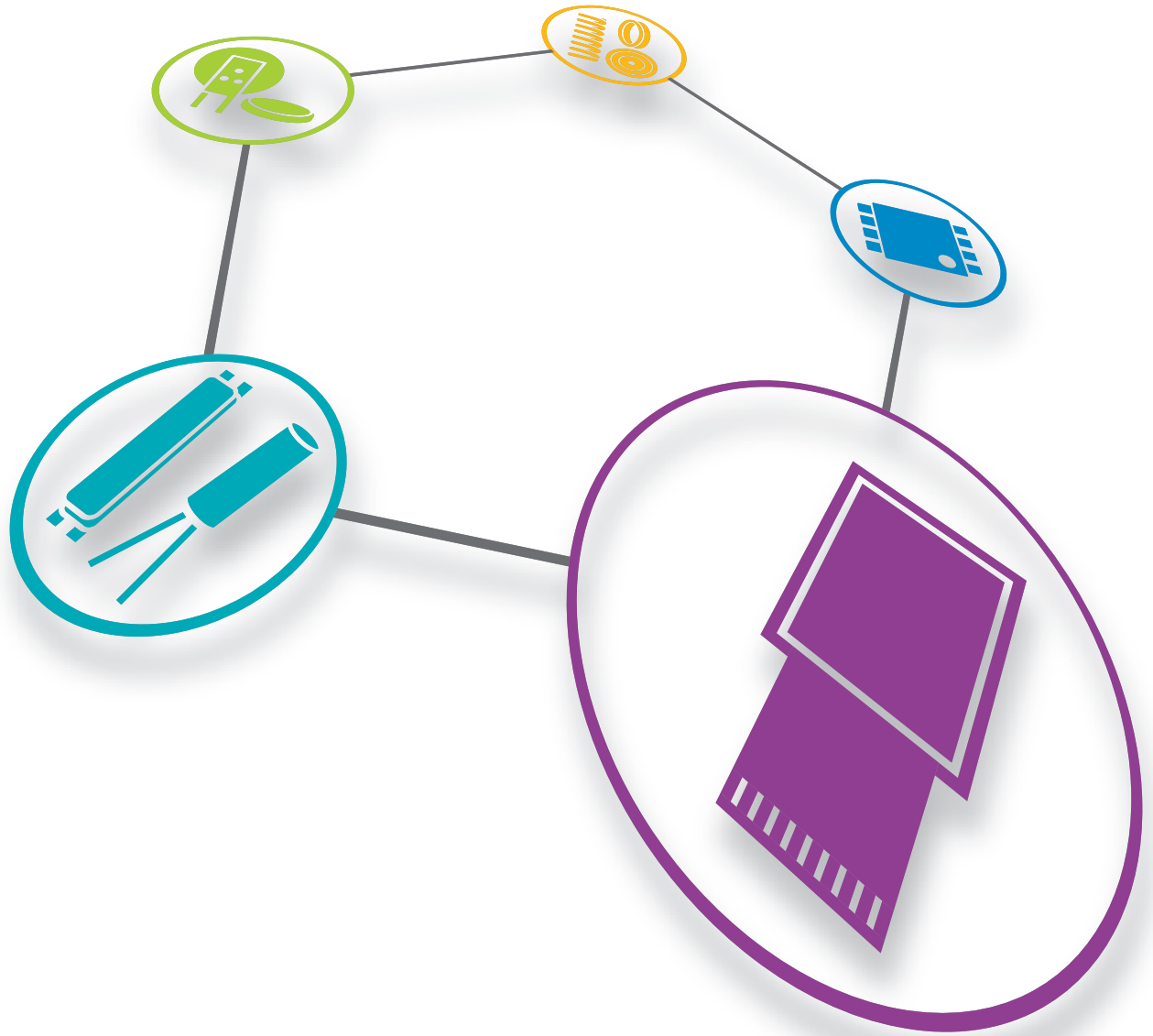


SII



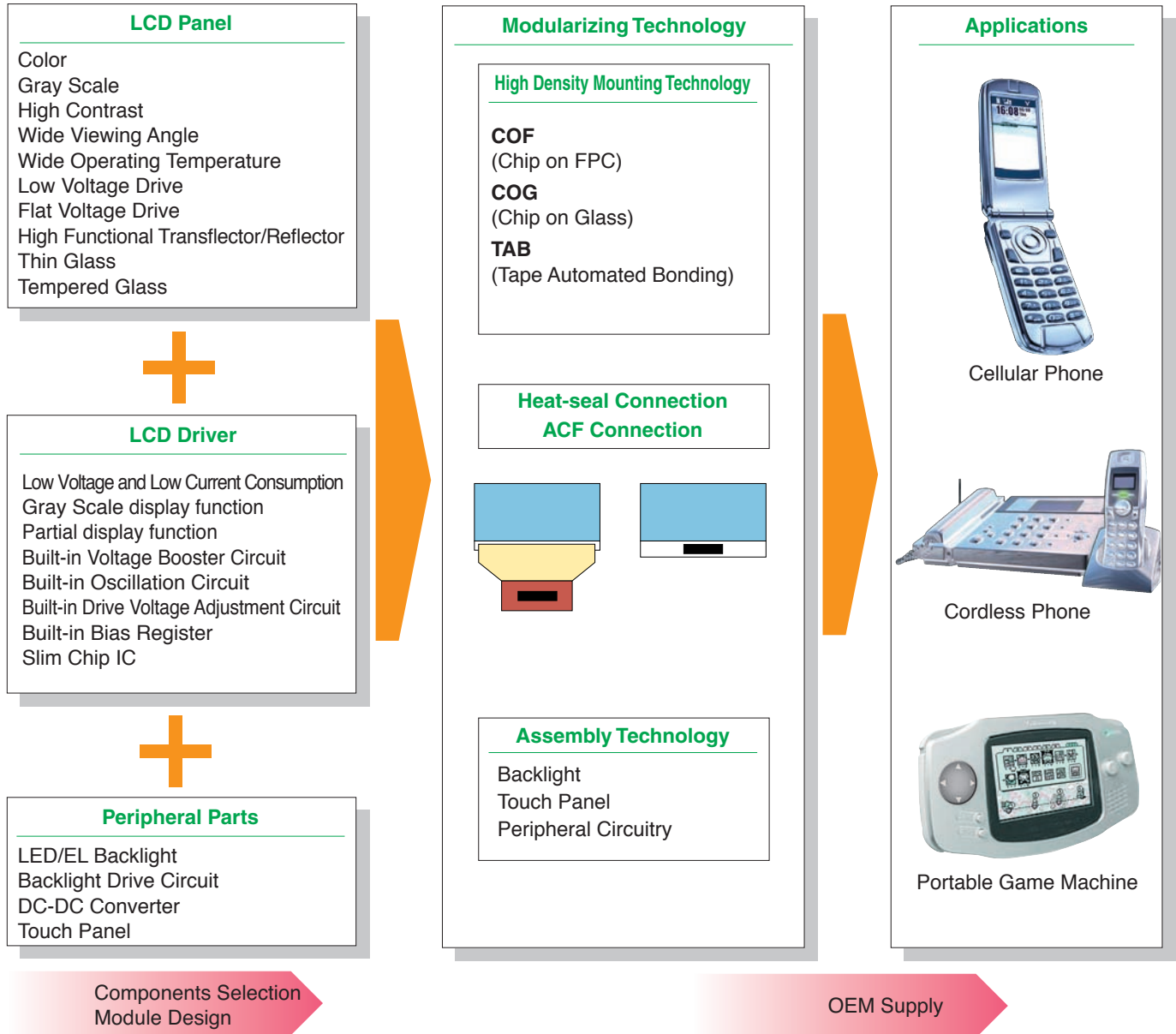
# LCD Device

Product catalogue 2008

# Module Technology

We at SII strive to provide solutions for our customers' different demands through our service system which integrates planning, development, design and production. The fact that we supply our products to a large number of companies is testimony to our superb high-density mounting technology. Especially in the field of mobile and portable devices where new developments are constantly being made for thinner, lighter and better performance products, we hope to create customized LCD modules by fully utilizing the properties of each individual component.

## SII Custom Module Overview



## ■ Features

- Smaller, thinner, lighter products made possible through high density mounting technology.
- Total support including backlighting, connectors, and frames.



# LCD Panel

We supply LCD panels with the optimum specifications for displays for every type of electronics device. The latest elements, technologies and methods allow us to provide solutions to our customers' demands.

## 1. STN\* LCD

This LCD is the best suited for portable displays, whether they are used indoors or out. We offer energy conserving type low voltage LCDs and flat voltage LCDs that need no temperature compensation in wide temperature range specifications.

