CORNING

Enabling Technologies and Processes for Wearable Displays

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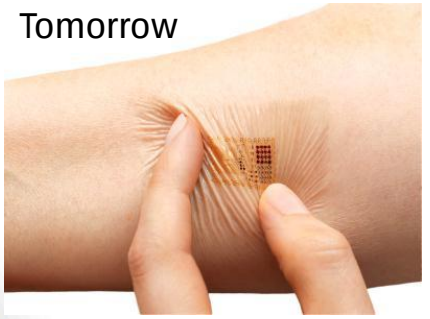
Evolution of wearables

Yesterday

Today

Tomorrow



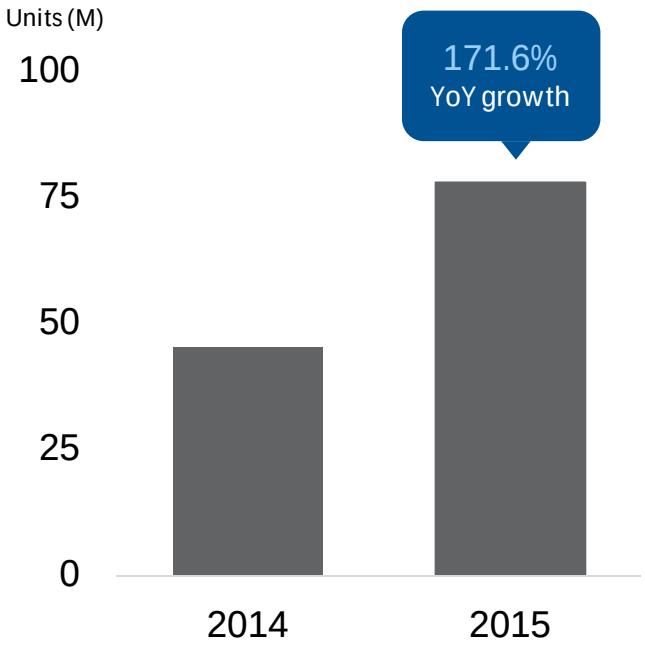
Wrist-worn devices dominate wearables market today, but growth is expected in several other form factors

	Head Mounted	Watch	Clothes	Accessory	Bioelectronics
					
Basic functions	Incorporates users' vision, speech and hearing Serves as a display screen in the form of glasses or visor	Voice/text message interface Smartphone app extension Health & location monitoring	Maintains appearance of normal clothing, but can warm up the body and/or provide simple electronic functions	Fashionable functionality, usually in the shape of a ring, bracelet, belt, headband or ring	Combines electronics and biotechnologies e.g. electronic skin, subcutaneous devices, ingestible devices
Some products currently on the market	Google Glass; wearable cameras, Oculus Rift	Apple Watch; Moto 360; Samsung Gear; Pebble; Sony	Under Armor E39	Jawbone Up, Nike +	EKG Heart monitor

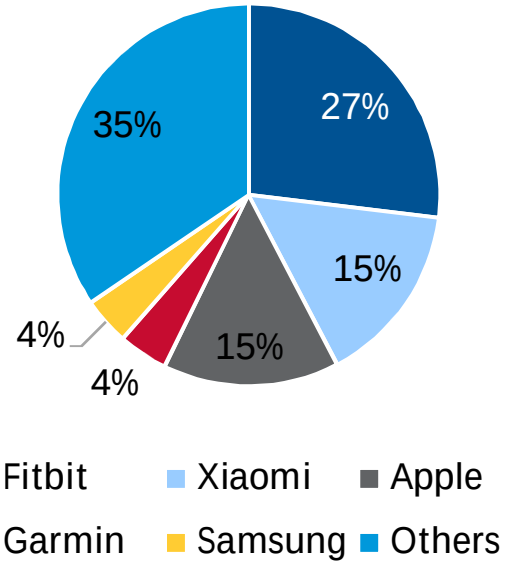
Data Source: Yuanta

Triple-digit growth highlights growing interest in wearables market from both end-users and manufacturers

