ZVA-403GX+
Wideband Double Balanced Mixer

10 to 40 GHz Level 15 (LO Power 15 dBm)

Key Features

- LO-RF isolation: 37 dB typ. at 25 GHz
- Conversion loss: 8.4 dB typ.
- P1dB: 10 dBm typ.
- IP3: 20 dBm typ.
- Usable as up & down converter

Markets

- Satellite
- Aerospace and Defense
- Telecommunications
  - 5G
**Key Features**

- Ultra wideband output
- Wide input power range: 12 – 18 dBm
- Low conversion loss: 14 dB
- Good fundamental and harmonic suppression:
  - F1: -26dBc
  - F3: -34dBc

**Markets**

- Telecommunications
- Aerospace and Defense
## 2 Way 0° Power Splitter / Combiner

### 5000 to 43500 MHz

### Key Features
- Up to 43.5 GHz in a molded package!
- Ultra wide bandwidth
- High power handling as splitter: up to 2.5 watts
- Exceptional amplitude balance: < 0.2 dB
- Small size: 4 x 4 x 1 mm & 3.5 x 2.5 x 0.85 mm

### EP2K Series
- New Case Style: MCLP 3.5 x 2.5 10L

### Frequency Range Parameters

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Frequency Range (MHz)</th>
<th>Isolation (dB)</th>
<th>Insertion Loss (dB)</th>
<th>Phase Unbalance (Degrees)</th>
<th>Amplitude Unbalance (dB)</th>
<th>VSWR (:1) Typ.</th>
<th>Power Handling (Watts) Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>EP2K+</td>
<td>5000 to 20000</td>
<td>20</td>
<td>1.7</td>
<td>3.6</td>
<td>0.1</td>
<td>1.4</td>
<td>2.5</td>
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<tr>
<td>EP2K1+</td>
<td>2000 to 26500</td>
<td>20</td>
<td>1.7</td>
<td>3.6</td>
<td>0.1</td>
<td>1.4</td>
<td>2.5</td>
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<tr>
<td>EP2KA+</td>
<td>10000 to 43500</td>
<td>22</td>
<td>0.9</td>
<td>6.1</td>
<td>0.2</td>
<td>1.4</td>
<td>1.0</td>
</tr>
</tbody>
</table>
### High Power, Splitter / Combiners

0.5 to 26.5 GHz  2-8 Way 0°

#### Key Features

- High isolation minimizes interference between ports
- High power handling: 20 Watts as a splitter
- Excellent return loss: better than 1.6:1
- Rugged aluminum alloy case
- Connectors: 2.92 mm F/F

<table>
<thead>
<tr>
<th>Model</th>
<th>Frequency Range (GHz)</th>
<th>Type</th>
<th>Power Input as Splitter (W), Max.</th>
<th>Isolation (dB), Typ.</th>
<th>Insertion Loss (dB), typ.</th>
<th>Phase Unbalance (Degrees) +/-, Max</th>
<th>Amplitude Unbalance (dB) +/-, Max</th>
<th>VSWR In/Out (:1) Typ</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZC2PD-5R263-S+</td>
<td>0.5-26.5</td>
<td>2 Way 0°</td>
<td>20</td>
<td>17</td>
<td>2.4</td>
<td>4</td>
<td>0.4</td>
<td>1.6/1.6</td>
</tr>
<tr>
<td>ZC2PD-01263-S+</td>
<td>1-26.5</td>
<td>2 Way 0°</td>
<td>20</td>
<td>17</td>
<td>1.6</td>
<td>4</td>
<td>0.3</td>
<td>1.5/1.5</td>
</tr>
<tr>
<td>ZC2PD-02263-S+</td>
<td>2-26.5</td>
<td>2 Way 0°</td>
<td>20</td>
<td>18</td>
<td>1.2</td>
<td>3</td>
<td>0.3</td>
<td>1.5/1.5</td>
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<tr>
<td>ZC2PD-06263-S+</td>
<td>6-26.5</td>
<td>2 Way 0°</td>
<td>20</td>
<td>17</td>
<td>1.2</td>
<td>3</td>
<td>0.3</td>
<td>1.5/1.5</td>
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<tr>
<td>ZC4PD-01263-S+</td>
<td>1-26.5</td>
<td>4 Way 0°</td>
<td>20</td>
<td>16</td>
<td>3.2</td>
<td>6</td>
<td>0.5</td>
<td>1.6/1.6</td>
</tr>
<tr>
<td>ZC4PD-02263-S+</td>
<td>2-26.5</td>
<td>4 Way 0°</td>
<td>20</td>
<td>17</td>
<td>2.7</td>
<td>5</td>
<td>0.4</td>
<td>1.6/1.6</td>
</tr>
<tr>
<td>ZC8PD-K0244+</td>
<td>2-40</td>
<td>4 Way 0°</td>
<td>20</td>
<td>16</td>
<td>3.8</td>
<td>6</td>
<td>0.5</td>
<td>1.6/1.6</td>
</tr>
<tr>
<td>ZC8PD-06263-S+</td>
<td>6-26.5</td>
<td>8 Way 0°</td>
<td>20</td>
<td>16</td>
<td>2.9</td>
<td>6</td>
<td>0.6</td>
<td>1.6/1.6</td>
</tr>
</tbody>
</table>
## Key Features

