![Realtek logo]

RTL8771B(W/F)

SINGLE-CHIP MULTI-STANDARD GNSS RECEIVER

DRAFT DATASHEET
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DISCLAIMER

TRADEMARKS

USING THIS DOCUMENT

This document is intended for the software engineer's reference and provides detailed programming information.

Though every effort has been made to ensure that this document is current and accurate, more information may have become available subsequent to the production of this guide.

REVISION HISTORY

Revision	Release Date	Summary
0.5	2017/04/06	First release.

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1. General Description

The RTL8771B(W/F) is a high-performance GNSS single chip that supports a multi-standard (GPS/ BeiDou/GLONASS) positioning solution. The RTL8771B(W/F) includes on chip RF, baseband, and RISC CPU. The RTL8771B(W/F) achieves high-performance low-SNR tracking/acquisition sensitivity, and fast Time-to-First-Fix (TTFF). The RTL8771B(W/F) supports up to 210 PRN channels, including 22 simultaneous tracking channels.

The RTL8771B(W/F) also provides various navigation applications including SBAS/DGPS (WAAS, MSAS, EGNOS, GAGAN, etc.) and AGPS, which speeds the positioning time. An always-on backed-up memory and a real time clock are provided to accelerate acquisition at system restart up.

With an on-chip integrated LNA, RTL8771B(W/F) delivers a total receiver noise figure of 2.6 dB (before ADC). RTL8771B(W/F) has on chip regulators easily integrated into your system without extra voltage regulator. The crystal supporting feature allows users to implement low-cost design circuit with minimum BOM cost.

With an embedded 32-bits RISC controller running at 87/43.5MHz, the system performs time-critical processes, including data decoding and positioning. The real-time operating system also allows for efficient task scheduling.

The RTL8771B(W/F) offers an RS-232 data port and I2C interface for data exchange. The configurable RS-232 interface enables use of a higher data rate to send more data, as well as National Marine Electronics Association (NMEA) packets. Standard pre-defined HCI commands make the RTL8771B(W/F) easy and flexible to configure.

A time mark pulse of 1PPS is generated by the RTL8771B(W/F), which is synchronized with GPS time. A General-purpose IO configured as Position-Fixed indicator allows customer to implement system functions. The general-purpose IO with power-on trap functions allows for easier system configuration.

The difference between RTL8771BW with RTL8771BF is the extra MCM flash mounted on the RTL8771BW chip core. The MCM flash provides the flexibility for further user request, such as data logging function, modification for binary GNSS message, etc.

2. Features

General

- 22 tracking/210 PRN-channel GNSS Receiver

- Multi-standard GPS/BeiDou/GLONASS navigation system supported

- SBAS supported (at user request)

- AGPS supported (at user request)

- Supports TCXO

- Update rate of 1/2/5/10Hz

Reference Oscillator

- TCXO

- Frequency 26MHz

- Frequency maximum error: +/-2.5ppm

RF Configuration

- 5-bit IF I/Q signal

- RF Integrated in single chip

MIPS Compatible CPU

- 87/43.5MHz processor clock

- Supports MIPS16 instructions

Host Interface

- UART

- I2C

NMEA

- NMEA 0183 standard (compatible to version 4.10)

