

GSM/GPRS Chipset and Reference design Update

2G - 2.5G Chipset Business Unit



Wireless Handset Segmentation

Multimedia Rich Phones

Smartphone

High-End

Classic

Basic/Entry

Low Cost

PERFORMANCE-Driven

- ❖ MIPS/Technology/Architecture
- ❖ Open OS and Applications
- ❖ 15% of the market in 2005

MODEM & APPLICATIONS-Driven

- ❖ State of the Art Modem
- ❖ Embedded Applications
- ❖ BOM
- ❖ 65% of the market in 2005

COST-Driven

- ❖ "Lowest Cost Attitude"
- ❖ Trade-off on Features
- ❖ 20% of the market in 2005

2002

2003

2004

2005

2006/7

TI Chipset Current Offer Enables All Market Segments



**OMAP1510
Helen**

**TCS2100
Calypso**

Combines
Communications
& Applications
on a Single Chip

TCS2500

OMAP710

**OMAP710
PERSEUS1**



**TCS2110
Calypso**



**TCS1100
Hercules**

Multimedia Rich phone / PDA

- ❖ High Level OS
- ❖ Open Applications Environment
- ❖ Multimedia Enhanced Apps
- ❖ High Performance Java

Multimedia / Smartphone

- ❖ High-level OS
- ❖ Open Applications Environment
- ❖ Simple Multimedia
- ❖ Java Enabled

Classic / Java phone

- ❖ Embedded Environment
- ❖ Optimized Applications and Communication
- ❖ Java Enabled
- ❖ Riviera Tool Support

Entry / Voice phone

- ❖ Melody
- ❖ BOM Centric
- ❖ Roadmap Towards Single Chip
- ❖ Riviera Tool Support

TI Proprietary Information - Strictly Private

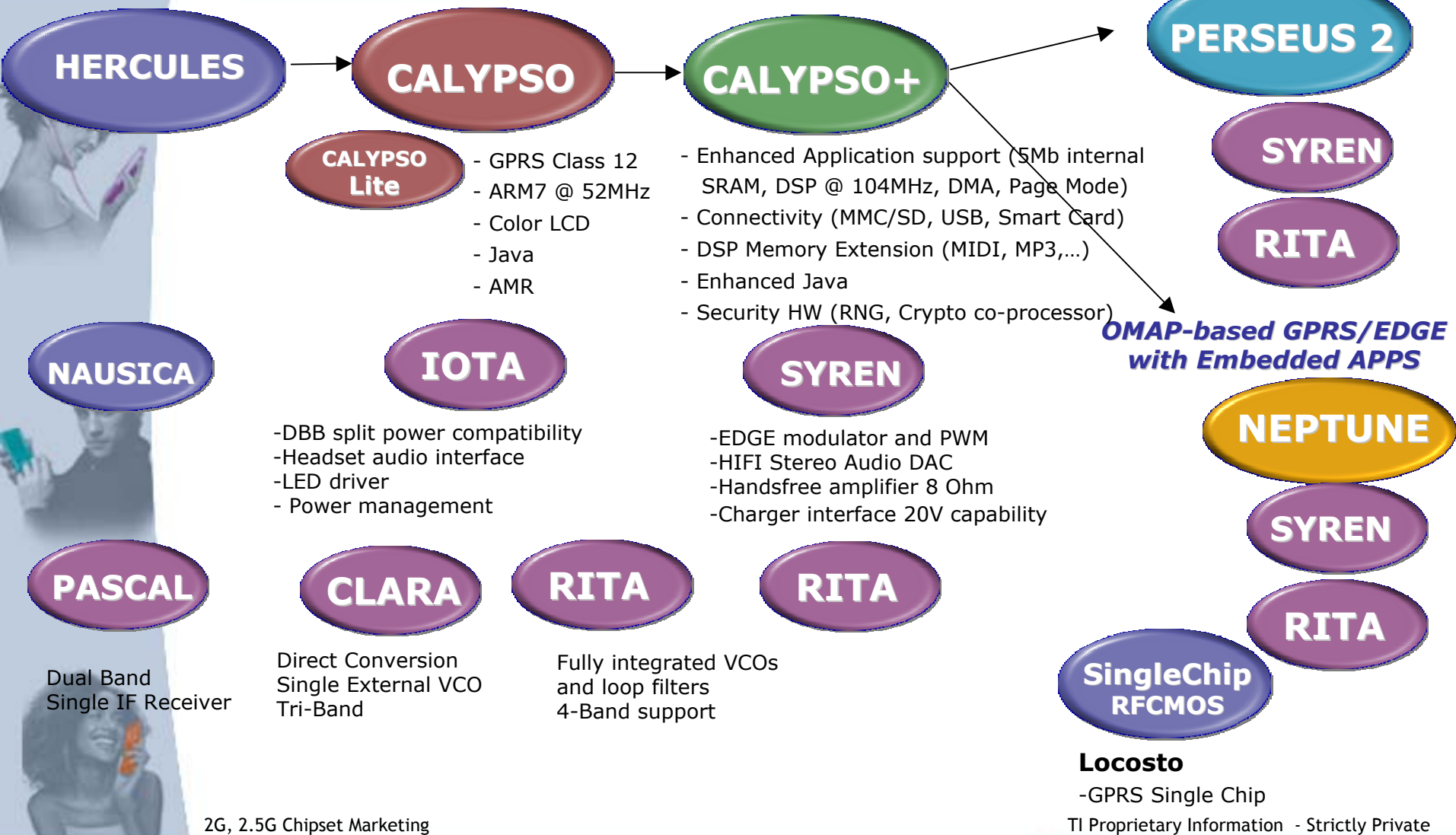
2G, 2.5G Chipset Marketing

Some Customers and Models...



