MRF24J40

MRF24J40 Silicon Errata

The MRF24J40 RF transceiver you have received conforms functionally to the Device Data Sheet (DS39776C), except for the anomalies described in this document.

1. Module: RX MAC

If the RX filter is configured for Promiscuous mode, packets with a reserved packet type in the MAC frame type field may cause the RX module to put an incorrect packet length in the RX buffer.

Work around

When operating in Promiscuous mode, flush the RX buffer by setting the RXFLUSH bit (RXFLUSH<0>) after every RX interrupt.

Date Codes that pertain to this issue

All engineering and production devices.

2. Module: Security Module

When the device is performing encryption or decryption, there is a very small chance that the encryption or decryption result may be incorrect.

Work around

During decryption operations, repeat the decryption one or more times if a MIC error is indicated on the first attempt.

During encryption operations, verify the encryption by immediately decrypting the packet and checking it against the original for errors. If an error is found, repeat the encryption and verification.

Date Codes that pertain to this issue

All engineering and production devices.

3. Module: RX MAC

Under certain conditions, such as channel scanning, unexpected packets may be received at alternative channels spaced at 20 MHz intervals. This occurs when the interfering sources contain sufficient intensity and proximity to the receiver.

For example, if the device is tuned to the 2,425 MHz channel, spurious signals can be detected at 2,405 MHz, 2,445 MHz and 2,465 MHz.

Work around

To prevent this system degradation, do one of the following:

- Add a “Channel ID” to the “Frame Payload” of the MAC layer.
  This enables the firmware to filter out unexpected packets.
- Increase the distance between the nodes.
- Reduce the transmitted power of the other nodes.

Date Codes that pertain to this issue

All engineering and production devices.

4. Module: RX MAC

After initializing the MRF24J40 and after successful reception and transmission of packets, the module suddenly stops receiving packets. At this stage, all register settings, SPI operations, and interrupts appear normal. Performing a reset on the module restores communications.

This issue is seen on a very small percentage (<1%) of MRF24J40 modules (MRF24J40MA, MB, MC, MD, and ME). The issue is random and intermittent, which means that the time of the apparent issue only occurs at random times. A deterministic test has not been found to isolate the issue.

Work around

Please ensure that the Initialization settings for MRF24J40 are used as described in section 3.2 of the MRF24J40 Data Sheet (DS39776C). Specifically, use the following settings for the registers as these control the internal frequency synthesizer in the MRF24J40:

RFCON0 (0x200) = 0x03 - Initialize RFOPT = 0x03

RFCON1 (0x201) = 0x02 - Initialize VCOOPT = 0x02

If the issue persists after performing the settings, one of the following workarounds can be implemented based on the type of customer application:

- Reprogram the channel information (refer to the steps in Programming Channel Information) if the receiver is dormant (without receiving any packets). For example, if the device must receive a packet in a determined amount of time but no packet is received during the specified period, the host MCU can reprogram the channel information to resume packet reception.
- In the customer main application while loop, continuously reprogram the channel information.

Reprogramming channel information resets the internal RF State Machine and enables the module to start communicating with other devices.

Programming Channel Information

Perform the following steps:

1. Program RFCON0 (0x200 <7:4>)
2. Reset RF State Machine

   RFRST (RFCTL 0x36<2>) = 1

   RFRST (RFCTL 0x36<2>) = 0
3. Delay at least 192 µs before attempting to transmit a packet to enable the RF circuitry to calibrate. For more information, refer to Section 3.4 of the MRF24J40 Data Sheet.

Applications using MiWi™ Stack can call the MiApp function to perform the programming channel information:

```
MiApp_SetChannel(uint8_t channelNum)
```

Date Codes that pertain to this issue

Issue appears in modules with MRF24J40 date codes from the year 2013 to present.

5. Module: RX MAC SLEEP

Transmission and reception of packets may not be successful under certain conditions, if the WAKE pin on the device is used to wake up the device from sleep.

For example: performing *a sleep —> Wake-up (using the WAKE pin) —> Transmission of Packet* on MRF24J40.

Work around

The following is the work around for such scenarios:

1. Perform an external hardware reset, by asserting the RESET pin 13 low. The MRF24J40 will be released from reset approximately 250 us after the RESET pin is released.
2. Perform a Software Reset on MRF24J40, SOFTRST (0x2A) = 0x07.
3. Re-initialize the RF configuration in the Application.

Applications using MiWi Stack can call the MiApp function to perform the preceding work around by enabling a macro, which enables the wake up of MRF24J40 using RESET pin 13.

In the “bool MiMAC_PowerState(uint8_t PowerState)” function, modify the case POWER_STATE_OPERATE to disable wake up from WAKE pin and enable the wake up from the RESET pin.

APPENDIX A: DOCUMENT REVISION HISTORY

Rev A Document (12/2006)

Original revision. Silicon errata issues 1 (RX MAC), 2 (SPI Interface), 3 (Security Module) and 4 (TX/RX PHY).

Rev B Document (4/2007)

Added silicon issue 5 (SPI Interface).

Rev C Document (3/2009)

Removed silicon issues 2 (SPI Interface, SDO pin) and 4 (TX/RX PHY) which were assimilated into the data sheet. Deleted issue 5 (SPI Interface). Added issue 3 (RX MAC).

Rev D Document (6/2015)

Added silicon issue 4 (RX MAC).

Rev E Document (5/2019)

Added silicon issue 5 (RX MAC)

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