Package

- 32-pin 4mmx4mm QFN
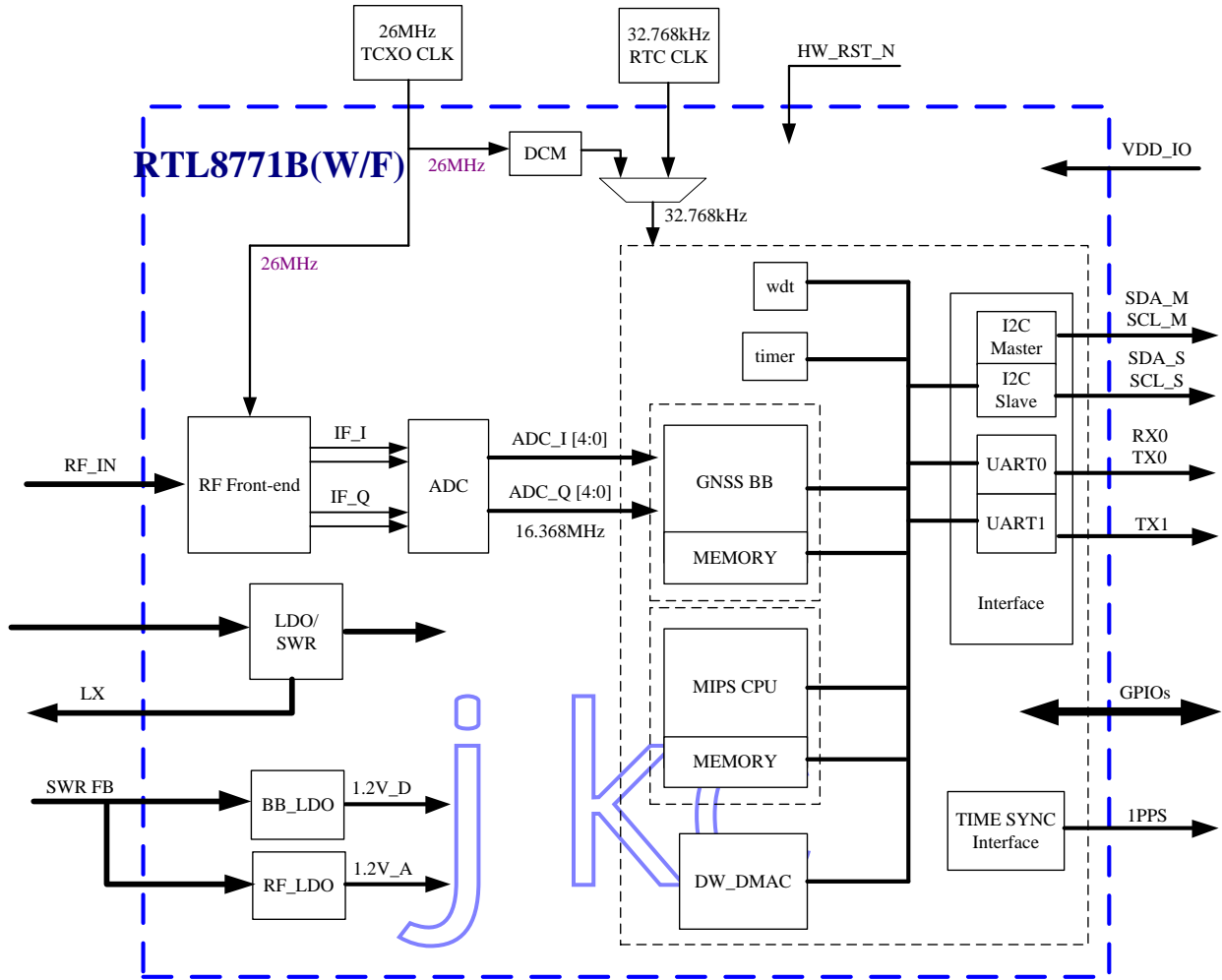
3. Block Diagram

Figure 1. Block Diagram

4. Pin Assignments
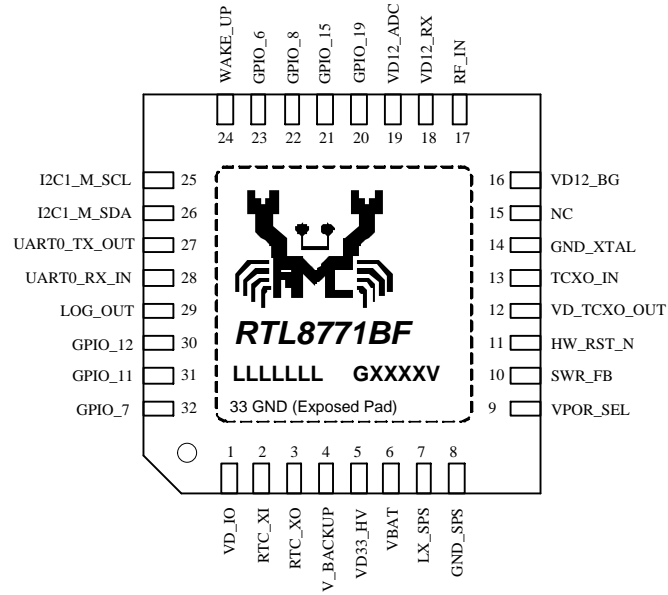
Figure 2. Pin Assignments

4.1. Package Identification

Green package is indicated by the 'G' in GXXXXV (Figure 2).
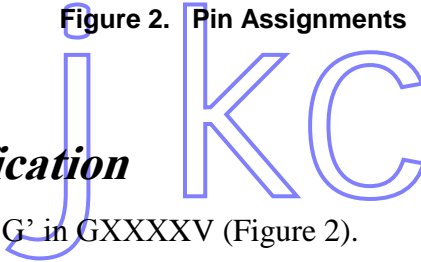
5. Pin Descriptions

