

BLOOD GLUCOSE METERS - MEDICAL LABS IN THE PALM OF YOUR HAND

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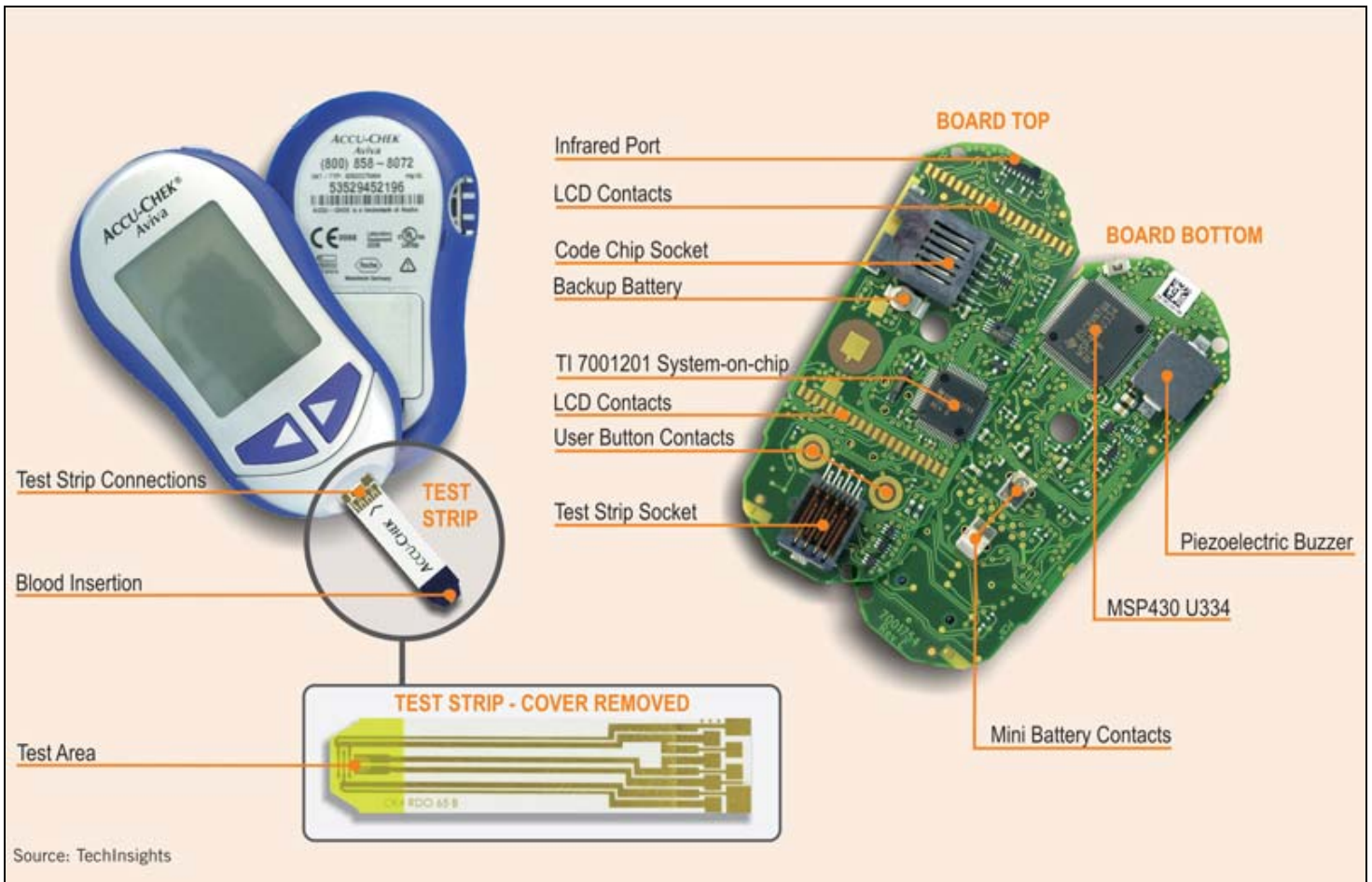
The number of people who suffer from diabetes is growing. The CDC (Centers for Disease Control and Prevention) states that 23.6 million Americans had diabetes in 2007, with more cases every year. With an overburdened and expensive healthcare system, cost-effective home diagnostics has become an attractive solution. Blood glucose meters (or BGMs) can now be found in pharmacies everywhere.