- High isolation minimizes interference between ports: >20 dB
- High power handling: 10-20 Watts
- Rugged aluminum alloy case
- Connectors: 2.92 mm-F

<table>
<thead>
<tr>
<th>Model</th>
<th>Frequency Range (GHz)</th>
<th>Type</th>
<th>Power Input as Splitter (W) Max.</th>
<th>Isolation (dB) Typ.</th>
<th>Insertion Loss (dB) Typ.</th>
<th>Phase Unbalance (Degrees) Max</th>
<th>Amplitude Unbalance (dB) Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZN2PD-K44+</td>
<td>10 to 40</td>
<td>2 Way 0°</td>
<td>10</td>
<td>20</td>
<td>0.8</td>
<td>7</td>
<td>0.2</td>
</tr>
<tr>
<td>ZN4PD-K44+</td>
<td>10 to 40</td>
<td>4 Way 0°</td>
<td>20</td>
<td>22</td>
<td>1.5</td>
<td>6</td>
<td>0.3</td>
</tr>
<tr>
<td>ZN8PD-K44+</td>
<td>10 to 40</td>
<td>8 Way 0°</td>
<td>20</td>
<td>20</td>
<td>2.0</td>
<td>8</td>
<td>0.4</td>
</tr>
<tr>
<td>ZN2PD-V54+</td>
<td>10 to 50</td>
<td>2 Way 0°</td>
<td>10</td>
<td>20</td>
<td>1.8</td>
<td>10</td>
<td>1.0</td>
</tr>
<tr>
<td>ZN2PD-E653+</td>
<td>10 To 65</td>
<td>2 Way 0°</td>
<td>10</td>
<td>20</td>
<td>2.0</td>
<td>15</td>
<td>1.5</td>
</tr>
</tbody>
</table>
MMIC Directional Coupler

6 to 26.5 GHz

Key Features

- Very wideband: 6-26.5 GHz
- Excellent coupling flatness: 10±1.5 dB typ.
- Small Size: 4 x 4 mm
- No external termination required

Markets

- Satellite
- Telecommunications
- Test and Measurement

![Insertion Loss vs. TEMPERATURE](image1)

- @ -40°C
- @ +25°C
- @ +85°C

![Coupling Loss vs. TEMPERATURE](image2)

- @ -40°C
- @ +25°C
- @ +85°C

![Directivity vs. TEMPERATURE](image3)

- @ -40°C
- @ +25°C
- @ +85°C

EDC10-273+
Wideband Bi-Directional Coupler Die

5 to 43.5 GHz

Key Features

• Wide bandwidth
• Excellent coupling Flatness, ±0.6dB over 20 to 40 GHz
• Nominal Coupling 18.6 dB over 20 to 40 GHz
• DC passing

Markets

• Aerospace and Defense
# High Power Directional Couplers

## 0.5 to 40 GHz

### Key Features

- Wideband, 10-30 dB Coupling
- Insertion loss: as low as 1 dB, typ.
- Coupling Flatness: as low as 0.5 dB, typ.
- DC current pass through input to output

