GB106
Service Manual

LG Electronics
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1. INTRODUCTION

Purpose

This manual provides information necessary to repair, description and download the features of this model.

1.2 Regulatory Information

A. Security
Toll fraud, the unauthorized use of telecommunications system by an unauthorized part (for example, persons other than your company’s employees, agents, subcontractors, or person working on your company’s behalf) can result in substantial additional charges for your telecommunications services. System users are responsible for the security of own system. There are may be risks of toll fraud associated with your telecommunications system. System users are responsible for programming and configuring the equipment to prevent unauthorized use. The manufacturer does not warrant that this product is immune from the above case but will prevent unauthorized use of common-carrier telecommunications service of facilities accessed through or connected to it. The manufacturer will not be responsible for any charges that result from such unauthorized use.

B. Incidence of Harm
If a telephone company determines that the equipment provided to customer is faulty and possibly causing harm or interruption in service to the telephone network, it should disconnect telephone service until repair can be done. A telephone company may temporarily disconnect service as long as repair is not done.

C. Changes in Service
A local telephone company may make changes in its communications facilities or procedure. If these changes could reasonably be expected to affect the use of the this phone or compatibility with the network, the telephone company is required to give advanced written notice to the user, allowing the user to take appropriate steps to maintain telephone service.

D. Maintenance Limitations
Maintenance limitations on this model must be performed only by the manufacturer or its authorized agent. The user may not make any changes and/or repairs except as specifically noted in this manual. Therefore, note that authorized alternations or repair may affect the regulatory status of the system and may void any remaining warranty.
E. Notice of Radiated Emissions
This model complies with rules regarding radiation and radio frequency emission as defined by local regulatory agencies. In accordance with these agencies, you may be required to provide information such as the following to the end user.

F. Pictures
The pictures in this manual are for illustrative purposes only; your actual hardware may look slightly different.

G. Interference and Attenuation
Phone may interfere with sensitive laboratory equipment, medical equipment, etc. Interference from unsuppressed engines or electric motors may cause problems.

H. Electrostatic Sensitive Devices

**ATTENTION**

Boards, which contain Electrostatic Sensitive Devices (ESD), are indicated by the sign .

Following information is ESD handing:
. Service personnel should ground themselves by using a wrist strap when exchange system boards.
. When repairs are made to a system board, they should spread the floor with anti-static mat which is also grounded .
. Use a suitable, grounded soldering iron.
. Keep sensitive parts in these protective packages until these are used.
. When returning system boards or parts like EEPROM to the factory, use the protective packages as described.
## 2. PERFORMANCE

### H/W Features

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
<th>etc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solution</td>
<td>EGOLD voice PME7880 (ULC2)</td>
<td>Infineon</td>
</tr>
<tr>
<td>Battery</td>
<td>950mAh Li-ion inner pack</td>
<td>950mAh: 55x34x50mm</td>
</tr>
<tr>
<td>Audio player</td>
<td>MIDI ring tone, 16poly</td>
<td>MIDI ring tone</td>
</tr>
<tr>
<td>Loud Speaker</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Memory Size</td>
<td>32Mb+4Mb</td>
<td>No user memory</td>
</tr>
<tr>
<td>LMT (Lost Mobile Tracker)</td>
<td>Shall support SIM card both 1.8V and 3V.</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>70g</td>
<td></td>
</tr>
<tr>
<td>Vibrator</td>
<td>Shall support in built vibration alert</td>
<td></td>
</tr>
<tr>
<td>SIM Card</td>
<td>Shall support SIM card both 1.8V and 3V.</td>
<td></td>
</tr>
<tr>
<td>KEY Back Light</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>KEY Back Light color</td>
<td>Blue</td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td>850 MHz/class 4 (2W)</td>
<td>850/1900</td>
</tr>
<tr>
<td></td>
<td>900 MHz/class 4 (2W)</td>
<td>900/1800</td>
</tr>
<tr>
<td></td>
<td>1800 MHz/class 1 (1W)</td>
<td>900/1800</td>
</tr>
<tr>
<td></td>
<td>1900 MHz/class 1 (1W)</td>
<td>850/1900</td>
</tr>
<tr>
<td>Standby Time</td>
<td>Shall support minimum test minutes as [min] based on battery capacity of [mAh]</td>
<td>↑ 440 hrs &amp; ↓ 2.1mA @ 950mAh (P.P.: 5)</td>
</tr>
<tr>
<td>Talk Time</td>
<td>Shall support minimum test hours as [hrs] based on battery capacity of [mAh]</td>
<td>↑ 6 hrs 30min @ 950mAh (PCL: 10) (Talk time = 95% Capacity / Talk current)</td>
</tr>
<tr>
<td>RTC</td>
<td>The real time clock shall be able to sustain for at least [#hrs] after removing the battery</td>
<td>LGE confirm to put 22uf capacitor for RTC backup time</td>
</tr>
</tbody>
</table>
## S/W Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Detail Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS</td>
<td>OSE</td>
<td>Operating System</td>
</tr>
<tr>
<td>Audio</td>
<td>Speech Code</td>
<td>FR, EFR, HR, AMR-NB</td>
</tr>
<tr>
<td></td>
<td>AMR code</td>
<td>GSM Full Rate, 3GPP Adaptive Multi Rate (AMR-NB)</td>
</tr>
<tr>
<td></td>
<td>FM Radio</td>
<td>Only GB105, GB105a, GB105b, GB106, GB107, GB107a, GB107b (GB 106: FM internal antenna)</td>
</tr>
<tr>
<td></td>
<td>MP3 Ring Tone</td>
<td>MP3 decode</td>
</tr>
<tr>
<td></td>
<td>Integrated hands free speaker</td>
<td>Speaker phone mode</td>
</tr>
<tr>
<td></td>
<td>Key Tone Volume</td>
<td>6 Level (Include Mute)</td>
</tr>
<tr>
<td></td>
<td>Ring Tone Volume</td>
<td>6 Level (Include Mute)</td>
</tr>
<tr>
<td></td>
<td>Ring Tone</td>
<td>10 Midi</td>
</tr>
<tr>
<td></td>
<td>Call Alert type</td>
<td>Ring, Vibrate, Ring &amp; Vibrate, Ring after vibrate, Silent</td>
</tr>
<tr>
<td></td>
<td>Earpiece Volume</td>
<td>6 Level (Include Mute)</td>
</tr>
<tr>
<td></td>
<td>Mute</td>
<td></td>
</tr>
<tr>
<td>Frequency Bands</td>
<td>GSM dual band MS</td>
<td>900-1800</td>
</tr>
<tr>
<td></td>
<td>PCS dual band MS</td>
<td>850-1900, Configuration is during software compile time.</td>
</tr>
<tr>
<td>Date Service</td>
<td>Circuit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Packet</td>
<td></td>
</tr>
<tr>
<td>Connectivity</td>
<td>Infrared (IrDA)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bluetooth</td>
<td></td>
</tr>
<tr>
<td></td>
<td>USB</td>
<td></td>
</tr>
<tr>
<td></td>
<td>USB Mass storage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RS232(UART)</td>
<td>Only for Phone tool &amp; download</td>
</tr>
<tr>
<td>Voice Function</td>
<td>Voice Recording</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Voice Command</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Answering machine</td>
<td></td>
</tr>
<tr>
<td>Display</td>
<td>RSSI</td>
<td>6 level (0-5Level)</td>
</tr>
<tr>
<td></td>
<td>Battery level</td>
<td>4 level (0-3Level)</td>
</tr>
<tr>
<td></td>
<td>RTC</td>
<td>Date &amp; Time Display</td>
</tr>
<tr>
<td></td>
<td>PLMN/Service Indicator</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quick Access Mode</td>
<td>Profile/ SMS + Voice Mail</td>
</tr>
<tr>
<td></td>
<td>In Idle</td>
<td></td>
</tr>
<tr>
<td>Feature</td>
<td>Option</td>
<td></td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----------------</td>
<td></td>
</tr>
<tr>
<td>Dimming Clock</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Dual Clock</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Home shortcut</td>
<td>Display Shortcut icon in Idle</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Call History</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Last Dial Number</td>
<td>Max : 20 records</td>
<td>Y</td>
</tr>
<tr>
<td>Last Received Number</td>
<td>Max : 20 records</td>
<td>Y</td>
</tr>
<tr>
<td>Last Missed Number</td>
<td>Max : 20 records</td>
<td>Y</td>
</tr>
<tr>
<td>Scratch Pad Memory</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Call Duration</td>
<td>Last Call time, Total Call Time</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Call Cost</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Last Call Charge Units</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Total Charge Units</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td><strong>Call Management</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Call Waiting</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Call Swap</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Call Retrieve</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Auto Answer</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Auto Redial</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Calling Line</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Full Call Divert</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Speed Dialing</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Last Number Redial</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Multi Party Call</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>ECT</td>
<td>Explicit Call Transfer (4 + Send)</td>
<td>Y</td>
</tr>
<tr>
<td><strong>Network</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automatic Network</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Selection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manual Network</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Preferred Network</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Network Service Status</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td><strong>DTMF</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DTMF Signaling</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>DTMF Enable &amp; Disable</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td><strong>Cell Broadcast</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Read Cell Broadcast</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>On/Off setting</td>
<td>Receive On/Off</td>
<td>Y</td>
</tr>
<tr>
<td>Alert setting</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Language setting</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Topics Setting</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td><strong>Contacts(Phone Book)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entry</td>
<td>Phone 300 + SIM</td>
<td>Y</td>
</tr>
<tr>
<td>Field</td>
<td>Name, Mobile, Home, Office</td>
<td>Y</td>
</tr>
<tr>
<td>Copy</td>
<td>ME &lt;&gt; SIM</td>
<td>Y</td>
</tr>
<tr>
<td>Move</td>
<td>ME &lt;&gt; SIM</td>
<td>Y</td>
</tr>
<tr>
<td>Feature</td>
<td>Action</td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------------------------</td>
<td></td>
</tr>
<tr>
<td>FDN</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>SDN</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Email Entry</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Picture ID</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Video Caller ID</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>vCard</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Business Card</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Delete</td>
<td>Delete, Delete All(SIM or Phone), Multi Delete</td>
<td>Y</td>
</tr>
</tbody>
</table>

