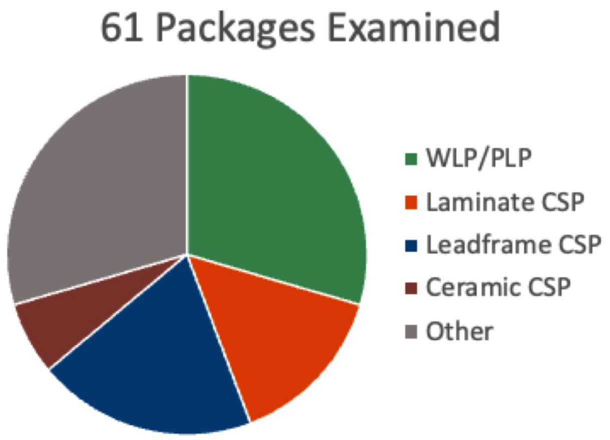
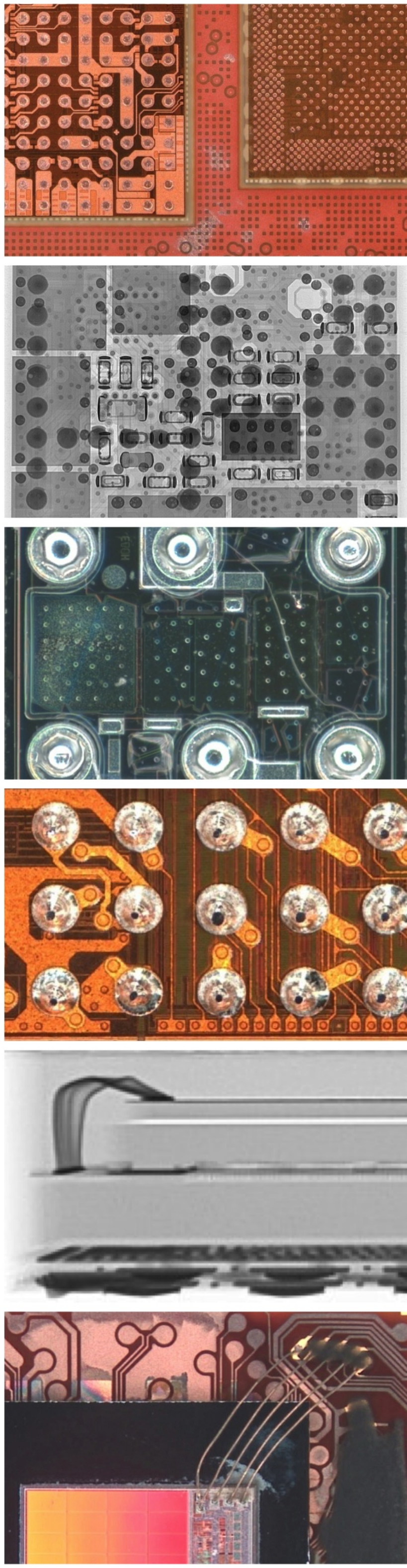
Samsung Galaxy Watch7 (Wi-Fi + LTE)

Teardown from TechSearch International, Inc.





Contents and Highlights

- 95-page report with package quantity summaries, high-resolution photos and x-rays, package dimensions, part numbers and descriptions, as well as analysis of packaging and assembly technologies discovered from package decapsulation
- 13 additional slides with construction analysis details for packages such as:
  - Samsung Exynos W1000 PoP with a stacked-die memory package mounted on top of a panel FO-assembled mobile processor, including RDL count and metrics
  - Qualcomm QPA6590 PAM and QFM6515 FEM, Samsung S5M9170 transceiver, Airoha AG3335M GNSS receiver with flash
  - LX Semicon LX83806 display driver
  - Flip chip-mounted photodiodes on redesigned biosensor board

Teardowns backed by 37 years serving as the industry's trusted source for semiconductor packaging trend analysis

- Examination of all chips with emphasis on assembly and packaging technologies
- Superb quality photographs and x-ray images
- Both the packages and the die within are identified and characterized
- Detailed construction analysis of key chips and packages

