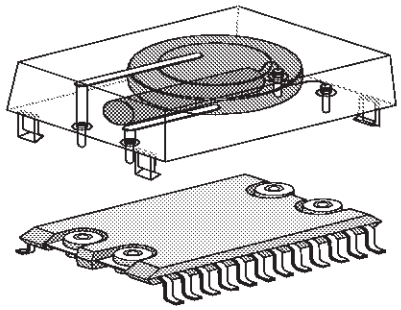
AN928
APPLICATION NOTE

SNAPHAT Assembly and Process Control

The SNAPHAT assembly process is fully automated so as to produce a highly reliable product consistently in volume. This automated equipment takes advantage of microcomputer controlled robotics to obtain the reproducible accuracy required to pick, place, weld and encapsulate both battery and crystal in the SNAPHAT package. To insure that the highest quality is maintained, proven quality control techniques are used at each step. This includes monitoring critical weld parameters in real time along with X bar R charts that can stop the line if any one parameter is out of a predetermined reject limit. In addition, all incoming piece part lots are inspected for compliance to an incoming specification. Thus, the combination of automation and quality process control procedures allows STMicroelectronics to offer the industry's 1st surface mountable non-volatile SRAM solution (Figure 1).

Figure 1. SOIC and SNAPHAT Package



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This document describes the assembly process, along with the quality control monitors, used to manufacture the SNAPHAT.

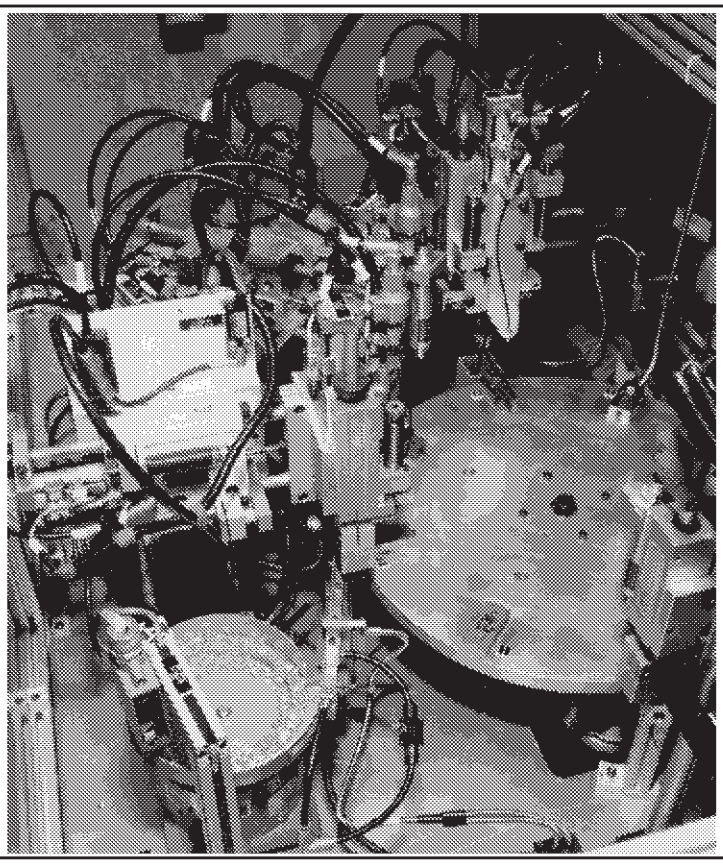
STEP I: PIN INSERTION

The process flow starts with the assembly of the base (Figure 2). This includes inserting gold plated pins that are used for electrical connection between the battery, crystal and the SOIC (in the case of TIMEKEEPER devices); and between the battery and the SOIC (in the case of ZEROPOWER devices).

Pin Insertion Inspection

- Visual inspection at 5X-30X magnification
- 6 units per hour are inspected (pass on 0 rejects)
- Inspection includes checks for foreign material, unseated pins, and base damage.