<table>
<thead>
<tr>
<th>Model</th>
<th>Freq. Range (GHz)</th>
<th>Coupling (dB) Typ.</th>
<th>Coupling Flatness (dB), Typ.</th>
<th>Mainline Loss (dB) Max.</th>
<th>Directivity Up to 4 GHz (dB), Min.</th>
<th>VSWR (1:1) Max.</th>
<th>Power Input (W) Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZCDC10-K5R44W+</td>
<td>0.5 to 40</td>
<td>10</td>
<td>+/- 1.0</td>
<td>3</td>
<td>11</td>
<td>1.7</td>
<td>1</td>
</tr>
<tr>
<td>ZCDC10-02263S+</td>
<td>2 to 26.5</td>
<td>10</td>
<td>+/- 0.5</td>
<td>1.5</td>
<td>13</td>
<td>1.5</td>
<td>1</td>
</tr>
<tr>
<td>ZCDC20-02263S+</td>
<td>2 to 26.5</td>
<td>20</td>
<td>+/- 0.5</td>
<td>1</td>
<td>14</td>
<td>1.5</td>
<td>1</td>
</tr>
<tr>
<td>ZCDC10-K0244+</td>
<td>2 to 40</td>
<td>10</td>
<td>+/- 0.6</td>
<td>2.1</td>
<td>10</td>
<td>1.7</td>
<td>1</td>
</tr>
<tr>
<td>ZCDC20-K0244+</td>
<td>2 to 40</td>
<td>20</td>
<td>+/- 0.8</td>
<td>1.5</td>
<td>10</td>
<td>1.7</td>
<td>1</td>
</tr>
<tr>
<td>ZCDC30-5R263+</td>
<td>2 to 26.5</td>
<td>30</td>
<td>+/- 0.8</td>
<td>1.9</td>
<td>16</td>
<td>1.5</td>
<td>1</td>
</tr>
</tbody>
</table>
# Waveguide Bandpass Filters

## Key Features

- Low insertion loss: 0.3 - 0.6 dB, Typ.
- Super-high rejection: > 25-39 dB, upper stop band
- Excellent return loss: > 18 dB

### Waveguide Bandpass Filters

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Passband F1 (GHz)</th>
<th>Passband F2 (GHz)</th>
<th>Insertion Loss (dB), Typ</th>
<th>Stopband F3 (GHz)</th>
<th>Rejection @ F3 (dB), Typ</th>
<th>Stopband F4 (GHz)</th>
<th>Rejection @ F4 (dB), Typ</th>
</tr>
</thead>
<tbody>
<tr>
<td>WVBP-283-WR28+</td>
<td>27.5</td>
<td>28.35</td>
<td>0.5</td>
<td>22-27</td>
<td>30</td>
<td>28.85-38</td>
<td>39</td>
</tr>
<tr>
<td>WVBP-383-WR28+</td>
<td>37</td>
<td>40</td>
<td>0.6</td>
<td>22-36</td>
<td>49</td>
<td>41-42</td>
<td>25</td>
</tr>
<tr>
<td>WVBP-613-WR15+</td>
<td>57.2</td>
<td>65.9</td>
<td>0.4</td>
<td>50-56.2</td>
<td>44</td>
<td>66.9-75</td>
<td>31</td>
</tr>
<tr>
<td>WVBP-673-WR12+</td>
<td>64</td>
<td>71</td>
<td>0.3</td>
<td>60-61.5</td>
<td>39</td>
<td>73.5-90</td>
<td>26</td>
</tr>
<tr>
<td>WVBP-733-WR12+</td>
<td>71</td>
<td>76</td>
<td>0.6</td>
<td>60-69.5</td>
<td>56</td>
<td>77.5-90</td>
<td>39</td>
</tr>
<tr>
<td>WVBP-783-WR12+</td>
<td>76</td>
<td>81</td>
<td>0.6</td>
<td>60-74.5</td>
<td>33</td>
<td>82.5-90</td>
<td>29</td>
</tr>
<tr>
<td>WVBP-833-WR12+</td>
<td>81</td>
<td>86</td>
<td>0.5</td>
<td>60-79</td>
<td>38</td>
<td>88-90</td>
<td>26</td>
</tr>
</tbody>
</table>
## Reflectionless High Pass Filters