### Supplementary Services

<table>
<thead>
<tr>
<th>Service</th>
<th>Description</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFU</td>
<td>Call Forwarding Unconditional</td>
<td>Y</td>
</tr>
<tr>
<td>CFB</td>
<td>Call Forwarding on Mobile Subscriber Busy</td>
<td>Y</td>
</tr>
<tr>
<td>CFNRy</td>
<td>Call Forwarding on No Reply</td>
<td>Y</td>
</tr>
<tr>
<td>CFNRe</td>
<td>Call Forwarding on Mobile Subscriber Not Reachable</td>
<td>Y</td>
</tr>
<tr>
<td>BAOC</td>
<td>Barring of All Outgoing Calls</td>
<td>Y</td>
</tr>
<tr>
<td>BOIC</td>
<td>Barring of Outgoing International Calls</td>
<td>Y</td>
</tr>
<tr>
<td>BOICexHC</td>
<td>Barring of Outgoing International Calls except those directed to the Home PLMN Country</td>
<td>Y</td>
</tr>
<tr>
<td>BAIC</td>
<td>Barring of All Incoming Calls</td>
<td>Y</td>
</tr>
<tr>
<td>BICRoom</td>
<td>Barring of Incoming Calls when Roaming Outside the/Home PLMN Country</td>
<td>Y</td>
</tr>
<tr>
<td>Conference Call</td>
<td>Up to 5 calls + 1 Waiting Call</td>
<td>Y</td>
</tr>
</tbody>
</table>

### SIM

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plug in Type</td>
<td>3V &amp; 1.8 V</td>
<td>Y</td>
</tr>
<tr>
<td>SIM Lock</td>
<td>Service Provider / Network Lock / Hard Lock</td>
<td>Y</td>
</tr>
<tr>
<td>SIM Toolkit</td>
<td>Class 3</td>
<td>Y</td>
</tr>
</tbody>
</table>

### Short Message

<table>
<thead>
<tr>
<th>Feature</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Read Message</td>
<td></td>
</tr>
<tr>
<td>Write and Edit Message</td>
<td></td>
</tr>
<tr>
<td>Send and Receive Message</td>
<td></td>
</tr>
<tr>
<td>Reply to Message</td>
<td></td>
</tr>
<tr>
<td>Forward Message</td>
<td></td>
</tr>
<tr>
<td>Extract Number from Message</td>
<td></td>
</tr>
<tr>
<td>Message Status</td>
<td></td>
</tr>
<tr>
<td>Message Unread</td>
<td></td>
</tr>
<tr>
<td>Settable Message</td>
<td></td>
</tr>
<tr>
<td>Center Number</td>
<td></td>
</tr>
<tr>
<td>Reply Path and Validity</td>
<td></td>
</tr>
<tr>
<td>Visible and Audible</td>
<td></td>
</tr>
<tr>
<td>Message Receive</td>
<td></td>
</tr>
<tr>
<td>Function</td>
<td>Value</td>
</tr>
<tr>
<td>-------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Voice Mail</td>
<td>Y</td>
</tr>
<tr>
<td>Settable Voice Mail</td>
<td>Y</td>
</tr>
<tr>
<td>Center Number</td>
<td></td>
</tr>
<tr>
<td>Message Protocol</td>
<td>Normal, Fax, National Paging, X400, ERMES, Voice</td>
</tr>
<tr>
<td>Message Overflow Indicator</td>
<td></td>
</tr>
<tr>
<td>Message Center Number</td>
<td>Y</td>
</tr>
<tr>
<td>Nokia Smart Message</td>
<td>Not supported. [Can be supported based on operator request]</td>
</tr>
<tr>
<td>Development &amp; Test Facility</td>
<td>Y</td>
</tr>
<tr>
<td>Field Test Facility</td>
<td>Y</td>
</tr>
<tr>
<td>Display Software Version</td>
<td>Y</td>
</tr>
<tr>
<td>IMEI</td>
<td>Y</td>
</tr>
<tr>
<td>Restore Factory Setting</td>
<td>Y</td>
</tr>
<tr>
<td>Battery Charging Mode</td>
<td>Y</td>
</tr>
<tr>
<td>Language</td>
<td>Selectable Auto Language</td>
</tr>
<tr>
<td>Predictive word input</td>
<td>T9</td>
</tr>
<tr>
<td>Calendar</td>
<td>MAX: 20 records (18 chars)</td>
</tr>
<tr>
<td>To Do</td>
<td>N</td>
</tr>
<tr>
<td>Memo</td>
<td>MAX: 10 records (80 chars)</td>
</tr>
<tr>
<td>Setting Local Time</td>
<td>Y</td>
</tr>
<tr>
<td>Display Two Cities Time</td>
<td>N</td>
</tr>
<tr>
<td>Daylight saving</td>
<td></td>
</tr>
<tr>
<td>NITZ</td>
<td>Y</td>
</tr>
<tr>
<td>Unit converter</td>
<td>Length, Weight, Volume, Surface, Velocity, Temperature, User-defined</td>
</tr>
<tr>
<td>Stop Watch</td>
<td>Y</td>
</tr>
<tr>
<td>Calculator</td>
<td>+ - * /</td>
</tr>
<tr>
<td>Phone Book Sync</td>
<td>Only For service Center</td>
</tr>
<tr>
<td>Message Sync</td>
<td>N</td>
</tr>
<tr>
<td>Game</td>
<td>1Game, SuDoKu</td>
</tr>
<tr>
<td>Emergency Call</td>
<td>Y</td>
</tr>
<tr>
<td>Handset Lock</td>
<td>Y</td>
</tr>
<tr>
<td>Security Code</td>
<td>When Delete All</td>
</tr>
<tr>
<td>SIM Lock</td>
<td>Y</td>
</tr>
<tr>
<td>Security Code</td>
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</tr>
<tr>
<td>Feature</td>
<td>Status</td>
</tr>
<tr>
<td>------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Keypad Lock</td>
<td>Y</td>
</tr>
<tr>
<td>Real Time Clock</td>
<td></td>
</tr>
<tr>
<td>12/24 Hour</td>
<td>Y</td>
</tr>
<tr>
<td>Calendar</td>
<td>Y</td>
</tr>
<tr>
<td>Time Zone</td>
<td>Y</td>
</tr>
<tr>
<td>Daylight saving</td>
<td>Y</td>
</tr>
<tr>
<td>Alarm Manager</td>
<td>Y</td>
</tr>
<tr>
<td>Dimming Clock</td>
<td>N</td>
</tr>
<tr>
<td>Power-off Alarm</td>
<td>Y</td>
</tr>
<tr>
<td>On Alarm Event</td>
<td>Y</td>
</tr>
<tr>
<td>Others</td>
<td></td>
</tr>
<tr>
<td>Mobile Tracking software</td>
<td></td>
</tr>
<tr>
<td>For India, Asia</td>
<td>Y</td>
</tr>
<tr>
<td>M-DOG</td>
<td></td>
</tr>
<tr>
<td>For China</td>
<td>Y</td>
</tr>
<tr>
<td>Accessory</td>
<td></td>
</tr>
<tr>
<td>Micro SD Adapter</td>
<td>N</td>
</tr>
<tr>
<td>Stereo Ear-mic without hook switch</td>
<td></td>
</tr>
<tr>
<td>Ear-mic type Stereo without hook key. Only FM play supports Stereo.</td>
<td>Y</td>
</tr>
</tbody>
</table>
3. TECHNICAL BRIEF

Digital Main Processor

Figure 3-1 PMB7880 FUNCTIONAL BLOCK DIAGRAM
3.1.1 Overview of E-GOLDvoice

The E-GOLDvoice is a GSM baseband modem including RF transceiver covering the low bands GSM850 / GSM900 and high bands GSM1800 / GSM1900 bands.

