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We help decision makers in semiconductor, system, financial, and communication service provider companies:

• Discover what products are winning in the highest-growth markets and why
• Spot or anticipate disruptive events, including the entrance of new players
• Understand state-of-the-art technology through independent, objective analysis
• Make better, faster product decisions with greater confidence
• Understand product costs and bill of materials

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We help IP Professionals in global technology companies, licensing entities and legal firms to:

• Build higher quality, more effective patents
• Identify patents of value and gather evidence of use to demonstrate this value
• Obtain accurate data for planning a potential defensive strategy or assertion case
• Make better portfolio management decisions to invest, abandon, acquire or divest
• Understand their competition, identify strategic partners, acquisition targets and business threats
TechInsights has been publishing technology analysis for 30 years, enabling our customers to advance their intellectual property and product strategies. We maintain the world’s largest database of reverse engineering analysis of semiconductor and consumer products

- 14,000+ technical reports available for purchase
- Covering 40 years of technologies (1977 to today)
- Thousands of new programs every year

### Markets
- Consumer Electronics
- Mobile Devices
- Medical Devices
- Storage Devices
- Automotive Electronics
- Internet of Things
- Semiconductors
- Wi-Fi
- Clean-Tech Devices
- Optoelectronics

### Devices
- DRAM Memory
- NAND Flash Memory
- Microprocessors / Controllers
- Wireless R/F
- Analog
- Antennas
- Power Management
- Sensors
- Displays

### Scope
- Product Teardowns & Costing / BOM
- Structural / Materials Analysis
- Packaging Analysis
- Circuit Extraction and Analysis
- Transistor Characterization
- Waveform Analysis
- Functional Testing
- Software Analysis
Apple’s U1 Marketing


Ultra Wideband technology comes to iPhone. The new Apple-designed U1 chip uses Ultra Wideband technology for spatial awareness — allowing iPhone 11 to precisely locate other U1-equipped Apple devices. Think GPS at the scale of your living room. So if you want to share a file with someone using AirDrop, just point your iPhone at theirs and they’ll be first on the list.³
What is UWB (Ultra-Wideband)?

UWB (Ultra-wideband) is a short-range radio technology that precisely pinpoints and measures distance between other UWB equipped devices. Similar to Bluetooth Low Energy, in that it requires low power to function, but different, as Bluetooth measures signal strength between devices, and UWB measures signal time between devices.

UWB-enabled devices exchange pulse shapes of information that improves the ranging accuracy and can be used for a future ranging exchange. The pulse shape information provides a time-zero index to a received ranging signal to develop timestamps for time-of-flight (TOF) calculations (similar to GPS technology). Distance is then calculated by assessing associated TOF data and exchanged pulse shape information.

UWB is not a new concept; the Estimote UWB comes equipped with Decawave UWB transceivers (DW1000 Radio IC).
Apple iPhone 11 U1 (UWB)

- According to Apple, the U1 chip allows the iPhone 11 to accurately detect other U1-equipped Apple devices through spatial awareness technology.
- Apple is the first company to offer a UWB chip in a smartphone device.
- UWB in Apple iPhones transmit on two different frequencies – 6.24 GHz and 8.2368 GHz.
- U1 chip can only communicate with other U1 chips.
- Apple applied for an "Ultra-wideband radios for time-of-flight-ranging and network position estimation" patent in 2006 (prior to the first iPhone's release) and has since applied for at least 3 more UWB-centric patents to be utilized in their future product offerings.
The US1 module shown here contains the Apple U1 chip.
The UWB in the Apple iPhones transmits on two different frequencies - 6.24 GHz and 8.2368 GHz.
The U1 chip can only communicate with other U1 chips. We expect to see the U1 in more Apple products, but note that we did not find it in the Apple Watch Series 5.
UWB and in-room tracking is not a new concept; it has been on Apple’s agenda since before the first iPhone was released.

https://www.techinsights.com/blog/apple-iphone-11-pro-max-teardown
Decawave DW1000 and Apple U1

Decawave DW1000 die

Manufactured on TSMC’s 90 nm process

Apple U1 TMKA75 die

Die allocation: 33% memory, 33% digital, 33% analog
This was manufactured on TSMC’s 16FF process
U1 Package
U1 Package X-Ray (Top)
U1 Package Jet-Etched
U1 – Die Photo & Bond Pads
Potential Apple UWB Use Cases

- **Apple ‘Tag1,1’:** The Apple Tag device will pair to the iPhone, utilizing UWB (among other locational technology such as NFC) and can be attached to any item. Will notify users of its whereabouts in proximity to the smartphone device in the event of misplacement. Apple Tag technology included in iOS 13 as ‘Find My’ app.

- **Apple Products:** Future iterations of Apple Watch, AirPods, AirPod cases, Apple Glasses, MacBook Pro, etc.

- **IoT:** Some potential applications include – smart home technology, enhanced mobile payments, indoor navigation, gaming, augmented reality and keyless car entry.

http://apple.com/icloud/find-my/
Planned Analysis
Circuit Analysis

- Hierarchical schematics are recreated in a way that mirror a developer's design
- Sub 10 nm - From the block down to the gate level – all linked to the original layout, showing the extracted gates and associated interconnects
- All circuit reports are shipped with CircuitVision™, providing a highly interactive, easy to navigate view of circuit design including the physical implementation on the integrated circuit.
Apple U1 (TMKA75 die) Ultra-Wideband die (USI RF Module of the iPhone 11) Circuit Analysis: CAR-1910-801

- Report Details:
  - Full Circuit Analysis on the Apple Ultra-Wideband TMKA75 die found in the USI RF Module of the iPhone 11
  - Interim deliverables available on request.
Apple Ultra-Wideband TMKA75 RF Architecture Analysis: ARC-1910-801

- Report Details:
  - Full RF Architecture Analysis on the Apple Ultra-Wideband
  - Interim deliverables available on request.

- Table of Contents:
  - Device Summary
  - Introduction
  - General Overview
  - RF Architecture
Floorplan and Teardown Reports

- **BFR-1910-801**
  - Apple U1 UWB SoC Basic Floorplan Analysis Report

- **CUT-1910-901**
  - iPhone 11 Block Diagram with U1 Poly Die Photo Teardown Analysis
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# Latest IoT Analysis Reports

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