



# Working Instruction, Electrical

Applicable for G502

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## Read this first!

### CAUTION

- ***Keep all contact surfaces clean, no dirt or hand grease!***
  - 
  - ***Attention! All repair action with Hot air station or BGA repair station around and on the opposite side of these components shall be performed with care, if the soldering joints temperature on these components will reach 220 degree than soldering of these components will be damaged.***
  - 
  - ***Remove the Main Camera and VGA Camera before you perform any repair action by using heating tools: Soldering Iron, Hot Air Station or BGA station!***
  -
- Protect the phone from ESD damages whenever it has been opened by using:***
- ***ESD-wristband***
  - ***ESD-gloves***
  -



# 1 Lead-free soldering

**KEEP ALL CONTACT SURFACES CLEAN OF DIRT AND HAND GREASE!**

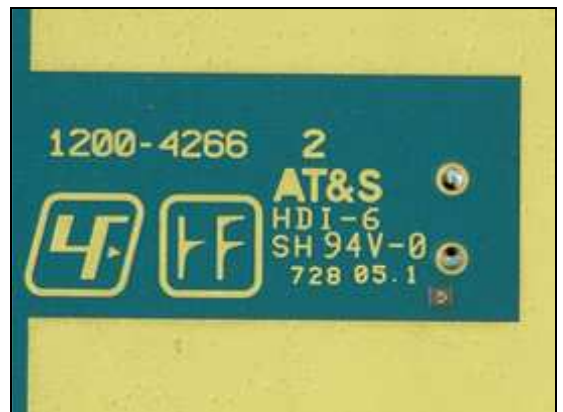
**THIS PRODUCT IS MANUFACTURED WITH LEAD-FREE SOLDER AND LEAD-FREE COMPONENTS!**

During electrical repair, it is critical to make sure that no lead is introduced.

This symbol indicates that the product is lead- free.



All lead-free PBA's will be marked with this symbol.



A lead-free work area must be set up completely separated from work areas that are used to make lead repairs.

The lead-free work area must also be clearly labeled with the lead free symbol as shown in the adjacent picture.

The items on this desk must remain lead-free.

They must be adequately labeled to make their lead-free status clearly and easily recognized.





## Lead-free soldering *continued*

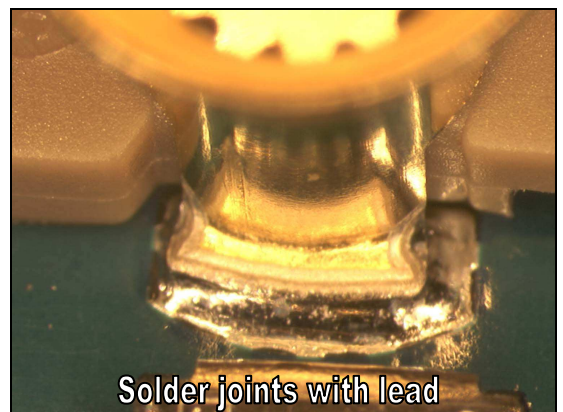
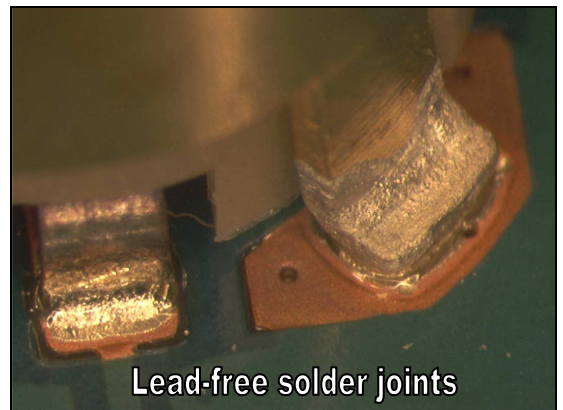
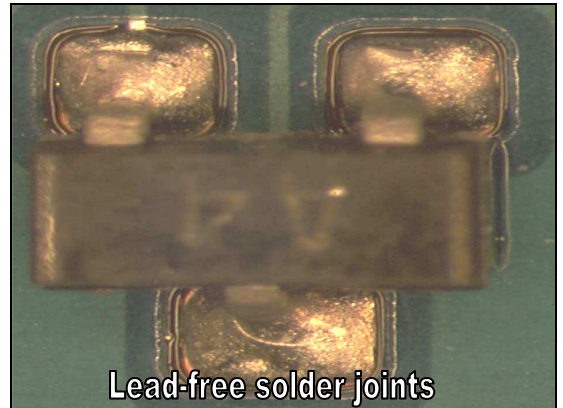
LFS (lead-free solder paste) characteristics:

- High melting point (typically 220°C)
- Low wettability
- High surface tension
- Difficult to spread
- Recommended tip temperature = 370°C

**WHEN SERVICING PBA'S THAT HAVE BEEN MANUFACTURED WITH LFS (LEAD-FREE SOLDER PASTE), LFS MUST BE USED. IF NOT, THERE IS A HIGH RISK FOR UNRELIABLE SOLDERING JOINTS.**

Lead-free solder joints are more difficult to inspect because they do not have shiny surfaces like leaded solder joints.

Also, lead-free solder does not flow as well as leaded solder, so some of the solder pad areas may remain exposed.





## 2 Hot air gun temperature requirements

The air temperature shall not exceed 360°C. The temperature shall be measured 5 mm from the nozzle outlet. If it's not possible to remove and/ or solder with 360°C a BGA Rework Station or another repair process shall be considered to ensure high process control.

Too high temperature can cause damage and cracks due to thermal stress on sensitive components, e.g. ceramic components like capacitors.

## 3 Soldering tip temperature requirements

The soldering tip temperature shall be minimum 310°C and maximum 370°C.

Too high temperature can cause damage and cracks due to thermal stress on sensitive components, e.g. ceramic components like capacitors.

## 4 BGA equipment reflow profiles

### 4.1 General

This document contains reflow profile recommendations for mobile phones and similar products.

