Never stop thinking

PMA71xx/PMA51xx

SmartLEWIS™ MCU

RF Transmitter FSK/ASK 315/434/868/915 MHz
Embedded 8051 Microcontroller with 10 bit ADC
Embedded 125 kHz ASK LF Receiver

Application Note

Protocol Examples for ISM Band Applications
Revision 1.0, 2009-10-09

Wireless Control

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Revision History: 2009-10-09, Revision 1.0

Previous Revision:

Page	Subjects (major changes since last revision)

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Last Trademarks Update 2009-05-27

List of Figures

1 Introduction

This document is a description of the software implementation of RF protocol examples for ISM band applications on PMA71xx/PMA51xx. The protocol examples are designed to be compatible with Infineon SmartLEWIS™ Receiver TDA5230. The configuration of Infineon SmartLEWIS™ Receiver TDA5230 to receive this protocol examples is shown in detail in **[1]** and can be downloaded from **http://www.infineon.com/TDA5230**.

In the following chapters the program flow, the protocol examples and the tooling are described. This application note is compatible to source code revision 1.0.

2 Program flow

Figure 1 on Page 6 shows a state diagram of the software implementation of RF protocol examples for PMA71xx/PMA51xx.

First of all the Interval Timer is set to a wake-up time of approx. 500ms and PMA71xx/PMA51xx is set into Power Down Mode. Every 500ms four different pin connections are checked. If a pin connection is set, the appropriate protocol is sent. Protocol A and C are examples for protocols usable in the USA and have a break between WUP (Wake-up Pattern) and TSI (Telegram Start Identifier) + data. The reason for this break is a legislative restriction in the USA. Find more information about legislative restrictions in **[1]**.

The priority of the pin connection check is as following:

1. Protocol A: PP4 & PP5
2. Protocol B: PP2 & PP3
3. Protocol C: PP4 & PP2
4. Protocol D: PP5 & PP3

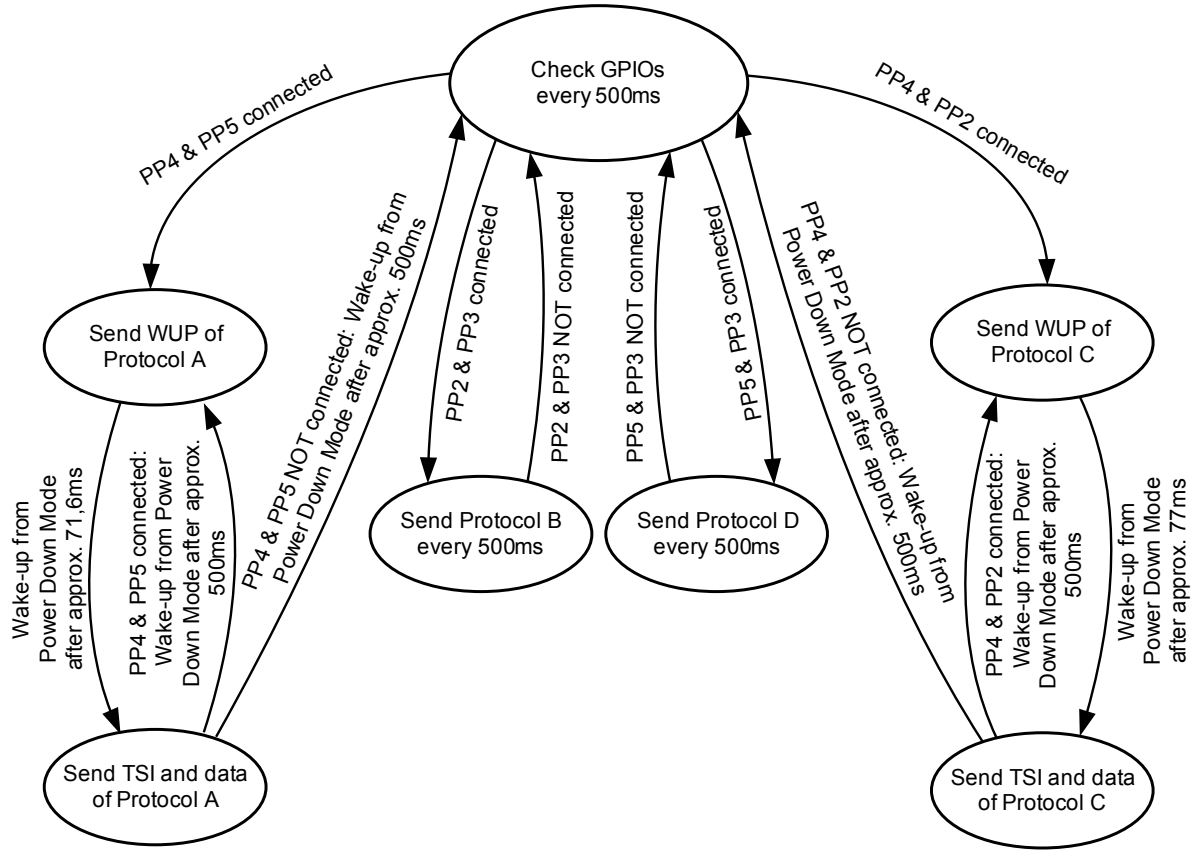


Figure 1 State diagram of the software implementation of RF protocol examples for PMA71xx/PMA51xx

3 Detailed Description of RF Protocol Examples

PMA71xx/PMA51xx supports four different frequency bands: 315MHz, 434MHz, 868MHz and 915MHz. The protocol examples of this application note only cover 315MHz and 434MHz because they are designed to be used with Infineon TDA5230 receiver.

3.1 Protocol A: 5kBit ASK USA Pattern

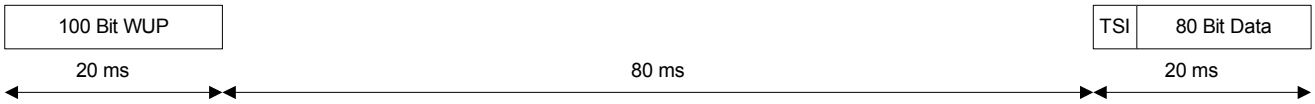


Figure 2 5kBit ASK USA Pattern

Table 1 Detailed description of Protocol A

Frequency band:	315MHz
Modulation:	ASK
Data Rate:	5kBit
Coding:	Manchester
WUP Data:	100Bit -> all 0
SYNC Data:	6Bit -> all 0
TSI Data:	14Bit -> 00110011110100
Payload:	10Byte data (could be modified for different applications)

3.2 Protocol B: 5kBit FSK EU Pattern

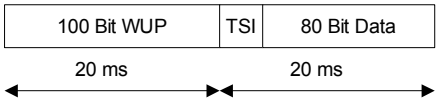


Figure 3 5kBit FSK EU Pattern

Table 2 Detailed description of Protocol B

Frequency band:	434MHz
Modulation:	FSK
Data Rate:	5kBit
FSK Deviation:	35kHz
Coding:	Manchester
WUP Data:	100Bit -> all 0
SYNC Data:	6Bit -> all 0
TSI Data:	14Bit -> 00110011110100
Payload:	10Byte data (could be modified for different applications)

3.3 Protocol C: 10kBit FSK USA Pattern

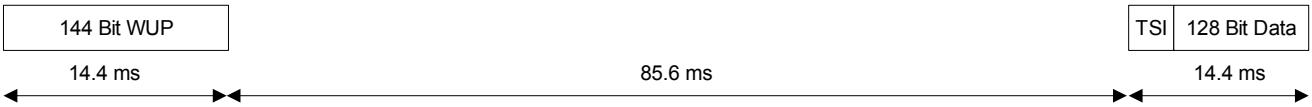


Figure 4 10kBit FSK USA Pattern

Table 3 Detailed description of Protocol C

Frequency band:	315MHz
Modulation:	FSK
Data Rate:	10kBit
FSK Deviation:	50kHz
Coding:	Manchester
WUP Data:	144Bit -> all 0
SYNC Data:	6Bit -> all 0
TSI Data:	10Bit -> 0011110100
Payload:	16Byte data (could be modified for different applications)