The market for the BGMs has attracted the attention of the big players in the medical electronics area, as well as some

I talk about the Roche Diagnostics Accu-Chek Aviva teardown we recently performed at UBM TechInsights.

FUNCTIONALITY

The blood glucose measurement starts with the test strip. Each batch of test strips comes with a code chip that contains information on the batch including the important expiration date. The code chip is inserted into the BGM if the strips are OK, the test can continue. A blood sample is then required from the user. Accu-Chek has a separate



smaller companies. A selection of companies involved includes Roche, Johnson and Johnson, Bayer, Abbott and Home Diagnostics. David Carey has looked at the Bayer Ascencia Breeze back in a 2007 teardown. In this article,

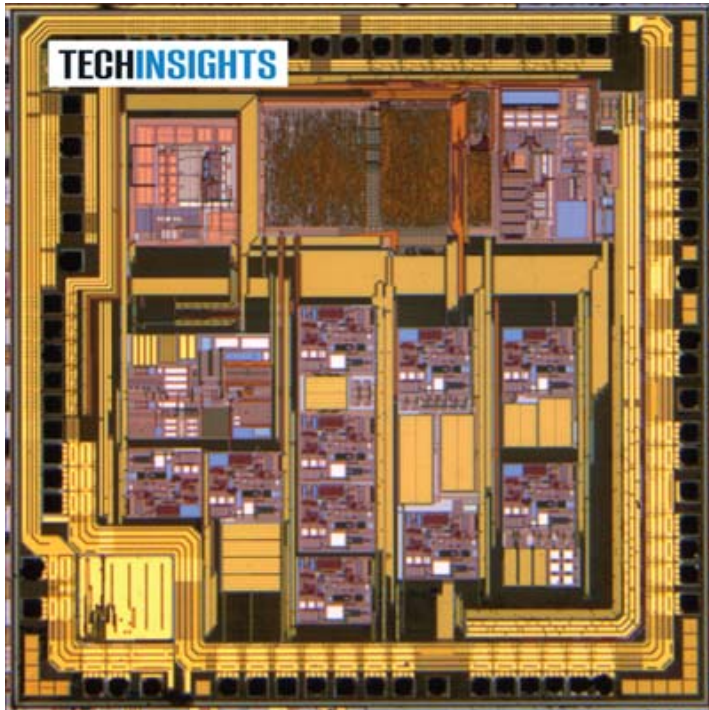
lancing device to get the right amount of blood for the test, supposedly as painlessly as possible. The blood is deposited into the specified area on a test strip, with the contact end of the test strip then entered into the meter. This particular BGM is able to perform the test with the

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results read out on the LCD screen in approximately five seconds. The speed of test result is one of the areas that these home meters have improved in the past few years. This BGM has the capability of storing 500 readings and can also show the user a 7, 14 or 30 day average when required. It contains an alarm function that can be set to four different times of the day so that the user will be reminded (with a buzzer) to perform another test. This meter can communicate with a home PC using the infrared port located at the top of the device.

TEARDOWN

Opening up the device we see a relatively basic electronics design. There is one PCB in the plastic casing, with connections to the LCD screen and the two buttons. The semiconductor content is limited in this cost-effective design with the two major ICs, both from Texas Instruments.



Die photo of the Texas Instruments 7001201

The overall control of the glucose meter comes from the Texas Instruments MSP430U334. According to the MSP430 part numbering code, this device is part of the MSP430x3xx legacy series running at the relatively slow clock speed of 8MHz. Among other features of this particular device is the LCD controller/driver with 1 kB of RAM and 32 kB of nonvolatile memory. The "U" designation is undocumented--perhaps it is a special class of MSP430 devices for medical electronics. This device controls the infrared port, the LCD display, the computations, and the storage of the results.

BLOOD GLUCOSE MEASUREMENT

The Roche Diagnostics Accu-Chek Aviva uses what is called an amperometric electrochemical reaction to read the glucose level in the blood. The current produced at a specific point in time is proportional to the glucose content in the blood. Amperometric and coulometric are the two most popular methodologies for glucose detection in modern BGMs

The Texas Instruments 7001201 is the semiconductor device that is used to control the amperometric reaction on the test strip. When testing, a voltage is produced by the 7001201 and is applied to the blood sample. This voltage, applied to the blood sample, induces a current. The 7001201 reads this current and provides the result to the MSP430U334.

As the need for home diabetes care continues to increase, and with many competitors in the space, look for blood glucose meters to add features and reduce price in the future.

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