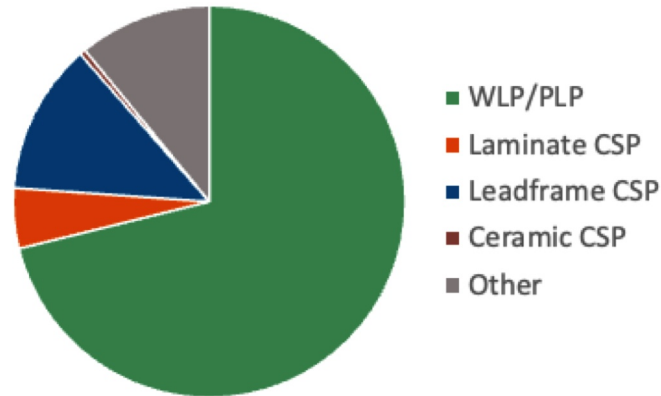


SpaceX Starlink Mini

Teardown from TechSearch International, Inc.



201 Packages Examined



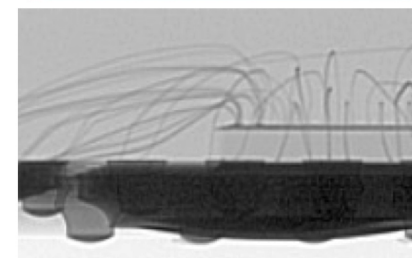
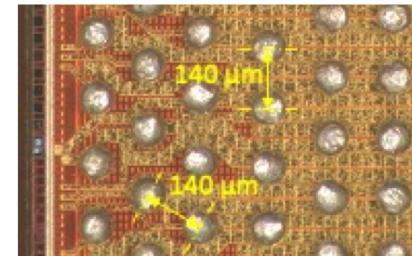
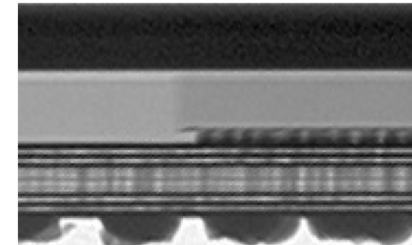
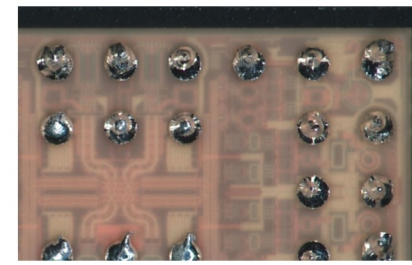
Contents and Highlights

- 88-page report with package quantity summaries, high-resolution photos and x-rays, chip function and package dimensions, die images and characteristics, and more
- 18 additional slides with extra details about STMicroelectronics application processor, RF front-end ICs in molded WLPs, and digital beamforming ICs, Samsung 8Gb DDR4 DRAM with flip chip die attach, Kingston 4GB eMMC flash memory with Samsung DRAM die, Kingston 2Gb DDR3L DRAM with board-on-chip construction, MediaTek Wi-Fi router processor with nearly 1,000 Cu wire bonds, and multiple leadframe-based packages with flip chip die

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

SpaceX Starlink Mini

UTA-231

category Consumer
released Jul 2024



Package quantities (by package type)

WLP/PLP	
Laminate CSP	
Leadframe CSP	
MIS CSP	
Ceramic CSP	
Other	
TOTAL	201

Die quantities (by die interconnect type)

RDL/WLP	
Flip chip	
Wire bond	
Clip	
Ribbon	
TOTAL	

Package area Bare die solutions included excluded

TOTAL area (mm²)

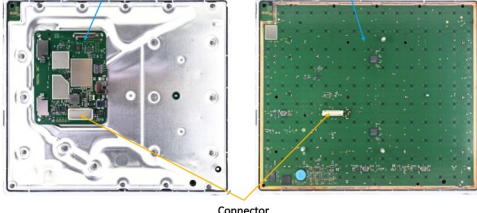
TOTAL

Package = Any device that has completed final packaging steps. Includes all 4000 packaged devices as well as all finished packages mounted inside other packages/modules. Counts include but are not limited to packages and modules. Bare die solutions = Finished devices received directly on boards or flex circuits (e.g., chip on board, chip on flex, chip on substrate, etc.)

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Inside of Starlink Mini




Wi-Fi router board Antenna board

Connector

Dish has two single-sided circuit boards: The main antenna board and a Wi-Fi router board

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ASSEMBLY 3 — Wi-Fi router board side 1



3-11 SO 3-12 QFN 3-13 QFN 3-8 SO

3-10 SO 3-9 SO 3-14 QFN 3-15 QFN

3-6 SO 3-7 SON 3-16 SON 3-17 QFN

3-4 QFN 3-3 SMD 3-2 FBGA 3-1 FBGA 3-9 SO

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PACKAGE QUANTITY DETAILS

Board-level assembled packages	Board-level	Package-level
WLP/PLP		
Laminate CSP		
Leadframe CSP		
MIS CSP		
Ceramic CSP		
Bare die on board/flex		
Other		
TOTAL	201	