3.4 Protocol D: 10kBit FSK EU Pattern

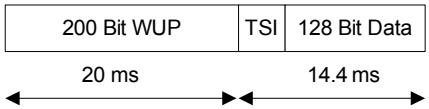


Figure 5 10kBit FSK EU Pattern

Table 4 Detailed description of Protocol D

Frequency band:	434MHz
Modulation:	FSK
Data Rate:	10kBit
FSK Deviation:	50kHz
Coding:	Manchester
WUP Data:	200Bit -> all 0
SYNC Data:	6Bit -> all 0
TSI Data:	10Bit -> 0011110100
Payload:	16Byte data (could be modified for different applications)

4 Tooling

To get the defined protocols properly running, Infineon provides a toolset which helps the developer to verify his work and that both transmitter and receiver are correctly configured. The provided quick start guides will give more details and also the steps to get the tools and boards running.

- Transmitter - PMA71xx/PMA51xx (Download more information from **http://www.infineon.com/PMA_tooling**)
- Receiver - TDA523x (Download more information from **http://www.infineon.com/TDA5230**)

4.1 Transmitter

The source code is designed to be usable with both development boards, the PMA Evaluation Kit and the PMA Starter Kit.

Note: Please ensure that the matching network of the transmitter board corresponds to the selected protocol example frequency.

4.1.1 How to download RF Protocol Examples to the PMA71xx/PMA51xx

1) Download and unzip PMA_RF_Protocol_Examples_Vx.x.zip from **http://www.infineon.com/PMA**.

2) Install PMA_RF_Protocol_Examples_V1.0.msi to your preferred location on your hard or network drive.

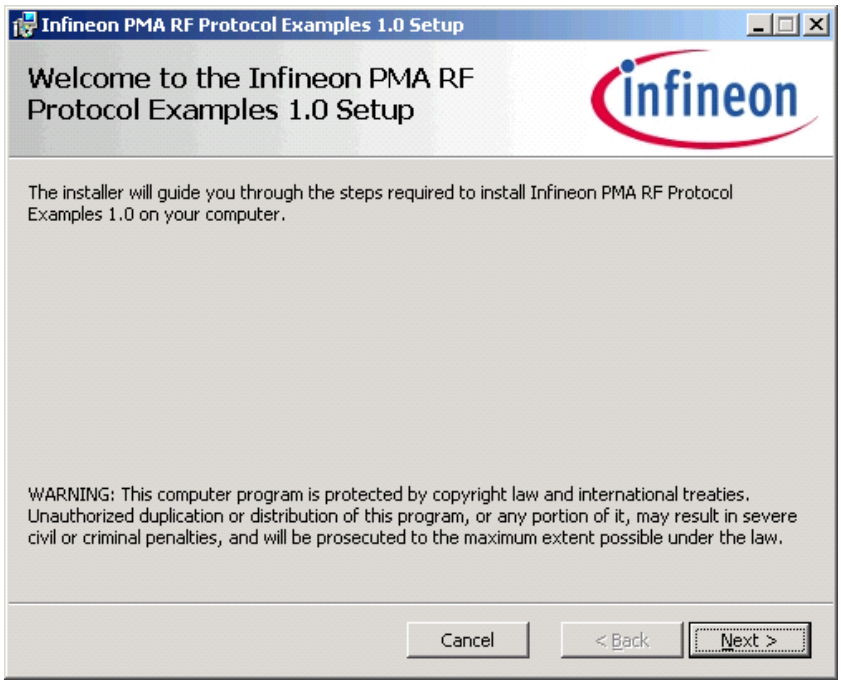


Figure 6 PMA RF Protocol Examples Installer

3) Connect PMA Starter Kit or PMA Evaluation Kit to the PC or Notebook (ensure that you have installed the software environment for your development boards)

