Multilayer Balun Transformers
For DVB-H/ISDB-T

HHM Series

Type:  
- HHM1591A1 (2.0×1.25×0.95mm)
- HHM1591A2 (2.0×1.25×0.95mm)
- HHM1589B1 (2.0×1.25×0.95mm)
- HHM1589D1 (2.0×1.25×0.95mm)
- HHM1591D1 (2.0×1.25×0.95mm)
- HHM1589E1 (2.0×1.25×0.95mm)

Issue date:  December 2010

- All specifications are subject to change without notice.
- Conformity to RoHS Directive: This means that, in conformity with EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.
Multilayer Chip Baluns
For DVB-H/ISDB-T

HHM Series HHM1591A1

SHAPES AND DIMENSIONS

CIRCUIT DIAGRAM

RECOMMENDED PC BOARD PATTERNS

ELECTRICAL CHARACTERISTICS

- Conformity to RoHS Directive: This means that, in conformity with EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

- All specifications are subject to change without notice.
FREQUENCY CHARACTERISTICS
Unbalance 50Ω/Balance 100Ω

RETURN LOSS

INSERTION LOSS

AMPLITUDE BALANCE

PHASE BALANCE

All specifications are subject to change without notice.
Multilayer Chip Baluns
For DVB-H/ISDB-T

HHM Series HHM1591A2

SHAPES AND DIMENSIONS

![Diagram](image)

Terminal functions

1. Unbalanced port
2. GND or DC feed+ RF GND
3. Balanced port
4. Balanced port
5. GND
6. N.C.

Dimensions in mm

0.2 ± 0.2
0.35 ± 0.2
0.35 ± 0.2

CIRCUIT DIAGRAM

Unbalanced input 50Ω

Balanced output 100Ω

RECOMMENDED PC BOARD PATTERNS

![Diagram](image)

Dimensions in mm

0.30
0.35

ELECTRICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unbalanced impedance</td>
<td>50Ω</td>
</tr>
<tr>
<td>Balanced impedance</td>
<td>100Ω</td>
</tr>
<tr>
<td>Frequency range</td>
<td>350 to 950MHz</td>
</tr>
<tr>
<td>Unbalanced port return loss</td>
<td>4.5dB min.</td>
</tr>
<tr>
<td>Phase imbalance at balanced port</td>
<td>180°±20deg.</td>
</tr>
<tr>
<td>Amplitude imbalance at balanced port</td>
<td>0±2.0dB</td>
</tr>
<tr>
<td>Insertion loss</td>
<td>2.8dB max.</td>
</tr>
<tr>
<td>Temperature range</td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td>−40 to +85°C</td>
</tr>
<tr>
<td>Storage</td>
<td>−40 to +85°C</td>
</tr>
<tr>
<td>Packaging style and quantities</td>
<td>2000 pieces/reel</td>
</tr>
</tbody>
</table>

• Conformity to RoHS Directive: This means that, in conformity with EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

• All specifications are subject to change without notice.
FREQUENCY CHARACTERISTICS
Unbalance 50Ω/Balance 100Ω

RETURN LOSS

INSERTION LOSS

AMPLITUDE BALANCE

PHASE BALANCE

• All specifications are subject to change without notice.
Multilayer Chip Baluns
For DVB-H/ISDB-T

HHM Series HHM1589B1

SHAPES AND DIMENSIONS

<table>
<thead>
<tr>
<th>Terminal functions</th>
<th>Dimensions in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Unbalanced port</td>
<td>0.65±0.2</td>
</tr>
<tr>
<td>2 GND or DC feed+ RF GND</td>
<td>0.3±0.2</td>
</tr>
<tr>
<td>3 Balanced port</td>
<td>0.25±0.1</td>
</tr>
<tr>
<td>4 Balanced port</td>
<td>0.2±0.1</td>
</tr>
<tr>
<td>5 GND</td>
<td>0.3±0.2</td>
</tr>
<tr>
<td>6 N.C.</td>
<td>0.2±0.2</td>
</tr>
</tbody>
</table>

CIRCUIT DIAGRAM

Unbalanced input 50Ω

Balanced output 200Ω

RECOMMENDED PC BOARD PATTERNS

Dimensions in mm

0.25

0.35

0.30

0.60

0.50

ELECTRICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unbalanced impedance</td>
<td>50Ω</td>
</tr>
<tr>
<td>Balanced impedance</td>
<td>200Ω</td>
</tr>
<tr>
<td>Frequency range</td>
<td>470 to 710MHz</td>
</tr>
<tr>
<td>Unbalanced port return loss</td>
<td>9.5dB min.</td>
</tr>
<tr>
<td>Phase imbalance at balanced port</td>
<td>180±10deg.</td>
</tr>
<tr>
<td>Amplitude imbalance at balanced port</td>
<td>0±1.5dB</td>
</tr>
<tr>
<td>Insertion loss</td>
<td>1.4dB max.</td>
</tr>
<tr>
<td>Temperature range</td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td>−40 to +85°C</td>
</tr>
<tr>
<td>Storage</td>
<td>−40 to +85°C</td>
</tr>
<tr>
<td>Packaging style and quantities</td>
<td>2000 pieces/reel</td>
</tr>
</tbody>
</table>

