

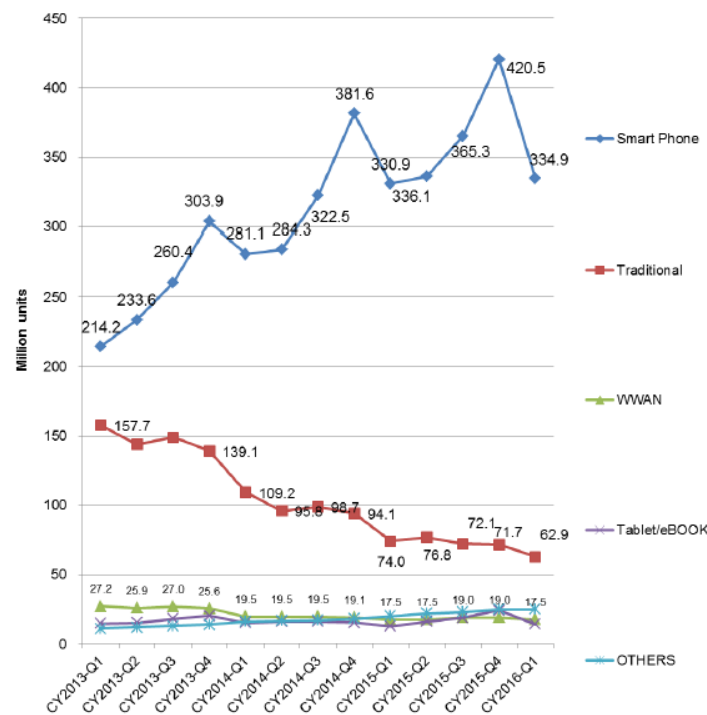
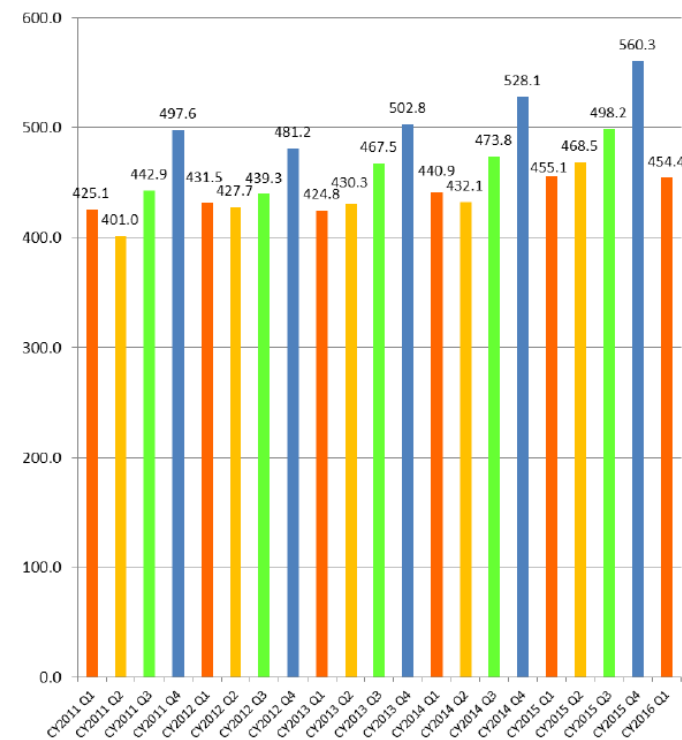
Navian Marketing Report

RF Devices/Modules For Cellular Terminal Quarterly Market Report Q1 2016

Released on July 10th 2016

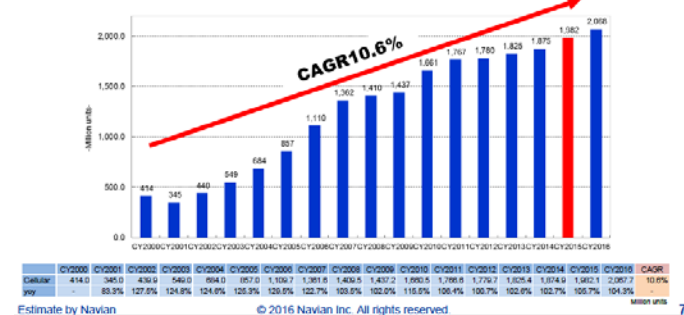
RF Devices/Modules for Cellular Terminal in the report