4) Start KEIL µVision

5) Compile the PMA_RF_Protocol_Examples_Vx.x project

6) Choose your development environment (PMA Starter Kit or PMA Evaluation Kit)

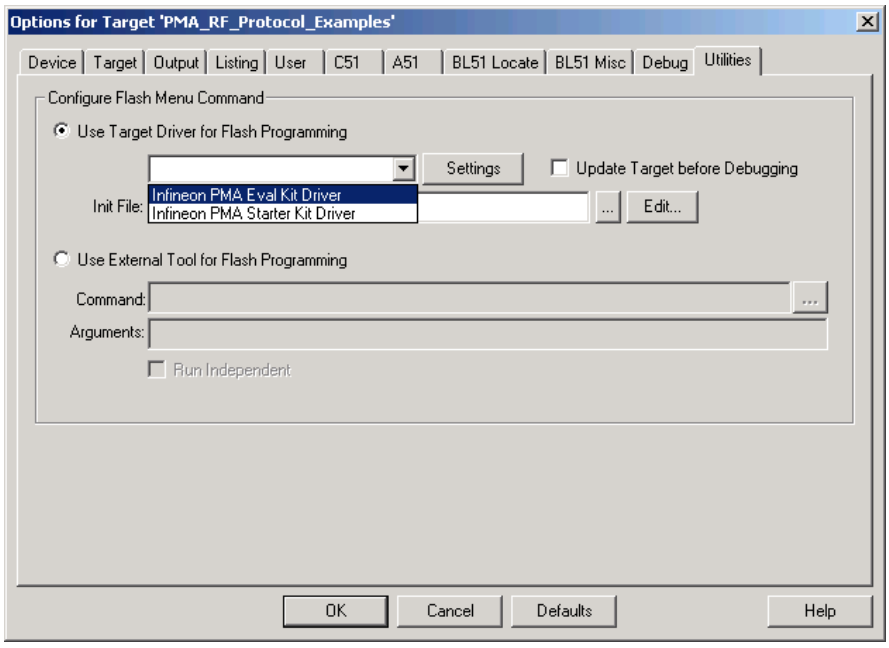


Figure 7 Development Board selection in KEIL µVision

7) Download the .hex file to your development board

8) To start a transmission connect the appropriate PPx on your development board

4.1.2 PMA Evaluation Kit

The PMA Evaluation Kit consists of a PMA RF Evaluation Board. This kit is tailored for concrete application development based on PMA giving the developer highest flexibility and design freedom. Furthermore, the evaluation kit is required if the PMA LF receiver or ADC shall be used in the application.

The PMA RF Evaluation Board may be operated in two alternative options: The connection to the PC may be established by the PMA RF USB Stick (see PMA Starter Kit) or by the advanced SmartLEWIS™ System Interface Board (SIB) which is optionally available.

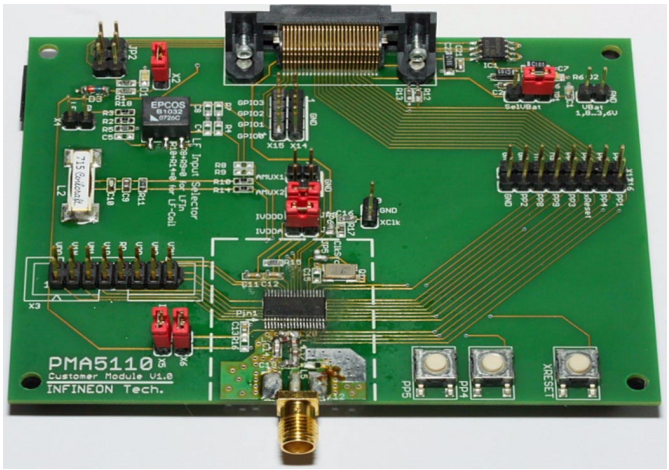


Figure 8 PMA Evaluation Kit

4.1.3 PMA Starter Kit

The PMA Starter Kit is an easy to use development tool coming along in a small form factor size, which can be directly connected to the PC via the USB interface.

