

PLM100

LoRaTM Module

Hardware Datasheet

Revision History

<i>Who</i>	<i>Version</i>	<i>Date</i>	<i>Comment</i>
Kung, Kim	1.0	Feb 03, 2016	Initial release

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1 Introduction

1.1 Description

PLM100은 IEEE802.15.4(e) MAC 호환 LoRa™ RF module로서 센서 네트워크, 원격검침, 스마트그리드 등 IoT 응용에 적용 가능한 무선 통신을 제공한다. Semtech사의 LoRa 기술을 적용하여 저전력 동작 및 장거리 송수신이 가능하며, 다양한 센서네트워크 및 IoT Application에서 안정적인 통신을 제공한다. 저전력 MCU와 LoRa RF Transceiver를 내장하고 있으며 IEEE802.15.4(e) MAC, 6LoWPAN, IPv6, RPL, CoAP 등 여러 프로토콜을 지원하며 다양한 환경에서 보다 쉬운 적용을 가능하게 한다. 또한 소형 사이즈로 제작되어 다양한 센서 시스템에서도 공간적인 배치를 최소화 할 수 있는 모듈 구조로서 주변 MCU와 접속연결이 가능하며 PLM100이 장치의 호스트 기능을 수행하여 주변 인터페이스와 I2C 혹은 UART로 연결되어 사용될 수 있다.

1.2 Features

- Size: 22.0 X 19.0 X 3 mm, 24 pin
- Support IEEE802.15.4(e) MAC or LoRaWAN 1.02
- Support 6LoWPAN, IPv6, RPL, UDP, CoAP (지원예정)
- Wide supply voltage range :2.1V~3.6V (3.3V typical)
- Temperature Range: -30°C to +70°C
- Microcontroller
 - ✓ High performance & low power 16-Bit RISC Architecture
 - ✓ 128KB In-System-programmable
 - ✓ 16KB SRAM
- RF Transceiver
 - ✓ Ultra Low Power
 - ✓ Frequency Band: 920.3 ~924.8MHz (Chip Spec. 902-958MHz)
 - ✓ Data Rate: 0.3Kbps ~ 5Kbps
 - ✓ RF Output Power: 0dBm to 14dBm
 - ✓ single-ended PA: MAX 20dBm

- ✓ Accurate Digital Received Signal Strength Indicator(RSSI)
- Support various interfaces
 - ✓ Two UART with support for several serial protocols
 - ✓ General purpose I/O
 - ✓ I2C Interface

1.3 Applications

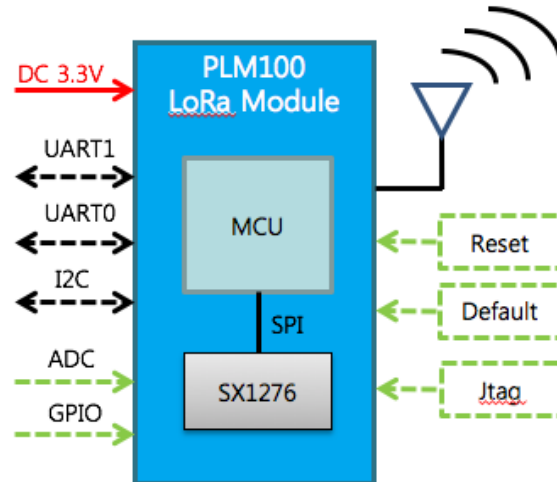
PLM100 은 다양한 IoT, M2M 네트워크의 무선 Connectivity 솔루션으로 활용되어 B2B, B2C 등 다양한 Application 에 적용할 수 있다.