Worldwide Wearables Shipments



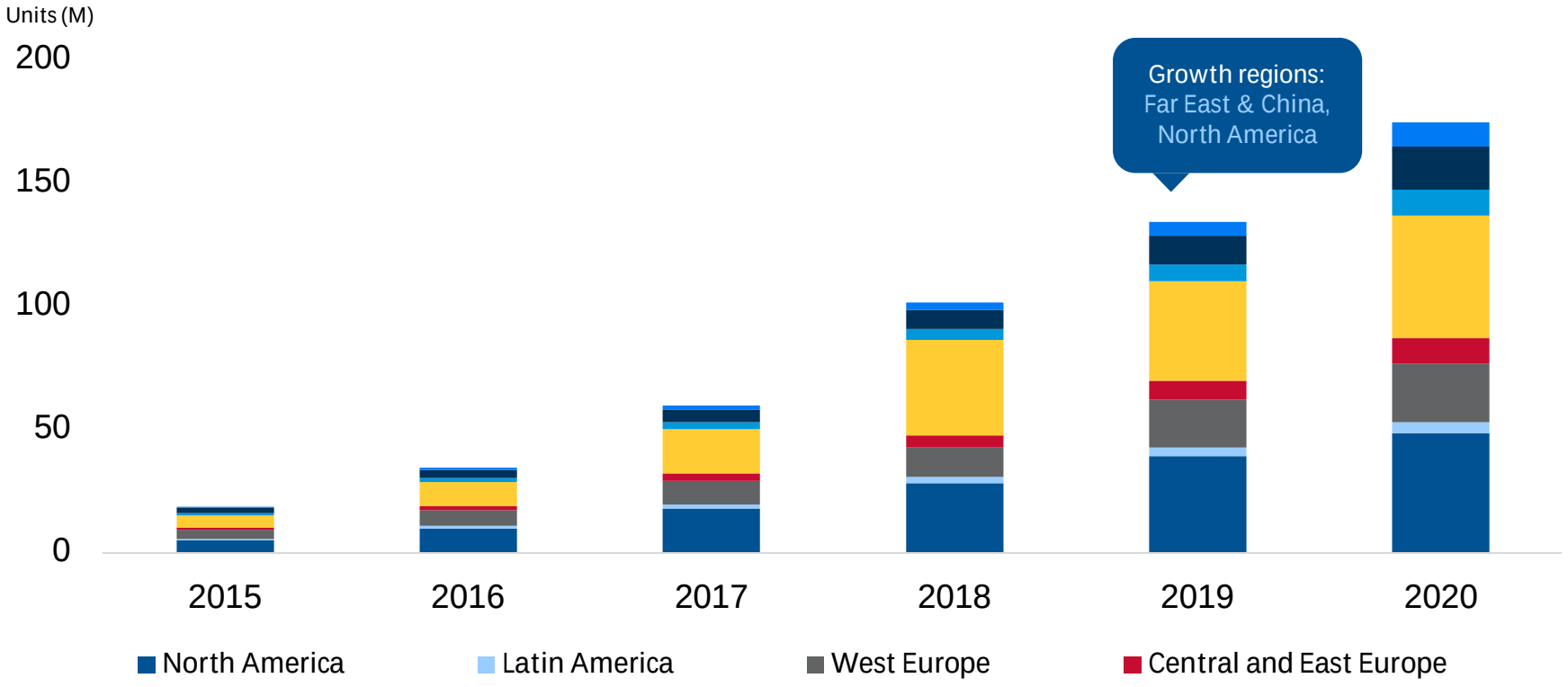
2015 Market Share



Data Source: IDC

Spotlight On: Smart Watch

Smart watch category could reach 100 million devices by 2019



Data Source: Juniper Research

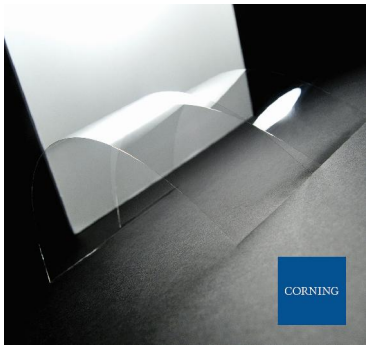
Spotlight On: Smart Watch

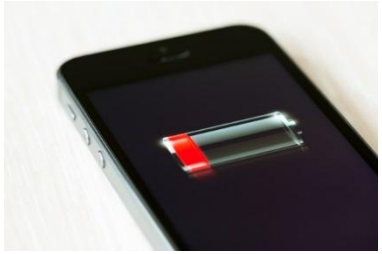
Compare and contrast: heirloom timepiece vs. smart watch

Functions	Time, date, pressure, altitude	+ Health monitoring, notifications, apps extension, location
Design	Wide range of fixed material choices, customized features	Customize digital face Choice of fixed materials
Battery Life	Years - unlimited	1-3 days
Lifetime	Generations	3-5 years
Durability	Sapphire face, metal housing	Glass or sapphire face, metal housing

