

# EXHIBIT 12

# Mini-Teardown: Samsung Galaxy S (T-Mobile Vibrant)

iPod/iPhone New Tech 8.10.10

- Summary
- Product Specs
- Features
- Disassembly
- HW Components
- Software Features
- Additional Comments

p2  
p3  
p4  
p5  
p10  
p12  
p13



## Contributors:

**Jeff Mehlman**  
iPod/iPhone New Tech  
jmehlman@apple.com

**Ryan Garrone**  
iPod/iPhone New Tech  
rgarrone@apple.com

Wednesday, September 8, 2010

# Summary



## Goals of Teardown:

- Analyze the mechanical structure and components used
- Examine software features and UI
- Research reviews & issues

## Key Learnings/Observations:

- Onboard GPU PowerVR SGX540 is very powerful: 90M triangles/sec vs. 22M triangles/sec on the Snapdragon
- Uses the same CPU ARM core (Cortex A8) as the iPhone 4
- International version has a front facing camera, but the US version does not
- Bump-out at bottom of phone is for the antenna. Phone doesn't feel right to hold
- Power/wake button placement is poor (side vs. top). No other way to wake the phone.
- Haptic feedback for capacitive button bar (settings/home/back/search)

## Outstanding issues/complaints:

- Major issues w/the GPS exist - it does not work well. Supposed fix is in the works for November
- Issues also exist with the filesystem - it is "not optimized" - utilizes RFS (Non-flash filesystem)