This kit is tailored for first evaluation and software programming covering all products of the PMA71xx/51xx family.

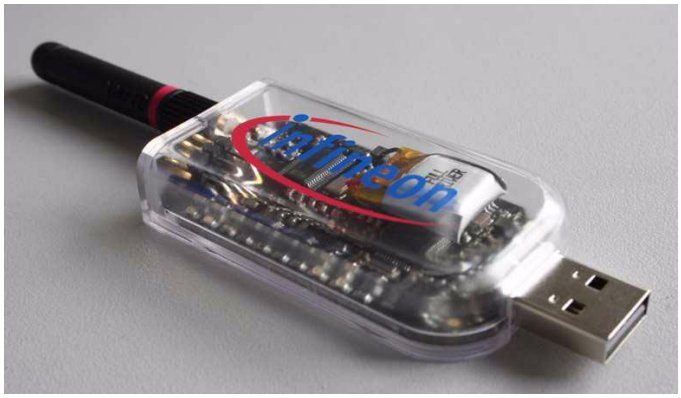


Figure 9 PMA Starter Kit

4.1.3.1 Pin settings

Table 5 shows which pin settings are used to select one of the implemented protocol examples.

Note: Please ensure that only one connection is set at the same time!

Table 5 Implemented pin connections for RF protocol examples on PMA Starter Kit

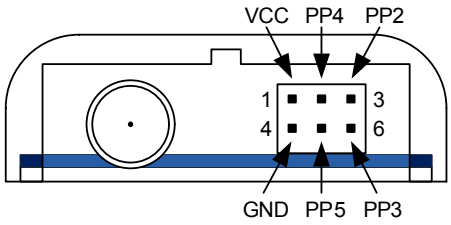
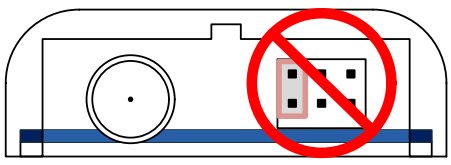
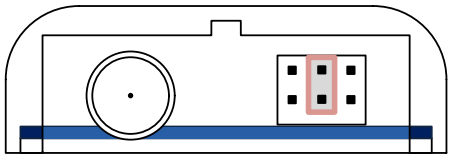
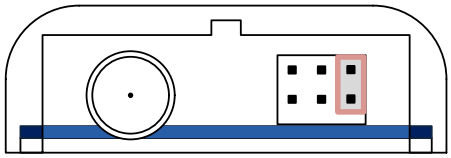
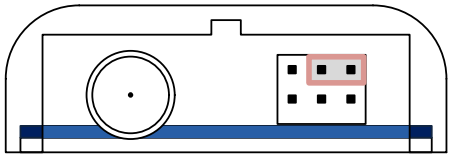
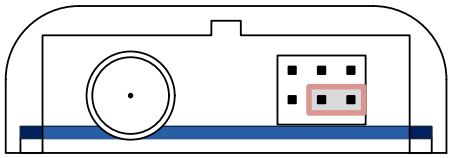
Pin setting	Description
	This is the pin out of the PMA Starter Kit.
	Never connect VCC (Pin 1) and GND (Pin 4)!
	PP4 & PP5 are connected: **Protocol A - 5kBit ASK USA Pattern** is transmitted every approx. 500ms.

Table 5 Implemented pin connections for RF protocol examples on PMA Starter Kit

Pin setting	Description
	PP2 & PP3 are connected: **Protocol B - 5kBit FSK EU Pattern** is transmitted every approx. 500ms.
	PP4 & PP2 are connected: **Protocol C - 10kBit FSK USA Pattern** is transmitted every approx. 500ms.
	PP5 & PP3 are connected: **Protocol D - 10kBit FSK EU Pattern** is transmitted every approx. 500ms.