We at SII make suggestions as to the best LCD for our customer based on criteria such as the LCD driver, LCD driving voltage, contrast and response time.

\*STN: Super-Twisted Nematic

### ① Temperature range : Wide range as is shown below.

( ) : Partinal compatibility

Duty	Operating temperature range	Storage temperature range
≤ 1/128	-20°C – +70°C	-30°C – +80°C
1/160 ≤	-10°C – +60°C(-20°C – +70°C)	-30°C – +70°C(-30°C – +80°C)

Usage is also possible for items not noted above. Please contact a SII representative if you have any questions.

### ② Availability : Widely available for each feature.

○ : Available △ : Partial compatibility

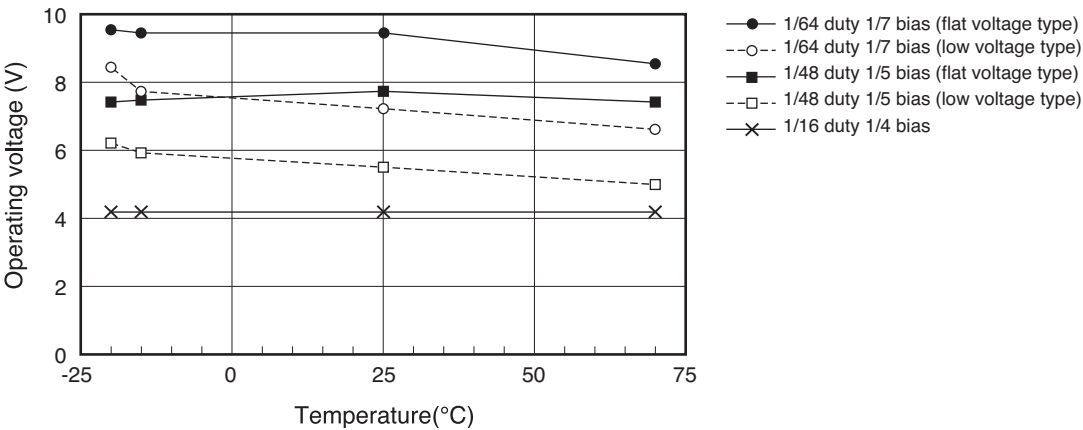
Duty	Flat voltage	Low voltage	High contrast	Hith speed response	Gray Scale
≤ 1/48	○	○	○	○	△
1/48 – 1/80	○	○	○	○	○
1/80 ≤	△	△	○	○	○

### ③ Operating voltage : Various LC for each duty available.

[25°C]

Duty	1/16	1/48	1/64	1/80	1/128	1/160
Operating voltage	3.0V ≤	5.5V ≤	7.2V ≤	11.0V ≤	13.0V ≤	14.5V ≤

Please contact a SII representative for drive condition and other feature.



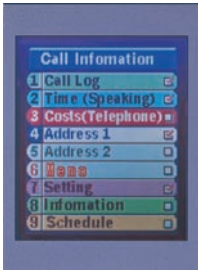
## 2. Color LCD Display's High Brightness Filter Type Color LCD's

Using a patented color filtering process SII's new color LCD displays provide rich bright dynamic multiple colors with ultra low power consumption. This filtering technology allows SII to optimize the optical design, which gives SII's color displays the widest viewing angle in the industry in spite of using transfective, transmissive or reflective LCD panel.

Needless to say in bright place, using state of the art backlighting technology SII's color displays are easily readable in poor lighting conditions while minimizing power consumption.

In the case of using transfective LCD panel backlighting does not require constant light, and use of a dedicated LCD driver and a low-voltage LCD panel, it is effective in saving electric power. The wide temperature range of this LCD panel makes it perfect as portable use color display.

### (1) Transmissive / Transfective STN Color



- 128 × (RGB) × 128 dots
- 128 × (RGB) × 160 dots
- 65,536 colors applicable
- LCD Driver with internal RAM, built in DC-DC converter
- COF/COG mounting technology

### (2) Transmissive / Transfective TFT Color



- 128 × (RGB) × 160 dots
- 176 × (RGB) × 220 dots
- 240 × (RGB) × 320 dots
- 65,536 colors, 262,144 colors applicable
- Built in LCD Driver and DC-DC converter
- COF / COG mounting technology

\* A composite picture

## 3. Glass

The glass used in LCD panels comes in various thickness. Please choose the appropriate thickness for the panel size and your needs.