2.5G Chipset Roadmap

MULTIMEDIA and OpenOS

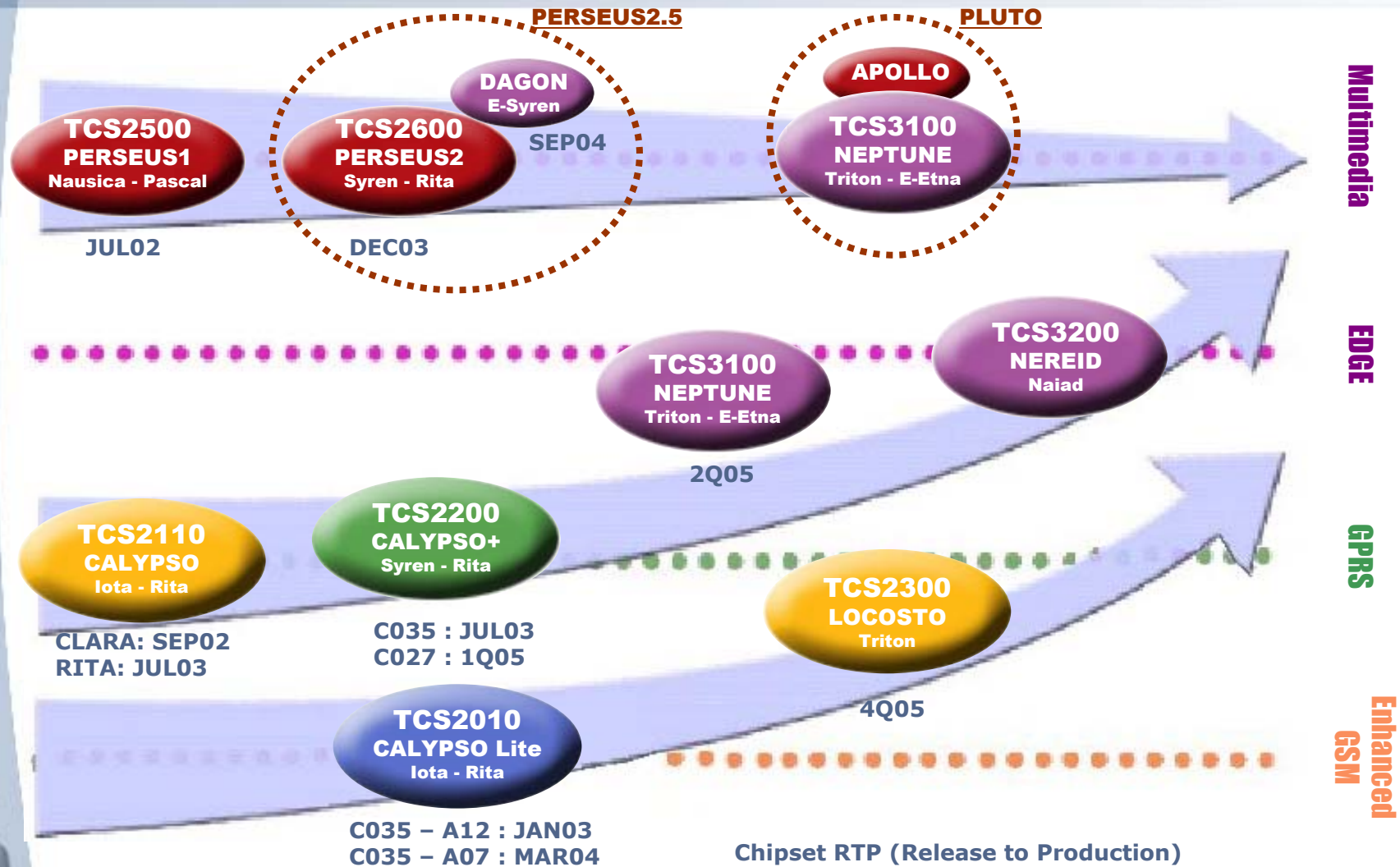


2G, 2.5G Chipset Marketing

TI Proprietary Information - Strictly Private

Chipset Product Roadmap

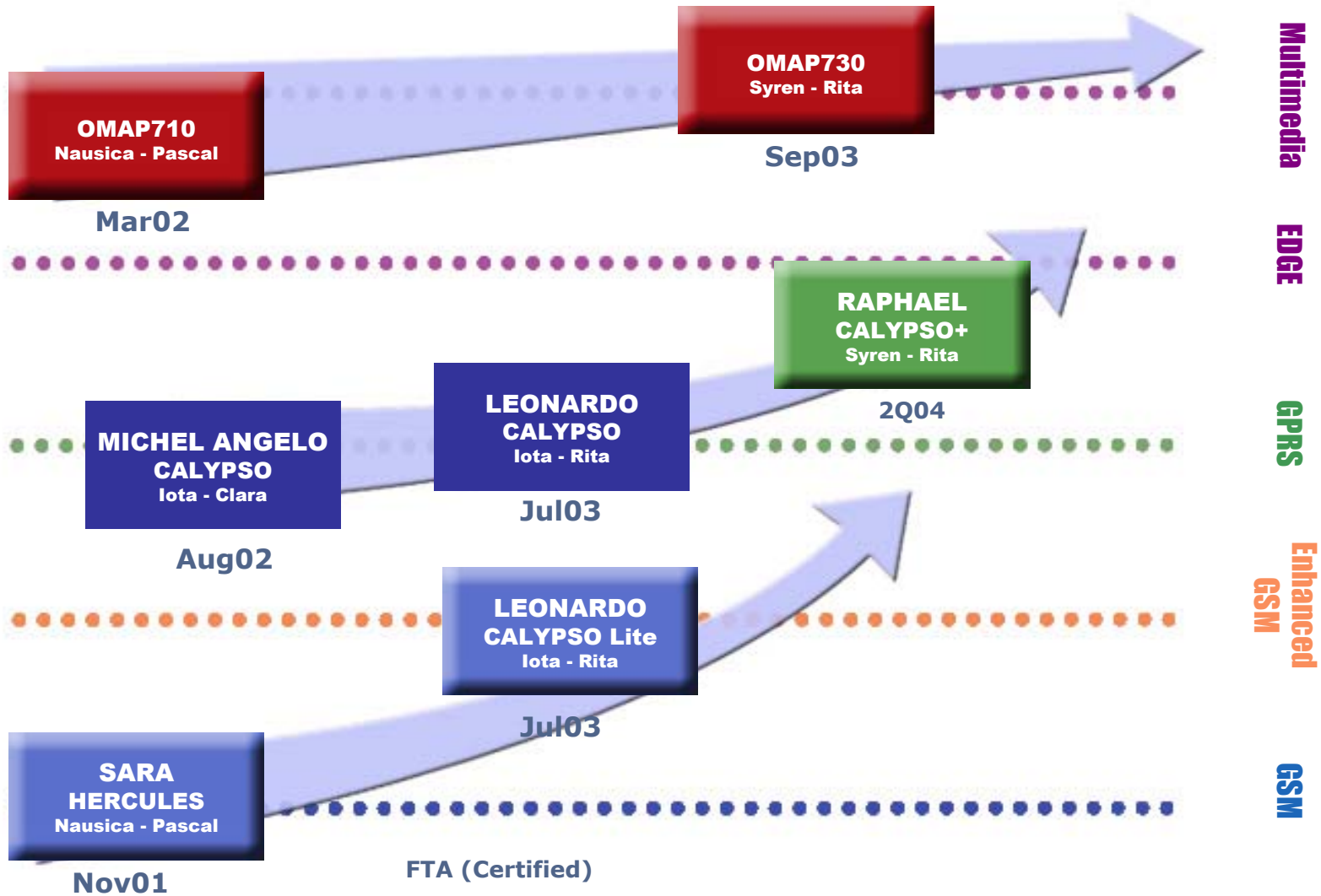
Complete GSM-GPRS Solutions



2G, 2.5G Chipset Marketing

TI Proprietary Information - Strictly Private

2.5G Reference Design Roadmap



TI Proprietary Information - Strictly Private

TI Next Generation Offer

Enables All Market Segments

TCS2600

OMAP730

**Combines
Communications
& Applications
on a Single Chip**

High Performance, Open OS and Multimedia

- ❖ Dedicated ARM9@175MHz (Jazelle)
- ❖ GPRS Class 12 and AMR
- ❖ WinCE, SymbianOS, PalmOS and Linux...

Connectivity

- ❖ USB, MMC/SD, Memory Stick

Enhanced Security

- ❖ Secure Mode

**OMAP730
PERSEUS2**

Performance Enhancement

- ❖ ARM7@52MHZ, 5MBit i-SRAM, DMA, Page Mode
- ❖ DSP@104MHZ, 32KW RAM (Total = 60KW)

More Connectivity

- ❖ MMC/SD, USB Client, Parallel Color LCD,
- ❖ Smart Card, Bluetooth Modem, NAND Flash, Audio Port

Enhanced Security

- ❖ H/W and S/W Crypto Libraries and Security Protocols
- ❖ Secure mode (Flash Loader)

