ZEBRA 24XX SM
ZigBee™ Enabled Board for Radio Applications
Product Information 1.7: 2007/05/16

Module Hardware Features:
- Wireless communication module for use in embedded applications
- Worldwide available 2.4 GHz frequency band: 2.4000 - 2.4835 GHz
- 16 channels with 5 MHz spacing (not overlapping)
- DSSS (Direct Sequence Spread Spectrum)
- Gross data rate 250 kbps
- Antennas integrated on the module
- Freescale MC13192 RF or MC13213 front end
- Freescale HCS08 base band controller with 60 kByte flash
- 50 pins HIROSE connector or BGA SMT footprint
- Operating voltage 2.0 - 3.4 V
- Mechanical dimensions 16 mm x 33 mm with metallic shielding
- Starter kit available
- Several software options, including ZigBee™ network stack

ZEBRA 240X:
- RF output power 0 dBm (1 mW)
- Receive sensitivity of -92 dB (typical)
- Link range up to 100 m (depending on the actual environment)

ZEBRA 241X:
- PA on board, RF output power max. of 10 dBm (10 mW),
- LNA on board, receive sensitivity of -97 dB (typical)
- Link range up to 1000 m (depending on the actual environment)

Typical Applications:
- Wireless sensor networks
- Automation and industrial control
- Measurement equipment and data logging
- Medical devices and applications
ZEBRA Module Block Diagram:

Software Options:

<table>
<thead>
<tr>
<th>Option</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMAC</td>
<td>Simple data frame structure</td>
</tr>
<tr>
<td></td>
<td>No storage of data packets, no retransmission</td>
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<tr>
<td></td>
<td>Bi-directional or peer-to-peer operation</td>
</tr>
<tr>
<td></td>
<td>Very little resources required</td>
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<tr>
<td></td>
<td>No licenses or royalties</td>
</tr>
<tr>
<td>IEEE 802.15.4™ PHY and MAC</td>
<td>Standardized protocol for reliable delivery of data</td>
</tr>
<tr>
<td></td>
<td>Storage and retransmission of data packets</td>
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<tr>
<td></td>
<td>CSMA-CA radio channel access</td>
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<tr>
<td></td>
<td>Optional superframe structure with beacons</td>
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<tr>
<td></td>
<td>Optional guaranteed time slots</td>
</tr>
<tr>
<td></td>
<td>All devices have unique 64-bit IEEE addresses</td>
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<tr>
<td></td>
<td>Star or cluster-tree wireless network</td>
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<tr>
<td></td>
<td>No licenses or royalties</td>
</tr>
<tr>
<td>ZigBee™ network stack</td>
<td>Based on the IEEE 802.15.4 data transfer mechanism</td>
</tr>
<tr>
<td>(delivery option)</td>
<td>Standard user profiles offer interoperability</td>
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<td></td>
<td>Cluster-tree and mesh networks</td>
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<tr>
<td></td>
<td>Security and data encryption</td>
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<tr>
<td></td>
<td>ZigBee™ software stack license required</td>
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The ZEBRA Module is delivered with the SMAC (Simple Media Access Control) and example software. The SMAC requires only very little resources and leaves plenty of space for a customer specific application software. An embedded boot loader allows easy reload of the customized application.

As a delivery option the ZEBRA Module can be loaded with a ZigBee™ network stack. This enables interoperability due to standardized application profiles. To implement a true ZigBee™ application, the user has to obtain a license for the ZigBee™ software stack and the appropriate compiler. Alternatively, senTec Elektronik is able to develop the ZigBee™ application based on the customer’s specification, since we are experienced in wireless networking software and IEEE 802.15.4.
ZEBRA Module Connector Layout:

50-Pin HIROSE Receptacle: DF12C (3.0)-50DS-0.5V (standard delivery).

ZEBRA Module Pin-Out Options:

The SMT BGA footprint is a delivery option, pin-out is available on request.

ZEBRA Module Mechanical Dimensions:
ZEBRA Module Starter Kit:
Contains 2 modules, 2 base boards, demo software and detailed documentation

Ordering Information:
ZEBRA2401-SM: Module with 50-pin receptacle
ZEBRA2402-SM: Module with SMT BGA footprint
ZEBRA2411-SM: Module with PA / LNA and 50-pin receptacle
ZEBRA2412-SM: Module with PA / LNA and SMT BGA footprint
ZEBRA2400-SK: Starter Kit

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Product status: development finished, product available