The golden age of radio in Japan spanned the 35-year period from 1925, when broadcasts began, to 1960, when television became widespread. The wartime economy of the mid-1930s and later hampered development of technology for radios. But in homes across the nation, radio continued to serve as the family’s primary source of information and entertainment.

Crystal Radio
Comprising a tuned circuit for picking up broadcast signals and a crystal detector for extracting the audio signal from the radio waves, the crystal radio required a receiver in order to function properly.

Battery-Powered Vacuum-Tube Radio
Although the vacuum-tube radio had a speaker to amplify sound and boasted high sensitivity, its expensive battery had to be replaced periodically, making it no more than a temporary product on the scene.

AC Vacuum-Tube Radio (No. 30)
Drawing its power from a lamp line, this radio featured a separate speaker placed on top of the main unit.

Radio with Built-in Speaker (No. 21)
This radio used regenerative detection to improve sensitivity, with sound being picked up directly from different frequencies. This was the most common type of radio until the end of World War II. Sharp was the first company to make a radio with built-in speakers.

Phono Radio (No. 53)
Sharp released a combination radio and record player, designed as a luxurious piece of furniture.

Midget Radio (No. 34)
Advancements in vacuum tube performance—including four- and five-terminal designs—enabled radios to become smaller. Sharp’s midget radio was a popular addition to the company’s product lineup.

Wartime Austerity Radio (Aikoku No. 1)
Tightening wartime measures restricted the amount of metal that could be used for radio parts such as transformers. Soon only government-standardized models were being manufactured.

Note: The Sino-Japanese War broke out in 1937, miring the country in war.

Superheterodyne Radio (SR-50)
Shortly before the onset of private broadcasting in Japan, there was an industry-wide switch to superheterodyne models, which offered superior sensitivity and clearer channel selection. Compact, inexpensive models became popular.

Note: Superheterodyne models were built during the war years, but these were specialized models designed to function over long distances.

Transistor Radio (TR-115)
The transistor revolutionized the radio. Compact, portable radios were a hit around the world.
### History of Television

#### 1950s
- **1953: CV-2101**
  - Sharp's first color TV

#### 1960s
- **1960: CT-1562Q**
  - Introduced Thin Film Transistor (TFT)

#### 1970s
- **1972: CT-1818V**
  - TV with integrated detachable remote control

#### 1980s
- **1982: CT-1618V**
  - Integrated a TV and VCR into a single, detachable unit

- **1984: CT-162X**
  - Color TV with a detachable remote control

- **1985: 2C-G10**
  - Introduced a TV that could display images from multiple sources on the same screen

- **1988: CT-1818V**
  - Display of nine channels on the screen

- **1990s**
  - **1991: 3E-HC1**
    - Color TV with connected digital TV panel

- **2000s**
  - **2001: LC-32DA1**
    - Used Advanced Super-V LCD with support for 16 text programs

- **2010s**
  - **2011: LC-42FE1**
    - Proposed the idea of carrying the TV with you to wherever in the home you want to watch it

### Development at Sharp

#### 1950s
- **1953: TV-314T**
  - The first TV to be mass-produced in Japan

#### 1960s
- **1960: CT-1562Q**
  - Introduced Thin Film Transistor (TFT)

- **1966: CT-1618V**
  - Integrated a TV and VCR into a single, detachable unit

#### 1970s
- **1972: CT-1818V**
  - TV with integrated detachable remote control

- **1975: CT-1818V**
  - TV-in-TV capability

#### 1980s
- **1982: CT-1562Q**
  - Introduced Thin Film Transistor (TFT)

- **1984: CT-1618V**
  - Integrated a TV and VCR into a single, detachable unit

- **1985: 2C-G10**
  - Introduced a TV that could display images from multiple sources on the same screen

- **1990s**
  - **1991: 3E-HC1**
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#### 2000s
- **2001: LC-32DA1**
  - Used Advanced Super-V LCD with support for 16 text programs

#### 2010s
- **2011: LC-42FE1**
  - Proposed the idea of carrying the TV with you to wherever in the home you want to watch it

### 70-inch AQUOS Quattron 3D

- **2011: LC-70E1**
  - Proposed the idea of carrying the TV with you to wherever in the home you want to watch it
  - Advanced Super-V Four-primary-color display technology

### Freestyle AQUOS featuring freedom of installation

- **2011: LC-42FE1**
  - Proposed the idea of carrying the TV with you to wherever in the home you want to watch it
  - Advanced Super-V Four-primary-color display technology

### LED AQUOS

- **2009: LC-60LX1**
  - FreeStyle AQUOS
  - Allowed the user to view news in the form of text broadcasts while watching a TV program

### 70-inch AQUOS Quattron 3D

- **2011: LC-70E1**
  - Proposed the idea of carrying the TV with you to wherever in the home you want to watch it
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### Terrestrial digital high-definition LCD TV

- **2009: LC-60LX1**
  - FreeStyle AQUOS
  - Allowed the user to view news in the form of text broadcasts while watching a TV program

### All-channel TV

- **1991: LC-104TV1**
  - Used an Advanced Super-V four-primary-color technology
  - Proposed the idea of carrying the TV with you to wherever in the home you want to watch it

### Display of nine channels on the screen

- **1985: CT-1562Q**
  - Introduced Thin Film Transistor (TFT)

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- **1985: CT-1562Q**
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Faced with the need for LSIs to use in its calculators, Sharp built the Advanced Development and Planning Center including a semiconductor plant in Tanri in 1970 and began mass-producing LSIs. Sharp’s approach of developing distinctive products through the in-house manufacture of key devices began here.