Tailored to Support Embedded Applications

- ❖ Java, MP3/AAC, MIDI, EMS, MMS, m-Commerce

**TCS2200
Calypso+**

Raphael

- ❖ GPRS Class 12

- ❖ ARM7 @ 52MHz, 4Mb internal SRAM

- ❖ Color LCD

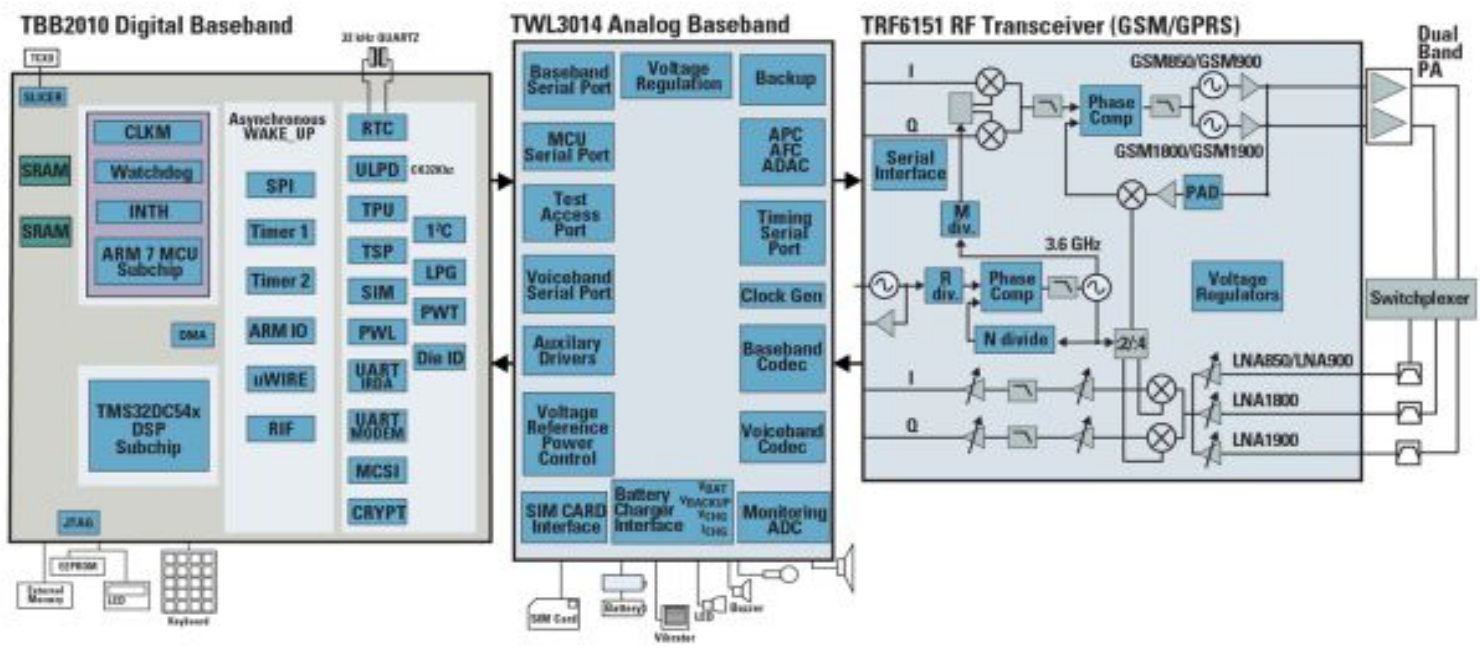
- ❖ Java

- ❖ AMR

**TCS2110
Calypso**

Leonardo

TCS 2110: Calypso Block Diagram

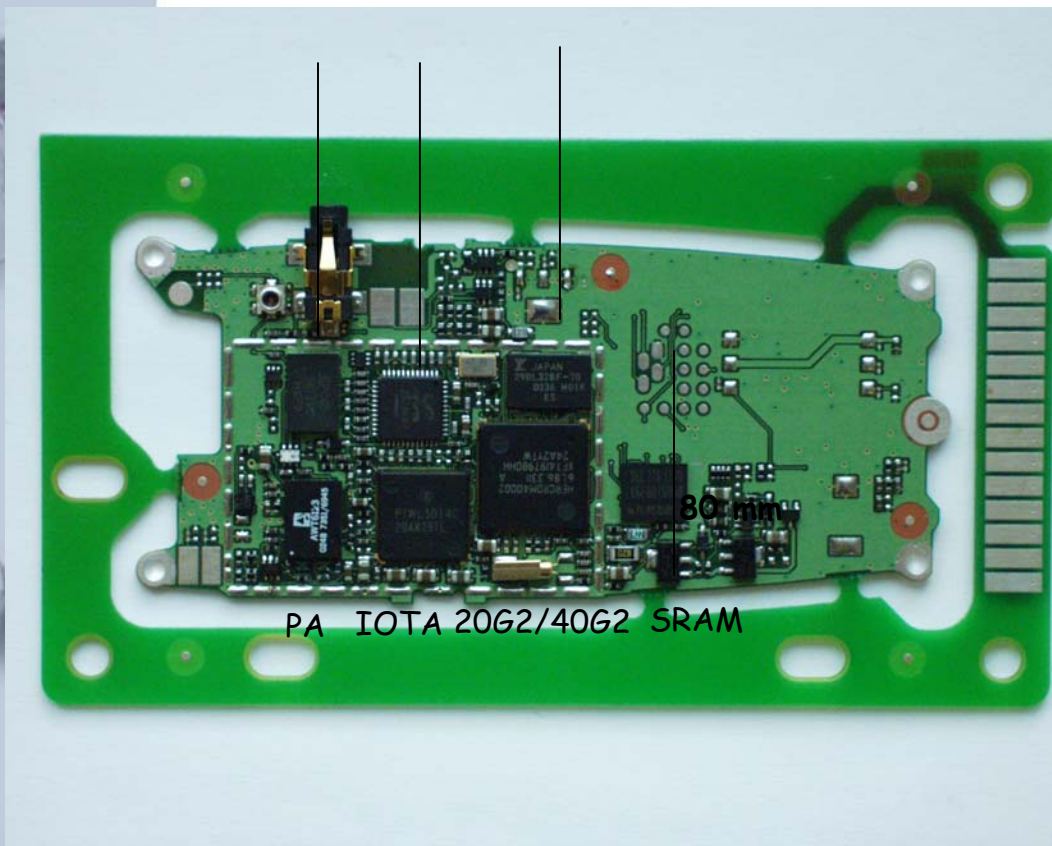


2G, 2.5G Chipset Marketing

TI Proprietary Information - Strictly Private

LEONARDO REFERENCE DESIGN

FEM RITA FLASH



- 1 side PCB (6 layers)
- Chipset : Calypso-IOTA-RITA
- GPRS QUAD band 850/900/1800/1900
- Number of components active & passive (R,L,C)
RF : 55
BB : 93 (low cost charging circuitry)
Electronic BOM : 148 components

❖ Phone Features :

GPRS Class 12
EMS/MMS/WAP

❖ Chipset status :

Calypso c035
Iota
Rita SiGe
Customer engagement

In production
In production
In production
NOW

❖ Reference Design status :