Wednesday, September 8, 2010

# Product (Marketing) Specifications



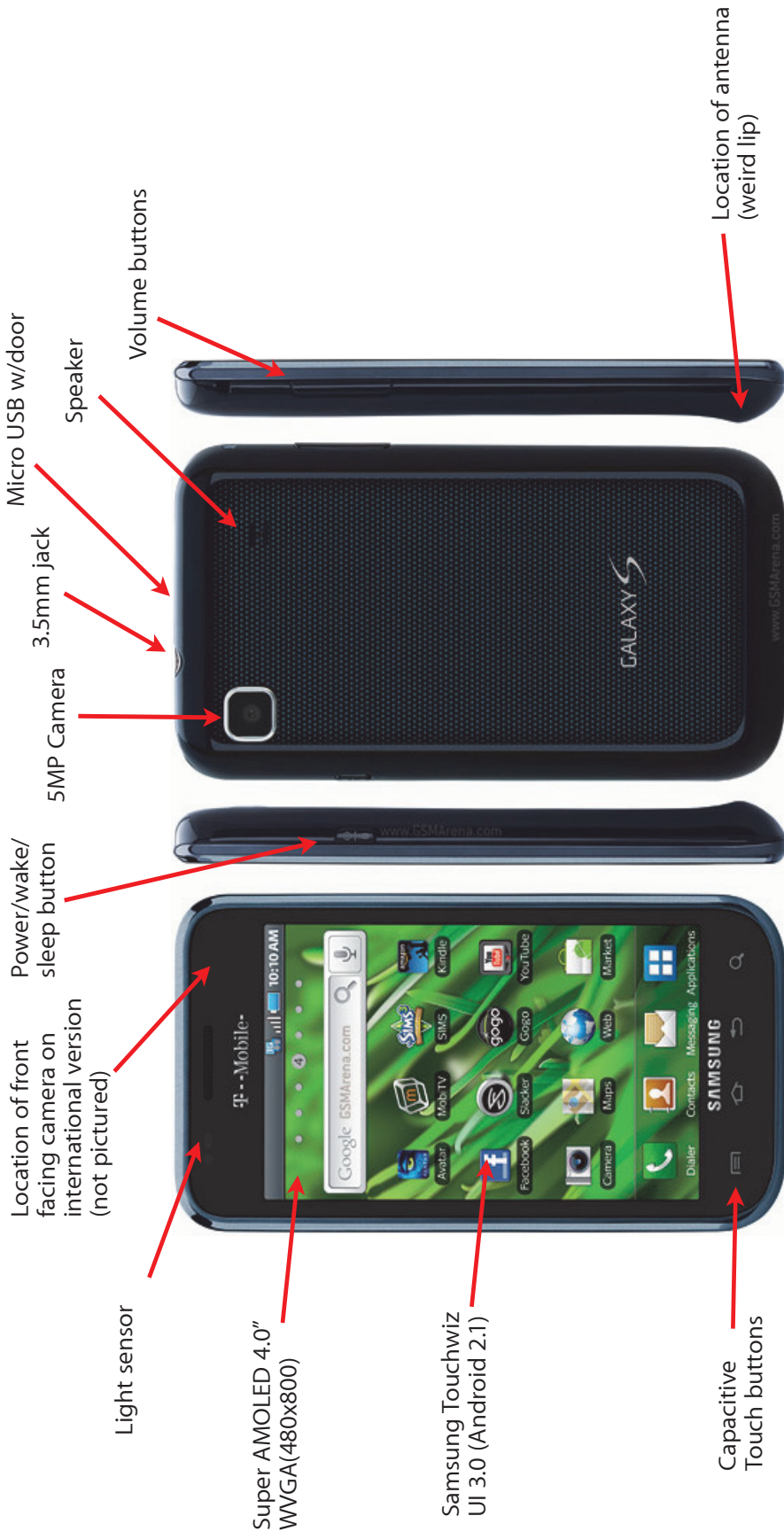
<b>Key Features</b>	Swype, Social Hub (integrated SMS, email, calendar), Layar Reality Browser, USB Tethering
<b>Operating System</b>	Android 2.1, Modified UI (Eclair)
<b>CPU</b>	"Hummingbird" 1 Ghz ARM Cortex-A8, onboard PowerVR SGX450 GPU
<b>Mass Storage Capacity</b>	8/16GB + microSD (up to 32GB)
<b>Connectors</b>	USB
<b>Price</b>	AT&T: \$199.99 w/2 year contract, \$499.99 w/o T-Mobile: \$199.99 w/contract, \$499.99 w/o
<b>Dimensions</b>	64.2 X 122.4 X 9.9 mm
<b>Weight</b>	119g
<b>Display</b>	4.0" WVGA(480x800) 16M SUPER AMOLED, Atmel IMXT22 touch driver
<b>Battery</b>	Samsung LiPol 1,500mAh, 51x51x5mm Talk time: 391 minutes, Standby: 625 hours (3G network)
<b>Camera</b>	5.0 Megapixel AF camera, HD record @ 720p
<b>Audio Compatible Format</b>	MP3, AAC, AAC+, eAAC+, OGG, WMA, AMR-NB, AMR-WB, WAV, MID, AC3, IMY, FLAC, XMF
<b>Video Compatible Format</b>	HD Video Player & Recorder 720p @ 30fps supported codecs: DivX, XviD, MPEG4, H.263, H.264, WMV, VC-1
<b>Wireless</b>	WAN: HSUPA 900/1900/2100 . EDGE/GPRS 850/ 900/1800/1900 LAN: WiFi 802.11b/g/n, Bluetooth
<b>Sensors</b>	Light, Accelerometer, GPS, Proximity, Digital Compass, multi-touch display

