Wireless accelerometer with integrated data logger

APPLICATIONS

FEATURED VIDEO
- BeanDevice® AX-3DS main presentation video
- BeanDevice® AX-3DS - Wireless Sensor Network dedicated to health monitoring on

USER MANUAL
- BeanDevice® SmartSensor user manual

MECHANICAL DRAWING
- BeanDevice® AX-3DS drawing

MAIN FEATURES
- Wireless accelerometer dedicated to shock measurement
  - Scalable measurement range: ±6g/±12g/±24g or ±2g/±4g/±8g
- Embedded data logger: up to 1 million data points (with events dating)
- Fully autonomous system with an integrated Lithium-Ion battery charger
- Waterproof for IP66 casing (Nema 4)
- Excellent radio link relying on the radio antenna diversity developed by Beanair®

SMART SHOCK DETECTION

«RETHINKING SENSING TECHNOLOGY»
The BeanDevice® AX-3DS integrates a smart shock detection technology which permits to detect & recognize a shock event during the sleeping or deep sleeping mode of the BeanDevice® AX-3DS. When the BeanDevice® AX-3DS is in sleeping mode, the accelerometer continues to track a shock event with a power consumption of 68 uA in sleeping mode and 28uA in deep sleeping mode.

A hysteresis on the shock event, fully configurable through the BeanScape®, allows to avoid false alarm.

**EXAMPLE : THIS CURVE SHOWS TWO SHOCK EVENTS, ONE CONSIDERED AS SIGNIFICANT (REAL ALARM) AND ANOTHER CONSIDERED AS NOT SIGNIFICANT (FALSE ALARM).**

\[ \Delta t < \Delta d \]

\[ \Delta t > \Delta d \]

The following tables show the accelerometer sampling rate and the hysteresis time value in deep sleeping mode and sleeping mode of the BeanDevice® AX-3DS.

<table>
<thead>
<tr>
<th>Accelerometer sampling rate during deep sleeping mode (in HZ)</th>
<th>( \Delta d ) max value(s)</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>128 s</td>
<td>2 s</td>
</tr>
<tr>
<td>1</td>
<td>64 s</td>
<td>1 s</td>
</tr>
<tr>
<td>2</td>
<td>32 s</td>
<td>500 ms</td>
</tr>
<tr>
<td>5</td>
<td>12.8 s</td>
<td>200 ms</td>
</tr>
<tr>
<td>10</td>
<td>6.4 s</td>
<td>100 ms</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Accelerometer sampling rate during deep sleeping mode (in HZ)</th>
<th>( \Delta d ) max value(s)</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>1,28 s</td>
<td>20 ms</td>
</tr>
<tr>
<td>100</td>
<td>640 ms</td>
<td>10 ms</td>
</tr>
<tr>
<td>400</td>
<td>160 ms</td>
<td>2.5 ms</td>
</tr>
<tr>
<td>1000</td>
<td>64 ms</td>
<td>1 ms</td>
</tr>
</tbody>
</table>
SHOCK MEASUREMENT ON PANTOGRAPH

Wireless accelerometer with integrated data logger

SHOCK TRACKING ON HIGH-VALUE ITEMS

Standalone Operation
BeanScape® Basic

The BeanScape® application allows the user to view all the data transmitted by the BeanDevice® AX-3DS. With the OTAC (Over-the-Air configuration) feature, the user can remotely configure the BeanDevice® AX-3DS.

SEVERAL DATA ACQUISITION MODES ARE AVAILABLE ON THE BEANDEVICE® AX-3D:

- **Low Duty Cycle Data Acquisition mode (LDCDA)**: the data acquisition is immediately transmitted by radio. The transmission frequency can be configured from 1s to 24h.
- **Alarm Mode**: the measured value is transmitted by radio whenever an alarm threshold (fixed by the user) is detected (4 alarm threshold levels High/Low).
- **Survey Mode**: operates like the Alarm mode but the device sends frequently a beacon frame informing its current status.
- **Streaming Packet Mode**: all measured values are transmitted by packet within a continuous flow at 3 kbps/s maximum.
- **Streaming Mode**: all measured values are transmitted in real-time within a continuous flow at 100 samples per second maximum.