They are just general recommendations and considerations have to be taken for every single product.

The solder paste is secondary but could also affect the parameters.

In this document one alloy is specified:

SnAgCu (Lead free) melting point 217°C

### 4.2 Temperature measurement

At least four probes should be used.

They should be placed on components with the highest and lowest thermal mass.

The probes shall be located in the beginning, in the middle and at the end of the board/panel.

It is recommended that the probes are soldered on the board, but glue and caption tape could also be used, if necessary.

At least one probe shall be placed in the air or on top of a component.

These values are strongly depending on the BGA replacement equipment.

Nozzle type will be chosen after the outer size of the actual component.

Make sure the nozzle does not affect any nearby placed components.

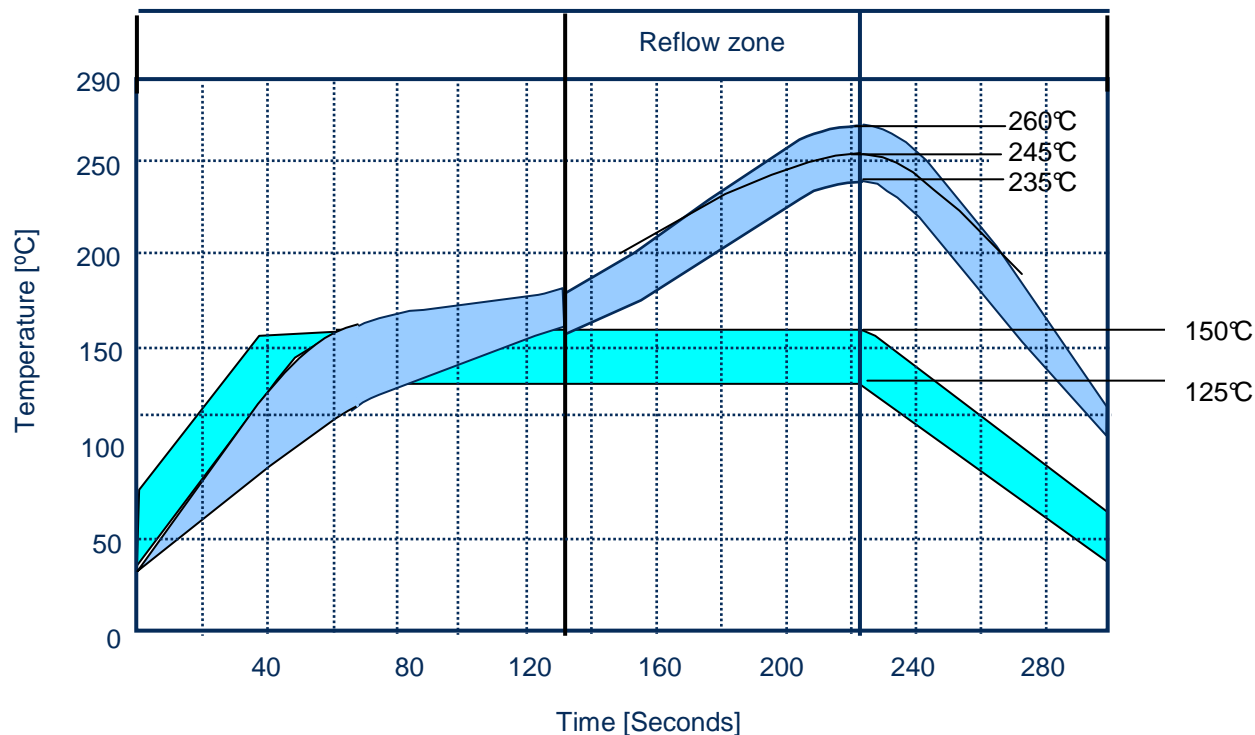
***These values are recommendations and may have to be changed depending on the type of equipment.***

***The maximum temperature for any component must not exceed 260° C.***



## 4.3 Reflow profiles

### Sn/Ag/Cu (lead-free)



Ramp rate	< 3°C/sec
Ramp rate cooling	< 4°C/sec
Pre heating time	60-150 sec
Time above liquid	40-70 sec
Minimum temperature	230°C
Maximum temperature	245°C°
Maximum component temperature	260 °C
Time between 230 and 245	30 sec
Board temperature bottom side	160°C-185°C
Total time	Approx. 3-5min

\* The higher temperature in case the board has extremely high  $\Delta T$ .





## 4.4 REWORK BGA

Process for changing the modules is highly advanced rework and it **shall** only be carried out by well trained repair technicians/operators.

Every module **shall** have dedicated heat profiles that should be tested in every BGA reworking station individually with dedicated heat profiling board (complete SMT assembled PWB) with thermocouples.

Heat profile **shall** be done according solder paste manufacturers specification and it **shall** be according components maximum temperature.

### Target group

Target group for this document are repair process engineers which have understanding of following standards: IPC-A-610 D, IPC J-STD-001 D (preferably they are certified specialists).

### Heat Profile

Heat profile in this document always refers to the heat curve which is measured on the board with thermocouples and do not refer BGA rework stations setting which can vary depending on the machine type and individual machine.

Heat profile specifications are defined in the table 2-1 This profile differs from the SEMC mass production heat profile. Reason for this is that mass production oven heating and zone separation capability is considerably better than in BGA rework stations. In mass production oven there can be 10 separate zones that can be adjusted individually and heat capacity allows introducing soak zone and more controlled peak temperature than BGA rework machine. Soak zone in mass production oven is needed in order to have minimum delta T before reaching peak zone. This is needed to have as small delta T as possible when solder is above liquidus point. Soak zone is not possible to be introduced in BGA rework station. Soak zone is not needed either because purpose is only reflow one component and delta T is not issue in this process.

### Thermocouples

Type K thermocouples are most commonly used in the electronics industry. Type K thermocouples should be used when profiling the modules.