Wednesday, September 8, 2010

APPLE CONFIDENTIAL BUSINESS INFORMATION,  
SUBJECT TO PROTECTIVE ORDER

APL7940009836307

# Phone Features



Wednesday, September 8, 2010

# Disassembly (1)



**Step 1: Remove back cover**



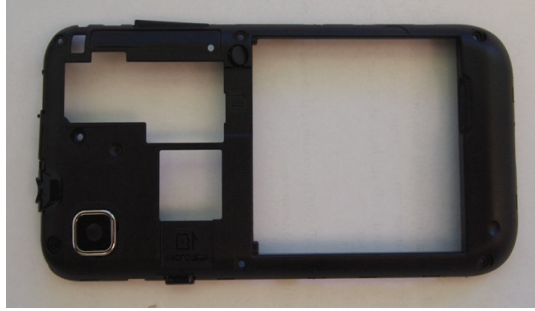
**Step 2: Remove battery**

Wednesday, September 8, 2010

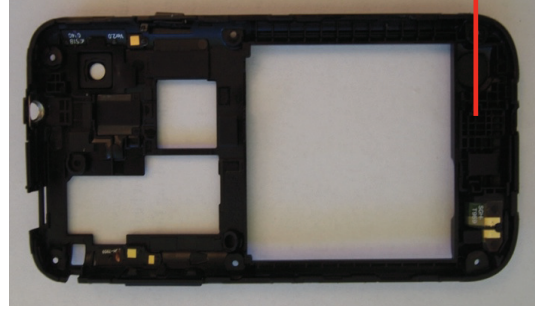
# Disassembly (2)



Step 3: Remove mid-housing



Mid-housing back



Mid-housing front

Step 3a: Remove antenna



Antenna back



Antenna front



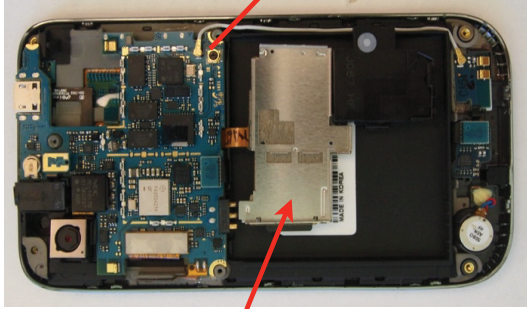
# Disassembly (3)



Loud-speaker

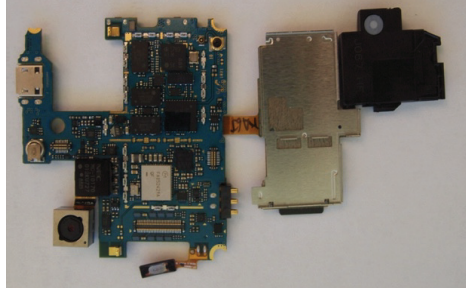
SIM

Antenna sprung contacts

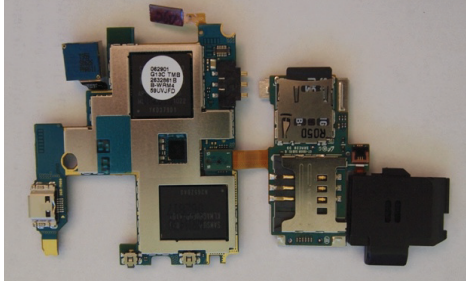


Step 4a: Lift SD, SIM, loudspeaker daughterboard

Step 4b: Remove multi-PCB assembly



PCB Assembly Front



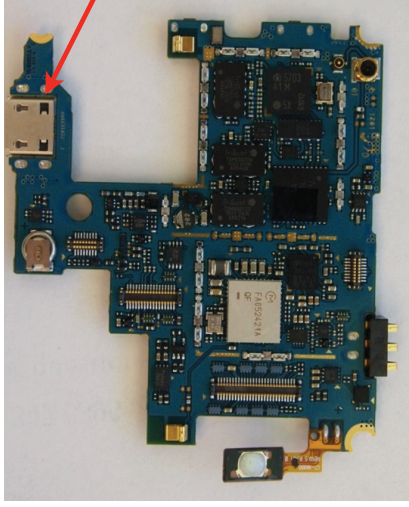
PCB Assembly Back



Touch/Display assembly + audio i/o



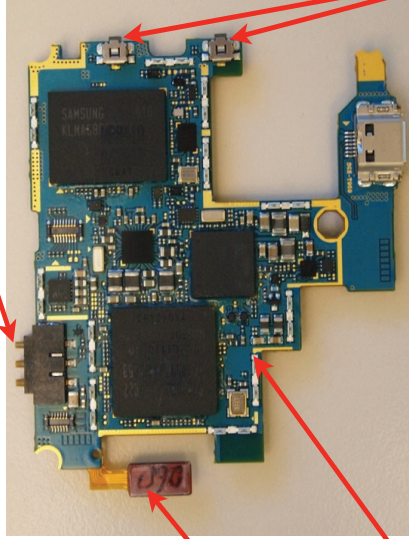
# Disassembly (4)