The following signal type codes are used in the tables:

I: Input   O: Output

P: Power

5.1. Power-On Trap Pins

Table 1. Power-On Trap Pins

Symbol	Type	Pin No	Description
GPIO_12	I	30	0: AVDD_TCXO_OUT = 1.8V
GPIO_7	I	32	0: Internal LDO select 1: Internal SWR select
LOG_OUT/GPIO_9	I	29	0: Internal RTC clock select 1: External RTC clock select

5.2. RF Interface

Table 2. RF Interface

Symbol	Type	Pin No	Description
RF_IN	I	17	RF input

5.3. Enable and Wakeup

Table 3. Enable and Wakeup

Symbol	Type	Pin No	Description
HW_RST_N	I	11	Enable chip
WAKE_UP	I	24	Wakeup chip

5.4. Clock and Other Pins

Table 4. Clock and Other Pins

Symbol	Type	Pin No	Description
TCXO_IN	I	13	TCXO input
RTC_XI	I	2	RTC(32.768kHz) XI
RTC_XO	O	3	RTC (32.768kHz) XO
VPOR_SEL	I	9	0: Turn off VBAT LDO 1: Turn on VBAT LDO

5.5. Power Pins

Table 5. Power Pins

Symbol	Type	Pin No	Description
VD_IO	P	1	VDD (1.8~3.3V) for IO
VD33_HV	P	5	VBAT LDO output (if VPOR_SEL is high) 3.3V power input (if VPOR_SEL is low)
VBAT	P	6	Regulator input
V_BACKUP	P	4	Backup battery supply
SWR_FB	P	10	Regulator feedback pin
VD_TCXO_OUT	P	12	VDD 1.8V output for TCXO
VD12_BG	P	16	VDD 1.2V for Bandgap
VD12_ADC	P	19	VDD 1.2V for ADC
VD12_RX	P	18	VDD 1.2V for RX

5.6. Ground Pins

Table 6. Ground Pins

Symbol	Type	Pin No	Description
GND_SPS	G	8	Ground
GNS_XTAL	G	14	Ground
E-pad	G	33	Exposed ground

5.7. *GPIO Pins*

Table 7.   GPIO Pins

Symbol	Type	Pin No	Description
GPIO_19/LNA_EN	IO	20	GPIO (input/output)
GPIO_15/LNA_EN	IO	21	External LNA enable
GPIO_8/CLK_REQ_IN	I	22	GPIO (input only)
GPIO_6/1PPS	IO	23	GPIO (1PPS/TSYNC)
I2C1_M_SCL/GPIO_1	IO	25	Master I2C clock
I2C1_M_SDA/GPIO_0	IO	26	Master I2C data
UART0_TX_OUT/GPIO_3	O	27	Uart0 TX output
UART0_RX_IN/GPIO_2	I	28	Uart0 RX input
GPIO_12	O	30	Programmable signal for position fixed
GPIO_11	O	31	GPIO (output only)
GPIO_7	O	32	GPIO (output only)
LOG_OUT/GPIO_9	O	29	Log output

6. Electrical and Thermal Characteristics

6.1. Temperature Limit Ratings

Table 8. Temperature Limit Ratings

Parameter	Minimum	Maximum	Units
Storage Temperature	-55	+125	°C
Ambient Operating Temperature	-40	+85	°C
Junction Temperature	-40	125	°C

6.2. Power Supply DC Characteristics

Table 9. Power Supply DC Characteristics

Symbol	Parameter	Minimum	Typical	Maximum	Units
VBAT	VBAT supply voltage	2.60	3.3	5.25	V
VDD_IO	IO supply voltage	1.62	3.3	3.63	V
VBK	Backup Voltage	1.62	3.0	3.63	V
IBK	Backup Current		9		uA

6.3. Digital IO Pin DC Characteristics

Table 10. Digital IO Pin DC Characteristics

Symbol	Parameter	Minimum	Normal	Maximum	Units
V_{IH}	Input high voltage	VDD_IO	3.3	VDD_IO	V
V_{IL}	Input low voltage	VDD_IO	0	VDD_IO	V
V_{OH}	Output high voltage	VDD_IO	-	VDD_IO	V
V_{OL}	Output low voltage	VDD_IO	-	VDD_IO	V