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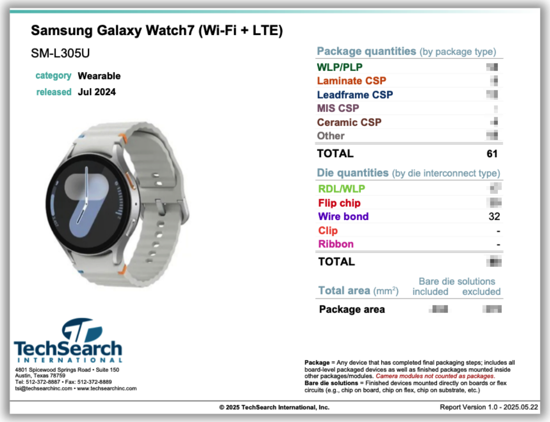
Sample pages from the report and slides



Samsung Galaxy Watch7 (Wi-Fi + LTE)

SM-L305U

category Wearable

released Jul 2024

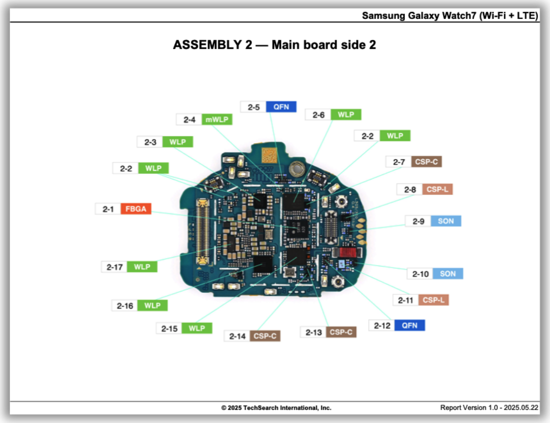
Package quantities (by package type)	
WLP/PLP	[redacted]
Laminate CSP	[redacted]
Leadframe CSP	[redacted]
MIS CSP	[redacted]
Ceramic CSP	[redacted]
Other	[redacted]
TOTAL	61

Die quantities (by die interconnect type)	
RDL/WLP	[redacted]
Flip chip	[redacted]
Wire bond	32
Clip	-
Ribbon	-
TOTAL	[redacted]

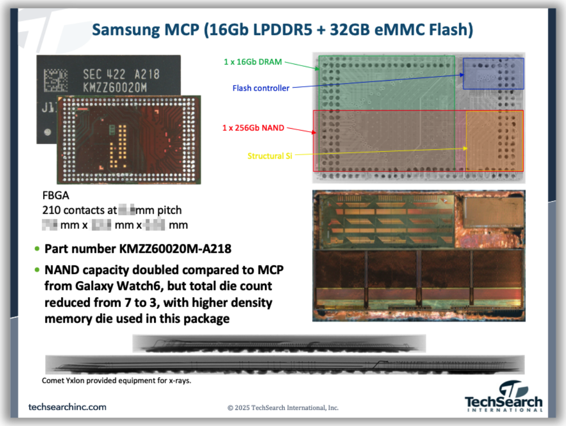
Total area (mm²)	Bare die solutions included	Bare die solutions excluded
Package area	[redacted]	[redacted]

Package = Any device that has completed final packaging steps; includes all board-level packaged devices as well as finished packages mounted inside other packages/modules. *Camera modules not counted as packages.*
Bare die solutions = Finished devices mounted directly on boards or flex circuits (e.g., chip on board, chip on flex, chip on substrate, etc.)

TechSearch International
4801 Spicewood Springs Road • Suite 150
Austin, Texas 78759
Tel: 512-372-8887 • Fax: 512-372-8889
tsi@techsearchinc.com • www.techsearchinc.com



ASSEMBLY 2 — Main board side 2

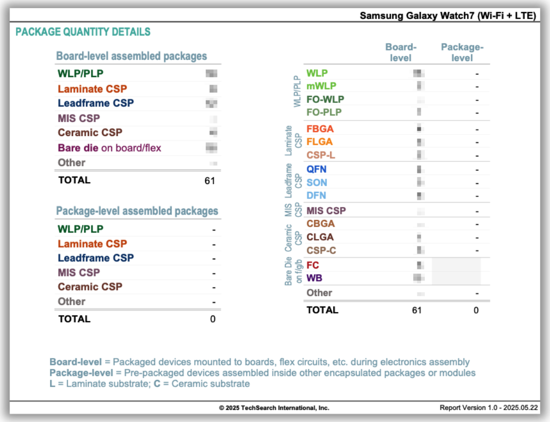


Samsung MCP (16Gb LPDDR5 + 32GB eMMC Flash)