- IoT Applications
- Wireless sensor Network and Security System
- Smart Utility
- Smart Metering
- Home and Building Automation
- Process and building Control
- Wireless Healthcare
- Industrial Monitoring and Control

2 PLM100 Hardware Specification

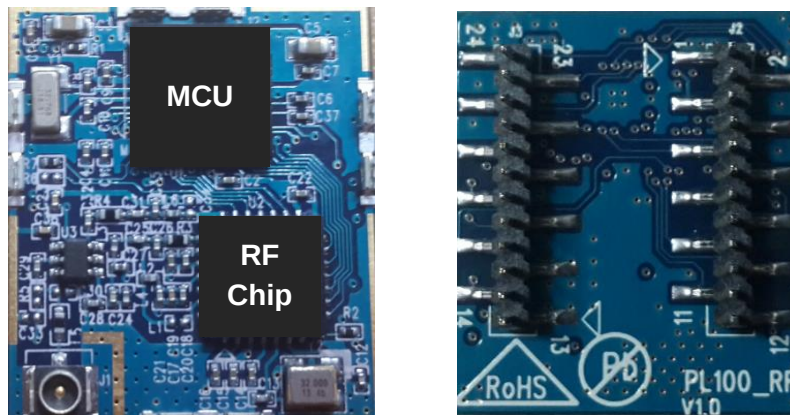
2.1 Device Overview

PLM100 은 Sub-GHz Wireless Connectivity 를 제공하기 위한 LoRa 무선부와 이를 제어하기 위한 MCU 부분으로 구성되어 있으며, 외부 센서 연동을 위한 General GPIO, 12bit-ADC 및 I2C 를 제공하며, Host MCU(CPU)와 연결을 위한 UART 인터페이스를 제공한다.



[그림 1 PLM100 HW Specification]

2.1.1 PLM100 View



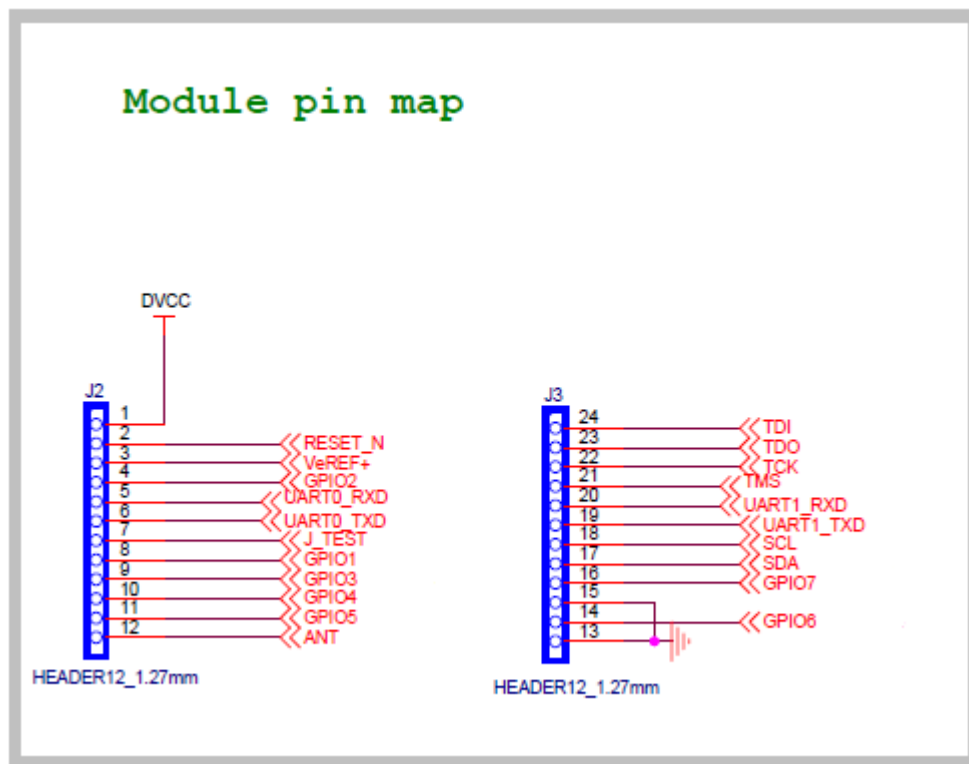
[그림 2 PLM100 View(Top/Bottom)]

2.1.2 Mechanical Specification

[표 1 Mechanical Specification]