6.4. Power Consumption

6.4.1. GPS Mode Power Consumption

Table 11. GPS Mode Power Consumption

Symbol	Parameter	Condition	Minimum (SWR/LDO)	Normal (SWR/LDO)	Maximum (SWR/LDO)	Units
I_{total}	Total current under 3.3V	Acquisition	-	18.51	-	mA
		Tracking	-	15.99	-	mA

6.4.2. *GPS/BeiDou Mode Power Consumption*

Table 12. GPS/BeiDou Mode Power Consumption

Symbol	Parameter	Condition	Minimum (SWR/LDO)	Normal (SWR/LDO)	Maximum (SWR/LDO)	Units
I_total	Total current under 3.3V	Acquisition	-	24.51	-	mA
		Tracking	-	21.10	-	mA

6.4.3. *GPS/GLONASS Mode Power Consumption*

Table 13. GPS/GLONASS Mode Power Consumption

Symbol	Parameter	Condition	Minimum (SWR/LDO)	Normal (SWR/LDO)	Maximum (SWR/LDO)	Units
I_total	Total current under 3.3V	Acquisition	-	24.51	-	mA
		Tracking	-	23.51	-	mA

6.4.4. *Low Power Mode Power Consumption*

Table 14. Low Power Mode Power Consumption

Symbol	Parameter	Condition	Minimum	Normal	Maximum	Units
I_total	Total current under 3.3V	Walking mode Tracking	-	3.3	-	mA

6.5 *UART Interface Characteristics*

The RTL8771B(W/F) UART interface is a standard 4-wire interface with RX, TX, CTS, and RTS. The interface supports the UART HCI H4 and specifications. The default baud is 9.6 kbps. In order to support high and low speed baud , the RTL8771B(W/F) provides multiple UART clocks. The recommended baud rate settings are listed in the following table.

Table 14. UART Interface Power-On Timing Parameters

| Desired Baud	Actual Baud	Baud mismatch (%)
4800	4803	0.07%
9600	9607	0.07%
14400	14423	0.16%
19200	19214	0.07%
38400	38564	0.42%
57600	57846	0.43%
115200	115691	0.43%
1346000	1359375	0.1%
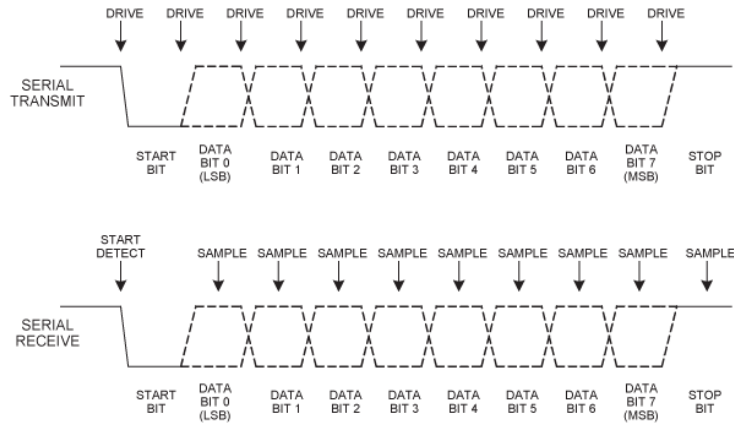
Figure 3.   UART Interface Waveform

The UART signal level ranges from 1.8V to 3.3V. The host provides the power source with the targeted power level to the RTL8771B(W/F) UART interface.

The 3.3V, 2.8V, and 1.8V DC characteristics of typical signal levels are shown in Table 10 Digital IO Pin DC Characteristics, page 8.