FBGA
210 contacts at [redacted] mm pitch
[redacted] mm x [redacted] mm x [redacted] mm

- Part number KMZZ60020M-A218
- NAND capacity doubled compared to MCP from Galaxy Watch6, but total die count reduced from 7 to 3, with higher density memory die used in this package

Comet Yxlon provided equipment for x-rays.



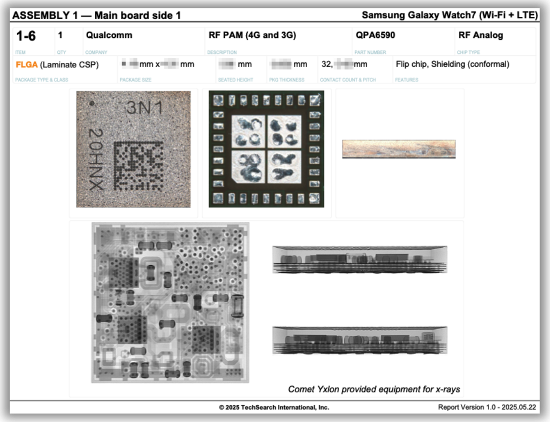
PACKAGE QUANTITY DETAILS

Board-level assembled packages	
WLP/PLP	[redacted]
Laminate CSP	[redacted]
Leadframe CSP	[redacted]
MIS CSP	[redacted]
Ceramic CSP	[redacted]
Bare die on board/flex	[redacted]
Other	[redacted]
TOTAL	61

Package-level assembled packages	
WLP/PLP	-
Laminate CSP	-
Leadframe CSP	-
MIS CSP	-
Ceramic CSP	-
Other	-
TOTAL	0

		Board-level	Package-level
WLP/PLP	WLP	[redacted]	-
	mWLP	[redacted]	-
	FO-WLP	[redacted]	-
	FO-PLP	[redacted]	-
Laminate CSP	FBGA	[redacted]	-
	FLGA	[redacted]	-
	CSP-L	[redacted]	-
Leadframe CSP	QFN	[redacted]	-
	SON	[redacted]	-
	DFN	[redacted]	-
MIS CSP	MIS CSP	[redacted]	-
Ceramic CSP	CBGA	[redacted]	-
	CLGA	[redacted]	-
	CSP-C	[redacted]	-
Bare Die on board/flex	FC	[redacted]	
	WB	[redacted]	
	Other	[redacted]	-
	TOTAL	61	0

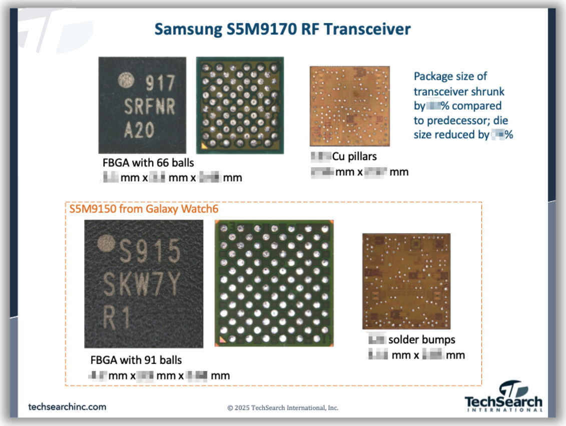
Board-level = Packaged devices mounted to boards, flex circuits, etc. during electronics assembly
Package-level = Pre-packaged devices assembled inside other encapsulated packages or modules
L = Laminate substrate; C = Ceramic substrate



ITEM	QTY	COMPANY	DESCRIPTION	PART NUMBER	CHIP TYPE
1-6	1	Qualcomm	RF PAM (4G and 3G)	QPA6590	RF Analog