E-GOLDvoice is Dual Band, therefore, it supports by default a low / high pair of bands at the same time:

1. GSM850 / GSM1800
2. GSM850 / GSM1900
3. GSM900 / GSM1800
4. GSM900 / GSM1900

The E-GOLDvoice is optimized for voice-centric Mobile Phone applications. The E-GOLDvoice is designed as a single chip solution that integrates the digital, mixed-signal, RF functionality and a direct-to-battery Power Management Unit.

The transceiver consists of:

- Constant gain direct conversion receiver with an analog I/Q baseband interface
- Fully integrated Sigma-Delta-synthesizer capability
- Fully integrated two-band RF oscillator
- Two-band digital GMSK modulator with digital TX interface
- Digitally controlled crystal oscillator generating system clocks.

The E-GOLDvoice supports a direct battery connection, hence eliminating the need for an external Power Management Unit. The E-GOLDvoice has different power down modes and an integrated power up sequencer.

The E-GOLDvoice is powered by the C166®S MCU and TEAKLite® DSP cores. The operating temperature range from -40°C to 85°C. It is manufactured using the 0.13 µm CMOS process.
3.1.2 Features

**Baseband**
- High performance fixed-point TEAKlite DSP
- C166S high performance microcontroller
- There are several Interfaces:
  - I2S interface for DAI connections (for Tape Approval)
  - High Speed SSC Interface for connection of external peripherals
  - SIM Interface
  - Keypad Interface (6x4 or 5x5 keys)
  - EBU for external RAM/FLASH connection
  - Asynchronous serial interface (incl. IrDA support capability)
  - JTAG Interface
  - Black & white and color displays are supported
  - PWM source to drive vibrator
  - Keypad and display backlight supported.

**Receiver**
- Constant gain, direct conversion receiver with fully integrated blocking filter
- Two integrated LNAs
- No need of interstage and IF filter
- Highly linear RF quadrature demodulator
- Programmable DC output level
- Very low power budget.

**Transmitter**
- Digital Sigma-Delta modulator for GMSK modulation, typical -163.5 dBc/Hz @ 20 MHz
- Single ended outputs to PA, Pout = +3.5 dBm
- Very low power budget.

**RF-Synthesizer**
- $\Sigma\Delta$Synthesizer for multi-slot operation
  - Fast lock-in times (< 150 $\mu$s)
  - Integrated loop filter
  - RF Oscillator
  - Fully integrated RF VCO.

**Crystal Oscillator**
- Fully digital controlled crystal oscillator core with a highly linear tuning characteristic.

**Mixed Signal and Power Management Unit**
- DC/DC boost for voltages up to 15 V for driving White or Blue LEDs
- 8-Ohm loud speaker driver (250/350 mW)
• 16-Ohm earpiece driver
• 32-Ohm headset driver
• 4 measurement interfaces (PA temperature, battery voltage, battery temperature, and ambient temperature)
• Differential microphone input
• System start up circuitry
• Charger circuitry for NiCd, NiMh and Lilon cells
• Integrated regulators for direct connection to battery.
3.1.3 GSM System Description
The E-GOLDvoice is suited for mobile stations operating in the GSM850/900/1800/1900 bands. In the receiver path the antenna input signal is converted to the baseband, filtered, and then amplified to target level by the RF transceiver chip set. Two A-to-D converters generate two 6.5 Mbit/s data streams. The decimation and narrowband channel filtering is done by a digital baseband filter in each path. The DSP performs:
1. The GMSK equalization of the received baseband signal (SAIC support available)
2. Viterbi channel decoding supported by an hardware accelerator.
The recovered digital speech data is fed into the speech decoder. The E-GOLDvoice supports fullrate, halfrate, enhanced fullrate and adaptive multirate speech CODEC algorithms.
The generated voice signal passes through a digital voiceband filter. The resulting 4 Mbit/s data stream is D-to-A converted by a multi-bit-oversampling converter, postfiltered, and then amplified by a programmable gain stage.
The output buffer can drive a handset ear-piece or an external audio amplifier, an additional output driver for external loud speaker is implemented.
In the transmit direction the differential microphone signal is fed into a programmable gain amplifier. The prefiltered and A-to-D converted voice signal forms a 2 Mbit/s data stream. The oversampled voice signal passes a digital decimation filter.
The E-GOLDvoice performs speech and channel encoding (including voice activity detection (VAD) and discontinuous transmission (DTX)) and digital GMSK modulation.
In the RF transceiver part, the baseband signal modulates the RF carrier at the desired frequency in the 850 MHz, 900 MHz, 1.8 GHz, and 1.9 GHz bands using an I/Q modulator. The E-GOLDvoice supports dual band applications.
Finally, an RF power module amplifies the RF transmit signal at the required power level. Using software, the E-GOLDvoice controls the gain of the power amplifier by predefined ramping curves (16 words, 11 bits).
For baseband operation, the E-GOLDvoice supports:
• Making or receiving a voice call
• Sending or receiving an SMS.

3.1.4 PMU Details
The E-GOLDvoice includes battery charger support (various sensor connections for temperature, battery technology, voltage, etc.) and a ringer buffer.
E-GOLDvoice avoids the need for an external power management component because its internal power management unit contains:
• Voltage regulators for the On-chip and Off-chip functional blocks
• Charger circuitry for NiCd, NiMh and Lilon cells.

3.1.5 Bus Concept
The E-GOLDvoice has two cores (a microcontroller and a DSP), each with its own bus. There is an interconnection between the TEAKlite bus and the C166S X-Bus.

### 3.1.6 C166S Buses
The C166S is connected to three buses:
1. Local Memory (LM) bus
2. X-Bus
3. PD-Bus.

### 3.1.7 TEAKLite Bus
The TEAKlite is connected to the TEAKlite bus.

### 3.1.8 Bus Interconnections
The interconnection between the X-Bus and the TEAKlite Bus uses:
- Multicore Synchronization
- Shared Memory.

### 3.1.9 Clock Concept
The E-GOLDvoice has a flexible clock control.

### 3.1.10 Interrupt Concept
The C166 MCU carries out the E-GOLDvoice interrupt system.

### 3.1.11 Debug Concept
The E-GOLDvoice includes a multi-core debug. The C166 and TEAKlite cores can be debugged in parallel with:
- A single JTAG port (that is, on a single host)
- Mutual breakpoint control.

### 3.1.12 C166 Debug Concept
The debugging of the C166 uses the OCDS and the Cerberus.

### 3.1.13 TEAKLite Debug Concept
TEAKlite debugging uses the OCEM and the SEIB.

### 3.1.14 Power Management
The E-GOLDvoice provides the power management unit (PMU) for the complete mobile phone application. The integrated PMU is directly connected to the battery and provides a set of linear voltage regulators (LDO’s). These LDO’s generate all required supply voltages and currents needed in a low feature mobile phone.

A charger control circuit charges NiCd, NiMH and LiIon batteries. The charger control supports hardware controlled pre-charging and software controlled charging. It offers a wide charger voltage range, making halfwave/ full-wave charging with cheap transformers possible.

White/blue backlight generation is supported with a special driver for very a low external parts count.

Power consumption during operation phases is minimized due to flexible clock switching.

In the Standby Mode most parts of the device are switched off, only a small part is running at 32kHz and the controller RAM is switched to a power saving mode. The TEAKLite ROM can be
switched off during Standby via SW.

3.1.15 On-Chip Security Concept
Secure boot is based on a public/private key approach. Flash images that are not signed with the private key during phone manufacture cannot be loaded. Verification of the Flash code is done with the public key. The public key as well as hash and verify algorithms are stored in the ROM, which ensures a hardware secured boot procedure.

The following security features are supported:
• Prevention of illegal Flash programming
• Flash programming makes use of the E-GOLDvoice ID for personalization checks with IMEI and SIM-lock protection

The security features use the following mechanism:
• Boot ROM flow:
  – Controls the boot transition to external flash
  – Controls the flash update
• Flash tied to the individual chip via an ID using e-fuses, that is, each E-GOLDvoice chip has its own fused ID.

Further details on the E-GOLDvoice security concept are not publicly documented.

3.1.16 Asynchronous Operation Mode Concept
The E-GOLDvoice can operate in either:
• The traditional synchronous mode with the 26 MHz system clock synchronized on the base station
• A special asynchronous mode (XO concept).