Component	Features
Size	22.0(H) X 19.0(W) X 3mm(T)
Weight	5g
Antenna Receptacle	Murata, MM9329-2700
PCB Thick	1.0mm

2.2 PIN Map & Description



[그림 3 PLM100 PIN Map]

[표 2 PIN Description]

No	PIN Name	Description
1	VDD	Voltage Input (DC2.1~3.6V)
2	RESET_N	Reset (active Low)
3	VeREF+	Input for an external reference voltage to the ADC * ADC 미 사용 시 Ground 에 연결
4	GPIO	General purpose Input/Output
5	UART0_RXD	UART0 receive data input
6	UART0_TXD	UART0 transmit data output
7	JTST	JTAG Test mode pin
8	GPIO	General purpose Input/Output
9	GPIO	General purpose Input/Output
10	GPIO	General purpose Input/Output
11	GPIO	General purpose Input/Output
12	ANT	Antenna connection (*옵션: External SMA antenna 사용시 적용)
13	GND	Ground
14	GPIO	General purpose Input/Output
15	GND	Ground
16	GPIO	General purpose Input/Output
17	I2C_SDA	I2C data
18	I2C_SCL	I2C clock
19	UART1_TXD	UART1 transmit data output
20	UART1_RXD	UART1 receive data input
21	TMS	JTAG test mode select
22	TCK	JTAG test clock

23	TDO	JTAG test data output
24	TDI	JTAG test data input

2.3 General Specification

[표 3 General Specification]

Components	Features
MCU	* 16-Bit RISC Architecture * Low power consumption (Standby Mode(LPM3): 2.1uA at 3.0V)
RF Transceiver	* LoRa Technology RF modulation * Frequency: 902MHz ~ 958MHz * Modulation: FSK, GFSK, MSK,GMSK, LoRa™ and OOK
Internal Memory	128KB Flash, 16KB SRAM
Interface Type	I2C, UART 2 ports, GPIO, ADC
Operation Range	Up to 15Km(5Km coverage at urban area)
Rx Sensitivity	Up to -137dBm (BW:125kHz, SF:12)
RF Tx Power	0 to 14dBm * PA Boost mode 적용 시: 20dBm
DC Input Voltage	+3.3VD
Battery Operation Voltage	+2.1 to +3.6V
Operating Temperature	-20°C ~ +60°C
Maximum Current	40mA

2.3.1 Current Consumption

[表 4 Current Consumption]