• Conformity to RoHS Directive: This means that, in conformity with EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

• All specifications are subject to change without notice.
FREQUENCY CHARACTERISTICS
Unbalance 50Ω/Balance 200Ω

RETURN LOSS

INFORMATION LOSS

AMPLITUDE BALANCE

PHASE BALANCE

Insertion loss (dB)

Frequency (MHz)

1: 470.0MHz
-1.06dB
2: 590.0MHz
-0.77dB
3: 710.0MHz
-1.55dB

Frequency (MHz)

1: 470.0MHz
-14.55dB
2: 590.0MHz
-21.42dB
3: 710.0MHz
-12.53dB

Frequency (MHz)

1: 470.0MHz
-0.36dB
2: 590.0MHz
-0.43dB
3: 710.0MHz
-0.38dB

Frequency (MHz)

1: 470.0MHz
180.71deg.
2: 590.0MHz
181.07deg.
3: 710.0MHz
180.24deg.

All specifications are subject to change without notice.
Multilayer Chip Baluns
For DVB-H/ISDB-T

HHM Series  HHM1589D1

SHAPES AND DIMENSIONS

<table>
<thead>
<tr>
<th>Terminal functions</th>
<th>Dimensions in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Unbalanced port</td>
<td>0.95±0.1</td>
</tr>
<tr>
<td>2 GND or DC feed+ RF GND</td>
<td>2.0±0.15</td>
</tr>
<tr>
<td>3 Balanced port</td>
<td></td>
</tr>
<tr>
<td>4 Balanced port</td>
<td>1.25±0.15</td>
</tr>
<tr>
<td>5 GND</td>
<td></td>
</tr>
<tr>
<td>6 N.C.</td>
<td></td>
</tr>
</tbody>
</table>

CIRCUIT DIAGRAM

Unbalanced input 50Ω

Balanced output 200Ω

RECOMMENDED PC BOARD PATTERNS

Dimensions in mm

- 0.25
- 0.3
- 0.35
- 0.65
- 0.7
- 1

ELECTRICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unbalanced impedance</td>
<td>50Ω</td>
</tr>
<tr>
<td>Balanced impedance</td>
<td>200Ω</td>
</tr>
<tr>
<td>Frequency range</td>
<td>350 to 950MHz</td>
</tr>
<tr>
<td>Unbalanced port return loss</td>
<td>5dB min.</td>
</tr>
<tr>
<td>Phase imbalance at balanced port</td>
<td>180±20deg.</td>
</tr>
<tr>
<td>Amplitude imbalance at balanced port</td>
<td>0±2 dB</td>
</tr>
<tr>
<td>Insertion loss</td>
<td>2.6dB max.</td>
</tr>
<tr>
<td>Temperature range</td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td>–40 to +85°C</td>
</tr>
<tr>
<td>Storage</td>
<td>–40 to +85°C</td>
</tr>
<tr>
<td>Packaging style and quantities</td>
<td>2000 pieces/reel</td>
</tr>
</tbody>
</table>

- Conformity to RoHS Directive: This means that, in conformity with EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

- All specifications are subject to change without notice.
FREQUENCY CHARACTERISTICS
Unbalance 50Ω/Balance 200Ω

RETURN LOSS

INSERTION LOSS

AMPLITUDE BALANCE

PHASE BALANCE

All specifications are subject to change without notice.
Multilayer Chip Baluns
For DVB-H/ISDB-T

HHM Series HHM1591D1

SHAPES AND DIMENSIONS

CIRCUIT DIAGRAM

RECOMMENDED PC BOARD PATTERNS

ELECTRICAL CHARACTERISTICS

- Conformity to RoHS Directive: This means that, in conformity with EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

- All specifications are subject to change without notice.
FREQUENCY CHARACTERISTICS
Unbalance 50Ω/Balance 200Ω

RETURN LOSS

INSERTION LOSS

AMPLITUDE BALANCE

PHASE BALANCE

All specifications are subject to change without notice.
Multilayer Chip Baluns
For DVB-H/ISDB-T

HHM Series HHM1589E1

SHAPES AND DIMENSIONS

CIRCUIT DIAGRAM

RECOMMENDED PC BOARD PATTERNS

ELECTRICAL CHARACTERISTICS

Unbalanced impedance 50Ω
Balanced impedance 200Ω
Frequency range 350 to 470MHz
Unbalanced port return loss 9.54dB min.
Phase imbalance at balanced port 180±10deg.
Amplitude imbalance at balanced port 0±1.0dB
Insertion loss 1.5dB max.
Temperature range
   Operating −40 to +85°C
   Storage −40 to +85°C
Packaging style and quantities 2000pieces/reel

Conformity to RoHS Directive: This means that, in conformity with EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

All specifications are subject to change without notice.
FREQUENCY CHARACTERISTICS
Unbalance 50Ω/Balance 200Ω

RETURN LOSS

INSERTION LOSS

AMPLITUDE BALANCE

PHASE BALANCE

All specifications are subject to change without notice.