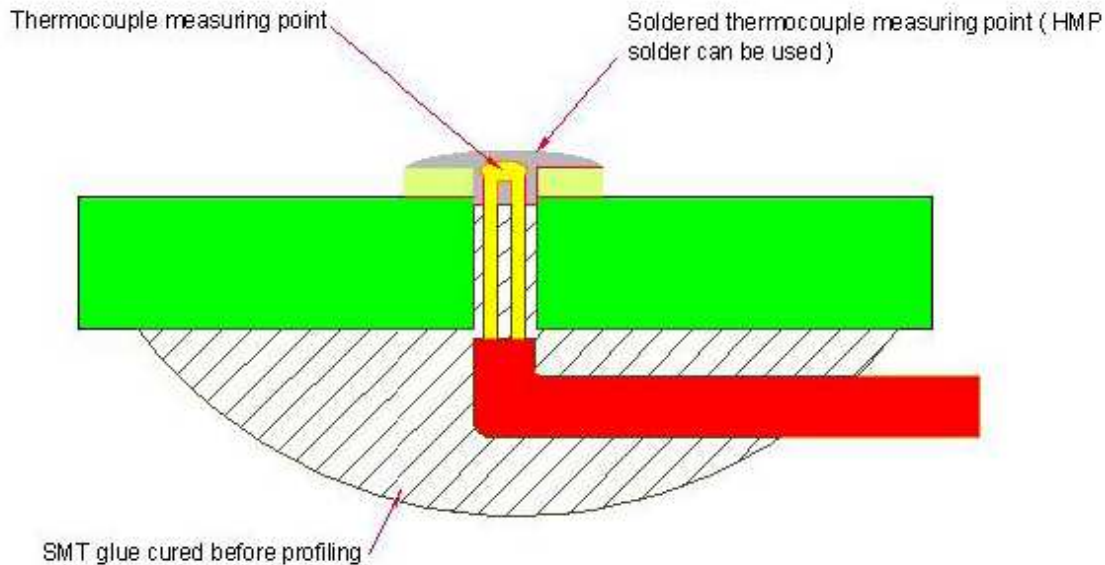
The method of attaching the thermocouple to the assembly to be profiled can be specific to the assembly and situation as well as preference of the user

Adhesives shall be used to secure the thermocouple to the assembly. This usually results in a positive physical connection of the thermocouple junction to the assembly. Drawbacks are the possibility of the adhesive failing during the heating process, removal at the conclusion of the profile. Caution should be taken to use the minimum amount of adhesive since adding thermal mass can affect the results of the profile. HMP (high melting point solder) solder that is preferred when attaching thermocouples in ordinary SMT components can be used to solder thermocouple tip to the pad but it dissolves to the lead free bump and do not have high melting point features when profiling is executed.



### Thermocouple attachment.

Primary thermocouple should be attached from back side of the board on the drilled hole (precision drill, drill bit 0,4mm) as **figure 2-2** illustrates. If pad on the board is small the hole should be drilled of center of the pad so it is possible to solder thermocouple tip on the pad. Thermocouples has are usually hard to solder due the poor wetting characteristics and additional flux and underside heating should be used during this operation.



**Figure 2-2**

### Process flow for module replacement

Heat module by using BGA rework machine and applicable heating profile and applicable nozzle for the module.

When profile reaches end of the peak zone (just before cooling) remove module by using dental hook.

Remove solder PWB pads by using soldering iron, gel flux, soldering wick. Underside heating unit is required when performing cleaning. This minimizes the possibility to lift pads of from the PWB.

Clean PWB after solder removal by using isopropyl alcohol

Apply gel flux to the PWB module area

Place the module to the board by using BGA rework station.

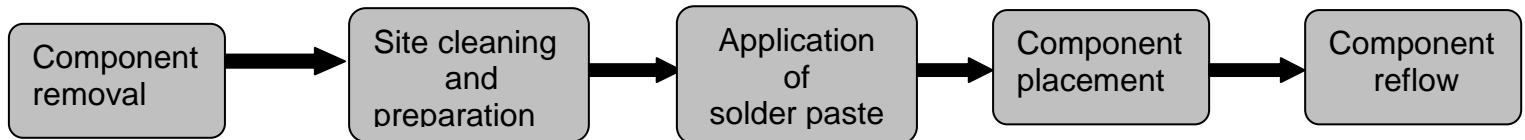
Reflow the module with BGA rework station by using applicable heat profile and nozzle.



### Inspection instructions for replacement of the module

Inspection of the replaced module should be carried out according to IPC-610D BGA inspection guidelines. X-ray can be used as an indicator. For more detailed investigations in problem situations dye and prairie method and micro sectioning can be carried out.

## 4.5 Process Flow BGA



## 5 Shield fence instruction

This instruction shows how to cut and bend the shield can fence to be able to replace components under the fence. Use a sharp-edged pliers to cut the fence.



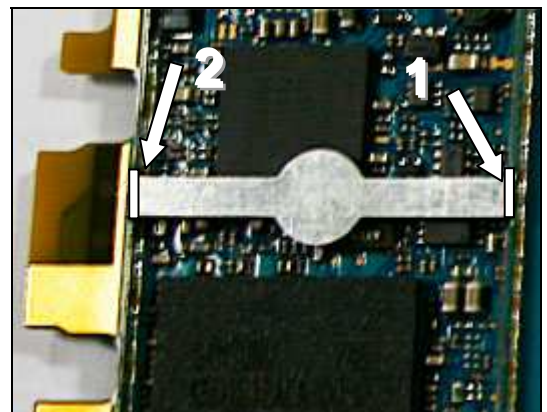
**MAKE SURE THAT CUTTING PLIERS IS SHARP-EDGED TO PREVENT DAMAGING THE SHIELD CAN FENCE.**

Remove the shield can lid, use a dentist hook.

Remove the pick up area according to the white lines with a cutting plier. (1)

This pick up area is only used when machine mounting and there is no need to put it back again.

