Apply Zigbee Transceiver MC12311 as TPMS receiver to kit with TPMS Transmitter MPXY8600 as Total solution

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10/14/2013
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History

The MC12311 is a highly-integrated, cost-effective, system-in-package (SIP), sub-1GHz wireless node solution with an FSK, GFSK, MSK, or OOK modulation-capable transceiver and low-power HCS08 8-bit microcontroller. The highly integrated RF transceiver operates over a wide frequency range including 315 MHz, 433 MHz, 470 MHz, 868 MHz, 915 MHz, 928 MHz, and 955 MHz in the license-free Industrial, Scientific and Medical (ISM) frequency bands.

The MPXY8600 is a sensor for use in applications that monitor tire pressure and temperature. It contains the pressure and temperature sensors, an X-axis and a Z-axis accelerometer, a microcontroller, an LF receiver and an RF transmitter all within a single package.

This setup offer customers to utilize Freescale MPXY8600 as transmitter and MC12311 as receiver to form 315MHz, 433.92MHz TPMS transmitter and receiver solution.
MC12311 packet format

Fixed Length Packet Format

- DC free Data encoding
- CRC checksum calculation
- AES Enc/Dec

<table>
<thead>
<tr>
<th>Preamble</th>
<th>Sync Word</th>
<th>Address byte</th>
<th>Message Up to 255 bytes</th>
<th>CRC 2-bytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 65535 bytes</td>
<td>0 to 8 bytes</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Fields added by the packet handler in Tx and processed and removed in Rx
- Optional User provided fields which are part of the payload
- Message part of the payload
**Variable Length Packet Format**

- **Preamble**: 0 to 65535 bytes
- **Sync Word**: 0 to 8 bytes
- **Length byte**
- **Address byte**
- **Message**: Up to 255 bytes
- **CRC**: 2-bytes

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- **Fields added by the packet handler in Tx and processed and removed in Rx**
- **Optional User provided fields which are part of the payload**
- **Message part of the payload**
MC12311 packet format (continued)

Unlimited Length Packet Format

- DC free Data encoding
- Payload

- Preamble
  - 0 to 65535 bytes
- SyncWord
  - 0 to 8 bytes
- Address byte
- Message unlimited length

- Fields added by the packet handler in Tx and processed and removed in Rx
- Message part of the payload
- Optional User provided fields which are part of the payload
MC12311 packet format (continued)

Tips:

1. User needs to follow above one of three packet formats sending from transmitter and MC12311 decode Preamble and Sync Word, then decode payload data.

2. Preamble value can’t be changed, Sync Word length can be configurable. Sync word length must be matched.

3. Payload can be encoded to other format, like Manchester encoding or DC-whitening. Preamble and Sync word can’t be encoded to other format. The format of Preamble and Sync Word can’t be changed.
/**
   Function: Send_RF_Datagram
   NOTES: This function fills the buffers and codes the RF frame in
   Manchester
**/
H/W Environment setup

1. Prepare MPXY8600 EVB as Transmitter. MPXY8600’s RF data buffer sends data packet every 5 sec.
2. Prepare one MC12311 EVB as receiver, Freescale radio utility GUI will be connected through USB interface to monitor received data sending from MPXY8600.
MC12311 related register configuration

1. **DC-free encoding/decoding is set to None(off) mode.**
   *(This can be monitored by reading PacketConfig1 register)*

<table>
<thead>
<tr>
<th>RegPacketConfig1 (0x37)</th>
<th>PacketFormat</th>
<th>rw</th>
<th>0</th>
<th>Defines the packet format used: 0 → Fixed length, 1 → Variable length</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-5</td>
<td>DcFree</td>
<td>rw</td>
<td>00</td>
<td>Defines DC-free encoding/decoding performed: 00 → None (Off), 01 → Manchester, 10 → Whitening, 11 → reserved</td>
</tr>
</tbody>
</table>
MC12311 related register configuration (Continued)

2. On the Simple Range Demo:

   The packet is formed as follows:
   Preamble (3 bytes, value 0x55) + SyncWord (2 bytes, value 0x01) + Payload

3. CRC calculation needs to be considered (This can be monitored by reading PacketConfig1 register)

4. Variable length packet format needs to be considered (This can be monitored by reading PacketConfig1 register)
MC12311 related register configuration (Continued)

5. Center carrier Frequency can be programmed in

(void)PhyPib_SetCarrierFreq(0x4EC000),
Set it to 315MHz or 433.92MHz

6. The value of the preamble cannot be changed (it is always a sequence of 1 0 1 0) this is handled by the transceiver and can’t be modified, you can modify the preamble size (0-65535) by writing to the registers RegPreambleMsb and RegPreambleLsb.

You can change the preamble size inside MLMERadiolInit() function.
void Fill_RFBUFFER(void)
{
    // Two init byte for ECHO- DO NOT CHANGE IT!!
    #if 1
        RFD0 = Rotate_data(0x55);
        RFD1 = Rotate_data(0x55);
        // Supllier ID - FSL byte - this byte can be change
        RFD2 = Rotate_data(0x55);
        RFD3 = Rotate_data(0x01);
        RFD4 = Rotate_data(0x01);
        RFD5 = Rotate_data(0x09);
        RFD6 = Rotate_data(0x48);
        RFD7 = Rotate_data(0x69);
        RFD8 = Rotate_data(0x20);
        RFD9 = Rotate_data(0x74);
        RFD10 = Rotate_data(0x68);
        RFD11 = Rotate_data(0x65);
        RFD12 = Rotate_data(0x72);
        RFD13 = Rotate_data(0x65);
        RFD14 = Rotate_data(0x11);
    #endif
}

Insert "Preamble" data here
Insert "Sync Word" data here
Insert " length+Payload “data here
Test results(一)

Received data
Test results (二)