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APN Content Level	BASIC	INTERMEDIATE	✓	ADVANCED	Confidentiality	Public	✓	Private	
Hardware Compatibility	Product Line	AirPrime	Series	WP75xx	WP76xx				
				WP77xx	WP8548				
Software Compatibility	ALL				Document Type	Application Note		Technical Note	✓

1 Version

These documents may be updated over their lifetime. To ensure you design with the correct version, please check [The Source](#) for latest versions.

2 Introduction

This document is provided to Sierra Wireless distributors and clients to aid more rapid development of embedded applications using the Sierra Wireless portfolio of cellular solutions. To request a new technical note, contact your regional Sierra Wireless Product Marketing Manager.

3 Overview

This document reuses the design of document [1] AirPrime AR758x Antenna Diagnosis Application Note, and is needed to validate and finalize a customer application.

4 RF_MAIN and RF_DIV Antenna Diagnostic

4.1 Schematic

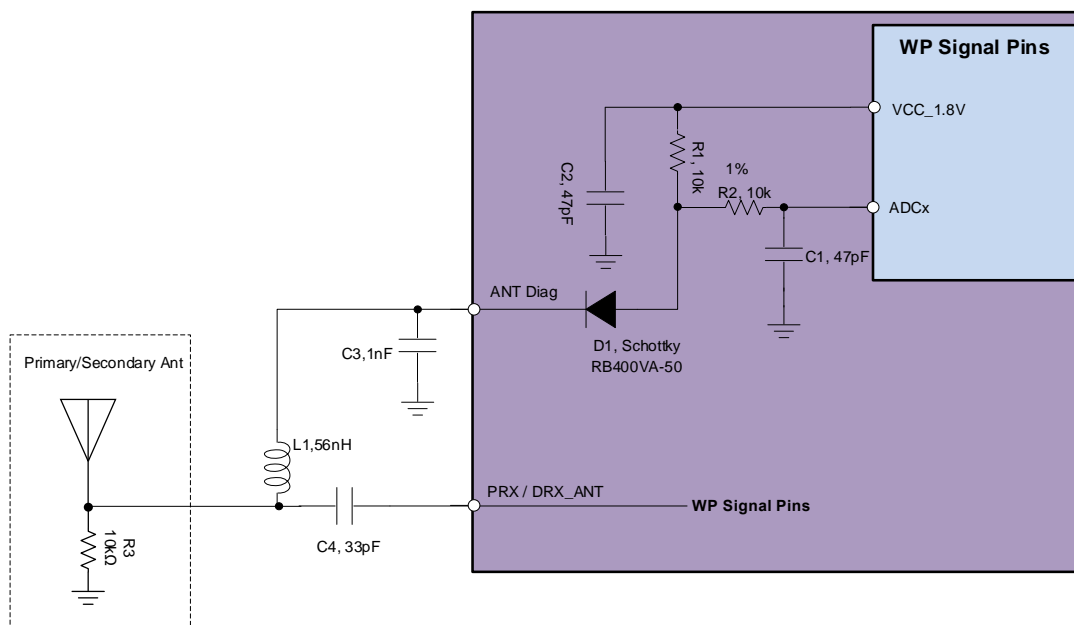


Figure 1. RF_MAIN and RF_DIV Antenna Diagnostic Schematic Diagram

4.2 Description

The RF_MAIN and RF_DIV antenna diagnostic feature allows the module to determine if the primary or secondary antenna connected to the module is open, shorted or normal. The antenna connected to this interface needs to have a DC resistance to ground of $10\text{ k}\Omega \pm 1\text{ k}$ embedded inside.

The 1V8 supply provides a DC current to the antenna resistor R3 through R1. The resulting voltage is measured using an ADC.

Three different antenna status must be determined on the customer application:

- Antenna is short circuited to ground,
- Antenna is normal, and
- Antenna is disconnected.

Table 1: WP75xx and WP8548 ADC Characteristics

	Minimum	Typical	Maximum	Units
ADC Voltage Range	0	0.9	1.8	Volts

Table 2: WP76xx and WP77xx ADC Characteristics

	Minimum	Typical	Maximum	Units
ADC0/1 Voltage Range	0.1	0.9	1.7	Volts
ADC2/3 Voltage Range	0	0.9	1.8	Volts

Predetermine the antenna resistance range for a particular antenna status and its corresponding ADC value limits on the customer application.

The following table can be used to fill in the minimum and maximum ADC voltage depending on customer application.

Table 3: Antenna Diagnostics Example

Antenna State	Minimum ADC Voltage	Maximum ADC Voltage	Antenna Resistance Range (example)
Short			$\sim \leq 7\text{ k}\Omega$
Normal			$7\text{ k}\Omega < x < 13\text{ k}\Omega$
Open			$\geq 13\text{ k}\Omega$

4.3 AT Command

The external ADC input can be determined using AT command **AT!MADC?x**. This command will then return the ADC value, 1784 (mV) for example.