Figure 2. Pin Insertion



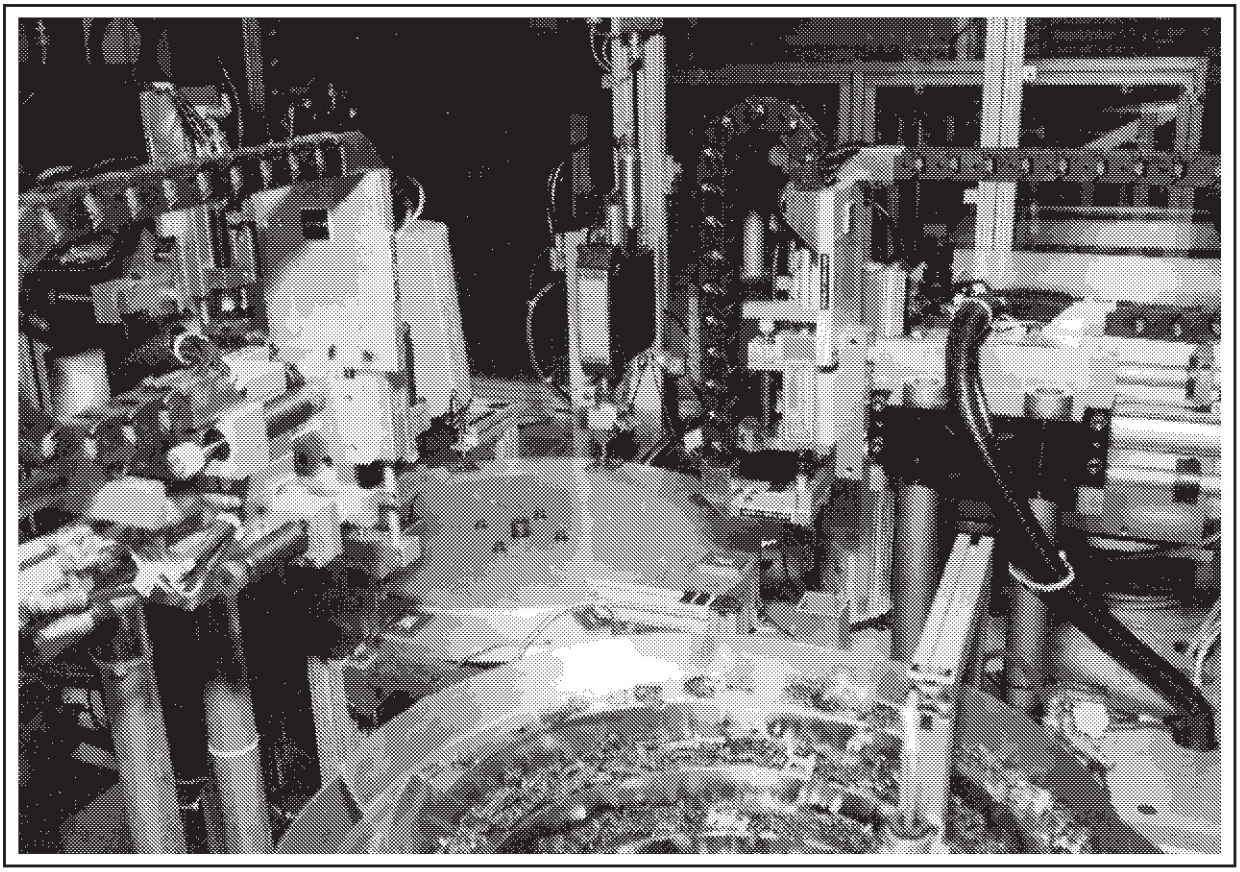
STEP 2: CRYSTAL WELD

This step is only applicable for TIMEKEEPER devices. The crystal is tested prior to assembly to insure quality. During this process step (Figure 3) the crystal is bowl fed on to a track. The leads of the crystal are then trimmed and formed to the appropriate dimension, tested for both frequency and resistance, and then placed on to the gold-plated posts. The crystal is then welded to the post.

Crystal Weld Inspection

- Visual inspection at 5X-30X magnification
- 6 units per hour are inspected (accept on 0 rejects)
- An additional 3 units per lot are used for a destructive weld pull, testing for a minimum strength of 0.5 kg (approximately 1 lb.)
- Inspection includes checks for crystal lead placement on the pin, and for missing welds.