O : Available

Unit: mm

Thickness	1.1	0.7	0.5	0.4	0.3
STN/FSTN	○	○	○	○	○

## 4. Tempered glass

Advances in making LCD panels thinner and lighter have made it possible to also make glass thinner. Simply making use of thin glass leads to a drop in the strength of LCD panels resulting glass breakage. In order to eliminate this problem, it is possible to counter this drop in strength by making use of tempered glass.

For example, the strength of ordinary glass at a thickness of 0.7 can be obtained by using tempered glass at a thickness of 0.55.

O: Available

Unit : mm

Thickness	0.7	0.5	0.4
STN/FSTN	○	○	○

# **Backlight**

Liquid crystal displays make use of external light for display and thus the display screen cannot be seen in dark places. For this reason, backlighting is used in dark places in order to make it possible to see the display screen.

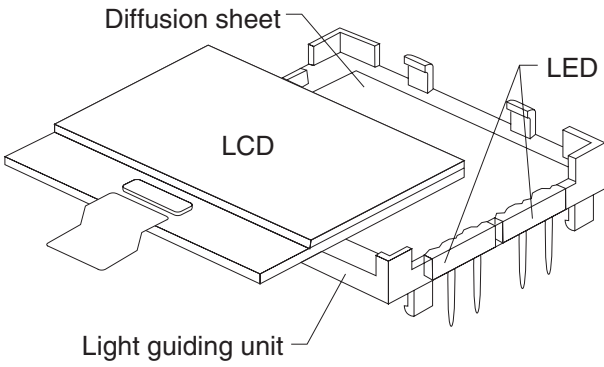
## **LED\*1 BackLight**

LED, EL\*2 and light valves are available for use in backlighting liquid crystal displays, with most portable devices making use of LED.

LED backlights are used for general use due to their simple drive and low cost. Its respective special characteristics are basically as shown below.

\*1 LED : Light Emitting Diode

\*2 EL : Electroluminescence

Item	LED backlight
Features	<ul style="list-style-type: none"> <li>●Low cost</li> <li>●Direct drive with DC power</li> <li>●Noiseless</li> </ul>
Components and basic structure	<ul style="list-style-type: none"> <li>●Light guiding unit (Used also as a frame)</li> <li>●Diffusion sheet</li> <li>●LED</li> </ul> <div style="text-align: center;">  </div>
Emitted colors	Yellow, Green, Red, Orange, Blue, White (Drive conditions vary for blue and white)
Drive conditions	Input voltage : 2.0 - 2.5VDC LED current : 10 - 30 mA/chip
Lifespan	Approx. 50,000 hours

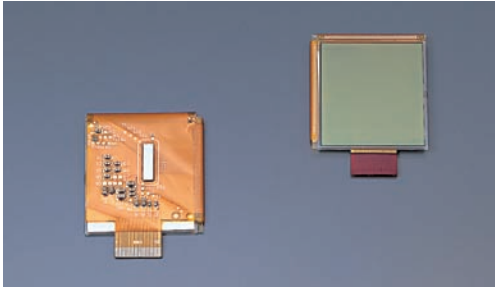
LCD modules installed with backlights are available with components and frame structures which make the most of the respective backlight characteristics.

# High Density Mounting Technology

Various high density mounting technologies and assembly technologies to fit every type of custom specification.

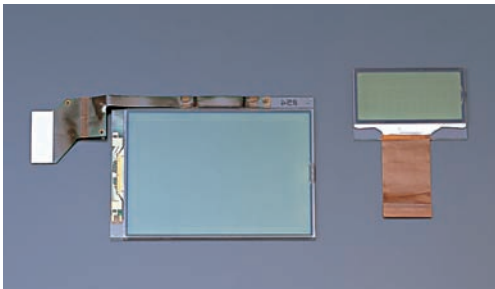
## High Density Mounting Technology

### ● COF Chip on FPC



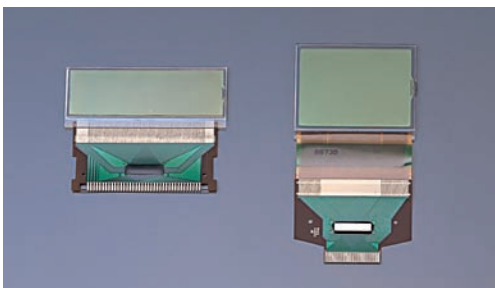
- Module construction suited for the product assembly is available.
- Thin and highly functional modules are made possible by mounting multiple chips onto the FPC.
- We are capable of mounting ICs with more than 500 pins and slim chip ICs.

