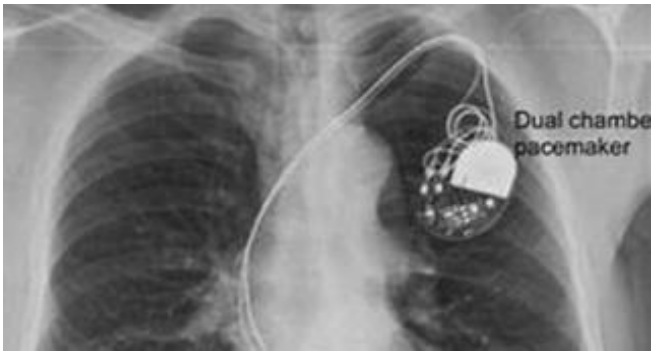
Handout 10 – UHDI for Medical Applications

Medical electronics demand miniaturization, reliability, and precision.
For next-generation devices, Ultra High-Density Interconnect (UHDI) technology is a game-changer. Implantable devices, wearables, and diagnostic tools can be smaller, lighter, and smarter - *without* sacrificing signal integrity or performance.

***High reliability* products have:**

- Impact on human life - medical, defense, communication, transportation sectors
- Parts that must function for a long time - when repair is difficult/impossible, as with an implanted device

Because medical applications are inherently high reliability driven, UHDI approaches are a must: Fabricators must build to meet stringent standards for long-term performance under harsh conditions – like moisture, body temperature, and movement.



✓**ASC holds ISO 13485 Certification to the International Standard for Medical Devices.**

Ultra HDI benefits for High Reliability Medical Applications

Miniaturization

- SWaP (Size, Weight and Power) – to make **devices that are smaller, lightweight and have greater functionality**
- **Smaller devices - ease of portability** allow them to be used in tracking patients and reporting via wifi connections of vitals
- **Less density for more functionality**
- Reduction of stacked microvias/layers/elimination of sub assembly
- Circuit miniaturization **allows for new surgical advances**

Signal Integrity

- Improved Performance - less variation in impedance

Biocompatibility

- Devices can be produced without copper and nickel, which are toxic in the body
- Circuits can be produced using only noble metals, such as Palladium and Gold.

Materials

- Improved reliability with thinner dielectrics and lower CTE/High Tg

- Other materials are available that have promise for use in the body, such as LCPs and Polyimide films

Reduced Parasitics: Improved signal integrity translates into lower energy requirements, especially in high-speed designs. *Parasitics* are unintended resistances, capacitances, and inductances - significant in high-frequency environments, where they can lead to signal loss, interference, and distortion.



Wearable Devices
Fitness trackers and smartwatches benefit from the reduced size and weight of Ultra HDI PCBs.

Implantable devices like pacemakers and neurostimulators demand ultra-reliable, space-efficient circuitry. With Ultra HDI, designers can increase routing density and integrate advanced signal processing directly on the board, for real-time responsiveness. Applications for **direct brain connection** are a reality today, with extensive research to expand on these avenues. Glucose monitoring, pacemakers, endoscopic devices, etc.