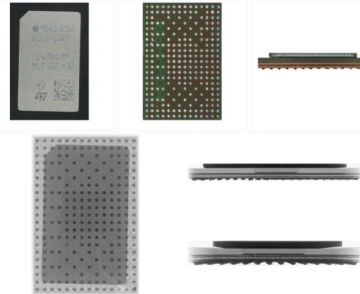
Package-level assembled packages	Board-level	Package-level
WLP/PLP		
Laminate CSP		
Leadframe CSP		
MIS CSP		
Ceramic CSP		
Other		
TOTAL	201	0

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

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ASSEMBLY 1 — Antenna board side 1

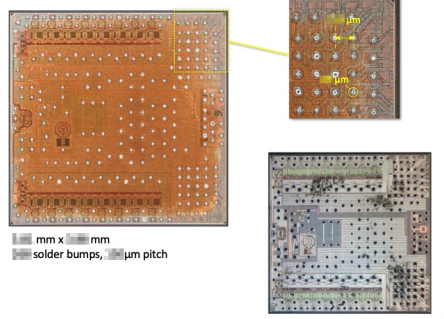
1-4	1	STMicroelectronics	Arm-based application processor	GLLCPUAKE	Logic
FBGA (Laminate CSP)					Flip chip



Comet Xylon provided equipment for x-rays

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Die from ST Digital Beamformer



mm x mm
solder bumps, μm pitch

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PACKAGES BY SUPPLIER LOCATION

Supplier HQ	Count
China	
Europe	
Japan	
Korea	
N America	
SE Asia	
Taiwan	13
Other	
unknown	
TOTAL	201

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

PACKAGE AREA BY CHIP TYPE

Chip Type	Area (mm ²)
Analog/Mixed-signal	
RF analog	
Logic	323.7
Memory	
Sensor-Actuator	
Image sensor	
Discrete	
Opto	
RF Passive	
IPD	
unknown	
TOTAL	


Measured width x length; includes bare die solutions

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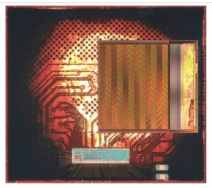
ASSEMBLY 1 — Antenna board side 1

Component Details

Die count: 2	Die count: 1	Die count: 1	Die count: 1
1-1-1 1 Samsung Semiconductor 32Gb NAND Flash	1-1-2 1 Phison Flash controller		



Additional Images



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List of Packages

REF	QTY	REF	MANUFACTURER	PART NUMBER	CHIP TYPE	PACKAGE	SIZE	CONTACT	REF	QTY	REF	QTY	REF	QTY	REF	QTY	REF	QTY	REF	QTY
1.1	1	Kingston Technology	EMACDGL W732-01010	4GB 48MB NAND Flash	Memory	FBGA	11.30 x 12.71 x 0.71	153	2	1	1	1	1	1	1	1	1	1	1	1
1.2	1	Samsung Semiconductor	KA40166WC-BWE	8GB DDR4 DRAM	Memory	FBGA														
1.3	1	Texas Instruments	TPS51320-Q1	QDR termination regulator	Analog/Mix-Sig	SON														
1.4	1	STMicroelectronics	GLLCPUAKE	Arm-based application processor	Logic	FBGA														
1.5	1	STMicroelectronics	ST92FH0	Ethernet PHY transceiver	Analog/Mix-Sig	QFN														
1.6	1	STMicroelectronics	ST92FH0	Synchronous step-down converter	Analog/Mix-Sig	QFN														
1.7	2	Texas Instruments	LM508A	Dual operational amplifier	Analog/Mix-Sig	SO														
1.8	1	STMicroelectronics	ST92FH0	Synchronous buck converter	Analog/Mix-Sig	QFN														
1.9	3	STMicroelectronics	LM85DTR	4-pin I ² C Sensor-Actuator	Logic	FBGA	2.45 x 2.95 x 0.86	14	0.5	2	1	1	1	1	1	1	1	1	1	1
1.10	1	STMicroelectronics	STANWFG	Texas II GNSS receiver with SDR flash	RF Analog	QFN														
1.11	1	STMicroelectronics	ST92FH0	SAW filter for GNSS	RF Passive	CSP-C														
1.12	1	STMicroelectronics	ST92FH0	Clock buffer and level translator for PCIe	Logic	QFN														
1.13	1	STMicroelectronics	ST92FH0	RF front-end	RF Analog	mWLP														
1.14	1	STMicroelectronics	ST92FH0	RF front-end	Analog/Mix-Sig	FBGA														
1.15	1	STMicroelectronics	ST92FH0	RF front-end	Analog/Mix-Sig	SO														
1.16	1	STMicroelectronics	ST92FH0	Synchronous step-down regulator	Analog/Mix-Sig	SO														
1.17	1	STMicroelectronics	ST92FH0	Synchronous step-down regulator	Analog/Mix-Sig	SO														
1.18	1	STMicroelectronics	ST92FH0	Multi-color LED	Opto	LCC														
1.19	1	STMicroelectronics	ST92FH0	Synchronous step-down converter	Analog/Mix-Sig	QFN														
1.20	1	STMicroelectronics	ST92FH0	Synchronous step-down converter	Analog/Mix-Sig	QFN														

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