Modes	Typical Current at 3V(mA)
Tx	90
Rx	12
Sleep	0.01

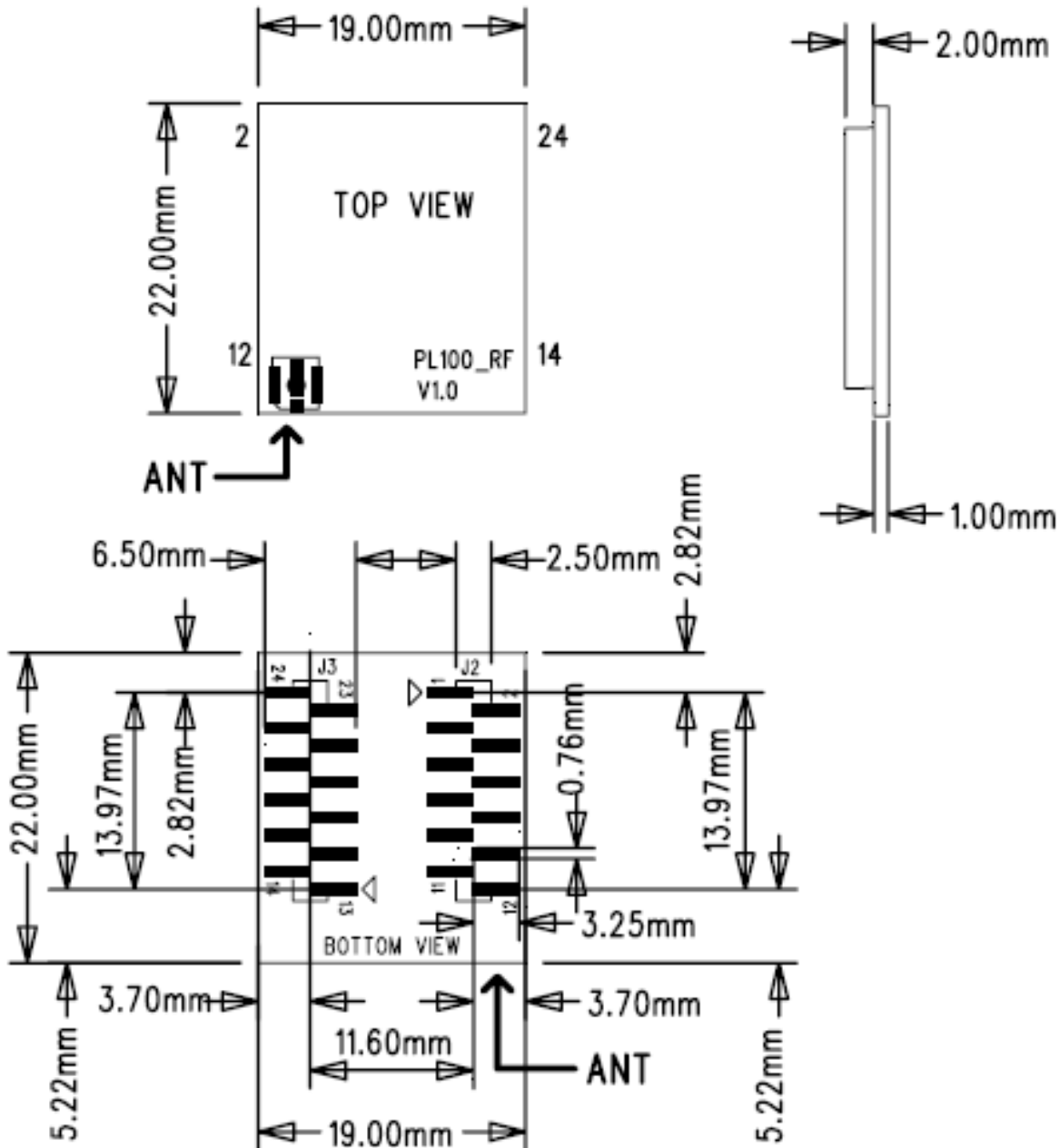
2.3.2 Module Dimensions

[表 5 Module Dimensions]

