BHW Technologies (博泓微科技有限公司)

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

BHW Application Note #007

UWB RF Front-End Solution Using BHWA350 and BHWM552

Rev. 1.3

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Background: UWB for High-Precision RTLS

Background & Challenges:

- **Based on IEEE 802.15.4z Standard, Ultra Wideband (UWB) Technology Provides Decimeter-Level Precision Positioning Capabilities, both Indoor and Outdoor, Enabling Key Applications such as Real Time Location Services (RTLS)**
- **UWB Operates in Several 500MHz/1GHz Channels in the 3~7GHz Frequencies Bands, Providing Four Data Rates from 110 kbps to 27 Mbps**
- **Both Antennas and RF Front-Ends (PA/LNA/Switch) Capable of Wideband Operation over 500MHz~1GHz Bandwidth are Critical for Successful Deployment of UWB Systems**

UWB Frequency Channels

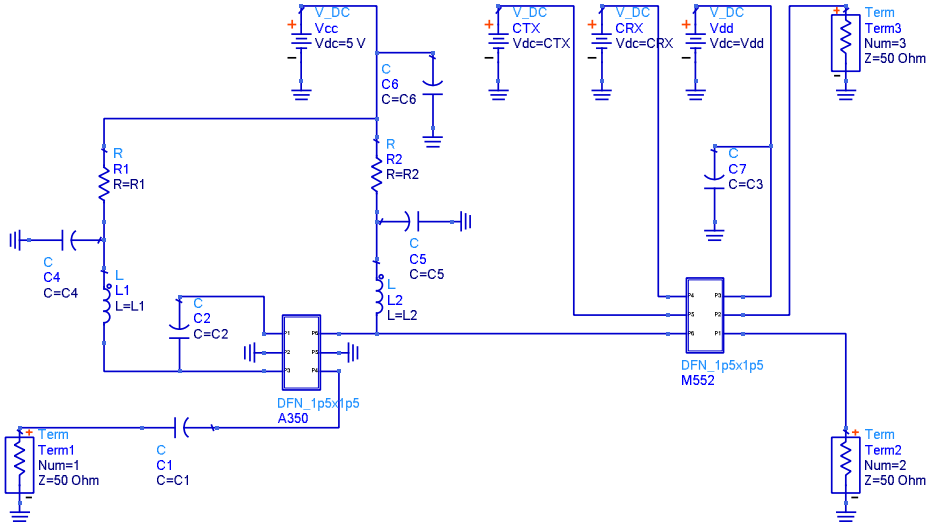
UWB Channel Number	Centre Frequency (MHz)	Band (MHz)	Bandwidth (MHz)
1	3494.4	3244.8 – 3744	499.2
2	3993.6	3744 – 4243.2	499.2
3	4492.8	4243.2 – 4742.4	499.2
4	3993.6	3328 – 4659.2	1331.2*
5	6489.6	6240 – 6739.2	499.2
7	6489.6	5980.3 – 6998.9	1081.6*