In the asynchronous mode the 26 MHz clock input is not synchronized with the base station; the residual frequency offset is compensated in the digital signal processing domain. This processing includes frequency and timing compensation of the baseband and voiceband signals.
Power Amplifier Module (SKY77517/ SKY77518)

3.2.1 GB100/GB100b/GB105/GB105b (SKY77518)

The SKY77518-21 is a transmit and receive front-end module (FEM) with Integrated Power Amplifier Control (IPAC™) for dual-band cellular handsets comprising GSM900 and DCS1800 operation. Designed in a low profile, compact form factor, the SKY77518-21 offers a complete Transmit VCO-to-Antenna and Antenna-to-Receive SAW filter solution. The FEM also supports Class 12 General Packet Radio Service (GPRS) multi-slot operation.

The module consists of a GSM900 PA block and a DCS1800 PA block, impedance-matching circuitry for 50 Ω input and output impedances, TX harmonics filtering, high linearity and low insertion loss PHEMT RF switches, diplexer and a Power Amplifier Control (PAC) block with internal current sense resistor. A custom BiCMOS integrated circuit provides the internal PAC function and decoder circuitry to control the RF switches. The two Heterojunction Bipolar Transistor (HBT) PA blocks are fabricated onto a single Gallium Arsenide (GaAs) die. One PA block supports the GSM900 band and the other PA block supports the DCS1800 band. Both PA blocks share common power supply pads to distribute current. The output of each PA block and the outputs to the two receive pads are connected to the antenna pad through PHEMT RF switches and a diplexer. The GaAs die, PHEMT die, Silicon (Si) die and passive components are mounted on a multi-layer laminate substrate.
The assembly is encapsulated with plastic overmold. Band selection and control of transmit and receive modes are performed using two external control pads. Refer to the functional block diagram in Figure.3-2-1 below. The band select pad (BS) selects between GSM and DCS modes of operation. The transmit enable (TX_EN) pad controls receive or transmit mode of the respective RF switch (TX = logic 1). Proper timing between transmit enable (TX_EN) and Analog Power Control (VRAMP) allows for high isolation between the antenna and TXVCO while the VCO is being tuned prior to the transmit burst.

The SKY77518-21 is compatible with logic levels from 1.2 V to VCC for BS and TX_EN pads, depending on the level applied to the VLOGIC pad. This feature provides additional flexibility for the designer in the selection of FEM interface control logic.

### 3.2.2 GB100a/GB105a (SKY77517)

![SKY77518 FUNCTIONAL BLOCK DIAGRAM](image)

The SKY77517–21 is a transmit and receive front-end module (FEM) with Integrated Power Amplifier Control (iPAC.) for dual-band cellular handsets comprising GSM850 and PCS1900 operation. Designed in a low profile, compact form factor, the SKY77517–21 offers a complete Transmit VCO-to-Antenna and Antenna-to-Receive SAW filter solution. The FEM also supports Class 12 General Packet Radio Service (GPRS) multi-slot operation.

The module consists of a GSM850 PA block and a PCS1900 PA block, impedance-matching circuitry for 50 Ω input and output impedances, TX harmonics filtering, high linearity and low insertion loss PHEMT RF switches, diplexer and a Power Amplifier Control (PAC) block with internal current sense resistor.
A custom BiCMOS integrated circuit provides the internal PAC function and decoder circuitry to control the RF switches. The two Heterojunction Bipolar Transistor (HBT) PA blocks are fabricated onto a single Gallium Arsenide (GaAs) die. One PA block supports the GSM850 band and the other PA block supports the PCS1900 band. Both PA blocks share common power supply pads to distribute current. The output of each PA block and the outputs to the two receive pads are connected to the antenna pad through PHEMT RF switches and a diplexer. The GaAs die, PHEMT die, Silicon (Si) die and passive components are mounted on a multi-layer laminate substrate. The assembly is encapsulated with plastic overmold.

Band selection and control of transmit and receive modes are performed using two external control pads. Refer to the functional block diagram in Figure.3-2-2 below. The band select pad (BS) selects between GSM and PCS modes of operation. The transmit enable (TX_EN) pad controls receive or transmit mode of the respective RF switch (TX = logic 1). Proper timing between transmit enable (TX_EN) and Analog Power Control (VRAMP) allows for high isolation between the antenna and TX-VCO while the VCO is being tuned prior to the transmit burst.

The SKY77517 is compatible with logic levels from 1.2 V to VCC for BS and TX_EN pads, depending on the level applied to the VLOGIC pad. This feature provides additional flexibility for the designer in the selection of FEM interface control logic.
The XO_TUNE register holds the digital correction value for the crystal oscillator frequency. The XOMODE bits of XO_INIT1 register contain setup informations for the crystal oscillator (for example, current programming, etc.). See Figure 3-3 Crystal Oscillator Functional Overview.

The registers XO_INIT2 and XO_INIT3 contain the coefficients information for the linearization unit of crystal oscillator (LUXO). This linearization unit computes the required digital control word out of the programmed AFC bits in order to have a linear pulling curve ppm vs. AFC word. The resulting digital control word DIG is filtered by a digital lowpass filter, which can be scaled or deactivated using the bits DIGFILT0 and DIGFILT1 of the XO_INIT3 register.

The frequency correction splits into 2 parts:
1. The XOCAL bits in the XO_INIT1 register are used for the coarse frequency adjustment and are set once for a mobile lifetime (during production test).
2. The XO_TUNE register contains the information for frequency correction when the mobile is used (correction of temperature drift, crystal aging).
The integrated Real Time Clock (RTC) is able to provide programmable alarm functions and external interrupts. Due to its extreme low power consumption the RTC can be supplied from a small backup battery. This allows the generation of external interrupts, even when the main PMB7880 supply voltage is switched off. For this purpose the RTC is powered by own voltage supply pins VDD_RTC and VSS_RTC.

The RTC shall be driven by a 32.768 kHz (32k) clock which needs to be applied via the PMB7880 F32K and OSC32K pins. The clock can be fed from either an external clock source or use the on chip 32 KHz oscillator module.

The low clock frequency and the optimized low power design give the possibility to run the chip with a minimum of power dissipation. For example, for this specific application the 26 MHz reference oscillator can be switched off during system standby and a lowpower time reference can be kept when the 32k clock is provided to the RTC.

The RTC consists of an PMB7880 specific RTC shell, containing the RTC macro, as well as the 32 kHz oscillator, as described in the following sections. The module RTC Shell solely performs level translation of the 32KHz clock to the VDD_LCD power supply domain, and is not functionally associated with the RTC.
3.5 LCD Interface (3 wire SPI interface)

Figure 3-5-1 LCD Interface

CHARGING PUMP

Figure 3-5-2 Charging PUMP Interface
<table>
<thead>
<tr>
<th>Signals</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>_LCD_CS</td>
<td>This signal enable to access to the driver IC of LCD.</td>
</tr>
<tr>
<td>SSC0_MTSR</td>
<td>This signal transfer serial data to driver IC.</td>
</tr>
<tr>
<td>SSC0_CLK</td>
<td>This signal transfer serial clock to driver IC.</td>
</tr>
<tr>
<td>LCD_RESET</td>
<td>This signal makes driver IC to HW default status.</td>
</tr>
<tr>
<td>MLED</td>
<td>This signal provide power to white LEDs.</td>
</tr>
<tr>
<td>MLED1/2</td>
<td>This signal be feed back from white LEDs.</td>
</tr>
<tr>
<td>2V8_VIO</td>
<td>This signal provides power to LCD modules,(2.8V)</td>
</tr>
</tbody>
</table>

The AAT3157 is a low noise, constant frequency charge pump DC/DC converter that uses a trimode load switch (1X), fractional (1.5X), and doubling (2X) conversion to maximize efficiency for white LED applications. The AAT3157 is capable of driving up to three channels of LEDs at 20mA per channel from a 2.7V to 5.5V input. The current sinks may be operated individually or in parallel for driving higher current LEDs. A low external parts count (two 1μF flying capacitors and two small 1μF capacitors at VIN and VOUT) make this part ideally suited for small, battery-powered applications. AnalogicTech's S2Cwire™ (Simple Serial Control™) serial digital input is used to enable, disable, and set current for each LED with 16 settings down to 50μA. The low-current mode supply current can be as low as 50μA to save power.