Leonardo HW FTA

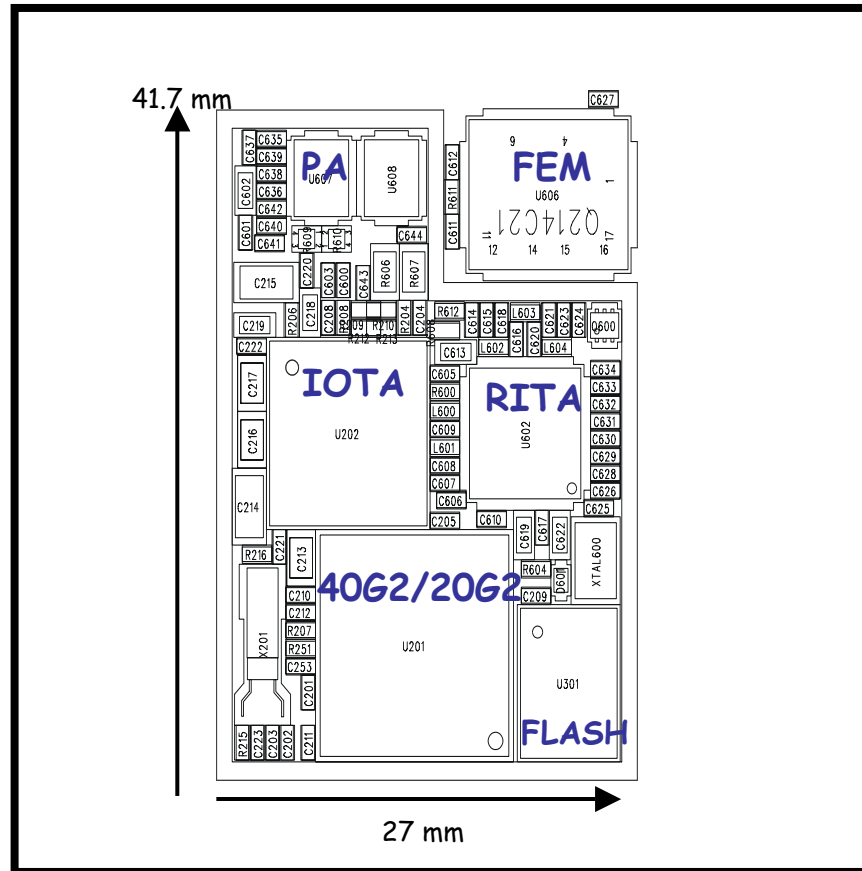
PASSED in Nov.
Delta-FTA available

GPRS-Color-MMS-WAP Phone

Leonardo Development Milestones

TCS2110
CALYPSO
Iota - Rita

Around 15\$ eBOM
for a basic voice centric phone



Leonardo

2G, 2.5G Chipset Marketing

TI Proprietary Information - Strictly Private

D-sample GSM/GPRS development board (1/2)

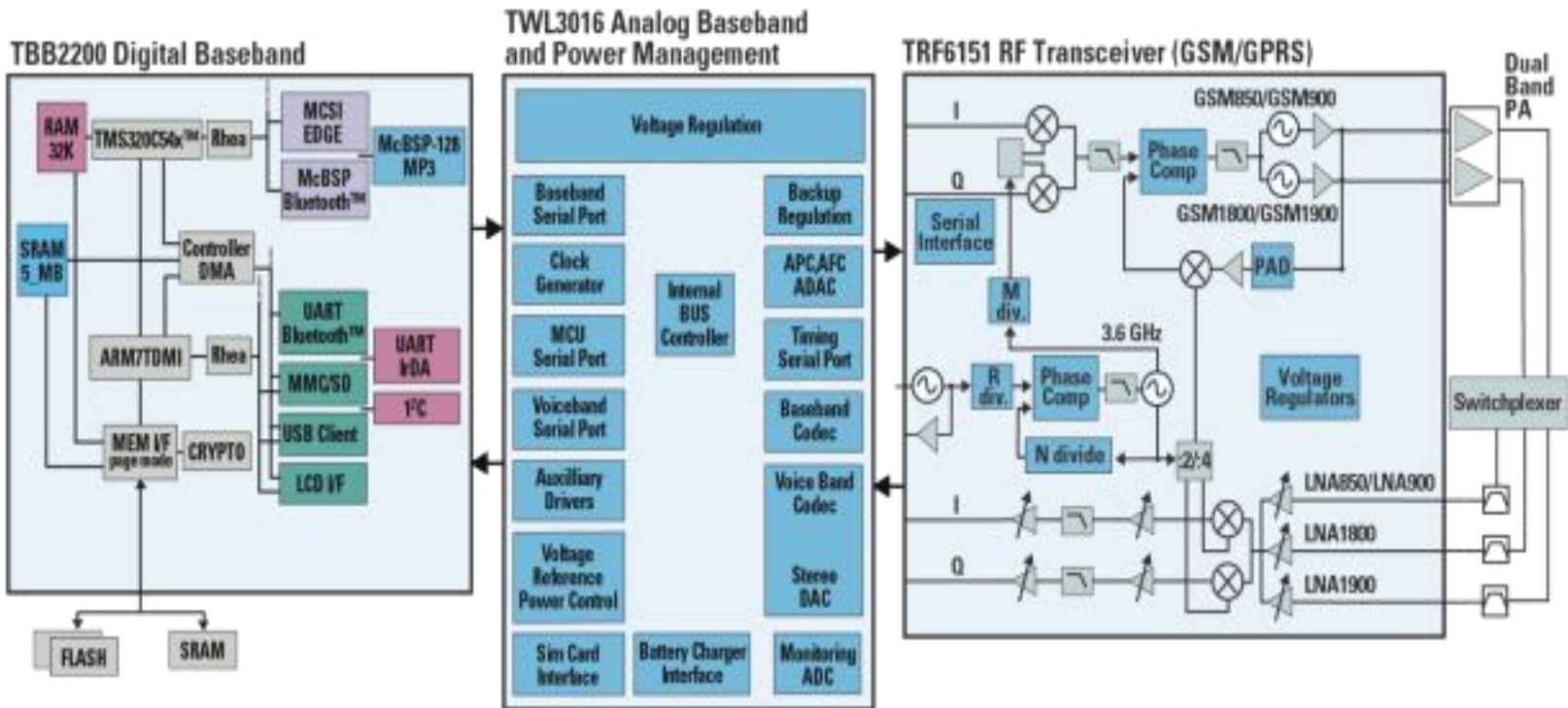


- Provide a compact development tool for SW and HW
- Provide a SW verification tool SW FTA & field testing
- Utilities (Flash programming, Protocol trace, Test and calibration...)

