GORDON MOORE'S $15 MILLION WATCH

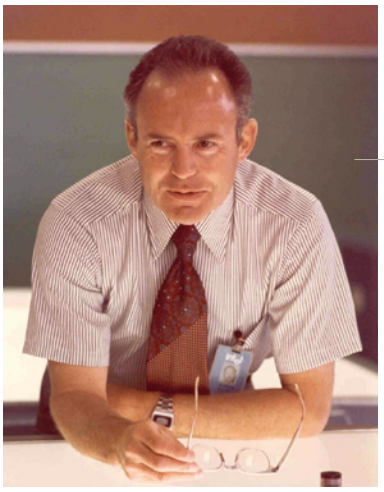
THE STORY OF INTEL AND THE FIRST SILICON VALLEY SMART WATCH

BY STEPHEN FOSKETT / GRAIL WATCH

The Swiss watch industry buzzed as Apple, Google, and others introduced smart watches a few years ago. But this wasn't the first time Silicon Valley collided with the Swiss mountains! Companies like Texas Instruments and Intersil played a key role in the development of inexpensive quartz movements during the 1970s. In 1972, an even more famous name joined the race to build such watches: Intel purchased Microma to attempt to corner the market for digital quartz watch movements. However, as Intel founder and chairman Gordon Moore was quick to admit, this adventure in the watch market proved to be the company's first great mistake.

Gordon Moore, who co-founded Intel in 1968 and led the company through the 1990s, long wore a humble digital watch on his wrist. When asked about it, he would relate the story of Intel's ill-fated foray into consumer products and his "15 million dollar watch." Intel was a pioneer of computer memory and was seeking a new market in the 1970s. Moore's team decided to purchase Microma, a young startup that was developing an integrated movement for quartz watches.

However, competition was fierce, and Intel's decision to produce a whole watch for consumers ultimately doomed the venture. Despite this setback, the concept of a "system on a chip" to deliver an integrated digital watch for consumers would ultimately prove successful for Seiko and Casio, not to mention Apple!



Intel Co-Founder Gordon Moore, who died on March 24, 2023, wore a digital watch for years. He called the Microma "my 15 million dollar watch" as a reminder of Intel's failure in the consumer watch maket. ©Intel Corporation

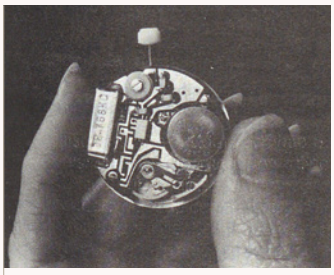
How integrated circuits enabled quartz watches

The development of the integrated circuit is one of the most important advancements of the 20th century (editor's note: for more on this, read my article on the Quartz Crisis from July 2022 or Longines Ultra-Quartz from August 2020), and no company deserves more credit for it than Intel. However, few people are aware that in the earliest days, this technology was driven by a need for low-powered electronics for watches. Quartz crystals oscillate at a predictable frequency, enabling timekeeping by counting these vibrations and advancing a hand or counter once a certain number have passed. Because they vibrate 8,000 or more times per second, even a primitive digital watch requires many components. The most significant challenge in creating a practical quartz watch was the cost and power consumption of these transistors, resistors, and capacitors. An integrated circuit (IC) combines these

components, making mass production possible, and CMOS IC technology significantly reduces power consumption.

Swiss watchmakers were not caught off guard by quartz and electronic watches. Swiss scientists and engineers played a key role in the development of the integrated circuit: The Centre Electronique Horloger (CEH) under Roger Wellinger brought IC pioneer Kurt Hübner and others to Switzerland to develop the technology, and Jean Hoerni founded low-power IC leader Intersil. CEH produced the first quartz watch and the first low-voltage CMOS chip. As a result, Swiss quartz movements were as technologically advanced as anything produced in the United States, Japan, or Germany.

