

# **WUB1900RM Operational Description**

## **RTL8188SU-GR SINGLE-CHIP IEEE 802.11b/g/n 1T1R WLAN CONTROLLER WITH USB 2.0 INTERFACE**

### **General Description**

The Realtek RTL8188SU-GR is a highly integrated single-chip Wireless LAN (WLAN) USB 2.0 network interface controller compatible with the IEEE 802.11n Draft specification 2.0. It combines a MAC, a 1T1R capable baseband, and RF in a single chip. The RTL8188SU-GR provides a complete solution for a high-performance wireless client.

The RTL8188SU-GR baseband implements Multiple Input, Multiple Output (MIMO) Orthogonal Frequency Division Multiplexing (OFDM) with one transmit and one receive path (1T1R). Features include one spatial stream transmission, short Guard Interval (GI) of 400ns, spatial spreading, and support for both 20MHz and 40MHz channel bandwidth.

For legacy compatibility, Direct Sequence Spread Spectrum (DSSS), Complementary Code Keying (CCK) and OFDM baseband processing are included to support all IEEE 802.11b, and 802.11g data rates. Differential phase shift keying modulation schemes, DBPSK and DQPSK with data scrambling capability are available, and CCK provides support for legacy data rates, with long or short preamble. The high speed FFT/IFFT paths, combined with BPSK, QPSK, 16QAM, and 64QAM modulation of the individual subcarriers, and rate compatible punctured convolutional coding with coding rate of 1/2, 2/3, 3/4, and 5/6, provide higher data rates of 54Mbps and 150Mbps for IEEE 802.11g and 802.11n OFDM respectively.

The RTL8188SU-GR builds in an enhanced signal detector, an adaptive frequency domain equalizer, and a soft-decision Viterbi decoder to alleviate severe multi-path

effects and mutual interference in the reception of multiple streams. Robust interference detection and suppression are provided to protect against. Bluetooth , cordless phone, and microwave oven interference.

Efficient IQ-imbalance, DC offset, phase noise, frequency offset, and timing offset compensations are provided for the radio frequency front-end. Selectable digital transmit and receive FIR filters are provided to meet transmit spectrum mask requirements and to reject adjacent channel interference, respectively.

The RTL8188SU-GR supports fast receiver Automatic Gain Control (AGC) with synchronous and asynchronous control loops among antennas, antenna diversity functions, and adaptive transmit power control functions to obtain better performance in the analog portions of the transceiver.

The RTL8188SU-GR MAC supports 802.11e for multimedia applications, 802.11i for security, and 802.11n for enhanced MAC protocol efficiency. Using packet aggregation techniques such as A-MPDU with BA and A-MSDU, protocol efficiency is significantly improved. Power saving mechanisms such as Legacy Power Save and U-APSD reduce power wasted during idle time, and compensate for the extra power required to transmit OFDM. The RTL8188SU-GR provides simple legacy and 20MHz/40MHz

## **Features**

### **General**

CMOS MAC, Baseband PHY and RF in a single chip for IEEE 802.11b/g/n compatible WLAN

72.2Mbps receive PHY rate and 72.2Mbps transmit PHY rate using 20MHz bandwidth

150Mbps receive PHY rate and 150Mbps transmit PHY rate using 40MHz bandwidth

Compatible with 802.11n draft 2.0 specification

Backward compatible with 802.11b/g devices while operating at 802.11n data rates

### **Host Interface**

Complies with USB 2.0

### **Standards Supported**

IEEE 802.11b/g/n compatible WLAN

IEEE 802.11e QoS Enhancement (WMM)

IEEE 802.11i (WPA, WPA2). Open, shared key, and pair-wise key authentication services

Cisco Compatible Extensions (CCX4)

### **MAC Features**

Frame aggregation for increased MAC efficiency (A-MSDU, A-MPDU)

Low latency immediate High-Throughput Block Acknowledgement (HT-BA)

Long NAV for media reservation with CF-End for NAV release

PHY-level spoofing to enhance legacy compatibility

Power saving mechanism

Channel management and co-existence

Multiple BSSID feature allows the RTL8188SU-GR to assume multiple MAC identities when used as a wireless bridge