Cut the shield can fence according to the white lines with a cutting plier. (2)





## 6 Replacement of components

### EQUIPMENT

- Dentist hook
- ESD-gloves (cotton gloves)
- ESD-wristband
- Soldering tool
- Hot air soldering station
- BGA replacement equipment
- Pair of tweezers
- Solder cleaning wiper (tin wick)
- Solder paste lead-free (SN 96% Ag 3.5% Cu 0.5%)  
Use the soldering tip only for lead-free solder paste!
- Flux, RMA no-clean flux
- Cutting pliers
- Shield fence pliers NTZ 112 537

### CAUTION

***Remove the Main Camera and VGA Camera before you perform any repair action by using heating tools: Soldering Iron, Hot Air Station or BGA station!***

***Keep all contact surfaces clean, no dirt or hand grease!***

***Protect the phone from ESD damages whenever it has been opened by using:***

- ***ESD-wristband***
- ***ESD-gloves***

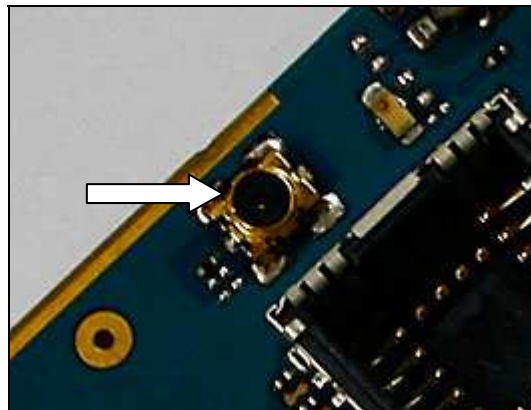
### MECHANICAL INSTRUCTIONS

For all the following part replacements, disassemble and assemble the phone as described in *Working Instruction 1213-7894*.

## 6.1 X1200: Antenna switch connector

***PROTECT THE MAIN CAMERA SOCKET WITH CAPTION TAPE***

Replace the Antenna switch connector with BGA equipment.

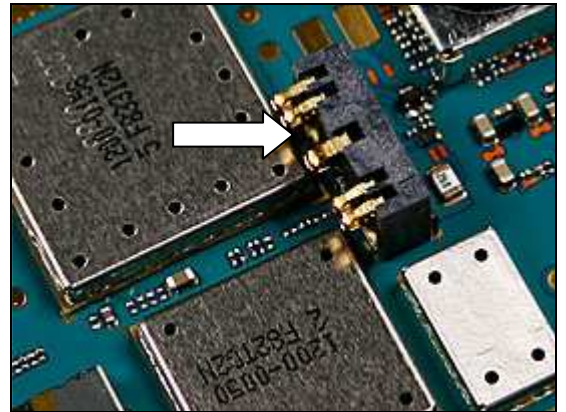




## 6.2 X2200: Battery Connector

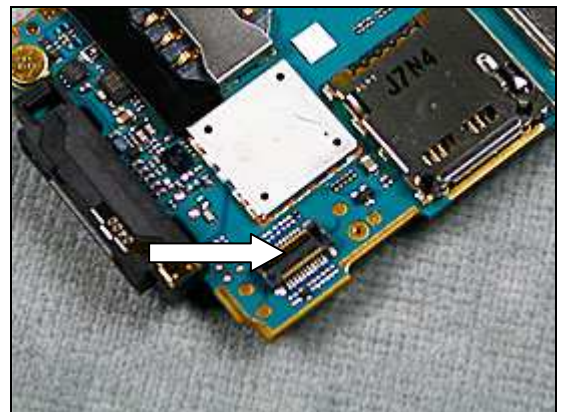
**PROTECT THE MAIN CAMERA SOCKET WITH CAPTION TAPE**

Replace the Battery connector with BGA repair equipment.



## 6.3 X2402: Keypad Connector

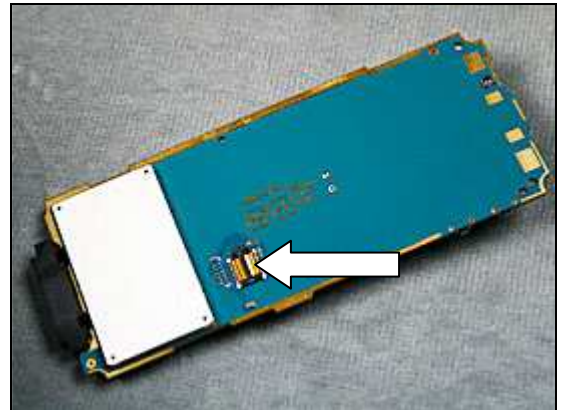
Replace the Keypad Connector with BGA equipment.





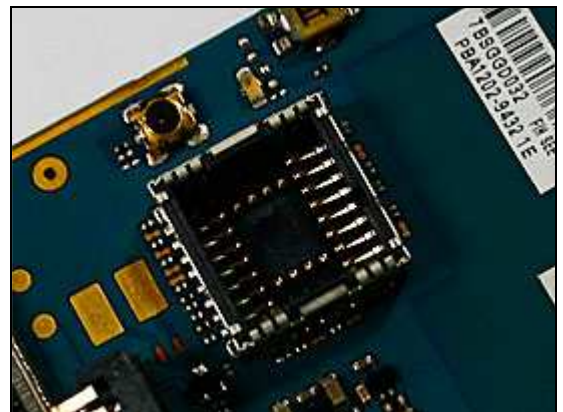
## 6.4 X4200: B to B connector, female, 22 pin

Replace the LCD Connector with BGA equipment.