Sharp began conducting research into solar cells in 1959 and initiated mass production in 1963, but it was the incorporation of solar cells into calculators that provided the key impetus to development of the component.

The solar cell industry will continue to grow in the future, with products ranging from residential solar power systems to mega-solar plants.

Sharp calculators have been recognized as an IEEE Milestone by the IEEE, an international academic society in the area of electricity and electronics. The honor recognizes innovative initiatives undertaken by Sharp from 1964 to 1973 to miniaturize calculators and reduce their power consumption. Semiconductor, LCD, and solar cell technologies established as part of these research processes have made significant contributions to the development of the electronics industry.

To differentiate its offerings from those of competitors, Sharp incorporated an LCD, which it had been researching since 1969, into a calculator, thereby creating a thinner device that used less power. LCDs went on to become key devices used in fields ranging from information/communications devices to audiovisual products, evolving into a premier electronics industry.

Sharp’s information communications products that are attracting attention today
What are optoelectronics devices? Optoelectronics devices—comprising components that combine optics and electronics—have played a major role in the development of an advanced, information-based society thanks to their ability to communicate, store, and convert large volumes of information quickly and accurately. They consist of light-emitting and light-receiving elements, and they are available in numerous variations of purpose and function. Sharp began dedicating resources to research in this field early on and established a lead in the global market thanks to technological advances in terms of products and manufacturing techniques.

Developing along with Application Products: Optoelectronic Devices

- LEDs for lighting
- Video recording
- White and Sharp’s One-of-a-Kind Technologies That Bolster Its Lead in Optoelectronics

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**Evolution of LCD Technology and Application Products**

### 1970s
- DSM LCD
- TN LCD
- STN LCDs
- Color STN LCDs
- Color TFT LCDs
- Active matrix type
- TFT displays use thin-film transistors (TFTs) to switch pixels on and off.

### 1980s
- Passive matrix type
- Passive matrix drive design
- When a voltage is applied to X and Y electrodes forming a matrix along the display’s X- and Y-axes, the potential difference created in the point (pixel) at their intersection causes the orientation of the LCD molecules there to change.

### 1990s
- Active matrix drive (TFT) design
- Transistors attached to individual pixels serve as switches, turning elements on and off.

### From passive matrix to active matrix
- As the size and resolution of displays increased, manufacturers were unable to resolve contrast and response speed inadequacies with passive matrix designs, and active matrix LCDs became the dominant technology.

### Principle of color LCDs
- In IGZO displays, the silicon in the TFT material is replaced with an oxide of indium (In), gallium (Ga), and zinc (Zn) to more readily facilitate the flow of electrons. This technology allows for higher TFTs while increasing screen brightness and lowering energy use.

### CG-Silicon
- CG-Silicon incorporates innovations in the crystalline structure of TFT silicon to more readily facilitate the flow of electrons. It can be used to create high-definition LCD panels into which peripheral functionality has been integrated.

### Full-HD panels
- Full-HD panels with a resolution of 1,920 (horizontal) x 1,080 (vertical) pixels can reproduce the high-definition signal format (1080p) used for digital broadcasts at their native resolution.

### Double-speed Advanced Super-V LCDs
- Double-speed Advanced Super-V LCDs create an intermediate frame between each frame sent in TV broadcasts to display 120 frames per second, enabling them to reproduce motion more smoothly.

### Advanced technology for large LCDs
- UV-A* technology
- Four-primary-color technology
- Ultra-high-resolution LCD technology

#### Representative application products

- **Mobile**
  - Tablets
  - Large-screen LCD TVs
  - Mobile phones
  - PDAs
- **Tablet**
  - This new display technology incorporates innovations in liquid crystal molecule alignment and pixel structure.
  - It provides excellent viewing angles in all directions, fast response, and no image persistence, even when displaying fast-motion video.
  - Moreover, they can display high-contrast images.

- **Large-screen LCD TVs**
  - With an aperture ratio that is at least 20% higher than previous technologies for vivid colors and reduced energy use.
  - Moreover, the simple design affords a high level of production efficiency.

- **Advanced Super-V LCDs**
  - This new display technology incorporates innovations in liquid crystal molecule alignment and pixel structure.
  - Advanced Super-V LCDs provide excellent viewing angles in all directions, fast response, and no image persistence, even when displaying fast-motion video.
  - Moreover, they can display high-contrast images.

### Type of information displayed

- DSM (dynamic scattering mode) displays use the fact that light is scattered when a voltage is applied to liquid crystal.
- The advantage of a simple design was offset by high operating voltages and sluggish response in cold environments.

### LCD technology today (2000 and beyond)

- **Advanced technology**
  - Requires high contrast and response.
  - A reflector inside the LCD’s crystal molecules to be aligned with a high degree of precision. It also allows high contrast of 5,000:1 (1.6 times better than previous technologies), fast response (2 times better than previous technologies), and high light utilization efficiency (with an aperture ratio that is at least 20% higher than previous technologies) for vivid colors and reduced energy use.
  - Moreover, the simple design affords a high level of production efficiency.

### Four-primary-color technology

- This technology adds yellow to the conventional three primary colors of red, green, and blue to implement four-primary-color pixels. This enhancement allows displays to vividly reproduce colors such as glittery gold and emerald-green, which are difficult to create with the conventional three primary colors.

### Ultra-high-resolution LCD technology

- Ultra-high-resolution LCDs can display extremely realistic images with smooth edges at resolutions far in excess of standard high-definition broadcasts.

### Note:

- Sharp’s four-primary-color concept was designed for use with LCDs: it differs from the conventional three-primary-color concept of light and color.