### ● COG Chip on Glass



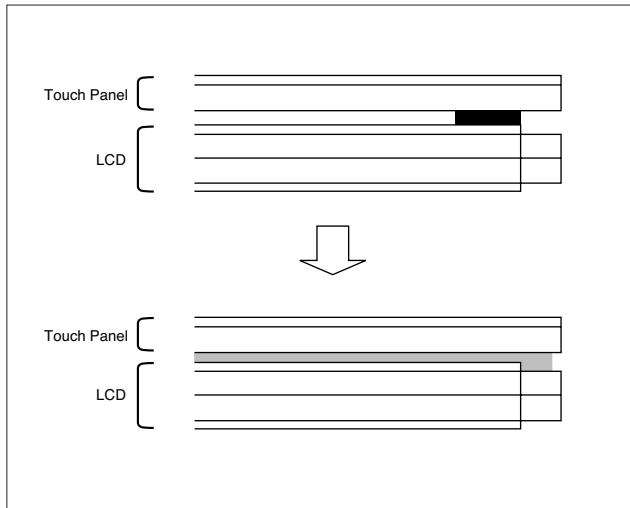
- Bare chip mounting on the LCD glass for extra-thin, extra-small products.
- Connectable with IC chips of 200 or more pins through ACF.
- Fully automated production from parts feeding to LCD inspection.

### ● TAB Tape Automated Bonding



- Supports tape widths of 35mm, 48mm and 70mm.
- We are able to mount ICs with more than 200 pins and slim chip ICs. We also support inner lead pitches as small as 60 $\mu$ m.

### ● One Plate Touch Panel LCD Module



- We are able to integrate the LCD panel and touch panel with our special adhesion technology.
- There is no surface reflection between the LCD panel and touch panel which makes for a clear display image.
- By combining the integrated structure with COG, we are able to produce thin, narrow frame LCD modules with touch panels.

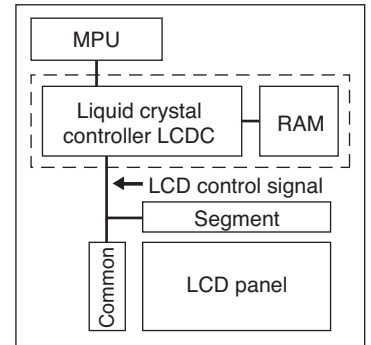
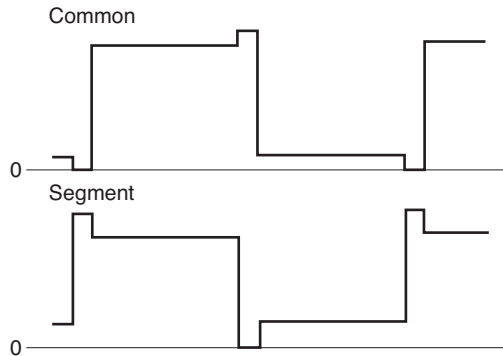
# Low Power Consumption Drive

Low power consumption is demanded for long term portable usage of mobile communication devices. Along with advances being made in low power consumption due to the low voltage of liquid crystals, the drive methods are also continually being improved upon. An outline of all types of drive methods is shown below.

## 1. Ordinary drive methods

### ■Features

- Adaptable to multi-gradation display
- Segment driver is of mid-voltage
- Common driver is of mid-voltage

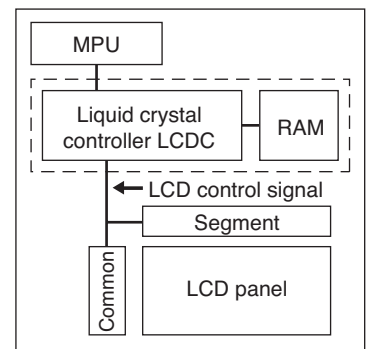
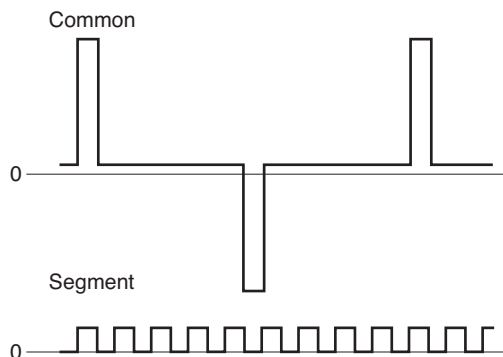