But the Americans were building an entire industry around the integrated circuit, spurred by Department of Defense funding. Key among these was Jean Hoerni, who was one of the "traitorous eight" at Shockley Semiconductor with Robert Noyce and Gordon Moore and co-founded Fairchild Semiconductor with them. Sensing the opportunity in custom computer chips, Hoerni founded Cupertino, California based Intersil in 1967, a year before his former co-workers founded Intel. Intersil quickly became a leader in low-powered CMOS counters for watches and worked closely with Omega, Seiko, and others to build the first truly practical quartz watches.



Before the Intel purchase, Microma built this quartz module for conventional watch movements. ©*Europa Star* Archives

Microma Universal's Quartz Platform

The market opportunity for electronic components in the watch industry was evident, but it was a serious challenge to integrate the various components to build a functioning watch. Microma Universal was incorporated in Mountain View, California on December 30, 1970 to develop an integrated platform that would enable watch companies to adopt quartz . The "Universal" part of the name referred to Universal Perret Frères SA of Genève, the parent company of the famous watchmaker Universal Genève, who was part owner of this Swiss-American company.

As seen in the Europa Star archives, Microma's EWC-1000 was an integrated circuit that contained an oscillator, a binary frequency divider, a pulse control, and a motor power compensator on a single chip. Introduced in mid-1971, it supported frequencies from 8 KHz to 128 MHz and drew just 10 microamps from a 1.35V battery. The company quickly packaged this into a module containing most of the components required to build a watch, including a quartz crystal. The QTM-0001 replaced the balance and escapement of a conventional watch movement, converting it to analog quartz.

At the same time, Microma was working on a revolutionary integrated quartz digital watch. There were many attempts to create LCD digital watch components at this time, but Microma wanted to build the entire watch. They paired their integrated circuit with an LCD display produced by Hamlin in Wisconsin, and hoped to bring it to market in 1972.

Intel, Microma, and the LCD digital watch

Gordon Moore at Intel was impressed by the Microma concept. He saw digital watches as a growth market for Intel and saw the potential of the "system on a chip" concept. On July 14, 1972, Intel purchased Microma for $15 million. The firm was soon moved from Mountain View to nearby Cupertino, which was also home to Intersil and is now famous for Apple's headquarters. Intel decided to position Microma as a consumer watch brand, launching a line of LCD watches in October 1972. These were available first through American department store chain Troudman's Emporium, with sales at Sears Roebuck following soon after. Other outlets for Microma included Albatronix, Ness Time, and Nepro. The original Microma watch sold for $250, competitive with quality mechanical and electric watches and far less than other quartz offerings. But the initial models were finicky, especially the display, and return rates were said to be over 25%.

Europa Star published this photo of the new Microma digital LCD watch in 1973 in its Trade Bulletin. ©*Europa Star* Archives

Intel invested in the development of the Microma line, which soon included the first digital LCD watch for women. Another Microma innovation was a continuous display of seconds, though the display could only show four digits. This was achieved by pressing a button to switch the function of the display, concept that enabled calendar and chronograph functions in future models.

Microma launched the first quartz digital watch for women and the first with an alternate display function in 1974. ©*Europa Star* Archives

The first Microma watch used two button cell batteries, but as battery technology improved alongside CMOS, the next-generation Microma needed just one. However, the batteries did not last long, and this was one of many issues with the Intel watch. One unusual approach to solving this problem came from Timetron of Hong Kong, which outfitted a Microma model with no less than eight 1.5-volt batteries in parallel!

Competition was heating up. Optel signed on additional users for their LCD module, including a consortium of German brands as well as the General Time Corporation, makers of Westclox and Seth Thomas. However, Field-Effect LCDs were far more promising, and both Seiko and Citizen threw their weight behind the Cleveland-made Ilixco display. On the IC side, SSS, AMI, Sharp, and the powerful Texas Instruments were rolling out cheaper and lower powered chips all the time.

The single-chip watch

Intel Microma had a radical idea to reduce costs and power consumption and beat these chip vendors. Instead of producing individual components, Intel would create a "system on a chip" that combined all elements into a single CMOS chip. To build a complete watch, all that was needed was a quartz crystal, a display, a battery, and a few supporting power components. While this promised greater efficiency, it also required customers to standardize on a single supplier for most of the watch. This concept proved correct, and today every mobile phone and smartwatch uses a monolithic "system on a chip."