## 6.5 X4310: Camera connector

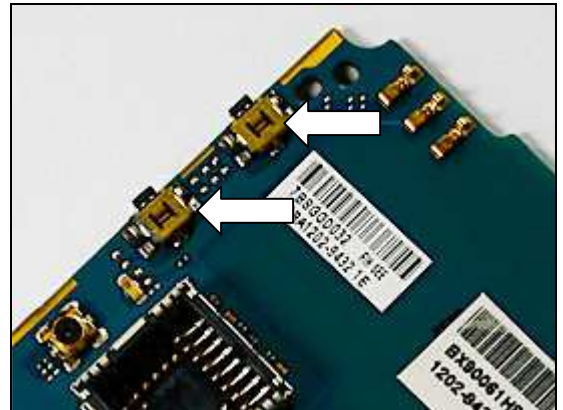
**PROTECT THE BATTERY CONNECTOR WITH CAPTION TAPE!**  
Replace the Camera Connector with BGA equipment.





## 6.6 S2402, S2403: Input Switch Side Push

Remove the Switch Connector with Hot wind equipment.  
Replace a new Switch with Soldering Iron.



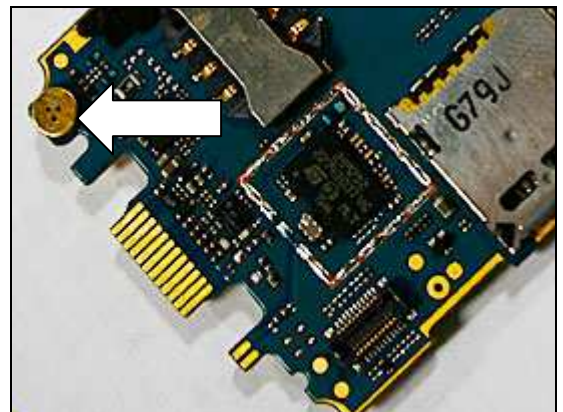
## 6.7 B3100: Microphone

**REMOVE THE BLACK SIM TAPE**

**PROTECT THE SIM HOLDER WITH CAPTION TAPE**

Replace the Microphone with BGA equipment.

**PUT BACK A NEW BLACK SIM TAPE**







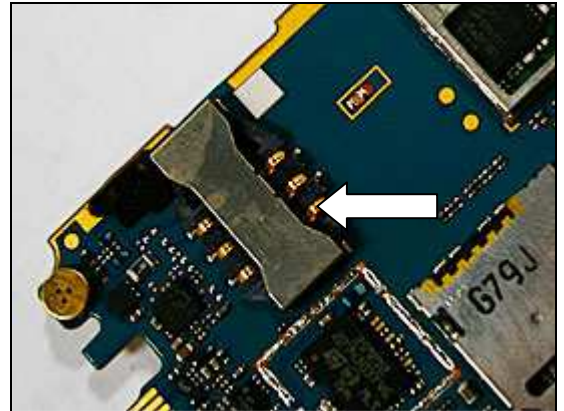
## 6.8 X2403: SIM Card Conn Micro SD Hight, 2.2 mm

**REMOVE THE BLACK SIM TAPE AND WATER INDICATOR**

**PROTECT THE MICROPHONE WITH CAPTION TAPE**

Replace the SIM Card connector with BGA equipment.

**PUT BACK THE NEW BLACK SIM TAPE AND WATER INDICATOR**



## 6.9 X2490: MS-Micro Pico holder

Replace the MS-Micro Pico holder with BGA equipment.



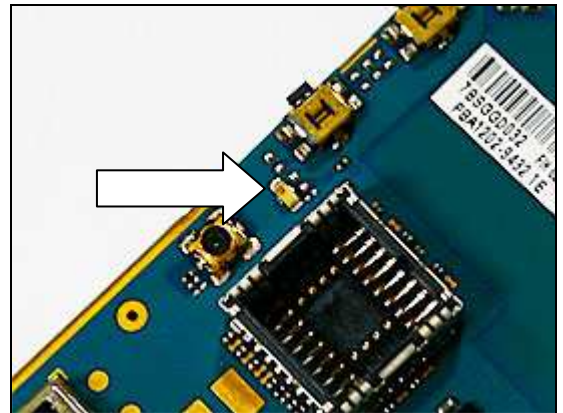


## 6.10 V2201: LED Diode

### ***PROTECT THE MAIN CAMERA SOCKET WITH CAPTION TAPE***

Remove the LED Diode with Hot wind equipment.

Replace a new LED Diode with Soldering Iron.



## 6.11 C3113, C3120, C3145, C3146: Capacitor Ceramic

### ***REMOVE THE BLACK SIM TAPE***

Remove the Capacitor with Hot wind equipment.

Replace a new Switch with Soldering Iron.

### ***PUT BACK A NEW BLACK SIM TAPE***

Remove the shield can lid.

Use a dentist hook.

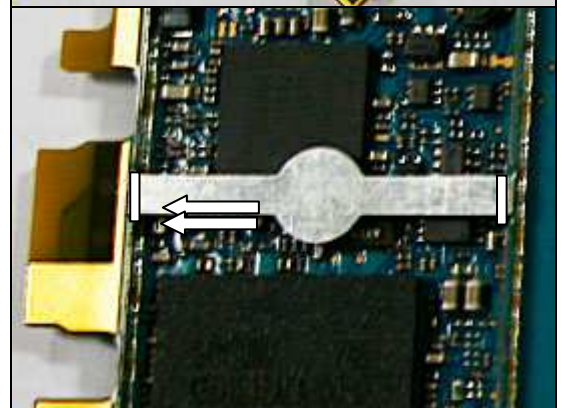
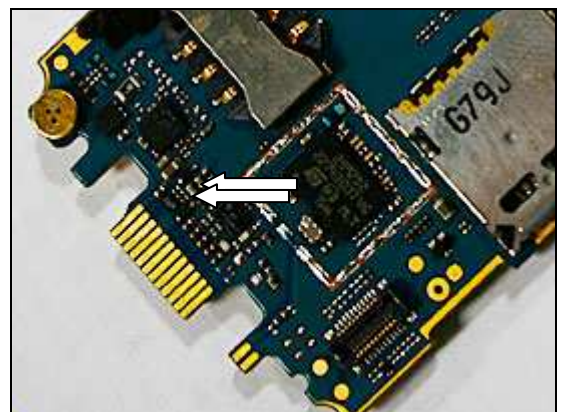
Cut the fence according to the white lines.