<table>
<thead>
<tr>
<th>Data</th>
<th>Output (mA/Ch)</th>
<th>Data</th>
<th>Output (mA/Ch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20.0</td>
<td>9</td>
<td>5.0</td>
</tr>
<tr>
<td>2</td>
<td>17.0</td>
<td>10</td>
<td>4.2</td>
</tr>
<tr>
<td>3</td>
<td>14.0</td>
<td>11</td>
<td>3.4</td>
</tr>
<tr>
<td>4</td>
<td>12.0</td>
<td>12</td>
<td>2.8</td>
</tr>
<tr>
<td>5</td>
<td>10.0</td>
<td>13</td>
<td>1.0</td>
</tr>
<tr>
<td>6</td>
<td>8.6</td>
<td>14</td>
<td>0.5</td>
</tr>
<tr>
<td>7</td>
<td>7.0</td>
<td>15</td>
<td>0.1</td>
</tr>
<tr>
<td>8</td>
<td>6.0</td>
<td>16</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Figure 3-5-3. Charge pump Output Current
3.6 SIM Card Interface

SIM CONNECT

![Diagram of SIM Card Interface](Image)

**Figure 3-6 SIM CARD Interface**

The EGoldVoice provides SIM Interface Module. The AD6527 checks status periodically during established call mode whether SIM card is inserted or not, but it doesn't check during deep sleep mode. In order to communicate with SIM card, 3 signals SIM_DATA, SIM_CLK, SIM_RST.

<table>
<thead>
<tr>
<th>Signals</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIM_RST</td>
<td>This signal makes SIM card to HW default status.</td>
</tr>
<tr>
<td>SIM_CLK</td>
<td>This signal is transferred to SIM card.</td>
</tr>
<tr>
<td>SIM_DATA</td>
<td>This signal is interface datum.</td>
</tr>
</tbody>
</table>
3.7 KEYPAD Interface

Figure 3-7 KEY MAXTRIX Interface

The keypad interface is connected to the X-Bus, together with the XBIU and the Shared Memory Register, using a single Bus Interface.

The keypad supports two scan modes:
- By default, the keypad is a 4x6 scan matrix (4 input and 6 output pins).
- To set the keypad to a 5x5 scan matrix (5 input and 5 output pins)

The scan mode should be determined at the very beginning of the system start because changes are not allowed later.
3.8 Battery Charging Block Interface

CHARGING IC

Figure 3-8 Charging IC Interface

The MP26021 is a linear, high-performance single cell Li-Ion battery charger. By integrating high voltage input protection into the charger IC, the MP26021 can tolerate an input surge up to 28V.

The device features constant current (CC) and constant voltage (CV) charging modes with programmable charge currents (85mA to 1A), programmable battery full threshold, thermal protection, battery temperature monitoring, reverse current blocking and trickle charge. The device also provides AC adapter power good and Charge status indications to the system.

MP26021 is available in a 10-pin 3mm x 3mm QFN package.
3.9 RF Interface

Figure 3-9 RF Module/SAW Filter Interface

E-GOLDvoice features a fully integrated constant-gain direct conversion receiver, i.e. there is no interstage filter needed and the baseband level at the analogue IQ interface follows directly the RF input level. Depending on the baseband ADC dynamic range, single- or multiple-step gain switching schemes are possible.

An integrated, self-aligning, low-pass filter ensures the receivers to function under blocking and reference interference conditions and avoids aliasing by baseband sampling. An automatic DC-offset compensation is implemented and can be switched depending on the gain setting.
The digital transmitter architecture is based on a fractional-N sigma-delta synthesizer for constant envelope GMSK modulation. This configuration allows a very low power design with a reduced external component count.

The modulation is transferred between baseband- and RF-part of the PMB7880 via a digital interface signal into the digital modulator. The following Gaussian filter shapes the digital data stream for the GMSK modulation. Additionally a pre-distortion filter compensates the attenuation of the PLL transfer function resulting in a very low distortion at the transmit output.

The filtered digital data stream is scaled appropriately and added to the channel word.

This sum is fed into the MASH modulator. The output of the MASH modulator is a sequence of integer divider values representing the high resolution fractional input signal. This sequence controls the MMD (multi modulus divider) at a sample rate of 26MHz. Thus a tightly controlled frequency modulation of the VCO is achieved.
The audio front-end of E-GOLDvoice offers the digital and analog circuit blocks for both receive and transmit audio operation and ringing. It features a high-quality, digital-to-analog path with amplifying stages for connecting acoustic transducers to the E-GOLDvoice. In the transmit direction the supply voltage generation for microphones, low-noise amplifier and analog to digital conversion are integrated on the E-GOLDvoice.

For E-GOLDvoice the EPP1/EPN1 driver are used as differential Earpiece-Driver, EPPa1 is used as single-ended Headset-Driver.

The audio front-end itself can be considered to be organized in three sub-blocks:

- Interface to processor cores (TEAKlite and - indirectly - C166S)
- Digital filters
- Analog part.
The interface to the processor cores consists of a direct physical connection to the TEAKlite DSP bus and a set of firmware commands to handle communication between the C166S and the audio front-end which serves as the interface peripheral for audio algorithms running on the DSP or the controller. The audio front-end generates interrupts on certain occasions, for example, when exchange of data is requested. The core interface part of the audio front-end also contains the control and status registers which are used to set up certain operation modes of the peripheral.

The section next to the core interface contains the digital filters for interpolation and decimation of the audio signals being received and transmitted. The data path for the receive direction can be set up to process sampling rates between 8kHz and 48kHz.

The interpolation filters for the respective sampling rates are implemented in a dedicated hardware block and are automatically selected to suite the chosen sampling rate. Low-pass interpolation filtering, which produces an unsigned 16-bit data stream with a sampling rate of 4 MHz, is performed digitally.

D-to-A conversion, postfiltering, and final amplification are performed on the analog part. The amplifier buffer for voiceband receive does also support ringer functionality. The ringer functionality is activated by setting bits RINGSELNP or RINGSELPA in the voiceband part of the analog control register.

In transmit direction, amplification, prefiltering and A-to-D conversion (analog ΣΔ modulation) are performed on the analog part. The resulting 2-Mbit/s data stream is filtered by a digital low-pass decimation filter for further processing by DSP firmware.

Two sampling rates, 8kHz and 16kHz, are supported. The analog section contains all the necessary analog functional blocks including microphone supply generation, output and input amplifiers and analog filtering.

<table>
<thead>
<tr>
<th>Signals</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPp1</td>
<td>Main Receiver Positive signal (Differential signal)</td>
</tr>
<tr>
<td>EPn1</td>
<td>Main Receiver Negative signal (Differential signal)</td>
</tr>
<tr>
<td>EPpa1</td>
<td>Headset signal (Single Ended signal)</td>
</tr>
<tr>
<td>Loud1</td>
<td>Speaker Output Positive signal (Differential signal)</td>
</tr>
<tr>
<td>Loud2</td>
<td>Speaker Output Negative signal (Differential signal)</td>
</tr>
<tr>
<td>MICP1</td>
<td>Main Microphone Positive signal (Differential signal)</td>
</tr>
<tr>
<td>MICN1</td>
<td>Main Microphone Negative signal (Differential signal)</td>
</tr>
<tr>
<td>MICP2</td>
<td>Headset Microphone Positive signal (Differential signal)</td>
</tr>
<tr>
<td>MICN2</td>
<td>Headset Microphone Negative signal (Differential signal)</td>
</tr>
<tr>
<td>VMIC</td>
<td>Main/Headset Microphone supply power</td>
</tr>
</tbody>
</table>
Figure 3.10.2 Main Speaker (Receiver) Interface
Figure 3-10-3 Main Microphone Interface

Figure 3-10-4 Headset Interface
3.11 Key LED Interface

This handset has 8 LEDs that illuminates blue color.
Control signal is controlled by E-GoldVoice with PWM and handset has 3 methods, ON, OFF, Dimming.
3.12 Vibrator Interface

This handset has Vibrator operation. Control signal is controlled by E-GoldVoice with PWM.
3.13 Memory Interface

In E-GOLDvoice, the 16bits demultiplex X-bus interface is used for memory device support. NOR Flash memory is supported. (The NAND Flash memory is not supported). The page mode can be supported for flash memories. Up to 8MBytes of external RAM and/or ROM can be connected to the MCU via its external bus interface.

Up to 3 external CS signals can be generated to save external glue logic. Access to very slow memories is supported via a special ‘Ready’ function. The system MCU clock is set to run with 26Mhz.
The E-GOLDvoice integrated power management unit (PMU) supports direct connection to battery (DCB), see Figure 3-1 E-GOLDvoice Block Diagram. That means all supply voltages needed are generated on-chip with integrated linear voltage regulators. The input of these linear voltage regulators is the battery voltage. The external memory and SIM card supply is provided by the on-chip voltage regulators. Figure.3-14-2 is an overview of the internal generated supply voltages.
The integrated power management also provides the control state machine for system start up, including start up with discharged batteries, pre-charging and system reset control. After system start up several methods are implemented for active and idle power saving.

**LDO output voltage selection**
- LD1, LIO, LSIM, LBUF output voltage programmable by software.
- LMEM output voltage is selectable by pin configuration upon startup.
Active and idle power saving options:
- The flexible clock switching options allow minimizing the power consumption during the operation phases of the E-GOLDvoice.
- Current consumption during the standby mode is minimized by reducing the clock to 32 kHz and switching it off for most of the device. In addition, the power supply for the TEAKLite ROM is switched off and the controller RAM is switched to a power saving mode.

