

# BHW Technologies (博泓微科技有限公司)



Advanced RF IC, Antenna, Filter, RF Front-End  
and Wireless System Solutions

## BHW AppNote #027

Multi-Band High-Accuracy GNSS Solutions Using BHWP150  
DFN1x1 Ultra-Compact Power Divider & Combiner

Rev. 1.0, 6/27/2021

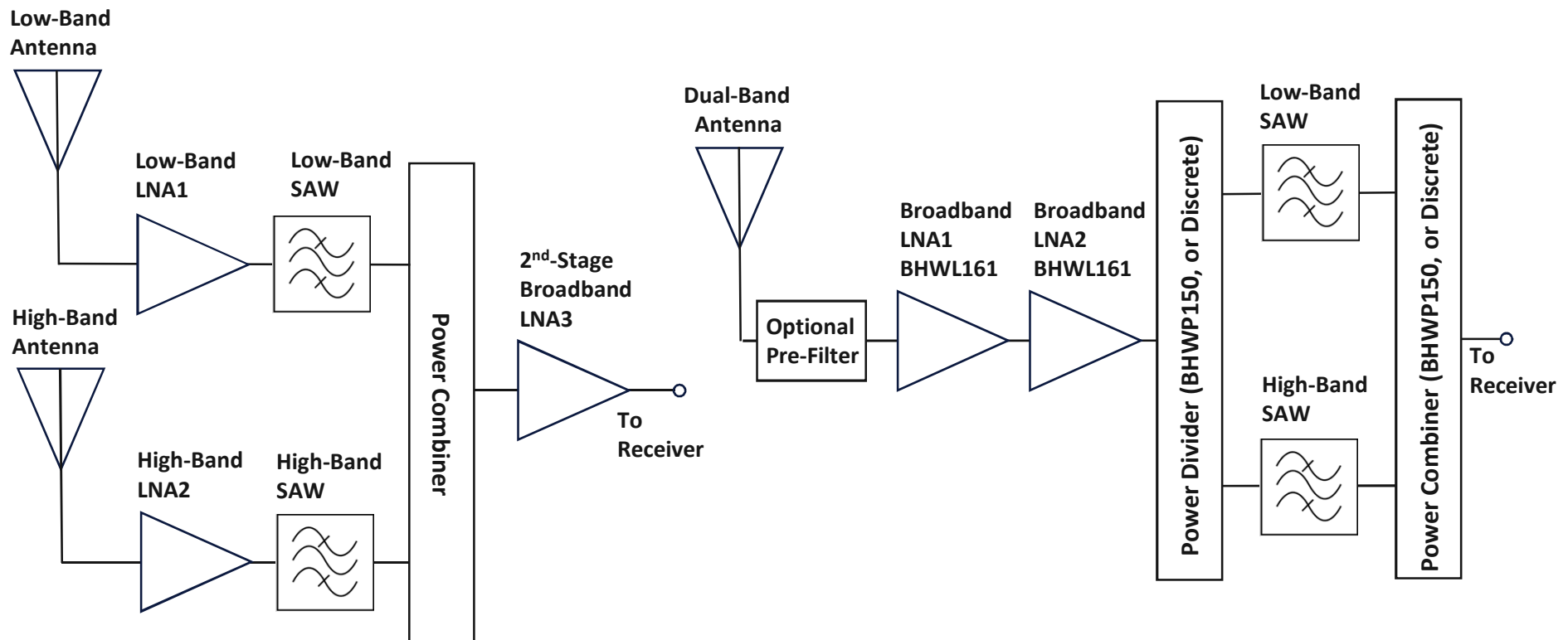
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# RF Front-End Topologies for Multi-Band GNSS