Remove the Capacitor with Hot wind equipment.

Replace a new Switch with Soldering Iron.

Put back a **new** shield can lid.

Press on all sides of the lid until you hear a “click” sound.



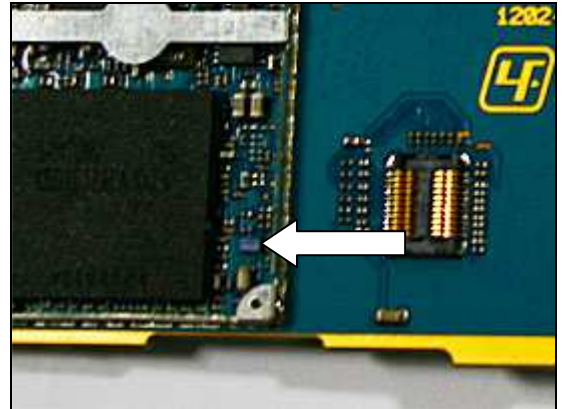


## 6.12 D2105: IC Single bus buffer gate

Remove the shield can lid.  
Use a dentist hook.

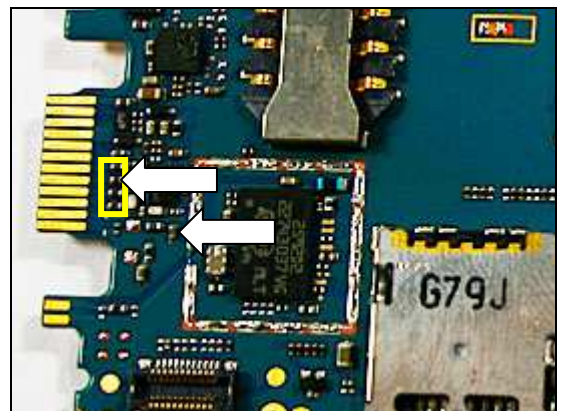
Replace the IC Single bus buffer gate with BGA equipment.

Put back a **new** shield can lid.  
Press on all sides of the lid until you hear a “click” sound.



## 6.13 L2400, L2401, L2402, L2403, L2404: Filter 0.0 Hz 0402

Remove the Filters with Hot wind equipment.  
Replace the new Filters with Soldering Iron.

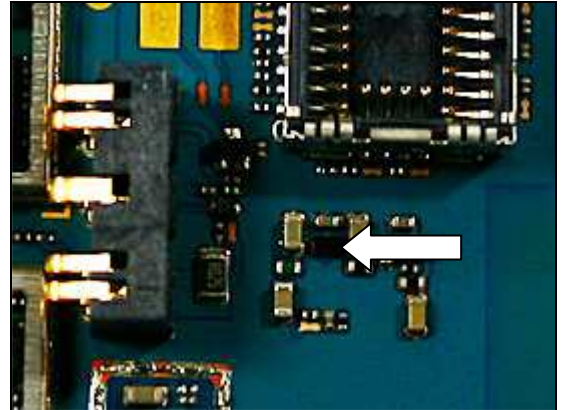




## 6.14 N2203: IC Vreg

**PROTECT THE MAIN CAMERA SOCKET AND BATTERY CONNECTOR WITH CAPTION TAPE**

Replace the IC Vreg with BGA equipment.

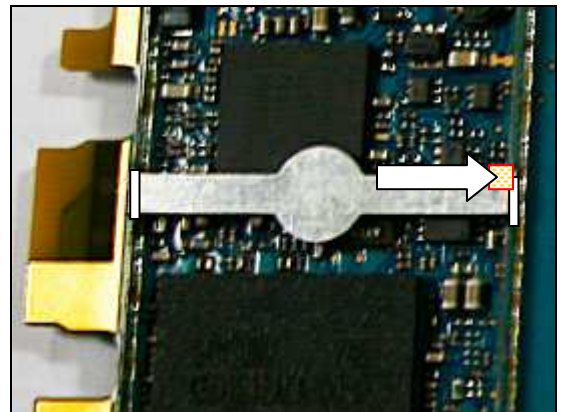


## 6.15 N2400: 1-Bit Level Translator

Remove the shield can lid. Use a dentist hook.  
Cut the fence according to the white lines.

Replace the Translator with BGA equipment.

Put back a **new** shield can lid.  
Press on all sides of the lid until you hear a “click” sound.





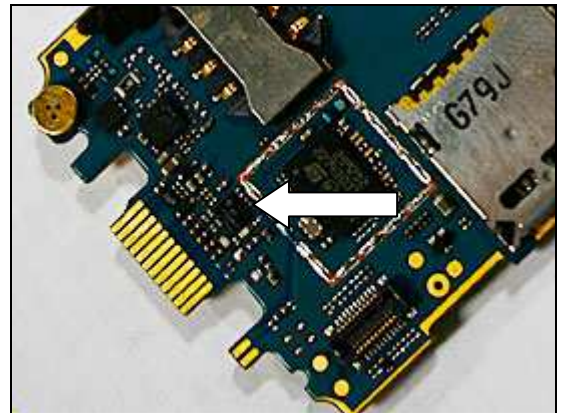


## 6.16 N3101: ASIC Tjatte3 CSP20

### **REMOVE THE BLACK SIM TAPE**

Replace the ASIC Tjatte3 with BGA equipment.

### **PUT BACK A NEW BLACK SIM TAPE**



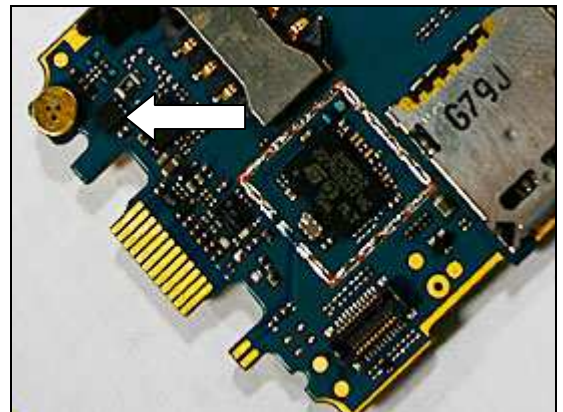
## 6.17 V2202: Trans P-ch FET

### **REMOVE THE BLACK SIM TAPE**

**PROTECT THE SIM HOLDER AND MICROPHONE WITH CAPTION TAPE**

Remove the Translator with Hot wind equipment.  
Replace a new Switch with Soldering Iron.