**Start-up and Reset Control State Machine Features**
- Power up upon battery insertion, push button, alarm, charger connection.
- Detection of battery exchange or re-insertion.
- Complete start-up sequence management.
- System turn-on, system turn-off operation management including emergency (under-voltage) and programmed shutdown functions.
- Internal reset of the baseband.
- Tristate function of the baseband module.
- Standby mode controlled by VCXO_EN provided by SCCU module.

<table>
<thead>
<tr>
<th>Name</th>
<th>Output Voltage(V)</th>
<th>Output Current (mA)</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRRTC</td>
<td>2.0</td>
<td>4</td>
<td>Used for the real time and digital PMU supply</td>
</tr>
<tr>
<td>LD1</td>
<td>1.2/1.5</td>
<td>150</td>
<td>Used for the core supplies (MCU and DSP via switch)</td>
</tr>
<tr>
<td>LIO</td>
<td>1.8/2.85</td>
<td>30</td>
<td>Used for the I/O pad supply and, for example, the display</td>
</tr>
<tr>
<td>LRFXO</td>
<td>2.5</td>
<td>10</td>
<td>Used for the crystal oscillator supply</td>
</tr>
<tr>
<td>LMEM</td>
<td>1.8/2.85</td>
<td>100</td>
<td>Used for the external memory supply, voltage can be configured during startup</td>
</tr>
<tr>
<td>LANA</td>
<td>2.5</td>
<td>100</td>
<td>Used for analog (audio and baseband processing) and headset driver</td>
</tr>
<tr>
<td>LSIM</td>
<td>1.8/2.85</td>
<td>30</td>
<td>Used of the SIM card supply</td>
</tr>
<tr>
<td>LBUF</td>
<td>2.6/2.8/3.0/3.2</td>
<td>300</td>
<td>Used for the loudspeaker and earpiece driver</td>
</tr>
<tr>
<td>LRFRX</td>
<td>2.5</td>
<td>100</td>
<td>Used for the RF RX part</td>
</tr>
<tr>
<td>LRFTRX</td>
<td>1.5</td>
<td>120</td>
<td>Used for the RF TX/TX part</td>
</tr>
</tbody>
</table>

*Figure 3-14-2 EGold Voice PMU*
3.15 FM Radio Interface (GB105&GB105b&GB106)

Figure 3-15 FM Radio Interface
3.15.1 FM Tuner (GB105&GB105b&GB106 only)
The Si4702 patented digital low-IF architecture reduces external components and eliminates the need for factory adjustments. The receive (RX) section integrates a low noise amplifier (LNA) supporting the worldwide FM broadcast band (76 to 108 MHz). An automatic gain control (AGC) circuit controls the gain of the LNA to optimize sensitivity and rejection of strong interferers. For two-wire operation, a transfer begins with the START condition. The control word is latched internally on rising SCLK edges and is eight bits in length, comprised of a seven bit device address equal to 0010000b and a read/write bit (write = 0 and read = 1). The device acknowledges the address by setting SDIO low on the next falling SCLK edge. For write operations, the device acknowledge is followed by an eight bit data word latched internally on rising edges of SCLK. The device always acknowledges the data by setting SDIO low on the next falling SCLK edge. An internal address counter automatically increments to allow continuous data byte writes, starting with the upper byte of register 02h, followed by the lower byte of register 02h, and onward until the lower byte of the last register is reached. The internal address counter then automatically wraps around to the upper byte of register 00h and proceeds from there until continuous writes cease. Data transfer ceases with the STOP command. After every STOP command, the internal address counter is reset. For read operations, the device acknowledge is followed by an eight bit data word shifted out on falling SCLK edges. An internal address counter automatically increments to allow continuous data byte reads, starting with the upper byte of register 0Ah, followed by the lower byte of register 0Ah, and onward until the lower byte of the last register is reached. The internal address counter then automatically wraps around to the upper byte of register 00h and proceeds from there until continuous reads cease. After each byte of data is read, the controller IC should return an acknowledge if an additional byte of data will be requested. Data transfer ceases with the STOP command. After every STOP command, the internal address counter is reset.

3.15.2 Headphone Amplifier
The TS486 is a dual audio power amplifier capable of driving, in single-ended mode, either a 16 or a 32W stereo headset. Capable of descending to low voltages, it delivers up to 90mW per channel (into 16W loads) of continuous average power with 0.3% THD+N in the audio band width from a 5V power supply. An externally-controlled standby mode reduces the supply current to 10nA (typ.). The unity gain stable TS486 can be configured by external gain-setting resistors or used in a fixed gain version.
4. TROUBLE SHOOTING

4.1 RF Trouble

<table>
<thead>
<tr>
<th>REFERENCE</th>
<th>PART Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>U601</td>
<td>PAM (Power Amp. Module+ASM)</td>
</tr>
<tr>
<td>X6101</td>
<td>DCXO (26MHz)</td>
</tr>
<tr>
<td>W601</td>
<td>Mobile Switch</td>
</tr>
<tr>
<td>U602</td>
<td>RX SAW Filter</td>
</tr>
</tbody>
</table>
RX Trouble

TEST POINT  CHECKING FLOW

START

Setup Test Equipment
Cell Power: -74dBm
GSM950 CH190
PCS CH660

Check point:
DCXO(X6101)

Check point:
Mobile SW &
SAW Filter
(W601,U602)

Re-Download Software &
Calibration
RX Trouble

(1) Checking VCTCXO Circuit

TEST POINT

CHECKING FLOW

Is the waveform of Pin3 similar to DCXO(X6101) Waveform?

Replace X6101

DCXO Circuit is OK. See next page to check PLL Circuit.

CIRCUIT

WAVE FORM

Waveform

TP1

TP2

26M Hz

TP1

TP2

X6101

NX3225SA

TP1

TP2
RX Trouble

**TEST POINT**

- Check TP1, TP2 of W601 with RF Cable
- Signal is OK?
- Replace Mobile SW(W601)
- Check TP3,4 and 5,6 of U602?
- Replace SAW Filter(U602)
- Mobile SW & ASM is OK. See next Page

* TP 3, 4 and 5, 6 outputs of U602 are balanced
4.2 TX Trouble

**TEST POINT**

**CHECKING FLOW**

- Setup Test Equipment
  - Cell Power: -74 dBm
- **CHECK POINT** DCXO (X6101)
- **CHECK POINT** ULC2 (U101)
- **CHECK POINT** PAM CONTROL POINT
- **CHECK ASK & MOBILE SW & SAW** (W601, U602)
- Re-Download S/W & RF CAL
### Signal configuration

<table>
<thead>
<tr>
<th>Mode</th>
<th>GSM850 TX</th>
<th>PCS1900 TX</th>
</tr>
</thead>
<tbody>
<tr>
<td>TXON_PA (TP1)</td>
<td>H(2.7V)</td>
<td>H(2.7V)</td>
</tr>
<tr>
<td>BS (TP2)</td>
<td>L</td>
<td>H(2.7V)</td>
</tr>
<tr>
<td>VLOGIC (TP3)</td>
<td>H(2.7V)</td>
<td>H(2.7V)</td>
</tr>
</tbody>
</table>

### CHECKING FLOW

- **Check Control Signals (TP1,2,3)**

  **Signals are Normal?**

  *Yes*
  - **PAM Control Signal is OK?**
    - See next page to check Mobile SW Circuit.
  *No*
  - Check U LC2 (U 101)
<table>
<thead>
<tr>
<th>Mode</th>
<th>GSM850 TX</th>
<th>PCS1900 TX</th>
<th>GSM850 RX</th>
<th>PCS1900 RX</th>
</tr>
</thead>
<tbody>
<tr>
<td>TXON_PA (TP1)</td>
<td>H(2.7V)</td>
<td>H(2.7V)</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>BS (TP2)</td>
<td>L</td>
<td>H(2.7V)</td>
<td>L</td>
<td>H(2.7V)</td>
</tr>
<tr>
<td>VLOGIC (TP3)</td>
<td>H(2.7V)</td>
<td>H(2.7V)</td>
<td>H(2.7V)</td>
<td>H(2.7V)</td>
</tr>
</tbody>
</table>
RF Trouble

<table>
<thead>
<tr>
<th>Mode</th>
<th>GSM850 RX</th>
<th>PCS1900 RX</th>
</tr>
</thead>
<tbody>
<tr>
<td>VLOGIC (TP3)</td>
<td>H(2.7V)</td>
<td>H(2.7V)</td>
</tr>
<tr>
<td>TXON_PA (TP4)</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>BS (TP5)</td>
<td>L</td>
<td>H(2.7V)</td>
</tr>
</tbody>
</table>
4.3 Power On Trouble