**Conventional Topology A  
Dual-Antenna/Dual-LNA**

**BHW Proposal Topology B  
Single-Antenna/Broadband-LNA**



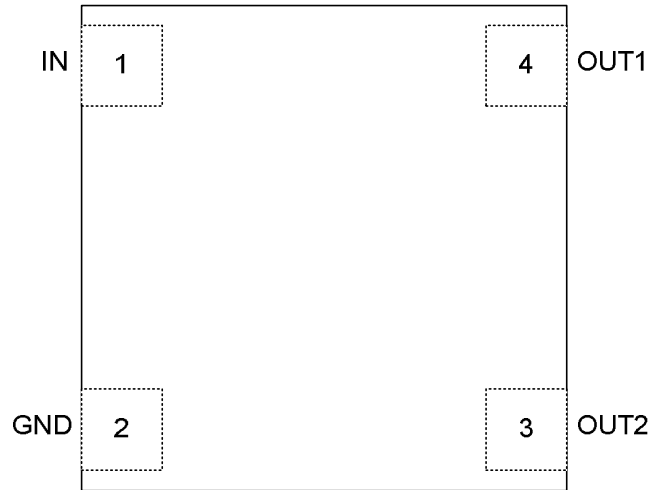
**Notes:**

- Most current dual-band GNSS designs use Topology A, based on separate antennas and LNAs for low and high band
- Dual/Multi-Band GNSS receiver with broadband antenna and LNA (Topology B) has huge size and cost advantages over dual-antenna/ dual-LNA based topology
- Full-band all-constellation LNAs with state-of-art RF performance are available today, such as BHWL160 & BHWL161
- Concerns over potential interference/desensitization for broadband design is address by high input P1dB/IIP3 of the LNA
- Topology B takes full advantage of BHWL160/L161's broadband, low-NF, moderate gain and outstanding IIP3 to enable multi-band GNSS LNBs (Low Noise Block) with best system NF and IIP3 at minimal device count, power, and BOM cost
- An optional double-notch pre-filter can be added between the antenna and LNA to further improve anti-jamming capability of the GNSS system significantly, while causing only very minor degradation in C/N0 and TTFF from cold start
- **Power Dividing/combining functions associated with dual/multi-band GNSS can be provided by BHWP150 in ultra-compact 1x1mm DFN**

# BHWP150 Power Divider/Combiner in DFN1x1

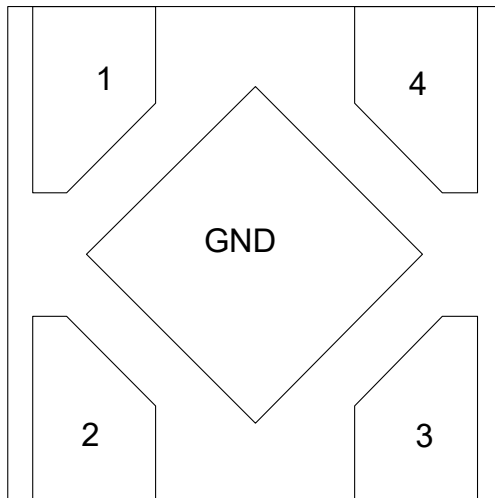


## Functional Block Diagram

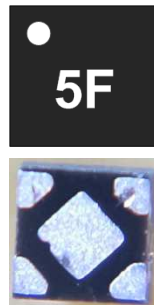


## Package Pin-Out

(Top "See-Through" View)



DFN-4L 1.0x1.0x0.45mm



## Product Overview:

- Broadband Operation from 800~2500MHz
- Support Full-Band GNSS 1165~1610MHz
- Low Insertion Loss ~0.5dB in GNSS Bands
- No External Isolation Resistor Required on PCB
- Zero External Matching Components for GNSS
- Ultra-Compact 1.0x1.0mm DFN-4L Package
- Relaxed Pin Pitch 0.65mm for Easy PCB Assembly