Refer to document [2] AirPrime WPx5xx-76xx-77xx AT Command Reference for more information regarding this AT command.

5 RF_GNSS Antenna Diagnostic

5.1 Schematic

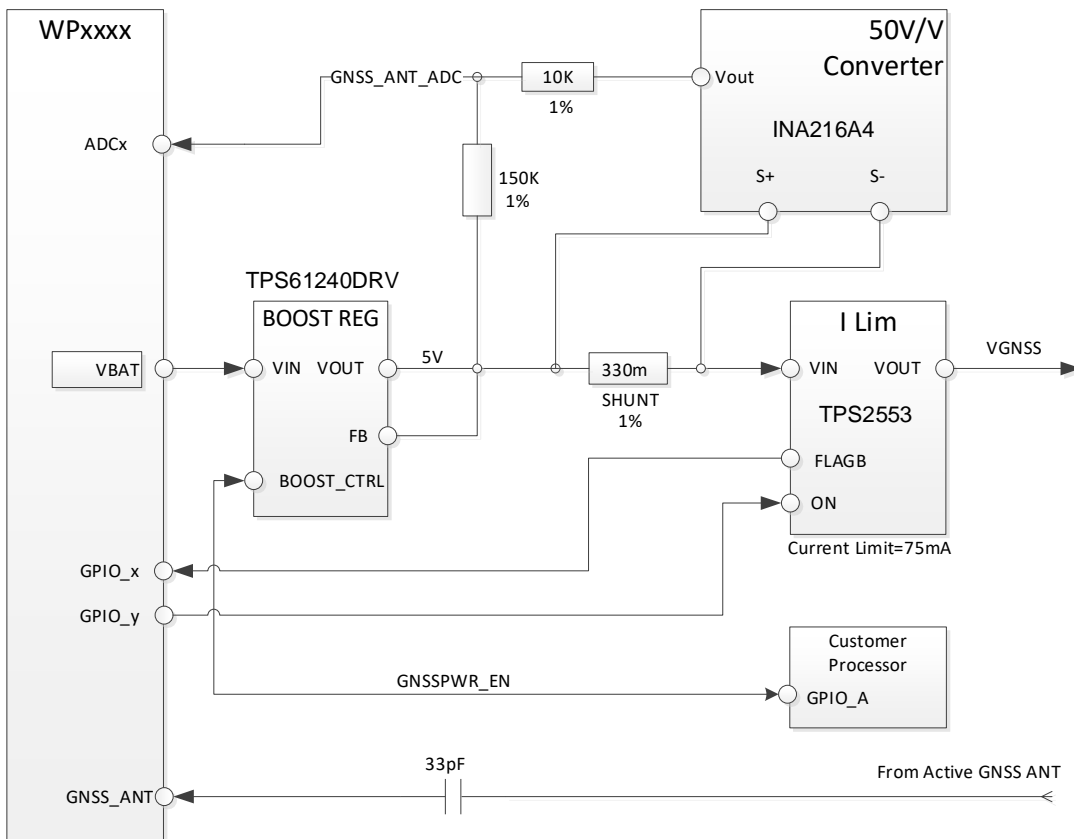


Figure 1. External GNSS Power Supply and Antenna Diagnostic Schematic Diagram

5.2 Description

The RF_GNSS antenna diagnostic feature measures the current drawn by an active GNSS antenna to determine the state of the antenna interface. Based on the current draw, an assessment of open, short, normal or over-current is made. If an over-current is detected, the bias for the active antenna is removed to eliminate the fault for drawing excess current which could potentially damage the antenna.

The GNSS antenna supply is powered from VBATT through a boost regulator.

Predetermine the limits between open/normal and normal/short antenna status on the customer application.

Table 4: GNSS Antenna Limits

ADC Value	<	openLim	< >	shortLim	>
GNSS Antenna State	Open		Normal		Short

Table 5: Suggested Antenna Diagnostics Values

Control	State	Minimum	Typical	Maximum	Units
HW	Over Current	50	75	100	mA
HW	Output Voltage		5		V

The following table can be used to fill in typical ADC values associated with key VGNSS_ANT current draw values.

Table 6: VGNSS_ANT Current Draw and Typical ADC Values

I (mA)	Typical
0	
5	
10	
15	
20	
25	
30	
35	
40	
45	
50	
55	
60	
65	
70	

6 Reference Documents

- [1] AirPrime AR758x Antenna Diagnosis Application Note
Reference number: 2174108
- [2] AirPrime WPx5xx-76xx-77xx AT Command Reference
Reference number: 4118047

8 Document History

Level	Date	History
1.0	July 04, 2018	Creation

9 Legal Notice

Important Notice

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