## 2. SA(Smart addressing) drive method

### ■Features

- Adaptable to multi-gradation display
- Low power consumption
- Segment driver is of low-voltage
- Common driver is of high-voltage

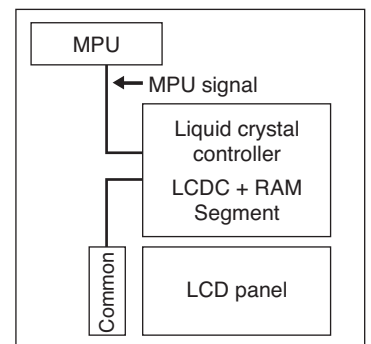
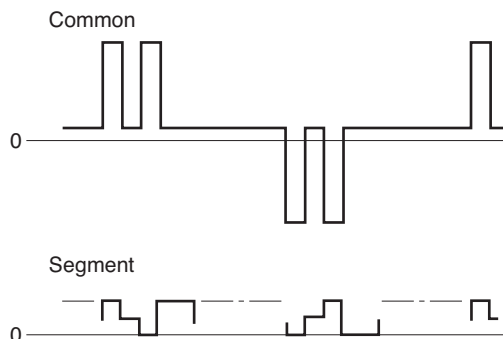
The segment operating voltage is  $2/b$  times and the common operating voltage is  $2(1-1/b)$  times the ordinary drive methods when the bias ratio is set as  $1/b$ .