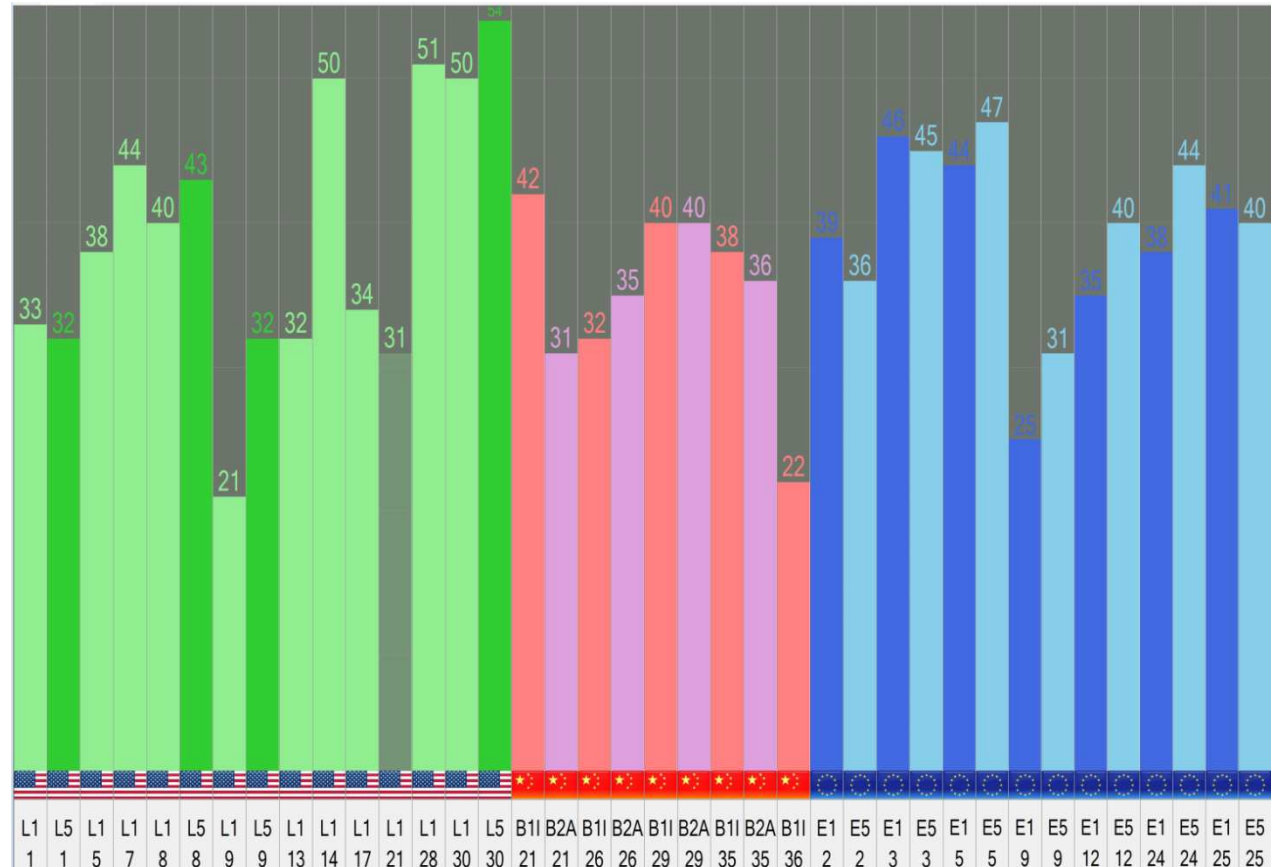
## Applications:

- Multi-Band, Multi-Constellation GNSS
- Post-LNA Power Divider for Dual-Channel SAW Implementation
- Post-SAW Power Combiner for Interface with GNSS SoC with Single RF Port
- Alternative to Dual-SAW Filter for Specific Applications (e.g. L2 Support, RFI Rejection)
- Other Power Divider/Combiner Applications from Sub-1GHz to 2.5GHz

# BHWP150 Power Divider/Combiner in DFN1x1



## Proof-of-Concept Test: Measured C/N0 for Full-Band GNSS Active Antenna



### Comments:

- C/N0 test results depend on several factors including sky clearance and satellite positions.
- Maximum C/N0 of 50~54dB was measured in L1, B1, L5, B2, E5 bands, depending on satellite positions during test.
- Antenna was placed on tripod with height ~1.5m above ground.
- Allstar Satrack was used for multi-constellation C/N0 measurement.