Parameter	Value
Dimensions	22.0 X 19.0 X 3 mm
Weight	5g

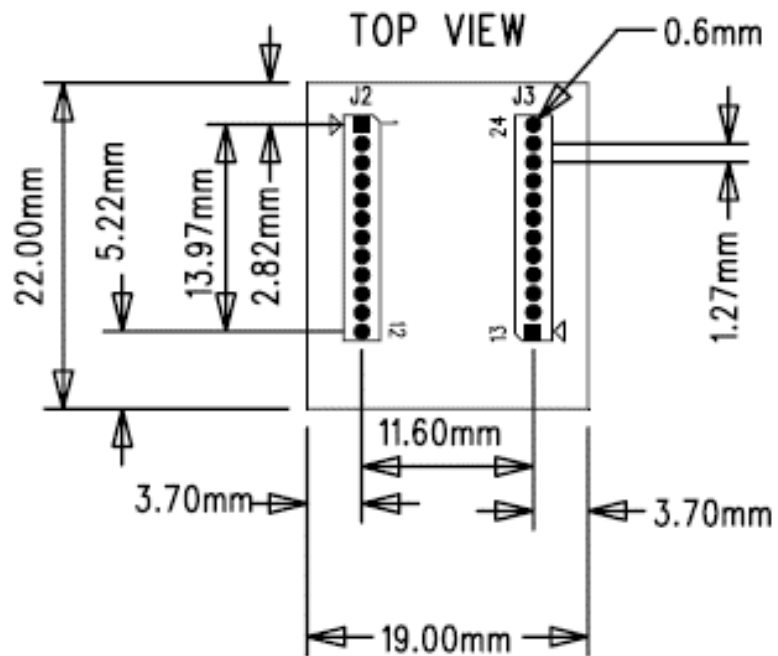
2.4 Physical Dimensions

2.4.1 Package Dimensions



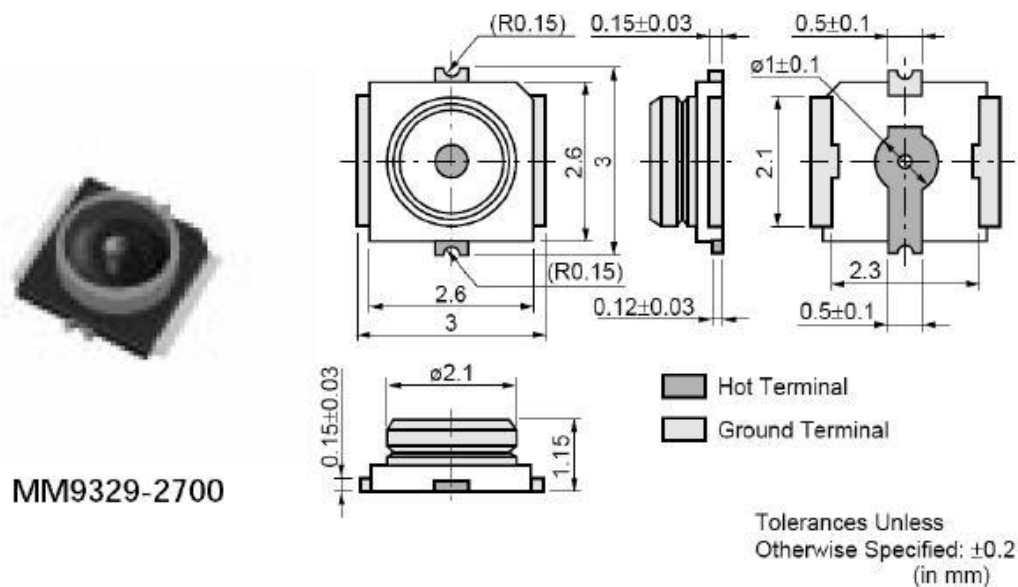
[그림 4 Package Dimension]

2.4.2 PCB Layout



[그림 5 PCB Layout]

2.4.3 Antenna Connector



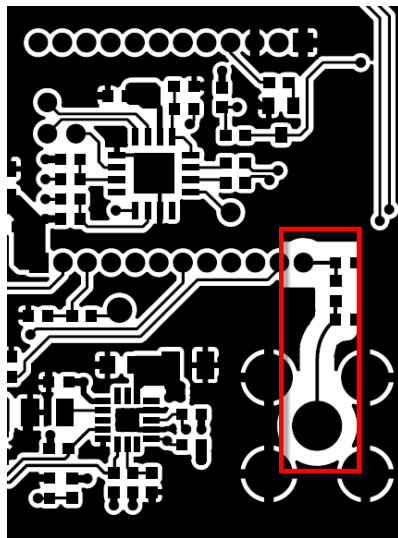
Nominal Characteristic Impedance	50 Ω
Voltage rating	300V AC(rms)
Frequency range	DC to 6 GHz
Contact resistance	Center:20m Ω , Outside:10 m Ω / 10mA max
Insulation resistance	500M Ω / 250V DC
VSWR	1.2 Max / Up to 3GHz
Operating temperature range	-40 $^{\circ}$ C to +90 $^{\circ}$ C

[그림 6 Antenna Connector]