## 3. MLA(Multi Line Addressing) drive method

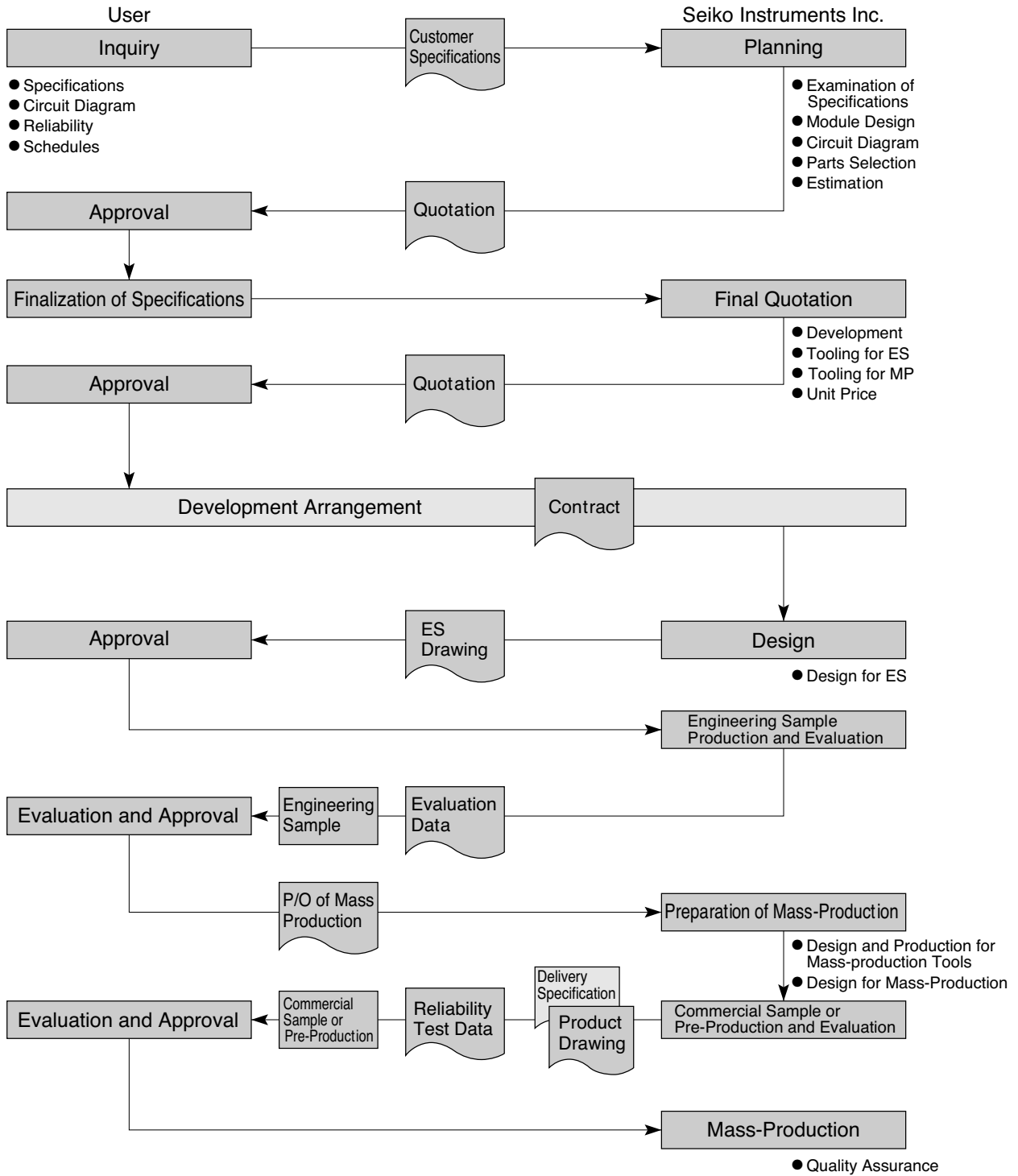
### ■Features

- Low power consumption
  - Segment driver is of low-voltage
  - Common driver is of mid-voltage
- The common drive voltage is  $1/\sqrt{L}$  times and the segment drive voltage is  $\sqrt{L}$  times the SA drive when the number of the simultaneous selection line is set as  $L$ .



# SII's Comprehensive User Response System

Development, design, manufacturing, quality assurance, and service in single package



## Environmental Activities at Seiko Instruments Inc. LCD Display Division

### SII Group Environmental Policy :

#### Environmental Concept

As a good corporate citizen, the SII Group will continue to harmonize its corporate activities with the global environment, protect and improve the environment, and contribute to the establishment of a sustainable society that can coexist with all living things.

SII Display Division is implementing the energy-saving actions, the reduction of waste, the reduction of hazardous materials, the effective use of paper resources and the development of environmental friendly products based on the SII Group Environmental Policy.

### – Six Specific Actions to Protect the Environment from the Display Division of SII –

#### 1. Energy Saving

##### ♣ Energy Saving in Manufacturing Process

Our factories, which manufacture display products, are implementing energy saving procedures in their manufacturing process.

##### ♣ Energy Saving through Low Power Consumption

By design, the Liquid Crystal display is an energy saving product. SII is continuously improving our LCD products for lower current consumption, resulting in further energy saving.

#### 2. Recycle Materials to Reduce Waste Generated

SII factories recycle the glass, which is the main material of LCD. In addition, our factories recycle the etching liquid and water used in manufacturing. We encourage our customers to recycle the packing materials back to us for re-use. Even at our administration offices, we recycle paper and sort our wastes correctly.

#### 3. Chemical Materials Management

SII Display Division has been an industry leader to stop the use of ozone-layer depletion materials :

- SII discontinued specific fluorine in August 1992 ;
- SII discontinued Trichloroethane in November 1993 ;
- SII discontinued organic chloride solvents in March 1999 ;
- SII discontinued alternative fluorine HCFC-141b (a global warming factor gas) in March 2000.

We continuously review our processes to reduce chemical materials which are harmful to our global environment.

#### 4. Manufacturing an Environmentally Friendly Product

Evaluating environmental impact is part of our culture at SII. Before adopting new materials or processes, we make sure the material or process is not using any prohibited or restricted materials.

#### 5. Lead-Free Soldering

Display Division has switched to Pb-free solder in our mounting process of LCD modules. (March 2004)

Although a part of external procurement parts include leaded solder, Display Division promote lead-free with sub-supplier's cooperation.

#### 6. Green Purchase

We promote "Green Purchase" along with "Green Purchase Guideline" . These are two innovative programs established by SII Group.

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TAKUMI, only achieved by the finest artisans and craftsmen in Japan's long history. Based on our 60 years history of precision watch manufacturing, SII embodies TAKUMI as the core of our DNA. Our TAKUMI spirit comes to life in all of our components through lower power consumption, high precision and continuous commitment to challenge and improve.



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