Requirements for wearables

1	2	3
Surface material achieving arbitrary shapes, forms and finishes	Display with flexibility / conformability	Adequate battery life





1

Requirements for Wearables:

Surface material achieving arbitrary shapes, forms and finishes

Challenge

Designers want the freedom to choose shape, form and finish without sacrificing the damage resistance and image clarity of existing mobile device screens

Innovation

Supply chain is emerging to offer shaped glass parts, custom finishes and custom decoration process

Example: Vibrant™ Corning® Gorilla® Glass

2

Requirements for Wearables:

Display with flexibility / conformability

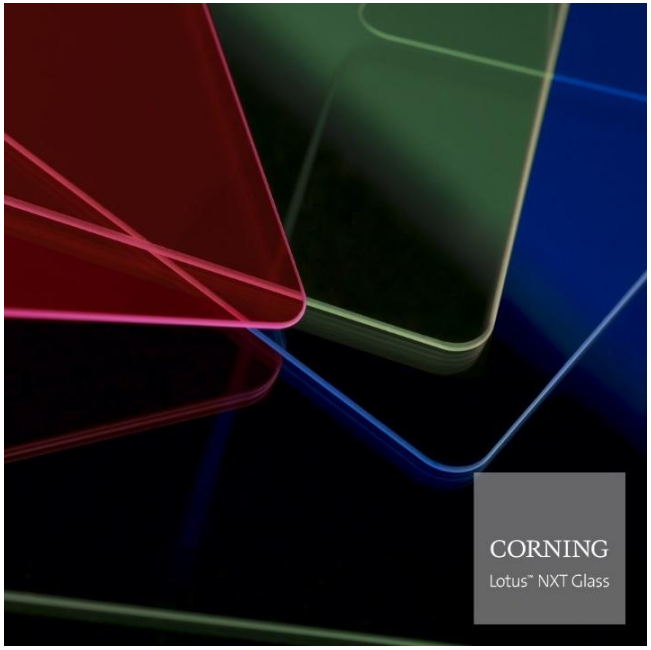
Challenge

Low cost, high-yield manufacturing of thin, light, flexible displays capable of arbitrary form factors

Innovation

Advantaged carrier glass is key to enabling PI OLED process

Example: Corning Lotus™ NXT Glass as a carrier for PI-OLED Displays



3 *Requirements for Wearables:* Adequate battery life

Challenge

Extend battery life of wearables from days to weeks

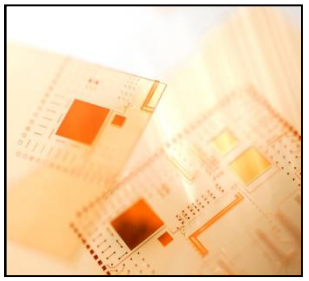
Innovation

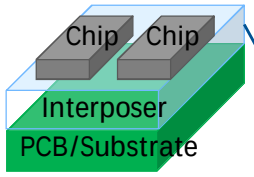
Power efficient displays & chipsets

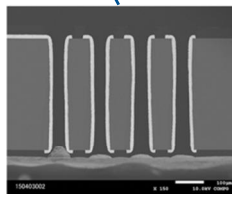
Conformable batteries

Advanced reflective displays process

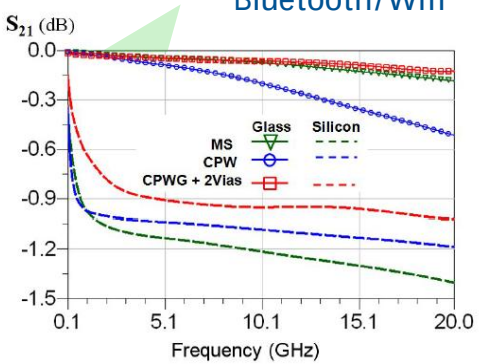
Example: Corning through-glass via packaging solutions







Bluetooth/Wifi



Summary

- Wrist-worn wearables are not heirloom devices, but we still expect them to look good and function well
- Future requirements for wrist-worn wearables push further on traditional values for mobile devices:
  - sunlight readable, low power, thin & light
  - form fitting and attractive design
- Corning is partnering with industry leaders to bring:
  - cost effective solutions for conformable and decorative surface materials and flexible displays
  - substrates and materials for more efficient displays and components

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