Micro USB

Battery contacts

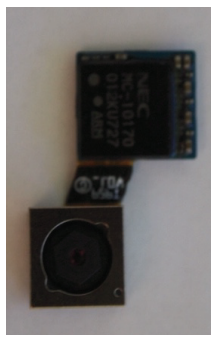
Main PCB Module



Push button

Metal can removed

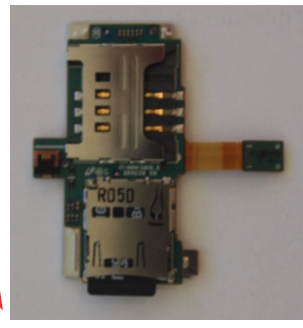
Volume buttons



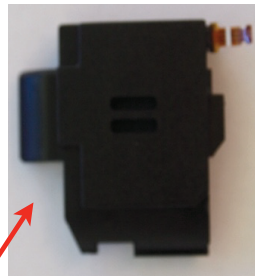
\*With camera team for further analysis

Camera module

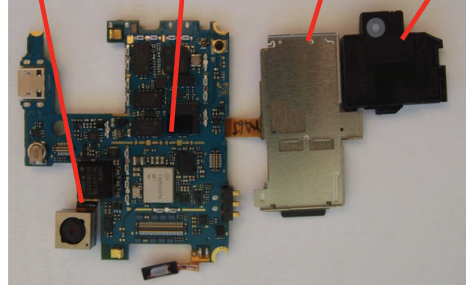
Step 5:  
Separate sub-modules



SD/SIM cards



Loudspeaker



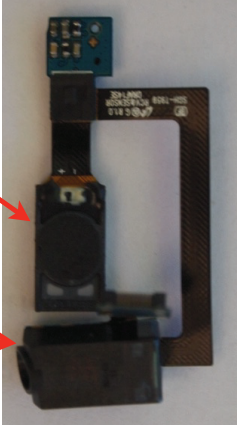
PCB Assembly Front

Wednesday, September 8, 2010

# Disassembly (5)



Touch/Display assembly + audio i/o



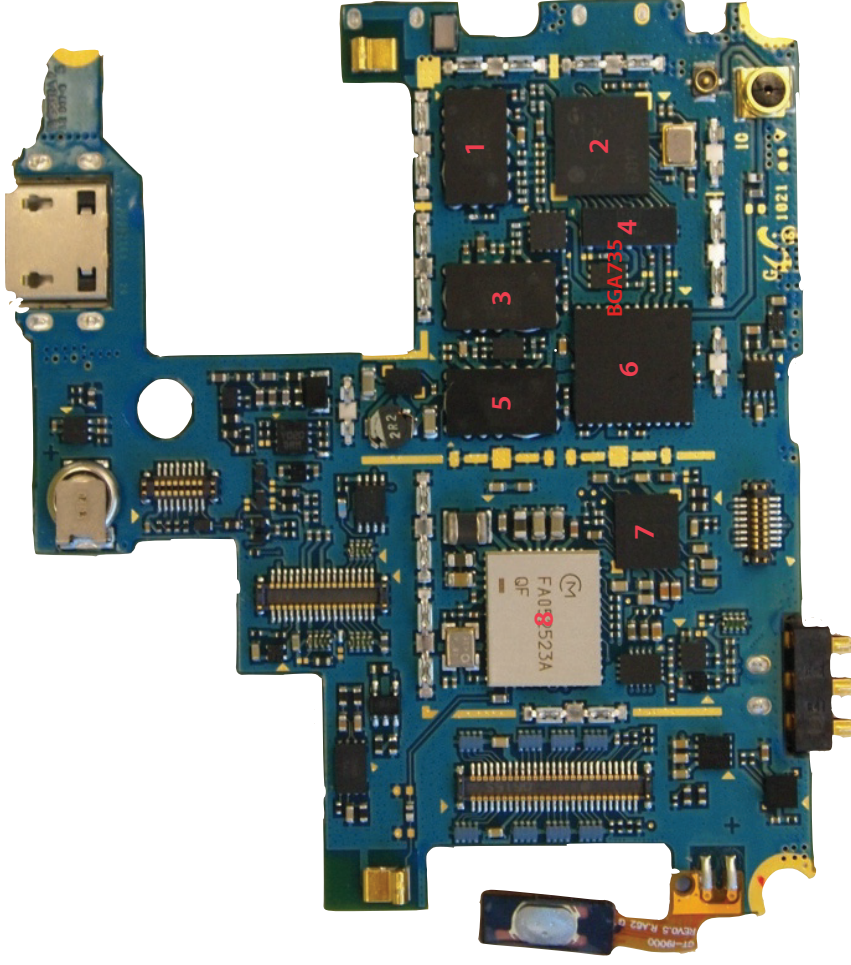
Step 6: Touch/Display/Audio I/O assemblies