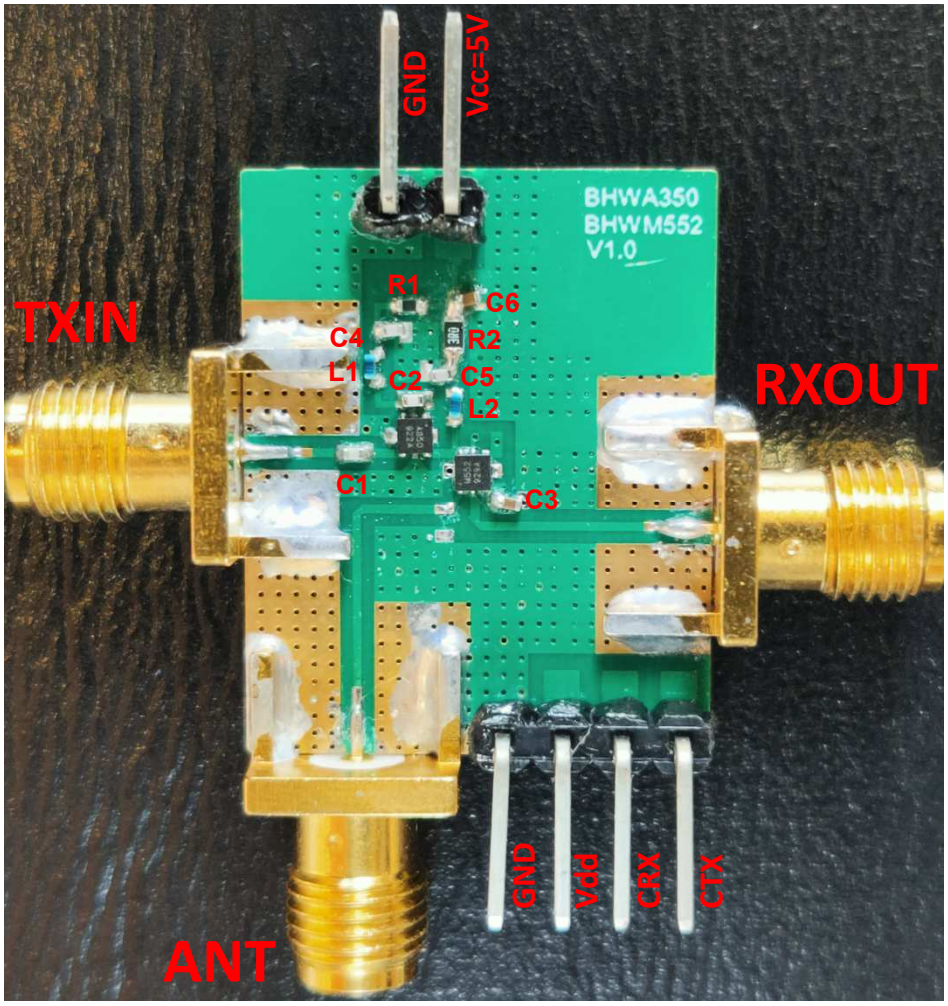
Source: Decawave DW1000.

This AppNote Introduces a Complete UWB RF Front-End Solution Based on BHWA350 PA and BHWM552 Rx Front-End IC, which Delivers up to ~17dBm Tx Power and 1.6dB NF in the UWB B2 Band. Support to Other UWB Bands is Available Upon Request.