For further information about the different data acquisition modes:
TN_RF_008 – “Data acquisition modes available on the BeanDevice®”

BeanScape® Premium+

The BeanScape® Premium+ integrates an OPC DA server (Data Access). OPC DA is particularly well suited for real-time measurement and data sharing. Each data/measurement can be associated to a tag or its attributes and shared with one or many OPC clients.

*Over-the-Air Configuration*
While the vast majority of wireless sensors show their limits in harsh industrial environment, the BeanDevice® AX-3DS integrates an innovative antenna diversity design, boosting the radio link quality in environments subject to random and diverse disturbances. Antenna Diversity improves both the quality and reliability of a wireless link by 30%.

The BeanDevice® AX-3DS integrates an embedded data logger, which can be used to log data when a Wireless Sensor network can not be easily deployed on your site. All the data acquisition are stored on the embedded flash and then transmitted to the BeanGateway® when a Wireless Sensor Network is established. The data logger function is compatible with all the data acquisition mode available on your BeanDevice® AX-3DS:

• LowDutyCycle Data Acquisition
• Alarm & Survey
• Shock detection
• Streaming & Streaming packet

EXAMPLE : SHOCK DETECTION ON A TRAIN

For further information about the Datalogger, please read the following technical note:
TN_RF_007 – “BeanDevice® DataLogger User Guide”
## Sensor Specifications

<table>
<thead>
<tr>
<th>Accelerometer technology</th>
<th>MEMS technology</th>
</tr>
</thead>
</table>
| Scalable measurement range | 24G Version: ±6g / ±12g / ±24g  
8G Version: ±2g / ±4g / ±8g |
| Measurement resolution | 24G Version: 3 mg/digit @±6g, 6 mg/digit @±12g, 12 mg/digit @±24g  
8G Version: 1 mg/digit @±2g, 2 mg/digit @±4g, 3.9 mg/digit @±8g |
| Typical non-linearity | ±0.15% |
| Sensitivity change Vs temperature | ±0.01% /°C |
| Zero-g level change vs temperature (max delta from 25°C) | 24G Version: ±0.4 mg/°C  
8G Version: ±0.1 mg/°C |
| Typical zero-g level offset accuracy | 24G Version: ±70 mg  
8G Version: ±20 mg |
| Analog to Digital converter | 12-bits with temperature compensation |
| Noise spectral density @ BW 10Hz | 24G Version: 650 µg/√Hz  
8G Version: 218 µg/√Hz |
| Anti-aliasing filter | Butterworth 2th order filter |