\*With display team for further analysis

Wednesday, September 8, 2010

# HW Components (1)



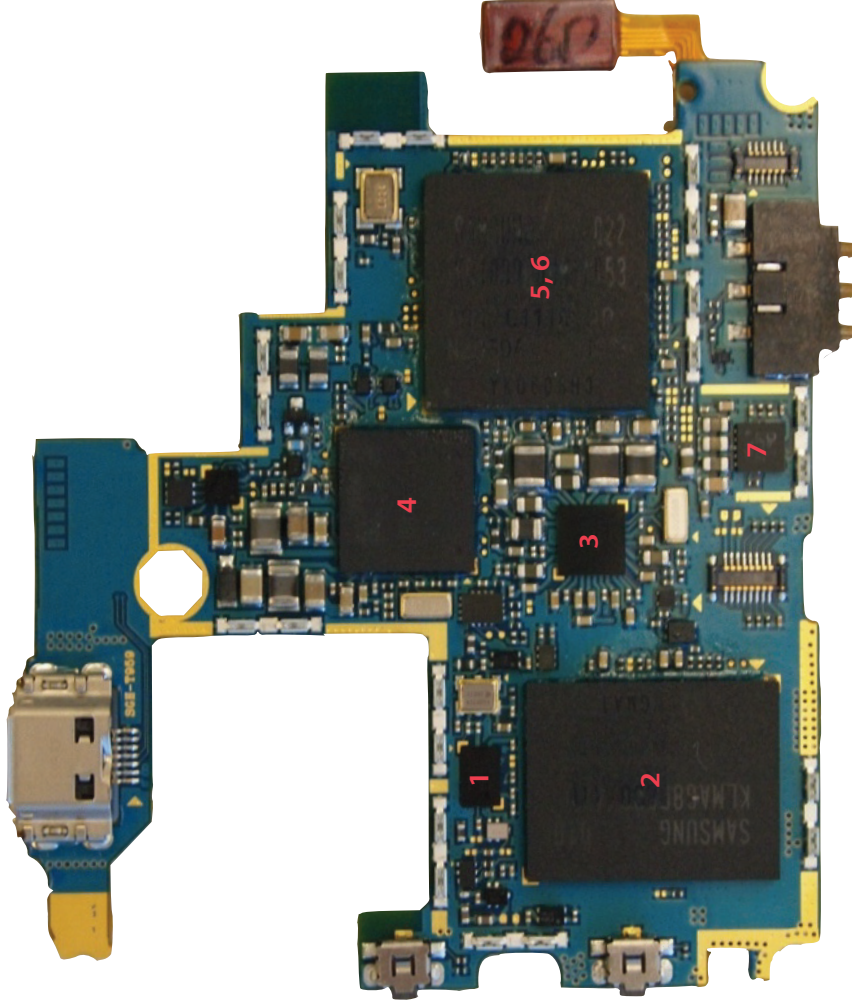
Top PCB

1. **TriQuint TOM676021**  
WCDMA / HSUPA Band I Tritium III PA Duplexer Module
2. **Infinion 5703**  
PMB 5703 SMARTI UE
3. **TriQuint TOM656024**  
WCDMA/HSUPA PA-Duplexer Module
4. **Epcos D1056**  
?
5. **TriQuint TOM666022**  
WCDMA / HSUPA Band II Tritium III PA Duplexer Module
6. **TriQuint TOM6M9014**  
Quad-Band GSM / GPRS / EDGE-Linear TRP Tx Module
7. **Wolfson Micro WM8994E**  
Digital audio codec
8. **FA05233A**  
? Possibly Broadcom BCM4329FKUBG WIFI, Bluetooth, FM
9. **Atmel MXT22**  
Touchscreen driver



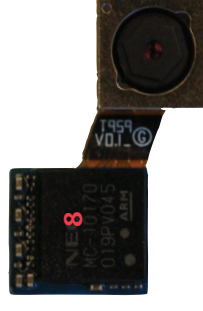
Wednesday, September 8, 2010

# HW Components (2)



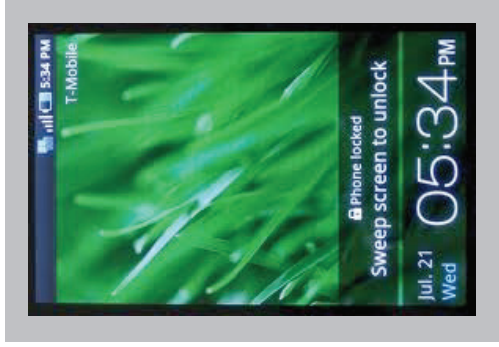
Bottom PCB

1. **Broadcom BCM4751** GPS
2. **Samsung KLMAG8DEDD**  
moviNAND, 16GB
3. **Maxim MAX8998**  
Power management IC