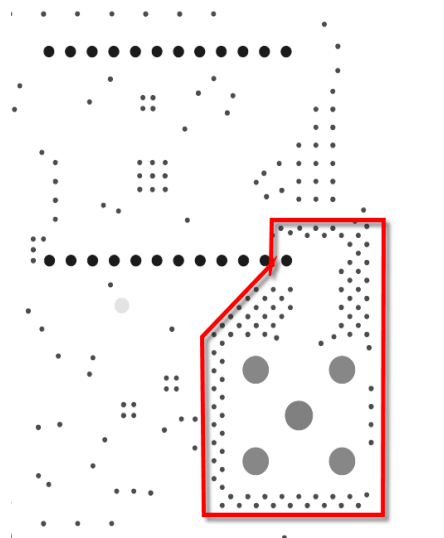
2.5 Application Information

2.5.1 RF Trace Routing

PLM100의 RF Pin을 적용하여 사용할 경우 RF Signal 세기 및 Noise 감소를 위해서 RF Trace 주변으로 1.5mm 이격을 유지하며, 그 주위에 Ground로 등간격 배치를 하여야 한다.



(TOP Layer)

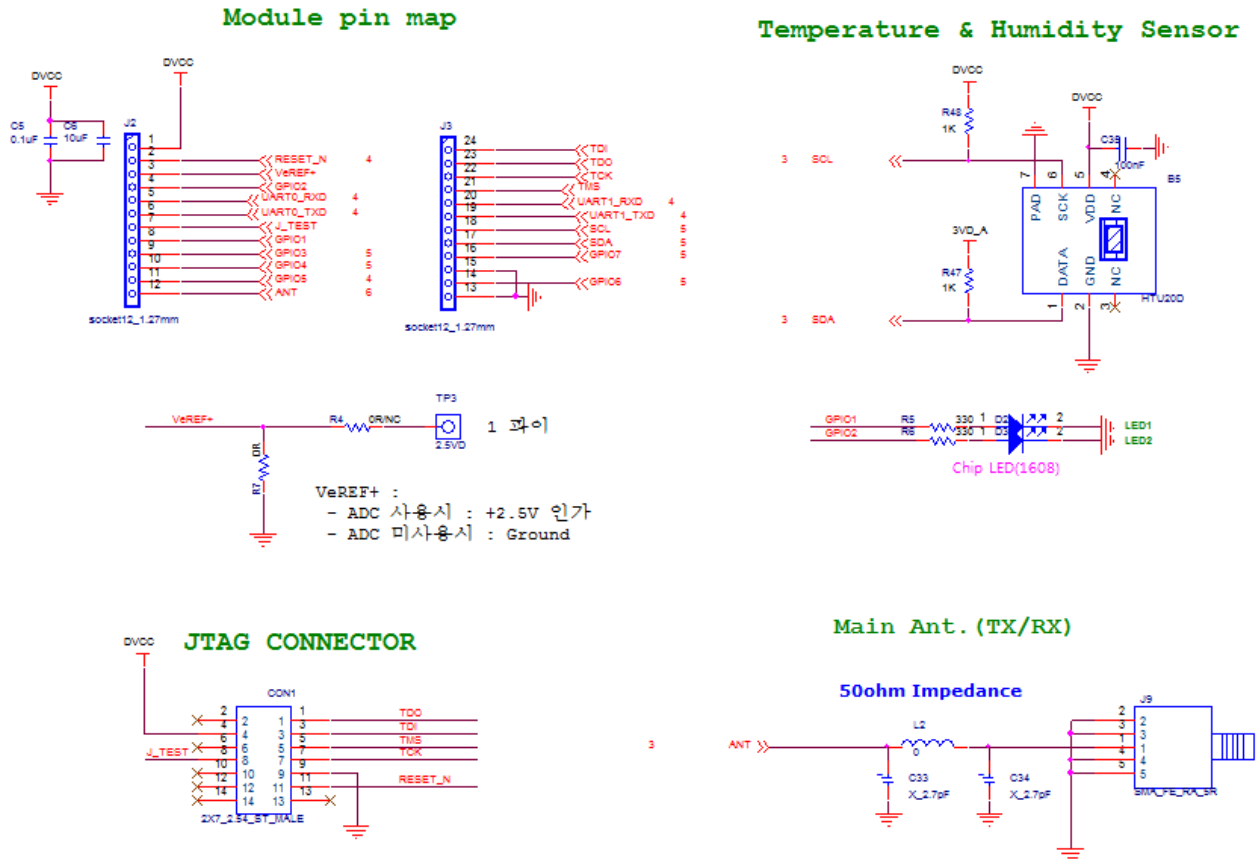


(Bottom Layer)