9.1 to 40 GHz F3-F5

### Key Features

- Low insertion loss: 1.3-2.7 dB
- High rejection: > 18 dB in die form
- Excellent return loss: > 12 dB

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Passband F3-F5 (GHz)</th>
<th>Passband F2 (GHz)</th>
<th>Insertion Loss (dB), Typ</th>
<th>Stopband F1 (GHz)</th>
<th>Rejection @ F1 (dB), Typ</th>
</tr>
</thead>
<tbody>
<tr>
<td>XHF-153-D+</td>
<td>15000-40000</td>
<td>14400</td>
<td>2</td>
<td>DC-12</td>
<td>20.7</td>
</tr>
<tr>
<td>XHF-912-D+</td>
<td>9100-40000</td>
<td>8400</td>
<td>1.5-1.6</td>
<td>DC-7.3</td>
<td>20.5</td>
</tr>
<tr>
<td>XHF-1162-D+</td>
<td>11600-40000</td>
<td>10500</td>
<td>1.3-1.8</td>
<td>DC-9.1</td>
<td>21.3</td>
</tr>
<tr>
<td>XHF-1352-D+</td>
<td>13500-40000</td>
<td>12700</td>
<td>1.3-2.3</td>
<td>DC-10.5</td>
<td>22.5</td>
</tr>
<tr>
<td>XHF-1832-D+</td>
<td>18300-40000</td>
<td>17400</td>
<td>1.3-1.8</td>
<td>DC-14.6</td>
<td>18.3</td>
</tr>
<tr>
<td>XHF2-153+</td>
<td>15300-30000</td>
<td>14200</td>
<td>2.2-2.7</td>
<td>DC-12</td>
<td>13.7</td>
</tr>
<tr>
<td>XHF2-912+</td>
<td>9100-30000</td>
<td>8200</td>
<td>2.1-2.7</td>
<td>DC-7.1</td>
<td>14.3</td>
</tr>
<tr>
<td>XHF2-1162+</td>
<td>11600-30000</td>
<td>10400</td>
<td>1.8-2.7</td>
<td>DC-8.7</td>
<td>13.6</td>
</tr>
<tr>
<td>XHF2-1352+</td>
<td>13500-30000</td>
<td>12700</td>
<td>1.8-2.7</td>
<td>DC-10.5</td>
<td>13.8</td>
</tr>
<tr>
<td>XHF2-1832+</td>
<td>18300-30000</td>
<td>17500</td>
<td>1.7-2.8</td>
<td>DC-14.6</td>
<td>14.0</td>
</tr>
</tbody>
</table>
Microwave Gain Equalizers

DC to 20 GHz

Key Features

- Wide bandwidth
- Multiple slope selection (2, 3, 5, 6, 8, 10 & 12 dB)
- Excellent return loss, 20 dB typ.
- Excellent power handling
- Small package, 2 x 2 mm

Markets

- All Markets

EQY-X-24+

Insertion Loss (dB)
Hermetic Precision Attenuators

DC to 20 GHz

Key Features

- Ceramic, hermetically sealed, high reliability
- Broad frequency range
- 0-30 dB attenuation values
- Up to 2 Watts power handling
- Very good return loss

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Freq. Low (MHz)</th>
<th>Freq. High (MHz)</th>
<th>Attenuation (dB) Nom.</th>
<th>Attenuation variation (dB), typ.</th>
<th>Return Loss (dB), typ.</th>
<th>Power Input Max. (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCAT-00+</td>
<td>DC</td>
<td>20000</td>
<td>0</td>
<td>+/- 0.25</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>RCAT-03+</td>
<td>DC</td>
<td>20000</td>
<td>3</td>
<td>+/- 0.5</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>RCAT-10+</td>
<td>DC</td>
<td>20000</td>
<td>10</td>
<td>+/- 1.1</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>RCAT-20+</td>
<td>DC</td>
<td>20000</td>
<td>20</td>
<td>+/- 3.5</td>
<td>21</td>
<td>2</td>
</tr>
<tr>
<td>RCAT-30+</td>
<td>DC</td>
<td>20000</td>
<td>30</td>
<td>+/- 1.0</td>
<td>20</td>
<td>2</td>
</tr>
</tbody>
</table>
Microwave Precision Fixed Attenuator
DC to 40 GHz