BHWA350 & M552 Combo Breadboard

Application Schematic



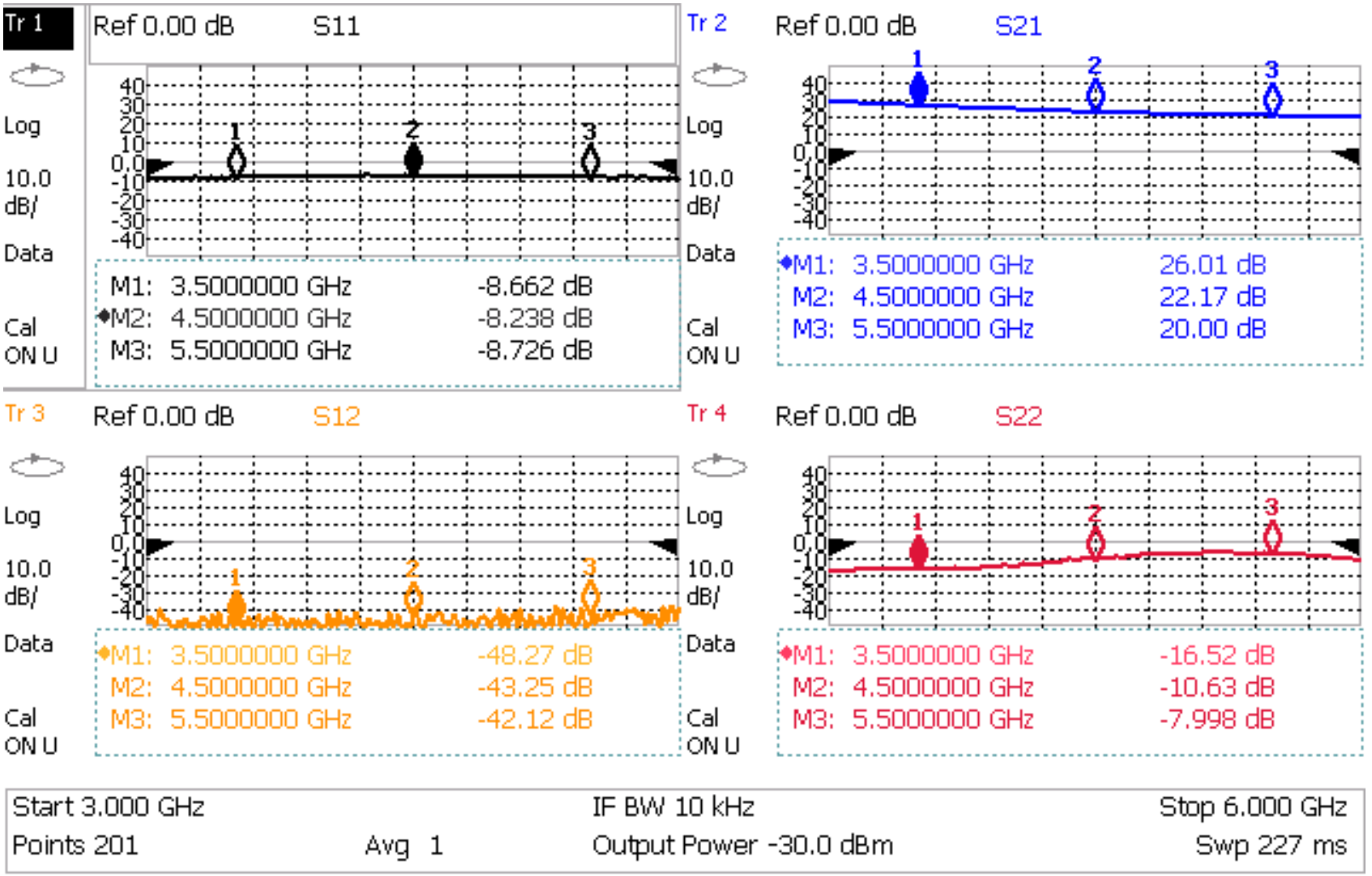


Recommended BOM for UWB B2 (3744-4243.2MHz):

- C1=C2=10pF, C3=1uF, C4=C5=100pF, C5=1uF
- L1=L2=8.2nH
- R1=68 Ohm, R2=3 Ohm

- BHWA350 cascade provides ~18dBm maximum power and ~20dB gain at 5.8GHz at Vcc=5V
- BHWM552 provides ~0.8dB insert loss in Tx mode, resulting in ~17dBm Tx power at antenna
- BHWM552 provides ~1.6dB noise figure at antenna, with ~10dB Rx gain in the 5-6GHz band

BHWA350 & M552 Combo: Tx S-Parameters



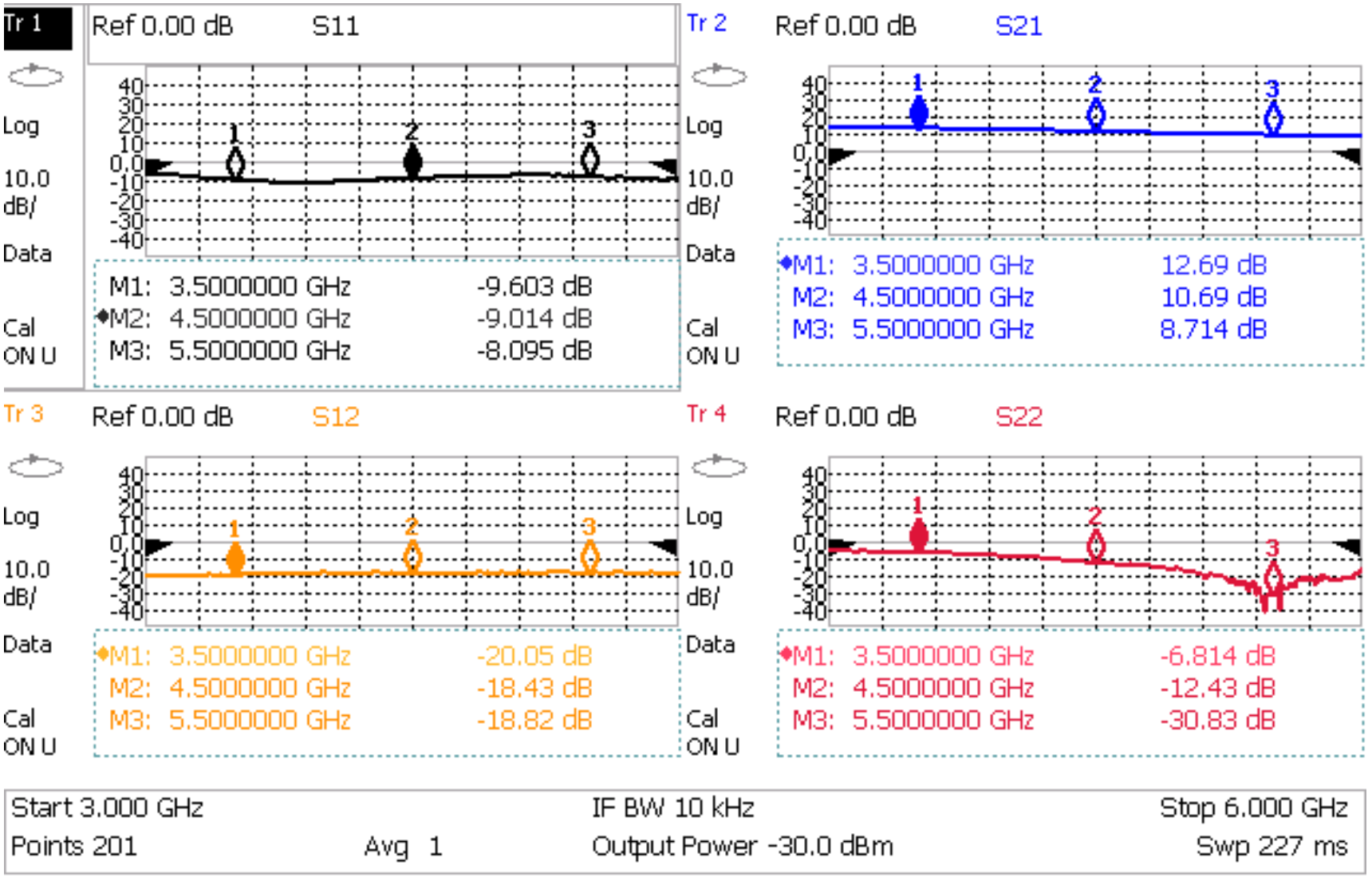
Notes:

-BHWA350 DC Bias: Vcc=5V, Icq~76mA

-BHWM552 DC Bias: Vdd=CTX=3.3V, CRX=0

-Measured data includes SMA connector/adapter and PCB feedline losses (estimated total ~0.4dB at 5.8GHz)

BHWA350 & M552 Combo: Rx S-Parameters



Notes:

-BHWM552 DC Bias: Vdd=CRX=3.3V, CTX=0, Idq~14mA

-Measured data includes SMA connector and PCB feedline losses (estimated total ~0.4dB at 5.8GHz)

BHW RF Front-End AppNote Library

This is an abridged version of BHW AppNote #007. Please contact BHW Support or your local sales rep/distributor for a complete copy of the document and other related information.

BHW RF Front-End Solutions 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 BHWM253 to Boost Tx Power and Rx Sensitivity of 2.4GHz Systems
- 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 BHWM252
- 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 BHWM552
- BHW AppNote #008 - High-Power 5.8GHz RF Front-End Solution Using BHWA555 and BHWM552 for ETC, V2X and Wireless Video
- BHW AppNote #009 - 5.8GHz RF Front-End Using BHWA350 and BHWM552 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 RC and IoT
- BHW AppNote #012 - Enabling Cost-Effective High-Precision GNSS Using BHWL161 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 IoT Using BHWA251 and BHWM252
- 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 BHWM253 for TWS and IoT
- BHW AppNote #020 - Multiplying the Range for 2.4GHz Music Streaming with BHWR250L Active Integrated Antenna (AiA)
- BHW AppNote #021 - Range Extension for 2.4GHz Wireless Systems with BHWR250M Active Integrated Antenna (AiA)
- BHW AppNote #022 - Enabling Long-Range Angle-of-Arrival for High-Precision Indoor Positioning with BHWR250N RF AiA
- BHW AppNote #023 - Extend the Range for 5.8GHz Audio/Video Streaming with BHWR580M Active Integrated Antenna (AiA)
- BHW AppNote #024 - Improving 5.8GHz Radio Link Budget with BHWR580L Active Integrated Antenna (AiA)
- BHW AppNote #025 - Improving Range and Throughput of 2.4GHz Wi-Fi with BHWR250 Array Antenna
- BHW AppNote #026 - Improving Range and Throughput of 5GHz Wi-Fi with BHWR550 Array Antenna
- BHW AppNote #027 - Multi-Band High-Accuracy GNSS Solutions Using BHWP150 DFN1x1 Ultra-Compact Power Divider & Combiner
- BHW AppNote #028 - Use BHWM252 Cascade to Extend Range of 2.4GHz Wireless Systems with Single-Port SoCs
- BHW AppNote #029 - Improving Range of 2.4GHz Wireless Microphones and Audio Systems with BHWR250A Active Integrated Antenna (AiA)
- BHW AppNote #030 - Simultaneous Improvement in Range and Battery Life of 2.4GHz Wireless Systems with BHWR250M AiA

Contact support@bhwtechnologies.com or BHW distributors/representatives for your copy of the above and new up-coming documents.