PACKAGE TYPE & CLASS	PACKAGE SIZE	SEATED HEIGHT	PKG THICKNESS	CONTACT COUNT & PITCH	FEATURES
FLGA (Laminate CSP)	[redacted] mm x [redacted] mm	[redacted] mm	[redacted] mm	32, [redacted] mm	Flip chip, Shielding (conformal)

Comet Yxlon provided equipment for x-rays



Samsung S5M9170 RF Transceiver

FBGA with 66 balls
[redacted] mm x [redacted] mm x [redacted] mm

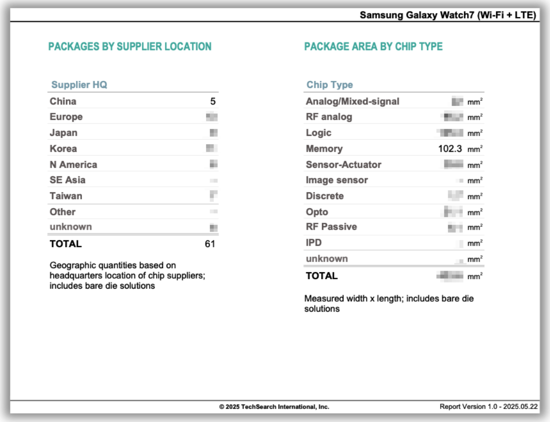
[redacted] Cu pillars
[redacted] mm x [redacted] mm

Package size of transceiver shrunk by [redacted]% compared to predecessor; die size reduced by [redacted]%

S5M9150 from Galaxy Watch6

FBGA with 91 balls
[redacted] mm x [redacted] mm x [redacted] mm

[redacted] solder bumps
[redacted] mm x [redacted] mm



PACKAGES BY SUPPLIER LOCATION

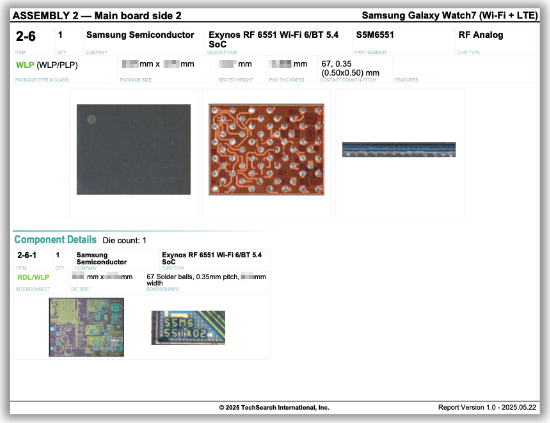
Supplier HQ	
China	5
Europe	[redacted]
Japan	[redacted]
Korea	[redacted]
N America	[redacted]
SE Asia	[redacted]
Taiwan	[redacted]
Other	[redacted]
unknown	[redacted]
TOTAL	61

Geographic quantities based on headquarters location of chip suppliers; includes bare die solutions

PACKAGE AREA BY CHIP TYPE

Chip Type	
Analog/Mixed-signal	[redacted] mm²
RF analog	[redacted] mm²
Logic	[redacted] mm²
Memory	102.3 mm²
Sensor-Actuator	[redacted] mm²
Image sensor	[redacted] mm²
Discrete	[redacted] mm²
Opto	[redacted] mm²
RF Passive	[redacted] mm²
IPD	[redacted] mm²
unknown	[redacted] mm²
TOTAL	[redacted] mm²

Measured width x length; includes bare die solutions



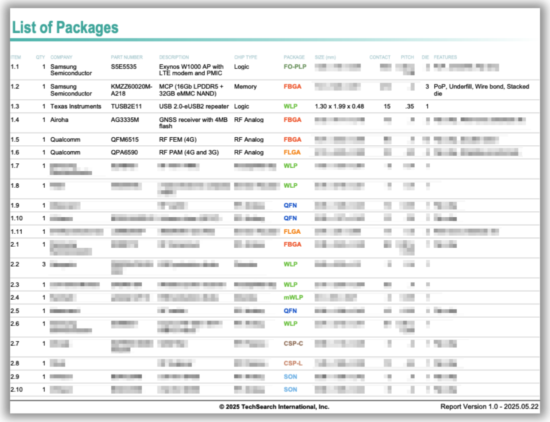
ITEM	QTY	COMPANY	DESCRIPTION	PART NUMBER	CHIP TYPE
2-6	1	Samsung Semiconductor	Exynos RF 6551 Wi-Fi 6/BT 5.4 SoC	S5M6551	RF Analog