### **PUT BACK A NEW BLACK SIM TAPE**



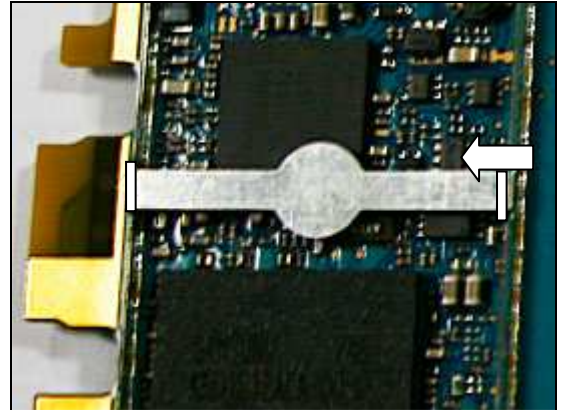


## 6.18 V2405: Trans MOSFET Complementary N P 20 V (D S)

Remove the shield can lid. Use a dentist hook.  
Cut the fence according to the white lines.

Remove the Translator with Hot wind equipment.  
Replace a new Switch with Soldering Iron.

Put back a **new** shield can lid.  
Press on all sides of the lid until you hear a “click” sound.



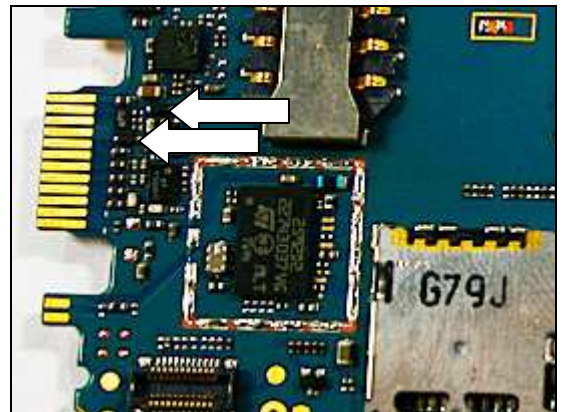
## 6.19 V2420, V2421: Zener Diode voltage regulator 15V 5%

**REMOVE THE BLACK SIM TAPE**

**PROTECT THE SIM HOLDER WITH CAPTION TAPE**

Remove the Zener Diode with Hot wind equipment.  
Replace a new Switch with Soldering Iron.

**PUT BACK A NEW BLACK SIM TAPE**







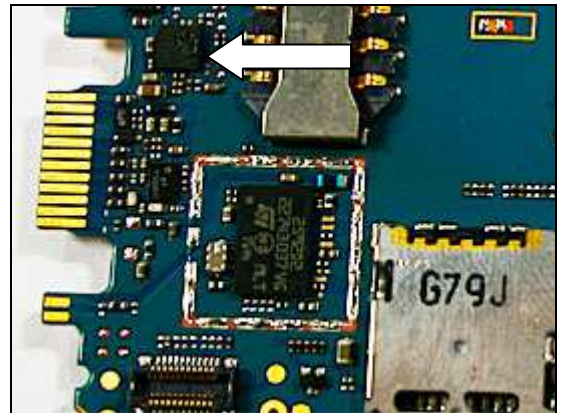
## 6.20 D2404: MICROCIRCUIT/USB transceiver and UART MU

**REMOVE THE BLACK SIM TAPE**

**PROTECT THE SIM HOLDER WITH CAPTION TAPE**

Replace the MICROCIRCUIT/USB transceiver and UART MU with BGA equipment.

**PUT BACK A NEW BLACK SIM TAPE**



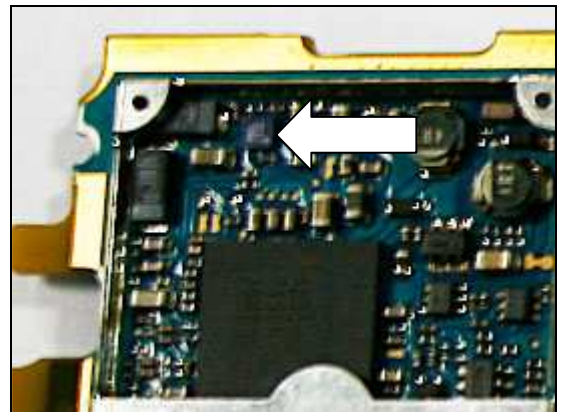
## 6.21 N3100: MIKROKRETS/Class AB Audio Amplifier

Remove the shield can lid. Use a dentist hook.

Replace the MIKROKRETS/Class AB Audio Amplifier with BGA equipment.

Put back a **new** shield can lid.

Press on all sides of the lid until you hear a "click" sound.





## 6.22 N1400: Module Bluetooth + FM STLC2592

**REMOVE THE BLACK SIM TAPE**

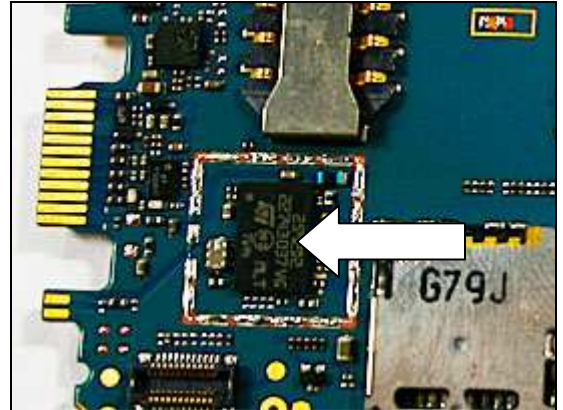
**PROTECT THE SIM HOLDER WITH CAPTION TAPE**

Remove the Shield can with BGA equipment.