2G, 2.5G Chipset Marketing

TI Proprietary Information - Strictly Private

TCS 2200: Calypso+ Block Diagram



CALYPSO+

SYREN

RITA

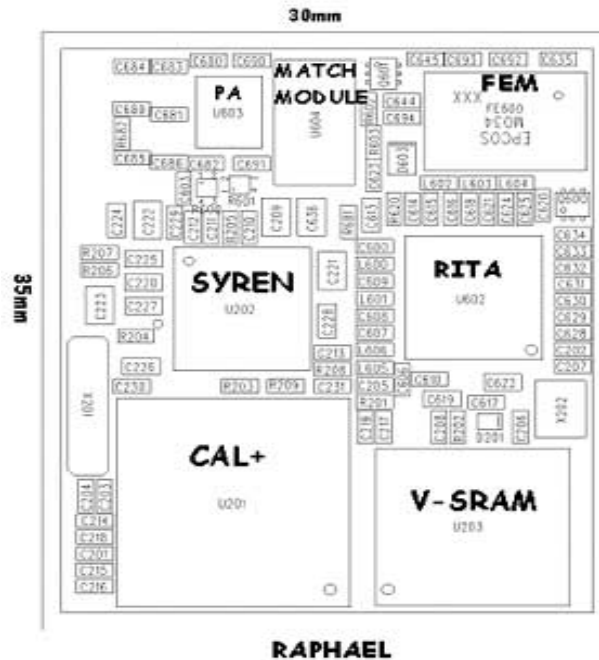
2G, 2.5G Chipset Marketing

TI Proprietary Information - Strictly Private



Security-Java-Camera Phone

Raphael Development Milestones



❖ Phone Features

- GPRS Class 12
- EMS/MMS/WAP/ JAVA MIDP2.0
- USB/ SD card/ NAND FLASH/Hardware SECURITY/CMOS Sensor Interface/mp3/MIDI

❖ Chipset status :

- | | |
|---------------------|-----------|
| Calypso + c035 | RTP Nov03 |
| Syren | RTP Nov03 |
| Rita SiGe | RTP Jul03 |
| Customer engagement | Now |

❖ Reference Design status:

2G, 2.5G Chipset Marketing **E-sample** HW FTA passed in Dec 03

TI Proprietary Information - Strictly Private

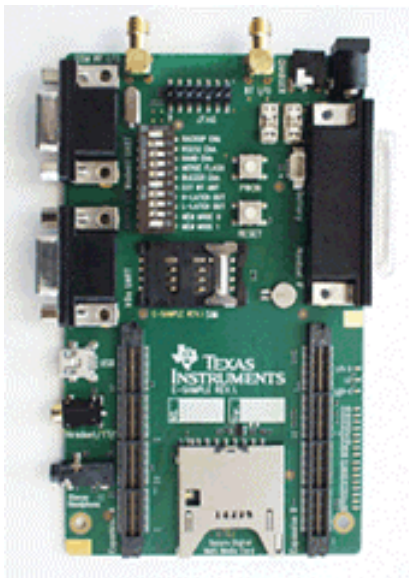
E-sample GSM/GPRS development board (1/2)



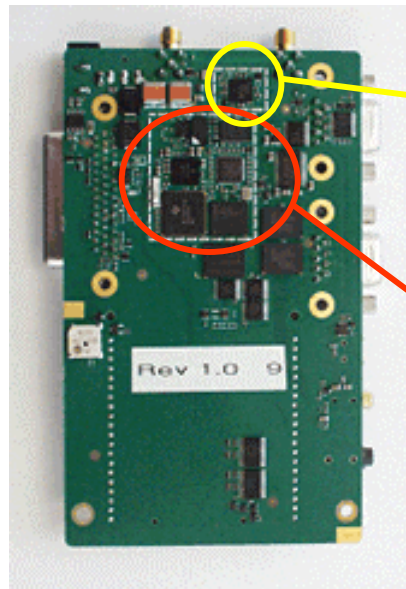
Main features:

- Based on Rita RF, Syren ABB & Calypso+ DBB
- GSM/GPRS - 850/900/1800/1900 bands
- GPRS class 12
- 128Mbit NOR FLASH and 32MBit PSRAM MCP memory
- Prepared for second source memory
- Prepared for BlueTooth
- Size 30x35mm
- Large colour display through dedicated interface
- User data storage by NAND FLASH or memory cards
- USB connectivity
- Stereo playback
- 8 Ohm speaker
- Security features

E-sample GSM/GPRS development board (2/2)



TOP SIDE



BOTTOM SIDE

Bluetooth ISLAND
Cell

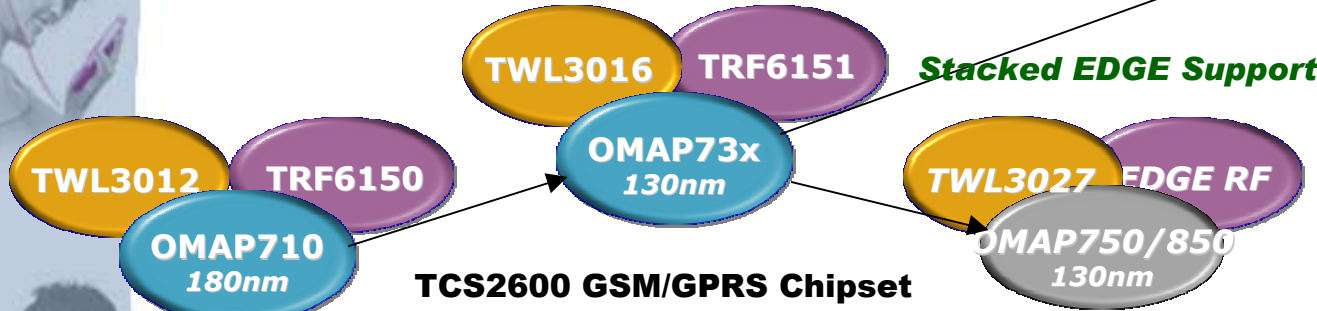
Based on Raphael 2.5G
modem building block:
RITA/SYREN/CALYPSO+

- Provides a standardized HW/SW development platform.
- Provides a compact and highly transportable development platform, usable for field trails, IOT and FTA testing.
- Provides a real "proof of concept" for bill-of-material, power consumption, stability and formfactor of an end product.