## Over-the-air configuration (OTAC) parameters

| Data Acquisition mode (SPS = Sample Per Second) | Low Duty Cycle Data Acquisition (LDCDA) Mode: 1s to 24 hour  
Alarm & Survey mode: 1s to 24 hour  
Streaming Packet Mode & Streaming Mode  
Shock detection |
| Shock detection function | · Shock threshold in mg  
· Data acquisition sample rate in sleeping mode  
· Data acquisition sample rate after the shock detection  
· Shock detection hysteresis |
| Sampling Rate (in streaming packet mode) | Minimum: 1 SPS  
Maximum: 3 kSPS per axis (one axis enabled)  
1.5 kSPS per axis (2-axis enabled)  
1 kSPS per axis (3-axis enabled) |
<p>| Alarm Treshold | 2 high levels alarms &amp; 2 low levels alarms |
| Programmable Cut-off frequency (Anti-aliasing filter) | 1-2000 Hz |
| Power Mode | Sleeping, Sleeping with Network Listening &amp; Active |
| TX Power | +5 dBm/ +11 dBm/ +15 dBm/ +18 dBm |</p>
<table>
<thead>
<tr>
<th><strong>Wireless Protocol Stack</strong></th>
<th>IEEE 802.15.4 (2006 version)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WSN Topology</strong></td>
<td>Point-to-Point / Star</td>
</tr>
<tr>
<td><strong>Data Rate</strong></td>
<td>250 Kbits/s</td>
</tr>
<tr>
<td><strong>RF Characteristics</strong></td>
<td>ISM 2.4GHz - 16 Channels. Antenna diversity architecture designed by BeanAir®</td>
</tr>
<tr>
<td><strong>TX Power</strong></td>
<td>+0 dBm to +18 dBm</td>
</tr>
<tr>
<td><strong>Receiver Sensitivity</strong></td>
<td>-95.5 dBm to -104 dBm</td>
</tr>
<tr>
<td><strong>Maximum Radio Range</strong></td>
<td>650 m (L.O.S)</td>
</tr>
<tr>
<td><strong>Antenna</strong></td>
<td>Antenna Diversity: 2 omni-directional antenna with a gain of 3dBi</td>
</tr>
</tbody>
</table>

**Embedded Data Logger**

- **Storage Capacity**: up to 1 million data points
- **Wireless data downloading**: 3 minutes to download the full memory (average time)

**Real Time Clock and Crustal**

- **Real Time Clock**: Extremely Accurate Real Time Clock for measurement time stamping in Low duty cycle mode (±10ppm)
- **Crystal**: Extremely accurate crystal for measurement time stamping in streaming & streaming packet mode / Tolerance ±10ppm, stability ±10ppm

**Environmental and Mechanical**

- **Enclosure**: Aluminum & waterproof enclosure
  - * Standard Version: IP66 | NEMA 4
  - * Screw Mounting Version: IP67 | NEMA 6
  - Enclosure Dimensions(W/O Antenna) L×W×H: 80×55×21 mm , Weight (battery included) 145g
- **Shock Resistance**: 100g during 50ms
- **Operating Temperature**: -20 °C to +65 °C
- **Norms**: CE Labelling Directive R&TTE (Radio) ETSI EN 300 328
  - ROHS - Directive 2002/95/EC

**Power Supply**

- **Integrated Battery Charger**: Integrated Lithium-ion battery charger with high precision battery monitoring:
  - Overvoltage/Overcurrent/Short-Circuit/Undervoltage protection
  - Battery Temperature monitoring
- **Current Consumption @3.3V**: During data acquisition : 20 to 30 mA, During Radio transmission : 40 mA @ 5dBm , 70 mA @ 18 dBm
- **External Power Supply**: External power supply: +8v to +28v
- **Rechargeable Battery**: High density Lithium-ion rechargeable battery with a capacity of 1.25 Ah

**Option(s)**

- **Power-supply bloc**: Wall plug-in, Switchmode power supply 12V@ 1.25A with sealed M8 Plug (IP67 | Nema 6)
- **Screw Mounting**: The sensor module is to be mounted on a flat and smooth surface with 3 screws; dimension M5. Mounting torque 5 ±1Nm
//SCREW MOUNTING OPTION

The BeanDevice® AX-3DS comes with screw mounting option. The sensor module is to be mounted on a flat and smooth surface with 3 screws; dimension M5. Mounting torque 5 ±1Nm

//GETTING STARTED WITH A WIRELESS SENSOR NETWORK

The BeanDevice® AX-3DS operates only on our Wireless Sensor Networks, you will need the BeanGateway® and the BeanScape® for starting a wireless sensor Network.

For further information about the BeanDevice® battery life:
TN_RF_002 Current consumption in active & sleeping mode
TN_RF_012 Beandevice autonomy in Streaming and Streaming Packet Mode

Product specifications are subject to change without notice. Contact Beanair for latest specifications.
FOR MORE INFORMATION:

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