Replace the Module Bluetooth + FM STLC2592 with BGA equipment.

Put back a **new** shield can with BGA equipment.

**PUT BACK A NEW BLACK SIM TAPE**



## 6.23 B2100: Crystal 32,768 kHz

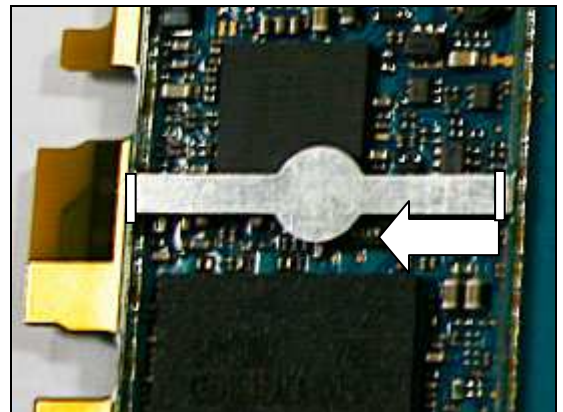
Remove the shield can lid. Use a dentist hook.

Cut the fence according to the white lines.

Replace the Crystal 32,768 kHz with BGA equipment.

Put back a **new** shield can lid.

Press on all sides of the lid until you hear a "click" sound.

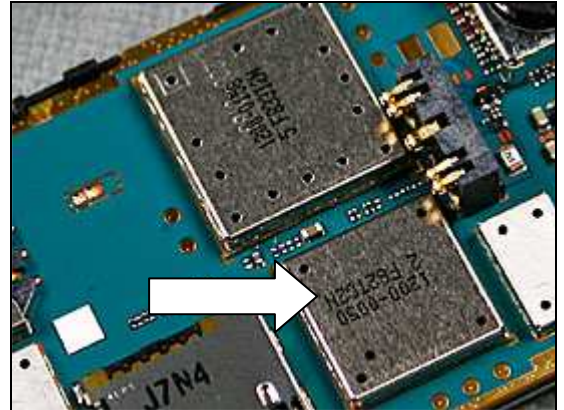




## 6.24 N1210: RF-Module Squid Pre -bumped

***PROTECT THE BATTERY CONNECTOR WITH CAPTION TAPE!***

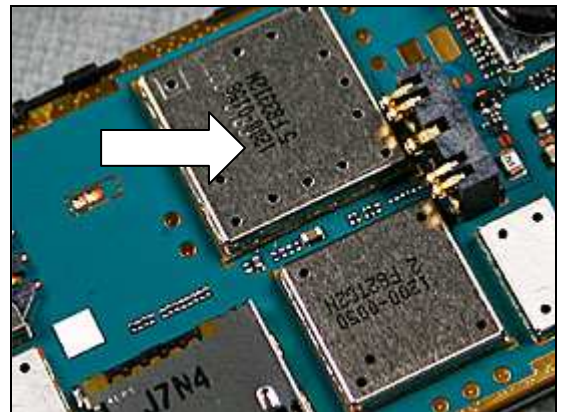
Replace the RF-Module Squid Pre -bumped with BGA equipment.



## 6.25 N1200: RF-Module Thor Pre-bumped

***PROTECT THE BATTERY CONNECTOR WITH CAPTION TAPE!***

Replace the RF-Module Thor Pre-bumped with BGA equipment.



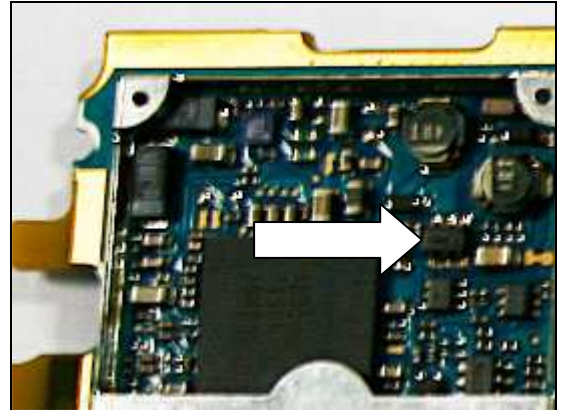


## 6.26 V4200: Transistor, Mosfet, N-Channel

Remove the shield can lid. Use a dentist hook.

Remove the Transistor with Hot wind equipment.  
Replace a new Transistor with Soldering Iron.

Put back a **new** shield can lid.  
Press on all sides of the lid until you hear a “click” sound.

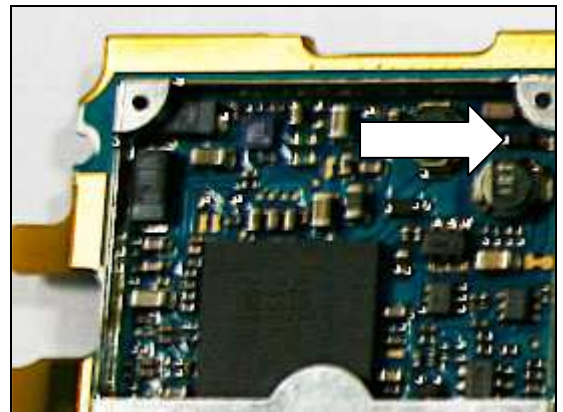


## 6.27 V4201: Schottky Diode

Remove the shield can lid. Use a dentist hook.

Remove the Schottky Diode with Hot wind equipment.  
Replace a new Schottky Diode with Soldering Iron.

Put back a **new** shield can lid.  
Press on all sides of the lid until you hear a “click” sound.





## 7 Revision history

Rev.	Date	Changes / Comments
1	2008-05-26	1 <sup>st</sup> version
2	2009-03-16	Add V4200 and V4201