PACKAGE TYPE & CLASS	PACKAGE SIZE	SEATED HEIGHT	PKG THICKNESS	CONTACT COUNT & PITCH	FEATURES
WLP (WLP/PLP)	[redacted] mm x [redacted] mm	[redacted] mm	[redacted] mm	67, 0.35 (0.50x0.50) mm	

Component Details Die count: 1

ITEM	QTY	COMPANY	FUNCTION
2-6-1	1	Samsung Semiconductor	Exynos RF 6551 Wi-Fi 6/BT 5.4 SoC

INTERCONNECT	DIE SIZE	BONDS/BUMPS
RDL/WLP	[redacted] mm x [redacted] mm	67 Solder balls, 0.35mm pitch, [redacted] mm width



List of Packages

ITEM	QTY	COMPANY	PART NUMBER	DESCRIPTION	CHIP TYPE	PACKAGE	SIZE (mm)	CONTACT	PITCH	DIE	FEATURES
1.1	1	Samsung Semiconductor	S5E5535	Exynos W1000 AP with LTE modem and PMIC	Logic	FO-PLP	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1.2	1	Samsung Semiconductor	KMZZ60020M-A218	MCP (16Gb LPDDR5 + 32GB eMMC NAND)	Memory	FBGA	[redacted]	[redacted]	[redacted]	3	PoP, Underfill, Wire bond, Stacked die
1.3	1	Texas Instruments	TUSB2E11	USB 2.0-eUSB2 repeater	Logic	WLP	1.30 x 1.99 x 0.48	15	.35	1	
1.4	1	Airoha	AG3335M	GNSS receiver with 4MB flash	RF Analog	FBGA	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1.5	1	Qualcomm	QFM6515	RF FEM (4G)	RF Analog	FBGA	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1.6	1	Qualcomm	QPA6590	RF PAM (4G and 3G)	RF Analog	FLGA	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1.7	1	[redacted]	[redacted]	[redacted]	[redacted]	WLP	[redacted]	[redacted]	[redacted]	[redacted]	
1.8	1	[redacted]	[redacted]	[redacted]	[redacted]	WLP	[redacted]	[redacted]	[redacted]	[redacted]	
1.9	1	[redacted]	[redacted]	[redacted]	[redacted]	QFN	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1.10	1	[redacted]	[redacted]	[redacted]	[redacted]	QFN	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1.11	1	[redacted]	[redacted]	[redacted]	[redacted]	FLGA	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2.1	1	[redacted]	[redacted]	[redacted]	[redacted]	FBGA	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2.2	3	[redacted]	[redacted]	[redacted]	[redacted]	WLP	[redacted]	[redacted]	[redacted]	[redacted]	
2.3	1	[redacted]	[redacted]	[redacted]	[redacted]	WLP	[redacted]	[redacted]	[redacted]	[redacted]	
2.4	1	[redacted]	[redacted]	[redacted]	[redacted]	mWLP	[redacted]	[redacted]	[redacted]	[redacted]	
2.5	1	[redacted]	[redacted]	[redacted]	[redacted]	QFN	[redacted]	[redacted]	[redacted]	[redacted]	
2.6	1	[redacted]	[redacted]	[redacted]	[redacted]	WLP	[redacted]	[redacted]	[redacted]	[redacted]	
2.7	1	[redacted]	[redacted]	[redacted]	[redacted]	CSP-C	[redacted]	[redacted]	[redacted]	[redacted]	
2.8	1	[redacted]	[redacted]	[redacted]	[redacted]	CSP-L	[redacted]	[redacted]	[redacted]	[redacted]	
2.9	1	[redacted]	[redacted]	[redacted]	[redacted]	SON	[redacted]	[redacted]	[redacted]	[redacted]	
2.10	1	[redacted]	[redacted]	[redacted]	[redacted]	SON	[redacted]	[redacted]	[redacted]	[redacted]	

For pricing, please call +1-512-372-8887