7. Mechanical Dimensions

Plastic Quad Flat No Lead Package 32 Leads 4x4mm^2 Outline

TOP VIEW

SIDE VIEW

BOTTOM VIEW

DETAIL : "A"
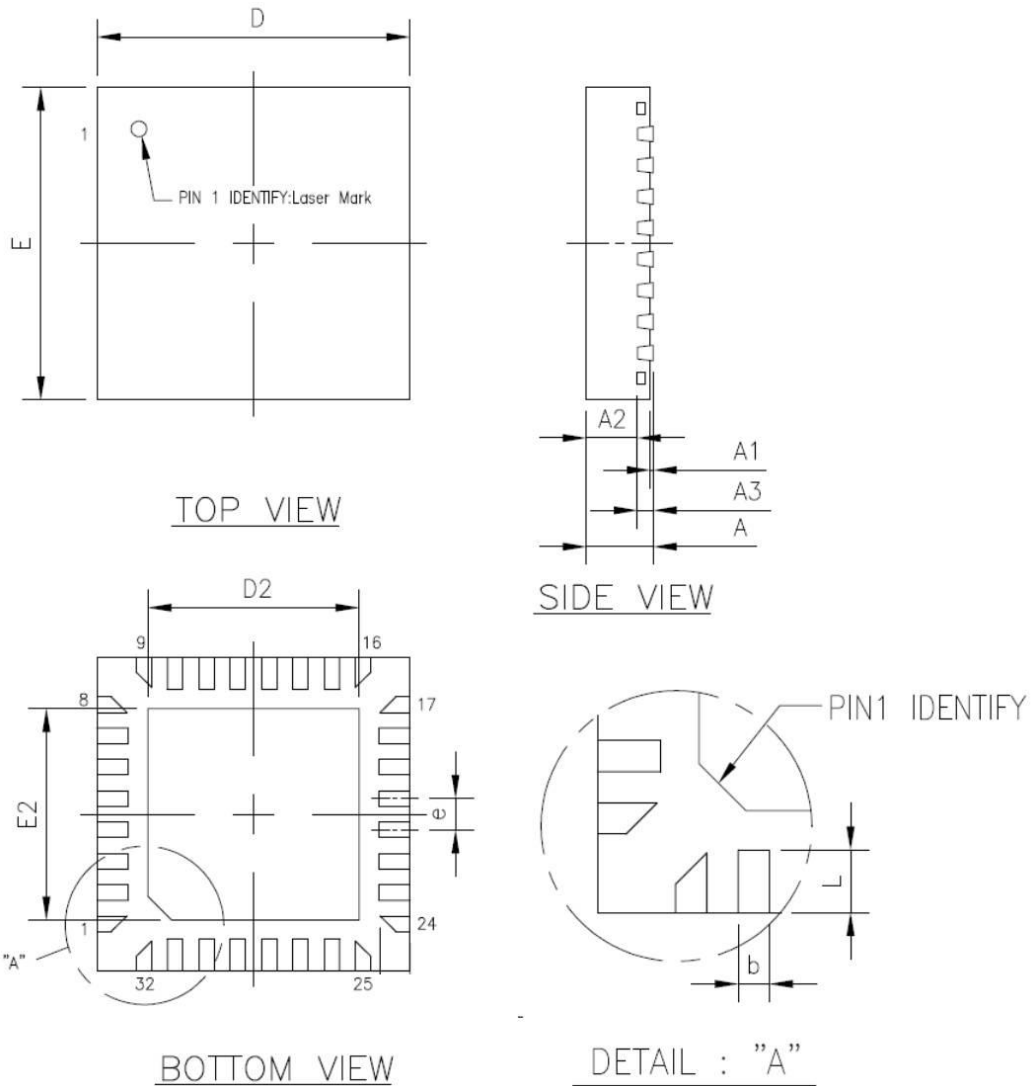
7.1. Mechanical Dimensions Notes

Symbol	Dimension in mm			Dimension in inch		
	Min	**Nom**	**Max**	**Min**	**Nom**	**Max**
A	0.80	0.85	0.90	0.031	0.033	0.035
A1	0.00	0.035	0.05	0.000	0.001	0.002
A2	-	0.65	0.70	-	0.026	0.028
A3	0.20 REF			0.008 REF		
b	0.15	0.20	0.25	0.006	0.008	0.010
D/E	4.00 BSC			0.157 BSC		
D2/E2	2.55	2.70	2.85	0.096	0.106	0.116
e	0.40 BSC			0.016 BSC		
L	0.25	0.35	0.45	0.01	0.014	0.018

Note 1: CONTROLLING DIMENSION: MILLIMETER (mm).
Note 2: REFERENCE DOCUMENT: JEDEC MO-220.

8. Ordering Information

Table 15. Ordering Information

Part Number	Package	Status
RTL8771B(W/F)	QFN-32, 'Green' Package	MP

Note: See page 4 for package identification.