4. **Infineon 8824**  
Infineon X-GOLD 6ix Baseband processor
5. **Lower chip: Samsung KB100D00WM-A4**  
Hummingbird Cortex A8 processor
6. **Upper chips: KB100D00WM-A4**  
KFG8GH6Q4M (8 Gb of OneNand),  
K4X2G323PB (2 Gb of DDR SDRAM),  
K4X1G323B (1 Gb of DDR SDRAM).
7. **Accelerometer?**
8. **NEC MC-10170**  
Camera processor + memory



Wednesday, September 8, 2010

# Software Features



## Samsung Touchwiz UI 3.0

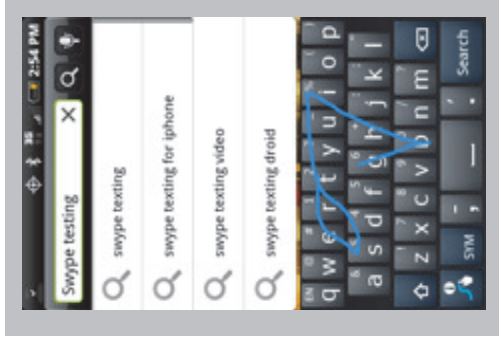
Custom skinned Android 2.1 operating system



## Social Hub

Samsung widget

Integrates all messaging streams into one



## Swype (Beta)

3rd party application, still in beta version for Android

Drag-to-text keyboard input software

Up to 40 words per minute

Wednesday, September 8, 2010

# Additional Analysis

- Display team teardown underway
- Camera module handed off to camera team week of 8/2. Awaiting report



Wednesday, September 8, 2010