Figure 3. Crystal Weld



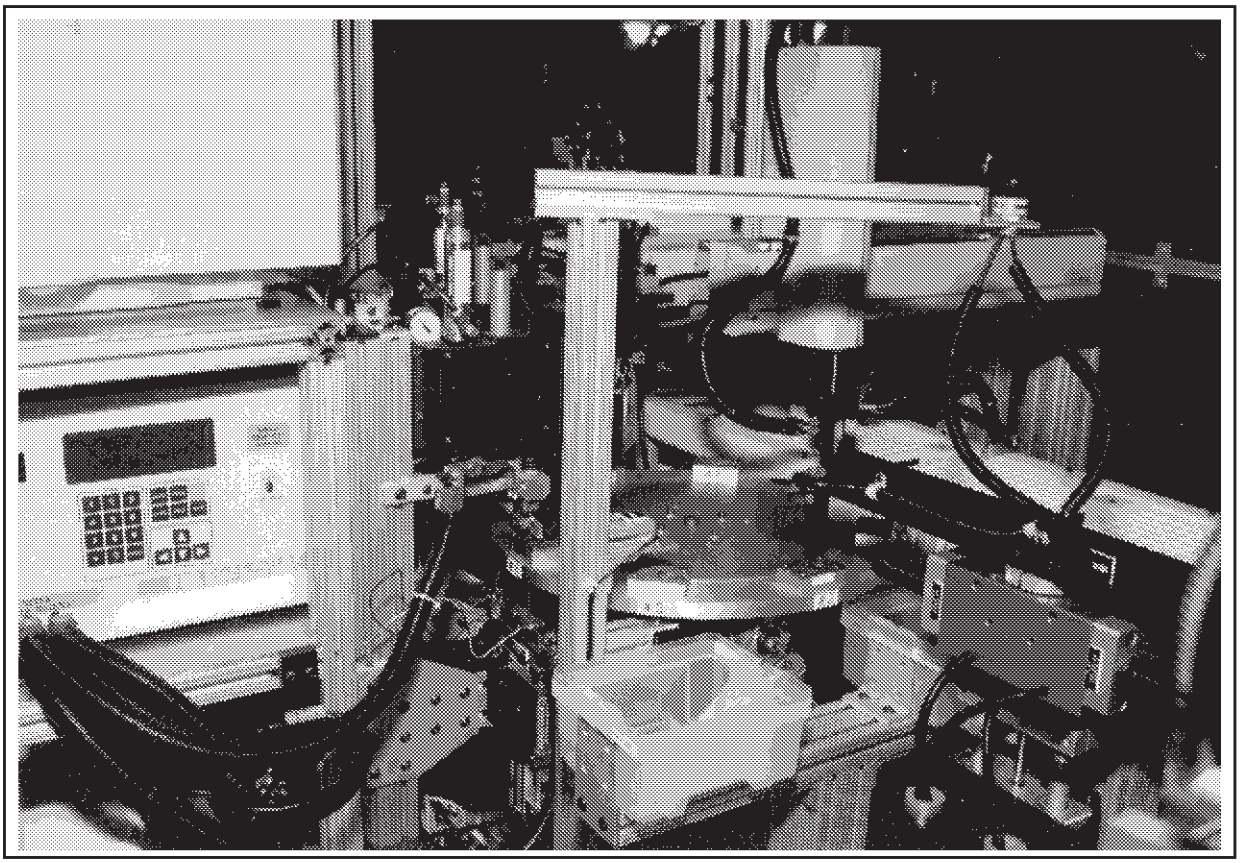
STEPS 3 & 4: BATTERY WELD AND ENCAPSULATION SYSTEMS

The battery weld and encapsulation systems are combined in order to finish the device (Figure 4 and Figure 5). During this process, the battery weld is completed first (Figure 4). The battery is tested prior to assembly to insure quality. The base is bowl fed on to a track, and positioned so that the pre-tabbed battery can be placed on the base. The battery tabs are then welded to the gold-plated posts. Once the battery is welded, the base is inserted into a housing which is pre-filled with encapsulant. The finished unit is then mechanically placed on a tray in preparation for final bake.

Battery Weld Inspection

- Visual inspection at 5X-30X magnification
- 6 units per hour are inspected (accept on 0 rejects)
- An additional 6 units per lot are used for a destructive weld pull.This includes checks on both long and short battery pins, with a minimum pull strength of 0.5 kg (approximately 1 lb.)
- Inspection includes checks for battery lead placement on the pin, and for missing welds.