TI smartphone Roadmap

**Quantum Lead in Apps Performance
Integrated EDGE Support**

**GPRS CS12, 200+Mhz ARM
Java Acceleration, Security,
EDGE Co-Processor**



TCS3600 EDGE Chipset

OMAP™ 2.0-based
330Mhz ARM1136 (1.3V/1.2V)
133Mhz Mem I/F, DDR
1.8V IO
Video HW Accelerator
3D Graphics HW Accelerator
Integrated EDGE C12 DBB
Quad-Band RF

TCS3500 EDGE Chipset

OMAP™ 1.3-based
200Mhz ARM926EJ
100Mhz Memory I/F
Stacked EDGE
Mobile DDR Stacking
OCP Camera I/F

TCS2600 GSM/GPRS Chipset

OMAP™ 1.2-based
Class 12 GPRS DBB
200Mhz ARM926EJ
100Mhz Memory I/F (1.8V/3V)
Java Jazelle™ Acceleration
Enh. DMA w/ 2D Graphics
1.6Mbit ISRAM
MUX A/D Flash 100Mhz
HW Security
Enhanced Debug (Trace)/ETM
E-GPRS external DBB I/F
SD/MMC (4-bit SDIO)
I2C Slave/Master
VLYNQ 802.11b/g interface
USB OTG

Mobile SDRAM Stacking

TCS2500 GSM/GPRS Chipset

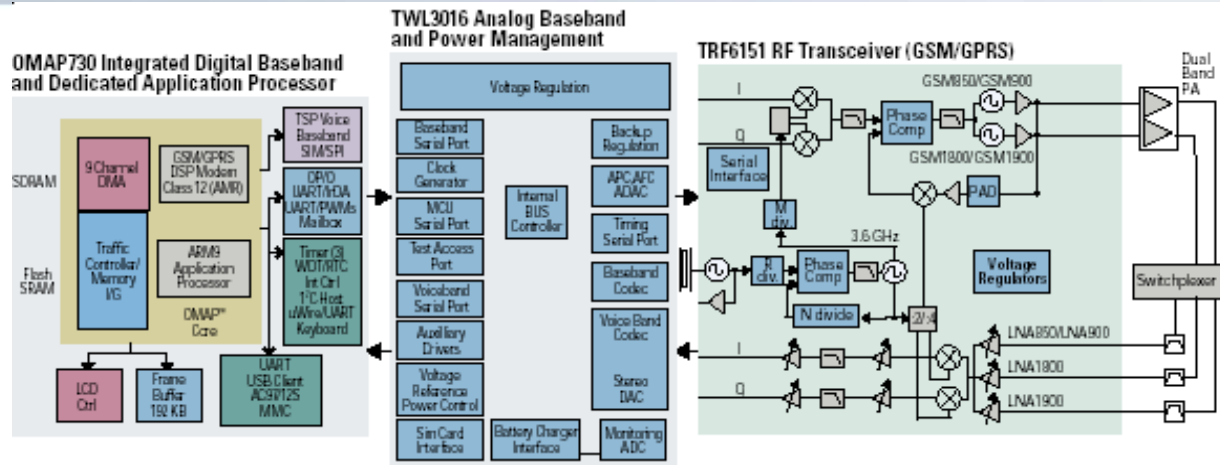
OMAP™ 1.0-based
Class 8 GPRS DBB, ROM-based
132Mhz ARM925 TDMI
66Mhz Memory I/F
1.5Mbit ISRAM
Optimized DMA
Optimized USB Client
MMC (SD via SPI)
Enhanced Audio Codec I/F
CompactFlash I/F

2G, 2.5G Chipset Marketing

TI Proprietary Information - Strictly Private

TCS2600 GSM/GPRS Chipset Reference Design

Building Blocks



TCS2600 elements

- OMAP730 GSM/GPRS smartphone processor with integrated digital baseband and dedicated ARM926T EJ application processor
- TWL3016 analog baseband integrated with power management
- TRF6151 direct conversion, quad-band RF transceiver
- Full featured L1/L2/L3 GSM/GPRS protocol stack
- Complete hardware and software smartphone reference design including Series 60 and Microsoft Smartphone 200x

TCS2600 features

- Double the application processing of previous generation with a 70% boost in audio performance and 8x improvement in Java processing
- High-level mobile OS support, including Symbian OS™, Series 60, Microsoft Pocket PC, Microsoft® Windows® CE, Palm OS®, Linux®, and others
- Software compatibility with OMAP™ processor family
- OMAP Developer Network support
- Proven GSM/GPRS modem technology
- Highly integrated solution for reduced smartphone BOM cost and chip count
- Hardware security features a state of the art Memory Protection Unit on FLASH and SDRAM memory interface
- Quad-band, direct-conversion RF solution
- Hardware Java acceleration
- Complete peripherals set; USB On-the-Go, SD/MMC/SDIO, high-speed Bluetooth connectivity, dedicated 802.11 a/b/g high-speed link, Fast IrDA, etc.