Supports Wake-On-WLAN via Magic Packet and Wake-up frame

Transmit Opportunity (TXOP) Short Inter-Frame Space (SIFS) bursting for higher multimedia bandwidth

### **Peripheral Interfaces**

Complies with USB Specification 2.0

Supports Full-speed (12Mbps) and High-speed (480Mbps)

General Purpose Input/Output (8 pins)

4-wire EEPROM control interface (93C46)

Two configurable LED pins

Configurable Bluetooth Coexistence Interface

### **PHY Features**

IEEE 802.11n draft 2.0 OFDM

One Transmit and one Receive path (1T1R)

20MHz and 40MHz bandwidth transmission

Short Guard Interval (400ns)

DSSS with DBPSK and DQPSK, CCK modulation with long and short preamble

OFDM with BPSK, QPSK, 16QAM, and 64QAM modulation. Convolutional Coding  
Rate: 1/2, 2/3, 3/4, and 5/6

Maximum data rate 54Mbps in 802.11g, and 150Mbps in 802.11n Switch diversity for  
DSSS/CCK

Hardware antenna diversity

Selectable digital transmit and receive FIR filters

Programmable scaling in transmitter and receiver to trade quantization noise  
against increased probability of clipping

Fast receiver Automatic Gain Control (AGC)

On-chip ADC and DAC

## Diagrams

### 11n Compatible Single-Band 1x1 RF Application

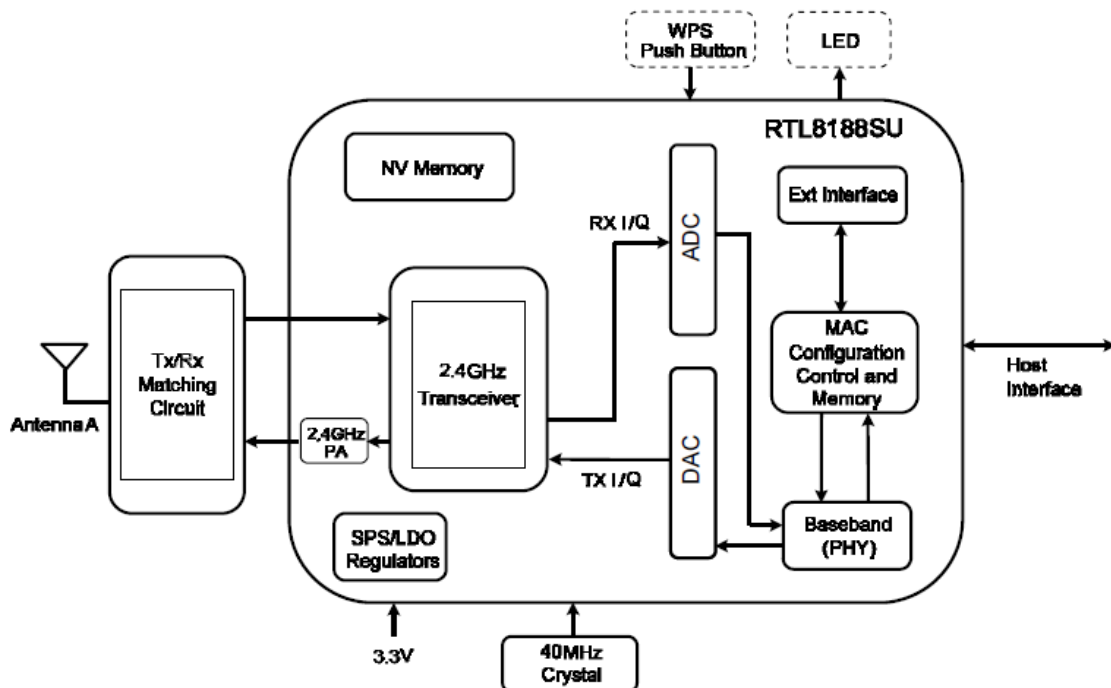


Figure 1. 11n Compatible Single-Band 1x1 Solution – RTL8188SU-GR (11n 1x1 MAC/BB/RF + PA)