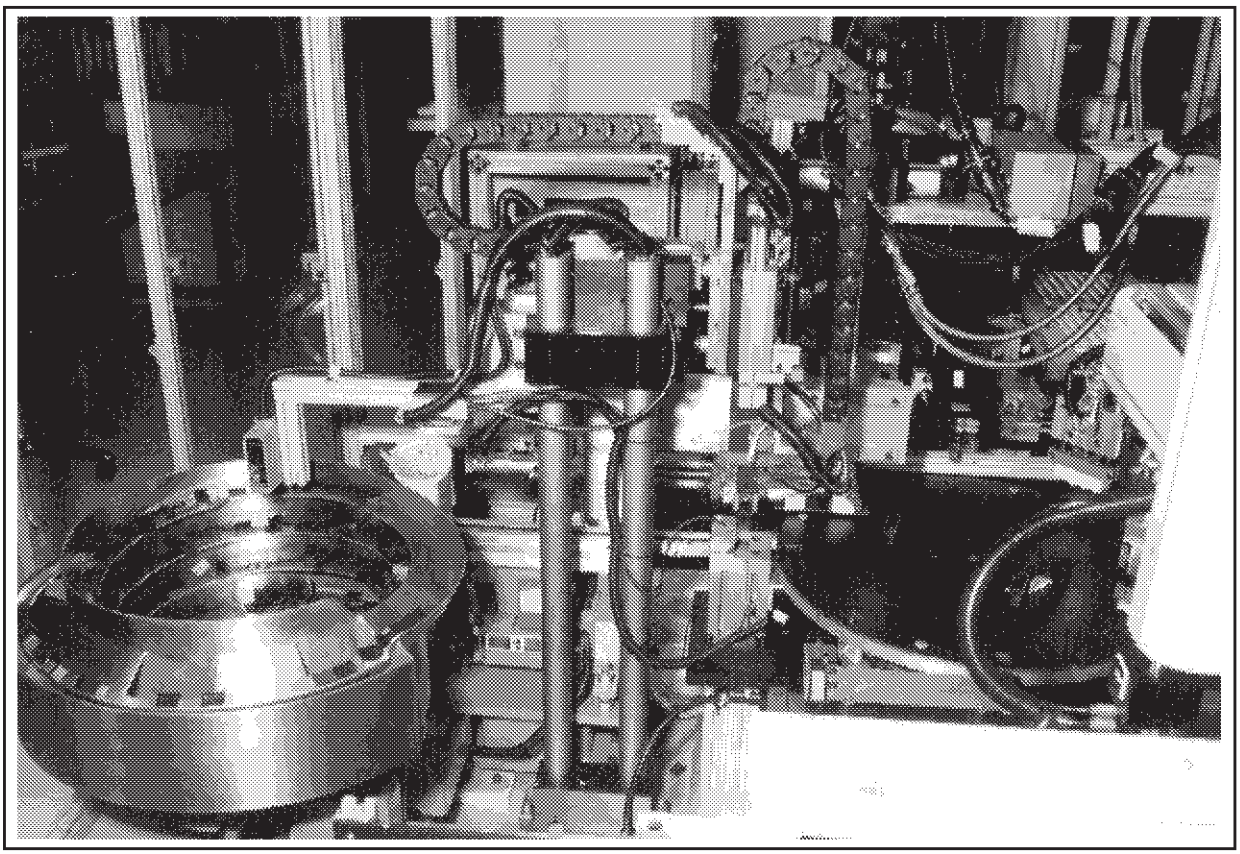
Figure 4. Battery Weld



Encapsulation Inspection

- Visual inspection at 1X magnification
- 100% inspection, rejects are scrapped
- Mix ratio performed once per shift
- Snap cure for hardness once per hour
- Final quality gate every fifth lot

Figure 5. Encapsulation



FINAL TEST

The final test flow includes brand and two electrical test steps.

Brand

Each device is branded with the appropriate device type, trace code and lithium battery warning.

Test

The final test includes a room temperature test which tests the battery for open circuit voltage and closed circuit voltage, and the crystal for both capacitance and resistance. The second test insertion is performed at hot temperature and checks the crystal for series resistance.

If you have any questions or suggestions concerning the matters raised in this document, please send them to the following electronic mail addresses:

apps.nvram@st.com (for application support)
ask.memory@st.com (for general enquiries)

Please remember to include your name, company, location, telephone number and fax number.