- ① Front end Module (ASM • RX Module • TX Module • PAiD • FEMiD • All-in-One FEM • PAMiD • FILTER BANK • Duplexer Bank)
- ② Antenna Switch (Main RF/Diversity) Power Amplifier Module
- ④ Duplexer
- ⑤ Band Pass Filter
- ⑥ TCXO



Cellular Terminal Annual Shipment History CY2000-CY2015

- Shipment size of Cellular Terminal in 2016 is expected to be 2,067.7 million units (YoY 104.3%).
- As far as shipment in Q1 goes, 4.3% growth is a big challenge.
- GALAXY S7 said to be doing well, and iPhone7, a full model-change version after 2yrs, should both add momentum to the top 2 manufacturers after Q2, and increased demands in markets of emerging nations such as India are promising.
- The promising field of non-voice Cellular Terminals such as Tablet and Notebook PC is thought to gain full momentum from 2016 to 2017.



1Q 2016: FEMiD Market Size

- Market size of FEMiD in Q1 2016 was 57.5 million pcs based on quantity, 127.8 million dollars based on amount.
- It shows significant YoY growth, with 121.1% (quantity) and 123.5% (amount), but seasonal factors produced negative QoQ growth, with 94.3% (quantity) and 93.2% (amount).
- FEMiD is adopted in middle-/low-end LTE smartphones like J Series, E Series, and A Series that SAMSUNG is trying to expand sales to cover the loss created by high-end smartphones like GALAXY S6. FEMiD demands are expanding from late 2015 and the trend is still continuing on in 2016.
- FEMiD users other than SAMSUNG are LG, ASUS, OPPO, Microsoft, Lenovo, etc., but most is for SAMSUNG products.
- Also, OPPO and Lenovo are thought to stop adopting FEMiD in the near future.

QTY	AMOUNT	YoY	QoQ
FEMiD	57.5	121.1%	94.3%
Other	127.8	123.5%	93.2%

Multiplexer: Quadplexer Example & Outline

- Quadplexer is earning increased demands as component that support Carrier Aggregation in middle-band group such as Band-1&3, and Band-2&4.
- The component is constituted by 2 Duplexers that work simultaneously.
- Both high isolation and attenuation characteristics are required for simultaneous processing, and thus product development is truly challenging.
- Currently, Quadplexer by AVAGO's FBAR that can be equipped with phase shifter natively, is leading the market.
- Aside from this, some of MURATA's SAW types are mass produced for Band-1 and 3.
- Skyworks is said to be developing a product which a Switch is used to replace phase shifter function, but since big loss can be expected, the competitiveness is unknown.
- Also, there is a "Quadplexer" to demultiplex frequency into 4, used in "Extractor" of iPhone6s, but this has different usage from the Quadplexer we are talking about.

iPhone SE A1723 RF Block diagram Estimation

- "iPhone SE" is low-end version of iPhone, released in March.
- Composition of RF component was said to have been diverted from iPhone6, but it is actually the same as iPad Air2 that has RF component from same generation.
- Difference with iPhone6 is the Antenna part.
- iPhone6 had circuit composition that shared Antenna between WiFi and GPS to save mounting surface.
- iPad Air2 and iPhone SE have 1 Antenna each for WiFi and for GPS.
- Other difference is how vendors of PAiD for high-band and PAiD for low-band are both Qorvo.
- This is also same as iPad Air2.

e-Book Reader
Tablet PC

WWAN Terminal
Adapter

Embedded Module

Smart Phone

Traditional Handset
Mobile Phone

Fixed Wireless Terminal

Non-Voice

Voice

■ Outline of the report

RF Devices/Modules For Cellular Terminal Quarterly Market Report Q1 2016
-CD-ROM (PDF file)-

- The date of issue July 10, 2016
- The Documents of the report The PDF file of 249 SLIDES : MS PowerPoint based/Excel data/JPEG files of Teardown photos
- Report price JP¥168,000
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Antenna Switch for Main RF =>SP7T
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