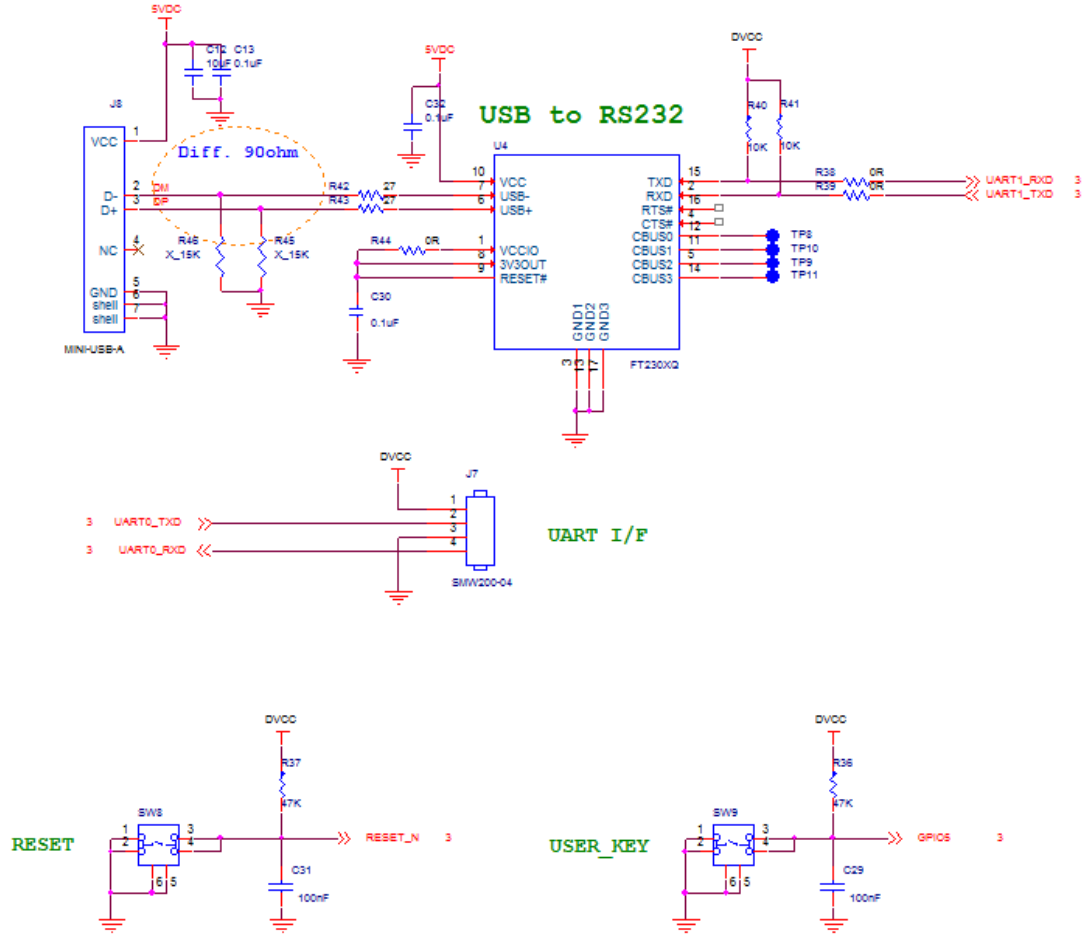
[그림 7 RF Trace Routing]

2.5.2 Application Schematic

PLM100 의 External Interface 를 적용하여 Application Component 구성 시 아래 Schematic 을 참고하여 적용한다.



[그림 8 Application Schematic - 1]



[그림 9 Application Schematic - 2]