X-ray and acoustic imaging are two very complimentary tools for non destructively inspecting the quality of electronics components. Both techniques give information on different aspects of component integrity.

**X-ray images** are created by transmitting X-rays through the sample and detecting the shadow image it casts. Higher density materials such as solder cast a darker shadow while lower density regions such as voids cast a lighter shadow, making it easy to see features such as voiding.

**Acoustic imaging** transmits high frequency sound waves into the sample. Reflected sound waves reveal delaminations, voids, cracks and other features. The echo time gives depth information making it easy to inspect sample quality at different layers. Transmitted sound waves may also be measured to image features throughout the sample.
Efficient heat dissipation is particularly important for IGBT power devices and it is important to minimize the amount of voiding at interface layers.

High quality wire bonding and good encapsulation quality ensures good device performance.
BGA Device

High quality reflow of the solder balls connecting the device to the PCB is ensures long term reliability. Good device encapsulation is also important for durability.

Flip Chip

Internal solder bump size and voiding can affect device performance, as can underfill and encapsulation quality.
Summary
Together, Nordson X-ray and acoustic inspection tools provide the full picture.

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<thead>
<tr>
<th>Applications</th>
<th>X-ray</th>
<th>Acoustic</th>
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<tr>
<td>Solder, heavy metals and dense plastics</td>
<td>Good X-ray contrast</td>
<td>Limited Acoustic contrast</td>
</tr>
<tr>
<td>Organic and light metals</td>
<td>Limited X-ray contrast</td>
<td>Good Acoustic contrast</td>
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Defects

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<tr>
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<tbody>
<tr>
<td>Voiding</td>
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<tr>
<td>Delamination</td>
<td>Limited</td>
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<td>Solder open, bridging, head in pillow</td>
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<tr>
<td>Cracks</td>
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<td>Wire bonds</td>
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Modes of operation

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<th>Imaging modes</th>
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<tr>
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<td>Reflection, transmission, surface flatness/warpage</td>
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Solutions

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<th>Laboratory based inspection</th>
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<td>Nordson DAGE Quadra®</td>
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<td>Nordson SONOSCAN Gen7™</td>
<td>Nordson SONOSCAN Facts2™ DF2400</td>
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</table>

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