Test Point

Check Points:
- Battery Voltage (Need to over 3.35V)
- Power-On key detection (PWRON signal)
- Outputs of LDOs U101 (EGV)

<table>
<thead>
<tr>
<th>Voltage</th>
<th>PART</th>
</tr>
</thead>
<tbody>
<tr>
<td>VBUF</td>
<td>2.8V</td>
</tr>
<tr>
<td>VMEM</td>
<td>2.8V</td>
</tr>
<tr>
<td>VIO</td>
<td>2.8V</td>
</tr>
<tr>
<td>VSIM</td>
<td>2.85V</td>
</tr>
<tr>
<td>VRF0</td>
<td>1.5V</td>
</tr>
<tr>
<td>VANA</td>
<td>2.5V</td>
</tr>
</tbody>
</table>
Checking Flow

1. Check Battery Voltage > 3.35V?
   - NO: Charge or Change Battery
   - YES: Push Power_ON key and check the level change of PWRON key
     - NO: Charge or Change Battery
     - YES: Check the Voltage of LDOs Output @U101
       - NO: Replace U101
       - YES: The Phone will Power

   LDO Voltage:
   - VBUF = 2.8V
   - VMEM = 2.8V
   - VIO = 2.8V
   - VSIM = 2.85V
   - VRF0 = 1.5V
   - VANA = 2.5V
4.4 SIM Card Trouble
Test Point

Circuit Diagram
Checking Flow

Start

Does the SIM Card supports 2V or 3V ?

YES

Check soldering status of J201 and other component (R201/C203/C204/C205)

NG

Resolder J201 or other component

NG

Check TP1 = 2.85V ?

NO

Change the SIM Card . Our phone supports only 2V or 3V SIM Card

NG

Check Operation

NO

Change Board

YES

Change Board

Re-download the SW
4.5 Vibrator Trouble

Test Point

Circuit Diagram
Checking Flow

Start

Enter the Engineer Mode and set Vibrator ON

- Check Voltage Level of TP1
  - TP1 = 2.8V?
    - NG: Change Board
    - OK: OK

- Check Voltage level of TP2
  - TP2 = 0V?
    - NG: Change U506
    - OK: Replace Vibrator
4.6 Keypad Trouble

Test Point

Circuit Diagram
Checking Flow

Start

Check Metal Dome?

NG → Change Metal Dome

OK → Change PCB
4.7 RTC Trouble

Test Point

Circuit Diagram
Checking Flow

Start

Is the Frequency about 32kHz?

NO → Replace X102 and try again

YES

Check soldering status of C122, C123

NO → Replace C122, C123

YES

Check Voltage Level of TP1 = 2V?

NO → Replace C101

YES → RTC will work properly
4.8 Key Backlight Trouble
Test Point
Circuit Diagram
Checking Flow

Start

- Check Voltage Level of TP1 = 2.8V ?
  - NO → Replace U505 or Change PCB
  - YES

- Check LED Component (D501, D502, D503, D504, D505, R501, R507, R506, R508, R510, R513)
  - NO
  - YES → Change PCB

- Replace Component (D501, D502, D503, D504, D505, R501, R507, R506, R508, R510, R513)
4.9 LCM Backlight Trouble

Test Point

Circuit Diagram
Checking Flow

Start

Check Voltage Level of TP1 & TP2 as 2.8V step waveform?

NO

Replace R408 or Change PCB

YES

Check Voltage Level of TP3 as 4.9V step waveform?

NO

Replace U401

YES

Change PCB
4.10 LCM Trouble

Test Point

Circuit Diagram

Checking Flow
Start

Backlight is OK ?

YES

Check Control Signal and power including soldering status, as the waveform ?

NG

Replace Component or LCM

OK

Check soldering status of J401

NG

Replace J401

OK

Change PCB
4.11 Microphone Trouble

Test Point

Circuit Diagram

Checking Flow
4.12 Receiver Trouble
Test Point

Circuit Diagram

Handset

Checking Flow
Make a Call

Start

Make a Call

YES

NG

Check Component status (L301, L302, R303, R309)

L301 & L302 bias will fluctuate above 1.2V

OK

NG

Check TP1 & TP2

Re-solder or Replace Component

OK

NG

Check the Contact of Receiver

Re-solder or replace Receiver

OK

Replace U101(EGV) or Change PCB
4.13 Speaker Trouble

Test Point

Circuit Diagram
Checking Flow

1. Start
2. Turn On the sound
3. Check the voltage level of TP1 = VBAT? (NO → Check the Battery; YES)
4. Check the signal of TP2 & TP3 (NO → Check U101(EGV); YES)
5. Check the Level of TP4 = High? (NO → Check U101(EGV); YES)
6. Check the signal of TP5 & TP6 (NO → Re-solder L301,L302; YES)
7. Check the Contact of Speaker (NO → Re-assemble or replace Speaker; YES)

Try again or Change PCB
4.14  Headphone Trouble

Test Point
Checking Flow

Start

Does the audio profile of the phone change to the earphone mode?

NO

YES

MIC

Earphone

YES

NO

Check voltage level of TP6 VMIC = 2.5V?

YES

NO

Check component status around VMIC

YES

NO

Re-solder or replace the component

Re-solder causal component (J501)

YES

Check the signal level and HS_MIC. Is it about 1.2~1.5VDC with a few tens mV AC?

NO

YES

Replace U101(EGV) or Change another Ear-Mic set and Try again.
Earphone

Acoustic

Does waveform at TP3(U101.HS_REC) fluctuate?

NO → Replace U101(EGV) or Change the PCB.

YES →

Does waveform at TP4 & TP5(U305.3 &.9) fluctuate?

NO → Check U305 and component status around U305

YES →

Does waveform at TP1 & TP2(J501.4 & .5) fluctuate?

NO → Re-solder causal component(J501, C322 etc)

YES → Change another Ear-Mic set and Try again.
4.15 Charging Trouble

Test Point

Circuit Diagram
Checking Flow

Start

1. I/O Connector(J501) is well-soldered?
   - NO ➔ Re-solder the J501 pin12,13: VCHARGE
   - YES ➔ Is the Voltage of TP1 & TP2 between 4.8V & 6.4V?

2. The Voltage of TP1 & TP2 between 4.8V & 6.4V?
   - NO ➔ The TA is out of order. Change the TA
   - YES ➔ The voltage of TP3 & TP4 is over 2.5V?

3. The voltage of TP3 & TP4 is over 2.5V?
   - NO ➔ Replace the U503
   - YES ➔ Check the voltage of TP5 is High or Low?

4. Check the voltage of TP5 is High or Low?
   - NO ➔ Check the U101(EGV).
   - YES ➔ Battery is charged?

5. Battery is charged?
   - NO ➔ The battery may have problem. Change the Battery.
   - YES ➔ Charging is properly operating.
4.16 FM Radio Trouble (GB105 / GB105b / GB106 only)

* FM intenna (internal antenna) : GB106 only

Test Point
Circuit Diagram

<table>
<thead>
<tr>
<th>PM RADIO</th>
<th>FM RADIO_DETECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>RADIO 27K</td>
<td>27kHz</td>
</tr>
<tr>
<td>NO RADIO 2.7K</td>
<td>2.7kHz</td>
</tr>
</tbody>
</table>

I/O CONNECTOR

TP6
TP5
PM_ANT
C503 27pf
L501 100mH
0603
Checking Flow

Start

INT-FM or EXT-FM ANT

INT FM

Check a condition of Ear Jack connector soldering(J501) for Ext-FM-ANT

A condition is Good ?

NO  

Replace the J501

YES

Check a condition of FM tuner Matching component (TP5,6,7)

A condition is Good ?

NO  

Give the additory solder in TP5,6,7

YES

FM_Radio working is good ?

Finish

A condition is Good ?

NO  

Replace PCB

YES

A

Check a condition of power supply points(TP1,2,3) ; Reasonable range(3.1V > TP1,2,3 > 2.7V)

A condition is Good ?

NO

B

NO

NO
Check a condition of CLK (TP8 = 32KHz)

A condition is Good?

NO → Replace PCB

YES → Check a condition of U303 soldering

A condition is Good?

NO → Replace U303

YES → Check a condition of TP10, U304 Soldering

A condition is Good?

NO → Give the additory in TP10, U304

YES → Check a condition of FM_Radio Performance

A condition is Good?

NO → Replace PCB

YES → Finish
FM intenna trouble (GB106 only)

1. Check a condition of Pogo PIN for Z301
   Int-FM-ANT(TP11)

   - A condition is Good?
     - YES
     - NO: Replace the Z301

   - NO
     - Give the additory solder in TP12,13,7

2. Check a condition of FM tuner
   Matching component (TP12,13,7)

   - A condition is Good?
     - YES
     - NO: B

3. FM Radio working is good?
   - NO: Finish
5. DOWNLOAD

5.1 Download Setup
5.2 Download Process

Download step[1]

Ⓐ: Start or Stop download
Ⓑ: Selected configuration DLL file
Ⓒ: File name downloading

File(F) → Exit(X): End program

Setting(S) → Configuration: configuration download condition DLL, SW files and etc.