Key Features

• Super wide bandwidth
• Wide range of nominal attenuation values (0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15, 20, 30)
• High power handling, up to 2W
• Small size, available in die form and 2 x 2 mm

Markets

• All Markets

YAT-X+, YAT-X-D+
Microwave Precision Fixed Attenuator

DC to 40 GHz

Key Features

- Super wide bandwidth,
- Wide range of nominal attenuation values (0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15, 20, 30)
- High power handling, up to 2W
- Small size, available in die form and 2 x 2 mm

Markets

- All Markets

KAT-X+, KAT-X-D+
# Attenuators

## DC to 26 GHz

### Key Features

- Input power: 2 watts
- Precise attenuation
- Attenuation flatness: ± 0.5 dB, typ.

<table>
<thead>
<tr>
<th>Model</th>
<th>Attenuation</th>
</tr>
</thead>
<tbody>
<tr>
<td>BW-S1-2W263+</td>
<td>1 dB</td>
</tr>
<tr>
<td>BW-S3-2W263+</td>
<td>3 dB</td>
</tr>
<tr>
<td>BW-S6-2W263+</td>
<td>6 dB</td>
</tr>
<tr>
<td>BW-S10-2W263+</td>
<td>10 dB</td>
</tr>
<tr>
<td>BW-S20-2W263+</td>
<td>20 dB</td>
</tr>
</tbody>
</table>
### Precision Fixed Attenuators

DC to 40 GHz

**Key Features**

- 2 watt power handling
- Passivated stainless steel connectors
- Connectors: 2.92 mm F/M
- VSWR: 1.20:1 typ.

<table>
<thead>
<tr>
<th>Model</th>
<th>Attenuation (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BW-K1-2W44+</td>
<td>1</td>
</tr>
<tr>
<td>BW-K2-2W44+</td>
<td>2</td>
</tr>
<tr>
<td>BW-K3-2W44+</td>
<td>3</td>
</tr>
<tr>
<td>BW-K4-2W44+</td>
<td>4</td>
</tr>
<tr>
<td>BW-K5-2W44+</td>
<td>5</td>
</tr>
<tr>
<td>BW-K6-2W44+</td>
<td>6</td>
</tr>
<tr>
<td>BW-K10-2W44+</td>
<td>10</td>
</tr>
<tr>
<td>BW-K20-2W44+</td>
<td>20</td>
</tr>
</tbody>
</table>
Precision Fixed Attenuators
DC to 40 GHz

Key Features

- 2 Watt Power Handling
- Passivated Stainless Steel Connectors
- Connectors: 2.92 mm M/M

<table>
<thead>
<tr>
<th>Model</th>
<th>Attenuation (dB)</th>
<th>Attenuation Accuracy (dB)</th>
<th>VSWR, Max.:1</th>
<th>Power (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BW-KM3-2W44+</td>
<td>3</td>
<td>+/-0.4</td>
<td>1.2</td>
<td>2</td>
</tr>
<tr>
<td>BW-KM6-2W44+</td>
<td>6</td>
<td>+/-0.5</td>
<td>1.1</td>
<td>2</td>
</tr>
<tr>
<td>BW-KM10-2W44+</td>
<td>10</td>
<td>+/-0.4</td>
<td>1.1</td>
<td>2</td>
</tr>
<tr>
<td>BW-KM20-2W44+</td>
<td>20</td>
<td>+/-0.1</td>
<td>1.1</td>
<td>2</td>
</tr>
</tbody>
</table>
Precision Fixed Attenuators

DC to 50 GHz

Key Features

- Input power: 1 Watt max.
- VSWR: 1.20:1 typ.
- Connectors: 2.4 mm Female - 2.4 mm Male
- Passivated stainless steel

<table>
<thead>
<tr>
<th>Model</th>
<th>Attenuation (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BW-V3-1W54+</td>
<td>3 dB</td>
</tr>
<tr>
<td>BW-V6-1W54+</td>
<td>6 dB</td>
</tr>
<tr>
<td>BW-V10-1W54+</td>
<td>10 dB</td>
</tr>
<tr>
<td>BW-V20-1W54+</td>
<td>20 dB</td>
</tr>
</tbody>
</table>
Precision Fixed Attenuators
DC to 65 GHz