TCS2600 GSM/GPRS Chipset Reference Design

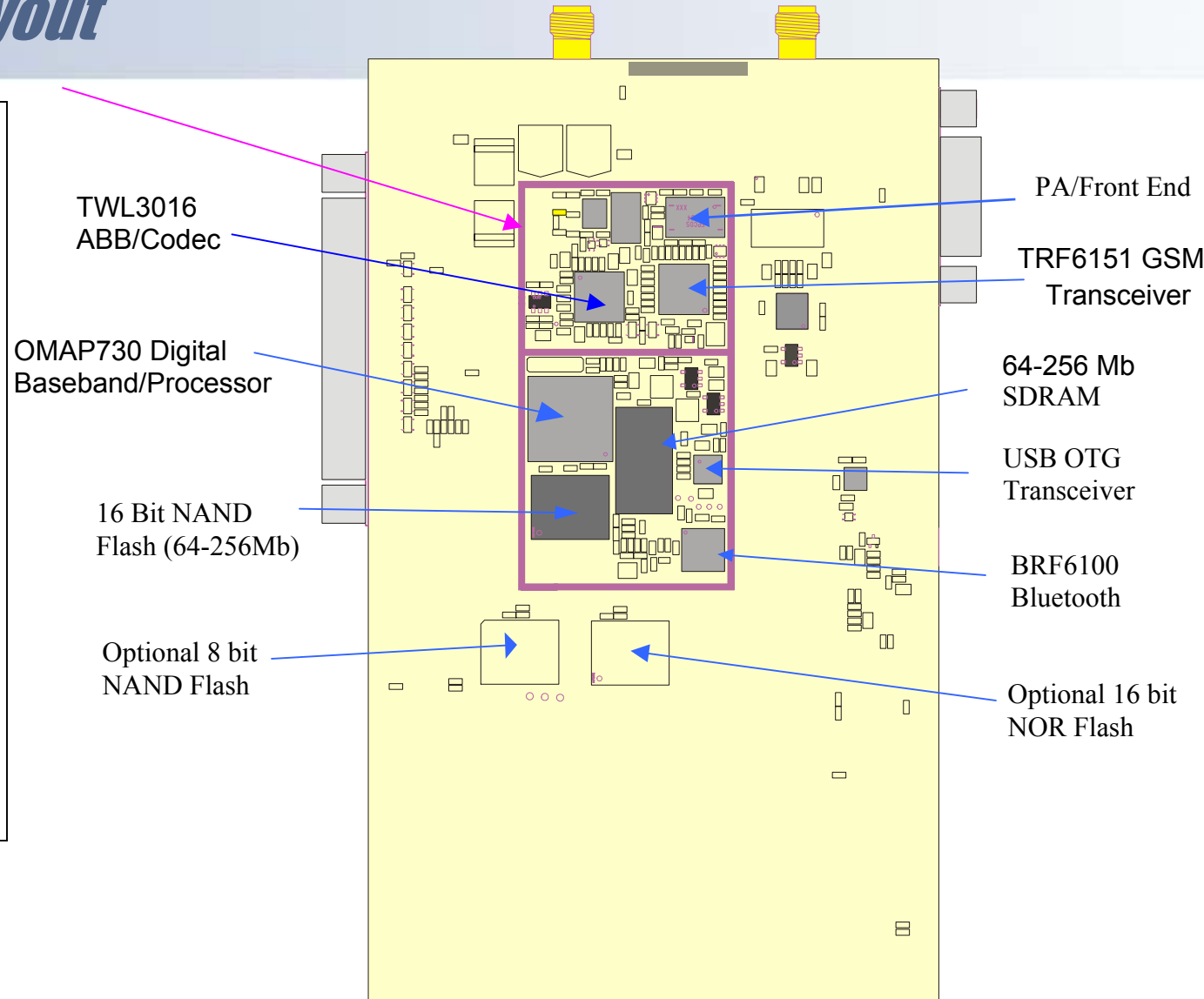
Back PCB Layout

- 58 x 30 mm form factor layout ports directly to end product

- < 200 'reference design' part count

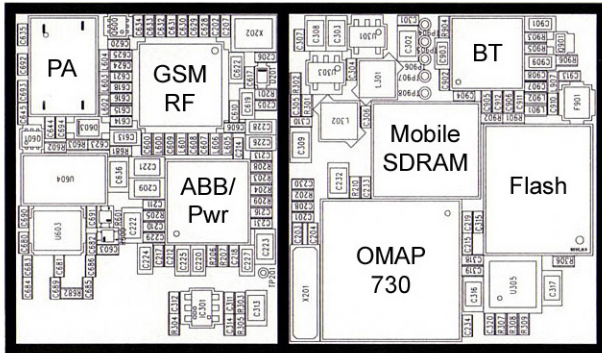
- Optional memory Configurations

- 6 Layer, one sided PCB stack



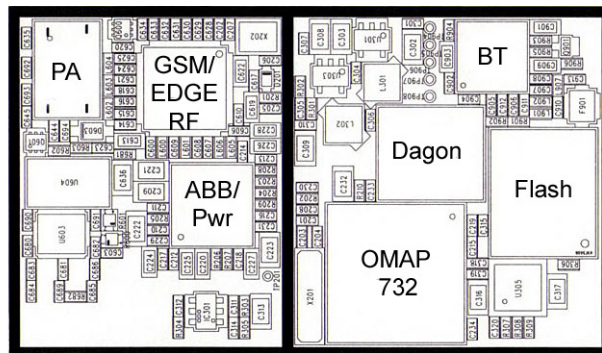
TCS2600 GSM/GPRS Chipset Reference Design

Overview



GSM/GPRS

TCS2600 GSM/GPRS Reference Design
with OMAP 730



GSM/GPRS/EDGE

TCS2600 GSM/GPRS Reference Design
with OMAP 732 (incl. stacked SDR) and
Dagon Edge processor
→ No impact on size

Concept PCB design

2G, 2.5G Chipset Marketing

TI Proprietary Information - Strictly Private

UMTS Chipset Roadmap

- Samples
- Technology

Now
C05 (0.15um)
TCS4100DC
 UMTS Development Platform

DOLOMITES_DC
 (TBB4100DC)

SHAMU

WCDMA ABB

IOTA

GSM ABB/UMTS PM

CLARA

GSM/GPRS RF

RAINIER

WCDMA Rx

TASSILI

WCDMA Tx

2Q2004
C035 (0.13um)
TCS4105

Dolomites1
 (TBB4105)

Garibaldi

ABB/PM for DBB and Apps

RITA

GSM/GPRS RF

ALHAMBRA

WCDMA RF

1Q2005
C027 (0.09um)
TCS4500

Dakota
 (TBB4500)

Naiad

PM for DBB

E-ETNA

GSM->EDGE RF

ALHAMBRA+

WCDMA RF

Apps Processor for HLOS
 (optional)

OMAP331 / OMAP16xx / OMAP24xx

Integrated

3GPP Release

Rel99 – June 2001
 (WCDMA @ 2100)

Rel99 – March 2003 + CR's
 (WCDMA @ 800/2100, 1900/2100)

Release 5
 (WCDMA @ 800/2100, 1900/2100)

Phone Class

384Kbps

384Kbps

>384Kbps
 (Up to Category 5)

**Standby
 Time Target**

200 hrs

>350 hrs

>500 hrs

Talk Time Target

100 min

>130 min

>130 min

Note: Battery Size is 750mA/Hr @ 80% efficiency

TI Proprietary Information - Strictly Private



Thanks !