About(H) → MultiGSM: Provide version information

First, select Setting Menu.
Download step[2]

Ⓐ: Select a appropriated DLL file
- You must select KP100_xxxxxx.DLL file.

Ⓑ: Select files downloaded
- GB100- *.bin.

Ⓒ: Select download speed
- You must 460800. System supports maximum 460800bps.

Ⓓ: Select port
- select start and end port be operated
Download step[3]

Ⓐ : Start download and stop download next step.

If configuration is finished, then push start button and then button is changed to STOP.

Turn on power of multi download and connector phones.

If download is started, then push start button else program will download repeatedly.
Download step[4]

Ⓐ This region appears download status.

If download is finished, PASS or FAIL message is showed.
6. BLOCK DIAGRAM
8. BGA IC PIN Check

BGA PIN Check of main chip
(Bottom view)

- Use U101 Main chip (PMB7880)
- Not Use (EUSY0317401)
BGA PIN Check of Memory
(Top View)

Use U201 Memory (S71GL032N40BFW0P)

Not Use (EUSY0328002)
9. PCB LAYOUT
U601
PAM(SKY77518/SKY77517)
No TX & No RX

X6101 26MHz Crystal
No TX & No RX

U401 charging Pump
No Display

U201 Memory
No Booting

U505 Key LED TR switch
No LED

J201 SIM connector
No SIM

VIB501 Vibrator PAD
No Vibrator

U506 Vibrator TR switch
No Vibrator

J501 I/O Connector
No Charging etc

X102 32.768KHz Crystal
No Booting

U304 FM Speaker AMP
No sound (Speaker or Headset)

U303 FM Tuner
No FM radio

J502 Battery Connector
No Charging
No Power On

U301 Speaker AMP
No Speaker

J501 I/O Connector
No Charging etc

U503 Charging IC
No Charging

J502 Battery Connector
No Charging
No Power On

101
10. Engineering Mode

1. Function Test

1.1 Test Purpose
To verify handset functional is pass or fail when assembled by visual check.

1.2 Test Facilities List
1. Battery
2. Earphone
3. Charger
4. GSM tester (4201S)
5. Battery Cover
6. FM transmitter
### 1.3 Test Procedure

#### 1.3.1 Auto test sequence

1. Operator not need to insert test SIM card, and enter "*8*" to check “auto test” as below.
2. When operator into function test mode, we just press “yes” key or “enter” key to into next test item.
3. When use auto test, every test item always turn on together.

<table>
<thead>
<tr>
<th>No.</th>
<th>Test item</th>
<th>Verifying item</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LCD</td>
<td>Display check (All white, all black, red, blue, green test) Every screen is 0.5 second</td>
</tr>
<tr>
<td></td>
<td></td>
<td><img src="image.png" alt="image" /></td>
</tr>
<tr>
<td>2</td>
<td>LED/Illumination +Vibrator+ Melody</td>
<td>Speaker and Melody function check (Always on/Set max volume) All Keypad LED Vibrator function check (Always on)</td>
</tr>
<tr>
<td>3</td>
<td>Keyboard + Receiver</td>
<td>All keys function check Method 1: screen shows all icons for key and operator press key one by one then it disappear in screen. Method 2: screen shows icon of key one by one then operator press it as phone instruction. Receiver check</td>
</tr>
<tr>
<td>4</td>
<td>Audio</td>
<td>Main Mic to Main Receiver audio loop check</td>
</tr>
<tr>
<td>5</td>
<td>Headsets (Earpiece)</td>
<td>Aux-Mic to Aux Receiver audio loop check</td>
</tr>
<tr>
<td>6</td>
<td>FM</td>
<td>Default handset in FM channel 100.7 MHz Method 1: Testing FM through headset (earpiece) Method 2: Testing FM through SPK</td>
</tr>
<tr>
<td>7</td>
<td>Antenna</td>
<td>Antenna circuit check by Radiation Power                              (Turn on GSM Power level 5 @ Ch40 for 900/1800 band Turn on GSM Power level 5 @ Ch190 for 850/1900 band)</td>
</tr>
</tbody>
</table>
1.3.2 Test mode for after download MMI

1.3.2.1 Service information Test

Operator not need to insert test SIM card, and enter “***” to check “Service information” as below.

<table>
<thead>
<tr>
<th>Service information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Conducted</td>
</tr>
<tr>
<td>IMEI:</td>
</tr>
<tr>
<td>Software version:</td>
</tr>
</tbody>
</table>
11. Calibration

11.1 Test equipment setup

11.2 Calibration Steps

Execute “HK_36.exe”
Click “SETTING” Menu

Setup Logic operation such as the following figure

- PWR: Power Supply
- CELL: Call-Test Equipment

Setup UART Port

- Operation Mode
  1. By-Pass: not control by GPIB
  2. Normal: control by GPIB
Select “MODEL”

Click “START” for RF calibration

RF Calibration finish
12. Stand alone test

12.1 Test program setting
12.1.1 Set COM port
12.1.2 Check PC Baud rate (115200)
12.1.3 Confirm EEPROM &Delta; file prefix name
12.1.4 Press power on key, then click “V24AT#ON” and then “Update Info” for communicating Phone and Test Program
12.1.5 For the purpose of the Stand alone Test, change the phone to "ptest mode" and then click the "Reset" bar.

12.1.6 Select "Non signaling" in the Quick Bar menu. Then Stand alone Test setup finished.
12.2 TX Test

12.2.1 Click “Non signaling mode” bar and then confirm “OK” test in the command line.

12.2.2 Put the number of TX channel in the ARFCN.
12.2.3 Select “TX” in the RF mode menu and “PCL” in PA level menu .
12.2.4 Finally, Click “Write All” bar and try the efficiency test of phone.
12.3 RX Test

12.3.1 Put the number of RX channel in the ARFCN.
12.2.2 Select “RX” in the RF mode menu.
12.2.3 Finally, Click “Write All” bar and try the efficiency test of phone.
13. EXPLODED VIEW&REPLACEMENT PART LIST

13.1 Exploded View (GB106)

Main Lens

Keypad

Battery cover,FM ANT | 1 405-71210-0001 | ACGA0026901
IMEI Label (CE logo) | 1 478-711560-001 | MLA-A06650100
Screw | 6 409-00000-0068 | GMZD027301
RF cover | 1 405-71210-0003 | MCCF00559901
Water dissolvable label | 1 478-712100-004 | MIA/B12715100
Juego pin FM | 1 314-00000-0033 | NCA-10002001
Rear cabinet | 1 402-71220-0001 | MC-JNQ093301
Vibrator | 1 325-00000-00035 | SJY10009301
2 in 1 speaker | 1 313-00000-0013 | SUSY10026001
Mylar for LOM connector | 1 415-71220-0012 | MBZ10191901
I/O cover | 1 405-71210-0002 | MCC00600010
Sponge for speaker chamber | 1 415-71210-0002 | MFB00634010
Main board | 1 8PCB-71219-2-01 | SAFN0235402
Mesh for microphone | 1 415-71210-0003 | MBE0034601
Metal done | 1 415-71210-0004 | ABC00903010
Recevier sponge | 1 415-71210-0006 | MFB00270010
LED luidite | 1 327-00000-0062 | SMLID120101
Keypad | 1 404-71210-0007 | MACB0012911
Recevier mesh | 1 415-71201-0011 | MFBC0045401
Sponge for LCD | 1 415-71210-0001 | MFBG0084901
Front cabinet | 1 401-71210-0001 | MC-JNQ095601
Adhesive for main lens | 1 415-71210-0015 | MIA/B12715301
Main lens | 1 403-71210-0002 | MVA/005301

ND | ITEM | Qty | ARMA-Part No | LGP-Part No |
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<td>AGC8000</td>
<td>COVER ASSY/FRONT 610-7121-0001 Front cover, H=100mm, W=200mm, T=5mm</td>
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<td>Fiber Front, Speaker mesh for front cover 610-7121-0011 Fiber front, H=80mm, W=100mm, T=2mm</td>
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<td>PAD, LCD, LCM porous Sponge 610-7121-0040 Pad, LCD, LCM porous Sponge</td>
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<td>MOLDED PANEL 610-7121-0050 Molded panel</td>
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<td>MAIN LENS 610-7121-0050 Main lens, H=30mm, W=100mm, T=5mm</td>
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<td>RF cap (rubber) 610-7121-0070 RF cap, H=20mm, W=20mm, T=10mm</td>
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<td>Vx connector 610-7121-0080 Vx connector, H=30mm, W=30mm, T=10mm</td>
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13.2 Replacement part list

**GB106 SPPL**