4.2 Receiver

Infineon TDA5230 is used as receiver. The TDA523x Eval Board is shown in **Figure 10**. For the configuration of the TDA523x Eval Board and the visualisation of the received user data the TDA523x Explorer is used (see **Figure 11**). More information about the configuration of TDA5230 and the handling of the TDA523x Explorer can be found in **[1]**.

Figure 10 TDA523x Eval Board

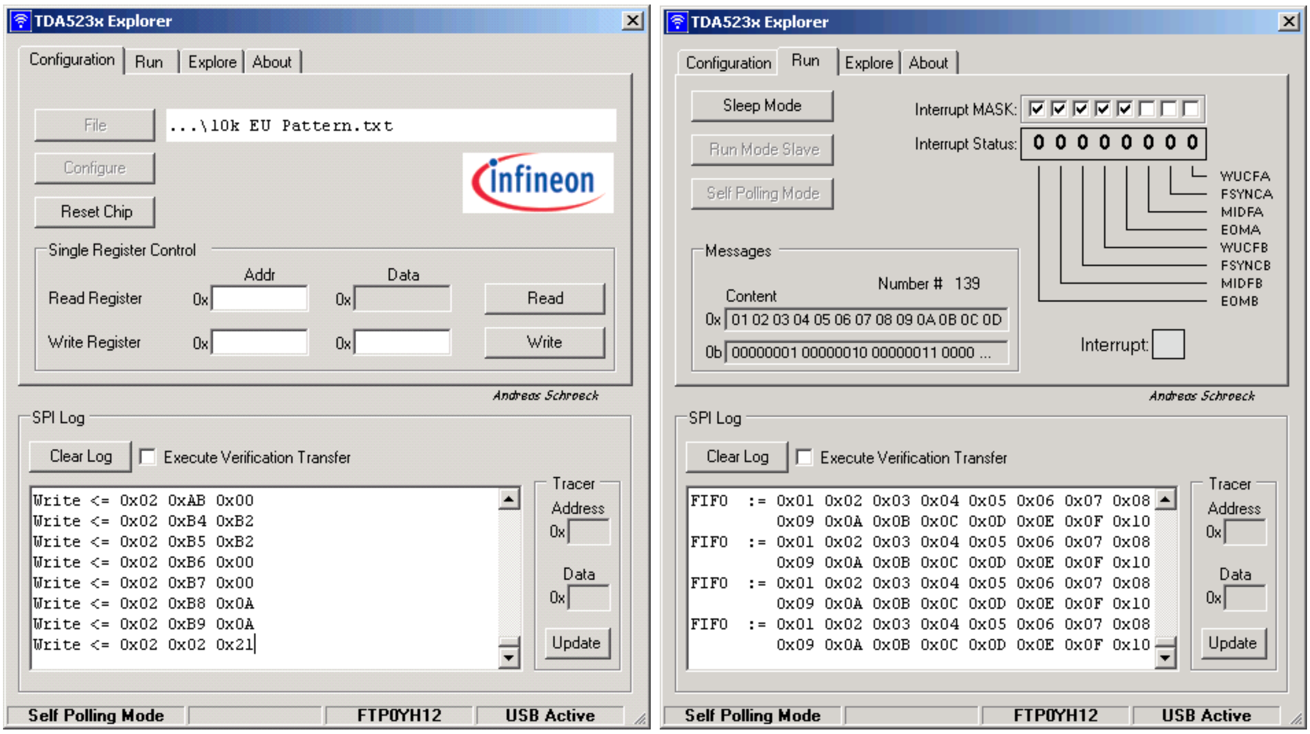


Figure 11 TDA523x Explorer in configuration and run mode

References

[1] TDA523x - Protocol Examples for ISM Band Applications

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