**Key Features**

- Input power: 1 Watt max.
- VSWR: 1.3:1 typ. to 65 GHz
- Connectors: 1.85 mm Female – 1.85 mm Male
- Passivated stainless steel

<table>
<thead>
<tr>
<th>Model</th>
<th>Attenuation (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BW-E1-1E653+</td>
<td>2 dB</td>
</tr>
<tr>
<td>BW-E3-1W653+</td>
<td>3 dB</td>
</tr>
<tr>
<td>BW-E6-1W653+</td>
<td>6 dB</td>
</tr>
<tr>
<td>BW-E10-1W653+</td>
<td>10 dB</td>
</tr>
<tr>
<td>BW-E20-1W653+</td>
<td>20 dB</td>
</tr>
</tbody>
</table>
LTCC Technology
Innovation for High Frequencies
LTCC Distributed Filters

X-Band, Ku-Band Distributed Filter Prototype

Distributed Filter Test Data

- Better than 20 dB rejection to 43 GHz

Passband Close-Up

- Exceptionally low insertion loss
LTCC Distributed Filters

11 to 28% BW Band Pass Filter Prototypes

Distributed Filter Test Data

Passband Close-Up

Frequency (MHz)

Attenuation (dB)

Frequency (MHz)

Attenuation (dB)

Second Spin S21 dB  First Spin S21 dB

Second Spin S21 dB  First Spin S21 dB
LTCC Distributed Filters

Band Pass Filter with improved Shielding

Pick and Place Compatible
SIW filter components:

- Band Pass
- 5G Ready
- 4 – 20 %BW achievable

Outline Dimensions (inch/mm):

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>.142</td>
<td>.079</td>
<td>.010</td>
<td>.021</td>
<td>.044</td>
</tr>
<tr>
<td>3.60</td>
<td>2.00</td>
<td>0.25</td>
<td>0.53</td>
<td>1.13</td>
</tr>
</tbody>
</table>
LTCC Substrate Integrated Waveguide Filters

$f_1 (@-2dB) = 27.33 \text{ GHz}$

$f_2 (@-2dB) = 29.494 \text{ GHz}$

$f_0 = 28.404 \text{ GHz}$

$\%BW = 7.6\%$

$\text{IL} = 1.59 \text{ dB}$
State of the Art
High Frequency Packaging
Overmolded Package Technology

- Customized for Dual MMIC solution
- Optimized layout and lead frame for reduced parasitics
- Ultra small package delivers high performance up to 30 GHz in a small footprint
- Unique Lead frame optimized for performance up to 43.5 GHz!
- MCLP 1.4 x 2.0 6L
- MCLP 2 x 2.6L
- MCLP 3.5 x 2.5 10L
- MCLP 3.5 x 2.5 16L
High Frequency Systems

Chip and Wire

Ceramic

Courtesy: Microwaves 101, Barry Ind.
Ceramic Packaging for 20+ GHz applications

- High Temperature Co-fired Ceramic substrates
- Excellent RF Performance
- Excellent Thermal Performance

Expensive  High NRE  Less Versatile

Courtesy: Kyocera, NGK/NTK, Stratedge
High performance air cavity package, customizable, optimized for high volume SMT manufacturing
LTCC mmWave Packaging Solution

KAT-0 LTCC Package (A1-00)

Attenuation (dB)

Frequency (MHz)

S11 S21 S22
LTCC mmWave Packaging Solution

KAT-2 LTCC Package (A3-02)

![Graph showing attenuation vs. frequency with S11, S21, and S22 curves.]
Organic PCB mmWave Packaging Solution

ISOMETRIC VIEW

Drop in die

Q2 Release!
Flip-Chip Packaging Solution

SPDT switch assembly

SPDT Die size:
2.495mm x 2.149mm

Package Dimensions:
3.0 x 3.0mm
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Product Marketing Manager  
Mini Circuits  

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+1 978 494 2400
Your partners for success since 1968

Thank You