# BHW RF Front-End AppNote Library



In addition to standard datasheets and EVB/BOM info, BHW publishes an AppNote series that address various topics on RF front-end design and performance over a wide frequency range from 300MHz to 6GHz, as an effort to assist customers in developing cutting-edge, cost-competitive products:

- BHW AppNote #001 - Cross-Over Cascade of BHMW253 to Boost Tx Power and Rx Sensitivity of BLE and 2.4GHz IoT
- BHW AppNote #002 - Accurate Benchmark of GNSS CN0 Using the Power-Splitter Method
- BHW AppNote #003 - Boosting Wi-Fi Tx Power and Rx Sensitivity with BHWA251 and BHMW252
- BHW AppNote #004 - UHF 900MHz RF Front-End Solution Using BHWA251 Half-Watt PA and BHWL160 Sub-1dB-NF LNA
- BHW AppNote #005 - Sub-1GHz Applications of BHWA350 2-in-1 Wideband Fully Matched Amplifier
- BHW AppNote #006 - Low-Noise High-IIP3 LNB Architecture for Dual-Band High-Precision GNSS Using Cascade of BHWL160
- BHW AppNote #007 - UWB RF Front-End Solution Using BHWA350 and BHMW552
- BHW AppNote #008 - High-Power 5.8GHz RF Front-End Solution Using BHWA555 and BHMW552 for ETC, V2X and Wireless Video
- BHW AppNote #009 - 5.8GHz RF Front-End Using BHWA350 and BHMW552 for Wireless Audio
- BHW AppNote #010 - Multi-Constellation GNSS Active Antenna Using BHWL161 Cascade and Single-Fed Dual-Band Antenna
- BHW AppNote #011 - BHWL161 Super-Compact Low-Power Low Noise Amplifier for Range Extension of 2.4GHz BLE, RC and IoT
- BHW AppNote #012 - Enabling Cost-Effective High-Precision GNSS Using BHWL160 and Linear-Polarization PCB Antenna
- BHW AppNote #013 - GNSS Noise Floor vs Receiver Architecture
- BHW AppNote #014 - Designing Ultra Low-Power High-Performance GNSS Products Using BHWL160 GaAs PHEMT LNA
- BHW AppNote #015 - BHWL161 GNSS Full-Band High-Performance LNA in Super-Compact 1x1mm DFN with Relaxed Pin Pitch
- BHW AppNote #016 - Improving GNSS NF Measurement Accuracy Using Broadband LNA BHWL161 as Pre-Amp
- BHW AppNote #017 - High-Efficiency, Low-NF 2.4GHz Front-End Solution for BLE & IoT Using BHWA251 and BHMW252
- BHW AppNote #018 - Optimizing BHWA555 Wideband One-Watt PA for Long-Range 5.8GHz Transmitter Applications
- BHW AppNote #019 - Miniature 2.4GHz RF Front-End with Integrated Chip Antenna and BHMW253 for TWS and IoT
- BHW AppNote #020 - Multiplying the Range for BLE Music Streaming with BHWL250L Active Integrated Antenna (AiA)
- BHW AppNote #021 - Range Extension for 2.4GHz Systems with BHWA251 PA and BHWL250M Active Integrated Antenna (AiA)
- BHW AppNote #022 - Enabling Long-Range BLE AoA & AoD for High-Precision Indoor Positioning with BHWL250N RF AiA
- BHW AppNote #023 - Extend the Range for 5.8GHz Audio/Video Streaming with BHWL580M Active Integrated Antenna (AiA)
- BHW AppNote #024 - Improving 5.8GHz Radio Link Budget with BHWL580L Active Integrated Antenna (AiA)
- BHW AppNote #025 - Improving Range and Throughput of 2.4GHz Wi-Fi with BHWL250 Array Antenna
- BHW AppNote #026 - Improving Range and Throughput of 5GHz Wi-Fi with BHWL550 Array Antenna
- BHW AppNote #027 - Multi-Band High-Accuracy GNSS Solutions Using BHWL150 DFN1x1 Ultra-Compact Power Divider & Combiner
- BHW AppNote #028 - Use BHMW252 Cascade to Extend Range of 2.4GHz Wireless Systems with Single-Port SoCs

Contact [support@bhwrtechnologies.com](mailto:support@bhwrtechnologies.com) or BHW distributor/representative for your copy of the above and new up-coming documents.