Intel's next-generation Microma would be their make-or-break push into the watch market. Boasting a two-line display, the new Microma continuously showed the date and could transform into a chronograph at the press of a button. However, Seiko, Citizen, and many other companies were already selling watches with similar capabilities at a comparable price. Despite a high-profile and expensive television ad, Intel failed to reach the buying public.

Another issue for Intel was the success of their competitors in the digital watch market. Texas Instruments developed a low-power control chip that enabled mass-produced digital watches to be sold for just $20, a price point the New York Times called a "bombshell" in 1976. But by 1977 these watches could be sold for half that amount! Most competing companies simply dropped out of the market, and popular watch brands like Benrus and Gruen abandoned the LCD digital watch market. By 1977 the mass market in America was dominated by Timex, with their $30 integrated watch, and no-name competitors using TI chips.

Intel was rapidly losing faith in Microma. Although he was fond of the watch division, Gordon Moore could see that Intel wasn't cut out to be a consumer products company. Microma boss Dick Boucher had the same recognition that many companies realized in recent years: "The watch business is not a technology business." Marketing a consumer product like jewelry is completely different from the chip business and requires different skills and staffing. Ultimately Intel was unable to sell consumer products, and Boucher's boss Andy Grove decided to end the venture.

Microma was purchased by ASUAG in 1977 and re-launched as Microma Swiss with a hybrid analog and digital display. ©Europa Star Archives

Making Microma Swiss Again

Five years after purchasing Microma Intel decided to exit the consumer products space permanently. In September of 1977 Intel sold the Microma division to Endura SA, part of the General Watch Co. within ASUAG, the Swiss "superholding" company. Rather than integrating Microma's technology with the quartz and digital watch expertise inside Ebauches SA, the decision was taken to re-brand the company as Microma Swiss and sell watches alongside Longines, Oris, Mido, and Eterna.
Microma Swiss continued in the market for a decade, introducing a range of good but not exceptional products. The company used quartz movement technology developed by Ebauches SA and ASUAG, including the so-called "hybrid" display, which combined conventional hands with an inset LCD readout for additional complications. Microma de-emphasized the LCD digital watch market, as this was dominated by far cheaper offerings from Seiko, Citizen, Casio, Timex, and others.
It appears that Microma Swiss was positioned to compete specifically with Seiko, given the design and technology of their watches around 1980. Like Seiko the company offered a wide variety of quartz watches with various styles and designs, including paired men's and ladies models. One last attempt at differentiation was the "Golden Quartz" LCD that displayed simulated analog hands on a gold background. The Microma brand was ultimately retired later in the 1980s as ASUAG and SSIH merged and trimmed the number of brands and models they offered.

Microma continued to offer multi-function digital quartz watches for years but this market was dominated by companies like Seiko and Casio. ©*Europa Star* Archives

The so-called Golden Quartz was developed by Ebauches SA and simulated analog hands on gold LCD background. ©Europa Star Archives

Reconsidering Microma

Microma was ultimately unsuccessful because neither Intel nor ASUAG needed it. From a technical standpoint, Microma's "system on a chip" concept and multi-function display was far ahead of its time. But Intel was not the right steward for a consumer watch line, and the Swiss "superholding" had better established brands. It took the innovative Swatch to beat quartz watches from Japan and Hong Kong in the mass market, and the Swiss were right to rely on well-known brands in the fine watch market.
Those concerned about smart and connected watches could learn some lessons from Microma. The decision to build a complete integrated watch, including custom hardware and software, yields a far better product. But success with consumers requires consistent marketing and wide distribution, something Intel was not prepared to commit to. And economies of scale in the electronics industry make it difficult to maintain a premium product in the face of far-cheaper competitors. Today's watchmakers have taken these lessons to heart, even if they weren't aware of the Microma story. ◆

Check the *Europa Star* archives for more about the early history of LCD watches. Some terms to search include Optel, a Swiss-American firm that worked with SSIH, Texas Instruments, which was used by Ebauches SA in a radical model from Longines, and the Field Effect LCD developed by Ilixco and the CEH, used by Gruen. **www.europastar.com/club**